

# S71WS-N

**Stacked Multi-Chip Product (MCP)  
1.8 Volt-only Simultaneous Read/Write,  
Burst-mode Flash Memory with CellularRAM**

*Data Sheet*

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When a product has been in production for a period of time such that no changes or only nominal changes are expected, the Preliminary designation is removed from the data sheet. Nominal changes may include those affecting the number of ordering part numbers available, such as the addition or deletion of a speed option, temperature range, package type, or  $V_{IO}$  range. Changes may also include those needed to clarify a description or to correct a typographical error or incorrect specification. Spansion Inc. applies the following conditions to documents in this category:

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Questions regarding these document designations may be directed to your local sales office.

# S71WS-N

## Stacked Multi-Chip Product (MCP) 1.8 Volt-only Simultaneous Read/Write, Burst-mode Flash Memory with CellularRAM



### Data Sheet

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## Features

- Power supply voltage of 1.7 V to 1.95 V
- Burst Speed: 54 MHz, 66 MHz, 80 MHz
- Package
  - 8 x 11.6 mm, 9 x 12 mm
- Operating Temperature
  - Wireless, -25° C to +85° C

## General Description

The S71WS-N Series is a product line of stacked Multi-Chip Product (MCP) packages and consists of the following items:

- One or more flash memory die (for the S71WS512N, two S29WS256N devices are used)
- CellularRAM Type 2 pSRAM

The products covered by this document are listed in the table below. For details about their specifications, please refer to the individual constituent datasheet for further details.

Flash Density	pSRAM		
	32 Mb	64 Mb	128 Mb
S29WS128N	S71WS128NB0	S71WS128NC0	
S29WS256N		S71WS256NC0	S71WS256ND0
S29WS512N		S71WS512NC0	S71WS512ND0

For detailed specifications, please refer to the individual data sheets.

Document	Publication Identification Number (PID)
S29WS-N	S29WS-N_00
32 M CellularRAM Type 2	CellularRAM_08
64 M CellularRAM Type 2	Cellram_07
128 M CellularRAM Type 2	Cellram_07

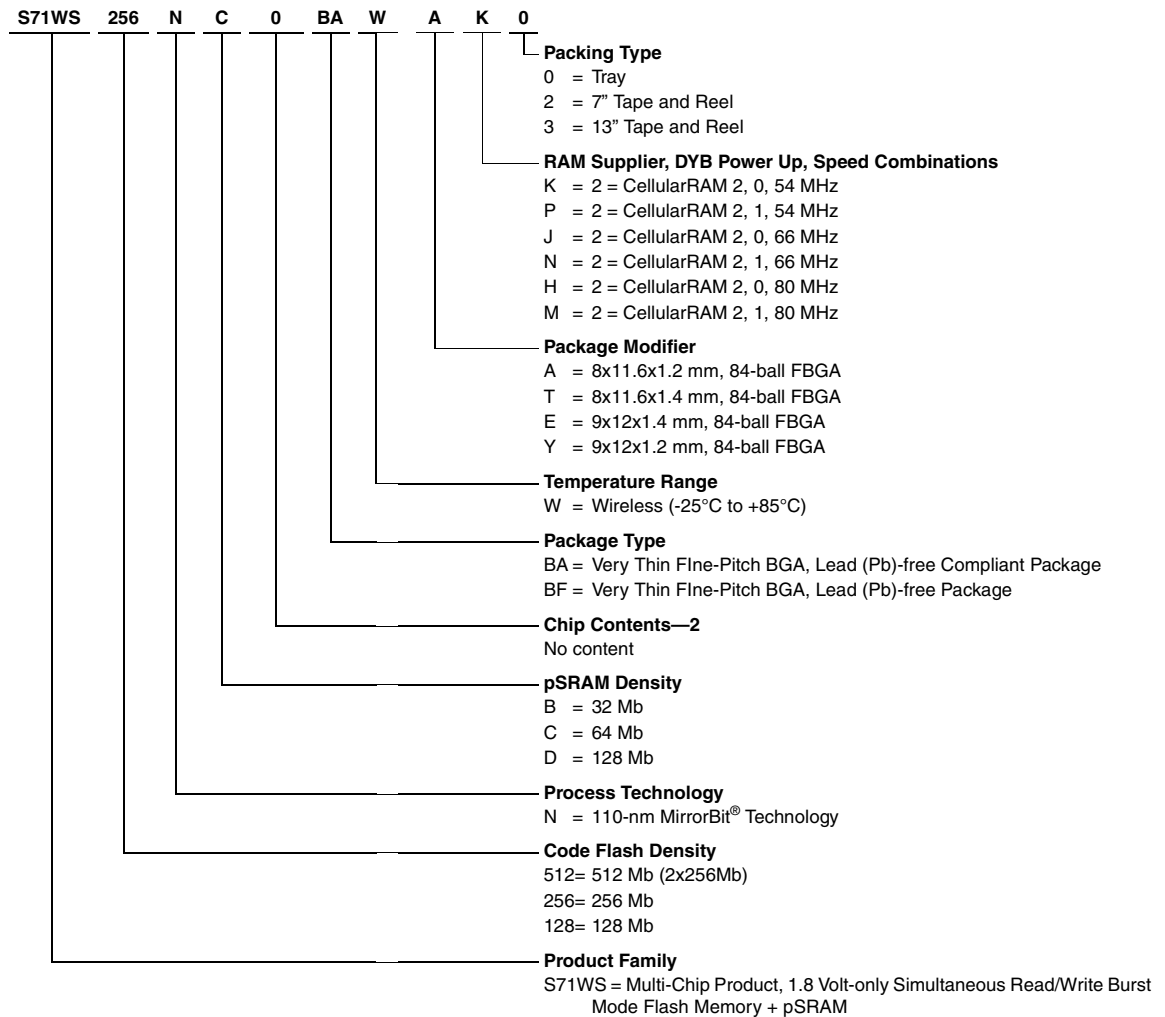
# 1. Product Selector Guide

Device	Model Numbers	Flash	pSRAM Density (Mb)	Flash Speed (MHz)	pSRAM Speed (MHz)	DYB Power-Up State (See Note)	pSRAM (Cellular RAM) Supplier	Package (mm)
S71WS128NB0	AK	WS128N	32	54	54	0	2	8.0X11.6X1.2
	AP					1		
	AJ			66	66	0		
	AN					1		
	AH			80	80	0		
	AM					1		
S71WS128NC0	AK	WS128N	64	54	54	0	2	8.0X11.6X1.2
	AP					1		
	AJ			66	66	0		
	AN					1		
	AH			80	80	0		
	AM					1		
S71WS256NC0	AK	WS256N	64	54	54	0	2	11.6x8.0x1.2
	AP					1	2	
	AJ			66	66	0	2	
	AN					1	2	
	AH			80	80	0	2	
	AM					1	2	
S71WS256ND0	YK	WS256N	128	54	54	0	2	9x12x1.2
	YP					1		
	YJ			66	66	0		
	YN					1		
	YH			80	80	0		
	YM					1		
S71WS512NC0	AK	WS512N	64	54	54	0	2	11.6x8.0x1.2
	AP					1	2	
	TJ			66	66	0	2	11.6x8.0x1.4
	TN					1		
	TH			80	80	0	2	
	TM					1		
S71WS512ND0	EK	WS512N	128	54	54	0	2	9x12x1.4
	EP					1		
	EJ			66	66	0		
	EN					1		
	EH			80	80	0		
	EM					1		

**Note:**  
0 (Protected), 1 (Unprotected [Default State])

## 2. Ordering Information

The order number is formed by a valid combinations of the following:



### 2.1 Valid Combinations

Valid Combinations list configurations planned to be supported in volume for this device. Consult your local sales office to confirm availability of specific valid combinations and to check on newly released combinations.

**Table 2.1** MCP Configurations and Valid Combinations

Valid Combinations					
S71WS128N	B	0	BAW, BFW	A	K, P, J, N, H, M
	C			A	K, P, J, N, H, M
S71WS256N	C			A	K, P, J, N, H, M
	D			Y	K, P, J, N, H, M
S71WS512N	C			A	K, P, H, M
				T	J, N, H, M
				E	K, P, J, N, H, M

**Package Marking Note:**  
The package marking omits the leading S from the ordering part number.

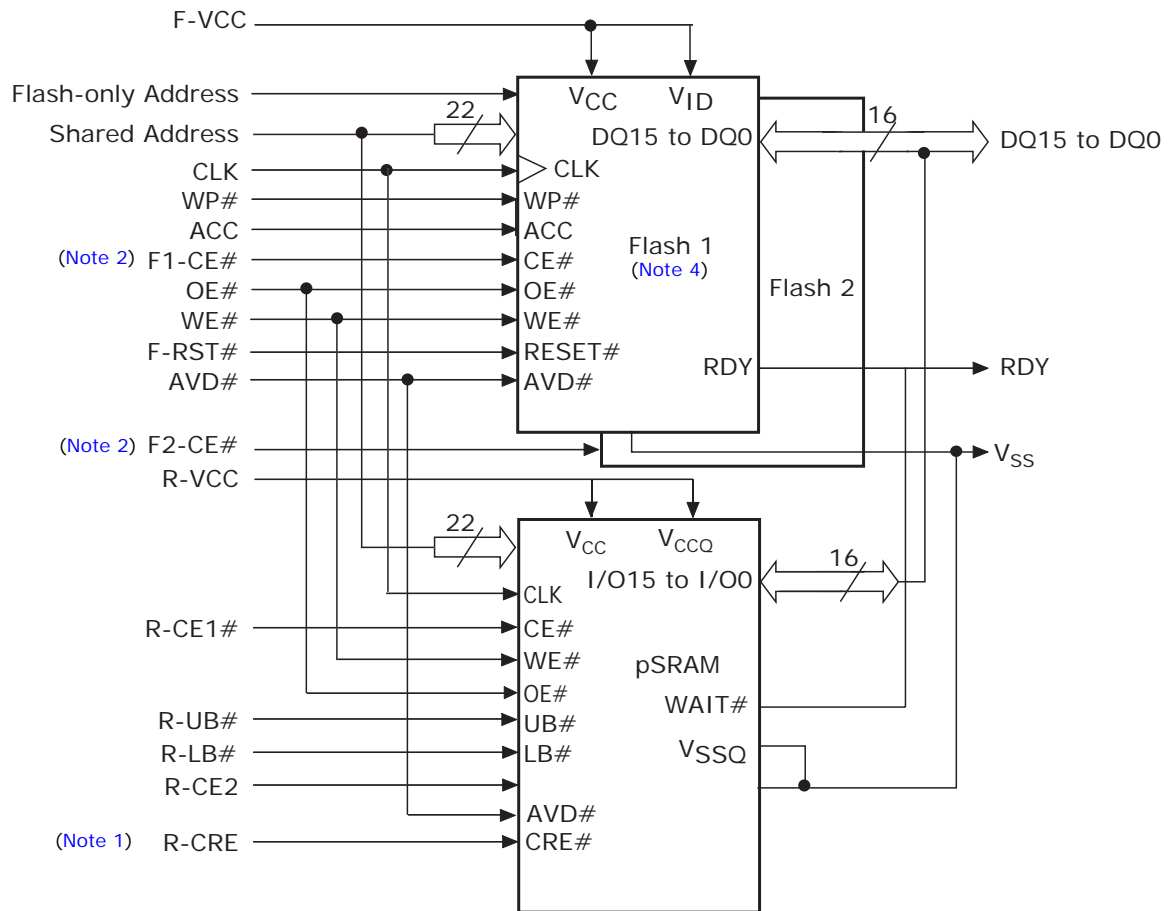
### 3. Input/Output Descriptions

Table 3.1 identifies the input and output package connections provided on the device.

**Table 3.1** Input/Output Descriptions

Symbol	Description
A23-A0	Address inputs
DQ15-DQ0	Data input/output
OE#	Output Enable input. Asynchronous relative to CLK for the Burst mode.
WE#	Write Enable input.
V <sub>SS</sub>	Ground
NC	No Connect; not connected internally
RDY	Ready output. Indicates the status of the Burst read. The WAIT# pin of the pSRAM is tied to RDY.
CLK	Clock input. In burst mode, after the initial word is output, subsequent active edges of CLK increment the internal address counter. Should be at V <sub>IL</sub> or V <sub>IH</sub> while in asynchronous mode
AVD#	Address Valid input. Indicates to device that the valid address is present on the address inputs. Low = for asynchronous mode, indicates valid address; for burst mode, causes starting address to be latched. High = device ignores address inputs
F-RST#	Hardware reset input. Low = device resets and returns to reading array data
F-WP#	Hardware write protect input. At V <sub>IL</sub> , disables program and erase functions in the four outermost sectors. Should be at V <sub>IH</sub> for all other conditions.
F-ACC	Accelerated input. At V <sub>IH</sub> , accelerates programming; automatically places device in unlock bypass mode. At V <sub>IL</sub> , disables all program and erase functions. Should be at V <sub>IH</sub> for all other conditions.
R-CE1#	Chip-enable input for pSRAM.
F1-CE#	Chip-enable input for Flash 1. Asynchronous relative to CLK for Burst Mode.
F2-CE#	Chip-enable input for Flash 2. Asynchronous relative to CLK for Burst Mode. This applies to the 512Mb MCP only.
R-CRE	Control Register Enable (pSRAM). For CellularRAM only.
F-VCC	Flash 1.8 Volt-only single power supply.
R-VCC	pSRAM Power Supply.
R-UB#	Upper Byte Control (pSRAM).
R-LB#	Lower Byte Control (pSRAM)
DNU	Do Not Use

## 4. MCP Block Diagram



**Notes:**

1. R-CRE is only present in CellularRAM-compatible pSRAM.
2. For 1 Flash + pSRAM, F1-CE# = CE#. For 2 Flash + pSRAM, CE# = F1-CE# and F2-CE# is the chip-enable pin for the second Flash.
3. Only needed for S71WS512N.
4. For the 128M pSRAM devices, there are 23 shared addresses.

## 5. Connection Diagrams/Physical Dimensions

This section contains the I/O designations and package specifications for the S71WS-N.

### 5.1 Special Handling Instructions for FBGA Packages

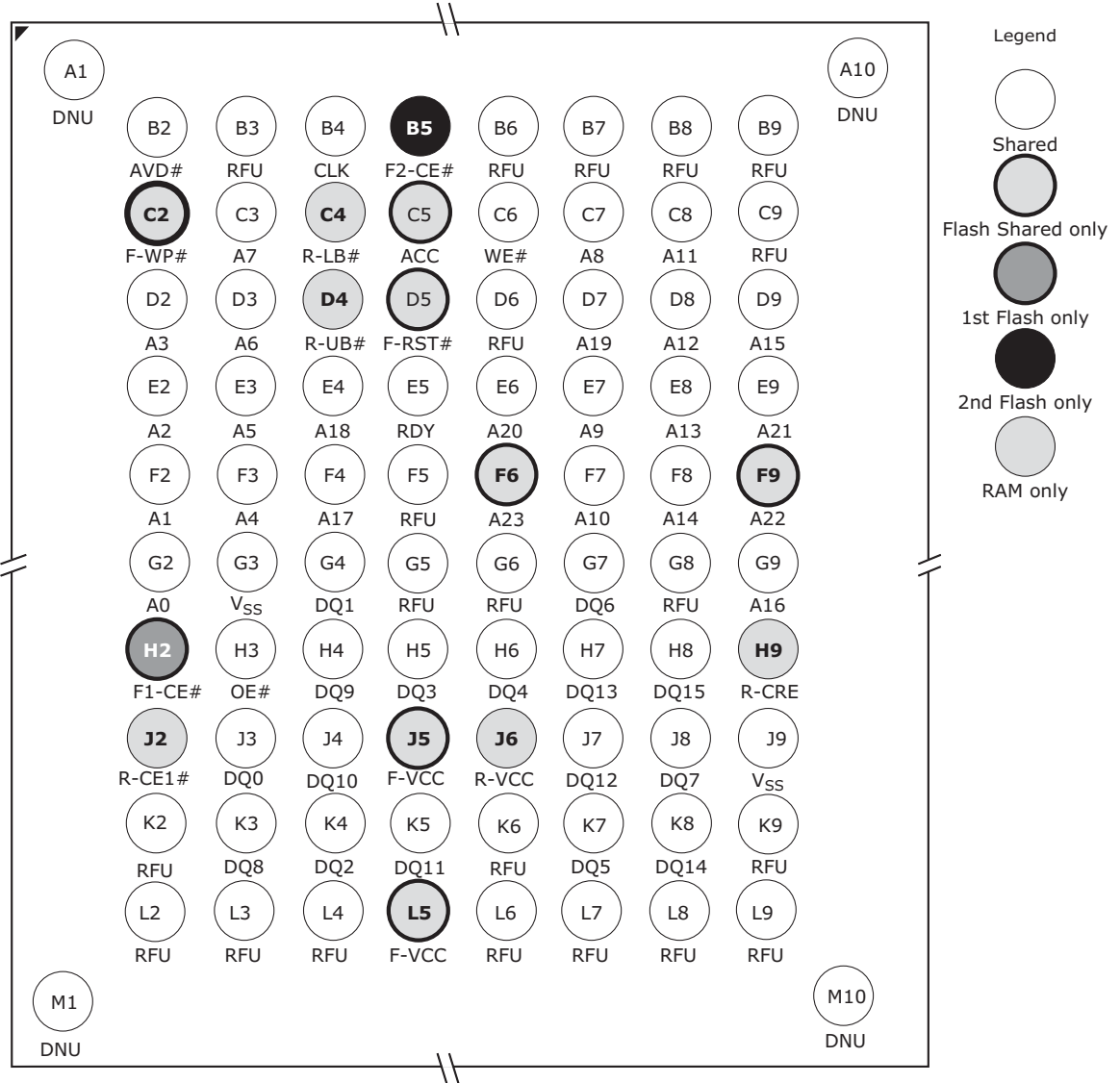
Special handling is required for Flash Memory products in FBGA packages.

Flash memory devices in FBGA packages may be damaged if exposed to ultrasonic cleaning methods. The package and/or data integrity may be compromised if the package body is exposed to temperatures above 150°C for prolonged periods of time.

## 5.2 Connection Diagrams

### 5.2.1 CellularRAM Based Pinout

84-ball Fine-Pitch Ball Grid Array  
CellularRAM-based Pinout (Top View, Balls Facing Down)



**Notes:**

1. In MCPs based on a single S29WS256N (S71WS256N), ball B5 is RFU. In MCP's based on two S29WS256N (S71WS512), ball B5 is F2-CE#.
2. Addresses are shared between Flash and RAM depending on the density of the pSRAM.

MCP	Flash-only Addresses	Shared Addresses
S71WS128NB0	A22-A21	A20-A0
S71WS128NC0	A22	A21-A0
S71WS256NC0	A23 - A22	A21 - A0
S71WS256ND0	A23	A22 - A0
S71WS512NC0	A23 - A22	A21-A0
S71WS512ND0	A23	A22-A0

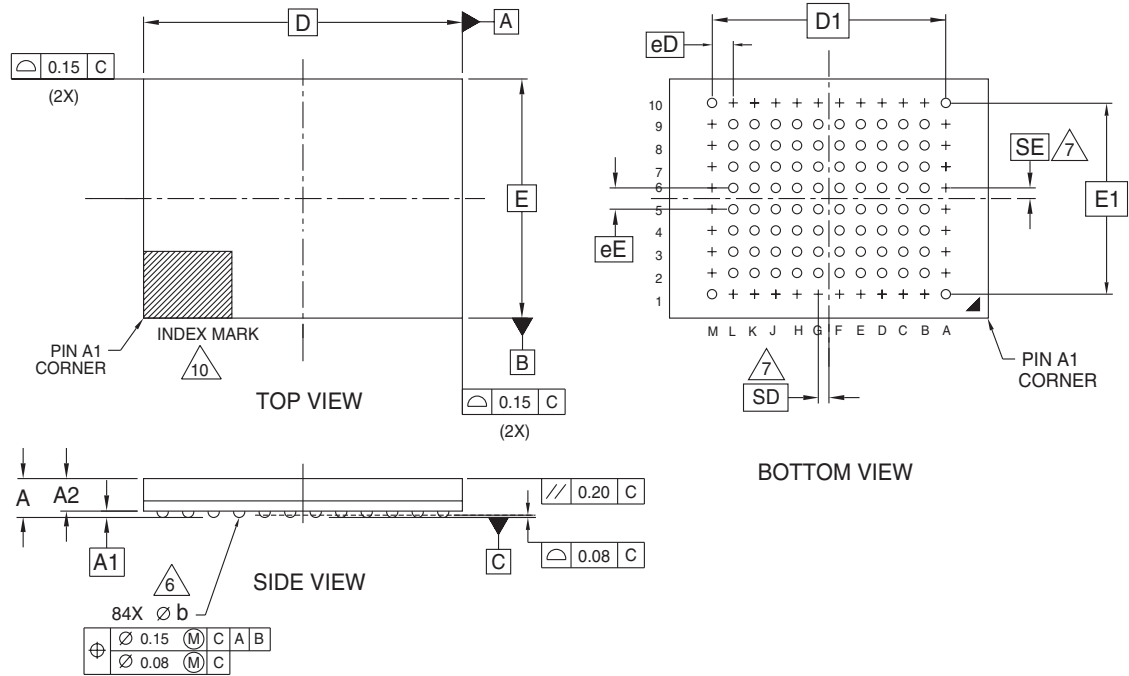


### 5.2.2 Look-Ahead Pinout for Future Designs

Please refer to the Design-in Scalable Wireless Solutions with Spansion Products application note (publication number: Design\_Scalable\_Wireless\_A0\_E). Contact your local Spansion sales representative for more details.

## 5.3 Physical Dimensions

### 5.3.1 TLA084—84-ball Fine-Pitch Ball Grid Array (FBGA) 11.6 x 8.0 x 1.2 mm



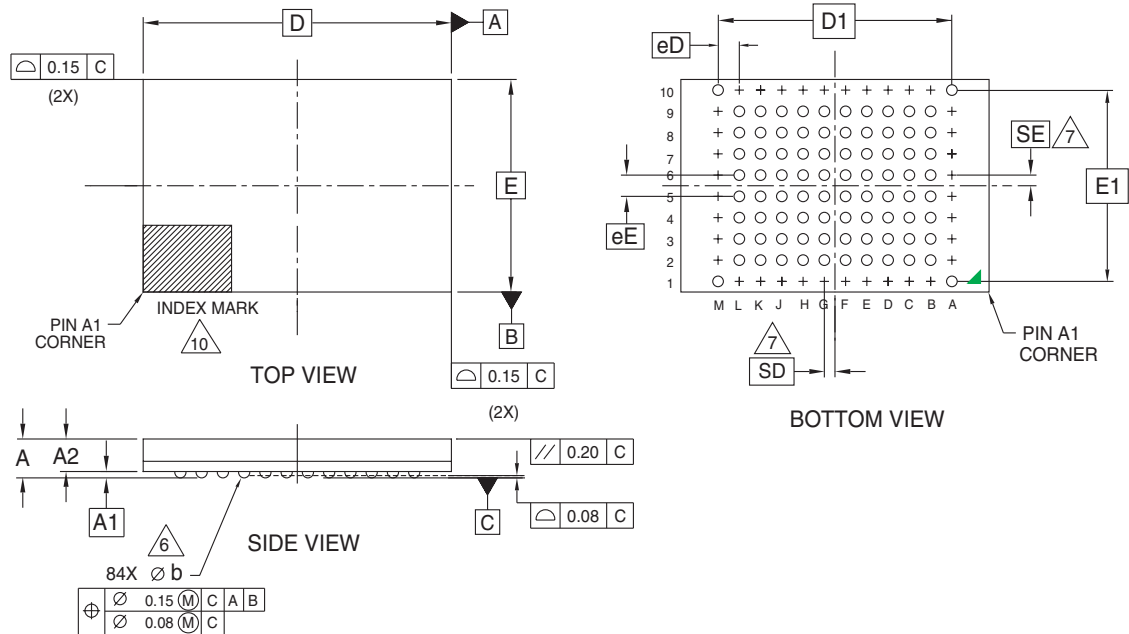
PACKAGE	TLA 084			
JEDEC	N/A			
D x E	11.60 mm x 8.00 mm PACKAGE			
SYMBOL	MIN	NOM	MAX	NOTE
A	---	---	1.20	PROFILE
A1	0.17	---	---	BALL HEIGHT
A2	0.81	---	0.97	BODY THICKNESS
D	11.60 BSC.			BODY SIZE
E	8.00 BSC.			BODY SIZE
D1	8.80 BSC.			MATRIX FOOTPRINT
E1	7.20 BSC.			MATRIX FOOTPRINT
MD	12			MATRIX SIZE D DIRECTION
ME	10			MATRIX SIZE E DIRECTION
n	84			BALL COUNT
$\varnothing b$	0.35	0.40	0.45	BALL DIAMETER
eE	0.80 BSC.			BALL PITCH
eD	0.80 BSC.			BALL PITCH
SD / SE	0.40 BSC.			SOLDER BALL PLACEMENT
	A2,A3,A4,A5,A6,A7,A8,A9 B1,B10,C1,C10,D1,D10, E1,E10,F1,F10,G1,G10, H1,H10,J1,J10,K1,K10,L1,L10, M2,M3,M4,M5,M6,M7,M8,M9			DEPOPULATED SOLDER BALLS

NOTES:

- DIMENSIONING AND TOLERANCING METHODS PER ASME Y14.5M-1994.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- BALL POSITION DESIGNATION PER JESD 95-1, SPP-010.
- eE REPRESENTS THE SOLDER BALL GRID PITCH.
- SYMBOL "MD" IS THE BALL MATRIX SIZE IN THE "D" DIRECTION.  
SYMBOL "ME" IS THE BALL MATRIX SIZE IN THE "E" DIRECTION.  
n IS THE NUMBER OF POPULATED SOLDER BALL POSITIONS FOR MATRIX SIZE MD X ME.
- DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM C.
- SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW.  
WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW SD OR SE = 0.000.  
WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, SD OR SE =  $\frac{eD}{2}$
- "+" INDICATES THE THEORETICAL CENTER OF DEPOPULATED BALLS.
- N/A
- A1 CORNER TO BE IDENTIFIED BY CHAMFER, LASER OR INK MARK, METALLIZED MARK INDENTATION OR OTHER MEANS.

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### 5.3.2 FTA084—84-ball Fine-Pitch Ball Grid Array (FBGA) 11.6 x 8.0 x 1.4 mm



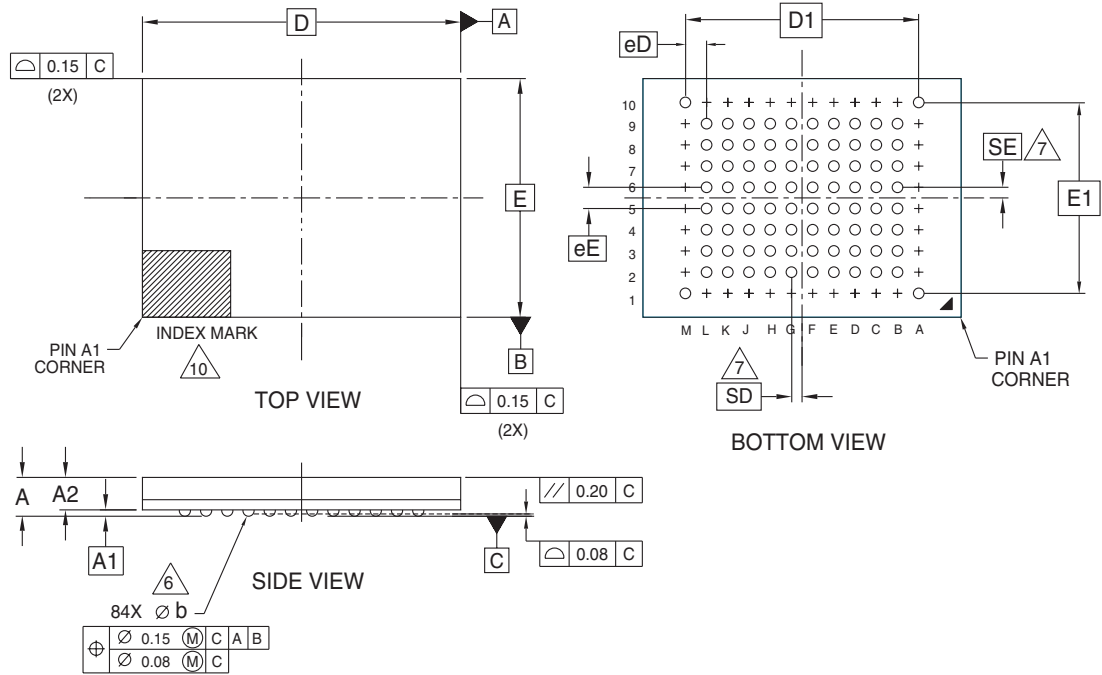
PACKAGE	FTA 084			NOTE
JEDEC	N/A			
D x E	11.60 mm x 8.00 mm PACKAGE			
SYMBOL	MIN	NOM	MAX	
A	---	---	1.40	PROFILE
A1	0.17	---	---	BALL HEIGHT
A2	1.02	---	1.17	BODY THICKNESS
D	11.60 BSC.			BODY SIZE
E	8.00 BSC.			BODY SIZE
D1	8.80 BSC.			MATRIX FOOTPRINT
E1	7.20 BSC.			MATRIX FOOTPRINT
MD	12			MATRIX SIZE D DIRECTION
ME	10			MATRIX SIZE E DIRECTION
n	84			BALL COUNT
øb	0.35	0.40	0.45	BALL DIAMETER
eE	0.80 BSC.			BALL PITCH
eD	0.80 BSC.			BALL PITCH
SD / SE	0.40 BSC.			SOLDER BALL PLACEMENT
	A2,A3,A4,A5,A6,A7,A8,A9 B1,B10,C1,C10,D1,D10,E1,E10 F1,F10,G1,G10,H1,H10 J1,J10,K1,K10,L1,L10 M2,M3,M4,M5,M6,M7,M8,M9			DEPOPULATED SOLDER BALLS

NOTES:

- DIMENSIONING AND TOLERANCING METHODS PER ASME Y14.5M-1994.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- BALL POSITION DESIGNATION PER JESD 95-1, SPP-010.
- e REPRESENTS THE SOLDER BALL GRID PITCH.
- SYMBOL "MD" IS THE BALL MATRIX SIZE IN THE "D" DIRECTION.  
SYMBOL "ME" IS THE BALL MATRIX SIZE IN THE "E" DIRECTION.  
n IS THE NUMBER OF POPULATED SOLDER BALL POSITIONS FOR MATRIX SIZE MD X ME.
- DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM C.
- SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW.  
WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW SD OR SE = 0.000.  
WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, SD OR SE =  $\frac{\varnothing}{2}$
- "+" INDICATES THE THEORETICAL CENTER OF DEPOPULATED BALLS.
- N/A
- A1 CORNER TO BE IDENTIFIED BY CHAMFER, LASER OR INK MARK, METALLIZED MARK INDENTATION OR OTHER MEANS.

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### 5.3.3 TSD084—84-ball Fine-Pitch Ball Grid Array (FBGA) 12.0 x 9.0 x 1.2 mm



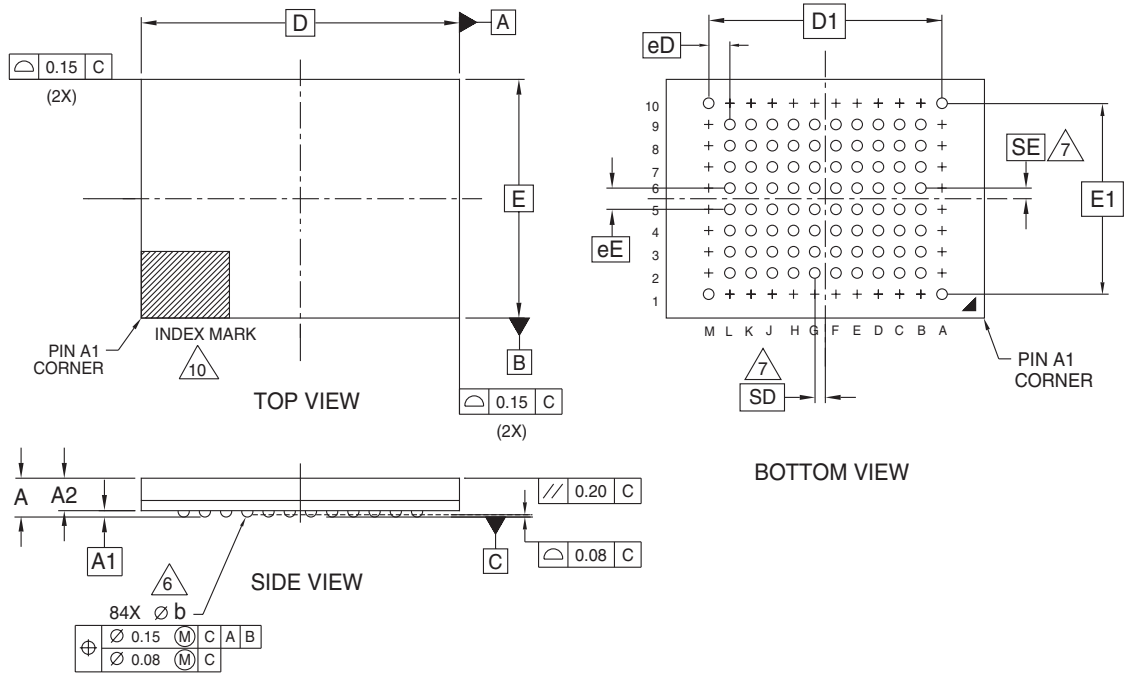
PACKAGE	TSD 084			NOTE
JEDEC	N/A			
D x E	12.00 mm x 9.00 mm PACKAGE			
SYMBOL	MIN	NOM	MAX	NOTE
A	---	---	1.20	PROFILE
A1	0.17	---	---	BALL HEIGHT
A2	0.81	---	0.94	BODY THICKNESS
D	12.00 BSC.			BODY SIZE
E	9.00 BSC.			BODY SIZE
D1	8.80 BSC.			MATRIX FOOTPRINT
E1	7.20 BSC.			MATRIX FOOTPRINT
MD	12			MATRIX SIZE D DIRECTION
ME	10			MATRIX SIZE E DIRECTION
n	84			BALL COUNT
$\phi b$	0.35	0.40	0.45	BALL DIAMETER
eE	0.80 BSC.			BALL PITCH
eD	0.80 BSC.			BALL PITCH
SD / SE	0.40 BSC.			SOLDER BALL PLACEMENT
	A2,A3,A4,A5,A6,7,A8,A9 B1,B10,C1,C10,D1,D10 E1,E10,F1,F10,G1,G10 H1,H10,J1,J10,K1,K10,L1,L10 M2,M3,M4,M5,M6,M7,M8,M9			DEPOPULATED SOLDER BALLS

NOTES:

- DIMENSIONING AND TOLERANCING METHODS PER ASME Y14.5M-1994.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- BALL POSITION DESIGNATION PER JESD 95-1, SPP-010.
- [e] REPRESENTS THE SOLDER BALL GRID PITCH.
- SYMBOL "MD" IS THE BALL MATRIX SIZE IN THE "D" DIRECTION.  
SYMBOL "ME" IS THE BALL MATRIX SIZE IN THE "E" DIRECTION.  
n IS THE NUMBER OF POPULATED SOLDER BALL POSITIONS FOR MATRIX SIZE MD X ME.
- [6] DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM C.
- SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW.
- WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW SD OR SE = 0.000.  
WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, SD OR SE =  $\frac{e}{2}$
- "+" INDICATES THE THEORETICAL CENTER OF DEPOPULATED BALLS.
- N/A
- [10] A1 CORNER TO BE IDENTIFIED BY CHAMFER, LASER OR INK MARK, METALLIZED MARK INDENTATION OR OTHER MEANS.

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### 5.3.4 FEA084—84-ball Fine-Pitch Ball Grid Array (FBGA) 12.0 x 9.0 x 1.4 mm



PACKAGE	FEA 084			NOTE
JEDEC	N/A			
D x E	12.00 mm x 9.00 mm PACKAGE			
SYMBOL	MIN	NOM	MAX	
A	---	---	1.40	PROFILE
A1	0.10	---	---	BALL HEIGHT
A2	1.11	---	1.26	BODY THICKNESS
D	12.00 BSC.			BODY SIZE
E	9.00 BSC.			BODY SIZE
D1	8.80 BSC.			MATRIX FOOTPRINT
E1	7.20 BSC.			MATRIX FOOTPRINT
MD	12			MATRIX SIZE D DIRECTION
ME	10			MATRIX SIZE E DIRECTION
n	84			BALL COUNT
Ø b	0.35	0.40	0.45	BALL DIAMETER
eE	0.80 BSC.			BALL PITCH
eD	0.80 BSC.			BALL PITCH
SD / SE	0.40 BSC.			SOLDER BALL PLACEMENT
	A2,A3,A4,A5,A6,A7,A8,A9 B1,B10,C1,C10,D1,D10 E1,E10,F1,F10,G1,G10 H1,H10,J1,J10,K1,K10,L1,L10 M2,M3,M4,M5,M6,M7,M8,M9			DEPOPULATED SOLDER BALLS

NOTES:

- DIMENSIONING AND TOLERANCING METHODS PER ASME Y14.5M-1994.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- BALL POSITION DESIGNATION PER JESD 95-1, SPP-010.
- [e] REPRESENTS THE SOLDER BALL GRID PITCH.
- SYMBOL "MD" IS THE BALL MATRIX SIZE IN THE "D" DIRECTION.  
SYMBOL "ME" IS THE BALL MATRIX SIZE IN THE "E" DIRECTION.  
n IS THE NUMBER OF POPULATED SOLDER BALL POSITIONS FOR MATRIX SIZE MD X ME.
- DIMENSION "b" IS MEASURED AT THE MAXIMUM BALL DIAMETER IN A PLANE PARALLEL TO DATUM C.
- SD AND SE ARE MEASURED WITH RESPECT TO DATUMS A AND B AND DEFINE THE POSITION OF THE CENTER SOLDER BALL IN THE OUTER ROW.  
WHEN THERE IS AN ODD NUMBER OF SOLDER BALLS IN THE OUTER ROW SD OR SE = 0.000.  
WHEN THERE IS AN EVEN NUMBER OF SOLDER BALLS IN THE OUTER ROW, SD OR SE = [e/2]
- "+" INDICATES THE THEORETICAL CENTER OF DEPOPULATED BALLS.
- N/A
- A1 CORNER TO BE IDENTIFIED BY CHAMFER, LASER OR INK MARK, METALLIZED MARK INDENTATION OR OTHER MEANS.

**Note:**  
BSC is an ANSI standard for Basic Space Centering.

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## 6. Revision History

Section	Description
<b>Revision A (February 1, 2004)</b>	
	Initial release.
<b>Revision A1 (February 9, 2005)</b>	
Global	Updated document to include Burst Speed of 66 MHz Updated Publication Number
<b>Revision A2 (March 31, 2005)</b>	
Global	Updated Product Selector Guide and Ordering Information tables
<b>Revision A3 (May 2, 2005)</b>	
Global	Added 80 MHz speed options to: Product Selector Guide Ordering Information table Valid Combination table
<b>Revision A4 (August 25, 2005)</b>	
Global	Replaced module cellRAM_00_A0 with cellRAM_03 and cellRAM_04
<b>Revision A5 (February 7, 2006)</b>	
Global	Updated Product Selector Guide with new options Updated the Ordering Part Number table Updated the Valid Combinations table Removed the Look-ahead Diagram
<b>Revision A6 (July 19, 2006)</b>	
Global	Reformatted document to new template Added reference to 32 Mb CellRAM module
<b>Revision A7 (April 4, 2008)</b>	
Global	Removed "Advanced Information" status
General Description	Updated pSRAM Publication Identification Numbers

### Colophon

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