CONTENTS

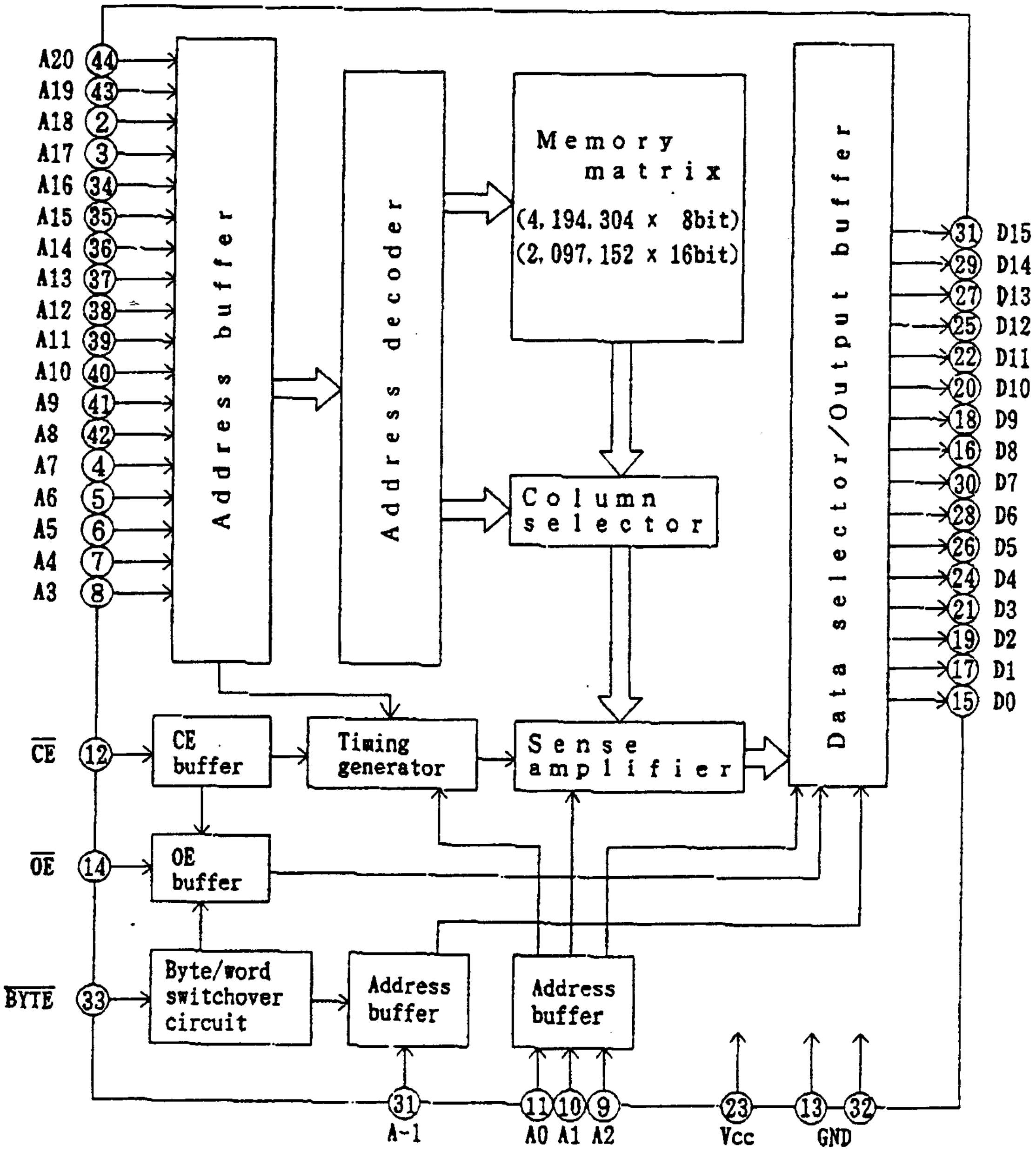
1. General Description

The SHARP LHMC56xx(LH53C32600N) is a 32Mbit CMOS mask ROM (mask-programmable read-only memory) with page mode operation, produced by the silicon gate CMOS process.

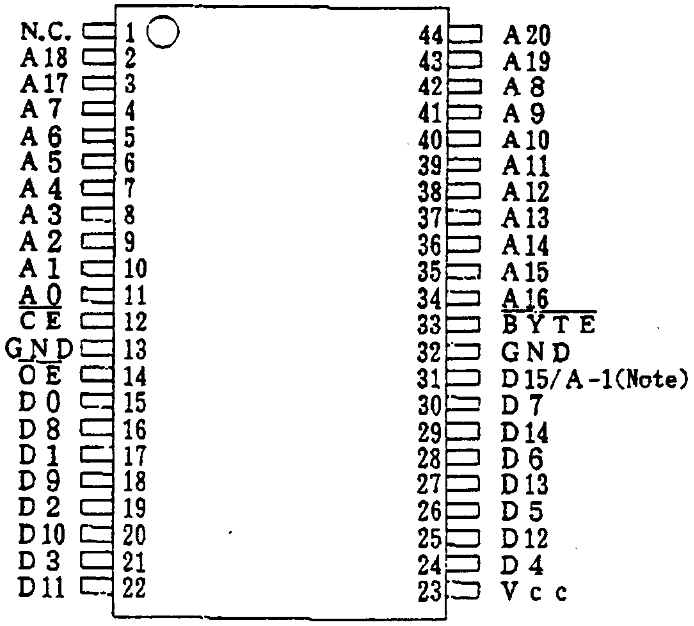
2. Features

- Memory organization selection
  4,194,304 x 8-bit (Byte mode : $\overline{\text{BYTE}}=V_{IL}$)
  2,097,152 x 16-bit (Word mode : $\overline{\text{BYTE}}=V_{IH}$)
- Single +5V Power supply
- Static operation
- 3-state output
- Access time: 100ns (max.)
  Access time in page mode: 50ns (max.)
- Addressable page: 8 words or 16 bytes
- 44Pin-SOP
- Supply current
  Operating: 170mA (max.)
  Standby : 300μA (max.)
- Others
  Non programmable
  Not designed or rated as radiation hardened
  CMOS process(P type silicon substrate)

3. Block Diagram



4. Pin Connections



(44 Pin SOP)

5. Pin Description

A-1 ~ A2	Address input (page mode operation)
A3 ~ A20	Address input
D0 ~ D15	Data output
$\overline{\text{BYTE}}$	x8bit/x16bit(byte/word) mode select input (Note1, Note2)
$\overline{\text{CE}}$	Chip enable input (Note2)
$\overline{\text{OE}}$	Output enable input (Note2)
Vcc	Power pin (+5V)
GND	Ground
N.C.	Non connection (No wire bonding)

(Note1)

The D15/A-1 pin becomes LSB address input (A-1) when the $\overline{\text{BYTE}}$ pin is set to be low in byte mode, and data output (D15) when set to be high in word mode.

(Note2)

$\overline{\text{CE}}$	$\overline{\text{OE}}$	$\overline{\text{BYTE}}$	A-1 (D15)	Data output		Address input		Supply current
				D0~D7-Pin	D8~D15-Pin	LSB	MSB	
H	X	X	X	High Impedance	High Impedance	–	–	Standby
L	H	X	X	High Impedance	High Impedance	–	–	Operating
L	L	H	-	D0~D7	D8~D15	A0	A20	Operating
L	L	L	L	D0~D7	High Impedance	A-1	A20	Operating
L	L	L	H	D8~D15	High Impedance	A-1	A20	Operating

X : Don't Care

6. Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply Voltage	V_{CC}	−0.3 ~ +7.0	V
Input Voltage	V_{IN}	−0.3 ~ Vcc+0.3	V
Output Voltage	V_{OUT}	−0.3 ~ Vcc+0.3	V
Operating Temperature	T_{OPR}	0 ~ +70	℃
Storage Temperature	T_{STG}	−65 ~ +150	℃

7. Operating Ranges

Ta=0℃~70℃

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	V

8. D.C. Electrical Characteristics

Vcc=5.0V±10%, Ta=0℃~70℃

Item	Symbol	Test conditions	Min.	Max.	Unit	Note
Input high voltage	V_{IH}		2.2	Vcc+0.3	V	
Input low voltage	V_{IL}		-0.3	0.8	V	
Output high voltage	V_{OH}	I_{OH} = -400μA	2.4		V	
Output low voltage	V_{OL}	I_{OL} = 2.0mA		0.4	V	
Input leakage current	$\lvert I_{LI} \rvert$	V_{IN} = 0V~Vcc		10	μA	
Output leakage current	$\lvert I_{LO} \rvert$	V_{OUT} = 0V~Vcc		10	μA	1
Supply current(Operating)	I_{CC}	t_{RC} = 100ns		170	mA	2
Supply current(standby)	I_{SB}	$\overline{CE}$ = Vcc-0.2V		300	μA	3
Input capacitance	C_{IN}	f = 1MHz, Ta=25℃		10	pF	
Output capacitance	C_{OUT}			10	pF	

Note 1: $\overline{CE}$ = V_{IH}
$\overline{OE}$ = V_{IH}

Note 2: V_{IN} = V_{IH} , V_{IL}
$\overline{CE}$ = V_{IL} (Output is open)

Note 3: V_{IN}(A0~A20 and A-1) = 0.2V or Vcc-0.2V

9. A.C. Electrical Characteristics

Vcc=5.0V±10%, Ta=0℃~70℃

Item	Symbol	Min.	Max.	Unit
Read cycle time	t_{RC}	100		ns
Address access time	t_{AA}		100	
Chip enable access time	t_{ACE}		100	
Page address access time	t_{APA}		50	
Output enable delay time	t_{OE}		50	
Output hold time	t_{OH}	0		
Output high impedance delay time	t_{CHZ}		40(Note)	
	t_{OHZ}		40(Note)	

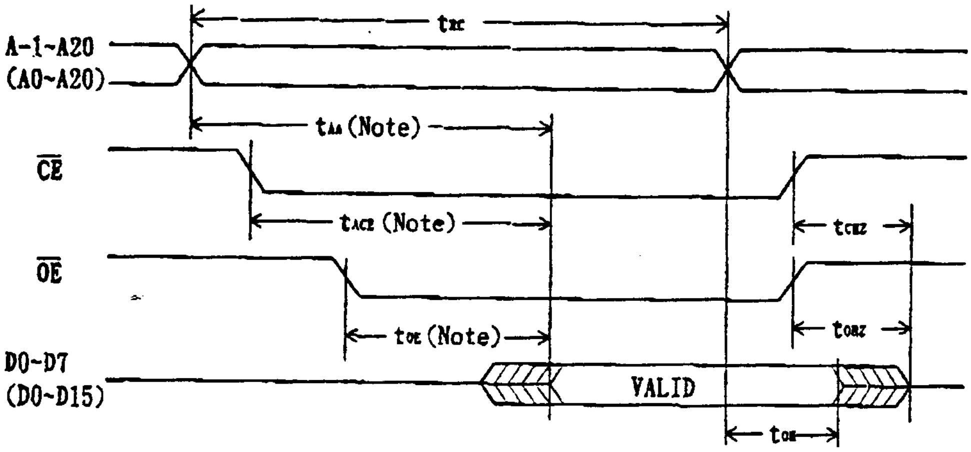
Test Condition

Input voltage amplitude : 0.4V ~ 2.6V
Input signal rise time : 10ns
Input signal fall time : 10ns
Input reference level : 1.5V
Output reference level : 1.5V
Output load condition : 1TTL + 100pF

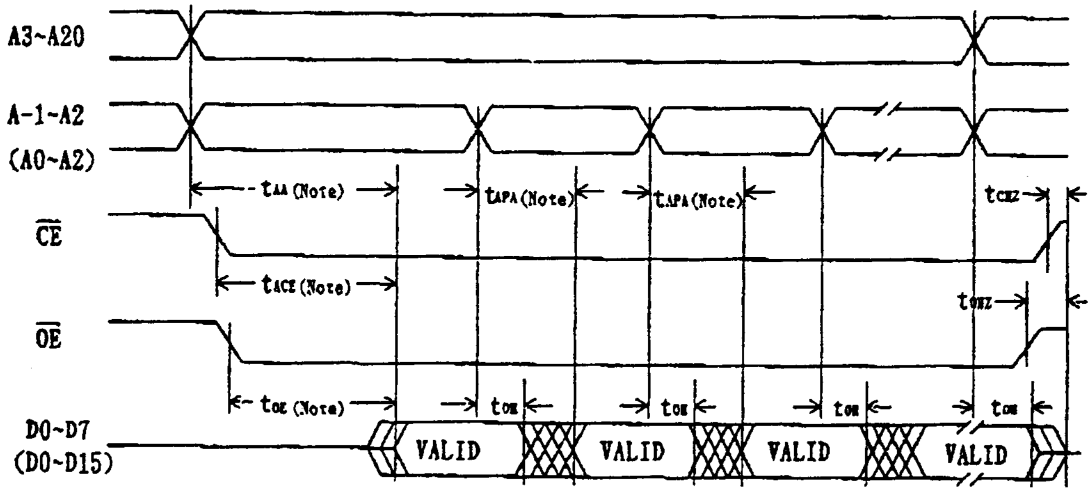
(Note) Determined by the time for the output to be opened.
(irrespective of output voltage)

10. Timing Chart

i)Read cycle



ii)Page mode read cycle



Note: The output data becomes valid when the last interval, t_{AA}, t_{ACE}, t_{APA} or t_{OE} have concluded.

11. Note

It is recommended that a decoupling capacitor be connected between Vcc and GND-Pin.

12 Package and packing specification

1. Package Outline Specification
Refer to drawing No.AA1050

2. Markings
2−1. Marking contents
(1) Product name : □□□□□□□□
(2) Company name : SHARP
(3) Date code
(Example) YY WW XXX Indicates the product was manufactured in the WWth week of 19YY.
XXX → Denotes the production ref.code (1~3)
WW → Denotes the production week. (01, 02, 03, · · · · · 52, 53)
YY → Denotes the production year. (Lower two digits of the year.)
(4) The marking of "JAPAN" indicates the country of origin.
2−2. Marking layout
Refer to drawing No.AA1050
(This layout does not define the dimensions of marking character and marking position.)

3. Packing Specification (Dry packing for surface mount packages)

Dry packing is used for the purpose of maintaining IC quality after mounting packages on the PCB (Printed Circuit Board).
When the epoxy resin which is used for plastic packages is stored at high humidity, it may absorb 0.15% or more of its weight in moisture. If the surface mount type package for a relatively large chip absorbs a large amount of moisture between the epoxy resin and insert material (e.g. chip, lead frame) this moisture may suddenly vaporize into steam when the entire package is heated during the soldering process (e.g. VPS). This causes expansion and results in separation between the resin and insert material, and sometimes cracking of the package.
This dry packing is designed to prevent the above problem from occurring in surface mount packages.

3−1. Packing Materials

Material Name	Material Specificaiton	Purpose
Magazine	Anti-static treated plastic (15devices/magazine)	Packing of device
Stopper	Plastic or rubber	Fixing of device
Cap	Plastic (2caps/bag)	Fixing of Magazine
Laminated aluminum bag	Aluminum polyethylene (1bag/case)	Drying of device
Desiccant	Silica gel	Drying of device
Inner case	Card board (600devices/case)	Packaging of device
Label	Paper	Indicates part number, quantity and date of manufacture
Outer case	Card board	Outer packing of Magazine

(Devices shall be inserted into a magazine (sleeve) in the same direction.)

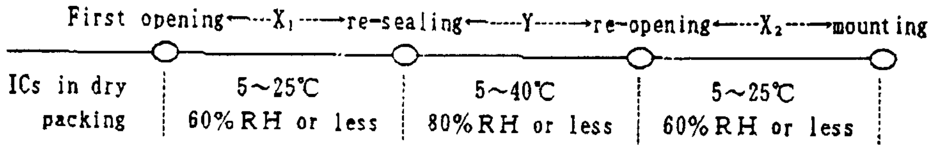
3－2. Outline dimension of magazine (sleeve)
Refer to attached drawing

4. Storage and Opening of Dry Packing

4－1. Store under conditions shown below before opening the dry packing
(1) Temperature range : 5～40℃
(2) Humidity : 80% RH or less

4－2. Notes on opening the dry packing
(1) Before opening the dry packing, prepare a working table which is grounded against ESD and use a grounding strap.
(2) The magazine has been treated to be conductive or anti-static. If the device is transferred to another magazine, use a equivalent magazine.
(3) A stopper is included with the magazine. Before storage, make sure the stopper is inserted.

4－3. Storage after opening the dry packing
Perform the following to prevent absorption of moisture after opening.
(1) After opening the dry packing, store the ICs in an environment with a temperature of 5～25℃ and a relative humidity of 60% or less and mount ICs within 4 days after opening dry packing.
(2) To re-store the ICs for an extended period of time within 4 days after opening the dry packing, use a dry box or re-seal the ICs in the dry packing with desiccant (whoes indicater is blue), and store in an environment with a temperature of 5～40℃ and a relative humidity of 80% or less, and mount ICs within 2 weeks.
(3) Total period of storage after first opening and re-opening is within 4 days, and store the ICs in the same environment as section 4-3.(1).



X_1+X_2 : within 4 days
Y : within 2 weeks

4－4. Baking (drying) before mounting
(1) Baking is necessary
(A) If the humidity indicator in the desiccant becomes pink
(B) If the procedure in section 4－3 could not be performed
(2) Recommended baking conditions
If the above conditions (A) and (B) are applicable, bake it before mounting. The recommended conditions are 16～24 hours at 120℃ or 5～10 hours at 150℃. Note that the standard magazine can not be baked. Use the heat resistant magazine.
(3) Storage after baking
After baking ICs, store the ICs in the same environment as section 4-3.(1).

5. Surface Mount Conditions

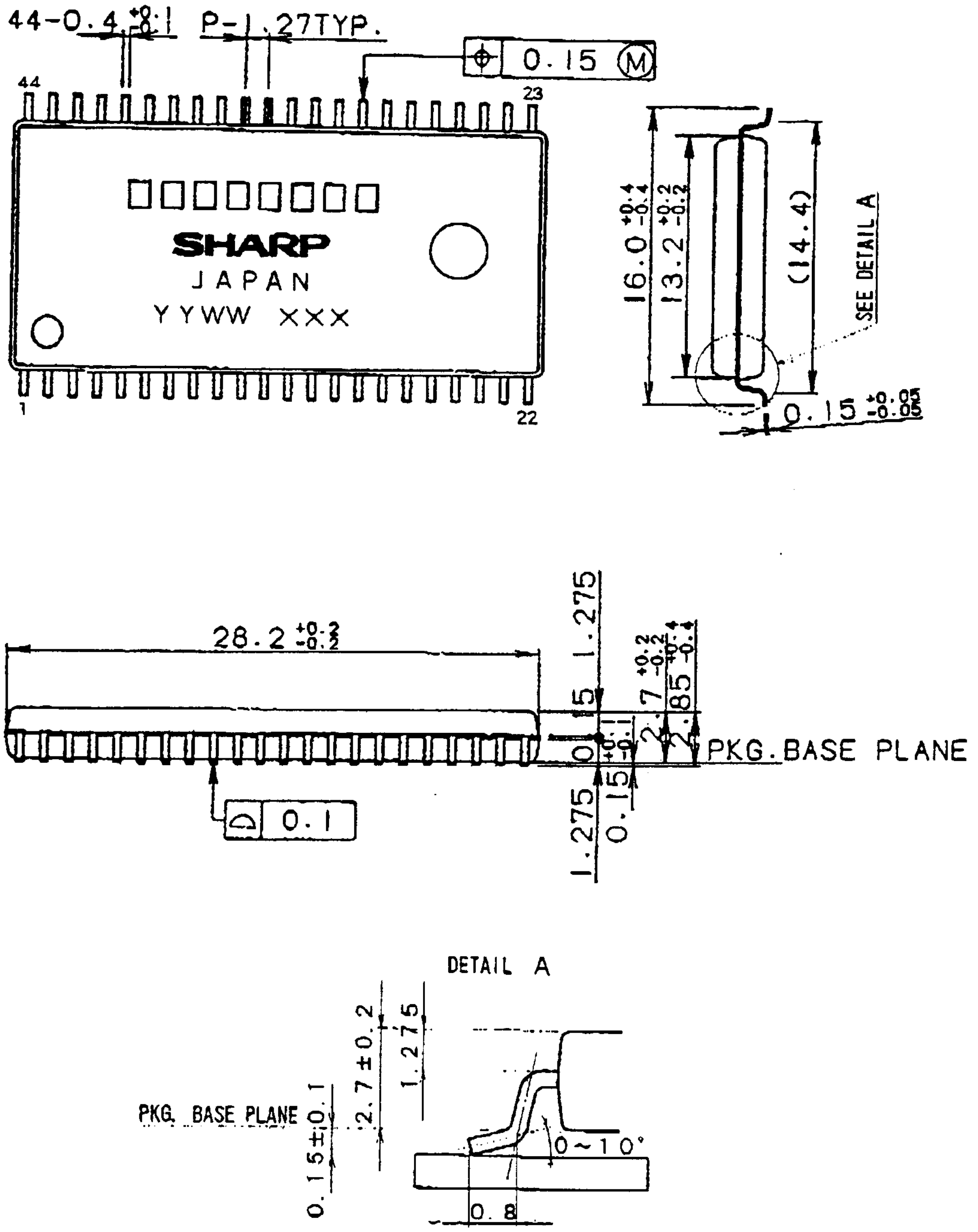
Please perform the following conditions when mounting ICs not to deteriorate IC quality.

5－1. Soldering conditions (The following conditions are valid only for one time soldering.)

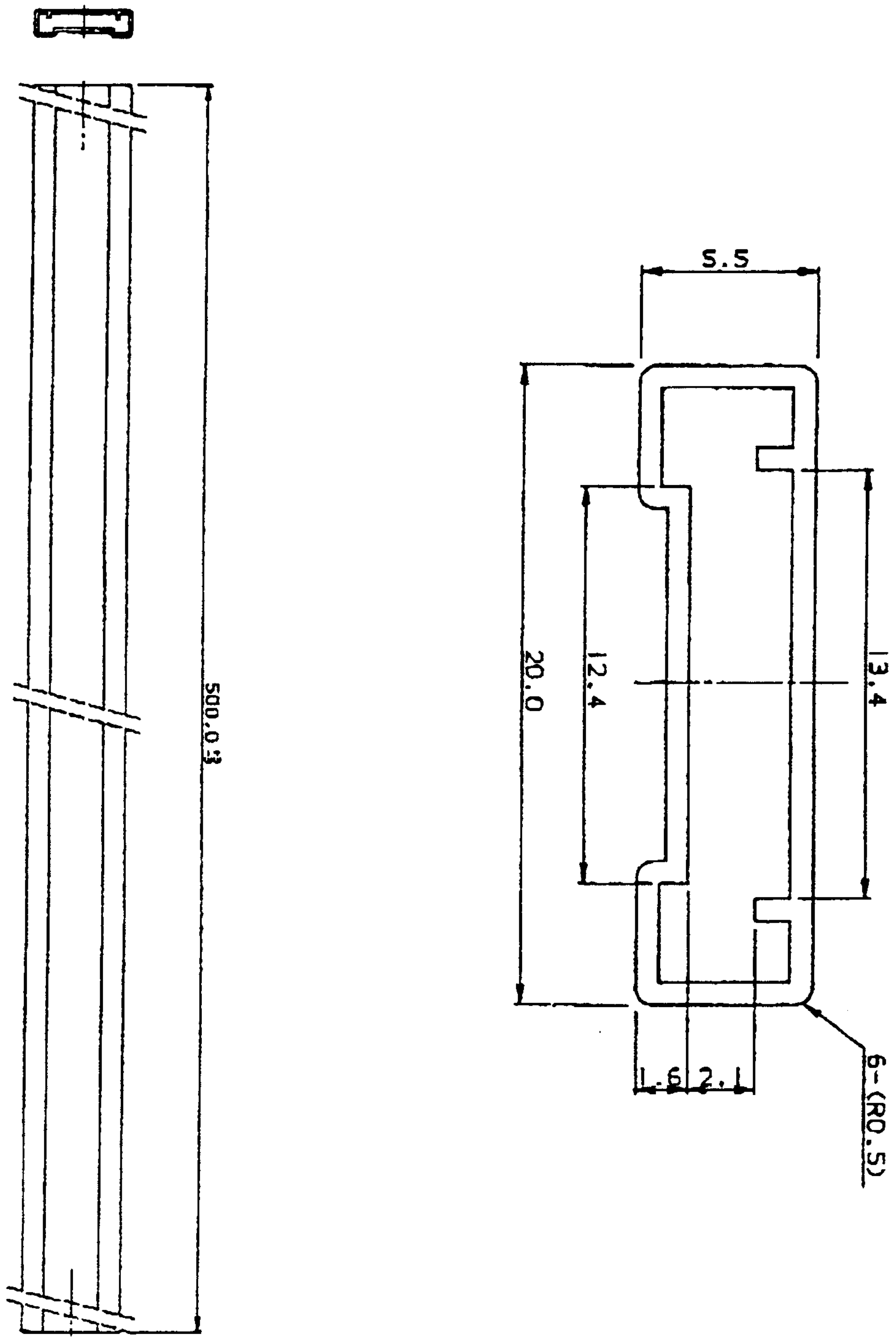
Mounting Method	Temperature and Duration	Measurement Point
Reflow soldering (air)	Peak temperature of 240℃ or less, duration of less than 15 seconds above 230℃, temperature increase rate of 1～4℃/second	IC package surface
Solder dipping	245℃ or less, duration of less than 3 seconds/dip, total of 5 seconds	Solder bath
Vapor phase soldering	215℃ or less, duration of less than 40 seconds above 200℃	Steam
Manual soldering (soldering iron)	260℃ or less, duration of less than 10 seconds	IC outer lead surface

5－2. Conditions for removal of residual flux

(1) Ultrasonic washing power : 25 Watts/liter or less
(2) Washing time : Total 1 minute maximum
(3) Solvent temperature : 15～40℃



名称 NAME	SOP44-P-600	リード仕上 LEAD FINISH	TIN-LEAD PLATING	備考 NOTE	プラスチックパッケージ外形寸法は、バリを含まないものとする。 Plastic body dimensions do not include burr of resin.
DRAWING NO.	AA1050	単位 UNIT	mm		



注記 ：マガジン(スリーブ)両側のストッパーは、ゴムストッパーとする。
指示無き寸法公差は全て±０．４mmとする。

NOTES : Stopper which is set at the both ends of magazine (sleeve) is made of rubber.
All tolerances are ±0.4mm unless otherwise specified.

名称 NAME	SOP600SPK-A2			備考 NOTE
DRAWING NO.	CV648	単位 UNIT	mm	