

Design Manual**CMOS Gate Array,
Embedded Array****Package Ver. 4.0**

Target Series**CMOS-N5 Series****CMOS-9HD Series****CMOS-10HD Series****EA-9HD Series**

[MEMO]

NOTES FOR CMOS DEVICES

① VOLTAGE APPLICATION WAVEFORM AT INPUT PIN

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (MAX) and V_{IH} (MIN) due to noise, etc., the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (MAX) and V_{IH} (MIN).

② HANDLING OF UNUSED INPUT PINS

Unconnected CMOS device inputs can be cause of malfunction. If an input pin is unconnected, it is possible that an internal input level may be generated due to noise, etc., causing malfunction. CMOS devices behave differently than Bipolar or NMOS devices. Input levels of CMOS devices must be fixed high or low by using pull-up or pull-down circuitry. Each unused pin should be connected to V_{DD} or GND via a resistor if there is a possibility that it will be an output pin. All handling related to unused pins must be judged separately for each device and according to related specifications governing the device.

③ PRECAUTION AGAINST ESD

A strong electric field, when exposed to a MOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop generation of static electricity as much as possible, and quickly dissipate it when it has occurred. Environmental control must be adequate. When it is dry, a humidifier should be used. It is recommended to avoid using insulators that easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors should be grounded. The operator should be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions need to be taken for PW boards with mounted semiconductor devices.

④ STATUS BEFORE INITIALIZATION

Power-on does not necessarily define the initial status of a MOS device. Immediately after the power source is turned ON, devices with reset functions have not yet been initialized. Hence, power-on does not guarantee output pin levels, I/O settings or contents of registers. A device is not initialized until the reset signal is received. A reset operation must be executed immediately after power-on for devices with reset functions.

⑤ POWER ON/OFF SEQUENCE

In the case of a device that uses different power supplies for the internal operation and external interface, as a rule, switch on the external power supply after switching on the internal power supply. When switching the power supply off, as a rule, switch off the external power supply and then the internal power supply. Use of the reverse power on/off sequences may result in the application of an overvoltage to the internal elements of the device, causing malfunction and degradation of internal elements due to the passage of an abnormal current.

The correct power on/off sequence must be judged separately for each device and according to related specifications governing the device.

⑥ INPUT OF SIGNAL DURING POWER OFF STATE

Do not input signals or an I/O pull-up power supply while the device is not powered. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Input of signals during the power off state must be judged separately for each device and according to related specifications governing the device.

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M8E 02.11-1

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- Device availability
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- Product release schedule
- Availability of related technical literature
- Development environment specifications (for example, specifications for third-party tools and components, host computers, power plugs, AC supply voltages, and so forth)
- Network requirements

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Tel: 6253-8311

J04.1

Major Revisions in This Edition (1/2)

Page	Description
Throughout	Deletion of descriptions of "QFP (fine pitch) with heat spreader"
pp.23 to 38	Modification of configuration and renewal of content in 1.2 Standard (Leaded) Packages
pp.39 to 52	Modification of configuration and renewal of content in 1.3 Lead-free Packages
pp.54, 55	Modification of 2.1.1 CMOS-N5 Series
p.56	Modification of 2.1.2 CMOS-9HD, EA-9HD Series
pp.61, 62	Modification of 2.2.2 CMOS-9HD, EA-9HD Series
pp.66 to 69	Modification of 3.1.1 CMOS-N5 Series
pp.76 to 84	Modification of 3.1.3 CMOS-10HD Series
pp.86 to 91	Modification of 3.2.2 CMOS-9HD, EA-9HD Series
p.92	Modification of 3.2.3 CMOS-10HD Series
pp.94, 95	Addition of 4.1 SSOP
p.97	Addition of 4.2.2 52-pin QFP
p.98	Addition of 4.2.3 100-pin QFP (Correspondence to the replacement of CMOS-6, 6A, 6V)
p.99	Addition of 4.2.4 100-pin QFP (Correspondence to the replacement of CMOS-6S, 6X)
p.117	Addition of 4.6 SDIP
pp.235 to 237	Addition of 4.9.1 80-pin FPBGA
pp.276 to 280	Addition of 4.9.9 303-pin FPBGA
pp.295 to 300	Addition of 4.9.11 393-pin FPBGA
pp.301, 302	Addition of 4.10 FPLGA
pp.303, 304	Addition of 4.11 TFPBGA
p.305	Addition of Note 2 in CHAPTER 5 [DUAL POWER SUPPLY] ASSIGNMENT OF V_{DD}, GND, NC, SCAN PINS
pp.416, 417	Addition of part number in Table 5-10 Correspondence Between Internal Chip Sides and Ball Numbers (108-pin FPBGA) (μ PD65341, 65342, 65345, 65541, 65542, 65545)
pp.421, 422	Addition of Table 5-11 Correspondence Between Internal Chip Sides and Ball Numbers (161-pin FPBGA) (μ PD65346, 65546)
pp.430 to 432	Addition of Table 5-14 Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (μ PD65346, 65347, 65546 65547)
pp.435 to 437	Addition of part number in Table 5-15 Correspondence Between Internal Chip Sides and Ball Numbers (240-pin FPBGA) (μ PD65345, 65346, 65545, 65546)
pp.450 to 454	Addition of Table 5-18 Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (μ PD65347, 65547)
p.455	Modification of Table 6-1 CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65891)
p.456	Modification of Table 6-2 CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65880)
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p.459	Modification of Table 6-8 CMOS-N5 Series Pins That Can Be Used for Oscillators (CPD65884)
p.462	Addition of part number in Table 6-14 CMOS-9HD Series Pins That Can Be Used for Oscillators (μ PD65441, μ PD65941)
p.462	Addition of part number in Table 6-15 CMOS-9HD Series Pins That Can Be Used for Oscillators (μ PD65442, μ PD65942)

Major Revisions in This Edition (2/2)

Page	Description
p.463	Modification of Table 6-16 CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65943, 65443)
p.468	Modification of Table 6-21 CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65949, 65449)
p.474	Addition of Note 2 in CHAPTER 7 PACKAGE DRAWINGS
pp.474, 475	Modification of Table 7-1 List of Package Drawings
p.478	Modification of 7.2.1 44-pin QFP
p.480	Addition of 7.2.3 100-pin QFP
pp.481 to 487	Addition of “fine pitch” in 7.3 QFP (Fine Pitch)
3rd edition p.456	Deletion of 7.1.9 240-pin QFP (Including H/Sp)
3rd edition p.457	Deletion of 7.1.10 240-pin QFP (Stacked H/Sp)
p.489	Modification of 7.4.2 48-pin TQFP (for MP)
p.500	Addition of “for ES, CS” in 7.5.3 144-pin LQFP (for ES, CS)
p.502	Deletion of “for ES, CS” in 7.5.5 160-pin LQFP
3rd edition p.488	Deletion of 7.6.2 73-pin FPBGA
p.524	Modification of 7.8.9 240-pin FPBGA
p.526	Modification of 7.8.11 304-pin FPBGA
p.531	Addition of 7.11 TFPBGA
pp.543, 544	Modification of Table 9-1 CMOS-N5 Series Recommended Soldering Conditions
pp.553 to 556	Modification of Table 9-3 CMOS-10HD Series Recommended Soldering Conditions
pp.557 to 568	Modification of 9.2 Lead-free Packages
p.571	Modification of Table 9-7 List of Soldering Conditions (b) Partial Heating (Pin Temperature: 350°C Max., Time: 3 Sec. Max. (Per Pin Row))

The mark ★ shows major revised points.

To obtain the latest documents when designing, contact an NEC Electronics sales office or a representative.

INTRODUCTION

This manual explains the limits and points to be noted when designing LSIs using NEC Electronics's CMOS gate arrays and embedded arrays.

Thoroughly read this manual to ensure smooth LSI design.

Be sure to observe the items (general items, cautions, and limitations) described in this manual; otherwise, the quality and performance of the LSI may be affected and the operation of the LSI may be abnormal.

Package Names

The following abbreviations are used for the package names in this manual.

Also refer to **1.1 Package Outline**.

Abbreviation	Standard Package Name
QFP	Plastic QFP
PBGA	Plastic BGA
ABGA	Plastic BGA (C/D advanced type) with heat spreader
TBGA	Tape BGA
FPBGA™	Fine pitch plastic BGA
SDIP	Plastic shrink DIP

Regarding Production Lines

The production lines for the CMOS gate array and embedded array products differ in their maximum allowable power consumption, thermal resistance and types of packages. This manual refers to the production lines as follows.

Products for which production lines are not described in the package lists in **CHAPTER 1**:

→ Manufactured on "Line 1"

Products with superscript "Line 2" added in the package lists in **CHAPTER 1**:

→ Manufactured on "Line 2"

Package information (package drawing, maximum allowable power consumption, thermal resistance, etc.) may differ depending on the production line. Please refer to the package lists in **CHAPTER 1** for package types (type and number of pins) and production lines, and find the corresponding package information in each chapter.

The packages manufactured on Line 2 may have different markings depending on the product type, that is CS (ES) or MP. For details, please refer to **CHAPTER 8 PACKAGE MARKINGS**.

Regarding the Order of Masters

Each of the information is described in gate size order, not in master order.

★ Body Thickness of Each Package

The body thickness described in **CHAPTER 1 PACKAGES** in this manual includes the ball thickness.

For details, refer to **CHAPTER 7 PACKAGE DRAWINGS**.

Related Documents

The related documents in this publication may include preliminary versions. However, preliminary versions are not marked as such.

- CMOS-N5 Series Design Manual (A13826E)
- CMOS-9HD Series Design Manual (A12985E)
- EA-9HD Series Design Manual (A13282E)
- CMOS-10HD Series Design Manual (A15308E)
- SEMICONDUCTOR SELECTION GUIDE -Products and Packages- (X13769X)

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CHAPTER 1 PACKAGES

Each Series offer a variety of packages for each master. Base your package selection first on the number of I/O pins in the circuit specification.

Each Series has no input-only or output-only pins. The number of I/O pins and the number of power supply pins differ depending on the master used. In addition, the position of power supply pins and the number of signal pins differ depending on the package, consult NEC Electronics.

1.1 Package Outline

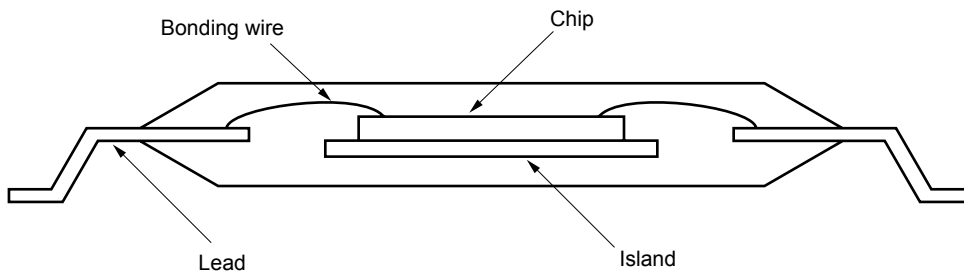
This section outlines the packages covered in this manual.

1.1.1 QFP (Quad Flat Package)

Figure 1-1 shows a cross-section of a normal QFP. In a normal QFP, the chip is placed on a metal plate called an island. The leads and chip are connected by fine bonding wires measuring only several $10\ \mu\text{m}$ in diameter.

In a low thermal resistance type QFP, the lead and island materials have increased thermal dissipation properties. The construction itself is the same as a normal QFP.

Figure 1-1. Cross-section of QFP



1.1.2 PBGA (Plastic Ball Grid Array)

Figure 1-2 shows a cross-section of a PBGA package and Figure 1-3 shows the ball arrangements of a BGA package. PBGA is a basic BGA package that uses a glass epoxy board for the interposer, and a wire bonding method. It has an outstanding cost performance.

Figure 1-2. Cross-section of PBGA

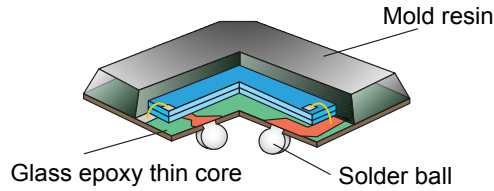
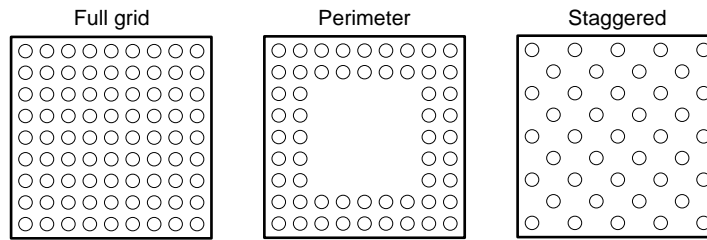


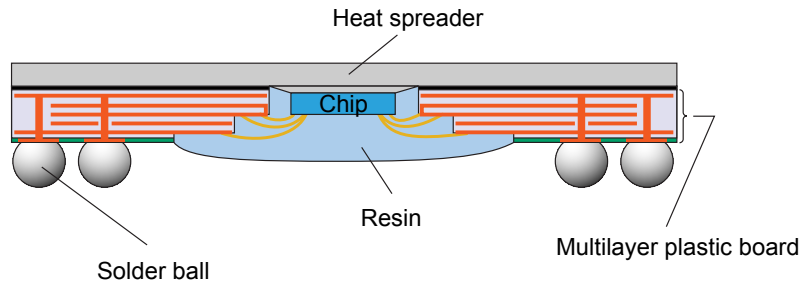
Figure 1-3. Ball Arrangement of BGA Package



1.1.3 ABGA (Advanced BGA)

Figure 1-4 shows a cross-section of an ABGA package. ABGA is a high-performance BGA that uses a multilayer plastic board. It enables a high pin count, and has excellent electrical characteristics and heat dissipation.

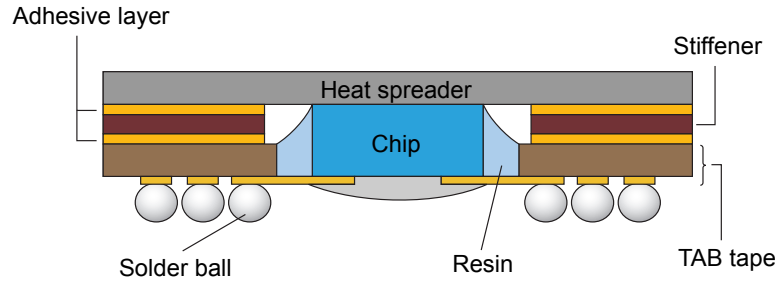
Figure 1-4. Cross-section of ABGA



1.1.4 TBGA (Tape BGA)

Figure 1-5 shows a cross-section of a TBGA package. TBGA is a BGA in which a tape automated bonding (TAB) method is used for the internal connections. It enables a high pin count, and has excellent electrical characteristics and heat dissipation.

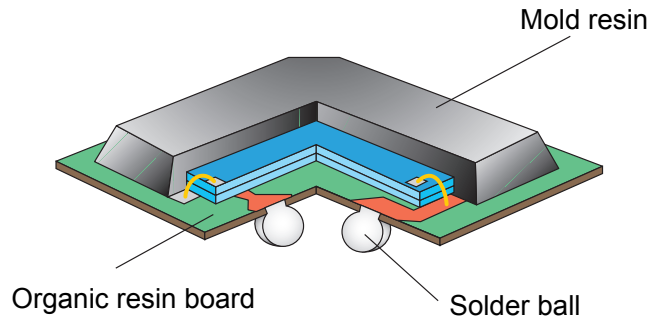
Figure 1-5. Cross-section of TBGA



1.1.5 FPBGA (Fine pitch Plastic BGA)

Figure 1-6 shows a cross-section of a FPBGA package. FPBGA is a basic chip size package (CSP) that uses an organic resin board for the interposer, and a wire bonding method. It provides superior solder connection reliability after being mounted on a motherboard.

Figure 1-6. Cross-section of FPBGA



★ 1.2 Standard (Leaded) Packages

1.2.1 CMOS-N5 Series

Table 1-1. CMOS-N5 Series List of Packages (1/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65891	μ PD65880	μ PD65881	μ PD65892	μ PD65882	μ PD65894	μ PD65883
SSOP	20	0.65	6.65 × 6.1	1.20	√	√	√	–	–	–	–
	30	0.65	9.85 × 6.1	1.20	√	√	√	–	–	–	–
QFP	44 ^{Note 1}	0.8	10 × 10	2.70		√	–	–	–	–	–
	52	1.0	14 × 14	2.70	–	–	–	–	–	–	√
	100 ^{Note 2}	0.65	14 × 20	2.70	–	–	–	–	√	–	–
	100 ^{Note 3}	0.65	14 × 20	2.70	–	–	–	–	√	–	–
QFP ^{Note 4} (fine pitch)	160	0.5	24 × 24	2.70	–	–	–	–	–	–	–
	208	0.5	28 × 28	3.20	–	–	–	–	–	–	–
	240	0.5	32 × 32	3.20	–	–	–	–	–	–	–
	304	0.5	40 × 40	3.70	–	–	–	–	–	–	–
TQFP ^{Note 1}	48 ^{Note 4}	0.5	7 × 7	1.00	√	√	√		√	–	–
	64 ^{Note 4}	0.5	10 × 10	1.00	–	–	√		√		√
	80	0.5	12 × 12	1.00	–	–	–		√		√
	100 ^{Note 4}	0.5	14 × 14	1.00	–	–	–				
	120	0.4	14 × 14	1.00	–	–	–	–	–		
	64	0.65	12 × 12	1.00	–	–	√		√		√
LQFP ^{Note 1}	44	0.8	10 × 10	1.40	–	√	√	–	√	–	√
	100 ^{Note 4}	0.5	14 × 14	1.40	–	–	–	√	√		√
	144 ^{Note 4}	0.5	20 × 20	1.40	–	–	–	–	–	√	√
	160	0.5	24 × 24	1.40	–	–	–	–	–	–	–
PBGA	256	1.27, perimeter	27 × 27	2.13	–	–	–	–	–	–	–
FPBGA ^{Note 1}	61	0.65, perimeter	6 × 6	1.43	–	–	–	–	–	–	–
	73	0.8, perimeter	8 × 8	1.28	–	–	–	–	–	–	–
	80	0.8, perimeter	9 × 9	1.31	–	–	–	–	√	–	√
	108	0.8, perimeter	11 × 11	1.48	–	–	–	–	–	–	–
	144	0.8, perimeter	13 × 13	1.48	–	–	–	–	–	–	–
	160	0.8, perimeter	13 × 13	1.48	–	–	–	–	–	–	–
SDIP	64	1.78	17 × 58	4.05	–	–	√	–	–	–	–
FPLGA	64	0.65	6 × 6	1.13	–	–	–	–	–	–	–
	84	0.65	7.5 × 7.5	1.13	–	–	–	–	–	–	–
	108	0.65	7.5 × 7.5	1.13	–	–	–	–	–	–	–

Notes 1. Line 2

2. Correspondence to the replacement of CMOS-6X, 6S
3. Correspondence to the replacement of CMOS-6, 6A, 6V
4. Low thermal resistance type

Remark √: Available, –: Cannot be used, Blank: Under study

Table 1-1. CMOS-N5 Series List of Packages (2/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65884	μ PD65885	μ PD65887	μ PD65889	μ PD65890	μ PD65893
QFP ^{Note 1} (fine pitch)	160	0.5	24 × 24	2.70	–	√	√	–	–	–
	208	0.5	28 × 28	3.20	–	√	√	√	√	√
	240	0.5	32 × 32	3.20	–	–	√	√	√	√
	304	0.5	40 × 40	3.70	–	–	–	–	√	√
TQFP ^{Note 2}	48 ^{Note 1}	0.5	7 × 7	1.00	–	–	–	–	–	–
	64 ^{Note 1}	0.5	10 × 10	1.00	–	–	–	–	–	–
	80	0.5	12 × 12	1.00				–	–	–
	100 ^{Note 1}	0.5	14 × 14	1.00					–	–
	120	0.4	14 × 14	1.00		–	–	–	–	–
	64	0.65	12 × 12	1.00				–	–	–
LQFP ^{Note 2}	44	0.8	10 × 10	1.40	√	–	–	–	–	–
	100	0.5	14 × 14	1.40	√	√	√	–	–	–
	144 ^{Note 1}	0.5	20 × 20	1.40	√	√	√			√
	160	0.5	24 × 24	1.40	√	–	–	√	√	–
PBGA	256	1.27, perimeter	27 × 27	2.13		–	–	–	–	–
FPBGA ^{Note 2}	80	0.8, perimeter	9 × 9	1.31			–	–	–	–
	108	0.8, perimeter	11 × 11	1.48					–	–
	144	0.8, perimeter	13 × 13	1.48						
	160	0.8, perimeter	13 × 13	1.48						

Notes 1. Low thermal resistance type

2. Line 2

Remark √: Available, –: Cannot be used, Blank: Under study

1.2.2 CMOS-9HD Series

Table 1-2. CMOS-9HD Series List of Packages (1/4)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948
QFP (fine pitch)	100	0.5	14 × 14	1.45	–	–	√	√	√	√	√
	120	0.5	20 × 20	2.70	–	–	–	–	–	√	–
	144	0.5	20 × 20	2.70	–	–	√	√	√	√	√
	160	0.5	24 × 24	2.70	–	–	√	√	√	√	√
	176	0.5	24 × 24	2.70	–	–	–	√	√	√	√
	208	0.5	28 × 28	3.20	–	–	–	–	√	√	√
	240	0.5	32 × 32	3.20	–	–	–	–	–	√	√
	304	0.5	40 × 40	3.70	–	–	–	–	–	–	√
TQFP (fine pitch)	48 ^{Note}	0.5	7 × 7	1.00	√	√	√	–	–	–	–
	64 ^{Note}	0.5	10 × 10	1.00	√	√	√	–	–	–	–
	80	0.5	12 × 12	1.05	–	–	–	–	–	–	–
	80 ^{Note}	0.5	12 × 12	1.00	–	√	√	√	√	√	–
	100	0.5	14 × 14	1.00	–	–	–	–	–	–	√
	100 ^{Note}	0.5	14 × 14	1.00	–	√	√	–	–	–	–
	120	0.4	14 × 14	1.00	–	–	√	–	–	√	–
	120 ^{Note}	0.4	14 × 14	1.00	–	–	√	–	–	–	–
LQFP (fine pitch)	100 ^{Note}	0.5	14 × 14	1.40	–	–	√	√	√	√	√
	144	0.5	20 × 20	1.40	–	–	–	–	–	–	–
	144 ^{Note}	0.5	20 × 20	1.40	–	–	√	√	√	√	√
PBGA	225	1.5, full grid	27 × 27	2.13	–	–	–	–	–	–	–
	256	1.27, perimeter	27 × 27	2.13	–	–	–	–	–	–	√
	272	1.27, perimeter	27 × 27	2.13	–	–	–	–	–	–	√
	313	1.27, staggered	35 × 35	2.33	–	–	–	–	–	–	–
	352	1.27, perimeter	35 × 35	2.33	–	–	–	–	–	–	–

Note Line 2

Remark √: Available, –: Cannot be used, Blank: Under study

Table 1-2. CMOS-9HD Series List of Packages (2/4)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948
FPBGA	108	0.8, perimeter	11 × 11	1.51	–	–					
	108 ^{Note}	0.8, perimeter	11 × 11	1.48	–	–	√	√			√
	144	0.8, perimeter	13 × 13	1.51	–	–					
	144 ^{Note}	0.8, perimeter	13 × 13	1.48	–	–				√	√
	160	0.8, perimeter	13 × 13	1.51	–	–	–				
	160 ^{Note}	0.8, perimeter	13 × 13	1.48	–	–	–			√	
	161 ^{Note}	0.65, perimeter	10 × 10	1.43	–	–	√				
	176	0.8, perimeter	15 × 15	1.51	–	–	–				
	176 ^{Note}	0.8, perimeter	15 × 15	1.48	–	–	–	√	√	√	√
	208	0.8, perimeter	15 × 15	1.51	–	–	–	–	–	–	
	208 ^{Note}	0.8, perimeter	15 × 15	1.48	–	–	–	–	√	√	√
	240	0.8, perimeter	19 × 19	1.51	–	–	–	–	–	–	–
	240 ^{Note}	0.8, perimeter	19 × 19	1.48	–	–	–	–	–	√	–
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	–	–	–	–	–	√	√
	352	1.27, perimeter	35 × 35	1.40	–	–	–	–	–	–	–
	420	1.27, perimeter	35 × 35	1.40	–	–	–	–	–	–	–
	500	1.27, perimeter	40 × 40	1.40	–	–	–	–	–	–	–
	576	1.27, perimeter	40 × 40	1.40	–	–	–	–	–	–	–
	696	1.0, perimeter	40 × 40	1.40	–	–	–	–	–	–	–
ABGA	672	1.27, perimeter	45 × 45	2.48	–	–	–	–	–	–	–
FPLGA	64	0.65	6 × 6	1.13	–	–	√	–	–	–	–
	84	0.65	7.5 × 7.5	1.13	–	–					–
	108	0.65	7.5 × 7.5	1.13	–	–					–
TFPBGA	65	0.5	6 × 6	0.83	–	–		–	–	–	–

Note Line 2

Remark √: Available, –: Cannot be used, Blank: Under study

Table 1-2. CMOS-9HD Series List of Packages (3/4)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65949	μ PD65951	μ PD65954	μ PD65956	μ PD65958
						μ PD65961	μ PD65964	μ PD65966	μ PD65968
QFP (fine pitch)	100	0.5	14 × 14	1.45	√	√	√	–	–
	120	0.5	20 × 20	2.70	–	–	–	–	–
	144	0.5	20 × 20	2.70	√	√	–	–	–
	160	0.5	24 × 24	2.70	√	√	√	√	–
	176	0.5	24 × 24	2.70	–	–	–	–	–
	208	0.5	28 × 28	3.20	√	√	√	√	√
	240	0.5	32 × 32	3.20	√	√	√	√	√
	304	0.5	40 × 40	3.70	√	√	√	√	√
TQFP ^{Note} (fine pitch)	48	0.5	7 × 7	1.00	–	–	–	–	–
	64	0.5	10 × 10	1.00	–	–	–	–	–
	80	0.5	12 × 12	1.05	–	–	–	–	–
	100	0.5	14 × 14	1.00	√	–	–	–	–
	120	0.4	14 × 14	1.00	√	–	–	–	–
LQFP (fine pitch)	100 ^{Note}	0.5	14 × 14	1.40	–	–	√	–	–
	144	0.5	20 × 20	1.40	√	–	–	–	–
	144 ^{Note}	0.5	20 × 20	1.40	√	–	–	–	–
PBGA	225	1.5, full grid	27 × 27	2.13	–	–	–	–	–
	256	1.27, perimeter	27 × 27	2.13	√	√	√	–	–
	272	1.27, perimeter	27 × 27	2.13	√	√	–	–	–
	313	1.27, staggered	35 × 35	2.33	√	√	–	–	–
	352	1.27, perimeter	35 × 35	2.33	√	√	√	√	√
FPBGA	108	0.8, perimeter	11 × 11	1.51	–	–	–	–	–
	144	0.8, perimeter	13 × 13	1.51	√	–	–	–	–
	160	0.8, perimeter	13 × 13	1.51	√	–	–	–	–
	176	0.8, perimeter	15 × 15	1.51	–	–	√	√	–
	208	0.8, perimeter	15 × 15	1.51	–	–	–	–	–
	208 ^{Note}	0.8, perimeter	15 × 15	1.51	√	√	–	–	–
	240	0.8, perimeter	19 × 19	1.51	–	–	–	–	–
	303 ^{Note}	0.65, perimeter	16 × 16	1.43	–	–	–	√	–
	304	0.8, perimeter	19 × 19	1.51	–	–	–	–	–
	393 ^{Note}	0.65, perimeter	16 × 16	1.39	√	–	–	–	–
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	√	√	–	–	–
	352	1.27, perimeter	35 × 35	1.40	√	√	√	√	–
	420	1.27, perimeter	35 × 35	1.40	–	√	√	√	√
	500	1.27, perimeter	40 × 40	1.40	–	–	√	√	√
	576	1.27, perimeter	40 × 40	1.40	–	–	–	√	√
	696	1.0, perimeter	40 × 40	1.40	–	–	–	–	√
ABGA	672	1.27, perimeter	45 × 45	2.48	–	–	–	–	√

Note Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-2. CMOS-9HD Series List of Packages (4/4)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65969	μ PD65970	μ PD65971
QFP (fine pitch)	100	0.5	14 × 14	1.45	–	–	–
	120	0.5	20 × 20	2.70	–	–	–
	144	0.5	20 × 20	2.70	–	–	–
	160	0.5	24 × 24	2.70	–	–	–
	176	0.5	24 × 24	2.70	–	–	–
	208	0.5	28 × 28	3.20			
	240	0.5	32 × 32	3.20			
	304	0.5	40 × 40	3.70			
TQFP (fine pitch)	48	0.5	7 × 7	1.00	–	–	–
	64	0.5	10 × 10	1.00	–	–	–
	80	0.5	12 × 12	1.05	–	–	–
	100	0.5	14 × 14	1.00	–	–	–
	120	0.4	14 × 14	1.00	–	–	–
LQFP (fine pitch)	144	0.5	20 × 20	1.40	–	–	–
PBGA	225	1.5, full grid	27 × 27	2.13	–	–	–
	256	1.27, perimeter	27 × 27	2.13	–	–	–
	272	1.27, perimeter	27 × 27	2.13	–	–	–
	313	1.27, staggered	35 × 35	2.33	–	–	–
	352	1.27, perimeter	35 × 35	2.33	–	–	–
FPBGA	108	0.8, perimeter	11 × 11	1.51	–	–	–
	144	0.8, perimeter	13 × 13	1.51	–	–	–
	160	0.8, perimeter	13 × 13	1.51	–	–	–
	176	0.8, perimeter	15 × 15	1.51	–	–	–
	208	0.8, perimeter	15 × 15	1.51	–	–	–
	240	0.8, perimeter	19 × 19	1.51	–	–	–
	304	0.8, perimeter	19 × 19	1.51	–	–	–
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	–	–	–
	352	1.27, perimeter	35 × 35	1.40			
	420	1.27, perimeter	35 × 35	1.40	√	√	√
	500	1.27, perimeter	40 × 40	1.40	√	√	√
	576	1.27, perimeter	40 × 40	1.40	√		
	696	1.0, perimeter	40 × 40	1.40			
ABGA	672	1.27, perimeter	45 × 45	2.48			

Remark √: Available, –: Cannot be used, Blank: Under study

1.2.3 EA-9HD Series

Table 1-3. EA-9HD Series List of Packages (1/4)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448
QFP (fine pitch)	100	0.5	14 × 14	1.45	–	–					
	120	0.5	20 × 20	2.70	–	–	–	–	–		–
	144	0.5	20 × 20	2.70	–	–	√	√	√	√	√
	160	0.5	24 × 24	2.70	–	–	√	√	√	√	√
	176	0.5	24 × 24	2.70	–	–	–				
	208	0.5	28 × 28	3.20	–	–	–	–	√	√	√
	240	0.5	32 × 32	3.20	–	–	–	–	–	√	√
	304	0.5	40 × 40	3.70	–	–	–	–	–	–	
TQFP (fine pitch)	48 ^{Note}	0.5	7 × 7	1.00	√	–	√	–	–	–	–
	64	0.5	10 × 10	1.00	–	–		–	–	–	–
	64 ^{Note}	0.5	10 × 10	1.00	–	–	√	–	–	–	–
	80	0.5	12 × 12	1.05	–	–					–
	80 ^{Note}	0.5	12 × 12	1.00	–	–	√	√	√	√	–
	100 ^{Note}	0.5	14 × 14	1.00	–	√					√
	120	0.4	14 × 14	1.00	–	–				√	
	120 ^{Note}	0.4	14 × 14	1.00	–	–	√	–	–		
LQFP ^{Note} (fine pitch)	100	0.5	20 × 20	1.40	–	–	√	√	√	√	√
	144	0.5	20 × 20	1.40	–	–	√		√	√	√
PBGA	225	1.5, full grid	27 × 27	2.13	–	–	–	–	–		
	256	1.27, perimeter	27 × 27	2.13	–	–	–	–	–	–	√
	272	1.27, perimeter	27 × 27	2.13	–	–	–	–	–	–	
	313	1.27, staggered	35 × 35	2.33	–	–	–	–	–	–	
	352	1.27, perimeter	35 × 35	2.33	–	–	–	–	–	–	–

Note Line 2

Remark √: Available, –: Cannot be used, Blank: Under study

Table 1-3. EA-9HD Series List of Packages (2/4)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65441	μ D65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448
FPBGA	108	0.8, perimeter	11 × 11	1.51	–	–					
	108 ^{Note}	0.8, perimeter	11 × 11	1.48	–	–	√	√			
	109 ^{Note}	0.8, perimeter	11 × 11	1.48	–	–				√	
	144	0.8, perimeter	13 × 13	1.51	–	–					
	160	0.8, perimeter	13 × 13	1.51	–	–	–				
	160 ^{Note}	0.8, perimeter	13 × 13	1.48	–	–	–			√	
	176	0.8, perimeter	15 × 15	1.51	–	–	–				
	176 ^{Note}	0.8, perimeter	15 × 15	1.48	–	–	–	√		√	√
	208	0.8, perimeter	15 × 15	1.51	–	–					
	208 ^{Note}	0.8, perimeter	15 × 15	1.48	–	–	–	–	√		–
	240	0.8, perimeter	19 × 19	1.51	–	–	–	–	–	–	–
	240 ^{Note}	0.8, perimeter	19 × 19	1.48	–	–				√	
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	–	–	–	–	–	√	√
	352	1.27, perimeter	35 × 35	1.40	–	–	–	–	–	–	–
	420	1.27, perimeter	35 × 35	1.40	–	–	–	–	–	–	–
	500	1.27, perimeter	40 × 40	1.40	–	–	–	–	–	–	–
	576	1.27, perimeter	40 × 40	1.40	–	–	–	–	–	–	–
	696	1.0, perimeter	40 × 40	1.40	–	–	–	–	–	–	–
ABGA	672	1.27, perimeter	45 × 45	2.48	–	–	–	–	–	–	–
FPLGA	64	0.65	6 × 6	1.13	–	–		–	–	–	–
	84	0.65	7.5 × 7.5	1.13	–	–					–
	108	0.65	7.5 × 7.5	1.13	–	–					–
TFPBGA	65	0.5	6 × 6	0.83	–	–	√	–	–	–	–

Note Line 2

Remark √: Available, –: Cannot be used, Blank: Under study

Table 1-3. EA-9HD Series List of Packages (3/4)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65449	μ PD65451	μ PD65454	μ PD65456	μ PD65458
						μ PD65461	μ PD65464	μ PD65466	μ PD65468
QFP (fine pitch)	100	0.5	14 × 14	1.45			√ ^{Note 1}	–	–
	120	0.5	20 × 20	2.70	–	–	–	–	–
	144	0.5	20 × 20	2.70	√	√	√	–	–
	160	0.5	24 × 24	2.70	√	√	√	√	–
	176	0.5	24 × 24	2.70					–
	208	0.5	28 × 28	3.20	√	√	√	√	√
	240	0.5	32 × 32	3.20	√	√	√	√	√
	304	0.5	40 × 40	3.70		√	√ ^{Note 1}	√	√
TQFP ^{Note 2} (fine pitch)	48	0.5	7 × 7	1.00	–	–	–	–	–
	64	0.5	10 × 10	1.00	–	–	–	–	–
	80	0.5	12 × 12	1.05	–	–	–	–	–
	100	0.5	14 × 14	1.00	√	–	–	–	–
	120	0.4	14 × 14	1.00		–	–	–	–
LQFP (fine pitch)	100 ^{Note 2}	0.5	14 × 14	1.40	–	–	√	–	–
	144	0.5	20 × 20	1.40		–	–	–	–
	144 ^{Note 2}	0.5	20 × 20	1.40	√	–	–	–	–
PBGA	225	1.5, full grid	27 × 27	2.13					–
	256	1.27, perimeter	27 × 27	2.13	√	√	√		–
	272	1.27, perimeter	27 × 27	2.13	√	√			–
	313	1.27, staggered	35 × 35	2.33	√	√			
	352	1.27, perimeter	35 × 35	2.33	√	√	√	√	√
FPBGA	108	0.8, perimeter	11 × 11	1.51	–	–	–	–	–
	144	0.8, perimeter	13 × 13	1.51			–	–	–
	160	0.8, perimeter	13 × 13	1.51			–	–	–
	176	0.8, perimeter	15 × 15	1.51					–
	208	0.8, perimeter	15 × 15	1.51					–
	208 ^{Note 2}	0.8, perimeter	15 × 15	1.51	√	√			–
	240	0.8, perimeter	19 × 19	1.51	–	–			
	303 ^{Note 2}	0.65, perimeter	16 × 16	1.43	–	–	–	√	–
	304	0.8, perimeter	19 × 19	1.51	–	–	–	–	
393 ^{Note 2}	0.65, perimeter	16 × 16	1.39		–	–	–	–	
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	√	√		–	–
	352	1.27, perimeter	35 × 35	1.40	√	√	√	√	
	420	1.27, perimeter	35 × 35	1.40	–	√	√	√	√
	500	1.27, perimeter	40 × 40	1.40	–	–	√	√	√
	576	1.27, perimeter	40 × 40	1.40	–	–	–	√	√
	696	1.0, perimeter	40 × 40	1.40	–	–	–	–	√
ABGA	672	1.27, perimeter	45 × 45	2.48	–	–	–	–	

Notes 1. 4-layer product is under study.

2. Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-3. EA-9HD Series List of Packages (4/4)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65469	μ PD65470	μ PD65471
QFP (fine pitch)	100	0.5	14 × 14	1.45	–	–	–
	120	0.5	20 × 20	2.70	–	–	–
	144	0.5	20 × 20	2.70	–	–	–
	160	0.5	24 × 24	2.70	–	–	–
	176	0.5	24 × 24	2.70	–	–	–
	208	0.5	28 × 28	3.20			
	240	0.5	32 × 32	3.20			
	304	0.5	40 × 40	3.70			
TQFP (fine pitch)	48	0.5	7 × 7	1.00	–	–	–
	64	0.5	10 × 10	1.00	–	–	–
	80	0.5	12 × 12	1.05	–	–	–
	100	0.5	14 × 14	1.00	–	–	–
	120	0.4	14 × 14	1.00	–	–	–
LQFP (fine pitch)	144	0.5	20 × 20	1.40	–	–	–
PBGA	225	1.5, full grid	27 × 27	2.13	–	–	–
	256	1.27, perimeter	27 × 27	2.13	–	–	–
	272	1.27, perimeter	27 × 27	2.13	–	–	–
	313	1.27, staggered	35 × 35	2.33	–	–	–
	352	1.27, perimeter	35 × 35	2.33	–	–	–
FPBGA	108	0.8, perimeter	11 × 11	1.51	–	–	–
	144	0.8, perimeter	13 × 13	1.51	–	–	–
	160	0.8, perimeter	13 × 13	1.51	–	–	–
	176	0.8, perimeter	15 × 15	1.51	–	–	–
	208	0.8, perimeter	15 × 15	1.51	–	–	–
	240	0.8, perimeter	19 × 19	1.51	–	–	–
	304	0.8, perimeter	19 × 19	1.51	–	–	–
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	–	–	–
	352	1.27, perimeter	35 × 35	1.40			
	420	1.27, perimeter	35 × 35	1.40	√	√	√
	500	1.27, perimeter	40 × 40	1.40	√	√	√
	576	1.27, perimeter	40 × 40	1.40	√		
	696	1.0, perimeter	40 × 40	1.40			
ABGA	672	1.27, perimeter	45 × 45	2.48			

Remark √: Available, –: Cannot be used, Blank: Under study

1.2.4 CMOS-10HD Series

Table 1-4. CMOS-10HD Series List of Packages (1/10)

(a) Single power supply (1/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65301	μ PD65302	μ PD65303	μ PD65304	μ PD65305
					μ PD65501	μ PD65502	μ PD65503	μ PD65504	μ PD65505
QFP (fine pitch)	144	0.5	20 × 20	2.70	–				
	160	0.5	24 × 24	2.70	–				
	208	0.5	28 × 28	3.20	–	–			
	240	0.5	32 × 32	3.20	–	–	–		
	304	0.5	40 × 40	3.70	–	–	–	–	–
TQFP ^{Note}	48	0.5	7 × 7	1.00	√	–	–	–	–
	64	0.5	10 × 10	1.00	–			–	–
	80	0.5	12 × 12	1.00	–				
	120	0.4	14 × 14	1.00	–	–	–		
LQFP ^{Note}	44	0.8	10 × 10	1.40					–
	100	0.5	14 × 14	1.40	–	–	–		
	144	0.5	20 × 20	1.40	–		–		
FPBGA	61 ^{Note}	0.65, perimeter	6 × 6	1.43		–	–	–	–
	108 ^{Note}	0.8, perimeter	11 × 11	1.48					
	144 ^{Note}	0.8, perimeter	13 × 13	1.48	–				
	160	0.8, perimeter	13 × 13	1.51	–				
	208	0.8, perimeter	15 × 15	1.51	–	–	–		
	240	0.8, perimeter	19 × 19	1.51	–	–	–		
	240 ^{Note}	0.8, perimeter	19 × 19	1.48	–	–	–		
	304 ^{Note}	0.8, perimeter	19 × 19	1.48	–	–	–	–	
	393 ^{Note}	0.65, perimeter	16 × 16	1.39	–	–	–	–	–
PBGA	256	1.27, perimeter	27 × 27	2.13	–	–	–		
	313	1.27, staggered	35 × 35	2.33	–	–	–	–	–
	352	1.27, perimeter	35 × 35	2.33	–	–	–	–	–
FPLGA	64	0.65	6 × 6	1.13		–	–	–	–
	84	0.65	7.5 × 7.5	1.13					–
	108	0.65	7.5 × 7.5	1.13					–

Note Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-4. CMOS-10HD Series List of Packages (2/10)

(a) Single power supply (2/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65306	μ PD65307	μ PD65308	μ PD65309	μ PD65310	μ PD65311
					μ PD65506	μ PD65507	μ PD65508	μ PD65509	μ PD65510	μ PD65511
QFP (fine pitch)	144	0.5	20 × 20	2.70						
	160	0.5	24 × 24	2.70					√	
	208	0.5	28 × 28	3.20						
	240	0.5	32 × 32	3.20						
	304	0.5	40 × 40	3.70	–					
TQFP ^{Note}	48	0.5	7 × 7	1.00	–	–	–	–	–	–
	64	0.5	10 × 10	1.00	–	–	–	–	–	–
	80	0.5	12 × 12	1.00				–	–	–
	120	0.4	14 × 14	1.00					–	–
LQFP ^{Note}	44	0.8	10 × 10	1.40	–	–	–	–	–	–
	100	0.5	14 × 14	1.40					–	–
	144	0.5	20 × 20	1.40						
FPBGA	108 ^{Note}	0.8, perimeter	11 × 11	1.48		–	–	–	–	–
	144 ^{Note}	0.8, perimeter	13 × 13	1.48			–	–	–	–
	160 ^{Note}	0.8, perimeter	13 × 13	1.48					–	–
	161 ^{Note}	0.65, perimeter	10 × 10	1.43		–	–	–	–	–
	208 ^{Note}	0.8, perimeter	15 × 15	1.48						–
	240	0.8, perimeter	19 × 19	1.51						
	240 ^{Note}	0.8, perimeter	19 × 19	1.48						
	304 ^{Note}	0.8, perimeter	19 × 19	1.48						
	393 ^{Note}	0.65, perimeter	16 × 16	1.39	–				–	–
PBGA	256	1.27, perimeter	27 × 27	2.13						–
	313	1.27, staggered	35 × 35	2.33						
	352	1.27, perimeter	35 × 35	2.33						

Note Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-4. CMOS-10HD Series List of Packages (3/10)

(a) Single power supply (3/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65321	μ PD65322	μ PD65323
					μ PD65521	μ PD65522	μ PD65523
TQFP ^{Note}	64	0.5	10 × 10	1.00		–	–
	80	0.5	12 × 12	1.00		–	–
	100	0.5	14 × 14	1.00			
	120	0.4	14 × 14	1.00	–		
LQFP ^{Note}	100	0.5	14 × 14	1.40			
	144	0.5	20 × 20	1.40	–	–	

Note Line 2

Remarks 1. \checkmark : Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-4. CMOS-10HD Series List of Packages (4/10)

(b) Single power supply, dedicated TBGA package (1/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65324	μ PD65325	μ PD65326	μ PD65327	μ PD65328
					μ PD65524	μ PD65525	μ PD65526	μ PD65527	μ PD65528
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40					
	352	1.27, perimeter	35 × 35	1.40	–	–			
	420	1.27, perimeter	35 × 35	1.40	–	–	–		
	500	1.27, perimeter	40 × 40	1.40	–	–	–	–	
	576	1.27, perimeter	40 × 40	1.40	–	–	–	–	–

Remarks 1. \checkmark : Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-4. CMOS-10HD Series List of Packages (5/10)

(b) Single power supply, dedicated TBGA package (2/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65329	μ PD65330	μ PD65331
					μ PD65529	μ PD65530	μ PD65531
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40			
	352	1.27, perimeter	35 × 35	1.40			
	420	1.27, perimeter	35 × 35	1.40			
	500	1.27, perimeter	40 × 40	1.40			
	576	1.27, perimeter	40 × 40	1.40			

Remarks 1. \checkmark : Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-4. CMOS-10HD Series List of Packages (6/10)

(c) Dual power supply (1/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65341	μ PD65342	μ PD65343	μ PD65344	μ PD65345
					μ PD65541	μ PD65542	μ PD65543	μ PD65544	μ PD65545
QFP (fine pitch)	144	0.5	20 × 20	2.70	–	√			
	160	0.5	24 × 24	2.70	–	√			
	208	0.5	28 × 28	3.20	–	–		√	
	240	0.5	32 × 32	3.20	–	–	–		
	304	0.5	40 × 40	3.70	–	–	–	–	–
TQFP ^{Note}	48	0.5	7 × 7	1.00		–	–	–	–
	64	0.5	10 × 10	1.00	–			–	–
	80	0.5	12 × 12	1.00	–				
	120	0.4	14 × 14	1.00	–	–	–		
LQFP ^{Note}	44	0.8	10 × 10	1.40					–
	100	0.5	14 × 14	1.40	–	–	–	√	
	144	0.5	20 × 20	1.40	–		–	√	√
FPBGA	61 ^{Note}	0.65, perimeter	6 × 6	1.43		–	–	–	–
	108 ^{Note}	0.8, perimeter	11 × 11	1.48	√	√			√
	144 ^{Note}	0.8, perimeter	13 × 13	1.48	–				
	160 ^{Note}	0.8, perimeter	13 × 13	1.48	–				
	161 ^{Note}	0.65, perimeter	10 × 10	1.43	–				
	208 ^{Note}	0.8, perimeter	15 × 15	1.48	–	–		√	√
	240	0.8, perimeter	19 × 19	1.51	–	–	–		√
	240 ^{Note}	0.8, perimeter	19 × 19	1.48	–	–	–		√
	304 ^{Note}	0.8, perimeter	19 × 19	1.48	–	–	–	–	
	393 ^{Note}	0.65, perimeter	16 × 16	1.39	–	–	–	–	–
PBGA	256	1.27, perimeter	27 × 27	2.13	–	–	–	–	–
	313	1.27, staggered	35 × 35	2.33	–	–	–	–	–
	352	1.27, perimeter	35 × 35	2.33	–	–	–	–	–
FPLGA	64	0.65	6 × 6	1.13		–	–	–	–
	84	0.65	7.5 × 7.5	1.13					–
	108	0.65	7.5 × 7.5	1.13					–

Note Line 2**Remarks 1.** √: Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-4. CMOS-10HD Series List of Packages (7/10)

(c) Dual power supply (2/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65346	μ PD65347	μ PD65348	μ PD65349	μ PD65350	μ PD65351
					μ PD65546	μ PD65547	μ PD65548	μ PD65549	μ PD65550	μ PD65551
QFP (fine pitch)	144	0.5	20 × 20	2.70						
	160	0.5	24 × 24	2.70						
	208	0.5	28 × 28	3.20			√			
	240	0.5	32 × 32	3.20				√		
	304	0.5	40 × 40	3.70	–	√				
TQFP	48	0.5	7 × 7	1.00	–	–	–	–	–	–
	64	0.5	10 × 10	1.00	–	–	–	–	–	–
	80	0.5	12 × 12	1.00						
	120	0.4	14 × 14	1.00						
LQFP	44	0.8	10 × 10	1.40	–	–	–	–	–	–
	100	0.5	14 × 14	1.40	√	√	√	√		
	144	0.5	20 × 20	1.40	√					
FPBGA	61 ^{Note}	0.65, perimeter	6 × 6	1.43	–	–	–	–	–	–
	108 ^{Note}	0.8, perimeter	11 × 11	1.48		–	–	–	–	–
	144 ^{Note}	0.8, perimeter	13 × 13	1.48			–	–	–	–
	160 ^{Note}	0.8, perimeter	13 × 13	1.48				√	–	–
	161 ^{Note}	0.65, perimeter	10 × 10	1.43	√	–	–	–	–	–
	208 ^{Note}	0.8, perimeter	15 × 15	1.48						–
	240	0.8, perimeter	19 × 19	1.51	√	√				
	240 ^{Note}	0.8, perimeter	19 × 19	1.48	√					
	304 ^{Note}	0.8, perimeter	19 × 19	1.48				√	√	
	393 ^{Note}	0.65, perimeter	16 × 16	1.39	–	√			–	–
PBGA	256	1.27, perimeter	27 × 27	2.13	√					–
	313	1.27, staggered	35 × 35	2.33						
	352	1.27, perimeter	35 × 35	2.33						

Note Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-4. CMOS-10HD Series List of Packages (8/10)

(c) Dual power supply (3/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65361	μ PD65362	μ PD65363
					μ PD65561	μ PD65562	μ PD65563
TQFP ^{Note}	64	0.5	10 × 10	1.00	√	–	–
	80	0.5	12 × 12	1.00		–	–
	100	0.5	14 × 14	1.00			
	120	0.4	14 × 14	1.00	–		
LQFP ^{Note}	100	0.5	14 × 14	1.40			√
	144	0.5	20 × 20	1.40	–	–	

Note Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-4. CMOS-10HD Series List of Packages (9/10)

(d) Dual power supply, dedicated TBGA package (1/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65364	μ PD65365	μ PD65366	μ PD65367	μ PD65368
					μ PD65564	μ PD65565	μ PD65566	μ PD65567	μ PD65568
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40					
	352	1.27, perimeter	35 × 35	1.40	–	–	√	√	√
	420	1.27, perimeter	35 × 35	1.40	–	–	–	√	√
	500	1.27, perimeter	40 × 40	1.40	–	–	–	–	√
	576	1.27, perimeter	40 × 40	1.40	–	–	–	–	–

Remarks 1. √: Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-4. CMOS-10HD Series List of Packages (10/10)

(d) Dual power supply, dedicated TBGA package (2/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65369	μ PD65370	μ PD65371
					μ PD65569	μ PD65570	μ PD65571
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40			
	352	1.27, perimeter	35 × 35	1.40	√	√	√
	420	1.27, perimeter	35 × 35	1.40	√		
	500	1.27, perimeter	40 × 40	1.40	√	√	√
	576	1.27, perimeter	40 × 40	1.40	√		

Remarks 1. √: Available, –: Cannot be used, Blank: Under study

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

★ 1.3 Lead-free Packages

1.3.1 CMOS-N5 Series

Caution If you need the latest information, please contact NEC Electronics.

Table 1-5. CMOS-N5 Series List of Packages (1/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μPD65891	μPD65880	μPD65881	μPD65892	μPD65882	μPD65894	μPD65883
SSOP	20	0.65	6.65 × 6.1	1.20	√	√	√	–	–	–	–
	30	0.65	9.85 × 6.1	1.20	√	√	√	–	–	–	–
QFP	44 ^{Note 1}	0.8	10 × 10	2.70	√	√	–	–	–	–	–
	52	1.0	14 × 14	2.70	–	–	–	–	–	–	–
	64	1.0	14 × 20	2.70	–	–	–	–	√	–	–
	100 ^{Note 2}	0.65	14 × 20	2.70	–	–	–	–	√	–	–
	100 ^{Note 3}	0.65	14 × 20	2.70	–	–	–	–	√	–	–
QFP ^{Note 4} (fine pitch)	160	0.5	24 × 24	2.70	–	–	–	–	–	–	–
	208	0.5	28 × 28	3.20	–	–	–	–	–	–	–
	240	0.5	32 × 32	3.20	–	–	–	–	–	–	–
	304	0.5	40 × 40	3.70	–	–	–	–	–	–	–
TQFP ^{Note 1}	48 ^{Note 4}	0.5	7 × 7	1.00	√	√	√	–	–	–	–
	64 ^{Note 4}	0.5	10 × 10	1.00	–	–	√	–	√	–	√
	80	0.5	12 × 12	1.00	–	–	–	–	√	–	√
	100 ^{Note 4}	0.5	14 × 14	1.00	–	–	–	–	–	–	–
	120	0.4	14 × 14	1.00	–	–	–	–	–	–	–
	64	0.65	12 × 12	1.00	–	–	√	–	–	–	–
LQFP ^{Note 1}	44	0.8	10 × 10	1.40	–	√	√	–	√	–	√
	100 ^{Note 4}	0.5	14 × 14	1.40	–	–	–	√	√	–	√
	144 ^{Note 4}	0.5	20 × 20	1.40	–	–	–	–	–	–	√
	160	0.5	24 × 24	1.40	–	–	–	–	–	–	–
PBGA	256	1.27, perimeter	27 × 27	2.13	–	–	–	–	–	–	–
FPBGA ^{Note 1}	61	0.65, perimeter	6 × 6	1.43	–	–	–	–	–	–	–
	80	0.8, perimeter	9 × 9	1.48	–	–	–	–	√	–	√
	108	0.8, perimeter	11 × 11	1.48	–	–	–	–	–	–	–
	144	0.8, perimeter	13 × 13	1.48	–	–	–	–	–	–	–
	160	0.8, perimeter	13 × 13	1.48	–	–	–	–	–	–	–
SDIP	64	1.78	17 × 58	4.05	–	–	√	–	–	–	–
FPLGA	64	0.65	6 × 6	1.13	–	–	–	–	–	–	–
	84	0.65	7.5 × 7.5	1.13	–	–	–	–	–	–	–
	108	0.65	7.5 × 7.5	1.13	–	–	–	–	–	–	–

Notes 1. Line 2

2. Correspondence to the replacement of CMOS-6X, 6S
3. Correspondence to the replacement of CMOS-6, 6A, 6V
4. Low thermal resistance type

Remark √: Available, –: Cannot be used, Blank: Ask

Table 1-5. CMOS-N5 Series List of Packages (2/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65884	μ PD65885	μ PD65887	μ PD65889	μ PD65890	μ PD65893
QFP ^{Note 1} (fine pitch)	160	0.5	24 × 24	2.70	–			–	–	–
	208	0.5	28 × 28	3.20	–		√			
	240	0.5	32 × 32	3.20	–	–		√		
	304	0.5	40 × 40	3.70	–	–	–	–		
TQFP ^{Note 2}	48 ^{Note 1}	0.5	7 × 7	1.00	–	–	–	–	–	–
	64 ^{Note 1}	0.5	10 × 10	1.00		–	–	–	–	–
	80	0.5	12 × 12	1.00				–	–	–
	100 ^{Note 1}	0.5	14 × 14	1.00				–	–	–
	120	0.4	14 × 14	1.00					–	–
	64	0.65	12 × 12	1.00				–	–	–
LQFP ^{Note 2}	44	0.8	10 × 10	1.40	√	–	–	–	–	–
	100	0.5	14 × 14	1.40	√		√	–	–	–
	144 ^{Note 1}	0.5	20 × 20	1.40	√	√				√
	160	0.5	24 × 24	1.40	√	–	–	–	–	–
PBGA	256	1.27, perimeter	27 × 27	2.13		–	–	–	–	–
FPBGA	80	0.8, perimeter	9 × 9	1.31			–	–	–	–
	108	0.8, perimeter	11 × 11	1.51					–	–
	144	0.8, perimeter	13 × 13	1.51						
	160	0.8, perimeter	13 × 13	1.51						

Notes 1. Low thermal resistance type

2. Line 2

Remark √: Available, –: Cannot be used, Blank: Ask

1.3.2 CMOS-9HD Series

Table 1-6. CMOS-9HD Series List of Packages (1/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948
QFP (fine pitch)	100	0.5	14 × 14	1.45	–	–	√		√		√
	120	0.5	20 × 20	2.70	–	–	–	–	–	√	–
	144	0.5	20 × 20	2.70	–	–	√	√	√	√	√
	160	0.5	24 × 24	2.70	–	–	√	√	√	√	
	176	0.5	24 × 24	2.70	–	–	–	√		√	
	208	0.5	28 × 28	3.20	–	–	–	–	√	√	√
	240	0.5	32 × 32	3.20	–	–	–	–	–	√	√
	304	0.5	40 × 40	3.70	–	–	–	–	–	–	–
TQFP ^{Note} (fine pitch)	48	0.5	7 × 7	1.00	√	√	√	–	–	–	–
	64	0.5	10 × 10	1.00			√	–	–	–	–
	80	0.5	12 × 12	1.00	–	√	√	√	√	√	–
	100	0.5	14 × 14	1.00	–	√	√				√
	120	0.4	14 × 14	1.00	–	–	√	–	–	–	–
LQFP ^{Note} (fine pitch)	100	0.5	14 × 14	1.40	–	–	√	√	√		√
	144	0.5	20 × 20	1.40	–	–	√	√	√		√
PBGA	225	1.5, full grid	27 × 27	2.13	–	–	–	–	–	–	–
	256	1.27, perimeter	27 × 27	2.13	–	–	–	–	–	–	–
	272	1.27, perimeter	27 × 27	2.13	–	–	–	–	–	–	–
	313	1.27, staggered	35 × 35	2.33	–	–	–	–	–	–	–
	352	1.27, perimeter	35 × 35	2.33	–	–	–	–	–	–	–
FPBGA ^{Note}	108	0.8, perimeter	11 × 11	1.48	–	–	√	√			√
	144	0.8, perimeter	13 × 13	1.48	–	–				√	√
	160	0.8, perimeter	13 × 13	1.48	–	–	–			√	
	161	0.65, perimeter	10 × 10	1.43	–	–	√				
	176	0.8, perimeter	15 × 15	1.48	–	–	–	√	√	√	√
	208	0.8, perimeter	15 × 15	1.48	–	–	–	–	√	√	√
	240	0.8, perimeter	19 × 19	1.48	–	–	–	–	–	√	–
	304	0.8, perimeter	19 × 19	1.48	–	–	–	–	–	–	–
	393	0.65, perimeter	16 × 16	1.39	–	–					
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	–	–	–	–	–	√	√
	352	1.27, perimeter	35 × 35	1.40	–	–	–	–	–	–	–
	420	1.27, perimeter	35 × 35	1.40	–	–	–	–	–	–	–
	500	1.27, perimeter	40 × 40	1.40	–	–	–	–	–	–	–
	576	1.27, perimeter	40 × 40	1.40	–	–	–	–	–	–	–
	696	1.0, perimeter	40 × 40	1.40	–	–	–	–	–	–	–
ABGA	672	1.27, perimeter	45 × 45	2.48	–	–	–	–	–	–	–
FPLGA	84	0.65	7.5 × 7.5	1.13	–	–					–
	108	0.65	7.5 × 7.5	1.13	–	–					–
TFPBGA	65	0.5	6 × 6	0.83	–	–					–

Note Line 2

Remark √: Available, –: Cannot be used, Blank: Ask

Table 1-6. CMOS-9HD Series List of Packages (2/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65949	μ PD65951	μ PD65954	μ PD65956	μ PD65958
						μ PD65961	μ PD65964	μ PD65966	μ PD65968
QFP (fine pitch)	100	0.5	14 × 14	1.45		√	√ ^{Note 1}	–	–
	120	0.5	20 × 20	2.70	–	–	–	–	–
	144	0.5	20 × 20	2.70			–	–	–
	160	0.5	24 × 24	2.70		√	√ ^{Note 1}		–
	176	0.5	24 × 24	2.70					–
	208	0.5	28 × 28	3.20	√	√ ^{Note 2}	√ ^{Note 1}		√ ^{Note 1}
	240	0.5	32 × 32	3.20	√	√	√ ^{Note 1}		
	304	0.5	40 × 40	3.70	√		√ ^{Note 1}	√ ^{Note 1}	
TQFP ^{Note 3} (fine pitch)	48	0.5	7 × 7	1.00	–	–	–	–	–
	64	0.5	10 × 10	1.00	–	–	–	–	–
	80	0.5	12 × 12	1.05	–	–	–	–	–
	100	0.5	14 × 14	1.00	–	–	–	–	–
	120	0.4	14 × 14	1.00	–	–	–	–	–
LQFP ^{Note 3} (fine pitch)	100	0.5	14 × 14	1.40	–	–	√	–	–
	144	0.5	20 × 20	1.40	√	–	–	–	–
PBGA	225	1.5, full grid	27 × 27	2.13					–
	256	1.27, perimeter	27 × 27	2.13	√				–
	272	1.27, perimeter	27 × 27	2.13					–
	313	1.27, staggered	35 × 35	2.33	√				
	352	1.27, perimeter	35 × 35	2.33	√	√ ^{Note 1}			
FPBGA ^{Note 3}	108	0.8, perimeter	11 × 11	1.48	–	–	–	–	–
	144	0.8, perimeter	13 × 13	1.48			–	–	–
	160	0.8, perimeter	13 × 13	1.48			–	–	–
	161	0.65, perimeter	10 × 10	1.43		–	–	–	–
	176	0.8, perimeter	15 × 15	1.48					–
	208	0.8, perimeter	15 × 15	1.48	√	√			–
	240	0.8, perimeter	19 × 19	1.48	–				
	304	0.8, perimeter	19 × 19	1.48	–	–			
	393	0.65, perimeter	16 × 16	1.39	√				
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	√	√		–	–
	352	1.27, perimeter	35 × 35	1.40	√	√	√	√	–
	420	1.27, perimeter	35 × 35	1.40	–	√	√	√	√
	500	1.27, perimeter	40 × 40	1.40	–	–	√	√	√
	576	1.27, perimeter	40 × 40	1.40	–	–	–	√	√
	696	1.0, perimeter	40 × 40	1.40	–	–	–	–	√
ABGA	672	1.27, perimeter	45 × 45	2.48	–	–	–	–	

- Notes**
- 4-layer product is under study.
 - 3-layer product is under study.
 - Line 2

- Remarks**
- √: Available, –: Cannot be used, Blank: Ask
 - Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-6. CMOS-9HD Series List of Packages (3/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65969	μ PD65970	μ PD65971
QFP (fine pitch)	100	0.5	14 × 14	1.45	–	–	–
	120	0.5	20 × 20	2.70	–	–	–
	144	0.5	20 × 20	2.70	–	–	–
	160	0.5	24 × 24	2.70	–	–	–
	176	0.5	24 × 24	2.70	–	–	–
	208	0.5	28 × 28	3.20			
	240	0.5	32 × 32	3.20			
	304	0.5	40 × 40	3.70			
TQFP (fine pitch)	48	0.5	7 × 7	1.00	–	–	–
	64	0.5	10 × 10	1.00	–	–	–
	80	0.5	12 × 12	1.05	–	–	–
	100	0.5	14 × 14	1.00	–	–	–
	120	0.4	14 × 14	1.00	–	–	–
LQFP (fine pitch)	144	0.5	20 × 20	1.40	–	–	–
PBGA	256	1.27, perimeter	27 × 27	2.13	–	–	–
	272	1.27, perimeter	27 × 27	2.13	–	–	–
	313	1.27, staggered	35 × 35	2.33	–	–	–
	352	1.27, perimeter	35 × 35	2.33	–	–	–
FPBGA	108	0.8, perimeter	11 × 11	1.51	–	–	–
	144	0.8, perimeter	13 × 13	1.51	–	–	–
	160	0.8, perimeter	13 × 13	1.51	–	–	–
	176	0.8, perimeter	15 × 15	1.51	–	–	–
	208	0.8, perimeter	15 × 15	1.51	–	–	–
	240	0.8, perimeter	19 × 19	1.51	–	–	–
	304	0.8, perimeter	19 × 19	1.51	–	–	–
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	–	–	–
	352	1.27, perimeter	35 × 35	1.40			
	420	1.27, perimeter	35 × 35	1.40	√	√	√
	500	1.27, perimeter	40 × 40	1.40	√	√	√
	576	1.27, perimeter	40 × 40	1.40	√		
	696	1.0, perimeter	40 × 40	1.40			
ABGA	672	1.27, perimeter	45 × 45	2.48			

Remark √: Available, –: Cannot be used, Blank: Ask

1.3.3 EA-9HD Series

Table 1-7. EA-9HD Series List of Packages (1/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448
QFP (fine pitch)	100	0.5	14 × 14	1.45	-	-	-	-	-	-	-
	120	0.5	20 × 20	2.70	-	-	-	-	-	-	-
	144	0.5	20 × 20	2.70	-	-	-	√	-	√	-
	160	0.5	24 × 24	2.70	-	-	√	√	-	-	-
	176	0.5	24 × 24	2.70	-	-	-	-	-	-	-
	208	0.5	28 × 28	3.20	-	-	-	-	√	√	√
	240	0.5	32 × 32	3.20	-	-	-	-	-	√	√
TQFP ^{Note} (fine pitch)	48	0.5	7 × 7	1.00	√	-	√	-	-	-	-
	64	0.5	10 × 10	1.00	-	-	√	-	-	-	-
	80	0.5	12 × 12	1.00	-	√	-	√	-	√	-
	100	0.5	14 × 14	1.00	-	√	-	-	-	-	-
	120	0.4	14 × 14	1.00	-	-	-	-	-	-	-
LQFP ^{Note} (fine pitch)	100	0.5	20 × 20	1.40	-	-	√	-	√	-	√
	144	0.5	20 × 20	1.40	-	-	√	-	√	-	√
	160	0.5	24 × 24	1.40	-	-	-	-	-	-	-
PBGA	225	1.5, full grid	27 × 27	2.13	-	-	-	-	-	-	-
	256	1.27, perimeter	27 × 27	2.13	-	-	-	-	-	-	-
	272	1.27, perimeter	27 × 27	2.13	-	-	-	-	-	-	-
	313	1.27, staggered	35 × 35	2.33	-	-	-	-	-	-	-
	352	1.27, perimeter	35 × 35	2.33	-	-	-	-	-	-	-
FPBGA ^{Note}	108	0.8, perimeter	11 × 11	1.48	-	-	√	√	-	-	-
	109	0.8, perimeter	11 × 11	1.48	-	-	-	-	-	-	-
	144	0.8, perimeter	13 × 13	1.48	-	-	-	-	-	-	-
	160	0.8, perimeter	13 × 13	1.48	-	-	-	-	-	-	-
	161	0.65, perimeter	10 × 10	1.43	-	-	-	-	-	-	-
	176	0.8, perimeter	15 × 15	1.48	-	-	-	√	-	√	-
	208	0.8, perimeter	15 × 15	1.48	-	-	-	-	√	√	-
	240	0.8, perimeter	19 × 19	1.48	-	-	-	-	-	√	-
	304	0.8, perimeter	19 × 19	1.48	-	-	-	-	-	-	-
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	-	-	-	-	-	√	√
	352	1.27, perimeter	35 × 35	1.40	-	-	-	-	-	-	-
	420	1.27, perimeter	35 × 35	1.40	-	-	-	-	-	-	-
	500	1.27, perimeter	40 × 40	1.40	-	-	-	-	-	-	-
	576	1.27, perimeter	40 × 40	1.40	-	-	-	-	-	-	-
	696	1.0, perimeter	40 × 40	1.40	-	-	-	-	-	-	-
ABGA	672	1.27, perimeter	45 × 45	2.48	-	-	-	-	-	-	-
FPLGA	64	0.65	6 × 6	1.13	-	-	-	-	-	-	-
	84	0.65	7.5 × 7.5	1.13	-	-	-	-	-	-	-
	108	0.65	7.5 × 7.5	1.13	-	-	-	-	-	-	-
TFPBGA	65	0.5	6 × 6	0.83	-	-	-	-	-	-	-

Note Line 2

Remark √: Available, -: Cannot be used, Blank: Ask

Table 1-7. EA-9HD Series List of Packages (2/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65449	μ PD65451	μ PD65454	μ PD65456	μ PD65458
						μ PD65461	μ PD65464	μ PD65466	μ PD65468
QFP (fine pitch)	100	0.5	14 × 14	1.45		√		–	–
	120	0.5	20 × 20	2.70	–	–	–	–	–
	144	0.5	20 × 20	2.70		√ ^{Note 1}		–	–
	160	0.5	24 × 24	2.70		√	√		–
	176	0.5	24 × 24	2.70					–
	208	0.5	28 × 28	3.20	√	√		√	√ ^{Note 1}
	240	0.5	32 × 32	3.20		√ ^{Note 1}	√		√ ^{Note 1}
	304	0.5	40 × 40	3.70			√ ^{Note 1}	√ ^{Note 1}	
TQFP ^{Note 2} (fine pitch)	100	0.5	14 × 14	1.00	√	–	–	–	–
	120	0.4	14 × 14	1.00		–	–	–	–
LQFP ^{Note 2} (fine pitch)	100	0.5	14 × 14	1.40	–	–	√	–	–
	144	0.5	20 × 20	1.40	√		–	–	–
	160	0.5	24 × 24	1.40					–
PBGA	225	1.5, full grid	27 × 27	2.13					–
	256	1.27, perimeter	27 × 27	2.13	√				–
	272	1.27, perimeter	27 × 27	2.13					–
	313	1.27, staggered	35 × 35	2.33					–
	352	1.27, perimeter	35 × 35	2.33	√				–
FPBGA ^{Note 2}	108	0.8, perimeter	11 × 11	1.48	–	–	–	–	–
	144	0.8, perimeter	13 × 13	1.48			–	–	–
	160	0.8, perimeter	13 × 13	1.48			–	–	–
	161	0.65, perimeter	10 × 10	1.43			–	–	–
	176	0.8, perimeter	15 × 15	1.48					–
	208	0.8, perimeter	15 × 15	1.48		√			–
	240	0.8, perimeter	19 × 19	1.48	–				
	303	0.65, perimeter	16 × 16	1.43	–	–			
	304	0.8, perimeter	19 × 19	1.48	–	–	–		
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	√	√		–	–
	352	1.27, perimeter	35 × 35	1.40	√	√	√	√	
	420	1.27, perimeter	35 × 35	1.40	–	√	√	√	√
	500	1.27, perimeter	40 × 40	1.40	–	–	√	√	√
	576	1.27, perimeter	40 × 40	1.40	–	–	–	√	√
	696	1.0, perimeter	40 × 40	1.40	–	–	–	–	√
ABGA	672	1.27, perimeter	45 × 45	2.48	–	–	–	–	

Notes 1. 4-layer product is under study.

2. Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-7. EA-9HD Series List of Packages (3/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65469	μ PD65470	μ PD65471
QFP (fine pitch)	100	0.5	14 × 14	1.45	–	–	–
	120	0.5	20 × 20	2.70	–	–	–
	144	0.5	20 × 20	2.70	–	–	–
	160	0.5	24 × 24	2.70	–	–	–
	176	0.5	24 × 24	2.70	–	–	–
	208	0.5	28 × 28	3.20			
	240	0.5	32 × 32	3.20			
	304	0.5	40 × 40	3.70			
TQFP (fine pitch)	48	0.5	7 × 7	1.00	–	–	–
	64	0.5	10 × 10	1.00	–	–	–
	80	0.5	12 × 12	1.05	–	–	–
	100	0.5	14 × 14	1.00	–	–	–
	120	0.4	14 × 14	1.00	–	–	–
LQFP (fine pitch)	100	0.5	14 × 14	1.40	–	–	–
	144	0.5	20 × 20	1.40	–	–	–
PBGA	225	1.5, full grid	27 × 27	2.13	–	–	–
	256	1.27, perimeter	27 × 27	2.13	–	–	–
	272	1.27, perimeter	27 × 27	2.13	–	–	–
	313	1.27, staggered	35 × 35	2.33	–	–	–
	352	1.27, perimeter	35 × 35	2.33	–	–	–
FPBGA	108	0.8, perimeter	11 × 11	1.51	–	–	–
	144	0.8, perimeter	13 × 13	1.51	–	–	–
	160	0.8, perimeter	13 × 13	1.51	–	–	–
	176	0.8, perimeter	15 × 15	1.51	–	–	–
	208	0.8, perimeter	15 × 15	1.51	–	–	–
	240	0.8, perimeter	19 × 19	1.51	–	–	–
	304	0.8, perimeter	19 × 19	1.51	–	–	–
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	–	–	–
	352	1.27, perimeter	35 × 35	1.40			
	420	1.27, perimeter	35 × 35	1.40	√	√	√
	500	1.27, perimeter	40 × 40	1.40	√	√	√
	576	1.27, perimeter	40 × 40	1.40	√		
	696	1.0, perimeter	40 × 40	1.40			
ABGA	672	1.27, perimeter	45 × 45	2.48			

Remark √: Available, –: Cannot be used, Blank: Ask

1.3.4 CMOS-10HD Series

Table 1-8. CMOS-10HD Series List of Packages (1/10)

(a) Single power supply (1/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65301	μ PD65302	μ PD65303	μ PD65304	μ PD65305
					μ PD65501	μ PD65502	μ PD65503	μ PD65504	μ PD65505
QFP (fine pitch)	144	0.5	20 × 20	2.70	–				
	160	0.5	24 × 24	2.70	–				
	208	0.5	28 × 28	3.20	–	–			
	240	0.5	32 × 32	3.20	–	–	–		
	304	0.5	40 × 40	3.70	–	–	–	–	–
TQFP ^{Note}	48	0.5	7 × 7	1.00		–	–	–	–
	64	0.5	10 × 10	1.00	–			–	–
	80	0.5	12 × 12	1.00	–				
	120	0.4	14 × 14	1.00	–	–	–		
LQFP ^{Note}	44	0.8	10 × 10	1.40					–
	100	0.5	14 × 14	1.40	–	–	–		
	144	0.5	20 × 20	1.40	–	–	–		
FPBGA ^{Note}	61	0.65, perimeter	6 × 6	1.48		–	–	–	–
	108	0.8, perimeter	11 × 11	1.48					
	144	0.8, perimeter	13 × 13	1.48	–				
	160	0.8, perimeter	13 × 13	1.48	–				
	161	0.65, perimeter	10 × 10	1.43	–				
	208	0.8, perimeter	15 × 15	1.48	–	–			
	240	0.8, perimeter	19 × 19	1.48	–	–	–		
	304	0.8, perimeter	19 × 19	1.48	–	–	–	–	
	393	0.65, perimeter	16 × 16	1.39	–	–	–	–	–
PBGA	256	1.27, perimeter	27 × 27	2.13	–	–	–		
	313	1.27, staggered	35 × 35	2.33	–	–	–	–	–
	352	1.27, perimeter	35 × 35	2.33	–	–	–	–	–
FPLGA	64	0.65	6 × 6	1.13		–	–	–	–
	84	0.65	7.5 × 7.5	1.13					–
	108	0.65	7.5 × 7.5	1.13					–

Note Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-8. CMOS-10HD Series List of Packages (2/10)

(a) Single power supply (2/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65306	μ PD65307	μ PD65308	μ PD65309	μ PD65310	μ PD65311
					μ PD65506	μ PD65507	μ PD65508	μ PD65509	μ PD65510	μ PD65511
QFP (fine pitch)	144	0.5	20 x 20	2.70						
	160	0.5	24 x 24	2.70						
	208	0.5	28 x 28	3.20						
	240	0.5	32 x 32	3.20				√		
	304	0.5	40 x 40	3.70	–					
TQFP ^{Note}	48	0.5	7 x 7	1.00	–	–	–	–	–	–
	64	0.5	10 x 10	1.00	–	–	–	–	–	–
	80	0.5	12 x 12	1.00				–	–	–
	120	0.4	14 x 14	1.00					–	–
LQFP ^{Note}	44	0.8	10 x 10	1.40	–	–	–	–	–	–
	100	0.5	14 x 14	1.40					–	–
	144	0.5	20 x 20	1.40						
FPBGA ^{Note}	108	0.8, perimeter	11 x 11	1.48		–	–	–	–	–
	144	0.8, perimeter	13 x 13	1.48			–	–	–	–
	160	0.8, perimeter	13 x 13	1.48					–	–
	161	0.65, perimeter	10 x 10	1.43		–	–	–	–	–
	208	0.8, perimeter	15 x 15	1.48						–
	240	0.8, perimeter	19 x 19	1.48						
	304	0.8, perimeter	19 x 19	1.48						
	393	0.65, perimeter	16 x 16	1.39	–				–	–
PBGA	256	1.27, perimeter	27 x 27	2.13						–
	313	1.27, staggered	35 x 35	2.33						
	352	1.27, perimeter	35 x 35	2.33						

Note Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-8. CMOS-10HD Series List of Packages (3/10)

(a) Single power supply (3/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65321	μ PD65322	μ PD65323
					μ PD65521	μ PD65522	μ PD65523
TQFP ^{Note}	64	0.5	10 × 10	1.00		–	–
	80	0.5	12 × 12	1.00		–	–
	100	0.5	14 × 14	1.00			
	120	0.4	14 × 14	1.00	–		
LQFP ^{Note}	100	0.5	14 × 14	1.40			
	144	0.5	20 × 20	1.40	–	–	

Note Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-8. CMOS-10HD Series List of Packages (4/10)

(b) Single power supply, dedicated TBGA package (1/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65324	μ PD65325	μ PD65326	μ PD65327	μ PD65328
					μ PD65524	μ PD65525	μ PD65526	μ PD65527	μ PD65528
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40					
	352	1.27, perimeter	35 × 35	1.40	–	–			
	420	1.27, perimeter	35 × 35	1.40	–	–	–		
	500	1.27, perimeter	40 × 40	1.40	–	–	–	–	
	576	1.27, perimeter	40 × 40	1.40	–	–	–	–	–

Remarks 1. √: Available, –: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-8. CMOS-10HD Series List of Packages (5/10)

(b) Single power supply, dedicated TBGA package (2/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65329	μ PD65330	μ PD65331
					μ PD65529	μ PD65530	μ PD65531
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40			
	352	1.27, perimeter	35 × 35	1.40			
	420	1.27, perimeter	35 × 35	1.40			
	500	1.27, perimeter	40 × 40	1.40			
	576	1.27, perimeter	40 × 40	1.40			

Remarks 1. √: Available, –: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-8. CMOS-10HD Series List of Packages (6/10)

(c) Dual power supply (1/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65341	μ PD65342	μ PD65343	μ PD65344	μ PD65345
					μ PD65541	μ PD65542	μ PD65543	μ PD65544	μ PD65545
QFP (fine pitch)	144	0.5	20 × 20	2.70	–				
	160	0.5	24 × 24	2.70	–				
	208	0.5	28 × 28	3.20	–	–			
	304	0.5	40 × 40	3.70	–	–	–	–	–
TQFP ^{Note}	48	0.5	7 × 7	1.00		–	–	–	–
	64	0.5	10 × 10	1.00	–			–	–
	80	0.5	12 × 12	1.00	–				
	120	0.4	14 × 14	1.00	–	–	–		
LQFP ^{Note}	44	0.8	10 × 10	1.40					–
	100	0.5	14 × 14	1.40	–	–	–	√	
	144	0.5	20 × 20	1.40	–		–	√	√
FPBGA ^{Note}	61	0.65, perimeter	6 × 6	1.43		–	–	–	–
	108	0.8, perimeter	11 × 11	1.48	√	√			√
	144	0.8, perimeter	13 × 13	1.48	–				
	160	0.8, perimeter	13 × 13	1.48	–				
	161	0.65, perimeter	10 × 10	1.43	–				
	208	0.8, perimeter	15 × 15	1.48	–	–		√	√
	240	0.8, perimeter	19 × 19	1.48	–	–	–		√
	304	0.8, perimeter	19 × 19	1.48	–	–	–	–	
	393	0.65, perimeter	16 × 16	1.39	–	–	–	–	–
PBGA	256	1.27, perimeter	27 × 27	2.13	–	–	–		
	313	1.27, staggered	35 × 35	2.33	–	–	–	–	–
	352	1.27, perimeter	35 × 35	2.33	–	–	–	–	–
FPLGA	64	0.65	6 × 6	1.13		–	–	–	–
	84	0.65	7.5 × 7.5	1.13					–
	108	0.65	7.5 × 7.5	1.13					–

Note Line 2

Remarks 1. √: Available, –: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-8. CMOS-10HD Series List of Packages (7/10)

(c) Dual power supply (2/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65346	μ PD65347	μ PD65348	μ PD65349	μ PD65350	μ PD65351
					μ PD65546	μ PD65547	μ PD65548	μ PD65549	μ PD65550	μ PD65551
QFP (fine pitch)	144	0.5	20 x 20	2.70						
	160	0.5	24 x 24	2.70						
	208	0.5	28 x 28	3.20						
	240	0.5	32 x 32	3.20				√		
	304	0.5	40 x 40	3.70	-					
TQFP ^{Note}	48	0.5	7 x 7	1.00	-	-	-	-	-	-
	64	0.5	10 x 10	1.00	-	-	-	-	-	-
	80	0.5	12 x 12	1.00				-	-	-
	120	0.4	14 x 14	1.00					-	-
LQFP ^{Note}	44	0.8	10 x 10	1.40	-	-	-	-	-	-
	100	0.5	14 x 14	1.40	√				-	-
	144	0.5	20 x 20	1.40	√					
FPBGA ^{Note}	108	0.8, perimeter	11 x 11	1.48		-	-	-	-	-
	144	0.8, perimeter	13 x 13	1.48		-	-	-	-	-
	160	0.8, perimeter	13 x 13	1.48		-	-	-	-	-
	161	0.65, perimeter	10 x 10	1.43	√	-	-	-	-	-
	208	0.8, perimeter	15 x 15	1.48						-
	240	0.8, perimeter	19 x 19	1.48	√					
	304	0.8, perimeter	19 x 19	1.48				√		
	393	0.65, perimeter	16 x 16	1.39	-	√			-	-
PBGA	256	1.27, perimeter	27 x 27	2.13						-
	313	1.27, staggered	35 x 35	2.33						
	352	1.27, perimeter	35 x 35	2.33						

Note Line 2

Remarks 1. √: Available, -: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-8. CMOS-10HD Series List of Packages (8/10)

(c) Dual power supply (3/3)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65361	μ PD65362	μ PD65363
					μ PD65561	μ PD65562	μ PD65563
TQFP	64	0.5	10 × 10	1.00		–	–
	80	0.5	12 × 12	1.00		–	–
	100	0.5	14 × 14	1.00			
	120	0.4	14 × 14	1.00	–		
LQFP	100	0.5	14 × 14	1.40			
	144	0.5	20 × 20	1.40	–	–	

Remarks 1. √: Available, –: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-8. CMOS-10HD Series List of Packages (9/10)

(d) Dual power supply, dedicated TBGA package (1/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65364	μ PD65365	μ PD65366	μ PD65367	μ PD65368
					μ PD65564	μ PD65565	μ PD65566	μ PD65567	μ PD65568
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40					
	352	1.27, perimeter	35 × 35	1.40	–	–	√	√	√
	420	1.27, perimeter	35 × 35	1.40	–	–	–	√	√
	500	1.27, perimeter	40 × 40	1.40	–	–	–	–	√
	576	1.27, perimeter	40 × 40	1.40	–	–	–	–	–

Remarks 1. √: Available, –: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

Table 1-8. CMOS-10HD Series List of Packages (10/10)

(d) Dual power supply, dedicated TBGA package (2/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	μ PD65369	μ PD65370	μ PD65371
					μ PD65569	μ PD65570	μ PD65571
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40			
	352	1.27, perimeter	35 × 35	1.40	√	√	√
	420	1.27, perimeter	35 × 35	1.40			
	500	1.27, perimeter	40 × 40	1.40	√	√	√
	576	1.27, perimeter	40 × 40	1.40	√	√	

Remarks 1. √: Available, –: Cannot be used, Blank: Ask

2. Part number on the top are 3-layer products and those on the bottom are 4-layer products.

CHAPTER 2 MAXIMUM ALLOWABLE POWER CONSUMPTION

Caution Depending on the combination of master and package, some packages may not yet be available. Be sure to confirm with NEC Electronics that the desired package has been released. Also contact NEC Electronics if the desired package does not appear in the Package column.

2.1 Standard (Leaded) Packages

★ 2.1.1 CMOS-N5 Series

Table 2-1. CMOS-N5 Series Maximum Allowable Power Consumption (T_A = 85°C, T_J = 125°C) (1/2)

Unit: W

Package	Number of Pins	μ PD65891	μ PD65880	μ PD65881	μ PD65892	μ PD65882	μ PD65894	μ PD65883
SSOP ^{Note 1}	20	0.40	0.40	0.40	–	–	–	–
	30	0.50	0.50	0.50	–	–	–	–
QFP	44 ^{Note 2}	0.33	0.35	–	–	–	–	–
	52	–	–	–	–	–	–	0.38
	100 ^{Note 3}	–	–	–	–	0.47	–	–
	100 ^{Note 4}	–	–	–	–	0.48	–	–
QFP (fine pitch)	160	–	–	–	–	–	–	–
	208	–	–	–	–	–	–	–
	240	–	–	–	–	–	–	–
	304	–	–	–	–	–	–	–
TQFP ^{Note 2}	48	0.30	0.31	0.37	–	0.40	–	–
	64 ^{Note 5}	–	–	0.45	–	0.50	–	0.55
	80	–	–	–	–	0.30	–	0.37
	100	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–
	64 ^{Note 6}	–	–	0.41	–	0.43	–	0.52
LQFP ^{Note 2}	44	–	0.30	0.34	–	0.39	–	0.43
	100	–	–	–	0.31	0.35	–	0.36
	144	–	–	–	–	–	0.57	0.66
	160	–	–	–	–	–	–	–
FPBGA ^{Note 2}	80	–	–	–	–	0.87	–	0.87 ^{Note 1}
	108	–	–	–	–	–	–	0.96
	144	–	–	–	–	–	–	1.05
	160	–	–	–	–	–	–	–
SDIP	64	–	–	0.36	–	–	–	–

Notes 1. Preliminary value**2.** Line 2**3.** Correspondence to the replacement of CMOS-6X, 6S**4.** Correspondence to the replacement of CMOS-6, 6A, 6V**5.** 0.5 mm pitch**6.** 0.65 mm pitch**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 2-1. CMOS-N5 Series Maximum Allowable Power Consumption ($T_A = 85^\circ\text{C}$, $T_J = 125^\circ\text{C}$) (2/2)

Unit: W

Package	Number of Pins	μ PD65884	μ PD65885	μ PD65887	μ PD65889	μ PD65890	μ PD65893
QFP (fine pitch)	160	–	0.70	0.75	–	–	–
	208	–	0.76	0.83	0.93	1.00	1.05
	240	–	–	0.81	0.88	1.02	1.11
	304	–	–	–	–	1.00	1.05
TQFP ^{Note 1}	48	–	–	–	–	–	–
	64 ^{Note 2}	–	–	–	–	–	–
	80						
	100				–	–	–
	120					–	–
	64 ^{Note 3}						
LQFP ^{Note 1}	44	0.43					
	100	0.44	0.47	0.48	–	–	–
	144		0.70	0.75			0.86
	160	0.64			0.76	0.81	
FPBGA ^{Note 1}	80	0.96	0.99	–	–	–	–
	108	0.99	1.02	1.08	1.15	–	–
	144	1.08	1.11	1.17	1.24	1.34	1.46
	160	1.09	1.13	1.19	1.26	1.36	1.49
SDIP	64	–	–	–	–	–	–

Notes 1. Line 2

2. 0.5 mm pitch
3. 0.65 mm pitch

Remarks 1. Blank: Under study, –: Cannot be used

2. Refer to the package list of each series (**CHAPTER 1**) for package details

★ 2.1.2 CMOS-9HD, EA-9HD Series

Table 2-2. CMOS-9HD, EA-9HD Series Maximum Allowable Power Consumption
(T_A = 85°C, T_J = 125°C, with No Wind) (1/2)

Unit: W

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
QFP (fine pitch)	100	–	–	0.32	0.34	0.36	0.40	0.45	0.50
	120	–	–	–	–	–	0.46	–	–
	144	–	–	0.56	0.58	0.60	0.64	0.66	0.72
	160	–	–	0.56	0.60	0.62	0.68	0.74	0.80
	176	–	–	–	0.60	0.63	0.90	–	–
	208	–	–	–	–	0.71	0.78	0.85	0.90
	240	–	–	–	–	–	0.74	0.81	0.90
	304	–	–	–	–	–	–	1.29	1.29
TQFP (fine pitch)	48 ^{Note2}	0.34	0.36	0.38	–	–	–	–	–
	64 ^{Note2}	–	–	0.50	–	–	–	–	–
	80	–	–	–	–	–	0.44	–	–
	80 ^{Note2}	–	0.42	0.32	–	–	–	–	–
	100	–	–	–	–	–	–	0.58	0.61
	100 ^{Note2}	–	0.45	0.48	–	–	–	–	–
	120	–	–	0.48	–	–	0.54	–	0.63
LQFP (fine pitch)	100	–	–	–	–	–	0.65	–	–
	144	–	–	–	–	–	–	0.70	0.77
	144 ^{Note2}	–	–	0.61	0.64	0.64	–	–	–
PBGA	225 ^{Note1}	–	–	–	–	–	–	–	–
	256	–	–	–	–	–	–	1.33	1.33
	272	–	–	–	–	–	–	1.53	1.53
	313	–	–	–	–	–	–	–	1.54
	352	–	–	–	–	–	–	–	1.82
FPBGA	108	–	–	0.83	0.86	0.88	0.81	–	–
	144	–	–	0.90	0.95	0.97	0.93	1.14	1.05
	160	–	–	–	–	–	–	1.17	1.11
	161	–	–	0.88	–	–	–	–	–
	176	–	–	–	0.85	0.88	0.93	–	–
	208	–	–	–	–	–	–	1.11	1.29
	240	–	–	–	–	–	–	–	–
	304	–	–	–	–	–	–	–	–
	393	–	–	–	–	–	–	–	1.48
TBGA with heat spreader	256	–	–	–	–	–	1.90	1.90	1.90
	352	–	–	–	–	–	–	–	2.50
	420	–	–	–	–	–	–	–	–
	500	–	–	–	–	–	–	–	–
	576	–	–	–	–	–	–	–	–
	696	–	–	–	–	–	–	–	–

Notes 1. Under development

2. Line 2

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each series (CHAPTER 1) for package details.

**Table 2-2. CMOS-9HD, EA-9HD Series Maximum Allowable Power Consumption
(T_A = 85°C, T_J = 125°C, with No Wind) (2/2)**

Unit: W

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451	μ PD65454	μ PD65456	μ PD65458	μ PD65469	μ PD65470	μ PD65471
		μ PD65461	μ PD65464	μ PD65466	μ PD65468			
QFP (fine pitch)	100	0.54	0.60	–	–	–	–	–
	120	–	–	–	–	–	–	–
	144	0.76	–	–	–	–	–	–
	160	0.85	0.90	0.97	–	–	–	–
	176				–	–	–	–
	208	0.97	1.05	1.11	1.21			
	240	0.97	1.08	1.17	1.33			
	304	1.02	1.08	1.17	1.25			
TQFP (fine pitch)	48					–	–	–
	64					–	–	–
	80	–	–	–	–	–	–	–
	100	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–
LQFP (fine pitch)	144	–	–	–	–	–	–	–
PBGA	225 ^{Note}					–	–	–
	256	1.33	1.33		–	–	–	–
	272	1.53				–	–	–
	313	1.54				–	–	–
	352	1.82	1.82	1.82	1.82	–	–	–
FPBGA	108	–	–	–	–	–	–	–
	144	–	–	–	–	–	–	–
	160	–	–	–	–	–	–	–
	176				–	–	–	–
	208	1.33			–	–	–	–
	240					–	–	–
	304	–	–		1.90	–	–	–
TBGA with heat spreader	256	1.90		–	–	–	–	–
	352	2.50	2.50	2.50				
	420	2.50	2.50	2.50	2.50	2.50	2.50	2.50
	500	–	2.85	2.85	2.85	2.85	2.85	2.85
	576	–	–	2.85	2.85	2.85		
	696	–	–	–	2.85			

Note Under development

- Remarks**
1. Blank: Under study, –: Cannot be used
 2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.
 3. Refer to the package list of each series (**CHAPTER 1**) for package details.

2.1.3 CMOS-10HD Series

Table 2-3. CMOS-10HD Series Allowable Internal Power Consumption of 3-Layer Product

Master	μ PD65301	μ PD65302	μ PD65303	μ PD65304	μ PD65305	μ PD65306
	μ PD65321	μ PD65322	μ PD65323	μ PD65324	μ PD65325	μ PD65326
	μ PD65341	μ PD65342	μ PD65343	μ PD65344	μ PD65345	μ PD65346
	μ PD65361	μ PD65362	μ PD65363	μ PD65364	μ PD65365	μ PD65366
Maximum allowable power (W) (1.8 V)	0.37	0.54	0.67	0.83	0.97	1.12
Maximum allowable power (W) (2.5 V)	0.51	0.76	0.93	1.16	1.23	1.22

Master	μ PD65307	μ PD65308	μ PD65309	μ PD65310	μ PD65311
	μ PD65327	μ PD65328	μ PD65329	μ PD65330	μ PD65331
	μ PD65347	μ PD65348	μ PD65349	μ PD65350	μ PD65351
	μ PD65367	μ PD65368	μ PD65369	μ PD65360	μ PD65371
Maximum allowable power (W) (1.8 V)	1.23	1.22	1.22	1.22	1.22
Maximum allowable power (W) (2.5 V)	1.23	1.22	1.22	1.22	1.22

Table 2-4. CMOS-10HD Series Maximum Allowable Power When Standard Power Supply Only Is Used in Each Package

Package		QFP ^{Note}										
Number of pins		44	48	64	80	100	120	144	160	208	240	304
Number of standard V _{DD}		1	1	1	4	4	4	4	6	8	12	20
Number of standard GND		1	1	2	4	4	6	8	10	12	16	28
1.8 V	Maximum allowable power of V _{DD} (W)	0.05	0.05	0.05	0.68	0.68	0.68	0.68	0.78	0.89	0.63	1.51
	Maximum allowable power of GND (W)	0.05	0.05	0.10	0.68	0.68	0.78	0.89	0.99	1.10	0.84	1.93
2.5 V	Maximum allowable power of V _{DD} (W)	0.07	0.07	0.07	0.94	0.94	0.94	0.94	1.09	1.23	0.87	2.10
	Maximum allowable power of GND (W)	0.07	0.07	0.15	0.94	0.94	1.09	1.23	1.38	1.52	1.16	2.69

Package		FPBGA					
Number of pins		100	144	160	208	240	304
Number of standard V _{DD}		4	4	6	8	12	20
Number of standard GND		4	8	10	12	16	28
1.8 V	Maximum allowable power of V _{DD} (W)	0.68	0.68	0.78	0.89	1.10	1.51
	Maximum allowable power of GND (W)	0.68	0.89	0.99	1.10	1.31	1.93
2.5 V	Maximum allowable power of V _{DD} (W)	0.94	0.94	1.09	1.23	1.52	2.10
	Maximum allowable power of GND (W)	0.94	1.23	1.38	1.52	1.81	2.69

Package		PBGA			TBGA				
Number of pins		256	313	352	256	352	420	500	576
Number of standard V _{DD}		12	32	16	16	24	28	36	40
Number of standard GND		13	25	32	16	24	28	36	40
1.8 V	Maximum allowable power of V _{DD} (W)	1.10	2.14	1.31	0.84	1.26	1.47	1.89	2.10
	Maximum allowable power of GND (W)	1.15	1.78	2.14	0.84	1.26	1.47	1.89	2.10
2.5 V	Maximum allowable power of V _{DD} (W)	1.52	2.98	1.81	1.16	1.75	2.04	2.62	2.91
	Maximum allowable power of GND (W)	1.59	2.47	2.98	1.16	1.75	2.04	2.62	2.91

Note QFP: QFP, QFP (FP), TQFP, LQFP

Remark For a single power supply, compare with the power consumption of internal area + I/O area, and for a dual power supply, compare with the internal power consumption.

2.2 Lead-free Packages

2.2.1 CMOS-N5 Series

Please refer to 2.1.1 **CMOS-N5 Series** because the values of the lead-free packages of this series are the same as those of the leaded packages.

Lead-free

★ 2.2.2 CMOS-9HD, EA-9HD Series

Table 2-5. CMOS-9HD, EA-9HD Series Maximum Allowable Power Consumption
(T_A = 85°C, T_J = 125°C, with No Wind) (1/2)

Unit: W

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
QFP (fine pitch)	100	–	–						
	120	–	–						
	144	–	–						
	160	–	–						
	176	–	–	–					
	208	–	–	–	–				
	240	–	–	–	–	–			
	304	–	–	–	–	–	–		
TQFP ^{Note 1} (fine pitch)	48				–	–	–	–	–
	64			0.55	–	–	–	–	–
	80	–		0.59			0.56	–	–
	100	–		0.68					
	120	–	–	0.67					
LQFP ^{Note 1} (fine pitch)	100	–							–
	144	–	–		0.76				
PBGA	225 ^{Note 2}	–	–	–	–	–	–	–	–
	256	–	–	–	–	–	–	–	–
	272	–	–	–	–	–	–	–	–
	313	–	–	–	–	–	–	–	–
	352	–	–	–	–	–	–	–	–
FPBGA	108	–	0.88	0.93	0.95	0.95	1.00	1.08	–
	144	–	–	1.02	1.03	1.03	1.08	1.14	1.17
	160	–	–	–	1.05	1.05	1.11	1.18	1.21
	161	–	–						
	176	–	–	–	1.08	1.08	1.14	1.18	1.25
	208	–	–	–	–	–	–	1.21	1.25
	240	–	–	–	–	–	–	–	–
	304	–	–	–	–	–	–	–	–
TBGA with heat spreader	256	–	–	–	–	–	1.90	1.90	1.90
	352	–	–	–	–	–	–	–	2.50
	420	–	–	–	–	–	–	–	–
	500	–	–	–	–	–	–	–	–
	576	–	–	–	–	–	–	–	–
	696	–	–	–	–	–	–	–	–
ABGA	672								

Notes 1. Line 2

2. Under development

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each series (CHAPTER 1) for package details.

Table 2-5. CMOS-9HD, EA-9HD Series Maximum Allowable Power Consumption
(T_A = 85°C, T_J = 125°C, with No Wind) (2/2)

Unit: W

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451	μ PD65454	μ PD65456	μ PD65458	μ PD65469	μ PD65470	μ PD65471
		μ PD65461	μ PD65464	μ PD65466	μ PD65468			
QFP (fine pitch)	100			–	–	–	–	–
	120	–	–	–	–	–	–	–
	144		–	–	–	–	–	–
	160				–	–	–	–
	176				–	–	–	–
	208							
	240							
	304							
TQFP ^{Note 1} (fine pitch)	48	–	–	–	–	–	–	–
	64	–	–	–	–	–	–	–
	80	–	–	–	–	–	–	–
	100	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–
LQFP ^{Note 1} (fine pitch)	100		0.80	–	–	–	–	–
	144		–	–	–	–	–	–
PBGA	225 ^{Note 2}							
	256				–	–	–	–
	272				–	–	–	–
	313				–	–	–	–
	352				–	–	–	–
FPBGA	108	–	–	–	–	–	–	–
	144	1.25	–	–	–	–	–	–
	160	1.29		1.33	–	–	–	–
	176	1.33	1.48	1.66	–	–	–	–
	208	1.33	1.48	1.66	–	–	–	–
	240					–	–	–
	303			1.42		–	–	–
	304					–	–	–
TBGA with heat spreader	256	1.90		–	–	–	–	–
	352	2.50	2.50	2.50				
	420	2.50	2.50	2.50	2.50	2.50	2.50	2.50
	500	–	2.85	2.85	2.85	2.85	2.85	2.85
	576	–	–	2.85	2.85	2.85		
	696	–	–	–	2.85			
ABGA	672				2.85			

Notes 1. Line 2

2. Under development

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each series (**CHAPTER 1**) for package details.

2.2.3 CMOS-10HD Series

Table 2-6. CMOS-10HD Series Allowable Internal Power Consumption of 3-Layer Product

Master	μ PD65301	μ PD65302	μ PD65303	μ PD65304	μ PD65305	μ PD65306
	μ PD65321	μ PD65322	μ PD65323	μ PD65324	μ PD65325	μ PD65326
	μ PD65341	μ PD65342	μ PD65343	μ PD65344	μ PD65345	μ PD65346
	μ PD65361	μ PD65362	μ PD65363	μ PD65364	μ PD65365	μ PD65366
Maximum allowable power (W) (1.8 V)	0.37	0.54	0.67	0.83	0.97	1.12
Maximum allowable power (W) (2.5 V)	0.51	0.76	0.93	1.16	1.23	1.22

Master	μ PD65307	μ PD65308	μ PD65309	μ PD65310	μ PD65311
	μ PD65327	μ PD65328	μ PD65329	μ PD65330	μ PD65331
	μ PD65347	μ PD65348	μ PD65349	μ PD65350	μ PD65351
	μ PD65367	μ PD65368	μ PD65369	μ PD65360	μ PD65371
Maximum allowable power (W) (1.8 V)	1.23	1.22	1.22	1.22	1.22
Maximum allowable power (W) (2.5 V)	1.23	1.22	1.22	1.22	1.22

Table 2-7. CMOS-10HD Series Maximum Allowable Power When Standard Power Supply Only Is Used in Each Package

Package		QFP ^{Note}										
Number of pins		44	48	64	80	100	120	144	160	208	240	304
Number of standard V _{DD}		1	1	1	4	4	4	4	6	8	12	20
Number of standard GND		1	1	2	4	4	6	8	10	12	16	28
1.8 V	Maximum allowable power of V _{DD} (W)	0.05	0.05	0.05	0.68	0.68	0.68	0.68	0.78	0.89	0.63	1.51
	Maximum allowable power of GND (W)	0.05	0.05	0.10	0.68	0.68	0.78	0.89	0.99	1.10	0.84	1.93
2.5 V	Maximum allowable power of V _{DD} (W)	0.07	0.07	0.07	0.94	0.94	0.94	0.94	1.09	1.23	0.87	2.10
	Maximum allowable power of GND (W)	0.07	0.07	0.15	0.94	0.94	1.09	1.23	1.38	1.52	1.16	2.69

Package		FPBGA					
Number of pins		100	144	160	208	240	304
Number of standard V _{DD}		4	4	6	8	12	20
Number of standard GND		4	8	10	12	16	28
1.8 V	Maximum allowable power of V _{DD} (W)	0.68	0.68	0.78	0.89	1.10	1.51
	Maximum allowable power of GND (W)	0.68	0.89	0.99	1.10	1.31	1.93
2.5 V	Maximum allowable power of V _{DD} (W)	0.94	0.94	1.09	1.23	1.52	2.10
	Maximum allowable power of GND (W)	0.94	1.23	1.38	1.52	1.81	2.69

Package		PBGA			TBGA				
Number of pins		256	313	352	256	352	420	500	576
Number of standard V _{DD}		12	32	16	16	24	28	36	40
Number of standard GND		13	25	32	16	24	28	36	40
1.8 V	Maximum allowable power of V _{DD} (W)	1.10	2.14	1.31	0.84	1.26	1.47	1.89	2.10
	Maximum allowable power of GND (W)	1.15	1.78	2.14	0.84	1.26	1.47	1.89	2.10
2.5 V	Maximum allowable power of V _{DD} (W)	1.52	2.98	1.81	1.16	1.75	2.04	2.62	2.91
	Maximum allowable power of GND (W)	1.59	2.47	2.98	1.16	1.75	2.04	2.62	2.91

Note QFP: QFP, QFP (FP), TQFP, LQFP

Remark For a single power supply, compare with the power consumption of internal area + I/O area, and for a dual power supply, compare with the internal power consumption.

CHAPTER 3 THERMAL RESISTANCE

Caution Depending on the combination of master and package, some packages may not yet be available. Be sure to confirm with NEC Electronics that the desired package has been released. Also contact NEC Electronics if the desired package does not appear in the Package column.

3.1 Standard (Leaded) Packages

★ 3.1.1 CMOS-N5 Series

Table 3-1. CMOS-N5 Series Thermal Resistance (1/4)

(a) With no wind (with no forced air cooling)

Unit: °C/W

Package	Number of Pins	μ PD65891	μ PD65880	μ PD65881	μ PD65892	μ PD65882	μ PD65894	μ PD65883
SSOP ^{Note 1}	20	100	100	100	–	–	–	–
	30	80	80	80	–	–	–	–
QFP	44 ^{Note 2}	122	113	–	–	–	–	–
	52	–	–	–	–	–	–	104
	100 ^{Note 3}	–	–	–	–	83	–	–
	100 ^{Note 4}	–	–	–	–	84	–	–
QFP (fine pitch)	160	–	–	–	–	–	–	–
	208	–	–	–	–	–	–	–
	240	–	–	–	–	–	–	–
	304	–	–	–	–	–	–	–
TQFP ^{Note 2}	48	131	128	108	–	98	–	–
	64 ^{Note 5}	–	–	87	–	79	–	72
	80	–	–	–	–	130	–	108
	100	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–
	64 ^{Note 6}	–	–	97	–	92	–	76
LQFP ^{Note 2}	44	–	130	115	–	103	–	93
	100	–	–	–	127	114	–	111
	144	–	–	–	–	–	69	60
	160	–	–	–	–	–	–	–
FPBGA ^{Note 2}	80	–	–	–	–	46	–	46 ^{Note 1}
	108	–	–	–	–	–	–	41
	144	–	–	–	–	–	–	38
	160	–	–	–	–	–	–	–
SDIP	64	–	–	111	–	–	–	–

Notes 1. Preliminary value**2.** Line 2**3.** Correspondence to the replacement of CMOS-6X, 6S**4.** Correspondence to the replacement of CMOS-6, 6A, 6V**5.** 0.5 mm pitch**6.** 0.65 mm pitch**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-1. CMOS-N5 Series Thermal Resistance (2/4)

(a) With no wind (with no forced air cooling)

Unit: °C/W

Package	Number of Pins	μ PD65884	μ PD65885	μ PD65887	μ PD65889	μ PD65890	μ PD65893
QFP (fine pitch)	160	–	57	53	–	–	–
	208	–	52	48	43	40	38
	240	–		49	45	39	36
	304	–	–	–		40	38
TQFP ^{Note 1}	48						
	64 ^{Note 2}	–	–	–	–	–	–
	80						
	100				–	–	–
	120					–	–
	64 ^{Note 3}						
LQFP ^{Note 1}	44	93					
	100	89	84	82	–	–	–
	144		57	53			46
	160	62			52	49	
FPBGA ^{Note 1}	80	42	40	–	–	–	–
	108	40	39	37	35	–	–
	144	37	36	34	32	30	27
	160	36	35	34	32	29	27
SDIP	64	–	–	–	–	–	–

Notes 1. Line 2

2. 0.5 mm pitch
3. 0.65 mm pitch

Remarks 1. Blank: Under study, –: Cannot be used

2. Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-1. CMOS-N5 Series Thermal Resistance (3/4)

(b) With 1 m/s forced air cooling

Unit: °C/W

Package	Number of Pins	μPD65880	μPD65881	μPD65882	μPD65883	μPD65884	μPD65885	μPD65887	μPD65889	μPD65890	μPD65893
QFP	52	–	–	–	95	–	–	–	–	–	–
	100 ^{Note 1}	–	–	–	–	–	–	–	–	–	–
	100 ^{Note 2}	–	–	74	–	–	–	–	–	–	–
QFP (fine pitch)	160	–	–	–	–	–	45	41	–	–	–
	208	–	–	–	–	–	43	39	35	33	32
	240	–	–	–	–	–	–	43	38	34	31
	304	–	–	–	–	–	–	–	–	34	33
TQFP ^{Note 3}	48	107	87	68	–	–	–	–	–	–	–
	64 ^{Note 4}	–	–	–	–	–	–	–	–	–	–
	80	–	–	111	88	–	–	–	–	–	–
	100	–	–	–	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–	–	–	–
	64 ^{Note 5}	–	80	76	62	–	–	–	–	–	–
LQFP ^{Note 3}	44	116	103	90	81	84	–	–	–	–	–
	100	–	–	104	96	79	74	62	–	–	–
	144	–	–	–	–	–	–	–	–	–	35
	160	–	–	–	–	56	–	–	40	37	–
FPBGA ^{Note 3}	80	–	–	39	39 ^{Note 6}	37	36	–	–	–	–
	108	–	–	–	37	36	35	33	31	–	–
	144	–	–	–	34	33	32	30	28	26	23
	160	–	–	–	–	33	31	30	28	25	23
SDIP	64	–	98	–	–	–	–	–	–	–	–

Notes 1. Correspondence to the replacement of CMOS-6X, 6S**2.** Correspondence to the replacement of CMOS-6, 6A, 6V**3.** Line 2**4.** 0.5 mm pitch**5.** 0.65 mm pitch**6.** Preliminary value**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-1. CMOS-N5 Series Thermal Resistance (4/4)

(c) With 2 m/s forced air cooling

Unit: °C/W

Package	Number of Pins	μPD65880	μPD65881	μPD65882	μPD65883	μPD65884	μPD65885	μPD65887	μPD65889	μPD65890	μPD65893
QFP	52	–	–	–	85	–	–	–	–	–	–
	100 ^{Note 1}	–	–	–	–	–	–	–	–	–	–
	100 ^{Note 2}	–	–	69	–	–	–	–	–	–	–
QFP (fine pitch)	160	–	–	–	–	–	41	37	–	–	–
	208	–	–	–	–	–	43	38	34	32	30
	240	–	–	–	–	–	–	40	36	32	29
	304	–	–	–	–	–	–	–	–	32	30
TQFP ^{Note 3}	48	96	78	60	–	–	–	–	–	–	–
	64 ^{Note 4}	–	–	–	–	–	–	–	–	–	–
	80	–	–	106	81	–	–	–	–	–	–
	100	–	–	–	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–	–	–	–
	64 ^{Note 5}	–	76	72	57	–	–	–	–	–	–
LQFP ^{Note 3}	44	104	91	78	69	73	–	–	–	–	–
	100	–	–	94	89	71	66	53	–	–	–
	144	–	–	–	–	–	–	–	–	–	31
	160	–	–	–	–	51	–	–	36	33	–
FPBGA ^{Note 3}	80	–	–	36	36 ^{Note 6}	35	34	–	–	–	–
	108	–	–	–	35	33	32	30	28	–	–
	144	–	–	–	32	31	30	28	26	24	21
	160	–	–	–	–	30	29	27	25	23	21
SDIP	64	–	91	–	–	–	–	–	–	–	–

- Notes**
1. Correspondence to the replacement of CMOS-6X, 6S
 2. Correspondence to the replacement of CMOS-6, 6A, 6V
 3. Line 2
 4. 0.5 mm pitch
 5. 0.65 mm pitch
 6. Preliminary value

- Remarks**
1. Blank: Under study, –: Cannot be used
 2. Refer to the package list of each Series (**CHAPTER 1**) for package details.

3.1.2 CMOS-9HD, EA-9HD Series

Table 3-2. CMOS-9HD, EA-9HD Series Thermal Resistance (1/6)

(a) With no wind (with no forced air cooling) (1/2)

Unit: °C/W

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
QFP (fine pitch)	100	–	–	125	118	111	98	88	80
	120	–	–	–	–	–	86	–	–
	144	–	–	71	69	66	62	60	55
	160	–	–	71	67	64	58	54	50
	176	–	–	–	67	64	44	–	–
	208	–	–	–	–	56	51	47	44
	240	–	–	–	–	–	54	49	44
	304	–	–	–	–	–	–	31	31
TQFP (fine pitch)	48 ^{Note2}	116	109	104	–	–	–	–	–
	64 ^{Note2}	–	–	79	–	–	–	–	–
	80	–	–	–	–	–	90	–	–
	80 ^{Note2}	–	94	122	–	–	–	–	–
	100	–	–	–	–	–	–	68	65
	100 ^{Note2}	–	87	82	–	–	–	–	–
	120	–	–	83	–	–	74	–	63
LQFP (fine pitch)	100	–	–	–	–	–	61	–	–
	144	–	–	–	–	–	–	57	52
	144 ^{Note2}	–	–	65	52	62	–	–	–
PBGA	225 ^{Note1}	–	–	–	–	–	–	–	–
	256	–	–	–	–	–	–	30	30
	272	–	–	–	–	–	–	26	26
	313	–	–	–	–	–	–	–	26
	352	–	–	–	–	–	–	–	22
FPBGA	108	–	–	48	46	45	49	42	–
	144	–	–	44	42	41	43	35	38
	160	–	–	–	–	–	–	34	36
	161	–	–	45	–	–	–	–	–
	176	–	–	–	47	45	43	–	–
	208	–	–	–	–	–	–	36	31
	240	–	–	–	–	–	–	–	–
	304	–	–	–	–	–	–	–	–
	393	–	–	–	–	–	–	–	27
TBGA with heat spreader	256	–	–	–	–	–	21	21	21
	352	–	–	–	–	–	–	–	16
	420	–	–	–	–	–	–	–	–
	500	–	–	–	–	–	–	–	–
	576	–	–	–	–	–	–	–	–
	696	–	–	–	–	–	–	–	–
ABGA	672	–	–	–	–	–	–	–	–

Notes 1. Under development

2. Line 2

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each Series (CHAPTER 1) for package details.

Table 3-2. CMOS-9HD, EA-9HD Series Thermal Resistance (2/6)

(a) With no wind (with no forced air cooling) (2/2)

Unit: °C/W

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451	μ PD65454	μ PD65456	μ PD65458	μ PD65469	μ PD65470	μ PD65471
		μ PD65461	μ PD65464	μ PD65466	μ PD65468			
QFP (fine pitch)	100	73	66	–	–	–	–	–
	120	–	–	–	–	–	–	–
	144	52	–	–	–	–	–	–
	160	47	44	41	–	–	–	–
	176	–	–	–	–	–	–	–
	208	41	38	36	33	–	–	–
	240	41	37	34	30	–	–	–
	304	39	37	34	32	–	–	–
TQFP (fine pitch)	48 ^{Note2}	–	–	–	–	–	–	–
	64 ^{Note2}	–	–	–	–	–	–	–
	80 ^{Note2}	–	–	–	–	–	–	–
	100 ^{Note2}	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–
LQFP (fine pitch)	144	–	–	–	–	–	–	–
PBGA	225 ^{Note1}	–	–	–	–	–	–	–
	256	30	30	–	–	–	–	–
	272	26	–	–	–	–	–	–
	313	26	–	–	–	–	–	–
	352	22	22	22	22	–	–	–
FPBGA	108	–	–	–	–	–	–	–
	144	–	–	–	–	–	–	–
	160	–	–	–	–	–	–	–
	176	–	30	29	–	–	–	–
	208	30	–	–	–	–	–	–
	240	–	–	–	–	–	–	–
	304	–	–	–	21	–	–	–
TBGA with heat spreader	256	21	–	–	–	–	–	–
	352	16	16	16	–	–	–	–
	420	16	16	16	16	16	16	16
	500	–	14	14	14	14	14	14
	576	–	–	14	14	14	–	–
	696	–	–	–	14	–	–	–

Notes 1. Under development

2. Line 2

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each Series (CHAPTER 1) for package details.

Table 3-2. CMOS-9HD, EA-9HD Series Thermal Resistance (3/6)

(b) With 1 m/s forced air cooling (1/2)

Unit: °C/W

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
QFP (fine pitch)	100	–	–	116	108	101	83	74	66
	120	–	–	–	–	–	78	–	–
	144	–	–	66	62	60	51	49	45
	160	–	–	57	54	53	48	44	41
	176	–	–	–	54	53	36	–	–
	208	–	–	–	–	46	42	39	36
	240	–	–	–	–	–	49	43	39
TQFP (fine pitch)	48 ^{Note2}	95	88	83	–	–	–	–	–
	64 ^{Note2}	–	–	–	–	–	–	–	–
	80	–	–	–	–	–	70	–	–
	80 ^{Note2}	–	84	109	–	–	–	–	–
	100	–	–	–	–	–	–	55	52
	100 ^{Note2}	–	72	73	–	–	–	–	–
	120	–	–	68	–	–	65	–	51
LQFP (fine pitch)	100	–	–	–	–	–	50	–	–
	144	–	–	–	–	–	–	51	41
	144 ^{Note2}	–	–	–	43	–	–	–	–
PBGA	225 ^{Note1}	–	–	–	–	–	–	–	–
	256	–	–	–	–	–	–	26	26
	272	–	–	–	–	–	–	21	21
	313	–	–	–	–	–	–	–	22
	352	–	–	–	–	–	–	–	18
FPBGA	108	–	41	43	41	38	41	34	–
	144	–	–	39	37	36	36	31	30
	160	–	–	–	–	–	–	30	29
	161	–	–	38	–	–	–	–	–
	176	–	–	–	42	40	36	–	–
	208	–	–	–	–	–	–	30	27
	240	–	–	–	–	–	–	–	–
	304	–	–	–	–	–	–	–	–
	393	–	–	–	–	–	–	–	21
TBGA with heat spreader	256	–	–	–	–	–	15	15	15
	352	–	–	–	–	–	–	–	11
	420	–	–	–	–	–	–	–	–
	500	–	–	–	–	–	–	–	–
	576	–	–	–	–	–	–	–	–
	696	–	–	–	–	–	–	–	–
ABGA	672	–	–	–	–	–	–	–	–

Notes 1. Under development**2.** Line 2**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.**3.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-2. CMOS-9HD, EA-9HD Series Thermal Resistance (4/6)

(b) With 1 m/s forced air cooling (2/2)

Unit: °C/W

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451	μ PD65454	μ PD65456	μ PD65458	μ PD65469	μ PD65470	μ PD65471
		μ PD65461	μ PD65464	μ PD65466	μ PD65468			
QFP (fine pitch)	100	60	53	–	–	–	–	–
	120	–	–	–	–	–	–	–
	144	43	–	–	–	–	–	–
	160	39	36	34	–	–	–	–
	176	–	–	–	–	–	–	–
	208	34	31	30	27	–	–	–
	240	35	31	29	25	–	–	–
	304	34	31	30	27	–	–	–
TQFP (fine pitch)	48 ^{Note2}	–	–	–	–	–	–	–
	64 ^{Note2}	–	–	–	–	–	–	–
	80	–	–	–	–	–	–	–
	100	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–
LQFP (fine pitch)	144	–	–	–	–	–	–	–
PBGA	225 ^{Note1}	–	–	–	–	–	–	–
	256	26	26	–	–	–	–	–
	272	21	21	–	–	–	–	–
	313	22	–	–	–	–	–	–
	352	18	18	18	18	–	–	–
FPBGA	108	–	–	–	–	–	–	–
	144	–	–	–	–	–	–	–
	160	–	–	–	–	–	–	–
	176	–	23	22	–	–	–	–
	208	26	–	–	–	–	–	–
	240	–	–	–	–	–	–	–
	304	–	–	–	18	–	–	–
TBGA with heat spreader	256	15	–	–	–	–	–	–
	352	11	11	11	–	–	–	–
	420	11	11	11	11	11	11	11
	500	–	10	10	10	10	10	10
	576	–	–	10	10	10	–	–
	696	–	–	–	10	–	–	–

Notes 1. Under development**2.** Line 2**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.**3.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-2. CMOS-9HD, EA-9HD Series Thermal Resistance (5/6)

(c) With 2 m/s forced air cooling (1/2)

Unit: °C/W

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
QFP (fine pitch)	100	–	–	102	99	93	76	67	59
	120	–	–	–	–	–	69	–	–
	144	–	–	60	57	55	47	47	44
	160	–	–	56	53	52	47	43	40
	176	–	–	–	53	52	34	–	–
	208	–	–	–	–	45	41	38	35
	240	–	–	–	–	–	47	41	37
	304	–	–	–	–	–	–	23	23
TQFP (fine pitch)	48 ^{Note2}	86	79	73	–	–	–	–	–
	64 ^{Note2}	–	–	–	–	–	–	–	–
	80	–	–	–	–	–	61	–	–
	80 ^{Note2}	–	80	98	–	–	–	–	–
	100	–	–	–	–	–	–	50	47
	100 ^{Note2}	–	68	65	–	–	–	–	–
	120	–	–	63	–	–	58	–	46
LQFP (fine pitch)	100	–	–	–	–	–	46	–	–
	144	–	–	–	–	–	–	45	36
	144 ^{Note2}	–	–	–	40	–	–	–	–
PBGA	225 ^{Note1}	–	–	–	–	–	–	–	–
	256	–	–	–	–	–	–	24	24
	272	–	–	–	–	–	–	–	–
	313	–	–	–	–	–	–	–	20.5
	352	–	–	–	–	–	–	–	16
FPBGA	108	–	38	40	38	35	38	31	–
	144	–	–	37	35	34	33	29	29
	160	–	–	–	–	–	–	28	26
	161	–	–	36	–	–	–	–	–
	176	–	–	–	39	37	33	–	–
	208	–	–	–	–	–	–	27	25
	240	–	–	–	–	–	–	–	–
	304	–	–	–	–	–	–	–	–
	393	–	–	–	–	–	–	–	20
TBGA with heat spreader	256	–	–	–	–	–	12	12	12
	352	–	–	–	–	–	–	–	9
	420	–	–	–	–	–	–	–	–
	500	–	–	–	–	–	–	–	–
	576	–	–	–	–	–	–	–	–
	696	–	–	–	–	–	–	–	–
ABGA	672	–	–	–	–	–	–	–	–

Notes 1. Under development**2.** Line 2**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.**3.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-2. CMOS-9HD, EA-9HD Series Thermal Resistance (6/6)

(c) With 2 m/s forced air cooling (2/2)

Unit: °C/W

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451	μ PD65454	μ PD65456	μ PD65458	μ PD65469	μ PD65470	μ PD65471
		μ PD65461	μ PD65464	μ PD65466	μ PD65468			
QFP (fine pitch)	100	53	46	–	–	–	–	–
	120	–	–	–	–	–	–	–
	144	41	–	–	–	–	–	–
	160	37	34	31	–	–	–	–
	176				–	–	–	–
	208	33	30	28	25			
	240	33	29	26	23			
	304	31	28	26	24			
TQFP (fine pitch)	48 ^{Note2}					–	–	–
	64 ^{Note2}					–	–	–
	80	–	–	–	–	–	–	–
	100	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–
LQFP (fine pitch)	144	–	–	–	–	–	–	–
PBGA	225 ^{Note1}					–	–	–
	256	24	24		–	–	–	–
	272					–	–	–
	313	20.5				–	–	–
	352	16	16	16	16	–	–	–
FPBGA	108	–	–	–	–	–	–	–
	144	–	–	–	–	–	–	–
	160	–	–	–	–	–	–	–
	176		21	20	–	–	–	–
	208	24			–	–	–	–
	240					–	–	–
	304	–	–		16	–	–	–
TBGA with heat spreader	256	12		–	–	–	–	–
	352	9	9	9				
	420	9	9	9	9	9	9	9
	500	–	8	8	8	8	8	8
	576	–	–	8	8	8		
	696	–	–	–	8			

Notes 1. Under development**2.** Line 2**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.**3.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

★ 3.1.3 CMOS-10HD Series

Table 3-3. CMOS-10HD Series Thermal Resistance (1/12)

(a) With no wind (with no forced air cooling) (1/4)

Unit: °C/W

Package	Number of Pins	μ PD65301	μ PD65302	μ PD65303	μ PD65304	μ PD65305
		μ PD65341	μ PD65342	μ PD65343	μ PD65344	μ PD65345
		μ PD65501	μ PD65502	μ PD65503	μ PD65504	μ PD65505
		μ PD65541	μ PD65542	μ PD65543	μ PD65544	μ PD65545
QFP (fine pitch)	144	–	50.5	49.5	48.0	47.0
	160	–	48.5	47.5	46.0	45.0
	208	–	–	53.0	51.0	49.5
	240	–	–	–	47.0	45.5
	304	–	–	–	–	–
TQFP ^{Note}	48	95.5	–	–	–	–
	64	–	74.0	71.0	–	–
	80	–	85.0	80.0	–	–
	120	–	–	–	–	–
LQFP ^{Note}	44	99.5	91.5	86.0	78.0	–
	100	–	–	–	77.5	73.5
	144	–	–	–	47.5	46.5
PBGA	256	–	–	–	–	–
	313	–	–	–	–	–
	352	–	–	–	–	–
FPBGA ^{Note}	61	–	–	–	–	–
	108	44.0	42.5	41.5	40.5	38.5
	144	–	39.0	38.0	37.0	35.5
	160	–	38.5	37.5	36.5	35.0
	161	–	–	–	–	–
	208	–	–	–	34.5	34.0
	240	–	–	–	38.5	37.5
	304	–	–	–	–	37.0
393	–	–	–	–	–	
FPLGA	64	–	–	–	–	–
	84	–	–	–	–	–
	108	–	–	–	–	–

Note Line 2**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Part number on the top are 3-layer product and those on the bottom are 4-layer product.**3.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (2/12)

(a) With no wind (with no forced air cooling) (2/4)

Unit: °C/W

Package	Number of Pins	μ PD65306	μ PD65307	μ PD65308	μ PD65309	μ PD65310	μ PD65311
		μ PD65346	μ PD65347	μ PD65348	μ PD65349	μ PD65350	μ PD65351
		μ PD65506	μ PD65507	μ PD65508	μ PD65509	μ PD65510	μ PD65511
		μ PD65546	μ PD65547	μ PD65548	μ PD65549	μ PD65550	μ PD65551
QFP (fine pitch)	144	45.5	44.0	42.0	40.0	37.0	34.0
	160	43.5	42.0	40.0	38.0	35.0	32.0
	208	47.5	46.0	43.0	40.0	36.5	33.0
	240	44.0	42.0	39.5	37.0	33.5	30.0
	304	–	42.0	39.5	37.0	33.5	30.5
TQFP ^{Note}	48	–	–	–	–	–	–
	64	–	–	–	–	–	–
	80						
	120						
LQFP ^{Note}	44	–	–	–	–	–	–
	100	69.5	64.5	57.5	49.5		
	144	44.5	43.0	41.0	39.0	36.0	
PBGA	256						–
	313						
	352						
FPBGA ^{Note}	61	–	–	–	–	–	–
	108	37.0	–	–	–	–	–
	144	34.0	33.0	–	–	–	–
	160	33.5	32.5	30.0	26.5	–	–
	161	38.0	–	–	–	–	–
	208	33.0	31.5	29.0	26.0	22.5	–
	240	36.5	35.0	33.0	31.0	28.5	26.0
	304	36.0	34.5	32.5	30.5	28.0	25.5
393	–	28.5				–	–

Note Line 2

- Remarks**
- Blank: Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (3/12)

(a) With no wind (with no forced air cooling) (3/4)

Unit: °C/W

Package	Number of Pins	μ PD65321	μ PD65322	μ PD65323
		μ PD65361	μ PD65362	μ PD65363
		μ PD65521	μ PD65522	μ PD65523
		μ PD65561	μ PD65562	μ PD65563
TQFP ^{Note}	64	78.5	–	–
	80	91.5	–	–
	100	63.5	61.5	59.5
	120	–	–	–
LQFP ^{Note}	100	91.0	86.0	82.5
	144	–	–	48.5

Note Line 2

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.

3. Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (4/12)

(a) With no wind (with no forced air cooling) (4/4)

Unit: °C/W

Package	Number of Pins	μ PD65324	μ PD65325	μ PD65326	μ PD65327	μ PD65328	μ PD65329	μ PD65330	μ PD65331
		μ PD65364	μ PD65365	μ PD65366	μ PD65367	μ PD65368	μ PD65369	μ PD65370	μ PD65371
		μ PD65524	μ PD65525	μ PD65526	μ PD65527	μ PD65528	μ PD65529	μ PD65530	μ PD65531
		μ PD65564	μ PD65565	μ PD65566	μ PD65567	μ PD65568	μ PD65569	μ PD65570	μ PD65571
TBGA with heat spreader	256								
	352	–	–	20.0	19.5	19.0	18.5	18.0	17.0
	420	–	–	–	19.5	19.0	18.5	18.0	17.0
	500	–	–	–	–	17.5	17.0	16.5	16.0
	576	–	–	–	–	–	17.0	16.5	16.0

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.

3. Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (5/12)

(b) With 1 m/s forced air cooling (1/4)

Unit: °C/W

Package	Number of Pins	μ PD65301	μ PD65302	μ PD65303	μ PD65304	μ PD65305
		μ PD65341	μ PD65342	μ PD65343	μ PD65344	μ PD65345
		μ PD65501	μ PD65502	μ PD65503	μ PD65504	μ PD65505
		μ PD65541	μ PD65542	μ PD65543	μ PD65544	μ PD65545
QFP (fine pitch)	144	–	41.0	40.0	38.5	37.5
	160	–	39.5	38.5	37.0	36.0
	208	–	–	43.0	41.0	39.5
	240	–	–	–	37.5	36.0
	304	–	–	–	–	–
TQFP ^{Note}	48	81.5	–	–	–	–
	64	–	62.5	59.5	–	–
	80	–	73.0	68.0	–	–
	120	–	–	–	–	–
LQFP ^{Note}	44	85.5	78.0	72.5	64.5	–
	100	–	–	–	66.0	62.0
	144	–	–	–	38.5	37.5
PBGA	256	–	–	–	–	–
	313	–	–	–	–	–
	352	–	–	–	–	–
FPBGA ^{Note}	61	–	–	–	–	–
	108	40.0	38.5	37.5	36.0	34.0
	144	–	35.0	34.5	33.0	31.5
	160	–	34.5	34.0	32.5	31.0
	161	–	–	–	–	–
	208	–	–	–	31.0	30.0
	240	–	–	–	31.5	30.5
	304	–	–	–	–	30.0
	393	–	–	–	–	–
FPLGA	64	–	–	–	–	–
	84	–	–	–	–	–
	108	–	–	–	–	–

Note Line 2

- Remarks**
- Blank: Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (6/12)

(b) With 1 m/s forced air cooling (2/4)

Unit: °C/W

Package	Number of Pins	μ PD65306	μ PD65307	μ PD65308	μ PD65309	μ PD65310	μ PD65311
		μ PD65346	μ PD65347	μ PD65348	μ PD65349	μ PD65350	μ PD65351
		μ PD65506	μ PD65507	μ PD65508	μ PD65509	μ PD65510	μ PD65511
		μ PD65546	μ PD65547	μ PD65548	μ PD65549	μ PD65550	μ PD65551
QFP (fine pitch)	144	36.0	34.5	32.5	30.5	27.5	25.0
	160	34.5	33.0	31.0	29.0	26.0	23.5
	208	38.0	36.0	33.5	30.5	27.0	23.0
	240	34.5	33.0	30.5	28.0	24.5	21.5
	304	–	33.5	31.0	28.5	25.5	22.5
TQFP ^{Note}	48	–	–	–	–	–	–
	64	–	–	–	–	–	–
	80						
	120						
LQFP ^{Note}	44	–	–	–	–	–	–
	100	58.0	53.5	46.5	39.0		
	144	35.5	34.5	32.5	30.0	27.5	
PBGA	256						–
	313						
	352						
FPBGA ^{Note}	61	–	–	–	–	–	–
	108	33.0	–	–	–	–	–
	144	30.5	29.0	–	–	–	–
	160	30.0	28.5	26.0	22.5	–	–
	161	32.0	–	–	–	–	–
	208	29.0	27.5	25.5	22.0	19.0	–
	240	29.5	28.5	26.5	24.5	22.0	20.0
	304	29.0	28.0	26.0	24.0	21.5	19.5
393	–	22.5				–	–

Note Line 2**Remarks** 1. Blank: Under study, –: Cannot be used

2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.

3. Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (7/12)

(b) With 1 m/s forced air cooling (3/4)

Unit: °C/W

Package	Number of Pins	μ PD65321	μ PD65322	μ PD65323
		μ PD65361	μ PD65362	μ PD65363
		μ PD65521	μ PD65522	μ PD65523
		μ PD65561	μ PD65562	μ PD65563
TQFP ^{Note}	64	66.5	–	–
	80	79.5	–	–
	100	54.0	51.5	50.0
	120	–		
LQFP ^{Note}	100	79.0	74.5	71.0
	144	–	–	39.5

Note Line 2

- Remarks**
1. Blank: Under study, –: Cannot be used
 2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 3. Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (8/12)

(b) With 1 m/s forced air cooling (4/4)

Unit: °C/W

Package	Number of Pins	μ PD65324	μ PD65325	μ PD65326	μ PD65327	μ PD65328	μ PD65329	μ PD65330	μ PD65331
		μ PD65364	μ PD65365	μ PD65366	μ PD65367	μ PD65368	μ PD65369	μ PD65370	μ PD65371
		μ PD65524	μ PD65525	μ PD65526	μ PD65527	μ PD65528	μ PD65529	μ PD65530	μ PD65531
		μ PD65564	μ PD65565	μ PD65566	μ PD65567	μ PD65568	μ PD65569	μ PD65570	μ PD65571
TBGA with heat spreader	256								
	352	–	–	14.5	14.0	13.5	13.0	12.0	11.5
	420	–	–	–	14.0	13.5	13.0	12.0	11.5
	500	–	–	–	–	12.0	11.5	11.0	10.5
	576	–	–	–	–	–	11.5	11.0	10.5

- Remarks**
1. Blank: Under study, –: Cannot be used
 2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 3. Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (9/12)

(c) With 2 m/s forced air cooling (1/4)

Unit: °C/W

Package	Number of Pins	μ PD65301	μ PD65302	μ PD65303	μ PD65304	μ PD65305
		μ PD65341	μ PD65342	μ PD65343	μ PD65344	μ PD65345
		μ PD65501	μ PD65502	μ PD65503	μ PD65504	μ PD65505
		μ PD65541	μ PD65542	μ PD65543	μ PD65544	μ PD65545
QFP (fine pitch)	144	–	38.0	37.0	35.5	34.0
	160	–	36.5	35.5	34.0	33.0
	208	–	–	39.5	38.0	36.5
	240	–	–	–	34.5	33.0
	304	–	–	–	–	–
TQFP ^{Note}	48	74.0	–	–	–	–
	64	–	57.0	54.0	–	–
	80	–	67.5	63.0	–	–
	120	–	–	–	–	–
LQFP ^{Note}	44	79.5	72.0	66.5	59.0	–
	100	–	–	–	61.5	57.5
	144	–	–	–	35.0	34.5
PBGA	256	–	–	–	–	–
	313	–	–	–	–	–
	352	–	–	–	–	–
FPBGA ^{Note}	61	–	–	–	–	–
	108	37.5	36.0	35.0	33.5	31.5
	144	–	33.0	32.0	31.0	29.5
	160	–	32.5	31.5	30.5	29.0
	161	–	–	–	–	–
	208	–	–	–	28.5	27.5
	240	–	–	–	29.5	28.5
	304	–	–	–	–	28.0
	393	–	–	–	–	–
FPLGA	64	–	–	–	–	–
	84	–	–	–	–	–
	108	–	–	–	–	–

Note Line 2

- Remarks**
1. Blank: Under study, –: Cannot be used
 2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 3. Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (10/12)

(c) With 2 m/s forced air cooling (2/4)

Unit: °C/W

Package	Number of Pins	μ PD65306	μ PD65307	μ PD65308	μ PD65309	μ PD65310	μ PD65311
		μ PD65346	μ PD65347	μ PD65348	μ PD65349	μ PD65350	μ PD65351
		μ PD65506	μ PD65507	μ PD65508	μ PD65509	μ PD65510	μ PD65511
		μ PD65546	μ PD65547	μ PD65548	μ PD65549	μ PD65550	μ PD65551
QFP (fine pitch)	144	33.0	31.5	29.5	27.0	24.0	21.5
	160	32.0	30.5	28.5	26.0	23.5	20.5
	208	34.5	33.0	30.0	27.5	23.5	20.0
	240	31.5	30.0	27.5	25.0	22.0	19.0
	304	–	31.0	29.0	26.5	23.5	20.5
TQFP ^{Note}	48	–	–	–	–	–	–
	64	–	–	–	–	–	–
	80						
	120						
LQFP ^{Note}	44	–	–	–	–	–	–
	100	53.5	48.5	42.0	35.0		
	144	32.5	31.0	29.5	27.0	24.5	
PBGA	256						–
	313						
	352						
FPBGA ^{Note}	61	–	–	–	–	–	–
	108	30.5	–	–	–	–	–
	144	28.0	27.0	–	–	–	–
	160	27.5	26.5	24.0	20.5	–	–
	161	30.0	–	–	–	–	–
	208	27.0	25.5	23.0	20.0	17.0	–
	240	27.5	26.0	24.5	22.5	20.0	18.0
	304	27.0	25.5	24.0	22.0	19.5	17.5
FPLGA	64	–	–	–	–	–	–
	84	–	–	–	–	–	–
	108	–	–	–	–	–	–

Note Line 2

- Remarks**
- Blank: Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (11/12)

(c) With 2 m/s forced air cooling (3/4)

Unit: °C/W

Package	Number of Pins	μ PD65321	μ PD65322	μ PD65323
		μ PD65361	μ PD65362	μ PD65363
		μ PD65521	μ PD65522	μ PD65523
		μ PD65561	μ PD65562	μ PD65563
TQFP ^{Note}	64	61.5	–	–
	80	74.0	–	–
	100	50.0	47.5	46.0
	120	–		
LQFP ^{Note}	100	74.0	69.0	66.0
	144	–	–	36.0

Note Line 2**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Part number on the top are 3-layer product and those on the bottom are 4-layer product.**3.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-3. CMOS-10HD Series Thermal Resistance (12/12)

(c) With 2 m/s forced air cooling (4/4)

Unit: °C/W

Package	Number of Pins	μ PD65324	μ PD65325	μ PD65326	μ PD65327	μ PD65328	μ PD65329	μ PD65330	μ PD65331
		μ PD65364	μ PD65365	μ PD65366	μ PD65367	μ PD65368	μ PD65369	μ PD65370	μ PD65371
		μ PD65524	μ PD65525	μ PD65526	μ PD65527	μ PD65528	μ PD65529	μ PD65530	μ PD65531
		μ PD65564	μ PD65565	μ PD65566	μ PD65567	μ PD65568	μ PD65569	μ PD65570	μ PD65571
TBGA with heat spreader	256								
	352	–	–	13.0	12.5	12.0	11.5	10.5	10.0
	420	–	–	–	12.5	12.0	11.5	10.5	10.0
	500	–	–	–	–	11.0	10.5	10.0	9.0
	576	–	–	–	–	–	10.5	10.0	9.0

Remarks 1. Blank: Under study, –: Cannot be used**2.** Part number on the top are 3-layer product and those on the bottom are 4-layer product.**3.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

3.2 Lead-free Packages

3.2.1 CMOS-N5 Series

Please refer to **3.1.1 CMOS-N5 Series** because the values of the lead-free packages of this Series are the same as those of the leaded packages.

Lead-free

★ 3.2.2 CMOS-9HD, EA-9HD Series

Table 3-4. CMOS-9HD, EA-9HD Series Thermal Resistance (1/6)

(a) With no wind (with no forced air cooling) (1/2)

Unit: °C/W

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
QFP (fine pitch)	100	–	–						
	120	–	–						
	144	–	–						
	160	–	–						
	176	–	–	–					
	208	–	–	–	–				
	240	–	–	–	–	–			
	304	–	–	–	–	–	–		
TQFP ^{Note 1} (fine pitch)	48				–	–	–	–	–
	64			72	–	–	–	–	–
	80	–		87			71	–	–
	100	–		58					
	120	–	–	59					
LQFP ^{Note 1} (fine pitch)	100	–							–
	144	–	–		52				–
PBGA	225 ^{Note 2}	–	–	–	–	–	–	–	–
	256	–	–	–	–	–	–	–	–
	272	–	–	–	–	–	–	–	–
	313	–	–	–	–	–	–	–	–
	352	–	–	–	–	–	–	–	–
FPBGA ^{Note 1}	108	–	45	43	42	42	40	37	–
	144	–	–	39	39	39	37	35	34
	160	–	–	–	38	38	36	34	33
	161	–	–						
	176	–	–	–	37	37	35	34	32
	208	–	–	–	–	–	–	33	32
	240	–	–	–	–	–	–	–	–
	304	–	–	–	–	–	–	–	–
	393	–	–	–	–	–	–	–	–
TBGA with heat spreader	256	–	–	–	–	–	21	21	21
	352	–	–	–	–	–	–	–	16
	420	–	–	–	–	–	–	–	–
	500	–	–	–	–	–	–	–	–
	576	–	–	–	–	–	–	–	–
	696	–	–	–	–	–	–	–	–
ABGA	672								

Notes 1. Line 2**2.** Under development**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.**3.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-4. CMOS-9HD, EA-9HD Series Thermal Resistance (2/6)

(a) With no wind (with no forced air cooling) (2/2)

Unit: °C/W

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451	μ PD65454	μ PD65456	μ PD65458	μ PD65469	μ PD65470	μ PD65471
		μ PD65461	μ PD65464	μ PD65466	μ PD65468			
QFP (fine pitch)	100			–	–	–	–	–
	120							
	144		–	–	–	–	–	–
	160				–	–	–	–
	176				–	–	–	–
	208							
	240							
	304							
TQFP ^{Note 1} (fine pitch)	48	–	–	–	–	–	–	–
	64	–	–	–	–	–	–	–
	80	–	–	–	–	–	–	–
	100	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–
LQFP ^{Note 1} (fine pitch)	100		50	–	–	–	–	–
	144		–	–	–	–	–	–
PBGA	225 ^{Note 2}							
	256				–	–	–	–
	272				–	–	–	–
	313				–	–	–	–
	352				–	–	–	–
FPBGA ^{Note 1}	108	–	–	–	–	–	–	–
	144	32	–	–	–	–	–	–
	160	31		30	–	–	–	–
	176	30	27	24	–	–	–	–
	208	30	27	24	–	–	–	–
	240					–	–	–
	303			28		–	–	–
	304					–	–	–
TBGA with heat spreader	256	21		–	–	–	–	–
	352	16	16	16				
	420	16	16	16	16	16	16	16
	500	–	14	14	14	14	14	14
	576	–	–	14	14	14		
	696	–	–	–	14			
ABGA	672				14			

Notes 1. Line 2

2. Under development

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-4. CMOS-9HD, EA-9HD Series Thermal Resistance (3/6)

(b) With 1 m/s forced air cooling (1/2)

Unit: °C/W

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
QFP (fine pitch)	100	–	–						
	120	–	–						
	144	–	–						
	160	–	–						
	176	–	–	–					
	208	–	–	–	–				
	240	–	–	–	–	–			
TQFP ^{Note 1} (fine pitch)	48				–	–	–	–	–
	64			61	–	–	–	–	–
	80	–		75			60	–	–
	100	–		48					
	120	–	–	49					
LQFP ^{Note 1} (fine pitch)	100	–							–
	144	–	–		43				
PBGA	225 ^{Note 2}	–	–	–	–	–	–	–	–
	256	–	–	–	–	–	–	–	–
	272	–	–	–	–	–	–	–	–
	313	–	–	–	–	–	–	–	–
	352	–	–	–	–	–	–	–	–
FPBGA ^{Note 1}	108	–	41	39	38	38	36	33	–
	144	–	–	35	35	34	33	31	30
	160	–	–	–	34	34	33	30	29
	161	–	–						
	176	–	–	–	33	32	31	30	28
	208	–	–	–	–			30	28
	240	–	–	–	–	–			
	304	–	–	–	–	–	–	–	–
TBGA with heat spreader	256	–	–	–	–	–	15	15	15
	352	–	–	–	–	–	–	–	11
	420	–	–	–	–	–	–	–	–
	500	–	–	–	–	–	–	–	–
	576	–	–	–	–	–	–	–	–
	696	–	–	–	–	–	–	–	–
ABGA	672								

Notes 1. Line 2**2.** Under development**Remarks 1.** Blank: Under study, –: Cannot be used**2.** Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.**3.** Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-4. CMOS-9HD, EA-9HD Series Thermal Resistance (4/6)

(b) With 1 m/s forced air cooling (2/2)

Unit: °C/W

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451	μ PD65454	μ PD65456	μ PD65458	μ PD65469	μ PD65470	μ PD65471
		μ PD65461	μ PD65464	μ PD65466	μ PD65468			
QFP (fine pitch)	100			–	–	–	–	–
	120							
	144		–	–	–	–	–	–
	160				–	–	–	–
	176				–	–	–	–
	208							
	240							
	304							
TQFP ^{Note 1} (fine pitch)	48	–	–	–	–	–	–	–
	64	–	–	–	–	–	–	–
	80	–	–	–	–	–	–	–
	100	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–
LQFP ^{Note 1} (fine pitch)	100		39	–	–	–	–	–
	144		–	–	–	–	–	–
PBGA	225 ^{Note 2}							
	256				–	–	–	–
	272				–	–	–	–
	313				–	–	–	–
	352				–	–	–	–
FPBGA ^{Note 1}	108	–	–	–	–	–	–	–
	144	28	–	–	–	–	–	–
	160	27		23	–	–	–	–
	176	26	23	20	–	–	–	–
	208	26	23	20	–	–	–	–
	240					–	–	–
	303			22		–	–	–
	304					–	–	–
TBGA with heat spreader	256	15		–	–	–	–	–
	352	11	11	11				
	420	11	11	11	11	11	11	11
	500	–	10	10	10	10	10	10
	576	–	–	10	10	10		
	696	–	–	–	10			
ABGA	672				8			

Notes 1. Line 2

2. Under development

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each Series (**CHAPTER 1**) for package details.

Table 3-4. CMOS-9HD, EA-9HD Series Thermal Resistance (5/6)

(c) With 2 m/s forced air cooling (1/2)

Unit: °C/W

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
QFP (fine pitch)	100	–	–						
	120	–	–						
	144	–	–						
	160	–	–						
	176	–	–	–					
	208	–	–	–	–				
	240	–	–	–	–	–			
	304	–	–	–	–	–	–		
TQFP ^{Note 1} (fine pitch)	48				–	–	–	–	–
	64			55	–	–	–	–	–
	80	–		70			55	–	–
	100	–		44					
	120	–	–	45					
LQFP ^{Note 1} (fine pitch)	100	–							–
	144	–	–		40				
PBGA	225 ^{Note 2}	–	–	–	–	–	–	–	–
	256	–	–	–	–	–	–	–	–
	272	–	–	–	–	–	–	–	–
	313	–	–	–	–	–	–	–	–
	352	–	–	–	–	–	–	–	–
FPBGA ^{Note 1}	108	–	38	36	36	35	33	31	–
	144	–	–	33	33	32	31	28	28
	160	–	–	–	32	32	30	28	27
	161	–	–						
	176	–	–	–	30	30	29	28	26
	208	–	–	–	–			27	26
	240	–	–	–	–	–			
	304	–	–	–	–	–	–	–	–
	393	–	–	–	–	–	–	–	–
TBGA with heat spreader	256	–	–	–	–	–	12	12	12
	352	–	–	–	–	–	–	–	9
	420	–	–	–	–	–	–	–	–
	500	–	–	–	–	–	–	–	–
	576	–	–	–	–	–	–	–	–
	696	–	–	–	–	–	–	–	–
ABGA	672								

Notes 1. Line 2

2. Under development

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each Series (CHAPTER 1) for package details.

Table 3-4. CMOS-9HD, EA-9HD Series Thermal Resistance (6/6)

(c) With 2 m/s forced air cooling (2/2)

Unit: °C/W

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451	μ PD65454	μ PD65456	μ PD65458	μ PD65469	μ PD65470	μ PD65471
		μ PD65461	μ PD65464	μ PD65466	μ PD65468			
QFP (fine pitch)	100			–	–	–	–	–
	120	–	–	–	–	–	–	–
	144		–	–	–	–	–	–
	160				–	–	–	–
	176				–	–	–	–
	208							
	240							
	304							
TQFP ^{Note 1} (fine pitch)	48	–	–	–	–	–	–	–
	64	–	–	–	–	–	–	–
	80	–	–	–	–	–	–	–
	100	–	–	–	–	–	–	–
	120	–	–	–	–	–	–	–
LQFP ^{Note 1} (fine pitch)	100		34	–	–	–	–	–
	144		–	–	–	–	–	–
PBGA	225 ^{Note 2}							
	256				–	–	–	–
	272				–	–	–	–
	313				–	–	–	–
	352				–	–	–	–
FPBGA ^{Note 1}	108	–	–	–	–	–	–	–
	144	26	–	–	–	–	–	–
	160	25		21	–	–	–	–
	176	24	21	18	–	–	–	–
	208	24	21	18	–	–	–	–
	240					–	–	–
	303			20		–	–	–
	304					–	–	–
TBGA with heat spreader	256	12		–	–	–	–	–
	352	9	9	9				
	420	9	9	9	9	9	9	9
	500	–	8	8	8	8	8	8
	576	–	–	8	8	8		
	696	–	–	–	8			
ABGA	672				7			

Notes 1. Line 2

2. Under development

Remarks 1. Blank: Under study, –: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each Series (**CHAPTER 1**) for package details.

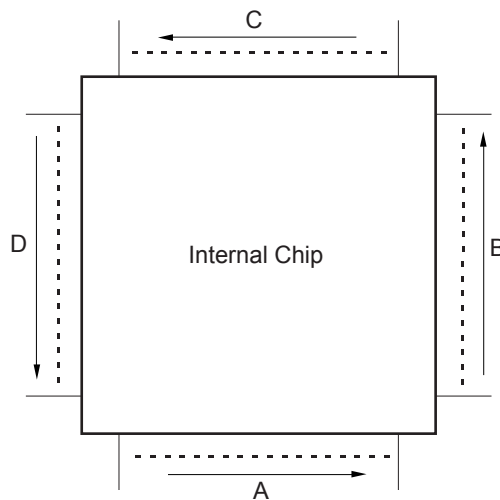
★ **3.2.3 CMOS-10HD Series**

Please refer to **3.1.3 CMOS-10HD Series** because the values of the lead-free packages of this series are the same as those of the leaded packages.

Lead-free

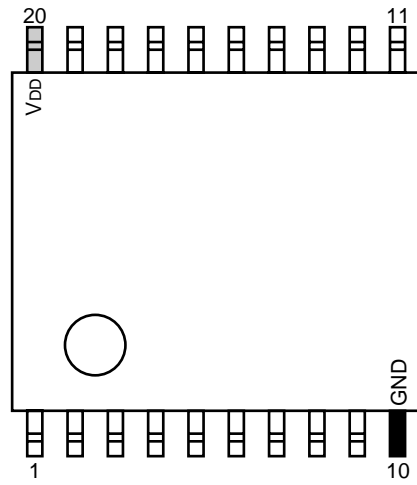
CHAPTER 4 [SINGLE POWER SUPPLY] ASSIGNMENT OF V_{DD}, GND, NC, SCAN PINS

- Cautions**
1. The pin assignment of QFP type packages and TBGA packages is common to the CMOS-N5, CMOS-9HD, (single power supply), EA-9HD, and CMOS-10HD Families. This pin assignment also applies to all part numbers using released packages.
 2. Depending on the combination of master and package, some packages may not yet be available. Be sure to confirm with NEC Electronics that the desired package has been released. Also contact NEC Electronics if the desired package does not appear in the Package column.
 3. Assignment of dedicated scan path pins is restricted in packages with 313 or fewer pins. For packages not described here, contact NEC Electronics.
Note that there are no restrictions on the assignment of dedicated scan path pins for packages with 314 or more pins, regardless of the package type.
 4. In the package of BGA type, A, B, C, and D in the chip side column correspond to A, B, C, and D in the figure below. The pin placement list describes from the top to the bottom in the direction of the arrows in the figure of the internal chip shown below. The last row of each table does not mean the chip side delimited.



★ 4.1 SSOP

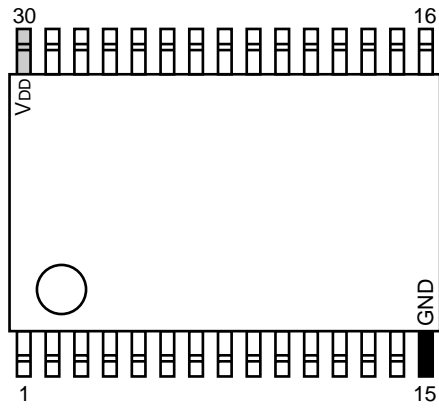
4.1.1 20-pin SSOP



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
10	20	None	14	15	16	18

Note Total number of usable signal pins.

4.1.2 30-pin SSOP

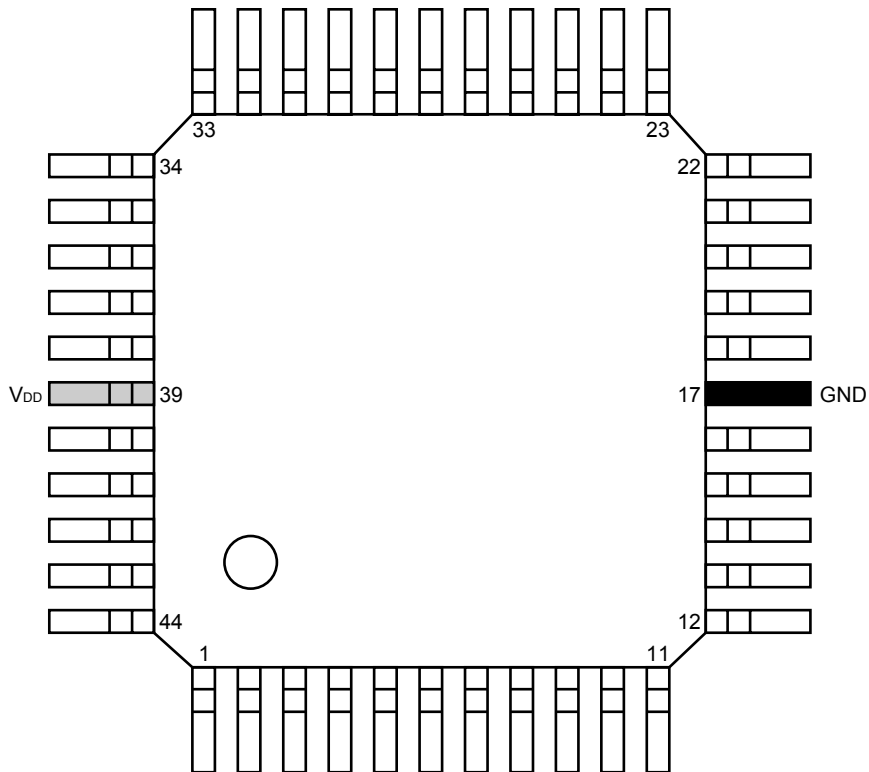


GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
15	30	None	20	21	22	28

Note Total number of usable signal pins.

4.2 QFP

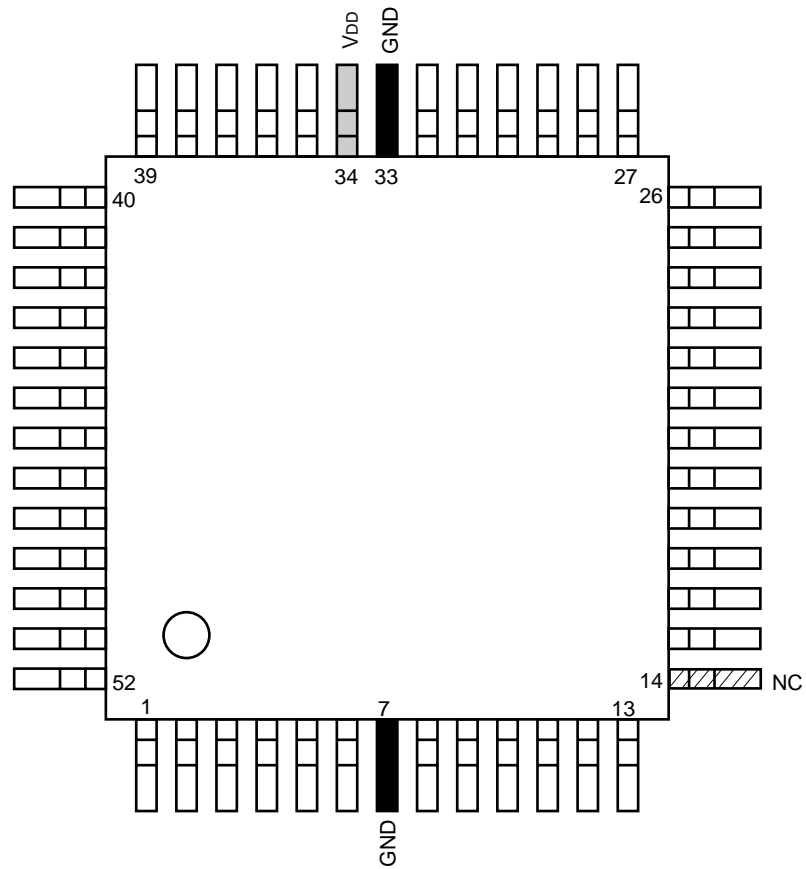
4.2.1 44-pin QFP



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
17	39	None	40	41	42	42

Note Total number of usable signal pins.

★ 4.2.2 52-pin QFP

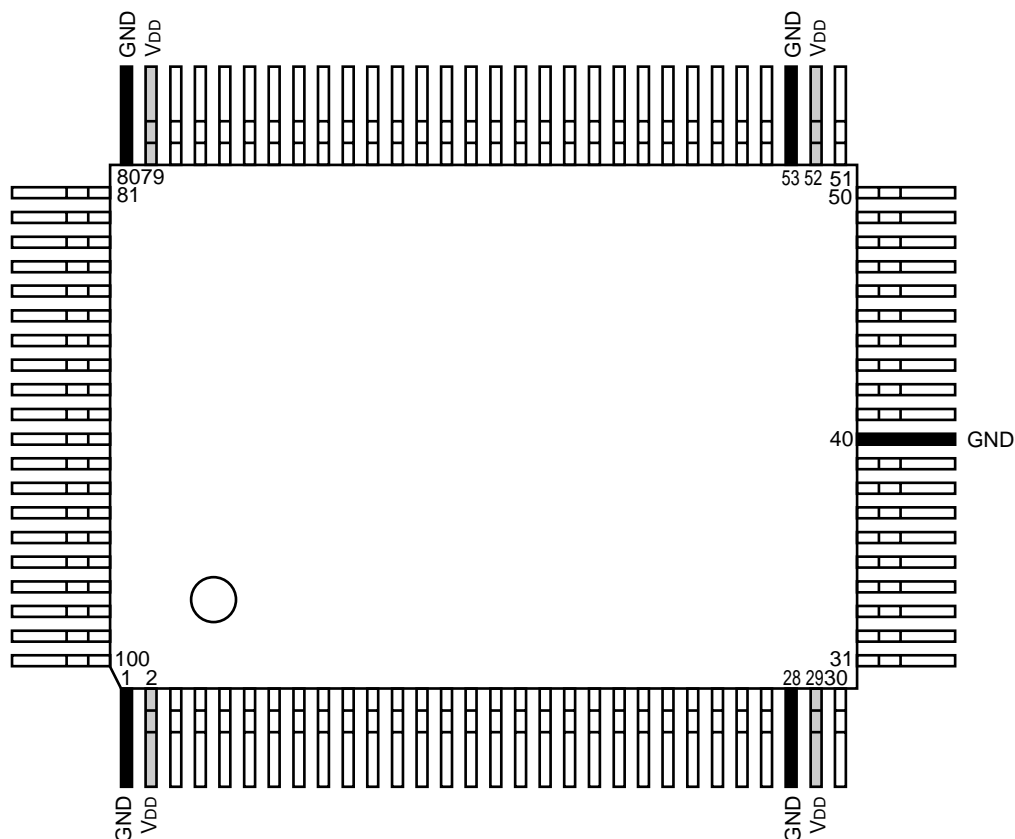


GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
7, 33	34	14	35	36	37	48

Note Total number of usable signal pins.

Caution If the respective locations and total quantity of NC, V_{DD} and GND pins on the package that is to be replaced do not in the least match the respective locations and quantities of the pins on the replacement package, then the package cannot be replaced.

★ 4.2.3 100-pin QFP (Correspondence to the replacement of CMOS-6, 6A, 6V)



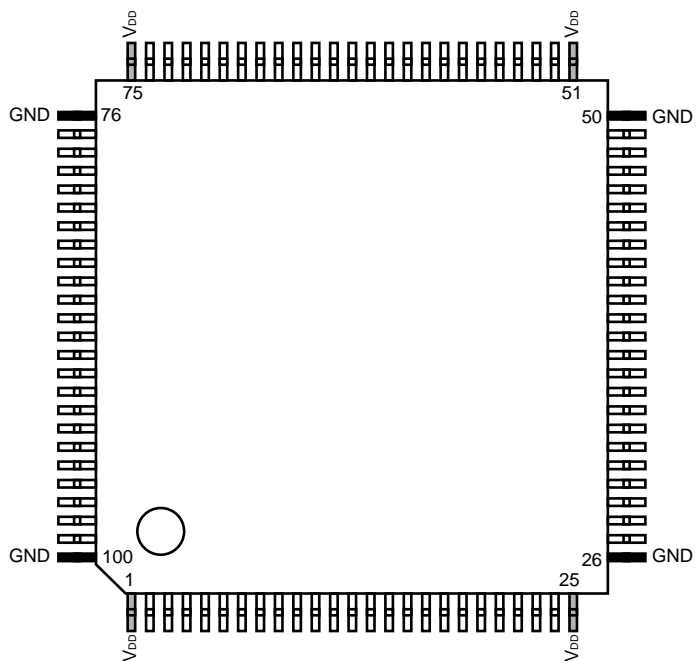
GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1, 28, 40, 53, 80	2, 29, 52, 79	None	71	73	75	91

Note Total number of usable signal pins.

Caution If the respective locations and total quantity of NC, V_{DD} and GND pins on the package that is to be replaced do not in the least match the respective locations and quantities of the pins on the replacement package, then the package cannot be replaced.

4.3 QFP (Fine Pitch)

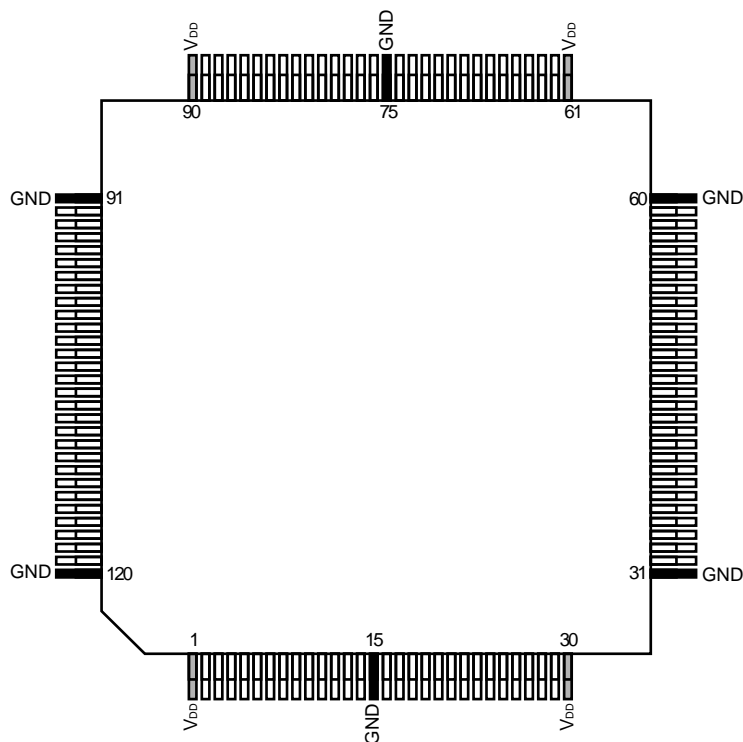
4.3.1 100-pin QFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
26, 50, 76, 100	1, 25, 51, 75	None	17	18	19	92

Note Total number of usable signal pins.

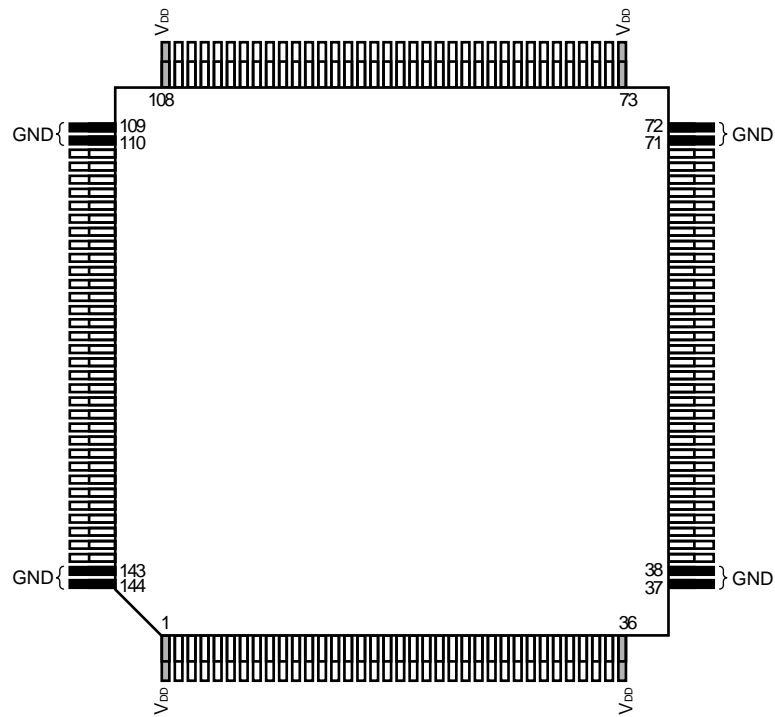
4.3.2 120-pin QFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
15, 31, 60, 75, 91, 120	1, 30, 61, 90	None	112	114	116	110

Note Total number of usable signal pins.

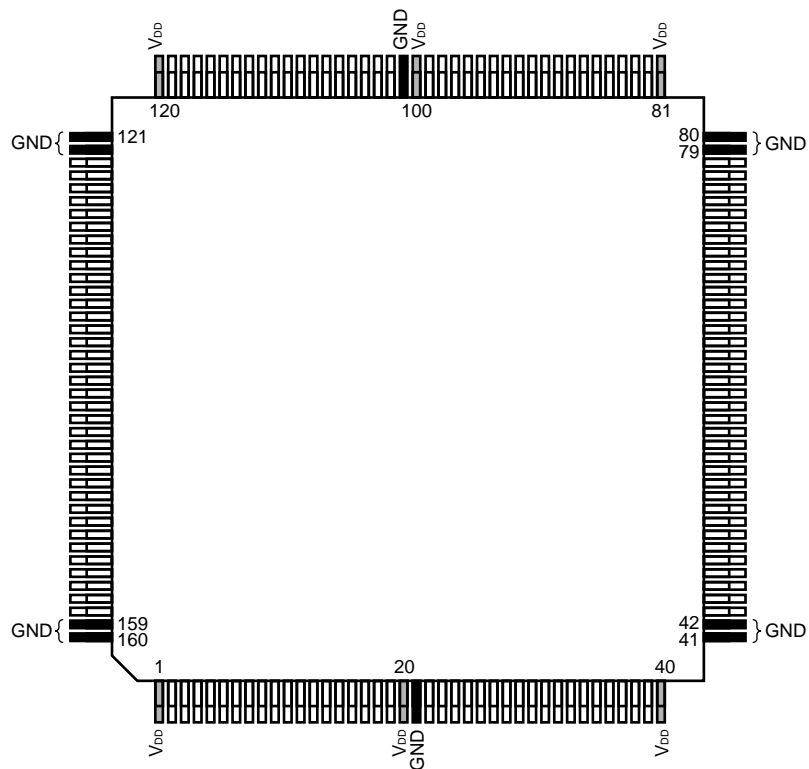
4.3.3 144-pin QFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
37, 38, 71, 72, 109, 110, 143, 144	1, 36, 73, 108	None	135	137	139	132

Note Total number of usable signal pins.

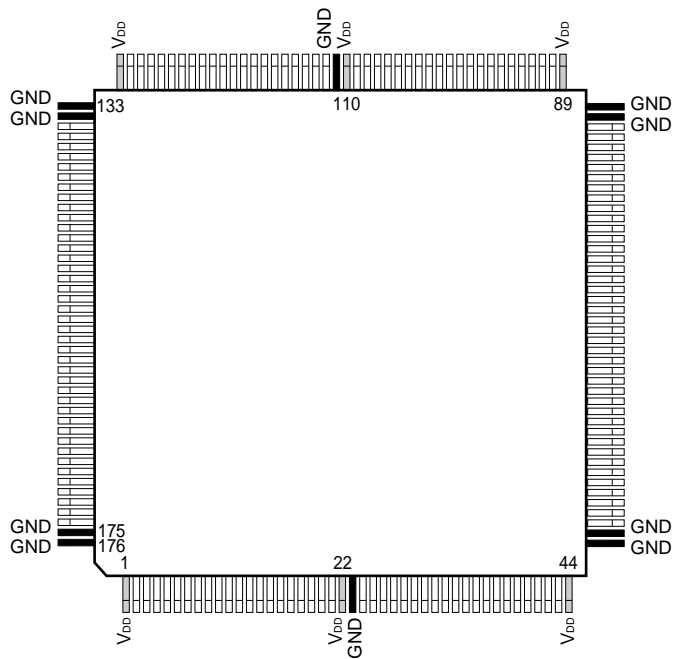
4.3.4 160-pin QFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
21, 41, 42, 79, 80, 101, 121, 122, 159, 160	1, 20, 40, 81, 100, 120	None	44	45	46	144

Note Total number of usable signal pins.

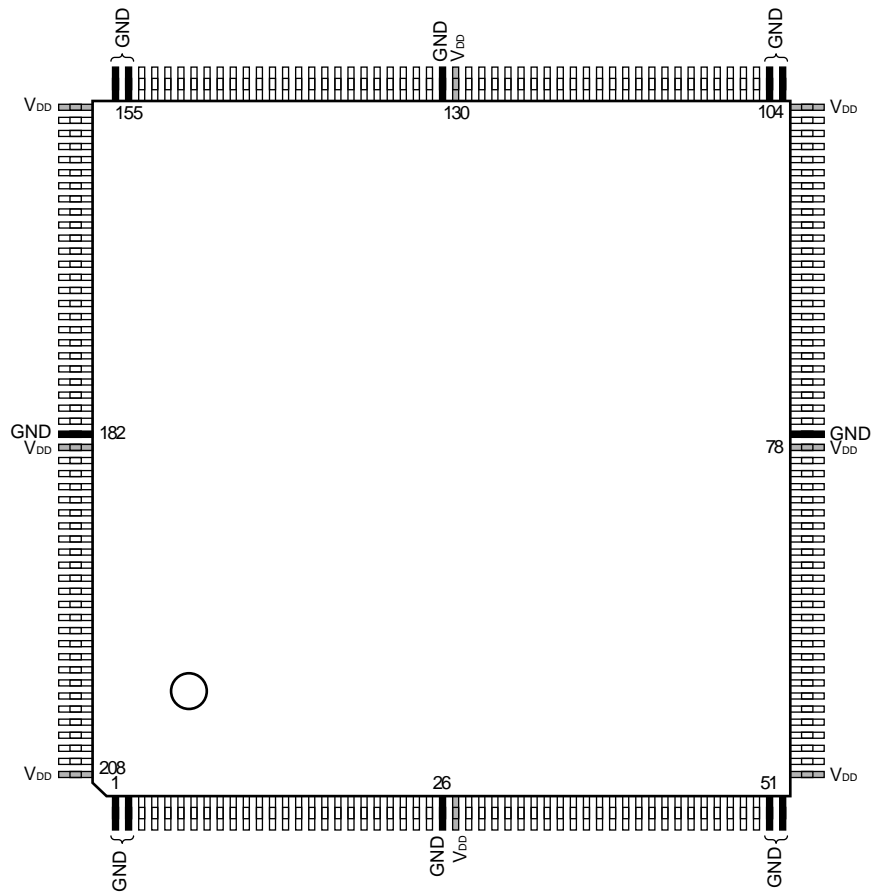
4.3.5 176-pin QFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
23, 45, 46, 87, 88, 111, 133, 134, 175, 176	1, 22, 44, 89, 110, 132	None	49	50	51	160

Note Total number of usable signal pins.

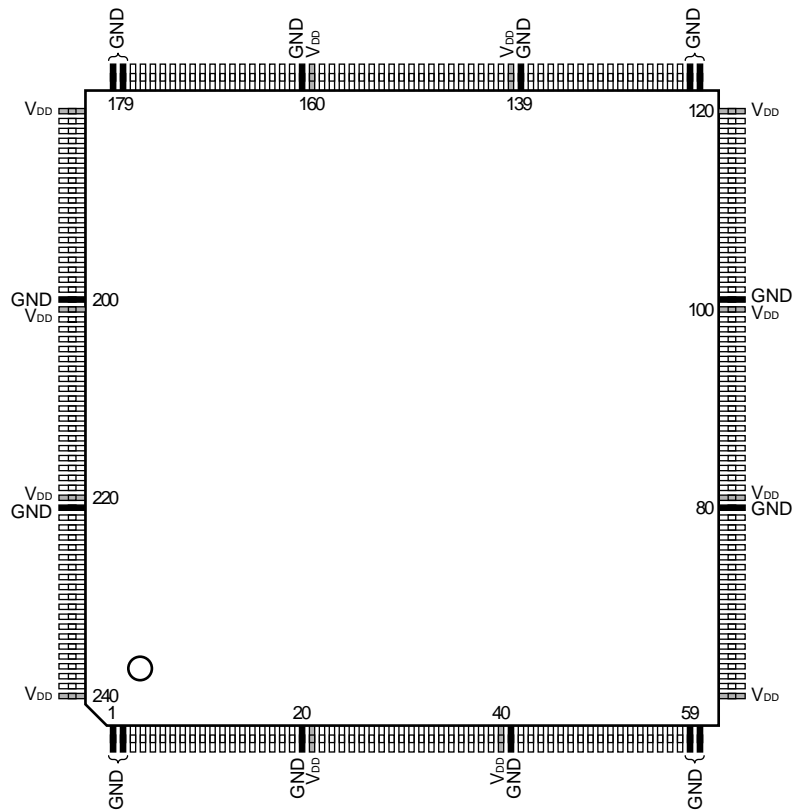
4.3.6 208-pin QFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1, 2, 26, 51, 52, 79, 105, 106, 131, 155, 156, 182	27, 53, 78, 104, 130, 157, 183, 208	None	5	6	7	188

Note Total number of usable signal pins.

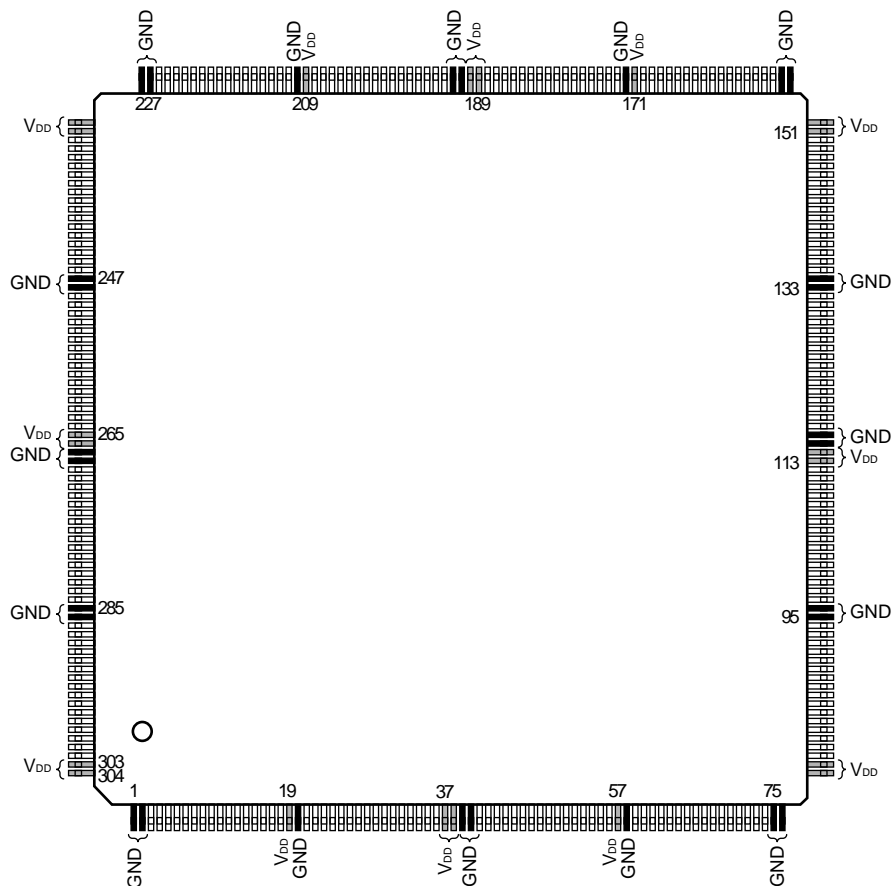
4.3.7 240-pin QFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1, 2, 20, 41, 59, 60, 80, 101, 121, 122, 139, 161, 179, 180, 200, 221	21, 40, 61, 81, 100, 120, 140, 160, 181, 201, 220, 240	None	5	6	7	212

Note Total number of usable signal pins.

4.3.8 304-pin QFP (fine pitch)

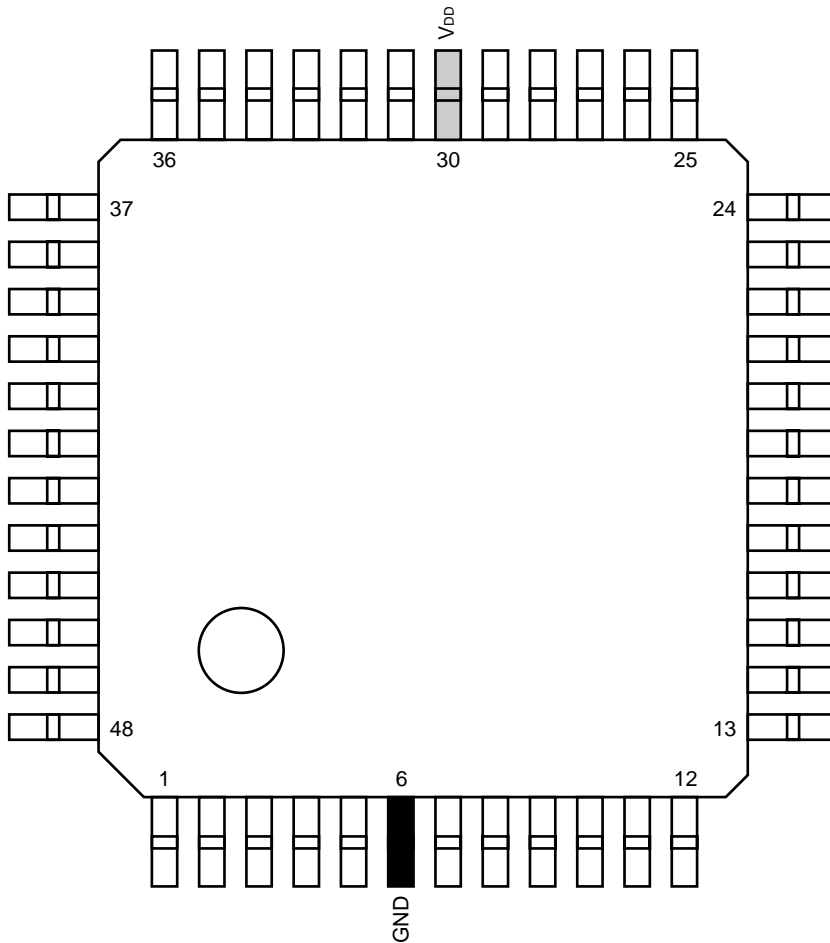


GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1, 2, 20, 39, 40, 58, 75, 76, 95, 96, 115, 116, 133, 134, 153, 154, 172, 191, 192, 210, 227, 228, 247, 248, 267, 268, 285, 286	19, 37, 38, 57, 77, 78, 113, 114, 151, 152, 171, 189, 190, 209, 229, 230, 265, 266, 303, 304	None	10	12	14	256

Note Total number of usable signal pins.

4.4 TQFP

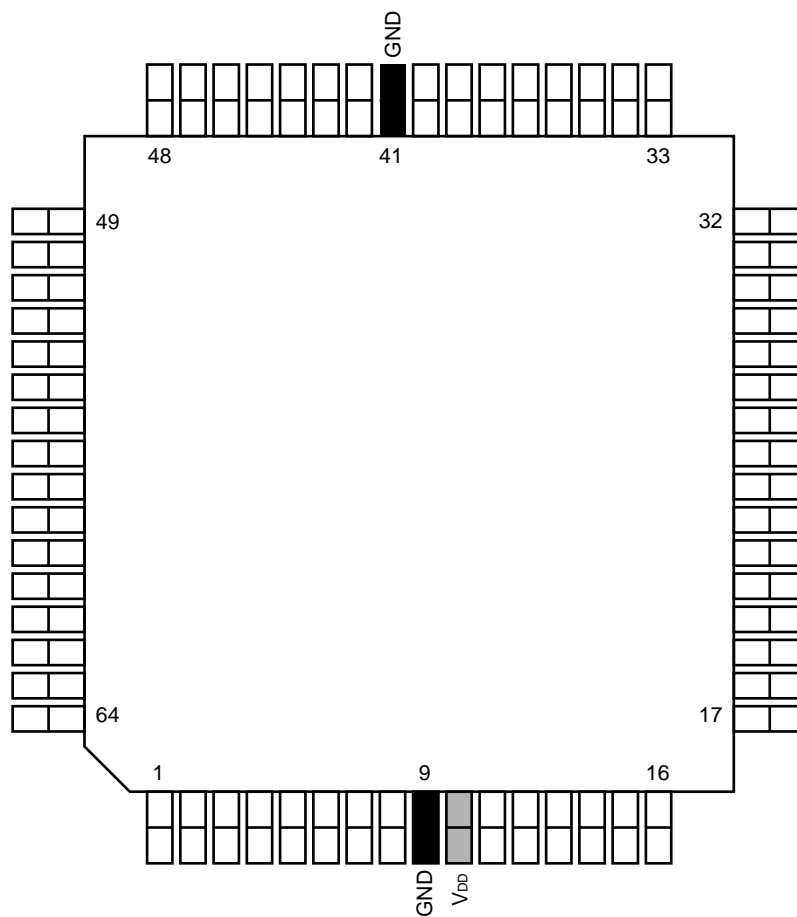
4.4.1 48-pin TQFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
6	30	None	32	33	34	46

Note Total number of usable signal pins.

4.4.2 64-pin TQFP (fine pitch)

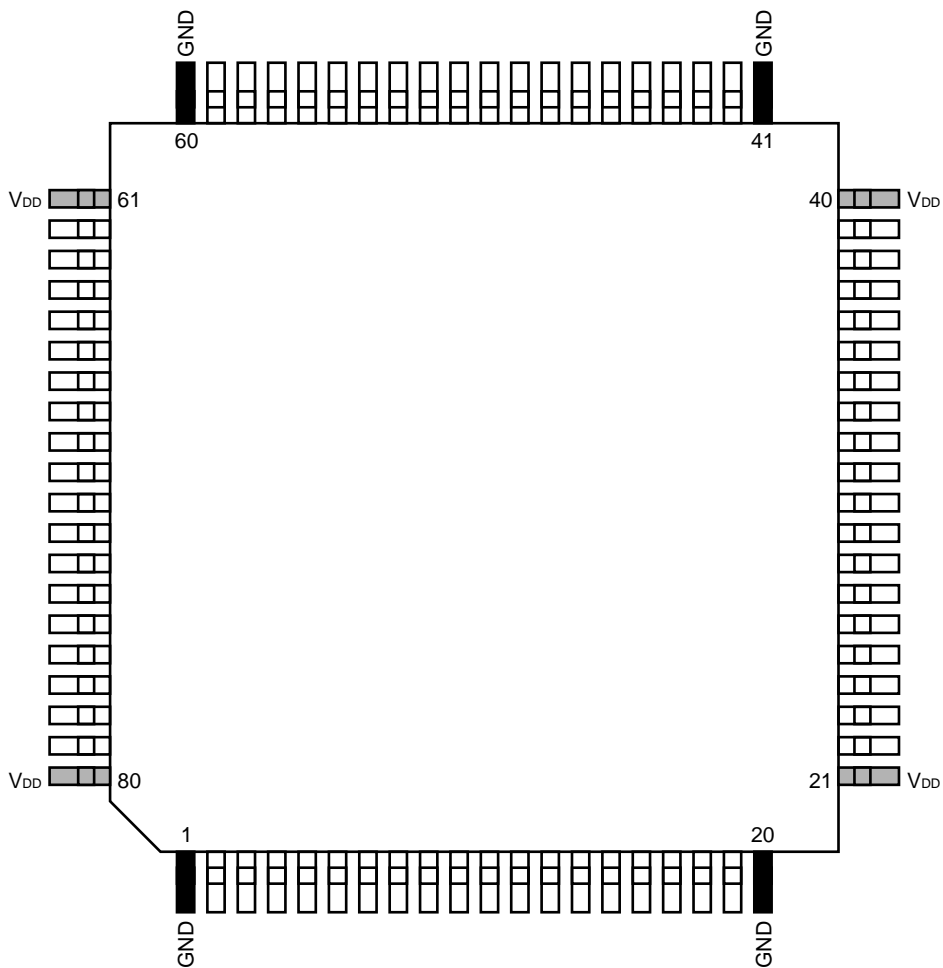


GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
9, 41	10	None	59	60	61	61

Note Total number of usable signal pins.

Remark 0.5 mm pitch and 0.65 mm pitch are common.

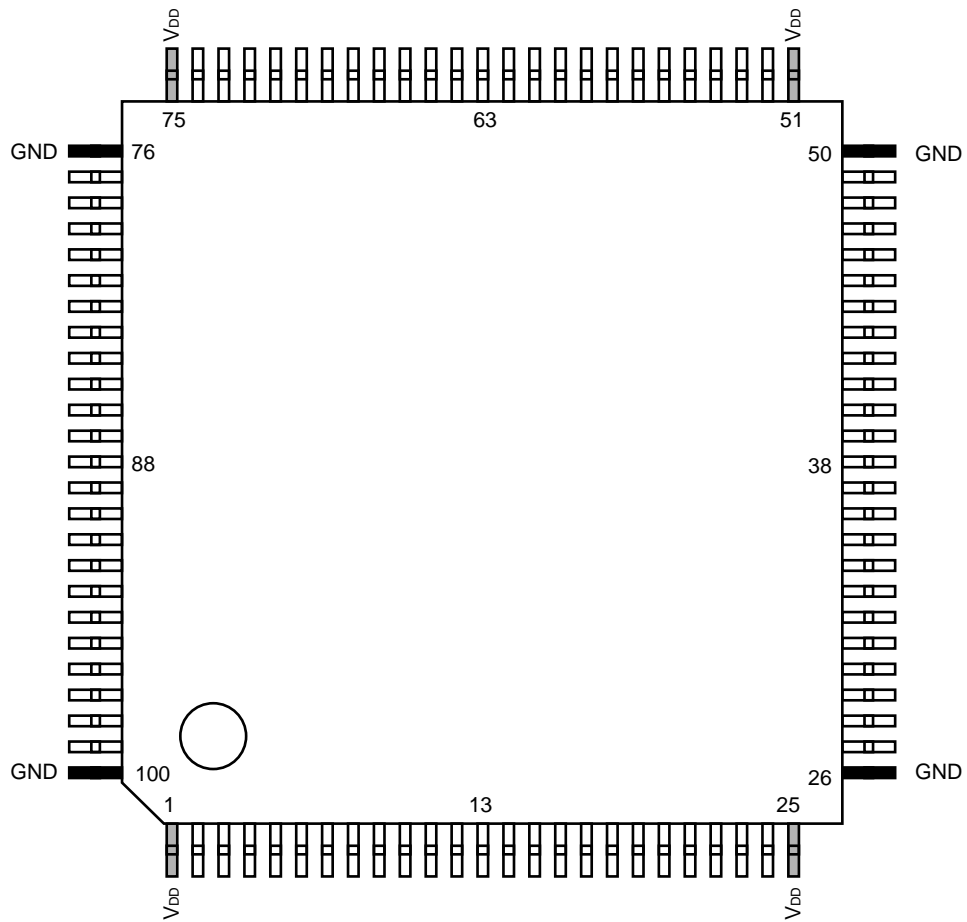
4.4.3 80-pin TQFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1, 20, 41, 60	21, 40, 61, 80	None	15	16	17	72

Note Total number of usable signal pins.

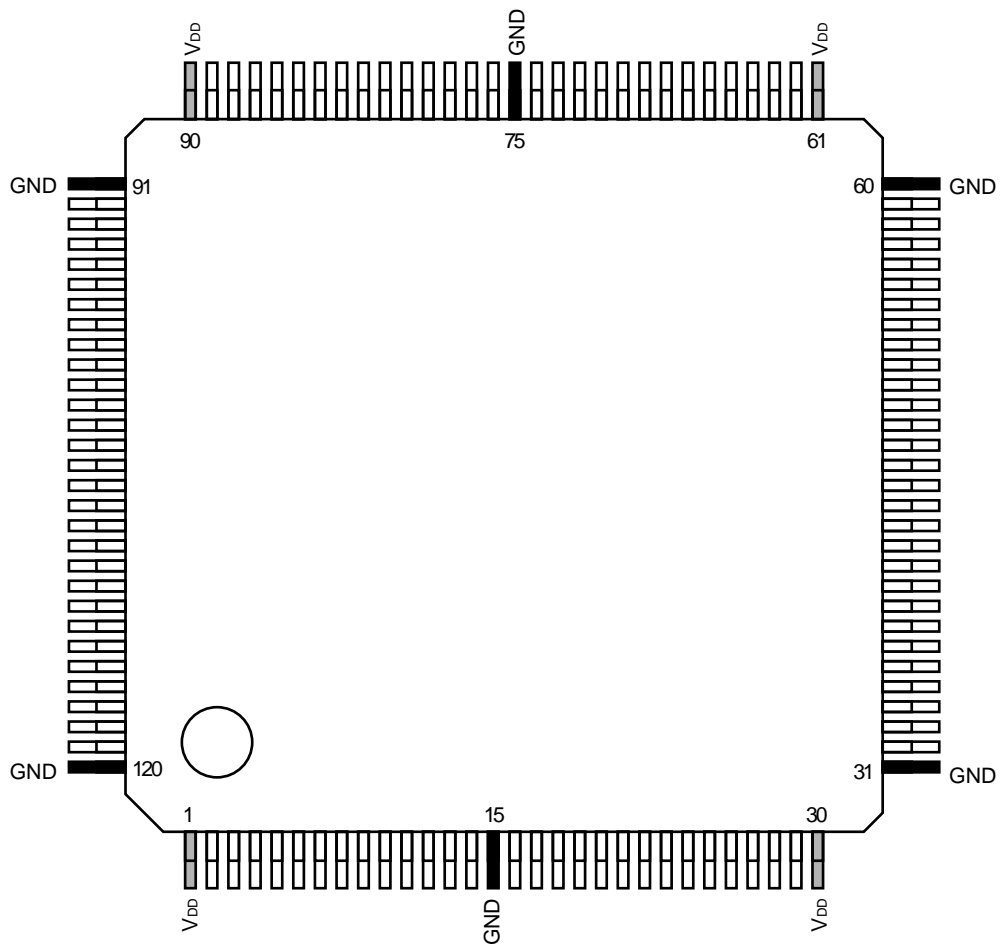
4.4.4 100-pin TQFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
26, 50, 76, 100	1, 25, 51, 75	None	17	18	19	92

Note Total number of usable signal pins.

4.4.5 120-pin TQFP (fine pitch)

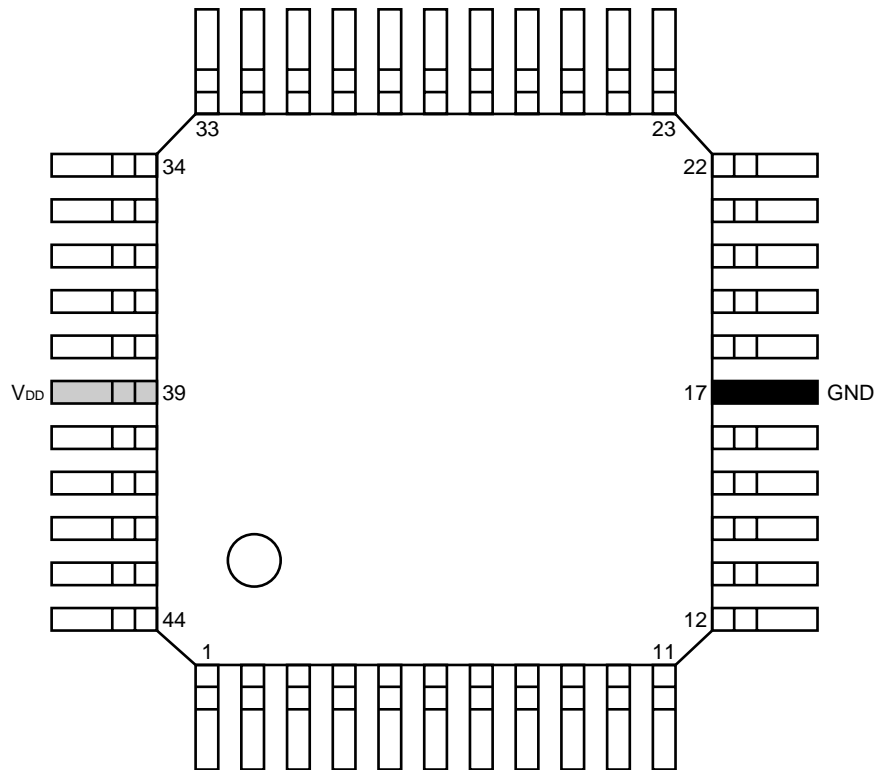


GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
15, 31, 60, 75, 91, 120	1, 30, 61, 90	None	112	114	116	110

Note Total number of usable signal pins.

4.5 LQFP

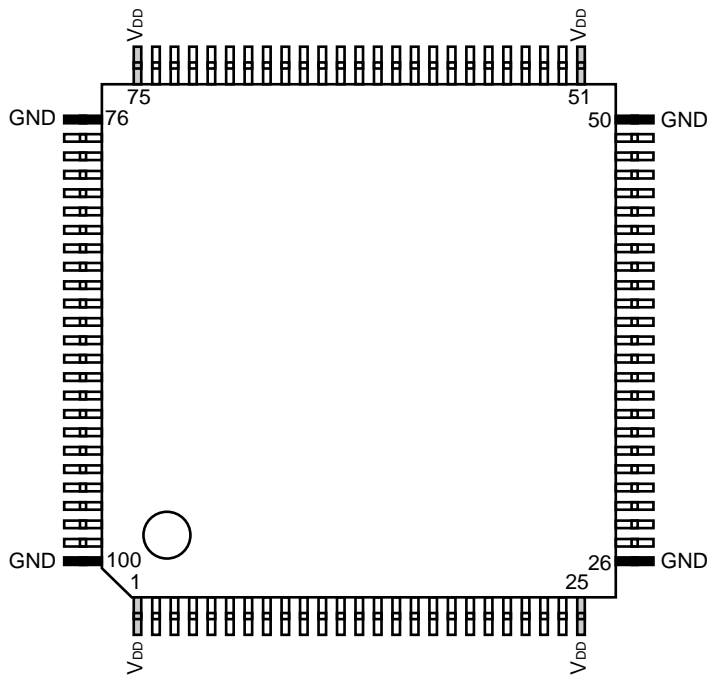
4.5.1 44-pin LQFP



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
17	39	None	40	41	42	42

Note Total number of usable signal pins.

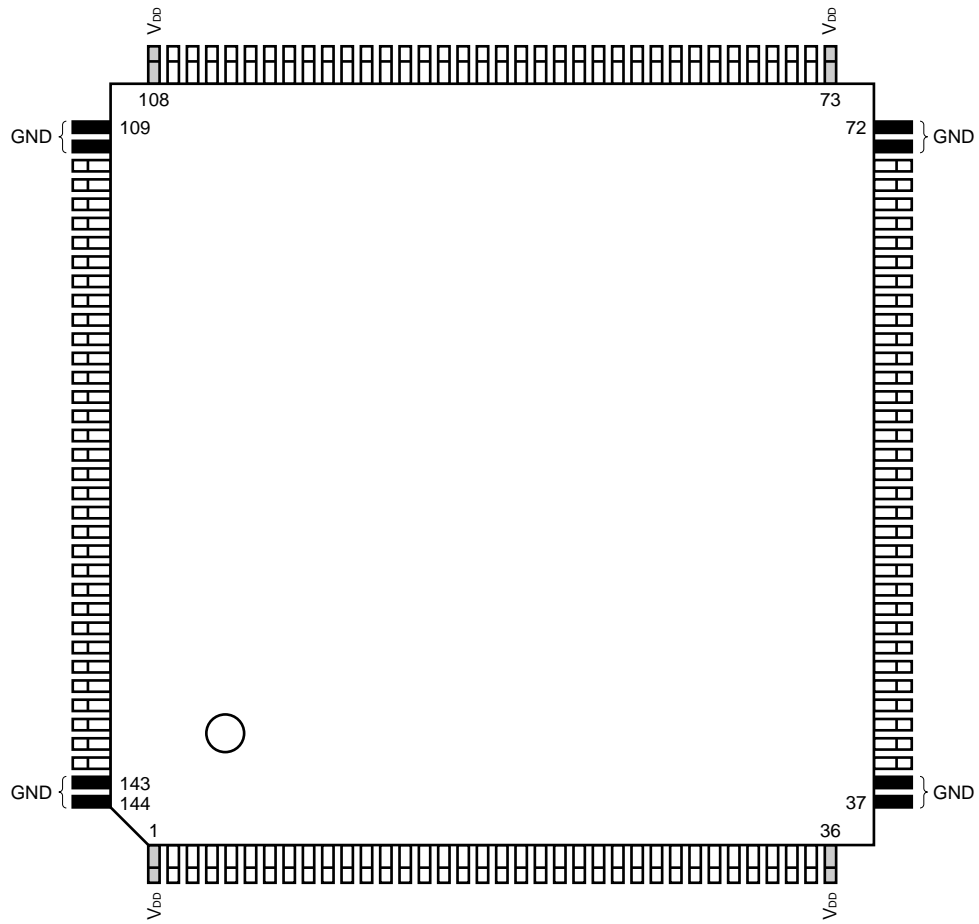
4.5.2 100-pin LQFP (fine pitch)



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
26, 50, 76, 100	1, 25, 51, 75	None	17	18	19	92

Note Total number of usable signal pins.

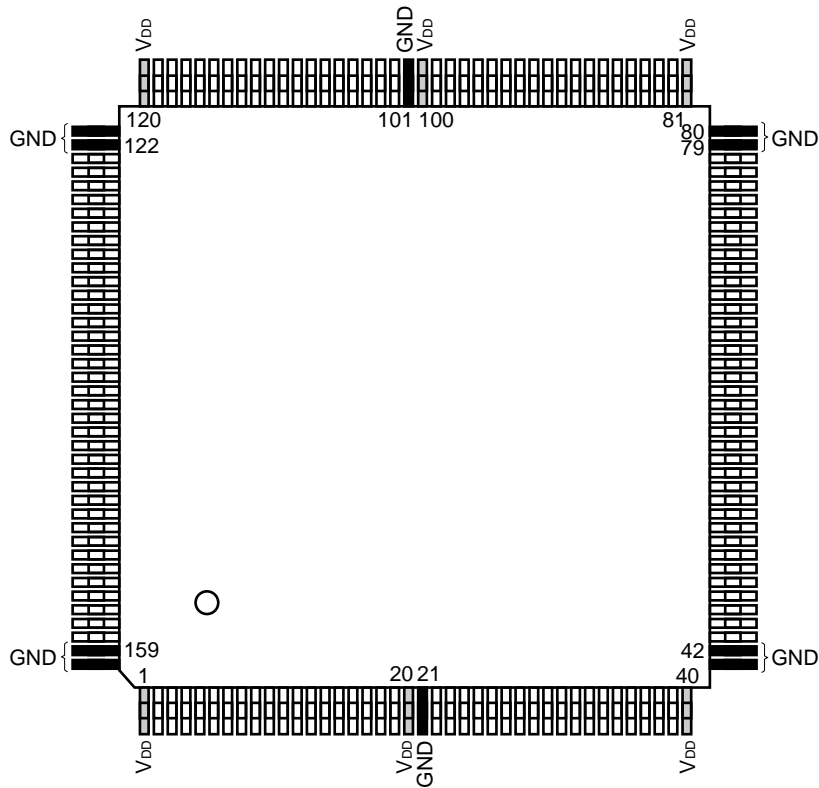
4.5.3 144-pin LQFP



GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
37, 38, 71, 72, 109, 110, 143, 144	1, 36, 73, 108	None	135	137	139	132

Note Total number of usable signal pins.

4.5.4 160-pin LQFP

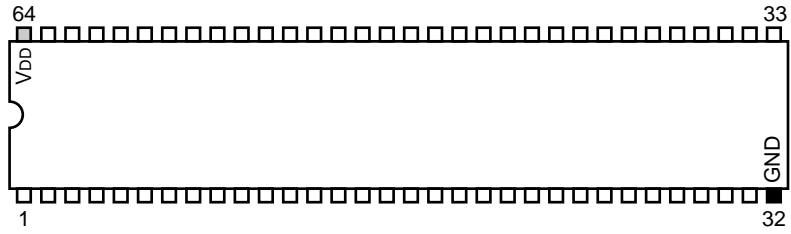


GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
21, 41, 42, 79, 80, 101, 121, 122, 159, 160	1, 20, 40, 81, 100, 120	None	44	45	46	144

Note Total number of usable signal pins.

★ 4.6 SDIP

4.6.1 64-pin SDIP

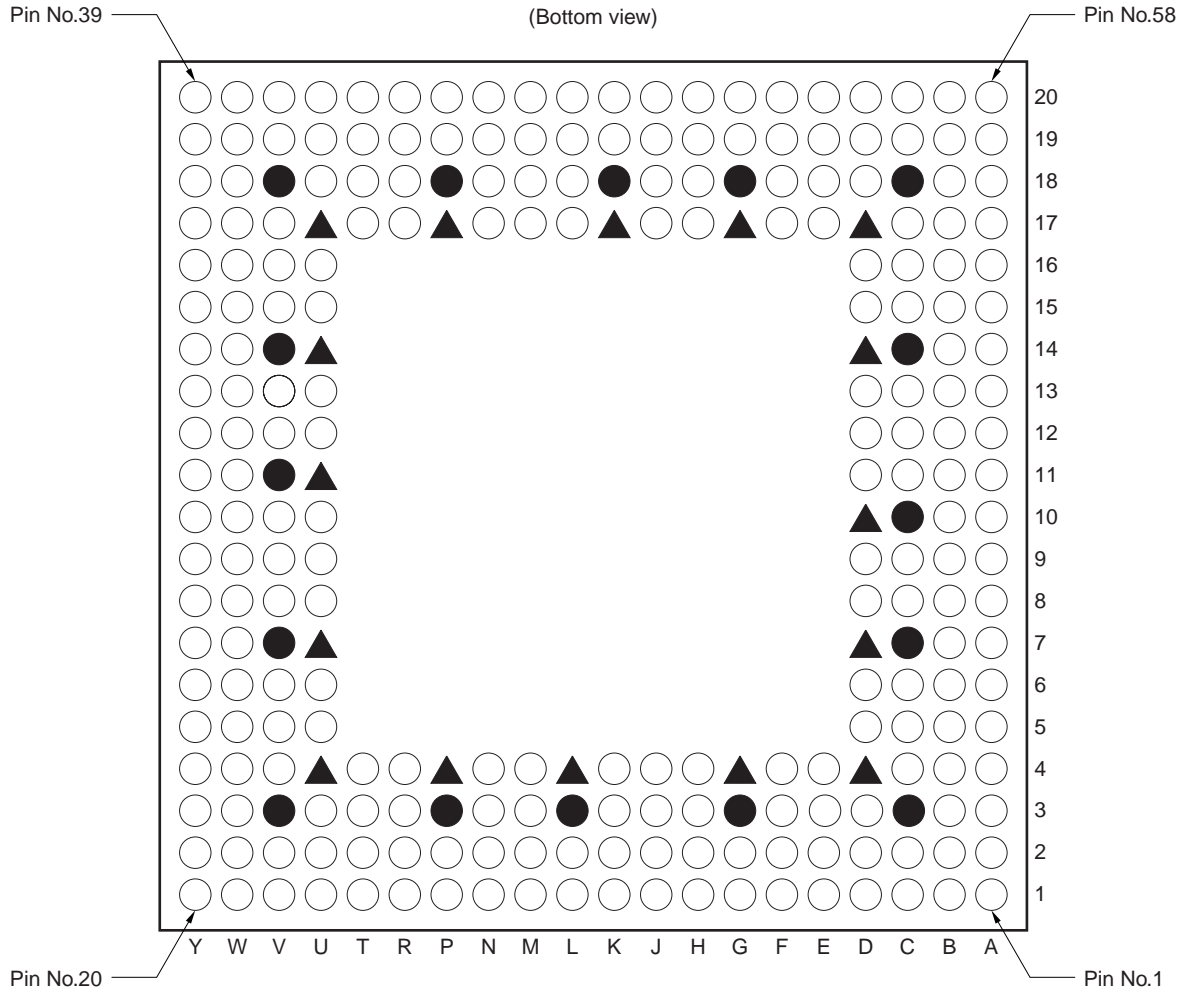


GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
32	64	None	2	3	4	62

Note Total number of usable signal pins.

4.7 TBGA

4.7.1 256-pin TBGA (with heat spreader)



Remark ▲ : GND (16 pins)

● : V_{DD} (16 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
205 (D4), 208 (G4), 212 (L4), 215 (P4), 218 (U4), 221 (U7), 225 (U11), 228 (U14), 231 (U17), 234 (P17), 238 (K17), 241 (G17), 244 (D17), 247 (D14), 251 (D10), 254 (D7)	145 (C3), 149 (G3), 153 (L3), 156 (P3), 160 (V3), 164 (V7), 168 (V11), 171 (V14), 175 (V18), 179 (P18), 183 (K18), 186 (G18), 190 (C18), 194 (C14), 198 (C10), 201 (C7)	None	142	143	144	224

Note Total number of usable signal pins.

**Table 4-1. Correspondence Between Internal Chip Pins and Ball Numbers
(256-pin TBGA (with Heat Spreader)) (1/4)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
1	A	160	V3	V _{DD}	33	A	10	K1	
2	A	94	W2		34	A	85	K2	
3	A	19	W1		35	A	152	K3	
4	A	93	V2		36	A	211	K4	
5	A	159	U3		37	A	9	J1	
6	A	18	V1		38	A	84	J2	
7	A	217	T4		39	A	151	J3	
8	A	92	U2		40	A	210	J4	
9	A	158	T3		41	A	8	H1	
10	A	17	U1		42	A	83	H2	
11	A	91	T2		43	A	150	H3	
12	A	16	T1		44	A	209	H4	
13	A	216	R4		45	A	7	G1	
14	A	157	R3		46	A	82	G2	
15	A	90	R2		47	A	149	G3	V _{DD}
16	A	15	R1		48	A	208	G4	GND
17	A	215	P4	GND	49	A	6	F1	
18	A	156	P3	V _{DD}	50	A	81	F2	
19	A	89	P2		51	A	148	F3	
20	A	14	P1		52	A	207	F4	
21	A	214	N4		53	A	5	E1	
22	A	155	N3		54	A	80	E2	
23	A	88	N2		55	A	4	D1	
24	A	13	N1		56	A	147	E3	
25	A	213	M4		57	A	79	D2	
26	A	154	M3		58	A	206	E4	
27	A	87	M2		59	A	3	C1	
28	A	12	M1		60	A	146	D3	
29	A	212	L4	GND	61	A	78	C2	
30	A	153	L3	V _{DD}	62	A	2	B1	
31	A	86	L2		63	A	1	A1	
32	A	11	L1		64	A	145	C3	V _{DD}

**Table 4-1. Correspondence Between Internal Chip Pins and Ball Numbers
(256-pin TBGA (with Heat Spreader)) (2/4)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
65	B	205	D4	GND	97	B	67	A11	
66	B	77	B2		98	B	136	B11	
67	B	76	A2		99	B	197	C11	
68	B	144	B3		100	B	250	D11	
69	B	204	C4		101	B	66	A12	
70	B	75	A3		102	B	135	B12	
71	B	256	D5		103	B	196	C12	
72	B	143	B4		104	B	249	D12	
73	B	203	C5		105	B	65	A13	
74	B	74	A4		106	B	134	B13	
75	B	142	B5		107	B	195	C13	
76	B	73	A5		108	B	248	D13	
77	B	255	D6		109	B	64	A14	
78	B	202	C6		110	B	133	B14	
79	B	141	B6		111	B	194	C14	V _{DD}
80	B	72	A6		112	B	247	D14	GND
81	B	254	D7	GND	113	B	63	A15	
82	B	201	C7	V _{DD}	114	B	132	B15	
83	B	140	B7		115	B	193	C15	
84	B	71	A7		116	B	246	D15	
85	B	253	D8		117	B	62	A16	
86	B	200	C8		118	B	131	B16	
87	B	139	B8		119	B	61	A17	
88	B	70	A8		120	B	192	C16	
89	B	252	D9		121	B	130	B17	
90	B	199	C9		122	B	245	D16	
91	B	138	B9		123	B	60	A18	
92	B	69	A9		124	B	191	C17	
93	B	251	D10	GND	125	B	129	B18	
94	B	198	C10	V _{DD}	126	B	59	A19	
95	B	137	B10		127	B	58	A20	
96	B	68	A10		128	B	244	D17	GND

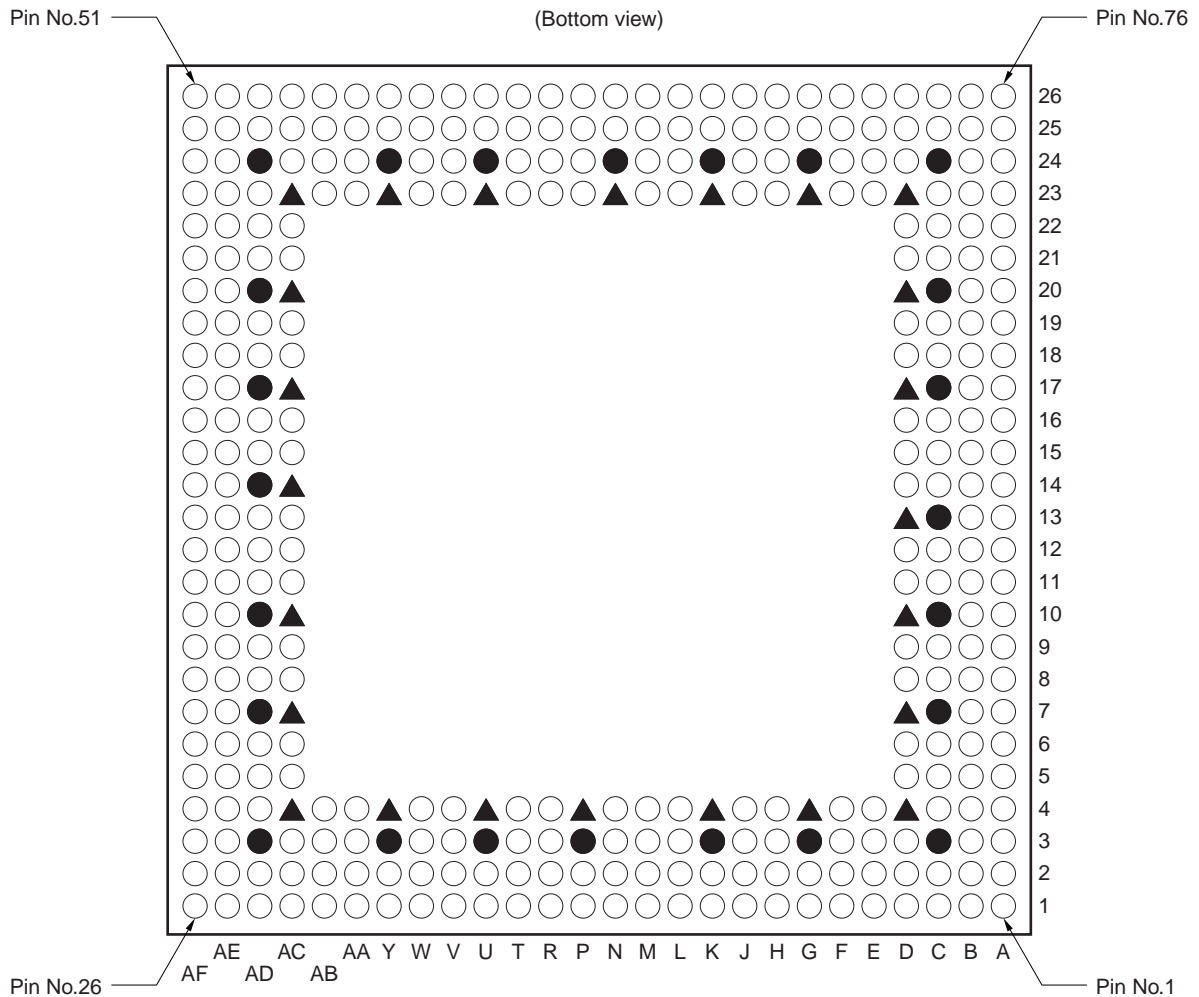
**Table 4-1. Correspondence Between Internal Chip Pins and Ball Numbers
(256-pin TBGA (with Heat Spreader)) (3/4)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
129	C	190	C18	V _{DD}	161	C	48	L20	
130	C	128	B19		162	C	119	L19	
131	C	57	B20		163	C	182	L18	
132	C	127	C19		164	C	237	L17	
133	C	189	D18		165	C	47	M20	
134	C	56	C20		166	C	118	M19	
135	C	243	E17		167	C	181	M18	
136	C	126	D19		168	C	236	M17	
137	C	188	E18		169	C	46	N20	
138	C	55	D20		170	C	117	N19	
139	C	125	E19		171	C	180	N18	
140	C	54	E20		172	C	235	N17	
141	C	242	F17		173	C	45	P20	
142	C	187	F18		174	C	116	P19	
143	C	124	F19		175	C	179	P18	V _{DD}
144	C	53	F20		176	C	234	P17	GND
145	C	241	G17	GND	177	C	44	R20	
146	C	186	G18	V _{DD}	178	C	115	R19	
147	C	123	G19		179	C	178	R18	
148	C	52	G20		180	C	233	R17	
149	C	240	H17		181	C	43	T20	
150	C	185	H18		182	C	114	T19	
151	C	122	H19		183	C	42	U20	
152	C	51	H20		184	C	177	T18	
153	C	239	J17		185	C	113	U19	
154	C	184	J18		186	C	232	T17	
155	C	121	J19		187	C	41	V20	
156	C	50	J20		188	C	176	U18	
157	C	238	K17	GND	189	C	112	V19	
158	C	183	K18	V _{DD}	190	C	40	W20	
159	C	120	K19		191	C	39	Y20	
160	C	49	K20		192	C	175	V18	V _{DD}

**Table 4-1. Correspondence Between Internal Chip Pins and Ball Numbers
(256-pin TBGA (with Heat Spreader)) (4/4)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
193	D	231	U17	GND	225	D	29	Y10	
194	D	111	W19		226	D	102	W10	
195	D	38	Y19		227	D	167	V10	
196	D	110	W18		228	D	224	U10	
197	D	174	V17		229	D	28	Y9	
198	D	37	Y18		230	D	101	W9	
199	D	230	U16		231	D	166	V9	
200	D	109	W17		232	D	223	U9	
201	D	173	V16		233	D	27	Y8	
202	D	36	Y17		234	D	100	W8	
203	D	108	W16		235	D	165	V8	
204	D	35	Y16		236	D	222	U8	
205	D	229	U15		237	D	26	Y7	
206	D	172	V15		238	D	99	W7	
207	D	107	W15		239	D	164	V7	V _{DD}
208	D	34	Y15		240	D	221	U7	GND
209	D	228	U14	GND	241	D	25	Y6	
210	D	171	V14	V _{DD}	242	D	98	W6	
211	D	106	W14		243	D	163	V6	
212	D	33	Y14		244	D	220	U6	
213	D	227	U13		245	D	24	Y5	
214	D	170	V13		246	D	97	W5	
215	D	105	W13		247	D	23	Y4	
216	D	32	Y13		248	D	162	V5	
217	D	226	U12		249	D	96	W4	
218	D	169	V12		250	D	219	U5	
219	D	104	W12		251	D	22	Y3	
220	D	31	Y12		252	D	161	V4	
221	D	225	U11	GND	253	D	95	W3	
222	D	168	V11	V _{DD}	254	D	21	Y2	
223	D	103	W11		255	D	20	Y1	
224	D	30	Y11		256	D	218	U4	GND

4.7.2 352-pin TBGA (with heat spreader)



Remark ▲ : GND (24 pins)
 ● : V_{DD} (24 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
277 (D4), 280 (G4), 283 (K4), 287 (P4), 290 (U4), 293 (Y4), 296 (AC4), 299 (AC7), 302 (AC10), 306 (AC14), 309 (AC17), 312 (AC20), 315 (AC23), 318 (Y23), 321 (U23), 325 (N23), 328 (K23), 331 (G23), 334 (D23), 337 (D20), 340 (D17), 344 (D13), 347 (D10), 350 (D7)	193 (C3), 197 (G3), 200 (K3), 204 (P3), 207 (U3), 210 (Y3), 214 (AD3), 218 (AD7), 221 (AD10), 225 (AD14), 228 (AD17), 231 (AD20), 235 (AD24), 239 (Y24), 242 (U24), 246 (N24), 249 (K24), 252 (G24), 256 (C24), 260 (C20), 263 (C17), 267 (C13), 270 (C10), 273 (C7)	None	There are no restrictions on the assignment of dedicated scan path pins.			304

Note Total number of usable signal pins.

**Table 4-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (1/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
1	A	214	AD3	V _{DD}	33	A	289	T4	
2	A	124	AE2		34	A	206	T3	
3	A	25	AE1		35	A	115	T2	
4	A	123	AD2		36	A	16	T1	
5	A	213	AC3		37	A	288	R4	
6	A	24	AD1		38	A	205	R3	
7	A	295	AB4		39	A	114	R2	
8	A	122	AC2		40	A	15	R1	
9	A	212	AB3		41	A	287	P4	GND
10	A	23	AC1		42	A	204	P3	V _{DD}
11	A	121	AB2		43	A	113	P2	
12	A	22	AB1		44	A	14	P1	
13	A	294	AA4		45	A	13	N1	
14	A	211	AA3		46	A	112	N2	
15	A	120	AA2		47	A	203	N3	
16	A	21	AA1		48	A	286	N4	
17	A	293	Y4	GND	49	A	12	M1	
18	A	210	Y3	V _{DD}	50	A	111	M2	
19	A	119	Y2		51	A	202	M3	
20	A	20	Y1		52	A	285	M4	
21	A	292	W4		53	A	11	L1	
22	A	209	W3		54	A	110	L2	
23	A	118	W2		55	A	201	L3	
24	A	19	W1		56	A	284	L4	
25	A	291	V4		57	A	10	K1	
26	A	208	V3		58	A	109	K2	
27	A	117	V2		59	A	200	K3	V _{DD}
28	A	18	V1		60	A	283	K4	GND
29	A	290	U4	GND	61	A	9	J1	
30	A	207	U3	V _{DD}	62	A	108	J2	
31	A	116	U2		63	A	199	J3	
32	A	17	U1		64	A	282	J4	

**Table 4-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (2/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
65	A	8	H1		97	B	275	C5	
66	A	107	H2		98	B	98	A4	
67	A	198	H3		99	B	190	B5	
68	A	281	H4		100	B	97	A5	
69	A	7	G1		101	B	351	D6	
70	A	106	G2		102	B	274	C6	
71	A	197	G3	V _{DD}	103	B	189	B6	
72	A	280	G4	GND	104	B	96	A6	
73	A	6	F1		105	B	350	D7	GND
74	A	105	F2		106	B	273	C7	V _{DD}
75	A	196	F3		107	B	188	B7	
76	A	279	F4		108	B	95	A7	
77	A	5	E1		109	B	349	D8	
78	A	104	E2		110	B	272	C8	
79	A	4	D1		111	B	187	B8	
80	A	195	E3		112	B	94	A8	
81	A	103	D2		113	B	348	D9	
82	A	278	E4		114	B	271	C9	
83	A	3	C1		115	B	186	B9	
84	A	194	D3		116	B	93	A9	
85	A	102	C2		117	B	347	D10	GND
86	A	2	B1		118	B	270	C10	V _{DD}
87	A	1	A1		119	B	185	B10	
88	A	193	C3	V _{DD}	120	B	92	A10	
89	B	277	D4	GND	121	B	346	D11	
90	B	101	B2		122	B	269	C11	
91	B	100	A2		123	B	184	B11	
92	B	192	B3		124	B	91	A11	
93	B	276	C4		125	B	345	D12	
94	B	99	A3		126	B	268	C12	
95	B	352	D5		127	B	183	B12	
96	B	191	B4		128	B	90	A12	

**Table 4-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (3/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
129	B	344	D13	GND	161	B	81	A21	
130	B	267	C13	V _{DD}	162	B	174	B21	
131	B	182	B13		163	B	259	C21	
132	B	89	A13		164	B	336	D21	
133	B	88	A14		165	B	80	A22	
134	B	181	B14		166	B	173	B22	
135	B	266	C14		167	B	79	A23	
136	B	343	D14		168	B	258	C22	
137	B	87	A15		169	B	172	B23	
138	B	180	B15		170	B	335	D22	
139	B	265	C15		171	B	78	A24	
140	B	342	D15		172	B	257	C23	
141	B	86	A16		173	B	171	B24	
142	B	179	B16		174	B	77	A25	
143	B	264	C16		175	B	76	A26	
144	B	341	D16		176	B	334	D23	GND
145	B	85	A17		177	C	256	C24	V _{DD}
146	B	178	B17		178	C	170	B25	
147	B	263	C17	V _{DD}	179	C	75	B26	
148	B	340	D17	GND	180	C	169	C25	
149	B	84	A18		181	C	255	D24	
150	B	177	B18		182	C	74	C26	
151	B	262	C18		183	C	333	E23	
152	B	339	D18		184	C	168	D25	
153	B	83	A19		185	C	254	E24	
154	B	176	B19		186	C	73	D26	
155	B	261	C19		187	C	167	E25	
156	B	338	D19		188	C	72	E26	
157	B	82	A20		189	C	332	F23	
158	B	175	B20		190	C	253	F24	
159	B	260	C20	V _{DD}	191	C	166	F25	
160	B	337	D20	GND	192	C	71	F26	

**Table 4-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (4/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
193	C	331	G23	GND	225	C	62	R26	
194	C	252	G24	V _{DD}	226	C	157	R25	
195	C	165	G25		227	C	244	R24	
196	C	70	G26		228	C	323	R23	
197	C	330	H23		229	C	61	T26	
198	C	251	H24		230	C	156	T25	
199	C	164	H25		231	C	243	T24	
200	C	69	H26		232	C	322	T23	
201	C	329	J23		233	C	60	U26	
202	C	250	J24		234	C	155	U25	
203	C	163	J25		235	C	242	U24	V _{DD}
204	C	68	J26		236	C	321	U23	GND
205	C	328	K23	GND	237	C	59	V26	
206	C	249	K24	V _{DD}	238	C	154	V25	
207	C	162	K25		239	C	241	V24	
208	C	67	K26		240	C	320	V23	
209	C	327	L23		241	C	58	W26	
210	C	248	L24		242	C	153	W25	
211	C	161	L25		243	C	240	W24	
212	C	66	L26		244	C	319	W23	
213	C	326	M23		245	C	57	Y26	
214	C	247	M24		246	C	152	Y25	
215	C	160	M25		247	C	239	Y24	V _{DD}
216	C	65	M26		248	C	318	Y23	GND
217	C	325	N23	GND	249	C	56	AA26	
218	C	246	N24	V _{DD}	250	C	151	AA25	
219	C	159	N25		251	C	238	AA24	
220	C	64	N26		252	C	317	AA23	
221	C	63	P26		253	C	55	AB26	
222	C	158	P25		254	C	150	AB25	
223	C	245	P24		255	C	54	AC26	
224	C	324	P23		256	C	237	AB24	

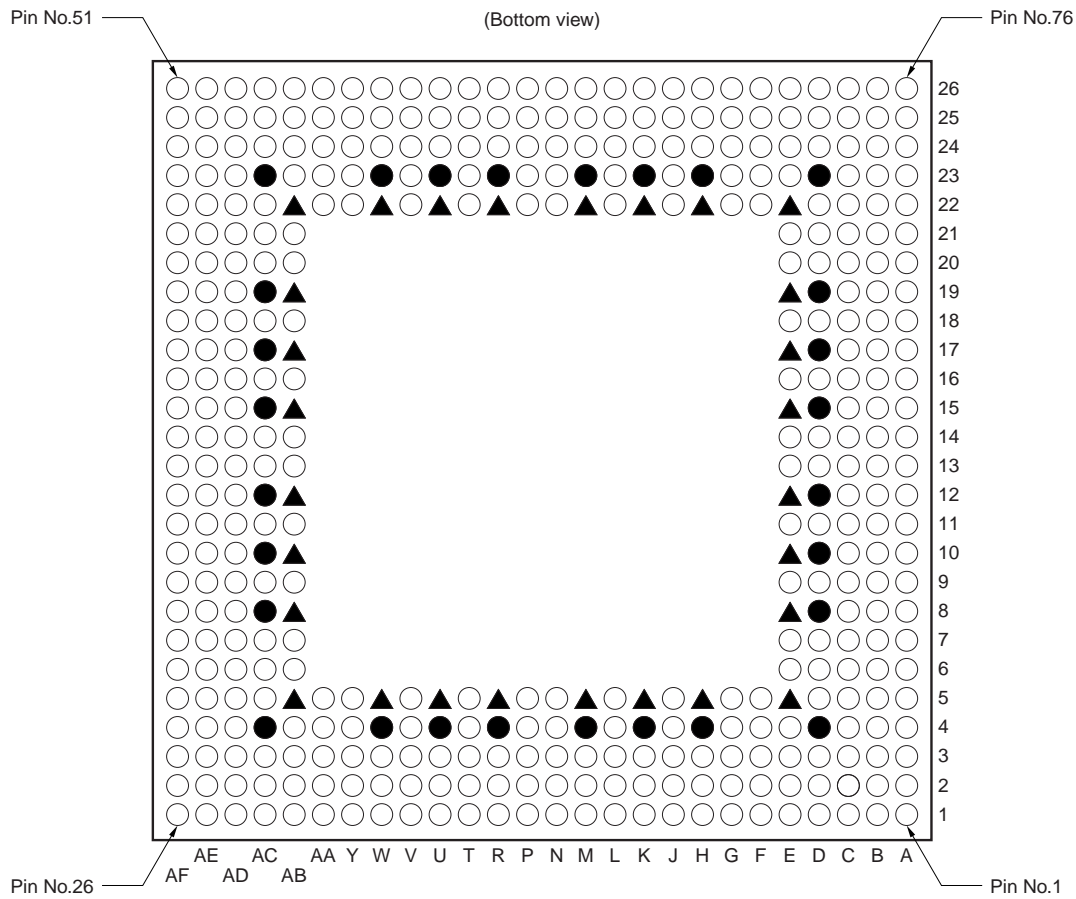
**Table 4-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (5/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
257	C	149	AC25		289	D	310	AC18	
258	C	316	AB23		290	D	229	AD18	
259	C	53	AD26		291	D	140	AE18	
260	C	236	AC24		292	D	43	AF18	
261	C	148	AD25		293	D	309	AC17	GND
262	C	52	AE26		294	D	228	AD17	V _{DD}
263	C	51	AF26		295	D	139	AE17	
264	C	235	AD24	V _{DD}	296	D	42	AF17	
265	D	315	AC23	GND	297	D	308	AC16	
266	D	147	AE25		298	D	227	AD16	
267	D	50	AF25		299	D	138	AE16	
268	D	146	AE24		300	D	41	AF16	
269	D	234	AD23		301	D	307	AC15	
270	D	49	AF24		302	D	226	AD15	
271	D	314	AC22		303	D	137	AE15	
272	D	145	AE23		304	D	40	AF15	
273	D	233	AD22		305	D	306	AC14	GND
274	D	48	AF23		306	D	225	AD14	V _{DD}
275	D	144	AE22		307	D	136	AE14	
276	D	47	AF22		308	D	39	AF14	
277	D	313	AC21		309	D	38	AF13	
278	D	232	AD21		310	D	135	AE13	
279	D	143	AE21		311	D	224	AD13	
280	D	46	AF21		312	D	305	AC13	
281	D	312	AC20	GND	313	D	37	AF12	
282	D	231	AD20	V _{DD}	314	D	134	AE12	
283	D	142	AE20		315	D	223	AD12	
284	D	45	AF20		316	D	304	AC12	
285	D	311	AC19		317	D	36	AF11	
286	D	230	AD19		318	D	133	AE11	
287	D	141	AE19		319	D	222	AD11	
288	D	44	AF19		320	D	303	AC11	

**Table 4-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (6/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
321	D	35	AF10	
322	D	132	AE10	
323	D	221	AD10	V _{DD}
324	D	302	AC10	GND
325	D	34	AF9	
326	D	131	AE9	
327	D	220	AD9	
328	D	301	AC9	
329	D	33	AF8	
330	D	130	AE8	
331	D	219	AD8	
332	D	300	AC8	
333	D	32	AF7	
334	D	129	AE7	
335	D	218	AD7	V _{DD}
336	D	299	AC7	GND
337	D	31	AF6	
338	D	128	AE6	
339	D	217	AD6	
340	D	298	AC6	
341	D	30	AF5	
342	D	127	AE5	
343	D	29	AF4	
344	D	216	AD5	
345	D	126	AE4	
346	D	297	AC5	
347	D	28	AF3	
348	D	215	AD4	
349	D	125	AE3	
350	D	27	AF2	
351	D	26	AF1	
352	D	296	AC4	GND

4.7.3 420-pin TBGA (with heat spreader)



Remark ▲ : GND (28 pins)
● : V_{DD} (28 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
353 (E5), 356 (H5), 358 (K5), 360 (M5), 363 (R5), 365 (U5), 367 (W5), 370 (AB5), 373 (AB8), 375 (AB10), 377 (AB12), 380 (AB15), 382 (AB17), 384 (AB19), 387 (AB22), 390 (W22), 392 (U22), 394 (R22), 397 (M22), 399 (K22), 401 (H22), 404 (E22), 407 (E19), 409 (E17), 411 (E15), 414 (E12), 416 (E10), 418 (E8)	277 (D4), 281 (H4), 283 (K4), 285 (M4), 288 (R4), 290 (U4), 292 (W4), 296 (AC4), 300 (AC8), 302 (AC10), 304 (AC12), 307 (AC15), 309 (AC17), 311 (AC19), 315 (AC23), 319 (W23), 321 (U23), 323 (R23), 326 (M23), 328 (K23), 330 (H23), 334 (D23), 338 (D19), 340 (D17), 342 (D15), 345 (D12), 347 (D10), 349 (D8)	None	There are no restrictions on the assignment of dedicated scan path pins.			364

Note Total number of usable signal pins.

**Table 4-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (1/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
1	A	296	AC4	V _{DD}	31	A	117	V2	
2	A	214	AD3		32	A	18	V1	
3	A	25	AE1		33	A	365	U5	GND
4	A	123	AD2		34	A	290	U4	V _{DD}
5	A	213	AC3		35	A	207	U3	
6	A	369	AA5		36	A	116	U2	
7	A	295	AB4		37	A	17	U1	
8	A	24	AD1		38	A	364	T5	
9	A	122	AC2		39	A	289	T4	
10	A	212	AB3		40	A	206	T3	
11	A	294	AA4		41	A	115	T2	
12	A	23	AC1		42	A	16	T1	
13	A	368	Y5		43	A	363	R5	GND
14	A	121	AB2		44	A	288	R4	V _{DD}
15	A	211	AA3		45	A	205	R3	
16	A	293	Y4		46	A	114	R2	
17	A	22	AB1		47	A	15	R1	
18	A	120	AA2		48	A	362	P5	
19	A	210	Y3		49	A	287	P4	
20	A	367	W5	GND	50	A	204	P3	
21	A	292	W4	V _{DD}	51	A	113	P2	
22	A	21	AA1		52	A	14	P1	
23	A	119	Y2		53	A	203	N3	
24	A	209	W3		54	A	286	N4	
25	A	20	Y1		55	A	361	N5	
26	A	118	W2		56	A	112	N2	
27	A	366	V5		57	A	13	N1	
28	A	291	V4		58	A	12	M1	
29	A	208	V3		59	A	111	M2	
30	A	19	W1		60	A	202	M3	

**Table 4-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (2/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
61	A	285	M4	V _{DD}	91	A	104	E2	
62	A	360	M5	GND	92	A	355	G5	
63	A	11	L1		93	A	4	D1	
64	A	110	L2		94	A	279	F4	
65	A	201	L3		95	A	195	E3	
66	A	284	L4		96	A	103	D2	
67	A	359	L5		97	A	3	C1	
68	A	10	K1		98	A	278	E4	
69	A	109	K2		99	A	354	F5	
70	A	200	K3		100	A	194	D3	
71	A	283	K4	V _{DD}	101	A	102	C2	
72	A	358	K5	GND	102	A	2	B1	
73	A	9	J1		103	A	1	A1	
74	A	108	J2		104	A	101	B2	
75	A	8	H1		105	A	277	D4	V _{DD}
76	A	199	J3		106	B	353	E5	GND
77	A	282	J4		107	B	193	C3	
78	A	357	J5		108	B	100	A2	
79	A	107	H2		109	B	192	B3	
80	A	7	G1		110	B	276	C4	
81	A	198	H3		111	B	420	E6	
82	A	106	G2		112	B	352	D5	
83	A	6	F1		113	B	99	A3	
84	A	281	H4	V _{DD}	114	B	191	B4	
85	A	356	H5	GND	115	B	275	C5	
86	A	197	G3		116	B	351	D6	
87	A	105	F2		117	B	98	A4	
88	A	5	E1		118	B	419	E7	
89	A	280	G4		119	B	190	B5	
90	A	196	F3		120	B	274	C6	

**Table 4-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (3/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
121	B	350	D7		151	B	183	B12	
122	B	97	A5		152	B	90	A12	
123	B	189	B6		153	B	413	E13	
124	B	273	C7		154	B	344	D13	
125	B	418	E8	GND	155	B	267	C13	
126	B	349	D8	V _{DD}	156	B	182	B13	
127	B	96	A6		157	B	89	A13	
128	B	188	B7		158	B	266	C14	
129	B	272	C8		159	B	343	D14	
130	B	95	A7		160	B	412	E14	
131	B	187	B8		161	B	181	B14	
132	B	417	E9		162	B	88	A14	
133	B	348	D9		163	B	87	A15	
134	B	271	C9		164	B	180	B15	
135	B	94	A8		165	B	265	C15	
136	B	186	B9		166	B	342	D15	V _{DD}
137	B	93	A9		167	B	411	E15	GND
138	B	416	E10	GND	168	B	86	A16	
139	B	347	D10	V _{DD}	169	B	179	B16	
140	B	270	C10		170	B	264	C16	
141	B	185	B10		171	B	341	D16	
142	B	92	A10		172	B	410	E16	
143	B	415	E11		173	B	85	A17	
144	B	346	D11		174	B	178	B17	
145	B	269	C11		175	B	263	C17	
146	B	184	B11		176	B	340	D17	V _{DD}
147	B	91	A11		177	B	409	E17	GND
148	B	414	E12	GND	178	B	84	A18	
149	B	345	D12	V _{DD}	179	B	177	B18	
150	B	268	C12		180	B	83	A19	

**Table 4-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (4/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
181	B	262	C18		211	C	334	D23	V _{DD}
182	B	339	D18		212	C	256	C24	
183	B	408	E18		213	C	75	B26	
184	B	176	B19		214	C	169	C25	
185	B	82	A20		215	C	255	D24	
186	B	261	C19		216	C	403	F22	
187	B	175	B20		217	C	333	E23	
188	B	81	A21		218	C	74	C26	
189	B	338	D19	V _{DD}	219	C	168	D25	
190	B	407	E19	GND	220	C	254	E24	
191	B	260	C20		221	C	332	F23	
192	B	174	B21		222	C	73	D26	
193	B	80	A22		223	C	402	G22	
194	B	337	D20		224	C	167	E25	
195	B	259	C21		225	C	253	F24	
196	B	173	B22		226	C	331	G23	
197	B	406	E20		227	C	72	E26	
198	B	79	A23		228	C	166	F25	
199	B	336	D21		229	C	252	G24	
200	B	258	C22		230	C	401	H22	GND
201	B	172	B23		231	C	330	H23	V _{DD}
202	B	78	A24		232	C	71	F26	
203	B	335	D22		233	C	165	G25	
204	B	405	E21		234	C	251	H24	
205	B	257	C23		235	C	70	G26	
206	B	171	B24		236	C	164	H25	
207	B	77	A25		237	C	400	J22	
208	B	76	A26		238	C	329	J23	
209	B	170	B25		239	C	250	J24	
210	B	404	E22	GND	240	C	69	H26	

**Table 4-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (5/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
241	C	163	J25		271	C	323	R23	V _{DD}
242	C	68	J26		272	C	394	R22	GND
243	C	399	K22	GND	273	C	61	T26	
244	C	328	K23	V _{DD}	274	C	156	T25	
245	C	249	K24		275	C	243	T24	
246	C	162	K25		276	C	322	T23	
247	C	67	K26		277	C	393	T22	
248	C	398	L22		278	C	60	U26	
249	C	327	L23		279	C	155	U25	
250	C	248	L24		280	C	242	U24	
251	C	161	L25		281	C	321	U23	V _{DD}
252	C	66	L26		282	C	392	U22	GND
253	C	397	M22	GND	283	C	59	V26	
254	C	326	M23	V _{DD}	284	C	154	V25	
255	C	247	M24		285	C	58	W26	
256	C	160	M25		286	C	241	V24	
257	C	65	M26		287	C	320	V23	
258	C	396	N22		288	C	391	V22	
259	C	325	N23		289	C	153	W25	
260	C	246	N24		290	C	57	Y26	
261	C	159	N25		291	C	240	W24	
262	C	64	N26		292	C	152	Y25	
263	C	245	P24		293	C	56	AA26	
264	C	324	P23		294	C	319	W23	V _{DD}
265	C	395	P22		295	C	390	W22	GND
266	C	158	P25		296	C	239	Y24	
267	C	63	P26		297	C	151	AA25	
268	C	62	R26		298	C	55	AB26	
269	C	157	R25		299	C	318	Y23	
270	C	244	R24		300	C	238	AA24	

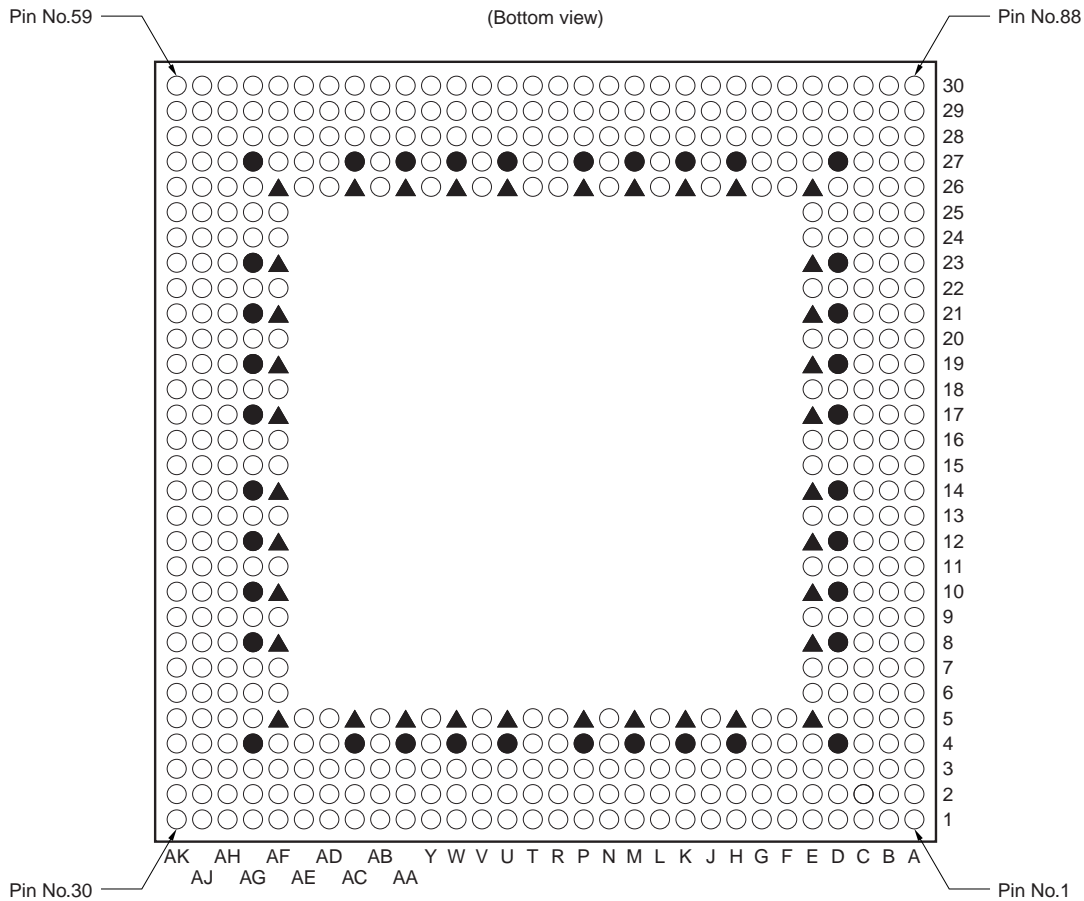
**Table 4-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (6/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
301	C	150	AB25		331	D	312	AC20	
302	C	389	Y22		332	D	47	AF22	
303	C	54	AC26		333	D	143	AE21	
304	C	317	AA23		334	D	231	AD20	
305	C	237	AB24		335	D	384	AB19	GND
306	C	149	AC25		336	D	311	AC19	V _{DD}
307	C	53	AD26		337	D	46	AF21	
308	C	316	AB23		338	D	142	AE20	
309	C	388	AA22		339	D	230	AD19	
310	C	236	AC24		340	D	45	AF20	
311	C	148	AD25		341	D	141	AE19	
312	C	52	AE26		342	D	383	AB18	
313	C	51	AF26		343	D	310	AC18	
314	C	147	AE25		344	D	229	AD18	
315	C	315	AC23	V _{DD}	345	D	44	AF19	
316	D	387	AB22	GND	346	D	140	AE18	
317	D	235	AD24		347	D	43	AF18	
318	D	50	AF25		348	D	382	AB17	GND
319	D	146	AE24		349	D	309	AC17	V _{DD}
320	D	234	AD23		350	D	228	AD17	
321	D	386	AB21		351	D	139	AE17	
322	D	314	AC22		352	D	42	AF17	
323	D	49	AF24		353	D	381	AB16	
324	D	145	AE23		354	D	308	AC16	
325	D	233	AD22		355	D	227	AD16	
326	D	313	AC21		356	D	138	AE16	
327	D	48	AF23		357	D	41	AF16	
328	D	385	AB20		358	D	380	AB15	GND
329	D	144	AE22		359	D	307	AC15	V _{DD}
330	D	232	AD21		360	D	226	AD15	

**Table 4-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (7/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
361	D	137	AE15		391	D	220	AD9	
362	D	40	AF15		392	D	301	AC9	
363	D	379	AB14		393	D	374	AB9	
364	D	306	AC14		394	D	130	AE8	
365	D	225	AD14		395	D	32	AF7	
366	D	136	AE14		396	D	219	AD8	
367	D	39	AF14		397	D	129	AE7	
368	D	224	AD13		398	D	31	AF6	
369	D	305	AC13		399	D	300	AC8	V _{DD}
370	D	378	AB13		400	D	373	AB8	GND
371	D	135	AE13		401	D	218	AD7	
372	D	38	AF13		402	D	128	AE6	
373	D	37	AF12		403	D	30	AF5	
374	D	134	AE12		404	D	299	AC7	
375	D	223	AD12		405	D	217	AD6	
376	D	304	AC12	V _{DD}	406	D	127	AE5	
377	D	377	AB12	GND	407	D	372	AB7	
378	D	36	AF11		408	D	29	AF4	
379	D	133	AE11		409	D	298	AC6	
380	D	222	AD11		410	D	216	AD5	
381	D	303	AC11		411	D	126	AE4	
382	D	376	AB11		412	D	28	AF3	
383	D	35	AF10		413	D	297	AC5	
384	D	132	AE10		414	D	371	AB6	
385	D	221	AD10		415	D	215	AD4	
386	D	302	AC10	V _{DD}	416	D	125	AE3	
387	D	375	AB10	GND	417	D	27	AF2	
388	D	34	AF9		418	D	26	AF1	
389	D	131	AE9		419	D	124	AE2	
390	D	33	AF8		420	D	370	AB5	GND

4.7.4 500-pin TBGA (with heat spreader)



Remark ▲ : GND (36 pins)
● : V_{DD} (36 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
417 (E5), 420 (H5), 422 (K5), 424 (M5), 426 (P5), 429 (U5), 431 (W5), 433 (AA5), 435 (AC5), 438 (AF5), 441 (AF8), 443 (AF10), 445 (AF12), 447 (AF14), 450 (AF17), 452 (AF19), 454 (AF21), 456 (AF23), 459 (AF26), 462 (AC26), 464 (AA26), 466 (W26), 468 (U26), 471 (P26), 473 (M26), 475 (K26), 477 (H26), 480 (E26), 483 (E23), 485 (E21), 487 (E19), 489 (E17), 492 (E14), 494 (E12), 496 (E10), 498 (E8)	325 (D4), 329 (H4), 331 (K4), 333 (M4), 335 (P4), 338 (U4), 340 (W4), 342 (AA4), 344 (AC4), 348 (AG4), 352 (AG8), 354 (AG10), 356 (AG12), 358 (AG14), 361 (AG17), 363 (AG19), 365 (AG21), 367 (AG23), 371 (AG27), 375 (AC27), 377 (AA27), 379 (W27), 381 (U27), 384 (P27), 386 (M27), 388 (K27), 390 (H27), 394 (D27), 398 (D23), 400 (D21), 402 (D19), 404 (D17), 407 (D14), 409 (D12), 411 (D10), 413 (D8)	None	There are no restrictions on the assignment of dedicated scan path pins.			428

Note Total number of usable signal pins.

**Table 4-4. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (1/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
1	A	348	AG4	V _{DD}	31	A	137	AB2	
2	A	250	AH3		32	A	22	AB1	
3	A	29	AJ1		33	A	433	AA5	GND
4	A	143	AH2		34	A	342	AA4	V _{DD}
5	A	249	AG3		35	A	243	AA3	
6	A	437	AE5		36	A	136	AA2	
7	A	347	AF4		37	A	21	AA1	
8	A	28	AH1		38	A	432	Y5	
9	A	142	AG2		39	A	341	Y4	
10	A	248	AF3		40	A	242	Y3	
11	A	346	AE4		41	A	135	Y2	
12	A	27	AG1		42	A	20	Y1	
13	A	436	AD5		43	A	431	W5	GND
14	A	141	AF2		44	A	340	W4	V _{DD}
15	A	247	AE3		45	A	241	W3	
16	A	345	AD4		46	A	134	W2	
17	A	26	AF1		47	A	19	W1	
18	A	140	AE2		48	A	430	V5	
19	A	246	AD3		49	A	339	V4	
20	A	435	AC5	GND	50	A	240	V3	
21	A	344	AC4	V _{DD}	51	A	133	V2	
22	A	25	AE1		52	A	18	V1	
23	A	139	AD2		53	A	429	U5	GND
24	A	245	AC3		54	A	338	U4	V _{DD}
25	A	24	AD1		55	A	239	U3	
26	A	138	AC2		56	A	132	U2	
27	A	434	AB5		57	A	17	U1	
28	A	343	AB4		58	A	428	T5	
29	A	244	AB3		59	A	337	T4	
30	A	23	AC1		60	A	238	T3	

**Table 4-4. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (2/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
61	A	131	T2		91	A	331	K4	V _{DD}
62	A	16	T1		92	A	422	K5	GND
63	A	237	R3		93	A	9	J1	
64	A	336	R4		94	A	124	J2	
65	A	427	R5		95	A	8	H1	
66	A	130	R2		96	A	231	J3	
67	A	15	R1		97	A	330	J4	
68	A	14	P1		98	A	421	J5	
69	A	129	P2		99	A	123	H2	
70	A	236	P3		100	A	7	G1	
71	A	335	P4	V _{DD}	101	A	230	H3	
72	A	426	P5	GND	102	A	122	G2	
73	A	13	N1		103	A	6	F1	
74	A	128	N2		104	A	329	H4	V _{DD}
75	A	235	N3		105	A	420	H5	GND
76	A	334	N4		106	A	229	G3	
77	A	425	N5		107	A	121	F2	
78	A	12	M1		108	A	5	E1	
79	A	127	M2		109	A	328	G4	
80	A	234	M3		110	A	228	F3	
81	A	333	M4	V _{DD}	111	A	120	E2	
82	A	424	M5	GND	112	A	419	G5	
83	A	11	L1		113	A	4	D1	
84	A	126	L2		114	A	327	F4	
85	A	233	L3		115	A	227	E3	
86	A	332	L4		116	A	119	D2	
87	A	423	L5		117	A	3	C1	
88	A	10	K1		118	A	326	E4	
89	A	125	K2		119	A	418	F5	
90	A	232	K3		120	A	226	D3	

**Table 4-4. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (3/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
121	A	118	C2		151	B	219	B8	
122	A	2	B1		152	B	497	E9	
123	A	1	A1		153	B	412	D9	
124	A	117	B2		154	B	319	C9	
125	A	325	D4	V _{DD}	155	B	110	A8	
126	B	417	E5	GND	156	B	218	B9	
127	B	225	C3		157	B	109	A9	
128	B	116	A2		158	B	496	E10	GND
129	B	224	B3		159	B	411	D10	V _{DD}
130	B	324	C4		160	B	318	C10	
131	B	500	E6		161	B	217	B10	
132	B	416	D5		162	B	108	A10	
133	B	115	A3		163	B	495	E11	
134	B	223	B4		164	B	410	D11	
135	B	323	C5		165	B	317	C11	
136	B	415	D6		166	B	216	B11	
137	B	114	A4		167	B	107	A11	
138	B	499	E7		168	B	494	E12	GND
139	B	222	B5		169	B	409	D12	V _{DD}
140	B	322	C6		170	B	316	C12	
141	B	414	D7		171	B	215	B12	
142	B	113	A5		172	B	106	A12	
143	B	221	B6		173	B	493	E13	
144	B	321	C7		174	B	408	D13	
145	B	498	E8	GND	175	B	315	C13	
146	B	413	D8	V _{DD}	176	B	214	B13	
147	B	112	A6		177	B	105	A13	
148	B	220	B7		178	B	492	E14	GND
149	B	320	C8		179	B	407	D14	V _{DD}
150	B	111	A7		180	B	314	C14	

**Table 4-4. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (4/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
181	B	213	B14		211	B	401	D20	
182	B	104	A14		212	B	486	E20	
183	B	491	E15		213	B	97	A21	
184	B	406	D15		214	B	206	B21	
185	B	313	C15		215	B	307	C21	
186	B	212	B15		216	B	400	D21	V _{DD}
187	B	103	A15		217	B	485	E21	GND
188	B	312	C16		218	B	96	A22	
189	B	405	D16		219	B	205	B22	
190	B	490	E16		220	B	95	A23	
191	B	211	B16		221	B	306	C22	
192	B	102	A16		222	B	399	D22	
193	B	101	A17		223	B	484	E22	
194	B	210	B17		224	B	204	B23	
195	B	311	C17		225	B	94	A24	
196	B	404	D17	V _{DD}	226	B	305	C23	
197	B	489	E17	GND	227	B	203	B24	
198	B	100	A18		228	B	93	A25	
199	B	209	B18		229	B	398	D23	V _{DD}
200	B	310	C18		230	B	483	E23	GND
201	B	403	D18		231	B	304	C24	
202	B	488	E18		232	B	202	B25	
203	B	99	A19		233	B	92	A26	
204	B	208	B19		234	B	397	D24	
205	B	309	C19		235	B	303	C25	
206	B	402	D19	V _{DD}	236	B	201	B26	
207	B	487	E19	GND	237	B	482	E24	
208	B	98	A20		238	B	91	A27	
209	B	207	B20		239	B	396	D25	
210	B	308	C20		240	B	302	C26	

**Table 4-4. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (5/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
241	B	200	B27		271	C	390	H27	V _{DD}
242	B	90	A28		272	C	83	F30	
243	B	395	D26		273	C	193	G29	
244	B	481	E25		274	C	295	H28	
245	B	301	C27		275	C	82	G30	
246	B	199	B28		276	C	192	H29	
247	B	89	A29		277	C	476	J26	
248	B	88	A30		278	C	389	J27	
249	B	198	B29		279	C	294	J28	
250	B	480	E26	GND	280	C	81	H30	
251	C	394	D27	V _{DD}	281	C	191	J29	
252	C	300	C28		282	C	80	J30	
253	C	87	B30		283	C	475	K26	GND
254	C	197	C29		284	C	388	K27	V _{DD}
255	C	299	D28		285	C	293	K28	
256	C	479	F26		286	C	190	K29	
257	C	393	E27		287	C	79	K30	
258	C	86	C30		288	C	474	L26	
259	C	196	D29		289	C	387	L27	
260	C	298	E28		290	C	292	L28	
261	C	392	F27		291	C	189	L29	
262	C	85	D30		292	C	78	L30	
263	C	478	G26		293	C	473	M26	GND
264	C	195	E29		294	C	386	M27	V _{DD}
265	C	297	F28		295	C	291	M28	
266	C	391	G27		296	C	188	M29	
267	C	84	E30		297	C	77	M30	
268	C	194	F29		298	C	472	N26	
269	C	296	G28		299	C	385	N27	
270	C	477	H26	GND	300	C	290	N28	

**Table 4-4. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (6/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
301	C	187	N29		331	C	379	W27	V _{DD}
302	C	76	N30		332	C	466	W26	GND
303	C	471	P26	GND	333	C	69	Y30	
304	C	384	P27	V _{DD}	334	C	180	Y29	
305	C	289	P28		335	C	283	Y28	
306	C	186	P29		336	C	378	Y27	
307	C	75	P30		337	C	465	Y26	
308	C	470	R26		338	C	68	AA30	
309	C	383	R27		339	C	179	AA29	
310	C	288	R28		340	C	282	AA28	
311	C	185	R29		341	C	377	AA27	V _{DD}
312	C	74	R30		342	C	464	AA26	GND
313	C	287	T28		343	C	67	AB30	
314	C	382	T27		344	C	178	AB29	
315	C	469	T26		345	C	66	AC30	
316	C	184	T29		346	C	281	AB28	
317	C	73	T30		347	C	376	AB27	
318	C	72	U30		348	C	463	AB26	
319	C	183	U29		349	C	177	AC29	
320	C	286	U28		350	C	65	AD30	
321	C	381	U27	V _{DD}	351	C	280	AC28	
322	C	468	U26	GND	352	C	176	AD29	
323	C	71	V30		353	C	64	AE30	
324	C	182	V29		354	C	375	AC27	V _{DD}
325	C	285	V28		355	C	462	AC26	GND
326	C	380	V27		356	C	279	AD28	
327	C	467	V26		357	C	175	AE29	
328	C	70	W30		358	C	63	AF30	
329	C	181	W29		359	C	374	AD27	
330	C	284	W28		360	C	278	AE28	

**Table 4-4. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (7/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
361	C	174	AF29		391	D	368	AG24	
362	C	461	AD26		392	D	55	AK26	
363	C	62	AG30		393	D	167	AJ25	
364	C	373	AE27		394	D	271	AH24	
365	C	277	AF28		395	D	456	AF23	GND
366	C	173	AG29		396	D	367	AG23	V _{DD}
367	C	61	AH30		397	D	54	AK25	
368	C	372	AF27		398	D	166	AJ24	
369	C	460	AE26		399	D	270	AH23	
370	C	276	AG28		400	D	53	AK24	
371	C	172	AH29		401	D	165	AJ23	
372	C	60	AJ30		402	D	455	AF22	
373	C	59	AK30		403	D	366	AG22	
374	C	171	AJ29		404	D	269	AH22	
375	C	371	AG27	V _{DD}	405	D	52	AK23	
376	D	459	AF26	GND	406	D	164	AJ22	
377	D	275	AH28		407	D	51	AK22	
378	D	58	AK29		408	D	454	AF21	GND
379	D	170	AJ28		409	D	365	AG21	V _{DD}
380	D	274	AH27		410	D	268	AH21	
381	D	458	AF25		411	D	163	AJ21	
382	D	370	AG26		412	D	50	AK21	
383	D	57	AK28		413	D	453	AF20	
384	D	169	AJ27		414	D	364	AG20	
385	D	273	AH26		415	D	267	AH20	
386	D	369	AG25		416	D	162	AJ20	
387	D	56	AK27		417	D	49	AK20	
388	D	457	AF24		418	D	452	AF19	GND
389	D	168	AJ26		419	D	363	AG19	V _{DD}
390	D	272	AH25		420	D	266	AH19	

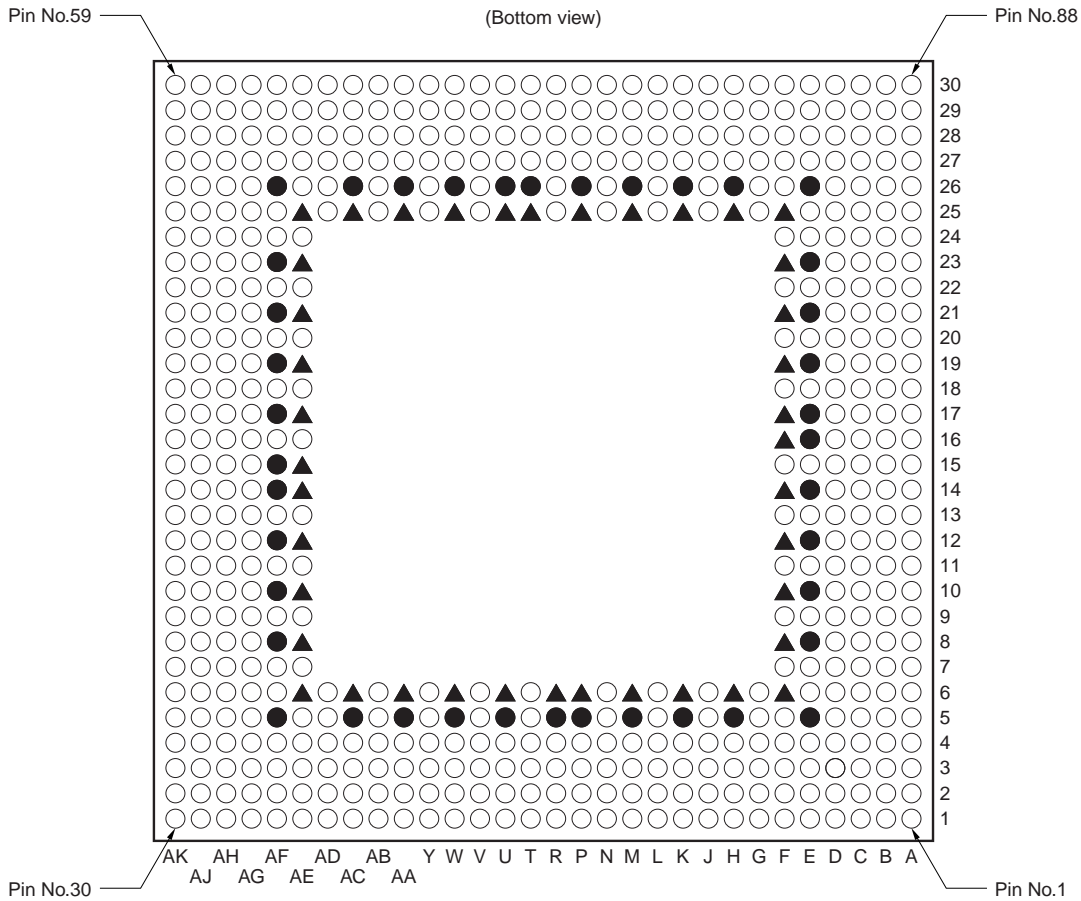
**Table 4-4. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (8/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
421	D	161	AJ19		451	D	357	AG13	
422	D	48	AK19		452	D	446	AF13	
423	D	451	AF18		453	D	41	AK12	
424	D	362	AG18		454	D	154	AJ12	
425	D	265	AH18		455	D	259	AH12	
426	D	160	AJ18		456	D	356	AG12	V _{DD}
427	D	47	AK18		457	D	445	AF12	GND
428	D	450	AF17	GND	458	D	40	AK11	
429	D	361	AG17	V _{DD}	459	D	153	AJ11	
430	D	264	AH17		460	D	258	AH11	
431	D	159	AJ17		461	D	355	AG11	
432	D	46	AK17		462	D	444	AF11	
433	D	449	AF16		463	D	39	AK10	
434	D	360	AG16		464	D	152	AJ10	
435	D	263	AH16		465	D	257	AH10	
436	D	158	AJ16		466	D	354	AG10	V _{DD}
437	D	45	AK16		467	D	443	AF10	GND
438	D	262	AH15		468	D	38	AK9	
439	D	359	AG15		469	D	151	AJ9	
440	D	448	AF15		470	D	37	AK8	
441	D	157	AJ15		471	D	256	AH9	
442	D	44	AK15		472	D	353	AG9	
443	D	43	AK14		473	D	442	AF9	
444	D	156	AJ14		474	D	150	AJ8	
445	D	261	AH14		475	D	36	AK7	
446	D	358	AG14	V _{DD}	476	D	255	AH8	
447	D	447	AF14	GND	477	D	149	AJ7	
448	D	42	AK13		478	D	35	AK6	
449	D	155	AJ13		479	D	352	AG8	V _{DD}
450	D	260	AH13		480	D	441	AF8	GND

**Table 4-4. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (9/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
481	D	254	AH7	
482	D	148	AJ6	
483	D	34	AK5	
484	D	351	AG7	
485	D	253	AH6	
486	D	147	AJ5	
487	D	440	AF7	
488	D	33	AK4	
489	D	350	AG6	
490	D	252	AH5	
491	D	146	AJ4	
492	D	32	AK3	
493	D	349	AG5	
494	D	439	AF6	
495	D	251	AH4	
496	D	145	AJ3	
497	D	31	AK2	
498	D	30	AK1	
499	D	144	AJ2	
500	D	438	AF5	GND

4.7.5 576-pin TBGA (with heat spreader)



Remark ▲ : GND (40 pins)
● : V_{DD} (40 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
501 (F6), 503 (H6), 505 (K6), 507 (M6), 509 (P6), 510 (R6), 512 (U6), 514 (W6), 516 (AA6), 518 (AC6), 520 (AE6), 522 (AE8), 524 (AE10), 526 (AE12), 528 (AE14), 529 (AE15), 531 (AE17), 533 (AE19), 535 (AE21), 537 (AE23), 539 (AE25), 541 (AC25), 543 (AA25), 545 (W25), 547 (U25), 548 (T25), 550 (P25), 552 (M25), 554 (K25), 556 (H25), 558 (F25), 560 (F23), 562 (F21), 564 (F19), 566 (F17), 567 (F16), 569 (F14), 571 (F12), 573 (F10), 575 (F8)	417 (E5), 420 (H5), 422 (K5), 424 (M5), 426 (P5), 427 (R5), 429 (U5), 431 (W5), 433 (AA5), 435 (AC5), 438 (AF5), 441 (AF8), 443 (AF10), 445 (AF12), 447 (AF14), 448 (AF15), 450 (AF17), 452 (AF19), 454 (AF21), 456 (AF23), 459 (AF26), 462 (AC26), 464 (AA26), 466 (W26), 468 (U26), 469 (T26), 471 (P26), 473 (M26), 475 (K26), 477 (H26), 480 (E26), 483 (E23), 485 (E21), 487 (E19), 489 (E17), 490 (E16), 492 (E14), 494 (E12), 496 (E10), 498 (E8)	None	There are no restrictions on the assignment of dedicated scan path pins.			496

Note Total number of usable signal pins.

**Table 4-5. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (1/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
1	A	438	AF5	V _{DD}	33	A	343	AB4	
2	A	348	AG4		34	A	433	AA5	V _{DD}
3	A	250	AH3		35	A	24	AD1	
4	A	144	AJ2		36	A	138	AC2	
5	A	30	AK1		37	A	244	AB3	
6	A	347	AF4		38	A	342	AA4	
7	A	437	AE5		39	A	23	AC1	
8	A	519	AD6		40	A	515	Y6	
9	A	249	AG3		41	A	432	Y5	
10	A	143	AH2		42	A	137	AB2	
11	A	29	AJ1		43	A	243	AA3	
12	A	142	AG2		44	A	341	Y4	
13	A	248	AF3		45	A	22	AB1	
14	A	346	AE4		46	A	136	AA2	
15	A	436	AD5		47	A	242	Y3	
16	A	518	AC6	GND	48	A	514	W6	GND
17	A	28	AH1		49	A	431	W5	V _{DD}
18	A	27	AG1		50	A	340	W4	
19	A	141	AF2		51	A	21	AA1	
20	A	247	AE3		52	A	135	Y2	
21	A	345	AD4		53	A	241	W3	
22	A	435	AC5	V _{DD}	54	A	20	Y1	
23	A	26	AF1		55	A	134	W2	
24	A	517	AB6		56	A	513	V6	
25	A	140	AE2		57	A	430	V5	
26	A	246	AD3		58	A	339	V4	
27	A	344	AC4		59	A	240	V3	
28	A	434	AB5		60	A	19	W1	
29	A	25	AE1		61	A	133	V2	
30	A	139	AD2		62	A	18	V1	
31	A	245	AC3		63	A	512	U6	GND
32	A	516	AA6	GND	64	A	429	U5	V _{DD}

**Table 4-5. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (2/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
65	A	338	U4		97	A	424	M5	V _{DD}
66	A	239	U3		98	A	507	M6	GND
67	A	132	U2		99	A	11	L1	
68	A	17	U1		100	A	126	L2	
69	A	428	T5		101	A	10	K1	
70	A	511	T6		102	A	233	L3	
71	A	337	T4		103	A	332	L4	
72	A	238	T3		104	A	423	L5	
73	A	131	T2		105	A	506	L6	
74	A	16	T1		106	A	125	K2	
75	A	237	R3		107	A	9	J1	
76	A	336	R4		108	A	232	K3	
77	A	427	R5	V _{DD}	109	A	124	J2	
78	A	510	R6	GND	110	A	8	H1	
79	A	130	R2		111	A	331	K4	
80	A	15	R1		112	A	422	K5	V _{DD}
81	A	14	P1		113	A	505	K6	GND
82	A	129	P2		114	A	231	J3	
83	A	236	P3		115	A	123	H2	
84	A	335	P4		116	A	7	G1	
85	A	426	P5	V _{DD}	117	A	330	J4	
86	A	509	P6	GND	118	A	230	H3	
87	A	13	N1		119	A	122	G2	
88	A	128	N2		120	A	421	J5	
89	A	235	N3		121	A	504	J6	
90	A	334	N4		122	A	6	F1	
91	A	425	N5		123	A	329	H4	
92	A	508	N6		124	A	229	G3	
93	A	12	M1		125	A	121	F2	
94	A	127	M2		126	A	5	E1	
95	A	234	M3		127	A	420	H5	V _{DD}
96	A	333	M4		128	A	328	G4	

**Table 4-5. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (3/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
129	A	503	H6	GND	161	B	115	A3	
130	A	228	F3		162	B	114	A4	
131	A	120	E2		163	B	222	B5	
132	A	4	D1		164	B	322	C6	
133	A	419	G5		165	B	414	D7	
134	A	119	D2		166	B	498	E8	V _{DD}
135	A	227	E3		167	B	113	A5	
136	A	327	F4		168	B	574	F9	
137	A	502	G6		169	B	221	B6	
138	A	3	C1		170	B	321	C7	
139	A	418	F5		171	B	413	D8	
140	A	326	E4		172	B	497	E9	
141	A	226	D3		173	B	112	A6	
142	A	118	C2		174	B	220	B7	
143	A	2	B1		175	B	320	C8	
144	A	417	E5	V _{DD}	176	B	573	F10	GND
145	B	501	F6	GND	177	B	412	D9	
146	B	325	D4		178	B	496	E10	V _{DD}
147	B	225	C3		179	B	111	A7	
148	B	117	B2		180	B	219	B8	
149	B	1	A1		181	B	319	C9	
150	B	416	D5		182	B	411	D10	
151	B	500	E6		183	B	110	A8	
152	B	576	F7		184	B	572	F11	
153	B	324	C4		185	B	495	E11	
154	B	224	B3		186	B	218	B9	
155	B	116	A2		187	B	318	C10	
156	B	223	B4		188	B	410	D11	
157	B	323	C5		189	B	109	A9	
158	B	415	D6		190	B	217	B10	
159	B	499	E7		191	B	317	C11	
160	B	575	F8	GND	192	B	571	F12	GND

**Table 4-5. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (4/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
193	B	494	E12	V _{DD}	225	B	101	A17	
194	B	409	D12		226	B	210	B17	
195	B	108	A10		227	B	311	C17	
196	B	216	B11		228	B	404	D17	
197	B	316	C12		229	B	489	E17	V _{DD}
198	B	107	A11		230	B	566	F17	GND
199	B	215	B12		231	B	100	A18	
200	B	570	F13		232	B	209	B18	
201	B	493	E13		233	B	310	C18	
202	B	408	D13		234	B	403	D18	
203	B	315	C13		235	B	488	E18	
204	B	106	A12		236	B	565	F18	
205	B	214	B13		237	B	99	A19	
206	B	105	A13		238	B	208	B19	
207	B	569	F14	GND	239	B	309	C19	
208	B	492	E14	V _{DD}	240	B	402	D19	
209	B	407	D14		241	B	487	E19	V _{DD}
210	B	314	C14		242	B	564	F19	GND
211	B	213	B14		243	B	98	A20	
212	B	104	A14		244	B	207	B20	
213	B	491	E15		245	B	97	A21	
214	B	568	F15		246	B	308	C20	
215	B	406	D15		247	B	401	D20	
216	B	313	C15		248	B	486	E20	
217	B	212	B15		249	B	563	F20	
218	B	103	A15		250	B	206	B21	
219	B	312	C16		251	B	96	A22	
220	B	405	D16		252	B	307	C21	
221	B	490	E16	V _{DD}	253	B	205	B22	
222	B	567	F16	GND	254	B	95	A23	
223	B	211	B16		255	B	400	D21	
224	B	102	A16		256	B	485	E21	V _{DD}

**Table 4-5. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (5/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
257	B	562	F21	GND	289	C	480	E26	V _{DD}
258	B	306	C22		290	C	394	D27	
259	B	204	B23		291	C	300	C28	
260	B	94	A24		292	C	198	B29	
261	B	399	D22		293	C	88	A30	
262	B	305	C23		294	C	393	E27	
263	B	203	B24		295	C	479	F26	
264	B	484	E22		296	C	557	G25	
265	B	561	F22		297	C	299	D28	
266	B	93	A25		298	C	197	C29	
267	B	398	D23		299	C	87	B30	
268	B	304	C24		300	C	196	D29	
269	B	202	B25		301	C	298	E28	
270	B	92	A26		302	C	392	F27	
271	B	483	E23	V _{DD}	303	C	478	G26	
272	B	397	D24		304	C	556	H25	GND
273	B	560	F23	GND	305	C	86	C30	
274	B	303	C25		306	C	85	D30	
275	B	201	B26		307	C	195	E29	
276	B	91	A27		308	C	297	F28	
277	B	482	E24		309	C	391	G27	
278	B	200	B27		310	C	477	H26	V _{DD}
279	B	302	C26		311	C	84	E30	
280	B	396	D25		312	C	555	J25	
281	B	559	F24		313	C	194	F29	
282	B	90	A28		314	C	296	G28	
283	B	481	E25		315	C	390	H27	
284	B	395	D26		316	C	476	J26	
285	B	301	C27		317	C	83	F30	
286	B	199	B28		318	C	193	G29	
287	B	89	A29		319	C	295	H28	
288	B	558	F25	GND	320	C	554	K25	GND

**Table 4-5. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (6/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
321	C	389	J27		353	C	384	P27	
322	C	475	K26	V _{DD}	354	C	289	P28	
323	C	82	G30		355	C	186	P29	
324	C	192	H29		356	C	75	P30	
325	C	294	J28		357	C	470	R26	
326	C	388	K27		358	C	549	R25	
327	C	81	H30		359	C	383	R27	
328	C	553	L25		360	C	288	R28	
329	C	474	L26		361	C	185	R29	
330	C	191	J29		362	C	74	R30	
331	C	293	K28		363	C	287	T28	
332	C	387	L27		364	C	382	T27	
333	C	80	J30		365	C	469	T26	V _{DD}
334	C	190	K29		366	C	548	T25	GND
335	C	292	L28		367	C	184	T29	
336	C	552	M25	GND	368	C	73	T30	
337	C	473	M26	V _{DD}	369	C	72	U30	
338	C	386	M27		370	C	183	U29	
339	C	79	K30		371	C	286	U28	
340	C	189	L29		372	C	381	U27	
341	C	291	M28		373	C	468	U26	V _{DD}
342	C	78	L30		374	C	547	U25	GND
343	C	188	M29		375	C	71	V30	
344	C	551	N25		376	C	182	V29	
345	C	472	N26		377	C	285	V28	
346	C	385	N27		378	C	380	V27	
347	C	290	N28		379	C	467	V26	
348	C	77	M30		380	C	546	V25	
349	C	187	N29		381	C	70	W30	
350	C	76	N30		382	C	181	W29	
351	C	550	P25	GND	383	C	284	W28	
352	C	471	P26	V _{DD}	384	C	379	W27	

**Table 4-5. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (7/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
385	C	466	W26	V _{DD}	417	C	541	AC25	GND
386	C	545	W25	GND	418	C	278	AE28	
387	C	69	Y30		419	C	174	AF29	
388	C	180	Y29		420	C	62	AG30	
389	C	68	AA30		421	C	461	AD26	
390	C	283	Y28		422	C	173	AG29	
391	C	378	Y27		423	C	277	AF28	
392	C	465	Y26		424	C	373	AE27	
393	C	544	Y25		425	C	540	AD25	
394	C	179	AA29		426	C	61	AH30	
395	C	67	AB30		427	C	460	AE26	
396	C	282	AA28		428	C	372	AF27	
397	C	178	AB29		429	C	276	AG28	
398	C	66	AC30		430	C	172	AH29	
399	C	377	AA27		431	C	60	AJ30	
400	C	464	AA26	V _{DD}	432	C	459	AF26	V _{DD}
401	C	543	AA25	GND	433	D	539	AE25	GND
402	C	281	AB28		434	D	371	AG27	
403	C	177	AC29		435	D	275	AH28	
404	C	65	AD30		436	D	171	AJ29	
405	C	376	AB27		437	D	59	AK30	
406	C	280	AC28		438	D	370	AG26	
407	C	176	AD29		439	D	458	AF25	
408	C	463	AB26		440	D	538	AE24	
409	C	542	AB25		441	D	274	AH27	
410	C	64	AE30		442	D	170	AJ28	
411	C	375	AC27		443	D	58	AK29	
412	C	279	AD28		444	D	169	AJ27	
413	C	175	AE29		445	D	273	AH26	
414	C	63	AF30		446	D	369	AG25	
415	C	462	AC26	V _{DD}	447	D	457	AF24	
416	C	374	AD27		448	D	537	AE23	GND

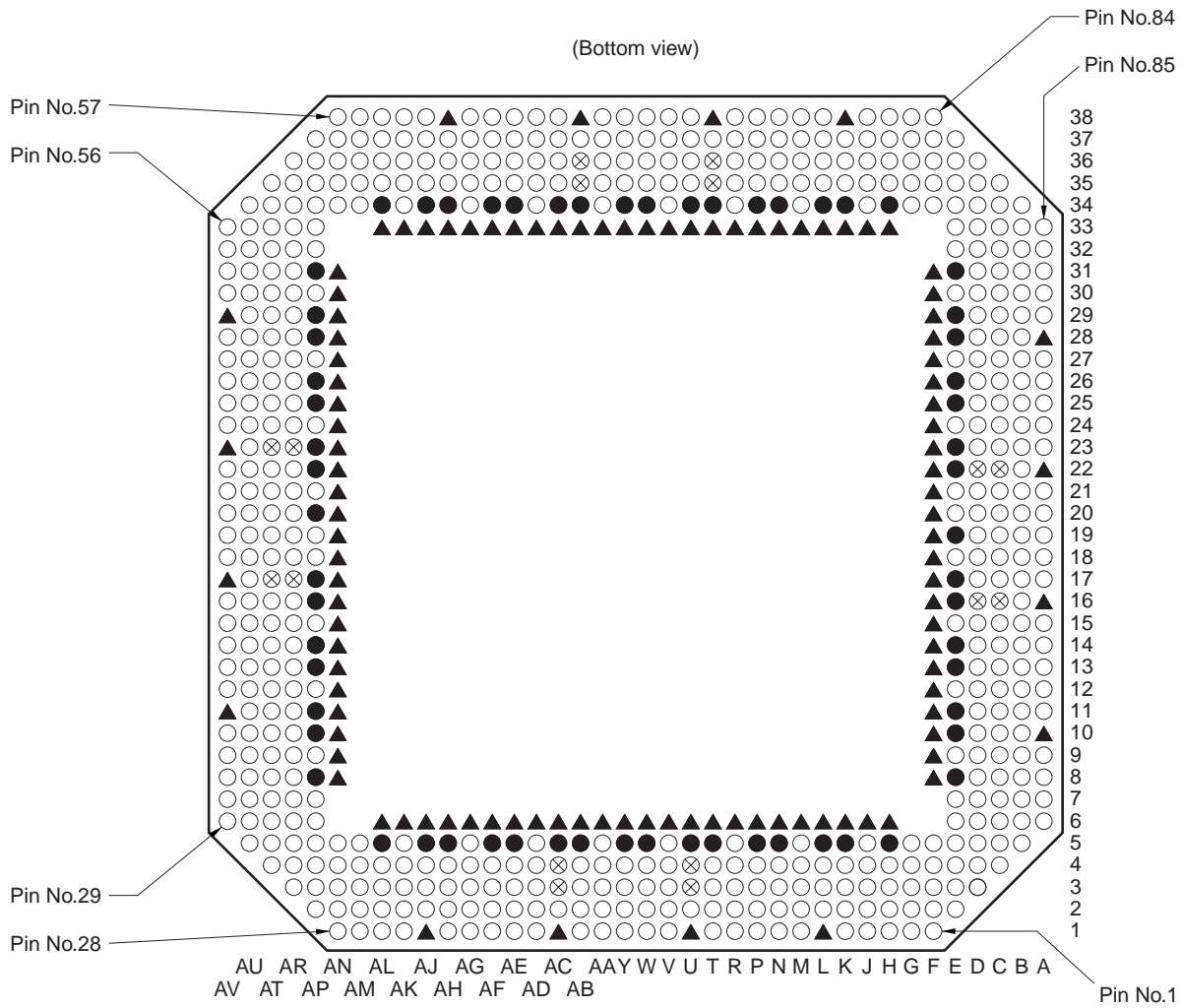
**Table 4-5. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (8/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
449	D	57	AK28		481	D	452	AF19	V _{DD}
450	D	56	AK27		482	D	363	AG19	
451	D	168	AJ26		483	D	50	AK21	
452	D	272	AH25		484	D	162	AJ20	
453	D	368	AG24		485	D	266	AH19	
454	D	456	AF23	V _{DD}	486	D	49	AK20	
455	D	55	AK26		487	D	161	AJ19	
456	D	536	AE22		488	D	532	AE18	
457	D	167	AJ25		489	D	451	AF18	
458	D	271	AH24		490	D	362	AG18	
459	D	367	AG23		491	D	265	AH18	
460	D	455	AF22		492	D	48	AK19	
461	D	54	AK25		493	D	160	AJ18	
462	D	166	AJ24		494	D	47	AK18	
463	D	270	AH23		495	D	531	AE17	GND
464	D	535	AE21	GND	496	D	450	AF17	V _{DD}
465	D	366	AG22		497	D	361	AG17	
466	D	454	AF21	V _{DD}	498	D	264	AH17	
467	D	53	AK24		499	D	159	AJ17	
468	D	165	AJ23		500	D	46	AK17	
469	D	269	AH22		501	D	449	AF16	
470	D	365	AG21		502	D	530	AE16	
471	D	52	AK23		503	D	360	AG16	
472	D	534	AE20		504	D	263	AH16	
473	D	453	AF20		505	D	158	AJ16	
474	D	164	AJ22		506	D	45	AK16	
475	D	268	AH21		507	D	262	AH15	
476	D	364	AG20		508	D	359	AG15	
477	D	51	AK22		509	D	448	AF15	V _{DD}
478	D	163	AJ21		510	D	529	AE15	GND
479	D	267	AH20		511	D	157	AJ15	
480	D	533	AE19	GND	512	D	44	AK15	

**Table 4-5. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (9/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
513	D	43	AK14		545	D	524	AE10	GND
514	D	156	AJ14		546	D	256	AH9	
515	D	261	AH14		547	D	150	AJ8	
516	D	358	AG14		548	D	36	AK7	
517	D	447	AF14	V _{DD}	549	D	353	AG9	
518	D	528	AE14	GND	550	D	255	AH8	
519	D	42	AK13		551	D	149	AJ7	
520	D	155	AJ13		552	D	442	AF9	
521	D	260	AH13		553	D	523	AE9	
522	D	357	AG13		554	D	35	AK6	
523	D	446	AF13		555	D	352	AG8	
524	D	527	AE13		556	D	254	AH7	
525	D	41	AK12		557	D	148	AJ6	
526	D	154	AJ12		558	D	34	AK5	
527	D	259	AH12		559	D	441	AF8	V _{DD}
528	D	356	AG12		560	D	351	AG7	
529	D	445	AF12	V _{DD}	561	D	522	AE8	GND
530	D	526	AE12	GND	562	D	253	AH6	
531	D	40	AK11		563	D	147	AJ5	
532	D	153	AJ11		564	D	33	AK4	
533	D	39	AK10		565	D	440	AF7	
534	D	258	AH11		566	D	146	AJ4	
535	D	355	AG11		567	D	252	AH5	
536	D	444	AF11		568	D	350	AG6	
537	D	525	AE11		569	D	521	AE7	
538	D	152	AJ10		570	D	32	AK3	
539	D	38	AK9		571	D	439	AF6	
540	D	257	AH10		572	D	349	AG5	
541	D	151	AJ9		573	D	251	AH4	
542	D	37	AK8		574	D	145	AJ3	
543	D	354	AG10		575	D	31	AK2	
544	D	443	AF10	V _{DD}	576	D	520	AE6	GND

4.7.6 696-pin TBGA (with heat spreader)



Remark ▲ : GND (112 pins)
● : V_{DD} (62 pins)
⊗ : NC (16 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
6 (L1), 12 (U1), 18 (AC1), 24 (AJ1), 34 (AV11), 40 (AV17), 46 (AV23), 52 (AV29), 62 (AH38), 68 (AB38), 74 (T38), 80 (K38), 90 (A28), 96 (A22), 102 (A16), 108 (A10), 601 (H6), 602 (J6), 603 (K6), 604 (L6), 605 (M6), 606 (N6), 607 (P6), 608 (R6), 609 (T6), 610 (U6), 611 (V6), 612 (W6), 613 (Y6), 614 (AA6), 615 (AB6), 616 (AC6), 617 (AD6), 618 (AE6), 619 (AF6), 620 (AG6), 621 (AH6), 622 (AJ6), 623 (AK6), 624 (AL6), 625 (AN8), 626 (AN9), 627 (AN10), 628 (AN11), 629 (AN12), 630 (AN13), 631 (AN14), 632 (AN15), 633 (AN16), 634 (AN17), 635 (AN18), 636 (AN19), 637 (AN20), 638 (AN21), 639 (AN22), 640 (AN23), 641 (AN24), 642 (AN25), 643 (AN26), 644 (AN27), 645 (AN28), 646 (AN29), 647 (AN30), 648 (AN31), 649 (AL33), 650 (AK33), 651 (AJ33), 652 (AH33), 653 (AG33), 654 (AF33), 655 (AE33), 656 (AD33), 657 (AC33), 658 (AB33), 659 (AA33), 660 (Y33), 661 (W33), 662 (V33), 663 (U33), 664 (T33), 665 (R33), 666 (P33), 667 (N33), 668 (M33), 669 (L33), 670 (K33), 671 (J33), 672 (H33), 673 (F31), 674 (F30), 675 (F29), 676 (F28), 677 (F27), 678 (F26), 679 (F25), 680 (F24), 681 (F23), 682 (F22), 683 (F21), 684 (F20), 685 (F19), 686 (F18), 687 (F17), 688 (F16), 689 (F15), 690 (F14), 691 (F13), 692 (F12), 693 (F11), 694 (F10), 695 (F9), 696 (F8)	488 (H5), 490 (K5), 491 (L5), 493 (N5), 494 (P5), 496 (T5), 497 (U5), 499 (W5), 500 (Y5), 502 (AB5), 503 (AC5), 505 (AE5), 506 (AF5), 508 (AH5), 509 (AJ5), 511 (AL5), 517 (AP8), 519 (AP10), 520 (AP11), 522 (AP13), 523 (AP14), 525 (AP16), 526 (AP17), 529 (AP20), 531 (AP22), 532 (AP23), 534 (AP25), 535 (AP26), 537 (AP28), 538 (AP29), 540 (AP31), 546 (AL34), 548 (AJ34), 549 (AH34), 551 (AF34), 552 (AE34), 554 (AC34), 555 (AB34), 557 (Y34), 558 (W34), 560 (U34), 561 (T34), 563 (P34), 564 (N34), 566 (L34), 567 (K34), 569 (H34), 575 (E31), 577 (E29), 578 (E28), 580 (E26), 581 (E25), 583 (E23), 584 (E22), 587 (E19), 589 (E17), 590 (E16), 592 (E14), 593 (E13), 595 (E11), 596 (E10), 598 (E8)	246 (U3), 252 (AC3), 278 (AT17), 284 (AT23), 310 (AB36), 316 (T36), 342 (C22), 348 (C16), 374 (U4), 380 (AC4), 405 (AR17), 411 (AR23), 436 (AB35), 442 (T35), 467 (D22), 473 (D16)	There are no restrictions on the assignment of dedicated scan path pins.	506		

Note Total number of usable signal pins.

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (1/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
1	A	392	AR4		31	A	258	AJ3	
2	A	264	AR3		32	A	137	AJ2	
3	A	391	AP4		33	A	24	AJ1	GND
4	A	263	AP3		34	A	621	AH6	GND
5	A	142	AP2		35	A	508	AH5	V _{DD}
6	A	513	AN5		36	A	385	AH4	
7	A	390	AN4		37	A	257	AH3	
8	A	262	AN3		38	A	136	AH2	
9	A	141	AN2		39	A	23	AH1	
10	A	28	AN1		40	A	620	AG6	GND
11	A	512	AM5		41	A	507	AG5	
12	A	389	AM4		42	A	384	AG4	
13	A	261	AM3		43	A	256	AG3	
14	A	140	AM2		44	A	135	AG2	
15	A	27	AM1		45	A	22	AG1	
16	A	624	AL6	GND	46	A	619	AF6	GND
17	A	511	AL5	V _{DD}	47	A	506	AF5	V _{DD}
18	A	388	AL4		48	A	383	AF4	
19	A	260	AL3		49	A	255	AF3	
20	A	139	AL2		50	A	134	AF2	
21	A	26	AL1		51	A	21	AF1	
22	A	623	AK6	GND	52	A	618	AE6	GND
23	A	510	AK5		53	A	505	AE5	V _{DD}
24	A	387	AK4		54	A	382	AE4	
25	A	259	AK3		55	A	254	AE3	
26	A	138	AK2		56	A	133	AE2	
27	A	25	AK1		57	A	20	AE1	
28	A	622	AJ6	GND	58	A	617	AD6	GND
29	A	509	AJ5	V _{DD}	59	A	504	AD5	
30	A	386	AJ4		60	A	381	AD4	

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (2/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
61	A	253	AD3		91	A	612	W6	GND
62	A	132	AD2		92	A	127	W2	
63	A	19	AD1		93	A	14	W1	
64	A	616	AC6	GND	94	A	126	V2	
65	A	503	AC5	V _{DD}	95	A	247	V3	
66	A	380	AC4	NC	96	A	375	V4	
67	A	252	AC3	NC	97	A	498	V5	
68	A	131	AC2		98	A	611	V6	GND
69	A	18	AC1	GND	99	A	13	V1	
70	A	615	AB6	GND	100	A	12	U1	GND
71	A	502	AB5	V _{DD}	101	A	125	U2	
72	A	379	AB4		102	A	246	U3	NC
73	A	251	AB3		103	A	374	U4	NC
74	A	130	AB2		104	A	497	U5	V _{DD}
75	A	17	AB1		105	A	610	U6	GND
76	A	501	AA5		106	A	11	T1	
77	A	614	AA6	GND	107	A	124	T2	
78	A	378	AA4		108	A	245	T3	
79	A	250	AA3		109	A	373	T4	
80	A	129	AA2		110	A	496	T5	V _{DD}
81	A	16	AA1		111	A	609	T6	GND
82	A	377	Y4		112	A	10	R1	
83	A	500	Y5	V _{DD}	113	A	123	R2	
84	A	613	Y6	GND	114	A	244	R3	
85	A	249	Y3		115	A	372	R4	
86	A	128	Y2		116	A	495	R5	
87	A	15	Y1		117	A	608	R6	GND
88	A	248	W3		118	A	9	P1	
89	A	376	W4		119	A	122	P2	
90	A	499	W5	V _{DD}	120	A	243	P3	

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (3/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
121	A	371	P4		151	A	366	J4	
122	A	494	P5	V _{DD}	152	A	489	J5	
123	A	607	P6	GND	153	A	602	J6	GND
124	A	8	N1		154	A	3	H1	
125	A	121	N2		155	A	116	H2	
126	A	242	N3		156	A	237	H3	
127	A	370	N4		157	A	365	H4	
128	A	493	N5	V _{DD}	158	A	488	H5	V _{DD}
129	A	606	N6	GND	159	A	601	H6	GND
130	A	7	M1		160	A	2	G1	
131	A	120	M2		161	A	115	G2	
132	A	241	M3		162	A	236	G3	
133	A	369	M4		163	A	364	G4	
134	A	492	M5		164	A	487	G5	
135	A	605	M6	GND	165	A	1	F1	
136	A	6	L1	GND	166	A	114	F2	
137	A	119	L2		167	A	235	F3	
138	A	240	L3		168	A	363	F4	
139	A	368	L4		169	A	486	F5	
140	A	491	L5	V _{DD}	170	A	113	E2	
141	A	604	L6	GND	171	A	234	E3	
142	A	5	K1		172	A	362	E4	
143	A	118	K2		173	A	233	D3	
144	A	239	K3		174	A	485	E5	
145	A	367	K4		175	B	361	D4	
146	A	490	K5	V _{DD}	176	B	360	C4	
147	A	603	K6	GND	177	B	484	D5	
148	A	4	J1		178	B	359	C5	
149	A	117	J2		179	B	232	B5	
150	A	238	J3		180	B	600	E6	

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (4/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
181	B	483	D6		211	B	353	C11	
182	B	358	C6		212	B	226	B11	
183	B	231	B6		213	B	107	A11	
184	B	112	A6		214	B	692	F12	GND
185	B	599	E7		215	B	594	E12	
186	B	482	D7		216	B	477	D12	
187	B	357	C7		217	B	352	C12	
188	B	230	B7		218	B	225	B12	
189	B	111	A7		219	B	106	A12	
190	B	696	F8	GND	220	B	691	F13	GND
191	B	598	E8	V _{DD}	221	B	593	E13	V _{DD}
192	B	481	D8		222	B	476	D13	
193	B	356	C8		223	B	351	C13	
194	B	229	B8		224	B	224	B13	
195	B	110	A8		225	B	105	A13	
196	B	695	F9	GND	226	B	690	F14	GND
197	B	597	E9		227	B	592	E14	V _{DD}
198	B	480	D9		228	B	475	D14	
199	B	355	C9		229	B	350	C14	
200	B	228	B9		230	B	223	B14	
201	B	109	A9		231	B	104	A14	
202	B	694	F10	GND	232	B	689	F15	GND
203	B	596	E10	V _{DD}	233	B	591	E15	
204	B	479	D10		234	B	474	D15	
205	B	354	C10		235	B	349	C15	
206	B	227	B10		236	B	222	B15	
207	B	108	A10	GND	237	B	103	A15	
208	B	693	F11	GND	238	B	688	F16	GND
209	B	595	E11	V _{DD}	239	B	590	E16	V _{DD}
210	B	478	D11		240	B	473	D16	NC

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (5/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
241	B	348	C16	NC	271	B	585	E21	
242	B	221	B16		272	B	683	F21	GND
243	B	102	A16	GND	273	B	97	A21	
244	B	687	F17	GND	274	B	96	A22	GND
245	B	589	E17	V _{DD}	275	B	215	B22	
246	B	472	D17		276	B	342	C22	NC
247	B	347	C17		277	B	467	D22	NC
248	B	220	B17		278	B	584	E22	V _{DD}
249	B	101	A17		279	B	682	F22	GND
250	B	588	E18		280	B	95	A23	
251	B	686	F18	GND	281	B	214	B23	
252	B	471	D18		282	B	341	C23	
253	B	346	C18		283	B	466	D23	
254	B	219	B18		284	B	583	E23	V _{DD}
255	B	100	A18		285	B	681	F23	GND
256	B	470	D19		286	B	94	A24	
257	B	587	E19	V _{DD}	287	B	213	B24	
258	B	685	F19	GND	288	B	340	C24	
259	B	345	C19		289	B	465	D24	
260	B	218	B19		290	B	582	E24	
261	B	99	A19		291	B	680	F24	GND
262	B	344	C20		292	B	93	A25	
263	B	469	D20		293	B	212	B25	
264	B	586	E20		294	B	339	C25	
265	B	684	F20	GND	295	B	464	D25	
266	B	217	B20		296	B	581	E25	V _{DD}
267	B	98	A20		297	B	679	F25	GND
268	B	216	B21		298	B	92	A26	
269	B	343	C21		299	B	211	B26	
270	B	468	D21		300	B	338	C26	

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (6/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
301	B	463	D26		331	B	458	D31	
302	B	580	E26	V _{DD}	332	B	575	E31	V _{DD}
303	B	678	F26	GND	333	B	673	F31	GND
304	B	91	A27		334	B	86	A32	
305	B	210	B27		335	B	205	B32	
306	B	337	C27		336	B	332	C32	
307	B	462	D27		337	B	457	D32	
308	B	579	E27		338	B	574	E32	
309	B	677	F27	GND	339	B	85	A33	
310	B	90	A28	GND	340	B	204	B33	
311	B	209	B28		341	B	331	C33	
312	B	336	C28		342	B	456	D33	
313	B	461	D28		343	B	573	E33	
314	B	578	E28	V _{DD}	344	B	203	B34	
315	B	676	F28	GND	345	B	330	C34	
316	B	89	A29		346	B	455	D34	
317	B	208	B29		347	B	329	C35	
318	B	335	C29		348	B	572	E34	
319	B	460	D29		349	C	454	D35	
320	B	577	E29	V _{DD}	350	C	328	D36	
321	B	675	F29	GND	351	C	453	E35	
322	B	88	A30		352	C	327	E36	
323	B	207	B30		353	C	202	E37	
324	B	334	C30		354	C	571	F34	
325	B	459	D30		355	C	452	F35	
326	B	576	E30		356	C	326	F36	
327	B	674	F30	GND	357	C	201	F37	
328	B	87	A31		358	C	84	F38	
329	B	206	B31		359	C	570	G34	
330	B	333	C31		360	C	451	G35	

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (7/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
361	C	325	G36		391	C	320	M36	
362	C	200	G37		392	C	195	M37	
363	C	83	G38		393	C	78	M38	
364	C	672	H33	GND	394	C	667	N33	GND
365	C	569	H34	V _{DD}	395	C	564	N34	V _{DD}
366	C	450	H35		396	C	445	N35	
367	C	324	H36		397	C	319	N36	
368	C	199	H37		398	C	194	N37	
369	C	82	H38		399	C	77	N38	
370	C	671	J33	GND	400	C	666	P33	GND
371	C	568	J34		401	C	563	P34	V _{DD}
372	C	449	J35		402	C	444	P35	
373	C	323	J36		403	C	318	P36	
374	C	198	J37		404	C	193	P37	
375	C	81	J38		405	C	76	P38	
376	C	670	K33	GND	406	C	665	R33	GND
377	C	567	K34	V _{DD}	407	C	562	R34	
378	C	448	K35		408	C	443	R35	
379	C	322	K36		409	C	317	R36	
380	C	197	K37		410	C	192	R37	
381	C	80	K38	GND	411	C	75	R38	
382	C	669	L33	GND	412	C	664	T33	GND
383	C	566	L34	V _{DD}	413	C	561	T34	V _{DD}
384	C	447	L35		414	C	442	T35	NC
385	C	321	L36		415	C	316	T36	NC
386	C	196	L37		416	C	191	T37	
387	C	79	L38		417	C	74	T38	GND
388	C	668	M33	GND	418	C	663	U33	GND
389	C	565	M34		419	C	560	U34	V _{DD}
390	C	446	M35		420	C	441	U35	

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (8/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
421	C	315	U36		451	C	436	AB35	NC
422	C	190	U37		452	C	555	AB34	V _{DD}
423	C	73	U38		453	C	658	AB33	GND
424	C	559	V34		454	C	67	AC38	
425	C	662	V33	GND	455	C	184	AC37	
426	C	440	V35		456	C	309	AC36	
427	C	314	V36		457	C	435	AC35	
428	C	189	V37		458	C	554	AC34	V _{DD}
429	C	72	V38		459	C	657	AC33	GND
430	C	439	W35		460	C	66	AD38	
431	C	558	W34	V _{DD}	461	C	183	AD37	
432	C	661	W33	GND	462	C	308	AD36	
433	C	313	W36		463	C	434	AD35	
434	C	188	W37		464	C	553	AD34	
435	C	71	W38		465	C	656	AD33	GND
436	C	312	Y36		466	C	65	AE38	
437	C	438	Y35		467	C	182	AE37	
438	C	557	Y34	V _{DD}	468	C	307	AE36	
439	C	660	Y33	GND	469	C	433	AE35	
440	C	187	Y37		470	C	552	AE34	V _{DD}
441	C	70	Y38		471	C	655	AE33	GND
442	C	186	AA37		472	C	64	AF38	
443	C	311	AA36		473	C	181	AF37	
444	C	437	AA35		474	C	306	AF36	
445	C	556	AA34		475	C	432	AF35	
446	C	659	AA33	GND	476	C	551	AF34	V _{DD}
447	C	69	AA38		477	C	654	AF33	GND
448	C	68	AB38	GND	478	C	63	AG38	
449	C	185	AB37		479	C	180	AG37	
450	C	310	AB36	NC	480	C	305	AG36	

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (9/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
481	C	431	AG35		511	C	426	AM35	
482	C	550	AG34		512	C	545	AM34	
483	C	653	AG33	GND	513	C	57	AN38	
484	C	62	AH38	GND	514	C	174	AN37	
485	C	179	AH37		515	C	299	AN36	
486	C	304	AH36		516	C	425	AN35	
487	C	430	AH35		517	C	544	AN34	
488	C	549	AH34	V _{DD}	518	C	173	AP37	
489	C	652	AH33	GND	519	C	298	AP36	
490	C	61	AJ38		520	C	424	AP35	
491	C	178	AJ37		521	C	297	AR36	
492	C	303	AJ36		522	C	543	AP34	
493	C	429	AJ35		523	D	423	AR35	
494	C	548	AJ34	V _{DD}	524	D	296	AT35	
495	C	651	AJ33	GND	525	D	422	AR34	
496	C	60	AK38		526	D	295	AT34	
497	C	177	AK37		527	D	172	AU34	
498	C	302	AK36		528	D	542	AP33	
499	C	428	AK35		529	D	421	AR33	
500	C	547	AK34		530	D	294	AT33	
501	C	650	AK33	GND	531	D	171	AU33	
502	C	59	AL38		532	D	56	AV33	
503	C	176	AL37		533	D	541	AP32	
504	C	301	AL36		534	D	420	AR32	
505	C	427	AL35		535	D	293	AT32	
506	C	546	AL34	V _{DD}	536	D	170	AU32	
507	C	649	AL33	GND	537	D	55	AV32	
508	C	58	AM38		538	D	648	AN31	GND
509	C	175	AM37		539	D	540	AP31	V _{DD}
510	C	300	AM36		540	D	419	AR31	

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (10/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
541	D	292	AT31		571	D	287	AT26	
542	D	169	AU31		572	D	164	AU26	
543	D	54	AV31		573	D	49	AV26	
544	D	647	AN30	GND	574	D	642	AN25	GND
545	D	539	AP30		575	D	534	AP25	V _{DD}
546	D	418	AR30		576	D	413	AR25	
547	D	291	AT30		577	D	286	AT25	
548	D	168	AU30		578	D	163	AU25	
549	D	53	AV30		579	D	48	AV25	
550	D	646	AN29	GND	580	D	641	AN24	GND
551	D	538	AP29	V _{DD}	581	D	533	AP24	
552	D	417	AR29		582	D	412	AR24	
553	D	290	AT29		583	D	285	AT24	
554	D	167	AU29		584	D	162	AU24	
555	D	52	AV29	GND	585	D	47	AV24	
556	D	645	AN28	GND	586	D	640	AN23	GND
557	D	537	AP28	V _{DD}	587	D	532	AP23	V _{DD}
558	D	416	AR28		588	D	411	AR23	NC
559	D	289	AT28		589	D	284	AT23	NC
560	D	166	AU28		590	D	161	AU23	
561	D	51	AV28		591	D	46	AV23	GND
562	D	644	AN27	GND	592	D	639	AN22	GND
563	D	536	AP27		593	D	531	AP22	V _{DD}
564	D	415	AR27		594	D	410	AR22	
565	D	288	AT27		595	D	283	AT22	
566	D	165	AU27		596	D	160	AU22	
567	D	50	AV27		597	D	45	AV22	
568	D	643	AN26	GND	598	D	530	AP21	
569	D	535	AP26	V _{DD}	599	D	638	AN21	GND
570	D	414	AR26		600	D	409	AR21	

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (11/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
601	D	282	AT21		631	D	404	AR16	
602	D	159	AU21		632	D	525	AP16	V _{DD}
603	D	44	AV21		633	D	633	AN16	GND
604	D	408	AR20		634	D	38	AV15	
605	D	529	AP20	V _{DD}	635	D	153	AU15	
606	D	637	AN20	GND	636	D	276	AT15	
607	D	281	AT20		637	D	403	AR15	
608	D	158	AU20		638	D	524	AP15	
609	D	43	AV20		639	D	632	AN15	GND
610	D	280	AT19		640	D	37	AV14	
611	D	407	AR19		641	D	152	AU14	
612	D	528	AP19		642	D	275	AT14	
613	D	636	AN19	GND	643	D	402	AR14	
614	D	157	AU19		644	D	523	AP14	V _{DD}
615	D	42	AV19		645	D	631	AN14	GND
616	D	156	AU18		646	D	36	AV13	
617	D	279	AT18		647	D	151	AU13	
618	D	406	AR18		648	D	274	AT13	
619	D	527	AP18		649	D	401	AR13	
620	D	635	AN18	GND	650	D	522	AP13	V _{DD}
621	D	41	AV18		651	D	630	AN13	GND
622	D	40	AV17	GND	652	D	35	AV12	
623	D	155	AU17		653	D	150	AU12	
624	D	278	AT17	NC	654	D	273	AT12	
625	D	405	AR17	NC	655	D	400	AR12	
626	D	526	AP17	V _{DD}	656	D	521	AP12	
627	D	634	AN17	GND	657	D	629	AN12	GND
628	D	39	AV16		658	D	34	AV11	GND
629	D	154	AU16		659	D	149	AU11	
630	D	277	AT16		660	D	272	AT11	

**Table 4-6. Correspondence Between Internal Chip Pins and Ball Numbers
(696-pin TBGA (with Heat Spreader)) (12/12)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND/NC
661	D	399	AR11		691	D	515	AP6	
662	D	520	AP11	V _{DD}	692	D	143	AU5	
663	D	628	AN11	GND	693	D	266	AT5	
664	D	33	AV10		694	D	393	AR5	
665	D	148	AU10		695	D	265	AT4	
666	D	271	AT10		696	D	514	AP5	
667	D	398	AR10						
668	D	519	AP10	V _{DD}					
669	D	627	AN10	GND					
670	D	32	AV9						
671	D	147	AU9						
672	D	270	AT9						
673	D	397	AR9						
674	D	518	AP9						
675	D	626	AN9	GND					
676	D	31	AV8						
677	D	146	AU8						
678	D	269	AT8						
679	D	396	AR8						
680	D	517	AP8	V _{DD}					
681	D	625	AN8	GND					
682	D	30	AV7						
683	D	145	AU7						
684	D	268	AT7						
685	D	395	AR7						
686	D	516	AP7						
687	D	29	AV6						
688	D	144	AU6						
689	D	267	AT6						
690	D	394	AR6						

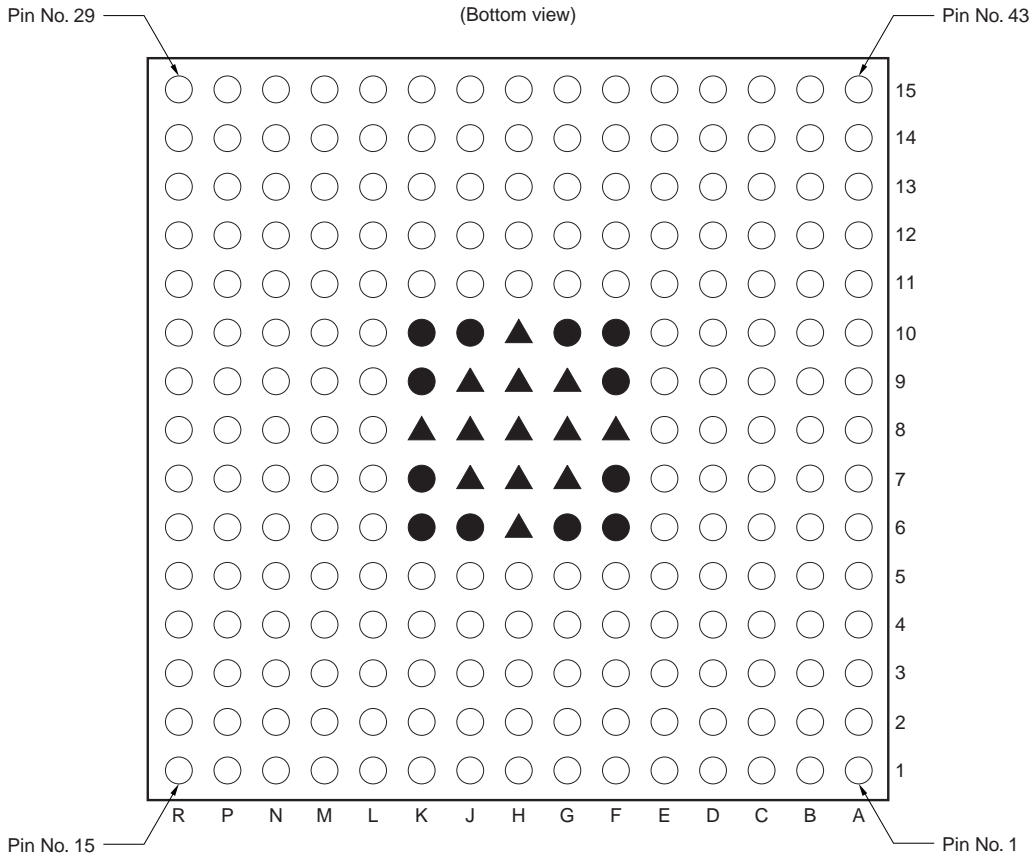
4.8 PBGA

Cautions 1. This number in the inside chip differs from this number that V_{DD}, GND of PBGA are out to the ball constructionally.

2. The correspondence between ball number and internal chip pin of PBGA differs with each series.

4.8.1 225-pin PBGA (under development)

The correspondence between chip side and ball number is not described (description of correspondence currently being considered).



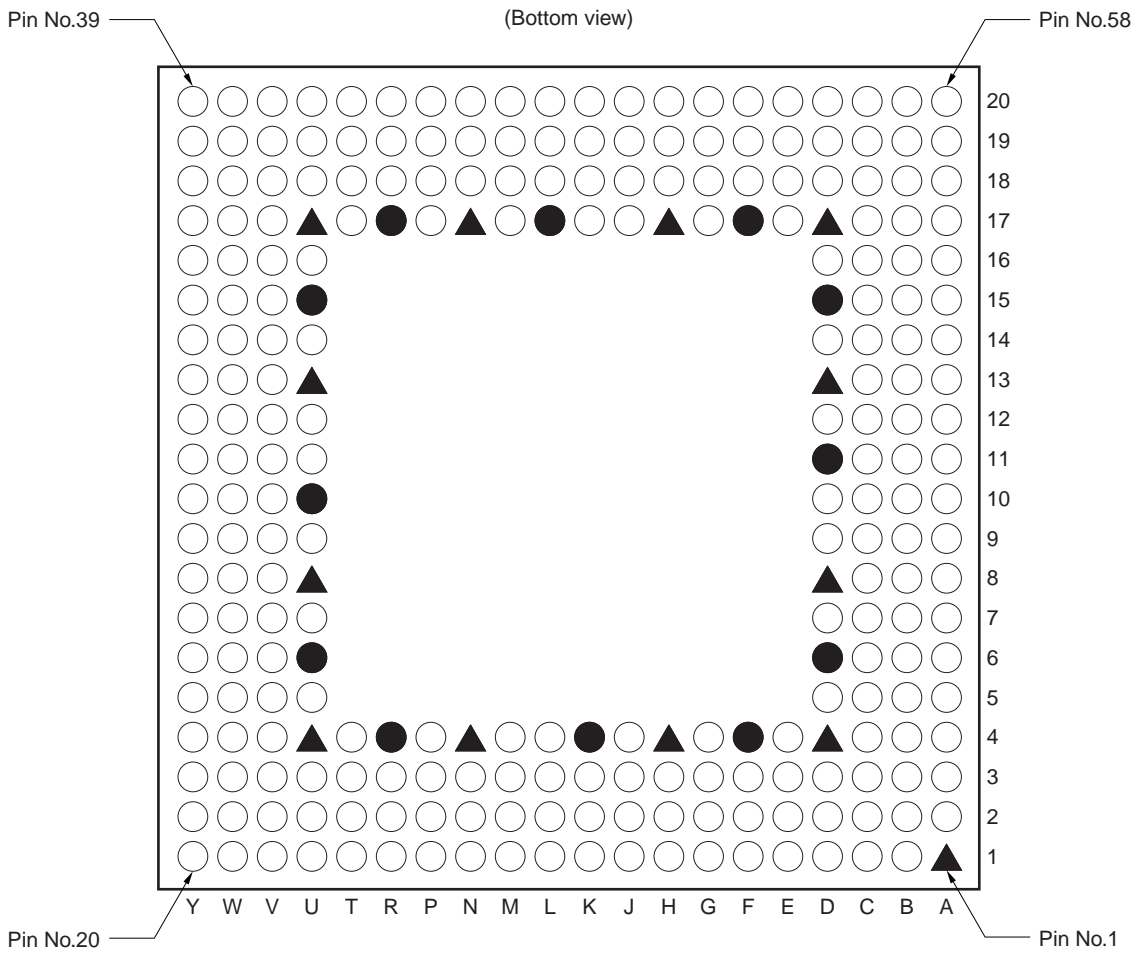
Remark ▲: GND (13 pins)

●: V_{DD} (12 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
203 (H6), 207 (K8), 211 (H10), 215 (F8), 217 (G7), 218 (H7), 219 (J7), 220 (J8), 221 (J9), 222 (H9), 223 (G9), 224 (G8), 225 (H8)	201 (F6), 202 (G6), 204 (J6), 205 (K6), 206 (K7), 208 (K9), 209 (K10), 210 (J10), 212 (G10), 213 (F10), 214 (F9), 216 (F7)	None	58	59	60	200

Note Total number of usable signal pins.

4.8.2 256-pin PBGA



Remark ▲ : GND (13 pins)
 ● : V_{DD} (12 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (A1), 205 (D4), 209 (H4), 214 (N4), 218 (U4), 222 (U8), 227 (U13), 231 (U17), 235 (N17), 240 (H17), 244 (D17), 248 (D13), 253 (D8)	207 (F4), 211 (K4), 216 (R4), 220 (U6), 224 (U10), 229 (U15), 233 (R17), 237 (L17), 242 (F17), 246 (D15), 250 (D11), 255 (D6)	None	162	24	163	231

Note Total number of usable signal pins.

Table 4-7. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (1/5)

(CMOS-9HD Series: μ PD65948, EA-9HD Series: μ PD65448)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	197	C11	
–	A	–	–	V _{DD}	–	A	67	A11	
–	A	129	B18		–	A	68	A10	
–	A	59	A19		–	A	–	–	V _{DD}
–	A	191	C17		–	A	137	B10	
–	A	130	B17		–	A	198	C10	
–	A	60	A18		–	A	251	D10	
–	A	245	D16		–	A	69	A9	
–	A	–	–	GND	–	A	138	B9	
–	A	192	C16		–	A	–	–	GND
–	A	61	A17		–	A	199	C9	
–	A	62	A16		–	A	252	D9	
–	A	131	B16		–	A	70	A8	
–	A	–	–	V _{DD}	–	A	139	B8	
–	A	193	C15		–	A	200	C8	
–	A	247	D14		–	A	71	A7	
–	A	132	B15		–	A	–	–	V _{DD}
–	A	63	A15		–	A	140	B7	
–	A	–	–	GND	–	A	72	A6	
–	A	194	C14		–	A	201	C7	
–	A	133	B14		–	A	141	B6	
–	A	64	A14		–	A	–	–	GND
–	A	195	C13		–	A	73	A5	
–	A	–	–	V _{DD}	–	A	254	D7	
–	A	134	B13		–	A	202	C6	
–	A	65	A13		–	A	142	B5	
–	A	249	D12		–	A	–	–	GND
–	A	196	C12		–	A	203	C5	
–	A	–	–	GND	–	A	74	A4	
–	A	135	B12		–	A	75	A3	
–	A	66	A12		–	A	143	B4	
–	A	136	B11		–	A	–	–	GND

Table 4-7. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (2/5)

(CMOS-9HD Series: μ PD65948, EA-9HD Series: μ PD65448)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	204	C4		–	B	8	H1	
–	A	256	D5		–	B	210	J4	
–	A	77	B2		–	B	151	J3	
–	A	144	B3		–	B	–	–	GND
–	A	145	C3		–	B	84	J2	
–	A	76	A2		–	B	9	J1	
–	A	–	–	V _{DD}	–	B	85	K2	
–	A	–	–	V _{DD}	–	B	152	K3	
–	B	–	–	GND	–	B	10	K1	
–	B	–	–	GND	–	B	11	L1	
–	B	78	C2		–	B	–	–	V _{DD}
–	B	2	B1		–	B	86	L2	
–	B	146	D3		–	B	153	L3	
–	B	79	D2		–	B	212	L4	
–	B	3	C1		–	B	12	M1	
–	B	206	E4		–	B	87	M2	
–	B	–	–	V _{DD}	–	B	–	–	GND
–	B	147	E3		–	B	154	M3	
–	B	4	D1		–	B	213	M4	
–	B	5	E1		–	B	13	N1	
–	B	80	E2		–	B	88	N2	
–	B	208	G4		–	B	–	–	V _{DD}
–	B	148	F3		–	B	155	N3	
–	B	–	–	GND	–	B	14	P1	
–	B	81	F2		–	B	89	P2	
–	B	6	F1		–	B	15	R1	
–	B	149	G3		–	B	–	–	GND
–	B	82	G2		–	B	156	P3	
–	B	7	G1		–	B	90	R2	
–	B	150	H3		–	B	16	T1	
–	B	–	–	V _{DD}	–	B	215	P4	
–	B	83	H2		–	B	157	R3	

Table 4-7. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (3/5)

(CMOS-9HD Series: μ PD65948, EA-9HD Series: μ PD65448)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	91	T2		–	C	98	W6	
–	B	–	–	GND	–	C	25	Y6	
–	B	158	T3		–	C	164	V7	
–	B	17	U1		–	C	99	W7	
–	B	18	V1		–	C	–	–	GND
–	B	92	U2		–	C	26	Y7	
–	B	159	U3		–	C	165	V8	
–	B	217	T4		–	C	100	W8	
–	B	–	–	V _{DD}	–	C	27	Y8	
–	B	19	W1		–	C	–	–	V _{DD}
–	B	93	V2		–	C	223	U9	
–	B	94	W2		–	C	166	V9	
–	B	160	V3		–	C	101	W9	
–	B	20	Y1		–	C	28	Y9	
–	B	–	–	GND	–	C	102	W10	
–	B	–	–	GND	–	C	167	V10	
–	C	–	–	V _{DD}	–	C	–	–	GND
–	C	–	–	V _{DD}	–	C	29	Y10	
–	C	21	Y2		–	C	30	Y11	
–	C	95	W3		–	C	103	W11	
–	C	161	V4		–	C	168	V11	
–	C	96	W4		–	C	225	U11	
–	C	22	Y3		–	C	–	–	V _{DD}
–	C	219	U5		–	C	31	Y12	
–	C	–	–	GND	–	C	104	W12	
–	C	162	V5		–	C	169	V12	
–	C	23	Y4		–	C	226	U12	
–	C	24	Y5		–	C	32	Y13	
–	C	97	W5		–	C	105	W13	
–	C	221	U7		–	C	–	–	GND
–	C	163	V6		–	C	170	V13	
–	C	–	–	V _{DD}	–	C	33	Y14	

Table 4-7. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (4/5)

(CMOS-9HD Series: μ PD65948, EA-9HD Series: μ PD65448)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	106	W14		–	D	–	–	V _{DD}
–	C	34	Y15		–	D	177	T18	
–	C	–	–	V _{DD}	–	D	42	U20	
–	C	171	V14		–	D	43	T20	
–	C	107	W15		–	D	114	T19	
–	C	35	Y16		–	D	234	P17	
–	C	228	U14		–	D	178	R18	
–	C	172	V15		–	D	–	–	GND
–	C	108	W16		–	D	115	R19	
–	C	–	–	GND	–	D	44	R20	
–	C	173	V16		–	D	179	P18	
–	C	36	Y17		–	D	116	P19	
–	C	37	Y18		–	D	45	P20	
–	C	109	W17		–	D	180	N18	
–	C	174	V17		–	D	–	–	V _{DD}
–	C	230	U16		–	D	117	N19	
–	C	–	–	GND	–	D	46	N20	
–	C	38	Y19		–	D	236	M17	
–	C	110	W18		–	D	181	M18	
–	C	111	W19		–	D	–	–	GND
–	C	175	V18		–	D	118	M19	
–	C	39	Y20		–	D	47	M20	
–	C	–	–	V _{DD}	–	D	119	L19	
–	C	–	–	V _{DD}	–	D	182	L18	
–	D	–	–	GND	–	D	–	–	V _{DD}
–	D	–	–	GND	–	D	48	L20	
–	D	112	V19		–	D	49	K20	
–	D	40	W20		–	D	120	K19	
–	D	176	U18		–	D	183	K18	
–	D	113	U19		–	D	238	K17	
–	D	41	V20		–	D	–	–	GND
–	D	232	T17		–	D	50	J20	

Table 4-7. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (5/5)

(CMOS-9HD Series: μ PD65948, EA-9HD Series: μ PD65448)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	121	J19	
–	D	184	J18	
–	D	239	J17	
–	D	–	–	V _{DD}
–	D	51	H20	
–	D	122	H19	
–	D	185	H18	
–	D	52	G20	
–	D	123	G19	
–	D	53	F20	
–	D	–	–	GND
–	D	186	G18	
–	D	124	F19	
–	D	54	E20	
–	D	241	G17	
–	D	187	F18	
–	D	125	E19	
–	D	–	–	GND
–	D	188	E18	
–	D	55	D20	
–	D	56	C20	
–	D	126	D19	
–	D	189	D18	
–	D	243	E17	
–	D	–	–	V _{DD}
–	D	57	B20	
–	D	127	C19	
–	D	128	B19	
–	D	190	C18	
–	D	58	A20	
–	D	–	–	GND
–	D	–	–	GND

Table 4-8. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (1/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	–	–	GND
–	A	–	–	V _{DD}	–	A	66	A12	
–	A	129	B18		–	A	136	B11	
–	A	59	A19		–	A	197	C11	
–	A	191	C17		–	A	–	–	V _{DD}
–	A	130	B17		–	A	67	A11	
–	A	–	–	GND	–	A	68	A10	
–	A	60	A18		–	A	137	B10	
–	A	245	D16		–	A	–	–	GND
–	A	192	C16		–	A	198	C10	
–	A	61	A17		–	A	251	D10	
–	A	–	–	V _{DD}	–	A	69	A9	
–	A	–	–	GND	–	A	–	–	V _{DD}
–	A	131	B16		–	A	138	B9	
–	A	62	A16		–	A	199	C9	
–	A	193	C15		–	A	252	D9	
–	A	–	–	GND	–	A	–	–	GND
–	A	247	D14		–	A	70	A8	
–	A	132	B15		–	A	139	B8	
–	A	63	A15		–	A	200	C8	
–	A	–	–	V _{DD}	–	A	–	–	V _{DD}
–	A	194	C14		–	A	71	A7	
–	A	133	B14		–	A	140	B7	
–	A	64	A14		–	A	72	A6	
–	A	–	–	GND	–	A	–	–	GND
–	A	195	C13		–	A	201	C7	
–	A	134	B13		–	A	141	B6	
–	A	65	A13		–	A	73	A5	
–	A	–	–	V _{DD}	–	A	–	–	V _{DD}
–	A	249	D12		–	A	254	D7	
–	A	196	C12		–	A	202	C6	
–	A	135	B12		–	A	142	B5	

Table 4-8. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (2/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	GND	–	B	–	–	GND
–	A	203	C5		–	B	81	F2	
–	A	74	A4		–	B	6	F1	
–	A	–	–	V _{DD}	–	B	149	G3	
–	A	75	A3		–	B	82	G2	
–	A	143	B4		–	B	–	–	GND
–	A	204	C4		–	B	7	G1	
–	A	256	D5		–	B	150	H3	
–	A	–	–	GND	–	B	83	H2	
–	A	77	B2		–	B	8	H1	
–	A	144	B3		–	B	–	–	V _{DD}
–	A	145	C3		–	B	210	J4	
–	A	76	A2		–	B	151	J3	
–	A	–	–	V _{DD}	–	B	84	J2	
–	A	–	–	V _{DD}	–	B	–	–	GND
–	B	–	–	GND	–	B	9	J1	
–	B	–	–	GND	–	B	85	K2	
–	B	78	C2		–	B	152	K3	
–	B	2	B1		–	B	–	–	V _{DD}
–	B	146	D3		–	B	10	K1	
–	B	79	D2		–	B	11	L1	
–	B	–	–	V _{DD}	–	B	–	–	GND
–	B	3	C1		–	B	86	L2	
–	B	206	E4		–	B	153	L3	
–	B	147	E3		–	B	212	L4	
–	B	4	D1		–	B	–	–	V _{DD}
–	B	–	–	GND	–	B	12	M1	
–	B	5	E1		–	B	87	M2	
–	B	80	E2		–	B	154	M3	
–	B	208	G4		–	B	–	–	GND
–	B	148	F3		–	B	213	M4	
–	B	–	–	V _{DD}	–	B	13	N1	

Table 4-8. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (3/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	88	N2		–	C	21	Y2	
–	B	–	–	V _{DD}	–	C	95	W3	
–	B	155	N3		–	C	161	V4	
–	B	14	P1		–	C	96	W4	
–	B	89	P2		–	C	–	–	GND
–	B	15	R1		–	C	22	Y3	
–	B	–	–	GND	–	C	219	U5	
–	B	156	P3		–	C	162	V5	
–	B	90	R2		–	C	23	Y4	
–	B	16	T1		–	C	–	–	V _{DD}
–	B	215	P4		–	C	24	Y5	
–	B	–	–	GND	–	C	97	W5	
–	B	–	–	V _{DD}	–	C	221	U7	
–	B	91	T2		–	C	163	V6	
–	B	157	R3		–	C	–	–	GND
–	B	158	T3		–	C	–	–	V _{DD}
–	B	17	U1		–	C	98	W6	
–	B	–	–	GND	–	C	25	Y6	
–	B	18	V1		–	C	164	V7	
–	B	92	U2		–	C	99	W7	
–	B	159	U3		–	C	–	–	GND
–	B	217	T4		–	C	26	Y7	
–	B	–	–	V _{DD}	–	C	165	V8	
–	B	19	W1		–	C	100	W8	
–	B	93	V2		–	C	27	Y8	
–	B	94	W2		–	C	–	–	V _{DD}
–	B	160	V3		–	C	223	U9	
–	B	20	Y1		–	C	166	V9	
–	B	–	–	GND	–	C	101	W9	
–	B	–	–	GND	–	C	28	Y9	
–	C	–	–	V _{DD}	–	C	–	–	GND
–	C	–	–	V _{DD}	–	C	102	W10	

Table 4-8. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (4/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	167	V10		–	C	37	Y18	
–	C	29	Y10		–	C	109	W17	
–	C	–	–	V _{DD}	–	C	–	–	V _{DD}
–	C	30	Y11		–	C	174	V17	
–	C	103	W11		–	C	230	U16	
–	C	168	V11		–	C	110	W18	
–	C	–	–	GND	–	C	38	Y19	
–	C	225	U11		–	C	–	–	GND
–	C	31	Y12		–	C	111	W19	
–	C	104	W12		–	C	175	V18	
–	C	–	–	V _{DD}	–	C	39	Y20	
–	C	169	V12		–	C	–	–	V _{DD}
–	C	226	U12		–	C	–	–	V _{DD}
–	C	32	Y13		–	D	–	–	GND
–	C	–	–	GND	–	D	–	–	GND
–	C	105	W13		–	D	112	V19	
–	C	170	V13		–	D	40	W20	
–	C	33	Y14		–	D	176	U18	
–	C	–	–	V _{DD}	–	D	113	U19	
–	C	106	W14		–	C	–	–	V _{DD}
–	C	34	Y15		–	D	41	V20	
–	C	171	V14		–	D	232	T17	
–	C	–	–	GND	–	D	177	T18	
–	C	107	W15		–	D	42	U20	
–	C	35	Y16		–	D	–	–	GND
–	C	228	U14		–	D	43	T20	
–	C	–	–	V _{DD}	–	D	114	T19	
–	C	108	W16		–	D	234	P17	
–	C	172	V15		–	D	178	R18	
–	C	–	–	GND	–	D	–	–	V _{DD}
–	C	173	V16		–	D	–	–	GND
–	C	36	Y17		–	D	115	R19	

Table 4-8. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (5/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	44	R20		–	D	52	G20	
–	D	179	P18		–	D	–	–	V _{DD}
–	D	116	P19		–	D	123	G19	
–	D	–	–	GND	–	D	53	F20	
–	D	45	P20		–	D	186	G18	
–	D	180	N18		–	D	124	F19	
–	D	117	N19		–	D	–	–	GND
–	D	46	N20		–	D	54	E20	
–	D	–	–	V _{DD}	–	D	241	G17	
–	D	236	M17		–	D	187	F18	
–	D	181	M18		–	D	125	E19	
–	D	118	M19		–	D	–	–	GND
–	D	47	M20		–	D	–	–	V _{DD}
–	D	–	–	GND	–	D	188	E18	
–	D	119	L19		–	D	55	D20	
–	D	182	L18		–	D	56	C20	
–	D	48	L20		–	D	126	D19	
–	D	–	–	V _{DD}	–	D	–	–	GND
–	D	49	K20		–	D	189	D18	
–	D	120	K19		–	D	243	E17	
–	D	183	K18		–	D	57	B20	
–	D	–	–	GND	–	D	127	C19	
–	D	238	K17		–	D	–	–	V _{DD}
–	D	50	J20		–	D	128	B19	
–	D	121	J19		–	D	190	C18	
–	D	–	–	V _{DD}	–	D	58	A20	
–	D	184	J18		–	D	–	–	GND
–	D	239	J17		–	D	–	–	GND
–	D	51	H20						
–	D	–	–	GND					
–	D	122	H19						
–	D	185	H18						

Table 4-9. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (1/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	–	–	V _{DD}
–	A	–	–	V _{DD}	–	A	249	D12	
–	A	–	–	GND	–	A	196	C12	
–	A	59	A19		–	A	135	B12	
–	A	129	B18		–	A	66	A12	
–	A	–	–	V _{DD}	–	A	–	–	GND
–	A	130	B17		–	A	136	B11	
–	A	191	C17		–	A	197	C11	
–	A	–	–	GND	–	A	67	A11	
–	A	245	D16		–	A	68	A10	
–	A	60	A18		–	A	–	–	GND
–	A	–	–	GND	–	A	137	B10	
–	A	61	A17		–	A	198	C10	
–	A	192	C16		–	A	251	D10	
–	A	–	–	V _{DD}	–	A	–	–	V _{DD}
–	A	131	B16		–	A	69	A9	
–	A	62	A16		–	A	138	B9	
–	A	–	–	GND	–	A	199	C9	
–	A	193	C15		–	A	252	D9	
–	A	247	D14		–	A	–	–	GND
–	A	–	–	GND	–	A	70	A8	
–	A	132	B15		–	A	139	B8	
–	A	63	A15		–	A	200	C8	
–	A	–	–	V _{DD}	–	A	71	A7	
–	A	194	C14		–	A	–	–	V _{DD}
–	A	133	B14		–	A	140	B7	
–	A	–	–	GND	–	A	72	A6	
–	A	64	A14		–	A	–	–	GND
–	A	195	C13		–	A	201	C7	
–	A	–	–	GND	–	A	141	B6	
–	A	134	B13		–	A	–	–	GND
–	A	65	A13		–	A	73	A5	

Table 4-9. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (2/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	254	D7		–	B	3	C1	
–	A	–	–	V _{DD}	–	B	4	D1	
–	A	202	C6		–	B	–	–	V _{DD}
–	A	142	B5		–	B	147	E3	
–	A	–	–	GND	–	B	80	E2	
–	A	74	A4		–	B	–	–	GND
–	A	203	C5		–	B	5	E1	
–	A	–	–	GND	–	B	148	F3	
–	A	143	B4		–	B	–	–	GND
–	A	75	A3		–	B	208	G4	
–	A	–	–	V _{DD}	–	B	81	F2	
–	A	256	D5		–	B	–	–	V _{DD}
–	A	204	C4		–	B	6	F1	
–	A	–	–	GND	–	B	149	G3	
–	A	144	B3		–	B	–	–	GND
–	A	77	B2		–	B	82	G2	
–	A	–	–	V _{DD}	–	B	7	G1	
–	A	76	A2		–	B	150	H3	
–	A	145	C3		–	B	83	H2	
–	A	–	–	GND	–	B	–	–	GND
–	A	–	–	V _{DD}	–	B	8	H1	
–	A	–	–	V _{DD}	–	B	210	J4	
–	B	–	–	GND	–	B	151	J3	
–	B	–	–	GND	–	B	84	J2	
–	B	2	B1		–	B	–	–	V _{DD}
–	B	–	–	V _{DD}	–	B	9	J1	
–	B	78	C2		–	B	85	K2	
–	B	79	D2		–	B	152	K3	
–	B	–	–	GND	–	B	10	K1	
–	B	146	D3		–	B	–	–	GND
–	B	206	E4		–	B	11	L1	
–	B	–	–	GND	–	B	86	L2	

Table 4-9. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (3/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	153	L3		–	B	–	–	V _{DD}
–	B	–	–	GND	–	B	159	U3	
–	B	212	L4		–	B	93	V2	
–	B	12	M1		–	B	–	–	GND
–	B	87	M2		–	B	19	W1	
–	B	154	M3		–	B	160	V3	
–	B	–	–	V _{DD}	–	B	–	–	V _{DD}
–	B	213	M4		–	B	94	W2	
–	B	13	N1		–	B	20	Y1	
–	B	88	N2		–	B	–	–	GND
–	B	155	N3		–	B	–	–	GND
–	B	–	–	GND	–	B	–	–	GND
–	B	14	P1		–	C	–	–	V _{DD}
–	B	89	P2		–	C	–	–	V _{DD}
–	B	–	–	V _{DD}	–	C	–	–	GND
–	B	15	R1		–	C	95	W3	
–	B	156	P3		–	C	21	Y2	
–	B	–	–	GND	–	C	–	–	GND
–	B	90	R2		–	C	96	W4	
–	B	16	T1		–	C	161	V4	
–	B	–	–	GND	–	C	–	–	V _{DD}
–	B	215	P4		–	C	219	U5	
–	B	157	R3		–	C	22	Y3	
–	B	–	–	V _{DD}	–	C	23	Y4	
–	B	91	T2		–	C	162	V5	
–	B	17	U1		–	C	–	–	GND
–	B	–	–	GND	–	C	97	W5	
–	B	158	T3		–	C	24	Y5	
–	B	92	U2		–	C	–	–	GND
–	B	–	–	GND	–	C	163	V6	
–	B	18	V1		–	C	221	U7	
–	B	217	T4		–	C	–	–	V _{DD}

Table 4-9. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (4/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	98	W6		–	C	105	W13	
–	C	25	Y6		–	C	170	V13	
–	C	–	–	GND	–	C	33	Y14	
–	C	164	V7		–	C	–	–	V _{DD}
–	C	99	W7		–	C	106	W14	
–	C	–	–	GND	–	C	34	Y15	
–	C	26	Y7		–	C	171	V14	
–	C	165	V8		–	C	107	W15	
–	C	–	–	V _{DD}	–	C	–	–	GND
–	C	100	W8		–	C	35	Y16	
–	C	27	Y8		–	C	228	U14	
–	C	–	–	GND	–	C	–	–	GND
–	C	223	U9		–	C	172	V15	
–	C	166	V9		–	C	108	W16	
–	C	101	W9		–	C	–	–	V _{DD}
–	C	28	Y9		–	C	36	Y17	
–	C	–	–	GND	–	C	173	V16	
–	C	102	W10		–	C	–	–	GND
–	C	167	V10		–	C	109	W17	
–	C	29	Y10		–	C	37	Y18	
–	C	30	Y11		–	C	–	–	GND
–	C	–	–	V _{DD}	–	C	230	U16	
–	C	103	W11		–	C	174	V17	
–	C	168	V11		–	C	–	–	V _{DD}
–	C	225	U11		–	C	110	W18	
–	C	–	–	GND	–	C	38	Y19	
–	C	31	Y12		–	C	–	–	GND
–	C	104	W12		–	C	175	V18	
–	C	169	V12		–	C	111	W19	
–	C	226	U12		–	C	–	–	GND
–	C	–	–	GND	–	C	39	Y20	
–	C	32	Y13		–	C	–	–	V _{DD}

Table 4-9. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (5/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

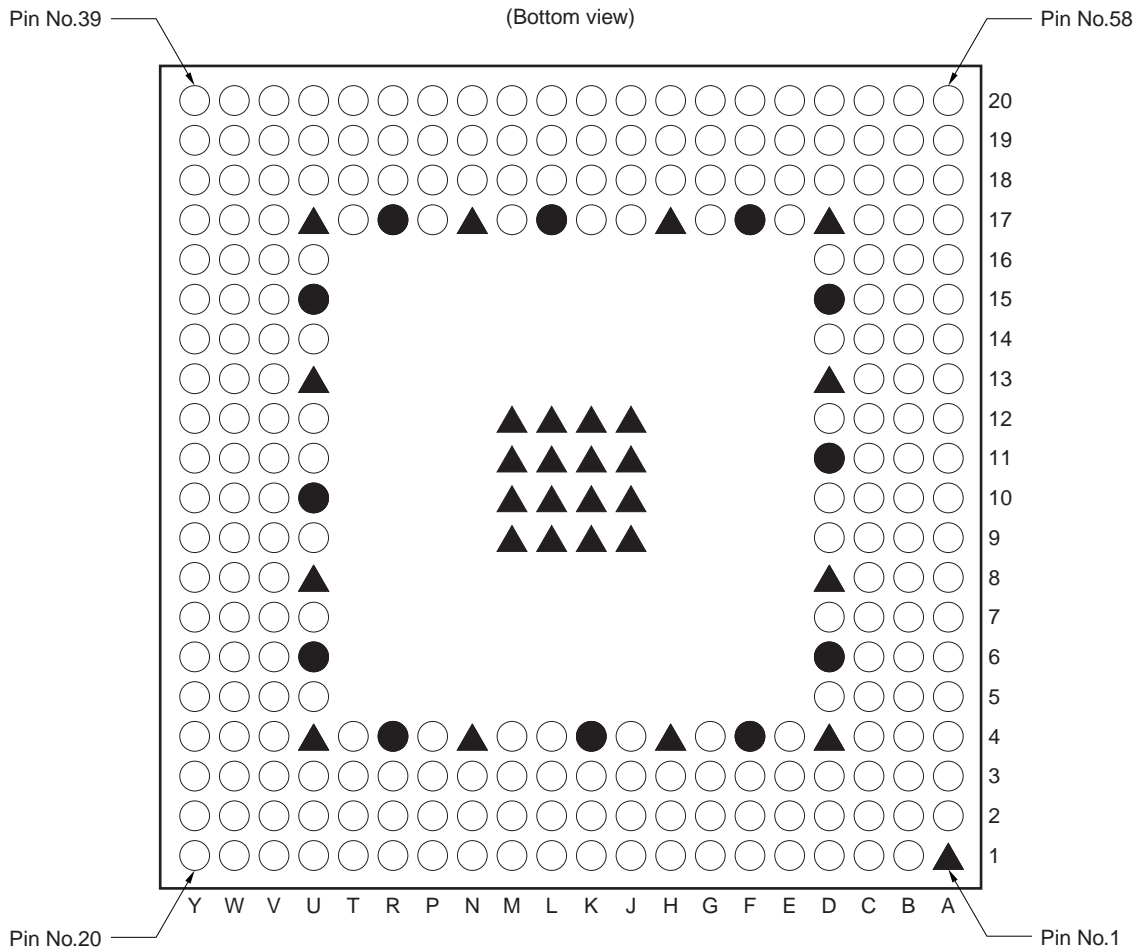
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
-	C	-	-	V _{DD}	-	D	236	M17	
-	D	-	-	GND	-	D	181	M18	
-	D	-	-	GND	-	D	118	M19	
-	D	40	W20		-	D	-	-	V _{DD}
-	D	-	-	V _{DD}	-	D	47	M20	
-	D	112	V19		-	D	119	L19	
-	D	113	U19		-	D	182	L18	
-	D	-	-	GND	-	D	48	L20	
-	D	176	U18		-	D	-	-	GND
-	D	232	T17		-	D	49	K20	
-	D	-	-	GND	-	D	120	K19	
-	D	41	V20		-	D	183	K18	
-	D	42	U20		-	D	-	-	GND
-	D	-	-	V _{DD}	-	D	238	K17	
-	D	177	T18		-	D	50	J20	
-	D	114	T19		-	D	121	J19	
-	D	-	-	GND	-	D	184	J18	
-	D	43	T20		-	D	-	-	V _{DD}
-	D	178	R18		-	D	239	J17	
-	D	-	-	GND	-	D	51	H20	
-	D	234	P17		-	D	122	H19	
-	D	115	R19		-	D	185	H18	
-	D	-	-	V _{DD}	-	D	-	-	GND
-	D	44	R20		-	D	52	G20	
-	D	179	P18		-	D	123	G19	
-	D	-	-	GND	-	D	-	-	V _{DD}
-	D	116	P19		-	D	53	F20	
-	D	45	P20		-	D	186	G18	
-	D	180	N18		-	D	-	-	GND
-	D	117	N19		-	D	124	F19	
-	D	-	-	GND	-	D	54	E20	
-	D	46	N20		-	D	-	-	GND

Table 4-9. Correspondence Between Internal Chip Sides and Ball Numbers (256-pin PBGA) (6/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	241	G17	
–	D	187	F18	
–	D	–	–	V _{DD}
–	D	125	E19	
–	D	55	D20	
–	D	–	–	GND
–	D	188	E18	
–	D	126	D19	
–	D	–	–	GND
–	D	56	C20	
–	D	243	E17	
–	D	–	–	V _{DD}
–	D	189	D18	
–	D	127	C19	
–	D	–	–	GND
–	D	57	B20	
–	D	190	C18	
–	D	–	–	GND
–	D	128	B19	
–	D	58	A20	
–	D	–	–	V _{DD}
–	D	–	–	GND
–	D	–	–	GND

4.8.3 272-pin PBGA



Remark ▲ : GND (29 pins)
● : V_{DD} (12 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (A1), 205 (D4), 209 (H4), 214 (N4), 218 (U4), 222 (U8), 227 (U13), 231 (U17), 235 (N17), 240 (H17), 244 (D17), 248 (D13), 253 (D8), 257 (J9), 258 (K9), 259 (L9), 260 (M9), 261 (M10), 262 (M11), 263 (M12), 264 (L12), 265 (K12), 266 (J12), 267 (J11), 268 (J10), 269 (K10), 270 (L10), 271 (L11), 272 (K11)	207 (F4), 211 (K4), 216 (R4), 220 (U6), 224 (U10), 229 (U15), 233 (R17), 237 (L17), 242 (F17), 246 (D15), 250 (D11), 255 (D6)	None	162	24	163	231

Note Total number of usable signal pins.

Table 4-10. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (1/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	–	–	GND
–	A	–	–	V _{DD}	–	A	66	A12	
–	A	129	B18		–	A	136	B11	
–	A	59	A19		–	A	197	C11	
–	A	191	C17		–	A	–	–	V _{DD}
–	A	130	B17		–	A	67	A11	
–	A	–	–	GND	–	A	68	A10	
–	A	60	A18		–	A	137	B10	
–	A	245	D16		–	A	–	–	GND
–	A	192	C16		–	A	198	C10	
–	A	61	A17		–	A	251	D10	
–	A	–	–	V _{DD}	–	A	69	A9	
–	A	–	–	GND	–	A	–	–	V _{DD}
–	A	131	B16		–	A	138	B9	
–	A	62	A16		–	A	199	C9	
–	A	193	C15		–	A	252	D9	
–	A	–	–	GND	–	A	–	–	GND
–	A	247	D14		–	A	70	A8	
–	A	132	B15		–	A	139	B8	
–	A	63	A15		–	A	200	C8	
–	A	–	–	V _{DD}	–	A	–	–	V _{DD}
–	A	194	C14		–	A	71	A7	
–	A	133	B14		–	A	140	B7	
–	A	64	A14		–	A	72	A6	
–	A	–	–	GND	–	A	–	–	GND
–	A	195	C13		–	A	201	C7	
–	A	134	B13		–	A	141	B6	
–	A	65	A13		–	A	73	A5	
–	A	–	–	V _{DD}	–	A	–	–	V _{DD}
–	A	249	D12		–	A	254	D7	
–	A	196	C12		–	A	202	C6	
–	A	135	B12		–	A	142	B5	

Table 4-10. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (2/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	GND	–	B	81	F2	
–	A	203	C5		–	B	6	F1	
–	A	74	A4		–	B	149	G3	
–	A	–	–	V _{DD}	–	B	82	G2	
–	A	75	A3		–	B	–	–	GND
–	A	143	B4		–	B	7	G1	
–	A	204	C4		–	B	150	H3	
–	A	256	D5		–	B	83	H2	
–	A	–	–	GND	–	B	8	H1	
–	A	77	B2		–	B	–	–	V _{DD}
–	A	144	B3		–	B	210	J4	
–	A	145	C3		–	B	151	J3	
–	A	76	A2		–	B	84	J2	
–	A	–	–	V _{DD}	–	B	–	–	GND
–	A	–	–	V _{DD}	–	B	9	J1	
–	B	–	–	GND	–	B	85	K2	
–	B	78	C2		–	B	152	K3	
–	B	2	B1		–	B	–	–	V _{DD}
–	B	146	D3		–	B	10	K1	
–	B	79	D2		–	B	11	L1	
–	B	–	–	V _{DD}	–	B	–	–	GND
–	B	3	C1		–	B	86	L2	
–	B	206	E4		–	B	153	L3	
–	B	147	E3		–	B	212	L4	
–	B	4	D1		–	B	–	–	V _{DD}
–	B	–	–	GND	–	B	12	M1	
–	B	5	E1		–	B	87	M2	
–	B	80	E2		–	B	154	M3	
–	B	208	G4		–	B	–	–	GND
–	B	148	F3		–	B	213	M4	
–	B	–	–	V _{DD}	–	B	13	N1	
–	B	–	–	GND	–	B	88	N2	

Table 4-10. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (3/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	–	–	V _{DD}	–	C	95	W3	
–	B	155	N3		–	C	161	V4	
–	B	14	P1		–	C	96	W4	
–	B	89	P2		–	C	–	–	GND
–	B	15	R1		–	C	22	Y3	
–	B	–	–	GND	–	C	219	U5	
–	B	156	P3		–	C	162	V5	
–	B	90	R2		–	C	23	Y4	
–	B	16	T1		–	C	–	–	V _{DD}
–	B	215	P4		–	C	24	Y5	
–	B	–	–	GND	–	C	97	W5	
–	B	–	–	V _{DD}	–	C	221	U7	
–	B	91	T2		–	C	163	V6	
–	B	157	R3		–	C	–	–	GND
–	B	158	T3		–	C	–	–	V _{DD}
–	B	17	U1		–	C	98	W6	
–	B	–	–	GND	–	C	25	Y6	
–	B	18	V1		–	C	164	V7	
–	B	92	U2		–	C	99	W7	
–	B	159	U3		–	C	–	–	GND
–	B	217	T4		–	C	26	Y7	
–	B	–	–	V _{DD}	–	C	165	V8	
–	B	19	W1		–	C	100	W8	
–	B	93	V2		–	C	27	Y8	
–	B	94	W2		–	C	–	–	V _{DD}
–	B	160	V3		–	C	223	U9	
–	B	20	Y1		–	C	166	V9	
–	B	–	–	GND	–	C	101	W9	
–	B	–	–	GND	–	C	28	Y9	
–	C	–	–	V _{DD}	–	C	–	–	GND
–	C	–	–	V _{DD}	–	C	102	W10	
–	C	21	Y2		–	C	167	V10	

Table 4-10. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (4/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	29	Y10		–	C	109	W17	
–	C	–	–	V _{DD}	–	C	–	–	V _{DD}
–	C	30	Y11		–	C	174	V17	
–	C	103	W11		–	C	230	U16	
–	C	168	V11		–	C	110	W18	
–	C	–	–	GND	–	C	38	Y19	
–	C	225	U11		–	C	–	–	GND
–	C	31	Y12		–	C	111	W19	
–	C	104	W12		–	C	175	V18	
–	C	–	–	V _{DD}	–	C	39	Y20	
–	C	169	V12		–	C	–	–	V _{DD}
–	C	226	U12		–	C	–	–	V _{DD}
–	C	32	Y13		–	D	–	–	GND
–	C	–	–	GND	–	D	–	–	GND
–	C	105	W13		–	D	112	V19	
–	C	170	V13		–	D	40	W20	
–	C	33	Y14		–	D	176	U18	
–	C	–	–	V _{DD}	–	D	113	U19	
–	C	106	W14		–	D	–	–	V _{DD}
–	C	34	Y15		–	D	41	V20	
–	C	171	V14		–	D	232	T17	
–	C	–	–	GND	–	D	177	T18	
–	C	107	W15		–	D	42	U20	
–	C	35	Y16		–	D	–	–	GND
–	C	228	U14		–	D	43	T20	
–	C	–	–	V _{DD}	–	D	114	T19	
–	C	108	W16		–	D	234	P17	
–	C	172	V15		–	D	178	R18	
–	C	–	–	GND	–	D	–	–	V _{DD}
–	C	173	V16		–	D	–	–	GND
–	C	36	Y17		–	D	115	R19	
–	C	37	Y18		–	D	44	R20	

Table 4-10. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (5/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	179	P18		–	D	–	–	V _{DD}
–	D	116	P19		–	D	123	G19	
–	D	–	–	GND	–	D	53	F20	
–	D	45	P20		–	D	186	G18	
–	D	180	N18		–	D	124	F19	
–	D	117	N19		–	D	–	–	GND
–	D	46	N20		–	D	54	E20	
–	D	–	–	V _{DD}	–	D	241	G17	
–	D	236	M17		–	D	187	F18	
–	D	181	M18		–	D	125	E19	
–	D	118	M19		–	D	–	–	GND
–	D	47	M20		–	D	–	–	V _{DD}
–	D	–	–	GND	–	D	188	E18	
–	D	119	L19		–	D	55	D20	
–	D	182	L18		–	D	56	C20	
–	D	48	L20		–	D	126	D19	
–	D	–	–	V _{DD}	–	D	–	–	GND
–	D	49	K20		–	D	189	D18	
–	D	120	K19		–	D	243	E17	
–	D	183	K18		–	D	57	B20	
–	D	–	–	GND	–	D	127	C19	
–	D	238	K17		–	D	–	–	V _{DD}
–	D	50	J20		–	D	128	B19	
–	D	121	J19		–	D	190	C18	
–	D	–	–	V _{DD}	–	D	58	A20	
–	D	184	J18		–	D	–	–	GND
–	D	239	J17		–	D	–	–	GND
–	D	51	H20						
–	D	–	–	GND					
–	D	122	H19						
–	D	185	H18						
–	D	52	G20						

Table 4-11. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (1/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	249	D12	
–	A	–	–	V _{DD}	–	A	196	C12	
–	A	–	–	GND	–	A	135	B12	
–	A	59	A19		–	A	66	A12	
–	A	129	B18		–	A	–	–	GND
–	A	–	–	V _{DD}	–	A	136	B11	
–	A	130	B17		–	A	197	C11	
–	A	191	C17		–	A	67	A11	
–	A	–	–	GND	–	A	68	A10	
–	A	245	D16		–	A	–	–	GND
–	A	60	A18		–	A	137	B10	
–	A	–	–	GND	–	A	198	C10	
–	A	61	A17		–	A	251	D10	
–	A	192	C16		–	A	–	–	V _{DD}
–	A	–	–	V _{DD}	–	A	69	A9	
–	A	131	B16		–	A	138	B9	
–	A	62	A16		–	A	199	C9	
–	A	–	–	GND	–	A	252	D9	
–	A	193	C15		–	A	–	–	GND
–	A	247	D14		–	A	70	A8	
–	A	–	–	GND	–	A	139	B8	
–	A	132	B15		–	A	200	C8	
–	A	63	A15		–	A	71	A7	
–	A	–	–	V _{DD}	–	A	–	–	V _{DD}
–	A	194	C14		–	A	140	B7	
–	A	133	B14		–	A	72	A6	
–	A	–	–	GND	–	A	–	–	GND
–	A	64	A14		–	A	201	C7	
–	A	195	C13		–	A	141	B6	
–	A	–	–	GND	–	A	–	–	GND
–	A	134	B13		–	A	73	A5	
–	A	65	A13		–	A	254	D7	

Table 4-11. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (2/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	B	4	D1	
–	A	202	C6		–	B	–	–	V _{DD}
–	A	142	B5		–	B	147	E3	
–	A	–	–	GND	–	B	80	E2	
–	A	74	A4		–	B	–	–	GND
–	A	203	C5		–	B	5	E1	
–	A	–	–	GND	–	B	148	F3	
–	A	143	B4		–	B	–	–	GND
–	A	75	A3		–	B	208	G4	
–	A	–	–	V _{DD}	–	B	81	F2	
–	A	256	D5		–	B	–	–	V _{DD}
–	A	204	C4		–	B	6	F1	
–	A	–	–	GND	–	B	149	G3	
–	A	144	B3		–	B	–	–	GND
–	A	77	B2		–	B	82	G2	
–	A	–	–	V _{DD}	–	B	7	G1	
–	A	76	A2		–	B	150	H3	
–	A	145	C3		–	B	83	H2	
–	A	–	–	GND	–	B	–	–	GND
–	A	–	–	V _{DD}	–	B	8	H1	
–	A	–	–	V _{DD}	–	B	210	J4	
–	B	–	–	GND	–	B	151	J3	
–	B	–	–	GND	–	B	84	J2	
–	B	2	B1		–	B	–	–	V _{DD}
–	B	–	–	V _{DD}	–	B	9	J1	
–	B	78	C2		–	B	85	K2	
–	B	79	D2		–	B	152	K3	
–	B	–	–	GND	–	B	10	K1	
–	B	146	D3		–	B	–	–	GND
–	B	206	E4		–	B	11	L1	
–	B	–	–	GND	–	B	86	L2	
–	B	3	C1		–	B	153	L3	

Table 4-11. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (3/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	–	–	GND	–	B	159	U3	
–	B	212	L4		–	B	93	V2	
–	B	12	M1		–	B	–	–	GND
–	B	87	M2		–	B	19	W1	
–	B	154	M3		–	B	160	V3	
–	B	–	–	V _{DD}	–	B	–	–	V _{DD}
–	B	213	M4		–	B	94	W2	
–	B	13	N1		–	B	20	Y1	
–	B	88	N2		–	B	–	–	GND
–	B	155	N3		–	B	–	–	GND
–	B	–	–	GND	–	B	–	–	GND
–	B	14	P1		–	C	–	–	V _{DD}
–	B	89	P2		–	C	–	–	V _{DD}
–	B	–	–	V _{DD}	–	C	–	–	GND
–	B	15	R1		–	C	95	W3	
–	B	156	P3		–	C	21	Y2	
–	B	–	–	GND	–	C	–	–	GND
–	B	90	R2		–	C	96	W4	
–	B	16	T1		–	C	161	V4	
–	B	–	–	GND	–	C	–	–	V _{DD}
–	B	215	P4		–	C	219	U5	
–	B	157	R3		–	C	22	Y3	
–	B	–	–	V _{DD}	–	C	23	Y4	
–	B	91	T2		–	C	162	V5	
–	B	17	U1		–	C	–	–	GND
–	B	–	–	GND	–	C	97	W5	
–	B	158	T3		–	C	24	Y5	
–	B	92	U2		–	C	–	–	GND
–	B	–	–	GND	–	C	163	V6	
–	B	18	V1		–	C	221	U7	
–	B	217	T4		–	C	–	–	V _{DD}
–	B	–	–	V _{DD}	–	C	98	W6	

Table 4-11. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (4/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	25	Y6		–	C	170	V13	
–	C	–	–	GND	–	C	33	Y14	
–	C	164	V7		–	C	–	–	V _{DD}
–	C	99	W7		–	C	106	W14	
–	C	–	–	GND	–	C	34	Y15	
–	C	26	Y7		–	C	171	V14	
–	C	165	V8		–	C	107	W15	
–	C	–	–	V _{DD}	–	C	–	–	GND
–	C	100	W8		–	C	35	Y16	
–	C	27	Y8		–	C	228	U14	
–	C	–	–	GND	–	C	–	–	GND
–	C	223	U9		–	C	172	V15	
–	C	166	V9		–	C	108	W16	
–	C	101	W9		–	C	–	–	V _{DD}
–	C	28	Y9		–	C	36	Y17	
–	C	–	–	GND	–	C	173	V16	
–	C	102	W10		–	C	–	–	GND
–	C	167	V10		–	C	109	W17	
–	C	29	Y10		–	C	37	Y18	
–	C	30	Y11		–	C	–	–	GND
–	C	–	–	V _{DD}	–	C	230	U16	
–	C	103	W11		–	C	174	V17	
–	C	168	V11		–	C	–	–	V _{DD}
–	C	225	U11		–	C	110	W18	
–	C	–	–	GND	–	C	38	Y19	
–	C	31	Y12		–	C	–	–	GND
–	C	104	W12		–	C	175	V18	
–	C	169	V12		–	C	111	W19	
–	C	226	U12		–	C	–	–	GND
–	C	–	–	GND	–	C	39	Y20	
–	C	32	Y13		–	C	–	–	V _{DD}
–	C	105	W13		–	C	–	–	V _{DD}

Table 4-11. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (5/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

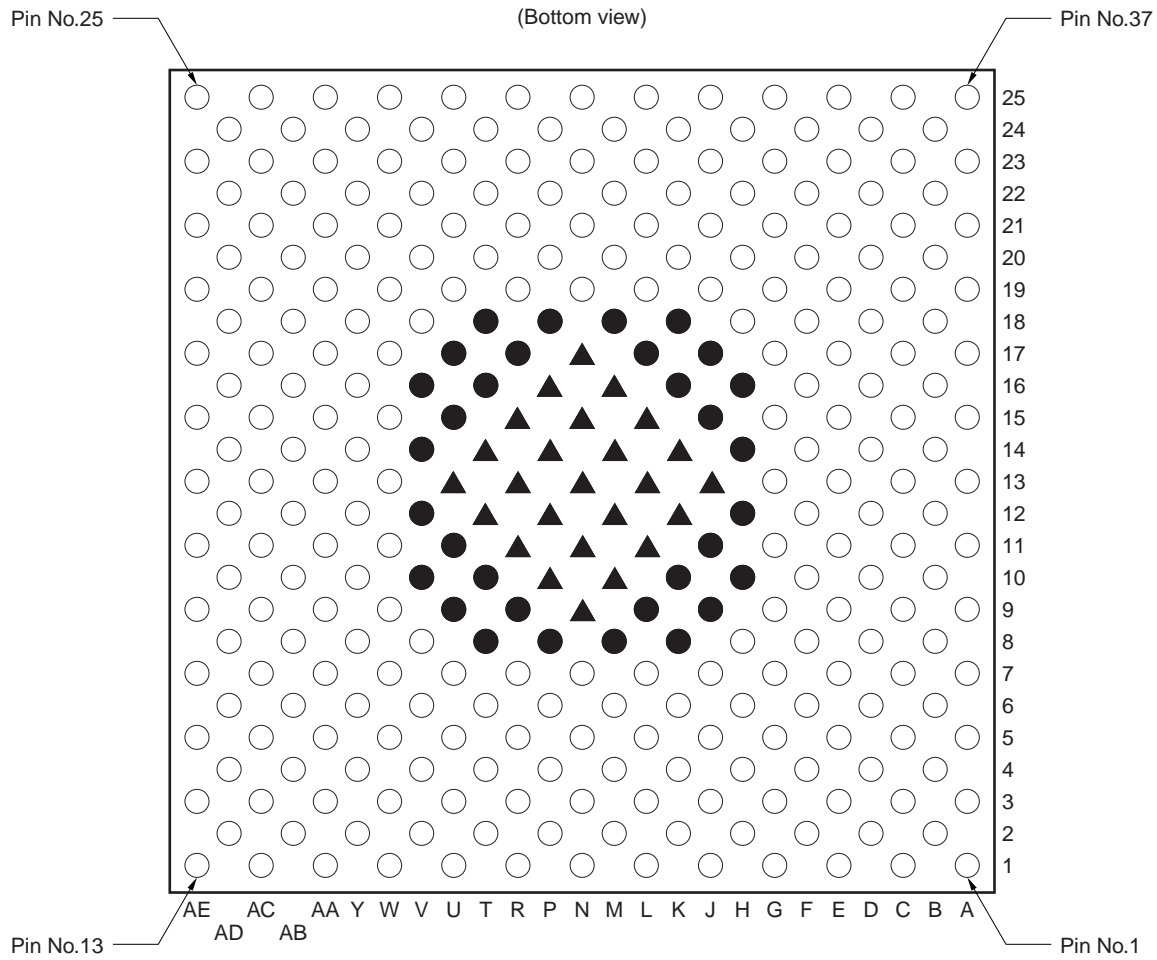
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
-	D	-	-	GND	-	D	181	M18	
-	D	-	-	GND	-	D	118	M19	
-	D	40	W20		-	D	-	-	V _{DD}
-	D	-	-	V _{DD}	-	D	47	M20	
-	D	112	V19		-	D	119	L19	
-	D	113	U19		-	D	182	L18	
-	D	-	-	GND	-	D	48	L20	
-	D	176	U18		-	D	-	-	GND
-	D	232	T17		-	D	49	K20	
-	D	-	-	GND	-	D	120	K19	
-	D	41	V20		-	D	183	K18	
-	D	42	U20		-	D	-	-	GND
-	D	-	-	V _{DD}	-	D	238	K17	
-	D	177	T18		-	D	50	J20	
-	D	114	T19		-	D	121	J19	
-	D	-	-	GND	-	D	184	J18	
-	D	43	T20		-	D	-	-	V _{DD}
-	D	178	R18		-	D	239	J17	
-	D	-	-	GND	-	D	51	H20	
-	D	234	P17		-	D	122	H19	
-	D	115	R19		-	D	185	H18	
-	D	-	-	V _{DD}	-	D	-	-	GND
-	D	44	R20		-	D	52	G20	
-	D	179	P18		-	D	123	G19	
-	D	-	-	GND	-	D	-	-	V _{DD}
-	D	116	P19		-	D	53	F20	
-	D	45	P20		-	D	186	G18	
-	D	180	N18		-	D	-	-	GND
-	D	117	N19		-	D	124	F19	
-	D	-	-	GND	-	D	54	E20	
-	D	46	N20		-	D	-	-	GND
-	D	236	M17		-	D	241	G17	

Table 4-11. Correspondence Between Internal Chip Sides and Ball Numbers (272-pin PBGA) (6/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	187	F18	
–	D	–	–	V _{DD}
–	D	125	E19	
–	D	55	D20	
–	D	–	–	GND
–	D	188	E18	
–	D	126	D19	
–	D	–	–	GND
–	D	56	C20	
–	D	243	E17	
–	D	–	–	V _{DD}
–	D	189	D18	
–	D	127	C19	
–	D	–	–	GND
–	D	57	B20	
–	D	190	C18	
–	D	–	–	GND
–	D	128	B19	
–	D	58	A20	
–	D	–	–	V _{DD}
–	D	–	–	GND
–	D	–	–	GND

4.8.4 313-pin PBGA



Remark ▲ : GND (25 pins)
 ● : V_{DD} (32 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
275 (N9), 279 (U13), 283 (N17), 287 (J13), 290 (M10), 291 (P10), 293 (T12), 294 (T14), 296 (P16), 297 (M16), 299 (K14), 300 (K12), 301 (L11), 302 (N11), 303 (R11), 304 (R13), 305 (R15), 306 (N15), 307 (L15), 308 (L13), 309 (M12), 310 (P12), 311 (P14), 312 (M14), 313 (N13)	254 (K8), 255 (M8), 256 (P8), 257 (T8), 259 (V10), 260 (V12), 261 (V14), 262 (V16), 264 (T18), 265 (P18), 266 (M18), 267 (K18), 269 (H16), 270 (H14), 271 (H12), 272 (H10), 273 (J9), 274 (L9), 276 (R9), 277 (U9), 278 (U11), 280 (U15), 281 (U17), 282 (R17), 284 (L17), 285 (J17), 286 (J15), 288 (J11), 289 (K10), 292 (T10), 295 (T16), 298 (K16)	None	152	73	115	256

Note Total number of usable signal pins.

Table 4-12. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (1/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	82	B24		–	A	42	A15	
–	A	37	A25		–	A	164	D14	
–	A	160	D22		–	A	–	–	V _{DD}
–	A	247	G19		–	A	225	F14	
–	A	83	B22		–	A	87	B14	
–	A	38	A23		–	A	43	A13	
–	A	–	–	GND	–	A	250	G13	
–	A	124	C21		–	A	197	E13	
–	A	161	D20		–	A	128	C13	
–	A	194	E19		–	A	88	B12	
–	A	39	A21		–	A	226	F12	
–	A	–	–	GND	–	A	165	D12	
–	A	84	B20		–	A	–	–	GND
–	A	248	G17		–	A	44	A11	
–	A	125	C19		–	A	198	E11	
–	A	223	F18		–	A	129	C11	
–	A	–	–	V _{DD}	–	A	251	G11	
–	A	40	A19		–	A	–	–	V _{DD}
–	A	162	D18		–	A	166	D10	
–	A	–	–	GND	–	A	89	B10	
–	A	195	E17		–	A	45	A9	
–	A	85	B18		–	A	130	C9	
–	A	–	–	V _{DD}	–	A	227	F10	
–	A	224	F16		–	A	90	B8	
–	A	126	C17		–	A	–	–	GND
–	A	41	A17		–	A	199	E9	
–	A	86	B16		–	A	46	A7	
–	A	163	D16		–	A	–	–	V _{DD}
–	A	249	G15		–	A	131	C7	
–	A	–	–	GND	–	A	167	D8	
–	A	127	C15		–	A	228	F8	
–	A	196	E15		–	A	91	B6	

Table 4-12. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (2/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	GND	–	B	253	H8	
–	A	200	E7		–	B	–	–	GND
–	A	252	G9		–	B	52	H2	
–	A	47	A5		–	B	230	J7	
–	A	132	C5		–	B	–	–	V _{DD}
–	A	–	–	V _{DD}	–	B	96	J3	
–	A	92	B4		–	B	5	J1	
–	A	168	D6		–	B	53	K2	
–	A	48	A3		–	B	136	K4	
–	A	93	C3		–	B	203	K6	
–	A	–	–	GND	–	B	97	L3	
–	A	1	A1		–	B	–	–	GND
–	A	229	G7		–	B	172	L5	
–	A	49	B2		–	B	231	L7	
–	B	133	D4		–	B	6	L1	
–	B	201	F6		–	B	137	M4	
–	B	50	D2		–	B	–	–	V _{DD}
–	B	2	C1		–	B	204	M6	
–	B	94	E3		–	B	54	M2	
–	B	169	E5		–	B	7	N1	
–	B	–	–	GND	–	B	232	N7	
–	B	134	F4		–	B	173	N5	
–	B	3	E1		–	B	98	N3	
–	B	51	F2		–	B	55	P2	
–	B	170	G5		–	B	205	P6	
–	B	–	–	GND	–	B	138	P4	
–	B	95	G3		–	B	–	–	GND
–	B	202	H6		–	B	8	R1	
–	B	4	G1		–	B	233	R7	
–	B	135	H4		–	B	174	R5	
–	B	–	–	V _{DD}	–	B	99	R3	
–	B	171	J5		–	B	–	–	V _{DD}

Table 4-12. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (3/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	206	T6		–	C	61	AD4	
–	B	139	T4		–	C	14	AE3	
–	B	56	T2		–	C	–	–	GND
–	B	9	U1		–	C	104	AC5	
–	B	100	U3		–	C	143	AB6	
–	B	234	U7		–	C	178	AA7	
–	B	–	–	GND	–	C	15	AE5	
–	B	57	V2		–	C	–	–	GND
–	B	175	U5		–	C	62	AD6	
–	B	–	–	V _{DD}	–	C	236	W9	
–	B	10	W1		–	C	105	AC7	
–	B	258	V8		–	C	209	Y8	
–	B	140	V4		–	C	–	–	V _{DD}
–	B	101	W3		–	C	16	AE7	
–	B	–	–	GND	–	C	144	AB8	
–	B	58	Y2		–	C	–	–	GND
–	B	207	V6		–	C	179	AA9	
–	B	176	W5		–	C	63	AD8	
–	B	141	Y4		–	C	–	–	V _{DD}
–	B	–	–	V _{DD}	–	C	210	Y10	
–	B	102	AA3		–	C	106	AC9	
–	B	11	AA1		–	C	17	AE9	
–	B	177	AA5		–	C	64	AD10	
–	B	59	AB2		–	C	145	AB10	
–	B	–	–	GND	–	C	237	W11	
–	B	142	AB4		–	C	–	–	GND
–	B	12	AC1		–	C	107	AC11	
–	B	208	Y6		–	C	180	AA11	
–	C	60	AD2		–	C	18	AE11	
–	C	13	AE1		–	C	146	AB12	
–	C	103	AC3		–	C	–	–	V _{DD}
–	C	235	W7		–	C	211	Y12	

Table 4-12. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (4/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	65	AD12		–	C	112	AC21	
–	C	19	AE13		–	C	–	–	V _{DD}
–	C	238	W13		–	C	70	AD22	
–	C	181	AA13		–	C	150	AB20	
–	C	108	AC13		–	C	24	AE23	
–	C	66	AD14		–	C	113	AC23	
–	C	212	Y14		–	C	–	–	GND
–	C	147	AB14		–	C	25	AE25	
–	C	–	–	GND	–	C	241	W19	
–	C	20	AE15		–	C	71	AD24	
–	C	182	AA15		–	D	151	AB22	
–	C	109	AC15		–	D	215	Y20	
–	C	239	W15		–	D	72	AB24	
–	C	–	–	V _{DD}	–	D	26	AC25	
–	C	148	AB16		–	D	114	AA23	
–	C	67	AD16		–	D	185	AA21	
–	C	21	AE17		–	D	–	–	GND
–	C	110	AC17		–	D	152	Y22	
–	C	213	Y16		–	D	27	AA25	
–	C	68	AD18		–	D	73	Y24	
–	C	–	–	GND	–	D	186	W21	
–	C	183	AA17		–	D	–	–	GND
–	C	22	AE19		–	D	115	W23	
–	C	–	–	V _{DD}	–	D	216	V20	
–	C	111	AC19		–	D	28	W25	
–	C	149	AB18		–	D	153	V22	
–	C	214	Y18		–	D	–	–	V _{DD}
–	C	69	AD20		–	D	187	U21	
–	C	–	–	GND	–	D	263	V18	
–	C	184	AA19		–	D	–	–	GND
–	C	240	W17		–	D	74	V24	
–	C	23	AE21		–	D	242	U19	

Table 4-12. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (5/5)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
-	D	-	-	V _{DD}	-	D	120	J23	
-	D	116	U23		-	D	246	J19	
-	D	29	U25		-	D	-	-	GND
-	D	75	T24		-	D	79	H24	
-	D	154	T22		-	D	191	J21	
-	D	217	T20		-	D	-	-	V _{DD}
-	D	117	R23		-	D	34	G25	
-	D	-	-	GND	-	D	268	H18	
-	D	188	R21		-	D	158	H22	
-	D	243	R19		-	D	121	G23	
-	D	30	R25		-	D	-	-	GND
-	D	155	P22		-	D	80	F24	
-	D	-	-	V _{DD}	-	D	221	H20	
-	D	218	P20		-	D	192	G21	
-	D	76	P24		-	D	159	F22	
-	D	31	N25		-	D	-	-	V _{DD}
-	D	244	N19		-	D	122	E23	
-	D	189	N21		-	D	35	E25	
-	D	118	N23		-	D	193	E21	
-	D	77	M24		-	D	81	D24	
-	D	219	M20		-	D	-	-	GND
-	D	156	M22		-	D	123	C23	
-	D	-	-	GND	-	D	36	C25	
-	D	32	L25		-	D	222	F20	
-	D	245	L19						
-	D	190	L21						
-	D	119	L23						
-	D	-	-	V _{DD}					
-	D	220	K20						
-	D	157	K22						
-	D	78	K24						
-	D	33	J25						

Table 4-13. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (1/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	127	C15	
–	A	82	B24		–	A	196	E15	
–	A	37	A25		–	A	42	A15	
–	A	160	D22		–	A	164	D14	
–	A	247	G19		–	A	225	F14	
–	A	–	–	GND	–	A	87	B14	
–	A	38	A23		–	A	–	–	V _{DD}
–	A	83	B22		–	A	43	A13	
–	A	161	D20		–	A	250	G13	
–	A	124	C21		–	A	–	–	GND
–	A	194	E19		–	A	197	E13	
–	A	39	A21		–	A	128	C13	
–	A	–	–	GND	–	A	88	B12	
–	A	84	B20		–	A	–	–	V _{DD}
–	A	248	G17		–	A	226	F12	
–	A	–	–	V _{DD}	–	A	165	D12	
–	A	125	C19		–	A	44	A11	
–	A	223	F18		–	A	198	E11	
–	A	–	–	GND	–	A	–	–	GND
–	A	162	D18		–	A	129	C11	
–	A	40	A19		–	A	251	G11	
–	A	85	B18		–	A	166	D10	
–	A	195	E17		–	A	89	B10	
–	A	–	–	V _{DD}	–	A	–	–	GND
–	A	224	F16		–	A	45	A9	
–	A	126	C17		–	A	130	C9	
–	A	–	–	GND	–	A	227	F10	
–	A	41	A17		–	A	90	B8	
–	A	86	B16		–	A	–	–	V _{DD}
–	A	163	D16		–	A	46	A7	
–	A	249	G15		–	A	199	E9	
–	A	–	–	GND	–	A	167	D8	

Table 4-13. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (2/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	131	C7		–	B	202	H6	
–	A	–	–	GND	–	B	–	–	V _{DD}
–	A	228	F8		–	B	4	G1	
–	A	91	B6		–	B	135	H4	
–	A	252	G9		–	B	–	–	GND
–	A	200	E7		–	B	253	H8	
–	A	–	–	V _{DD}	–	B	171	J5	
–	A	132	C5		–	B	230	J7	
–	A	47	A5		–	B	52	H2	
–	A	168	D6		–	B	–	–	V _{DD}
–	A	92	B4		–	B	96	J3	
–	A	–	–	GND	–	B	5	J1	
–	A	48	A3		–	B	–	–	GND
–	A	93	C3		–	B	53	K2	
–	A	–	–	GND	–	B	136	K4	
–	A	1	A1		–	B	203	K6	
–	A	229	G7		–	B	97	L3	
–	A	49	B2		–	B	–	–	GND
–	B	–	–	V _{DD}	–	B	172	L5	
–	B	133	D4		–	B	231	L7	
–	B	201	F6		–	B	6	L1	
–	B	50	D2		–	B	137	M4	
–	B	2	C1		–	B	204	M6	
–	B	–	–	GND	–	B	54	M2	
–	B	169	E5		–	B	–	–	V _{DD}
–	B	94	E3		–	B	7	N1	
–	B	3	E1		–	B	232	N7	
–	B	134	F4		–	B	–	–	GND
–	B	51	F2		–	B	173	N5	
–	B	170	G5		–	B	98	N3	
–	B	–	–	GND	–	B	55	P2	
–	B	95	G3		–	B	–	–	V _{DD}

Table 4-13. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (3/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	205	P6		–	B	–	–	GND
–	B	138	P4		–	B	142	AB4	
–	B	8	R1		–	B	12	AC1	
–	B	233	R7		–	B	208	Y6	
–	B	–	–	GND	–	C	–	–	V _{DD}
–	B	174	R5		–	C	60	AD2	
–	B	99	R3		–	C	13	AE1	
–	B	206	T6		–	C	103	AC3	
–	B	139	T4		–	C	235	W7	
–	B	–	–	GND	–	C	–	–	GND
–	B	56	T2		–	C	14	AE3	
–	B	9	U1		–	C	61	AD4	
–	B	100	U3		–	C	143	AB6	
–	B	234	U7		–	C	104	AC5	
–	B	–	–	V _{DD}	–	C	178	AA7	
–	B	175	U5		–	C	15	AE5	
–	B	57	V2		–	C	–	–	GND
–	B	258	V8		–	C	62	AD6	
–	B	10	W1		–	C	236	W9	
–	B	–	–	GND	–	C	–	–	V _{DD}
–	B	140	V4		–	C	105	AC7	
–	B	101	W3		–	C	209	Y8	
–	B	207	V6		–	C	–	–	GND
–	B	58	Y2		–	C	144	AB8	
–	B	–	–	V _{DD}	–	C	16	AE7	
–	B	141	Y4		–	C	63	AD8	
–	B	176	W5		–	C	179	AA9	
–	B	11	AA1		–	C	–	–	V _{DD}
–	B	102	AA3		–	C	210	Y10	
–	B	–	–	GND	–	C	106	AC9	
–	B	177	AA5		–	C	–	–	GND
–	B	59	AB2		–	C	17	AE9	

Table 4-13. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (4/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	64	AD10		–	C	–	–	V _{DD}
–	C	145	AB10		–	C	22	AE19	
–	C	237	W11		–	C	183	AA17	
–	C	–	–	GND	–	C	149	AB18	
–	C	107	AC11		–	C	111	AC19	
–	C	180	AA11		–	C	–	–	GND
–	C	18	AE11		–	C	214	Y18	
–	C	146	AB12		–	C	69	AD20	
–	C	211	Y12		–	C	240	W17	
–	C	65	AD12		–	C	184	AA19	
–	C	–	–	V _{DD}	–	C	–	–	V _{DD}
–	C	19	AE13		–	C	112	AC21	
–	C	238	W13		–	C	23	AE21	
–	C	–	–	GND	–	C	150	AB20	
–	C	181	AA13		–	C	70	AD22	
–	C	108	AC13		–	C	–	–	GND
–	C	66	AD14		–	C	24	AE23	
–	C	–	–	V _{DD}	–	C	113	AC23	
–	C	212	Y14		–	C	–	–	GND
–	C	147	AB14		–	C	25	AE25	
–	C	20	AE15		–	C	241	W19	
–	C	182	AA15		–	C	71	AD24	
–	C	–	–	GND	–	D	–	–	V _{DD}
–	C	109	AC15		–	D	151	AB22	
–	C	239	W15		–	D	215	Y20	
–	C	148	AB16		–	D	72	AB24	
–	C	67	AD16		–	D	26	AC25	
–	C	–	–	GND	–	D	–	–	GND
–	C	21	AE17		–	D	185	AA21	
–	C	110	AC17		–	D	114	AA23	
–	C	213	Y16		–	D	27	AA25	
–	C	68	AD18		–	D	152	Y22	

Table 4-13. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (5/6)

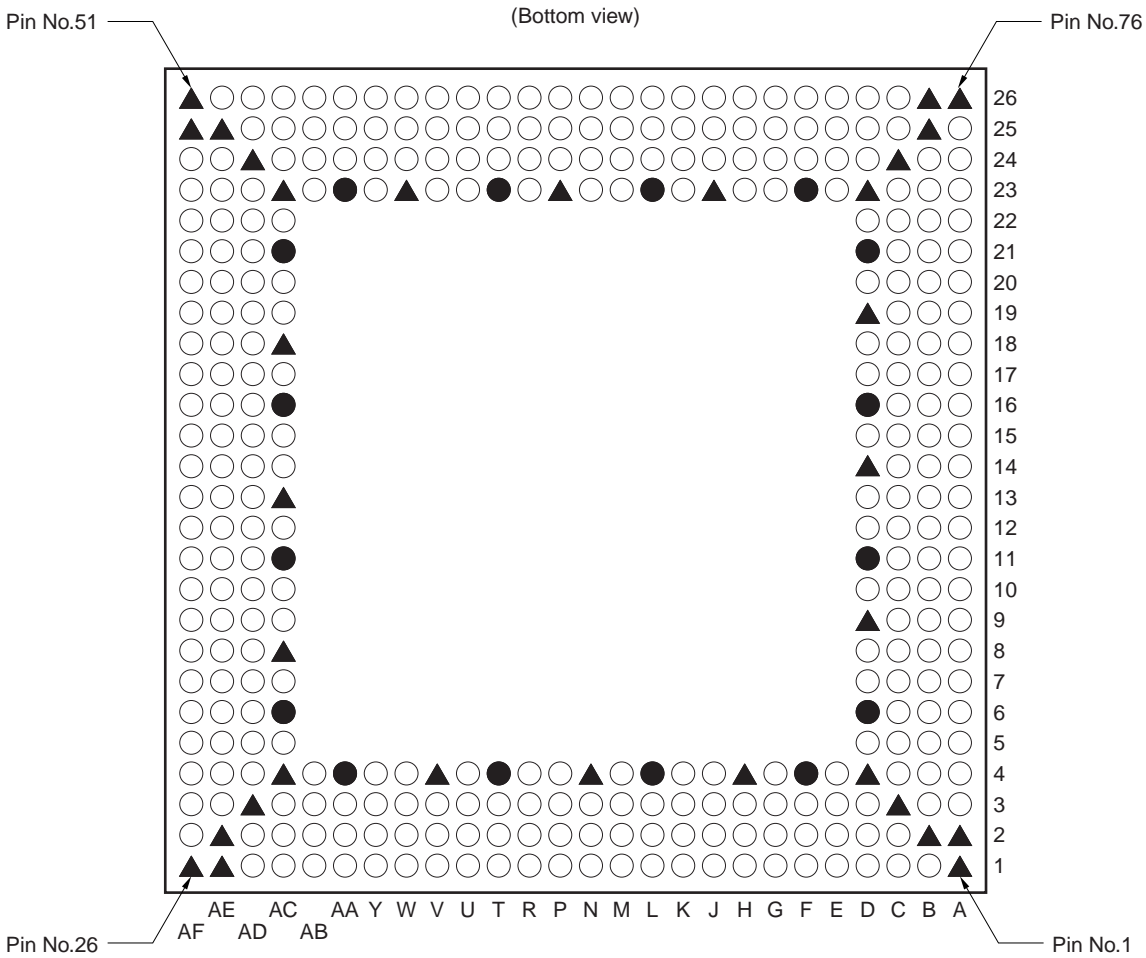
(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	73	Y24		–	D	189	N21	
–	D	186	W21		–	D	118	N23	
–	D	–	–	GND	–	D	77	M24	
–	D	115	W23		–	D	–	–	V _{DD}
–	D	216	V20		–	D	219	M20	
–	D	–	–	V _{DD}	–	D	156	M22	
–	D	28	W25		–	D	32	L25	
–	D	153	V22		–	D	245	L19	
–	D	–	–	GND	–	D	–	–	GND
–	D	263	V18		–	D	190	L21	
–	D	187	U21		–	D	119	L23	
–	D	242	U19		–	D	220	K20	
–	D	74	V24		–	D	157	K22	
–	D	–	–	V _{DD}	–	D	–	–	GND
–	D	116	U23		–	D	78	K24	
–	D	29	U25		–	D	33	J25	
–	D	–	–	GND	–	D	120	J23	
–	D	75	T24		–	D	246	J19	
–	D	154	T22		–	D	–	–	V _{DD}
–	D	217	T20		–	D	191	J21	
–	D	117	R23		–	D	79	H24	
–	D	–	–	GND	–	D	268	H18	
–	D	188	R21		–	D	34	G25	
–	D	243	R19		–	D	–	–	GND
–	D	30	R25		–	D	158	H22	
–	D	155	P22		–	D	121	G23	
–	D	218	P20		–	D	221	H20	
–	D	76	P24		–	D	80	F24	
–	D	–	–	V _{DD}	–	D	–	–	V _{DD}
–	D	31	N25		–	D	159	F22	
–	D	244	N19		–	D	192	G21	
–	D	–	–	GND	–	D	35	E25	

Table 4-13. Correspondence Between Internal Chip Sides and Ball Numbers (313-pin PBGA) (6/6)**(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	122	E23	
–	D	–	–	GND
–	D	193	E21	
–	D	81	D24	
–	D	–	–	GND
–	D	123	C23	
–	D	36	C25	
–	D	222	F20	

4.8.5 352-pin PBGA



Remark ▲ : GND (32 pins)
● : V_{DD} (16 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (A1), 25 (AE1), 26 (AF1), 50 (AF25), 51 (AF26), 75 (B26), 76 (A26), 100 (A2), 101 (B2), 124 (AE2), 147 (AE25), 170 (B25), 193 (C3), 214 (AD3), 235 (AD24), 256 (C24), 277 (D4), 281 (H4), 286 (N4), 291 (V4), 296 (AC4), 300 (AC8), 305 (AC13), 310 (AC18), 315 (AC23), 319 (W23), 324 (P23), 329 (J23), 334 (D23), 338 (D19), 343 (D14), 348 (D9)	279 (F4), 284 (L4), 289 (T4), 294 (AA4), 298 (AC6), 303 (AC11), 308 (AC16), 313 (AC21), 317 (AA23), 322 (T23), 327 (L23), 332 (F23), 336 (D21), 341 (D16), 346 (D11), 351 (D6)	None	There are no restrictions on the assignment of dedicated scan path pins.			304

Note Total number of usable signal pins.

Table 4-14. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (1/6)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	86	A16	
–	A	–	–	V _{DD}	–	A	180	B15	
–	A	171	B24		–	A	87	A15	
–	A	77	A25		–	A	342	D15	
–	A	172	B23		–	A	264	C16	
–	A	78	A24		–	A	181	B14	
–	A	79	A23		–	A	88	A14	
–	A	257	C23		–	A	265	C15	
–	A	258	C22		–	A	182	B13	
–	A	173	B22		–	A	344	D13	
–	A	335	D22		–	A	–	–	V _{DD}
–	A	174	B21		–	A	89	A13	
–	A	80	A22		–	A	266	C14	
–	A	337	D20		–	A	183	B12	
–	A	259	C21		–	A	267	C13	
–	A	81	A21		–	A	345	D12	
–	A	82	A20		–	A	90	A12	
–	A	175	B20		–	A	184	B11	
–	A	–	–	GND	–	A	268	C12	
–	A	260	C20		–	A	91	A11	
–	A	176	B19		–	A	347	D10	
–	A	83	A19		–	A	185	B10	
–	A	261	C19		–	A	269	C11	
–	A	177	B18		–	A	349	D8	
–	A	84	A18		–	A	92	A10	
–	A	178	B17		–	A	186	B9	
–	A	262	C18		–	A	270	C10	
–	A	85	A17		–	A	93	A9	
–	A	339	D18		–	A	187	B8	
–	A	179	B16		–	A	94	A8	
–	A	263	C17		–	A	271	C9	
–	A	340	D17		–	A	188	B7	

Table 4-14. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (2/6)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	95	A7		–	B	280	G4	
–	A	–	–	GND	–	B	196	F3	
–	A	189	B6		–	B	6	F1	
–	A	272	C8		–	B	7	G1	
–	A	96	A6		–	B	106	G2	
–	A	273	C7		–	B	–	–	GND
–	A	350	D7		–	B	197	G3	
–	A	97	A5		–	B	107	H2	
–	A	190	B5		–	B	8	H1	
–	A	352	D5		–	B	198	H3	
–	A	191	B4		–	B	108	J2	
–	A	274	C6		–	B	9	J1	
–	A	275	C5		–	B	109	K2	
–	A	98	A4		–	B	199	J3	
–	A	276	C4		–	B	10	K1	
–	A	192	B3		–	B	282	J4	
–	A	99	A3		–	B	110	L2	
–	A	–	–	V _{DD}	–	B	200	K3	
–	A	–	–	V _{DD}	–	B	283	K4	
–	B	–	–	GND	–	B	11	L1	
–	B	–	–	GND	–	B	111	M2	
–	B	102	C2		–	B	12	M1	
–	B	2	B1		–	B	285	M4	
–	B	103	D2		–	B	201	L3	
–	B	3	C1		–	B	112	N2	
–	B	4	D1		–	B	13	N1	
–	B	194	D3		–	B	202	M3	
–	B	195	E3		–	B	113	P2	
–	B	104	E2		–	B	287	P4	
–	B	278	E4		–	B	–	–	V _{DD}
–	B	105	F2		–	B	14	P1	
–	B	5	E1		–	B	203	N3	

Table 4-14. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (3/6)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	114	R2		–	B	23	AC1	
–	B	204	P3		–	B	213	AC3	
–	B	288	R4		–	B	123	AD2	
–	B	15	R1		–	B	24	AD1	
–	B	115	T2		–	B	–	–	GND
–	B	205	R3		–	B	–	–	GND
–	B	16	T1		–	C	–	–	V _{DD}
–	B	290	U4		–	C	–	–	V _{DD}
–	B	116	U2		–	C	125	AE3	
–	B	206	T3		–	C	27	AF2	
–	B	292	W4		–	C	126	AE4	
–	B	17	U1		–	C	28	AF3	
–	B	117	V2		–	C	29	AF4	
–	B	207	U3		–	C	215	AD4	
–	B	18	V1		–	C	216	AD5	
–	B	118	W2		–	C	127	AE5	
–	B	19	W1		–	C	297	AC5	
–	B	208	V3		–	C	128	AE6	
–	B	119	Y2		–	C	30	AF5	
–	B	20	Y1		–	C	299	AC7	
–	B	–	–	GND	–	C	217	AD6	
–	B	120	AA2		–	C	31	AF6	
–	B	209	W3		–	C	32	AF7	
–	B	21	AA1		–	C	129	AE7	
–	B	210	Y3		–	C	–	–	GND
–	B	293	Y4		–	C	218	AD7	
–	B	22	AB1		–	C	130	AE8	
–	B	121	AB2		–	C	33	AF8	
–	B	295	AB4		–	C	219	AD8	
–	B	122	AC2		–	C	131	AE9	
–	B	211	AA3		–	C	34	AF9	
–	B	212	AB3		–	C	132	AE10	

Table 4-14. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (4/6)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	220	AD9		–	C	228	AD17	
–	C	35	AF10		–	C	43	AF18	
–	C	301	AC9		–	C	141	AE19	
–	C	133	AE11		–	C	44	AF19	
–	C	221	AD10		–	C	229	AD18	
–	C	302	AC10		–	C	142	AE20	
–	C	36	AF11		–	C	45	AF20	
–	C	134	AE12		–	C	–	–	GND
–	C	37	AF12		–	C	143	AE21	
–	C	304	AC12		–	C	230	AD19	
–	C	222	AD11		–	C	46	AF21	
–	C	135	AE13		–	C	231	AD20	
–	C	38	AF13		–	C	312	AC20	
–	C	223	AD12		–	C	47	AF22	
–	C	136	AE14		–	C	144	AE22	
–	C	306	AC14		–	C	314	AC22	
–	C	–	–	V _{DD}	–	C	145	AE23	
–	C	39	AF14		–	C	232	AD21	
–	C	224	AD13		–	C	233	AD22	
–	C	137	AE15		–	C	48	AF23	
–	C	225	AD14		–	C	234	AD23	
–	C	307	AC15		–	C	146	AE24	
–	C	40	AF15		–	C	49	AF24	
–	C	138	AE16		–	C	–	–	V _{DD}
–	C	226	AD15		–	C	–	–	V _{DD}
–	C	41	AF16		–	D	–	–	GND
–	C	309	AC17		–	D	–	–	GND
–	C	139	AE17		–	D	148	AD25	
–	C	227	AD16		–	D	52	AE26	
–	C	311	AC19		–	D	149	AC25	
–	C	42	AF17		–	D	53	AD26	
–	C	140	AE18		–	D	54	AC26	

Table 4-14. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (5/6)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	236	AC24		–	D	244	R24	
–	D	237	AB24		–	D	159	N25	
–	D	150	AB25		–	D	325	N23	
–	D	316	AB23		–	D	–	–	V _{DD}
–	D	151	AA25		–	D	64	N26	
–	D	55	AB26		–	D	245	P24	
–	D	318	Y23		–	D	160	M25	
–	D	238	AA24		–	D	246	N24	
–	D	56	AA26		–	D	326	M23	
–	D	57	Y26		–	D	65	M26	
–	D	152	Y25		–	D	161	L25	
–	D	–	–	GND	–	D	247	M24	
–	D	239	Y24		–	D	66	L26	
–	D	153	W25		–	D	328	K23	
–	D	58	W26		–	D	162	K25	
–	D	240	W24		–	D	248	L24	
–	D	154	V25		–	D	330	H23	
–	D	59	V26		–	D	67	K26	
–	D	155	U25		–	D	163	J25	
–	D	241	V24		–	D	249	K24	
–	D	60	U26		–	D	68	J26	
–	D	320	V23		–	D	164	H25	
–	D	156	T25		–	D	69	H26	
–	D	242	U24		–	D	250	J24	
–	D	321	U23		–	D	165	G25	
–	D	61	T26		–	D	70	G26	
–	D	157	R25		–	D	–	–	GND
–	D	62	R26		–	D	166	F25	
–	D	323	R23		–	D	251	H24	
–	D	243	T24		–	D	71	F26	
–	D	158	P25		–	D	252	G24	
–	D	63	P26		–	D	331	G23	

Table 4-14. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (6/6)

(CMOS-9HD Series: μ PD65949, EA-9HD Series: μ PD65449)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	72	E26	
–	D	167	E25	
–	D	333	E23	
–	D	168	D25	
–	D	253	F24	
–	D	254	E24	
–	D	73	D26	
–	D	255	D24	
–	D	169	C25	
–	D	74	C26	
–	D	–	–	GND
–	D	–	–	GND

Table 4-15. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (1/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	340	D17	
–	A	–	–	V _{DD}	–	A	85	A17	
–	A	171	B24		–	A	179	B16	
–	A	77	A25		–	A	263	C17	
–	A	–	–	V _{DD}	–	A	342	D15	
–	A	78	A24		–	A	86	A16	
–	A	172	B23		–	A	180	B15	
–	A	–	–	GND	–	A	87	A15	
–	A	257	C23		–	A	264	C16	
–	A	79	A23		–	A	181	B14	
–	A	173	B22		–	A	88	A14	
–	A	335	D22		–	A	–	–	GND
–	A	80	A22		–	A	265	C15	
–	A	258	C22		–	A	182	B13	
–	A	339	D18		–	A	344	D13	
–	A	174	B21		–	A	89	A13	
–	A	337	D20		–	A	266	C14	
–	A	81	A21		–	A	183	B12	
–	A	259	C21		–	A	267	C13	
–	A	–	–	V _{DD}	–	A	90	A12	
–	A	175	B20		–	A	184	B11	
–	A	82	A20		–	A	268	C12	
–	A	260	C20		–	A	345	D12	
–	A	176	B19		–	A	91	A11	
–	A	–	–	GND	–	A	185	B10	
–	A	83	A19		–	A	269	C11	
–	A	261	C19		–	A	92	A10	
–	A	177	B18		–	A	347	D10	
–	A	84	A18		–	A	186	B9	
–	A	178	B17		–	A	270	C10	
–	A	–	–	V _{DD}	–	A	93	A9	
–	A	262	C18		–	A	187	B8	

Table 4-15. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (2/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	B	–	–	GND
–	A	94	A8		–	B	194	D3	
–	A	271	C9		–	B	4	D1	
–	A	188	B7		–	B	104	E2	
–	A	95	A7		–	B	278	E4	
–	A	272	C8		–	B	5	E1	
–	A	189	B6		–	B	195	E3	
–	A	–	–	V _{DD}	–	B	282	J4	
–	A	–	–	GND	–	B	105	F2	
–	A	96	A6		–	B	280	G4	
–	A	350	D7		–	B	6	F1	
–	A	273	C7		–	B	196	F3	
–	A	349	D8		–	B	–	–	V _{DD}
–	A	190	B5		–	B	106	G2	
–	A	97	A5		–	B	7	G1	
–	A	274	C6		–	B	197	G3	
–	A	352	D5		–	B	107	H2	
–	A	191	B4		–	B	–	–	GND
–	A	275	C5		–	B	8	H1	
–	A	98	A4		–	B	198	H3	
–	A	276	C4		–	B	108	J2	
–	A	192	B3		–	B	9	J1	
–	A	99	A3		–	B	109	K2	
–	A	–	–	V _{DD}	–	B	–	–	V _{DD}
–	A	–	–	V _{DD}	–	B	199	J3	
–	B	–	–	GND	–	B	283	K4	
–	B	–	–	GND	–	B	10	K1	
–	B	102	C2		–	B	110	L2	
–	B	2	B1		–	B	200	K3	
–	B	–	–	V _{DD}	–	B	285	M4	
–	B	3	C1		–	B	11	L1	
–	B	103	D2		–	B	111	M2	

Table 4-15. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (3/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	12	M1		–	B	–	–	V _{DD}
–	B	201	L3		–	B	–	–	GND
–	B	112	N2		–	B	21	AA1	
–	B	13	N1		–	B	293	Y4	
–	B	–	–	GND	–	B	210	Y3	
–	B	202	M3		–	B	292	W4	
–	B	113	P2		–	B	121	AB2	
–	B	287	P4		–	B	22	AB1	
–	B	14	P1		–	B	211	AA3	
–	B	203	N3		–	B	295	AB4	
–	B	114	R2		–	B	122	AC2	
–	B	204	P3		–	B	212	AB3	
–	B	15	R1		–	B	23	AC1	
–	B	115	T2		–	B	213	AC3	
–	B	205	R3		–	B	123	AD2	
–	B	288	R4		–	B	24	AD1	
–	B	16	T1		–	B	–	–	GND
–	B	116	U2		–	B	–	–	GND
–	B	206	T3		–	C	–	–	V _{DD}
–	B	17	U1		–	C	–	–	V _{DD}
–	B	290	U4		–	C	125	AE3	
–	B	117	V2		–	C	27	AF2	
–	B	207	U3		–	C	–	–	V _{DD}
–	B	18	V1		–	C	28	AF3	
–	B	118	W2		–	C	126	AE4	
–	B	–	–	V _{DD}	–	C	–	–	GND
–	B	19	W1		–	C	215	AD4	
–	B	208	V3		–	C	29	AF4	
–	B	119	Y2		–	C	127	AE5	
–	B	20	Y1		–	C	297	AC5	
–	B	209	W3		–	C	30	AF5	
–	B	120	AA2		–	C	216	AD5	

Table 4-15. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (4/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	301	AC9		–	C	306	AC14	
–	C	128	AE6		–	C	39	AF14	
–	C	299	AC7		–	C	224	AD13	
–	C	31	AF6		–	C	137	AE15	
–	C	217	AD6		–	C	225	AD14	
–	C	–	–	V _{DD}	–	C	40	AF15	
–	C	129	AE7		–	C	138	AE16	
–	C	32	AF7		–	C	226	AD15	
–	C	218	AD7		–	C	307	AC15	
–	C	130	AE8		–	C	41	AF16	
–	C	–	–	GND	–	C	139	AE17	
–	C	33	AF8		–	C	227	AD16	
–	C	219	AD8		–	C	42	AF17	
–	C	131	AE9		–	C	309	AC17	
–	C	34	AF9		–	C	140	AE18	
–	C	132	AE10		–	C	228	AD17	
–	C	–	–	V _{DD}	–	C	43	AF18	
–	C	220	AD9		–	C	141	AE19	
–	C	302	AC10		–	C	–	–	V _{DD}
–	C	35	AF10		–	C	44	AF19	
–	C	133	AE11		–	C	229	AD18	
–	C	221	AD10		–	C	142	AE20	
–	C	304	AC12		–	C	45	AF20	
–	C	36	AF11		–	C	230	AD19	
–	C	134	AE12		–	C	143	AE21	
–	C	37	AF12		–	C	–	–	V _{DD}
–	C	222	AD11		–	C	–	–	GND
–	C	135	AE13		–	C	46	AF21	
–	C	38	AF13		–	C	312	AC20	
–	C	–	–	GND	–	C	231	AD20	
–	C	223	AD12		–	C	311	AC19	
–	C	136	AE14		–	C	144	AE22	

Table 4-15. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (5/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	47	AF22		–	D	57	Y26	
–	C	232	AD21		–	D	239	Y24	
–	C	314	AC22		–	D	153	W25	
–	C	145	AE23		–	D	–	–	GND
–	C	233	AD22		–	D	58	W26	
–	C	48	AF23		–	D	240	W24	
–	C	234	AD23		–	D	154	V25	
–	C	146	AE24		–	D	59	V26	
–	C	49	AF24		–	D	155	U25	
–	C	–	–	V _{DD}	–	D	–	–	V _{DD}
–	C	–	–	V _{DD}	–	D	241	V24	
–	D	–	–	GND	–	D	321	U23	
–	D	–	–	GND	–	D	60	U26	
–	D	148	AD25		–	D	156	T25	
–	D	52	AE26		–	D	242	U24	
–	D	–	–	V _{DD}	–	D	323	R23	
–	D	53	AD26		–	D	61	T26	
–	D	149	AC25		–	D	157	R25	
–	D	–	–	GND	–	D	62	R26	
–	D	236	AC24		–	D	243	T24	
–	D	54	AC26		–	D	158	P25	
–	D	150	AB25		–	D	63	P26	
–	D	316	AB23		–	D	–	–	GND
–	D	55	AB26		–	D	244	R24	
–	D	237	AB24		–	D	159	N25	
–	D	320	V23		–	D	325	N23	
–	D	151	AA25		–	D	64	N26	
–	D	318	Y23		–	D	245	P24	
–	D	56	AA26		–	D	160	M25	
–	D	238	AA24		–	D	246	N24	
–	D	–	–	V _{DD}	–	D	65	M26	
–	D	152	Y25		–	D	161	L25	

Table 4-15. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (6/6)

(CMOS-9HD Series: μ PD65951, EA-9HD Series: μ PD65451)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	247	M24		–	D	169	C25	
–	D	326	M23		–	D	74	C26	
–	D	66	L26		–	D	–	–	GND
–	D	162	K25		–	D	–	–	GND
–	D	248	L24						
–	D	67	K26						
–	D	328	K23						
–	D	163	J25						
–	D	249	K24						
–	D	68	J26						
–	D	164	H25						
–	D	–	–	V _{DD}					
–	D	69	H26						
–	D	250	J24						
–	D	165	G25						
–	D	70	G26						
–	D	251	H24						
–	D	166	F25						
–	D	–	–	V _{DD}					
–	D	–	–	GND					
–	D	71	F26						
–	D	331	G23						
–	D	252	G24						
–	D	330	H23						
–	D	167	E25						
–	D	72	E26						
–	D	253	F24						
–	D	333	E23						
–	D	168	D25						
–	D	254	E24						
–	D	73	D26						
–	D	255	D24						

Table 4-16. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (1/8)

(CMOS-9HD Series: μ PD65958, EA-9HD Series: μ PD65458)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	–	–	GND
–	A	–	–	V _{DD}	–	A	84	A18	
–	A	77	A25		–	A	178	B17	
–	A	–	–	GND	–	A	–	–	V _{DD}
–	A	171	B24		–	A	262	C18	
–	A	78	A24		–	A	–	–	GND
–	A	–	–	V _{DD}	–	A	85	A17	
–	A	172	B23		–	A	340	D17	
–	A	257	C23		–	A	–	–	V _{DD}
–	A	–	–	GND	–	A	179	B16	
–	A	79	A23		–	A	263	C17	
–	A	173	B22		–	A	–	–	GND
–	A	335	D22		–	A	86	A16	
–	A	–	–	V _{DD}	–	A	–	–	V _{DD}
–	A	258	C22		–	A	180	B15	
–	A	80	A22		–	A	87	A15	
–	A	174	B21		–	A	–	–	GND
–	A	–	–	GND	–	A	264	C16	
–	A	337	D20		–	A	181	B14	
–	A	259	C21		–	A	–	–	V _{DD}
–	A	81	A21		–	A	342	D15	
–	A	–	–	V _{DD}	–	A	–	–	GND
–	A	175	B20		–	A	88	A14	
–	A	82	A20		–	A	265	C15	
–	A	260	C20		–	A	–	–	V _{DD}
–	A	–	–	GND	–	A	182	B13	
–	A	176	B19		–	A	344	D13	
–	A	339	D18		–	A	–	–	GND
–	A	83	A19		–	A	89	A13	
–	A	–	–	V _{DD}	–	A	266	C14	
–	A	261	C19		–	A	–	–	V _{DD}
–	A	177	B18		–	A	183	B12	

Table 4-16. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (2/8)

(CMOS-9HD Series: μ PD65958, EA-9HD Series: μ PD65458)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	GND	–	A	–	–	V _{DD}
–	A	267	C13		–	A	350	D7	
–	A	90	A12		–	A	96	A6	
–	A	–	–	V _{DD}	–	A	–	–	GND
–	A	184	B11		–	A	273	C7	
–	A	268	C12		–	A	190	B5	
–	A	–	–	GND	–	A	–	–	V _{DD}
–	A	91	A11		–	A	97	A5	
–	A	–	–	V _{DD}	–	A	274	C6	
–	A	345	D12		–	A	191	B4	
–	A	185	B10		–	A	–	–	GND
–	A	–	–	GND	–	A	352	D5	
–	A	269	C11		–	A	98	A4	
–	A	92	A10		–	A	275	C5	
–	A	–	–	V _{DD}	–	A	–	–	V _{DD}
–	A	347	D10		–	A	192	B3	
–	A	–	–	GND	–	A	276	C4	
–	A	186	B9		–	A	–	–	GND
–	A	270	C10		–	A	99	A3	
–	A	–	–	V _{DD}	–	A	–	–	V _{DD}
–	A	93	A9		–	B	–	–	GND
–	A	187	B8		–	B	–	–	GND
–	A	–	–	GND	–	B	–	–	V _{DD}
–	A	94	A8		–	B	2	B1	
–	A	271	C9		–	B	–	–	GND
–	A	–	–	V _{DD}	–	B	102	C2	
–	A	188	B7		–	B	3	C1	
–	A	349	D8		–	B	–	–	V _{DD}
–	A	–	–	GND	–	B	103	D2	
–	A	95	A7		–	B	194	D3	
–	A	272	C8		–	B	4	D1	
–	A	189	B6		–	B	–	–	GND

Table 4-16. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (3/8)

(CMOS-9HD Series: μ PD65958, EA-9HD Series: μ PD65458)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	104	E2		–	B	–	–	GND
–	B	278	E4		–	B	11	L1	
–	B	–	–	V _{DD}	–	B	111	M2	
–	B	195	E3		–	B	–	–	V _{DD}
–	B	5	E1		–	B	12	M1	
–	B	105	F2		–	B	201	L3	
–	B	–	–	GND	–	B	–	–	GND
–	B	280	G4		–	B	112	N2	
–	B	196	F3		–	B	285	M4	
–	B	6	F1		–	B	–	–	V _{DD}
–	B	–	–	V _{DD}	–	B	13	N1	
–	B	106	G2		–	B	202	M3	
–	B	7	G1		–	B	–	–	GND
–	B	197	G3		–	B	113	P2	
–	B	–	–	GND	–	B	287	P4	
–	B	107	H2		–	B	–	–	V _{DD}
–	B	282	J4		–	B	14	P1	
–	B	–	–	V _{DD}	–	B	203	N3	
–	B	8	H1		–	B	–	–	GND
–	B	198	H3		–	B	114	R2	
–	B	–	–	GND	–	B	204	P3	
–	B	108	J2		–	B	–	–	V _{DD}
–	B	9	J1		–	B	15	R1	
–	B	–	–	V _{DD}	–	B	115	T2	
–	B	109	K2		–	B	–	–	GND
–	B	199	J3		–	B	205	R3	
–	B	–	–	GND	–	B	16	T1	
–	B	10	K1		–	B	–	–	V _{DD}
–	B	283	K4		–	B	288	R4	
–	B	–	–	V _{DD}	–	B	116	U2	
–	B	110	L2		–	B	–	–	GND
–	B	200	K3		–	B	206	T3	

Table 4-16. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (4/8)

(CMOS-9HD Series: μ PD65958, EA-9HD Series: μ PD65458)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	17	U1		–	B	–	–	GND
–	B	–	–	V _{DD}	–	B	123	AD2	
–	B	290	U4		–	B	213	AC3	
–	B	117	V2		–	B	–	–	V _{DD}
–	B	–	–	GND	–	B	24	AD1	
–	B	207	U3		–	B	–	–	GND
–	B	18	V1		–	B	–	–	GND
–	B	–	–	V _{DD}	–	C	–	–	V _{DD}
–	B	118	W2		–	C	–	–	V _{DD}
–	B	19	W1		–	C	27	AF2	
–	B	–	–	GND	–	C	–	–	GND
–	B	208	V3		–	C	125	AE3	
–	B	119	Y2		–	C	28	AF3	
–	B	–	–	V _{DD}	–	C	126	AE4	
–	B	292	W4		–	C	215	AD4	
–	B	20	Y1		–	C	–	–	GND
–	B	209	W3		–	C	29	AF4	
–	B	–	–	GND	–	C	127	AE5	
–	B	120	AA2		–	C	297	AC5	
–	B	293	Y4		–	C	–	–	V _{DD}
–	B	–	–	V _{DD}	–	C	216	AD5	
–	B	21	AA1		–	C	30	AF5	
–	B	210	Y3		–	C	128	AE6	
–	B	121	AB2		–	C	–	–	GND
–	B	–	–	GND	–	C	299	AC7	
–	B	22	AB1		–	C	217	AD6	
–	B	211	AA3		–	C	31	AF6	
–	B	122	AC2		–	C	–	–	V _{DD}
–	B	–	–	V _{DD}	–	C	129	AE7	
–	B	295	AB4		–	C	32	AF7	
–	B	23	AC1		–	C	218	AD7	
–	B	212	AB3		–	C	–	–	GND

Table 4-16. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (5/8)

(CMOS-9HD Series: μ PD65958, EA-9HD Series: μ PD65458)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	130	AE8		–	C	306	AC14	
–	C	301	AC9		–	C	–	–	GND
–	C	33	AF8		–	C	39	AF14	
–	C	–	–	V _{DD}	–	C	224	AD13	
–	C	219	AD8		–	C	–	–	V _{DD}
–	C	131	AE9		–	C	137	AE15	
–	C	–	–	GND	–	C	–	–	GND
–	C	34	AF9		–	C	225	AD14	
–	C	132	AE10		–	C	40	AF15	
–	C	–	–	V _{DD}	–	C	–	–	V _{DD}
–	C	220	AD9		–	C	138	AE16	
–	C	–	–	GND	–	C	226	AD15	
–	C	35	AF10		–	C	–	–	GND
–	C	302	AC10		–	C	41	AF16	
–	C	–	–	V _{DD}	–	C	–	–	V _{DD}
–	C	133	AE11		–	C	307	AC15	
–	C	221	AD10		–	C	139	AE17	
–	C	–	–	GND	–	C	–	–	GND
–	C	36	AF11		–	C	227	AD16	
–	C	–	–	V _{DD}	–	C	42	AF17	
–	C	134	AE12		–	C	–	–	V _{DD}
–	C	37	AF12		–	C	309	AC17	
–	C	–	–	GND	–	C	–	–	GND
–	C	222	AD11		–	C	140	AE18	
–	C	135	AE13		–	C	228	AD17	
–	C	–	–	V _{DD}	–	C	–	–	V _{DD}
–	C	304	AC12		–	C	43	AF18	
–	C	–	–	GND	–	C	141	AE19	
–	C	38	AF13		–	C	–	–	GND
–	C	223	AD12		–	C	44	AF19	
–	C	–	–	V _{DD}	–	C	229	AD18	
–	C	136	AE14		–	C	–	–	V _{DD}

Table 4-16. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (6/8)

(CMOS-9HD Series: μ PD65958, EA-9HD Series: μ PD65458)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	142	AE20		–	D	53	AD26	
–	C	311	AC19		–	D	–	–	V _{DD}
–	C	–	–	GND	–	D	149	AC25	
–	C	45	AF20		–	D	236	AC24	
–	C	230	AD19		–	D	54	AC26	
–	C	143	AE21		–	D	–	–	GND
–	C	–	–	V _{DD}	–	D	150	AB25	
–	C	312	AC20		–	D	316	AB23	
–	C	46	AF21		–	D	–	–	V _{DD}
–	C	–	–	GND	–	D	237	AB24	
–	C	231	AD20		–	D	55	AB26	
–	C	144	AE22		–	D	151	AA25	
–	C	–	–	V _{DD}	–	D	–	–	GND
–	C	47	AF22		–	D	318	Y23	
–	C	232	AD21		–	D	238	AA24	
–	C	145	AE23		–	D	56	AA26	
–	C	–	–	GND	–	D	–	–	V _{DD}
–	C	314	AC22		–	D	152	Y25	
–	C	48	AF23		–	D	57	Y26	
–	C	233	AD22		–	D	239	Y24	
–	C	–	–	V _{DD}	–	D	–	–	GND
–	C	146	AE24		–	D	153	W25	
–	C	234	AD23		–	D	320	V23	
–	C	–	–	GND	–	D	–	–	V _{DD}
–	C	49	AF24		–	D	58	W26	
–	C	–	–	V _{DD}	–	D	240	W24	
–	D	–	–	GND	–	D	–	–	GND
–	D	–	–	GND	–	D	154	V25	
–	D	–	–	V _{DD}	–	D	59	V26	
–	D	52	AE26		–	D	–	–	V _{DD}
–	D	–	–	GND	–	D	155	U25	
–	D	148	AD25		–	D	241	V24	

Table 4-16. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (7/8)

(CMOS-9HD Series: μ PD65958, EA-9HD Series: μ PD65458)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	–	–	GND	–	D	66	L26	
–	D	60	U26		–	D	–	–	V _{DD}
–	D	321	U23		–	D	326	M23	
–	D	–	–	V _{DD}	–	D	162	K25	
–	D	156	T25		–	D	–	–	GND
–	D	242	U24		–	D	248	L24	
–	D	–	–	GND	–	D	67	K26	
–	D	61	T26		–	D	–	–	V _{DD}
–	D	157	R25		–	D	328	K23	
–	D	–	–	V _{DD}	–	D	163	J25	
–	D	62	R26		–	D	–	–	GND
–	D	243	T24		–	D	249	K24	
–	D	–	–	GND	–	D	68	J26	
–	D	158	P25		–	D	–	–	V _{DD}
–	D	323	R23		–	D	164	H25	
–	D	–	–	V _{DD}	–	D	69	H26	
–	D	63	P26		–	D	–	–	GND
–	D	244	R24		–	D	250	J24	
–	D	–	–	GND	–	D	165	G25	
–	D	159	N25		–	D	–	–	V _{DD}
–	D	325	N23		–	D	330	H23	
–	D	–	–	V _{DD}	–	D	70	G26	
–	D	64	N26		–	D	251	H24	
–	D	245	P24		–	D	–	–	GND
–	D	–	–	GND	–	D	166	F25	
–	D	160	M25		–	D	331	G23	
–	D	246	N24		–	D	–	–	V _{DD}
–	D	–	–	V _{DD}	–	D	71	F26	
–	D	65	M26		–	D	252	G24	
–	D	161	L25		–	D	167	E25	
–	D	–	–	GND	–	D	–	–	GND
–	D	247	M24		–	D	72	E26	

Table 4-16. Correspondence Between Internal Chip Sides and Ball Numbers (352-pin PBGA) (8/8)

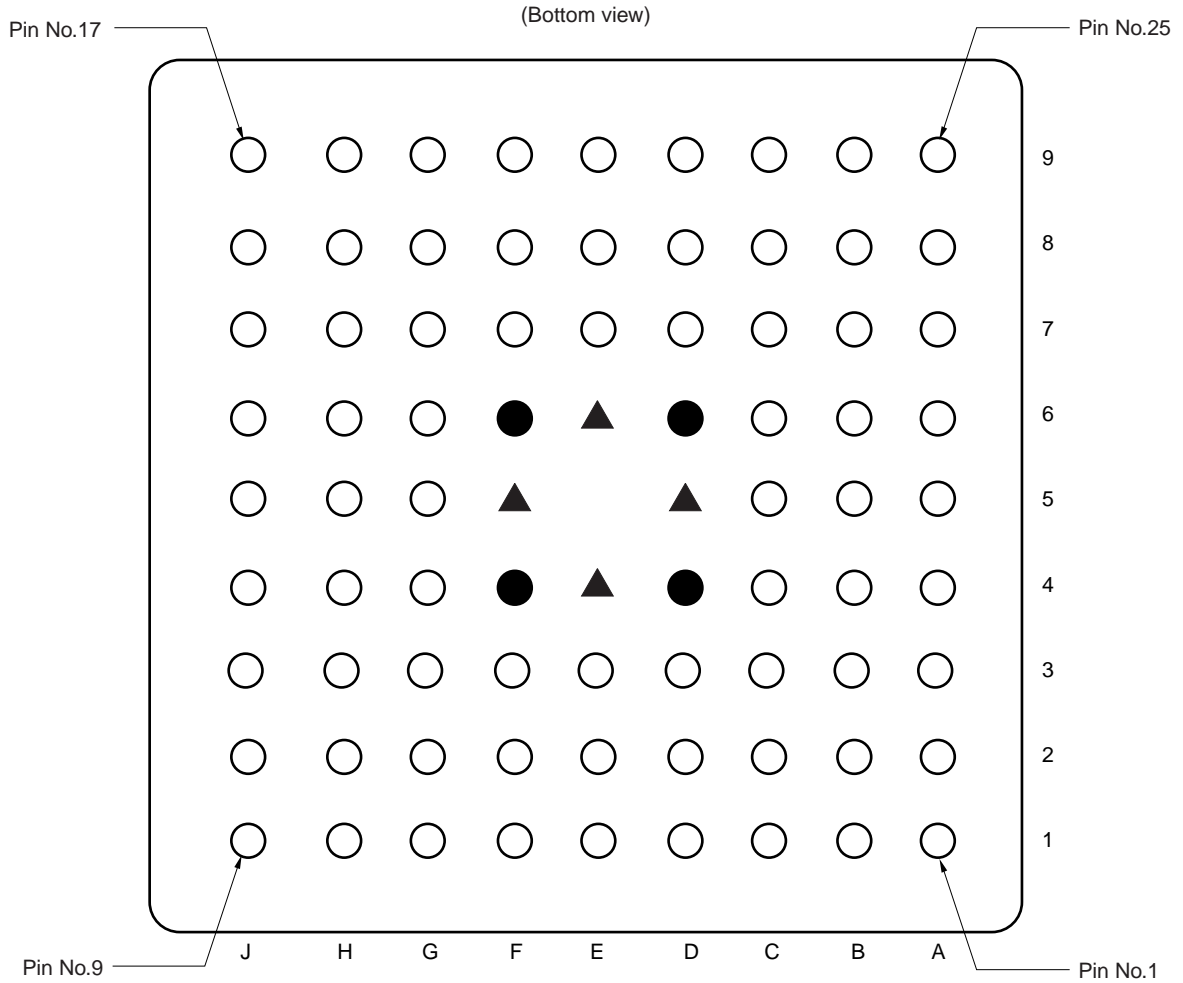
(CMOS-9HD Series: μ PD65958, EA-9HD Series: μ PD65458)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	253	F24	
–	D	168	D25	
–	D	–	–	V _{DD}
–	D	333	E23	
–	D	73	D26	
–	D	254	E24	
–	D	–	–	GND
–	D	169	C25	
–	D	255	D24	
–	D	–	–	V _{DD}
–	D	74	C26	
–	D	–	–	GND
–	D	–	–	GND

4.9 FPBGA

Caution This number in the inside chip differs from this number that V_{DD}, GND of FPBGA are out to the ball constructionally.

★ 4.9.1 80-pin FPBGA



Remark ▲ : GND (4 pins)
● : V_{DD} (4 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
74 (E4), 76 (F5), 78 (E6), 80 (D5)	73 (D4), 75 (F4), 77 (F6), 79 (D6)	None	58	59	60	72

Note Total number of usable signal pins.

Table 4-17. Correspondence Between Internal Chip Sides and Ball Numbers (80-pin FPBGA) (1/2)

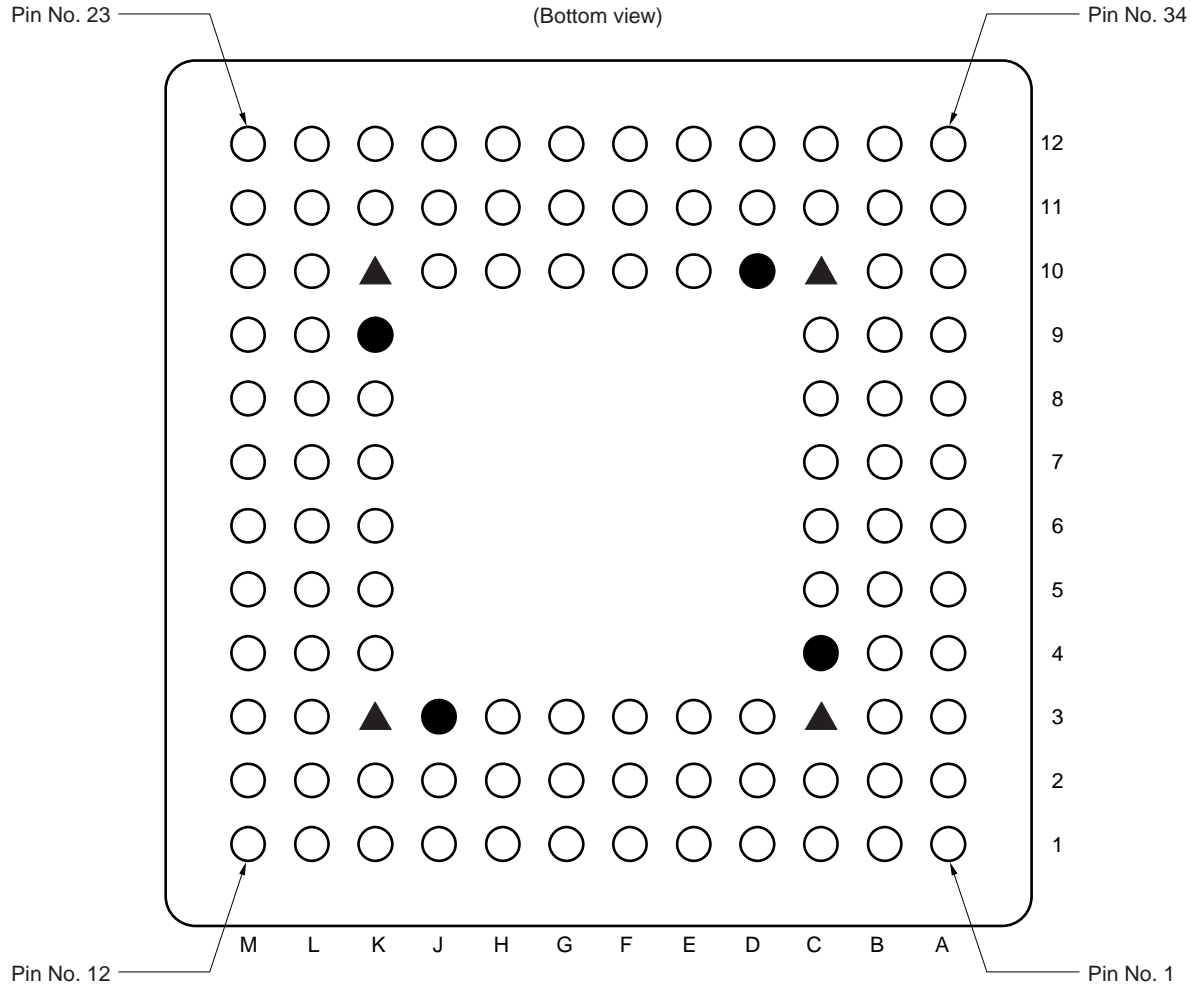
(CMOS-N5 Series: μ PD65882, 65883)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	51	B8		–	B	74	E4	GND
–	A	26	A8		–	B	7	G1	
–	A	27	A7		–	B	37	F2	
–	A	52	B7		–	B	38	G2	
–	A	70	C6		–	B	8	H1	
–	A	28	A6		–	B	9	J1	
–	A	79	D6	V _{DD}	–	B	61	G3	
–	A	71	C5		–	C	39	H2	
–	A	29	A5		–	C	10	J2	
–	A	53	B6		–	C	11	J3	
–	A	54	B5		–	C	40	H3	
–	A	30	A4		–	C	62	G4	
–	A	72	C4		–	C	12	J4	
–	A	80	D5	GND	–	C	75	F4	V _{DD}
–	A	31	A3		–	C	63	G5	
–	A	55	B4		–	C	13	J5	
–	A	56	B3		–	C	41	H4	
–	A	32	A2		–	C	42	H5	
–	A	1	A1		–	C	14	J6	
–	A	57	C3		–	C	64	G6	
–	B	33	B2		–	C	76	F5	GND
–	B	2	B1		–	C	15	J7	
–	B	3	C1		–	C	43	H6	
–	B	34	C2		–	C	44	H7	
–	B	58	D3		–	C	16	J8	
–	B	4	D1		–	C	17	J9	
–	B	73	D4	V _{DD}	–	C	65	G7	
–	B	59	E3		–	D	45	H8	
–	B	5	E1		–	D	18	H9	
–	B	35	D2		–	D	19	G9	
–	B	36	E2		–	D	46	G8	
–	B	6	F1		–	D	66	F7	
–	B	60	F3		–	D	20	F9	

Table 4-17. Correspondence Between Internal Chip Sides and Ball Numbers (80-pin FPBGA) (2/2)**(CMOS-N5 Series: μ PD65882, 65883)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	77	F6	V _{DD}
–	D	67	E7	
–	D	21	E9	
–	D	47	F8	
–	D	48	E8	
–	D	22	D9	
–	D	68	D7	
–	D	78	E6	GND
–	D	23	C9	
–	D	49	D8	
–	D	50	C8	
–	D	24	B9	
–	D	25	A9	
–	D	69	C7	

4.9.2 108-pin FPBGA



Remark ▲ : GND (4 pins)
 ● : V_{DD} (4 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
81 (C3), 88 (K3), 95 (K10), 102 (C10)	87 (J3), 94 (K9), 101 (D10), 108 (C4)	None	41	107	78	100

Note Total number of usable signal pins.

Table 4-18. Correspondence Between Internal Chip Sides and Ball Numbers (108-pin FPBGA) (1/2)

(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	101	D10	V _{DD}	–	B	4	D1	
–	A	35	A11		–	B	82	D3	
–	A	34	A12		–	B	48	E2	
–	A	36	A10		–	B	5	E1	
–	A	73	B10		–	B	83	E3	
–	A	74	B9		–	B	6	F1	
–	A	37	A9		–	B	85	G3	
–	A	103	C9		–	B	49	F2	
–	A	75	B8		–	B	84	F3	
–	A	38	A8		–	B	7	G1	
–	A	104	C8		–	B	50	G2	
–	A	39	A7		–	B	8	H1	
–	A	106	C6		–	B	86	H3	
–	A	76	B7		–	B	51	H2	
–	A	105	C7		–	B	9	J1	
–	A	40	A6		–	B	52	J2	
–	A	77	B6		–	B	53	K2	
–	A	41	A5		–	B	10	K1	
–	A	107	C5		–	B	54	L2	
–	A	78	B5		–	B	11	L1	
–	A	42	A4		–	B	88	K3	GND
–	A	79	B4		–	C	87	J3	V _{DD}
–	A	80	B3		–	C	13	M2	
–	A	43	A3		–	C	12	M1	
–	A	45	B2		–	C	14	M3	
–	A	44	A2		–	C	55	L3	
–	A	108	C4	V _{DD}	–	C	56	L4	
–	B	81	C3	GND	–	C	15	M4	
–	B	2	B1		–	C	89	K4	
–	B	1	A1		–	C	57	L5	
–	B	3	C1		–	C	16	M5	
–	B	46	C2		–	C	90	K5	
–	B	47	D2		–	C	17	M6	

Table 4-18. Correspondence Between Internal Chip Sides and Ball Numbers (108-pin FPBGA) (2/2)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	92	K7		–	D	100	E10	
–	C	58	L6		–	D	69	E11	
–	C	91	K6		–	D	31	D12	
–	C	18	M7		–	D	70	D11	
–	C	59	L7		–	D	71	C11	
–	C	19	M8		–	D	32	C12	
–	C	93	K8		–	D	72	B11	
–	C	60	L8		–	D	33	B12	
–	C	20	M9		–	D	102	C10	GND
–	C	61	L9						
–	C	62	L10						
–	C	21	M10						
–	C	63	L11						
–	C	22	M11						
–	C	94	K9	V _{DD}					
–	D	95	K10	GND					
–	D	24	L12						
–	D	23	M12						
–	D	25	K12						
–	D	64	K11						
–	D	65	J11						
–	D	26	J12						
–	D	96	J10						
–	D	66	H11						
–	D	27	H12						
–	D	97	H10						
–	D	28	G12						
–	D	99	F10						
–	D	67	G11						
–	D	98	G10						
–	D	29	F12						
–	D	68	F11						
–	D	30	E12						

Table 4-19. Correspondence Between Internal Chip Sides and Ball Numbers (108-pin FPBGA) (1/2)

(CMOS-10HD Series: μ PD65301, 65501)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	101	D10	V _{DD}	–	B	49	F2	
–	A	34	A12		–	B	84	F3	
–	A	35	A11		–	B	7	G1	
–	A	73	B10		–	B	50	G2	
–	A	36	A10		–	B	8	H1	
–	A	74	B9		–	B	86	H3	
–	A	37	A9		–	B	51	H2	
–	A	103	C9		–	B	9	J1	
–	A	75	B8		–	B	52	J2	
–	A	38	A8		–	B	10	K1	
–	A	104	C8		–	B	53	K2	
–	A	39	A7		–	B	11	L1	
–	A	106	C6		–	B	54	L2	
–	A	76	B7		–	B	88	K3	GND
–	A	105	C7		–	C	87	J3	V _{DD}
–	A	40	A6		–	C	12	M1	
–	A	77	B6		–	C	13	M2	
–	A	41	A5		–	C	55	L3	
–	A	107	C5		–	C	14	M3	
–	A	78	B5		–	C	56	L4	
–	A	42	A4		–	C	15	M4	
–	A	79	B4		–	C	89	K4	
–	A	43	A3		–	C	57	L5	
–	A	80	B3		–	C	16	M5	
–	A	44	A2		–	C	90	K5	
–	A	45	B2		–	C	17	M6	
–	A	108	C4	V _{DD}	–	C	92	K7	
–	B	81	C3	GND	–	C	58	L6	
–	B	1	A1		–	C	91	K6	
–	B	2	B1		–	C	18	M7	
–	B	46	C2		–	C	59	L7	
–	B	3	C1		–	C	19	M8	
–	B	47	D2		–	C	93	K8	
–	B	4	D1		–	C	60	L8	
–	B	82	D3		–	C	20	M9	
–	B	48	E2		–	C	61	L9	
–	B	5	E1		–	C	21	M10	
–	B	83	E3		–	C	62	L10	
–	B	6	F1		–	C	22	M11	
–	B	85	G3		–	C	63	L11	

Table 4-19. Correspondence Between Internal Chip Sides and Ball Numbers (108-pin FPBGA) (2/2)

(CMOS-10HD Series: μ PD65301, 65501)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	94	K9	V _{DD}
–	D	95	K10	GND
–	D	23	M12	
–	D	24	L12	
–	D	64	K11	
–	D	25	K12	
–	D	65	J11	
–	D	26	J12	
–	D	96	J10	
–	D	66	H11	
–	D	27	H12	
–	D	97	H10	
–	D	28	G12	
–	D	99	F10	
–	D	67	G11	
–	D	98	G10	
–	D	29	F12	
–	D	68	F11	
–	D	30	E12	
–	D	100	E10	
–	D	69	E11	
–	D	31	D12	
–	D	70	D11	
–	D	32	C12	
–	D	71	C11	
–	D	33	B12	
–	D	72	B11	
–	D	102	C10	GND

Table 4-20. Correspondence Between Internal Chip Sides and Ball Numbers (108-Pin FPBGA) (1/2)

(CMOS-10HD Series: μ PD65305, 65505)

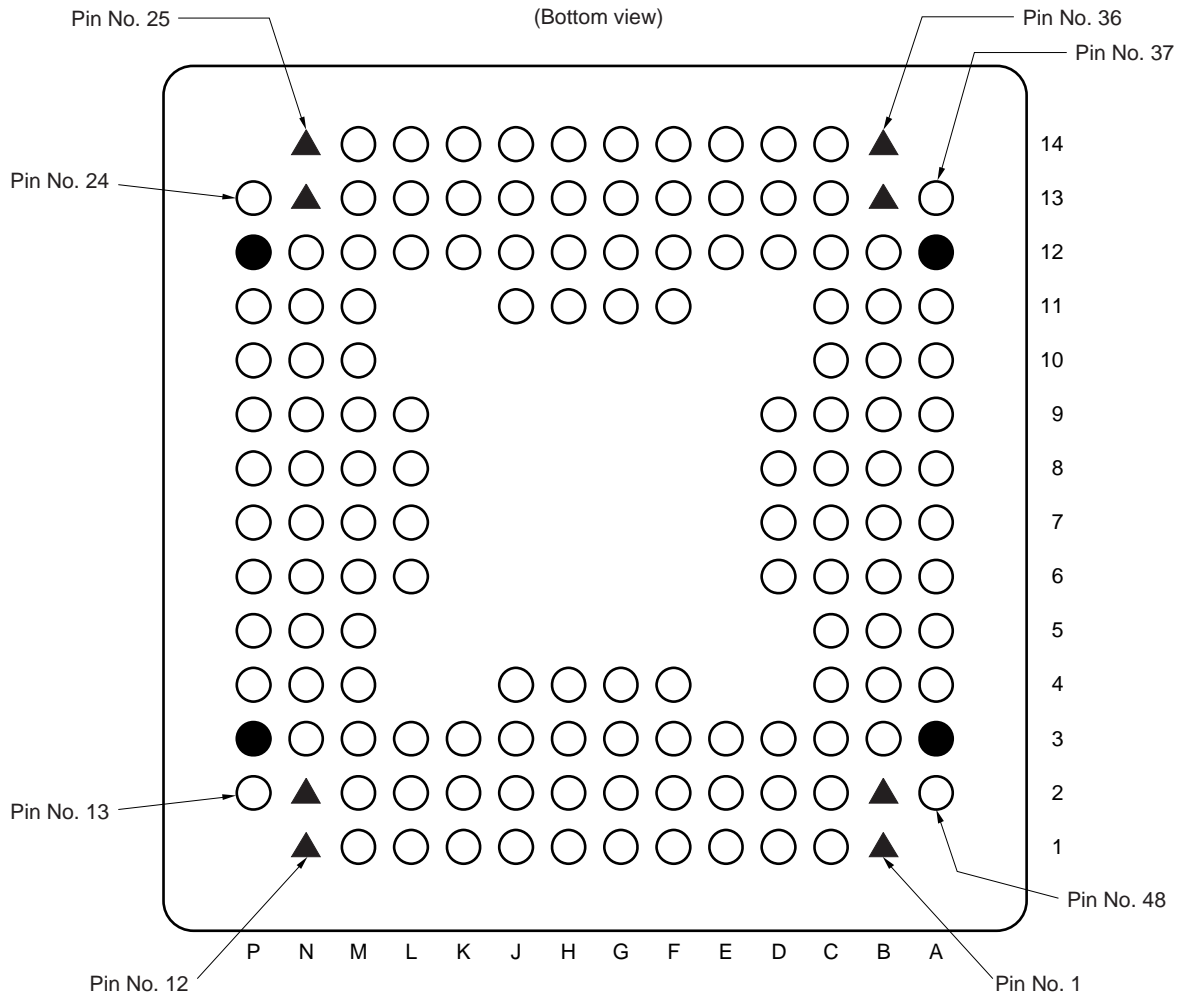
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	101	D10	V _{DD}	–	B	49	F2	
–	A	34	A12		–	B	84	F3	
–	A	35	A11		–	B	7	G1	
–	A	73	B10		–	B	50	G2	
–	A	36	A10		–	B	8	H1	
–	A	74	B9		–	B	86	H3	
–	A	37	A9		–	B	51	H2	
–	A	103	C9		–	B	9	J1	
–	A	75	B8		–	B	52	J2	
–	A	38	A8		–	B	10	K1	
–	A	104	C8		–	B	53	K2	
–	A	39	A7		–	B	11	L1	
–	A	106	C6		–	B	54	L2	
–	A	76	B7		–	B	88	K3	GND
–	A	105	C7		–	C	87	J3	V _{DD}
–	A	40	A6		–	C	12	M1	
–	A	77	B6		–	C	13	M2	
–	A	41	A5		–	C	55	L3	
–	A	107	C5		–	C	14	M3	
–	A	78	B5		–	C	56	L4	
–	A	42	A4		–	C	15	M4	
–	A	79	B4		–	C	89	K4	
–	A	43	A3		–	C	57	L5	
–	A	80	B3		–	C	16	M5	
–	A	44	A2		–	C	90	K5	
–	A	45	B2		–	C	17	M6	
–	A	108	C4	V _{DD}	–	C	92	K7	
–	B	81	C3	GND	–	C	58	L6	
–	B	1	A1		–	C	91	K6	
–	B	2	B1		–	C	18	M7	
–	B	46	C2		–	C	59	L7	
–	B	3	C1		–	C	19	M8	
–	B	47	D2		–	C	93	K8	
–	B	4	D1		–	C	60	L8	
–	B	82	D3		–	C	20	M9	
–	B	48	E2		–	C	61	L9	
–	B	5	E1		–	C	21	M10	
–	B	83	E3		–	C	62	L10	
–	B	6	F1		–	C	22	M11	
–	B	85	G3		–	C	63	L11	

Table 4-20. Correspondence Between Internal Chip Sides and Ball Numbers (108-Pin FPBGA) (2/2)

(CMOS-10HD Series: μ PD65305, 65505)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	94	K9	V _{DD}
–	D	95	K10	GND
–	D	23	M12	
–	D	24	L12	
–	D	64	K11	
–	D	25	K12	
–	D	65	J11	
–	D	26	J12	
–	D	96	J10	
–	D	66	H11	
–	D	27	H12	
–	D	97	H10	
–	D	28	G12	
–	D	99	F10	
–	D	67	G11	
–	D	98	G10	
–	D	29	F12	
–	D	68	F11	
–	D	30	E12	
–	D	100	E10	
–	D	69	E11	
–	D	31	D12	
–	D	70	D11	
–	D	32	C12	
–	D	71	C11	
–	D	33	B12	
–	D	72	B11	
–	D	102	C10	GND

4.9.3 144-pin FPBGA



Remark ▲ : GND (8 pins)
 ● : V_{DD} (4 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (B1), 12 (N1), 25 (N14), 36 (B14), 49 (B2), 60 (N2), 71 (N13), 82 (B13)	14 (P3), 23 (P12), 38 (A12), 47 (A3)	None	118	79	34	132

Note Total number of usable signal pins.

Table 4-21. Correspondence Between Internal Chip Sides and Ball Numbers (144-pin FPBGA) (1/3)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	38	A12	V _{DD}	–	A	48	A2	
–	A	83	B12		–	A	92	B3	
–	A	37	A13		–	A	47	A3	V _{DD}
–	A	84	B11		–	B	49	B2	GND
–	A	120	C12		–	B	2	C1	
–	A	121	C11		–	B	1	B1	GND
–	A	39	A11		–	B	51	D2	
–	A	40	A10		–	B	50	C2	
–	A	85	B10		–	B	94	D3	
–	A	122	C10		–	B	3	D1	
–	A	86	B9		–	B	4	E1	
–	A	41	A9		–	B	52	E2	
–	A	123	C9		–	B	95	E3	
–	A	141	D9		–	B	53	F2	
–	A	42	A8		–	B	5	F1	
–	A	87	B8		–	B	96	F3	
–	A	124	C8		–	B	129	F4	
–	A	142	D8		–	B	6	G1	
–	A	143	D7		–	B	54	G2	
–	A	125	C7		–	B	97	G3	
–	A	88	B7		–	B	130	G4	
–	A	43	A7		–	B	131	H4	
–	A	144	D6		–	B	98	H3	
–	A	126	C6		–	B	55	H2	
–	A	44	A6		–	B	7	H1	
–	A	89	B6		–	B	132	J4	
–	A	127	C5		–	B	99	J3	
–	A	90	B5		–	B	8	J1	
–	A	45	A5		–	B	56	J2	
–	A	46	A4		–	B	100	K3	
–	A	128	C4		–	B	57	K2	
–	A	93	C3		–	B	9	K1	
–	A	91	B4		–	B	10	L1	

Table 4-21. Correspondence Between Internal Chip Sides and Ball Numbers (144-pin FPBGA) (2/3)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

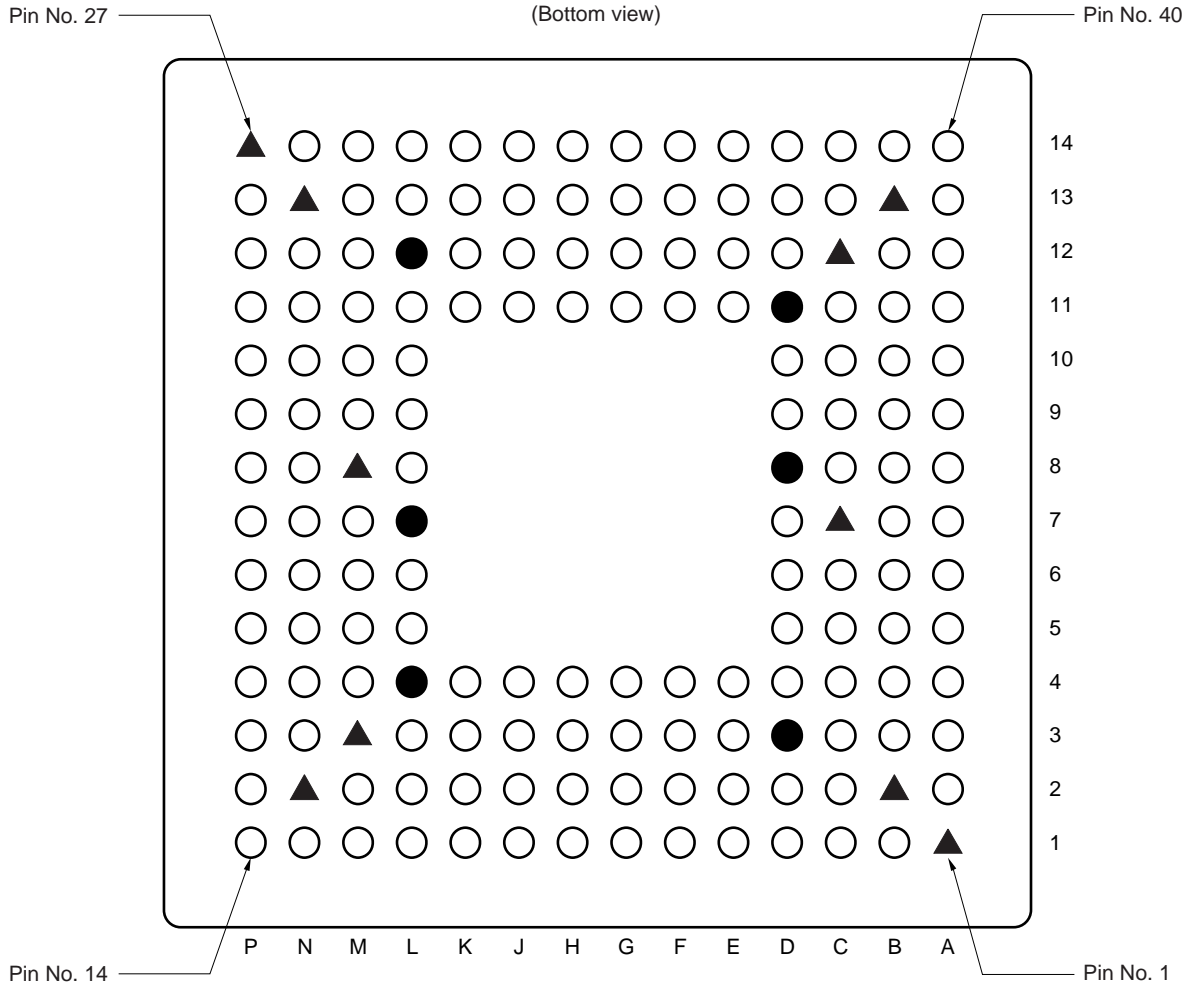
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	101	L3		–	C	68	N10	
–	B	59	M2		–	C	21	P10	
–	B	58	L2		–	C	22	P11	
–	B	12	N1	GND	–	C	110	M11	
–	B	11	M1		–	C	111	M12	
–	B	60	N2	GND	–	C	69	N11	
–	C	14	P3	V _{DD}	–	C	24	P13	
–	C	61	N3		–	C	70	N12	
–	C	13	P2		–	C	23	P12	V _{DD}
–	C	62	N4		–	D	71	N13	GND
–	C	102	M3		–	D	26	M14	
–	C	103	M4		–	D	25	N14	GND
–	C	15	P4		–	D	73	L13	
–	C	16	P5		–	D	72	M13	
–	C	63	N5		–	D	112	L12	
–	C	104	M5		–	D	27	L14	
–	C	64	N6		–	D	28	K14	
–	C	17	P6		–	D	74	K13	
–	C	105	M6		–	D	113	K12	
–	C	133	L6		–	D	75	J13	
–	C	18	P7		–	D	29	J14	
–	C	65	N7		–	D	114	J12	
–	C	106	M7		–	D	137	J11	
–	C	134	L7		–	D	30	H14	
–	C	135	L8		–	D	76	H13	
–	C	107	M8		–	D	115	H12	
–	C	66	N8		–	D	138	H11	
–	C	19	P8		–	D	139	G11	
–	C	136	L9		–	D	116	G12	
–	C	108	M9		–	D	77	G13	
–	C	20	P9		–	D	31	G14	
–	C	67	N9		–	D	140	F11	
–	C	109	M10		–	D	117	F12	

Table 4-21. Correspondence Between Internal Chip Sides and Ball Numbers (144-pin FPBGA) (3/3)

(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	32	F14	
–	D	78	F13	
–	D	118	E12	
–	D	79	E13	
–	D	33	E14	
–	D	34	D14	
–	D	119	D12	
–	D	81	C13	
–	D	80	D13	
–	D	36	B14	GND
–	D	35	C14	
–	D	82	B13	GND

4.9.4 160-pin FPBGA



Remark ▲ : GND (10 pins)
● : V_{DD} (6 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (A1), 27 (P14), 53 (B2), 64 (N2), 75 (N13), 86 (B13), 106 (M3), 111 (M8), 124 (C12), 129 (C7)	98 (D3), 116 (L12), 140 (L4), 143 (L7), 154 (D11), 157 (D8)	None	97	54	3	144

Note Total number of usable signal pins.

Table 4-22. Correspondence Between Internal Chip Sides and Ball Numbers (160-pin FPBGA) (1/3)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	154	D11	V _{DD}	–	A	95	B4	
–	A	41	A13		–	A	133	D4	
–	A	87	B12		–	A	97	C3	
–	A	42	A12		–	A	96	B3	
–	A	125	C11		–	A	51	A3	
–	A	155	D10		–	A	52	A2	
–	A	43	A11		–	A	98	D3	V _{DD}
–	A	88	B11		–	B	1	A1	GND
–	A	126	C10		–	B	53	B2	GND
–	A	44	A10		–	B	2	B1	
–	A	89	B10		–	B	54	C2	
–	A	127	C9		–	B	134	E4	
–	A	45	A9		–	B	3	C1	
–	A	156	D9		–	B	55	D2	
–	A	90	B9		–	B	99	E3	
–	A	46	A8		–	B	4	D1	
–	A	91	B8		–	B	56	E2	
–	A	128	C8		–	B	57	F2	
–	A	47	A7		–	B	5	E1	
–	A	157	D8	V _{DD}	–	B	135	F4	
–	A	129	C7	GND	–	B	100	F3	
–	A	92	B7		–	B	6	F1	
–	A	158	D7		–	B	58	G2	
–	A	48	A6		–	B	101	G3	
–	A	159	D6		–	B	136	G4	
–	A	93	B6		–	B	7	G1	
–	A	49	A5		–	B	102	H3	
–	A	131	C5		–	B	137	H4	
–	A	130	C6		–	B	60	J2	
–	A	50	A4		–	B	8	H1	
–	A	94	B5		–	B	59	H2	
–	A	160	D5		–	B	138	J4	
–	A	132	C4		–	B	9	J1	

Table 4-22. Correspondence Between Internal Chip Sides and Ball Numbers (160-pin FPBGA) (2/3)

(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	139	K4		–	C	143	L7	V _{DD}
–	B	103	J3		–	C	111	M8	GND
–	B	62	L2		–	C	70	N8	
–	B	104	K3		–	C	144	L8	
–	B	10	K1		–	C	22	P9	
–	B	61	K2		–	C	145	L9	
–	B	63	M2		–	C	71	N9	
–	B	11	L1		–	C	23	P10	
–	B	105	L3		–	C	113	M10	
–	B	12	M1		–	C	112	M9	
–	B	14	P1		–	C	24	P11	
–	B	13	N1		–	C	72	N10	
–	B	106	M3	GND	–	C	146	L10	
–	B	64	N2	GND	–	C	114	M11	
–	C	140	L4	V _{DD}	–	C	73	N11	
–	C	15	P2		–	C	147	L11	
–	C	65	N3		–	C	115	M12	
–	C	16	P3		–	C	74	N12	
–	C	107	M4		–	C	25	P12	
–	C	141	L5		–	C	26	P13	
–	C	17	P4		–	C	116	L12	V _{DD}
–	C	66	N4		–	D	27	P14	GND
–	C	108	M5		–	D	75	N13	GND
–	C	18	P5		–	D	28	N14	
–	C	67	N5		–	D	76	M13	
–	C	109	M6		–	D	148	K11	
–	C	19	P6		–	D	29	M14	
–	C	142	L6		–	D	77	L13	
–	C	68	N6		–	D	117	K12	
–	C	20	P7		–	D	30	L14	
–	C	69	N7		–	D	78	K13	
–	C	110	M7		–	D	79	J13	
–	C	21	P8		–	D	31	K14	

Table 4-22. Correspondence Between Internal Chip Sides and Ball Numbers (160-pin FPBGA) (3/3)

(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	149	J11	
–	D	118	J12	
–	D	32	J14	
–	D	80	H13	
–	D	119	H12	
–	D	150	H11	
–	D	33	H14	
–	D	120	G12	
–	D	151	G11	
–	D	82	F13	
–	D	34	G14	
–	D	81	G13	
–	D	152	F11	
–	D	35	F14	
–	D	153	E11	
–	D	121	F12	
–	D	84	D13	
–	D	122	E12	
–	D	36	E14	
–	D	83	E13	
–	D	85	C13	
–	D	37	D14	
–	D	123	D12	
–	D	38	C14	
–	D	40	A14	
–	D	39	B14	
–	D	124	C12	GND
–	D	86	B13	GND

Table 4-23. Correspondence Between Internal Chip Sides and Ball Numbers (161-pin FPBGA) (1/3)
(CMOS-N5, CMOS-9HD, EA-9HD, CMOS-10HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	154	D11	V _{DD}	–	A	52	A2	
–	A	41	A13		–	A	131	C5	
–	A	40	A14		–	A	96	B3	
–	A	125	C11		–	A	160	D5	
–	A	87	B12		–	A	132	C4	
–	A	88	B11		–	A	133	D4	
–	A	42	A12		–	A	161	E5	GND
–	A	43	A11		–	A	98	D3	V _{DD}
–	A	89	B10		–	B	1	A1	GND
–	A	155	D10		–	B	53	B2	GND
–	A	44	A10		–	B	2	B1	
–	A	90	B9		–	B	97	C3	
–	A	45	A9		–	B	54	C2	
–	A	126	C10		–	B	3	C1	
–	A	91	B8		–	B	55	D2	
–	A	127	C9		–	B	4	D1	
–	A	46	A8		–	B	56	E2	
–	A	156	D9		–	B	134	E4	
–	A	128	C8		–	B	5	E1	
–	A	157	D8	V _{DD}	–	B	57	F2	
–	A	129	C7	GND	–	B	6	F1	
–	A	47	A7		–	B	99	E3	
–	A	159	D6		–	B	58	G2	
–	A	92	B7		–	B	100	F3	
–	A	48	A6		–	B	7	G1	
–	A	49	A5		–	B	136	G4	
–	A	158	D7		–	B	101	G3	
–	A	94	B5		–	B	135	F4	
–	A	93	B6		–	B	102	H3	
–	A	50	A4		–	B	8	H1	
–	A	95	B4		–	B	138	J4	
–	A	51	A3		–	B	59	H2	
–	A	130	C6		–	B	9	J1	

Table 4-23. Correspondence Between Internal Chip Sides and Ball Numbers (161-pin FPBGA) (2/3)
(CMOS-N5, CMOS-9HD, EA-9HD, CMOS-10HD Series)

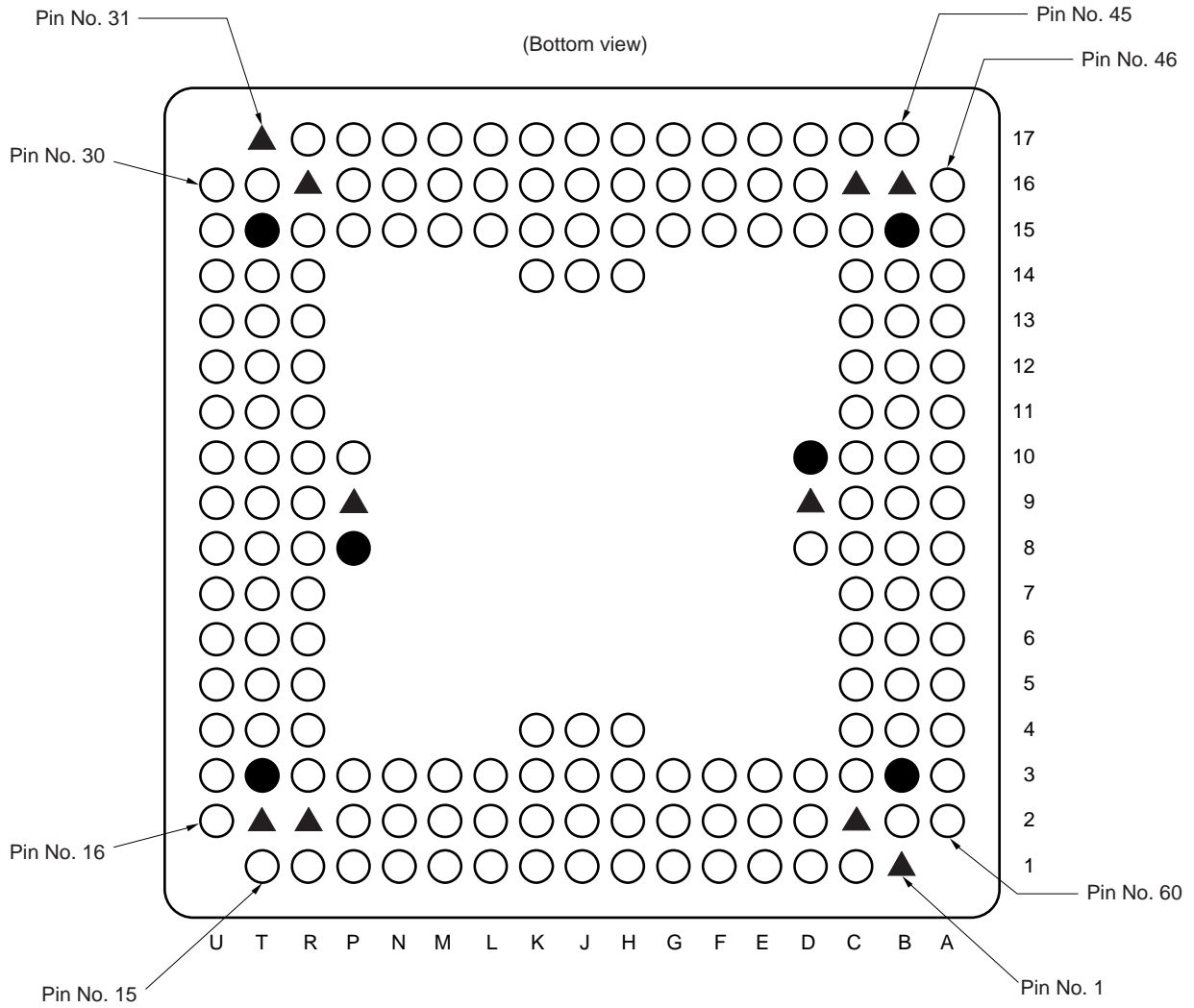
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	10	K1		–	C	110	M7	
–	B	137	H4		–	C	143	L7	V _{DD}
–	B	61	K2		–	C	111	M8	GND
–	B	60	J2		–	C	21	P8	
–	B	11	L1		–	C	145	L9	
–	B	62	L2		–	C	70	N8	
–	B	12	M1		–	C	22	P9	
–	B	103	J3		–	C	23	P10	
–	B	13	N1		–	C	144	L8	
–	B	104	K3		–	C	72	N10	
–	B	63	M2		–	C	71	N9	
–	B	139	K4		–	C	24	P11	
–	B	105	L3		–	C	73	N11	
–	B	106	M3	GND	–	C	25	P12	
–	B	64	N2	GND	–	C	112	M9	
–	C	140	L4	V _{DD}	–	C	26	P13	
–	C	15	P2		–	C	113	M10	
–	C	14	P1		–	C	74	N12	
–	C	107	M4		–	C	146	L10	
–	C	65	N3		–	C	147	L11	
–	C	66	N4		–	C	114	M11	
–	C	16	P3		–	C	116	L12	V _{DD}
–	C	17	P4		–	D	27	P14	GND
–	C	67	N5		–	D	75	N13	GND
–	C	141	L5		–	D	28	N14	
–	C	18	P5		–	D	115	M12	
–	C	68	N6		–	D	76	M13	
–	C	19	P6		–	D	77	L13	
–	C	108	M5		–	D	29	M14	
–	C	69	N7		–	D	30	L14	
–	C	109	M6		–	D	78	K13	
–	C	20	P7		–	D	148	K11	
–	C	142	L6		–	D	31	K14	

Table 4-23. Correspondence Between Internal Chip Sides and Ball Numbers (161-pin FPBGA) (3/3)

(CMOS-N5, CMOS-9HD, EA-9HD, CMOS-10HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	79	J13	
–	D	32	J14	
–	D	117	K12	
–	D	80	H13	
–	D	118	J12	
–	D	33	H14	
–	D	150	H11	
–	D	119	H12	
–	D	149	J11	
–	D	120	G12	
–	D	34	G14	
–	D	152	F11	
–	D	81	G13	
–	D	35	F14	
–	D	36	E14	
–	D	151	G11	
–	D	83	E13	
–	D	82	F13	
–	D	37	D14	
–	D	84	D13	
–	D	38	C14	
–	D	121	F12	
–	D	39	B14	
–	D	122	E12	
–	D	85	C13	
–	D	153	E11	
–	D	123	D12	
–	D	124	C12	GND
–	D	86	B13	GND

4.9.6 176-pin FPBGA



Remark ▲: GND (10 pins)
●: V_{DD} (6 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (B1), 31 (T17), 62 (C2), 74 (R2), 75 (T2), 90 (R16), 102 (C16), 103 (B16), 169 (P9), 175 (D9)	76 (T3), 88 (T15), 104 (B15), 116 (B3), 168 (P8), 174 (D10)	None	3	117	118	160

Note Total number of usable signal pins.

Table 4-24. Correspondence Between Internal Chip Sides and Ball Numbers (176-pin FPBGA) (1/3)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	104	B15	V _{DD}	–	A	113	B6	
–	A	46	A16		–	A	163	C5	
–	A	105	B14		–	A	57	A5	
–	A	47	A15		–	A	164	C4	
–	A	153	C15		–	A	114	B5	
–	A	48	A14		–	A	115	B4	
–	A	106	B13		–	A	58	A4	
–	A	154	C14		–	A	60	A2	
–	A	49	A13		–	A	59	A3	
–	A	155	C13		–	A	61	B2	
–	A	107	B12		–	A	116	B3	V _{DD}
–	A	156	C12		–	B	1	B1	GND
–	A	50	A12		–	B	62	C2	GND
–	A	108	B11		–	B	63	D2	
–	A	157	C11		–	B	2	C1	
–	A	51	A11		–	B	117	C3	
–	A	109	B10		–	B	3	D1	
–	A	158	C10		–	B	64	E2	
–	A	110	B9		–	B	118	D3	
–	A	52	A10		–	B	4	E1	
–	A	53	A9		–	B	119	E3	
–	A	174	D10	V _{DD}	–	B	65	F2	
–	A	175	D9	GND	–	B	120	F3	
–	A	159	C9		–	B	5	F1	
–	A	176	D8		–	B	66	G2	
–	A	54	A8		–	B	121	G3	
–	A	160	C8		–	B	6	G1	
–	A	111	B8		–	B	67	H2	
–	A	55	A7		–	B	122	H3	
–	A	161	C7		–	B	68	J2	
–	A	56	A6		–	B	7	H1	
–	A	112	B7		–	B	8	J1	
–	A	162	C6		–	B	165	H4	

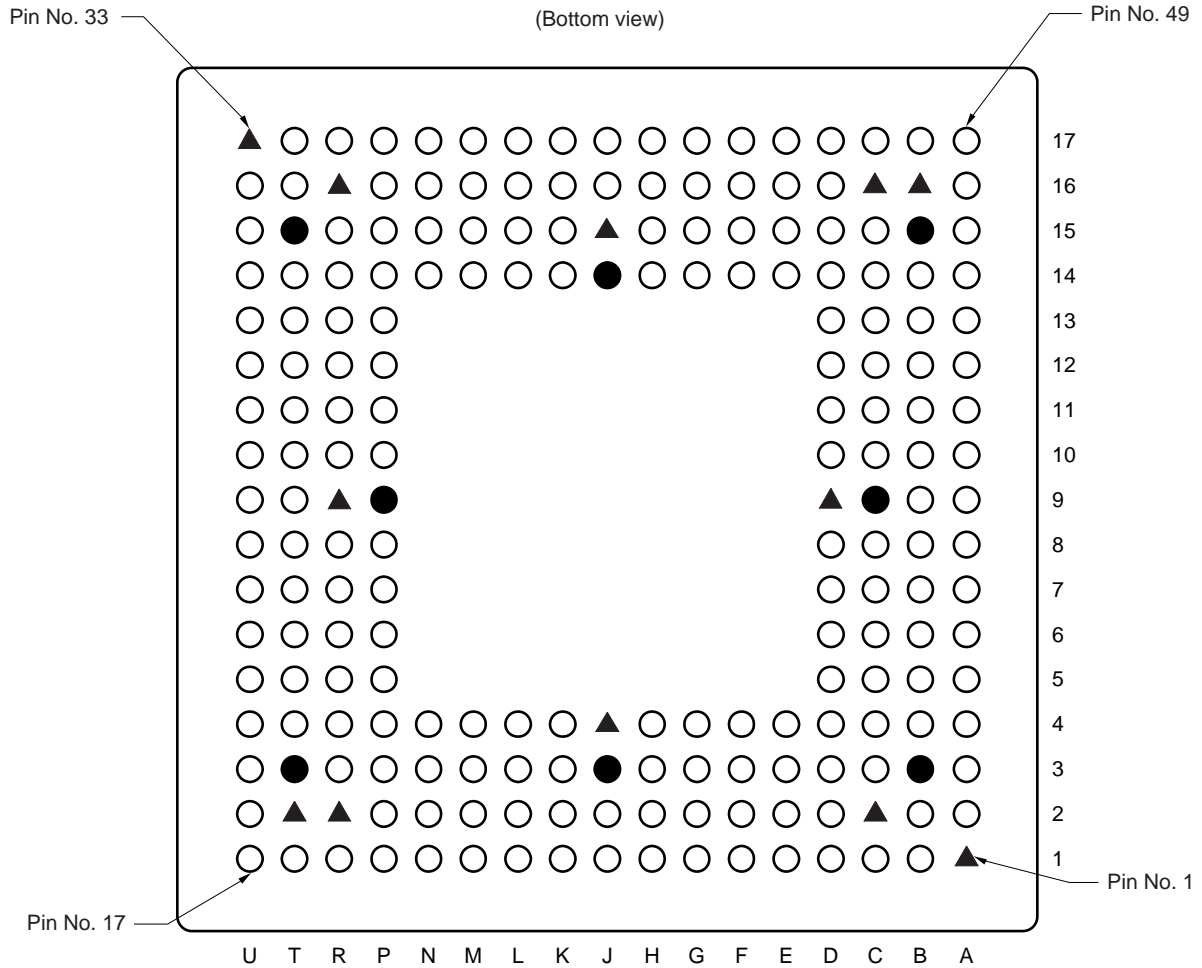
Table 4-24. Correspondence Between Internal Chip Sides and Ball Numbers (176-pin FPBGA) (2/3)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	166	J4		–	C	132	R6	
–	B	123	J3		–	C	20	U6	
–	B	167	K4		–	C	80	T7	
–	B	9	K1		–	C	133	R7	
–	B	124	K3		–	C	21	U7	
–	B	69	K2		–	C	81	T8	
–	B	10	L1		–	C	134	R8	
–	B	125	L3		–	C	82	T9	
–	B	11	M1		–	C	22	U8	
–	B	70	L2		–	C	23	U9	
–	B	126	M3		–	C	168	P8	V _{DD}
–	B	12	N1		–	C	169	P9	GND
–	B	71	M2		–	C	135	R9	
–	B	72	N2		–	C	170	P10	
–	B	127	N3		–	C	24	U10	
–	B	13	P1		–	C	136	R10	
–	B	128	P3		–	C	83	T10	
–	B	14	R1		–	C	25	U11	
–	B	73	P2		–	C	137	R11	
–	B	15	T1		–	C	26	U12	
–	B	74	R2	GND	–	C	84	T11	
–	B	75	T2	GND	–	C	138	R12	
–	C	76	T3	V _{DD}	–	C	85	T12	
–	C	16	U2		–	C	139	R13	
–	C	77	T4		–	C	27	U13	
–	C	17	U3		–	C	140	R14	
–	C	129	R3		–	C	86	T13	
–	C	18	U4		–	C	87	T14	
–	C	78	T5		–	C	28	U14	
–	C	130	R4		–	C	30	U16	
–	C	19	U5		–	C	29	U15	
–	C	131	R5		–	C	89	T16	
–	C	79	T6		–	C	88	T15	V _{DD}

Table 4-24. Correspondence Between Internal Chip Sides and Ball Numbers (176-pin FPBGA) (3/3)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	31	T17	GND	–	D	42	E17	
–	D	90	R16	GND	–	D	99	F16	
–	D	91	P16		–	D	100	E16	
–	D	32	R17		–	D	151	E15	
–	D	141	R15		–	D	43	D17	
–	D	33	P17		–	D	152	D15	
–	D	92	N16		–	D	44	C17	
–	D	142	P15		–	D	101	D16	
–	D	34	N17		–	D	45	B17	
–	D	143	N15		–	D	102	C16	GND
–	D	93	M16		–	D	103	B16	GND
–	D	144	M15						
–	D	35	M17						
–	D	94	L16						
–	D	145	L15						
–	D	36	L17						
–	D	95	K16						
–	D	146	K15						
–	D	96	J16						
–	D	37	K17						
–	D	38	J17						
–	D	171	K14						
–	D	172	J14						
–	D	147	J15						
–	D	173	H14						
–	D	39	H17						
–	D	148	H15						
–	D	97	H16						
–	D	40	G17						
–	D	149	G15						
–	D	41	F17						
–	D	98	G16						
–	D	150	F15						

4.9.7 208-pin FPBGA



Remark ▲ : GND (12 pins)
● : V_{DD} (8 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (A1), 33 (U17), 66 (C2), 78 (R2), 79 (T2), 94 (R16), 106 (C16), 107 (B16), 139 (R9), 151 (J15), 174 (J4), 204 (D9)	80 (T3), 92 (T15), 108 (B15), 120 (B3), 127 (J3), 163 (C9), 184 (P9), 194 (J14)	None	168	208	62	188

Note Total number of usable signal pins.

Table 4-25. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (1/4)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	165	C7	
–	A	49	A17		–	A	59	A7	
–	A	50	A16		–	A	116	B7	
–	A	51	A15		–	A	207	D6	
–	A	158	C14		–	A	60	A6	
–	A	52	A14		–	A	166	C6	
–	A	200	D13		–	A	117	B6	
–	A	53	A13		–	A	61	A5	
–	A	109	B14		–	A	208	D5	
–	A	199	D14		–	A	167	C5	
–	A	159	C13		–	A	119	B4	
–	A	110	B13		–	A	118	B5	
–	A	54	A12		–	A	168	C4	
–	A	201	D12		–	A	62	A4	
–	A	160	C12		–	A	63	A3	
–	A	111	B12		–	A	121	C3	
–	A	55	A11		–	A	64	A2	
–	A	202	D11		–	A	65	B2	
–	A	161	C11		–	A	–	–	V _{DD}
–	A	112	B11		–	B	–	–	GND
–	A	56	A10		–	B	–	–	GND
–	A	203	D10		–	B	2	B1	
–	A	162	C10		–	B	3	C1	
–	A	113	B10		–	B	122	D3	
–	A	57	A9		–	B	4	D1	
–	A	–	–	GND	–	B	170	E4	
–	A	–	–	V _{DD}	–	B	5	E1	
–	A	114	B9		–	B	67	D2	
–	A	205	D8		–	B	169	D4	
–	A	164	C8		–	B	123	E3	
–	A	58	A8		–	B	68	E2	
–	A	115	B8		–	B	6	F1	
–	A	206	D7		–	B	171	F4	

Table 4-25. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (2/4)

(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	124	F3		–	B	15	R1	
–	B	69	F2		–	B	133	R3	
–	B	7	G1		–	B	16	T1	
–	B	172	G4		–	B	–	–	GND
–	B	125	G3		–	B	–	–	GND
–	B	70	G2		–	C	–	–	V _{DD}
–	B	8	H1		–	C	17	U1	
–	B	173	H4		–	C	18	U2	
–	B	126	H3		–	C	19	U3	
–	B	71	H2		–	C	134	R4	
–	B	9	J1		–	C	20	U4	
–	B	–	–	GND	–	C	180	P5	
–	B	–	–	V _{DD}	–	C	21	U5	
–	B	72	J2		–	C	81	T4	
–	B	175	K4		–	C	179	P4	
–	B	128	K3		–	C	135	R5	
–	B	10	K1		–	C	82	T5	
–	B	73	K2		–	C	22	U6	
–	B	176	L4		–	C	181	P6	
–	B	129	L3		–	C	136	R6	
–	B	11	L1		–	C	83	T6	
–	B	74	L2		–	C	23	U7	
–	B	177	M4		–	C	182	P7	
–	B	12	M1		–	C	137	R7	
–	B	130	M3		–	C	84	T7	
–	B	75	M2		–	C	24	U8	
–	B	13	N1		–	C	183	P8	
–	B	178	N4		–	C	138	R8	
–	B	131	N3		–	C	85	T8	
–	B	77	P2		–	C	25	U9	
–	B	76	N2		–	C	–	–	V _{DD}
–	B	132	P3		–	C	–	–	GND
–	B	14	P1		–	C	86	T9	

Table 4-25. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (3/4)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	185	P10		–	D	189	P14	
–	C	140	R10		–	D	147	N15	
–	C	26	U10		–	D	96	N16	
–	C	87	T10		–	D	38	M17	
–	C	186	P11		–	D	191	M14	
–	C	141	R11		–	D	148	M15	
–	C	27	U11		–	D	97	M16	
–	C	88	T11		–	D	39	L17	
–	C	187	P12		–	D	192	L14	
–	C	28	U12		–	D	149	L15	
–	C	142	R12		–	D	98	L16	
–	C	89	T12		–	D	40	K17	
–	C	29	U13		–	D	193	K14	
–	C	188	P13		–	D	150	K15	
–	C	143	R13		–	D	99	K16	
–	C	91	T14		–	D	41	J17	
–	C	90	T13		–	D	–	–	V _{DD}
–	C	144	R14		–	D	–	–	GND
–	C	30	U14		–	D	100	J16	
–	C	31	U15		–	D	195	H14	
–	C	145	R15		–	D	152	H15	
–	C	32	U16		–	D	42	H17	
–	C	93	T16		–	D	101	H16	
–	C	–	–	V _{DD}	–	D	196	G14	
–	D	–	–	GND	–	D	153	G15	
–	D	–	–	GND	–	D	43	G17	
–	D	34	T17		–	D	102	G16	
–	D	35	R17		–	D	197	F14	
–	D	146	P15		–	D	44	F17	
–	D	36	P17		–	D	154	F15	
–	D	190	N14		–	D	103	F16	
–	D	37	N17		–	D	45	E17	
–	D	95	P16		–	D	198	E14	

Table 4-25. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (4/4)

(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	155	E15	
–	D	105	D16	
–	D	104	E16	
–	D	156	D15	
–	D	46	D17	
–	D	47	C17	
–	D	157	C15	
–	D	48	B17	
–	D	–	–	GND
–	D	–	–	GND

Table 4-26. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (1/3)
(CMOS-10HD Series: μ PD65304, 65504)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	108	B15	V _{DD}	–	A	62	A4	
–	A	158	C14		–	A	118	B5	
–	A	159	C13		–	A	169	D4	
–	A	49	A17		–	A	208	D5	
–	A	50	A16		–	A	63	A3	
–	A	109	B14		–	A	167	C5	
–	A	160	C12		–	A	119	B4	
–	A	51	A15		–	A	64	A2	
–	A	200	D13		–	A	65	B2	
–	A	52	A14		–	A	168	C4	
–	A	110	B13		–	A	121	C3	
–	A	111	B12		–	A	120	B3	V _{DD}
–	A	161	C11		–	B	1	A1	GND
–	A	53	A13		–	B	66	C2	GND
–	A	201	D12		–	B	123	E3	
–	A	54	A12		–	B	122	D3	
–	A	112	B11		–	B	2	B1	
–	A	55	A11		–	B	67	D2	
–	A	202	D11		–	B	124	F3	
–	A	113	B10		–	B	3	C1	
–	A	162	C10		–	B	170	E4	
–	A	56	A10		–	B	4	D1	
–	A	203	D10		–	B	68	E2	
–	A	114	B9		–	B	69	F2	
–	A	57	A9		–	B	125	G3	
–	A	204	D9	GND	–	B	5	E1	
–	A	163	C9	V _{DD}	–	B	171	F4	
–	A	164	C8		–	B	6	F1	
–	A	58	A8		–	B	70	G2	
–	A	205	D8		–	B	7	G1	
–	A	115	B8		–	B	172	G4	
–	A	206	D7		–	B	71	H2	
–	A	59	A7		–	B	126	H3	
–	A	165	C7		–	B	8	H1	
–	A	116	B7		–	B	173	H4	
–	A	207	D6		–	B	72	J2	
–	A	60	A6		–	B	9	J1	
–	A	166	C6		–	B	174	J4	GND
–	A	61	A5		–	B	127	J3	V _{DD}
–	A	117	B6		–	B	128	K3	

Table 4-26. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (2/3)

(CMOS-10HD Series: μ PD65304, 65504)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	10	K1		–	C	84	T7	
–	B	175	K4		–	C	23	U7	
–	B	73	K2		–	C	182	P7	
–	B	176	L4		–	C	85	T8	
–	B	11	L1		–	C	138	R8	
–	B	129	L3		–	C	24	U8	
–	B	74	L2		–	C	183	P8	
–	B	177	M4		–	C	86	T9	
–	B	12	M1		–	C	25	U9	
–	B	130	M3		–	C	184	P9	V _{DD}
–	B	13	N1		–	C	139	R9	GND
–	B	75	M2		–	C	140	R10	
–	B	14	P1		–	C	26	U10	
–	B	76	N2		–	C	185	P10	
–	B	179	P4		–	C	87	T10	
–	B	178	N4		–	C	186	P11	
–	B	15	R1		–	C	27	U11	
–	B	131	N3		–	C	141	R11	
–	B	77	P2		–	C	88	T11	
–	B	16	T1		–	C	187	P12	
–	B	133	R3		–	C	28	U12	
–	B	132	P3		–	C	142	R12	
–	B	78	R2	GND	–	C	29	U13	
–	B	79	T2	GND	–	C	89	T12	
–	C	80	T3	V _{DD}	–	C	30	U14	
–	C	134	R4		–	C	90	T13	
–	C	135	R5		–	C	189	P14	
–	C	17	U1		–	C	188	P13	
–	C	18	U2		–	C	31	U15	
–	C	81	T4		–	C	143	R13	
–	C	136	R6		–	C	91	T14	
–	C	19	U3		–	C	32	U16	
–	C	180	P5		–	C	93	T16	
–	C	20	U4		–	C	144	R14	
–	C	82	T5		–	C	145	R15	
–	C	83	T6		–	C	92	T15	V _{DD}
–	C	137	R7		–	D	33	U17	GND
–	C	21	U5		–	D	94	R16	GND
–	C	181	P6		–	D	147	N15	
–	C	22	U6		–	D	146	P15	

Table 4-26. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (3/3)
(CMOS-10HD Series: μ PD65304, 65504)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	34	T17		–	D	47	C17	
–	D	95	P16		–	D	155	E15	
–	D	148	M15		–	D	105	D16	
–	D	35	R17		–	D	48	B17	
–	D	190	N14		–	D	157	C15	
–	D	36	P17		–	D	156	D15	
–	D	96	N16		–	D	106	C16	GND
–	D	97	M16		–	D	107	B16	GND
–	D	149	L15						
–	D	37	N17						
–	D	191	M14						
–	D	38	M17						
–	D	98	L16						
–	D	39	L17						
–	D	192	L14						
–	D	99	K16						
–	D	150	K15						
–	D	40	K17						
–	D	193	K14						
–	D	100	J16						
–	D	41	J17						
–	D	194	J14	V _{DD}					
–	D	151	J15	GND					
–	D	152	H15						
–	D	42	H17						
–	D	195	H14						
–	D	101	H16						
–	D	196	G14						
–	D	43	G17						
–	D	153	G15						
–	D	102	G16						
–	D	197	F14						
–	D	44	F17						
–	D	154	F15						
–	D	45	E17						
–	D	103	F16						
–	D	46	D17						
–	D	104	E16						
–	D	199	D14						
–	D	198	E14						

Table 4-27. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (1/3)

(CMOS-10HD Series: μ PD65305, 65505)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	108	B15	V _{DD}	–	A	62	A4	
–	A	158	C14		–	A	169	D4	
–	A	159	C13		–	A	118	B5	
–	A	49	A17		–	A	208	D5	
–	A	50	A16		–	A	63	A3	
–	A	109	B14		–	A	167	C5	
–	A	160	C12		–	A	119	B4	
–	A	51	A15		–	A	64	A2	
–	A	200	D13		–	A	65	B2	
–	A	110	B13		–	A	168	C4	
–	A	52	A14		–	A	121	C3	
–	A	111	B12		–	A	120	B3	V _{DD}
–	A	161	C11		–	B	1	A1	GND
–	A	53	A13		–	B	66	C2	GND
–	A	201	D12		–	B	123	E3	
–	A	54	A12		–	B	122	D3	
–	A	112	B11		–	B	2	B1	
–	A	55	A11		–	B	67	D2	
–	A	202	D11		–	B	124	F3	
–	A	113	B10		–	B	3	C1	
–	A	162	C10		–	B	170	E4	
–	A	56	A10		–	B	68	E2	
–	A	203	D10		–	B	4	D1	
–	A	114	B9		–	B	69	F2	
–	A	57	A9		–	B	125	G3	
–	A	204	D9	GND	–	B	5	E1	
–	A	163	C9	V _{DD}	–	B	171	F4	
–	A	164	C8		–	B	6	F1	
–	A	58	A8		–	B	70	G2	
–	A	205	D8		–	B	7	G1	
–	A	115	B8		–	B	172	G4	
–	A	206	D7		–	B	71	H2	
–	A	59	A7		–	B	126	H3	
–	A	165	C7		–	B	8	H1	
–	A	116	B7		–	B	173	H4	
–	A	207	D6		–	B	72	J2	
–	A	60	A6		–	B	9	J1	
–	A	166	C6		–	B	174	J4	GND
–	A	61	A5		–	B	127	J3	V _{DD}
–	A	117	B6		–	B	128	K3	

Table 4-27. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (2/3)

(CMOS-10HD Series: μ PD65305, 65505)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	10	K1		–	C	84	T7	
–	B	175	K4		–	C	23	U7	
–	B	73	K2		–	C	182	P7	
–	B	176	L4		–	C	85	T8	
–	B	11	L1		–	C	138	R8	
–	B	129	L3		–	C	24	U8	
–	B	74	L2		–	C	183	P8	
–	B	177	M4		–	C	86	T9	
–	B	12	M1		–	C	25	U9	
–	B	130	M3		–	C	184	P9	V _{DD}
–	B	13	N1		–	C	139	R9	GND
–	B	75	M2		–	C	140	R10	
–	B	14	P1		–	C	26	U10	
–	B	179	P4		–	C	185	P10	
–	B	76	N2		–	C	87	T10	
–	B	178	N4		–	C	186	P11	
–	B	15	R1		–	C	27	U11	
–	B	131	N3		–	C	141	R11	
–	B	77	P2		–	C	88	T11	
–	B	16	T1		–	C	187	P12	
–	B	133	R3		–	C	28	U12	
–	B	132	P3		–	C	142	R12	
–	B	78	R2	GND	–	C	29	U13	
–	B	79	T2	GND	–	C	89	T12	
–	C	80	T3	V _{DD}	–	C	30	U14	
–	C	134	R4		–	C	189	P14	
–	C	135	R5		–	C	90	T13	
–	C	17	U1		–	C	188	P13	
–	C	18	U2		–	C	31	U15	
–	C	81	T4		–	C	143	R13	
–	C	136	R6		–	C	91	T14	
–	C	19	U3		–	C	32	U16	
–	C	180	P5		–	C	93	T16	
–	C	82	T5		–	C	144	R14	
–	C	20	U4		–	C	145	R15	
–	C	83	T6		–	C	92	T15	V _{DD}
–	C	137	R7		–	D	33	U17	GND
–	C	21	U5		–	D	94	R16	GND
–	C	181	P6		–	D	147	N15	
–	C	22	U6		–	D	146	P15	

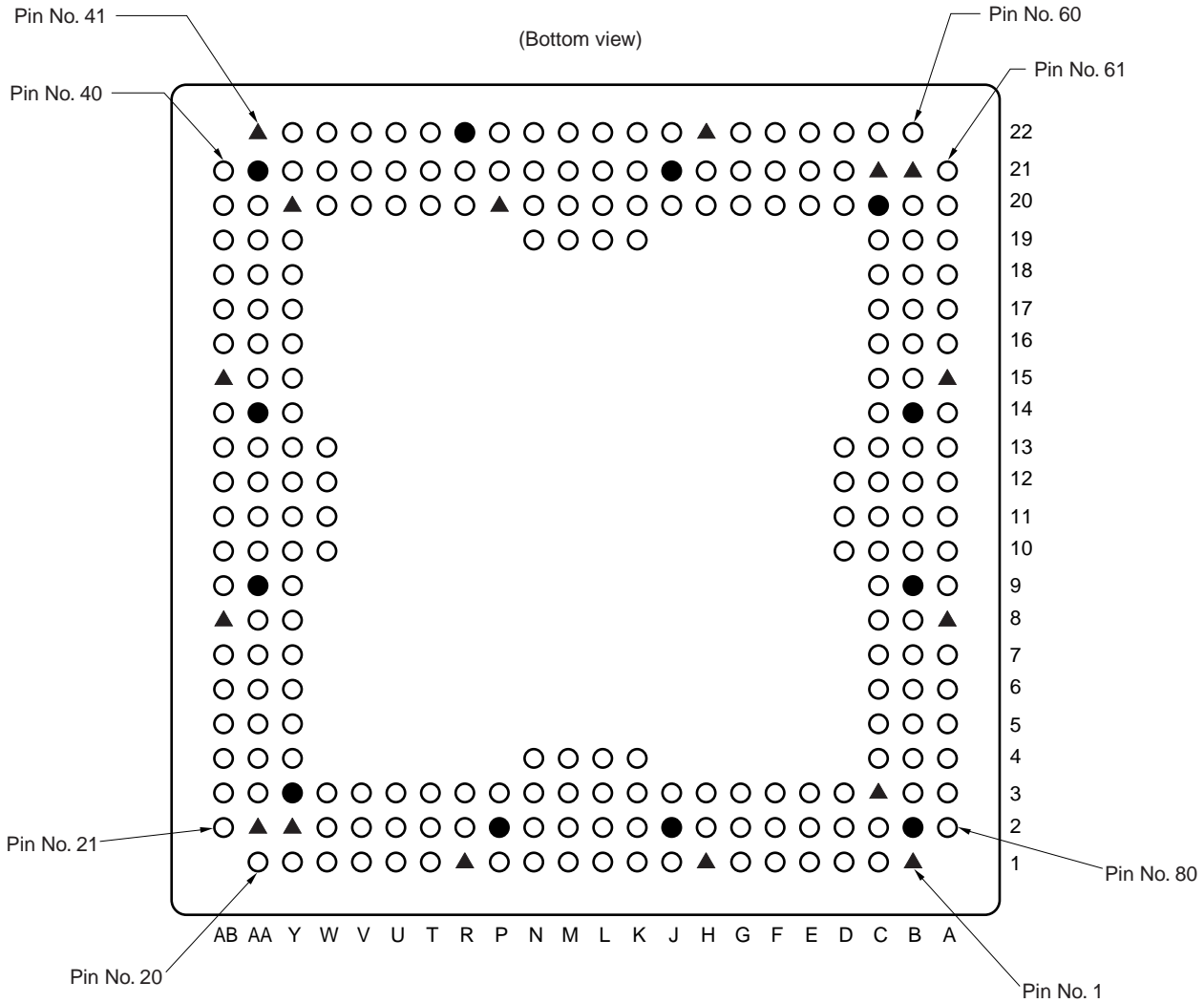
Table 4-27. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (3/3)

(CMOS-10HD Series: μ PD65305, 65505)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	34	T17		–	D	47	C17	
–	D	95	P16		–	D	155	E15	
–	D	148	M15		–	D	105	D16	
–	D	35	R17		–	D	48	B17	
–	D	190	N14		–	D	157	C15	
–	D	96	N16		–	D	156	D15	
–	D	36	P17		–	D	106	C16	GND
–	D	97	M16		–	D	107	B16	GND
–	D	149	L15						
–	D	37	N17						
–	D	191	M14						
–	D	38	M17						
–	D	98	L16						
–	D	39	L17						
–	D	192	L14						
–	D	99	K16						
–	D	150	K15						
–	D	40	K17						
–	D	193	K14						
–	D	100	J16						
–	D	41	J17						
–	D	194	J14	V _{DD}					
–	D	151	J15	GND					
–	D	152	H15						
–	D	42	H17						
–	D	195	H14						
–	D	101	H16						
–	D	196	G14						
–	D	43	G17						
–	D	153	G15						
–	D	102	G16						
–	D	197	F14						
–	D	44	F17						
–	D	154	F15						
–	D	45	E17						
–	D	103	F16						
–	D	46	D17						
–	D	199	D14						
–	D	104	E16						
–	D	198	E14						

4.9.8 240-pin FPBGA (under development)

The correspondence between chip side and ball number is not described (description of correspondence currently being considered), except for CMOS-10HD Series.



Remark ▲ : GND (16 pins)
● : V_{DD} (12 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (B1), 7 (H1), 14 (R1), 27 (AB8), 34 (AB15), 41 (AA22), 54 (H22), 67 (A15), 74 (A8), 99 (Y2), 100 (AA2), 137 (C21), 138 (B21), 157 (C3), 191 (Y20), 197 (P20)	47 (R22), 81 (B2), 88 (J2), 93 (P2), 107 (AA9), 112 (AA14), 119 (AA21), 131 (J21), 145 (B14), 150 (B9), 174 (Y3), 208 (C20)	None	2	158	84	212

Note Total number of usable signal pins.

Table 4-28. Correspondence Between Internal Chip Sides and Ball Numbers (240-pin FPBGA) (1/3)

(CMOS-10HD Series: μ PD65305, 65505)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	208	C20	V _{DD}	–	A	74	A8	GND
–	A	61	A21		–	A	219	C9	
–	A	139	B20		–	A	220	C8	
–	A	140	B19		–	A	75	A7	
–	A	62	A20		–	A	151	B8	
–	A	209	C19		–	A	221	C7	
–	A	141	B18		–	A	152	B7	
–	A	63	A19		–	A	76	A6	
–	A	210	C18		–	A	222	C6	
–	A	142	B17		–	A	77	A5	
–	A	64	A18		–	A	153	B6	
–	A	211	C17		–	A	223	C5	
–	A	143	B16		–	A	154	B5	
–	A	65	A17		–	A	78	A4	
–	A	212	C16		–	A	224	C4	
–	A	213	C15		–	A	155	B4	
–	A	66	A16		–	A	79	A3	
–	A	144	B15		–	A	80	A2	
–	A	214	C14		–	A	156	B3	
–	A	67	A15	GND	–	A	81	B2	V _{DD}
–	A	145	B14	V _{DD}	–	B	157	C3	GND
–	A	215	C13		–	B	1	B1	GND
–	A	68	A14		–	B	82	C2	
–	A	146	B13		–	B	83	D2	
–	A	237	D13		–	B	2	C1	
–	A	69	A13		–	B	158	D3	
–	A	147	B12		–	B	84	E2	
–	A	216	C12		–	B	3	D1	
–	A	70	A12		–	B	159	E3	
–	A	238	D12		–	B	85	F2	
–	A	239	D11		–	B	4	E1	
–	A	71	A11		–	B	160	F3	
–	A	217	C11		–	B	86	G2	
–	A	148	B11		–	B	5	F1	
–	A	72	A10		–	B	161	G3	
–	A	240	D10		–	B	162	H3	
–	A	149	B10		–	B	6	G1	
–	A	73	A9		–	B	87	H2	
–	A	218	C10		–	B	163	J3	
–	A	150	B9	V _{DD}	–	B	7	H1	GND

Table 4-28. Correspondence Between Internal Chip Sides and Ball Numbers (240-pin FPBGA) (2/3)
(CMOS-10HD Series: μ PD65305, 65505)

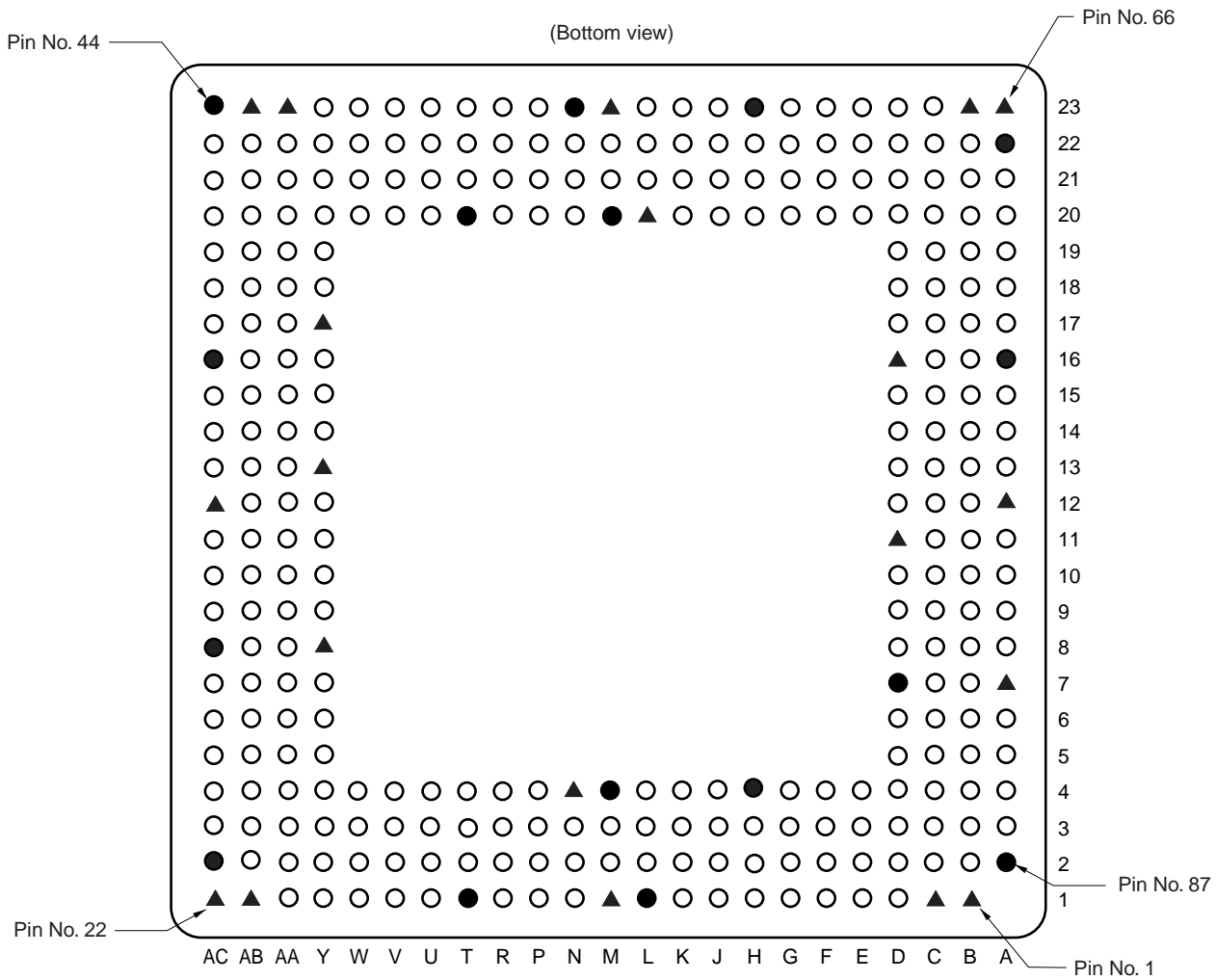
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	88	J2	V _{DD}	–	C	174	Y3	V _{DD}
–	B	164	K3		–	C	21	AB2	
–	B	8	J1		–	C	101	AA3	
–	B	89	K2		–	C	102	AA4	
–	B	225	K4		–	C	22	AB3	
–	B	9	K1		–	C	175	Y4	
–	B	90	L2		–	C	103	AA5	
–	B	165	L3		–	C	23	AB4	
–	B	10	L1		–	C	176	Y5	
–	B	226	L4		–	C	104	AA6	
–	B	227	M4		–	C	24	AB5	
–	B	11	M1		–	C	177	Y6	
–	B	166	M3		–	C	105	AA7	
–	B	91	M2		–	C	25	AB6	
–	B	12	N1		–	C	178	Y7	
–	B	228	N4		–	C	179	Y8	
–	B	92	N2		–	C	26	AB7	
–	B	13	P1		–	C	106	AA8	
–	B	167	N3		–	C	180	Y9	
–	B	93	P2	V _{DD}	–	C	27	AB8	GND
–	B	14	R1	GND	–	C	107	AA9	V _{DD}
–	B	168	P3		–	C	181	Y10	
–	B	169	R3		–	C	28	AB9	
–	B	15	T1		–	C	108	AA10	
–	B	94	R2		–	C	229	W10	
–	B	170	T3		–	C	29	AB10	
–	B	95	T2		–	C	109	AA11	
–	B	16	U1		–	C	182	Y11	
–	B	171	U3		–	C	30	AB11	
–	B	17	V1		–	C	230	W11	
–	B	96	U2		–	C	231	W12	
–	B	172	V3		–	C	31	AB12	
–	B	97	V2		–	C	183	Y12	
–	B	18	W1		–	C	110	AA12	
–	B	173	W3		–	C	32	AB13	
–	B	98	W2		–	C	232	W13	
–	B	19	Y1		–	C	111	AA13	
–	B	20	AA1		–	C	33	AB14	
–	B	99	Y2	GND	–	C	184	Y13	
–	B	100	AA2	GND	–	C	112	AA14	V _{DD}

Table 4-28. Correspondence Between Internal Chip Sides and Ball Numbers (240-pin FPBGA) (3/3)

(CMOS-10HD Series: μ PD65305, 65505)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	34	AB15	GND	–	D	126	P21	
–	C	185	Y14		–	D	198	N20	
–	C	186	Y15		–	D	48	P22	
–	C	35	AB16		–	D	127	N21	
–	C	113	AA15		–	D	233	N19	
–	C	187	Y16		–	D	49	N22	
–	C	114	AA16		–	D	128	M21	
–	C	36	AB17		–	D	199	M20	
–	C	188	Y17		–	D	50	M22	
–	C	37	AB18		–	D	234	M19	
–	C	115	AA17		–	D	235	L19	
–	C	189	Y18		–	D	51	L22	
–	C	116	AA18		–	D	200	L20	
–	C	38	AB19		–	D	129	L21	
–	C	190	Y19		–	D	52	K22	
–	C	117	AA19		–	D	236	K19	
–	C	39	AB20		–	D	130	K21	
–	C	40	AB21		–	D	53	J22	
–	C	118	AA20		–	D	201	K20	
–	C	119	AA21	V _{DD}	–	D	131	J21	V _{DD}
–	D	191	Y20	GND	–	D	54	H22	GND
–	D	41	AA22	GND	–	D	202	J20	
–	D	120	Y21		–	D	203	H20	
–	D	121	W21		–	D	55	G22	
–	D	42	Y22		–	D	132	H21	
–	D	192	W20		–	D	204	G20	
–	D	122	V21		–	D	133	G21	
–	D	43	W22		–	D	56	F22	
–	D	193	V20		–	D	205	F20	
–	D	123	U21		–	D	57	E22	
–	D	44	V22		–	D	134	F21	
–	D	194	U20		–	D	206	E20	
–	D	124	T21		–	D	135	E21	
–	D	45	U22		–	D	58	D22	
–	D	195	T20		–	D	207	D20	
–	D	196	R20		–	D	136	D21	
–	D	46	T22		–	D	59	C22	
–	D	125	R21		–	D	60	B22	
–	D	197	P20	GND	–	D	137	C21	GND
–	D	47	R22	V _{DD}	–	D	138	B21	GND

★ 4.9.9 303-pin FPBGA



Remark ▲ : GND (20 pins)
● : V_{DD} (16 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (B1), 2 (C1), 11 (M1), 21 (AB1), 22 (AC1), 33 (AC12), 45 (AB23), 46 (AA23), 55 (M23), 65 (B23), 66 (A23), 77 (A12), 82 (A7), 249 (N4), 260 (Y8), 265 (Y13), 269 (Y17), 281 (L20), 292 (D16), 297 (D11)	10 (L1), 15 (T1), 23 (AC2), 29 (AC8), 37 (AC16), 44 (AC23), 54 (N23), 59 (H23), 67 (A22), 73 (A16), 87 (A2), 244 (H4), 248 (M4), 276 (T20), 280 (M20), 301 (D7)	None	There are no restrictions on the assignment of dedicated scan path pins.			267

Note Total number of usable signal pins.

Table 4-29. Correspondence Between Internal Chip Sides and Ball Numbers (303-pin FPBGA) (1/4)
(CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	67	A22	V _{DD}	–	A	232	C11	
–	A	223	C20		–	A	79	A10	
–	A	68	A21		–	A	297	D11	GND
–	A	150	B20		–	A	160	B10	
–	A	289	D19		–	A	298	D10	
–	A	149	B21		–	A	80	A9	
–	A	224	C19		–	A	233	C10	
–	A	69	A20		–	A	161	B9	
–	A	290	D18		–	A	299	D9	
–	A	151	B19		–	A	81	A8	
–	A	225	C18		–	A	234	C9	
–	A	70	A19		–	A	163	B7	
–	A	291	D17		–	A	162	B8	
–	A	152	B18		–	A	82	A7	GND
–	A	226	C17		–	A	300	D8	
–	A	71	A18		–	A	164	B6	
–	A	153	B17		–	A	235	C8	
–	A	292	D16	GND	–	A	83	A6	
–	A	227	C16		–	A	236	C7	
–	A	72	A17		–	A	84	A5	
–	A	154	B16		–	A	301	D7	V _{DD}
–	A	293	D15		–	A	165	B5	
–	A	155	B15		–	A	237	C6	
–	A	73	A16	V _{DD}	–	A	85	A4	
–	A	228	C15		–	A	302	D6	
–	A	74	A15		–	A	166	B4	
–	A	294	D14		–	A	238	C5	
–	A	75	A14		–	A	86	A3	
–	A	229	C14		–	A	303	D5	
–	A	157	B13		–	A	167	B3	
–	A	156	B14		–	A	239	C4	
–	A	76	A13		–	A	168	C3	
–	A	295	D13		–	A	88	B2	
–	A	230	C13		–	A	240	D4	
–	A	231	C12		–	A	87	A2	V _{DD}
–	A	158	B12		–	B	1	B1	GND
–	A	296	D12		–	B	169	D3	
–	A	77	A12	GND	–	B	2	C1	GND
–	A	159	B11		–	B	90	D2	
–	A	78	A11		–	B	241	E4	

Table 4-29. Correspondence Between Internal Chip Sides and Ball Numbers (303-pin FPBGA) (2/4)
(CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	89	C2		–	B	14	R1	
–	B	170	E3		–	B	179	P3	
–	B	3	D1		–	B	101	R2	
–	B	242	F4		–	B	251	R4	
–	B	91	E2		–	B	15	T1	V _{DD}
–	B	171	F3		–	B	180	R3	
–	B	4	E1		–	B	103	U2	
–	B	243	G4		–	B	102	T2	
–	B	92	F2		–	B	16	U1	
–	B	172	G3		–	B	252	T4	
–	B	5	F1		–	B	104	V2	
–	B	93	G2		–	B	181	T3	
–	B	244	H4	V _{DD}	–	B	17	V1	
–	B	173	H3		–	B	182	U3	
–	B	6	G1		–	B	18	W1	
–	B	94	H2		–	B	253	U4	
–	B	245	J4		–	B	105	W2	
–	B	95	J2		–	B	183	V3	
–	B	7	H1		–	B	19	Y1	
–	B	174	J3		–	B	254	V4	
–	B	8	J1		–	B	106	Y2	
–	B	246	K4		–	B	184	W3	
–	B	9	K1		–	B	20	AA1	
–	B	175	K3		–	B	255	W4	
–	B	97	L2		–	B	107	AA2	
–	B	96	K2		–	B	185	Y3	
–	B	10	L1	V _{DD}	–	B	186	AA3	
–	B	247	L4		–	B	256	Y4	
–	B	176	L3		–	B	108	AB2	
–	B	177	M3		–	B	21	AB1	GND
–	B	98	M2		–	B	22	AC1	GND
–	B	248	M4	V _{DD}	–	C	23	AC2	V _{DD}
–	B	11	M1	GND	–	C	187	AA4	
–	B	99	N2		–	C	24	AC3	
–	B	12	N1		–	C	110	AB4	
–	B	178	N3		–	C	257	Y5	
–	B	13	P1		–	C	109	AB3	
–	B	249	N4	GND	–	C	188	AA5	
–	B	100	P2		–	C	25	AC4	
–	B	250	P4		–	C	258	Y6	

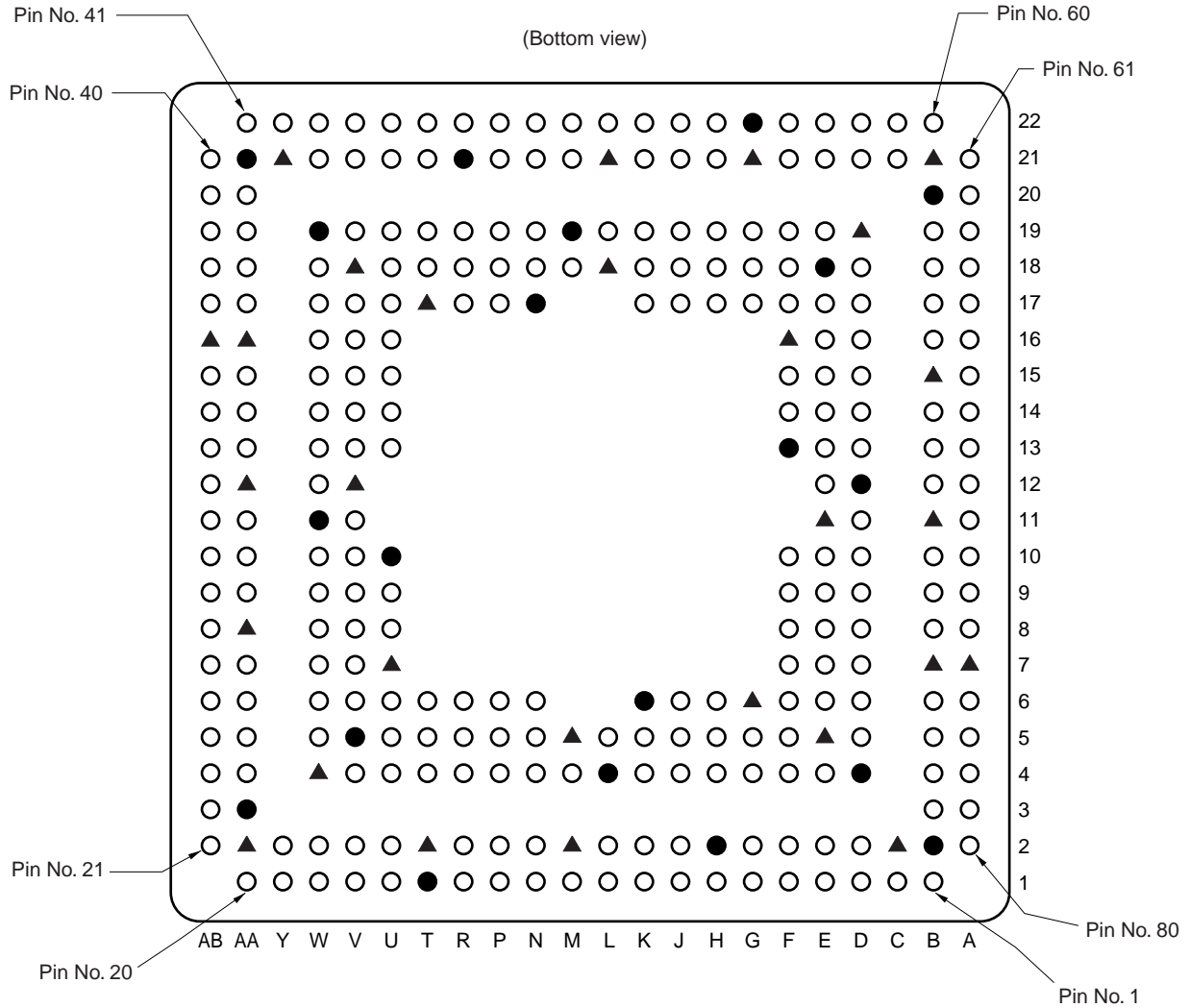
Table 4-29. Correspondence Between Internal Chip Sides and Ball Numbers (303-pin FPBGA) (3/4)
(CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	111	AB5		–	C	37	AC16	V _{DD}
–	C	189	AA6		–	C	198	AA15	
–	C	26	AC5		–	C	123	AB17	
–	C	259	Y7		–	C	122	AB16	
–	C	112	AB6		–	C	38	AC17	
–	C	190	AA7		–	C	268	Y16	
–	C	27	AC6		–	C	124	AB18	
–	C	113	AB7		–	C	199	AA16	
–	C	260	Y8	GND	–	C	39	AC18	
–	C	191	AA8		–	C	200	AA17	
–	C	28	AC7		–	C	40	AC19	
–	C	114	AB8		–	C	269	Y17	GND
–	C	261	Y9		–	C	125	AB19	
–	C	115	AB9		–	C	201	AA18	
–	C	29	AC8	V _{DD}	–	C	41	AC20	
–	C	192	AA9		–	C	270	Y18	
–	C	30	AC9		–	C	126	AB20	
–	C	262	Y10		–	C	202	AA19	
–	C	31	AC10		–	C	42	AC21	
–	C	193	AA10		–	C	271	Y19	
–	C	117	AB11		–	C	127	AB21	
–	C	116	AB10		–	C	203	AA20	
–	C	32	AC11		–	C	43	AC22	
–	C	263	Y11		–	C	272	Y20	
–	C	194	AA11		–	C	204	AA21	
–	C	195	AA12		–	C	128	AB22	
–	C	118	AB12		–	C	44	AC23	V _{DD}
–	C	264	Y12		–	D	45	AB23	GND
–	C	33	AC12	GND	–	D	205	Y21	
–	C	119	AB13		–	D	46	AA23	GND
–	C	34	AC13		–	D	130	Y22	
–	C	196	AA13		–	D	273	W20	
–	C	35	AC14		–	D	129	AA22	
–	C	265	Y13	GND	–	D	206	W21	
–	C	120	AB14		–	D	47	Y23	
–	C	266	Y14		–	D	274	V20	
–	C	36	AC15		–	D	131	W22	
–	C	197	AA14		–	D	207	V21	
–	C	121	AB15		–	D	48	W23	
–	C	267	Y15		–	D	275	U20	

Table 4-29. Correspondence Between Internal Chip Sides and Ball Numbers (303-pin FPBGA) (4/4)
(CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	132	V22		–	D	60	G23	
–	D	208	U21		–	D	284	H20	
–	D	49	V23		–	D	144	F22	
–	D	133	U22		–	D	217	H21	
–	D	276	T20	V _{DD}	–	D	61	F23	
–	D	209	T21		–	D	218	G21	
–	D	50	U23		–	D	62	E23	
–	D	134	T22		–	D	285	G20	
–	D	277	R20		–	D	145	E22	
–	D	135	R22		–	D	219	F21	
–	D	51	T23		–	D	63	D23	
–	D	210	R21		–	D	286	F20	
–	D	52	R23		–	D	146	D22	
–	D	278	P20		–	D	220	E21	
–	D	53	P23		–	D	64	C23	
–	D	211	P21		–	D	287	E20	
–	D	137	N22		–	D	147	C22	
–	D	136	P22		–	D	221	D21	
–	D	54	N23	V _{DD}	–	D	222	C21	
–	D	279	N20		–	D	288	D20	
–	D	212	N21		–	D	148	B22	
–	D	213	M21		–	D	65	B23	GND
–	D	138	M22		–	D	66	A23	GND
–	D	280	M20	V _{DD}					
–	D	55	M23	GND					
–	D	139	L22						
–	D	56	L23						
–	D	214	L21						
–	D	57	K23						
–	D	281	L20	GND					
–	D	140	K22						
–	D	282	K20						
–	D	58	J23						
–	D	215	K21						
–	D	141	J22						
–	D	283	J20						
–	D	59	H23	V _{DD}					
–	D	216	J21						
–	D	143	G22						
–	D	142	H22						

4.9.10 304-pin FPBGA



Remark ▲ : GND (28 pins)
● : V_{DD} (20 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
35 (AB16), 75 (A7), 82 (C2), 91 (M2), 95 (T2), 100 (AA2), 106 (AA8), 110 (AA12), 114 (AA16), 120 (Y21), 129 (L21), 133 (G21), 138 (B21), 144 (B15), 148 (B11), 152 (B7), 172 (W4), 202 (D19), 217 (E5), 224 (M5), 237 (V12), 243 (V18), 250 (L18), 263 (E11), 270 (G6), 279 (U7), 288 (T17), 297 (F16)	15 (T1), 55 (G22), 81 (B2), 87 (H2), 101 (AA3), 119 (AA21), 125 (R21), 139 (B20), 157 (D4), 164 (L4), 179 (W11), 187 (W19), 194 (M19), 209 (D12), 230 (V5), 256 (E18), 273 (K6), 282 (U10), 291 (N17), 300 (F13)	None	3	219	159	256

Note Total number of usable signal pins.

Table 4-30. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (1/5)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	256	E18	V _{DD}	–	A	147	B12	
–	A	139	B20	V _{DD}	–	A	262	E12	
–	A	61	A21		–	A	70	A12	
–	A	257	E17		–	A	209	D12	V _{DD}
–	A	141	B18		–	A	300	F13	V _{DD}
–	A	140	B19		–	A	148	B11	GND
–	A	62	A20		–	A	263	E11	GND
–	A	203	D18		–	A	71	A11	
–	A	296	F17		–	A	301	F10	
–	A	63	A19		–	A	149	B10	
–	A	142	B17		–	A	210	D11	
–	A	258	E16		–	A	72	A10	
–	A	64	A18		–	A	264	E10	
–	A	204	D17		–	A	302	F9	
–	A	143	B16		–	A	150	B9	
–	A	259	E15		–	A	73	A9	
–	A	65	A17		–	A	211	D10	
–	A	205	D16		–	A	265	E9	
–	A	144	B15	GND	–	A	303	F8	
–	A	297	F16	GND	–	A	74	A8	
–	A	66	A16		–	A	151	B8	
–	A	260	E14		–	A	212	D9	
–	A	206	D15		–	A	266	E8	
–	A	67	A15		–	A	75	A7	GND
–	A	145	B14		–	A	152	B7	GND
–	A	298	F15		–	A	214	D7	
–	A	207	D14		–	A	213	D8	
–	A	68	A14		–	A	76	A6	
–	A	146	B13		–	A	267	E7	
–	A	261	E13		–	A	153	B6	
–	A	299	F14		–	A	304	F7	
–	A	69	A13		–	A	77	A5	
–	A	208	D13		–	A	215	D6	

Table 4-30. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (2/5)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	154	B5		–	B	7	H1	
–	A	268	E6		–	B	88	J2	
–	A	78	A4		–	B	271	H6	
–	A	216	D5		–	B	162	J4	
–	A	79	A3		–	B	8	J1	
–	A	156	B3		–	B	89	K2	
–	A	155	B4		–	B	222	K5	
–	A	80	A2		–	B	272	J6	
–	A	81	B2	V _{DD}	–	B	9	K1	
–	A	157	D4	V _{DD}	–	B	163	K4	
–	B	217	E5	GND	–	B	90	L2	
–	B	82	C2	GND	–	B	223	L5	
–	B	1	B1		–	B	10	L1	
–	B	218	F5		–	B	164	L4	V _{DD}
–	B	84	E2		–	B	273	K6	V _{DD}
–	B	83	D2		–	B	91	M2	GND
–	B	2	C1		–	B	224	M5	GND
–	B	158	E4		–	B	11	M1	
–	B	269	F6		–	B	274	N6	
–	B	3	D1		–	B	92	N2	
–	B	85	F2		–	B	165	M4	
–	B	219	G5		–	B	12	N1	
–	B	4	E1		–	B	225	N5	
–	B	159	F4		–	B	275	P6	
–	B	86	G2		–	B	93	P2	
–	B	220	H5		–	B	13	P1	
–	B	5	F1		–	B	166	N4	
–	B	160	G4		–	B	226	P5	
–	B	87	H2	V _{DD}	–	B	276	R6	
–	B	270	G6	GND	–	B	14	R1	
–	B	6	G1		–	B	94	R2	
–	B	221	J5		–	B	167	P4	
–	B	161	H4		–	B	227	R5	

Table 4-30. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (3/5)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	15	T1	V _{DD}	–	C	174	W6	
–	B	95	T2	GND	–	C	105	AA7	
–	B	169	T4		–	C	233	V8	
–	B	168	R4		–	C	25	AB6	
–	B	16	U1		–	C	175	W7	
–	B	228	T5		–	C	106	AA8	GND
–	B	96	U2		–	C	279	U7	GND
–	B	277	T6		–	C	26	AB7	
–	B	17	V1		–	C	234	V9	
–	B	170	U4		–	C	176	W8	
–	B	97	V2		–	C	27	AB8	
–	B	229	U5		–	C	107	AA9	
–	B	18	W1		–	C	280	U8	
–	B	171	V4		–	C	177	W9	
–	B	19	Y1		–	C	28	AB9	
–	B	99	Y2		–	C	108	AA10	
–	B	98	W2		–	C	235	V10	
–	B	20	AA1		–	C	281	U9	
–	B	100	AA2	GND	–	C	29	AB10	
–	B	172	W4	GND	–	C	178	W10	
–	C	230	V5	V _{DD}	–	C	109	AA11	
–	C	101	AA3	V _{DD}	–	C	236	V11	
–	C	21	AB2		–	C	30	AB11	
–	C	231	V6		–	C	179	W11	V _{DD}
–	C	103	AA5		–	C	282	U10	V _{DD}
–	C	102	AA4		–	C	110	AA12	GND
–	C	22	AB3		–	C	237	V12	GND
–	C	173	W5		–	C	31	AB12	
–	C	278	U6		–	C	283	U13	
–	C	23	AB4		–	C	111	AA13	
–	C	104	AA6		–	C	180	W12	
–	C	232	V7		–	C	32	AB13	
–	C	24	AB5		–	C	238	V13	

Table 4-30. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (4/5)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	284	U14		–	D	244	U18	
–	C	112	AA14		–	D	122	V21	
–	C	33	AB14		–	D	121	W21	
–	C	181	W13		–	D	42	Y22	
–	C	239	V14		–	D	188	V19	
–	C	285	U15		–	D	287	U17	
–	C	34	AB15		–	D	43	W22	
–	C	113	AA15		–	D	123	U21	
–	C	182	W14		–	D	245	T18	
–	C	240	V15		–	D	44	V22	
–	C	35	AB16	GND	–	D	189	U19	
–	C	114	AA16	GND	–	D	124	T21	
–	C	184	W16		–	D	246	R18	
–	C	183	W15		–	D	45	U22	
–	C	36	AB17		–	D	190	T19	
–	C	241	V16		–	D	125	R21	V _{DD}
–	C	115	AA17		–	D	288	T17	GND
–	C	286	U16		–	D	46	T22	
–	C	37	AB18		–	D	247	P18	
–	C	185	W17		–	D	191	R19	
–	C	116	AA18		–	D	47	R22	
–	C	242	V17		–	D	126	P21	
–	C	38	AB19		–	D	289	R17	
–	C	186	W18		–	D	192	P19	
–	C	39	AB20		–	D	48	P22	
–	C	118	AA20		–	D	127	N21	
–	C	117	AA19		–	D	248	N18	
–	C	40	AB21		–	D	290	P17	
–	C	119	AA21	V _{DD}	–	D	49	N22	
–	C	187	W19	V _{DD}	–	D	193	N19	
–	D	243	V18	GND	–	D	128	M21	
–	D	120	Y21	GND	–	D	249	M18	
–	D	41	AA22		–	D	50	M22	

Table 4-30. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (5/5)
(CMOS-N5, CMOS-9HD, EA-9HD Series)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	194	M19	V _{DD}	–	D	201	E19	
–	D	291	N17	V _{DD}	–	D	59	C22	
–	D	129	L21	GND	–	D	137	C21	
–	D	250	L18	GND	–	D	136	D21	
–	D	51	L22		–	D	60	B22	
–	D	292	K17		–	D	138	B21	GND
–	D	130	K21		–	D	202	D19	GND
–	D	195	L19						
–	D	52	K22						
–	D	251	K18						
–	D	293	J17						
–	D	131	J21						
–	D	53	J22						
–	D	196	K19						
–	D	252	J18						
–	D	294	H17						
–	D	54	H22						
–	D	132	H21						
–	D	197	J19						
–	D	253	H18						
–	D	55	G22	V _{DD}					
–	D	133	G21	GND					
–	D	199	G19						
–	D	198	H19						
–	D	56	F22						
–	D	254	G18						
–	D	134	F21						
–	D	295	G17						
–	D	57	E22						
–	D	200	F19						
–	D	135	E21						
–	D	255	F18						
–	D	58	D22						

Table 4-31. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (1/4)

(CMOS-10HD Series: μ PD65309, 65509)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	256	E18	V _{DD}	–	A	71	A11	
–	A	139	B20	V _{DD}	–	A	264	E10	
–	A	296	F17		–	A	149	B10	
–	A	61	A21		–	A	210	D11	
–	A	140	B19		–	A	72	A10	
–	A	203	D18		–	A	301	F10	
–	A	62	A20		–	A	73	A9	
–	A	141	B18		–	A	265	E9	
–	A	204	D17		–	A	150	B9	
–	A	63	A19		–	A	211	D10	
–	A	257	E17		–	A	74	A8	
–	A	142	B17		–	A	302	F9	
–	A	258	E16		–	A	151	B8	
–	A	64	A18		–	A	266	E8	
–	A	205	D16		–	A	212	D9	
–	A	143	B16		–	A	303	F8	
–	A	259	E15		–	A	75	A7	GND
–	A	65	A17		–	A	152	B7	GND
–	A	144	B15	GND	–	A	76	A6	
–	A	297	F16	GND	–	A	153	B6	
–	A	206	D15		–	A	77	A5	
–	A	66	A16		–	A	213	D8	
–	A	298	F15		–	A	154	B5	
–	A	145	B14		–	A	267	E7	
–	A	260	E14		–	A	78	A4	
–	A	67	A15		–	A	304	F7	
–	A	207	D14		–	A	155	B4	
–	A	68	A14		–	A	214	D7	
–	A	299	F14		–	A	79	A3	
–	A	146	B13		–	A	268	E6	
–	A	261	E13		–	A	156	B3	
–	A	69	A13		–	A	215	D6	
–	A	208	D13		–	A	80	A2	
–	A	147	B12		–	A	216	D5	
–	A	262	E12		–	A	81	B2	V _{DD}
–	A	70	A12		–	A	157	D4	V _{DD}
–	A	300	F13	V _{DD}	–	B	217	E5	GND
–	A	209	D12	V _{DD}	–	B	82	C2	GND
–	A	148	B11	GND	–	B	269	F6	
–	A	263	E11	GND	–	B	1	B1	

Table 4-31. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (2/4)
(CMOS-10HD Series: μ PD65309, 65509)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	83	D2		–	B	12	N1	
–	B	158	E4		–	B	274	N6	
–	B	2	C1		–	B	13	P1	
–	B	84	E2		–	B	226	P5	
–	B	159	F4		–	B	93	P2	
–	B	3	D1		–	B	166	N4	
–	B	218	F5		–	B	14	R1	
–	B	85	F2		–	B	275	P6	
–	B	219	G5		–	B	94	R2	
–	B	4	E1		–	B	227	R5	
–	B	160	G4		–	B	167	P4	
–	B	86	G2		–	B	276	R6	
–	B	220	H5		–	B	15	T1	V _{DD}
–	B	5	F1		–	B	95	T2	GND
–	B	87	H2	V _{DD}	–	B	16	U1	
–	B	270	G6	GND	–	B	96	U2	
–	B	161	H4		–	B	17	V1	
–	B	6	G1		–	B	168	R4	
–	B	271	H6		–	B	97	V2	
–	B	88	J2		–	B	228	T5	
–	B	221	J5		–	B	18	W1	
–	B	7	H1		–	B	277	T6	
–	B	162	J4		–	B	98	W2	
–	B	8	J1		–	B	169	T4	
–	B	272	J6		–	B	19	Y1	
–	B	89	K2		–	B	229	U5	
–	B	222	K5		–	B	99	Y2	
–	B	9	K1		–	B	170	U4	
–	B	163	K4		–	B	20	AA1	
–	B	90	L2		–	B	171	V4	
–	B	223	L5		–	B	100	AA2	GND
–	B	10	L1		–	B	172	W4	GND
–	B	273	K6	V _{DD}	–	C	230	V5	V _{DD}
–	B	164	L4	V _{DD}	–	C	101	AA3	V _{DD}
–	B	91	M2	GND	–	C	278	U6	
–	B	224	M5	GND	–	C	21	AB2	
–	B	11	M1		–	C	102	AA4	
–	B	225	N5		–	C	173	W5	
–	B	92	N2		–	C	22	AB3	
–	B	165	M4		–	C	103	AA5	

Table 4-31. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (3/4)

(CMOS-10HD Series: μ PD65309, 65509)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	174	W6		–	C	112	AA14	
–	C	23	AB4		–	C	181	W13	
–	C	231	V6		–	C	34	AB15	
–	C	104	AA6		–	C	284	U14	
–	C	232	V7		–	C	113	AA15	
–	C	24	AB5		–	C	240	V15	
–	C	175	W7		–	C	182	W14	
–	C	105	AA7		–	C	285	U15	
–	C	233	V8		–	C	35	AB16	GND
–	C	25	AB6		–	C	114	AA16	GND
–	C	106	AA8	GND	–	C	36	AB17	
–	C	279	U7	GND	–	C	115	AA17	
–	C	176	W8		–	C	37	AB18	
–	C	26	AB7		–	C	183	W15	
–	C	280	U8		–	C	116	AA18	
–	C	107	AA9		–	C	241	V16	
–	C	234	V9		–	C	38	AB19	
–	C	27	AB8		–	C	286	U16	
–	C	177	W9		–	C	117	AA19	
–	C	28	AB9		–	C	184	W16	
–	C	281	U9		–	C	39	AB20	
–	C	108	AA10		–	C	242	V17	
–	C	235	V10		–	C	118	AA20	
–	C	29	AB10		–	C	185	W17	
–	C	178	W10		–	C	40	AB21	
–	C	109	AA11		–	C	186	W18	
–	C	236	V11		–	C	119	AA21	V _{DD}
–	C	30	AB11		–	C	187	W19	V _{DD}
–	C	282	U10	V _{DD}	–	D	243	V18	GND
–	C	179	W11	V _{DD}	–	D	120	Y21	GND
–	C	110	AA12	GND	–	D	287	U17	
–	C	237	V12	GND	–	D	41	AA22	
–	C	31	AB12		–	D	121	W21	
–	C	238	V13		–	D	188	V19	
–	C	111	AA13		–	D	42	Y22	
–	C	180	W12		–	D	122	V21	
–	C	32	AB13		–	D	189	U19	
–	C	283	U13		–	D	43	W22	
–	C	33	AB14		–	D	244	U18	
–	C	239	V14		–	D	123	U21	

Table 4-31. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (4/4)
(CMOS-10HD Series: μ PD65309, 65509)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	245	T18		–	D	132	H21	
–	D	44	V22		–	D	253	H18	
–	D	190	T19		–	D	197	J19	
–	D	124	T21		–	D	294	H17	
–	D	246	R18		–	D	55	G22	V _{DD}
–	D	45	U22		–	D	133	G21	GND
–	D	125	R21	V _{DD}	–	D	56	F22	
–	D	288	T17	GND	–	D	134	F21	
–	D	191	R19		–	D	57	E22	
–	D	46	T22		–	D	198	H19	
–	D	289	R17		–	D	135	E21	
–	D	126	P21		–	D	254	G18	
–	D	247	P18		–	D	58	D22	
–	D	47	R22		–	D	295	G17	
–	D	192	P19		–	D	136	D21	
–	D	48	P22		–	D	199	G19	
–	D	290	P17		–	D	59	C22	
–	D	127	N21		–	D	255	F18	
–	D	248	N18		–	D	137	C21	
–	D	49	N22		–	D	200	F19	
–	D	193	N19		–	D	60	B22	
–	D	128	M21		–	D	201	E19	
–	D	249	M18		–	D	138	B21	GND
–	D	50	M22		–	D	202	D19	GND
–	D	291	N17	V _{DD}					
–	D	194	M19	V _{DD}					
–	D	129	L21	GND					
–	D	250	L18	GND					
–	D	51	L22						
–	D	251	K18						
–	D	130	K21						
–	D	195	L19						
–	D	52	K22						
–	D	292	K17						
–	D	53	J22						
–	D	252	J18						
–	D	131	J21						
–	D	196	K19						
–	D	54	H22						
–	D	293	J17						

Table 4-32. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (1/4)

(CMOS-10HD Series: μ PD65310, 65510)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	256	E18	V _{DD}	–	A	71	A11	
–	A	139	B20	V _{DD}	–	A	301	F10	
–	A	61	A21		–	A	72	A10	
–	A	62	A20		–	A	210	D11	
–	A	203	D18		–	A	149	B10	
–	A	140	B19		–	A	264	E10	
–	A	296	F17		–	A	73	A9	
–	A	63	A19		–	A	302	F9	
–	A	257	E17		–	A	150	B9	
–	A	141	B18		–	A	211	D10	
–	A	204	D17		–	A	74	A8	
–	A	64	A18		–	A	265	E9	
–	A	258	E16		–	A	303	F8	
–	A	142	B17		–	A	212	D9	
–	A	259	E15		–	A	151	B8	
–	A	65	A17		–	A	266	E8	
–	A	205	D16		–	A	75	A7	GND
–	A	143	B16		–	A	152	B7	GND
–	A	144	B15	GND	–	A	76	A6	
–	A	297	F16	GND	–	A	213	D8	
–	A	206	D15		–	A	153	B6	
–	A	66	A16		–	A	304	F7	
–	A	298	F15		–	A	77	A5	
–	A	67	A15		–	A	267	E7	
–	A	260	E14		–	A	154	B5	
–	A	145	B14		–	A	214	D7	
–	A	207	D14		–	A	78	A4	
–	A	68	A14		–	A	268	E6	
–	A	299	F14		–	A	155	B4	
–	A	146	B13		–	A	215	D6	
–	A	261	E13		–	A	79	A3	
–	A	69	A13		–	A	216	D5	
–	A	208	D13		–	A	156	B3	
–	A	147	B12		–	A	80	A2	
–	A	262	E12		–	A	81	B2	V _{DD}
–	A	70	A12		–	A	157	D4	V _{DD}
–	A	300	F13	V _{DD}	–	B	217	E5	GND
–	A	209	D12	V _{DD}	–	B	82	C2	GND
–	A	148	B11	GND	–	B	1	B1	
–	A	263	E11	GND	–	B	2	C1	

Table 4-32. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (2/4)
(CMOS-10HD Series: μ PD65310, 65510)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	158	E4		–	B	92	N2	
–	B	83	D2		–	B	225	N5	
–	B	269	F6		–	B	13	P1	
–	B	3	D1		–	B	275	P6	
–	B	218	F5		–	B	93	P2	
–	B	84	E2		–	B	166	N4	
–	B	159	F4		–	B	14	R1	
–	B	4	E1		–	B	226	P5	
–	B	219	G5		–	B	276	R6	
–	B	85	F2		–	B	167	P4	
–	B	220	H5		–	B	94	R2	
–	B	5	F1		–	B	227	R5	
–	B	160	G4		–	B	15	T1	V _{DD}
–	B	86	G2		–	B	95	T2	GND
–	B	87	H2	V _{DD}	–	B	16	U1	
–	B	270	G6	GND	–	B	168	R4	
–	B	161	H4		–	B	96	U2	
–	B	6	G1		–	B	277	T6	
–	B	271	H6		–	B	17	V1	
–	B	7	H1		–	B	228	T5	
–	B	221	J5		–	B	97	V2	
–	B	88	J2		–	B	169	T4	
–	B	162	J4		–	B	18	W1	
–	B	8	J1		–	B	229	U5	
–	B	272	J6		–	B	98	W2	
–	B	89	K2		–	B	170	U4	
–	B	222	K5		–	B	19	Y1	
–	B	9	K1		–	B	171	V4	
–	B	163	K4		–	B	99	Y2	
–	B	90	L2		–	B	20	AA1	
–	B	223	L5		–	B	100	AA2	GND
–	B	10	L1		–	B	172	W4	GND
–	B	273	K6	V _{DD}	–	C	230	V5	V _{DD}
–	B	164	L4	V _{DD}	–	C	101	AA3	V _{DD}
–	B	91	M2	GND	–	C	21	AB2	
–	B	224	M5	GND	–	C	22	AB3	
–	B	11	M1		–	C	173	W5	
–	B	274	N6		–	C	102	AA4	
–	B	12	N1		–	C	278	U6	
–	B	165	M4		–	C	23	AB4	

Table 4-32. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (3/4)

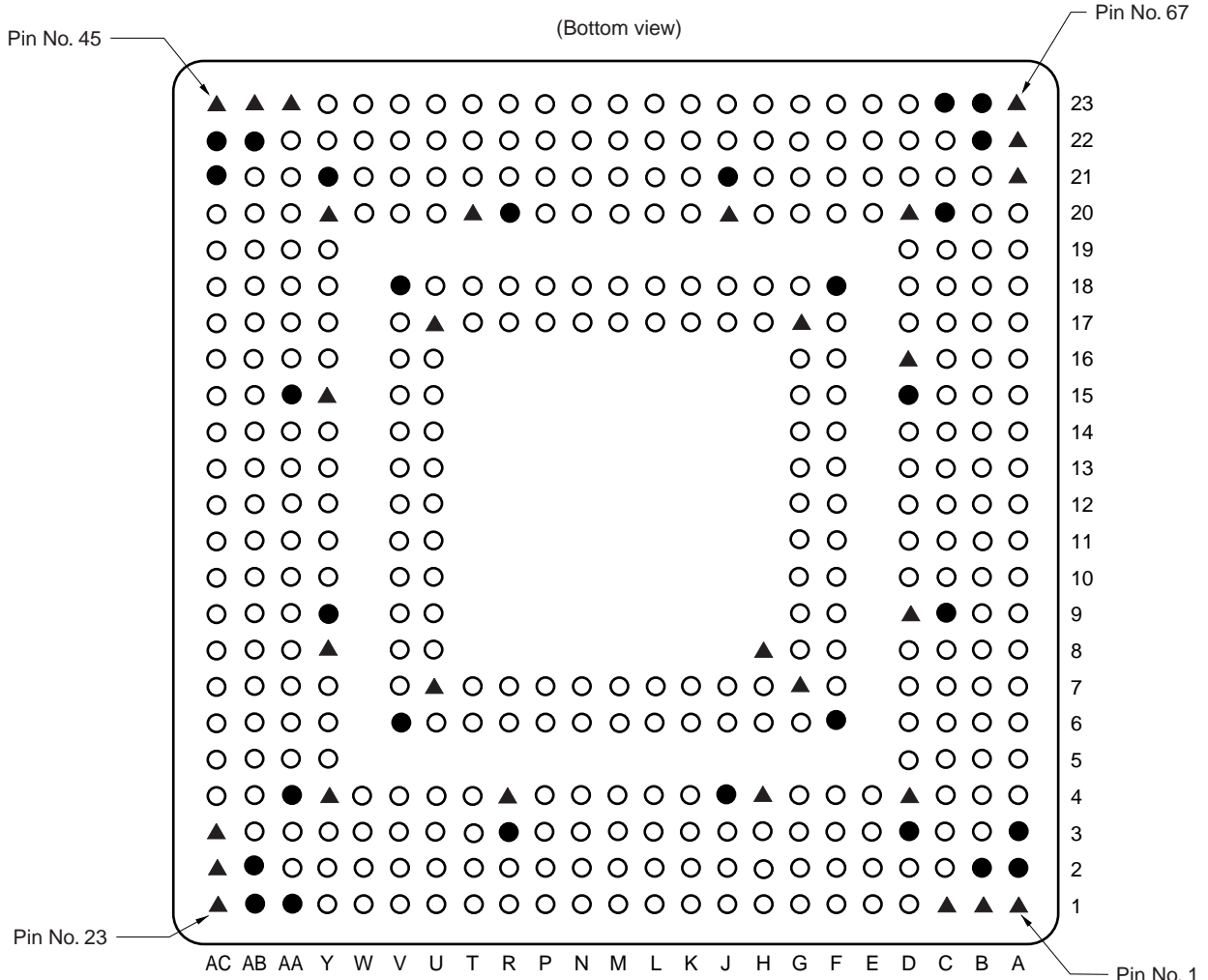
(CMOS-10HD Series: μ PD65310, 65510)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	231	V6		–	C	112	AA14	
–	C	103	AA5		–	C	181	W13	
–	C	174	W6		–	C	34	AB15	
–	C	24	AB5		–	C	239	V14	
–	C	232	V7		–	C	285	U15	
–	C	104	AA6		–	C	182	W14	
–	C	233	V8		–	C	113	AA15	
–	C	25	AB6		–	C	240	V15	
–	C	175	W7		–	C	35	AB16	GND
–	C	105	AA7		–	C	114	AA16	GND
–	C	106	AA8	GND	–	C	36	AB17	
–	C	279	U7	GND	–	C	183	W15	
–	C	176	W8		–	C	115	AA17	
–	C	26	AB7		–	C	286	U16	
–	C	280	U8		–	C	37	AB18	
–	C	27	AB8		–	C	241	V16	
–	C	234	V9		–	C	116	AA18	
–	C	107	AA9		–	C	184	W16	
–	C	177	W9		–	C	38	AB19	
–	C	28	AB9		–	C	242	V17	
–	C	281	U9		–	C	117	AA19	
–	C	108	AA10		–	C	185	W17	
–	C	235	V10		–	C	39	AB20	
–	C	29	AB10		–	C	186	W18	
–	C	178	W10		–	C	118	AA20	
–	C	109	AA11		–	C	40	AB21	
–	C	236	V11		–	C	119	AA21	V _{DD}
–	C	30	AB11		–	C	187	W19	V _{DD}
–	C	282	U10	V _{DD}	–	D	243	V18	GND
–	C	179	W11	V _{DD}	–	D	120	Y21	GND
–	C	110	AA12	GND	–	D	41	AA22	
–	C	237	V12	GND	–	D	42	Y22	
–	C	31	AB12		–	D	188	V19	
–	C	283	U13		–	D	121	W21	
–	C	32	AB13		–	D	287	U17	
–	C	180	W12		–	D	43	W22	
–	C	111	AA13		–	D	244	U18	
–	C	238	V13		–	D	122	V21	
–	C	33	AB14		–	D	189	U19	
–	C	284	U14		–	D	44	V22	

Table 4-32. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (4/4)
(CMOS-10HD Series: μ PD65310, 65510)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	245	T18		–	D	294	H17	
–	D	123	U21		–	D	197	J19	
–	D	246	R18		–	D	132	H21	
–	D	45	U22		–	D	253	H18	
–	D	190	T19		–	D	55	G22	V _{DD}
–	D	124	T21		–	D	133	G21	GND
–	D	125	R21	V _{DD}	–	D	56	F22	
–	D	288	T17	GND	–	D	198	H19	
–	D	191	R19		–	D	134	F21	
–	D	46	T22		–	D	295	G17	
–	D	289	R17		–	D	57	E22	
–	D	47	R22		–	D	254	G18	
–	D	247	P18		–	D	135	E21	
–	D	126	P21		–	D	199	G19	
–	D	192	P19		–	D	58	D22	
–	D	48	P22		–	D	255	F18	
–	D	290	P17		–	D	136	D21	
–	D	127	N21		–	D	200	F19	
–	D	248	N18		–	D	59	C22	
–	D	49	N22		–	D	201	E19	
–	D	193	N19		–	D	137	C21	
–	D	128	M21		–	D	60	B22	
–	D	249	M18		–	D	138	B21	GND
–	D	50	M22		–	D	202	D19	GND
–	D	291	N17	V _{DD}					
–	D	194	M19	V _{DD}					
–	D	129	L21	GND					
–	D	250	L18	GND					
–	D	51	L22						
–	D	292	K17						
–	D	52	K22						
–	D	195	L19						
–	D	130	K21						
–	D	251	K18						
–	D	53	J22						
–	D	293	J17						
–	D	131	J21						
–	D	196	K19						
–	D	54	H22						
–	D	252	J18						

★ 4.9.11 393-pin FPBGA



Remark ▲ : GND (29 pins)
● : V_{DD} (28 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (A1), 2 (B1), 3 (C1), 23 (AC1), 24 (AC2), 25 (AC3), 45 (AC23), 46 (AB23), 47 (AA23), 67 (A23), 68 (A22), 69 (A21), 241 (D4), 245 (H4), 252 (R4), 257 (Y4), 261 (Y8), 268 (Y15), 273 (Y20), 277 (T20), 284 (J20), 289 (D20), 293 (D16), 300 (D9), 353 (G7), 363 (U7), 373 (U17), 383 (G17), 393 (H8)	21 (AA1), 22 (AB1), 43 (AC21), 44 (AC22), 65 (C23), 66 (B23), 87 (A3), 88 (A2), 89 (B2), 109 (AB2), 129 (AB22), 149 (B22), 170 (D3), 181 (R3), 188 (AA4), 199 (AA15), 206 (Y21), 217 (J21), 224 (C20), 235 (C9), 246 (J4), 262 (Y9), 278 (R20), 294 (D15), 305 (F6), 317 (V6), 329 (V18), 341 (F18)	None	There are no restrictions on the assignment of dedicated scan path pins.			336

Note Total number of usable signal pins.

Table 4-33. Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (1/5)
(CMOS-9HD Series: μ PD65949)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	A	322	V11	
–	A	–	–	GND	–	A	195	AA11	
–	A	259	Y6		–	A	264	Y11	
–	A	110	AB3		–	A	118	AB11	
–	A	–	–	V _{DD}	–	A	323	V12	
–	A	111	AB4		–	A	34	AC12	
–	A	364	U8		–	A	368	U12	
–	A	258	Y5		–	A	265	Y12	
–	A	190	AA6		–	A	119	AB12	
–	A	26	AC4		–	A	197	AA13	
–	A	260	Y7		–	A	120	AB13	
–	A	112	AB5		–	A	324	V13	
–	A	318	V7		–	A	35	AC13	
–	A	189	AA5		–	A	369	U13	
–	A	319	V8		–	A	121	AB14	
–	A	113	AB6		–	A	196	AA12	
–	A	191	AA7		–	A	36	AC14	
–	A	27	AC5		–	A	198	AA14	
–	A	–	–	GND	–	A	–	–	V _{DD}
–	A	28	AC6		–	A	325	V14	
–	A	365	U9		–	A	122	AB15	
–	A	114	AB7		–	A	267	Y14	
–	A	320	V9		–	A	37	AC15	
–	A	29	AC7		–	A	370	U14	
–	A	192	AA8		–	A	200	AA16	
–	A	115	AB8		–	A	266	Y13	
–	A	–	–	V _{DD}	–	A	123	AB16	
–	A	30	AC8		–	A	326	V15	
–	A	–	–	GND	–	A	38	AC16	
–	A	31	AC9		–	A	–	–	GND
–	A	193	AA9		–	A	124	AB17	
–	A	116	AB9		–	A	371	U15	
–	A	366	U10		–	A	39	AC17	
–	A	32	AC10		–	A	372	U16	
–	A	263	Y10		–	A	40	AC18	
–	A	194	AA10		–	A	269	Y16	
–	A	321	V10		–	A	41	AC19	
–	A	117	AB10		–	A	201	AA17	
–	A	367	U11		–	A	125	AB18	
–	A	33	AC11		–	A	327	V16	

Table 4-33. Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (2/5)

(CMOS-9HD Series: μ PD65949)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	42	AC20		–	B	–	–	V _{DD}
–	A	270	Y17		–	B	52	T23	
–	A	203	AA19		–	B	–	–	GND
–	A	328	V17		–	B	53	R23	
–	A	126	AB19		–	B	211	R21	
–	A	202	AA18		–	B	136	R22	
–	A	205	AA21		–	B	376	P17	
–	A	271	Y18		–	B	54	P23	
–	A	127	AB20		–	B	279	P20	
–	A	272	Y19		–	B	212	P21	
–	A	128	AB21		–	B	333	P18	
–	A	204	AA20		–	B	137	P22	
–	A	–	–	V _{DD}	–	B	377	N17	
–	A	–	–	GND	–	B	55	N23	
–	B	–	–	V _{DD}	–	B	334	N18	
–	B	–	–	GND	–	B	213	N21	
–	B	275	V20		–	B	280	N20	
–	B	130	AA22		–	B	138	N22	
–	B	–	–	V _{DD}	–	B	335	M18	
–	B	131	Y22		–	B	56	M23	
–	B	374	T17		–	B	378	M17	
–	B	274	W20		–	B	281	M20	
–	B	208	V21		–	B	139	M22	
–	B	48	Y23		–	B	215	L21	
–	B	276	U20		–	B	140	L22	
–	B	132	W22		–	B	336	L18	
–	B	330	U18		–	B	57	L23	
–	B	207	W21		–	B	379	L17	
–	B	331	T18		–	B	141	K22	
–	B	133	V22		–	B	214	M21	
–	B	209	U21		–	B	58	K23	
–	B	49	W23		–	B	216	K21	
–	B	–	–	GND	–	B	–	–	V _{DD}
–	B	50	V23		–	B	337	K18	
–	B	375	R17		–	B	142	J22	
–	B	134	U22		–	B	283	K20	
–	B	332	R18		–	B	59	J23	
–	B	51	U23		–	B	380	K17	
–	B	210	T21		–	B	218	H21	
–	B	135	T22		–	B	282	L20	

Table 4-33. Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (3/5)
(CMOS-9HD Series: μ PD65949)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	B	143	H22		–	C	342	F17	
–	B	338	J18		–	C	225	C19	
–	B	60	H23		–	C	343	F16	
–	B	–	–	GND	–	C	153	B18	
–	B	144	G22		–	C	227	C17	
–	B	381	J17		–	C	71	A19	
–	B	61	G23		–	C	–	–	GND
–	B	382	H17		–	C	72	A18	
–	B	62	F23		–	C	385	G15	
–	B	285	H20		–	C	154	B17	
–	B	63	E23		–	C	344	F15	
–	B	219	G21		–	C	73	A17	
–	B	145	F22		–	C	228	C16	
–	B	339	H18		–	C	155	B16	
–	B	64	D23		–	C	–	–	V _{DD}
–	B	286	G20		–	C	74	A16	
–	B	221	E21		–	C	–	–	GND
–	B	340	G18		–	C	75	A15	
–	B	146	E22		–	C	229	C15	
–	B	220	F21		–	C	156	B15	
–	B	223	C21		–	C	386	G14	
–	B	287	F20		–	C	76	A14	
–	B	147	D22		–	C	295	D14	
–	B	288	E20		–	C	230	C14	
–	B	148	C22		–	C	345	F14	
–	B	222	D21		–	C	157	B14	
–	B	–	–	V _{DD}	–	C	387	G13	
–	B	–	–	GND	–	C	77	A13	
–	C	–	–	V _{DD}	–	C	346	F13	
–	C	–	–	GND	–	C	231	C13	
–	C	291	D18		–	C	296	D13	
–	C	150	B21		–	C	158	B13	
–	C	–	–	V _{DD}	–	C	347	F12	
–	C	151	B20		–	C	78	A12	
–	C	384	G16		–	C	388	G12	
–	C	290	D19		–	C	297	D12	
–	C	226	C18		–	C	159	B12	
–	C	70	A20		–	C	233	C11	
–	C	292	D17		–	C	160	B11	
–	C	152	B19		–	C	348	F11	

Table 4-33. Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (4/5)
(CMOS-9HD Series: μ PD65949)

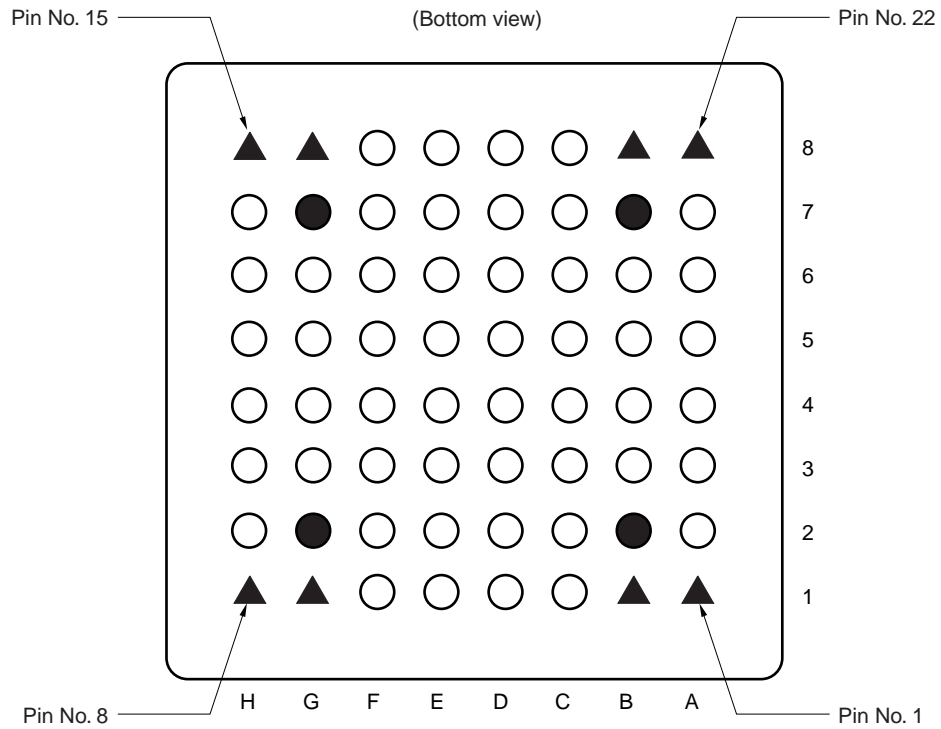
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	C	79	A11		–	C	–	–	V _{DD}
–	C	389	G11		–	C	–	–	GND
–	C	161	B10		–	D	–	–	V _{DD}
–	C	232	C12		–	D	–	–	GND
–	C	80	A10		–	D	243	F4	
–	C	234	C10		–	D	90	C2	
–	C	–	–	V _{DD}	–	D	–	–	V _{DD}
–	C	349	F10		–	D	91	D2	
–	C	162	B9		–	D	354	H7	
–	C	299	D10		–	D	242	E4	
–	C	81	A9		–	D	172	F3	
–	C	390	G10		–	D	4	D1	
–	C	236	C8		–	D	244	G4	
–	C	298	D11		–	D	92	E2	
–	C	163	B8		–	D	306	G6	
–	C	350	F9		–	D	171	E3	
–	C	82	A8		–	D	307	H6	
–	C	–	–	GND	–	D	93	F2	
–	C	164	B7		–	D	173	G3	
–	C	391	G9		–	D	5	E1	
–	C	83	A7		–	D	–	–	GND
–	C	392	G8		–	D	6	F1	
–	C	84	A6		–	D	355	J7	
–	C	301	D8		–	D	94	G2	
–	C	85	A5		–	D	308	J6	
–	C	237	C7		–	D	7	G1	
–	C	165	B6		–	D	174	H3	
–	C	351	F8		–	D	95	H2	
–	C	86	A4		–	D	–	–	V _{DD}
–	C	302	D7		–	D	8	H1	
–	C	239	C5		–	D	–	–	GND
–	C	352	F7		–	D	9	J1	
–	C	166	B5		–	D	175	J3	
–	C	238	C6		–	D	96	J2	
–	C	169	C3		–	D	356	K7	
–	C	303	D6		–	D	10	K1	
–	C	167	B4		–	D	247	K4	
–	C	304	D5		–	D	176	K3	
–	C	168	B3		–	D	309	K6	
–	C	240	C4		–	D	97	K2	

Table 4-33. Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (5/5)
(CMOS-9HD Series: μ PD65949)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	D	357	L7		–	D	105	V2	
–	D	11	L1		–	D	315	T6	
–	D	310	L6		–	D	20	Y1	
–	D	177	L3		–	D	254	U4	
–	D	248	L4		–	D	185	W3	
–	D	98	L2		–	D	316	U6	
–	D	311	M6		–	D	106	W2	
–	D	12	M1		–	D	184	V3	
–	D	358	M7		–	D	187	AA3	
–	D	249	M4		–	D	255	V4	
–	D	99	M2		–	D	107	Y2	
–	D	179	N3		–	D	256	W4	
–	D	100	N2		–	D	108	AA2	
–	D	312	N6		–	D	186	Y3	
–	D	13	N1		–	D	–	–	V _{DD}
–	D	359	N7		–	D	–	–	GND
–	D	101	P2						
–	D	178	M3						
–	D	14	P1						
–	D	180	P3						
–	D	–	–	V _{DD}					
–	D	313	P6						
–	D	102	R2						
–	D	251	P4						
–	D	15	R1						
–	D	360	P7						
–	D	182	T3						
–	D	250	N4						
–	D	103	T2						
–	D	314	R6						
–	D	16	T1						
–	D	–	–	GND					
–	D	104	U2						
–	D	361	R7						
–	D	17	U1						
–	D	362	T7						
–	D	18	V1						
–	D	253	T4						
–	D	19	W1						
–	D	183	U3						

★ 4.10 FPLGA

4.10.1 64-pin FPLGA



Remark ▲ : GND (8 pins)
● : V_{DD} (4 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (A1), 2 (B1), 7 (G1), 8 (H1), 15 (H8), 16 (G8), 21 (B8), 22 (A8)	29 (B2), 34 (G2), 39 (G7), 44 (B7)	None	30	3	49	52

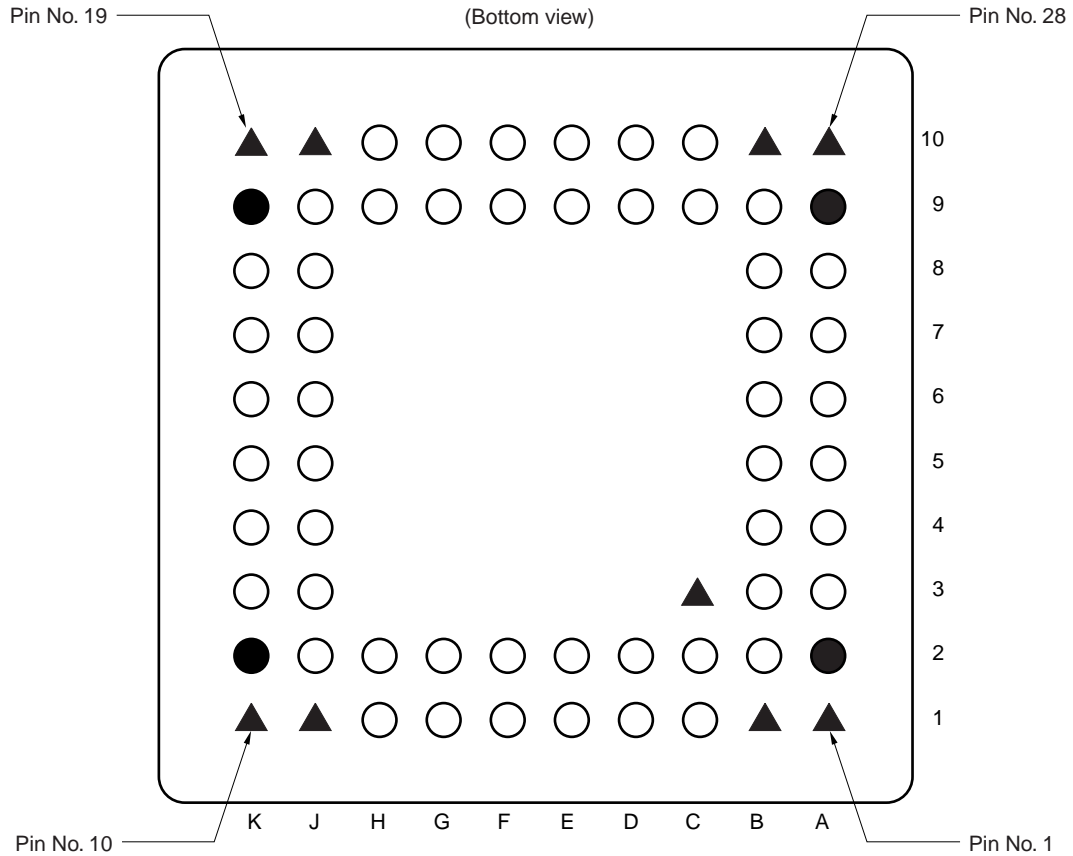
Note Total number of usable signal pins.

Table 4-34. Correspondence Between Internal Chip Sides and Ball Numbers (64-pin FPLGA)
(CMOS-9HD, EA-9HD Series: μ PD65943)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	C	12	H5	
–	A	23	A7		–	C	38	G6	
–	A	24	A6		–	C	13	H6	
–	A	45	B6		–	C	14	H7	
–	A	46	B5		–	C	–	–	V _{DD}
–	A	59	C5		–	D	–	–	GND
–	A	57	D6		–	D	40	F7	
–	A	25	A5		–	D	17	F8	
–	A	47	B4		–	D	55	F6	
–	A	61	D4		–	D	18	E8	
–	A	26	A4		–	D	56	E6	
–	A	48	B3		–	D	63	E5	
–	A	27	A3		–	D	19	D8	
–	A	28	A2		–	D	41	E7	
–	A	–	–	V _{DD}	–	D	64	D5	
–	B	–	–	GND	–	D	42	D7	
–	B	30	C2		–	D	58	C6	
–	B	3	C1		–	D	20	C8	
–	B	49	C3		–	D	43	C7	
–	B	31	D2		–	D	–	–	GND
–	B	50	D3						
–	B	60	C4						
–	B	4	D1						
–	B	51	E3						
–	B	62	E4						
–	B	5	E1						
–	B	32	E2						
–	B	33	F2						
–	B	6	F1						
–	B	–	–	GND					
–	C	–	–	V _{DD}					
–	C	9	H2						
–	C	10	H3						
–	C	52	F3						
–	C	35	G3						
–	C	53	F4						
–	C	36	G4						
–	C	11	H4						
–	C	54	F5						
–	C	37	G5						

★ 4.11 TFPBGA

4.11.1 65-pin TFPBGA



Remark ▲ : GND (9 pins)
● : V_{DD} (4 pins)

GND Pin	V _{DD} Pin	NC Pin	SCAN Pins			Signal Pin ^{Note}
			SMC	SIN	SOUT	
1 (A1), 2 (B1), 9 (J1), 10 (K1), 19 (K10), 20 (J10), 27 (B10), 28 (A10), 65 (C3)	11 (K2), 18 (K9), 29 (A9), 36 (A2)	None	3	37	38	52

Note Total number of usable signal pins.

Table 4-35. Correspondence Between Internal Chip Sides and Ball Numbers (65-pin TFPBGA)
(CMOS-9HD, EA-9HD Series: μ PD65443)

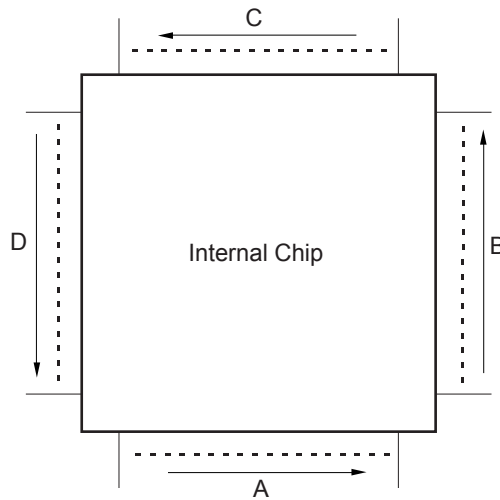
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD} /GND
–	A	–	–	V _{DD}	–	C	16	K7	
–	A	30	A8		–	C	49	J7	
–	A	58	B9		–	C	50	J8	
–	A	59	B8		–	C	17	K8	
–	A	31	A7		–	C	–	–	V _{DD}
–	A	60	B7		–	D	–	–	GND
–	A	32	A6		–	D	21	H10	
–	A	61	B6		–	D	51	J9	
–	A	33	A5		–	D	52	H9	
–	A	62	B5		–	D	22	G10	
–	A	34	A4		–	D	53	G9	
–	A	63	B4		–	D	23	F10	
–	A	64	B3		–	D	54	F9	
–	A	35	A3		–	D	24	E10	
–	A	–	–	V _{DD}	–	D	55	E9	
–	B	–	–	GND	–	D	25	D10	
–	B	3	B1		–	D	56	D9	
–	B	37	B2		–	D	57	C9	
–	B	38	C2		–	D	26	C10	
–	B	4	D1		–	D	–	–	GND
–	B	39	D2						
–	B	5	E1						
–	B	40	E2						
–	B	6	F1						
–	B	41	F2						
–	B	7	G1						
–	B	42	G2						
–	B	43	H2						
–	B	8	H1						
–	B	–	–	GND					
–	C	–	–	V _{DD}					
–	C	12	K3						
–	C	44	J2						
–	C	45	J3						
–	C	13	K4						
–	C	46	J4						
–	C	14	K5						
–	C	47	J5						
–	C	15	K6						
–	C	48	J6						

CHAPTER 5 [DUAL POWER SUPPLY] ASSIGNMENT OF V_{DD} , GND, NC, SCAN PINS

Cautions 1. This chapter is targeted for the CMOS-10HD Series.

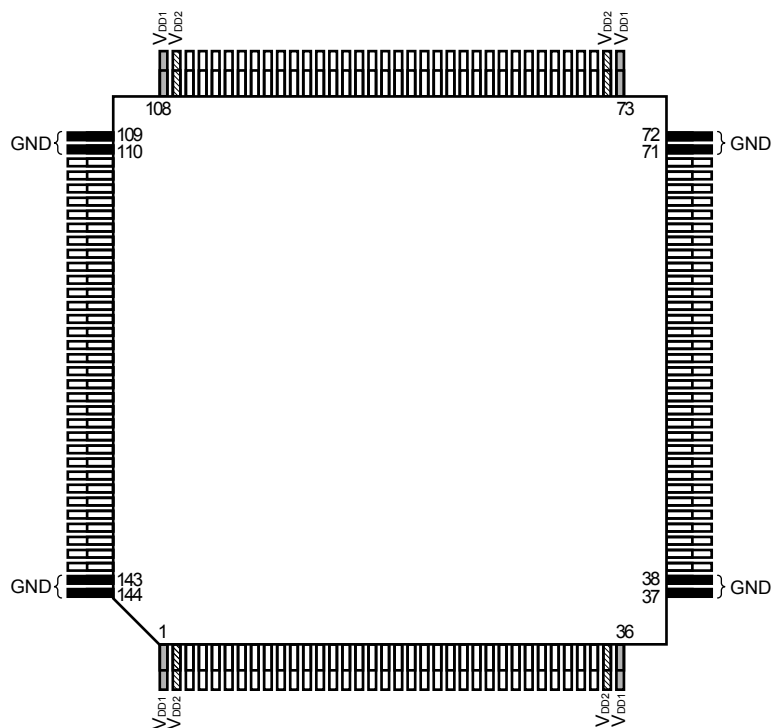
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2. The QFP and TBGA pin assignments are for all of the product names on the packages that have been released.
3. Depending on the combination of master and package, some packages may not yet be available. Be sure to confirm with NEC Electronics that the desired package has been released. Also contact NEC Electronics if the desired package does not appear in the Package column.
4. Assignment of dedicated scan path pins is restricted in packages with 313 or fewer pins. For packages not described here, contact NEC Electronics.
Note that there are no restrictions on the assignment of dedicated scan path pins for packages with 314 or more pins, regardless of the package type.
5. In the package of BGA type, A, B, C, and D in the chip side column correspond to A, B, C, and D in the figure below. The pin placement list describes from the top to the bottom in the direction of the arrows in the figure of the internal chip shown below. The last row of each table does not mean the chip side delimited.



5.1 QFP (fine pitch)

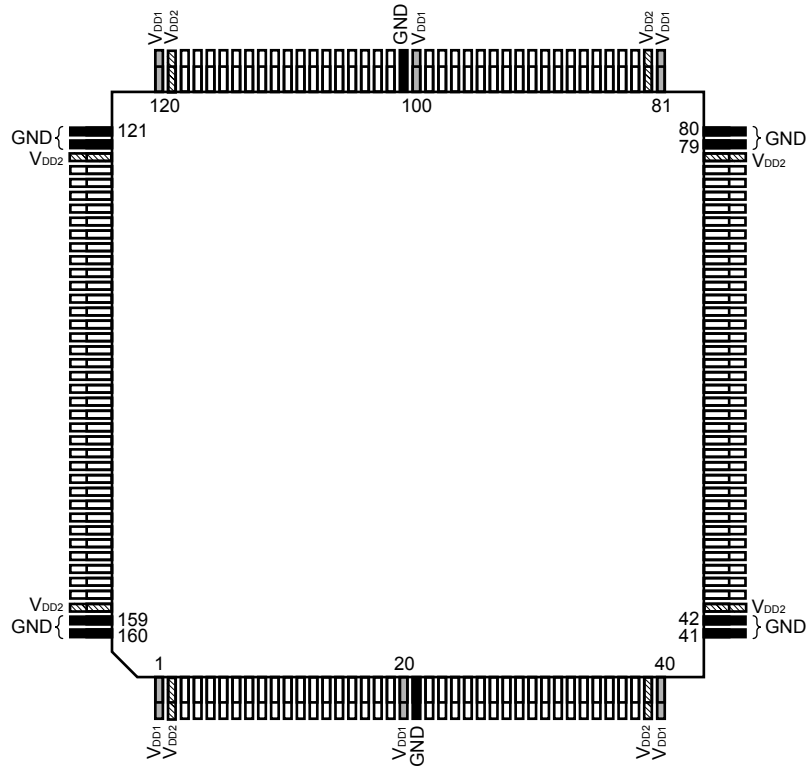
5.1.1 144-pin QFP (fine pitch)



GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
37, 38, 71, 72, 109, 110, 143, 144	1, 36, 73, 108	2, 35, 74, 107	None	135	137	139	128

- Notes**
1. GND pin: **G1 in DIF format
 2. V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
 3. V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
 4. Total number of usable signal pins.

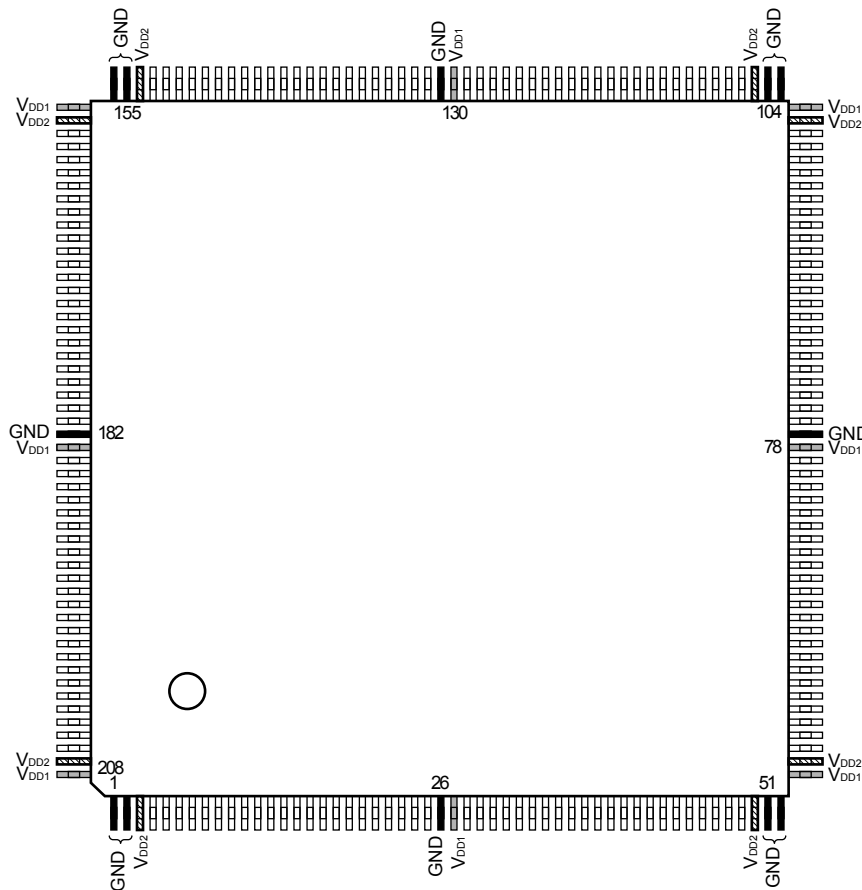
5.1.2 160-pin QFP (fine pitch)



GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
21, 41, 42, 79, 80, 101, 121, 122, 159, 160	1, 20, 40, 81, 100, 120	2, 39, 43, 78, 82, 119, 123, 158	None	44	45	46	136

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

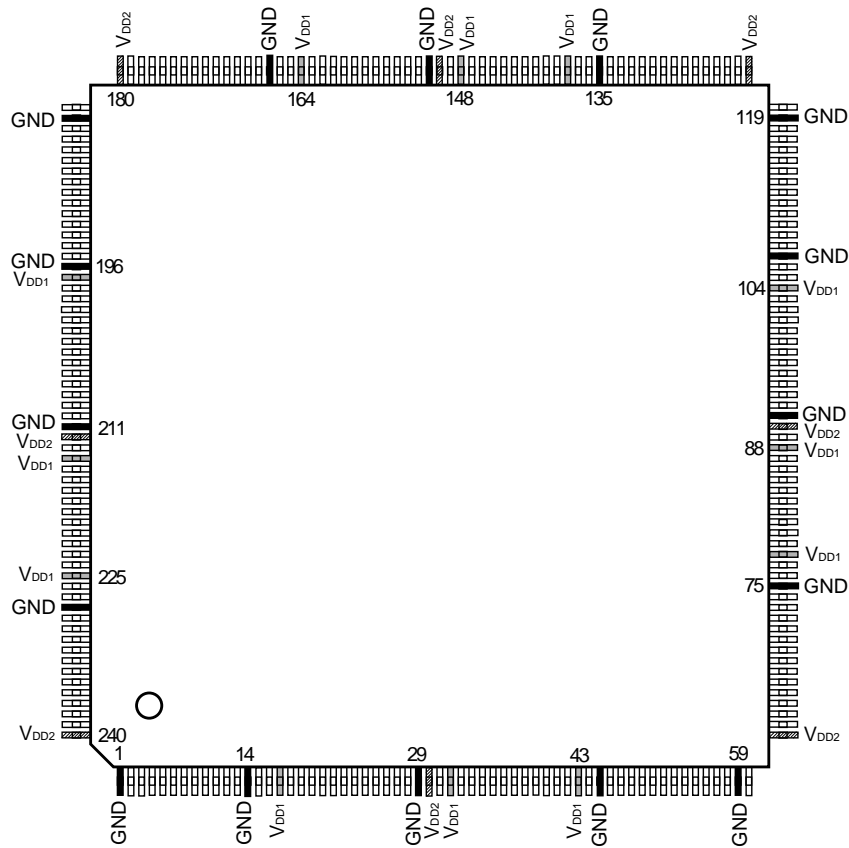
5.1.3 208-pin QFP (fine pitch)



GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1, 2, 26, 51, 52, 79, 105, 106, 131, 155, 156, 182	27, 53, 78, 104, 130, 157, 183, 208	3, 50, 54, 103, 107, 154, 158, 207	None	5	6	7	180

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

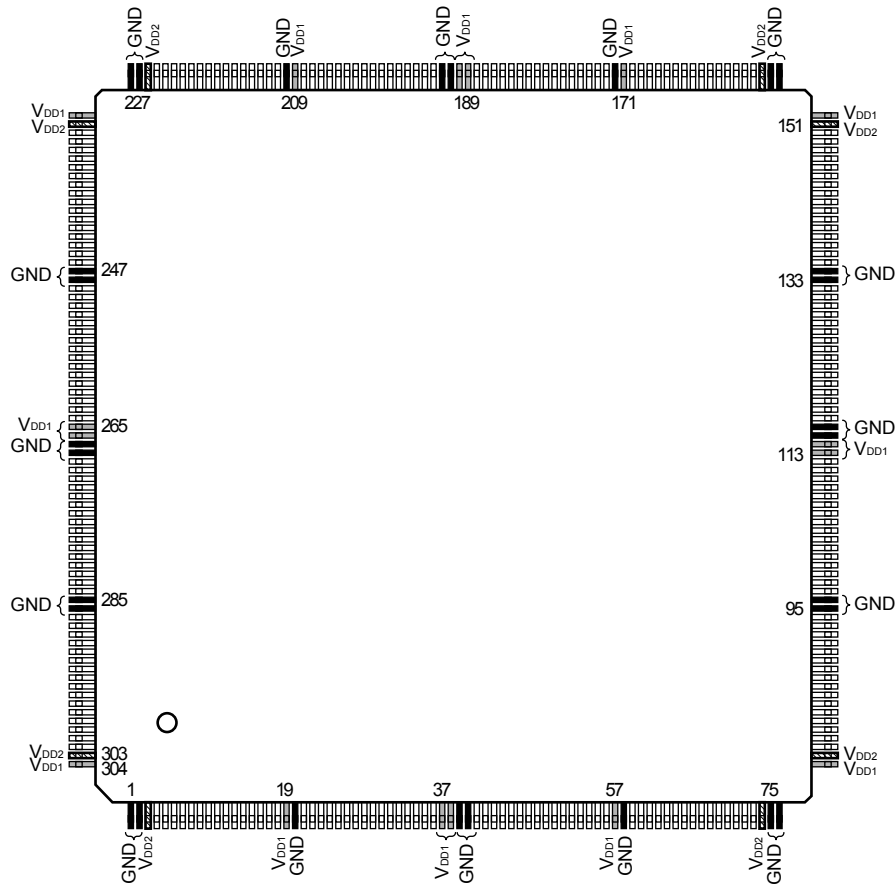
5.1.4 240-pin QFP (fine pitch)



GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1, 14, 29, 45, 59, 75, 91, 106, 119, 135, 151, 166, 182, 196, 211, 227	16, 32, 43, 77, 88, 104, 137, 148, 164, 198, 214, 225	30, 61, 90, 121, 150, 180, 212, 240	None	There are no restrictions on the assignment of dedicated scan path pins.			204

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

5.1.5 304-pin QFP (fine pitch)



GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1, 2, 20, 39, 40, 58, 75, 76, 95, 96, 115, 116, 133, 134, 153, 154, 172, 191, 192, 210, 227, 228, 247, 248, 267, 268, 285, 286	19, 37, 38, 57, 77, 113, 114, 152, 171, 189, 190, 209, 229, 265, 266, 304	3, 74, 78, 151, 155, 226, 230, 303,	None	10	12	14	252

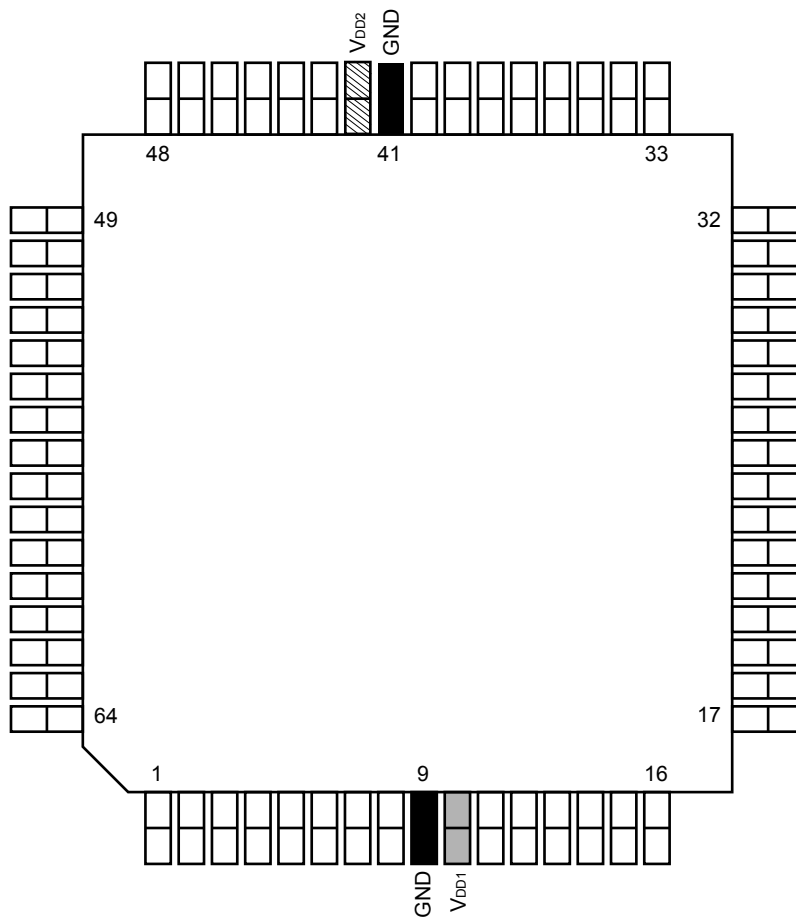
- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

5.2 TQFP (fine pitch)

5.2.1 48-pin TQFP (fine pitch)

Under Study

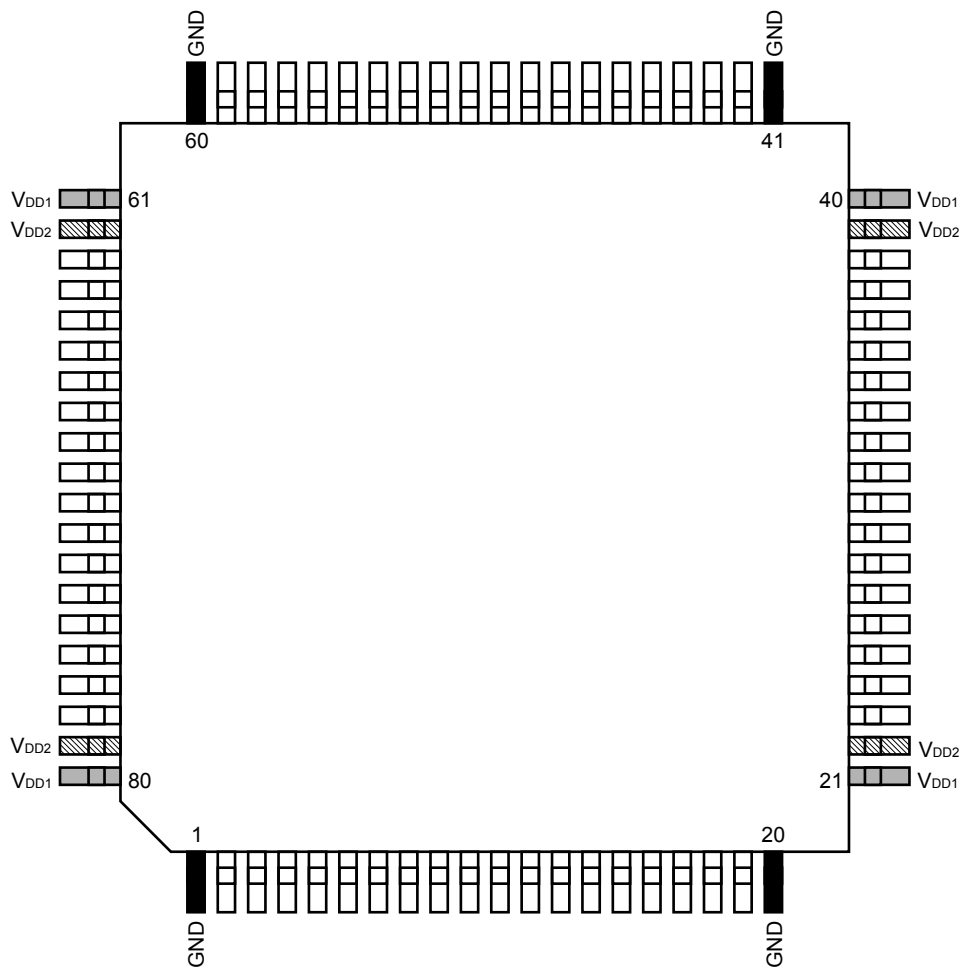
5.2.2 64-pin TQFP (fine pitch)



GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
9, 41	10	42	None	59	60	61	60

- Notes**
1. GND pin: **G1 in DIF format
 2. V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
 3. V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
 4. Total number of usable signal pins.

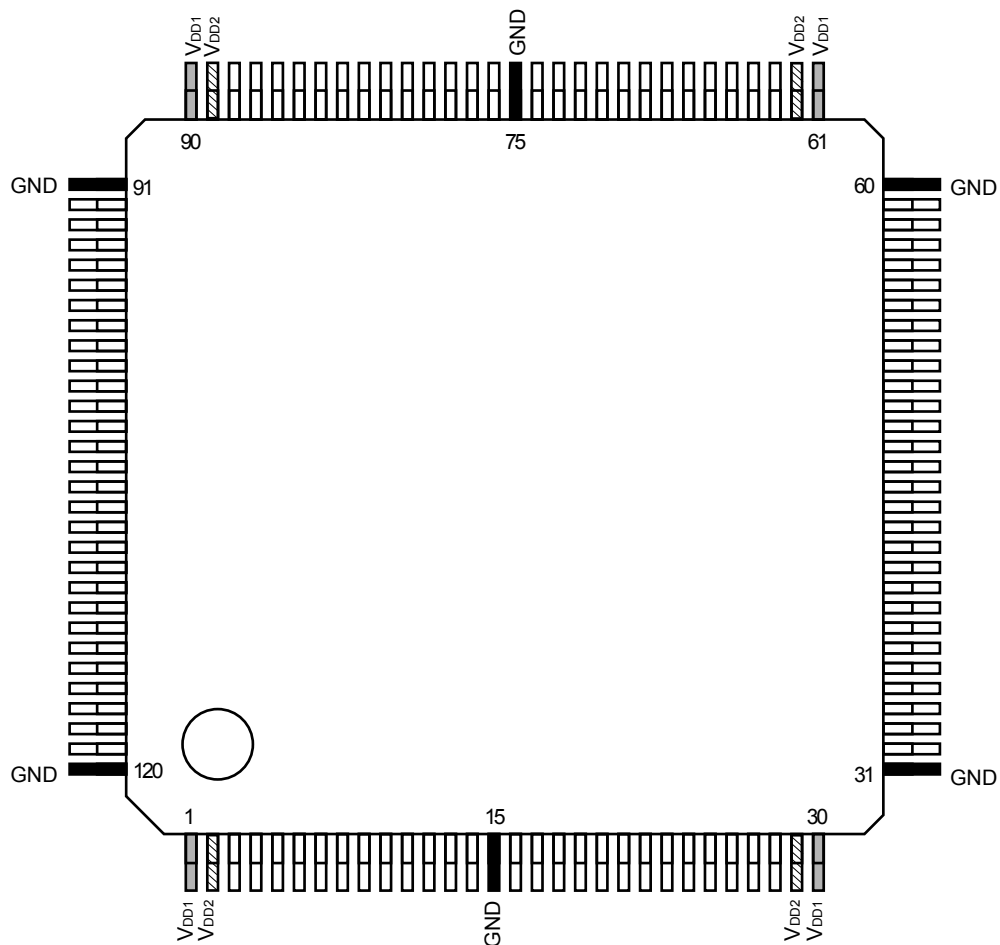
5.2.3 80-pin TQFP (fine pitch)



GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1, 20, 41, 60	21, 40, 61, 80	22, 39, 62, 79	None	15	16	17	68

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

5.2.5 120-pin TQFP (fine pitch)



GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
15, 31, 60, 75, 91, 120	1, 30, 61, 90	2, 29, 62, 89	None	112	114	116	106

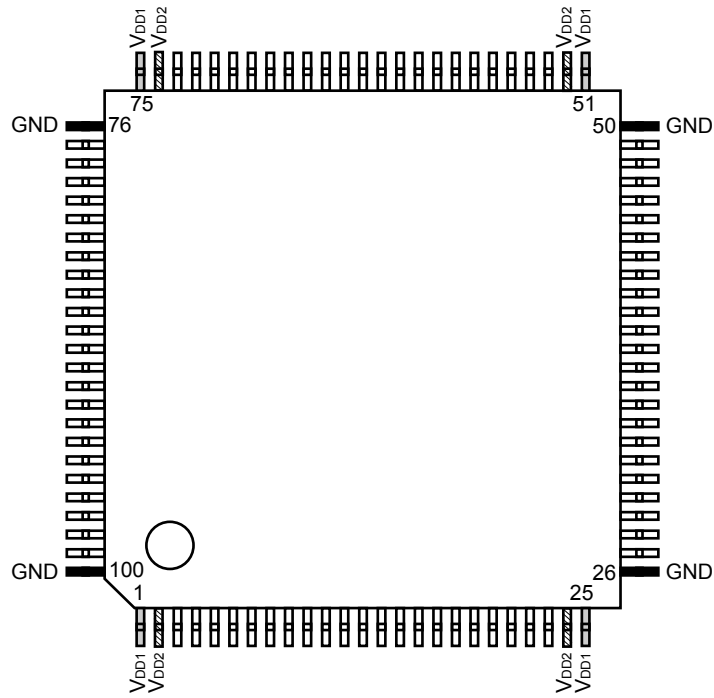
- Notes 1.** GND pin: **G1 in DIF format
2. V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
3. V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
4. Total number of usable signal pins.

5.3 LQFP

5.3.1 44-pin LQFP

Under Study

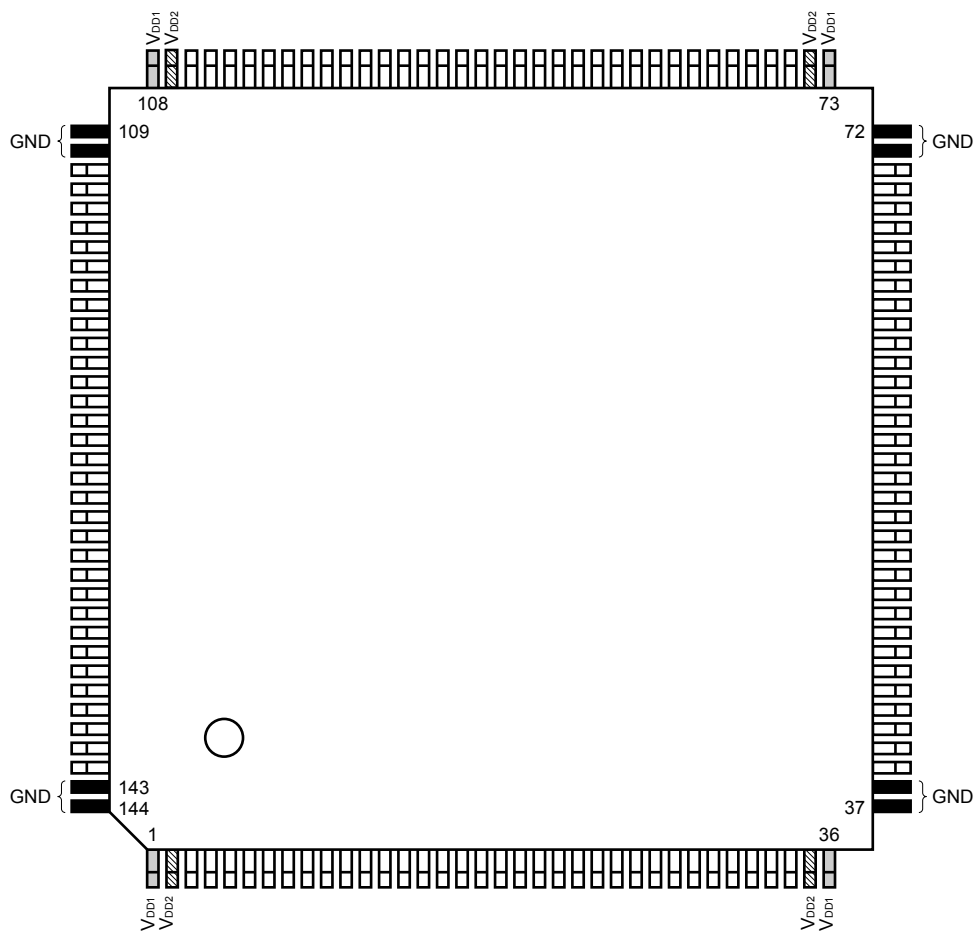
5.3.2 100-pin LQFP (fine pitch)



GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
26, 50, 76, 100	1, 25, 51, 75	2, 24, 52, 74	None	17	18	19	88

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

5.3.3 144-pin LQFP

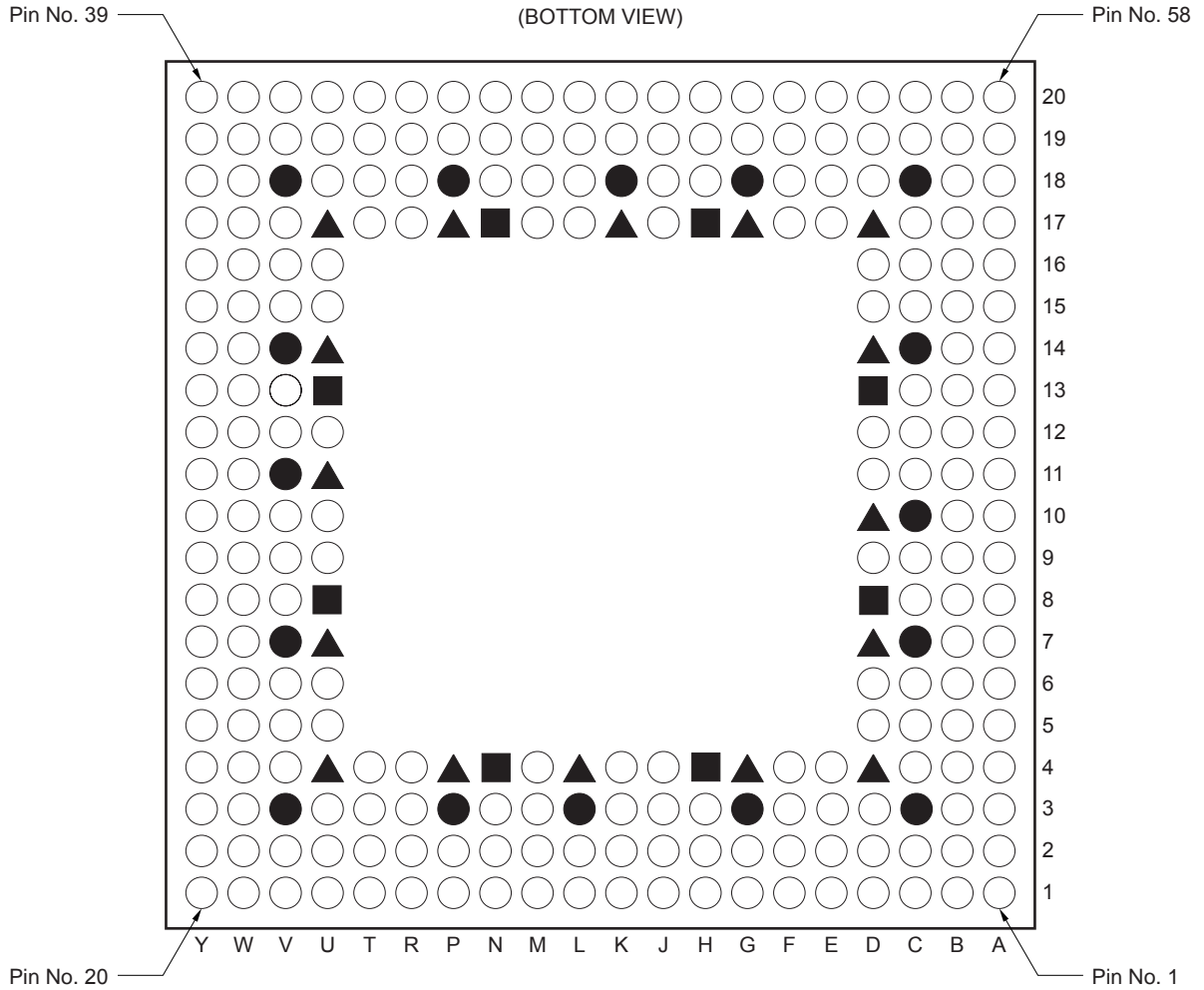


GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
37, 38, 71, 72, 109, 110, 143,144	1, 36, 73, 108	2, 35, 74, 107	None	135	137	139	128

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

5.4 TBGA

5.4.1 256-pin TBGA (with heat spreader)



Remark

- ▲ : GND (16 pins)
- : V_{DD1} (16 pins)
- : V_{DD2} (8 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
205 (D4), 208 (G4), 212 (L4), 215 (P4), 218 (U4), 221 (U7), 225 (U11), 228 (U14), 231 (U17), 234 (P17), 238 (K17), 241 (G17), 244 (D17), 247 (D14), 251 (D10), 254 (D7)	145 (C3), 149 (G3), 153 (L3), 156 (P3), 160 (V3), 164 (V7), 168 (V11), 171 (V14), 175 (V18), 179 (P18), 183 (K18), 186 (G18), 190 (C18), 194 (C14), 198 (C10), 201 (C7)	209 (H4), 214 (N4), 222 (U8), 227 (U13), 235 (N17), 240 (H17), 248 (D13), 253 (D8)	None	142	143	144	216

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

**Table 5-1. Correspondence Between Internal Chip Pins and Ball Numbers
(256-pin TBGA (with Heat Spreader)) (1/4)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
1	A	160	V3	V _{DD1}	33	A	10	K1	
2	A	94	W2		34	A	85	K2	
3	A	19	W1		35	A	152	K3	
4	A	93	V2		36	A	211	K4	
5	A	159	U3		37	A	9	J1	
6	A	18	V1		38	A	84	J2	
7	A	217	T4		39	A	151	J3	
8	A	92	U2		40	A	210	J4	
9	A	158	T3		41	A	8	H1	
10	A	17	U1		42	A	83	H2	
11	A	91	T2		43	A	150	H3	
12	A	16	T1		44	A	209	H4	V _{DD2}
13	A	216	R4		45	A	7	G1	
14	A	157	R3		46	A	82	G2	
15	A	90	R2		47	A	149	G3	V _{DD1}
16	A	15	R1		48	A	208	G4	GND
17	A	215	P4	GND	49	A	6	F1	
18	A	156	P3	V _{DD1}	50	A	81	F2	
19	A	89	P2		51	A	148	F3	
20	A	14	P1		52	A	207	F4	
21	A	214	N4	V _{DD2}	53	A	5	E1	
22	A	155	N3		54	A	80	E2	
23	A	88	N2		55	A	4	D1	
24	A	13	N1		56	A	147	E3	
25	A	213	M4		57	A	79	D2	
26	A	154	M3		58	A	206	E4	
27	A	87	M2		59	A	3	C1	
28	A	12	M1		60	A	146	D3	
29	A	212	L4	GND	61	A	78	C2	
30	A	153	L3	V _{DD1}	62	A	2	B1	
31	A	86	L2		63	A	1	A1	
32	A	11	L1		64	A	145	C3	V _{DD1}

**Table 5-1. Correspondence Between Internal Chip Pins and Ball Numbers
(256-pin TBGA (with Heat Spreader)) (2/4)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
65	B	205	D4	GND	97	B	67	A11	
66	B	77	B2		98	B	136	B11	
67	B	76	A2		99	B	197	C11	
68	B	144	B3		100	B	250	D11	
69	B	204	C4		101	B	66	A12	
70	B	75	A3		102	B	135	B12	
71	B	256	D5		103	B	196	C12	
72	B	143	B4		104	B	249	D12	
73	B	203	C5		105	B	65	A13	
74	B	74	A4		106	B	134	B13	
75	B	142	B5		107	B	195	C13	
76	B	73	A5		108	B	248	D13	V _{DD2}
77	B	255	D6		109	B	64	A14	
78	B	202	C6		110	B	133	B14	
79	B	141	B6		111	B	194	C14	V _{DD1}
80	B	72	A6		112	B	247	D14	GND
81	B	254	D7	GND	113	B	63	A15	
82	B	201	C7	V _{DD1}	114	B	132	B15	
83	B	140	B7		115	B	193	C15	
84	B	71	A7		116	B	246	D15	
85	B	253	D8	V _{DD2}	117	B	62	A16	
86	B	200	C8		118	B	131	B16	
87	B	139	B8		119	B	61	A17	
88	B	70	A8		120	B	192	C16	
89	B	252	D9		121	B	130	B17	
90	B	199	C9		122	B	245	D16	
91	B	138	B9		123	B	60	A18	
92	B	69	A9		124	B	191	C17	
93	B	251	D10	GND	125	B	129	B18	
94	B	198	C10	V _{DD1}	126	B	59	A19	
95	B	137	B10		127	B	58	A20	
96	B	68	A10		128	B	244	D17	GND

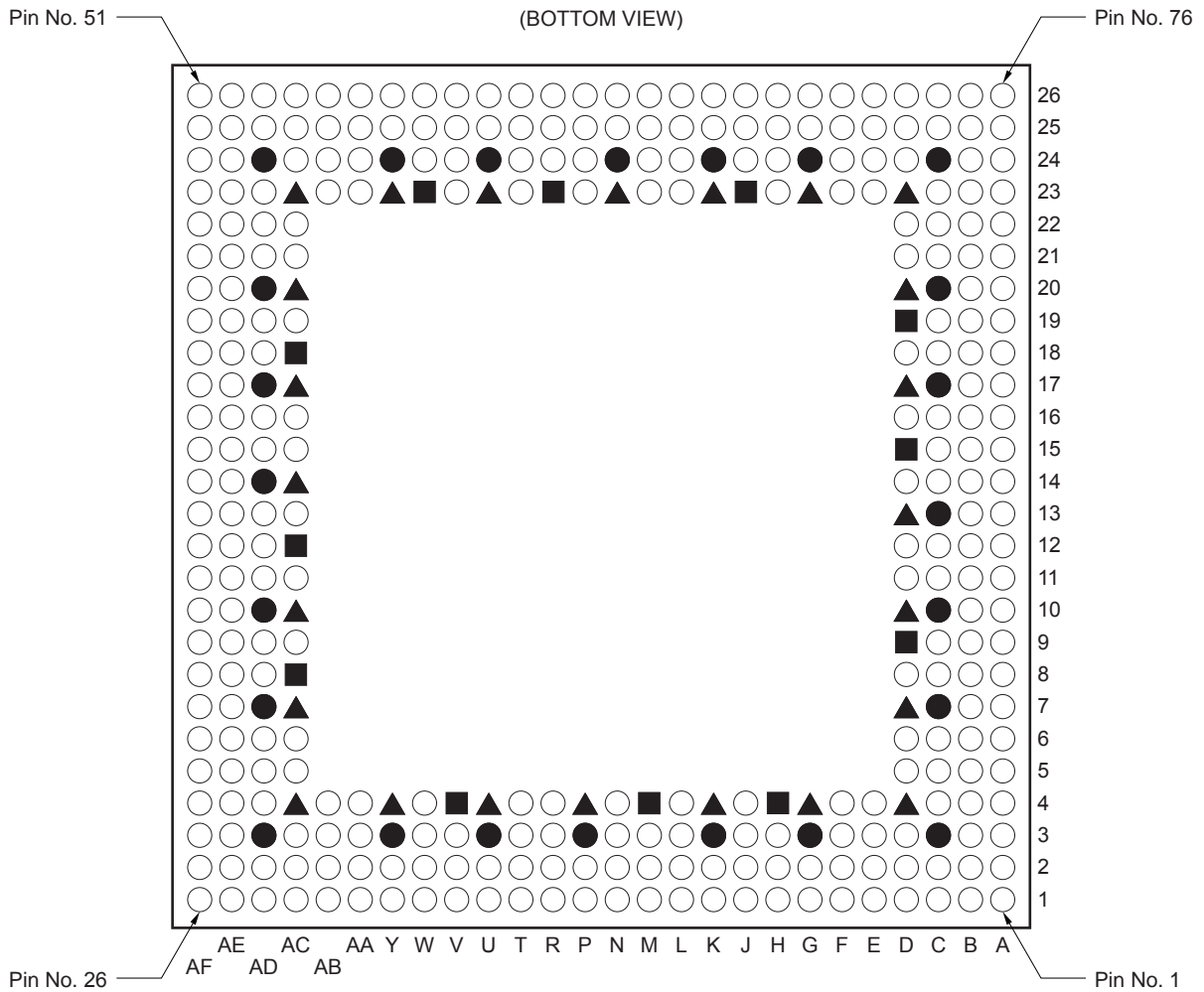
**Table 5-1. Correspondence Between Internal Chip Pins and Ball Numbers
(256-pin TBGA (with Heat Spreader)) (3/4)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
129	C	190	C18	V _{DD1}	161	C	48	L20	
130	C	128	B19		162	C	119	L19	
131	C	57	B20		163	C	182	L18	
132	C	127	C19		164	C	237	L17	
133	C	189	D18		165	C	47	M20	
134	C	56	C20		166	C	118	M19	
135	C	243	E17		167	C	181	M18	
136	C	126	D19		168	C	236	M17	
137	C	188	E18		169	C	46	N20	
138	C	55	D20		170	C	117	N19	
139	C	125	E19		171	C	180	N18	
140	C	54	E20		172	C	235	N17	V _{DD2}
141	C	242	F17		173	C	45	P20	
142	C	187	F18		174	C	116	P19	
143	C	124	F19		175	C	179	P18	V _{DD1}
144	C	53	F20		176	C	234	P17	GND
145	C	241	G17	GND	177	C	44	R20	
146	C	186	G18	V _{DD1}	178	C	115	R19	
147	C	123	G19		179	C	178	R18	
148	C	52	G20		180	C	233	R17	
149	C	240	H17	V _{DD2}	181	C	43	T20	
150	C	185	H18		182	C	114	T19	
151	C	122	H19		183	C	42	U20	
152	C	51	H20		184	C	177	T18	
153	C	239	J17		185	C	113	U19	
154	C	184	J18		186	C	232	T17	
155	C	121	J19		187	C	41	V20	
156	C	50	J20		188	C	176	U18	
157	C	238	K17	GND	189	C	112	V19	
158	C	183	K18	V _{DD1}	190	C	40	W20	
159	C	120	K19		191	C	39	Y20	
160	C	49	K20		192	C	175	V18	V _{DD1}

**Table 5-1. Correspondence Between Internal Chip Pins and Ball Numbers
(256-pin TBGA (with Heat Spreader)) (4/4)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
193	D	231	U17	GND	225	D	29	Y10	
194	D	111	W19		226	D	102	W10	
195	D	38	Y19		227	D	167	V10	
196	D	110	W18		228	D	224	U10	
197	D	174	V17		229	D	28	Y9	
198	D	37	Y18		230	D	101	W9	
199	D	230	U16		231	D	166	V9	
200	D	109	W17		232	D	223	U9	
201	D	173	V16		233	D	27	Y8	
202	D	36	Y17		234	D	100	W8	
203	D	108	W16		235	D	165	V8	
204	D	35	Y16		236	D	222	U8	V _{DD2}
205	D	229	U15		237	D	26	Y7	
206	D	172	V15		238	D	99	W7	
207	D	107	W15		239	D	164	V7	V _{DD1}
208	D	34	Y15		240	D	221	U7	GND
209	D	228	U14	GND	241	D	25	Y6	
210	D	171	V14	V _{DD1}	242	D	98	W6	
211	D	106	W14		243	D	163	V6	
212	D	33	Y14		244	D	220	U6	
213	D	227	U13	V _{DD2}	245	D	24	Y5	
214	D	170	V13		246	D	97	W5	
215	D	105	W13		247	D	23	Y4	
216	D	32	Y13		248	D	162	V5	
217	D	226	U12		249	D	96	W4	
218	D	169	V12		250	D	219	U5	
219	D	104	W12		251	D	22	Y3	
220	D	31	Y12		252	D	161	V4	
221	D	225	U11	GND	253	D	95	W3	
222	D	168	V11	V _{DD1}	254	D	21	Y2	
223	D	103	W11		255	D	20	Y1	
224	D	30	Y11		256	D	218	U4	GND

5.4.2 352-pin TBGA (with heat spreader)



- Remark**
- ▲ : GND (24 pins)
 - : V_{DD1} (24 pins)
 - : V_{DD2} (12 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
277 (D4), 280 (G4), 283 (K4), 287 (P4), 290 (U4), 293 (Y4), 296 (AC4), 299 (AC7), 302 (AC10), 306 (AC14), 309 (AC17), 312 (AC20), 315 (AC23), 318 (Y23), 321 (U23), 325 (N23), 328 (K23), 331 (G23), 334 (D23), 337 (D20), 340 (D17), 344 (D13), 347 (D10), 350 (D7)	193 (C3), 197 (G3), 200 (K3), 204 (P3), 207 (U3), 210 (Y3), 214 (AD3), 218 (AD7), 221 (AD10), 225 (AD14), 228 (AD17), 231 (AD20), 235 (AD24), 239 (Y24), 242 (U24), 246 (N24), 249 (K24), 252 (G24), 256 (C24), 260 (C20), 263 (C17), 267 (C13), 270 (C10), 273 (C7)	281 (H4), 285 (M4), 291 (V4), 300 (AC8), 304 (AC12), 310 (AC18), 319 (W23), 323 (R23), 329 (J23), 338 (D19), 342 (D15), 348 (D9)	None	There are no restrictions on the assignment of dedicated scan path pins.			292

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

**Table 5-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (1/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
1	A	214	AD3	V _{DD1}	33	A	289	T4	
2	A	124	AE2		34	A	206	T3	
3	A	25	AE1		35	A	115	T2	
4	A	123	AD2		36	A	16	T1	
5	A	213	AC3		37	A	288	R4	
6	A	24	AD1		38	A	205	R3	
7	A	295	AB4		39	A	114	R2	
8	A	122	AC2		40	A	15	R1	
9	A	212	AB3		41	A	287	P4	GND
10	A	23	AC1		42	A	204	P3	V _{DD1}
11	A	121	AB2		43	A	113	P2	
12	A	22	AB1		44	A	14	P1	
13	A	294	AA4		45	A	13	N1	
14	A	211	AA3		46	A	112	N2	
15	A	120	AA2		47	A	203	N3	
16	A	21	AA1		48	A	286	N4	
17	A	293	Y4	GND	49	A	12	M1	
18	A	210	Y3	V _{DD1}	50	A	111	M2	
19	A	119	Y2		51	A	202	M3	
20	A	20	Y1		52	A	285	M4	V _{DD2}
21	A	292	W4		53	A	11	L1	
22	A	209	W3		54	A	110	L2	
23	A	118	W2		55	A	201	L3	
24	A	19	W1		56	A	284	L4	
25	A	291	V4	V _{DD2}	57	A	10	K1	
26	A	208	V3		58	A	109	K2	
27	A	117	V2		59	A	200	K3	V _{DD1}
28	A	18	V1		60	A	283	K4	GND
29	A	290	U4	GND	61	A	9	J1	
30	A	207	U3	V _{DD1}	62	A	108	J2	
31	A	116	U2		63	A	199	J3	
32	A	17	U1		64	A	282	J4	

**Table 5-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (2/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
65	A	8	H1		97	B	275	C5	
66	A	107	H2		98	B	98	A4	
67	A	198	H3		99	B	190	B5	
68	A	281	H4	V _{DD2}	100	B	97	A5	
69	A	7	G1		101	B	351	D6	
70	A	106	G2		102	B	274	C6	
71	A	197	G3	V _{DD1}	103	B	189	B6	
72	A	280	G4	GND	104	B	96	A6	
73	A	6	F1		105	B	350	D7	GND
74	A	105	F2		106	B	273	C7	V _{DD1}
75	A	196	F3		107	B	188	B7	
76	A	279	F4		108	B	95	A7	
77	A	5	E1		109	B	349	D8	
78	A	104	E2		110	B	272	C8	
79	A	4	D1		111	B	187	B8	
80	A	195	E3		112	B	94	A8	
81	A	103	D2		113	B	348	D9	V _{DD2}
82	A	278	E4		114	B	271	C9	
83	A	3	C1		115	B	186	B9	
84	A	194	D3		116	B	93	A9	
85	A	102	C2		117	B	347	D10	GND
86	A	2	B1		118	B	270	C10	V _{DD1}
87	A	1	A1		119	B	185	B10	
88	A	193	C3	V _{DD1}	120	B	92	A10	
89	B	277	D4	GND	121	B	346	D11	
90	B	101	B2		122	B	269	C11	
91	B	100	A2		123	B	184	B11	
92	B	192	B3		124	B	91	A11	
93	B	276	C4		125	B	345	D12	
94	B	99	A3		126	B	268	C12	
95	B	352	D5		127	B	183	B12	
96	B	191	B4		128	B	90	A12	

**Table 5-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (3/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
129	B	344	D13	GND	161	B	81	A21	
130	B	267	C13	V _{DD1}	162	B	174	B21	
131	B	182	B13		163	B	259	C21	
132	B	89	A13		164	B	336	D21	
133	B	88	A14		165	B	80	A22	
134	B	181	B14		166	B	173	B22	
135	B	266	C14		167	B	79	A23	
136	B	343	D14		168	B	258	C22	
137	B	87	A15		169	B	172	B23	
138	B	180	B15		170	B	335	D22	
139	B	265	C15		171	B	78	A24	
140	B	342	D15	V _{DD2}	172	B	257	C23	
141	B	86	A16		173	B	171	B24	
142	B	179	B16		174	B	77	A25	
143	B	264	C16		175	B	76	A26	
144	B	341	D16		176	B	334	D23	GND
145	B	85	A17		177	C	256	C24	V _{DD1}
146	B	178	B17		178	C	170	B25	
147	B	263	C17	V _{DD1}	179	C	75	B26	
148	B	340	D17	GND	180	C	169	C25	
149	B	84	A18		181	C	255	D24	
150	B	177	B18		182	C	74	C26	
151	B	262	C18		183	C	333	E23	
152	B	339	D18		184	C	168	D25	
153	B	83	A19		185	C	254	E24	
154	B	176	B19		186	C	73	D26	
155	B	261	C19		187	C	167	E25	
156	B	338	D19	V _{DD2}	188	C	72	E26	
157	B	82	A20		189	C	332	F23	
158	B	175	B20		190	C	253	F24	
159	B	260	C20	V _{DD1}	191	C	166	F25	
160	B	337	D20	GND	192	C	71	F26	

**Table 5-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (4/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
193	C	331	G23	GND	225	C	62	R26	
194	C	252	G24	V _{DD1}	226	C	157	R25	
195	C	165	G25		227	C	244	R24	
196	C	70	G26		228	C	323	R23	V _{DD2}
197	C	330	H23		229	C	61	T26	
198	C	251	H24		230	C	156	T25	
199	C	164	H25		231	C	243	T24	
200	C	69	H26		232	C	322	T23	
201	C	329	J23	V _{DD2}	233	C	60	U26	
202	C	250	J24		234	C	155	U25	
203	C	163	J25		235	C	242	U24	V _{DD1}
204	C	68	J26		236	C	321	U23	GND
205	C	328	K23	GND	237	C	59	V26	
206	C	249	K24	V _{DD1}	238	C	154	V25	
207	C	162	K25		239	C	241	V24	
208	C	67	K26		240	C	320	V23	
209	C	327	L23		241	C	58	W26	
210	C	248	L24		242	C	153	W25	
211	C	161	L25		243	C	240	W24	
212	C	66	L26		244	C	319	W23	V _{DD2}
213	C	326	M23		245	C	57	Y26	
214	C	247	M24		246	C	152	Y25	
215	C	160	M25		247	C	239	Y24	V _{DD1}
216	C	65	M26		248	C	318	Y23	GND
217	C	325	N23	GND	249	C	56	AA26	
218	C	246	N24	V _{DD1}	250	C	151	AA25	
219	C	159	N25		251	C	238	AA24	
220	C	64	N26		252	C	317	AA23	
221	C	63	P26		253	C	55	AB26	
222	C	158	P25		254	C	150	AB25	
223	C	245	P24		255	C	54	AC26	
224	C	324	P23		256	C	237	AB24	

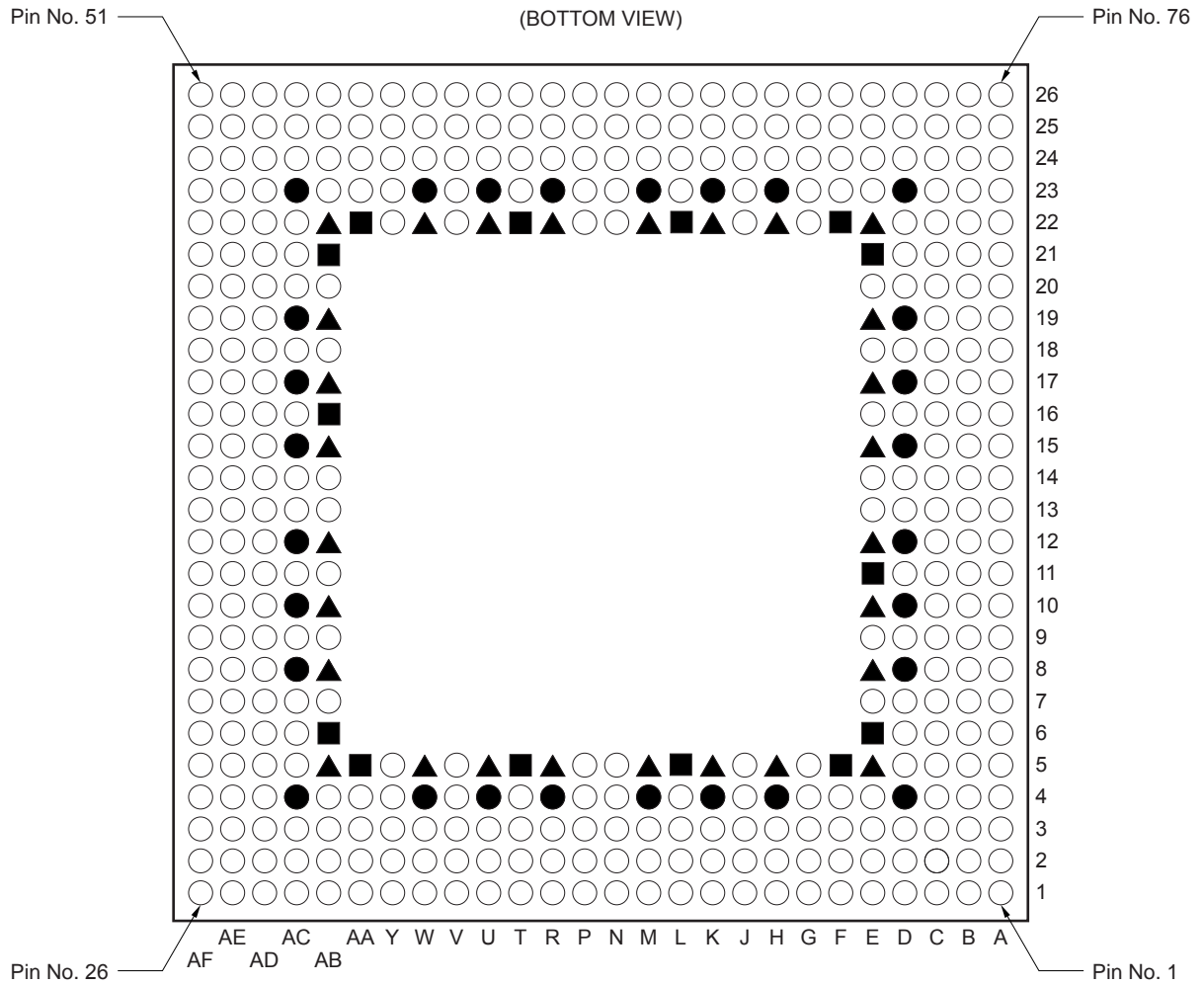
**Table 5-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (5/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
257	C	149	AC25		289	D	310	AC18	V _{DD2}
258	C	316	AB23		290	D	229	AD18	
259	C	53	AD26		291	D	140	AE18	
260	C	236	AC24		292	D	43	AF18	
261	C	148	AD25		293	D	309	AC17	GND
262	C	52	AE26		294	D	228	AD17	V _{DD1}
263	C	51	AF26		295	D	139	AE17	
264	C	235	AD24	V _{DD1}	296	D	42	AF17	
265	D	315	AC23	GND	297	D	308	AC16	
266	D	147	AE25		298	D	227	AD16	
267	D	50	AF25		299	D	138	AE16	
268	D	146	AE24		300	D	41	AF16	
269	D	234	AD23		301	D	307	AC15	
270	D	49	AF24		302	D	226	AD15	
271	D	314	AC22		303	D	137	AE15	
272	D	145	AE23		304	D	40	AF15	
273	D	233	AD22		305	D	306	AC14	GND
274	D	48	AF23		306	D	225	AD14	V _{DD1}
275	D	144	AE22		307	D	136	AE14	
276	D	47	AF22		308	D	39	AF14	
277	D	313	AC21		309	D	38	AF13	
278	D	232	AD21		310	D	135	AE13	
279	D	143	AE21		311	D	224	AD13	
280	D	46	AF21		312	D	305	AC13	
281	D	312	AC20	GND	313	D	37	AF12	
282	D	231	AD20	V _{DD1}	314	D	134	AE12	
283	D	142	AE20		315	D	223	AD12	
284	D	45	AF20		316	D	304	AC12	V _{DD2}
285	D	311	AC19		317	D	36	AF11	
286	D	230	AD19		318	D	133	AE11	
287	D	141	AE19		319	D	222	AD11	
288	D	44	AF19		320	D	303	AC11	

**Table 5-2. Correspondence Between Internal Chip Pins and Ball Numbers
(352-pin TBGA (with Heat Spreader)) (6/6)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
321	D	35	AF10	
322	D	132	AE10	
323	D	221	AD10	V _{DD1}
324	D	302	AC10	GND
325	D	34	AF9	
326	D	131	AE9	
327	D	220	AD9	
328	D	301	AC9	
329	D	33	AF8	
330	D	130	AE8	
331	D	219	AD8	
332	D	300	AC8	V _{DD2}
333	D	32	AF7	
334	D	129	AE7	
335	D	218	AD7	V _{DD1}
336	D	299	AC7	GND
337	D	31	AF6	
338	D	128	AE6	
339	D	217	AD6	
340	D	298	AC6	
341	D	30	AF5	
342	D	127	AE5	
343	D	29	AF4	
344	D	216	AD5	
345	D	126	AE4	
346	D	297	AC5	
347	D	28	AF3	
348	D	215	AD4	
349	D	125	AE3	
350	D	27	AF2	
351	D	26	AF1	
352	D	296	AC4	GND

5.4.3 420-pin TBGA (with heat spreader)



GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
353 (E5), 356 (H5), 358 (K5), 360 (M5), 363 (R5), 365 (U5), 367 (W5), 370 (AB5), 373 (AB8), 375 (AB10), 377 (AB12), 380 (AB15), 382 (AB17), 384 (AB19), 387 (AB22), 390 (W22), 392 (U22), 394 (R22), 397 (M22), 399 (K22), 401 (H22), 404 (E22), 407 (E19), 409 (E17), 411 (E15), 414 (E12), 416 (E10), 418 (E8)	277 (D4), 281 (H4), 283 (K4), 285 (M4), 288 (R4), 290 (U4), 292 (W4), 296 (AC4), 300 (AC8), 302 (AC10), 304 (AC12), 307 (AC15), 309 (AC17), 311 (AC19), 315 (AC23), 319 (W23), 321 (U23), 323 (R23), 326 (M23), 328 (K23), 330 (H23), 334 (D23), 338 (D19), 340 (D17), 342 (D15), 345 (D12), 347 (D10), 349 (D8)	354 (F5), 359 (L5), 364 (T5), 369 (AA5), 371 (AB6), 381 (AB16), 386 (AB21), 388 (AA22), 393 (T22), 398 (L22), 403 (F22), 405 (E21), 415 (E11), 420 (E6)	None	There are no restrictions on the assignment of dedicated scan path pins.			350

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

**Table 5-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (1/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
1	A	296	AC4	V _{DD1}	31	A	117	V2	
2	A	214	AD3		32	A	18	V1	
3	A	25	AE1		33	A	365	U5	GND
4	A	123	AD2		34	A	290	U4	V _{DD1}
5	A	213	AC3		35	A	207	U3	
6	A	369	AA5	V _{DD2}	36	A	116	U2	
7	A	295	AB4		37	A	17	U1	
8	A	24	AD1		38	A	364	T5	V _{DD2}
9	A	122	AC2		39	A	289	T4	
10	A	212	AB3		40	A	206	T3	
11	A	294	AA4		41	A	115	T2	
12	A	23	AC1		42	A	16	T1	
13	A	368	Y5		43	A	363	R5	GND
14	A	121	AB2		44	A	288	R4	V _{DD1}
15	A	211	AA3		45	A	205	R3	
16	A	293	Y4		46	A	114	R2	
17	A	22	AB1		47	A	15	R1	
18	A	120	AA2		48	A	362	P5	
19	A	210	Y3		49	A	287	P4	
20	A	367	W5	GND	50	A	204	P3	
21	A	292	W4	V _{DD1}	51	A	113	P2	
22	A	21	AA1		52	A	14	P1	
23	A	119	Y2		53	A	203	N3	
24	A	209	W3		54	A	286	N4	
25	A	20	Y1		55	A	361	N5	
26	A	118	W2		56	A	112	N2	
27	A	366	V5		57	A	13	N1	
28	A	291	V4		58	A	12	M1	
29	A	208	V3		59	A	111	M2	
30	A	19	W1		60	A	202	M3	

**Table 5-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (2/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
61	A	285	M4	V _{DD1}	91	A	104	E2	
62	A	360	M5	GND	92	A	355	G5	
63	A	11	L1		93	A	4	D1	
64	A	110	L2		94	A	279	F4	
65	A	201	L3		95	A	195	E3	
66	A	284	L4		96	A	103	D2	
67	A	359	L5	V _{DD2}	97	A	3	C1	
68	A	10	K1		98	A	278	E4	
69	A	109	K2		99	A	354	F5	V _{DD2}
70	A	200	K3		100	A	194	D3	
71	A	283	K4	V _{DD1}	101	A	102	C2	
72	A	358	K5	GND	102	A	2	B1	
73	A	9	J1		103	A	1	A1	
74	A	108	J2		104	A	101	B2	
75	A	8	H1		105	A	277	D4	V _{DD1}
76	A	199	J3		106	B	353	E5	GND
77	A	282	J4		107	B	193	C3	
78	A	357	J5		108	B	100	A2	
79	A	107	H2		109	B	192	B3	
80	A	7	G1		110	B	276	C4	
81	A	198	H3		111	B	420	E6	V _{DD2}
82	A	106	G2		112	B	352	D5	
83	A	6	F1		113	B	99	A3	
84	A	281	H4	V _{DD1}	114	B	191	B4	
85	A	356	H5	GND	115	B	275	C5	
86	A	197	G3		116	B	351	D6	
87	A	105	F2		117	B	98	A4	
88	A	5	E1		118	B	419	E7	
89	A	280	G4		119	B	190	B5	
90	A	196	F3		120	B	274	C6	

**Table 5-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (3/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
121	B	350	D7		151	B	183	B12	
122	B	97	A5		152	B	90	A12	
123	B	189	B6		153	B	413	E13	
124	B	273	C7		154	B	344	D13	
125	B	418	E8	GND	155	B	267	C13	
126	B	349	D8	V _{DD1}	156	B	182	B13	
127	B	96	A6		157	B	89	A13	
128	B	188	B7		158	B	266	C14	
129	B	272	C8		159	B	343	D14	
130	B	95	A7		160	B	412	E14	
131	B	187	B8		161	B	181	B14	
132	B	417	E9		162	B	88	A14	
133	B	348	D9		163	B	87	A15	
134	B	271	C9		164	B	180	B15	
135	B	94	A8		165	B	265	C15	
136	B	186	B9		166	B	342	D15	V _{DD1}
137	B	93	A9		167	B	411	E15	GND
138	B	416	E10	GND	168	B	86	A16	
139	B	347	D10	V _{DD1}	169	B	179	B16	
140	B	270	C10		170	B	264	C16	
141	B	185	B10		171	B	341	D16	
142	B	92	A10		172	B	410	E16	
143	B	415	E11	V _{DD2}	173	B	85	A17	
144	B	346	D11		174	B	178	B17	
145	B	269	C11		175	B	263	C17	
146	B	184	B11		176	B	340	D17	V _{DD1}
147	B	91	A11		177	B	409	E17	GND
148	B	414	E12	GND	178	B	84	A18	
149	B	345	D12	V _{DD1}	179	B	177	B18	
150	B	268	C12		180	B	83	A19	

**Table 5-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (4/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
181	B	262	C18		211	C	334	D23	V _{DD1}
182	B	339	D18		212	C	256	C24	
183	B	408	E18		213	C	75	B26	
184	B	176	B19		214	C	169	C25	
185	B	82	A20		215	C	255	D24	
186	B	261	C19		216	C	403	F22	V _{DD2}
187	B	175	B20		217	C	333	E23	
188	B	81	A21		218	C	74	C26	
189	B	338	D19	V _{DD1}	219	C	168	D25	
190	B	407	E19	GND	220	C	254	E24	
191	B	260	C20		221	C	332	F23	
192	B	174	B21		222	C	73	D26	
193	B	80	A22		223	C	402	G22	
194	B	337	D20		224	C	167	E25	
195	B	259	C21		225	C	253	F24	
196	B	173	B22		226	C	331	G23	
197	B	406	E20		227	C	72	E26	
198	B	79	A23		228	C	166	F25	
199	B	336	D21		229	C	252	G24	
200	B	258	C22		230	C	401	H22	GND
201	B	172	B23		231	C	330	H23	V _{DD1}
202	B	78	A24		232	C	71	F26	
203	B	335	D22		233	C	165	G25	
204	B	405	E21	V _{DD2}	234	C	251	H24	
205	B	257	C23		235	C	70	G26	
206	B	171	B24		236	C	164	H25	
207	B	77	A25		237	C	400	J22	
208	B	76	A26		238	C	329	J23	
209	B	170	B25		239	C	250	J24	
210	B	404	E22	GND	240	C	69	H26	

**Table 5-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (5/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
241	C	163	J25		271	C	323	R23	V _{DD1}
242	C	68	J26		272	C	394	R22	GND
243	C	399	K22	GND	273	C	61	T26	
244	C	328	K23	V _{DD1}	274	C	156	T25	
245	C	249	K24		275	C	243	T24	
246	C	162	K25		276	C	322	T23	
247	C	67	K26		277	C	393	T22	V _{DD2}
248	C	398	L22	V _{DD2}	278	C	60	U26	
249	C	327	L23		279	C	155	U25	
250	C	248	L24		280	C	242	U24	
251	C	161	L25		281	C	321	U23	V _{DD1}
252	C	66	L26		282	C	392	U22	GND
253	C	397	M22	GND	283	C	59	V26	
254	C	326	M23	V _{DD1}	284	C	154	V25	
255	C	247	M24		285	C	58	W26	
256	C	160	M25		286	C	241	V24	
257	C	65	M26		287	C	320	V23	
258	C	396	N22		288	C	391	V22	
259	C	325	N23		289	C	153	W25	
260	C	246	N24		290	C	57	Y26	
261	C	159	N25		291	C	240	W24	
262	C	64	N26		292	C	152	Y25	
263	C	245	P24		293	C	56	AA26	
264	C	324	P23		294	C	319	W23	V _{DD1}
265	C	395	P22		295	C	390	W22	GND
266	C	158	P25		296	C	239	Y24	
267	C	63	P26		297	C	151	AA25	
268	C	62	R26		298	C	55	AB26	
269	C	157	R25		299	C	318	Y23	
270	C	244	R24		300	C	238	AA24	

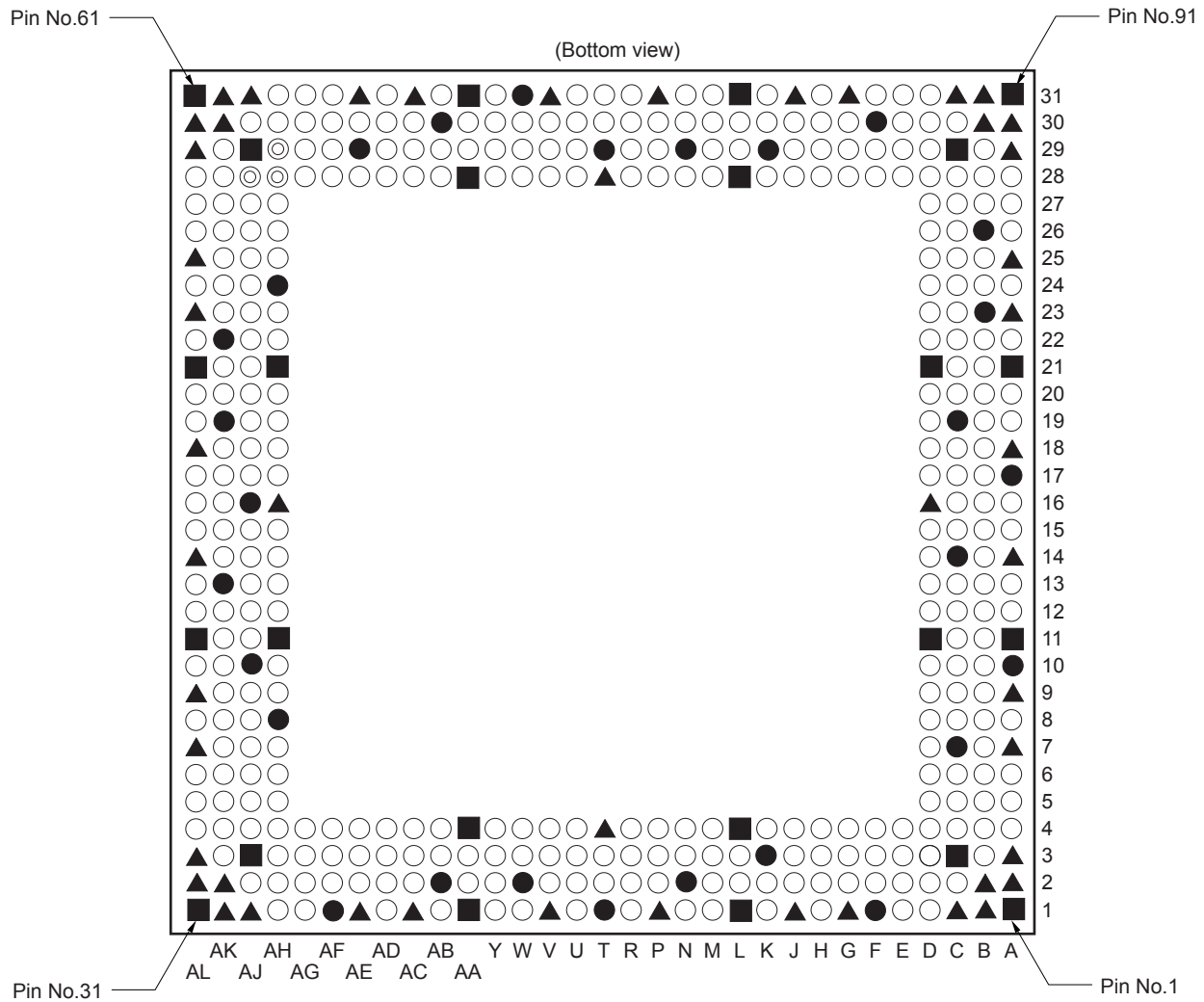
**Table 5-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (6/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
301	C	150	AB25		331	D	312	AC20	
302	C	389	Y22		332	D	47	AF22	
303	C	54	AC26		333	D	143	AE21	
304	C	317	AA23		334	D	231	AD20	
305	C	237	AB24		335	D	384	AB19	GND
306	C	149	AC25		336	D	311	AC19	V _{DD1}
307	C	53	AD26		337	D	46	AF21	
308	C	316	AB23		338	D	142	AE20	
309	C	388	AA22	V _{DD2}	339	D	230	AD19	
310	C	236	AC24		340	D	45	AF20	
311	C	148	AD25		341	D	141	AE19	
312	C	52	AE26		342	D	383	AB18	
313	C	51	AF26		343	D	310	AC18	
314	C	147	AE25		344	D	229	AD18	
315	C	315	AC23	V _{DD1}	345	D	44	AF19	
316	D	387	AB22	GND	346	D	140	AE18	
317	D	235	AD24		347	D	43	AF18	
318	D	50	AF25		348	D	382	AB17	GND
319	D	146	AE24		349	D	309	AC17	V _{DD1}
320	D	234	AD23		350	D	228	AD17	
321	D	386	AB21	V _{DD2}	351	D	139	AE17	
322	D	314	AC22		352	D	42	AF17	
323	D	49	AF24		353	D	381	AB16	V _{DD2}
324	D	145	AE23		354	D	308	AC16	
325	D	233	AD22		355	D	227	AD16	
326	D	313	AC21		356	D	138	AE16	
327	D	48	AF23		357	D	41	AF16	
328	D	385	AB20		358	D	380	AB15	GND
329	D	144	AE22		359	D	307	AC15	V _{DD1}
330	D	232	AD21		360	D	226	AD15	

**Table 5-3. Correspondence Between Internal Chip Pins and Ball Numbers
(420-pin TBGA (with Heat Spreader)) (7/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
361	D	137	AE15		391	D	220	AD9	
362	D	40	AF15		392	D	301	AC9	
363	D	379	AB14		393	D	374	AB9	
364	D	306	AC14		394	D	130	AE8	
365	D	225	AD14		395	D	32	AF7	
366	D	136	AE14		396	D	219	AD8	
367	D	39	AF14		397	D	129	AE7	
368	D	224	AD13		398	D	31	AF6	
369	D	305	AC13		399	D	300	AC8	V _{DD1}
370	D	378	AB13		400	D	373	AB8	GND
371	D	135	AE13		401	D	218	AD7	
372	D	38	AF13		402	D	128	AE6	
373	D	37	AF12		403	D	30	AF5	
374	D	134	AE12		404	D	299	AC7	
375	D	223	AD12		405	D	217	AD6	
376	D	304	AC12	V _{DD1}	406	D	127	AE5	
377	D	377	AB12	GND	407	D	372	AB7	
378	D	36	AF11		408	D	29	AF4	
379	D	133	AE11		409	D	298	AC6	
380	D	222	AD11		410	D	216	AD5	
381	D	303	AC11		411	D	126	AE4	
382	D	376	AB11		412	D	28	AF3	
383	D	35	AF10		413	D	297	AC5	
384	D	132	AE10		414	D	371	AB6	V _{DD2}
385	D	221	AD10		415	D	215	AD4	
386	D	302	AC10	V _{DD1}	416	D	125	AE3	
387	D	375	AB10	GND	417	D	27	AF2	
388	D	34	AF9		418	D	26	AF1	
389	D	131	AE9		419	D	124	AE2	
390	D	33	AF8		420	D	370	AB5	GND

5.4.4 432-pin TBGA (with heat spreader)



- Remark**
- ▲: GND (48 pins)
 - : V_{DD1} (28 pins)
 - : V_{DD2} (24 pins)
 - ⊙: NC (3 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
2 (B1), 3 (C1), 7 (G1), 9 (J1), 14 (P1), 18 (V1), 23 (AC1), 25 (AE1), 29 (AJ1), 30 (AK1), 32 (AL2), 33 (AL3), 37 (AL7), 39 (AL9), 44 (AL14), 48 (AL18), 53 (AL23), 55 (AL25), 59 (AL29), 60 (AL30), 62 (AK31), 63 (AJ31), 67 (AE31), 69 (AC31), 74 (V31), 78 (P31), 83 (J31), 85 (G31), 89 (C31), 90 (B31), 92 (A30), 93 (A29), 97 (A25), 99 (A23), 104 (A18), 108 (A14), 113 (A9), 115 (A7), 119 (A3), 120 (A2), 121 (B2), 149 (AK2), 177 (AK30), 205 (B30), 349 (T4), 373 (AH16), 397 (T28), 421 (D16)	6 (F1), 16 (T1), 26 (AF1), 73 (W31), 105 (A17), 112 (A12), 132 (N2), 138 (W2), 141 (AB2), 160 (AK13), 166 (AK19), 169 (AK22), 185 (AB30), 201 (F30), 209 (B26), 212 (B23), 240 (K3), 266 (AJ10), 272 (AJ17), 289 (AE29), 298 (T29), 301 (N29), 304 (K29), 321 (C19), 326 (C14), 333 (C7), 365 (AH8), 381 (AH24)	1 (A1), 11 (L1), 21 (AA1), 31 (AL1), 41 (AL11), 51 (AL21), 61 (AL31), 71 (AA31), 81 (L31), 91 (A31), 101 (A21), 111 (A11), 233 (C3), 259 (AJ3), 285 (AJ29), 311 (C29), 344 (L4), 354 (AA4), 368 (AH11), 378 (AH21), 392 (AA28), 402 (L28), 416 (D28), 426 (D11)	284 (AJ28), 285 (AJ29), 286 (AH29)	There are no restrictions on the assignment of dedicated scan path pins.			329

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

**Table 5-4. Correspondence Between Internal Chip Pins and Ball Numbers
(432-pin TBGA (with Heat Spreader)) (1/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	–	–	V _{DD2}	–	A	–	–	GND
–	A	–	–	GND	–	A	353	Y4	
–	A	–	–	V _{DD2}	–	A	250	Y3	
–	A	148	AJ2		–	A	139	Y2	
–	A	258	AH3		–	A	–	–	V _{DD2}
–	A	147	AH2		–	A	20	Y1	
–	A	28	AH1		–	A	352	W4	
–	A	360	AG4		–	A	249	W3	
–	A	257	AG3		–	A	–	–	V _{DD1}
–	A	–	–	GND	–	A	19	W1	
–	A	146	AG2		–	A	–	–	GND
–	A	27	AG1		–	A	137	V2	
–	A	359	AF4		–	A	248	V3	
–	A	256	AF3		–	A	351	V4	
–	A	–	–	GND	–	A	17	U1	
–	A	145	AF2		–	A	136	U2	
–	A	–	–	V _{DD1}	–	A	247	U3	
–	A	358	AE4		–	A	350	U4	
–	A	255	AE3		–	A	–	–	GND
–	A	144	AE2		–	A	246	T3	
–	A	–	–	GND	–	A	135	T2	
–	A	357	AD4		–	A	–	–	V _{DD1}
–	A	254	AD3		–	A	348	R4	
–	A	143	AD2		–	A	245	R3	
–	A	24	AD1		–	A	134	R2	
–	A	356	AC4		–	A	15	R1	
–	A	253	AC3		–	A	347	P4	
–	A	142	AC2		–	A	244	P3	
–	A	–	–	GND	–	A	133	P2	
–	A	355	AB4		–	A	–	–	GND
–	A	252	AB3		–	A	346	N4	
–	A	–	–	V _{DD1}	–	A	243	N3	
–	A	22	AB1		–	A	–	–	V _{DD1}
–	A	–	–	V _{DD2}	–	A	13	N1	
–	A	251	AA3		–	A	345	M4	
–	A	140	AA2		–	A	242	M3	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-4. Correspondence Between Internal Chip Pins and Ball Numbers
(432-pin TBGA (with Heat Spreader)) (2/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
–	A	131	M2		–	A	–	–	V _{DD2}
–	A	12	M1		–	A	122	C2	
–	A	–	–	GND	–	B	–	–	GND
–	A	–	–	V _{DD2}	–	B	232	B3	
–	A	241	L3		–	B	337	D4	
–	A	130	L2		–	B	–	–	V _{DD2}
–	A	343	K4		–	B	336	C4	
–	A	–	–	V _{DD1}	–	B	231	B4	
–	A	129	K2		–	B	118	A4	
–	A	10	K1		–	B	432	D5	
–	A	342	J4		–	B	335	C5	
–	A	239	J3		–	B	–	–	GND
–	A	128	J2		–	B	230	B5	
–	A	–	–	GND	–	B	117	A5	
–	A	–	–	V _{DD2}	–	B	431	D6	
–	A	341	H4		–	B	–	–	GND
–	A	238	H3		–	B	334	C6	
–	A	127	H2		–	B	229	B6	
–	A	8	H1		–	B	116	A6	
–	A	340	G4		–	B	430	D7	
–	A	237	G3		–	B	–	–	V _{DD1}
–	A	126	G2		–	B	228	B7	
–	A	–	–	GND	–	B	–	–	GND
–	A	–	–	V _{DD1}	–	B	429	D8	
–	A	125	F2		–	B	332	C8	
–	A	236	F3		–	B	227	B8	
–	A	339	F4		–	B	114	A8	
–	A	5	E1		–	B	428	D9	
–	A	4	D1		–	B	331	C9	
–	A	–	–	GND	–	B	226	B9	
–	A	124	E2		–	B	–	–	GND
–	A	235	E3		–	B	427	D10	
–	A	338	E4		–	B	330	C10	
–	A	–	–	GND	–	B	225	B10	
–	A	234	D3		–	B	–	–	V _{DD1}
–	A	123	D2		–	B	–	–	V _{DD2}

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-4. Correspondence Between Internal Chip Pins and Ball Numbers
(432-pin TBGA (with Heat Spreader)) (3/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	329	C11		–	B	417	D20	
–	B	224	B11		–	B	320	C20	
–	B	–	–	GND	–	B	215	B20	
–	B	425	D12		–	B	102	A20	
–	B	328	C12		–	B	–	–	GND
–	B	223	B12		–	B	–	–	V _{DD2}
–	B	–	–	V _{DD2}	–	B	319	C21	
–	B	110	A12		–	B	214	B21	
–	B	424	D13		–	B	415	D22	
–	B	327	C13		–	B	318	C22	
–	B	222	B13		–	B	213	B22	
–	B	109	A13		–	B	100	A22	
–	B	–	–	GND	–	B	414	D23	
–	B	221	B14		–	B	317	C23	
–	B	–	–	V _{DD1}	–	B	–	–	V _{DD1}
–	B	423	D14		–	B	–	–	GND
–	B	107	A15		–	B	–	–	V _{DD2}
–	B	220	B15		–	B	413	D24	
–	B	325	C15		–	B	316	C24	
–	B	422	D15		–	B	211	B24	
–	B	–	–	GND	–	B	98	A24	
–	B	324	C16		–	B	412	D25	
–	B	219	B16		–	B	315	C25	
–	B	106	A16		–	B	210	B25	
–	B	420	D17		–	B	–	–	GND
–	B	323	C17		–	B	96	A26	
–	B	218	B17		–	B	–	–	V _{DD1}
–	B	–	–	V _{DD1}	–	B	314	C26	
–	B	419	D18		–	B	411	D26	
–	B	322	C18		–	B	95	A27	
–	B	217	B18		–	B	94	A28	
–	B	–	–	GND	–	B	–	–	GND
–	B	418	D19		–	B	208	B27	
–	B	–	–	V _{DD1}	–	B	313	C27	
–	B	216	B19		–	B	410	D27	
–	B	103	A19		–	B	–	–	GND

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-4. Correspondence Between Internal Chip Pins and Ball Numbers
(432-pin TBGA (with Heat Spreader)) (4/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	312	C28		–	C	82	K31	
–	B	207	B28		–	C	–	–	V _{DD2}
–	B	206	B29		–	C	303	L29	
–	B	409	D28		–	C	196	L30	
–	C	–	–	V _{DD2}	–	C	–	–	GND
–	C	–	–	GND	–	C	401	M28	
–	C	–	–	V _{DD2}	–	C	302	M29	
–	C	204	C30		–	C	195	M30	
–	C	310	D29		–	C	–	–	V _{DD2}
–	C	203	D30		–	C	80	M31	
–	C	88	D31		–	C	400	N28	
–	C	408	E28		–	C	–	–	V _{DD1}
–	C	–	–	GND	–	C	194	N30	
–	C	309	E29		–	C	79	N31	
–	C	202	E30		–	C	–	–	GND
–	C	87	E31		–	C	193	P30	
–	C	407	F28		–	C	300	P29	
–	C	308	F29		–	C	399	P28	
–	C	–	–	V _{DD1}	–	C	77	R31	
–	C	–	–	GND	–	C	192	R30	
–	C	86	F31		–	C	299	R29	
–	C	406	G28		–	C	398	R28	
–	C	307	G29		–	C	–	–	GND
–	C	200	G30		–	C	–	–	V _{DD1}
–	C	–	–	GND	–	C	191	T30	
–	C	405	H28		–	C	76	T31	
–	C	306	H29		–	C	396	U28	
–	C	199	H30		–	C	297	U29	
–	C	84	H31		–	C	190	U30	
–	C	404	J28		–	C	75	U31	
–	C	305	J29		–	C	395	V28	
–	C	198	J30		–	C	296	V29	
–	C	–	–	GND	–	C	189	V30	
–	C	403	K28		–	C	–	–	GND
–	C	–	–	V _{DD1}	–	C	394	W28	
–	C	197	K30		–	C	295	W29	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-4. Correspondence Between Internal Chip Pins and Ball Numbers
(432-pin TBGA (with Heat Spreader)) (5/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	188	W30		–	C	287	AG29	
–	C	–	–	V _{DD1}	–	C	386	AG28	
–	C	393	Y28		–	C	179	AH30	
–	C	294	Y29		–	C	178	AJ30	
–	C	187	Y30		–	C	–	–	V _{DD2}
–	C	72	Y31		–	C	–	–	GND
–	C	–	–	GND	–	D	176	AK29	
–	C	–	–	V _{DD2}	–	D	–	–	V _{DD2}
–	C	293	AA29		–	D	175	AK28	
–	C	186	AA30		–	D	58	AL28	
–	C	391	AB28		–	D	384	AH27	
–	C	292	AB29		–	D	283	AJ27	
–	C	–	–	V _{DD1}	–	D	–	–	GND
–	C	70	AB31		–	D	174	AK27	
–	C	390	AC28		–	D	57	AL27	
–	C	291	AC29		–	D	383	AH26	
–	C	184	AC30		–	D	282	AJ26	
–	C	–	–	GND	–	D	–	–	GND
–	C	–	–	V _{DD2}	–	D	173	AK26	
–	C	389	AD28		–	D	56	AL26	
–	C	290	AD29		–	D	382	AH25	
–	C	183	AD30		–	D	281	AJ25	
–	C	68	AD31		–	D	172	AK25	
–	C	388	AE28		–	D	–	–	GND
–	C	–	–	V _{DD1}	–	D	–	–	V _{DD1}
–	C	182	AE30		–	D	280	AJ24	
–	C	–	–	GND	–	D	171	AK24	
–	C	66	AF31		–	D	54	AL24	
–	C	181	AF30		–	D	380	AH23	
–	C	288	AF29		–	D	279	AJ23	
–	C	–	–	GND	–	D	170	AK23	
–	C	387	AF28		–	D	–	–	GND
–	C	65	AG31		–	D	379	AH22	
–	C	64	AH31		–	D	278	AJ22	
–	C	–	–	GND	–	D	–	–	V _{DD1}
–	C	180	AG30		–	D	52	AL22	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-4. Correspondence Between Internal Chip Pins and Ball Numbers
(432-pin TBGA (with Heat Spreader)) (6/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	D	–	–	V _{DD2}	–	D	43	AL13	
–	D	277	AJ21		–	D	369	AH12	
–	D	168	AK21		–	D	268	AJ12	
–	D	–	–	GND	–	D	159	AK12	
–	D	377	AH20		–	D	42	AL12	
–	D	276	AJ20		–	D	–	–	GND
–	D	167	AK20		–	D	–	–	V _{DD2}
–	D	–	–	V _{DD2}	–	D	267	AJ11	
–	D	50	AL20		–	D	158	AK11	
–	D	376	AH19		–	D	367	AH10	
–	D	275	AJ19		–	D	–	–	V _{DD1}
–	D	–	–	V _{DD1}	–	D	157	AK10	
–	D	49	AL19		–	D	40	AL10	
–	D	–	–	GND	–	D	366	AH9	
–	D	165	AK18		–	D	265	AJ9	
–	D	274	AJ18		–	D	156	AK9	
–	D	375	AH18		–	D	–	–	GND
–	D	47	AL17		–	D	–	–	V _{DD2}
–	D	164	AK17		–	D	–	–	V _{DD1}
–	D	273	AJ17		–	D	264	AJ8	
–	D	374	AH17		–	D	155	AK8	
–	D	–	–	GND	–	D	38	AL8	
–	D	–	–	V _{DD1}	–	D	364	AH7	
–	D	163	AK16		–	D	263	AJ7	
–	D	46	AL16		–	D	154	AK7	
–	D	372	AH15		–	D	–	–	GND
–	D	271	AJ15		–	D	36	AL6	
–	D	162	AK15		–	D	153	AK6	
–	D	45	AL15		–	D	262	AJ6	
–	D	371	AH14		–	D	363	AH6	
–	D	270	AJ14		–	D	–	–	GND
–	D	161	AK14		–	D	35	AL5	
–	D	–	–	GND	–	D	34	AL4	
–	D	370	AH13		–	D	–	–	GND
–	D	269	AJ13		–	D	152	AK5	
–	D	–	–	V _{DD1}	–	D	261	AJ5	

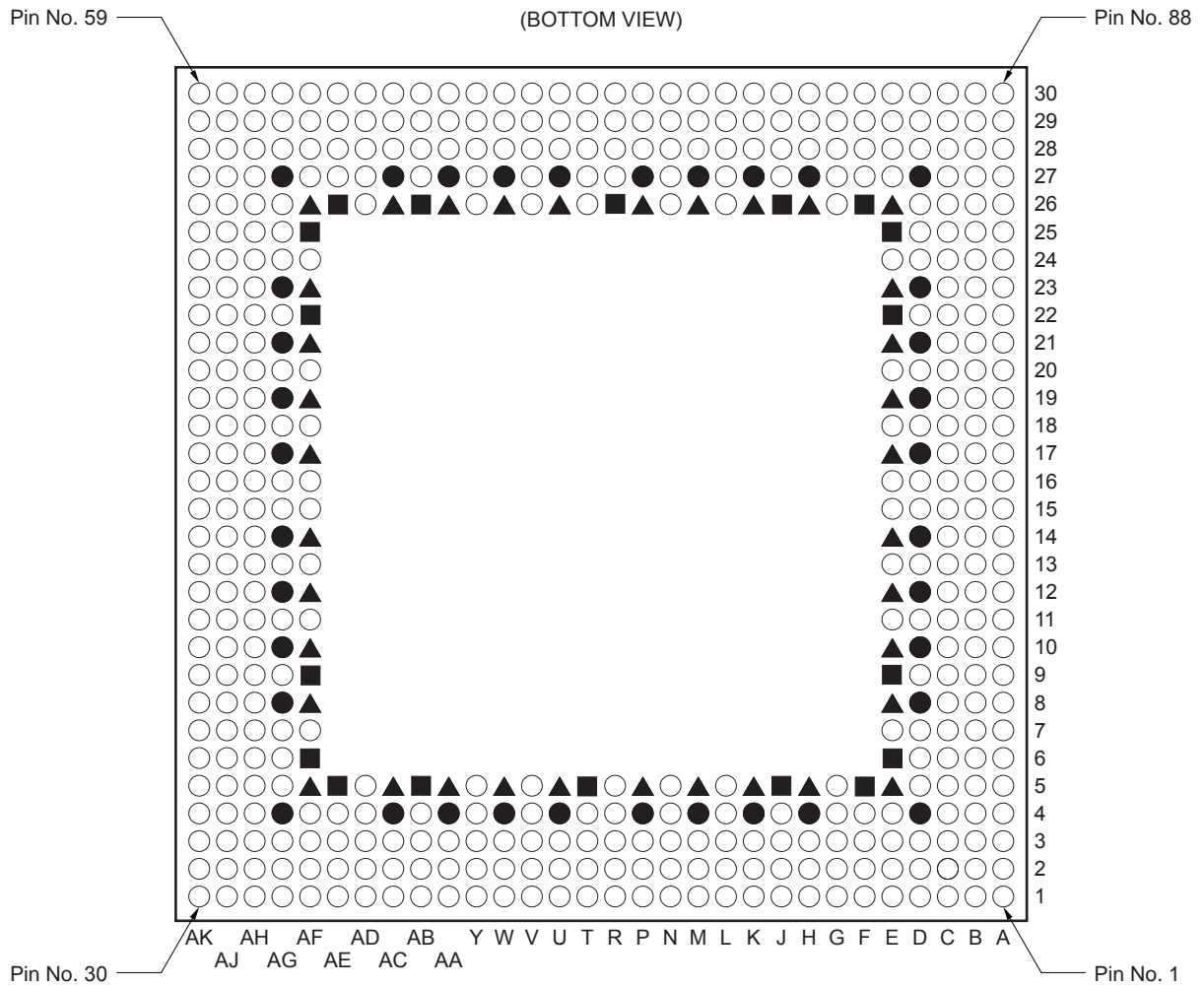
Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-4. Correspondence Between Internal Chip Pins and Ball Numbers
(432-pin TBGA (with Heat Spreader)) (7/7)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
–	D	362	AH5	
–	D	260	AJ4	
–	D	361	AH4	
–	D	151	AK4	
–	D	150	AK3	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

5.4.5 500-pin TBGA (with heat spreader)



- Remark**
- ▲ : GND (36 pins)
 - : V_{DD1} (36 pins)
 - : V_{DD2} (18 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
417 (E5), 420 (H5), 422 (K5), 424 (M5), 426 (P5), 429 (U5), 431 (W5), 433 (AA5), 435 (AC5), 438 (AF5), 441 (AF8), 443 (AF10), 445 (AF12), 447 (AF14), 450 (AF17), 452 (AF19), 454 (AF21), 456 (AF23), 459 (AF26), 462 (AC26), 464 (AA26), 466 (W26), 468 (U26), 471 (P26), 473 (M26), 475 (K26), 477 (H26), 480 (E26), 483 (E23), 485 (E21), 487 (E19), 489 (E17), 492 (E14), 494 (E12), 496 (E10), 498 (E8)	325 (D4), 329 (H4), 331 (K4), 333 (M4), 335 (P4), 338 (U4), 340 (W4), 342 (AA4), 344 (AC4), 348 (AG4), 352 (AG8), 354 (AG10), 356 (AG12), 358 (AG14), 361 (AG17), 363 (AG19), 365 (AG21), 367 (AG23), 371 (AG27), 375 (AC27), 377 (AA27), 379 (W27), 381 (U27), 384 (P27), 386 (M27), 388 (K27), 390 (H27), 394 (D27), 398 (D23), 400 (D21), 402 (D19), 404 (D17), 407 (D14), 409 (D12), 411 (D10), 413 (D8)	418 (F5), 421 (J5), 428 (T5), 434 (AB5), 437 (AE5), 439 (AF6), 442 (AF9), 455 (AF22), 458 (AF25), 460 (AE26), 463 (AB26), 470 (R26), 476 (J26), 479 (F26), 481 (E25), 484 (E22), 497 (E9), 500 (E6)	None	There are no restrictions on the assignment of dedicated scan path pins.			410

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

**Table 5-5. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (1/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
1	A	348	AG4	V _{DD1}	31	A	137	AB2	
2	A	250	AH3		32	A	22	AB1	
3	A	29	AJ1		33	A	433	AA5	GND
4	A	143	AH2		34	A	342	AA4	V _{DD1}
5	A	249	AG3		35	A	243	AA3	
6	A	437	AE5	V _{DD2}	36	A	136	AA2	
7	A	347	AF4		37	A	21	AA1	
8	A	28	AH1		38	A	432	Y5	
9	A	142	AG2		39	A	341	Y4	
10	A	248	AF3		40	A	242	Y3	
11	A	346	AE4		41	A	135	Y2	
12	A	27	AG1		42	A	20	Y1	
13	A	436	AD5		43	A	431	W5	GND
14	A	141	AF2		44	A	340	W4	V _{DD1}
15	A	247	AE3		45	A	241	W3	
16	A	345	AD4		46	A	134	W2	
17	A	26	AF1		47	A	19	W1	
18	A	140	AE2		48	A	430	V5	
19	A	246	AD3		49	A	339	V4	
20	A	435	AC5	GND	50	A	240	V3	
21	A	344	AC4	V _{DD1}	51	A	133	V2	
22	A	25	AE1		52	A	18	V1	
23	A	139	AD2		53	A	429	U5	GND
24	A	245	AC3		54	A	338	U4	V _{DD1}
25	A	24	AD1		55	A	239	U3	
26	A	138	AC2		56	A	132	U2	
27	A	434	AB5	V _{DD2}	57	A	17	U1	
28	A	343	AB4		58	A	428	T5	V _{DD2}
29	A	244	AB3		59	A	337	T4	
30	A	23	AC1		60	A	238	T3	

**Table 5-5. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (2/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
61	A	131	T2		91	A	331	K4	V _{DD1}
62	A	16	T1		92	A	422	K5	GND
63	A	237	R3		93	A	9	J1	
64	A	336	R4		94	A	124	J2	
65	A	427	R5		95	A	8	H1	
66	A	130	R2		96	A	231	J3	
67	A	15	R1		97	A	330	J4	
68	A	14	P1		98	A	421	J5	V _{DD2}
69	A	129	P2		99	A	123	H2	
70	A	236	P3		100	A	7	G1	
71	A	335	P4	V _{DD1}	101	A	230	H3	
72	A	426	P5	GND	102	A	122	G2	
73	A	13	N1		103	A	6	F1	
74	A	128	N2		104	A	329	H4	V _{DD1}
75	A	235	N3		105	A	420	H5	GND
76	A	334	N4		106	A	229	G3	
77	A	425	N5		107	A	121	F2	
78	A	12	M1		108	A	5	E1	
79	A	127	M2		109	A	328	G4	
80	A	234	M3		110	A	228	F3	
81	A	333	M4	V _{DD1}	111	A	120	E2	
82	A	424	M5	GND	112	A	419	G5	
83	A	11	L1		113	A	4	D1	
84	A	126	L2		114	A	327	F4	
85	A	233	L3		115	A	227	E3	
86	A	332	L4		116	A	119	D2	
87	A	423	L5		117	A	3	C1	
88	A	10	K1		118	A	326	E4	
89	A	125	K2		119	A	418	F5	V _{DD2}
90	A	232	K3		120	A	226	D3	

**Table 5-5. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (3/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
121	A	118	C2		151	B	219	B8	
122	A	2	B1		152	B	497	E9	V _{DD2}
123	A	1	A1		153	B	412	D9	
124	A	117	B2		154	B	319	C9	
125	A	325	D4	V _{DD1}	155	B	110	A8	
126	B	417	E5	GND	156	B	218	B9	
127	B	225	C3		157	B	109	A9	
128	B	116	A2		158	B	496	E10	GND
129	B	224	B3		159	B	411	D10	V _{DD1}
130	B	324	C4		160	B	318	C10	
131	B	500	E6	V _{DD2}	161	B	217	B10	
132	B	416	D5		162	B	108	A10	
133	B	115	A3		163	B	495	E11	
134	B	223	B4		164	B	410	D11	
135	B	323	C5		165	B	317	C11	
136	B	415	D6		166	B	216	B11	
137	B	114	A4		167	B	107	A11	
138	B	499	E7		168	B	494	E12	GND
139	B	222	B5		169	B	409	D12	V _{DD1}
140	B	322	C6		170	B	316	C12	
141	B	414	D7		171	B	215	B12	
142	B	113	A5		172	B	106	A12	
143	B	221	B6		173	B	493	E13	
144	B	321	C7		174	B	408	D13	
145	B	498	E8	GND	175	B	315	C13	
146	B	413	D8	V _{DD1}	176	B	214	B13	
147	B	112	A6		177	B	105	A13	
148	B	220	B7		178	B	492	E14	GND
149	B	320	C8		179	B	407	D14	V _{DD1}
150	B	111	A7		180	B	314	C14	

**Table 5-5. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (4/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
181	B	213	B14		211	B	401	D20	
182	B	104	A14		212	B	486	E20	
183	B	491	E15		213	B	97	A21	
184	B	406	D15		214	B	206	B21	
185	B	313	C15		215	B	307	C21	
186	B	212	B15		216	B	400	D21	V _{DD1}
187	B	103	A15		217	B	485	E21	GND
188	B	312	C16		218	B	96	A22	
189	B	405	D16		219	B	205	B22	
190	B	490	E16		220	B	95	A23	
191	B	211	B16		221	B	306	C22	
192	B	102	A16		222	B	399	D22	
193	B	101	A17		223	B	484	E22	V _{DD2}
194	B	210	B17		224	B	204	B23	
195	B	311	C17		225	B	94	A24	
196	B	404	D17	V _{DD1}	226	B	305	C23	
197	B	489	E17	GND	227	B	203	B24	
198	B	100	A18		228	B	93	A25	
199	B	209	B18		229	B	398	D23	V _{DD1}
200	B	310	C18		230	B	483	E23	GND
201	B	403	D18		231	B	304	C24	
202	B	488	E18		232	B	202	B25	
203	B	99	A19		233	B	92	A26	
204	B	208	B19		234	B	397	D24	
205	B	309	C19		235	B	303	C25	
206	B	402	D19	V _{DD1}	236	B	201	B26	
207	B	487	E19	GND	237	B	482	E24	
208	B	98	A20		238	B	91	A27	
209	B	207	B20		239	B	396	D25	
210	B	308	C20		240	B	302	C26	

**Table 5-5. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (5/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
241	B	200	B27		271	C	390	H27	V _{DD1}
242	B	90	A28		272	C	83	F30	
243	B	395	D26		273	C	193	G29	
244	B	481	E25	V _{DD2}	274	C	295	H28	
245	B	301	C27		275	C	82	G30	
246	B	199	B28		276	C	192	H29	
247	B	89	A29		277	C	476	J26	V _{DD2}
248	B	88	A30		278	C	389	J27	
249	B	198	B29		279	C	294	J28	
250	B	480	E26	GND	280	C	81	H30	
251	C	394	D27	V _{DD1}	281	C	191	J29	
252	C	300	C28		282	C	80	J30	
253	C	87	B30		283	C	475	K26	GND
254	C	197	C29		284	C	388	K27	V _{DD1}
255	C	299	D28		285	C	293	K28	
256	C	479	F26	V _{DD2}	286	C	190	K29	
257	C	393	E27		287	C	79	K30	
258	C	86	C30		288	C	474	L26	
259	C	196	D29		289	C	387	L27	
260	C	298	E28		290	C	292	L28	
261	C	392	F27		291	C	189	L29	
262	C	85	D30		292	C	78	L30	
263	C	478	G26		293	C	473	M26	GND
264	C	195	E29		294	C	386	M27	V _{DD1}
265	C	297	F28		295	C	291	M28	
266	C	391	G27		296	C	188	M29	
267	C	84	E30		297	C	77	M30	
268	C	194	F29		298	C	472	N26	
269	C	296	G28		299	C	385	N27	
270	C	477	H26	GND	300	C	290	N28	

**Table 5-5. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (6/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
301	C	187	N29		331	C	379	W27	V _{DD1}
302	C	76	N30		332	C	466	W26	GND
303	C	471	P26	GND	333	C	69	Y30	
304	C	384	P27	V _{DD1}	334	C	180	Y29	
305	C	289	P28		335	C	283	Y28	
306	C	186	P29		336	C	378	Y27	
307	C	75	P30		337	C	465	Y26	
308	C	470	R26	V _{DD2}	338	C	68	AA30	
309	C	383	R27		339	C	179	AA29	
310	C	288	R28		340	C	282	AA28	
311	C	185	R29		341	C	377	AA27	V _{DD1}
312	C	74	R30		342	C	464	AA26	GND
313	C	287	T28		343	C	67	AB30	
314	C	382	T27		344	C	178	AB29	
315	C	469	T26		345	C	66	AC30	
316	C	184	T29		346	C	281	AB28	
317	C	73	T30		347	C	376	AB27	
318	C	72	U30		348	C	463	AB26	V _{DD2}
319	C	183	U29		349	C	177	AC29	
320	C	286	U28		350	C	65	AD30	
321	C	381	U27	V _{DD1}	351	C	280	AC28	
322	C	468	U26	GND	352	C	176	AD29	
323	C	71	V30		353	C	64	AE30	
324	C	182	V29		354	C	375	AC27	V _{DD1}
325	C	285	V28		355	C	462	AC26	GND
326	C	380	V27		356	C	279	AD28	
327	C	467	V26		357	C	175	AE29	
328	C	70	W30		358	C	63	AF30	
329	C	181	W29		359	C	374	AD27	
330	C	284	W28		360	C	278	AE28	

**Table 5-5. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (7/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
361	C	174	AF29		391	D	368	AG24	
362	C	461	AD26		392	D	55	AK26	
363	C	62	AG30		393	D	167	AJ25	
364	C	373	AE27		394	D	271	AH24	
365	C	277	AF28		395	D	456	AF23	GND
366	C	173	AG29		396	D	367	AG23	V _{DD1}
367	C	61	AH30		397	D	54	AK25	
368	C	372	AF27		398	D	166	AJ24	
369	C	460	AE26	V _{DD2}	399	D	270	AH23	
370	C	276	AG28		400	D	53	AK24	
371	C	172	AH29		401	D	165	AJ23	
372	C	60	AJ30		402	D	455	AF22	V _{DD2}
373	C	59	AK30		403	D	366	AG22	
374	C	171	AJ29		404	D	269	AH22	
375	C	371	AG27	V _{DD1}	405	D	52	AK23	
376	D	459	AF26	GND	406	D	164	AJ22	
377	D	275	AH28		407	D	51	AK22	
378	D	58	AK29		408	D	454	AF21	GND
379	D	170	AJ28		409	D	365	AG21	V _{DD1}
380	D	274	AH27		410	D	268	AH21	
381	D	458	AF25	V _{DD2}	411	D	163	AJ21	
382	D	370	AG26		412	D	50	AK21	
383	D	57	AK28		413	D	453	AF20	
384	D	169	AJ27		414	D	364	AG20	
385	D	273	AH26		415	D	267	AH20	
386	D	369	AG25		416	D	162	AJ20	
387	D	56	AK27		417	D	49	AK20	
388	D	457	AF24		418	D	452	AF19	GND
389	D	168	AJ26		419	D	363	AG19	V _{DD1}
390	D	272	AH25		420	D	266	AH19	

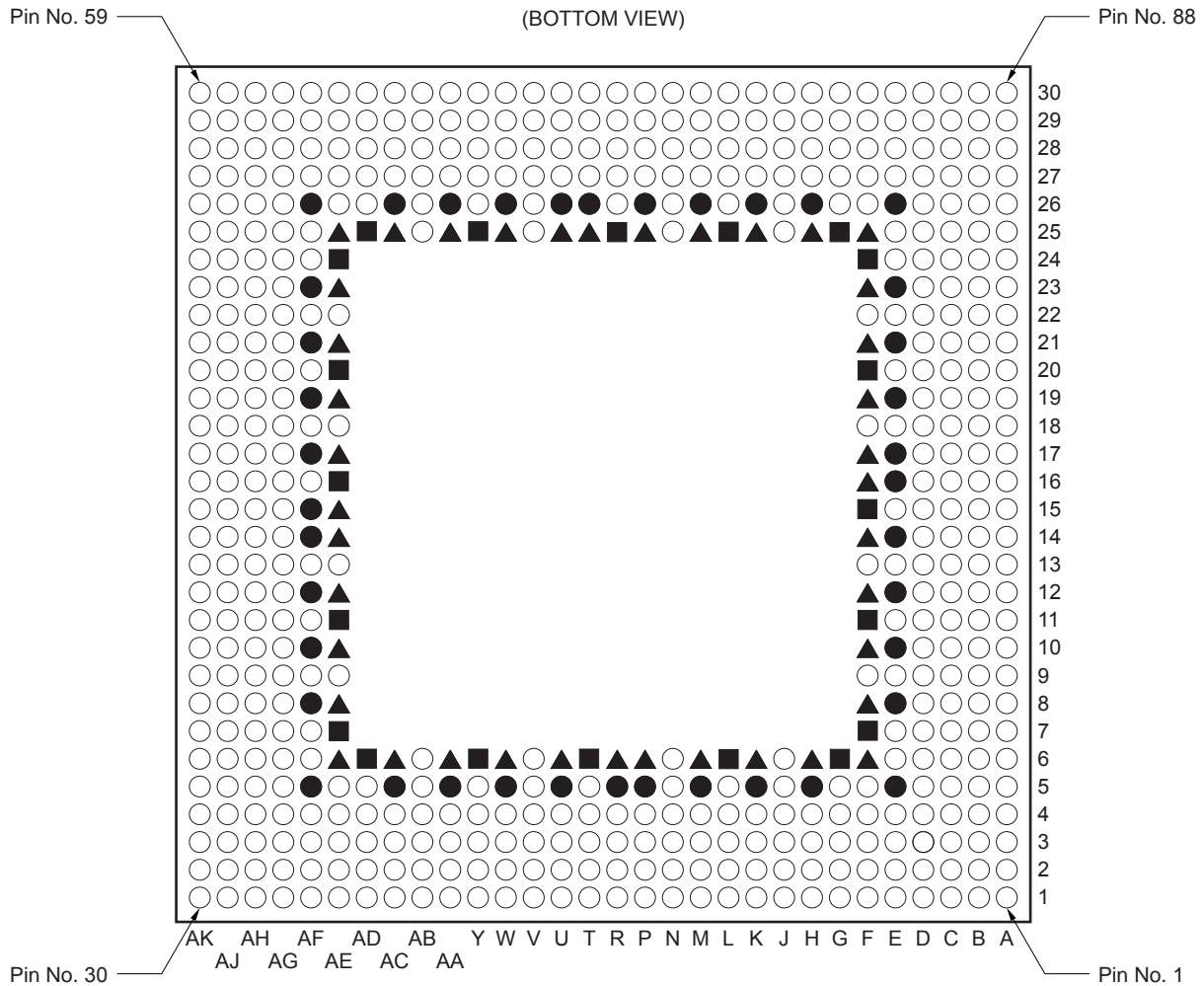
**Table 5-5. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (8/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
421	D	161	AJ19		451	D	357	AG13	
422	D	48	AK19		452	D	446	AF13	
423	D	451	AF18		453	D	41	AK12	
424	D	362	AG18		454	D	154	AJ12	
425	D	265	AH18		455	D	259	AH12	
426	D	160	AJ18		456	D	356	AG12	V _{DD1}
427	D	47	AK18		457	D	445	AF12	GND
428	D	450	AF17	GND	458	D	40	AK11	
429	D	361	AG17	V _{DD1}	459	D	153	AJ11	
430	D	264	AH17		460	D	258	AH11	
431	D	159	AJ17		461	D	355	AG11	
432	D	46	AK17		462	D	444	AF11	
433	D	449	AF16		463	D	39	AK10	
434	D	360	AG16		464	D	152	AJ10	
435	D	263	AH16		465	D	257	AH10	
436	D	158	AJ16		466	D	354	AG10	V _{DD1}
437	D	45	AK16		467	D	443	AF10	GND
438	D	262	AH15		468	D	38	AK9	
439	D	359	AG15		469	D	151	AJ9	
440	D	448	AF15		470	D	37	AK8	
441	D	157	AJ15		471	D	256	AH9	
442	D	44	AK15		472	D	353	AG9	
443	D	43	AK14		473	D	442	AF9	V _{DD2}
444	D	156	AJ14		474	D	150	AJ8	
445	D	261	AH14		475	D	36	AK7	
446	D	358	AG14	V _{DD1}	476	D	255	AH8	
447	D	447	AF14	GND	477	D	149	AJ7	
448	D	42	AK13		478	D	35	AK6	
449	D	155	AJ13		479	D	352	AG8	V _{DD1}
450	D	260	AH13		480	D	441	AF8	GND

**Table 5-5. Correspondence Between Internal Chip Pins and Ball Numbers
(500-pin TBGA (with Heat Spreader)) (9/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
481	D	254	AH7	
482	D	148	AJ6	
483	D	34	AK5	
484	D	351	AG7	
485	D	253	AH6	
486	D	147	AJ5	
487	D	440	AF7	
488	D	33	AK4	
489	D	350	AG6	
490	D	252	AH5	
491	D	146	AJ4	
492	D	32	AK3	
493	D	349	AG5	
494	D	439	AF6	V _{DD2}
495	D	251	AH4	
496	D	145	AJ3	
497	D	31	AK2	
498	D	30	AK1	
499	D	144	AJ2	
500	D	438	AF5	GND

5.4.6 576-pin TBGA (with heat spreader)



- Remark**
- ▲ : GND (40 pins)
 - : V_{DD1} (40 pins)
 - : V_{DD2} (20 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
501 (F6), 503 (H6), 505 (K6), 507 (M6), 509 (P6), 510 (R6), 512 (U6), 514 (W6), 516 (AA6), 518 (AC6), 520 (AE6), 522 (AE8), 524 (AE10), 526 (AE12), 528 (AE14), 529 (AE15), 531 (AE17), 533 (AE19), 535 (AE21), 537 (AE23), 539 (AE25), 541 (AC25), 543 (AA25), 545 (W25), 547 (U25), 548 (T25), 550 (P25), 552 (M25), 554 (K25), 556 (H25), 558 (F25), 560 (F23), 562 (F21), 564 (F19), 566 (F17), 567 (F16), 569 (F14), 571 (F12), 573 (F10), 575 (F8)	417 (E5), 420 (H5), 422 (K5), 424 (M5), 426 (P5), 427 (R5), 429 (U5), 431 (W5), 433 (AA5), 435 (AC5), 438 (AF5), 441 (AF8), 443 (AF10), 445 (AF12), 447 (AF14), 448 (AF15), 450 (AF17), 452 (AF19), 454 (AF21), 456 (AF23), 459 (AF26), 462 (AC26), 464 (AA26), 466 (W26), 468 (U26), 469 (T26), 471 (P26), 473 (M26), 475 (K26), 477 (H26), 480 (E26), 483 (E23), 485 (E21), 487 (E19), 489 (E17), 490 (E16), 492 (E14), 494 (E12), 496 (E10), 498 (E8)	502 (G6), 506 (L6), 511 (T6), 515 (Y6), 519 (AD6), 521 (AE7), 525 (AE11), 530 (AE16), 534 (AE20), 538 (AE24), 540 (AD25), 544 (Y25), 549 (R25), 553 (L25), 557 (G25), 559 (F24), 563 (F20), 568 (F15), 572 (F11), 576 (F7)	None	There are no restrictions on the assignment of dedicated scan path pins.			476

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

**Table 5-6. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (1/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
1	A	438	AF5	V _{DD1}	33	A	343	AB4	
2	A	348	AG4		34	A	433	AA5	V _{DD1}
3	A	250	AH3		35	A	24	AD1	
4	A	144	AJ2		36	A	138	AC2	
5	A	30	AK1		37	A	244	AB3	
6	A	347	AF4		38	A	342	AA4	
7	A	437	AE5		39	A	23	AC1	
8	A	519	AD6	V _{DD2}	40	A	515	Y6	V _{DD2}
9	A	249	AG3		41	A	432	Y5	
10	A	143	AH2		42	A	137	AB2	
11	A	29	AJ1		43	A	243	AA3	
12	A	142	AG2		44	A	341	Y4	
13	A	248	AF3		45	A	22	AB1	
14	A	346	AE4		46	A	136	AA2	
15	A	436	AD5		47	A	242	Y3	
16	A	518	AC6	GND	48	A	514	W6	GND
17	A	28	AH1		49	A	431	W5	V _{DD1}
18	A	27	AG1		50	A	340	W4	
19	A	141	AF2		51	A	21	AA1	
20	A	247	AE3		52	A	135	Y2	
21	A	345	AD4		53	A	241	W3	
22	A	435	AC5	V _{DD1}	54	A	20	Y1	
23	A	26	AF1		55	A	134	W2	
24	A	517	AB6		56	A	513	V6	
25	A	140	AE2		57	A	430	V5	
26	A	246	AD3		58	A	339	V4	
27	A	344	AC4		59	A	240	V3	
28	A	434	AB5		60	A	19	W1	
29	A	25	AE1		61	A	133	V2	
30	A	139	AD2		62	A	18	V1	
31	A	245	AC3		63	A	512	U6	GND
32	A	516	AA6	GND	64	A	429	U5	V _{DD1}

**Table 5-6. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (2/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
65	A	338	U4		97	A	424	M5	V _{DD1}
66	A	239	U3		98	A	507	M6	GND
67	A	132	U2		99	A	11	L1	
68	A	17	U1		100	A	126	L2	
69	A	428	T5		101	A	10	K1	
70	A	511	T6	V _{DD2}	102	A	233	L3	
71	A	337	T4		103	A	332	L4	
72	A	238	T3		104	A	423	L5	
73	A	131	T2		105	A	506	L6	V _{DD2}
74	A	16	T1		106	A	125	K2	
75	A	237	R3		107	A	9	J1	
76	A	336	R4		108	A	232	K3	
77	A	427	R5	V _{DD1}	109	A	124	J2	
78	A	510	R6	GND	110	A	8	H1	
79	A	130	R2		111	A	331	K4	
80	A	15	R1		112	A	422	K5	V _{DD1}
81	A	14	P1		113	A	505	K6	GND
82	A	129	P2		114	A	231	J3	
83	A	236	P3		115	A	123	H2	
84	A	335	P4		116	A	7	G1	
85	A	426	P5	V _{DD1}	117	A	330	J4	
86	A	509	P6	GND	118	A	230	H3	
87	A	13	N1		119	A	122	G2	
88	A	128	N2		120	A	421	J5	
89	A	235	N3		121	A	504	J6	
90	A	334	N4		122	A	6	F1	
91	A	425	N5		123	A	329	H4	
92	A	508	N6		124	A	229	G3	
93	A	12	M1		125	A	121	F2	
94	A	127	M2		126	A	5	E1	
95	A	234	M3		127	A	420	H5	V _{DD1}
96	A	333	M4		128	A	328	G4	

**Table 5-6. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (3/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
129	A	503	H6	GND	161	B	115	A3	
130	A	228	F3		162	B	114	A4	
131	A	120	E2		163	B	222	B5	
132	A	4	D1		164	B	322	C6	
133	A	419	G5		165	B	414	D7	
134	A	119	D2		166	B	498	E8	V _{DD1}
135	A	227	E3		167	B	113	A5	
136	A	327	F4		168	B	574	F9	
137	A	502	G6	V _{DD2}	169	B	221	B6	
138	A	3	C1		170	B	321	C7	
139	A	418	F5		171	B	413	D8	
140	A	326	E4		172	B	497	E9	
141	A	226	D3		173	B	112	A6	
142	A	118	C2		174	B	220	B7	
143	A	2	B1		175	B	320	C8	
144	A	417	E5	V _{DD1}	176	B	573	F10	GND
145	B	501	F6	GND	177	B	412	D9	
146	B	325	D4		178	B	496	E10	V _{DD1}
147	B	225	C3		179	B	111	A7	
148	B	117	B2		180	B	219	B8	
149	B	1	A1		181	B	319	C9	
150	B	416	D5		182	B	411	D10	
151	B	500	E6		183	B	110	A8	
152	B	576	F7	V _{DD2}	184	B	572	F11	V _{DD2}
153	B	324	C4		185	B	495	E11	
154	B	224	B3		186	B	218	B9	
155	B	116	A2		187	B	318	C10	
156	B	223	B4		188	B	410	D11	
157	B	323	C5		189	B	109	A9	
158	B	415	D6		190	B	217	B10	
159	B	499	E7		191	B	317	C11	
160	B	575	F8	GND	192	B	571	F12	GND

**Table 5-6. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (4/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
193	B	494	E12	V _{DD1}	225	B	101	A17	
194	B	409	D12		226	B	210	B17	
195	B	108	A10		227	B	311	C17	
196	B	216	B11		228	B	404	D17	
197	B	316	C12		229	B	489	E17	V _{DD1}
198	B	107	A11		230	B	566	F17	GND
199	B	215	B12		231	B	100	A18	
200	B	570	F13		232	B	209	B18	
201	B	493	E13		233	B	310	C18	
202	B	408	D13		234	B	403	D18	
203	B	315	C13		235	B	488	E18	
204	B	106	A12		236	B	565	F18	
205	B	214	B13		237	B	99	A19	
206	B	105	A13		238	B	208	B19	
207	B	569	F14	GND	239	B	309	C19	
208	B	492	E14	V _{DD1}	240	B	402	D19	
209	B	407	D14		241	B	487	E19	V _{DD1}
210	B	314	C14		242	B	564	F19	GND
211	B	213	B14		243	B	98	A20	
212	B	104	A14		244	B	207	B20	
213	B	491	E15		245	B	97	A21	
214	B	568	F15	V _{DD2}	246	B	308	C20	
215	B	406	D15		247	B	401	D20	
216	B	313	C15		248	B	486	E20	
217	B	212	B15		249	B	563	F20	V _{DD2}
218	B	103	A15		250	B	206	B21	
219	B	312	C16		251	B	96	A22	
220	B	405	D16		252	B	307	C21	
221	B	490	E16	V _{DD1}	253	B	205	B22	
222	B	567	F16	GND	254	B	95	A23	
223	B	211	B16		255	B	400	D21	
224	B	102	A16		256	B	485	E21	V _{DD1}

**Table 5-6. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (5/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
257	B	562	F21	GND	289	C	480	E26	V _{DD1}
258	B	306	C22		290	C	394	D27	
259	B	204	B23		291	C	300	C28	
260	B	94	A24		292	C	198	B29	
261	B	399	D22		293	C	88	A30	
262	B	305	C23		294	C	393	E27	
263	B	203	B24		295	C	479	F26	
264	B	484	E22		296	C	557	G25	V _{DD2}
265	B	561	F22		297	C	299	D28	
266	B	93	A25		298	C	197	C29	
267	B	398	D23		299	C	87	B30	
268	B	304	C24		300	C	196	D29	
269	B	202	B25		301	C	298	E28	
270	B	92	A26		302	C	392	F27	
271	B	483	E23	V _{DD1}	303	C	478	G26	
272	B	397	D24		304	C	556	H25	GND
273	B	560	F23	GND	305	C	86	C30	
274	B	303	C25		306	C	85	D30	
275	B	201	B26		307	C	195	E29	
276	B	91	A27		308	C	297	F28	
277	B	482	E24		309	C	391	G27	
278	B	200	B27		310	C	477	H26	V _{DD1}
279	B	302	C26		311	C	84	E30	
280	B	396	D25		312	C	555	J25	
281	B	559	F24	V _{DD2}	313	C	194	F29	
282	B	90	A28		314	C	296	G28	
283	B	481	E25		315	C	390	H27	
284	B	395	D26		316	C	476	J26	
285	B	301	C27		317	C	83	F30	
286	B	199	B28		318	C	193	G29	
287	B	89	A29		319	C	295	H28	
288	B	558	F25	GND	320	C	554	K25	GND

**Table 5-6. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (6/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
321	C	389	J27		353	C	384	P27	
322	C	475	K26	V _{DD1}	354	C	289	P28	
323	C	82	G30		355	C	186	P29	
324	C	192	H29		356	C	75	P30	
325	C	294	J28		357	C	470	R26	
326	C	388	K27		358	C	549	R25	V _{DD2}
327	C	81	H30		359	C	383	R27	
328	C	553	L25	V _{DD2}	360	C	288	R28	
329	C	474	L26		361	C	185	R29	
330	C	191	J29		362	C	74	R30	
331	C	293	K28		363	C	287	T28	
332	C	387	L27		364	C	382	T27	
333	C	80	J30		365	C	469	T26	V _{DD1}
334	C	190	K29		366	C	548	T25	GND
335	C	292	L28		367	C	184	T29	
336	C	552	M25	GND	368	C	73	T30	
337	C	473	M26	V _{DD1}	369	C	72	U30	
338	C	386	M27		370	C	183	U29	
339	C	79	K30		371	C	286	U28	
340	C	189	L29		372	C	381	U27	
341	C	291	M28		373	C	468	U26	V _{DD1}
342	C	78	L30		374	C	547	U25	GND
343	C	188	M29		375	C	71	V30	
344	C	551	N25		376	C	182	V29	
345	C	472	N26		377	C	285	V28	
346	C	385	N27		378	C	380	V27	
347	C	290	N28		379	C	467	V26	
348	C	77	M30		380	C	546	V25	
349	C	187	N29		381	C	70	W30	
350	C	76	N30		382	C	181	W29	
351	C	550	P25	GND	383	C	284	W28	
352	C	471	P26	V _{DD1}	384	C	379	W27	

**Table 5-6. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (7/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
385	C	466	W26	V _{DD1}	417	C	541	AC25	GND
386	C	545	W25	GND	418	C	278	AE28	
387	C	69	Y30		419	C	174	AF29	
388	C	180	Y29		420	C	62	AG30	
389	C	68	AA30		421	C	461	AD26	
390	C	283	Y28		422	C	173	AG29	
391	C	378	Y27		423	C	277	AF28	
392	C	465	Y26		424	C	373	AE27	
393	C	544	Y25	V _{DD2}	425	C	540	AD25	V _{DD2}
394	C	179	AA29		426	C	61	AH30	
395	C	67	AB30		427	C	460	AE26	
396	C	282	AA28		428	C	372	AF27	
397	C	178	AB29		429	C	276	AG28	
398	C	66	AC30		430	C	172	AH29	
399	C	377	AA27		431	C	60	AJ30	
400	C	464	AA26	V _{DD1}	432	C	459	AF26	V _{DD1}
401	C	543	AA25	GND	433	D	539	AE25	GND
402	C	281	AB28		434	D	371	AG27	
403	C	177	AC29		435	D	275	AH28	
404	C	65	AD30		436	D	171	AJ29	
405	C	376	AB27		437	D	59	AK30	
406	C	280	AC28		438	D	370	AG26	
407	C	176	AD29		439	D	458	AF25	
408	C	463	AB26		440	D	538	AE24	V _{DD2}
409	C	542	AB25		441	D	274	AH27	
410	C	64	AE30		442	D	170	AJ28	
411	C	375	AC27		443	D	58	AK29	
412	C	279	AD28		444	D	169	AJ27	
413	C	175	AE29		445	D	273	AH26	
414	C	63	AF30		446	D	369	AG25	
415	C	462	AC26	V _{DD1}	447	D	457	AF24	
416	C	374	AD27		448	D	537	AE23	GND

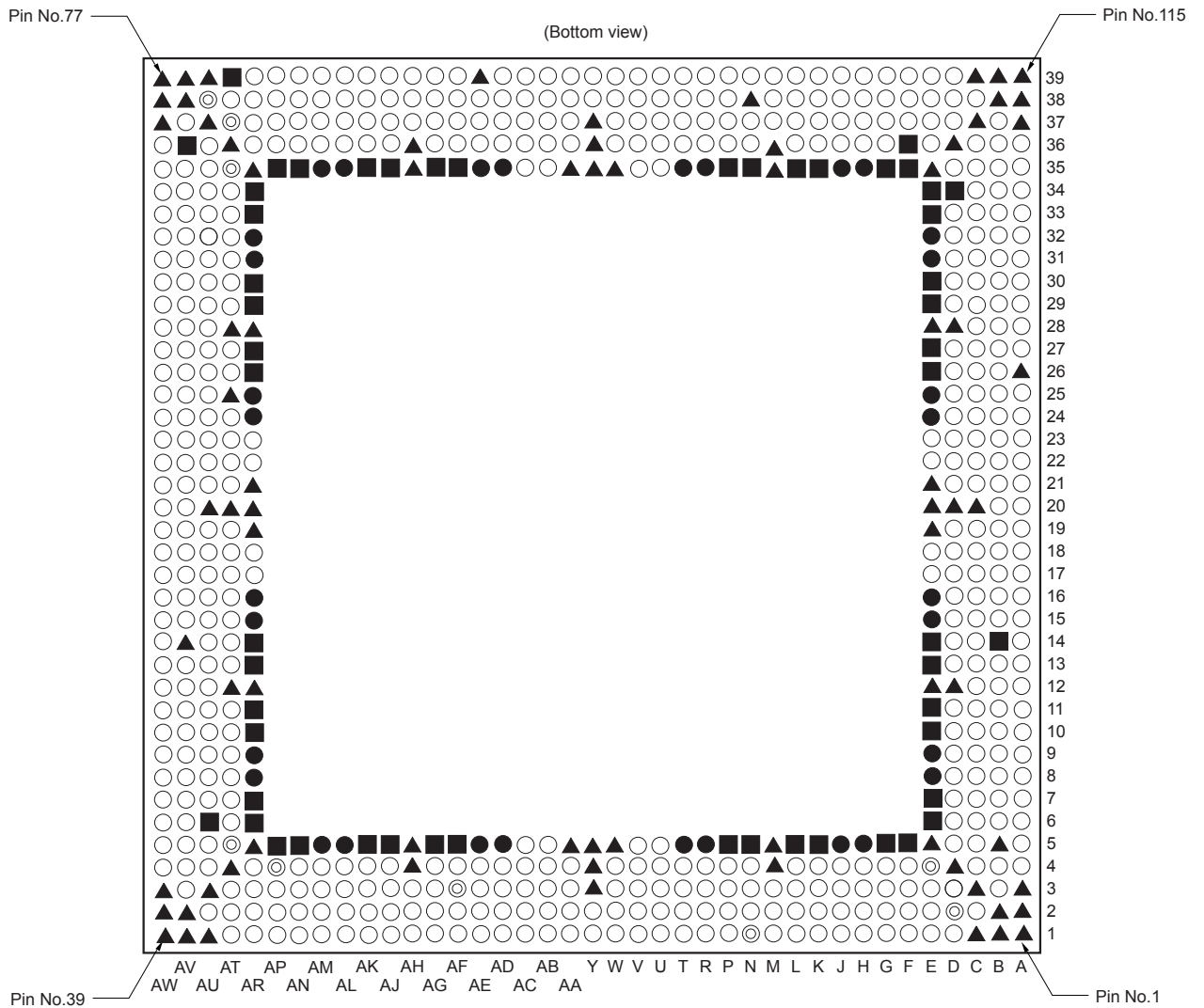
**Table 5-6. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (8/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
449	D	57	AK28		481	D	452	AF19	V _{DD1}
450	D	56	AK27		482	D	363	AG19	
451	D	168	AJ26		483	D	50	AK21	
452	D	272	AH25		484	D	162	AJ20	
453	D	368	AG24		485	D	266	AH19	
454	D	456	AF23	V _{DD1}	486	D	49	AK20	
455	D	55	AK26		487	D	161	AJ19	
456	D	536	AE22		488	D	532	AE18	
457	D	167	AJ25		489	D	451	AF18	
458	D	271	AH24		490	D	362	AG18	
459	D	367	AG23		491	D	265	AH18	
460	D	455	AF22		492	D	48	AK19	
461	D	54	AK25		493	D	160	AJ18	
462	D	166	AJ24		494	D	47	AK18	
463	D	270	AH23		495	D	531	AE17	GND
464	D	535	AE21	GND	496	D	450	AF17	V _{DD1}
465	D	366	AG22		497	D	361	AG17	
466	D	454	AF21	V _{DD1}	498	D	264	AH17	
467	D	53	AK24		499	D	159	AJ17	
468	D	165	AJ23		500	D	46	AK17	
469	D	269	AH22		501	D	449	AF16	
470	D	365	AG21		502	D	530	AE16	V _{DD2}
471	D	52	AK23		503	D	360	AG16	
472	D	534	AE20	V _{DD2}	504	D	263	AH16	
473	D	453	AF20		505	D	158	AJ16	
474	D	164	AJ22		506	D	45	AK16	
475	D	268	AH21		507	D	262	AH15	
476	D	364	AG20		508	D	359	AG15	
477	D	51	AK22		509	D	448	AF15	V _{DD1}
478	D	163	AJ21		510	D	529	AE15	GND
479	D	267	AH20		511	D	157	AJ15	
480	D	533	AE19	GND	512	D	44	AK15	

**Table 5-6. Correspondence Between Internal Chip Pins and Ball Numbers
(576-pin TBGA (with Heat Spreader)) (9/9)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
513	D	43	AK14		545	D	524	AE10	GND
514	D	156	AJ14		546	D	256	AH9	
515	D	261	AH14		547	D	150	AJ8	
516	D	358	AG14		548	D	36	AK7	
517	D	447	AF14	V _{DD1}	549	D	353	AG9	
518	D	528	AE14	GND	550	D	255	AH8	
519	D	42	AK13		551	D	149	AJ7	
520	D	155	AJ13		552	D	442	AF9	
521	D	260	AH13		553	D	523	AE9	
522	D	357	AG13		554	D	35	AK6	
523	D	446	AF13		555	D	352	AG8	
524	D	527	AE13		556	D	254	AH7	
525	D	41	AK12		557	D	148	AJ6	
526	D	154	AJ12		558	D	34	AK5	
527	D	259	AH12		559	D	441	AF8	V _{DD1}
528	D	356	AG12		560	D	351	AG7	
529	D	445	AF12	V _{DD1}	561	D	522	AE8	GND
530	D	526	AE12	GND	562	D	253	AH6	
531	D	40	AK11		563	D	147	AJ5	
532	D	153	AJ11		564	D	33	AK4	
533	D	39	AK10		565	D	440	AF7	
534	D	258	AH11		566	D	146	AJ4	
535	D	355	AG11		567	D	252	AH5	
536	D	444	AF11		568	D	350	AG6	
537	D	525	AE11	V _{DD2}	569	D	521	AE7	V _{DD2}
538	D	152	AJ10		570	D	32	AK3	
539	D	38	AK9		571	D	439	AF6	
540	D	257	AH10		572	D	349	AG5	
541	D	151	AJ9		573	D	251	AH4	
542	D	37	AK8		574	D	145	AJ3	
543	D	354	AG10		575	D	31	AK2	
544	D	443	AF10	V _{DD1}	576	D	520	AE6	GND

5.4.7 680-pin TBGA (with heat spreader)



- Remark**
- ▲ : GND (78 pins)
 - : V_{DD1} (32 pins)
 - : V_{DD2} (54 pins)
 - ◎ : NC (9 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1 (A1), 2 (B1), 3 (C1), 37 (AU1), 38 (AV1), 39 (AW1), 40 (AW2), 41 (AW3), 75 (AW37), 76 (AW38), 77 (AW39), 78 (AV39), 79 (AU39), 91 (AE39), 113 (C39), 114 (B39), 115 (A39), 116 (A38), 117 (A37), 128 (A26), 151 (A3), 152 (A2), 153 (B2), 189 (AV2), 201 (AV14), 225 (AV38), 250 (N38), 261 (B38), 294 (B5), 297 (C3), 314 (Y3), 331 (AU3), 348 (AU20), 365 (AU37), 382 (Y37), 399 (C37), 416 (C20), 433 (D4), 441 (M4), 449 (Y4), 457 (AH4), 465 (AT4), 473 (AT12), 481 (AT21), 486 (AT25), 489 (AT28), 497 (AT36), 505 (AH36), 513 (Y36), 521 (M36), 529 (D36), 537 (D28), 545 (D20), 553 (D12), 561 (E5), 568 (M5), 575 (W5), 576 (Y5), 577 (AA5), 584 (AH5), 591 (AR5), 598 (AR12), 605 (AR19), 606 (AR20), 607 (AR21), 614 (AR28), 621 (AR35), 628 (AH35), 635 (AA35), 636 (Y35), 637 (W35), 644 (M35), 651 (E35), 658 (E28), 665 (E21), 666 (E20), 667 (E19), 674 (E12)	564 (H5), 565 (J5), 571 (R5), 572 (T5), 580 (AD5), 581 (AE5), 587 (AL5), 588 (AM5), 594 (AR8), 595 (AR9), 601 (AR15), 602 (AR16), 610 (AR24), 611 (AR25), 617 (AR31), 618 (AR32), 624 (AM35), 625 (AL35), 631 (AE35), 632 (AD35), 640 (T35), 641 (R35), 647 (J35), 648 (H35), 654 (E32), 655 (E31), 661 (E25), 662 (E24), 670 (E16), 671 (E15), 677 (E9), 678 (E8)	80 (AT39), 223 (AV36), 285 (B14), 334 (AU6), 527 (F36), 531 (D34), 562 (F5), 563 (G5), 566 (K5), 567 (L5), 569 (N5), 570 (P5), 582 (AF5), 583 (AG5), 585 (AJ5), 586 (Ak5), 589 (AN5), 590 (AP5), 592 (AR6), 593 (AR7), 596 (AR10), 597 (AR11), 599 (AR13), 600 (AR14), 612 (AR26), 613 (AR27), 615 (AR29), 616 (AR30), 619 (AR33), 620 (AR34), 622 (AP35), 623 (AN35), 626 (Ak35), 627 (AJ35), 629 (AG35), 630 (AF35), 642 (P35), 643 (N35), 645 (L35), 646 (K35), 649 (G35), 650 (F35), 652 (E35), 653 (E33), 656 (E30), 657 (E29), 659 (E27), 660 (E26), 672 (E14), 673 (E13), 675 (E11), 676 (E10), 679 (E7), 680 (E6)	13 (N1), 155 (D2), 226(AU38), 320 (AF3), 366 (AT37), 434 (E4), 463 (AP4), 466 (AT5), 496 (AT35)	There are no restrictions on the assignment of dedicated scan path pins.			507

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

**Table 5-7. Correspondence Between Internal Chip Pins and Ball Numbers
(680-pin TBGA (with Heat Spreader)) (1/10)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
1	A	465	AT4	GND	37	A	585	AJ5	V _{DD2}
2	A	331	AU3	GND	38	A	458	AJ4	
3	A	38	AV1	GND	39	A	323	AJ3	
4	A	188	AU2		40	A	180	AJ2	
5	A	330	AT3		41	A	29	AJ1	
6	A	590	AP5	V _{DD2}	42	A	584	AH5	GND
7	A	464	AR4		43	A	457	AH4	GND
8	A	37	AU1	GND	44	A	322	AH3	
9	A	187	AT2		45	A	179	AH2	
10	A	329	AR3		46	A	28	AH1	
11	A	36	AT1		47	A	583	AG5	V _{DD2}
12	A	589	AN5	V _{DD2}	48	A	456	AG4	
13	A	186	AR2		49	A	321	AG3	
14	A	328	AP3		50	A	178	AG2	
15	A	462	AN4		51	A	27	AG1	
16	A	35	AR1		52	A	582	AF5	V _{DD2}
17	A	185	AP2		53	A	455	AF4	
18	A	327	AN3		54	A	177	AF2	
19	A	588	AM5	V _{DD1}	55	A	26	AF1	
20	A	461	AM4		56	A	581	AE5	V _{DD1}
21	A	34	AP1		57	A	454	AE4	
22	A	184	AN2		58	A	319	AE3	
23	A	326	AM3		59	A	176	AE2	
24	A	33	AN1		60	A	25	AE1	
25	A	183	AM2		61	A	580	AD5	V _{DD1}
26	A	587	AL5	V _{DD1}	62	A	453	AD4	
27	A	460	AL4		63	A	318	AD3	
28	A	325	AL3		64	A	175	AD2	
29	A	32	AM1		65	A	24	AD1	
30	A	182	AL2		66	A	579	AC5	
31	A	31	AL1		67	A	452	AC4	
32	A	586	AK5	V _{DD2}	68	A	317	AC3	
33	A	459	AK4		69	A	174	AC2	
34	A	324	AK3		70	A	23	AC1	
35	A	181	AK2		71	A	578	AB5	
36	A	30	AK1		72	A	451	AB4	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-7. Correspondence Between Internal Chip Pins and Ball Numbers
(680-pin TBGA (with Heat Spreader)) (2/10)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
73	A	316	AB3		109	A	444	R4	
74	A	173	AB2		110	A	571	R5	V _{DD1}
75	A	22	AB1		111	A	14	P1	
76	A	577	AA5	GND	112	A	165	P2	
77	A	450	AA4		113	A	308	P3	
78	A	315	AA3		114	A	443	P4	
79	A	172	AA2		115	A	570	P5	V _{DD2}
80	A	21	AA1		116	A	164	N2	
81	A	314	Y3	GND	117	A	307	N3	
82	A	449	Y4	GND	118	A	442	N4	
83	A	576	Y5	GND	119	A	569	N5	V _{DD2}
84	A	171	Y2		120	A	12	M1	
85	A	20	Y1		121	A	163	M2	
86	A	19	W1		122	A	306	M3	
87	A	170	W2		123	A	441	M4	GND
88	A	313	W3		124	A	568	M5	GND
89	A	448	W4		125	A	11	L1	
90	A	575	W5	GND	126	A	162	L2	
91	A	18	V1		127	A	305	L3	
92	A	169	V2		128	A	440	L4	
93	A	312	V3		129	A	567	L5	V _{DD2}
94	A	447	V4		130	A	10	K1	
95	A	574	V5		131	A	161	K2	
96	A	17	U1		132	A	304	K3	
97	A	168	U2		133	A	439	K4	
98	A	311	U3		134	A	566	K5	V _{DD2}
99	A	446	U4		135	A	9	J1	
100	A	573	U5		136	A	160	J2	
101	A	16	T1		137	A	8	H1	
102	A	167	T2		138	A	303	J3	
103	A	310	T3		139	A	438	J4	
104	A	445	T4		140	A	565	J5	V _{DD1}
105	A	572	T5	V _{DD1}	141	A	159	H2	
106	A	15	R1		142	A	7	G1	
107	A	166	R2		143	A	302	H3	
108	A	309	R3		144	A	158	G2	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-7. Correspondence Between Internal Chip Pins and Ball Numbers
(680-pin TBGA (with Heat Spreader)) (3/10)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
145	A	6	F1		181	B	558	D7	
146	A	437	H4		182	B	149	A5	
147	A	564	H5	V _{DD1}	183	B	293	B6	
148	A	301	G3		184	B	429	C7	
149	A	157	F2		185	B	678	E8	V _{DD1}
150	A	5	E1		186	B	557	D8	
151	A	436	G4		187	B	148	A6	
152	A	300	F3		188	B	292	B7	
153	A	156	E2		189	B	428	C8	
154	A	563	G5	V _{DD2}	190	B	147	A7	
155	A	4	D1		191	B	291	B8	
156	A	435	F4		192	B	677	E9	V _{DD1}
157	A	299	E3		193	B	556	D9	
158	A	3	C1	GND	194	B	427	C9	
159	A	562	F5	V _{DD2}	195	B	146	A8	
160	A	298	D3		196	B	290	B9	
161	A	154	C2		197	B	145	A9	
162	A	2	B1	GND	198	B	676	E10	V _{DD2}
163	A	1	A1	GND	199	B	555	D10	
164	A	153	B2	GND	200	B	426	C10	
165	A	433	D4	GND	201	B	289	B10	
166	B	561	E5	GND	202	B	144	A10	
167	B	297	C3	GND	203	B	675	E11	V _{DD2}
168	B	152	A2	GND	204	B	554	D11	
169	B	296	B3		205	B	425	C11	
170	B	432	C4		206	B	288	B11	
171	B	680	E6	V _{DD2}	207	B	143	A11	
172	B	560	D5		208	B	674	E12	GND
173	B	151	A3	GND	209	B	553	D12	GND
174	B	295	B4		210	B	424	C12	
175	B	431	C5		211	B	287	B12	
176	B	559	D6		212	B	142	A12	
177	B	150	A4		213	B	673	E13	V _{DD2}
178	B	679	E7	V _{DD2}	214	B	552	D13	
179	B	294	B5	GND	215	B	423	C13	
180	B	430	C6		216	B	286	B13	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-7. Correspondence Between Internal Chip Pins and Ball Numbers
(680-pin TBGA (with Heat Spreader)) (4/10)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
217	B	141	A13		253	B	133	A21	
218	B	672	E14	V _{DD2}	254	B	278	B21	
219	B	551	D14		255	B	415	C21	
220	B	422	C14		256	B	544	D21	
221	B	285	B14	V _{DD2}	257	B	665	E21	GND
222	B	140	A14		258	B	132	A22	
223	B	671	E15	V _{DD1}	259	B	277	B22	
224	B	550	D15		260	B	414	C22	
225	B	421	C15		261	B	543	D22	
226	B	284	B15		262	B	664	E22	
227	B	139	A15		263	B	131	A23	
228	B	670	E16	V _{DD1}	264	B	276	B23	
229	B	549	D16		265	B	413	C23	
230	B	420	C16		266	B	542	D23	
231	B	283	B16		267	B	663	E23	
232	B	138	A16		268	B	130	A24	
233	B	669	E17		269	B	275	B24	
234	B	548	D17		270	B	412	C24	
235	B	419	C17		271	B	541	D24	
236	B	282	B17		272	B	662	E24	V _{DD1}
237	B	137	A17		273	B	129	A25	
238	B	668	E18		274	B	274	B25	
239	B	547	D18		275	B	411	C25	
240	B	418	C18		276	B	540	D25	
241	B	281	B18		277	B	661	E25	V _{DD1}
242	B	136	A18		278	B	128	A26	GND
243	B	667	E19	GND	279	B	273	B26	
244	B	546	D19		280	B	410	C26	
245	B	417	C19		281	B	539	D26	
246	B	280	B19		282	B	660	E26	V _{DD2}
247	B	135	A19		283	B	127	A27	
248	B	416	C20	GND	284	B	272	B27	
249	B	545	D20	GND	285	B	409	C27	
250	B	666	E20	GND	286	B	538	D27	
251	B	279	B20		287	B	659	E27	V _{DD2}
252	B	134	A20		288	B	126	A28	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-7. Correspondence Between Internal Chip Pins and Ball Numbers
(680-pin TBGA (with Heat Spreader)) (5/10)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
289	B	271	B28		325	B	401	C35	
290	B	408	C28		326	B	263	B36	
291	B	537	D28	GND	327	B	117	A37	GND
292	B	658	E28	GND	328	B	530	D35	
293	B	125	A29		329	B	652	E34	V _{DD2}
294	B	270	B29		330	B	400	C36	
295	B	407	C29		331	B	262	B37	
296	B	536	D29		332	B	116	A38	GND
297	B	657	E29	V _{DD2}	333	B	115	A39	GND
298	B	124	A30		334	B	261	B38	GND
299	B	269	B30		335	B	651	E35	GND
300	B	406	C30		336	C	529	D36	GND
301	B	535	D30		337	C	399	C37	GND
302	B	656	E30	V _{DD2}	338	C	114	B39	GND
303	B	123	A31		339	C	260	C38	
304	B	268	B31		340	C	398	D37	
305	B	122	A32		341	C	650	F35	V _{DD2}
306	B	405	C31		342	C	528	E36	
307	B	534	D31		343	C	113	C39	GND
308	B	655	E31	V _{DD1}	344	C	259	D38	
309	B	267	B32		345	C	397	E37	
310	B	121	A33		346	C	527	F36	V _{DD2}
311	B	404	C32		347	C	112	D39	
312	B	266	B33		348	C	649	G35	V _{DD2}
313	B	120	A34		349	C	258	E38	
314	B	533	D32		350	C	396	F37	
315	B	654	E32	V _{DD1}	351	C	526	G36	
316	B	403	C33		352	C	111	E39	
317	B	265	B34		353	C	257	F38	
318	B	119	A35		354	C	395	G37	
319	B	532	D33		355	C	648	H35	V _{DD1}
320	B	402	C34		356	C	525	H36	
321	B	264	B35		357	C	110	F39	
322	B	653	E33	V _{DD2}	358	C	256	G38	
323	B	118	A36		359	C	394	H37	
324	B	531	D34	V _{DD2}	360	C	109	G39	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-7. Correspondence Between Internal Chip Pins and Ball Numbers
(680-pin TBGA (with Heat Spreader)) (6/10)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
361	C	255	H38		397	C	101	R39	
362	C	647	J35	V _{DD1}	398	C	640	T35	V _{DD1}
363	C	524	J36		399	C	517	T36	
364	C	393	J37		400	C	386	T37	
365	C	108	H39		401	C	247	T38	
366	C	254	J38		402	C	100	T39	
367	C	107	J39		403	C	639	U35	
368	C	646	K35	V _{DD2}	404	C	516	U36	
369	C	523	K36		405	C	385	U37	
370	C	392	K37		406	C	246	U38	
371	C	253	K38		407	C	99	U39	
372	C	106	K39		408	C	638	V35	
373	C	645	L35	V _{DD2}	409	C	515	V36	
374	C	522	L36		410	C	384	V37	
375	C	391	L37		411	C	245	V38	
376	C	252	L38		412	C	98	V39	
377	C	105	L39		413	C	637	W35	GND
378	C	644	M35	GND	414	C	514	W36	
379	C	521	M36	GND	415	C	383	W37	
380	C	390	M37		416	C	244	W38	
381	C	251	M38		417	C	97	W39	
382	C	104	M39		418	C	382	Y37	GND
383	C	643	N35	V _{DD2}	419	C	513	Y36	GND
384	C	520	N36		420	C	636	Y35	GND
385	C	389	N37		421	C	243	Y38	
386	C	250	N38	GND	422	C	96	Y39	
387	C	103	N39		423	C	95	AA39	
388	C	642	P35	V _{DD2}	424	C	242	AA38	
389	C	519	P36		425	C	381	AA37	
390	C	388	P37		426	C	512	AA36	
391	C	249	P38		427	C	635	AA35	GND
392	C	102	P39		428	C	94	AB39	
393	C	641	R35	V _{DD1}	429	C	241	AB38	
394	C	518	R36		430	C	380	AB37	
395	C	387	R37		431	C	511	AB36	
396	C	248	R38		432	C	634	AB35	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-7. Correspondence Between Internal Chip Pins and Ball Numbers
(680-pin TBGA (with Heat Spreader)) (7/10)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
433	C	93	AC39		469	C	233	AK38	
434	C	240	AC38		470	C	372	AK37	
435	C	379	AC37		471	C	503	AK36	
436	C	510	AC36		472	C	626	AK35	V _{DD2}
437	C	633	AC35		473	C	85	AL39	
438	C	92	AD39		474	C	232	AL38	
439	C	239	AD38		475	C	84	AM39	
440	C	378	AD37		476	C	371	AL37	
441	C	509	AD36		477	C	502	AL36	
442	C	632	AD35	V _{DD1}	478	C	625	AL35	V _{DD1}
443	C	91	AE39	GND	479	C	231	AM38	
444	C	238	AE38		480	C	83	AN39	
445	C	377	AE37		481	C	370	AM37	
446	C	508	AE36		482	C	230	AN38	
447	C	631	AE35	V _{DD1}	483	C	82	AP39	
448	C	90	AF39		484	C	501	AM36	
449	C	237	AF38		485	C	624	AM35	V _{DD1}
450	C	376	AF37		486	C	369	AN37	
451	C	507	AF36		487	C	229	AP38	
452	C	630	AF35	V _{DD2}	488	C	81	AR39	
453	C	89	AG39		489	C	500	AN36	
454	C	236	AG38		490	C	368	AP37	
455	C	375	AG37		491	C	228	AR38	
456	C	506	AG36		492	C	623	AN35	V _{DD2}
457	C	629	AG35	V _{DD2}	493	C	80	AT39	V _{DD2}
458	C	88	AH39		494	C	499	AP36	
459	C	235	AH38		495	C	367	AR37	
460	C	374	AH37		496	C	227	AT38	
461	C	505	AH36	GND	497	C	79	AU39	GND
462	C	628	AH35	GND	498	C	498	AR36	
463	C	87	AJ39		499	C	622	AP35	V _{DD2}
464	C	234	AJ38		500	C	78	AV39	GND
465	C	373	AJ37		501	C	77	AW39	GND
466	C	504	AJ36		502	C	225	AV38	GND
467	C	627	AJ35	V _{DD2}	503	C	497	AT36	GND
468	C	86	AK39		504	D	621	AR35	GND

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-7. Correspondence Between Internal Chip Pins and Ball Numbers
(680-pin TBGA (with Heat Spreader)) (8/10)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
505	D	365	AU37	GND	541	D	490	AT29	
506	D	76	AW38	GND	542	D	357	AU29	
507	D	224	AV37		543	D	216	AV29	
508	D	364	AU36		544	D	67	AW29	
509	D	620	AR34	V _{DD2}	545	D	614	AR28	GND
510	D	75	AW37	GND	546	D	489	AT28	GND
511	D	223	AV36	V _{DD2}	547	D	356	AU28	
512	D	363	AU35		548	D	215	AV28	
513	D	495	AT34		549	D	66	AW28	
514	D	74	AW36		550	D	613	AR27	V _{DD2}
515	D	619	AR33	V _{DD2}	551	D	488	AT27	
516	D	222	AV35		552	D	355	AU27	
517	D	362	AU34		553	D	214	AV27	
518	D	494	AT33		554	D	65	AW27	
519	D	73	AW35		555	D	612	AR26	V _{DD2}
520	D	221	AV34		556	D	487	AT26	
521	D	361	AU33		557	D	354	AU26	
522	D	618	AR32	V _{DD1}	558	D	213	AV26	
523	D	493	AT32		559	D	64	AW26	
524	D	72	AW34		560	D	611	AR25	V _{DD1}
525	D	220	AV33		561	D	486	AT25	GND
526	D	360	AU32		562	D	353	AU25	
527	D	71	AW33		563	D	212	AV25	
528	D	219	AV32		564	D	63	AW25	
529	D	617	AR31	V _{DD1}	565	D	610	AR24	V _{DD1}
530	D	492	AT31		566	D	485	AT24	
531	D	359	AU31		567	D	352	AU24	
532	D	70	AW32		568	D	211	AV24	
533	D	218	AV31		569	D	62	AW24	
534	D	69	AW31		570	D	609	AR23	
535	D	616	AR30	V _{DD2}	571	D	484	AT23	
536	D	491	AT30		572	D	351	AU23	
537	D	358	AU30		573	D	210	AV23	
538	D	217	AV30		574	D	61	AW23	
539	D	68	AW30		575	D	608	AR22	
540	D	615	AR29	V _{DD2}	576	D	483	AT22	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-7. Correspondence Between Internal Chip Pins and Ball Numbers
(680-pin TBGA (with Heat Spreader)) (9/10)**

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
577	D	350	AU22		613	D	476	AT15	
578	D	209	AV22		614	D	601	AR15	V _{DD1}
579	D	60	AW22		615	D	52	AW14	
580	D	607	AR21	GND	616	D	201	AV14	GND
581	D	482	AT21		617	D	342	AU14	
582	D	349	AU21		618	D	475	AT14	
583	D	208	AV21		619	D	600	AR14	V _{DD2}
584	D	59	AW21		620	D	51	AW13	
585	D	348	AU20	GND	621	D	200	AV13	
586	D	481	AT20	GND	622	D	341	AU13	
587	D	606	AR20	GND	623	D	474	AT13	
588	D	207	AV20		624	D	599	AR13	V _{DD2}
589	D	58	AW20		625	D	50	AW12	
590	D	57	AW19		626	D	199	AV12	
591	D	206	AV19		627	D	340	AU12	
592	D	347	AU19		628	D	473	AT12	GND
593	D	480	AT19		629	D	598	AR12	GND
594	D	605	AR19	GND	630	D	49	AW11	
595	D	56	AW18		631	D	198	AV11	
596	D	205	AV18		632	D	339	AU11	
597	D	346	AU18		633	D	472	AT11	
598	D	479	AT18		634	D	597	AR11	V _{DD2}
599	D	604	AR18		635	D	48	AW10	
600	D	55	AW17		636	D	197	AV10	
601	D	204	AV17		637	D	338	AU10	
602	D	345	AU17		638	D	471	AT10	
603	D	478	AT17		639	D	596	AR10	V _{DD2}
604	D	603	AR17		640	D	47	AW9	
605	D	54	AW16		641	D	196	AV9	
606	D	203	AV16		642	D	46	AW8	
607	D	344	AU16		643	D	337	AU9	
608	D	477	AT16		644	D	470	AT9	
609	D	602	AR16	V _{DD1}	645	D	595	AR9	V _{DD1}
610	D	53	AW15		646	D	195	AV8	
611	D	202	AV15		647	D	45	AW7	
612	D	343	AU15		648	D	336	AU8	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

**Table 5-7. Correspondence Between Internal Chip Pins and Ball Numbers
(680-pin TBGA (with Heat Spreader)) (10/10)**

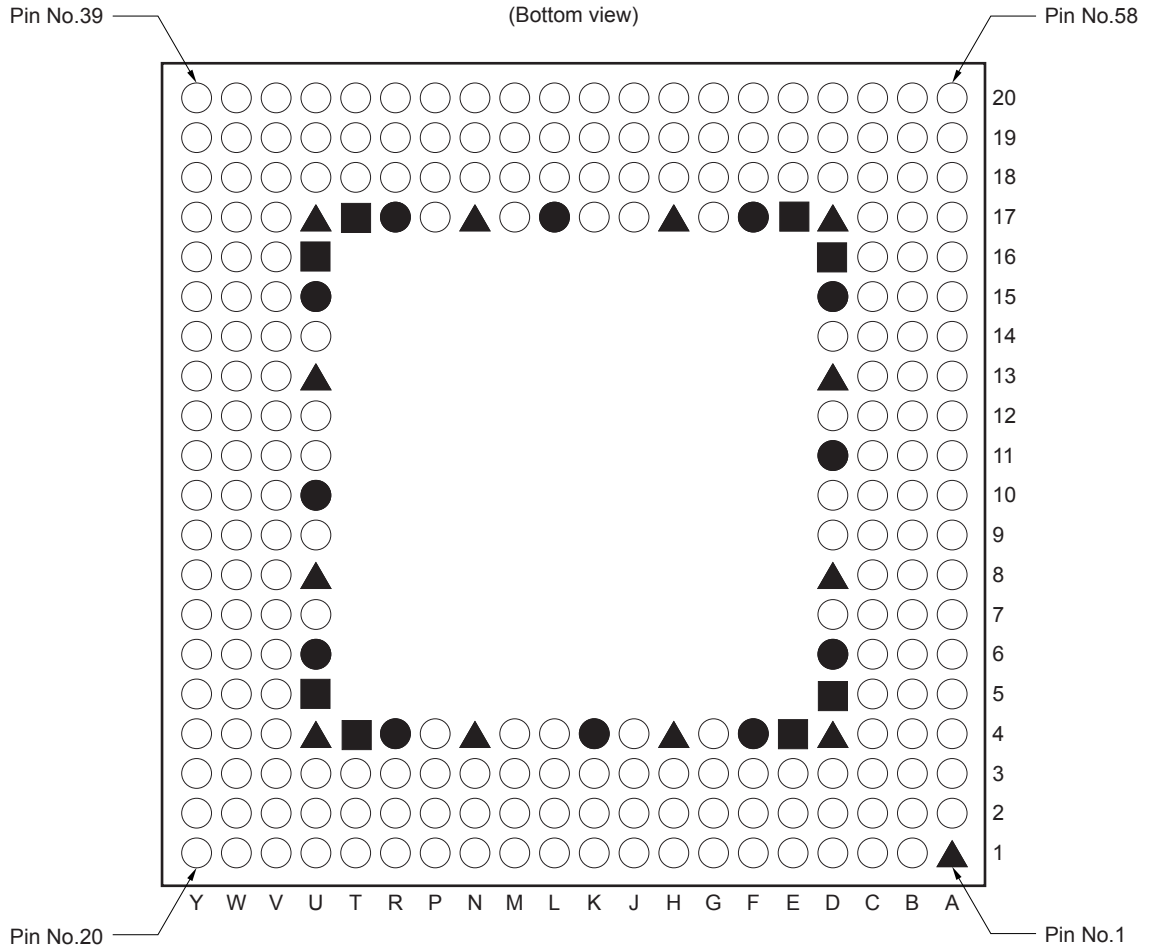
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
649	D	194	AV7	
650	D	44	AW6	
651	D	469	AT8	
652	D	594	AR8	V _{DD1}
653	D	335	AU7	
654	D	193	AV6	
655	D	43	AW5	
656	D	468	AT7	
657	D	334	AU6	V _{DD2}
658	D	192	AV5	
659	D	593	AR7	V _{DD2}
660	D	42	AW4	
661	D	467	AT6	
662	D	333	AU5	
663	D	191	AV4	
664	D	41	AW3	GND
665	D	592	AR6	V _{DD2}
666	D	332	AU4	
667	D	190	AV3	
668	D	40	AW2	GND
669	D	39	AW1	GND
670	D	189	AV2	GND
671	D	591	AR5	GND

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

5.5 PBGA

Caution For V_{DD} and GND of PBGA, there is a difference between the number of pins out on the ball and the number of pins on the internal chip for a structural reason.

5.5.1 256-pin PBGA

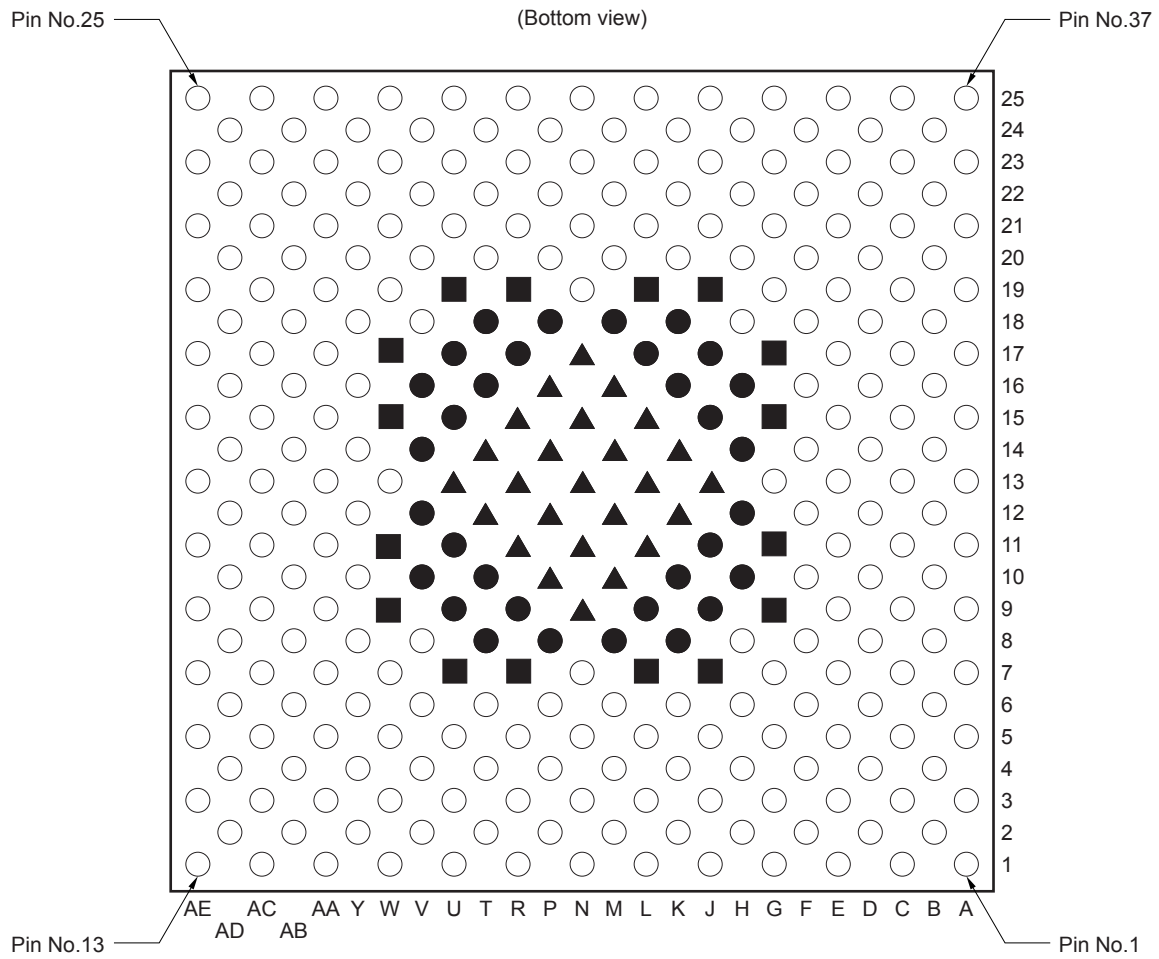


Remark ▲: GND (13 pins)
●: V_{DD1} (12 pins)
■: V_{DD2} (8 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1 (A1), 205 (D4), 209 (H4), 214 (N4), 218 (U4), 222 (U8), 227 (U13), 231 (U17), 235 (N17), 240 (H17), 244 (D17), 248 (D13), 253 (D8)	207 (F4), 211 (K4), 216 (R4), 220 (U6), 224 (U10), 229 (U15), 233 (R17), 237 (L17), 242 (F17), 246 (D15), 250 (D11), 255 (D6)	206 (E4), 217 (T4), 219 (U5), 230 (U16), 232 (T17), 243 (E17), 245 (D16), 256 (D5)	None	162	24	163	223

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

5.5.2 313-pin PBGA



- Remark**
- ▲ : GND (25 pins)
 - : V_{DD1} (32 pins)
 - : V_{DD2} (16 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
275 (N9), 279 (U13), 283 (N17), 287 (J13), 290 (M10), 291 (P10), 293 (T12), 294 (T14), 296 (P16), 297 (M16), 299 (K14), 300 (K12), 301 (L11), 302 (N11), 303 (R11), 304 (R13), 305 (R15), 306 (N15), 307 (L15), 308 (L13), 309 (M12), 310 (P12), 311 (P14), 312 (M14), 313 (N13)	254 (K8), 255 (M8), 256 (P7), 257 (T8), 259 (V10), 260 (V12), 261 (V14), 262 (V16), 264 (T18), 265 (P18), 266 (M18), 267 (K18), 269 (H16), 270 (H14), 271 (H12), 272 (H10), 273 (J9), 274 (L9), 276 (R9), 277(U9), 278 (U11), 280 (U15), 281 (U17), 282 (R17), 284 (L17), 285 (J17), 286 (J15), 288 (J11), 289 (K10), 292 (T10), 295 (T16), 298 (K16)	230 (J7), 231 (L7), 233 (R7), 234 (U7), 236 (W9), 237 (W11), 239 (W15), 240 (W17), 242 (U19), 243 (R19), 245 (L19), 246 (J19), 248 (G17), 249 (G15), 251 (G11), 252 (G9)	None	152	73	115	240

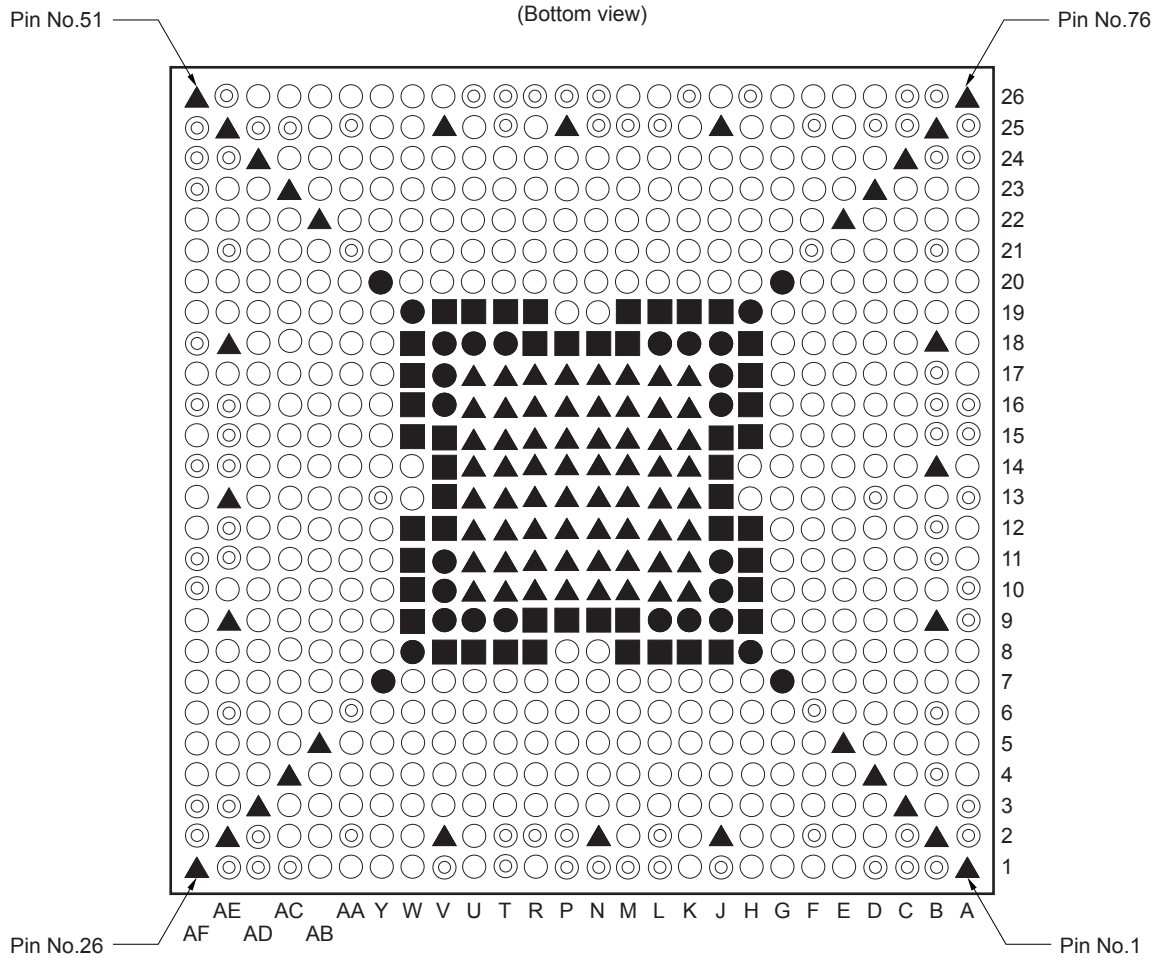
- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1 (A1), 25 (AE1), 26 (AF1), 50 (AF25), 51 (AF26), 75 (B26), 76 (A26), 100 (A2), 101 (B2), 124 (AE2), 147 (AE25), 170 (B25), 193 (C3), 214 (AD3), 235 (AD24), 256 (C24), 277 (D4), 281 (H4), 286 (N4), 291 (V4), 296 (AC4), 300 (AC8), 305 (AC13), 310 (AC18), 315 (AC23), 319 (W23), 324 (P23), 329 (J23), 334 (D23), 338 (D19), 343 (D14), 348 (D9)	279 (F4), 284 (L4), 289 (T4), 294 (AA4), 298 (AC6), 303 (AC11), 308 (AC16), 313 (AC21), 317 (AA23), 322 (T23), 327 (L23), 332 (F23), 336 (D21), 341 (D16), 346 (D11), 351 (D6)	278 (E4), 295 (AB4), 297 (AC5), 314 (AC22), 316 (AB23), 333 (E23), 335 (D22), 352 (D5)	None	There are no restrictions on the assignment of dedicated scan path pins.			296

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

5.5.4 676-pin PBGA

(1) μ PD65348, 65548



- Remark**
- ▲: GND (96 pins)
 - : V_{DD1} (28 pins)
 - : V_{DD2} (48 pins)
 - ⊙: NC (84 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1 (A1), 26 (AF1), 51 (AF26), 76 (A26), 101 (B2), 108 (J2), 112 (N2), 117 (V2), 124 (AE2), 131 (AE9), 135 (AE13), 140 (AE18), 147 (AE25), 154 (V25), 158 (P25), 163 (J25), 170 (B25), 177 (B18), 181 (B14), 186 (B9), 193 (C3), 214 (AD3), 235 (AD24), 256 (C24), 277 (D4), 296 (AC4), 315 (AC23), 334 (D23), 353 (E5), 370 (AB5), 387 (AB22), 404 (E22), 613 (K10), 614 (L10), 615 (M10), 616 (N10), 617 (P10), 618 (R10), 619 (T10), 620 (U10), 621 (U11), 622 (U12), 623 (U13), 624 (U14), 625 (U15), 626 (U16), 627 (U17), 628 (T17), 629 (R17), 630 (P17), 631 (N17), 632 (M17), 633 (L17), 634 (K17), 635 (K16), 636 (K15), 637 (K14), 638 (K13), 639 (K12), 640 (K11), 641 (L11), 642 (M11), 643 (N11), 644 (P11), 645 (R11), 646 (T11), 647 (T12), 648 (T13), 649 (T14), 650 (T15), 651 (T16), 652 (R16), 653 (P16), 654 (N16), 655 (M16), 656 (L16), 657 (L15), 658 (L14), 659 (L13), 660 (L12), 661 (M12), 662 (N12), 663 (P12), 664 (R12), 665 (R13), 666 (R14), 667 (R15), 668 (P15), 669 (N15), 670 (M15), 671 (M14), 672 (M13), 673 (N13), 674 (P13), 675 (P14), 676 (N14)	481 (G7), 494 (Y7), 507 (Y20), 520 (G20), 533 (H8), 544 (W8), 555 (W19), 566 (H19), 577 (J9), 578 (K9), 579 (L9), 584 (T9), 585 (U9), 586 (V9), 587 (V10), 588 (V11), 593 (V16), 594 (V17), 595 (V18), 596 (U18), 597 (T18), 602 (L18), 603 (K18), 604 (J18), 605 (J17), 606 (J16), 611 (J11), 612 (J12)	534 (J13), 535 (K13), 536 (L8), 537 (M8), 540 (R8), 541 (T8), 542 (U8), 543 (V8), 545 (W9), 546 (W10), 547 (W11), 548 (W12), 551 (W15), 552 (W16), 553 (W17), 554 (W18), 556 (V19), 557 (U19), 558 (T19), 559 (R19), 562 (M19), 563 (L19), 564 (K19), 565 (J19), 567 (H18), 568 (H17), 569 (H16), 570 (H15), 573 (H12), 574 (H11), 575 (H10), 576 (H9), 580 (M9), 581 (N9), 582 (P9), 583 (R9), 589 (V12), 590 (V13), 591 (V14), 592 (V15), 598 (R18), 599 (P18), 600 (N18), 601 (M18), 607 (J15), 608 (J14), 609 (J13), 610 (J12)	2 (B1), 3 (C1), 4 (D1), 9 (J1), 11 (L1), 12 (M1), 13 (N1), 14 (P1), 16 (T1), 18 (V1), 23 (AC1), 24 (AD1), 25 (AE1), 27 (AF2), 28 (AF3), 35 (AF10), 36 (AF11), 39 (AF14), 41 (AF16), 43 (AF18), 48 (AF23), 49 (AF24), 50 (AF25), 52 (AE26), 60 (U26), 61 (T26), 62 (R26), 63 (P26), 64 (N26), 67 (K26), 69 (H26), 74 (C26), 75 (B26), 77 (A25), 78 (A24), 86 (A16), 87 (A15), 89 (A13), 92 (A10), 93 (A9), 99 (A3), 100 (A2), 102 (C2), 105 (F2), 110 (L2), 113 (P2), 114 (R2), 115 (T2), 120 (AA2), 123 (AD2), 125 (AE3), 128 (AE6), 133 (AE11), 134 (AE12), 136 (AE14), 137 (AE15), 138 (AE16), 143 (AE21), 146 (AE26), 148 (AD25), 149 (AC25), 151 (AA25), 156 (T25), 159 (N25), 160 (M25), 161 (L25), 166 (F25), 168 (D25), 169 (C25), 171 (B24), 174 (B21), 178 (B17), 179 (B16), 180 (B15), 183 (B12), 184 (B11), 189 (B6), 191 (B4), 344 (D13), 421 (F6), 436 (AA6), 451 (AA21), 466 (F21), 500 (Y13)	There are no restrictions on the assignment of dedicated scan path pins.			420

- Notes**
1. GND pin: **G1 in DIF format
 2. V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
 3. V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
 4. Total number of usable signal pins.

Table 5-8. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (1/8)

(μ PD65348, 65548)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	–	–	GND	–	A	176	B19	
–	A	–	–	GND	–	A	470	F17	
–	A	405	E21		–	A	83	A19	
–	A	336	D21		–	A	340	D17	
–	A	406	E20		–	A	471	F16	
–	A	467	F20		–	A	–	–	VDD2
–	A	335	D22		–	A	410	E16	
–	A	521	G19		–	A	–	–	GND
–	A	257	C23		–	A	262	C18	
–	A	–	–	VDD2	–	A	472	F15	
–	A	407	E19		–	A	84	A18	
–	A	172	B23		–	A	525	G15	
–	A	258	C22		–	A	341	D16	
–	A	522	G18		–	A	263	C17	
–	A	173	B22		–	A	412	E14	
–	A	79	A23		–	A	85	A17	
–	A	468	F19		–	A	571	H14	
–	A	337	D20		–	A	264	C16	
–	A	80	A22		–	A	411	E15	
–	A	–	–	GND	–	A	473	F14	
–	A	259	C21		–	A	342	D15	
–	A	408	E18		–	A	–	–	GND
–	A	81	A21		–	A	526	G14	
–	A	523	G17		–	A	–	–	VDD2
–	A	338	D19		–	A	265	C15	
–	A	–	–	VDD2	–	A	572	H13	
–	A	260	C20		–	A	343	D14	
–	A	469	F18		–	A	266	C14	
–	A	175	B20		–	A	527	G13	
–	A	–	–	GND	–	A	88	A14	
–	A	82	A20		–	A	182	B13	
–	A	409	E17		–	A	–	–	VDD1
–	A	339	D18		–	A	267	C13	
–	A	–	–	VDD1	–	A	–	–	GND
–	A	261	C19		–	A	90	A12	
–	A	524	G16		–	A	–	–	VDD2

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-8. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (2/8)
(μ PD65348, 65548)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	413	E13		–	A	97	A5	
–	A	414	E12		–	A	274	C6	
–	A	474	F13		–	A	478	F9	
–	A	268	C12		–	A	–	–	GND
–	A	345	D12		–	A	350	D7	
–	A	528	G12		–	A	532	G8	
–	A	91	A11		–	A	98	A4	
–	A	269	C11		–	A	–	–	VDD1
–	A	475	F12		–	A	190	B5	
–	A	346	D11		–	A	–	–	VDD2
–	A	185	B10		–	A	418	E8	
–	A	–	–	GND	–	A	351	D6	
–	A	529	G11		–	A	192	B3	
–	A	270	C10		–	A	479	F8	
–	A	415	E11		–	A	275	C5	
–	A	–	–	VDD2	–	A	419	E7	
–	A	347	D10		–	A	276	C4	
–	A	476	F11		–	A	480	F7	
–	A	271	C9		–	A	352	D5	
–	A	94	A8		–	A	–	–	GND
–	A	416	E10		–	A	–	–	GND
–	A	95	A7		–	B	–	–	GND
–	A	348	D9		–	B	–	–	GND
–	A	–	–	VDD1	–	B	420	E6	
–	A	530	G10		–	B	279	F4	
–	A	–	–	GND	–	B	354	F5	
–	A	187	B8		–	B	355	G5	
–	A	272	C8		–	B	278	E4	
–	A	96	A6		–	B	482	H7	
–	A	477	F10		–	B	194	D3	
–	A	349	D8		–	B	–	–	VDD2
–	A	–	–	VDD2	–	B	422	G6	
–	A	417	E9		–	B	356	H5	
–	A	188	B7		–	B	103	D2	
–	A	531	G9		–	B	195	E3	
–	A	273	C7		–	B	483	J7	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-8. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (3/8)

(μ PD65348, 65548)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	–	–	GND	–	B	10	K1	
–	B	104	E2		–	B	538	N8	
–	B	423	H6		–	B	201	L3	
–	B	280	G4		–	B	360	M5	
–	B	5	E1		–	B	–	–	VDD2
–	B	196	F3		–	B	428	N6	
–	B	357	J5		–	B	–	–	GND
–	B	6	F1		–	B	285	M4	
–	B	484	K7		–	B	–	–	VDD1
–	B	281	H4		–	B	487	N7	
–	B	–	–	VDD2	–	B	111	M2	
–	B	197	G3		–	B	202	M3	
–	B	424	J6		–	B	539	P8	
–	B	106	G2		–	B	286	N4	
–	B	–	–	GND	–	B	203	N3	
–	B	7	G1		–	B	287	P4	
–	B	358	K5		–	B	488	P7	
–	B	282	J4		–	B	204	P3	
–	B	–	–	VDD1	–	B	–	–	GND
–	B	198	H3		–	B	15	R1	
–	B	485	L7		–	B	–	–	VDD2
–	B	107	H2		–	B	362	P5	
–	B	425	K6		–	B	363	R5	
–	B	8	H1		–	B	429	P6	
–	B	283	K4		–	B	205	R3	
–	B	426	L6		–	B	288	R4	
–	B	–	–	VDD2	–	B	489	R7	
–	B	359	L5		–	B	206	T3	
–	B	–	–	GND	–	B	430	R6	
–	B	199	J3		–	B	17	U1	
–	B	427	M6		–	B	–	–	VDD1
–	B	486	M7		–	B	289	T4	
–	B	284	L4		–	B	–	–	GND
–	B	200	K3		–	B	116	U2	
–	B	361	N5		–	B	490	T7	
–	B	109	K2		–	B	207	U3	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-8. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (4/8)
(μ PD65348, 65548)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	–	–	VDD2	–	B	368	Y5	
–	B	364	T5		–	B	295	AB4	
–	B	290	U4		–	B	435	Y6	
–	B	431	T6		–	B	369	AA5	
–	B	208	V3		–	B	–	–	GND
–	B	19	W1		–	B	–	–	GND
–	B	365	U5		–	C	–	–	GND
–	B	20	Y1		–	C	–	–	GND
–	B	291	V4		–	C	371	AB6	
–	B	491	U7		–	C	298	AC6	
–	B	–	–	GND	–	C	372	AB7	
–	B	118	W2		–	C	437	AA7	
–	B	209	W3		–	C	297	AC5	
–	B	21	AA1		–	C	495	Y8	
–	B	432	U6		–	C	215	AD4	
–	B	292	W4		–	C	–	–	VDD2
–	B	–	–	VDD2	–	C	373	AB8	
–	B	366	V5		–	C	126	AE4	
–	B	119	Y2		–	C	216	AD5	
–	B	492	V7		–	C	496	Y9	
–	B	210	Y3		–	C	127	AE5	
–	B	22	AB1		–	C	–	–	GND
–	B	211	AA3		–	C	29	AF4	
–	B	433	V6		–	C	438	AA8	
–	B	–	–	GND	–	C	299	AC7	
–	B	293	Y4		–	C	30	AF5	
–	B	493	W7		–	C	217	AD6	
–	B	121	AB2		–	C	374	AB9	
–	B	–	–	VDD1	–	C	31	AF6	
–	B	367	W5		–	C	497	Y10	
–	B	–	–	VDD2	–	C	300	AC8	
–	B	294	AA4		–	C	–	–	VDD2
–	B	122	AC2		–	C	218	AD7	
–	B	434	W6		–	C	439	AA9	
–	B	212	AB3		–	C	129	AE7	
–	B	213	AC3		–	C	–	–	GND

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-8. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (5/8)

(μ PD65348, 65548)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	32	AF7		–	C	306	AC14	
–	C	375	AB10		–	C	501	Y14	
–	C	301	AC9		–	C	225	AD14	
–	C	–	–	VDD1	–	C	–	–	GND
–	C	219	AD8		–	C	40	AF15	
–	C	498	Y11		–	C	–	–	VDD2
–	C	130	AE8		–	C	379	AB14	
–	C	440	AA10		–	C	380	AB15	
–	C	33	AF8		–	C	444	AA14	
–	C	302	AC10		–	C	226	AD15	
–	C	441	AA11		–	C	307	AC15	
–	C	–	–	VDD2	–	C	502	Y15	
–	C	376	AB11		–	C	227	AD16	
–	C	–	–	GND	–	C	445	AA15	
–	C	220	AD9		–	C	42	AF17	
–	C	442	AA12		–	C	308	AC16	
–	C	34	AF9		–	C	139	AE17	
–	C	499	Y12		–	C	–	–	GND
–	C	303	AC11		–	C	503	Y16	
–	C	221	AD10		–	C	–	–	VDD1
–	C	378	AB13		–	C	228	AD17	
–	C	132	AE10		–	C	–	–	GND
–	C	549	W13		–	C	381	AB16	
–	C	222	AD11		–	C	–	–	VDD2
–	C	377	AB12		–	C	309	AC17	
–	C	443	AA13		–	C	446	AA16	
–	C	304	AC12		–	C	229	AD18	
–	C	–	–	GND	–	C	44	AF19	
–	C	223	AD12		–	C	382	AB17	
–	C	–	–	VDD2	–	C	45	AF20	
–	C	550	W14		–	C	310	AC18	
–	C	–	–	VDD1	–	C	504	Y17	
–	C	37	AF12		–	C	141	AE19	
–	C	305	AC13		–	C	230	AD19	
–	C	224	AD13		–	C	46	AF21	
–	C	38	AF13		–	C	–	–	GND

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-8. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (6/8)
(μ PD65348, 65548)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	447	AA17		–	D	–	–	VDD2
–	C	–	–	VDD2	–	D	53	AD26	
–	C	311	AC19		–	D	390	W22	
–	C	383	AB18		–	D	237	AB24	
–	C	142	AE20		–	D	509	V20	
–	C	505	Y18		–	D	150	AB25	
–	C	231	AD20		–	D	–	–	GND
–	C	47	AF22		–	D	54	AC26	
–	C	232	AD21		–	D	453	W21	
–	C	448	AA18		–	D	318	Y23	
–	C	312	AC20		–	D	55	AB26	
–	C	506	Y19		–	D	238	AA24	
–	C	144	AE22		–	D	391	V22	
–	C	–	–	VDD1	–	D	56	AA26	
–	C	384	AB19		–	D	510	U20	
–	C	313	AC21		–	D	319	W23	
–	C	145	AE23		–	D	–	–	VDD2
–	C	–	–	VDD2	–	D	239	Y24	
–	C	449	AA19		–	D	454	V21	
–	C	233	AD22		–	D	152	Y25	
–	C	234	AD23		–	D	–	–	GND
–	C	385	AB20		–	D	57	Y26	
–	C	314	AC22		–	D	392	U22	
–	C	450	AA20		–	D	320	V23	
–	C	386	AB21		–	D	–	–	VDD1
–	C	–	–	GND	–	D	240	W24	
–	C	–	–	GND	–	D	511	T20	
–	D	–	–	GND	–	D	153	W25	
–	D	–	–	GND	–	D	455	U21	
–	D	388	AA22		–	D	58	W26	
–	D	317	AA23		–	D	321	U23	
–	D	389	Y22		–	D	456	T21	
–	D	452	Y21		–	D	–	–	VDD2
–	D	316	AB23		–	D	393	T22	
–	D	508	W20		–	D	–	–	GND
–	D	236	AC24		–	D	241	V24	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-8. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (7/8)

(μ PD65348, 65548)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	D	457	R21		–	D	327	L23	
–	D	59	V26		–	D	162	K25	
–	D	512	R20		–	D	–	–	GND
–	D	322	T23		–	D	516	L20	
–	D	242	U24		–	D	–	–	VDD1
–	D	395	P22		–	D	249	K24	
–	D	155	U25		–	D	–	–	VDD2
–	D	560	P19		–	D	398	L22	
–	D	243	T24		–	D	68	J26	
–	D	394	R22		–	D	328	K23	
–	D	–	–	VDD2	–	D	461	L21	
–	D	458	P21		–	D	250	J24	
–	D	–	–	GND	–	D	399	K22	
–	D	323	R23		–	D	70	G26	
–	D	513	P20		–	D	329	J23	
–	D	–	–	VDD1	–	D	517	K20	
–	D	157	R25		–	D	–	–	GND
–	D	244	R24		–	D	164	H25	
–	D	561	N19		–	D	251	H24	
–	D	324	P23		–	D	71	F26	
–	D	245	P24		–	D	462	K21	
–	D	325	N23		–	D	330	H23	
–	D	514	N20		–	D	–	–	VDD2
–	D	246	N24		–	D	400	J22	
–	D	–	–	GND	–	D	165	G25	
–	D	65	M26		–	D	518	J20	
–	D	–	–	VDD2	–	D	252	G24	
–	D	396	N22		–	D	72	E26	
–	D	397	M22		–	D	253	F24	
–	D	459	N21		–	D	463	J21	
–	D	247	M24		–	D	–	–	GND
–	D	326	M23		–	D	331	G23	
–	D	515	M20		–	D	519	H20	
–	D	66	L26		–	D	73	D26	
–	D	248	L24		–	D	–	–	VDD1
–	D	460	M21		–	D	167	E25	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

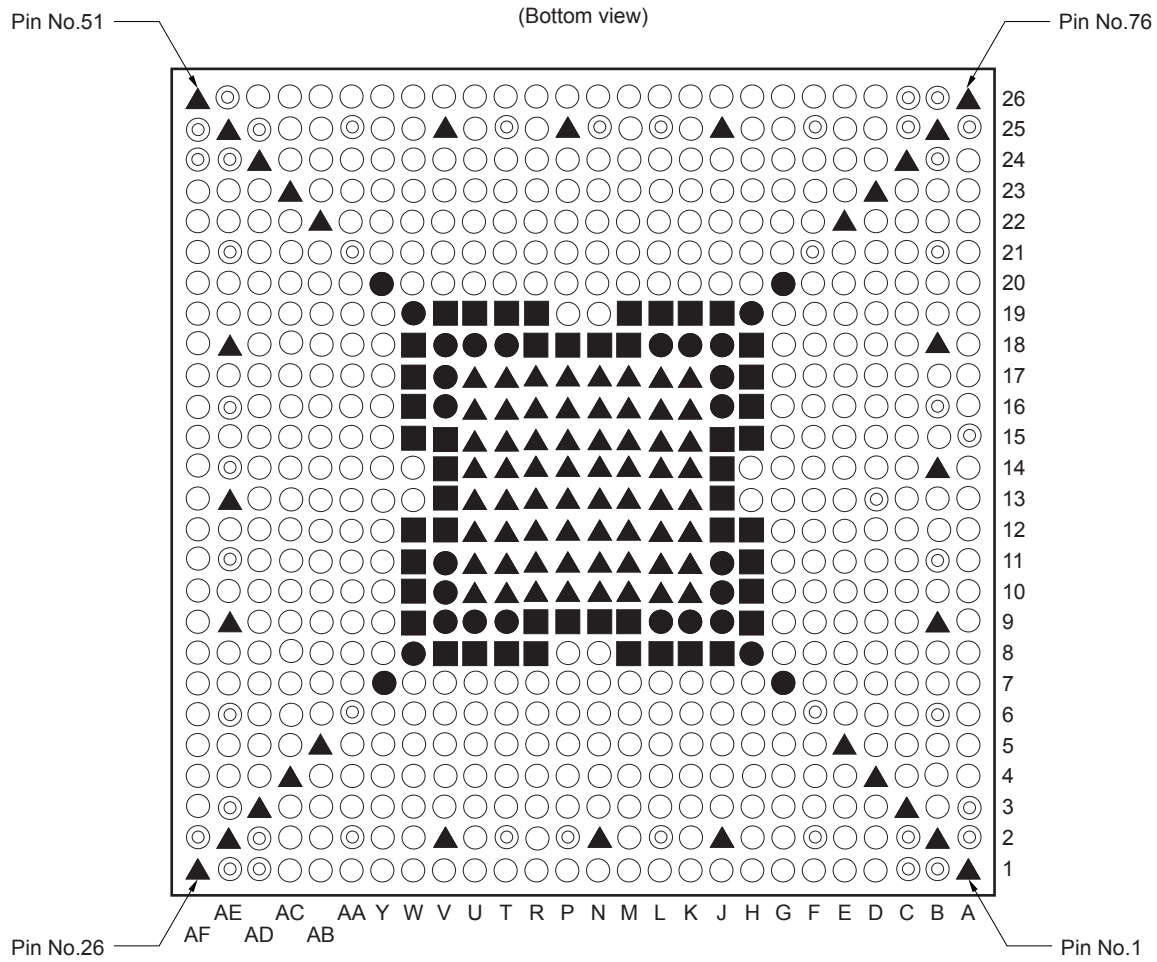
Table 5-8. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (8/8)

(μ PD65348, 65548)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	D	401	H22	
–	D	332	F23	
–	D	–	–	VDD2
–	D	464	H21	
–	D	254	E24	
–	D	255	D24	
–	D	402	G22	
–	D	333	E23	
–	D	465	G21	
–	D	403	F22	
–	D	–	–	GND
–	D	–	–	GND

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

(2) μ PD65349, 65549



- Remark**
- ▲ : GND (96 pins)
 - : V_{DD1} (28 pins)
 - : V_{DD2} (48 pins)
 - ⊙ : NC (45 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1 (A1), 26 (AF1), 51 (AF26), 76 (A26), 101 (B2), 108 (J2), 112 (N2), 117 (V2), 124 (AE2), 131 (AE9), 135 (AE13), 140 (AE18), 147 (AE25), 154 (V25), 158 (P25), 163 (J25), 170 (B25), 177 (B18), 181 (B14), 186 (B9), 193 (C3), 214 (AD3), 235 (AD24), 256 (C24), 277 (D4), 296 (AC4), 315 (AC23), 334 (D23), 353 (E5), 370 (AB5), 387 (AB22), 404 (E22), 613 (K10), 614 (L10), 615 (M10), 616 (N10), 617 (P10), 618 (R10), 619 (T10), 620 (U10), 621 (U11), 622 (U12), 623 (U13), 624 (U14), 625 (U15), 626 (U16), 627 (U17), 628 (T17), 629 (R17), 630 (P17), 631 (N17), 632 (M17), 633 (L17), 634 (K17), 635 (K16), 636 (K15), 637 (K14), 638 (K13), 639 (K12), 640 (K11), 641 (L11), 642 (M11), 643 (N11), 644 (P11), 645 (R11), 646 (T11), 647 (T12), 648 (T13), 649 (T14), 650 (T15), 651 (T16), 652 (R16), 653 (P16), 654 (N16), 655 (M16), 656 (L16), 657 (L15), 658 (L14), 659 (L13), 660 (L12), 661 (M12), 662 (N12), 663 (P12), 664 (R12), 665 (R13), 666 (R14), 667 (R15), 668 (P15), 669 (N15), 670 (M15), 671 (M14), 672 (M13), 673 (N13), 674 (P13), 675 (P14), 676 (N14)	481 (G7), 494 (Y7), 507 (Y20), 520 (G20), 533 (H8), 544 (W8), 555 (W19), 566 (H19), 577 (J9), 578 (K9), 579 (L9), 584 (T9), 585 (U9), 586 (V9), 587 (V10), 588 (V11), 593 (V16), 594 (V17), 595 (V18), 596 (U18), 597 (T18), 602 (L18), 603 (K18), 604 (J18), 605 (J17), 606 (J16), 611 (J11), 612 (J12)	534 (J13), 535 (K13), 536 (L8), 537 (M8), 540 (R8), 541 (T8), 542 (U8), 543 (V8), 545 (W9), 546 (W10), 547 (W11), 548 (W12), 551 (W15), 552 (W16), 553 (W17), 554 (W18), 556 (V19), 557 (U19), 558 (T19), 559 (R19), 562 (M19), 563 (L19), 564 (K19), 565 (J19), 567 (H18), 568 (H17), 569 (H16), 570 (H15), 573 (H12), 574 (H11), 575 (H10), 576 (H9), 580 (M9), 581 (N9), 582 (P9), 583 (R9), 589 (V12), 590 (V13), 591 (V14), 592 (V15), 598 (R18), 599 (P18), 600 (N18), 601 (M18), 607 (J15), 608 (J14), 609 (J13), 610 (J12)	2 (B1), 3 (C1), 24 (AD1), 25 (AE1), 27 (AF2), 49 (AF24), 50 (AF25), 52 (AE26), 74 (C26), 75 (B26), 77 (A25), 87 (A15), 99 (A3), 100 (A2), 102 (C2), 105 (F2), 110 (L2), 113 (P2), 115 (T2), 120 (AA2), 123 (AD2), 125 (AE3), 128 (AE6), 133 (AE11), 136 (AE14), 138 (AE16), 143 (AE21), 146 (AE26), 148 (AD25), 151 (AA25), 156 (T25), 159 (N25), 161 (L25), 166 (F25), 169 (C25), 171 (B24), 174 (B21), 179 (B16), 184 (B11), 189 (B6), 421 (F6), 436 (AA6), 451 (AA21), 466 (F21)	There are no restrictions on the assignment of dedicated scan path pins.	459		

- Notes**
1. GND pin: **G1 in DIF format
 2. V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
 3. V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
 4. Total number of usable signal pins.

Table 5-9. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (1/9)
(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	–	–	GND	–	A	261	C19	
–	A	–	–	GND	–	A	524	G16	
–	A	405	E21		–	A	176	B19	
–	A	336	D21		–	A	470	F17	
–	A	406	E20		–	A	83	A19	
–	A	467	F20		–	A	–	–	GND
–	A	335	D22		–	A	340	D17	
–	A	521	G19		–	A	471	F16	
–	A	257	C23		–	A	410	E16	
–	A	–	–	VDD2	–	A	–	–	VDD2
–	A	78	A24		–	A	262	C18	
–	A	407	E19		–	A	472	F15	
–	A	172	B23		–	A	84	A18	
–	A	258	C22		–	A	525	G15	
–	A	522	G18		–	A	341	D16	
–	A	173	B22		–	A	–	–	GND
–	A	79	A23		–	A	263	C17	
–	A	468	F19		–	A	412	E14	
–	A	337	D20		–	A	178	B17	
–	A	–	–	VDD2	–	A	–	–	VDD2
–	A	80	A22		–	A	85	A17	
–	A	–	–	GND	–	A	571	H14	
–	A	259	C21		–	A	264	C16	
–	A	408	E18		–	A	–	–	GND
–	A	81	A21		–	A	411	E15	
–	A	523	G17		–	A	473	F14	
–	A	338	D19		–	A	342	D15	
–	A	–	–	VDD2	–	A	–	–	VDD1
–	A	260	C20		–	A	86	A16	
–	A	469	F18		–	A	526	G14	
–	A	175	B20		–	A	265	C15	
–	A	–	–	GND	–	A	–	–	GND
–	A	82	A20		–	A	180	B15	
–	A	409	E17		–	A	572	H13	
–	A	339	D18		–	A	343	D14	
–	A	–	–	VDD1	–	A	–	–	VDD2

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-9. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (2/9)

(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	266	C14		–	A	271	C9	
–	A	88	A14		–	A	–	–	GND
–	A	–	–	GND	–	A	94	A8	
–	A	89	A13		–	A	416	E10	
–	A	182	B13		–	A	95	A7	
–	A	–	–	VDD1	–	A	–	–	VDD1
–	A	344	D13		–	A	348	D9	
–	A	527	G13		–	A	530	G10	
–	A	267	C13		–	A	187	B8	
–	A	–	–	GND	–	A	–	–	VDD2
–	A	90	A12		–	A	272	C8	
–	A	413	E13		–	A	–	–	GND
–	A	414	E12		–	A	96	A6	
–	A	–	–	VDD2	–	A	477	F10	
–	A	183	B12		–	A	349	D8	
–	A	474	F13		–	A	417	E9	
–	A	268	C12		–	A	188	B7	
–	A	–	–	GND	–	A	531	G9	
–	A	345	D12		–	A	273	C7	
–	A	528	G12		–	A	–	–	VDD2
–	A	91	A11		–	A	97	A5	
–	A	–	–	VDD2	–	A	–	–	GND
–	A	269	C11		–	A	274	C6	
–	A	475	F12		–	A	478	F9	
–	A	92	A10		–	A	350	D7	
–	A	–	–	VDD1	–	A	532	G8	
–	A	346	D11		–	A	98	A4	
–	A	–	–	GND	–	A	–	–	VDD1
–	A	185	B10		–	A	190	B5	
–	A	529	G11		–	A	418	E8	
–	A	270	C10		–	A	351	D6	
–	A	415	E11		–	A	–	–	GND
–	A	93	A9		–	A	192	B3	
–	A	–	–	VDD2	–	A	479	F8	
–	A	347	D10		–	A	275	C5	
–	A	476	F11		–	A	–	–	VDD2

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-9. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (3/9)
(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	191	B4		–	B	424	J6	
–	A	419	E7		–	B	106	G2	
–	A	276	C4		–	B	–	–	GND
–	A	480	F7		–	B	7	G1	
–	A	352	D5		–	B	358	K5	
–	A	–	–	GND	–	B	282	J4	
–	A	–	–	GND	–	B	–	–	VDD1
–	B	–	–	GND	–	B	198	H3	
–	B	–	–	GND	–	B	485	L7	
–	B	420	E6		–	B	107	H2	
–	B	279	F4		–	B	425	K6	
–	B	354	F5		–	B	8	H1	
–	B	355	G5		–	B	–	–	GND
–	B	278	E4		–	B	283	K4	
–	B	482	H7		–	B	426	L6	
–	B	194	D3		–	B	359	L5	
–	B	–	–	VDD2	–	B	–	–	VDD2
–	B	422	G6		–	B	199	J3	
–	B	356	H5		–	B	427	M6	
–	B	103	D2		–	B	9	J1	
–	B	195	E3		–	B	486	M7	
–	B	483	J7		–	B	284	L4	
–	B	104	E2		–	B	–	–	GND
–	B	4	D1		–	B	200	K3	
–	B	423	H6		–	B	361	N5	
–	B	280	G4		–	B	109	K2	
–	B	–	–	VDD2	–	B	–	–	VDD2
–	B	5	E1		–	B	10	K1	
–	B	–	–	GND	–	B	538	N8	
–	B	196	F3		–	B	201	L3	
–	B	357	J5		–	B	–	–	GND
–	B	6	F1		–	B	360	M5	
–	B	484	K7		–	B	428	N6	
–	B	281	H4		–	B	285	M4	
–	B	–	–	VDD2	–	B	–	–	VDD1
–	B	197	G3		–	B	11	L1	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-9. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (4/9)

(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	487	N7		–	B	490	T7	
–	B	111	M2		–	B	207	U3	
–	B	–	–	GND	–	B	364	T5	
–	B	202	M3		–	B	18	V1	
–	B	539	P8		–	B	–	–	VDD2
–	B	12	M1		–	B	290	U4	
–	B	–	–	VDD2	–	B	431	T6	
–	B	286	N4		–	B	208	V3	
–	B	203	N3		–	B	–	–	GND
–	B	–	–	GND	–	B	19	W1	
–	B	13	N1		–	B	365	U5	
–	B	14	P1		–	B	20	Y1	
–	B	–	–	VDD1	–	B	–	–	VDD1
–	B	287	P4		–	B	291	V4	
–	B	488	P7		–	B	491	U7	
–	B	204	P3		–	B	118	W2	
–	B	–	–	GND	–	B	–	–	VDD2
–	B	15	R1		–	B	209	W3	
–	B	362	P5		–	B	–	–	GND
–	B	363	R5		–	B	21	AA1	
–	B	–	–	VDD2	–	B	432	U6	
–	B	114	R2		–	B	292	W4	
–	B	429	P6		–	B	366	V5	
–	B	205	R3		–	B	119	Y2	
–	B	–	–	GND	–	B	492	V7	
–	B	288	R4		–	B	210	Y3	
–	B	489	R7		–	B	–	–	VDD2
–	B	16	T1		–	B	22	AB1	
–	B	–	–	VDD2	–	B	–	–	GND
–	B	206	T3		–	B	211	AA3	
–	B	430	R6		–	B	433	V6	
–	B	17	U1		–	B	293	Y4	
–	B	–	–	VDD1	–	B	493	W7	
–	B	289	T4		–	B	23	AC1	
–	B	–	–	GND	–	B	–	–	VDD1
–	B	116	U2		–	B	121	AB2	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-9. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (5/9)
(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	367	W5		–	C	217	AD6	
–	B	294	AA4		–	C	374	AB9	
–	B	–	–	GND	–	C	31	AF6	
–	B	122	AC2		–	C	497	Y10	
–	B	434	W6		–	C	300	AC8	
–	B	212	AB3		–	C	–	–	VDD2
–	B	–	–	VDD2	–	C	218	AD7	
–	B	213	AC3		–	C	439	AA9	
–	B	368	Y5		–	C	129	AE7	
–	B	295	AB4		–	C	–	–	GND
–	B	435	Y6		–	C	32	AF7	
–	B	369	AA5		–	C	375	AB10	
–	B	–	–	GND	–	C	301	AC9	
–	B	–	–	GND	–	C	–	–	VDD1
–	C	–	–	GND	–	C	219	AD8	
–	C	–	–	GND	–	C	498	Y11	
–	C	371	AB6		–	C	130	AE8	
–	C	298	AC6		–	C	440	AA10	
–	C	372	AB7		–	C	33	AF8	
–	C	437	AA7		–	C	–	–	GND
–	C	297	AC5		–	C	302	AC10	
–	C	495	Y8		–	C	441	AA11	
–	C	215	AD4		–	C	376	AB11	
–	C	–	–	VDD2	–	C	–	–	VDD2
–	C	28	AF3		–	C	220	AD9	
–	C	373	AB8		–	C	442	AA12	
–	C	126	AE4		–	C	34	AF9	
–	C	216	AD5		–	C	499	Y12	
–	C	496	Y9		–	C	303	AC11	
–	C	127	AE5		–	C	–	–	GND
–	C	29	AF4		–	C	221	AD10	
–	C	438	AA8		–	C	378	AB13	
–	C	299	AC7		–	C	132	AE10	
–	C	–	–	VDD2	–	C	–	–	VDD2
–	C	30	AF5		–	C	35	AF10	
–	C	–	–	GND	–	C	549	W13	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-9. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (6/9)

(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	222	AD11		–	C	227	AD16	
–	C	–	–	GND	–	C	445	AA15	
–	C	377	AB12		–	C	42	AF17	
–	C	443	AA13		–	C	–	–	VDD1
–	C	304	AC12		–	C	308	AC16	
–	C	–	–	VDD1	–	C	–	–	GND
–	C	36	AF11		–	C	139	AE17	
–	C	500	Y13		–	C	503	Y16	
–	C	134	AE12		–	C	228	AD17	
–	C	–	–	GND	–	C	381	AB16	
–	C	223	AD12		–	C	43	AF18	
–	C	550	W14		–	C	–	–	VDD2
–	C	37	AF12		–	C	309	AC17	
–	C	–	–	VDD2	–	C	446	AA16	
–	C	305	AC13		–	C	229	AD18	
–	C	224	AD13		–	C	–	–	GND
–	C	–	–	GND	–	C	44	AF19	
–	C	38	AF13		–	C	382	AB17	
–	C	39	AF14		–	C	45	AF20	
–	C	–	–	VDD1	–	C	–	–	VDD1
–	C	306	AC14		–	C	310	AC18	
–	C	501	Y14		–	C	504	Y17	
–	C	225	AD14		–	C	141	AE19	
–	C	–	–	GND	–	C	–	–	VDD2
–	C	40	AF15		–	C	230	AD19	
–	C	379	AB14		–	C	–	–	GND
–	C	380	AB15		–	C	46	AF21	
–	C	–	–	VDD2	–	C	447	AA17	
–	C	137	AE15		–	C	311	AC19	
–	C	444	AA14		–	C	383	AB18	
–	C	226	AD15		–	C	142	AE20	
–	C	–	–	GND	–	C	505	Y18	
–	C	307	AC15		–	C	231	AD20	
–	C	502	Y15		–	C	–	–	VDD2
–	C	41	AF16		–	C	47	AF22	
–	C	–	–	VDD2	–	C	–	–	GND

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-9. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (7/9)
(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	232	AD21		–	D	150	AB25	
–	C	448	AA18		–	D	54	AC26	
–	C	312	AC20		–	D	453	W21	
–	C	506	Y19		–	D	318	Y23	
–	C	48	AF23		–	D	–	–	VDD2
–	C	–	–	VDD1	–	D	55	AB26	
–	C	144	AE22		–	D	–	–	GND
–	C	384	AB19		–	D	238	AA24	
–	C	313	AC21		–	D	391	V22	
–	C	–	–	GND	–	D	56	AA26	
–	C	145	AE23		–	D	510	U20	
–	C	449	AA19		–	D	319	W23	
–	C	233	AD22		–	D	–	–	VDD2
–	C	–	–	VDD2	–	D	239	Y24	
–	C	234	AD23		–	D	454	V21	
–	C	385	AB20		–	D	152	Y25	
–	C	314	AC22		–	D	–	–	GND
–	C	450	AA20		–	D	57	Y26	
–	C	386	AB21		–	D	392	U22	
–	C	–	–	GND	–	D	320	V23	
–	C	–	–	GND	–	D	–	–	VDD1
–	D	–	–	GND	–	D	240	W24	
–	D	–	–	GND	–	D	511	T20	
–	D	388	AA22		–	D	153	W25	
–	D	317	AA23		–	D	455	U21	
–	D	389	Y22		–	D	58	W26	
–	D	452	Y21		–	D	–	–	GND
–	D	316	AB23		–	D	321	U23	
–	D	508	W20		–	D	456	T21	
–	D	236	AC24		–	D	393	T22	
–	D	–	–	VDD2	–	D	–	–	VDD2
–	D	53	AD26		–	D	241	V24	
–	D	390	W22		–	D	457	R21	
–	D	149	AC25		–	D	59	V26	
–	D	237	AB24		–	D	512	R20	
–	D	509	V20		–	D	322	T23	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-9. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (8/9)

(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	D	–	–	GND	–	D	459	N21	
–	D	242	U24		–	D	247	M24	
–	D	395	P22		–	D	–	–	GND
–	D	155	U25		–	D	326	M23	
–	D	–	–	VDD2	–	D	515	M20	
–	D	60	U26		–	D	66	L26	
–	D	560	P19		–	D	–	–	VDD2
–	D	243	T24		–	D	248	L24	
–	D	–	–	GND	–	D	460	M21	
–	D	394	R22		–	D	67	K26	
–	D	458	P21		–	D	–	–	VDD1
–	D	323	R23		–	D	327	L23	
–	D	–	–	VDD1	–	D	–	–	GND
–	D	61	T26		–	D	162	K25	
–	D	513	P20		–	D	516	L20	
–	D	157	R25		–	D	249	K24	
–	D	–	–	GND	–	D	398	L22	
–	D	244	R24		–	D	68	J26	
–	D	561	N19		–	D	–	–	VDD2
–	D	62	R26		–	D	328	K23	
–	D	–	–	VDD2	–	D	461	L21	
–	D	324	P23		–	D	250	J24	
–	D	245	P24		–	D	–	–	GND
–	D	–	–	GND	–	D	69	H26	
–	D	63	P26		–	D	399	K22	
–	D	64	N26		–	D	70	G26	
–	D	–	–	VDD1	–	D	–	–	VDD1
–	D	325	N23		–	D	329	J23	
–	D	514	N20		–	D	517	K20	
–	D	246	N24		–	D	164	H25	
–	D	–	–	GND	–	D	–	–	VDD2
–	D	65	M26		–	D	251	H24	
–	D	396	N22		–	D	–	–	GND
–	D	397	M22		–	D	71	F26	
–	D	–	–	VDD2	–	D	462	K21	
–	D	160	M25		–	D	330	H23	

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

Table 5-9. Correspondence Between Internal Chip Sides and Ball Numbers (676-pin PBGA) (9/9)

(μ PD65349, 65549)

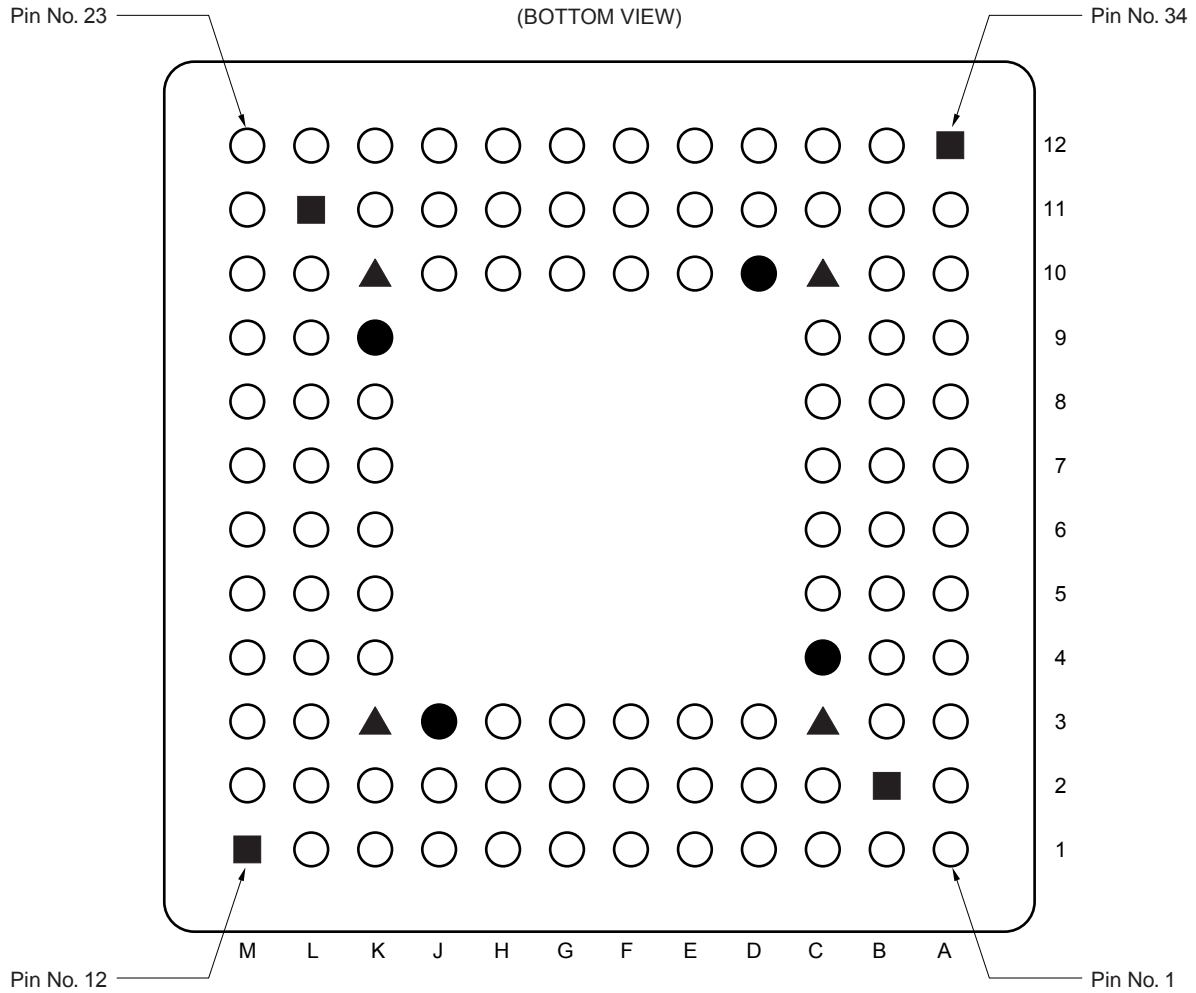
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	D	400	J22	
–	D	165	G25	
–	D	518	J20	
–	D	252	G24	
–	D	–	–	VDD2
–	D	72	E26	
–	D	–	–	GND
–	D	253	F24	
–	D	463	J21	
–	D	331	G23	
–	D	519	H20	
–	D	73	D26	
–	D	–	–	VDD1
–	D	167	E25	
–	D	401	H22	
–	D	332	F23	
–	D	–	–	GND
–	D	168	D25	
–	D	464	H21	
–	D	254	E24	
–	D	–	–	VDD2
–	D	255	D24	
–	D	402	G22	
–	D	333	E23	
–	D	465	G21	
–	D	403	F22	
–	D	–	–	GND
–	D	–	–	GND

Caution NC (non-connection) pins, which are not connected to the internal chip, are not included in table.

5.6 FPBGA

Caution For V_{DD} and GND of FPBGA, there is a difference between the number of pins out on the ball and the number of pins on the internal chip for a structural reason.

5.6.1 108-pin FPBGA



Remark ▲: GND (4 pins)
 ●: V_{DD1} (4 pins)
 ■: V_{DD2} (4 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
81 (C3), 88 (K3), 95 (K10), 102 (C10)	87 (J3), 94 (K9), 101 (D10), 108 (C4)	12 (M1), 34 (A12), 45 (B2), 63 (L11)	None	41	107	78	96

- Notes**
1. GND pin: **G1 in DIF format
 2. V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
 3. V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
 4. Total number of usable signal pins.

Table 5-10. Correspondence Between Internal Chip Sides and Ball Numbers (108-pin FPBGA) (1/2)

(μ PD65341, 65342, 65345, 65541, 65542, 65545)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	101	D10	V _{DD1}	–	B	49	F2	
–	A	34	A12	V _{DD2}	–	B	84	F3	
–	A	35	A11		–	B	7	G1	
–	A	73	B10		–	B	50	G2	
–	A	36	A10		–	B	8	H1	
–	A	74	B9		–	B	86	H3	
–	A	37	A9		–	B	51	H2	
–	A	103	C9		–	B	9	J1	
–	A	75	B8		–	B	52	J2	
–	A	38	A8		–	B	10	K1	
–	A	104	C8		–	B	53	K2	
–	A	39	A7		–	B	11	L1	
–	A	106	C6		–	B	54	L2	
–	A	76	B7		–	B	88	K3	GND
–	A	105	C7		–	C	87	J3	V _{DD1}
–	A	40	A6		–	C	12	M1	V _{DD2}
–	A	77	B6		–	C	13	M2	
–	A	41	A5		–	C	55	L3	
–	A	107	C5		–	C	14	M3	
–	A	78	B5		–	C	56	L4	
–	A	42	A4		–	C	15	M4	
–	A	79	B4		–	C	89	K4	
–	A	43	A3		–	C	57	L5	
–	A	80	B3		–	C	16	M5	
–	A	44	A2		–	C	90	K5	
–	A	45	B2	V _{DD2}	–	C	17	M6	
–	A	108	C4	V _{DD1}	–	C	92	K7	
–	B	81	C3	GND	–	C	58	L6	
–	B	1	A1		–	C	91	K6	
–	B	2	B1		–	C	18	M7	
–	B	46	C2		–	C	59	L7	
–	B	3	C1		–	C	19	M8	
–	B	47	D2		–	C	93	K8	
–	B	4	D1		–	C	60	L8	
–	B	82	D3		–	C	20	M9	
–	B	48	E2		–	C	61	L9	
–	B	5	E1		–	C	21	M10	
–	B	83	E3		–	C	62	L10	
–	B	6	F1		–	C	22	M11	
–	B	85	G3		–	C	63	L11	V _{DD2}

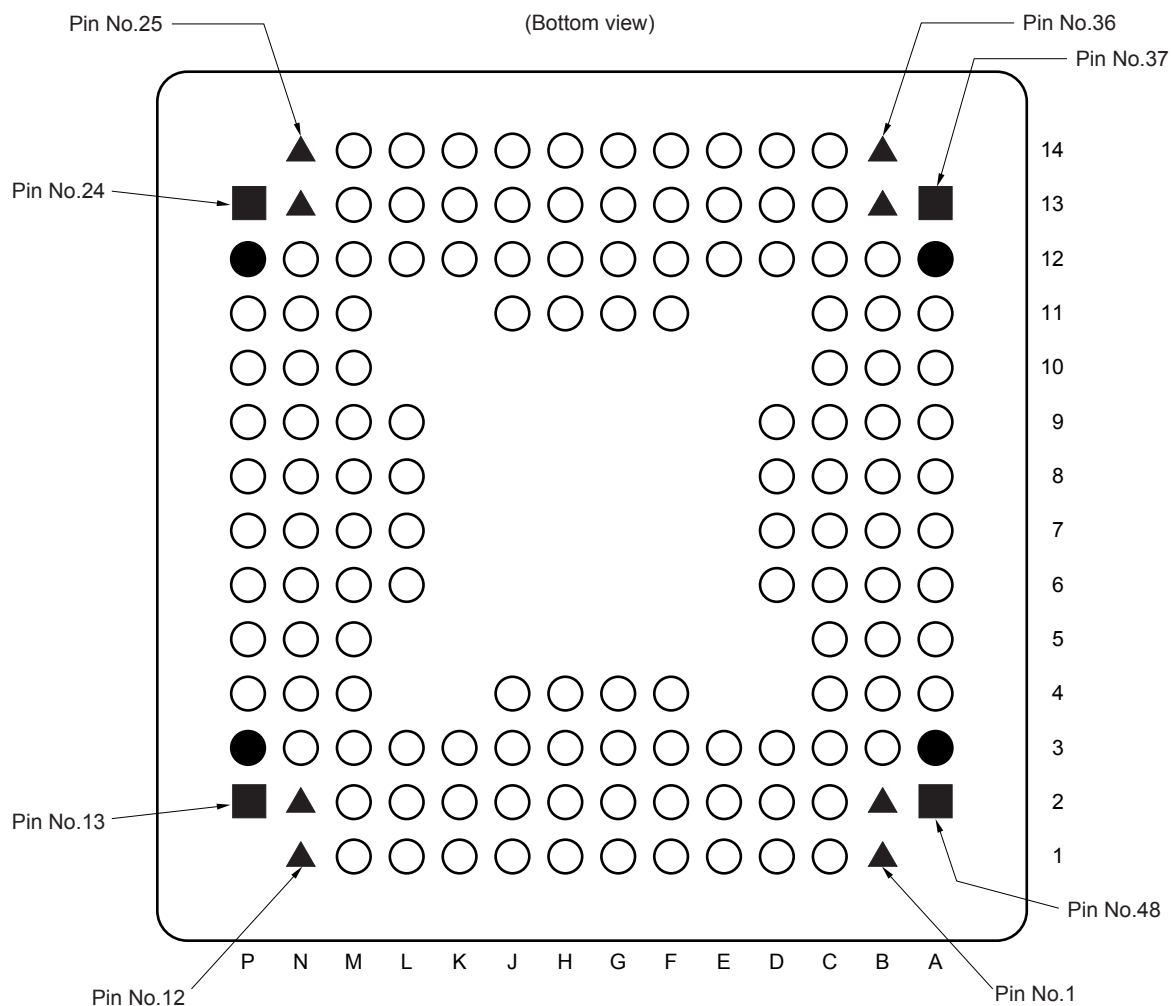
Table 5-10. Correspondence Between Internal Chip Sides and Ball Numbers (108-pin FPBGA) (2/2)

★

(μ PD65341, 65342, 65345, 65541, 65542, 65545)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	94	K9	V _{DD1}
–	D	95	K10	GND
–	D	23	M12	
–	D	24	L12	
–	D	64	K11	
–	D	25	K12	
–	D	65	J11	
–	D	26	J12	
–	D	96	J10	
–	D	66	H11	
–	D	27	H12	
–	D	97	H10	
–	D	28	G12	
–	D	99	F10	
–	D	67	G11	
–	D	98	G10	
–	D	29	F12	
–	D	68	F11	
–	D	30	E12	
–	D	100	E10	
–	D	69	E11	
–	D	31	D12	
–	D	70	D11	
–	D	32	C12	
–	D	71	C11	
–	D	33	B12	
–	D	72	B11	
–	D	102	C10	GND

5.6.2 144-pin FPBGA

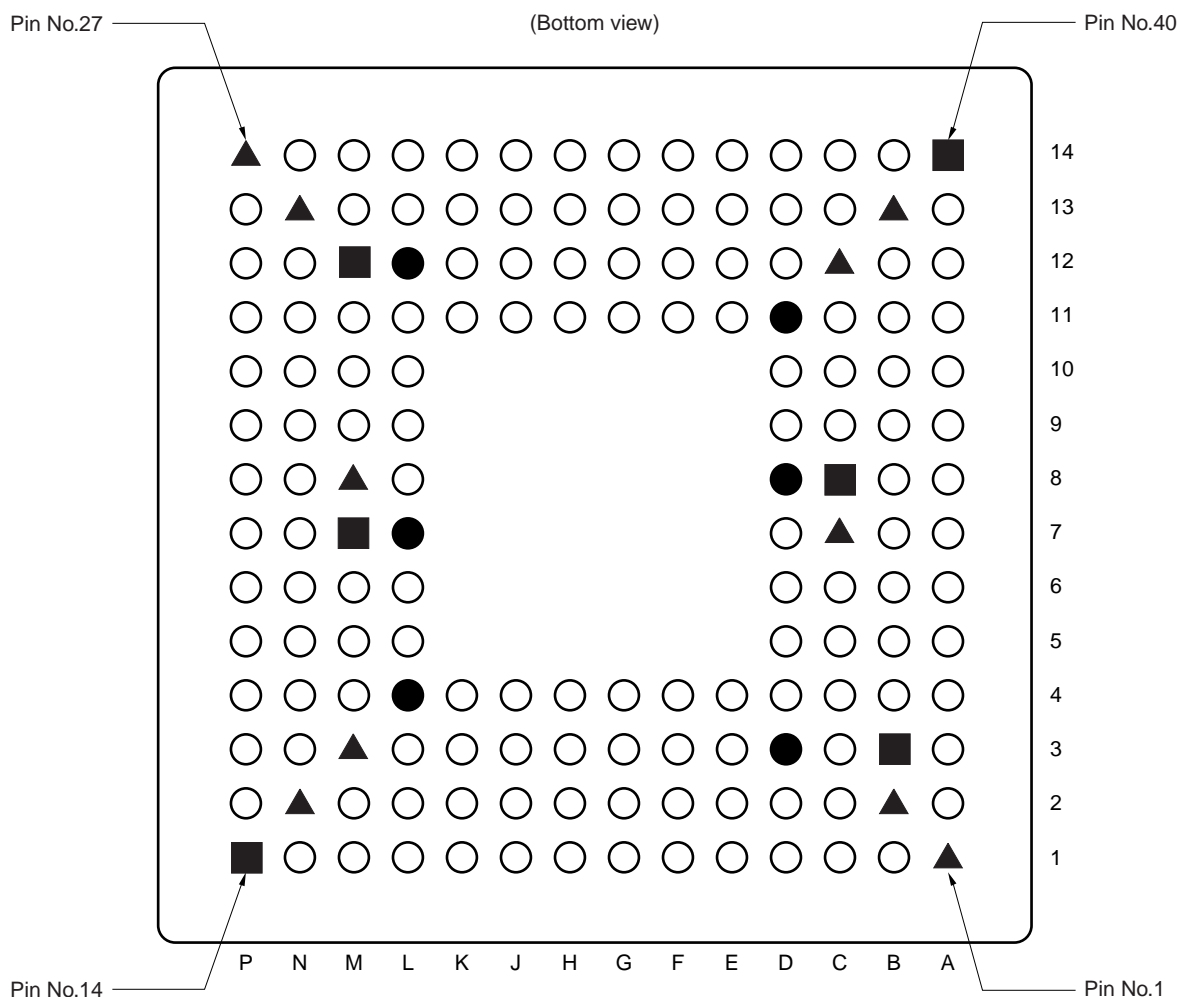


Remark ▲ : GND (8 pins)
 ● : V_{DD1} (4 pins)
 ■ : V_{DD2} (4 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1 (B1), 12 (N1), 25 (N14), 36 (B14), 49 (B2), 60 (N2), 71 (N13), 82 (B13)	14 (P3), 23 (P12), 38 (A12), 47 (A3)	13 (P1), 24 (P13), 37 (A13), 48 (A2)	None	118	79	34	128

- Notes 1.** GND pin: **G1 in DIF format
 2. V_{DD1} pin = 1.8 V or 2.5 V
 V_{DD1} pin: **V1 in DIF format
 3. V_{DD2} pin = 3.3 V
 V_{DD2} pin: **V2 in DIF format
 4. Total number of usable signal pins.

5.6.3 160-pin FPBGA

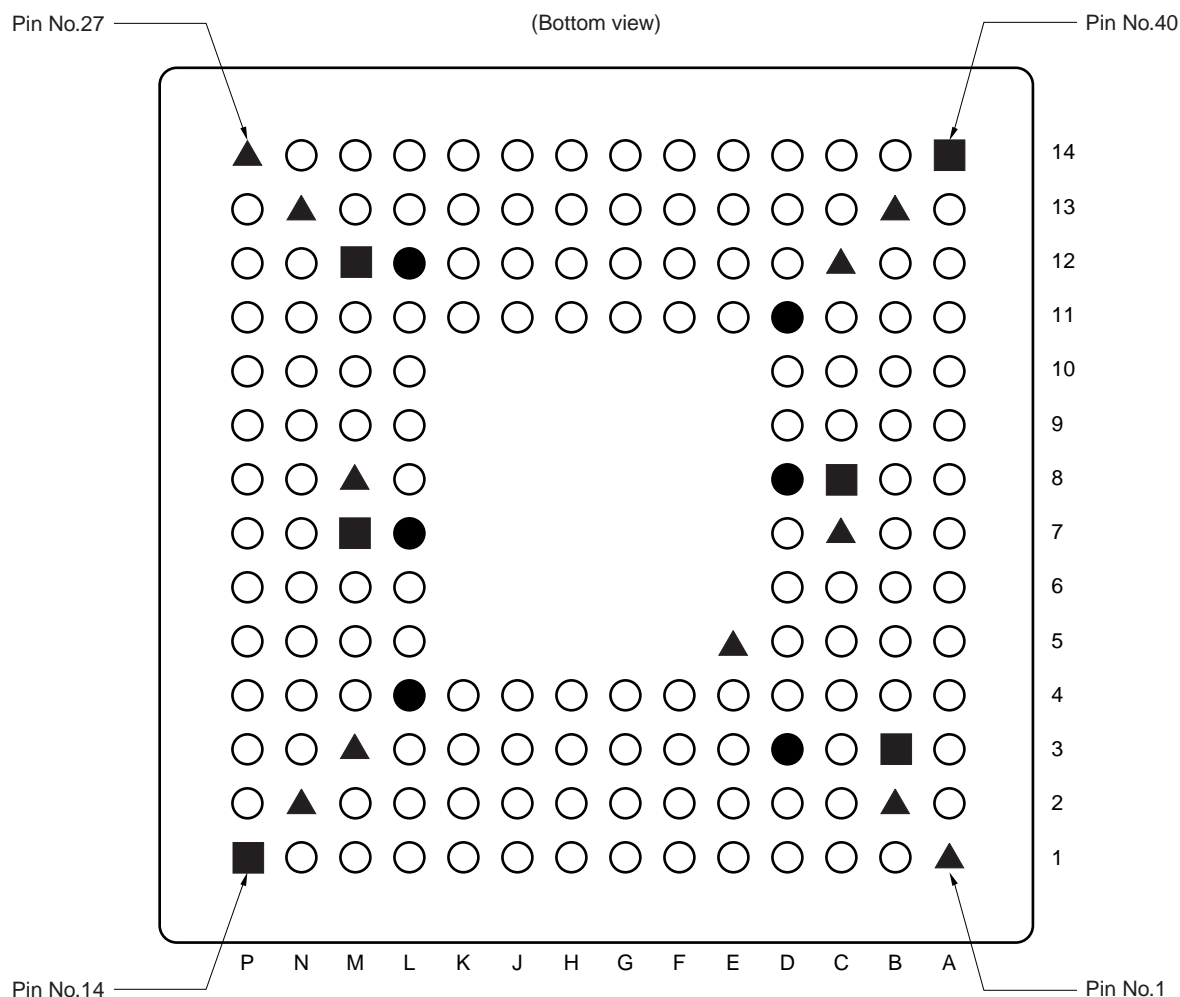


Remark ▲ : GND (10 pins)
 ● : V_{DD1} (6 pins)
 ■ : V_{DD2} (6 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1 (A1), 27 (P14), 53 (B2), 64 (N2), 75 (N13), 86 (B13), 106 (M3), 111 (M8), 124 (C12), 129 (C7)	98 (D3), 116 (L12), 140 (L4), 143 (L7), 154 (D11), 157 (D8)	14 (P1), 40 (A14), 96 (B3), 110 (M7), 115 (M12), 128 (C8)	None	97	54	3	138

- Notes**
- GND pin: **G1 in DIF format
 - V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
 - V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
 - Total number of usable signal pins.

5.6.4 161-pin FPBGA



Remark ▲ : GND (11 pins)
 ● : V_{DD1} (6 pins)
 ■ : V_{DD2} (6 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1(A1), 27 (P14), 53 (B2), 64 (N2), 75 (N13), 86 (B13), 106 (M3), 111 (M8), 124 (C12), 129 (C7), 161 (E5)	98 (D3), 116 (L12), 140 (L4), 143 (L7), 154 (D11), 157 (D8)	14 (P1), 40 (A14), 96 (B3), 110 (M7), 115 (M12), 128 (C8)	None	There are no restrictions on the assignment of dedicated scan path pins.			138

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
 V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
 V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

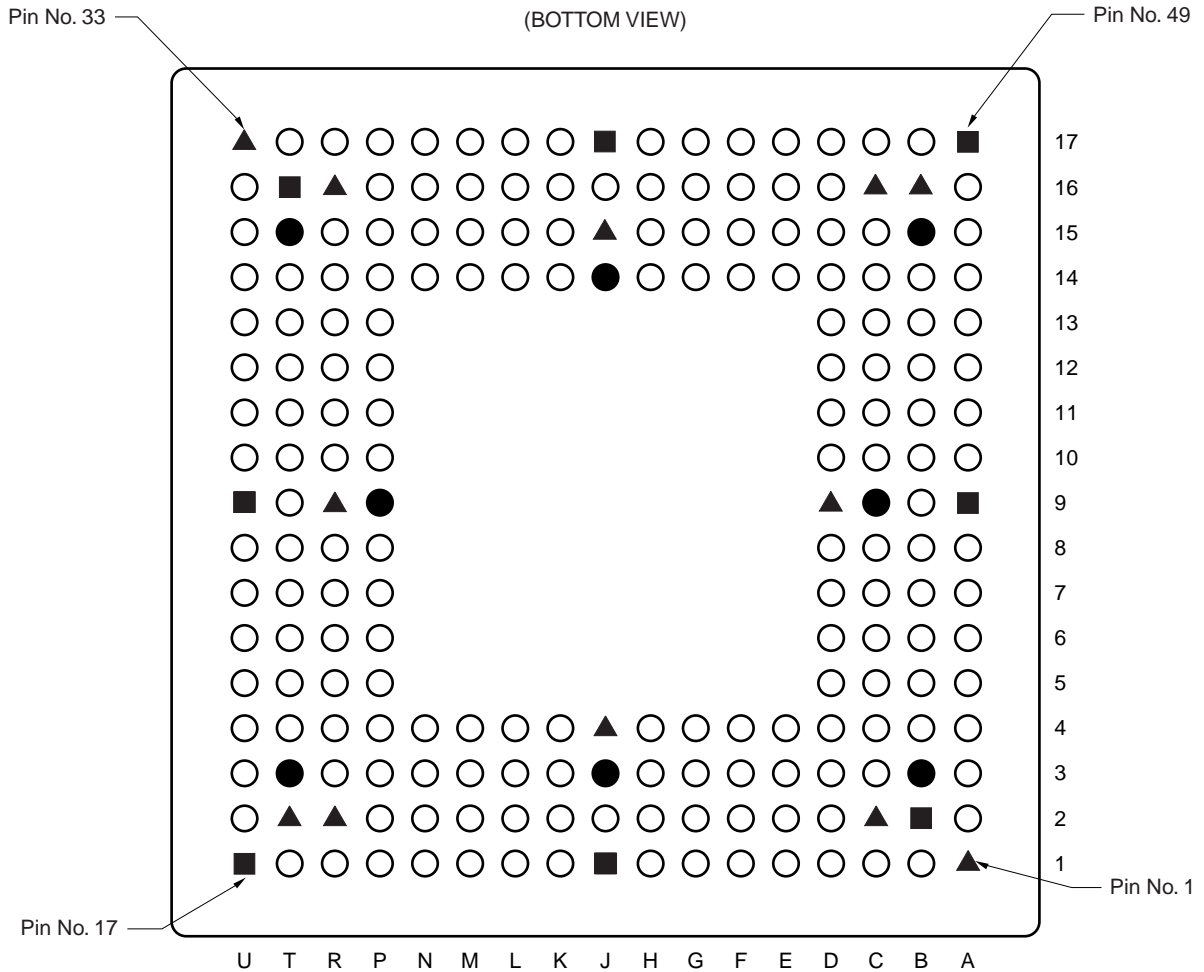
★ Table 5-11. Correspondence Between Internal Chip Sides and Ball Numbers (161-pin FPBGA) (1/2)
(μ PD65346, 65546)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	–	–	V _{DD1}	–	B	–	–	GND
–	A	41	A13		–	B	–	–	GND
–	A	87	B12		–	B	2	B1	
–	A	42	A12		–	B	54	C2	
–	A	125	C11		–	B	134	E4	
–	A	155	D10		–	B	3	C1	
–	A	43	A11		–	B	55	D2	
–	A	88	B11		–	B	99	E3	
–	A	126	C10		–	B	4	D1	
–	A	44	A10		–	B	56	E2	
–	A	89	B10		–	B	57	F2	
–	A	127	C9		–	B	5	E1	
–	A	45	A9		–	B	135	F4	
–	A	156	D9		–	B	100	F3	
–	A	90	B9		–	B	6	F1	
–	A	46	A8		–	B	58	G2	
–	A	91	B8		–	B	101	G3	
–	A	–	–	V _{DD2}	–	B	136	G4	
–	A	47	A7		–	B	7	G1	
–	A	–	–	V _{DD1}	–	B	102	H3	
–	A	–	–	GND	–	B	137	H4	
–	A	92	B7		–	B	60	J2	
–	A	158	D7		–	B	8	H1	
–	A	48	A6		–	B	59	H2	
–	A	159	D6		–	B	138	J4	
–	A	93	B6		–	B	9	J1	
–	A	49	A5		–	B	139	K4	
–	A	131	C5		–	B	103	J3	
–	A	130	C6		–	B	62	L2	
–	A	50	A4		–	B	104	K3	
–	A	94	B5		–	B	10	K1	
–	A	160	D5		–	B	61	K2	
–	A	132	C4		–	B	63	M2	
–	A	95	B4		–	B	11	L1	
–	A	133	D4		–	B	105	L3	
–	A	97	C3		–	B	12	M1	
–	A	–	–	V _{DD2}	–	B	–	–	V _{DD2}
–	A	51	A3		–	B	13	N1	
–	A	52	A2		–	B	–	–	GND
–	A	–	–	V _{DD1}	–	B	–	–	GND

★ Table 5-11. Correspondence Between Internal Chip Sides and Ball Numbers (161-pin FPBGA) (2/2)
(μ PD65346, 65546)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	–	–	V _{DD1}	–	D	–	–	GND
–	C	15	P2		–	D	–	–	GND
–	C	65	N3		–	D	28	N14	
–	C	16	P3		–	D	76	M13	
–	C	107	M4		–	D	148	K11	
–	C	141	L5		–	D	29	M14	
–	C	17	P4		–	D	77	L13	
–	C	66	N4		–	D	117	K12	
–	C	108	M5		–	D	30	L14	
–	C	18	P5		–	D	78	K13	
–	C	67	N5		–	D	79	J13	
–	C	109	M6		–	D	31	K14	
–	C	19	P6		–	D	149	J11	
–	C	142	L6		–	D	118	J12	
–	C	68	N6		–	D	32	J14	
–	C	20	P7		–	D	80	H13	
–	C	69	N7		–	D	119	H12	
–	C	–	–	V _{DD2}	–	D	150	H11	
–	C	21	P8		–	D	33	H14	
–	C	–	–	V _{DD1}	–	D	120	G12	
–	C	–	–	GND	–	D	151	G11	
–	C	70	N8		–	D	82	F13	
–	C	144	L8		–	D	34	G14	
–	C	22	P9		–	D	81	G13	
–	C	145	L9		–	D	152	F11	
–	C	71	N9		–	D	35	F14	
–	C	23	P10		–	D	153	E11	
–	C	113	M10		–	D	121	F12	
–	C	112	M9		–	D	84	D13	
–	C	24	P11		–	D	122	E12	
–	C	72	N10		–	D	36	E14	
–	C	146	L10		–	D	83	E13	
–	C	114	M11		–	D	85	C13	
–	C	73	N11		–	D	37	D14	
–	C	147	L11		–	D	123	D12	
–	C	–	–	V _{DD2}	–	D	38	C14	
–	C	74	N12		–	D	–	–	V _{DD2}
–	C	25	P12		–	D	39	B14	
–	C	26	P13		–	D	–	–	GND
–	C	–	–	V _{DD1}	–	D	–	–	GND

5.6.5 208-pin FPBGA



Remark ▲ : GND (12 pins)
 ● : V_{DD1} (8 pins)
 ■ : V_{DD2} (8 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1 (A1), 33 (U17), 66 (C2), 78 (R2), 79 (T2), 94 (R16), 106 (C16), 107 (B16), 139 (R9), 151 (J15), 174 (J4), 204 (D9)	80 (T3), 92 (T15), 108 (B15), 120 (B3), 127 (J3), 163 (C9), 184 (P9), 194 (J14)	9 (J1), 17 (U1), 25 (U9), 41 (J17), 49 (A17), 57 (A9), 65 (B2), 93 (T16)	None	168	208	62	180

- Notes**
- GND pin: **G1 in DIF format
 - V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
 - V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
 - Total number of usable signal pins.

Table 5-12. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (1/3)
(μ PD65344, 65544)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	108	B15	V _{DD1}	–	A	62	A4	
–	A	158	C14		–	A	118	B5	
–	A	159	C13		–	A	169	D4	
–	A	49	A17	V _{DD2}	–	A	208	D5	
–	A	50	A16		–	A	63	A3	
–	A	109	B14		–	A	167	C5	
–	A	160	C12		–	A	119	B4	
–	A	51	A15		–	A	64	A2	
–	A	200	D13		–	A	65	B2	V _{DD2}
–	A	52	A14		–	A	168	C4	
–	A	110	B13		–	A	121	C3	
–	A	111	B12		–	A	120	B3	V _{DD1}
–	A	161	C11		–	B	1	A1	GND
–	A	53	A13		–	B	66	C2	GND
–	A	201	D12		–	B	123	E3	
–	A	54	A12		–	B	122	D3	
–	A	112	B11		–	B	2	B1	
–	A	55	A11		–	B	67	D2	
–	A	202	D11		–	B	124	F3	
–	A	113	B10		–	B	3	C1	
–	A	162	C10		–	B	170	E4	
–	A	56	A10		–	B	4	D1	
–	A	203	D10		–	B	68	E2	
–	A	114	B9		–	B	69	F2	
–	A	57	A9	V _{DD2}	–	B	125	G3	
–	A	204	D9	GND	–	B	5	E1	
–	A	163	C9	V _{DD1}	–	B	171	F4	
–	A	164	C8		–	B	6	F1	
–	A	58	A8		–	B	70	G2	
–	A	205	D8		–	B	7	G1	
–	A	115	B8		–	B	172	G4	
–	A	206	D7		–	B	71	H2	
–	A	59	A7		–	B	126	H3	
–	A	165	C7		–	B	8	H1	
–	A	116	B7		–	B	173	H4	
–	A	207	D6		–	B	72	J2	
–	A	60	A6		–	B	9	J1	V _{DD2}
–	A	166	C6		–	B	174	J4	GND
–	A	61	A5		–	B	127	J3	V _{DD1}
–	A	117	B6		–	B	128	K3	

Table 5-12. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (2/3)

(μ PD65344, 65544)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
–	B	10	K1		–	C	84	T7	
–	B	175	K4		–	C	23	U7	
–	B	73	K2		–	C	182	P7	
–	B	176	L4		–	C	85	T8	
–	B	11	L1		–	C	138	R8	
–	B	129	L3		–	C	24	U8	
–	B	74	L2		–	C	183	P8	
–	B	177	M4		–	C	86	T9	
–	B	12	M1		–	C	25	U9	V _{DD2}
–	B	130	M3		–	C	184	P9	V _{DD1}
–	B	13	N1		–	C	139	R9	GND
–	B	75	M2		–	C	140	R10	
–	B	14	P1		–	C	26	U10	
–	B	76	N2		–	C	185	P10	
–	B	179	P4		–	C	87	T10	
–	B	178	N4		–	C	186	P11	
–	B	15	R1		–	C	27	U11	
–	B	131	N3		–	C	141	R11	
–	B	77	P2		–	C	88	T11	
–	B	16	T1		–	C	187	P12	
–	B	133	R3		–	C	28	U12	
–	B	132	P3		–	C	142	R12	
–	B	78	R2	GND	–	C	29	U13	
–	B	79	T2	GND	–	C	89	T12	
–	C	80	T3	V _{DD1}	–	C	30	U14	
–	C	134	R4		–	C	90	T13	
–	C	135	R5		–	C	189	P14	
–	C	17	U1	V _{DD2}	–	C	188	P13	
–	C	18	U2		–	C	31	U15	
–	C	81	T4		–	C	143	R13	
–	C	136	R6		–	C	91	T14	
–	C	19	U3		–	C	32	U16	
–	C	180	P5		–	C	93	T16	V _{DD2}
–	C	20	U4		–	C	144	R14	
–	C	82	T5		–	C	145	R15	
–	C	83	T6		–	C	92	T15	V _{DD1}
–	C	137	R7		–	D	33	U17	GND
–	C	21	U5		–	D	94	R16	GND
–	C	181	P6		–	D	147	N15	
–	C	22	U6		–	D	146	P15	

Table 5-12. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (3/3)
(μ PD65344, 65544)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	D	34	T17		–	D	47	C17	
–	D	95	P16		–	D	155	E15	
–	D	148	M15		–	D	105	D16	
–	D	35	R17		–	D	48	B17	
–	D	190	N14		–	D	157	C15	
–	D	36	P17		–	D	156	D15	
–	D	96	N16		–	D	106	C16	GND
–	D	97	M16		–	D	107	B16	GND
–	D	149	L15						
–	D	37	N17						
–	D	191	M14						
–	D	38	M17						
–	D	98	L16						
–	D	39	L17						
–	D	192	L14						
–	D	99	K16						
–	D	150	K15						
–	D	40	K17						
–	D	193	K14						
–	D	100	J16						
–	D	41	J17	V _{DD2}					
–	D	194	J14	V _{DD1}					
–	D	151	J15	GND					
–	D	152	H15						
–	D	42	H17						
–	D	195	H14						
–	D	101	H16						
–	D	196	G14						
–	D	43	G17						
–	D	153	G15						
–	D	102	G16						
–	D	197	F14						
–	D	44	F17						
–	D	154	F15						
–	D	45	E17						
–	D	103	F16						
–	D	46	D17						
–	D	104	E16						
–	D	199	D14						
–	D	198	E14						

Table 5-13. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (1/3)

(μ PD65345, 65545)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	108	B15	V _{DD1}	–	A	62	A4	
–	A	158	C14		–	A	169	D4	
–	A	159	C13		–	A	118	B5	
–	A	49	A17	V _{DD2}	–	A	208	D5	
–	A	50	A16		–	A	63	A3	
–	A	109	B14		–	A	167	C5	
–	A	160	C12		–	A	119	B4	
–	A	51	A15		–	A	64	A2	
–	A	200	D13		–	A	65	B2	V _{DD2}
–	A	110	B13		–	A	168	C4	
–	A	52	A14		–	A	121	C3	
–	A	111	B12		–	A	120	B3	V _{DD1}
–	A	161	C11		–	B	1	A1	GND
–	A	53	A13		–	B	66	C2	GND
–	A	201	D12		–	B	123	E3	
–	A	54	A12		–	B	122	D3	
–	A	112	B11		–	B	2	B1	
–	A	55	A11		–	B	67	D2	
–	A	202	D11		–	B	124	F3	
–	A	113	B10		–	B	3	C1	
–	A	162	C10		–	B	170	E4	
–	A	56	A10		–	B	68	E2	
–	A	203	D10		–	B	4	D1	
–	A	114	B9		–	B	69	F2	
–	A	57	A9	V _{DD2}	–	B	125	G3	
–	A	204	D9	GND	–	B	5	E1	
–	A	163	C9	V _{DD1}	–	B	171	F4	
–	A	164	C8		–	B	6	F1	
–	A	58	A8		–	B	70	G2	
–	A	205	D8		–	B	7	G1	
–	A	115	B8		–	B	172	G4	
–	A	206	D7		–	B	71	H2	
–	A	59	A7		–	B	126	H3	
–	A	165	C7		–	B	8	H1	
–	A	116	B7		–	B	173	H4	
–	A	207	D6		–	B	72	J2	
–	A	60	A6		–	B	9	J1	V _{DD2}
–	A	166	C6		–	B	174	J4	GND
–	A	61	A5		–	B	127	J3	V _{DD1}
–	A	117	B6		–	B	128	K3	

Table 5-13. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (2/3)
(μ PD65345, 65545)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	10	K1		–	C	84	T7	
–	B	175	K4		–	C	23	U7	
–	B	73	K2		–	C	182	P7	
–	B	176	L4		–	C	85	T8	
–	B	11	L1		–	C	138	R8	
–	B	129	L3		–	C	24	U8	
–	B	74	L2		–	C	183	P8	
–	B	177	M4		–	C	86	T9	
–	B	12	M1		–	C	25	U9	V _{DD2}
–	B	130	M3		–	C	184	P9	V _{DD1}
–	B	13	N1		–	C	139	R9	GND
–	B	75	M2		–	C	140	R10	
–	B	14	P1		–	C	26	U10	
–	B	179	P4		–	C	185	P10	
–	B	76	N2		–	C	87	T10	
–	B	178	N4		–	C	186	P11	
–	B	15	R1		–	C	27	U11	
–	B	131	N3		–	C	141	R11	
–	B	77	P2		–	C	88	T11	
–	B	16	T1		–	C	187	P12	
–	B	133	R3		–	C	28	U12	
–	B	132	P3		–	C	142	R12	
–	B	78	R2	GND	–	C	29	U13	
–	B	79	T2	GND	–	C	89	T12	
–	C	80	T3	V _{DD1}	–	C	30	U14	
–	C	134	R4		–	C	189	P14	
–	C	135	R5		–	C	90	T13	
–	C	17	U1	V _{DD2}	–	C	188	P13	
–	C	18	U2		–	C	31	U15	
–	C	81	T4		–	C	143	R13	
–	C	136	R6		–	C	91	T14	
–	C	19	U3		–	C	32	U16	
–	C	180	P5		–	C	93	T16	V _{DD2}
–	C	82	T5		–	C	144	R14	
–	C	20	U4		–	C	145	R15	
–	C	83	T6		–	C	92	T15	V _{DD1}
–	C	137	R7		–	D	33	U17	GND
–	C	21	U5		–	D	94	R16	GND
–	C	181	P6		–	D	147	N15	
–	C	22	U6		–	D	146	P15	

Table 5-13. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (3/3)

(μ PD65345, 65545)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
-	D	34	T17		-	D	47	C17	
-	D	95	P16		-	D	155	E15	
-	D	148	M15		-	D	105	D16	
-	D	35	R17		-	D	48	B17	
-	D	190	N14		-	D	157	C15	
-	D	96	N16		-	D	156	D15	
-	D	36	P17		-	D	106	C16	GND
-	D	97	M16		-	D	107	B16	GND
-	D	149	L15						
-	D	37	N17						
-	D	191	M14						
-	D	38	M17						
-	D	98	L16						
-	D	39	L17						
-	D	192	L14						
-	D	99	K16						
-	D	150	K15						
-	D	40	K17						
-	D	193	K14						
-	D	100	J16						
-	D	41	J17	V _{DD2}					
-	D	194	J14	V _{DD1}					
-	D	151	J15	GND					
-	D	152	H15						
-	D	42	H17						
-	D	195	H14						
-	D	101	H16						
-	D	196	G14						
-	D	43	G17						
-	D	153	G15						
-	D	102	G16						
-	D	197	F14						
-	D	44	F17						
-	D	154	F15						
-	D	45	E17						
-	D	103	F16						
-	D	46	D17						
-	D	199	D14						
-	D	104	E16						
-	D	198	E14						

★ Table 5-14. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (1/3)
(μ PD65346, 65347, 65546 65547)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	108	B15	V _{DD1}	–	A	61	A5	
–	A	49	A17	V _{DD2}	–	A	208	D5	
–	A	50	A16		–	A	167	C5	
–	A	51	A15		–	A	118	B5	
–	A	158	C14		–	A	119	B4	
–	A	200	D13		–	A	62	A4	
–	A	52	A14		–	A	168	C4	
–	A	109	B14		–	A	63	A3	
–	A	53	A13		–	A	121	C3	
–	A	199	D14		–	A	64	A2	
–	A	159	C13		–	A	65	B2	V _{DD2}
–	A	110	B13		–	A	120	B3	V _{DD1}
–	A	54	A12		–	B	1	A1	GND
–	A	201	D12		–	B	66	C2	GND
–	A	160	C12		–	B	2	B1	
–	A	111	B12		–	B	3	C1	
–	A	55	A11		–	B	122	D3	
–	A	202	D11		–	B	170	E4	
–	A	161	C11		–	B	4	D1	
–	A	112	B11		–	B	67	D2	
–	A	56	A10		–	B	5	E1	
–	A	203	D10		–	B	169	D4	
–	A	162	C10		–	B	123	E3	
–	A	113	B10		–	B	68	E2	
–	A	57	A9	V _{DD2}	–	B	6	F1	
–	A	204	D9	GND	–	B	171	F4	
–	A	163	C9	V _{DD1}	–	B	124	F3	
–	A	114	B9		–	B	69	F2	
–	A	205	D8		–	B	7	G1	
–	A	164	C8		–	B	172	G4	
–	A	58	A8		–	B	125	G3	
–	A	115	B8		–	B	70	G2	
–	A	206	D7		–	B	8	H1	
–	A	165	C7		–	B	173	H4	
–	A	59	A7		–	B	126	H3	
–	A	116	B7		–	B	71	H2	
–	A	207	D6		–	B	9	J1	V _{DD2}
–	A	60	A6		–	B	174	J4	GND
–	A	166	C6		–	B	127	J3	V _{DD1}
–	A	117	B6		–	B	72	J2	

★ Table 5-14. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (2/3)

(μ PD65346, 65347, 65546 65547)

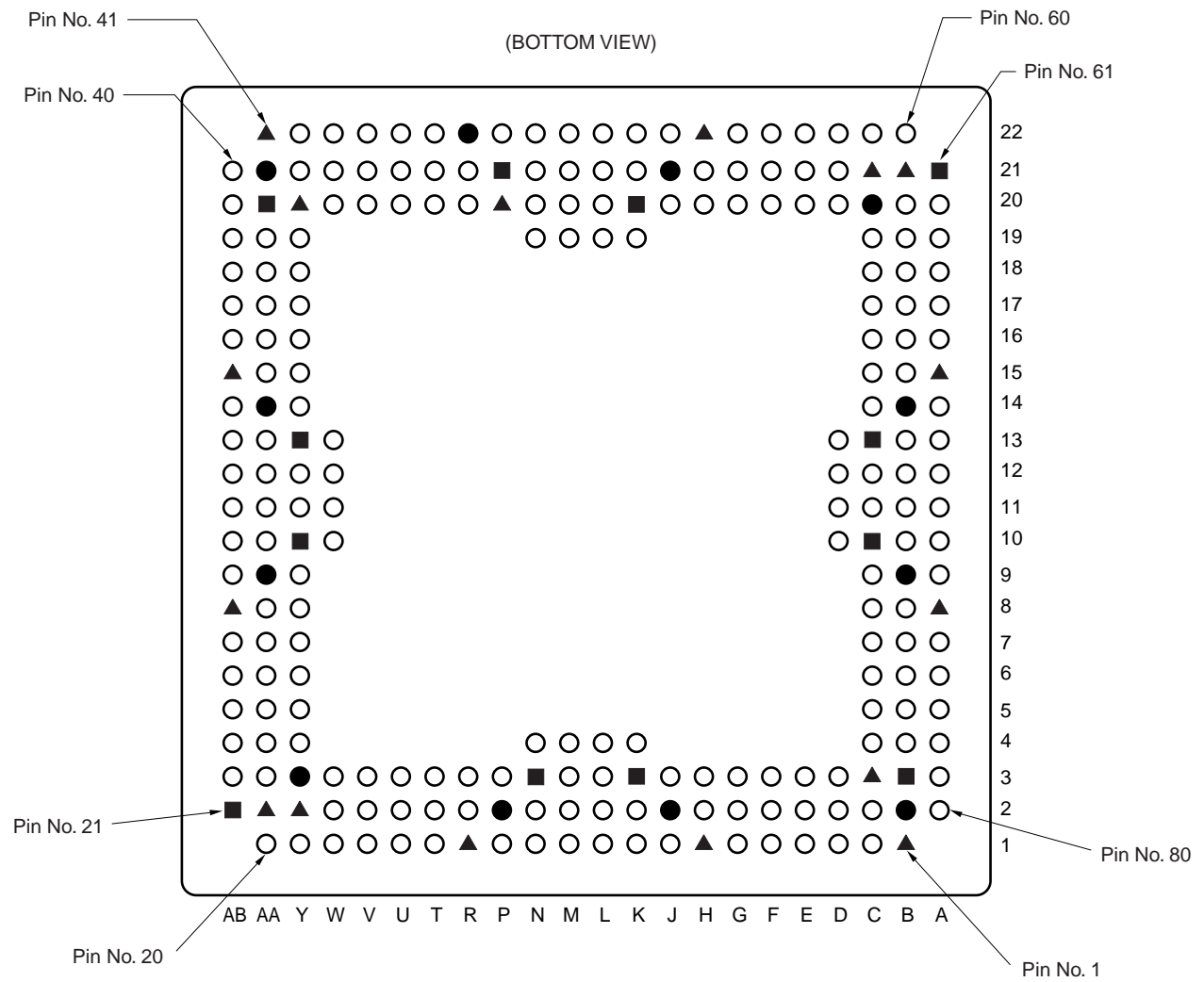
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	175	K4		–	C	23	U7	
–	B	128	K3		–	C	182	P7	
–	B	10	K1		–	C	137	R7	
–	B	73	K2		–	C	84	T7	
–	B	176	L4		–	C	24	U8	
–	B	129	L3		–	C	183	P8	
–	B	11	L1		–	C	138	R8	
–	B	74	L2		–	C	85	T8	
–	B	177	M4		–	C	25	U9	V _{DD2}
–	B	12	M1		–	C	184	P9	V _{DD1}
–	B	130	M3		–	C	139	R9	GND
–	B	75	M2		–	C	86	T9	
–	B	13	N1		–	C	185	P10	
–	B	178	N4		–	C	140	R10	
–	B	131	N3		–	C	26	U10	
–	B	76	N2		–	C	87	T10	
–	B	77	P2		–	C	186	P11	
–	B	14	P1		–	C	141	R11	
–	B	132	P3		–	C	27	U11	
–	B	15	R1		–	C	88	T11	
–	B	133	R3		–	C	187	P12	
–	B	16	T1		–	C	28	U12	
–	B	78	R2	GND	–	C	142	R12	
–	B	79	T2	GND	–	C	89	T12	
–	C	80	T3	V _{DD1}	–	C	29	U13	
–	C	17	U1	V _{DD2}	–	C	188	P13	
–	C	18	U2		–	C	143	R13	
–	C	19	U3		–	C	90	T13	
–	C	134	R4		–	C	91	T14	
–	C	180	P5		–	C	30	U14	
–	C	20	U4		–	C	144	R14	
–	C	81	T4		–	C	31	U15	
–	C	21	U5		–	C	145	R15	
–	C	179	P4		–	C	32	U16	
–	C	135	R5		–	C	93	T16	V _{DD2}
–	C	82	T5		–	C	92	T15	V _{DD1}
–	C	22	U6		–	D	33	U17	GND
–	C	181	P6		–	D	94	R16	GND
–	C	136	R6		–	D	34	T17	
–	C	83	T6		–	D	35	R17	

★ Table 5-14. Correspondence Between Internal Chip Sides and Ball Numbers (208-pin FPBGA) (3/3)

(μ PD65346, 65347, 65546 65547)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	D	146	P15		–	D	105	D16	
–	D	190	N14		–	D	46	D17	
–	D	36	P17		–	D	156	D15	
–	D	95	P16		–	D	47	C17	
–	D	37	N17		–	D	157	C15	
–	D	189	P14		–	D	48	B17	
–	D	147	N15		–	D	106	C16	GND
–	D	96	N16		–	D	107	B16	GND
–	D	38	M17						
–	D	191	M14						
–	D	148	M15						
–	D	97	M16						
–	D	39	L17						
–	D	192	L14						
–	D	149	L15						
–	D	98	L16						
–	D	40	K17						
–	D	193	K14						
–	D	150	K15						
–	D	99	K16						
–	D	41	J17	V _{DD2}					
–	D	194	J14	V _{DD1}					
–	D	151	J15	GND					
–	D	100	J16						
–	D	195	H14						
–	D	152	H15						
–	D	42	H17						
–	D	101	H16						
–	D	196	G14						
–	D	153	G15						
–	D	43	G17						
–	D	102	G16						
–	D	197	F14						
–	D	44	F17						
–	D	154	F15						
–	D	103	F16						
–	D	45	E17						
–	D	198	E14						
–	D	155	E15						
–	D	104	E16						

5.6.6 240-pin FPBGA



Remark ▲: GND (16 pins)
 ●: V_{DD1} (12 pins)
 ■: V_{DD2} (12 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1 (B1), 7 (H1), 14 (R1), 27 (AB8), 34 (AB15), 41 (AA22), 54 (H22), 67 (A15), 74 (A8), 99 (Y2), 100 (AA2), 137 (C21), 138 (B21), 157 (C3), 191 (Y20), 197 (P20)	47 (R22), 81 (B2), 88 (J2), 93 (P2), 107 (AA9), 112 (AA14), 119 (AA21), 131 (J21), 145 (B14), 150 (B9), 174 (Y3), 208 (C20)	21 (AB2), 61 (A21), 118 (AA20), 126 (P21), 156 (B3), 164 (K3), 167 (N3), 181 (Y10), 184 (Y13), 201 (K20), 215 (C13), 218 (C10)	None	2	158	84	200

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

Table 5-15. Correspondence Between Internal Chip Sides and Ball Numbers (240-pin FPBGA) (1/3)

★

(μ PD65345, 65346, 65545, 65546)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	208	C20	V _{DD1}	–	A	74	A8	GND
–	A	61	A21	V _{DD2}	–	A	219	C9	
–	A	139	B20		–	A	220	C8	
–	A	140	B19		–	A	75	A7	
–	A	62	A20		–	A	151	B8	
–	A	209	C19		–	A	221	C7	
–	A	141	B18		–	A	152	B7	
–	A	63	A19		–	A	76	A6	
–	A	210	C18		–	A	222	C6	
–	A	142	B17		–	A	77	A5	
–	A	64	A18		–	A	153	B6	
–	A	211	C17		–	A	223	C5	
–	A	143	B16		–	A	154	B5	
–	A	65	A17		–	A	78	A4	
–	A	212	C16		–	A	224	C4	
–	A	213	C15		–	A	155	B4	
–	A	66	A16		–	A	79	A3	
–	A	144	B15		–	A	80	A2	
–	A	214	C14		–	A	156	B3	V _{DD2}
–	A	67	A15	GND	–	A	81	B2	V _{DD1}
–	A	145	B14	V _{DD1}	–	B	157	C3	GND
–	A	215	C13	V _{DD2}	–	B	1	B1	GND
–	A	68	A14		–	B	82	C2	
–	A	146	B13		–	B	83	D2	
–	A	237	D13		–	B	2	C1	
–	A	69	A13		–	B	158	D3	
–	A	147	B12		–	B	84	E2	
–	A	216	C12		–	B	3	D1	
–	A	70	A12		–	B	159	E3	
–	A	238	D12		–	B	85	F2	
–	A	239	D11		–	B	4	E1	
–	A	71	A11		–	B	160	F3	
–	A	217	C11		–	B	86	G2	
–	A	148	B11		–	B	5	F1	
–	A	72	A10		–	B	161	G3	
–	A	240	D10		–	B	162	H3	
–	A	149	B10		–	B	6	G1	
–	A	73	A9		–	B	87	H2	
–	A	218	C10	V _{DD2}	–	B	163	J3	
–	A	150	B9	V _{DD1}	–	B	7	H1	GND

Table 5-15. Correspondence Between Internal Chip Sides and Ball Numbers (240-pin FPBGA) (2/3)

(μ PD65345, 65346, 65545, 65546)

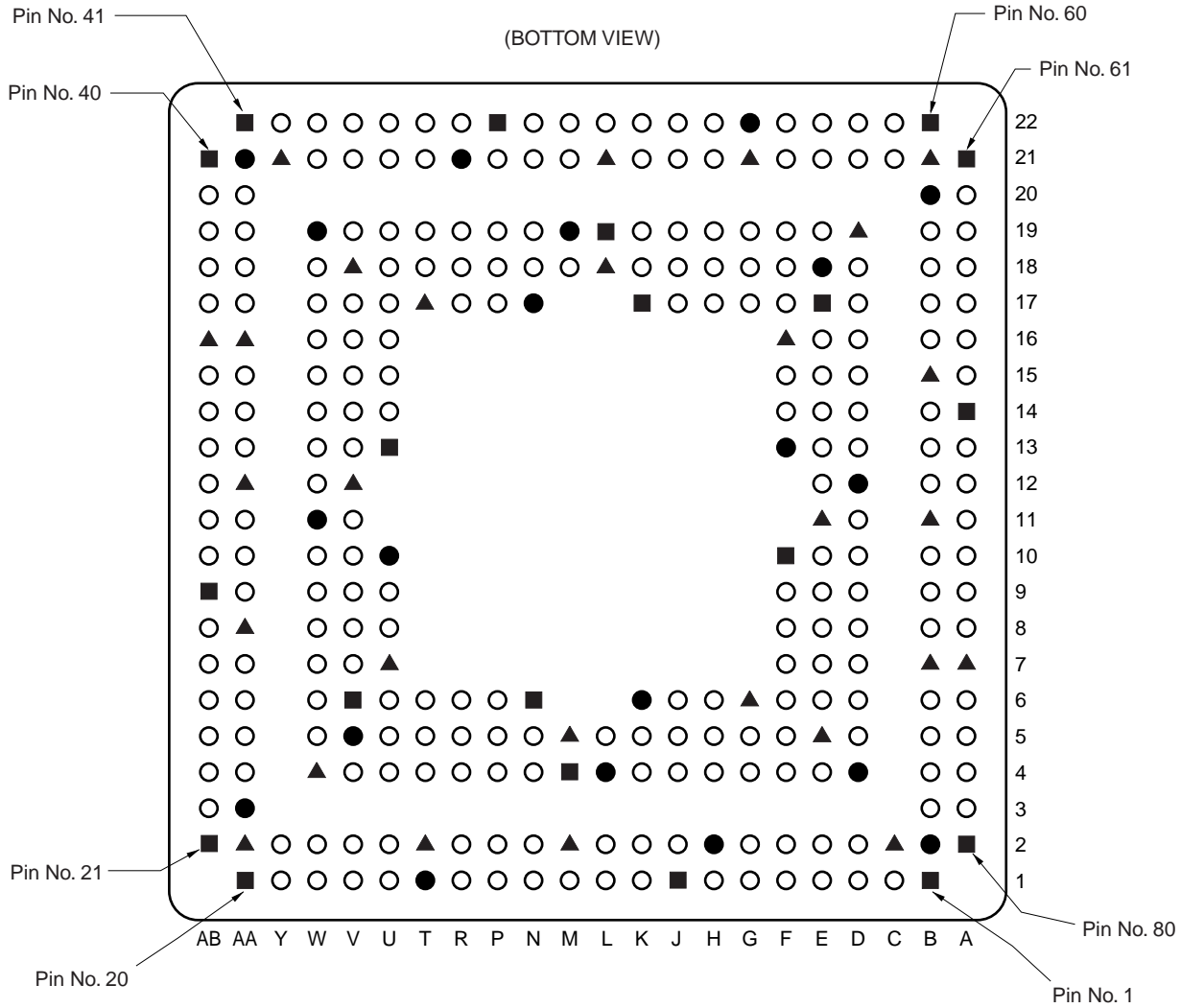
Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	88	J2	V _{DD1}	–	C	174	Y3	V _{DD1}
–	B	164	K3	V _{DD2}	–	C	21	AB2	V _{DD2}
–	B	8	J1		–	C	101	AA3	
–	B	89	K2		–	C	102	AA4	
–	B	225	K4		–	C	22	AB3	
–	B	9	K1		–	C	175	Y4	
–	B	90	L2		–	C	103	AA5	
–	B	165	L3		–	C	23	AB4	
–	B	10	L1		–	C	176	Y5	
–	B	226	L4		–	C	104	AA6	
–	B	227	M4		–	C	24	AB5	
–	B	11	M1		–	C	177	Y6	
–	B	166	M3		–	C	105	AA7	
–	B	91	M2		–	C	25	AB6	
–	B	12	N1		–	C	178	Y7	
–	B	228	N4		–	C	179	Y8	
–	B	92	N2		–	C	26	AB7	
–	B	13	P1		–	C	106	AA8	
–	B	167	N3	V _{DD2}	–	C	180	Y9	
–	B	93	P2	V _{DD1}	–	C	27	AB8	GND
–	B	14	R1	GND	–	C	107	AA9	V _{DD1}
–	B	168	P3		–	C	181	Y10	V _{DD2}
–	B	169	R3		–	C	28	AB9	
–	B	15	T1		–	C	108	AA10	
–	B	94	R2		–	C	229	W10	
–	B	170	T3		–	C	29	AB10	
–	B	95	T2		–	C	109	AA11	
–	B	16	U1		–	C	182	Y11	
–	B	171	U3		–	C	30	AB11	
–	B	17	V1		–	C	230	W11	
–	B	96	U2		–	C	231	W12	
–	B	172	V3		–	C	31	AB12	
–	B	97	V2		–	C	183	Y12	
–	B	18	W1		–	C	110	AA12	
–	B	173	W3		–	C	32	AB13	
–	B	98	W2		–	C	232	W13	
–	B	19	Y1		–	C	111	AA13	
–	B	20	AA1		–	C	33	AB14	
–	B	99	Y2	GND	–	C	184	Y13	V _{DD2}
–	B	100	AA2	GND	–	C	112	AA14	V _{DD1}

Table 5-15. Correspondence Between Internal Chip Sides and Ball Numbers (240-pin FPBGA) (3/3)

(μ PD65345, 65346, 65545, 65546)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	34	AB15	GND	–	D	126	P21	V _{DD2}
–	C	185	Y14		–	D	198	N20	
–	C	186	Y15		–	D	48	P22	
–	C	35	AB16		–	D	127	N21	
–	C	113	AA15		–	D	233	N19	
–	C	187	Y16		–	D	49	N22	
–	C	114	AA16		–	D	128	M21	
–	C	36	AB17		–	D	199	M20	
–	C	188	Y17		–	D	50	M22	
–	C	37	AB18		–	D	234	M19	
–	C	115	AA17		–	D	235	L19	
–	C	189	Y18		–	D	51	L22	
–	C	116	AA18		–	D	200	L20	
–	C	38	AB19		–	D	129	L21	
–	C	190	Y19		–	D	52	K22	
–	C	117	AA19		–	D	236	K19	
–	C	39	AB20		–	D	130	K21	
–	C	40	AB21		–	D	53	J22	
–	C	118	AA20	V _{DD2}	–	D	201	K20	V _{DD2}
–	C	119	AA21	V _{DD1}	–	D	131	J21	V _{DD1}
–	D	191	Y20	GND	–	D	54	H22	GND
–	D	41	AA22	GND	–	D	202	J20	
–	D	120	Y21		–	D	203	H20	
–	D	121	W21		–	D	55	G22	
–	D	42	Y22		–	D	132	H21	
–	D	192	W20		–	D	204	G20	
–	D	122	V21		–	D	133	G21	
–	D	43	W22		–	D	56	F22	
–	D	193	V20		–	D	205	F20	
–	D	123	U21		–	D	57	E22	
–	D	44	V22		–	D	134	F21	
–	D	194	U20		–	D	206	E20	
–	D	124	T21		–	D	135	E21	
–	D	45	U22		–	D	58	D22	
–	D	195	T20		–	D	207	D20	
–	D	196	R20		–	D	136	D21	
–	D	46	T22		–	D	59	C22	
–	D	125	R21		–	D	60	B22	
–	D	197	P20	GND	–	D	137	C21	GND
–	D	47	R22	V _{DD1}	–	D	138	B21	GND

5.6.7 304-pin FPBGA



Remark ▲: GND (28 pins)
 ●: V_{DD1} (20 pins)
 ■: V_{DD2} (20 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
35 (AB16), 75 (A7), 82 (C2), 91 (M2), 95 (T2), 100 (AA2), 106 (AA8), 110 (AA12), 114 (AA16), 120 (Y21), 129 (L21), 133 (G21), 138 (B21), 144 (B15), 148 (B11), 152 (B7), 172 (W4), 202 (D19), 217 (E5), 224 (M5), 237 (V12), 243 (V18), 250 (L18), 263 (E11), 270 (G6), 279 (U7), 288 (T17), 297 (F16)	15 (T1), 55 (G22), 81 (B2), 87 (H2), 101 (AA3), 119 (AA21), 125 (R21), 139 (B20), 157 (D4), 164 (L4), 179 (W11), 187 (W19), 194 (M19), 209 (D12), 230 (V5), 256 (E18), 273 (K6), 282 (U10), 291 (N17), 300 (F13)	1 (B1), 8 (J1), 20 (AA1), 21 (AB2), 28 (AB9), 40 (AB21), 41 (AA22), 48 (P22), 60 (B22), 61 (A21), 68 (A14), 80 (A2), 165 (M4), 195 (L19), 231 (V6), 257 (E17), 274 (N6), 283 (U13), 292 (K17), 301 (F10)	None	3	219	159	236

- Notes**
1. GND pin: **G1 in DIF format
 2. V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
 3. V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
 4. Total number of usable signal pins.

Table 5-16. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (1/4)
(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	256	E18	V _{DD1}	–	A	71	A11	
–	A	139	B20	V _{DD1}	–	A	264	E10	
–	A	296	F17		–	A	149	B10	
–	A	61	A21	V _{DD2}	–	A	210	D11	
–	A	140	B19		–	A	72	A10	
–	A	203	D18		–	A	301	F10	V _{DD2}
–	A	62	A20		–	A	73	A9	
–	A	141	B18		–	A	265	E9	
–	A	204	D17		–	A	150	B9	
–	A	63	A19		–	A	211	D10	
–	A	257	E17	V _{DD2}	–	A	74	A8	
–	A	142	B17		–	A	302	F9	
–	A	258	E16		–	A	151	B8	
–	A	64	A18		–	A	266	E8	
–	A	205	D16		–	A	212	D9	
–	A	143	B16		–	A	303	F8	
–	A	259	E15		–	A	75	A7	GND
–	A	65	A17		–	A	152	B7	GND
–	A	144	B15	GND	–	A	76	A6	
–	A	297	F16	GND	–	A	153	B6	
–	A	206	D15		–	A	77	A5	
–	A	66	A16		–	A	213	D8	
–	A	298	F15		–	A	154	B5	
–	A	145	B14		–	A	267	E7	
–	A	260	E14		–	A	78	A4	
–	A	67	A15		–	A	304	F7	
–	A	207	D14		–	A	155	B4	
–	A	68	A14	V _{DD2}	–	A	214	D7	
–	A	299	F14		–	A	79	A3	
–	A	146	B13		–	A	268	E6	
–	A	261	E13		–	A	156	B3	
–	A	69	A13		–	A	215	D6	
–	A	208	D13		–	A	80	A2	V _{DD2}
–	A	147	B12		–	A	216	D5	
–	A	262	E12		–	A	81	B2	V _{DD1}
–	A	70	A12		–	A	157	D4	V _{DD1}
–	A	300	F13	V _{DD1}	–	B	217	E5	GND
–	A	209	D12	V _{DD1}	–	B	82	C2	GND
–	A	148	B11	GND	–	B	269	F6	
–	A	263	E11	GND	–	B	1	B1	V _{DD2}

Table 5-16. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (2/4)

(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	83	D2		–	B	12	N1	
–	B	158	E4		–	B	274	N6	V _{DD2}
–	B	2	C1		–	B	13	P1	
–	B	84	E2		–	B	226	P5	
–	B	159	F4		–	B	93	P2	
–	B	3	D1		–	B	166	N4	
–	B	218	F5		–	B	14	R1	
–	B	85	F2		–	B	275	P6	
–	B	219	G5		–	B	94	R2	
–	B	4	E1		–	B	227	R5	
–	B	160	G4		–	B	167	P4	
–	B	86	G2		–	B	276	R6	
–	B	220	H5		–	B	15	T1	V _{DD1}
–	B	5	F1		–	B	95	T2	GND
–	B	87	H2	V _{DD1}	–	B	16	U1	
–	B	270	G6	GND	–	B	96	U2	
–	B	161	H4		–	B	17	V1	
–	B	6	G1		–	B	168	R4	
–	B	271	H6		–	B	97	V2	
–	B	88	J2		–	B	228	T5	
–	B	221	J5		–	B	18	W1	
–	B	7	H1		–	B	277	T6	
–	B	162	J4		–	B	98	W2	
–	B	8	J1	V _{DD2}	–	B	169	T4	
–	B	272	J6		–	B	19	Y1	
–	B	89	K2		–	B	229	U5	
–	B	222	K5		–	B	99	Y2	
–	B	9	K1		–	B	170	U4	
–	B	163	K4		–	B	20	AA1	V _{DD2}
–	B	90	L2		–	B	171	V4	
–	B	223	L5		–	B	100	AA2	GND
–	B	10	L1		–	B	172	W4	GND
–	B	273	K6	V _{DD1}	–	C	230	V5	V _{DD1}
–	B	164	L4	V _{DD1}	–	C	101	AA3	V _{DD1}
–	B	91	M2	GND	–	C	278	U6	
–	B	224	M5	GND	–	C	21	AB2	V _{DD2}
–	B	11	M1		–	C	102	AA4	
–	B	225	N5		–	C	173	W5	
–	B	92	N2		–	C	22	AB3	
–	B	165	M4	V _{DD2}	–	C	103	AA5	

Table 5-16. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (3/4)
(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	174	W6		–	C	112	AA14	
–	C	23	AB4		–	C	181	W13	
–	C	231	V6	V _{DD2}	–	C	34	AB15	
–	C	104	AA6		–	C	284	U14	
–	C	232	V7		–	C	113	AA15	
–	C	24	AB5		–	C	240	V15	
–	C	175	W7		–	C	182	W14	
–	C	105	AA7		–	C	285	U15	
–	C	233	V8		–	C	35	AB16	GND
–	C	25	AB6		–	C	114	AA16	GND
–	C	106	AA8	GND	–	C	36	AB17	
–	C	279	U7	GND	–	C	115	AA17	
–	C	176	W8		–	C	37	AB18	
–	C	26	AB7		–	C	183	W15	
–	C	280	U8		–	C	116	AA18	
–	C	107	AA9		–	C	241	V16	
–	C	234	V9		–	C	38	AB19	
–	C	27	AB8		–	C	286	U16	
–	C	177	W9		–	C	117	AA19	
–	C	28	AB9	V _{DD2}	–	C	184	W16	
–	C	281	U9		–	C	39	AB20	
–	C	108	AA10		–	C	242	V17	
–	C	235	V10		–	C	118	AA20	
–	C	29	AB10		–	C	185	W17	
–	C	178	W10		–	C	40	AB21	V _{DD2}
–	C	109	AA11		–	C	186	W18	
–	C	236	V11		–	C	119	AA21	V _{DD1}
–	C	30	AB11		–	C	187	W19	V _{DD1}
–	C	282	U10	V _{DD1}	–	D	243	V18	GND
–	C	179	W11	V _{DD1}	–	D	120	Y21	GND
–	C	110	AA12	GND	–	D	287	U17	
–	C	237	V12	GND	–	D	41	AA22	V _{DD2}
–	C	31	AB12		–	D	121	W21	
–	C	238	V13		–	D	188	V19	
–	C	111	AA13		–	D	42	Y22	
–	C	180	W12		–	D	122	V21	
–	C	32	AB13		–	D	189	U19	
–	C	283	U13	V _{DD2}	–	D	43	W22	
–	C	33	AB14		–	D	244	U18	
–	C	239	V14		–	D	123	U21	

Table 5-16. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (4/4)

(μ PD65349, 65549)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	D	245	T18		–	D	132	H21	
–	D	44	V22		–	D	253	H18	
–	D	190	T19		–	D	197	J19	
–	D	124	T21		–	D	294	H17	
–	D	246	R18		–	D	55	G22	V _{DD1}
–	D	45	U22		–	D	133	G21	GND
–	D	125	R21	V _{DD1}	–	D	56	F22	
–	D	288	T17	GND	–	D	134	F21	
–	D	191	R19		–	D	57	E22	
–	D	46	T22		–	D	198	H19	
–	D	289	R17		–	D	135	E21	
–	D	126	P21		–	D	254	G18	
–	D	247	P18		–	D	58	D22	
–	D	47	R22		–	D	295	G17	
–	D	192	P19		–	D	136	D21	
–	D	48	P22	V _{DD2}	–	D	199	G19	
–	D	290	P17		–	D	59	C22	
–	D	127	N21		–	D	255	F18	
–	D	248	N18		–	D	137	C21	
–	D	49	N22		–	D	200	F19	
–	D	193	N19		–	D	60	B22	V _{DD2}
–	D	128	M21		–	D	201	E19	
–	D	249	M18		–	D	138	B21	GND
–	D	50	M22		–	D	202	D19	GND
–	D	291	N17	V _{DD1}					
–	D	194	M19	V _{DD1}					
–	D	129	L21	GND					
–	D	250	L18	GND					
–	D	51	L22						
–	D	251	K18						
–	D	130	K21						
–	D	195	L19	V _{DD2}					
–	D	52	K22						
–	D	292	K17	V _{DD2}					
–	D	53	J22						
–	D	252	J18						
–	D	131	J21						
–	D	196	K19						
–	D	54	H22						
–	D	293	J17						

Table 5-17. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (1/4)
(μ PD65350, 65550)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	256	E18	V _{DD1}	–	A	71	A11	
–	A	139	B20	V _{DD1}	–	A	301	F10	V _{DD2}
–	A	61	A21	V _{DD2}	–	A	72	A10	
–	A	62	A20		–	A	210	D11	
–	A	203	D18		–	A	149	B10	
–	A	140	B19		–	A	264	E10	
–	A	296	F17		–	A	73	A9	
–	A	63	A19		–	A	302	F9	
–	A	257	E17	V _{DD2}	–	A	150	B9	
–	A	141	B18		–	A	211	D10	
–	A	204	D17		–	A	74	A8	
–	A	64	A18		–	A	265	E9	
–	A	258	E16		–	A	303	F8	
–	A	142	B17		–	A	212	D9	
–	A	259	E15		–	A	151	B8	
–	A	65	A17		–	A	266	E8	
–	A	205	D16		–	A	75	A7	GND
–	A	143	B16		–	A	152	B7	GND
–	A	144	B15	GND	–	A	76	A6	
–	A	297	F16	GND	–	A	213	D8	
–	A	206	D15		–	A	153	B6	
–	A	66	A16		–	A	304	F7	
–	A	298	F15		–	A	77	A5	
–	A	67	A15		–	A	267	E7	
–	A	260	E14		–	A	154	B5	
–	A	145	B14		–	A	214	D7	
–	A	207	D14		–	A	78	A4	
–	A	68	A14	V _{DD2}	–	A	268	E6	
–	A	299	F14		–	A	155	B4	
–	A	146	B13		–	A	215	D6	
–	A	261	E13		–	A	79	A3	
–	A	69	A13		–	A	216	D5	
–	A	208	D13		–	A	156	B3	
–	A	147	B12		–	A	80	A2	V _{DD2}
–	A	262	E12		–	A	81	B2	V _{DD1}
–	A	70	A12		–	A	157	D4	V _{DD1}
–	A	300	F13	V _{DD1}	–	B	217	E5	GND
–	A	209	D12	V _{DD1}	–	B	82	C2	GND
–	A	148	B11	GND	–	B	1	B1	V _{DD2}
–	A	263	E11	GND	–	B	2	C1	

Table 5-17. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (2/4)

(μ PD65350, 65550)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} / GND
–	B	158	E4		–	B	92	N2	
–	B	83	D2		–	B	225	N5	
–	B	269	F6		–	B	13	P1	
–	B	3	D1		–	B	275	P6	
–	B	218	F5		–	B	93	P2	
–	B	84	E2		–	B	166	N4	
–	B	159	F4		–	B	14	R1	
–	B	4	E1		–	B	226	P5	
–	B	219	G5		–	B	276	R6	
–	B	85	F2		–	B	167	P4	
–	B	220	H5		–	B	94	R2	
–	B	5	F1		–	B	227	R5	
–	B	160	G4		–	B	15	T1	V _{DD1}
–	B	86	G2		–	B	95	T2	GND
–	B	87	H2	V _{DD1}	–	B	16	U1	
–	B	270	G6	GND	–	B	168	R4	
–	B	161	H4		–	B	96	U2	
–	B	6	G1		–	B	277	T6	
–	B	271	H6		–	B	17	V1	
–	B	7	H1		–	B	228	T5	
–	B	221	J5		–	B	97	V2	
–	B	88	J2		–	B	169	T4	
–	B	162	J4		–	B	18	W1	
–	B	8	J1	V _{DD2}	–	B	229	U5	
–	B	272	J6		–	B	98	W2	
–	B	89	K2		–	B	170	U4	
–	B	222	K5		–	B	19	Y1	
–	B	9	K1		–	B	171	V4	
–	B	163	K4		–	B	99	Y2	
–	B	90	L2		–	B	20	AA1	V _{DD2}
–	B	223	L5		–	B	100	AA2	GND
–	B	10	L1		–	B	172	W4	GND
–	B	273	K6	V _{DD1}	–	C	230	V5	V _{DD1}
–	B	164	L4	V _{DD1}	–	C	101	AA3	V _{DD1}
–	B	91	M2	GND	–	C	21	AB2	V _{DD2}
–	B	224	M5	GND	–	C	22	AB3	
–	B	11	M1		–	C	173	W5	
–	B	274	N6	V _{DD2}	–	C	102	AA4	
–	B	12	N1		–	C	278	U6	
–	B	165	M4	V _{DD2}	–	C	23	AB4	

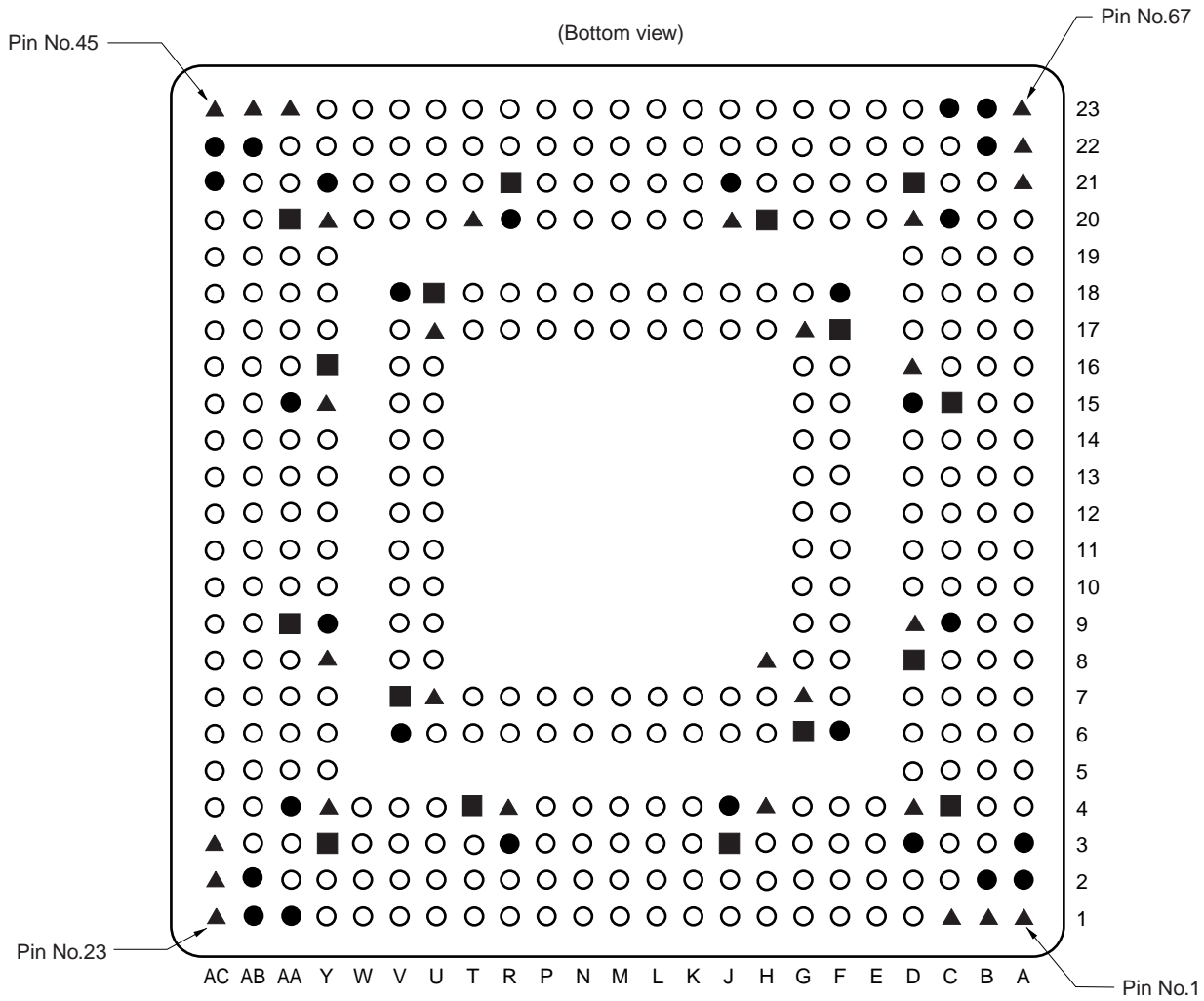
Table 5-17. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (3/4)
(μ PD65350, 65550)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	231	V6	V _{DD2}	–	C	112	AA14	
–	C	103	AA5		–	C	181	W13	
–	C	174	W6		–	C	34	AB15	
–	C	24	AB5		–	C	239	V14	
–	C	232	V7		–	C	285	U15	
–	C	104	AA6		–	C	182	W14	
–	C	233	V8		–	C	113	AA15	
–	C	25	AB6		–	C	240	V15	
–	C	175	W7		–	C	35	AB16	GND
–	C	105	AA7		–	C	114	AA16	GND
–	C	106	AA8	GND	–	C	36	AB17	
–	C	279	U7	GND	–	C	183	W15	
–	C	176	W8		–	C	115	AA17	
–	C	26	AB7		–	C	286	U16	
–	C	280	U8		–	C	37	AB18	
–	C	27	AB8		–	C	241	V16	
–	C	234	V9		–	C	116	AA18	
–	C	107	AA9		–	C	184	W16	
–	C	177	W9		–	C	38	AB19	
–	C	28	AB9	V _{DD2}	–	C	242	V17	
–	C	281	U9		–	C	117	AA19	
–	C	108	AA10		–	C	185	W17	
–	C	235	V10		–	C	39	AB20	
–	C	29	AB10		–	C	186	W18	
–	C	178	W10		–	C	118	AA20	
–	C	109	AA11		–	C	40	AB21	V _{DD2}
–	C	236	V11		–	C	119	AA21	V _{DD1}
–	C	30	AB11		–	C	187	W19	V _{DD1}
–	C	282	U10	V _{DD1}	–	D	243	V18	GND
–	C	179	W11	V _{DD1}	–	D	120	Y21	GND
–	C	110	AA12	GND	–	D	41	AA22	V _{DD2}
–	C	237	V12	GND	–	D	42	Y22	
–	C	31	AB12		–	D	188	V19	
–	C	283	U13	V _{DD2}	–	D	121	W21	
–	C	32	AB13		–	D	287	U17	
–	C	180	W12		–	D	43	W22	
–	C	111	AA13		–	D	244	U18	
–	C	238	V13		–	D	122	V21	
–	C	33	AB14		–	D	189	U19	
–	C	284	U14		–	D	44	V22	

Table 5-17. Correspondence Between Internal Chip Sides and Ball Numbers (304-pin FPBGA) (4/4)
(μ PD65350, 65550)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	D	245	T18		–	D	294	H17	
–	D	123	U21		–	D	197	J19	
–	D	246	R18		–	D	132	H21	
–	D	45	U22		–	D	253	H18	
–	D	190	T19		–	D	55	G22	V _{DD1}
–	D	124	T21		–	D	133	G21	GND
–	D	125	R21	V _{DD1}	–	D	56	F22	
–	D	288	T17	GND	–	D	198	H19	
–	D	191	R19		–	D	134	F21	
–	D	46	T22		–	D	295	G17	
–	D	289	R17		–	D	57	E22	
–	D	47	R22		–	D	254	G18	
–	D	247	P18		–	D	135	E21	
–	D	126	P21		–	D	199	G19	
–	D	192	P19		–	D	58	D22	
–	D	48	P22	V _{DD2}	–	D	255	F18	
–	D	290	P17		–	D	136	D21	
–	D	127	N21		–	D	200	F19	
–	D	248	N18		–	D	59	C22	
–	D	49	N22		–	D	201	E19	
–	D	193	N19		–	D	137	C21	
–	D	128	M21		–	D	60	B22	V _{DD2}
–	D	249	M18		–	D	138	B21	GND
–	D	50	M22		–	D	202	D19	GND
–	D	291	N17	V _{DD1}					
–	D	194	M19	V _{DD1}					
–	D	129	L21	GND					
–	D	250	L18	GND					
–	D	51	L22						
–	D	292	K17	V _{DD2}					
–	D	52	K22						
–	D	195	L19	V _{DD2}					
–	D	130	K21						
–	D	251	K18						
–	D	53	J22						
–	D	293	J17						
–	D	131	J21						
–	D	196	K19						
–	D	54	H22						
–	D	252	J18						

5.6.8 393-pin FPBGA



Remark ▲: GND (29 pins)
 ●: V_{DD1} (28 pins)
 ■: V_{DD2} (16 pins)

GND Pin ^{Note 1}	V _{DD1} Pin ^{Note 2}	V _{DD2} Pin ^{Note 3}	NC Pin	SCAN Pins			Signal Pin ^{Note 4}
				SMC	SIN	SOUT	
1 (A1), 2 (B1), 3 (C1), 23 (AC1), 24 (AC2), 25 (AC3), 45 (AC23), 46 (AB23), 47 (AA23), 67 (A23), 68 (A22), 69 (A21), 241 (D4), 245 (H4), 252 (R4), 257 (Y4), 261 (Y8), 268 (Y15), 273 (Y20), 277 (T20), 284 (J20), 289 (D20), 293 (D16), 300 (D9), 353 (G7), 363 (U7), 373 (U17), 383 (G17), 393 (H8)	21 (AA1), 22 (AB1), 43 (AC21), 44 (AC22), 65 (C23), 66 (B23), 87 (A3), 88 (A2), 89 (B2), 109 (AB2), 129 (AB22), 149 (B22), 170 (D3), 181 (R3), 188 (AA4), 199 (AA15), 206 (Y21), 217 (J21), 224 (C20), 235 (C9), 246 (J4), 262 (Y9), 278 (R20), 294 (D15), 305 (F6), 317 (V6), 329 (V18), 341 (F18)	175 (J3), 186 (Y3), 193 (AA9), 204 (AA20), 211 (R21), 222 (D21), 229 (C15), 240 (C4), 253 (T4), 269 (Y16), 285 (H20), 301 (D8), 306 (G6), 318 (V7), 330 (U18), 342 (F17)	None	There are no restrictions on the assignment of dedicated scan path pins.			320

- Notes 1.** GND pin: **G1 in DIF format
- 2.** V_{DD1} pin = 1.8 V or 2.5 V
V_{DD1} pin: **V1 in DIF format
- 3.** V_{DD2} pin = 3.3 V
V_{DD2} pin: **V2 in DIF format
- 4.** Total number of usable signal pins.

★ Table 5-18. Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (1/5)
(μ PD65347, 65547)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	–	–	V _{DD1}	–	A	322	V11	
–	A	–	–	GND	–	A	195	AA11	
–	A	259	Y6		–	A	264	Y11	
–	A	110	AB3		–	A	118	AB11	
–	A	–	–	V _{DD1}	–	A	323	V12	
–	A	111	AB4		–	A	34	AC12	
–	A	364	U8		–	A	368	U12	
–	A	190	AA6		–	A	265	Y12	
–	A	258	Y5		–	A	119	AB12	
–	A	260	Y7		–	A	197	AA13	
–	A	26	AC4		–	A	120	AB13	
–	A	–	–	V _{DD2}	–	A	324	V13	
–	A	112	AB5		–	A	35	AC13	
–	A	319	V8		–	A	369	U13	
–	A	189	AA5		–	A	121	AB14	
–	A	191	AA7		–	A	196	AA12	
–	A	113	AB6		–	A	36	AC14	
–	A	–	–	GND	–	A	198	AA14	
–	A	27	AC5		–	A	–	–	V _{DD1}
–	A	365	U9		–	A	325	V14	
–	A	28	AC6		–	A	122	AB15	
–	A	114	AB7		–	A	267	Y14	
–	A	320	V9		–	A	37	AC15	
–	A	29	AC7		–	A	370	U14	
–	A	192	AA8		–	A	200	AA16	
–	A	115	AB8		–	A	266	Y13	
–	A	–	–	V _{DD1}	–	A	123	AB16	
–	A	30	AC8		–	A	326	V15	
–	A	–	–	GND	–	A	38	AC16	
–	A	31	AC9		–	A	–	–	GND
–	A	–	–	V _{DD2}	–	A	124	AB17	
–	A	116	AB9		–	A	371	U15	
–	A	366	U10		–	A	39	AC17	
–	A	32	AC10		–	A	40	AC18	
–	A	263	Y10		–	A	372	U16	
–	A	194	AA10		–	A	41	AC19	
–	A	321	V10		–	A	–	–	V _{DD2}
–	A	117	AB10		–	A	125	AB18	
–	A	367	U11		–	A	201	AA17	
–	A	33	AC11		–	A	42	AC20	

★ Table 5-18. Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (2/5)

(μ PD65347, 65547)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	A	327	V16		–	B	–	–	V _{DD1}
–	A	203	AA19		–	B	52	T23	
–	A	270	Y17		–	B	–	–	GND
–	A	126	AB19		–	B	53	R23	
–	A	328	V17		–	B	–	–	V _{DD2}
–	A	205	AA21		–	B	136	R22	
–	A	202	AA18		–	B	376	P17	
–	A	271	Y18		–	B	54	P23	
–	A	127	AB20		–	B	279	P20	
–	A	272	Y19		–	B	212	P21	
–	A	128	AB21		–	B	333	P18	
–	A	–	–	V _{DD2}	–	B	137	P22	
–	A	–	–	V _{DD1}	–	B	377	N17	
–	A	–	–	GND	–	B	55	N23	
–	B	–	–	V _{DD1}	–	B	334	N18	
–	B	–	–	GND	–	B	213	N21	
–	B	275	V20		–	B	280	N20	
–	B	130	AA22		–	B	138	N22	
–	B	–	–	V _{DD1}	–	B	335	M18	
–	B	131	Y22		–	B	56	M23	
–	B	374	T17		–	B	378	M17	
–	B	208	V21		–	B	281	M20	
–	B	274	W20		–	B	139	M22	
–	B	276	U20		–	B	215	L21	
–	B	48	Y23		–	B	140	L22	
–	B	–	–	V _{DD2}	–	B	336	L18	
–	B	132	W22		–	B	57	L23	
–	B	331	T18		–	B	379	L17	
–	B	207	W21		–	B	141	K22	
–	B	209	U21		–	B	214	M21	
–	B	133	V22		–	B	58	K23	
–	B	–	–	GND	–	B	216	K21	
–	B	49	W23		–	B	–	–	V _{DD1}
–	B	375	R17		–	B	337	K18	
–	B	50	V23		–	B	142	J22	
–	B	134	U22		–	B	283	K20	
–	B	332	R18		–	B	59	J23	
–	B	51	U23		–	B	380	K17	
–	B	210	T21		–	B	218	H21	
–	B	135	T22		–	B	282	L20	

★ Table 5-18. Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (3/5)
(μ PD65347, 65547)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	B	143	H22		–	C	152	B19	
–	B	338	J18		–	C	343	F16	
–	B	60	H23		–	C	225	C19	
–	B	–	–	GND	–	C	227	C17	
–	B	144	G22		–	C	153	B18	
–	B	381	J17		–	C	–	–	GND
–	B	61	G23		–	C	71	A19	
–	B	62	F23		–	C	385	G15	
–	B	382	H17		–	C	72	A18	
–	B	63	E23		–	C	154	B17	
–	B	–	–	V _{DD2}	–	C	344	F15	
–	B	145	F22		–	C	73	A17	
–	B	219	G21		–	C	228	C16	
–	B	64	D23		–	C	155	B16	
–	B	339	H18		–	C	–	–	V _{DD1}
–	B	221	E21		–	C	74	A16	
–	B	286	G20		–	C	–	–	GND
–	B	146	E22		–	C	75	A15	
–	B	340	G18		–	C	–	–	V _{DD2}
–	B	223	C21		–	C	156	B15	
–	B	220	F21		–	C	386	G14	
–	B	287	F20		–	C	76	A14	
–	B	147	D22		–	C	295	D14	
–	B	288	E20		–	C	230	C14	
–	B	148	C22		–	C	345	F14	
–	B	–	–	V _{DD2}	–	C	157	B14	
–	B	–	–	V _{DD1}	–	C	387	G13	
–	B	–	–	GND	–	C	77	A13	
–	C	–	–	V _{DD1}	–	C	346	F13	
–	C	–	–	GND	–	C	231	C13	
–	C	291	D18		–	C	296	D13	
–	C	150	B21		–	C	158	B13	
–	C	–	–	V _{DD1}	–	C	347	F12	
–	C	151	B20		–	C	78	A12	
–	C	384	G16		–	C	388	G12	
–	C	226	C18		–	C	297	D12	
–	C	290	D19		–	C	159	B12	
–	C	292	D17		–	C	233	C11	
–	C	70	A20		–	C	160	B11	
–	C	–	–	V _{DD2}	–	C	348	F11	

★ **Table 5-18. Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (4/5)**
(μ PD65347, 65547)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
–	C	79	A11		–	C	–	–	V _{DD1}
–	C	389	G11		–	C	–	–	GND
–	C	161	B10		–	D	–	–	V _{DD1}
–	C	232	C12		–	D	–	–	GND
–	C	80	A10		–	D	243	F4	
–	C	234	C10		–	D	90	C2	
–	C	–	–	V _{DD1}	–	D	–	–	V _{DD1}
–	C	349	F10		–	D	91	D2	
–	C	162	B9		–	D	354	H7	
–	C	299	D10		–	D	172	F3	
–	C	81	A9		–	D	242	E4	
–	C	390	G10		–	D	244	G4	
–	C	236	C8		–	D	4	D1	
–	C	298	D11		–	D	–	–	V _{DD2}
–	C	163	B8		–	D	92	E2	
–	C	350	F9		–	D	307	H6	
–	C	82	A8		–	D	171	E3	
–	C	–	–	GND	–	D	173	G3	
–	C	164	B7		–	D	93	F2	
–	C	391	G9		–	D	–	–	GND
–	C	83	A7		–	D	5	E1	
–	C	84	A6		–	D	355	J7	
–	C	392	G8		–	D	6	F1	
–	C	85	A5		–	D	94	G2	
–	C	–	–	V _{DD2}	–	D	308	J6	
–	C	165	B6		–	D	7	G1	
–	C	237	C7		–	D	174	H3	
–	C	86	A4		–	D	95	H2	
–	C	351	F8		–	D	–	–	V _{DD1}
–	C	239	C5		–	D	8	H1	
–	C	302	D7		–	D	–	–	GND
–	C	166	B5		–	D	9	J1	
–	C	352	F7		–	D	–	–	V _{DD2}
–	C	169	C3		–	D	96	J2	
–	C	238	C6		–	D	356	K7	
–	C	303	D6		–	D	10	K1	
–	C	167	B4		–	D	247	K4	
–	C	304	D5		–	D	176	K3	
–	C	168	B3		–	D	309	K6	
–	C	–	–	V _{DD2}	–	D	97	K2	

★ Table 5-18. Correspondence Between Internal Chip Sides and Ball Numbers (393-pin FPBGA) (5/5)
(μ PD65347, 65547)

Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND	Internal Chip Pin	Chip Side	Ball Number	Ball Coordinates	V _{DD1} /V _{DD2} /GND
-	D	357	L7		-	D	183	U3	
-	D	11	L1		-	D	20	Y1	
-	D	310	L6		-	D	315	T6	
-	D	177	L3		-	D	185	W3	
-	D	248	L4		-	D	254	U4	
-	D	98	L2		-	D	106	W2	
-	D	311	M6		-	D	316	U6	
-	D	12	M1		-	D	187	AA3	
-	D	358	M7		-	D	184	V3	
-	D	249	M4		-	D	255	V4	
-	D	99	M2		-	D	107	Y2	
-	D	179	N3		-	D	256	W4	
-	D	100	N2		-	D	108	AA2	
-	D	312	N6		-	D	-	-	V _{DD2}
-	D	13	N1		-	D	-	-	V _{DD1}
-	D	359	N7		-	D	-	-	GND
-	D	101	P2						
-	D	178	M3						
-	D	14	P1						
-	D	180	P3						
-	D	-	-	V _{DD1}					
-	D	313	P6						
-	D	102	R2						
-	D	251	P4						
-	D	15	R1						
-	D	360	P7						
-	D	182	T3						
-	D	250	N4						
-	D	103	T2						
-	D	314	R6						
-	D	16	T1						
-	D	-	-	GND					
-	D	104	U2						
-	D	361	R7						
-	D	17	U1						
-	D	18	V1						
-	D	362	T7						
-	D	19	W1						
-	D	-	-	V _{DD2}					
-	D	105	V2						

CHAPTER 6 PINS THAT CAN BE USED FOR OSCILLATORS

When configuring an oscillator using the oscillator block, the pins can be assigned as follows.

Note, however, that for the combination of OSI1 + OSO9 pins can be assigned anywhere other than power supply pins (V_{DD} , GND).

Also, be aware that for the combination of OSIX + OSO3 + OSFX, depending on the package, the OSFX output pin may be used as V_{DD} (see **CHAPTER 4 [SINGLE POWER SUPPLY] ASSIGNMENT OF V_{DD} , GND, NC, SCAN PINS** and **CHAPTER 5 [DUAL POWER SUPPLY] ASSIGNMENT OF V_{DD} , GND, NC, SCAN PINS**).

At this time be sure to assign OSFX to each of the adjacent pins.

Caution Depending on the combination of master and package, some packages may not yet be available. Be sure to confirm with NEC Electronics that the desired package has been released. Also contact NEC Electronics if the desired package does not appear in the Package column.

6.1 CMOS-N5 Series

★

Table 6-1. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65891)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
SSOP	20	9	8
		19	18
	30	13	12
		28	27
QFP	44	2	1
		24	23
TQFP	48 ^{Note}	2	1
		26	25

Note Low thermal resistance type

★ **Table 6-2. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65880)**

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
SSOP	20	9	8
		19	18
	30	13	12
		28	27
QFP	44	13	12
		35	34
TQFP	48 ^{Note}	3	2
		27	26
LQFP	44	14	13
		36	35

Note Low thermal resistance type

★ **Table 6-3. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65881)**

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
SSOP	20	9	8
		19	18
	30	13	12
		28	27
TQFP	48 ^{Note}	2	1
		26	25
	64 (0.5 mm pitch)	2	1
		34	33
	64 (0.65 mm pitch)	3	2
		35	34
LQFP	44	2	1
		24	23
SDIP	64	58	57
		26	25

Note Low thermal resistance type

Table 6-4. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65892)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
LQFP	100	3	2
		53	52

★

Table 6-5. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65882)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
QFP	100 ^{Note 1}	30	29
		80	79
	100 ^{Note 2}	31	30
		82	81
TQFP	48 ^{Note 3}	2	1
		26	25
	64 (0.5 mm pitch)	2	1
		34	33
	80	23	22
		63	62
64 (0.65 mm pitch)	18	17	
	50	49	
LQFP	44	2	1
		24	23
	100	3	2
53		52	
FPBGA	80	26	51
		10	39

- Notes**
1. Correspondence to the replacement of CMOS-6X, 6S
 2. Correspondence to the replacement of CMOS-6, 6A, 6V
 3. Low thermal resistance type

Table 6-6. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65894)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
LQFP	144	3	2
		75	74

★

Table 6-7. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65883)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
QFP	52	2	1
		28	27
TQFP	64 (0.5 mm pitch)	2	1
		34	33
	80	23	22
		63	62
	64 (0.65 mm pitch)	18	17
		50	49
LQFP	44	2	1
		24	23
	100	3	2
		53	52
	144	3	2
		75	74
FPBGA	80	26	51
		10	39

★

Table 6-8. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65884)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
LQFP	44	2	1
		24	23
	100	3	2
		53	52
	144	3	2
		75	74
	160	83	82
		3	2

Table 6-9. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65885)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	160 ^{Note}	3	2
		83	82
	208 ^{Note}	159	158
		55	54
LQFP	100	3	2
		53	52
	144	3	2
		75	74

Note Low thermal resistance type

Table 6-10. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65887)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	160 ^{Note}	3	2
		83	82
	208 ^{Note}	159	158
		55	54
	240 ^{Note}	183	182
		63	62
LQFP	100	3	2
		53	52
	144 ^{Note}	3	2
		75	74

Note Low thermal resistance type

Table 6-11. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65889)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	208 ^{Note}	159	158
		55	54
	240 ^{Note}	183	182
		63	62
LQFP	160	83	82
		3	2

Note Low thermal resistance type

Table 6-12. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65890)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	208 ^{Note}	159	158
		55	54
	240 ^{Note}	183	182
		63	62
	304 ^{Note}	232	231
		80	79
LQFP	160	83	82
		3	2

Note Low thermal resistance type

Table 6-13. CMOS-N5 Series Pins That Can Be Used for Oscillators (μ PD65893)

Package		OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	208 ^{Note}	159	158
		55	54
	240 ^{Note}	63	62
		183	182
	304 ^{Note}	232	231
		80	79
LQFP	144	3	2
		75	74

Note Low thermal resistance type

6.2 CMOS-9HD, EA-9HD Series

★ **Table 6-14. CMOS-9HD Series Pins That Can Be Used for Oscillators (μ PD65441, μ PD65941)**

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
TQFP	48	–	–	–	2	1
		–	–	–	26	25
	64	–	–	–	2	1
		–	–	–	34	33

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

★ **Table 6-15. CMOS-9HD Series Pins That Can Be Used for Oscillators (μ PD65442, μ PD65942)**

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
TQFP	48	–	–	–	2	1
		–	–	–	26	25
	64	–	–	–	2	1
		–	–	–	34	33
	80 ^{Note}	–	–	–	23	22
		–	–	–	63	62
	100 ^{Note}	–	–	–	3	2
		–	–	–	53	52

Note Line 2

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

Table 6-16. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65943, 65443)

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	100				–	–
					–	–
	144	–	–	–	4	2
		–	–	–	76	74
160	–	–	–	3	2	
	–	–	–	83	82	
TQFP	48 ^{Note}	–	–	–	26	25
		–	–	–	2	1
	64 ^{Note}	–	–	–	2	1
		–	–	–	34	33
	80				–	–
					–	–
	80 ^{Note}	–	–	–	63	62
		–	–	–	23	22
	100				–	–
					–	–
	100 ^{Note}				–	–
					–	–
120	–	–	–	3	2	
	–	–	–	63	62	
120 ^{Note}	–	–	–	4	2	
	–	–	–	64	62	
★ LQFP	100				–	–
					–	–
	144 ^{Note}	–	–	–	4	2
		–	–	–	76	74
FPBGA	108	–	–	–	12	13
		–	–	–	34	35
	144	–	–	–	13	61
		–	–	–	37	83
161	–	–	–	41	40	
	–	–	–	14	15	

Note Line 2

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

Table 6-17. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65944, 65444)

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7		
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7	
QFP (fine pitch)	100	–	–	–	3	2	
		–	–	–	53	52	
	144	–	–	–	3	2	
		–	–	–	75	74	
	160	–	–	–	3	2	
		–	–	–	83	82	
	176	–	–	–	3	2	
		–	–	–	91	90	
	TQFP	80	–	–	–	23	22
			–	–	–	63	62
80 ^{Note}		–	–	–	23	22	
		–	–	–	63	62	
LQFP	100	–	–	–	3	2	
		–	–	–	53	52	
	144 ^{Note}	–	–	–	–	–	
		–	–	–	–	–	
FPBGA	108	–	–	–	12	13	
		–	–	–	34	35	
	144	–	–	–	13	61	
		–	–	–	37	83	
	160	–	–	–	41	87	
		–	–	–	15	65	
	176	–	–	–	17	16	
		–	–	–	47	46	

Note Line 2

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

Table 6-18. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65945, 65445)

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7		
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7	
QFP (fine pitch)	100	–	–	–	3	2	
		–	–	–	53	52	
	144	–	–	–	3	2	
		–	–	–	75	74	
	160	–	–	–	3	2	
		–	–	–	83	82	
	176	–	–	–	3	2	
		–	–	–	91	90	
	208	–	–	–	159	158	
		–	–	–	55	54	
	TQFP	80	–	–	–	23	22
			–	–	–	63	62
80 ^{Note}		–	–	–	23	22	
		–	–	–	63	62	
LQFP	100	–	–	–	3	2	
		–	–	–	53	52	
	144 ^{Note}	–	–	–	3	2	
		–	–	–	75	74	
FPBGA	108 (under development)	–	–	–	13	12	
		–	–	–	35	34	
	144 (under development)	–	–	–	13	61	
		–	–	–	37	83	
	160	–	–	–	41	87	
		–	–	–	15	65	
	176	–	–	–	47	46	
		–	–	–	17	16	
	208	–	–	–	50	49	
		–	–	–	18	17	

Note Line 2

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

Table 6-19. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65946, 65446)

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	100	–	–	–	3	2
		–	–	–	53	52
	120	–	–	–	–	–
		–	–	–	–	–
	144	–	–	–	–	–
		–	–	–	–	–
	160	–	–	–	3	2
		–	–	–	83	82
	176	–	–	–	3	2
		–	–	–	91	90
	208	–	–	–	159	158
		–	–	–	55	54
	240	–	–	–	183	182
		–	–	–	63	62
TQFP (fine pitch)	80	–	–	–	23	22
		–	–	–	63	62
	120	–	–	–	3	2
		–	–	–	63	62
LQFP	100	–	–	–	3	2
		–	–	–	53	52
	144 ^{Note}	–	–	–	3	2
		–	–	–	75	74
TBGA	256	–	–	–	19	94
		–	–	–	57	128
FPBGA	108	–	–	–	13	12
		–	–	–	35	34
	109	–	–	–	13	12
		–	–	–	35	34
	144	–	–	–	13	61
		–	–	–	37	83
	160	–	–	–	41	87
		–	–	–	15	65
	176	–	–	–	47	46
		–	–	–	17	16

Note Line 2

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

Table 6-20. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65948, 65448)

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	100	-	-	-	3	2
		-	-	-	53	52
	144	-	-	-	3	2
		-	-	-	75	74
	160	-	-	-	3	2
		-	-	-	83	82
	176	-	-	-	3	2
		-	-	-	91	90
	208	-	-	-	-	-
		-	-	-	-	-
	240	-	-	-	63	62
		-	-	-	183	182
304	-	-	-	-	-	
	-	-	-	-	-	
TQFP	100	-	-	-	3	2
		-	-	-	53	52
LQFP (fine pitch)	100	-	-	-	3	2
		-	-	-	53	52
	144	-	-	-	3	2
		-	-	-	75	74
PBGA	256	-	-	-	59	129
		-	-	-	95	21
	272	-	-	-	-	-
		-	-	-	-	-
TBGA	256	-	-	-	-	-
		-	-	-	-	-
FPBGA	108	-	-	-	35	34
		-	-	-	13	12
	144	-	-	-	61	13
		-	-	-	83	37
	160	-	-	-	41	87
		-	-	-	15	65
	208	-	-	-	19	17
		-	-	-	51	49

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, -: Cannot be used

Table 6-21. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65949, 65449)

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7		
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7	
QFP (fine pitch)	100	–	–	–	3	2	
		–	–	–	53	52	
	144	–	–	–	3	2	
		–	–	–	75	74	
	160	–	–	–	3	2	
		–	–	–	83	82	
	208	–	–	–	159	158	
		–	–	–	55	54	
	240	–	–	–	183	182	
		–	–	–	63	62	
	304	–	–	–	–	–	
		–	–	–	–	–	
	TQFP	100	–	–	–	3	2
			–	–	–	53	52
120		–	–	–	3	2	
		–	–	–	63	62	
LQFP	144	–	–	–	3	2	
		–	–	–	75	74	
PBGA	256	–	–	–	59	129	
		–	–	–	95	21	
	272	–	–	–	59	129	
		–	–	–	95	21	
	313	–	–	–	37	82	
		–	–	–	13	60	
	352	–	–	–	77	171	
		–	–	–	27	125	
TBGA	256	–	–	–	–	–	
		–	–	–	–	–	
	352	–	–	–	25	124	
–		–	–	75	170		
FPBGA	144	–	–	–	61	13	
		–	–	–	83	37	
	160	–	–	–	65	15	
		–	–	–	87	41	
	208	–	–	–	–	–	
		–	–	–	–	–	

★ **Remark** Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

**Table 6-22. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators
(μ PD65951, 65961, 65451, 65461)**

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7		
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7	
QFP (fine pitch)	100				–	–	
					–	–	
	144	–	–	–	3	2	
		–	–	–	75	74	
	160	–	–	–	3	2	
		–	–	–	83	82	
	208	–	–	–	159	158	
		–	–	–	55	54	
	240	–	–	–	63	62	
		–	–	–	183	182	
	304				–	–	
					–	–	
	PBGA	256				–	–
						–	–
272		–	–	–	59	129	
		–	–	–	95	21	
313		–	–	–	37	82	
		–	–	–	13	60	
352		–	–	–	77	171	
		–	–	–	27	125	
TBGA	256	–	–	–	59	129	
		–	–	–	95	21	
	352				–	–	
					–	–	
	420	–	–	–	25	214	
		–	–	–	75	256	
FPBGA	160	–	–	–	65	15	
		–	–	–	87	41	
	208	–	–	–	19	17	
		–	–	–	51	49	

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

**Table 6-23. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators
(μ PD65954, 65964, 65454, 65464)**

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	100				–	–
					–	–
	144	–	–	–	3	2
		–	–	–	75	74
	160	–	–	–	3	2
		–	–	–	83	82
	208	–	–	–	159	158
		–	–	–	55	54
	240	–	–	–	183	182
		–	–	–	63	62
304				–	–	
				–	–	
LQFP	100	–	–	–	2	1
		–	–	–	52	51
PBGA	256	–	–	–	79	2
		–	–	–	113	40
	352	–	–	–	77	171
		–	–	–	27	125
TBGA	352				–	–
					–	–
	420				–	–
					–	–
	500	–	–	–	29	250
		–	–	–	87	300
FPBGA	160	–	–	–	65	15
		–	–	–	87	41
	176	–	–	–	17	16
		–	–	–	47	46

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

**Table 6-24. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators
(μ PD65956, 65966, 65456, 65466)**

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	160	–	–	–	3	2
		–	–	–	83	82
	208	–	–	–	159	158
		–	–	–	55	54
	240	–	–	–	183	182
		–	–	–	63	62
	304	–	–	–	–	–
		–	–	–	–	–
PBGA	313	–	–	–	37	82
		–	–	–	13	60
	352	–	–	–	2	102
		–	–	–	52	148
TBGA	352	–	–	–	–	–
		–	–	–	–	–
	420	–	–	–	–	–
		–	–	–	–	–
	500	–	–	–	–	–
		–	–	–	–	–
	576	–	–	–	250	348
		–	–	–	300	394
FPBGA	160	–	–	–	65	15
		–	–	–	87	41
	176	–	–	–	17	16
		–	–	–	47	46
	303	–	–	–	68	223
		–	–	–	24	187
	304	–	–	–	–	–
		–	–	–	–	–

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

**Table 6-25. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators
(μ PD65958, 65968, 65458, 65468)**

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
QFP (fine pitch)	208	–	–	–	159	158
		–	–	–	55	54
	240	–	–	–	183	182
		–	–	–	63	62
	304	–	–	–	–	–
		–	–	–	–	–
PBGA	313	–	–	–	37	82
		–	–	–	13	60
	352	–	–	–	77	171
		–	–	–	27	125
TBGA	420	–	–	–	–	–
		–	–	–	–	–
	500	–	–	–	–	–
		–	–	–	–	–
	576	–	–	–	–	–
		–	–	–	–	–
696	–	–	–	264	392	
	–	–	–	328	454	
FPBGA	304	–	–	–	–	–
		–	–	–	–	–

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

Table 6-26. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65969, 65469)

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
TBGA	420	–	–	–	–	–
		–	–	–	–	–
	500	–	–	–	29	250
		–	–	–	87	300
	576	–	–	–	250	348
		–	–	–	300	394

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

Table 6-27. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65970, 65470)

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
TBGA	420				–	–
					–	–
	500	–	–	–	29	250
		–	–	–	87	300

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

Table 6-28. CMOS-9HD, EA-9HD Series Pins That Can Be Used for Oscillators (μ PD65971, 65471)

Package		OSI1 + OSO3 + OSF1 OSI2 + OSO3 + OSF3			OSI1 + OSO1 OSI2 + OSO7	
Type	Number of Pins	OSI1 OSI2	OSO3	OSF1 OSF3	OSI1 OSI2	OSO1 OSO7
TBGA	420	–	–	–	75	256
		–	–	–	25	214
	500	–	–	–	29	250
		–	–	–	87	300

Remark Blank: Can be supported individually for this package, so contact NEC Electronics, –: Cannot be used

6.3 CMOS-10HD Series

Under study

CHAPTER 7 PACKAGE DRAWINGS

Cautions 1. Depending on the combination of master and package, some packages may not yet be available. Be sure to confirm with NEC Electronics that the desired package has been released.

Also contact NEC Electronics if the desired package does not appear in the Package column.

★

2. The package body thickness includes the ball thickness.

Table 7-1. List of Package Drawings (1/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	Package Drawings Code	Page
SSOP	20	0.65	6.65 × 6.1	1.20	S20MC-65-5A4-2	p.476
	30	0.65	9.85 × 6.1	1.20	S30MC-65-5A4-2	p.477
★ QFP	44	0.8	10 × 10	2.70	S44GB-80-3BS-2	p.478
	52	1.0	14 × 14	2.70	P52GC-100-3B6,3BH-3	p.479
	100	0.65	14 × 20	2.70	P100GF-65-3BA-4	p.480
★ QFP (fine pitch)	100	0.5	14 × 14	1.45	P100GC-50-7EA-4	p.481
	120	0.5	20 × 20	2.70	S120GJ-50-3EB-3	p.482
	144	0.5	20 × 20	2.70	S144GJ-50-JEU, KEU-1	p.483
	160	0.5	24 × 24	2.70	S160GM-50-3ED, JED, KED, RED-5	p.484
	176	0.5	24 × 24	2.70	S176GM-50-3EU, JEU, KEU-3	p.485
	208	0.5	28 × 28	3.20	P208GD-50-LML, MML, SML, WML-7	p.486
	304	0.5	40 × 40	3.70	P304GL-50-NMU, PMU, TMU-4	p.487
★ TQFP	48	0.5	7 × 7	1.00	S48GA-50-9EU-2 (ES, CS) ^{Note1}	p.488
					P48GA-50-9EU-1 (MP) ^{Note2}	p.489
	64	0.5	10×10	1.00	S64GB-50-9EU-2 (ES, CS)	p.490
					S64GB-50-YEU-1 (MP) ^{Note2}	p.491
	80	0.5	12 × 12	1.05	P80GK-50-BE9-6	p.492
				1.00	P80GK-50-9EU-1 ^{Note2}	p.493
	100	0.5	14 × 14	1.00	S100GC-50-9EU-2 (ES, CS) ^{Note1}	p.494
					P100GC-50-9EU (MP) ^{Note2}	p.495
	120	0.4	14 × 14	1.00	S120GC-40-9EV-1	p.496
	64	0.65	12 × 12	1.00	P64GK-65-9ET-3 ^{Note2}	p.497
★ LQFP	44	0.8	10 × 10	1.40	S44GB-80-8ES-2 ^{Note2}	p.498
	100	0.5	14 × 14	1.40	S100GC-50-8EU,8EA-2 ^{Note2}	p.499
	144	0.5	20 × 20	1.40	S144GJ-50-8EU-3 (ES, CS)	p.500
					S144GJ-50-UEN (MP) ^{Note2}	p.501
160	0.5	24 × 24	1.40	S160GM-50-8ED-3 ^{Note2}	p.502	

Notes 1. Line 1, Line 2

2. Line 2

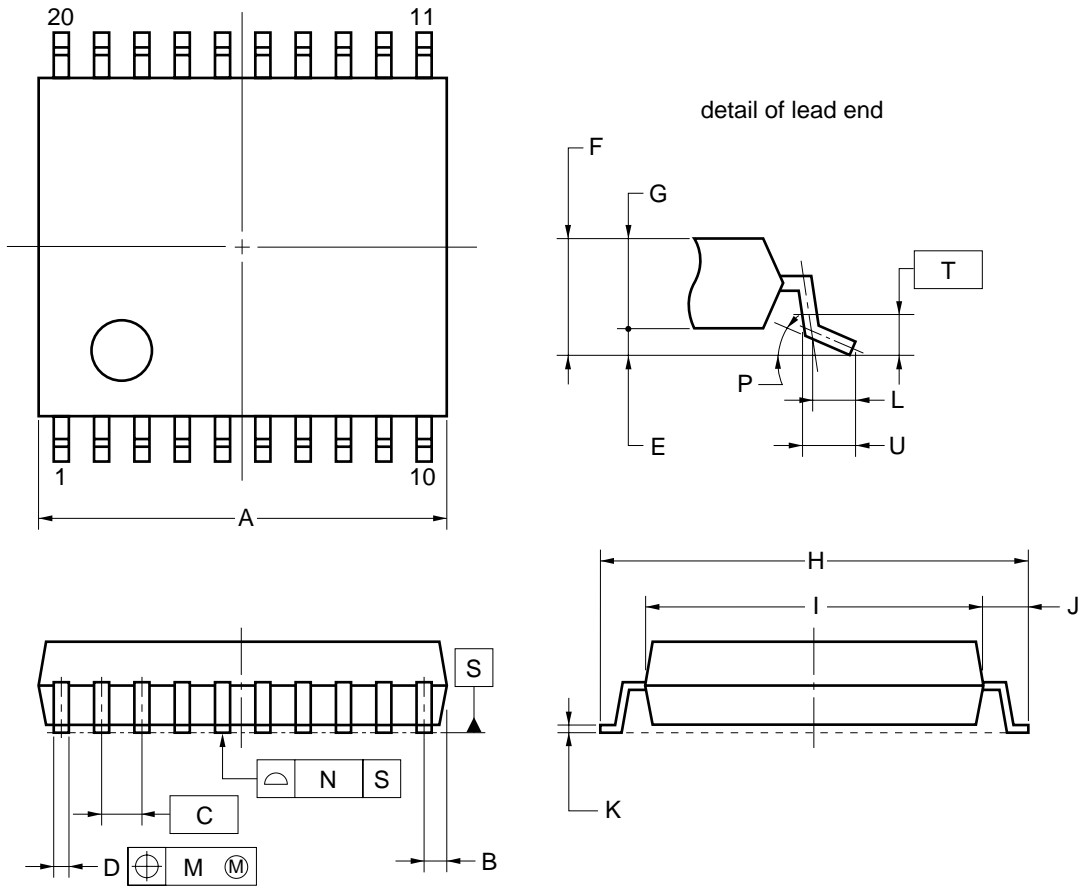
Remark ES: Engineering Sample, CS: Commercial Sample, MP: Mass Production

Table 7-1. List of Package Drawings (2/2)

Package	Number of Pins	Lead Pitch (mm)	Body Size (mm)	Body Thickness (mm)	Package Drawings Code	Page
TBGA with heat spreader	256	1.27, perimeter	27 × 27	1.40	S256N7-127-B6-1	p.503
	352	1.27, perimeter	35 × 35	1.40	S352N7-127-F6-3	p.504
	420	1.27, perimeter	35 × 35	1.40	S420N7-127-F6-1	p.505
	432	1.27, perimeter	40 × 40	1.40	P432FF-127-UA2	p.506
	500	1.27, perimeter	40 × 40	1.40	S500N7-127-H6-1	p.507
	576	1.27, perimeter	40 × 40	1.40	S576N7-127-H6-1	p.508
	680	1.00, perimeter	40 × 40	1.30	P680FF-100-UA1	p.509
	696	1.00, perimeter	40 × 40	1.40	S696N7-100-H9-1	p.510
PBGA	256	1.27, perimeter	27 × 27	2.13	Y256S1-127-B6-1	p.511
	272	1.27, perimeter	27 × 27	2.13	P272S1-127-B6	p.512
	313	1.27, staggered	35 × 35	2.33	Y313S1-127-F5-2	p.513
	352	1.27, perimeter	35 × 35	2.33	Y352S1-127-F6-3	p.514
	676	1.00, perimeter	27 × 27	2.23	P676F1-100-MN1	p.515
FPBGA	61	0.65, perimeter	6 × 6	1.43	P61F1-65-BA1	p.516
	80	0.8, full grid	9 × 9	1.48	P80F1-80-CN4	p.517
	108	0.8, perimeter	11 × 11	1.48	P108F1-80-DN3	p.518
	144	0.8, perimeter	13 × 13	1.48	P144F1-80-ENA	p.519
	160	0.8, perimeter	13 × 13	1.48	P160F1-80-EN9	p.520
	161	0.65, perimeter	10 × 10	1.43	P161F1-65-DA1	p.521
	176	0.8, perimeter	15 × 15	1.48	P176F1-80-FN1	p.522
	208	0.8, perimeter	15 × 15	1.48	P208F1-80-FN3	p.523
	★ 240	0.8, perimeter	19 × 19	1.48	P240F1-80-HN3	p.524
	★ 303	0.65, perimeter	16 × 16	1.43	P303F1-65-GA4	p.525
	304	0.8, perimeter	19 × 19	1.48	P304F1-80-HN2	p.526
	393	0.65, perimeter	16 × 16	1.39	P393F1-65-GA7	p.527
	ABGA	672	1.27	45 × 45	2.48	S672S2-127-K6-3
FPLGA	64	0.65	6 × 6	1.13	P64FC-65-BA1	p.529
	108	0.65	7.5 × 7.5	1.13	P108FC-65-CA1	p.530
★ TFPBGA	65	0.50	6 × 6	0.83	P65F9-50-BA1-1	p.531
SDIP	64	1.78	17 × 58	4.05	P64C-70-750A,C-4	p.532

7.1 SSOP

7.1.1 20-pin SSOP



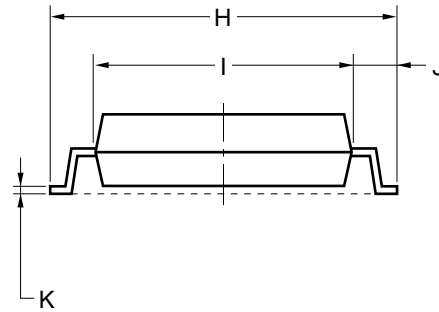
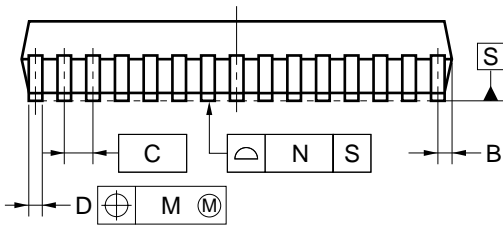
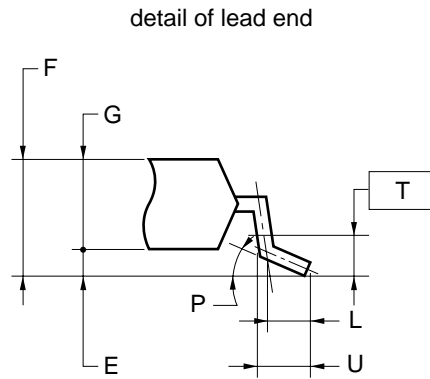
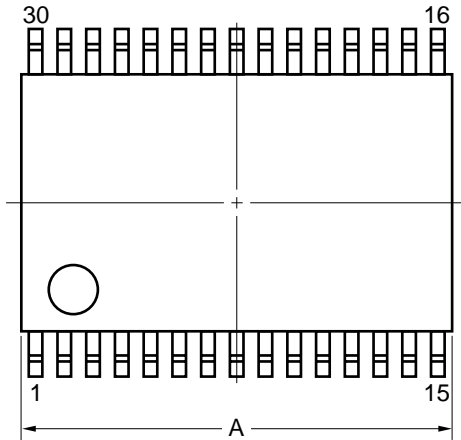
NOTE

Each lead centerline is located within 0.13 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	6.65±0.15
B	0.475 MAX.
C	0.65 (T.P.)
D	0.24 ^{+0.08} _{-0.07}
E	0.1±0.05
F	1.3±0.1
G	1.2
H	8.1±0.2
I	6.1±0.2
J	1.0±0.2
K	0.17±0.03
L	0.5
M	0.13
N	0.10
P	3° ^{+5°} _{-3°}
T	0.25
U	0.6±0.15

S20MC-65-5A4-2

7.1.2 30-pin SSOP



NOTE

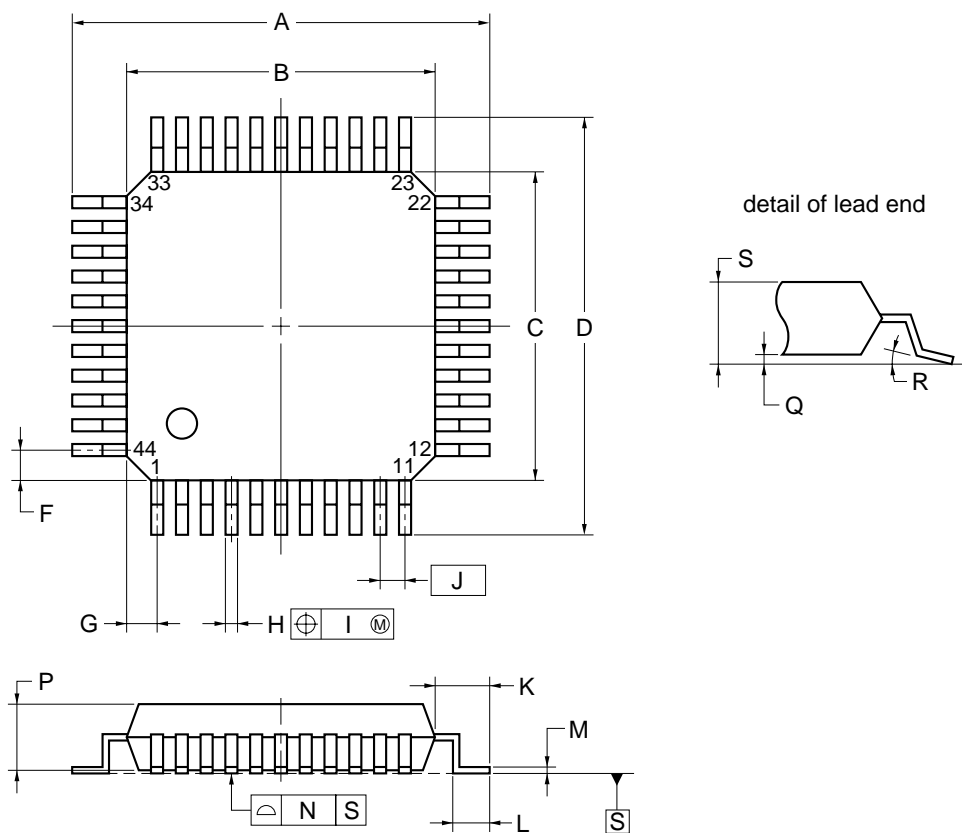
Each lead centerline is located within 0.13 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	9.85±0.15
B	0.45 MAX.
C	0.65 (T.P.)
D	0.24 ^{+0.08} _{-0.07}
E	0.1±0.05
F	1.3±0.1
G	1.2
H	8.1±0.2
I	6.1±0.2
J	1.0±0.2
K	0.17±0.03
L	0.5
M	0.13
N	0.10
P	3° ^{+5°} _{-3°}
T	0.25
U	0.6±0.15

S30MC-65-5A4-2

7.2 QFP

★ 7.2.1 44-pin QFP



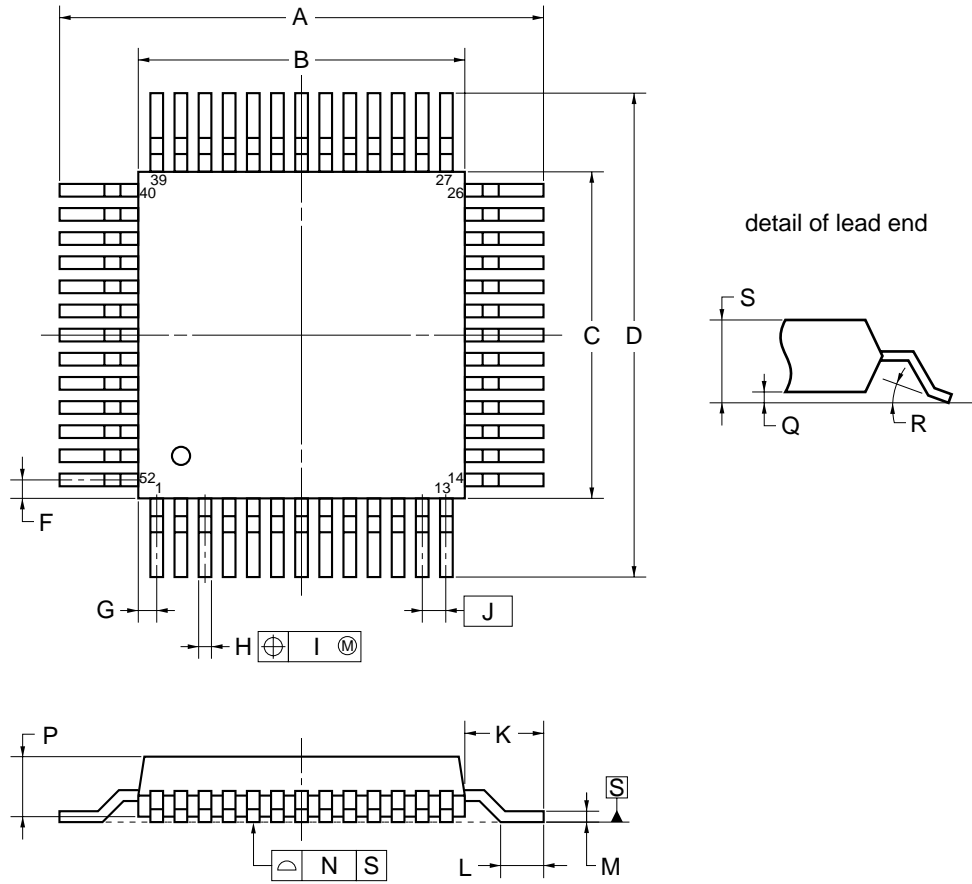
NOTE

Each lead centerline is located within 0.16 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	13.2±0.2
B	10.0±0.2
C	10.0±0.2
D	13.2±0.2
F	1.0
G	1.0
H	0.37 ^{+0.08} _{-0.07}
I	0.16
J	0.8 (T.P.)
K	1.6±0.2
L	0.8±0.2
M	0.17 ^{+0.06} _{-0.05}
N	0.10
P	2.7±0.1
Q	0.125±0.075
R	3° ^{+7°} _{-3°}
S	3.0 MAX.

S44GB-80-3BS-2

7.2.2 52-pin QFP



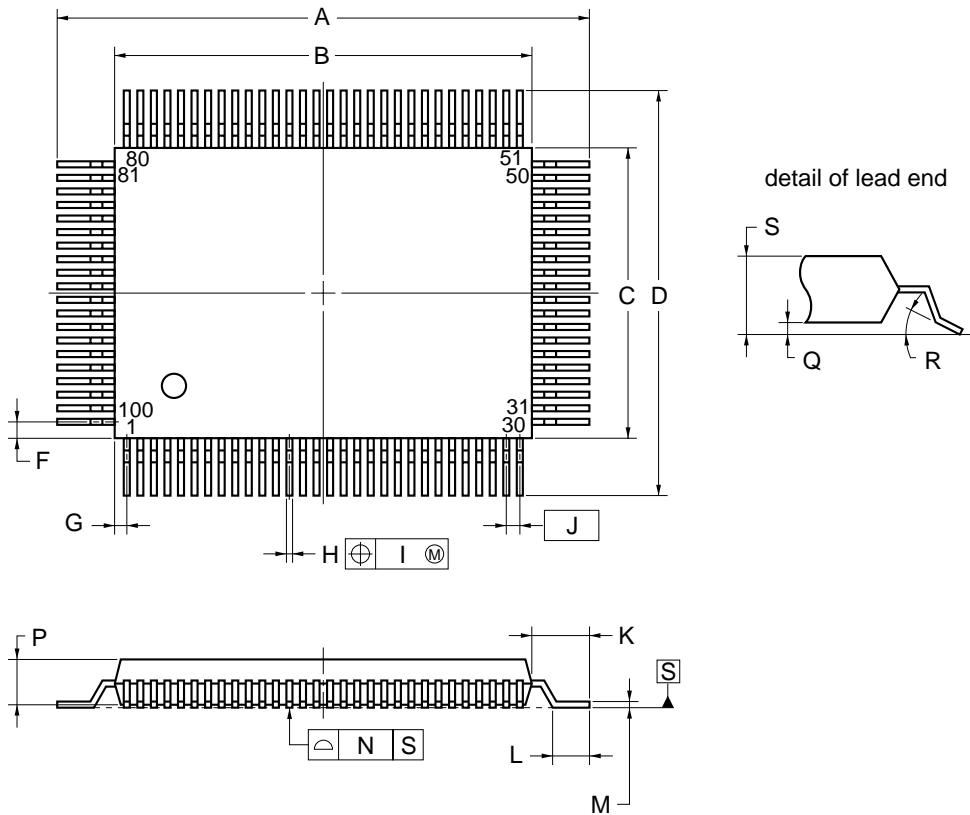
NOTE

Each lead centerline is located within 0.20 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	17.6±0.4
B	14.0±0.2
C	14.0±0.2
D	17.6±0.4
F	1.0
G	1.0
H	0.42 ^{+0.08} _{-0.07}
I	0.20
J	1.0 (T.P.)
K	1.8±0.2
L	0.8±0.2
M	0.17 ^{+0.08} _{-0.07}
N	0.10
P	2.7
Q	0.1±0.1
R	5°±5°
S	2.8±0.2

P52GC-100-3B6,3BH-3

★ 7.2.3 100-pin QFP



NOTE

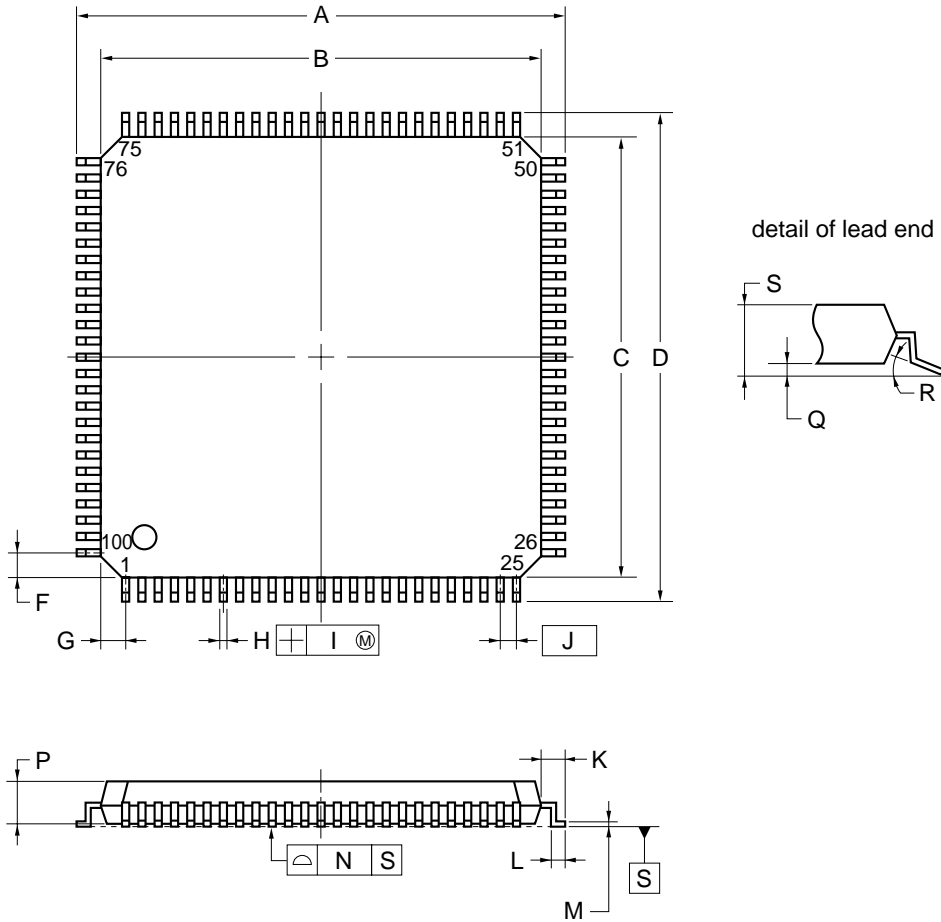
Each lead centerline is located within 0.15 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	23.6±0.4
B	20.0±0.2
C	14.0±0.2
D	17.6±0.4
F	0.8
G	0.6
H	0.30±0.10
I	0.15
J	0.65 (T.P.)
K	1.8±0.2
L	0.8±0.2
M	0.15 ^{+0.10} / _{-0.05}
N	0.10
P	2.7
Q	0.1±0.1
R	5°±5°
S	3.0 MAX.

P100GF-65-3BA-4

★ 7.3 QFP (Fine Pitch)

7.3.1 100-pin QFP (fine pitch)



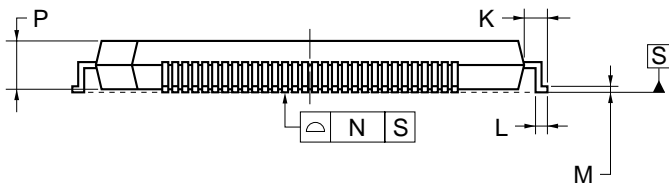
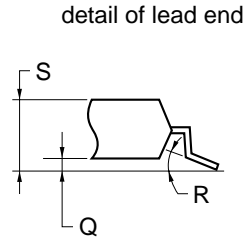
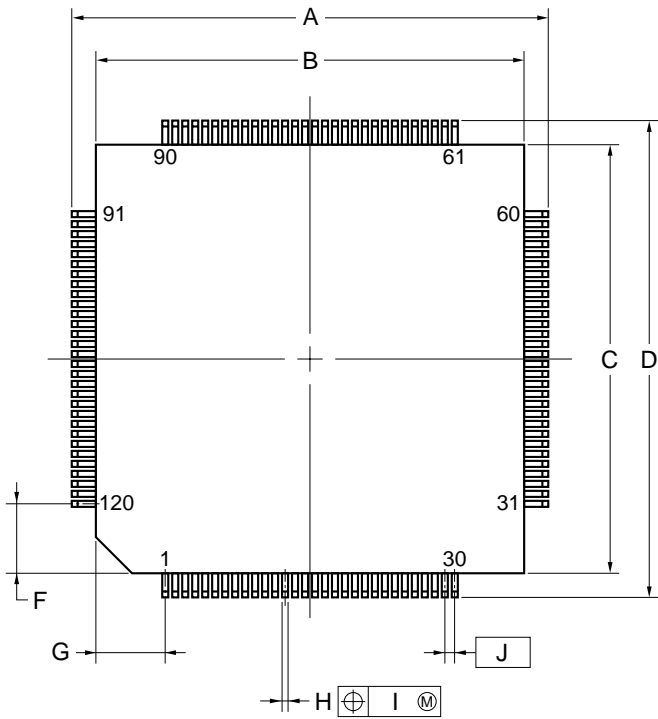
NOTE

Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	16.0±0.2
B	14.0±0.2
C	14.0±0.2
D	16.0±0.2
F	1.0
G	1.0
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.17 ^{+0.03} _{-0.07}
N	0.10
P	1.45±0.05
Q	0.125±0.075
R	5°±5°
S	1.7 MAX.

P100GC-50-7EA-4

7.3.2 120-pin QFP (fine pitch)



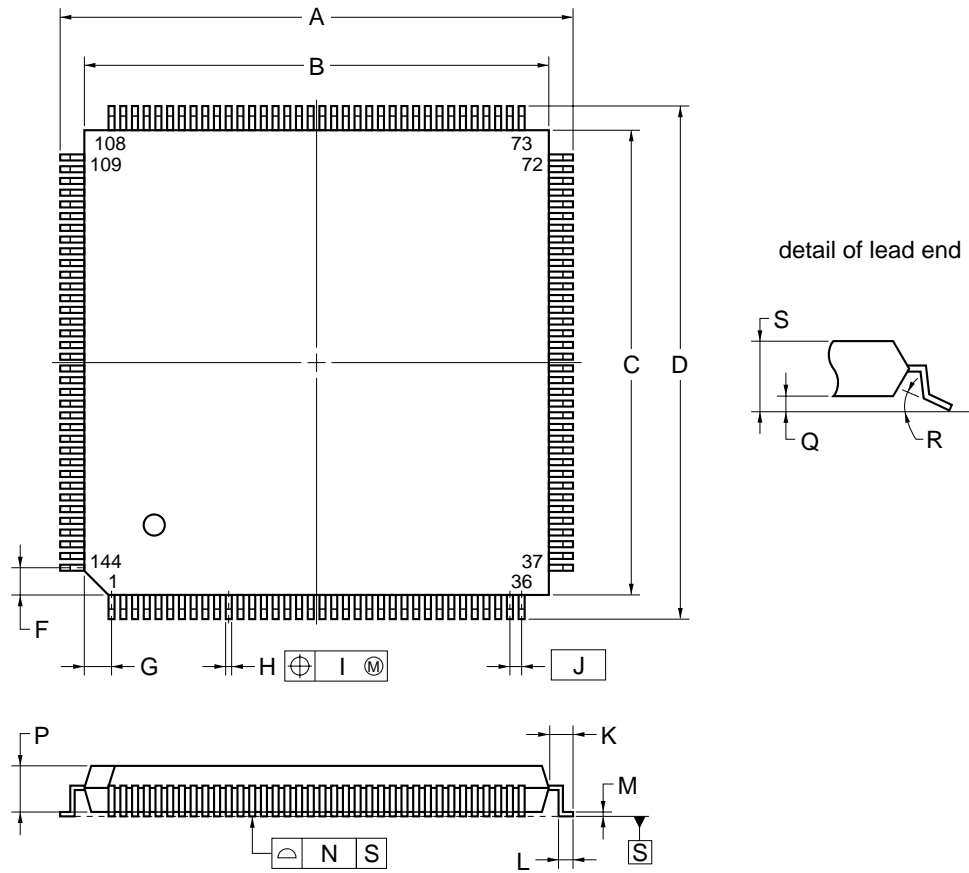
NOTE

Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	22.0±0.2
B	20.0±0.2
C	20.0±0.2
D	22.0±0.2
F	2.75
G	2.75
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.17 ^{+0.03} _{-0.07}
N	0.10
P	2.7
Q	0.125±0.075
R	5°±5°
S	3.0 MAX.

S120GJ-50-3EB-3

7.3.3 144-pin QFP (fine pitch)



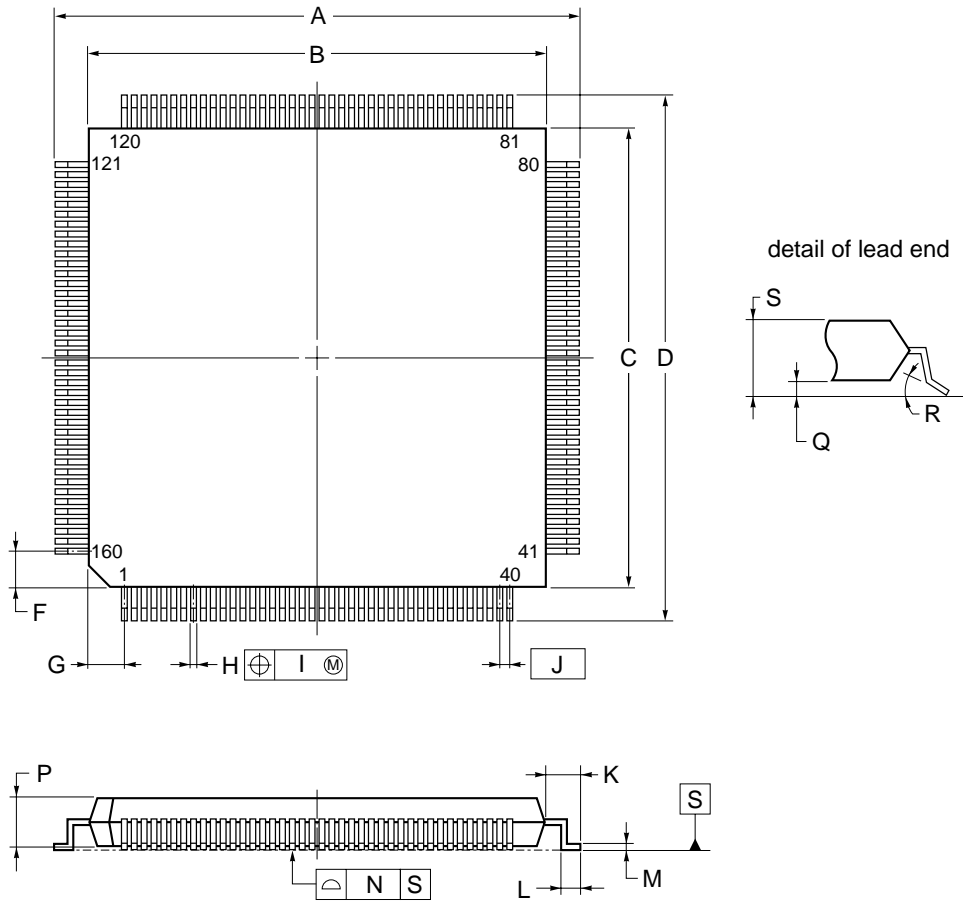
NOTE

Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	22.0±0.3
B	20.0±0.2
C	20.0±0.2
D	22.0±0.3
F	1.25
G	1.25
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.17 ^{+0.03} _{-0.07}
N	0.10
P	2.7
Q	0.125±0.075
R	3° ^{+7°} _{-3°}
S	3.0 MAX.

S144GJ-50-JEU, KEU-1

7.3.4 160-pin QFP (fine pitch)



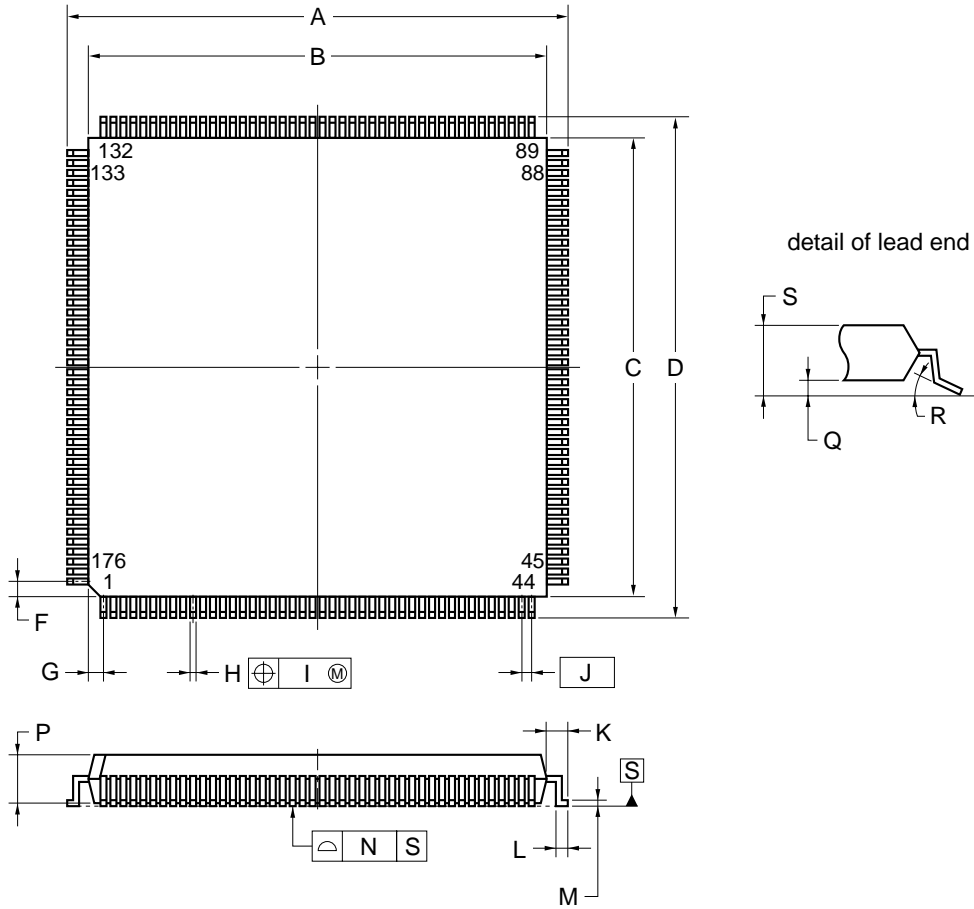
NOTE

Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	26.0±0.2
B	24.0±0.2
C	24.0±0.2
D	26.0±0.2
F	2.25
G	2.25
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.17 ^{+0.03} _{-0.07}
N	0.10
P	2.7±0.1
Q	0.125±0.075
R	5°±5°
S	3.0 MAX.

S160GM-50-3ED,JED,KED,RED-5

7.3.5 176-pin QFP (fine pitch)

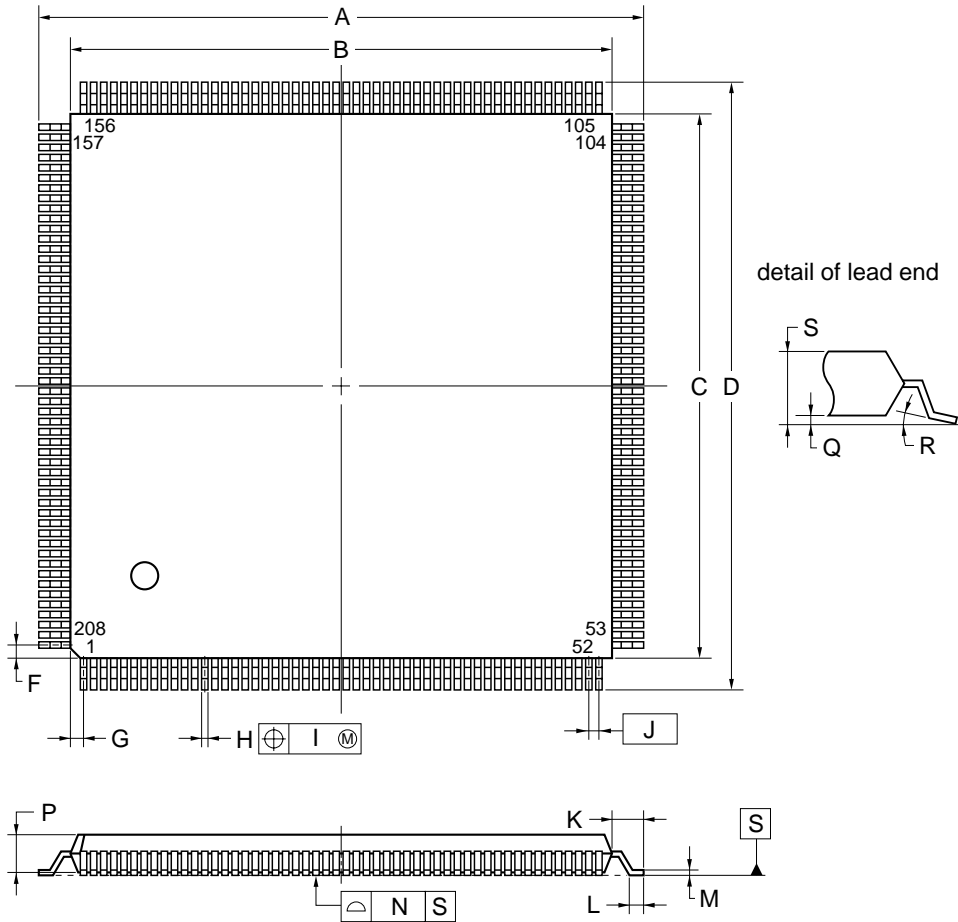


NOTE
 Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	26.0±0.2
B	24.0±0.2
C	24.0±0.2
D	26.0±0.2
F	1.25
G	1.25
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.17 ^{+0.03} _{-0.07}
N	0.10
P	2.7
Q	0.125±0.075
R	5°±5°
S	3.0 MAX.

S176GM-50-3EU, JEU, KEU-3

7.3.6 208-pin QFP (fine pitch)



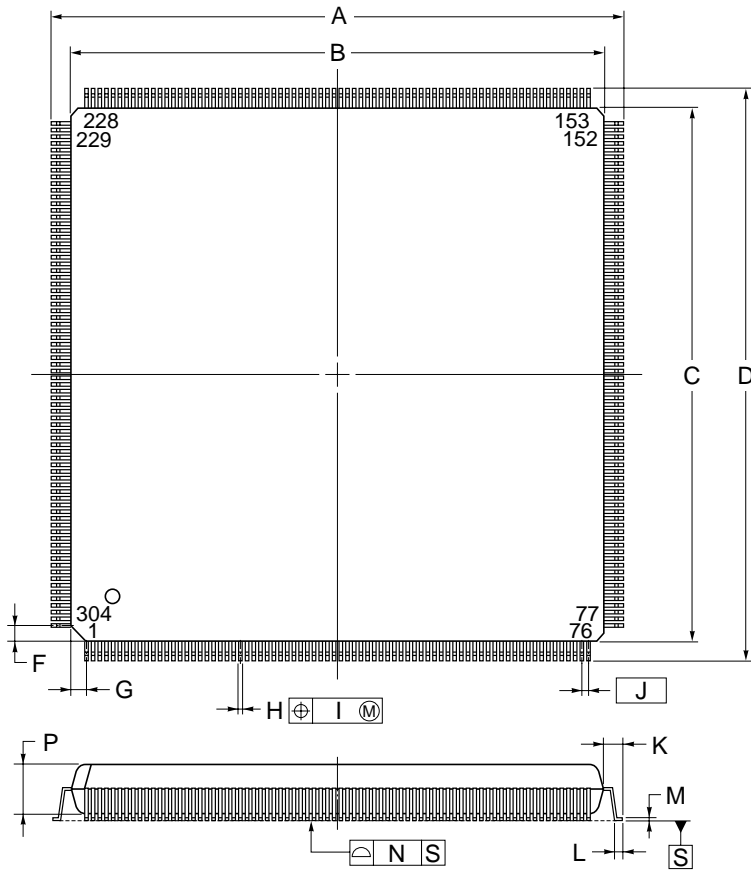
NOTE

Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

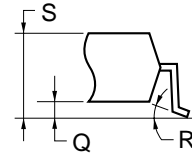
ITEM	MILLIMETERS
A	30.6±0.2
B	28.0±0.2
C	28.0±0.2
D	30.6±0.2
F	1.25
G	1.25
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.3±0.2
L	0.5±0.2
M	0.17 ^{+0.03} _{-0.07}
N	0.10
P	3.2±0.1
Q	0.4±0.1
R	5°±5°
S	3.8 MAX.

P208GD-50-LML,MML,SML,WML-7

7.3.7 304-pin QFP (fine pitch)



detail of lead end



NOTE

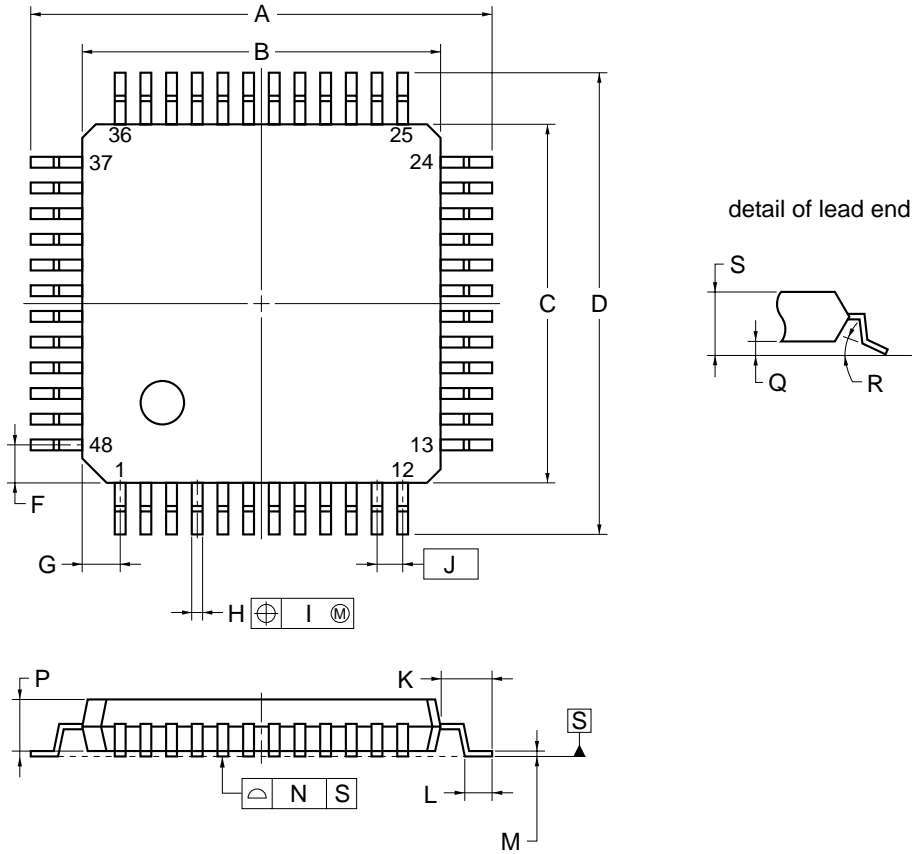
Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	42.6±0.2
B	40.0±0.2
C	40.0±0.2
D	42.6±0.2
F	1.25
G	1.25
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.3±0.2
L	0.5±0.2
M	0.145 ^{+0.055} _{-0.045}
N	0.10
P	3.7±0.1
Q	0.4±0.1
R	5°±5°
S	4.3 MAX.

P304GL-50-NMU, PMU, TMU-4

7.4 TQFP

7.4.1 48-pin TQFP (for ES, CS)



NOTE

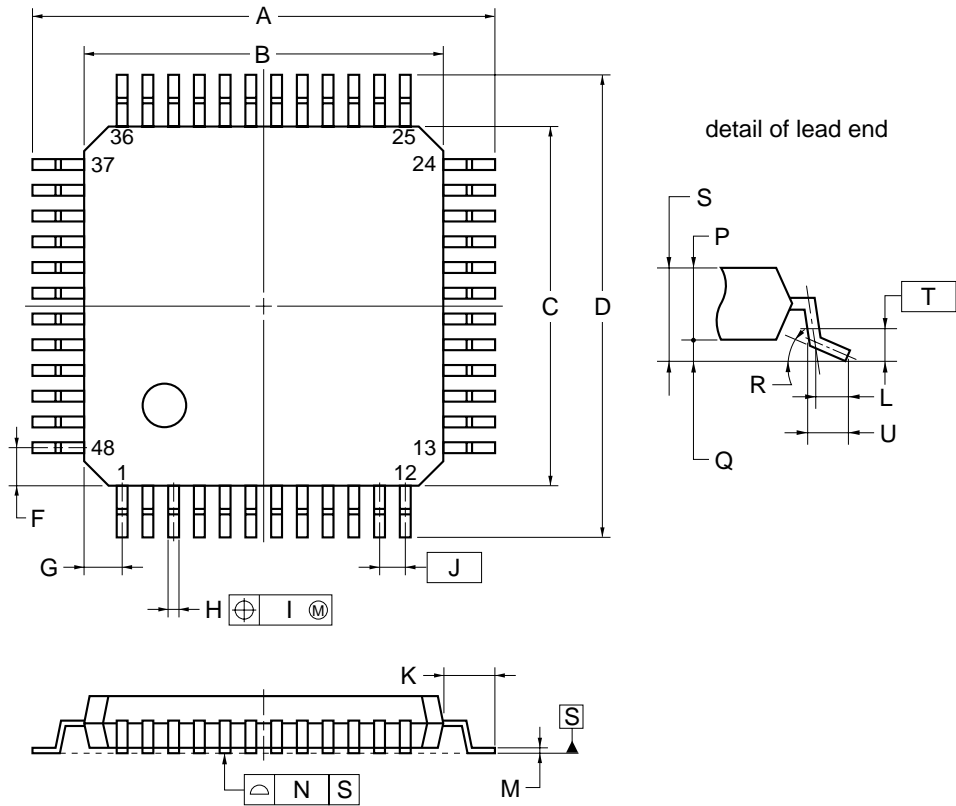
Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	9.0±0.2
B	7.0±0.2
C	7.0±0.2
D	9.0±0.2
F	0.75
G	0.75
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.145 ^{+0.055} _{-0.045}
N	0.10
P	1.0±0.1
Q	0.1±0.05
R	3° ^{+7°} _{-3°}
S	1.27 MAX.

Remark ES (Engineering Samples), CS (Commercial Samples)

S48GA-50-9EU-2

★ 7.4.2 48-pin TQFP (for MP)



NOTE

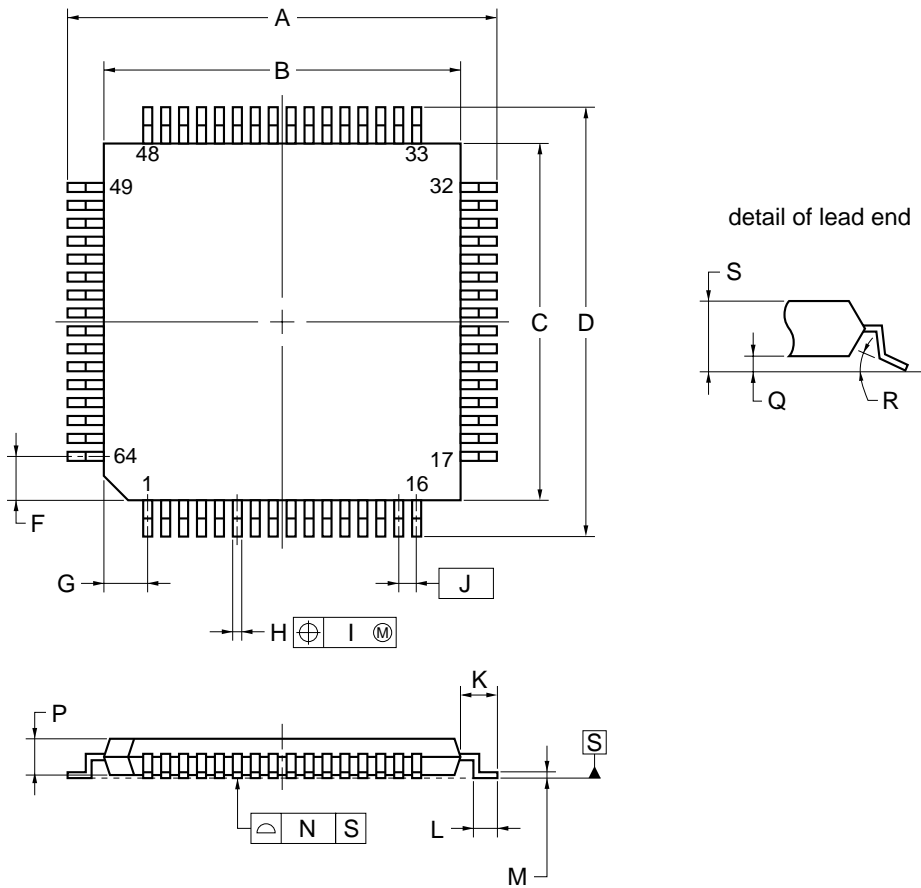
Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	9.0±0.2
B	7.0±0.2
C	7.0±0.2
D	9.0±0.2
F	0.75
G	0.75
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.0±0.2
L	0.5
M	0.17 ^{+0.03} _{-0.07}
N	0.08
P	1.0±0.1
Q	0.1±0.05
R	3° ^{+4°} _{-3°}
S	1.27 MAX.
T	0.25 (T.P.)
U	0.6±0.15

P48GA-50-9EU-1

Remark MP (Mass Production)

7.4.3 64-pin TQFP (10 × 10) (0.5 mm pitch, for ES, CS)



NOTE

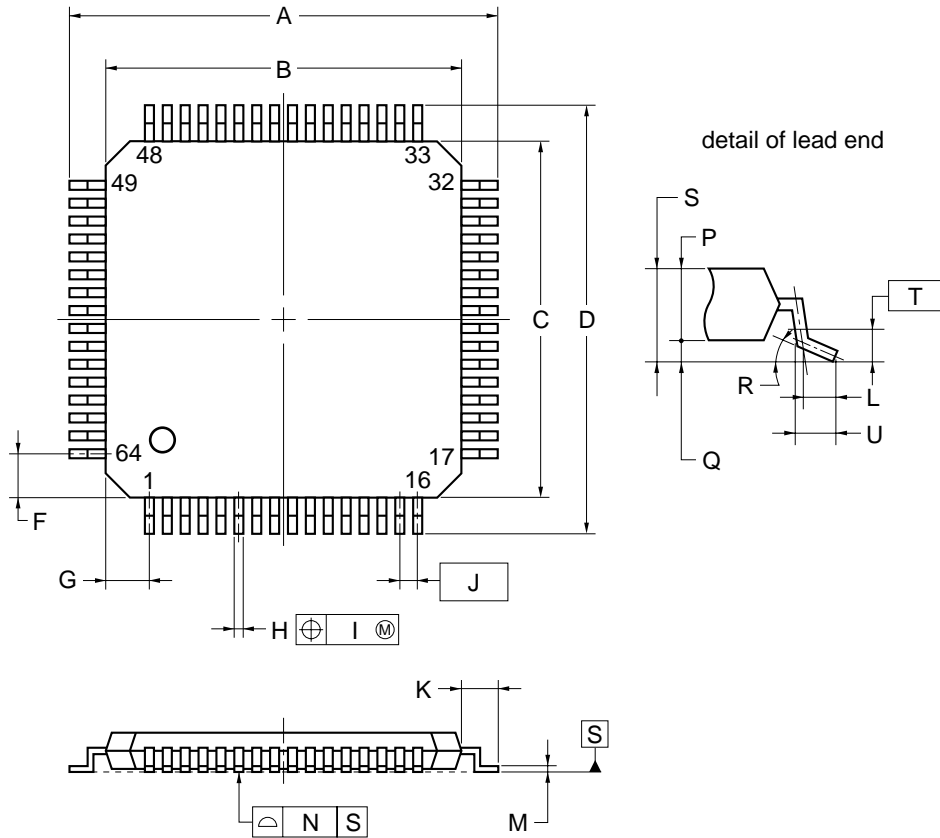
Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	12.0±0.2
B	10.0±0.2
C	10.0±0.2
D	12.0±0.2
F	1.25
G	1.25
H	0.22 ^{+0.055} _{-0.045}
I	0.10
J	0.5 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.145 ^{+0.055} _{-0.045}
N	0.10
P	1.0±0.1
Q	0.1±0.05
R	3° ^{+7°} _{-3°}
S	1.27 MAX.

S64GB-50-9EU-2

Remark ES (Engineering Sample), CS (Commercial Sample)

7.4.4 64-pin TQFP (10 × 10) (0.5 mm pitch, for MP)



NOTE

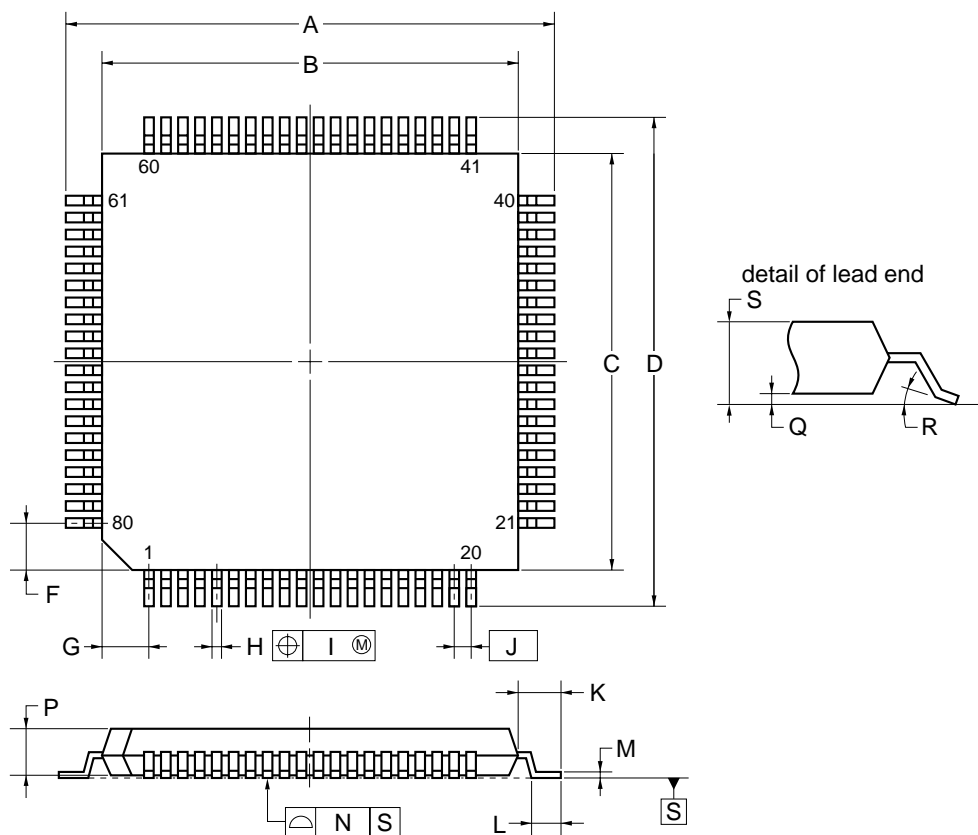
Each lead centerline is located within 0.08 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	12.0±0.2
B	10.0±0.2
C	10.0±0.2
D	12.0±0.2
F	1.25
G	1.25
H	0.22±0.05
I	0.08
J	0.5 (T.P.)
K	1.0±0.2
L	0.5
M	0.17 ^{+0.03} _{-0.07}
N	0.08
P	1.0
Q	0.1±0.05
R	3° ^{+4°} _{-3°}
S	1.10±0.10
T	0.25
U	0.6±0.15

S64GB-50-YEU-1

Remark MP (Mass Production)

7.4.5 80-pin TQFP (1.05 mm body thickness)



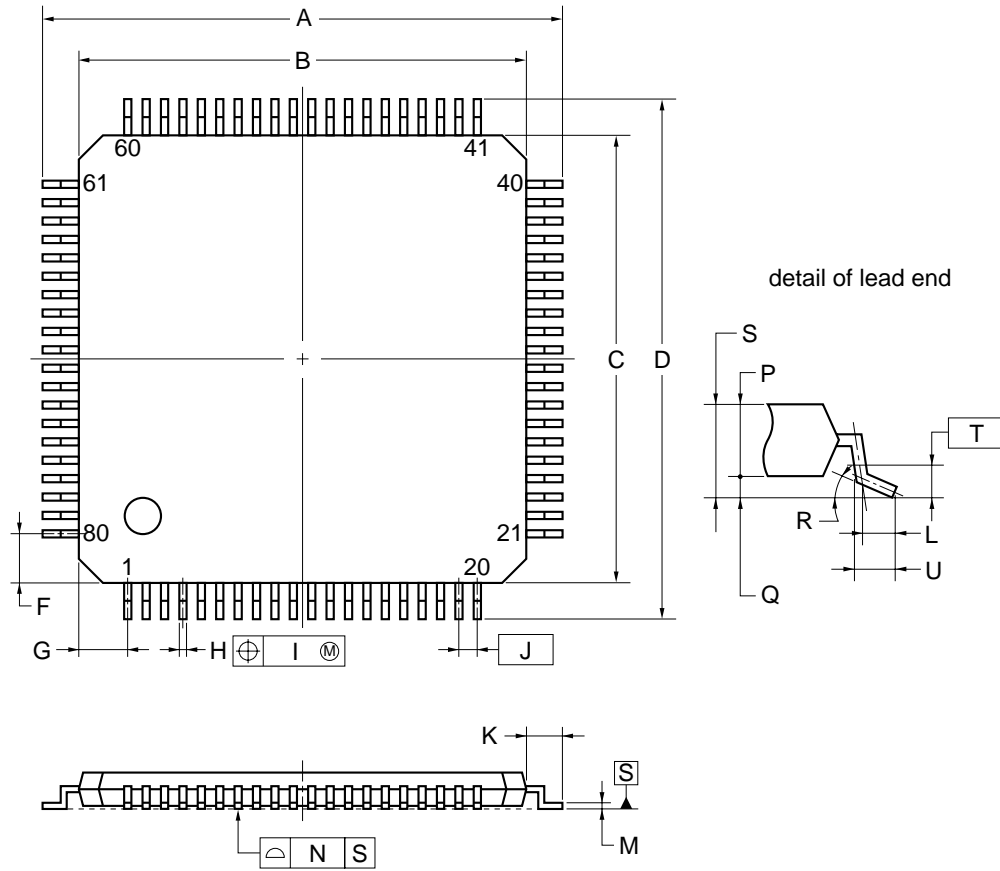
NOTE

Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	14.00±0.20
B	12.00±0.20
C	12.00±0.20
D	14.00±0.20
F	1.25
G	1.25
H	0.22 ^{+0.05} _{∅0.04}
I	0.10
J	0.50 (T.P.)
K	1.00±0.20
L	0.50±0.20
M	0.145 ^{+0.055} _{∅0.045}
N	0.10
P	1.05±0.07
Q	0.10±0.05
R	5j±5j
S	1.27 MAX.

P80GK-50-BE9-6

7.4.6 80-pin TQFP (1.00 mm body thickness)



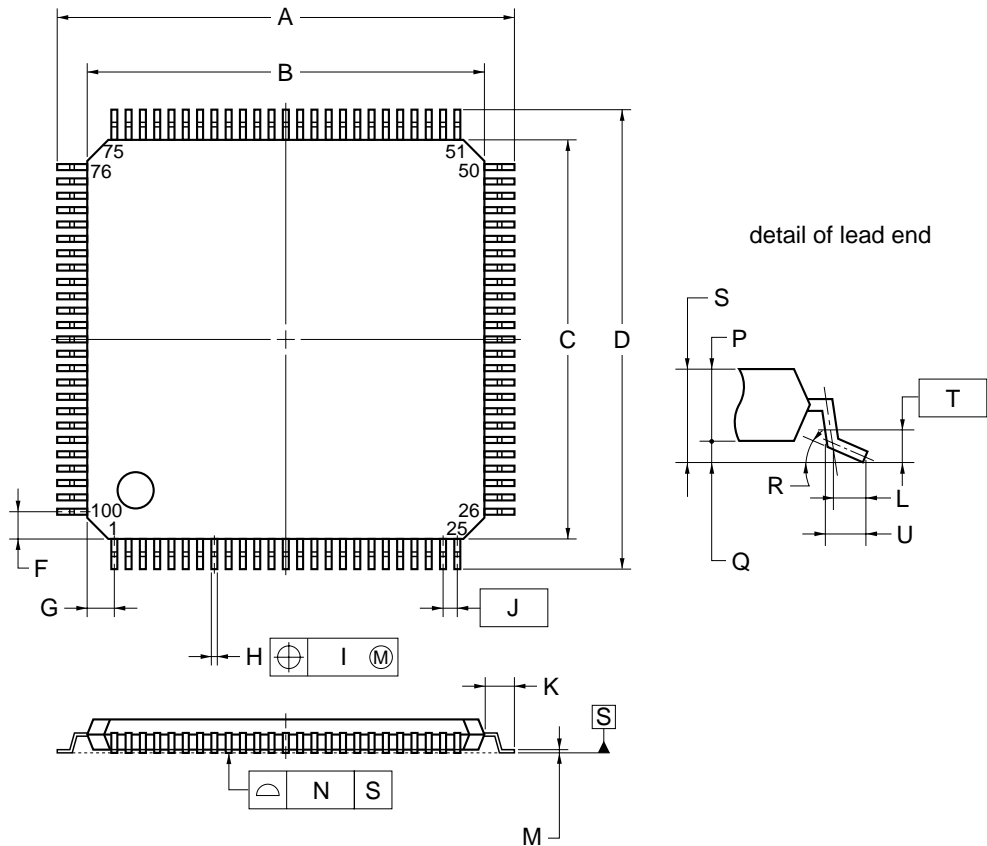
NOTE

Each lead centerline is located within 0.08 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	14.0±0.2
B	12.0±0.2
C	12.0±0.2
D	14.0±0.2
F	1.25
G	1.25
H	0.22±0.05
I	0.08
J	0.5 (T.P.)
K	1.0±0.2
L	0.5
M	0.145±0.05
N	0.08
P	1.0
Q	0.1±0.05
R	3°+4° -3°
S	1.1±0.1
T	0.25
U	0.6±0.15

P80GK-50-9EU-1

7.4.8 100-pin TQFP (for MP)



NOTE

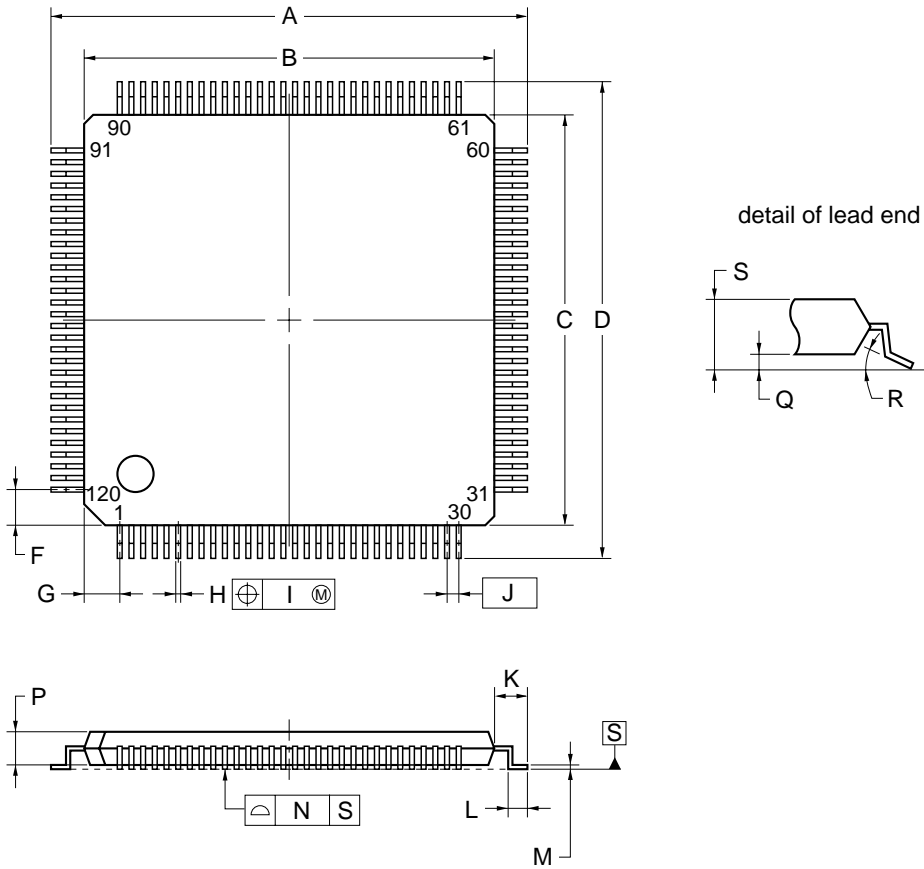
Each lead centerline is located within 0.08 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	16.0±0.2
B	14.0±0.2
C	14.0±0.2
D	16.0±0.2
F	1.0
G	1.0
H	0.22±0.05
I	0.08
J	0.5 (T.P.)
K	1.0±0.2
L	0.5
M	0.17 ^{+0.03} _{-0.07}
N	0.08
P	1.0
Q	0.1±0.05
R	3°+4° -3°
S	1.1±0.1
T	0.25
U	0.6±0.15

P100GC-50-9EU

Remark MP (Mass Production)

7.4.9 120-pin TQFP



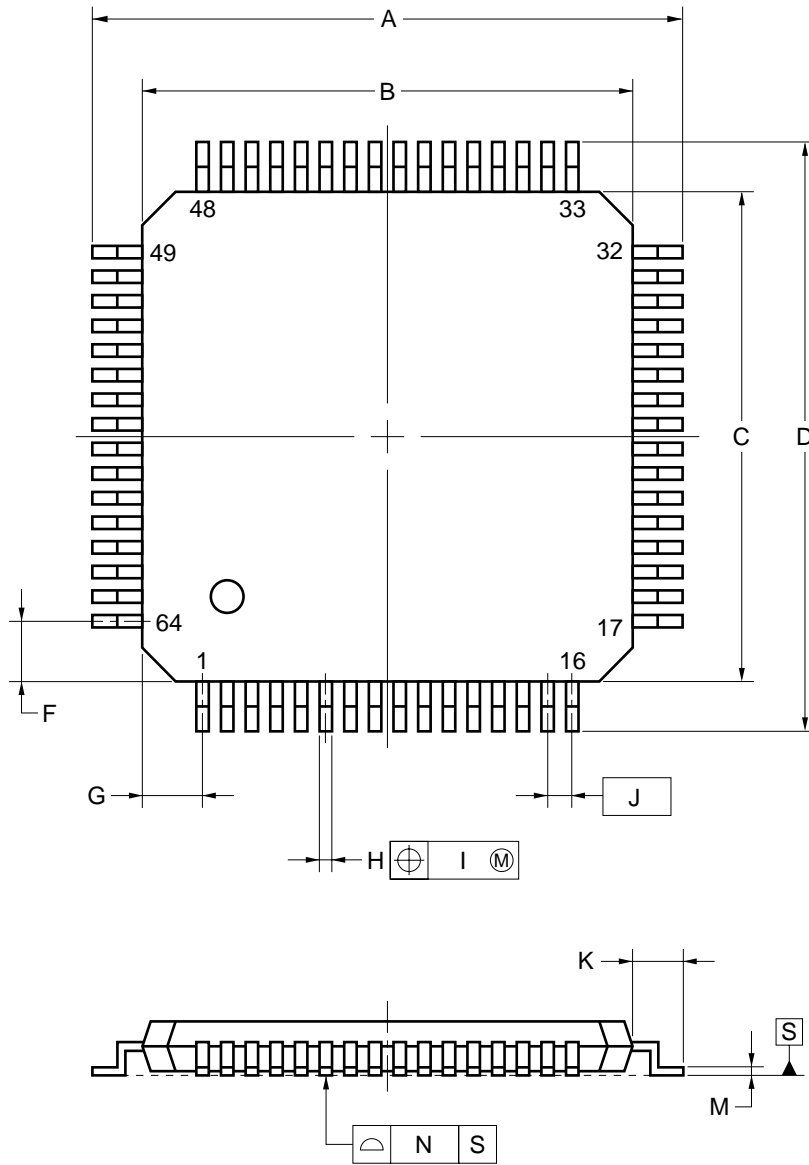
NOTE

Each lead centerline is located within 0.09 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	16.0±0.2
B	14.0±0.2
C	14.0±0.2
D	16.0±0.2
F	1.2
G	1.2
H	0.18±0.05
I	0.09
J	0.4 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.145±0.05
N	0.08
P	1.0±0.1
Q	0.1±0.05
R	3° ^{+7°} _{-3°}
S	1.2 MAX.

S120GC-40-9EV-1

7.4.10 64-pin TQFP (12 × 12)



detail of lead end

ITEM	MILLIMETERS
A	14.0±0.2
B	12.0±0.2
C	12.0±0.2
D	14.0±0.2
F	1.125
G	1.125
H	0.32 ^{+0.06} _{-0.10}
I	0.13
J	0.65 (T.P.)
K	1.0±0.2
L	0.5
M	0.17 ^{+0.03} _{-0.07}
N	0.10
P	1.0
Q	0.1±0.05
R	3° ^{+4°} _{-3°}
S	1.1±0.1
T	0.25
U	0.6±0.15

P64GK-65-9ET-3

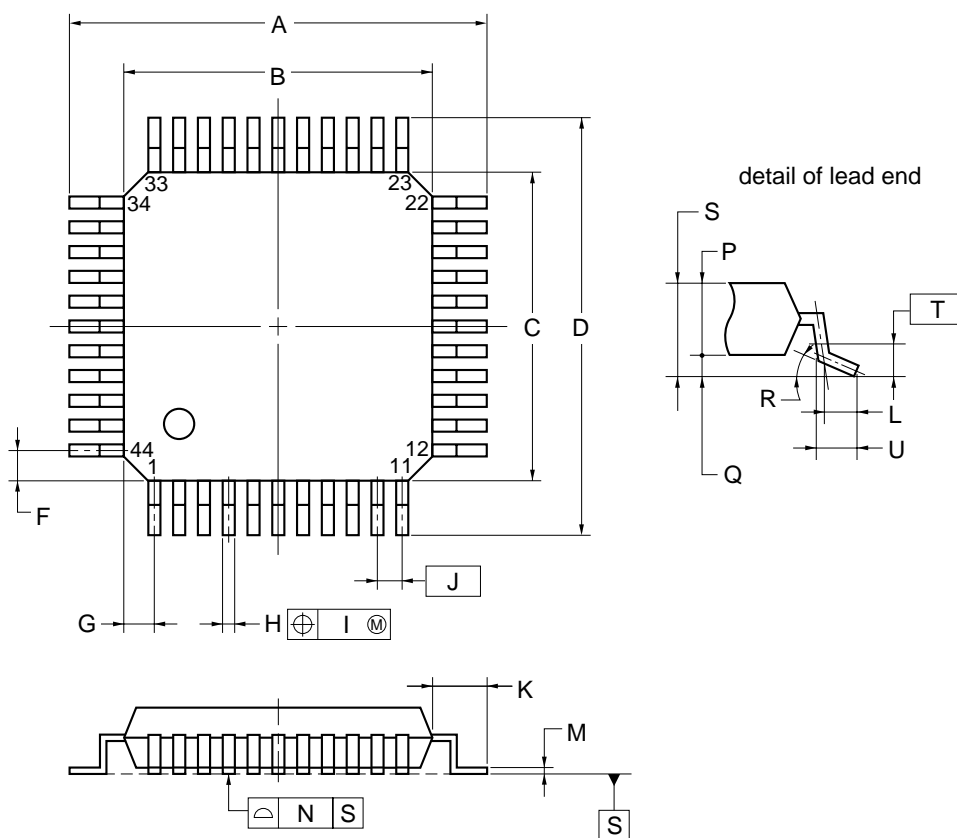
NOTE

Each lead centerline is located within 0.13 mm of its true position (T.P.) at maximum material condition.

Remark This package has a 0.65 mm pitch.

7.5 LQFP

7.5.1 44-pin LQFP



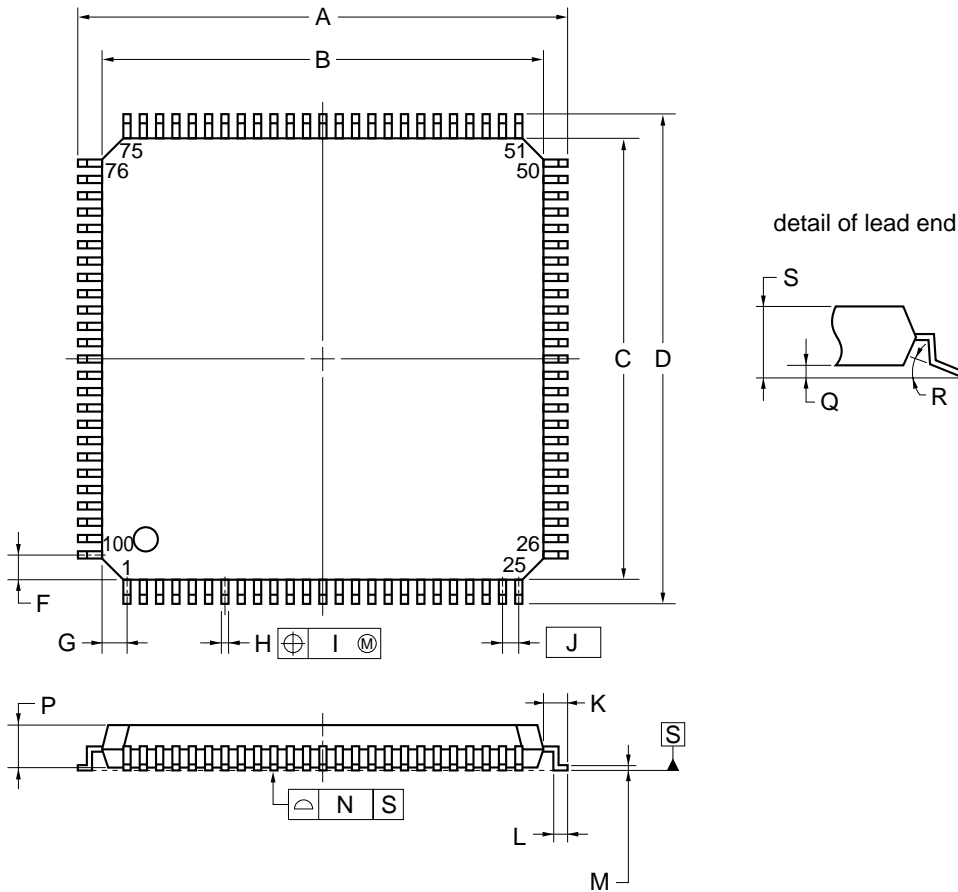
NOTE

Each lead centerline is located within 0.20 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	12.0±0.2
B	10.0±0.2
C	10.0±0.2
D	12.0±0.2
F	1.0
G	1.0
H	0.37 ^{+0.08} _{-0.07}
I	0.20
J	0.8 (T.P.)
K	1.0±0.2
L	0.5
M	0.17 ^{+0.03} _{-0.06}
N	0.10
P	1.4±0.05
Q	0.1±0.05
R	3°+4° -3°
S	1.6 MAX.
T	0.25 (T.P.)
U	0.6±0.15

S44GB-80-8ES-2

7.5.2 100-pin LQFP



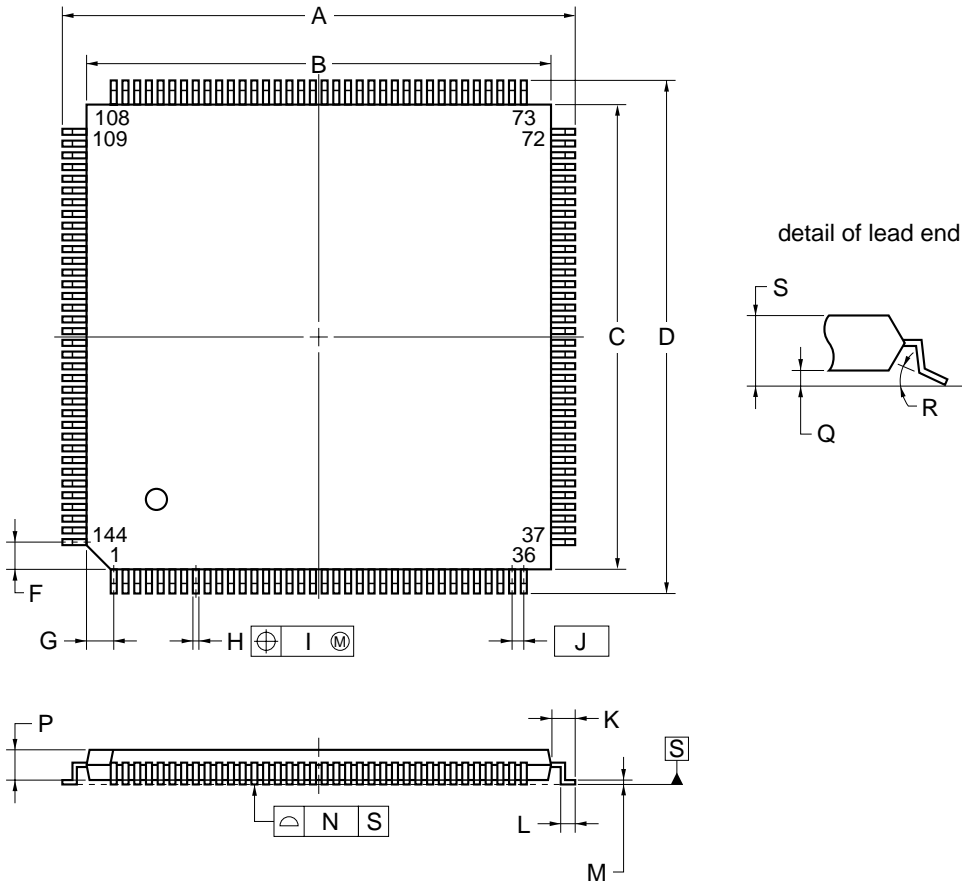
NOTE

Each lead centerline is located within 0.08 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	16.00±0.20
B	14.00±0.20
C	14.00±0.20
D	16.00±0.20
F	1.00
G	1.00
H	0.22 ^{+0.05} _{-0.04}
I	0.08
J	0.50 (T.P.)
K	1.00±0.20
L	0.50±0.20
M	0.17 ^{+0.03} _{-0.07}
N	0.08
P	1.40±0.05
Q	0.10±0.05
R	3° ^{+7°} _{-3°}
S	1.60 MAX.

S100GC-50-8EU, 8EA-2

★ 7.5.3 144-pin LQFP (for ES, CS)



NOTE

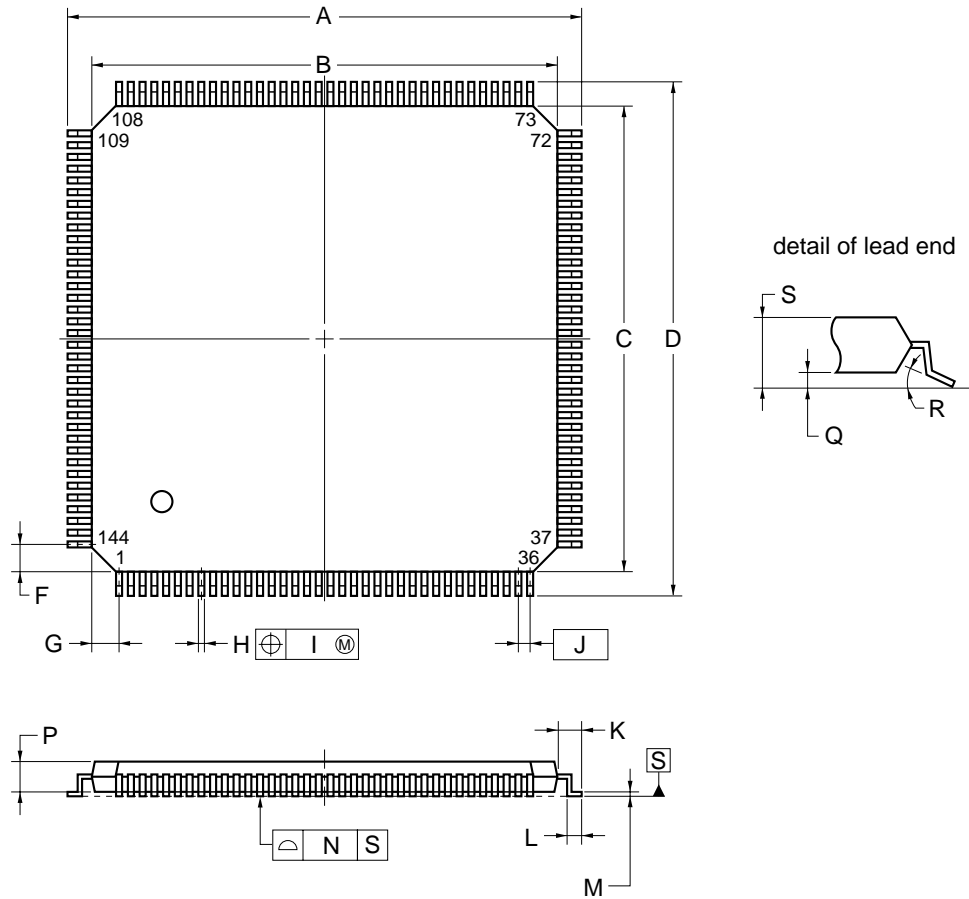
Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	22.0±0.2
B	20.0±0.2
C	20.0±0.2
D	22.0±0.2
F	1.25
G	1.25
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.145 ^{+0.055} _{-0.045}
N	0.10
P	1.4±0.1
Q	0.125±0.075
R	3° ^{+7°} _{-3°}
S	1.7 MAX.

Remark ES (Engineering Sample), CS (Commercial Sample)

S144GJ-50-8EU-3

7.5.4 144-pin LQFP (for MP)



NOTE

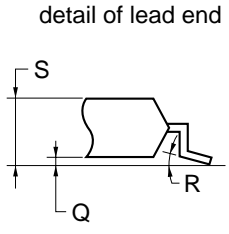
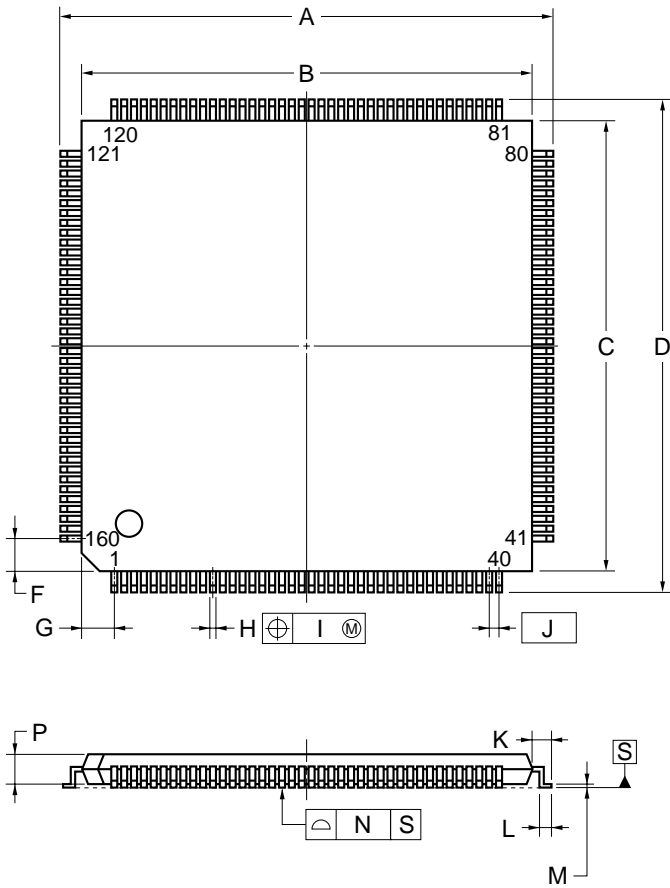
Each lead centerline is located within 0.08 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	22.0±0.2
B	20.0±0.2
C	20.0±0.2
D	22.0±0.2
F	1.25
G	1.25
H	0.22±0.05
I	0.08
J	0.5 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.17 ^{+0.03} _{-0.07}
N	0.08
P	1.4
Q	0.10±0.05
R	3° ^{+4°} _{-3°}
S	1.5±0.1

S144GJ-50-UEN

Remark MP (Mass Production)

★ 7.5.5 160-pin LQFP



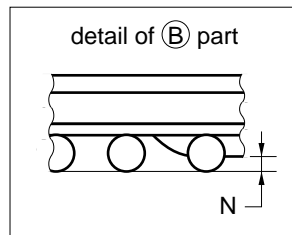
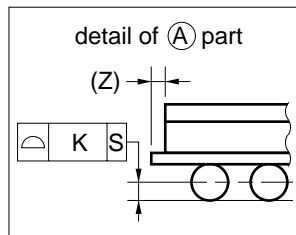
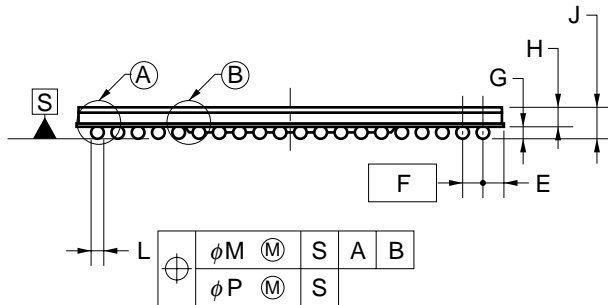
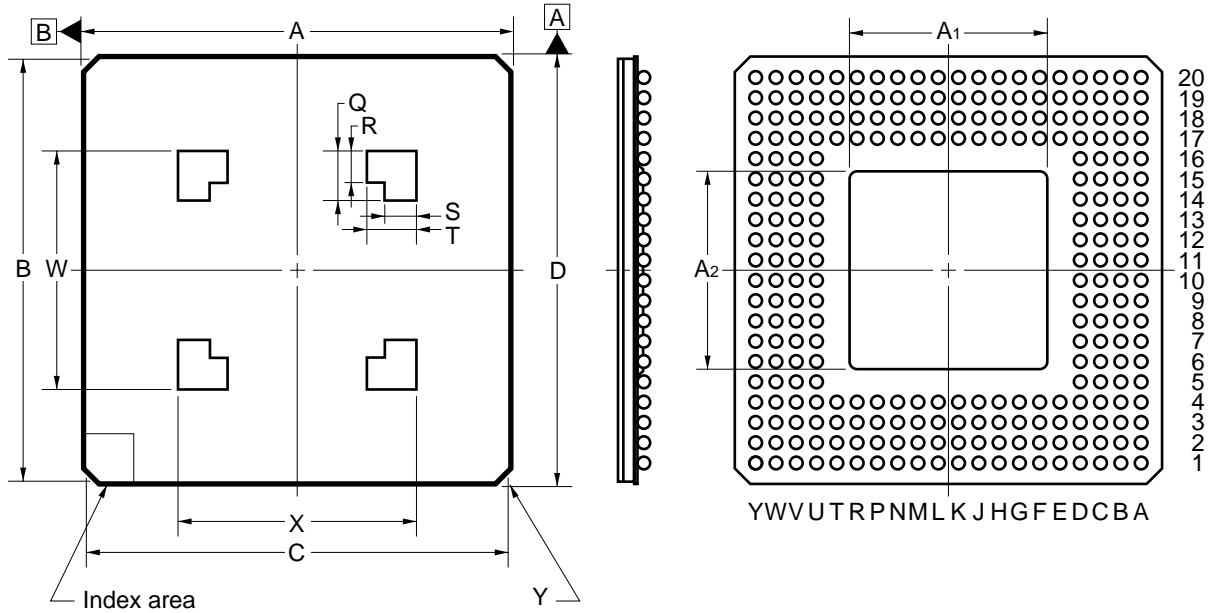
NOTE
 Each lead centerline is located within 0.10 mm of its true position (T.P.) at maximum material condition.

ITEM	MILLIMETERS
A	26.0±0.2
B	24.0±0.2
C	24.0±0.2
D	26.0±0.2
F	2.25
G	2.25
H	0.22 ^{+0.05} _{-0.04}
I	0.10
J	0.5 (T.P.)
K	1.0±0.2
L	0.5±0.2
M	0.145 ^{+0.055} _{-0.045}
N	0.10
P	1.4±0.1
Q	0.125±0.075
R	3° ^{+7°} _{-3°}
S	1.7 MAX.

S160GM-50-8ED-3

7.6 TBGA (with head spreader)

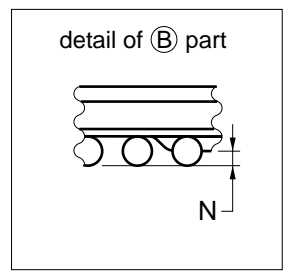
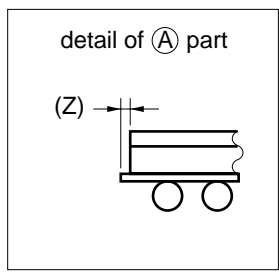
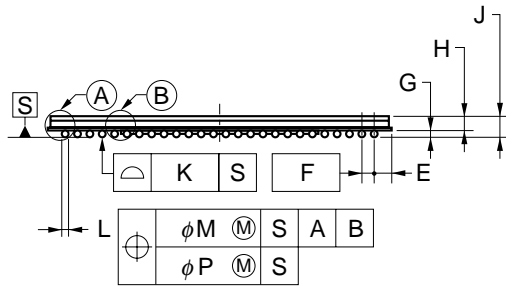
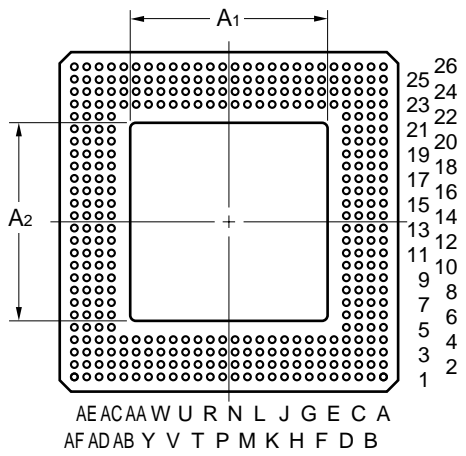
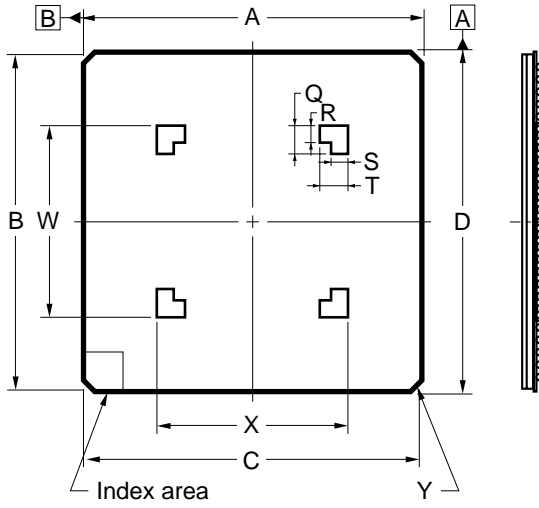
7.6.1 256-pin TBGA



ITEM	MILLIMETERS
A	27.00±0.20
A1	15.50 MAX.
A2	15.50 MAX.
B	26.60±0.15
C	26.60±0.15
D	27.00±0.20
E	1.435
F	1.27 (T.P.)
G	0.60±0.10
H	0.80 ^{+0.20} _{-0.10}
J	1.40 ^{+0.30} _{-0.20}
K	0.15
L	φ0.75±0.15
M	0.30
N	0.25MIN.
P	0.10
Q	3.0
R	2.0
S	2.0
T	3.0
W	15.11
X	15.11
Y	C 0.4
Z	0.20

S256N7-127-B6-1

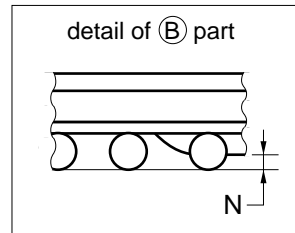
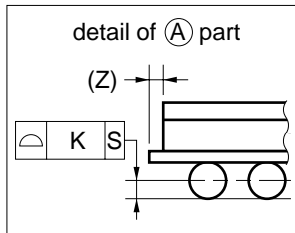
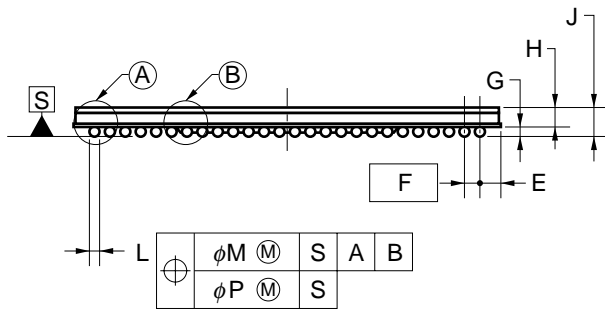
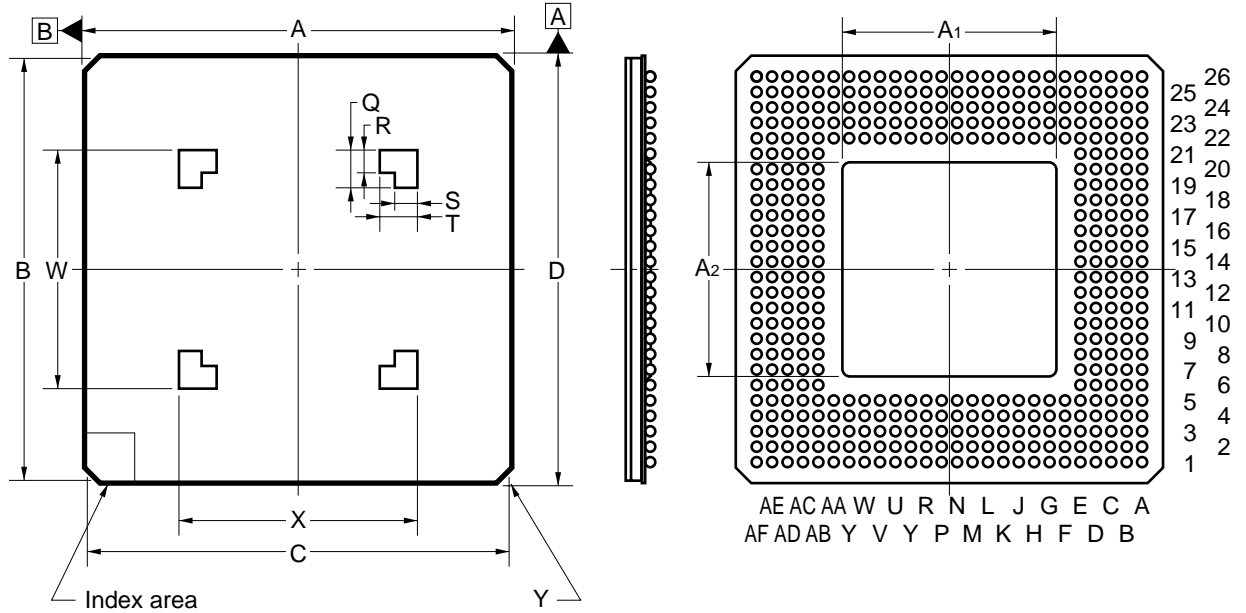
7.6.2 352-pin TBGA



ITEM	MILLIMETERS
A	35.00±0.20
A ₁	23.00 MAX.
A ₂	23.00 MAX.
B	34.60±0.15
C	34.60±0.15
D	35.00±0.20
E	1.625
F	1.27 (T.P.)
G	0.60±0.10
H	0.80 ^{+0.20} _{-0.10}
J	1.40 ^{+0.30} _{-0.20}
K	0.15
L	ϕ 0.75±0.15
M	0.30
N	0.25 MIN.
P	0.10
Q	3.0
R	2.0
S	2.0
T	3.0
W	20.19
X	20.19
Y	C0.4
Z	0.20

S352N7-127-F6-3

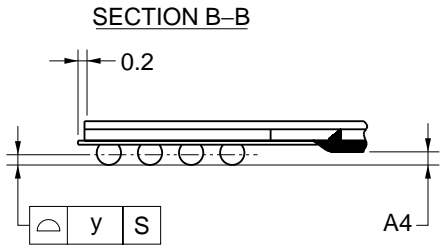
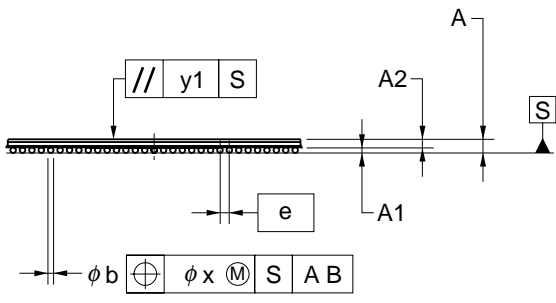
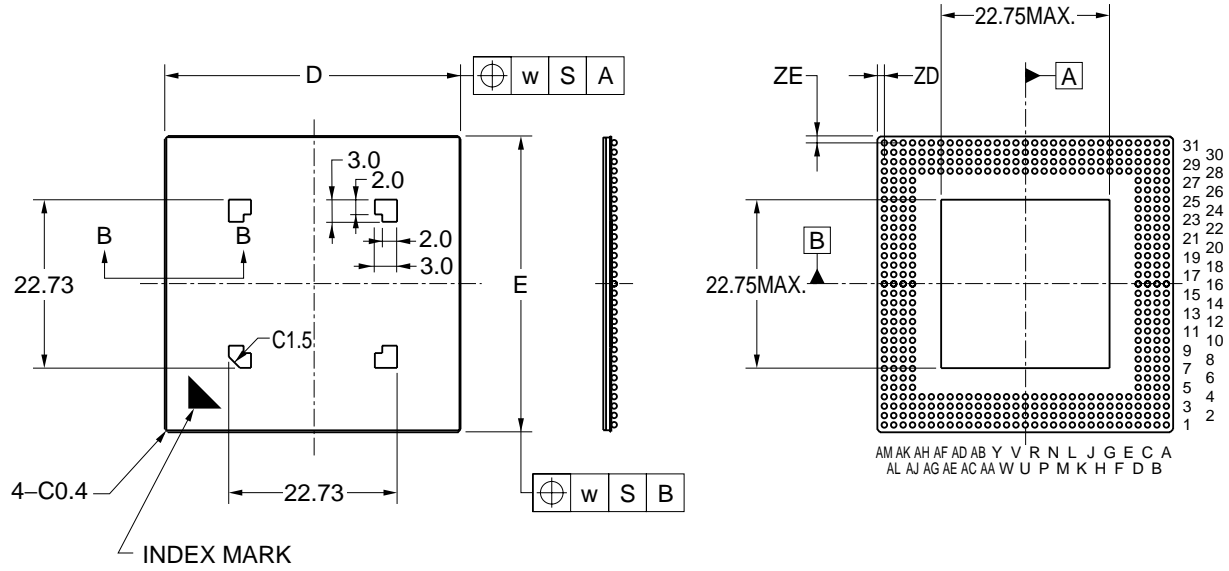
7.6.3 420-pin TBGA



ITEM	MILLIMETERS
A	35.00±0.20
A1	20.50 MAX.
A2	20.50 MAX.
B	34.60±0.15
C	34.60±0.15
D	35.00±0.20
E	1.625
F	1.27 (T.P.)
G	0.60±0.10
H	0.80 ^{+0.20} _{-0.10}
J	1.40 ^{+0.30} _{-0.20}
K	0.15
L	$\phi 0.75 \pm 0.15$
M	0.30
N	0.25 MIN.
P	0.10
Q	3.0
R	2.0
S	2.0
T	3.0
W	20.19
X	20.19
Y	C 0.40
Z	0.20

S420N7-127-F6-1

7.6.4 432-pin TBGA

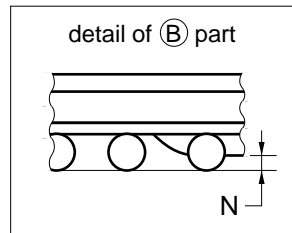
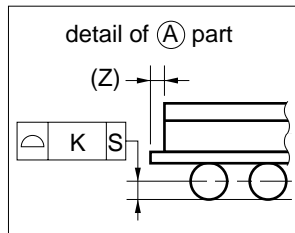
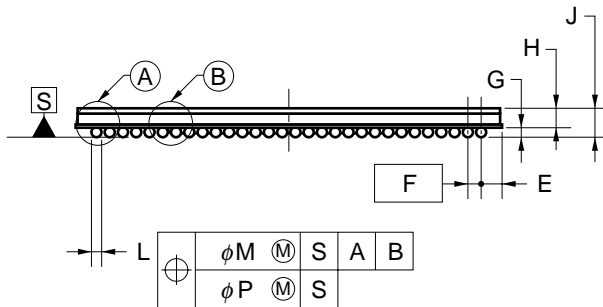
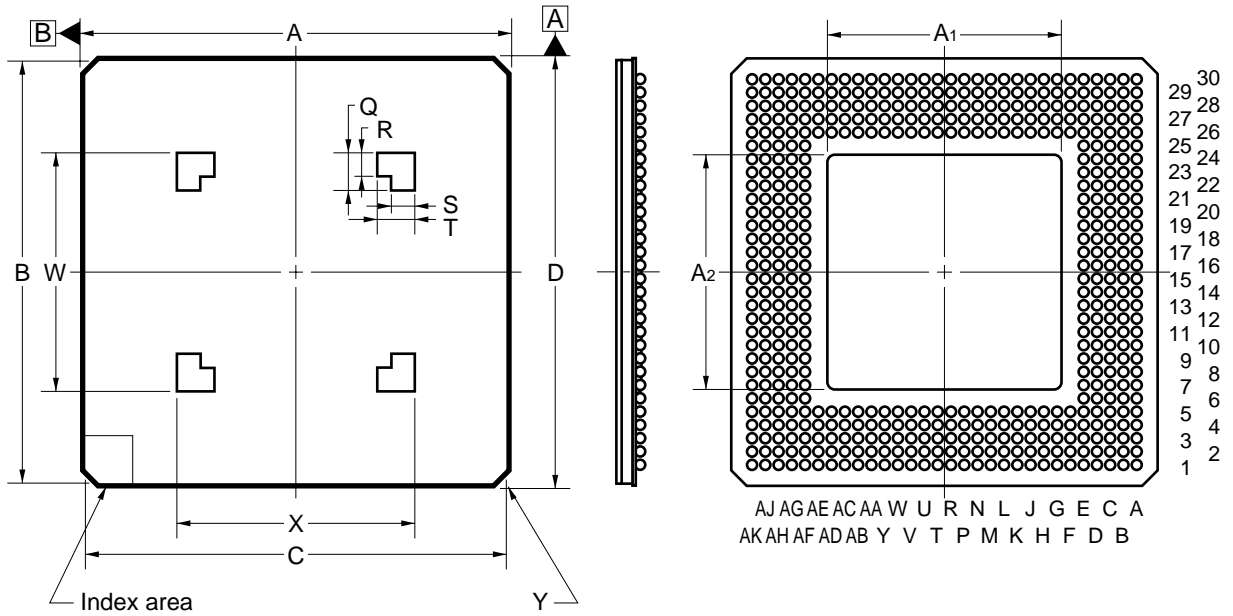


(UNIT:mm)

ITEM	DIMENSIONS
D	40.00±0.20
E	40.00±0.20
w	0.15
e	1.27
A	1.40±0.30
A1	0.60±0.10
A2	0.8
A4	0.25MIN.
b	0.75±0.15
x	0.15
y	0.20
y1	0.35
ZD	0.95
ZE	0.95

P432FF-127-UA2

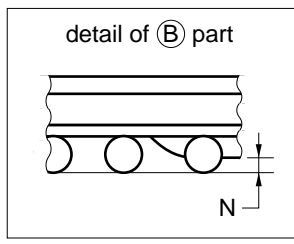
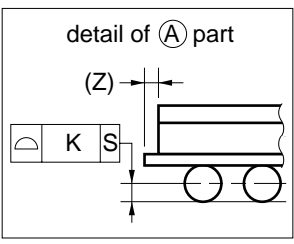
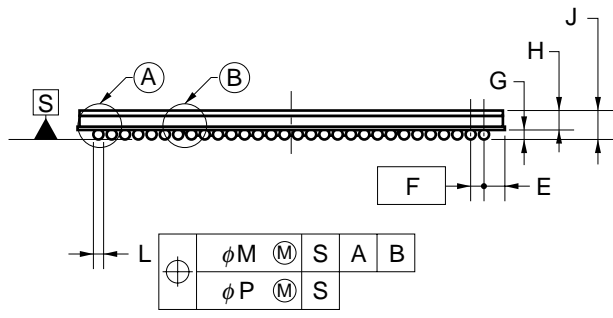
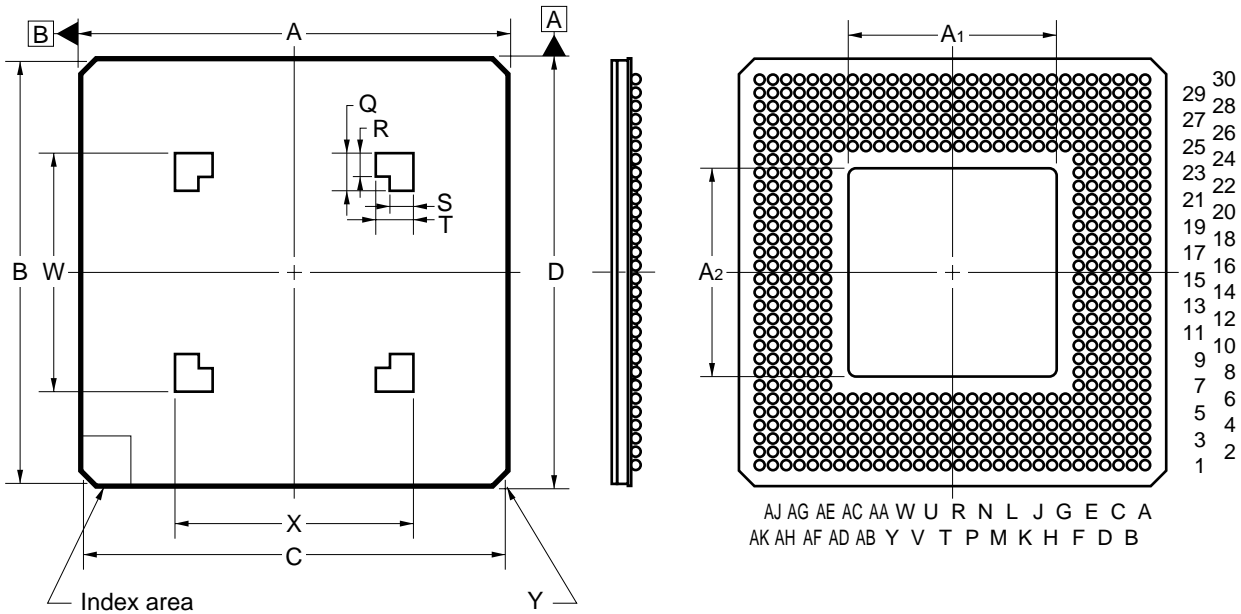
7.6.5 500-pin TBGA



ITEM	MILLIMETERS
A	40.00±0.20
A1	23.00 MAX.
A2	23.00 MAX.
B	39.60±0.15
C	39.60±0.15
D	40.00±0.20
E	1.585
F	1.27 (T.P.)
G	0.60±0.10
H	0.80 ^{+0.20} _{-0.10}
J	1.40 ^{+0.30} _{-0.20}
K	0.15
L	∅0.75±0.15
M	0.30
N	0.25 MIN.
P	0.10
Q	3.0
R	2.0
S	2.0
T	3.0
W	22.73
X	22.73
Y	C 0.40
Z	0.20

S500N7-127-H6-1

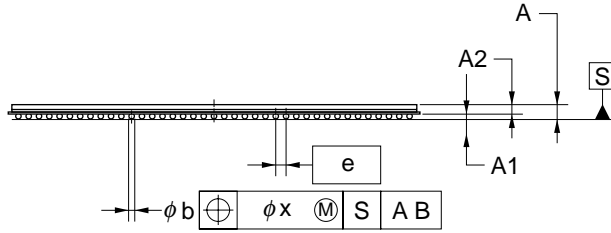
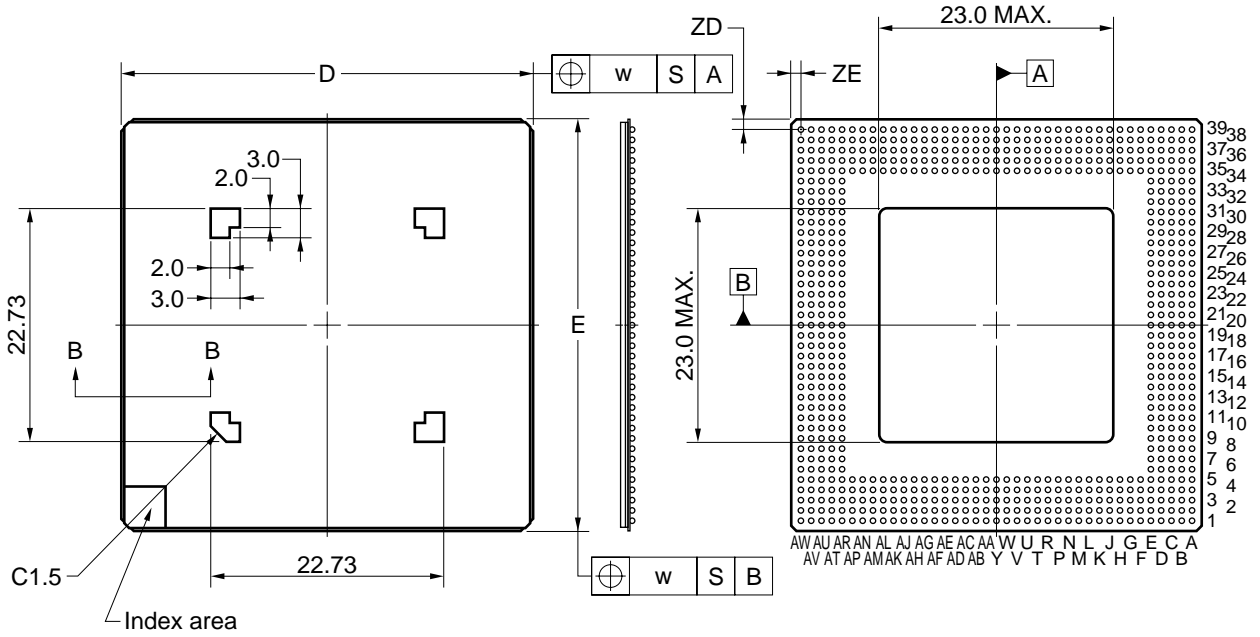
7.6.6 576-pin TBGA



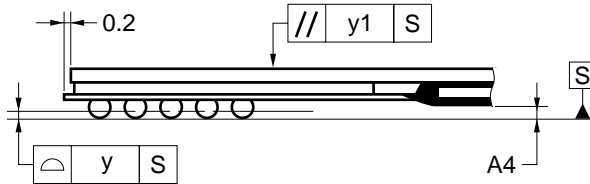
ITEM	MILLIMETERS
A	40.00±0.20
A1	23.00 MAX.
A2	23.00 MAX.
B	39.60±0.15
C	39.60±0.15
D	40.00±0.20
E	1.585
F	1.27 (T.P.)
G	0.60±0.10
H	0.80 ^{+0.20} _{-0.10}
J	1.40 ^{+0.30} _{-0.20}
K	0.15
L	∅0.75±0.15
M	0.30
N	0.25 MIN.
P	0.10
Q	3.0
R	2.0
S	2.0
T	3.0
W	22.73
X	22.73
Y	C 0.40
Z	0.20

S576N7-127-H6-1

7.6.7 680-pin TBGA



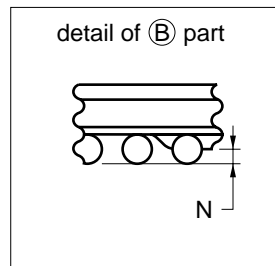
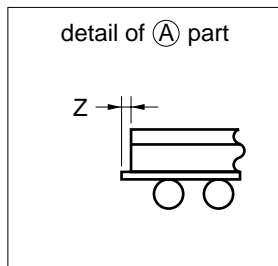
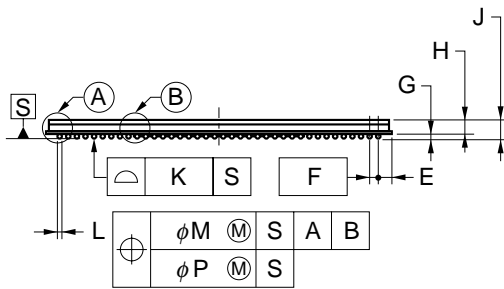
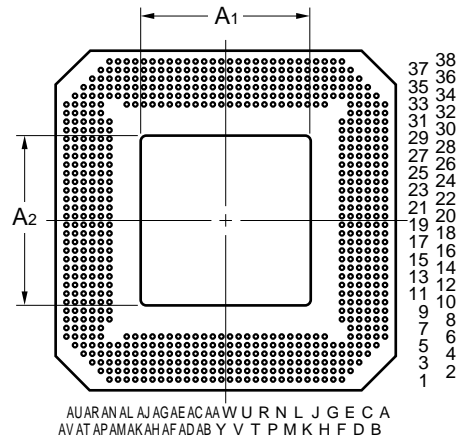
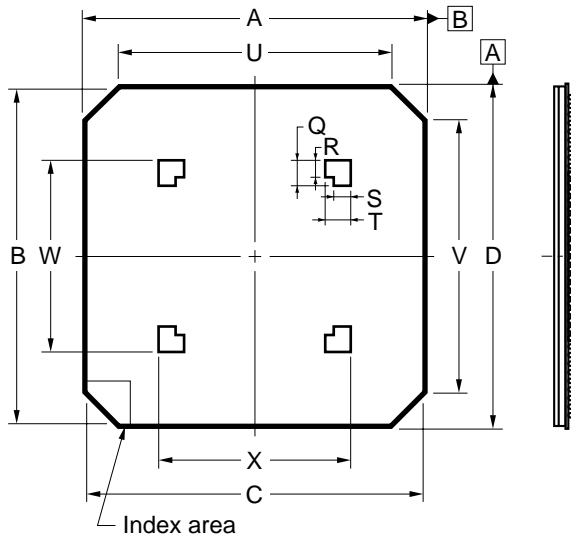
Section B-B



ITEM	MILLIMETERS
D	40.0±0.20
E	40.0±0.20
w	0.15
A	1.30 ^{+0.30} _{-0.20}
A1	0.50±0.10
A2	0.80
A4	0.25 MIN.
[e]	1.00
b	0.60±0.10
x	0.10
y	0.15
y1	0.35
ZD	1.00
ZE	1.00

P680FF-100-UA1

7.6.8 696-pin TBGA

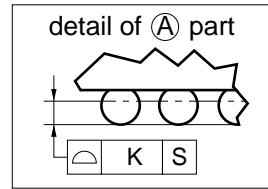
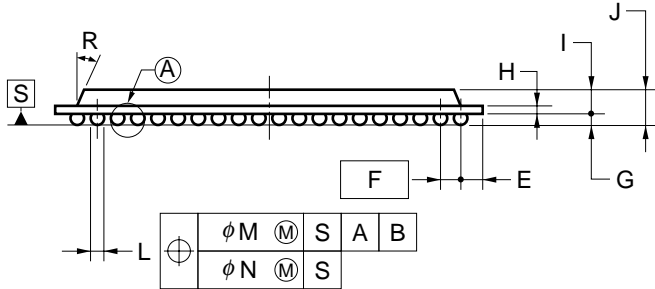
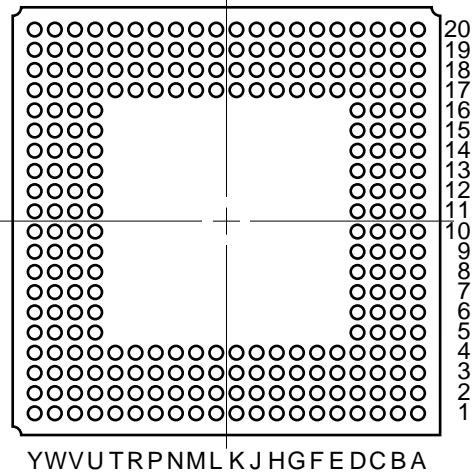
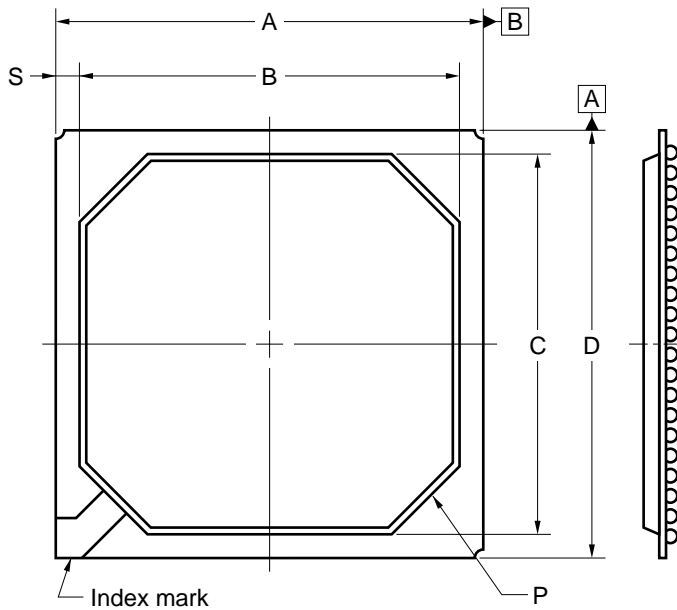


ITEM	MILLIMETERS
A	40.00±0.20
A ₁	23.00 MAX.
A ₂	23.00 MAX.
B	39.60±0.15
C	39.60±0.15
D	40.00±0.20
E	1.50
F	1.00 (T.P.)
G	0.50±0.10
H	0.90 ^{+0.20} _{-0.10}
J	1.40 ^{+0.30} _{-0.20}
K	0.15
L	φ 0.60±0.10
M	0.30
N	0.25 MIN.
P	0.10
Q	3.0
R	2.0
S	2.0
T	3.0
U	33.00±0.20
V	33.00±0.20
W	22.73
X	22.73
Z	0.20

S696N7-100-H9-1

7.7 PBGA

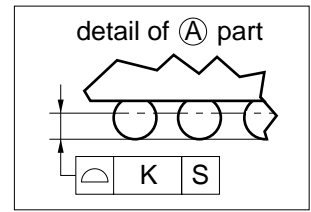
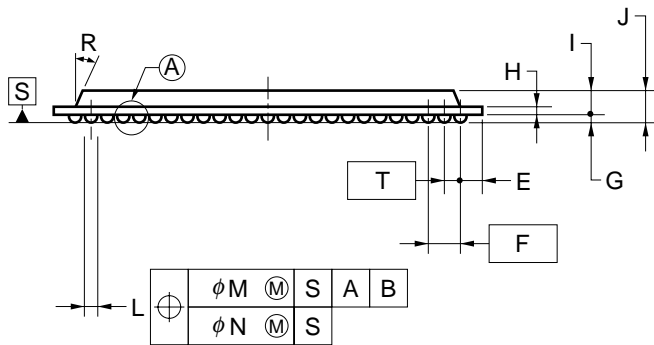
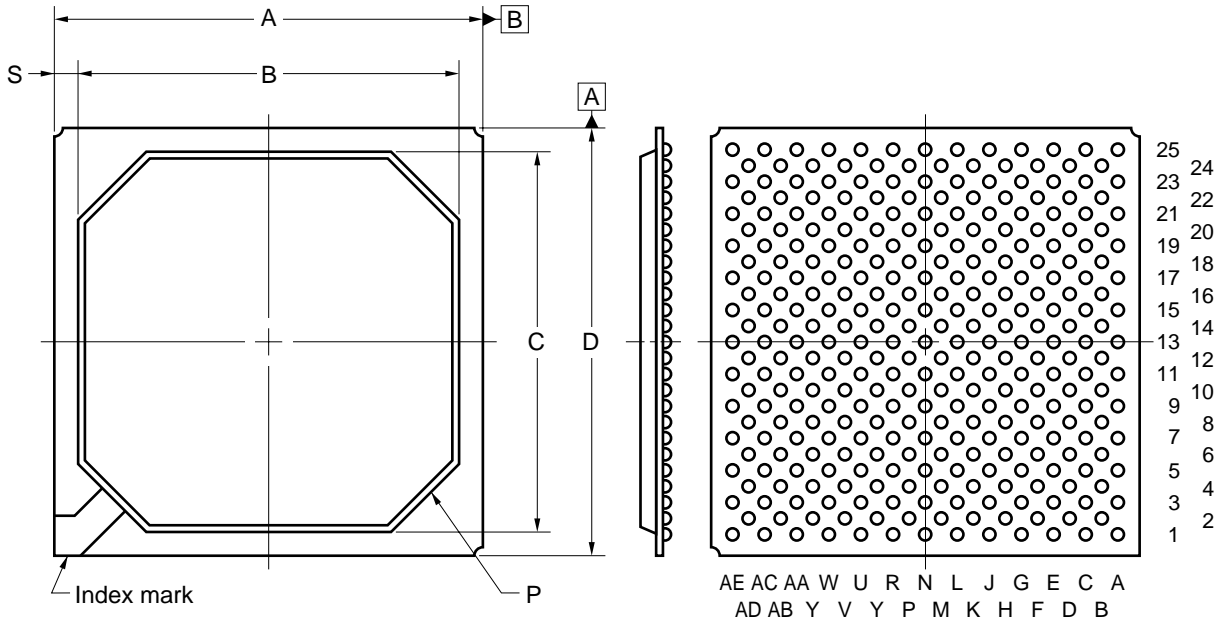
7.7.1 256-pin PBGA



ITEM	MILLIMETERS
A	27.00±0.20
B	24.0
C	24.0
D	27.00±0.20
E	1.44
F	1.27 (T.P.)
G	0.6±0.1
H	0.36
I	1.53±0.15
J	2.13±0.25
K	0.15
L	$\phi 0.75 \pm 0.15$
M	0.30
N	0.10
P	C3.95
R	25°
S	1.5

Y256S1-127-B6-1

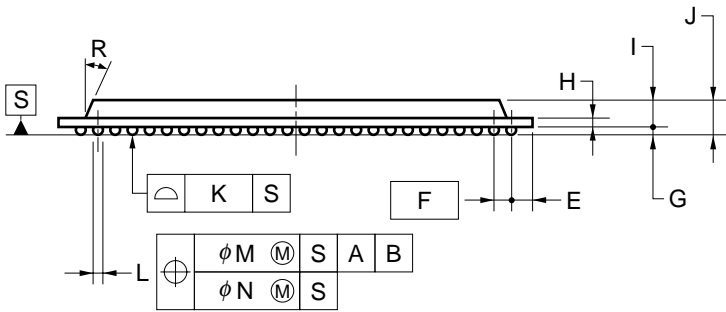
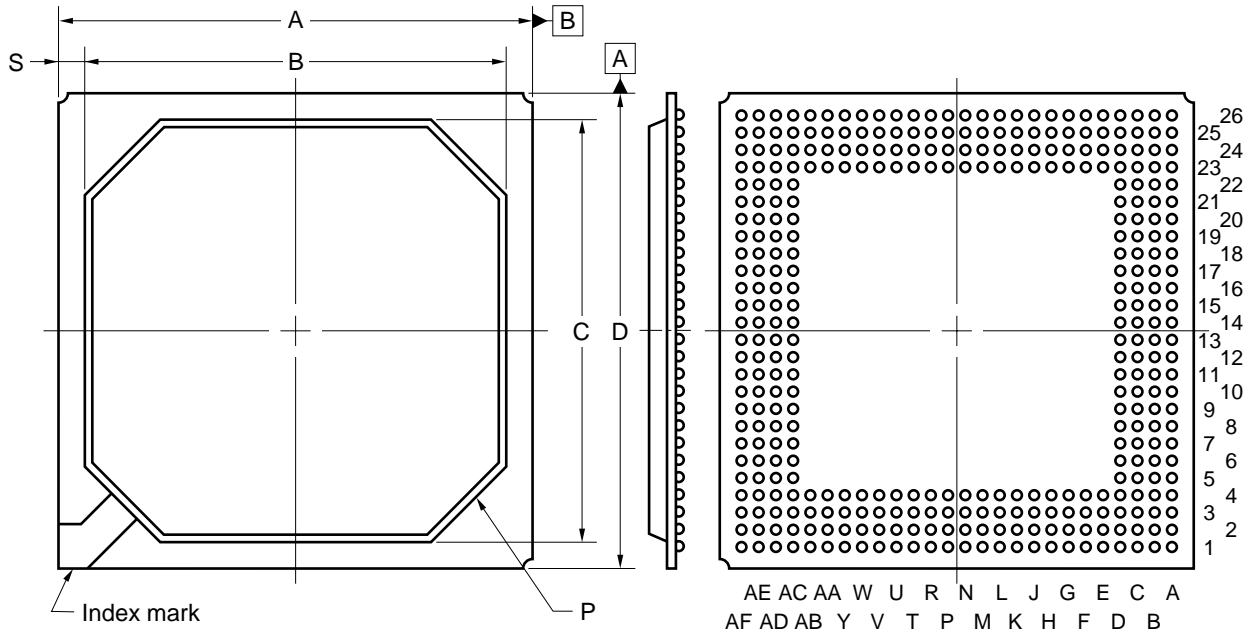
7.7.3 313-pin PBGA



ITEM	MILLIMETERS
A	35.00±0.20
B	32.0
C	32.0
D	35.00±0.20
E	2.26
F	2.54 (T.P.)
G	0.6±0.1
H	0.56
I	1.73±0.15
J	2.33±0.25
K	0.15
L	$\phi 0.75 \pm 0.15$
M	0.30
N	0.10
P	C4.0
R	25°
S	2.5
T	1.27 (T.P.)

Y313S1-127-F5-2

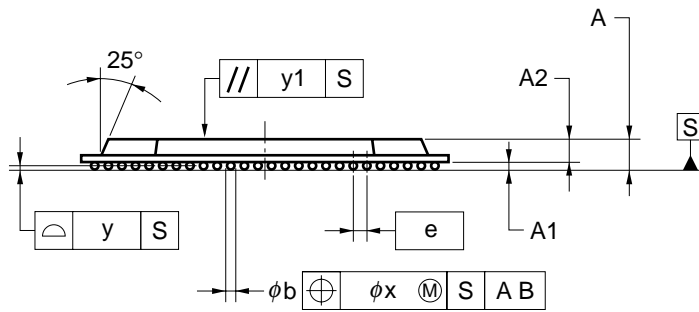
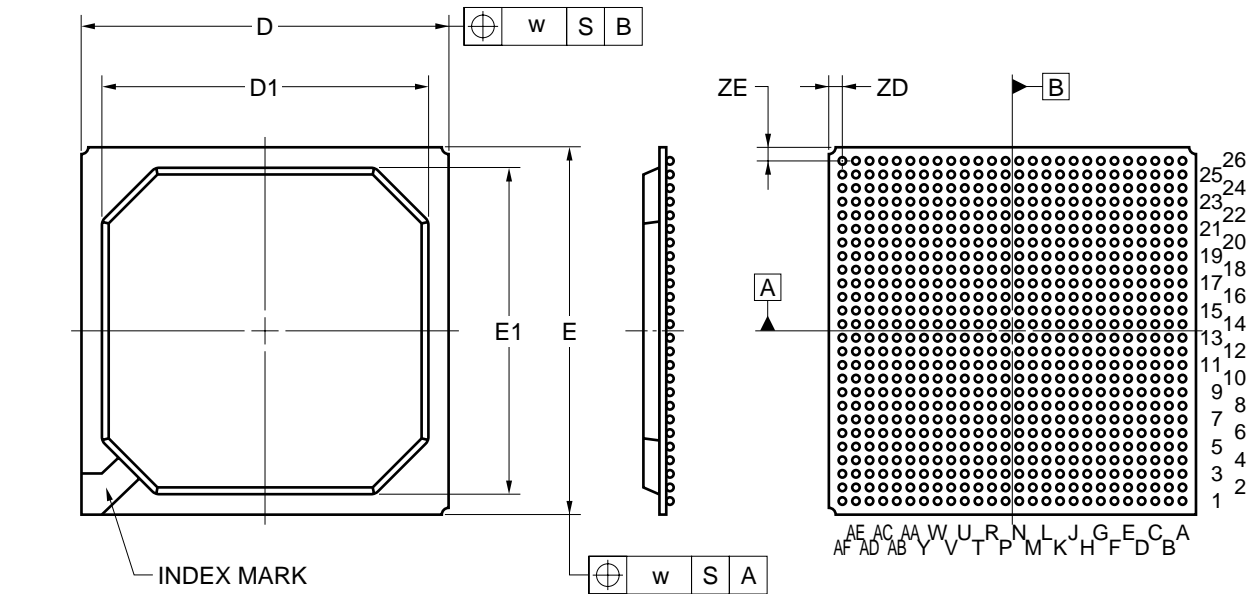
7.7.4 352-pin PBGA



ITEM	MILLIMETERS
A	35.00±0.20
B	32.0
C	32.0
D	35.00±0.20
E	1.62
F	1.27 (T.P.)
G	0.6±0.1
H	0.56
I	1.73±0.15
J	2.33±0.25
K	0.15
L	∅0.75±0.15
M	0.30
N	0.10
P	C4.0
R	25°
S	2.5

Y352S1-127-F6-3

7.7.5 676-pin PBGA

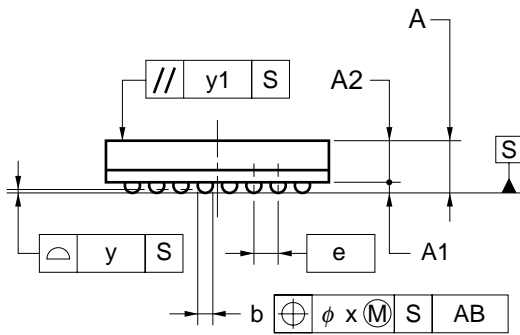
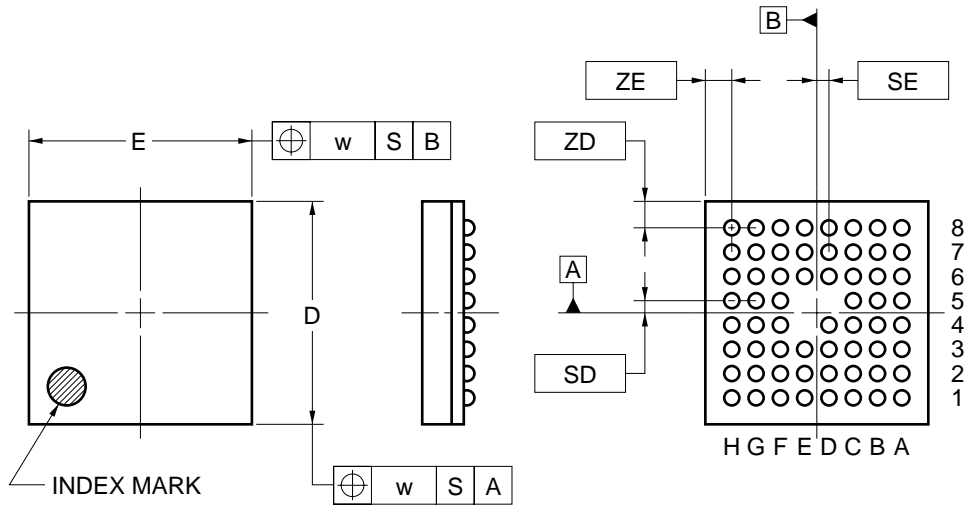


ITEM	MILLIMETERS
D	27.00±0.20
D1	24.00±0.10
E	27.00±0.20
E1	24.00±0.10
w	0.30
\overline{e}	1.00
A	2.23±0.30
A1	0.50±0.10
A2	1.73
b	0.60±0.10
x	0.15
y	0.15
y1	0.35
ZD	1.00
ZE	1.00

P676F1-100-MN1

7.8 FPBGA

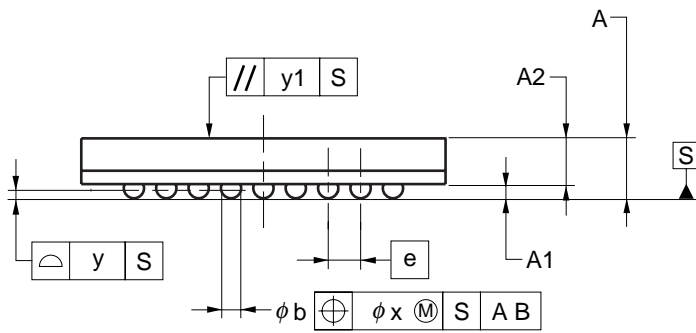
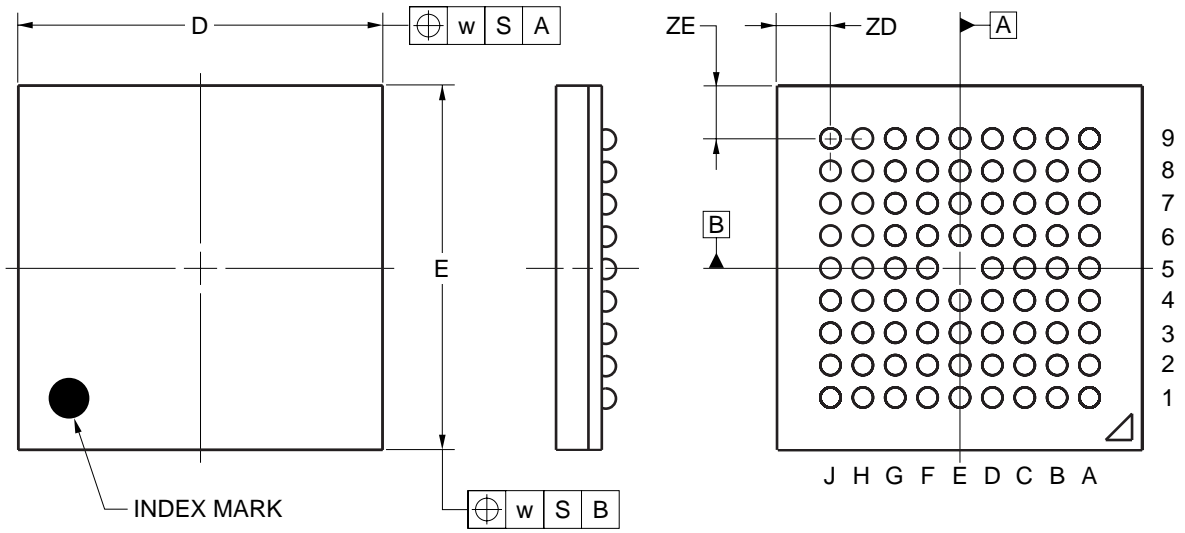
7.8.1 61-pin FPBGA



ITEM	MILLIMETERS
D	6.00±0.10
E	6.00±0.10
w	0.15
A	1.43±0.10
A1	0.30±0.05
A2	1.13
e	0.65
SD	0.325
SE	0.325
b	0.40±0.05
x	0.08
y	0.10
y1	0.20
ZD	0.725
ZE	0.725

P61F1-65-BA1

7.8.2 80-pin FPBGA

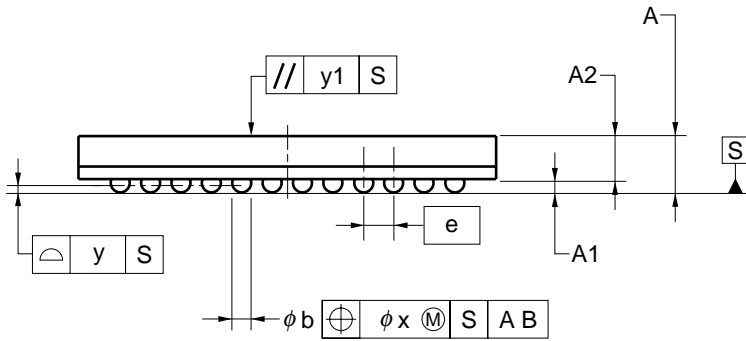
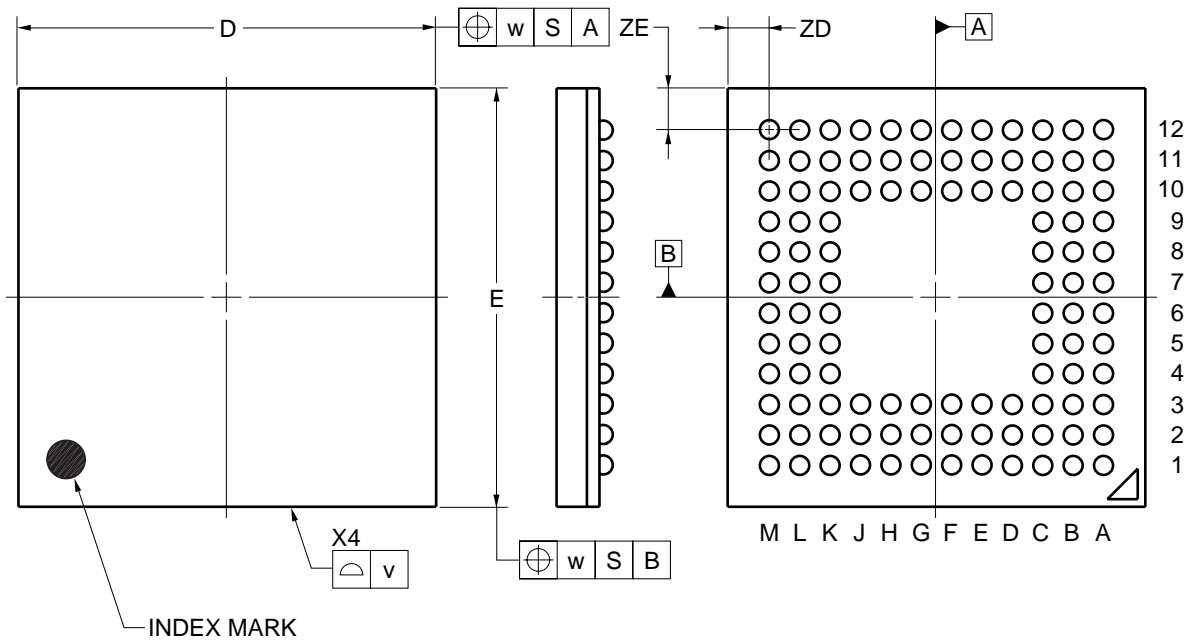


(UNIT:mm)

ITEM	DIMENSIONS
D	9.00±0.10
E	9.00±0.10
w	0.20
A	1.48±0.10
A1	0.35±0.06
A2	1.13
e	0.80
b	0.50 ^{+0.05} _{-0.10}
x	0.08
y	0.10
y1	0.20
ZD	1.30
ZE	1.30

P80F1-80-CN4

7.8.3 108-pin FPBGA

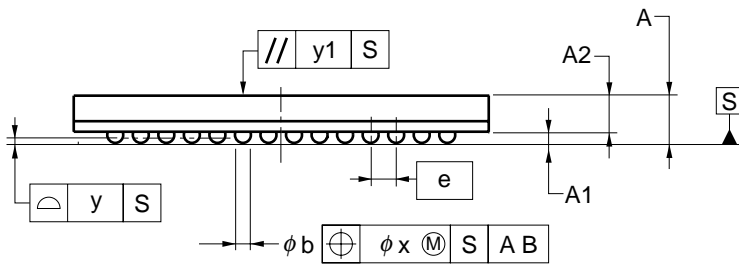
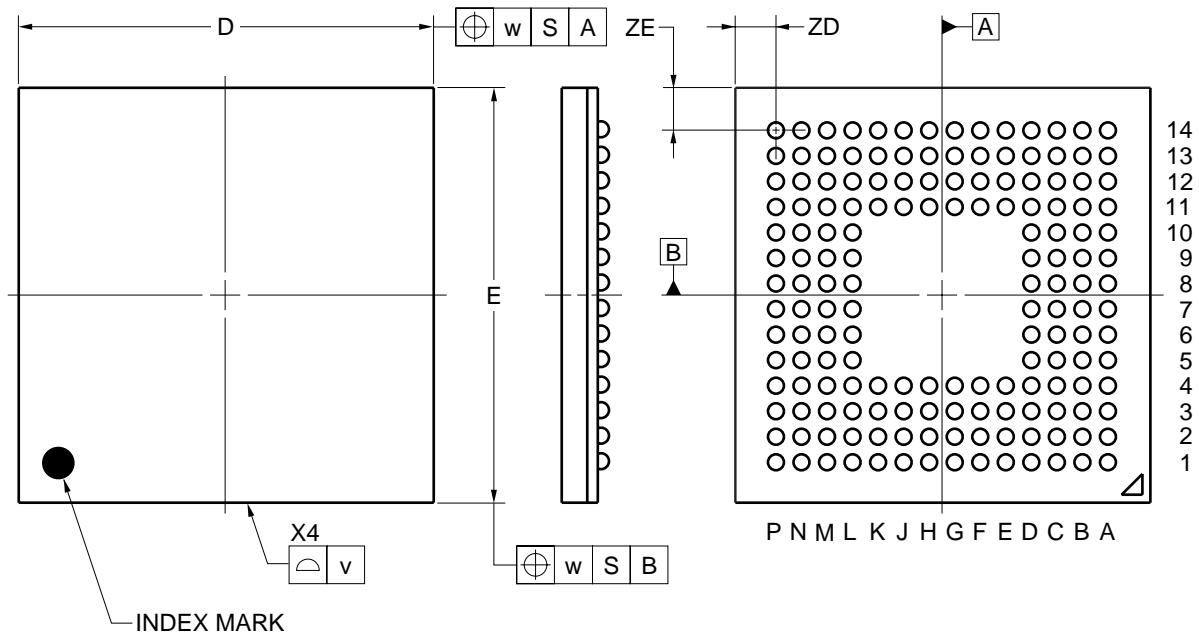


(UNIT:mm)

ITEM	DIMENSIONS
D	11.00±0.10
E	11.00±0.10
v	0.15
w	0.20
A	1.48±0.10
A1	0.35±0.06
A2	1.13
e	0.80
b	0.50 ^{+0.05} _{-0.10}
x	0.08
y	0.10
y1	0.20
ZD	1.10
ZE	1.10

P108F1-80-DN3

7.8.5 160-pin FPBGA

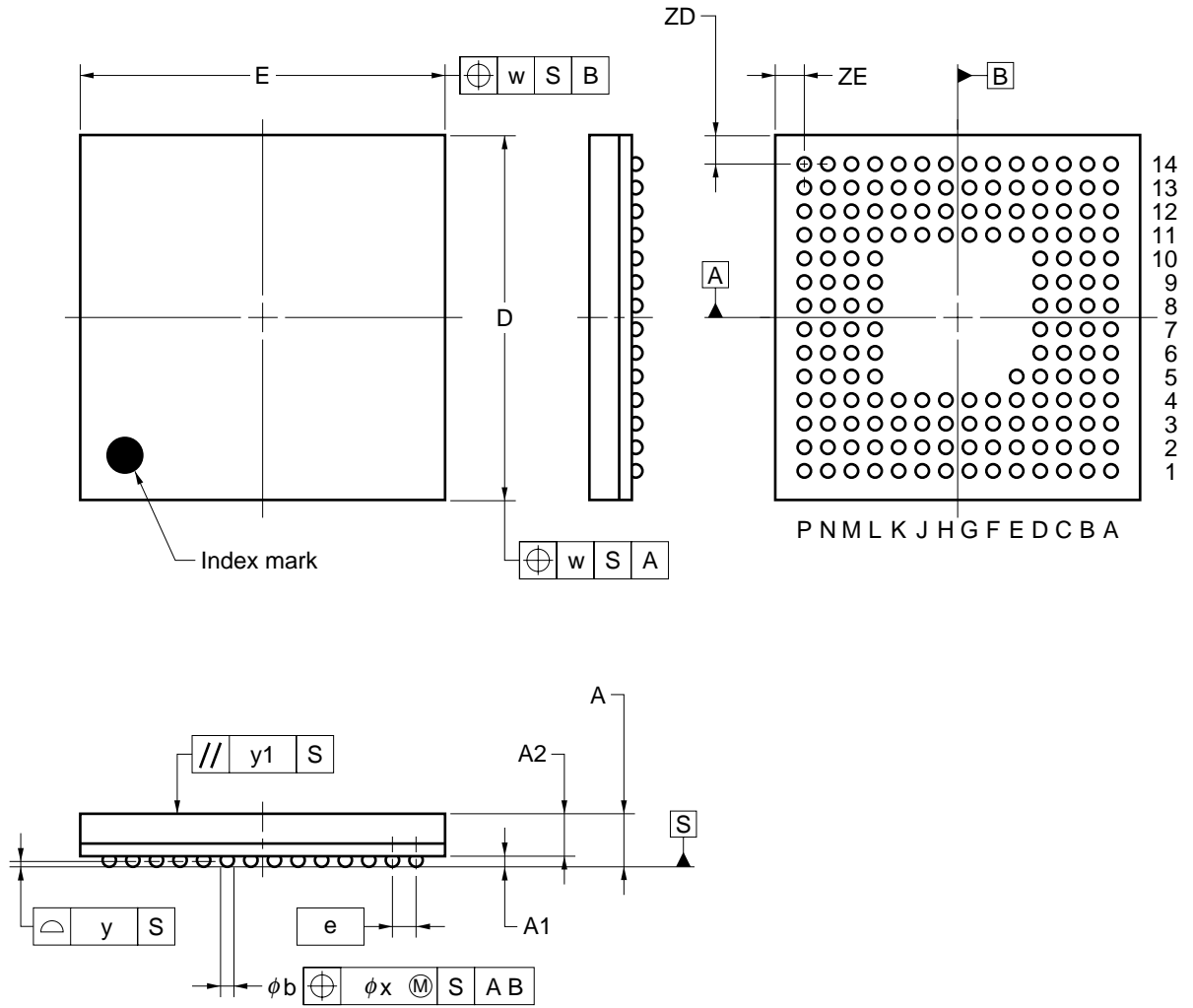


(UNIT:mm)

ITEM	DIMENSIONS
D	13.00±0.10
E	13.00±0.10
v	0.15
w	0.20
A	1.48±0.10
A1	0.35±0.06
A2	1.13
e	0.80
b	0.50 ^{+0.05} _{-0.10}
x	0.08
y	0.10
y1	0.20
ZD	1.30
ZE	1.30

P160F1-80-EN9

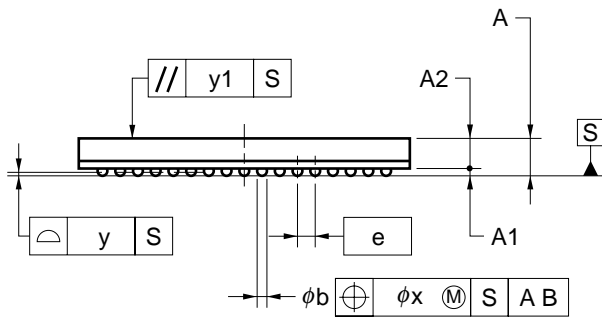
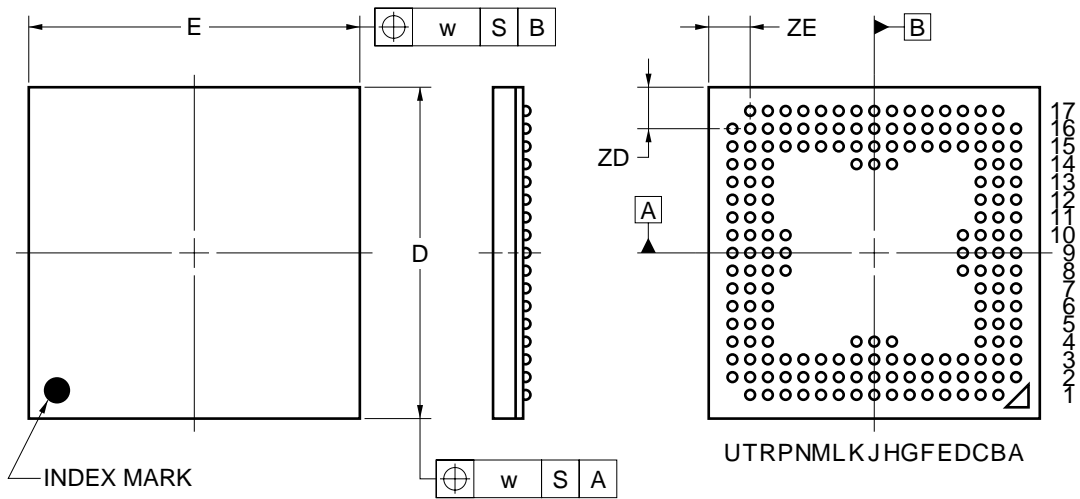
7.8.6 161-pin FPBGA



ITEM	MILLIMETERS
D	10.00±0.10
E	10.00±0.10
w	0.20
A	1.43±0.10
A1	0.30±0.05
A2	1.13
e	0.65
b	0.40±0.05
x	0.08
y	0.10
y1	0.20
ZD	0.775
ZE	0.775

P161F1-65-DA1

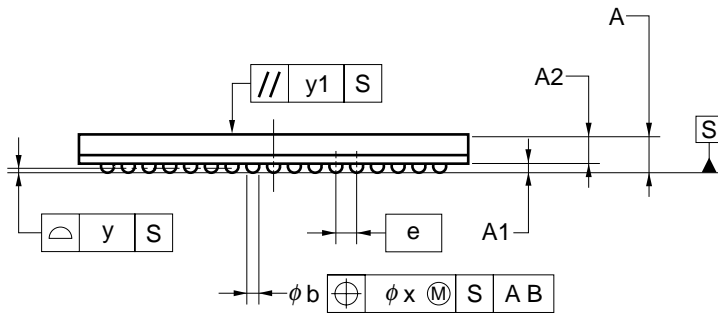
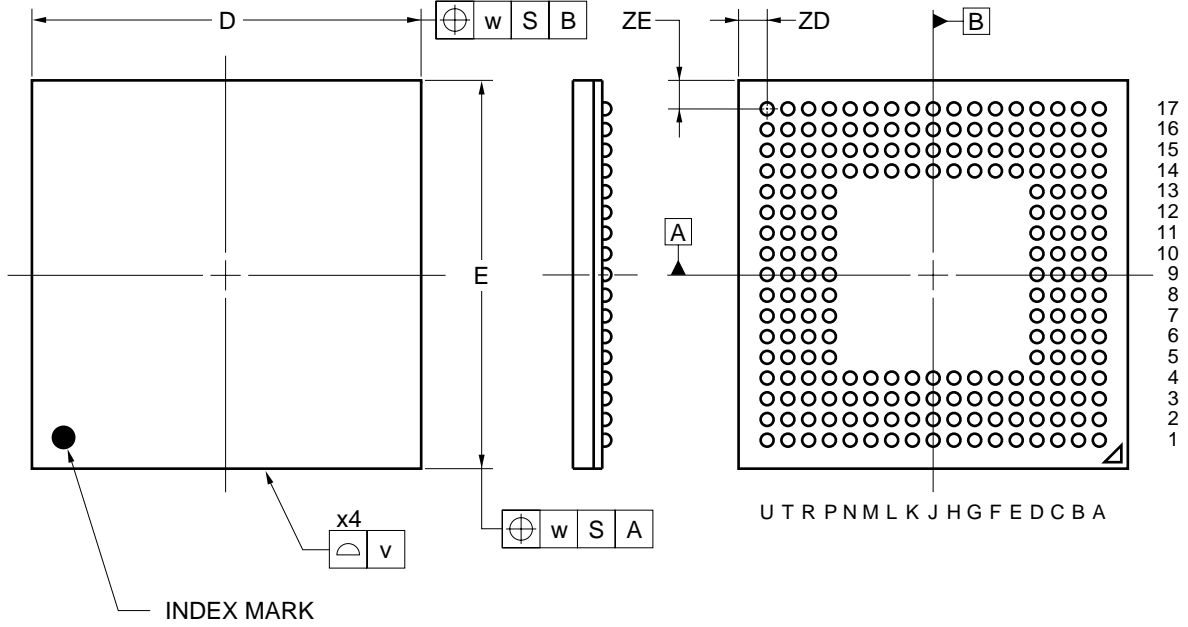
7.8.7 176-pin FPBGA



ITEM	MILLIMETERS
D	15.00±0.10
E	15.00±0.10
w	0.20
A	1.48±0.10
A1	0.35±0.06
A2	1.13
e	0.80
b	0.50 ^{+0.05} _{-0.10}
x	0.08
y	0.10
y1	0.20
ZD	1.10
ZE	1.10

P176F1-80-FN1

7.8.8 208-pin FPBGA

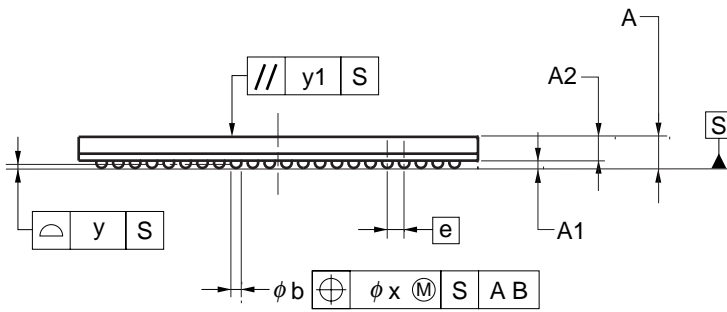
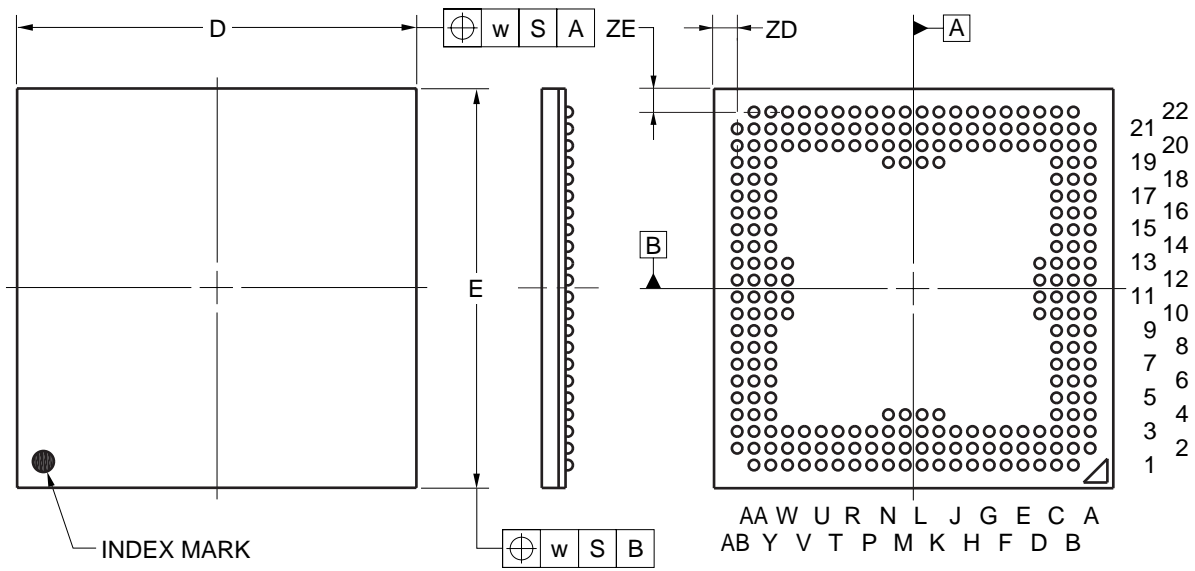


(UNIT:mm)

ITEM	DIMENSIONS
D	15.00±0.10
E	15.00±0.10
v	0.15
w	0.20
A	1.48±0.10
A1	0.35±0.06
A2	1.13
e	0.80
b	0.50 ^{+0.05} _{-0.10}
x	0.08
y	0.10
y1	0.20
ZD	1.10
ZE	1.10

P208F1-80-FN3

★ 7.8.9 240-pin FPBGA

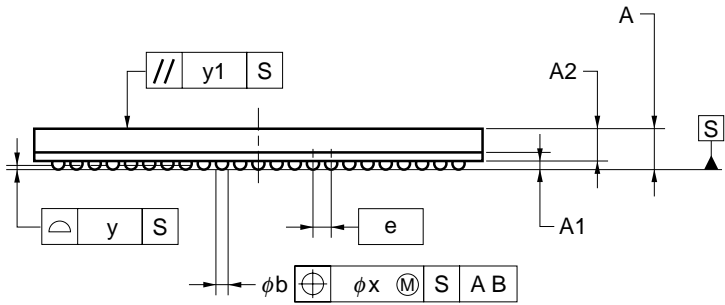
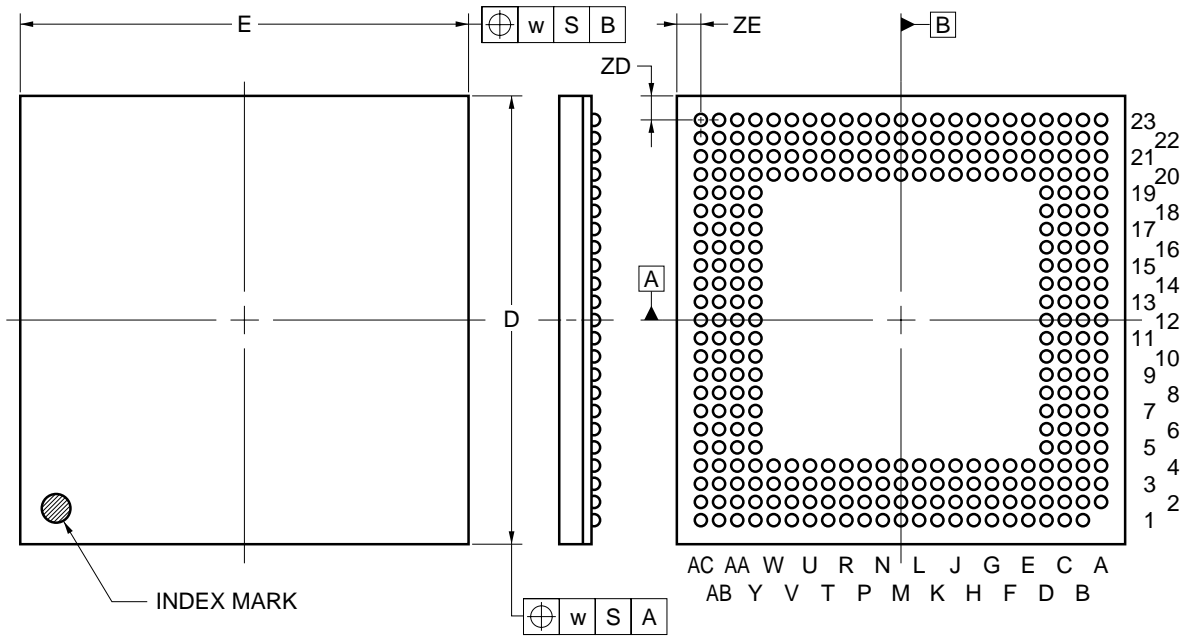


(UNIT:mm)

ITEM	DIMENSIONS
D	19.00±0.10
E	19.00±0.10
w	0.20
e	0.80
A	1.48±0.10
A1	0.35±0.06
A2	1.13
b	0.50 ^{+0.05} _{-0.10}
x	0.08
y	0.10
y1	0.20
ZD	1.10
ZE	1.10

P240F1-80-HN3

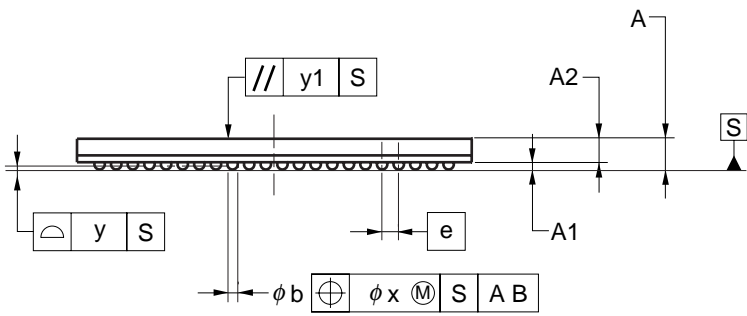
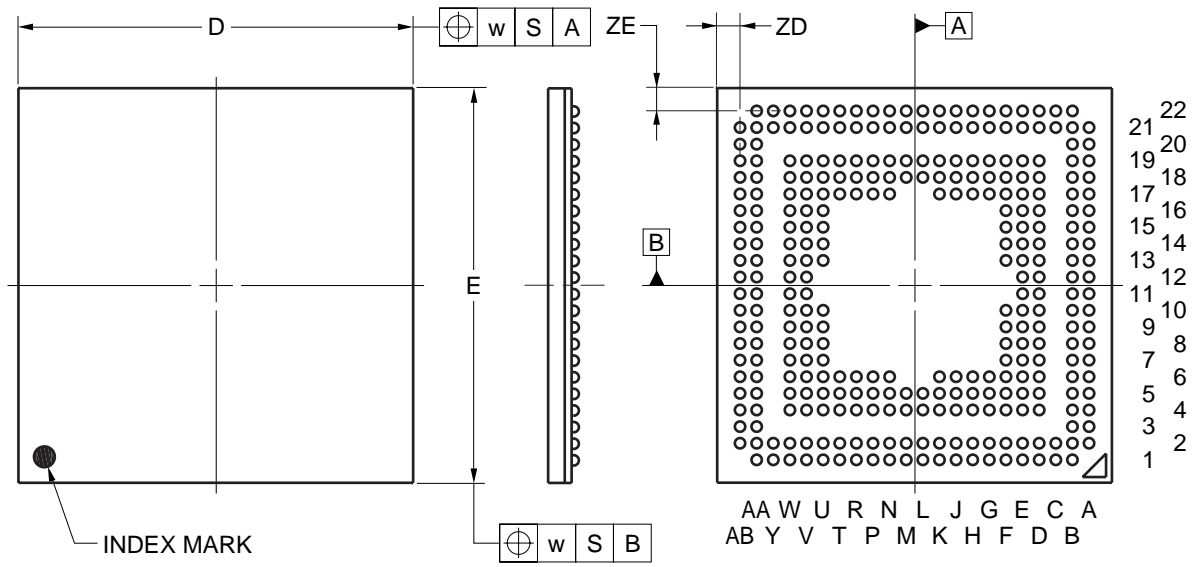
7.8.10 303-pin FPBGA



ITEM	MILLIMETERS
D	16.00±0.10
E	16.00±0.10
w	0.20
A	1.43±0.10
A1	0.30±0.05
A2	1.13
e	0.65
b	0.40±0.05
x	0.08
y	0.10
y1	0.20
ZD	0.85
ZE	0.85

P303F1-65-GA4

★ 7.8.11 304-pin FPBGA

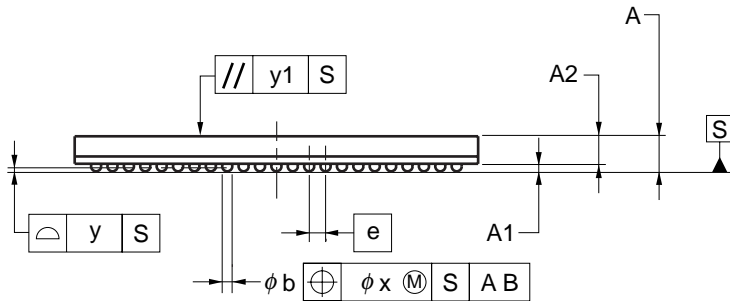
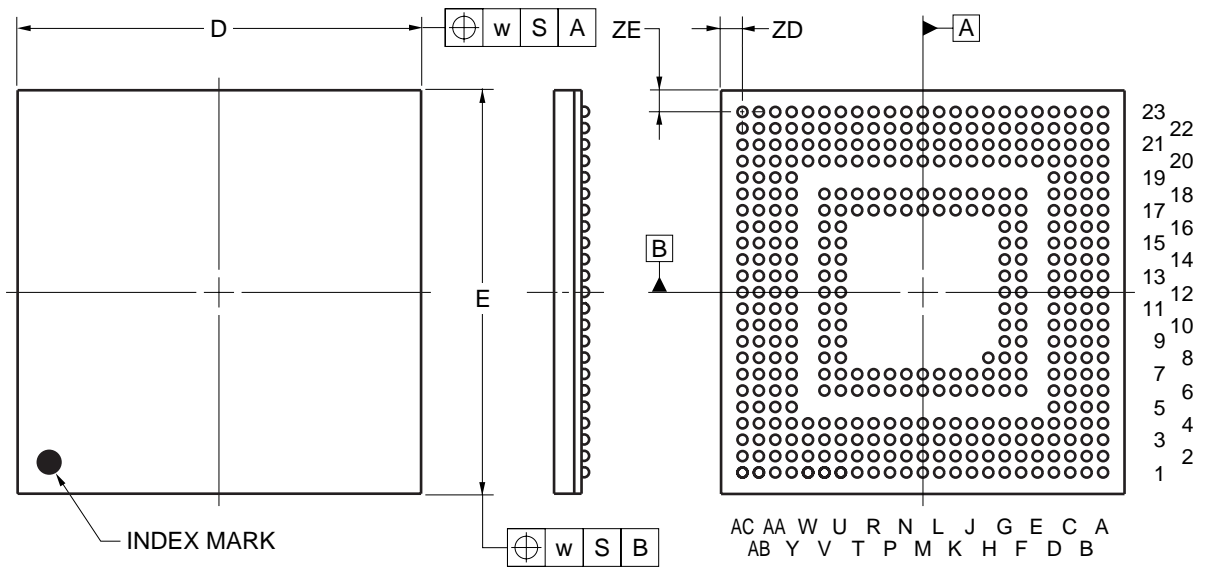


(UNIT:mm)

ITEM	DIMENSIONS
D	19.00±0.10
E	19.00±0.10
w	0.20
e	0.80
A	1.48±0.10
A1	0.35±0.06
A2	1.13
b	0.50 ^{+0.05} _{-0.10}
x	0.08
y	0.10
y1	0.20
ZD	1.10
ZE	1.10

P304F1-80-HN2

7.8.12 393-pin FPBGA



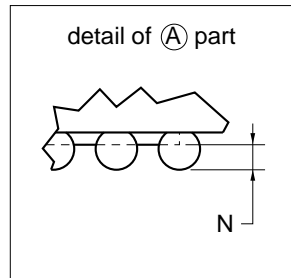
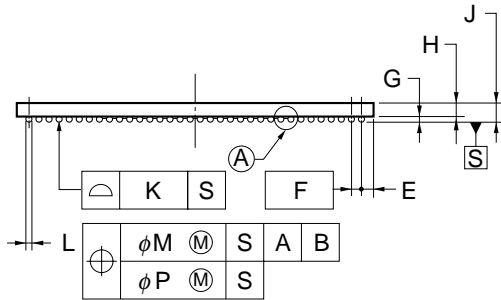
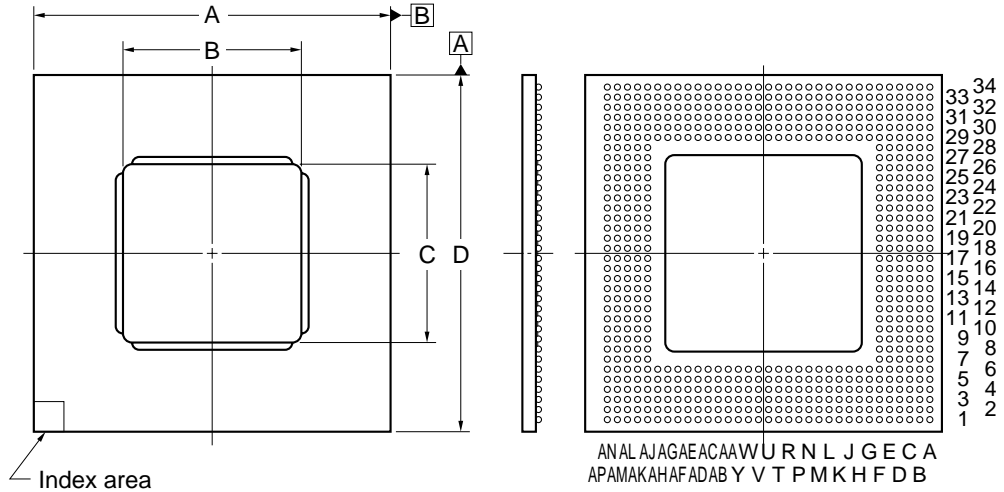
(UNIT:mm)

ITEM	DIMENSIONS
D	16.00±0.10
E	16.00±0.10
w	0.20
A	1.39±0.10
A1	0.30±0.05
A2	1.09
e	0.65
b	0.40±0.05
x	0.08
y	0.10
y1	0.20
ZD	0.85
ZE	0.85

P393F1-65-GA7

7.9 ABGA

7.9.1 672-pin ABGA

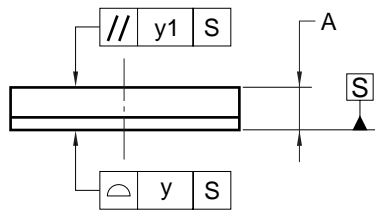
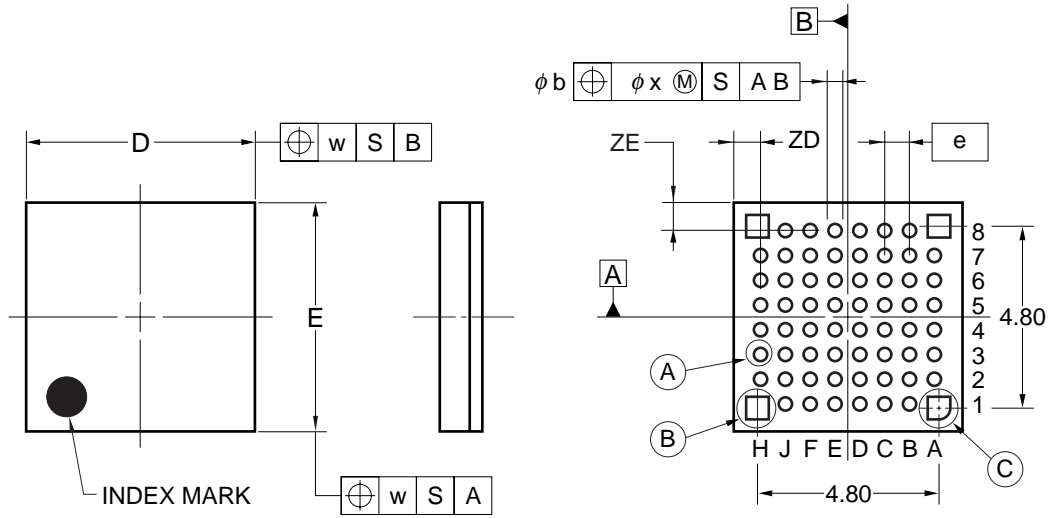


ITEM	MILLIMETERS
A	45.00±0.20
B	22.5
C	22.5
D	45.00±0.20
E	1.545
F	1.27 (T.P.)
G	0.60±0.10
H	1.88
J	2.48±0.30
K	0.15
L	φ0.75±0.15
M	0.30
N	0.25 MIN.
P	0.10

S672S2-127-K6-3

7.10 FPLGA

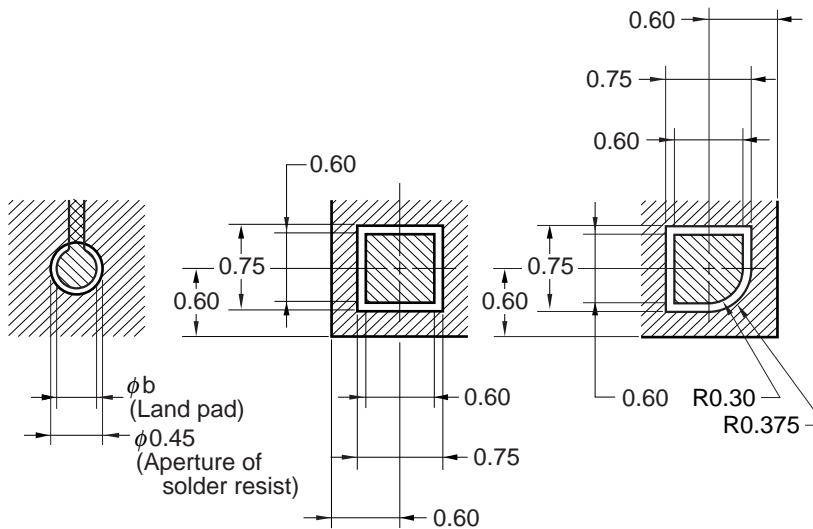
7.10.1 64-pin FPLGA



DETAIL OF (A) PART

DETAIL OF (B) PART

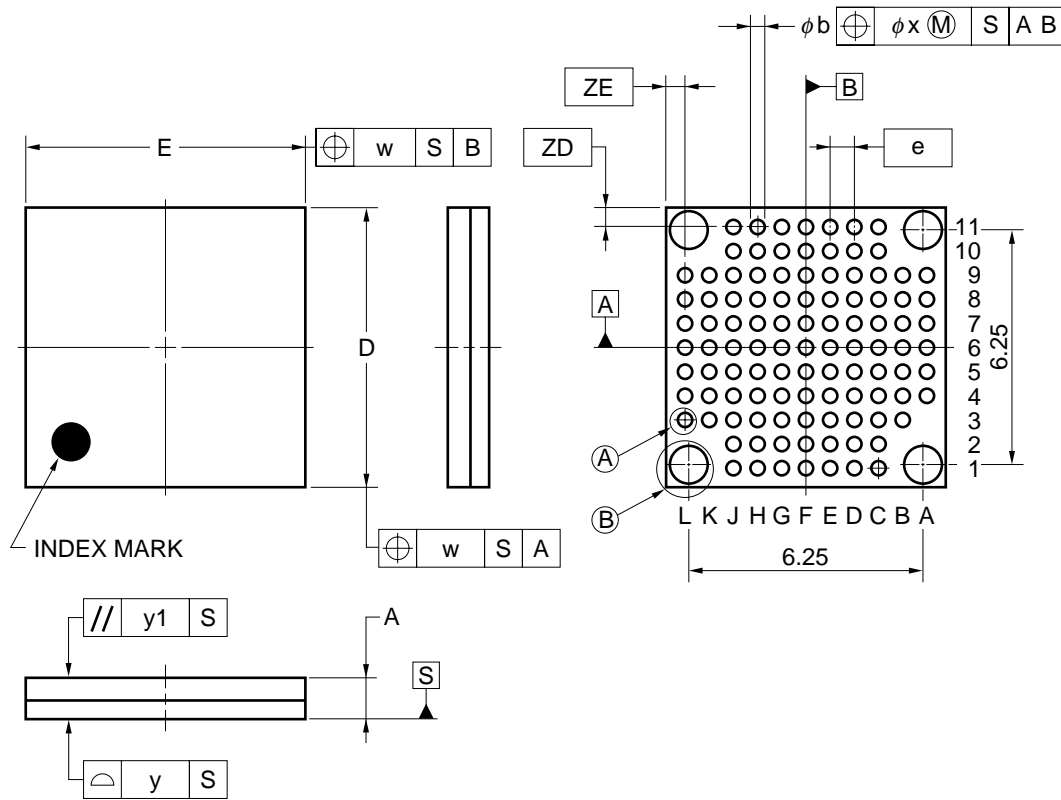
DETAIL OF (C) PART



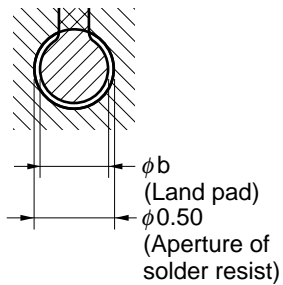
(UNIT:mm)

ITEM	DIMENSIONS
D	6.00±0.075
E	6.00±0.075
w	0.15
e	0.65
A	1.13±0.07
b	0.35±0.05
x	0.08
y	0.10
y1	0.20
ZD	0.725
ZE	0.725
P64FC-65-BA1	

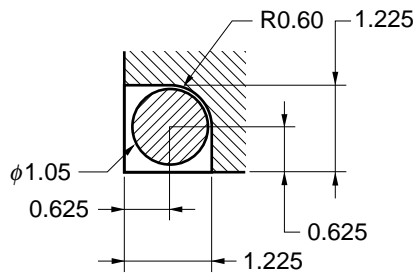
7.10.2 108-pin FPLGA



Detail of A part



Detail of B part

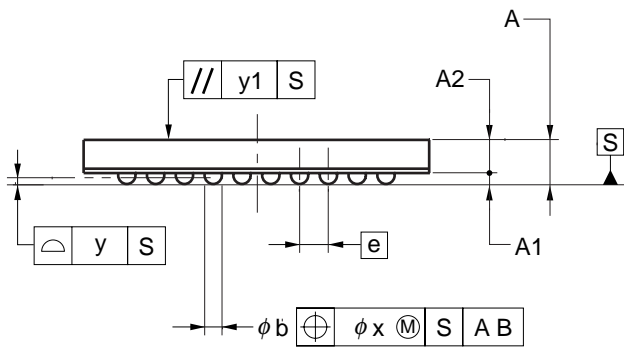
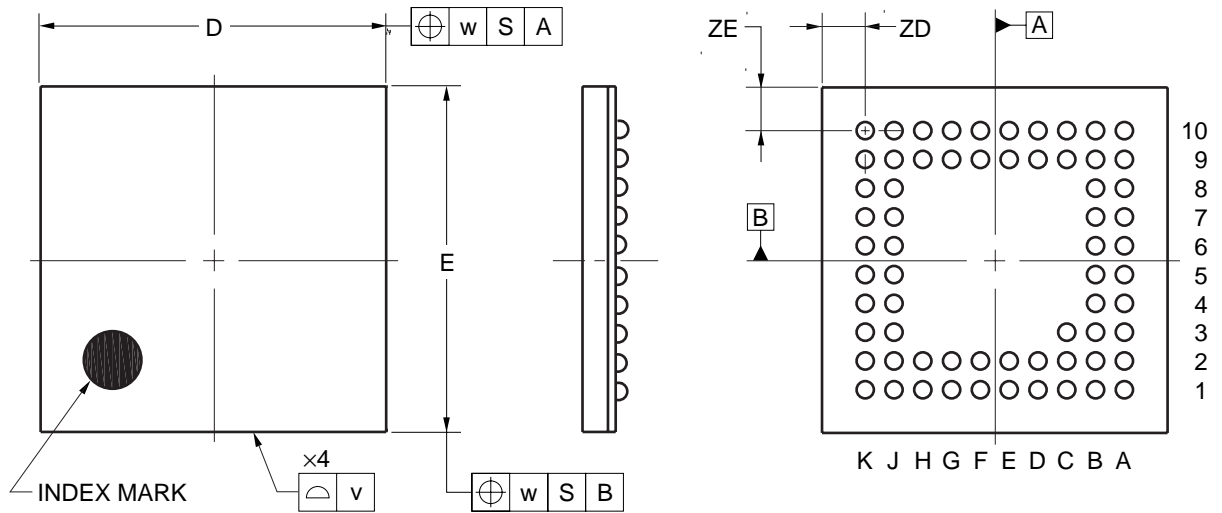


ITEM	MILLIMETERS
D	7.50±0.10
E	7.50±0.10
w	0.20
e	0.65
A	1.13±0.07
b	0.40±0.05
x	0.08
y	0.10
y1	0.20
ZD	0.50
ZE	0.50

P108FC-65-CA1

★ 7.11 TFPBGA

7.11.1 65-pin TFPBGA



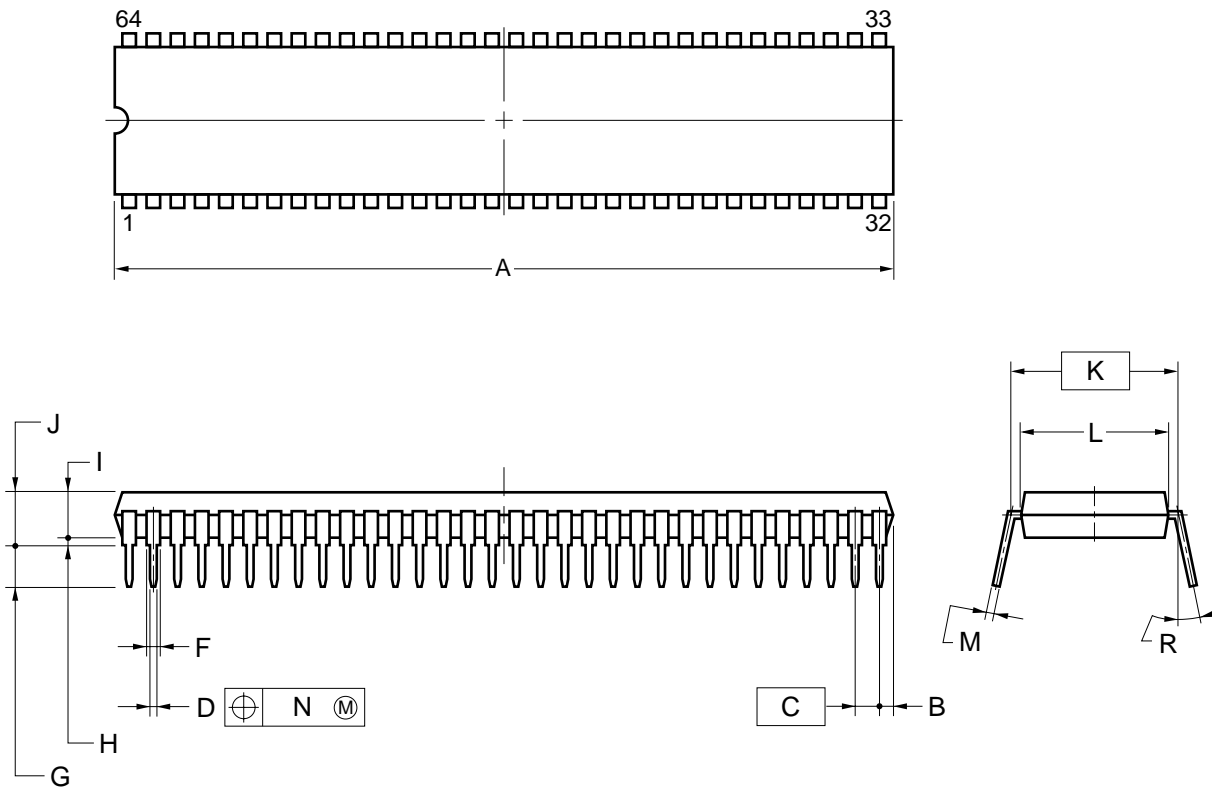
(UNIT:mm)

ITEM	DIMENSIONS
D	6.00±0.10
E	6.00±0.10
v	0.15
w	0.20
e	0.50
A	0.83±0.10
A1	0.18±0.05
A2	0.65
b	0.32±0.05
x	0.05
y	0.08
y1	0.20
ZD	0.75
ZE	0.75

P65F9-50-BA1-1

7.12 SDIP

7.12.1 64-pin SDIP



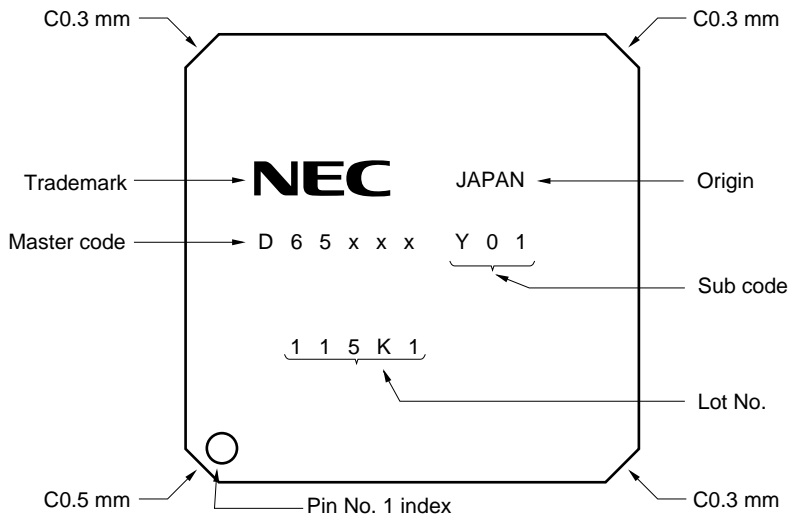
NOTES

1. Each lead centerline is located within 0.17 mm of its true position (T.P.) at maximum material condition.
2. Item "K" to center of leads when formed parallel.

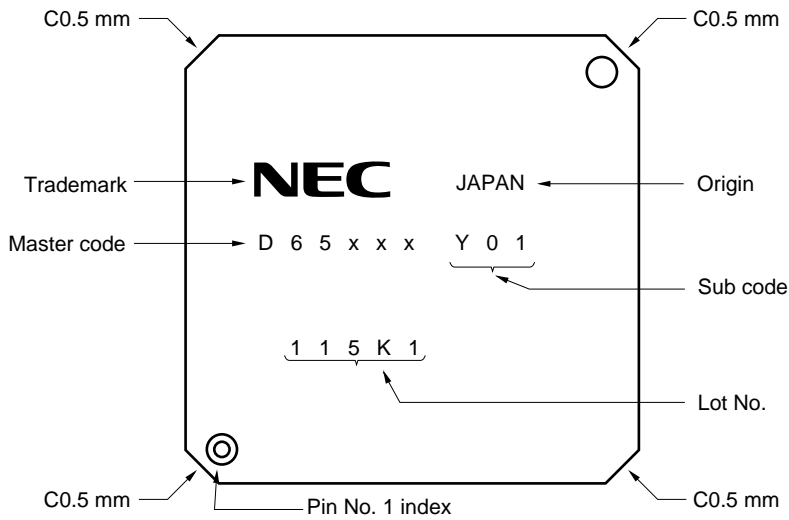
ITEM	MILLIMETERS
A	58.0 ^{+0.68} _{-0.20}
B	1.78 MAX.
C	1.778 (T.P.)
D	0.50±0.10
F	0.9 MIN.
G	3.2±0.3
H	0.51 MIN.
I	4.05 ^{+0.26} _{-0.20}
J	5.08 MAX.
K	19.05 (T.P.)
L	17.0±0.2
M	0.25 ^{+0.10} _{-0.05}
N	0.17
R	0 ~ 15°

P64C-70-750A,C-4

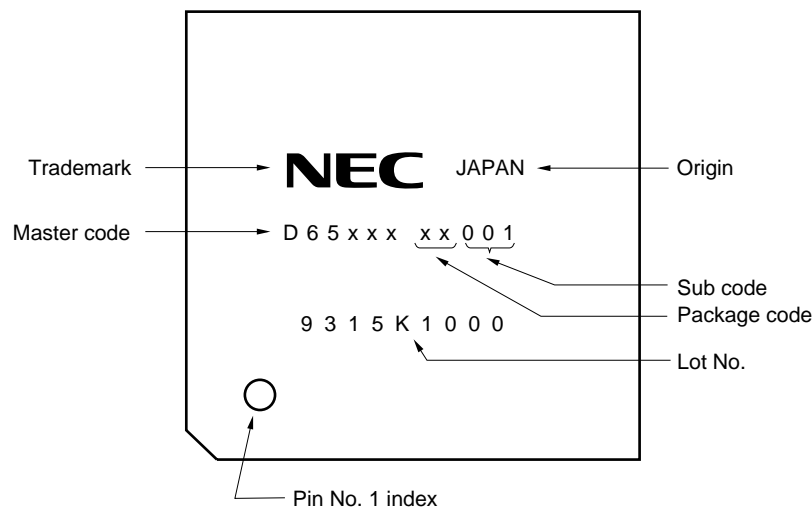
Figure 8-2. Examples of Markings on TQFP (Fine Pitch) Packages (1/2)



<Line 2>
48-pin TQFP (fine pitch) ES, CS



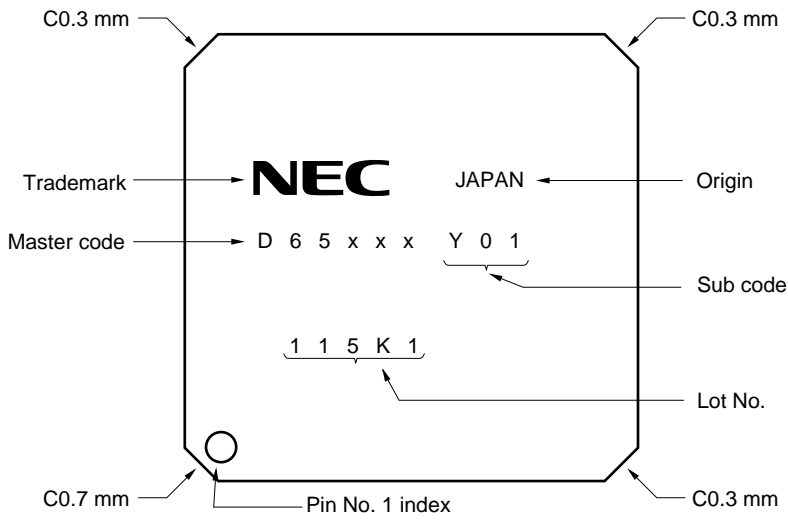
<Line 2>
48-pin TQFP (fine pitch) MP



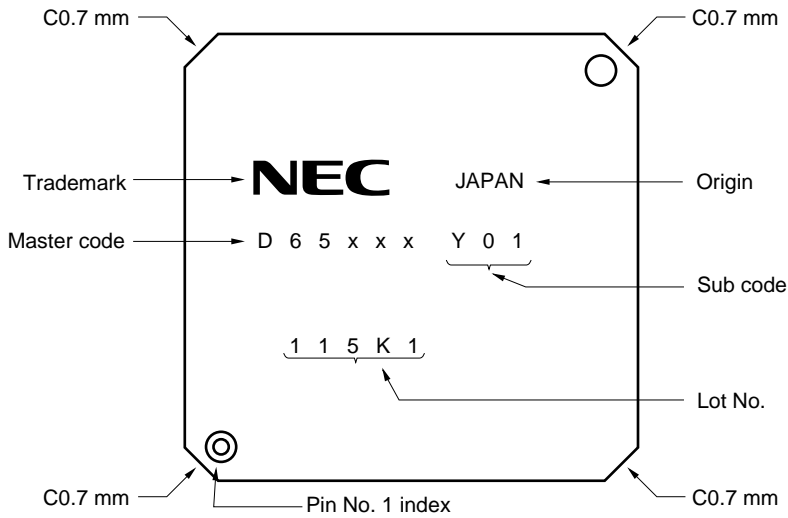
48-pin TQFP (fine pitch)
64-pin TQFP (fine pitch)
80-pin TQFP (fine pitch)

Remark ES: Engineering Sample, CS: Commercial Sample, MP: Mass Production

Figure 8-2. Examples of Markings on TQFP (Fine Pitch) Packages (2/2)



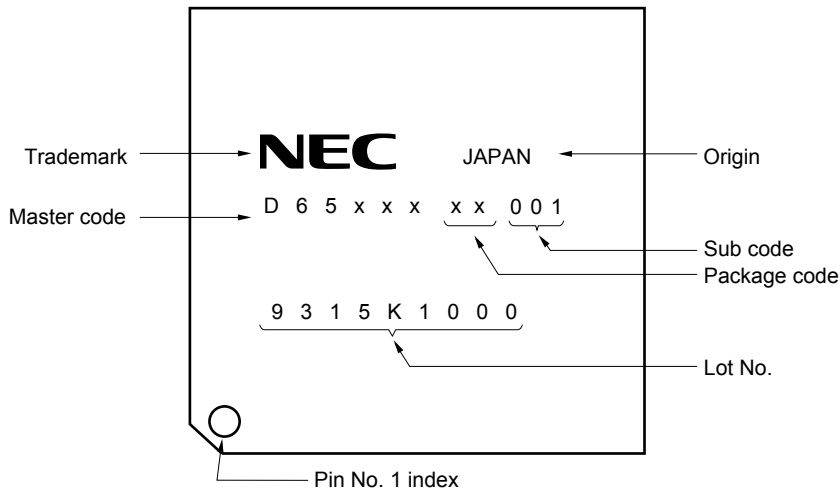
<Line 2>
64-pin TQFP (fine pitch) ES, CS



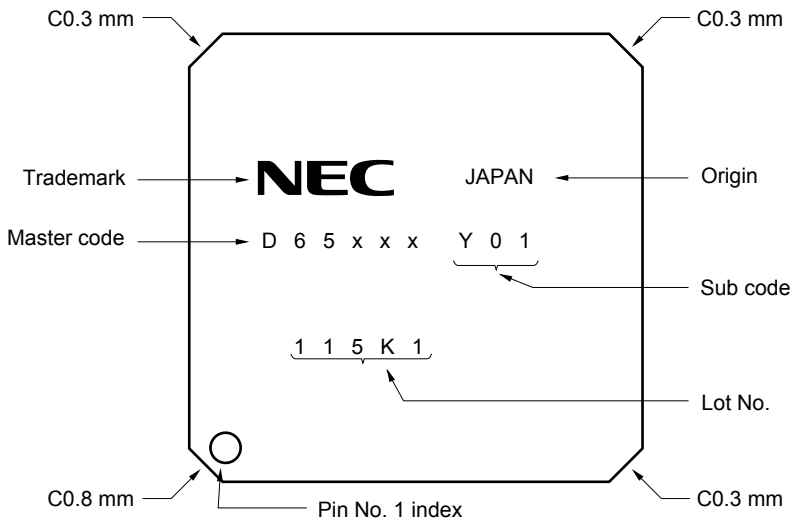
<Line 2>
64-pin TQFP (fine pitch) MP

Remark ES: Engineering Sample, CS: Commercial Sample, MP: Mass Production

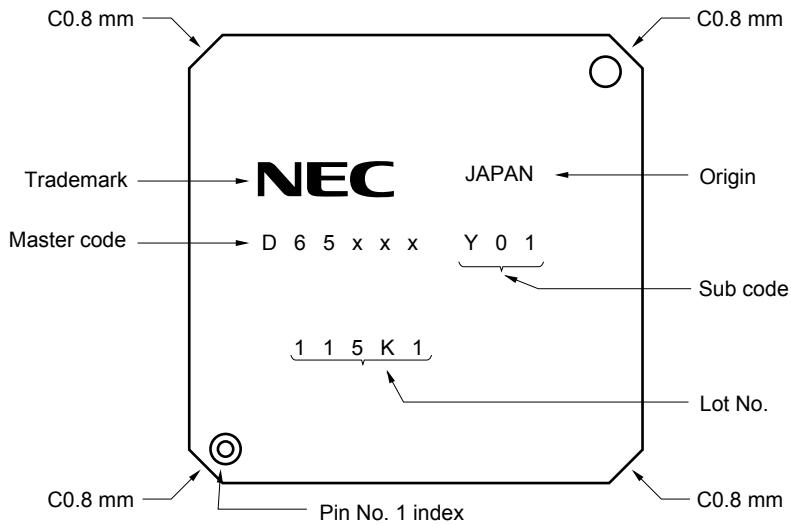
Figure 8-3. Examples of Markings on TQFP (Fine Pitch) and LQFP (Fine Pitch) Packages



100-pin TQFP (fine pitch)
 120-pin TQFP (fine pitch)
 144-pin LQFP (fine pitch)
 160-pin LQFP (fine pitch)
 176-pin LQFP (fine pitch)



<Line 2>
 100-pin TQFP (fine pitch) ES, CS



<Line 2>
 100-pin TQFP (fine pitch) MP

Remark ES: Engineering Sample, CS: Commercial Sample, MP: Mass Production

Figure 8-4. Examples of Markings on TBGA Packages

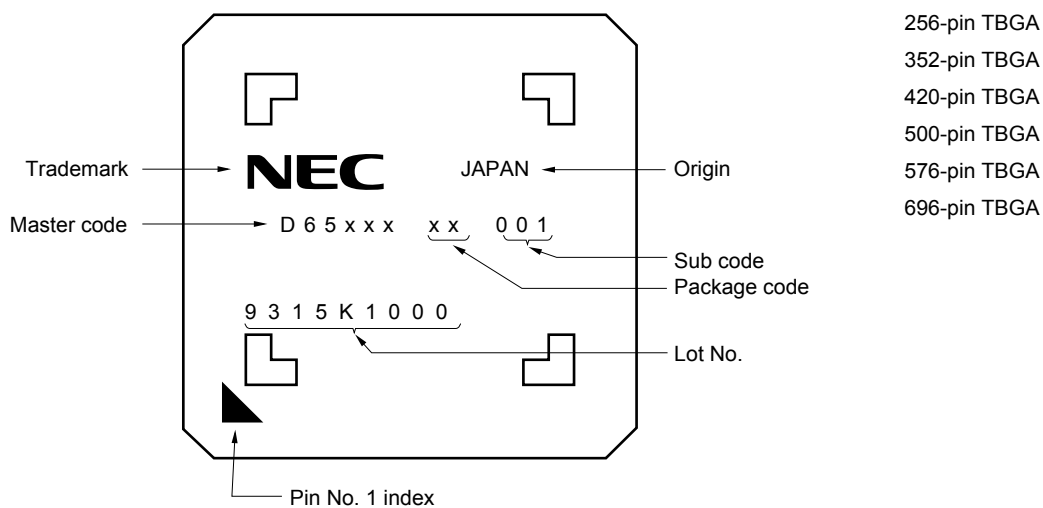


Figure 8-5. Examples of Markings on PBGA Packages

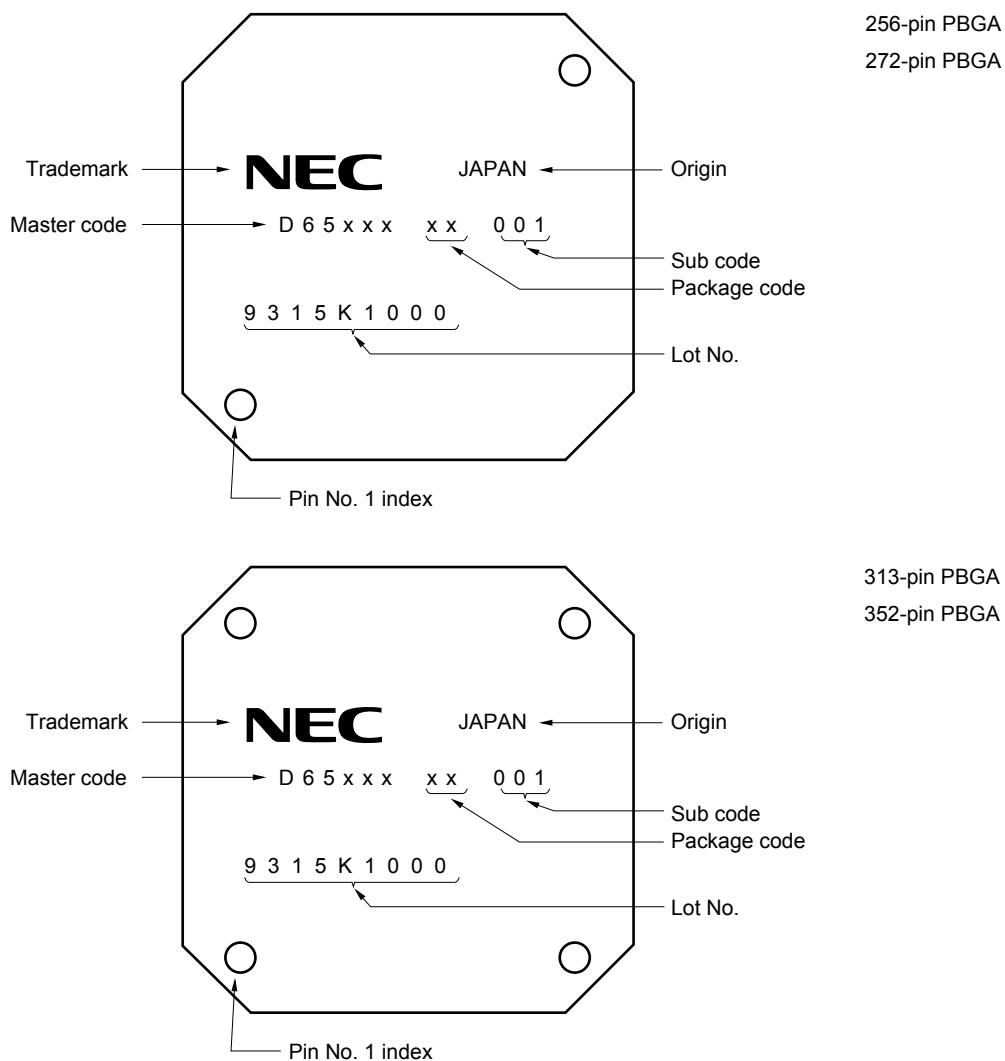
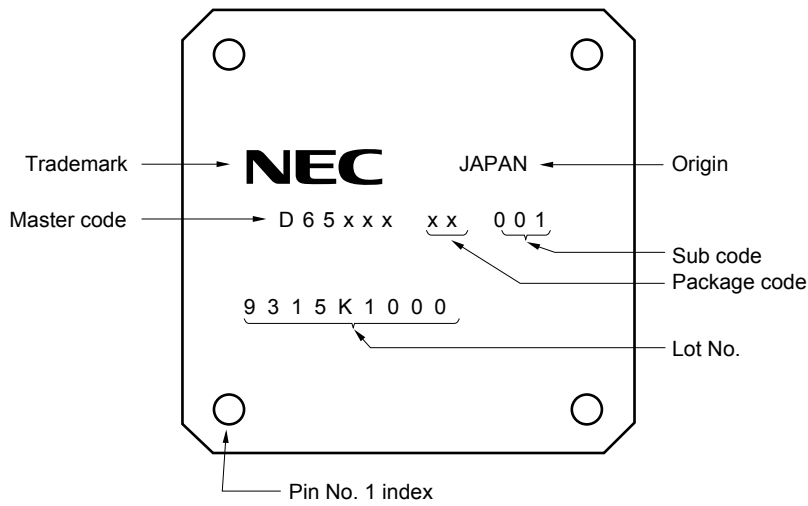


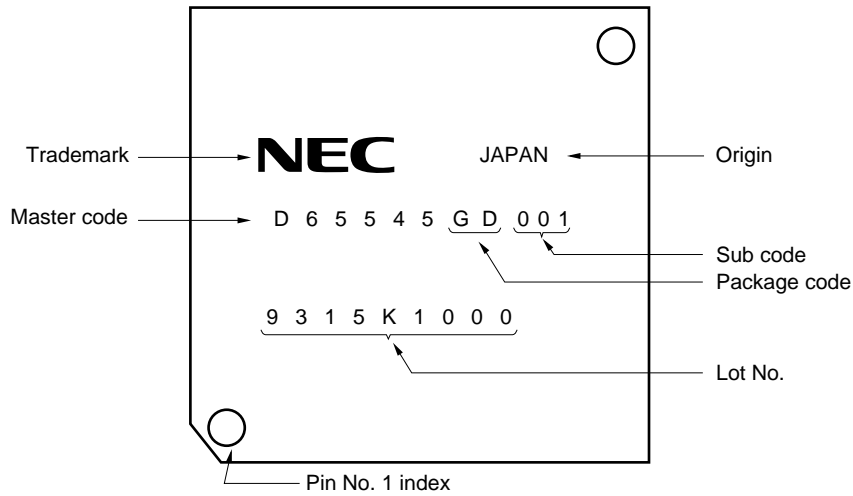
Figure 8-6. Examples of Markings on FPBGA Packages



- 108-pin FPBGA
- 144-pin FPBGA
- 160-pin FPBGA
- 176-pin FPBGA
- 208-pin FPBGA
- 304-pin FPBGA

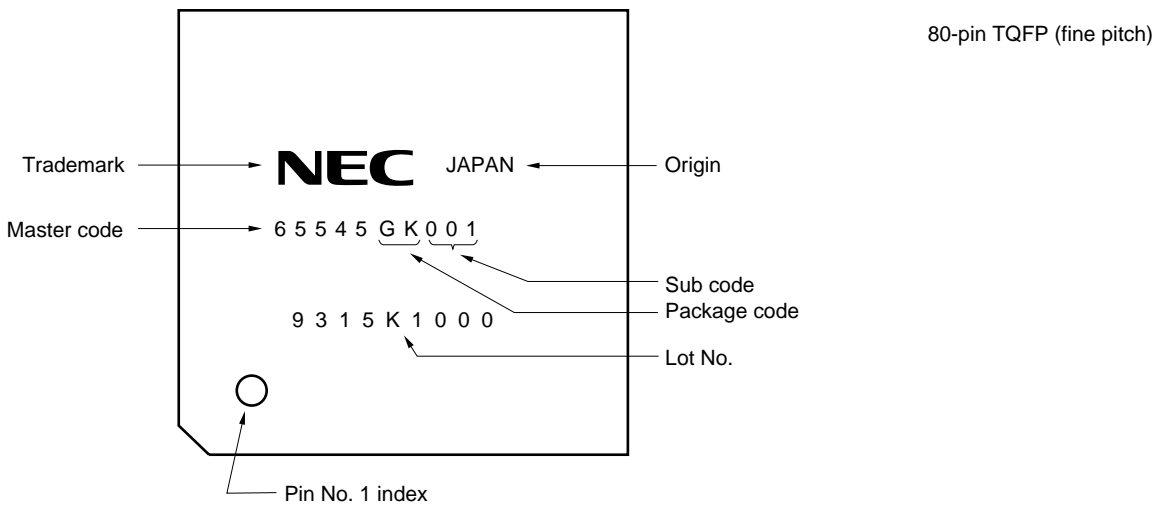
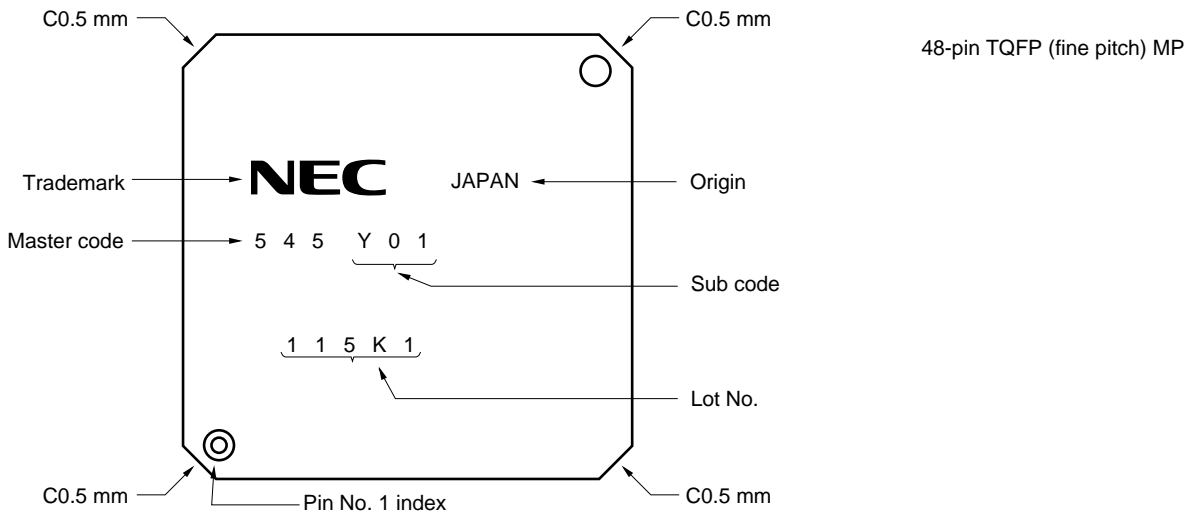
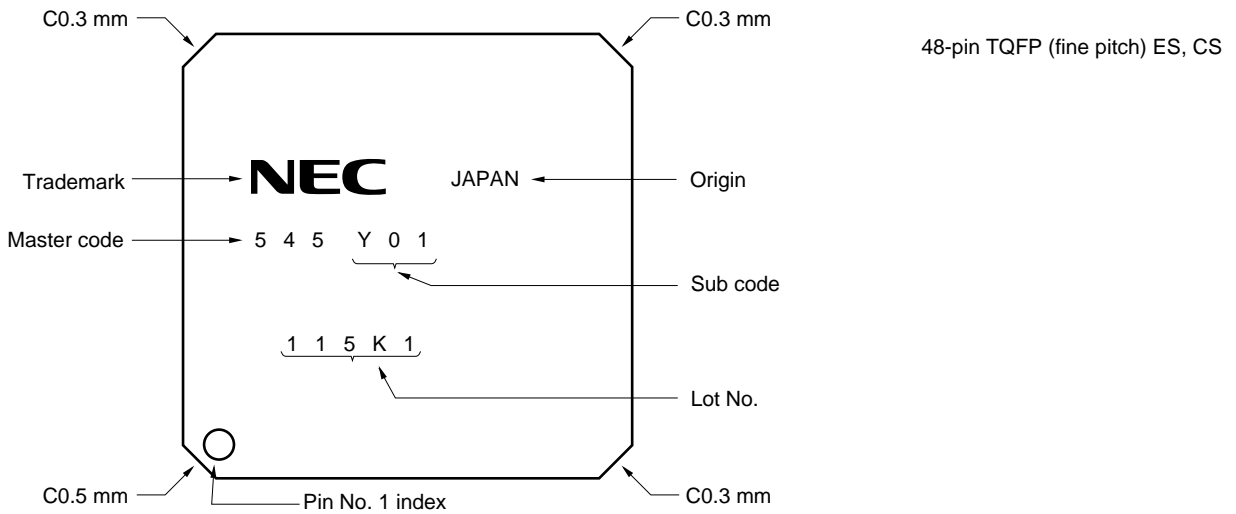
8.2 CMOS-10HD Series

Figure 8-7. Examples of Markings on QFP (Fine Pitch) Packages



- 144-pin QFP (fine pitch)
- 160-pin QFP (fine pitch)
- 208-pin QFP (fine pitch)
- 240-pin QFP (fine pitch)
- 304-pin QFP (fine pitch)

Figure 8-8. Examples of Markings on TQFP (Fine Pitch) Packages



Remark ES: Engineering Sample, CS: Commercial Sample, MP: Mass Production

Figure 8-9. Examples of Marking on TQFP (Fine Pitch) and LQFP (Fine Pitch) Packages

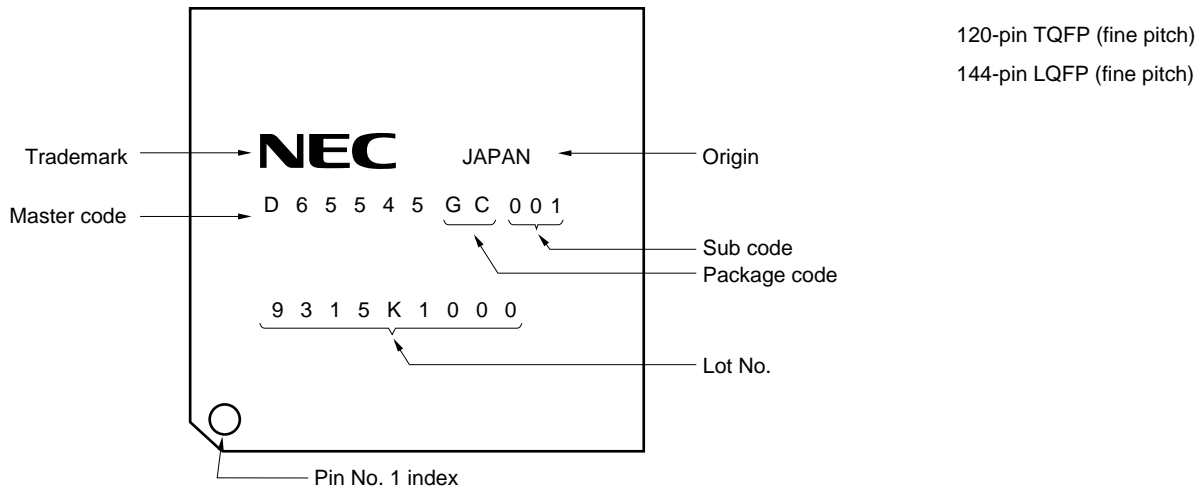


Figure 8-10. Examples of Marking on TBGA Packages

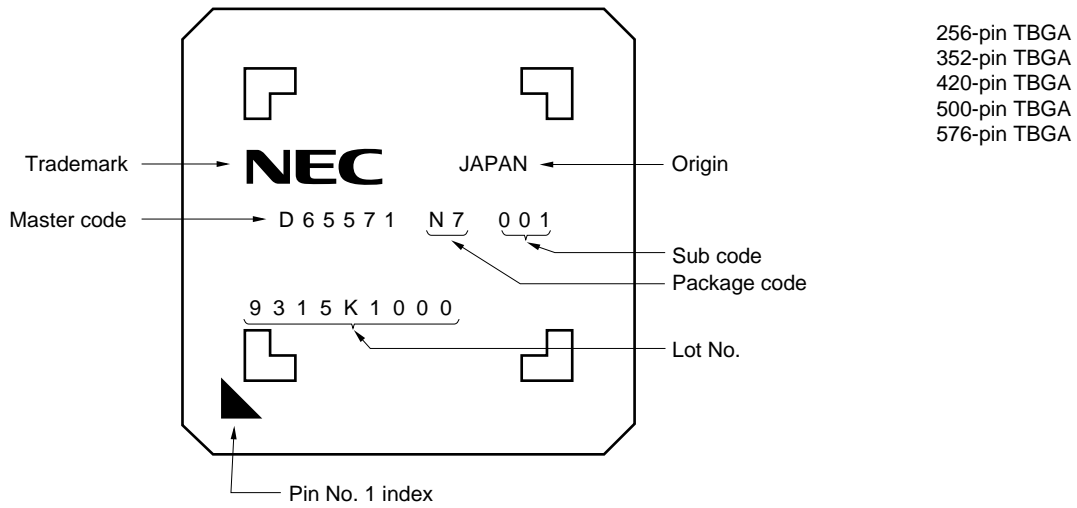


Figure 8-11. Examples of Markings on PBGA Packages

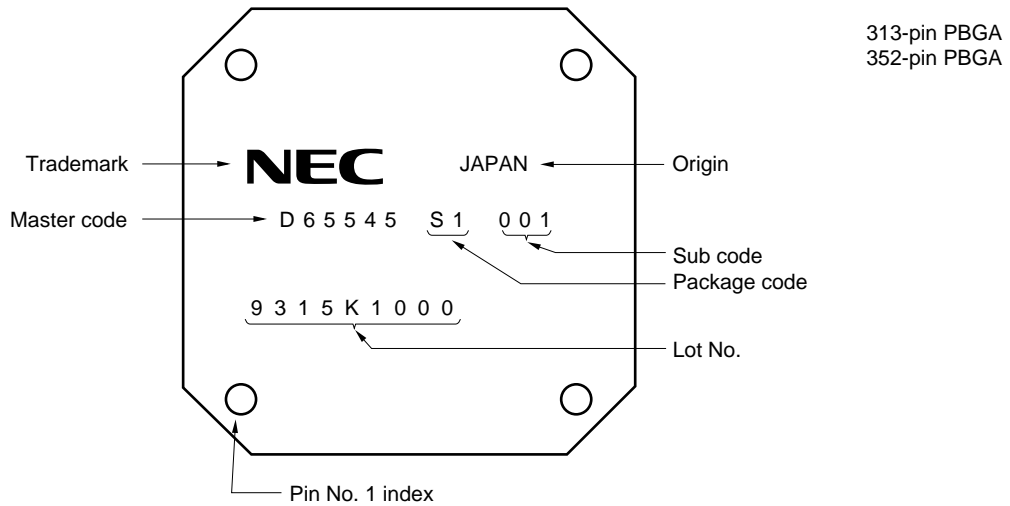
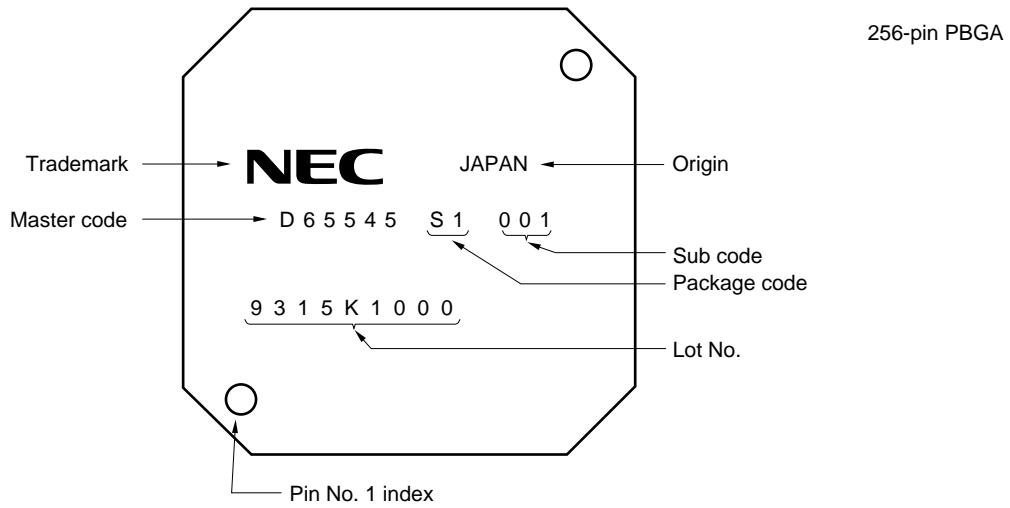
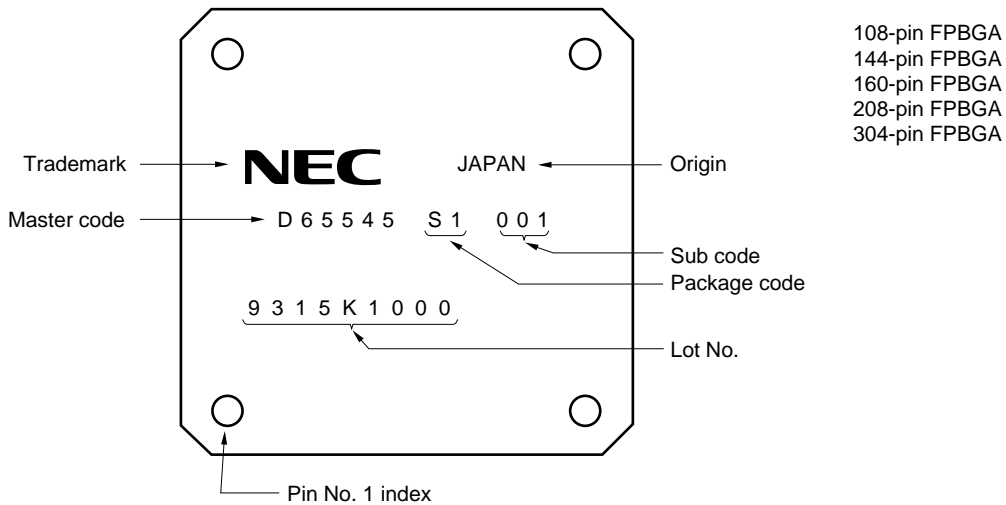


Figure 8-12. Examples of Marking on FPBGA Packages



CHAPTER 9 MOUNTING RANK (RECOMMENDED SOLDERING CONDITIONS)

This product should be soldered and mounted under the following recommended conditions.

For soldering methods and conditions other than those recommended below, contact your NEC Electronics sales representative.

For the details of the recommended soldering conditions, refer to the below.

Semiconductor Device Mounting Technology Manual (<http://www.necel.com/pkg/en/mount/index.html>)

Caution Depending on the combination of master and package, some packages may not yet be available. Be sure to confirm with NEC Electronics that the desired package has been released. Also contact NEC Electronics if the desired package does not appear in the Package column.

9.1 Standard (Leaded) Packages

9.1.1 CMOS-N5 Series

★ **Table 9-1. CMOS-N5 Series Recommended Soldering Conditions (1/2)**

Package	Number of Pins	μ PD65891	μ PD65880	μ PD65881	μ PD65892	μ PD65882	μ PD65894	μ PD65883
SSOP	20	IR35-00-3 VP15-00-3	IR35-00-3 VP15-00-3	IR35-00-3 VP15-00-3	–	–	–	–
	30	IR35-00-3 VP15-00-3	IR35-00-3 VP15-00-3	IR35-00-3 VP15-00-3	–	–	–	–
QFP	44 ^{Note 1}	IR35-207-1 VP15-207-1	IR30-00-3 VP15-00-3	–	–	–	–	–
	52	–	–	–	–	–	–	IR35-207-2 VP15-207-2
	100 ^{Note 2, Note 3}	–	–	–	–	IR35-207-3 VP15-207-3	–	–
QFP (fine pitch)	160	–	–	–	–	–	–	–
	208	–	–	–	–	–	–	–
	240	–	–	–	–	–	–	–
	304	–	–	–	–	–	–	–
TQFP ^{Note 1}	48	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	–	IR35-107-2 VP15-107-2	–	–
	64 ^{Note 4}	–	–	IR35-103-2 VP15-103-2	–	IR35-103-2 VP15-103-2	–	IR35-103-2 VP15-103-2
	80	–	–	–	–	IR35-107-2 VP15-107-2	–	IR35-107-2 VP15-107-2
	64	–	–	IR35-107-2 VP15-107-2	–	IR35-107-2 VP15-107-2	–	IR35-107-2 VP15-107-2
LQFP ^{Note 1}	44	–	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	–	IR35-107-2 VP15-107-2	–	IR35-107-2 VP15-107-2
	100	–	–	–	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	–	IR35-107-2 VP15-107-2
	144	–	–	–	–	–	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2
	160	–	–	–	–	–	–	–
SDIP	64	–	–	Note 5	–	–	–	–
FPBGA ^{Note 1}	80	–	–	–	–	IR35-107-3 VP15-107-3	–	–
	108	–	–	–	–	–	–	–
	144	–	–	–	–	–	–	–
	160	–	–	–	–	–	–	–

Notes 1. Line 2

2. Correspondence to the replacement of CMOS-6X, 6S
3. Correspondence to the replacement of CMOS-6, 6A, 6V
4. Low thermal resistance type
5. Mounting by wave soldering method

Remarks 1. Blank: Under development/Under study, –: Cannot be used

2. Refer to the package list of each series (**CHAPTER 1**) for package details.

★ **Table 9-1. CMOS-N5 Series Recommended Soldering Conditions (2/2)**

Package	Number of Pins	μ PD65884	μ PD65885	μ PD65887	μ PD65889	μ PD65890	μ PD65893
QFP (fine pitch)	160	–	IR35-203-1 VP15-203-1	IR35-203-1 VP15-203-1	–	–	–
	208	–	IR35-207-3 VP15-207-3	IR35-207-3 VP15-207-3	IR35-207-3 VP15-207-3	IR35-207-3 VP15-207-3	IR35-207-3 VP15-207-3
	240	–	–	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2
	304	–	–	–	–	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2
TQFP ^{Note}	48	–	–	–	–	–	–
	64				–	–	–
	80				–	–	–
LQFP ^{Note}	44	IR35-107-2 VP15-107-2	–	–	–	–	–
	100	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2		–	–
	144	IR35-103-2 VP15-103-2		IR35-103-2 VP15-103-2			IR35-107-2 VP15-107-2
	160	IR35-107-2 VP15-107-2	–	–	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2	
FPBGA ^{Note}	80	–		–	–	–	–
	108					–	–
	144						
	160						

Note Line 2

- Remarks**
1. Blank: Under development/Under study, –: Cannot be used
 2. Refer to the package list of each series (**CHAPTER 1**) for package details.

9.1.2 CMOS-9HD, EA-9HD Series

Table 9-2. CMOS-9HD, EA-9HD Series Recommended Soldering Conditions (1/4)

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
QFP (fine pitch)	100	-	-	IR35-103-3 VP15-103-3	IR35-103-3 VP15-103-3	IR35-103-3 VP15-103-3	IR35-103-3 VP15-103-3	IR35-103-3 VP15-103-3	IR35-103-3 VP15-103-3
	120	-	-	-	-	-	IR35-207-3 VP15-207-3	-	-
	144	-	-	IR35-207-2 VP15-207-2	IR35-207-2 VP15-207-2	IR35-203-3 VP15-203-3	IR35-207-2 VP15-207-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2
	160	-	-	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2
	176	-	-	-	IR35-203-1 VP15-203-1	IR35-203-1 VP15-203-1	IR35-203-1 VP15-203-1		
	208	-	-	-	-	IR35-207-3 VP15-207-3	IR35-203-3 VP15-203-3	IR35-207-3 VP15-207-3	IR35-207-3 VP15-207-3
	240	-	-	-	-	-	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2
	304	-	-	-	-	-	-	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2
TQFP (fine pitch)	48 ^{Note}	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2					
	64 ^{Note}	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2					
	80	-	-	-	-	-	IR35-107-2 VP15-107-2		-
	80 ^{Note}	-	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	IR35-107-3 VP15-107-3		
	100	-	-	-		-	-	IR35-103-2 VP15-103-2	IR30-103-3 VP15-103-3
	100 ^{Note}	-	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2					
	120	-	-	IR35-103-2 VP15-103-2			IR35-103-2 VP15-103-2	-	IR35-103-2 VP15-103-2
	120 ^{Note}	-	-	IR35-103-2 VP15-103-2	-	-			
LQFP (fine pitch)	100	-	-	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2	
	144	-	-	-				IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2
	144 ^{Note}	-	-	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2

Note Line 2

- Remarks**
- Blank: Under development/Under study, -: Cannot be used
 - Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-2. CMOS-9HD, EA-9HD Series Recommended Soldering Conditions (2/4)

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
PBGA	225								
	256			-	-	-		IR30-203-2 VP15-203-2	IR30-203-2 VP15-203-2
	272			-	-	-	-	IR35-203-3 VP15-203-3	IR30-203-2 VP15-203-2
	313			-	-	-	-	-	IR30-203-2 VP15-203-2
	352			-	-	-	-	-	IR30-203-2 VP15-203-2
FPBGA	108	-		IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	
	109	-	-				IR35-107-3 VP15-107-3		-
	144	-	-	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	160	-	-	-	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	161	-	-						
	176	-	-	-	IR30-103-3 VP15-103-3	IR30-103-3 VP15-103-3	IR35-107-3 VP15-107-3		
	208	-	-			IR35-107-3 VP15-107-3		IR35-107-3 VP15-107-3	IR30-103-3 VP15-103-3
	240	-	-	-	-	-	-	-	-
	304	-	-	-	-	-	-	-	-
	393	-	-	-	-	-	-	-	IR35-107-3 VP15-107-3
TBGA with heat spreader	256			-	-	-	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	352			-	-	-	-	-	IR35-107-3 VP15-107-3
	420			-	-	-	-	-	-
	500			-	-	-	-	-	-
	576			-	-	-	-	-	-
	696			-	-	-	-	-	-

Remarks 1. Blank: Under development/Under study, -: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-2. CMOS-9HD, EA-9HD Series Recommended Soldering Conditions (3/4)

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971	
		μ PD65961	μ PD65964	μ PD65966	μ PD65968				
		μ PD65451 μ PD65461	μ PD65454 μ PD65464	μ PD65456 μ PD65466	μ PD65458 μ PD65468	μ PD65469	μ PD65470	μ PD65471	
QFP (fine pitch)	100	IR35-103-3 VP15-103-3	IR35-103-2 VP15-103-2	–	–	–	–	–	
		IR35-103-2 VP15-103-2							
		IR35-103-3 VP15-103-3							
		IR35-103-2 VP15-103-2							
	120	–	–	–	–	–	–	–	
	144	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2	–	–	–	–	–	
	160	IR35-203-1 VP15-203-1	IR35-203-1 VP15-203-1	IR35-203-1 VP15-203-1	IR35-203-1 VP15-203-1	–	–	–	–
			IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2				
			IR35-203-1 VP15-203-1	IR35-203-1 VP15-203-1	IR35-203-1 VP15-203-1				
			IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2				
176				–	–	–	–		
208	IR35-207-3 VP15-207-3	IR35-207-3 VP15-207-3	IR35-203-3 VP15-203-3	IR35-203-3 VP15-203-3					
240	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2					
304	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2	IR35-203-2 VP15-203-2					

- Remarks**
1. Blank: Under development/Under study, –: Cannot be used
 2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.
 3. Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-2. CMOS-9HD, EA-9HD Series Recommended Soldering Conditions (4/4)

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451 μ PD65461	μ PD65454 μ PD65464	μ PD65456 μ PD65466	μ PD65458 μ PD65468	μ PD65469	μ PD65470	μ PD65471
TQFP (fine pitch)	48					-	-	-
	64					-	-	-
	80	-	-	-	-	-	-	-
	100	-	-	-	-	-	-	-
	120	-	-	-	-	-	-	-
LQFP (fine pitch)	100	-	IR35-107-3 VP15-107-3	-	-	-	-	-
	144	-	-	-	-	-	-	-
PBGA	225					-	-	-
	256	IR30-203-3 VP15-203-3	IR35-203-3 VP15-203-3		-	-	-	-
	272	IR30-203-3 VP15-203-3			-	-	-	-
	313	IR30-203-3 VP15-203-3		IR30-203-3 VP15-203-3	IR30-203-3 VP15-203-3	-	-	-
	352	IR30-203-3 VP15-203-3	IR30-203-3 VP15-203-3	IR30-203-3 VP15-203-3	IR30-203-3 VP15-203-3	-	-	-
FPBGA	108		-	-	-	-	-	-
	144		-	-	-	-	-	-
	160	IR30-107-3 VP15-107-3	IR30-107-3 VP15-107-3	IR30-107-3 VP15-107-3	-	-	-	-
	176		IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	-	-	-	-
	208	IR35-107-3 VP15-107-3			-	-	-	-
	240					-	-	-
	303	-	-	IR35-103-2 VP15-103-2	-	-	-	-
	304			IR30-103-3 VP15-103-3	IR35-103-3 VP15-103-3	-	-	-
TBGA with heat spreader	256	IR35-107-3 VP15-107-3		-	-	-	-	-
	352	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	-			
	420	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	500	-	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	576	-	-	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3		
	696	-	-	-	IR35-107-3 VP15-107-3			

- Remarks**
1. Blank: Under development/Under study, -: Cannot be used
 2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.
 3. Refer to the package list of each series (**CHAPTER 1**) for package details.

9.1.3 CMOS-10HD Series

Table 9-3. CMOS-10HD Series Recommended Soldering Conditions (1/10)

(a) Single power supply (1/3)

Package	Number of Pins	μ PD65301	μ PD65302	μ PD65303	μ PD65304	μ PD65305
		μ PD65501	μ PD65502	μ PD65503	μ PD65504	μ PD65505
QFP (fine pitch)	144	–	IR35-203-2 VP15-203-2			
	160	–				
	208	–	–		IR35-203-2 VP15-203-2	
	240	–	–	–		IR35-203-2 VP15-203-2
	304	–	–	–	–	–
TQFP	48	IR35-103-2 VP15-103-2	–	–	–	–
	64	–			–	–
	80	–				
	120	–	–	–		
LQFP	44					–
	100	–	–	–		
	144	–		–		IR35-103-2 VP15-103-2
FPBGA	108	IR35-107-3 VP15-107-3				IR35-107-3 VP15-107-3
	144	–				
	160	–				
	208	–	–	–	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	240	–	–	–		IR30-103-2 VP15-103-2
	304	–	–	–	–	
PBGA	256	–	–	–		
	313	–	–	–	–	–
	352	–	–	–	–	–

Remarks 1. Blank: Under development/Under study, –: Cannot be used

2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.

3. Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-3. CMOS-10HD Series Recommended Soldering Conditions (2/10)

(a) Single power supply (2/3)

Package	Number of Pins	μ PD65306	μ PD65307	μ PD65308	μ PD65309	μ PD65310	μ PD65311
		μ PD65506	μ PD65507	μ PD65508	μ PD65509	μ PD65510	μ PD65511
QFP (fine pitch)	144						
	160					IR35-203-2 VP15-203-2	
	208			IR35-207-3 VP15-207-3			
	240	IR35-203-2 VP15-203-2					
	304	–	IR35-203-2 VP15-203-2				
TQFP	48	–	–	–	–	–	–
	64	–	–	–	–	–	–
	80						
	120						
LQFP	44	–	–	–	–	–	–
	100	IR35-103-2 VP15-103-2	IR35-103-2 VP15-103-2	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2		
	144						
FPBGA	108		–	–	–	–	–
	144	–		–	–	–	–
	160					–	–
	208						–
	240	IR30-103-2 VP15-103-2	IR30-103-2 VP15-103-2				
	304				IR30-107-3 VP15-107-3	IR35-107-3 VP15-107-3	
PBGA	256						–
	313						
	352						

Remarks 1. Blank: Under development/Under study, –: Cannot be used

2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.

3. Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-3. CMOS-10HD Series Recommended Soldering Conditions (3/10)

(a) Single power supply (3/3)

Package	Number of Pins	μ PD65321	μ PD65322	μ PD65323
		μ PD65521	μ PD65522	μ PD65523
TQFP	64	IR35-103-2 VP15-103-2	–	–
	80		–	–
	100			
	120	–		
LQFP	100			IR35-107-2 VP15-107-2
	144	–	–	

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-3. CMOS-10HD Series Recommended Soldering Conditions (4/10)

(b) Single power supply, dedicated TBGA package (1/2)

Package	Number of Pins	μ PD65324	μ PD65325	μ PD65326	μ PD65327	μ PD65328
		μ PD65524	μ PD65525	μ PD65526	μ PD65527	μ PD65528
TBGA with heat spreader	256					
	352	–	–		IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	420	–	–	–	IR35-107-3 VP15-107-3	
	500	–	–	–	–	IR35-107-3 VP15-107-3
	576	–	–	–	–	–

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-3. CMOS-10HD Series Recommended Soldering Conditions (5/10)

(b) Single power supply, dedicated TBGA package (2/2)

Package	Number of Pins	μ PD65329	μ PD65330	μ PD65331
		μ PD65529	μ PD65530	μ PD65531
TBGA with heat spreader	256			
	352	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	420			
	500	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	576	IR35-107-3 VP15-107-3		

- Remarks**
1. Blank: Under development/Under study, -: Cannot be used
 2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 3. Refer to the package list of each series (**CHAPTER 1**) for package details.

★

Table 9-3. CMOS-10HD Series Recommended Soldering Conditions (6/10)

(c) Dual power supply (1/3)

Package	Number of Pins	μ PD65341	μ PD65342	μ PD65343	μ PD65344	μ PD65345
		μ PD65541	μ PD65542	μ PD65543	μ PD65544	μ PD65545
QFP (fine pitch)	144	–	IR35-203-2 VP15-203-2			
	160	–	IR35-207-3 VP15-207-3			
	208	–	–		IR35-203-2 VP15-203-2	
	240	–	–	–		IR35-203-2 VP15-203-2
	304	–	–	–	–	–
TQFP ^{Note}	48	IR35-103-2 VP15-103-2	–	–	–	–
	64	–			–	–
	80	–				
	120	–	–	–		
LQFP ^{Note}	44					–
	100	–	–	–	IR35-107-3 VP15-107-3	
	144	–		–		IR35-107-2 VP15-107-2
FPBGA ^{Note}	108	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3			IR35-107-3 VP15-107-3
	144	–				
	160	–				
	208	–	–	–	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	240	–	–	–		IR30-103-2 VP15-103-2
	304	–	–	–	–	
PBGA	256	–	–	–		
	313	–	–	–	–	–
	352	–	–	–	–	–

Note Line 2

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

★ Table 9-3. CMOS-10HD Series Recommended Soldering Conditions (7/10)

(c) Dual power supply (2/3)

Package	Number of Pins	μ PD65346	μ PD65347	μ PD65348	μ PD65349	μ PD65350	μ PD65351
		μ PD65546	μ PD65547	μ PD65548	μ PD65549	μ PD65550	μ PD65551
QFP (fine pitch)	144						
	160					IR35-203-2 VP15-203-2	
	208			IR35-207-3 VP15-207-3			
	240	IR35-203-3 VP15-203-3					
	304	–	IR35-203-2 VP15-203-2				
TQFP ^{Note}	48	–	–	–	–	–	–
	64	–	–	–	–	–	–
	80						
	120						
LQFP ^{Note}	44	–	–	–	–	–	–
	100		IR35-103-2 VP15-103-2	IR35-107-2 VP15-107-2	IR35-107-2 VP15-107-2		
	144	IR35-107-2 VP15-107-2					
FPBGA ^{Note}	108		–	–	–	–	–
	144	–	–	–	–	–	–
	160				IR35-107-3 VP15-107-3	–	–
	161	IR35-107-3 VP15-107-3	–	–	–	–	–
	208	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3				–
	240	IR35-107-3 VP15-107-3	IR30-103-2 VP15-103-2				
	304				IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	
	309	–	IR35-107-3 VP15-107-3	–	–	–	–
PBGA	256						–
	313						
	352						

Note Line 2

- Remarks**
1. Blank: Under development/Under study, –: Cannot be used
 2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 3. Refer to the package list of each series (**CHAPTER 1**) for package details.

★

Table 9-3. CMOS-10HD Series Recommended Soldering Conditions (8/10)

(c) Dual power supply (3/3)

Package	Number of Pins	μ PD65361	μ PD65362	μ PD65363
		μ PD65561	μ PD65562	μ PD65563
TQFP ^{Note}	64	IR35-103-2 VP15-103-2	–	–
	80		–	–
	100			
	120	–		
LQFP ^{Note}	100			IR35-107-2 VP15-107-2
	144	–	–	

Note Line 2

- Remarks 1.** Blank: Under development/Under study, –: Cannot be used
2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.
3. Refer to the package list of each series (**CHAPTER 1**) for package details.

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Table 9-3. CMOS-10HD Series Recommended Soldering Conditions (9/10)

(d) Dual power supply, dedicated TBGA package (1/2)

Package	Number of Pins	μ PD65364	μ PD65365	μ PD65366	μ PD65367	μ PD65368
		μ PD65564	μ PD65565	μ PD65566	μ PD65567	μ PD65568
TBGA with heat spreader	256					
	352	–	–	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	420	–	–	–	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	500	–	–	–	–	IR35-107-3 VP15-107-3
	576	–	–	–	–	–

- Remarks 1.** Blank: Under development/Under study, –: Cannot be used
2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.
3. Refer to the package list of each series (**CHAPTER 1**) for package details.

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Table 9-3. CMOS-10HD Recommended Soldering Conditions (10/10)

(d) Dual power supply, dedicated TBGA package (2/2)

Package	Number of Pins	μ PD65369	μ PD65370	μ PD65371
		μ PD65569	μ PD65570	μ PD65571
TBGA with heat spreader	256			
	352	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	420	IR35-107-3 VP15-107-3		
	500	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3
	576	IR35-107-3 VP15-107-3	IR35-107-3 VP15-107-3	

- Remarks**
- Blank: Under development/Under study, -: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

★ 9.2 Lead-free Packages

9.2.1 CMOS-N5 Series

Table 9-4. CMOS-N5 Series Recommended Soldering Conditions (1/2)

Package	Number of Pins	μ PD65891	μ PD65880	μ PD65881	μ PD65892	μ PD65882	μ PD65894	μ PD65883
SSOP	20	IR60-00-3-37	IR60-00-3-37	IR60-00-3-37	–	–	–	–
	30	IR60-00-3-37	IR60-00-3-37	IR60-00-3-37	–	–	–	–
QFP	44 ^{Note 1}	IR60-207-3-37	IR60-207-3-37	–	–	–	–	–
	52	–	–	–	–	–	–	–
	100 ^{Note 2, Note 3}	–	–	–	–	IR60-207-3-37	–	–
QFP (fine pitch)	160	–	–	–	–	–	–	–
	208	–	–	–	–	–	–	–
	240	–	–	–	–	–	–	–
	304	–	–	–	–	–	–	–
TQFP ^{Note 1}	48	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–	IR60-107-3-37	–	–
	64 ^{Note 4}	–	–	IR60-107-3-37	–	IR60-107-3-37	–	IR60-107-3-37
	80	–	–	–	–	–	–	IR60-107-3-37
	64	–	–	IR60-107-3-37	–	–	–	–
LQFP ^{Note 1}	44	–	IR60-107-3-37	IR60-107-3-37	–	IR60-107-3-37	–	IR60-107-3-37
	100	–	–	–	IR60-107-3-37	IR60-107-3-37	–	IR60-107-3-37
	144	–	–	–	–	–	IR60-107-3-37	IR60-107-3-37
	160	–	–	–	–	–	–	–
SDIP	64	–	–	Note 5	–	–	–	–
FPBGA ^{Note 1}	80	–	–	–	–	IR60-107-3-37	–	IR60-107-3-37
	108	–	–	–	–	–	–	IR60-107-3-37
	144	–	–	–	–	–	–	IR60-107-3-37
	160	–	–	–	–	–	–	–

Notes 1. Line 2

2. Correspondence to the replacement of CMOS-6X, 6S
3. Correspondence to the replacement of CMOS-6, 6A, 6V
4. Low thermal resistance type
5. Mounting by wave soldering method

Remarks 1. Blank: Under development/Under study, –: Cannot be used

2. Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-4. CMOS-N5 Series Recommended Soldering Conditions (2/2)

Package	Number of Pins	μ PD65884	μ PD65885	μ PD65887	μ PD65889	μ PD65890	μ PD65893
QFP (fine pitch)	160	–	IR60-207-3-37	IR60-207-3-37	–	–	–
	208	–	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37
	240	–	–	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37
	304	–	–	–	–	IR50-207-3-37	IR50-207-3-37
TQFP ^{Note}	48	–	–	–	–	–	–
	64	IR60-107-3-37	–	–	–	–	–
	80	IR60-107-3-37	–	–	–	–	–
LQFP ^{Note}	44	IR60-107-3-37	–	–	–	–	–
	100	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–	–	–
	144	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	160	IR60-107-3-37	–	–	IR60-107-3-37	–	–
FPBGA ^{Note}	80	IR60-107-3-37	IR60-107-3-37	–	–	–	–
	108	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–	–
	144	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	160	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37

Note Line 2

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

9.2.2 CMOS-9HD, EA-9HD Series

Table 9-5. CMOS-9HD, EA-9HD Series Recommended Soldering Conditions (1/4)

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
QFP (fine pitch)	100	–	–	IR60-107-3-37		IR60-107-3-37		IR60-107-3-37	
	120	–	–	–	–	–	IR60-207-3-37	–	–
	144	–	–	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	
	160	–	–	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37		
	176	–	–	–	IR60-207-3-37		IR60-207-3-37		
	208	–	–	–	–	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37
	240	–	–	–	–	–	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37
	304	–	–	–	–	–	–	IR50-203-3-37	IR50-203-3-37
TQFP ^{Note} (fine pitch)	48	IR60-103-2-37	IR60-103-2-37	IR60-103-2-37			–		
	64			IR60-107-3-37					
	80	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37		
	100	–	IR60-107-3-37	IR60-107-3-37				IR60-107-3-37	IR60-107-3-37
	120	–	–	IR60-107-3-37				–	
LQFP ^{Note} (fine pitch)	100	–	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37		IR60-107-3-37	
	144	–	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37		IR60-107-3-37	IR60-107-3-37
PBGA	225								
	256			–	–	–			
	272			–	–	–	–		
	313			–	–	–	–	–	IR50-203-3-37
	352			–	–	–	–	–	IR50-203-3-37

Note Line 2

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-5. CMOS-9HD, EA-9HD Series Recommended Soldering Conditions (2/4)

Package	Number of Pins	μ PD65941	μ PD65942	μ PD65943	μ PD65944	μ PD65945	μ PD65946	μ PD65948	μ PD65949
		μ PD65441	μ PD65442	μ PD65443	μ PD65444	μ PD65445	μ PD65446	μ PD65448	μ PD65449
FPBGA ^{Note}	108	–		IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	
	144	–	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	160	–	–	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	161	–	–	IR60-107-3-37					
	176	–	–	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	
	208	–	–			IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	240	–	–	–	–	–	IR60-107-3-37	–	
	304	–	–	–	–	–	–	–	
	393	–	–	–	–	–	–	–	IR60-107-3-37
TBGA with heat spreader	256	–	–	–	–	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	352	–	–	–	–	–	–	–	IR60-107-3-37
	420	–	–	–	–	–	–	–	–
	500	–	–	–	–	–	–	–	–
	576	–	–	–	–	–	–	–	–
	696	–	–	–	–	–	–	–	–

Note Line 2

- Remarks**
1. Blank: Under development/Under study, –: Cannot be used
 2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.
 3. Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-5. CMOS-9HD, EA-9HD Series Recommended Soldering Conditions (3/4)

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451	μ PD65454	μ PD65456	μ PD65458	μ PD65469	μ PD65470	μ PD65471
QFP (fine pitch)	100	IR60-107-3-37	IR60-107-3-37	–	–	–	–	–
	120	–	–	–	–	–	–	–
	144		–	–	–	–	–	–
	160	IR60-207-3-37	IR60-207-3-37		–	–	–	–
	176				–	–	–	–
	208	IR50-207-3-37	IR50-207-3-37		IR50-207-3-37			
	240	IR50-207-3-37	IR50-207-3-37					
	304		IR50-207-3-37	IR50-207-3-37				

- Remarks**
1. Blank: Under development/Under study, –: Cannot be used
 2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.
 3. Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-5. CMOS-9HD, EA-9HD Series Recommended Soldering Conditions (4/4)

Package	Number of Pins	μ PD65951	μ PD65954	μ PD65956	μ PD65958	μ PD65969	μ PD65970	μ PD65971
		μ PD65961	μ PD65964	μ PD65966	μ PD65968			
		μ PD65451 μ PD65461	μ PD65454 μ PD65464	μ PD65456 μ PD65466	μ PD65458 μ PD65468	μ PD65469	μ PD65470	μ PD65471
TQFP ^{Note} (fine pitch)	48	-	-	-	-	-	-	-
	64	-	-	-	-	-	-	-
	80	-	-	-	-	-	-	-
	100	-	-	-	-	-	-	-
	120	-	-	-	-	-	-	-
LQFP ^{Note} (fine pitch)	100	-	IR60-107-3-37	-	-	-	-	-
	144	-	-	-	-	-	-	-
PBGA	225	-	-	-	-	-	-	-
	256							
	272							
	313							
	352	IR50-203-3-37						
FPBGA ^{Note}	108		-	-	-	-	-	-
	144		-	-	-	-	-	-
	160		-	-	-	-	-	-
	176		IR60-107-3-37	IR60-107-3-37	-	-	-	-
	208	IR60-107-3-37			-	-	-	-
	240							
	303	-						
304								
TBGA with heat spreader	256	IR60-107-3-37		-	-	-	-	-
	352	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	-			
	420	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	500	-	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	576	-	-	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37		
	696	-	-	-	IR60-107-3-37			

Note Line 2

Remarks 1. Blank: Under development/Under study, -: Cannot be used

2. Part number on the top are CMOS-9HD Series and those on the bottom are EA-9HD Series.

3. Refer to the package list of each series (CHAPTER 1) for package details.

9.2.3 CMOS-10HD Series

Table 9-6. CMOS-10HD Series Recommended Soldering Conditions (1/10)

(a) Single power supply (1/3)

Package	Number of Pins	μ PD65301	μ PD65302	μ PD65303	μ PD65304	μ PD65305
		μ PD65501	μ PD65502	μ PD65503	μ PD65504	μ PD65505
QFP (fine pitch)	144	–	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37
	160	–	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37
	208	–	–	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37
	240	–	–	–	IR50-207-3-37	IR50-207-3-37
	304	–	–	–	–	–
TQFP ^{Note}	48	IR60-107-3-37	–	–	–	–
	64	–	IR60-107-3-37	IR60-107-3-37	–	–
	80	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–
	120	–	–	–	IR60-107-3-37	IR60-107-3-37
LQFP ^{Note}	44	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–
	100	–	–	–	IR60-107-3-37	IR60-107-3-37
	144	–	IR60-107-3-37	–	IR60-107-3-37	IR60-107-3-37
FPBGA ^{Note}	61	IR60-107-3-37	–	–	–	–
	108	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	144	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	160	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	161	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–
	208	–	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	240	–	–	–	IR60-107-3-37	IR60-107-3-37
	304	–	–	–	–	IR60-107-3-37
	393	–	–	–	–	–
PBGA	256	–	–	–	IR60-107-3-37	IR60-107-3-37
	313	–	–	–	–	–
	352	–	–	–	–	–

Note Line 2

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-6. CMOS-10HD Series Recommended Soldering Conditions (2/10)

(a) Single power supply (2/3)

Package	Number of Pins	μ PD65306	μ PD65307	μ PD65308	μ PD65309	μ PD65310	μ PD65311
		μ PD65506	μ PD65507	μ PD65508	μ PD65509	μ PD65510	μ PD65511
QFP (fine pitch)	144	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37		
	160	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37		
	208	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37
	240	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37
	304	–	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37
TQFP ^{Note}	48	–	–	–	–	–	–
	64	–	–	–	–	–	–
	80				–	–	–
	120	IR60-107-3-37	IR60-107-3-37			–	–
LQFP ^{Note}	44	–	–	–	–	–	–
	100	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37		–	–
	144	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37			
FPBGA ^{Note}	108	IR60-107-3-37	–	–	–	–	–
	144	IR60-107-3-37	IR60-107-3-37	–	–	–	–
	160	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–	–
	161	IR60-107-3-37	–	–	–	–	–
	208	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37			–
	240	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	304	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	393	–	IR60-107-3-37			–	–
PBGA	256	IR60-107-3-37					–
	313						
	352	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37

Note Line 2

- Remarks**
1. Blank: Under development/Under study, –: Cannot be used
 2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 3. Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-6. CMOS-10HD Series Recommended Soldering Conditions (3/10)

(a) Single power supply (3/3)

Package	Number of Pins	μ PD65321	μ PD65322	μ PD65323
		μ PD65521	μ PD65522	μ PD65523
TQFP ^{Note}	64	IR60-107-3-37	–	–
	80	IR60-107-3-37	–	–
	100	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	120	–	IR60-107-3-37	IR60-107-3-37
LQFP ^{Note}	100	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	144	–	–	IR60-107-3-37

Note Line 2

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-6. CMOS-10HD Series Recommended Soldering Conditions (4/10)

(b) Single power supply, dedicated TBGA package (1/2)

Package	Number of Pins	μ PD65324	μ PD65325	μ PD65326	μ PD65327	μ PD65328
		μ PD65524	μ PD65525	μ PD65526	μ PD65527	μ PD65528
TBGA with heat spreader	256	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	352	–	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	420	–	–	–	IR60-107-3-37	IR60-107-3-37
	500	–	–	–	–	IR60-107-3-37
	576	–	–	–	–	–

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-6. CMOS-10HD Series Recommended Soldering Conditions (5/10)

(b) Single power supply, dedicated TBGA package (2/2)

Package	Number of Pins	μ PD65329	μ PD65330	μ PD65331
		μ PD65529	μ PD65530	μ PD65531
TBGA with heat spreader	256	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	352	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	420	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	500	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	576	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-6. CMOS-10HD Series Recommended Soldering Conditions (6/10)

(c) Dual power supply (1/3)

Package	Number of Pins	μ PD65341	μ PD65342	μ PD65343	μ PD65344	μ PD65345
		μ PD65541	μ PD65542	μ PD65543	μ PD65544	μ PD65545
QFP (fine pitch)	144	–	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37
	160	–	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37
	208	–	–	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37
	240	–	–	–	IR50-207-3-37	IR50-207-3-37
	304	–	–	–	–	–
TQFP ^{Note}	48	IR60-107-3-37	–	–	–	–
	64	–	IR60-107-3-37	IR60-107-3-37	–	–
	80	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–
	120	–	–	–	IR60-107-3-37	IR60-107-3-37
LQFP ^{Note}	44	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–
	100	–	–	–	IR60-107-3-37	IR60-107-3-37
	144	–	IR60-107-3-37	–	IR60-107-3-37	IR60-107-3-37
FPBGA ^{Note}	61	IR60-107-3-37	–	–	–	–
	108	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	144	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	160	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	161	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–
	208	–	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	240	–	–	–	IR60-107-3-37	IR60-107-3-37
	304	–	–	–	–	IR60-107-3-37
	393	–	–	–	–	–
PBGA	256	–	–	–	IR60-107-3-37	IR60-107-3-37
	313	–	–	–	–	–
	352	–	–	–	–	–

Note Line 2

- Remarks**
1. Blank: Under development/Under study, –: Cannot be used
 2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 3. Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-6. CMOS-10HD Series Recommended Soldering Conditions (7/10)

(c) Dual power supply (2/3)

Package	Number of Pins	μ PD65346	μ PD65347	μ PD65348	μ PD65349	μ PD65350	μ PD65351
		μ PD65546	μ PD65547	μ PD65548	μ PD65549	μ PD65550	μ PD65551
QFP (fine pitch)	144	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37		
	160	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37	IR60-207-3-37		
	208	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37
	240	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37
	304	–	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37	IR50-207-3-37
TQFP ^{Note}	48	–	–	–	–	–	–
	64	–	–	–	–	–	–
	80				–	–	–
	120					–	–
LQFP ^{Note}	44	–	–	–	–	–	–
	100	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37		–	–
	144	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37			
FPBGA ^{Note}	108	IR60-107-3-37	–	–	–	–	–
	144	IR60-107-3-37	IR60-107-3-37	–	–	–	–
	160	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	–	–
	161	IR60-107-3-37	–	–	–	–	–
	208	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37		–	–
	240	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	304	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	393	–	IR60-107-3-37			–	–
PBGA	256	IR60-107-3-37					–
	313						
	352	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37	IR50-203-3-37

Note Line 2

- Remarks**
- Blank: Under development/Under study, -: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-6. CMOS-10HD Series Recommended Soldering Conditions (8/10)

(c) Dual power supply (3/3)

Package	Number of Pins	μ PD65361	μ PD65362	μ PD65363
		μ PD65561	μ PD65562	μ PD65563
TQFP ^{Note}	64	IR60-107-3-37	–	–
	80	IR60-107-3-37	–	–
	100	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	120	–	IR60-107-3-37	IR60-107-3-37
LQFP ^{Note}	100	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	144	–	–	IR60-107-3-37

Note Line 2

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-6. CMOS-10HD Series Recommended Soldering Conditions (9/10)

(d) Dual power supply, dedicated TBGA package (1/2)

Package	Number of Pins	μ PD65364	μ PD65365	μ PD65366	μ PD65367	μ PD65368
		μ PD65564	μ PD65565	μ PD65566	μ PD65567	μ PD65568
TBGA with heat spreader	256	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	352	–	–	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	420	–	–	–	IR60-107-3-37	IR60-107-3-37
	500	–	–	–	–	IR60-107-3-37
	576	–	–	–	–	–

- Remarks**
- Blank: Under development/Under study, –: Cannot be used
 - Part number on the top are 3-layer product and those on the bottom are 4-layer product.
 - Refer to the package list of each series (**CHAPTER 1**) for package details.

Table 9-6. CMOS-10HD Recommended Soldering Conditions (10/10)

(d) Dual power supply, dedicated TBGA package (2/2)

Package	Number of Pins	μ PD65369	μ PD65370	μ PD65371
		μ PD65569	μ PD65570	μ PD65571
TBGA with heat spreader	256	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	352	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	420	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	500	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37
	576	IR60-107-3-37	IR60-107-3-37	IR60-107-3-37

Remarks 1. Blank: Under development/Under study, -: Cannot be used

2. Part number on the top are 3-layer product and those on the bottom are 4-layer product.
3. Refer to the package list of each series (**CHAPTER 1**) for package details.

Lead-free

9.3 List of Soldering Conditions

The following table shows the meanings of the symbols used in the recommended soldering conditions.

Table 9-7. List of Soldering Conditions (1/3)

(a) Partial Heating (Pin Temperature: 300°C Max., Time: 3 Sec. Max. (Per Pin Row)) (1/2)

Symbol	Soldering Process	Soldering Conditions
IR30-00-3	Infrared reflow	Package peak temperature: 230°C, Time: 30 sec. Max. (at 210°C or higher), Count: three times or less
IR30-103-2	Infrared reflow	Package peak temperature: 230°C, Time: 30 sec. Max. (at 210°C or higher), Count: two times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
IR30-103-3	Infrared reflow	Package peak temperature: 230°C, Time: 30 sec. Max. (at 210°C or higher), Count: three times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
IR30-203-3	Infrared reflow	Package peak temperature: 230°C, Time: 30 sec. Max. (at 210°C or higher), Count: three times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
IR35-103-2	Infrared reflow	Package peak temperature: 235°C, Time: 30 sec. Max. (at 210°C or higher), Count: two times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
IR35-103-3	Infrared reflow	Package peak temperature: 235°C, Time: 30 sec. Max. (at 210°C or higher), Count: three times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
IR35-107-2	Infrared reflow	Package peak temperature: 235°C, Time: 30 sec. Max. (at 210°C or higher), Count: two times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
IR35-107-3	Infrared reflow	Package peak temperature: 235°C, Time: 30 sec. Max. (at 210°C or higher), Count: three times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
IR35-203-1	Infrared reflow	Package peak temperature: 235°C, Time: 30 sec. Max. (at 210°C or higher), Count: once, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
IR35-203-2	Infrared reflow	Package peak temperature: 235°C, Time: 30 sec. Max. (at 210°C or higher), Count: two times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
IR35-203-3	Infrared reflow	Package peak temperature: 235°C, Time: 30 sec. Max. (at 210°C or higher), Count: three times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
IR35-207-2	Infrared reflow	Package peak temperature: 235°C, Time: 30 sec. Max. (at 210°C or higher), Count: two times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
IR35-207-3	Infrared reflow	Package peak temperature: 235°C, Time: 30 sec. Max. (at 210°C or higher), Count: three times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)

Note After opening the dry pack, store it at 25°C or less and 65% (RH) or less for the allowable storage period.

Caution Do not use different soldering methods together (except for partial heating).

Table 9-7. List of Soldering Conditions (2/3)

(a) Partial Heating (Pin Temperature: 300°C Max., Time: 3 Sec. Max. (Per Pin Row)) (2/2)

Symbol	Soldering Process	Soldering Conditions
VP15-00-3	VPS	Package peak temperature: 215°C, Time: 25 to 40 sec. Max. (at 200°C or higher), Count: three times or less
VP15-103-2	VPS	Package peak temperature: 215°C, Time: 25 to 40 sec. Max. (at 200°C or higher), Count: two times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
VP15-103-3	VPS	Package peak temperature: 215°C, Time: 25 to 40 sec. Max. (at 200°C or higher), Count: three times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
VP15-107-2	VPS	Package peak temperature: 215°C, Time: 25 to 40 sec. Max. (at 200°C or higher), Count: two times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
VP15-107-3	VPS	Package peak temperature: 215°C, Time: 25 to 40 sec. Max. (at 200°C or higher), Count: three times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
VP15-203-1	VPS	Package peak temperature: 215°C, Time: 25 to 40 sec. Max. (at 200°C or higher), Count: once, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
VP15-203-2	VPS	Package peak temperature: 215°C, Time: 25 to 40 sec. Max. (at 200°C or higher), Count: two times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
VP15-203-3	VPS	Package peak temperature: 215°C, Time: 25 to 40 sec. Max. (at 200°C or higher), Count: three times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
VP15-207-2	VPS	Package peak temperature: 215°C, Time: 25 to 40 sec. Max. (at 200°C or higher), Count: two times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
VP15-207-3	VPS	Package peak temperature: 215°C, Time: 25 to 40 sec. Max. (at 200°C or higher), Count: three times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)

Note After opening the dry pack, store it at 25°C or less and 65% (RH) or less for the allowable storage period.

Caution Do not use different soldering methods together (except for partial heating).

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Table 9-7. List of Soldering Conditions (3/3)

(b) Partial Heating (Pin Temperature: 350°C Max., Time: 3 Sec. Max. (Per Pin Row))

Symbol	Soldering Process	Soldering Conditions
IR60-00-3-37	Infrared reflow	Package peak temperature: 260°C, Time: 60 sec. Max. (at 220°C or higher), Count: three times or less
IR60-103-2-37	Infrared reflow	Package peak temperature: 260°C, Time: 60 sec. Max. (at 220°C or higher), Count: two times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
IR60-107-2-37	Infrared reflow	Package peak temperature: 260°C, Time: 60 sec. Max. (at 220°C or higher), Count: two times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
IR60-107-3-37	Infrared reflow	Package peak temperature: 260°C, Time: 60 sec. Max. (at 220°C or higher), Count: three times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 10 to 72 hours)
IR60-207-3-37	Infrared reflow	Package peak temperature: 260°C, Time: 60 sec. Max. (at 220°C or higher), Count: three times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
IR50-203-3-37	Infrared reflow	Package peak temperature: 250°C, Time: 60 sec. Max. (at 220°C or higher), Count: three times or less, Exposure limit: 3 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)
IR50-207-3-37	Infrared reflow	Package peak temperature: 250°C, Time: 60 sec. Max. (at 220°C or higher), Count: three times or less, Exposure limit: 7 days ^{Note} (after that, prebake at 125°C for 20 to 72 hours)

Note After opening the dry pack, store it at 30°C or less and 70% (RH) or less for the allowable storage period.

Caution Do not use different soldering methods together (except for partial heating).