

LH5164A-10LF

64K Static RAM

(Model Number: LH516A2)

Spec. Issue Date: October 22, 2004
Spec No: EL16X051

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| SPEC No. | EL16X051 |
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| ISSUE: | Oct. 22. 2004 |
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To: _____

S P E C I F I C A T I O N S

Product Type _____ 64k SRAM _____

LH5164A-10LF

Model No. _____ (LH516A2) _____

*This specifications contains 18 pages including the cover and appendix.

If you have any objections, please contact us before issuing purchasing order.

CUSTOMER ACCEPTANCE

DATE: _____

BY: _____

PRESENTED

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- When using the products covered herein, please observe the conditions written herein and the precautions outlined in the following paragraphs. In no event shall the company be liable for any damages resulting from failure to strictly adhere to these conditions and precautions.
 - (1) The products covered herein are designed and manufactured for the following application areas. When using the products covered herein for the equipment listed in Paragraph (2), even for the following application areas, be sure to observe the precautions given in Paragraph (2). Never use the products for the equipment listed in Paragraph (3).
 - Office electronics
 - Instrumentation and measuring equipment
 - Machine tools
 - Audiovisual equipment
 - Home appliances
 - Communication equipment other than for trunk lines

 - (2) Those contemplating using the products covered herein for the following equipment which demands high reliability, should first contact a sales representative of the company and then accept responsibility for incorporating into the design fail-safe operation, redundancy, and other appropriate measures for ensuring reliability and safety of the equipment and the overall system.
 - Control and safety devices for airplanes, trains, automobiles, and other transportation equipment
 - Mainframe computers
 - Traffic control systems
 - Gas leak detectors and automatic cutoff devices
 - Rescue and security equipment
 - Other safety devices and safety equipment, etc.

 - (3) Do not use the products covered herein for the following equipment which demands extremely high performance in terms of functionality, reliability, or accuracy.
 - Aerospace equipment
 - Communications equipment for trunk lines
 - Control equipment for the nuclear power industry
 - Medical equipment related to life support, etc.

 - (4) Please direct all queries and comments regarding the interpretation of the above three Paragraphs to a sales representative of the company.

- Please direct all queries regarding the products covered herein to a sales representative of the company.

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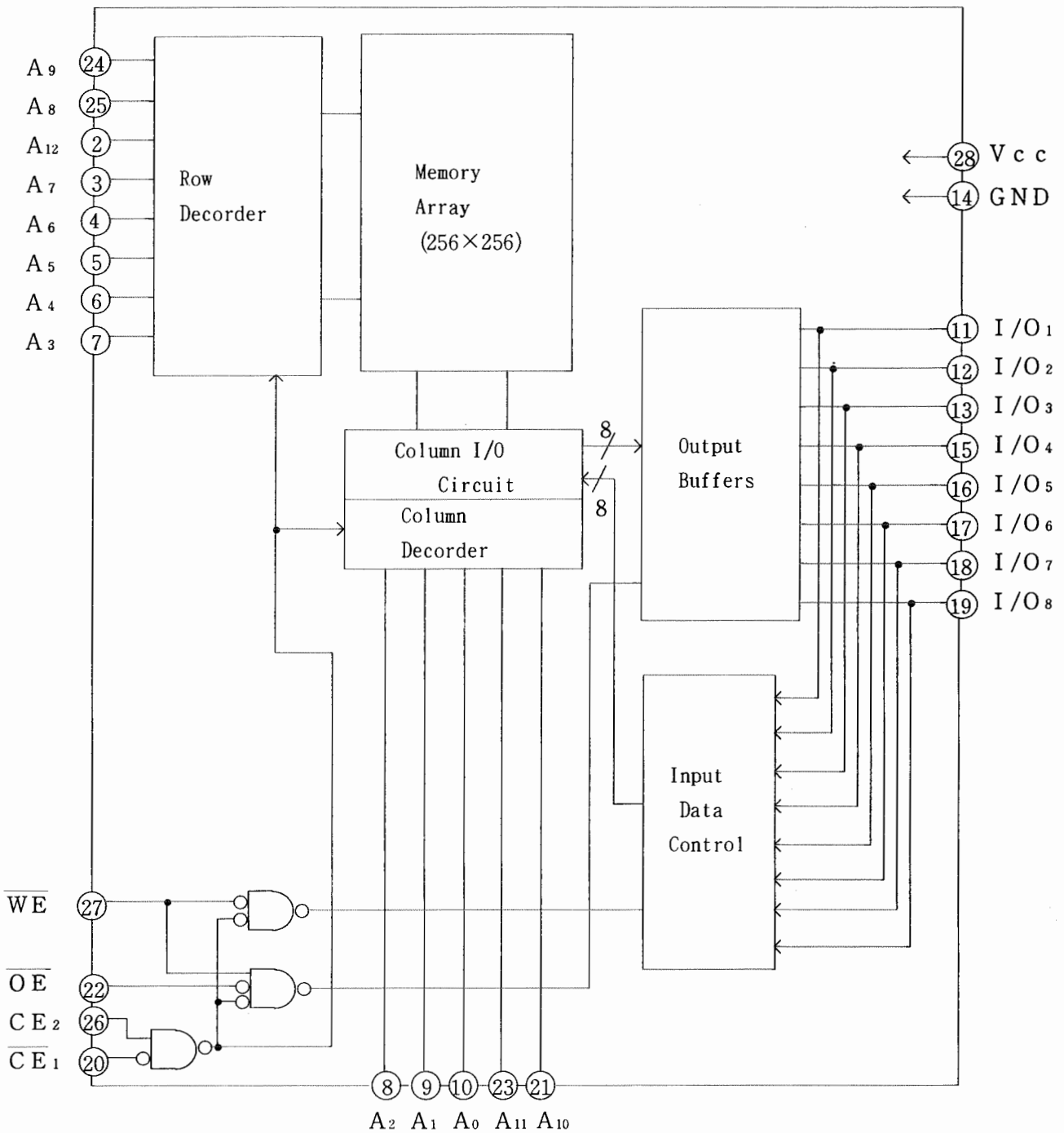
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3. Truth Table

| \overline{CE}_1 | CE_2 | \overline{WE} | \overline{OE} | Mode | I/O ₁ to I/O ₈ | Supply current |
|-------------------|--------|-----------------|-----------------|----------------|--------------------------------------|----------------------------|
| H | * | * | * | Standby | High impedance | Standby (I _{SB}) |
| * | L | * | * | Standby | High impedance | Standby (I _{SB}) |
| L | H | L | * | Write | Data input | Active (I _{CC}) |
| L | H | H | L | Read | Data output | Active (I _{CC}) |
| L | H | H | H | Output disable | High impedance | Active (I _{CC}) |

(* = Don't Care, L=Low, H=High)

4. Block Diagram



5. Absolute Maximum Ratings

| Parameter | Symbol | Ratings | Unit |
|-----------------------|-----------|---------------------------|------|
| Supply voltage (*1) | V_{CC} | -0.3 to +7.0 | V |
| Input voltage (*1) | V_{IN} | -0.3 (*2) to $V_{CC}+0.3$ | V |
| Operating temperature | T_{opr} | -10 to +70 | °C |
| Storage temperature | T_{stg} | -65 to +150 | °C |

Note) *1. The maximum applicable voltage on any pin with respect to GND.

*2. Undershoot of -3.0V is allowed width of pluse bellow 50ns.

6. Recommended DC Operating Conditions

($T_a = -10^{\circ}\text{C}$ to $+70^{\circ}\text{C}$)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|----------------|----------|-----------|------|--------------|------|
| Supply voltage | V_{CC} | 4.5 | 5.0 | 5.5 | V |
| Input voltage | V_{IH} | 2.2 | | $V_{CC}+0.3$ | V |
| | V_{IL} | -0.3 (*3) | | 0.8 | V |

Note) *3. Undershoot of -3.0V is allowed width of pluse below 50ns.

7. DC Electrical Characteristics

($T_a = -10^{\circ}\text{C}$ to $+70^{\circ}\text{C}$, $V_{CC} = 5\text{V} \pm 10\%$)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|--------------------------|-----------|---|------|-----------------------------------|------|---------------|
| Input leakage current | I_{LI} | $V_{IN}=0\text{V}$ to V_{CC} | -1.0 | | 1.0 | μA |
| Output leakage current | I_{LO} | $\overline{CE}_1=V_{IH}$ or $CE_2=V_{IL}$ or $\overline{OE}=V_{IH}$ or $\overline{WE}=V_{IL}$ $V_{I/O}=0\text{V}$ to V_{CC} | -1.0 | | 1.0 | μA |
| Operating supply current | I_{CC} | $\overline{CE}_1=V_{IL}$, $V_{IN}=V_{IH}$ or V_{IH} $CE_2=V_{IH}$, $I_{I/O}=0\text{mA}$ | | t_{CYCLE} =100ns | 45 | mA |
| | I_{CC1} | $\overline{CE}_1=0.2\text{V}$, $V_{IN}=0.2\text{V}$ or $V_{CC}-0.2\text{V}$ $CE_2=V_{CC}-0.2\text{V}$, $I_{I/O}=0\text{mA}$ | | t_{CYCLE} =1.0 μs | 10 | mA |
| Standby current | I_{SB} | $\overline{CE}_1, CE_2 \geq V_{CC}-0.2\text{V}$ or $CE_2 \leq 0.2\text{V}$ | | | 1.0 | μA |
| | I_{SB1} | $\overline{CE}_1=V_{IH}$ or $CE_2=V_{IL}$ | | | 5 | mA |
| Output voltage | V_{OL} | $I_{OL}=2.1\text{mA}$ | | | 0.4 | V |
| | V_{OH} | $I_{OH}=-1.0\text{mA}$ | 2.4 | | | V |

8. AC Electrical Characteristics

AC Test Conditions

| | |
|------------------------------------|--------------------------------------|
| Input pulse level | 0.6 V to 2.4 V |
| Input rise and fall time | 10 ns |
| Input and Output timing Ref. level | 1.5 V |
| Output load | 1 TTL + C _L (100 pF) (*4) |

Note) *4. Including scope and jig capacitance.

Read cycle

(T_a = -10°C to +70°C, V_{cc} = 5 V ± 10%)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|--|-------------------|------|------|------|------|
| Read cycle time | t _{RC} | 100 | | | ns |
| Address access time | t _{AA} | | | 100 | ns |
| CE ₁ access time | t _{ACE1} | | | 100 | ns |
| CE ₂ access time | t _{ACE2} | | | 100 | ns |
| Output enable to output valid | t _{OE} | | | 40 | ns |
| Output hold from address change | t _{OH} | 10 | | | ns |
| CE ₁ Low to output active | t _{LZ1} | 10 | | | ns |
| CE ₂ High to output active | t _{LZ2} | 10 | | | ns |
| OE Low to output active | t _{OLZ} | 5 | | | ns |
| CE ₁ High to output in High impedance | t _{HZ1} | 0 | | 30 | ns |
| CE ₂ Low to output in High impedance | t _{HZ2} | 0 | | 30 | ns |
| OE High to output in High impedance | t _{OHZ} | 0 | | 20 | ns |

Write cycle

(T_a = -10°C to +70°C, V_{cc} = 5 V ± 10%)

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|--------------------------------------|------------------|------|------|------|------|
| Write cycle time | t _{WC} | 100 | | | ns |
| CE ₁ Low to end of write | t _{CW1} | 80 | | | ns |
| CE ₂ High to end of write | t _{CW2} | 80 | | | ns |
| Address valid to end of write | t _{AW} | 80 | | | ns |
| Address setup time | t _{AS} | 0 | | | ns |
| Write pluse width | t _{WP} | 60 | | | ns |
| Write recovery time | t _{WR} | 0 | | | ns |
| Input data setup time | t _{DW} | 40 | | | ns |
| Input data hold time | t _{DH} | 0 | | | ns |
| WE High to output active | t _{OW} | 10 | | | ns |
| WE Low to output in High impedance | t _{WZ} | 0 | | 30 | ns |
| OE High to output in High impedance | t _{OHZ} | 0 | | 20 | ns |

9. Data Retention Characteristics

(T_a = -10 °C to +70 °C)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|----------------------------------|-------------------|---|-------------------------|------|------|------|
| Data Retention supply voltage | V _{CCDR} | $\overline{CE}_2 \leq 0.2 V$ or $\overline{CE}_1 \geq V_{CCDR} - 0.2 V$ (*5) | 2.0 | | 5.5 | V |
| Data Retention supply current | I _{CCDR} | V _{CCDR} = 3 V | | | 0.2 | μA |
| | | $\overline{CE}_2 \leq 0.2$ or | | | 0.4 | μA |
| | | $\overline{CE}_1 \geq V_{CCDR} - 0.2 V$ (*5) | | | 0.6 | μA |
| Chip enable setup time | t _{CDR} | | 0 | | | ns |
| Chip enable hold time | t _R | | (*6) t _{RC} | | | ns |

Note) *5. $\overline{CE}_2 \geq V_{CCDR} - 0.2 V$ or $\overline{CE}_2 \leq 0.2 V$

*6. Read Cycle

10. Pin Capacitance

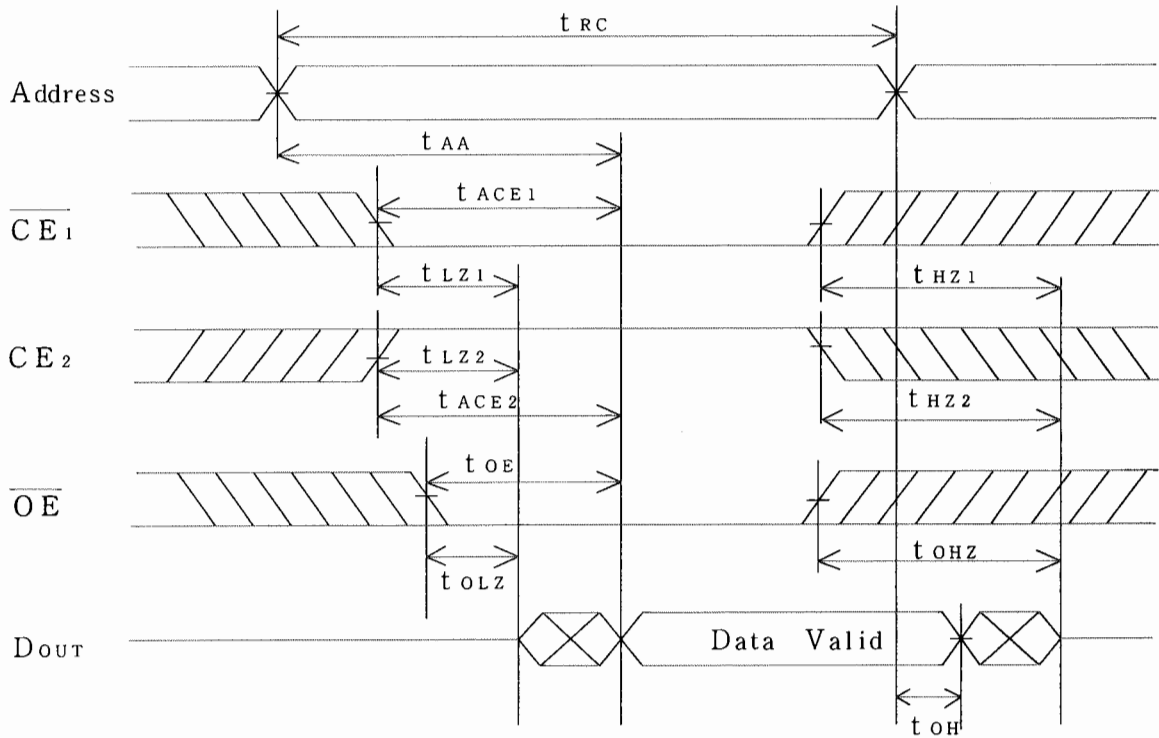
(T_a = 25 °C, f = 1 MHz)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|-------------------|------------------|------------------------|------|------|------|-------|
| Input capacitance | C _{IN} | V _{IN} = 0 V | | | 7 | pF *7 |
| I/O capacitance | C _{I/O} | V _{I/O} = 0 V | | | 10 | pF *7 |

Note) *7. This parameter is sampled and not production tested.

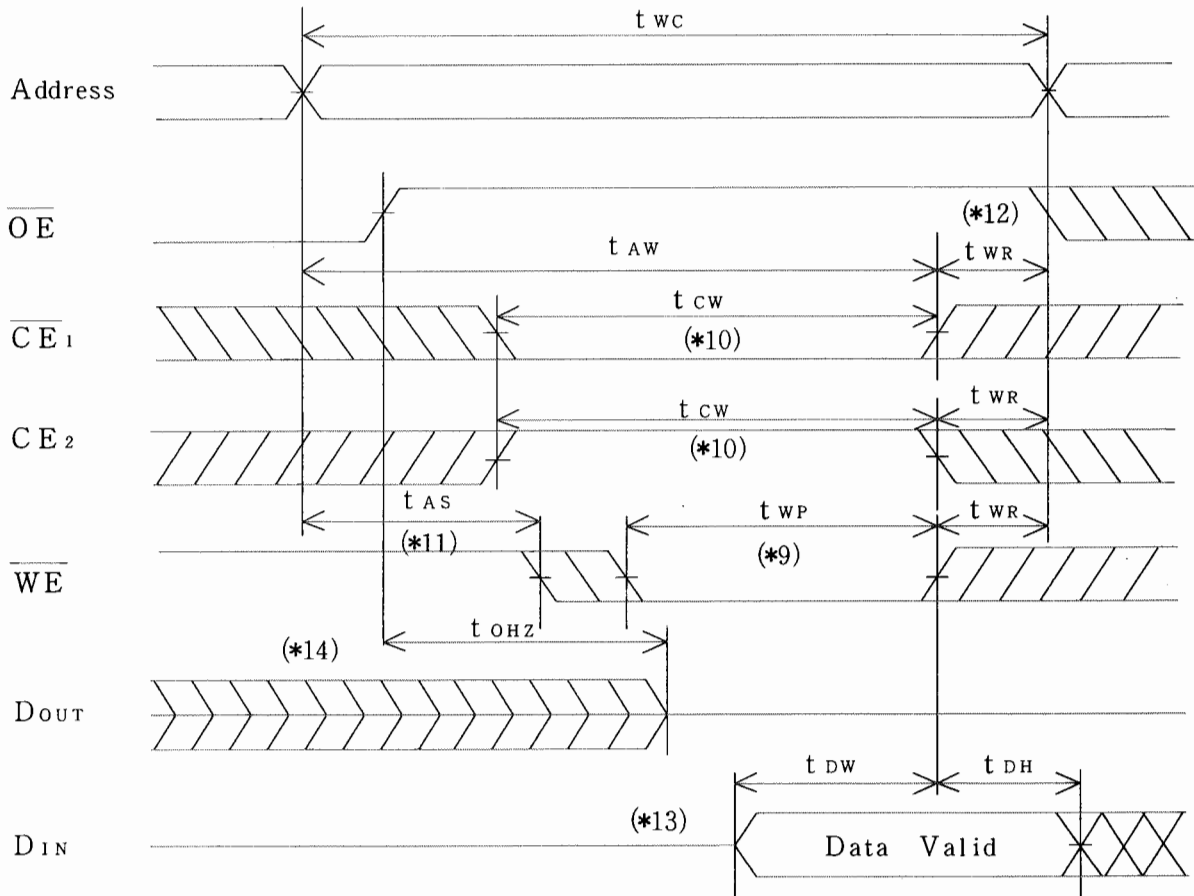
11. Timing Chart

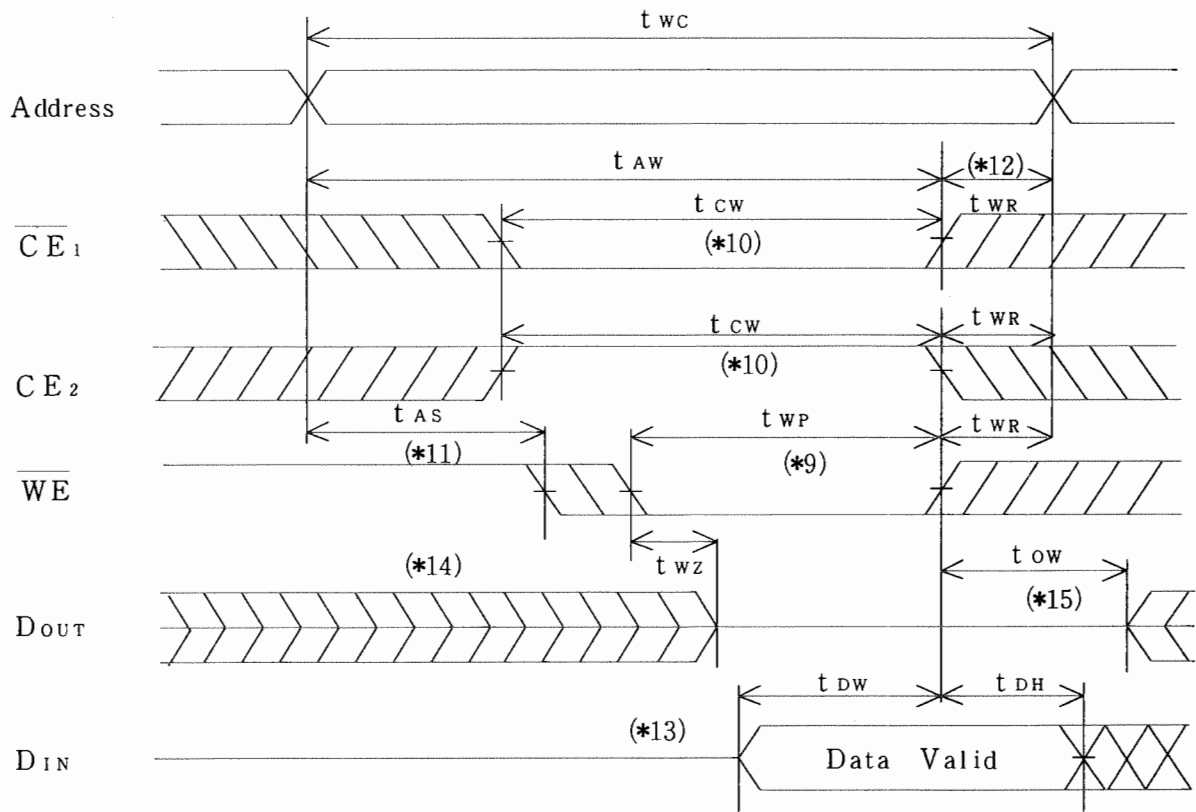
Read cycle timing chart -- (*8)



Note) *8. \overline{WE} is high for Read cycle.

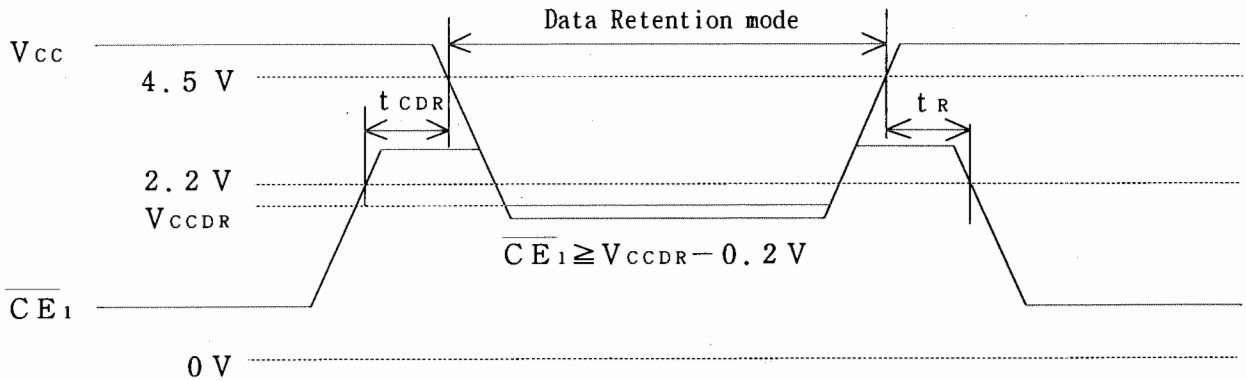
Write cycle timing chart -- (\overline{OE} Controlled)



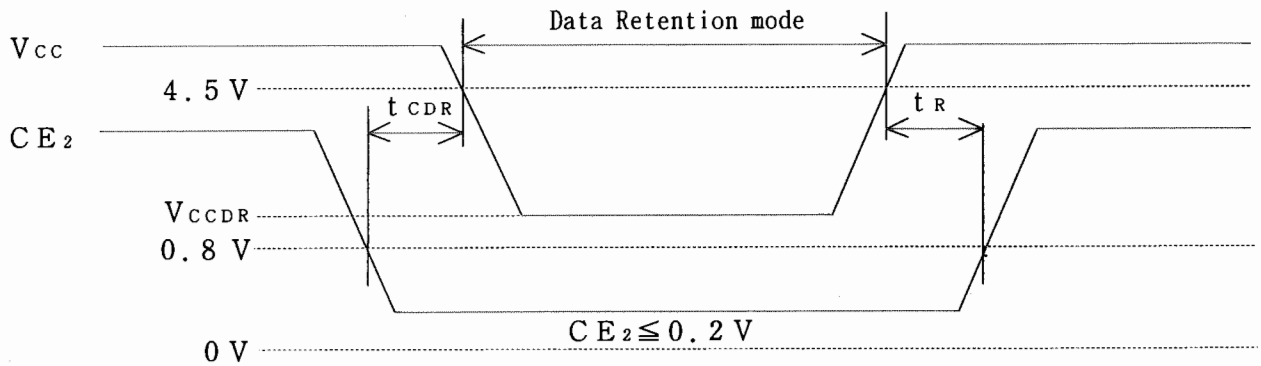
Write cycle timing chart— (\overline{OE} Low fixed)

- Note) * 9. A write occurs during the overlap of a low \overline{CE}_1 , a high CE_2 and a low \overline{WE} . A write begins at the latest transition among \overline{CE}_1 going low, CE_2 going high and \overline{WE} going low. A write ends at the earliest transition among \overline{CE}_1 going high, CE_2 going low and \overline{WE} going high. t_{WP} is measured from the beginning of write to the end of write.
- * 10. t_{CW} is measured from the later of \overline{CE}_1 going low or CE_2 going high to the end of write.
- * 11. t_{AS} is measured from the address valid to the beginning of write.
- * 12. t_{WR} is measured from the end of write to the address change. t_{WR1} applies in case a write ends at \overline{CE}_1 or \overline{WE} going high. t_{WR2} applies in case a write ends at CE_2 going low.
- * 13. During this period, I/O pins are in the output state, therefore the input signals of opposite phase to the outputs must not be applied.
- * 14. If \overline{CE}_1 goes low simultaneously with \overline{WE} going low or after \overline{WE} going low, the outputs remain in high impedance state.
- * 15. If \overline{CE}_1 goes high simultaneously with \overline{WE} going high or before \overline{WE} going high, the outputs remain in high impedance state.

Data Retention timing chart - ($\overline{CE_1}$ Controlled) (*16)



Data Retention timing chart - (CE_2 Controlled)



Note) *15. To control the data retention mode at $\overline{CE_1}$, fix the input level of CE_2 between V_{CCDR} and $V_{CCDR} - 0.2V$ or $0V$ and $0.2V$ during the data retention mode.

12 Package and packing specification

[Applicability]

This specification applies to IC package of the LEAD-FREE delivered as a standard specification.

1. Storage Conditions.

- Normal temperature : 5~40°C
- Normal humidity : 80%(Relative humidity) max.
"Humidity" means "Relative humidity"

2. Baking Condition.

Baking is no necessity.

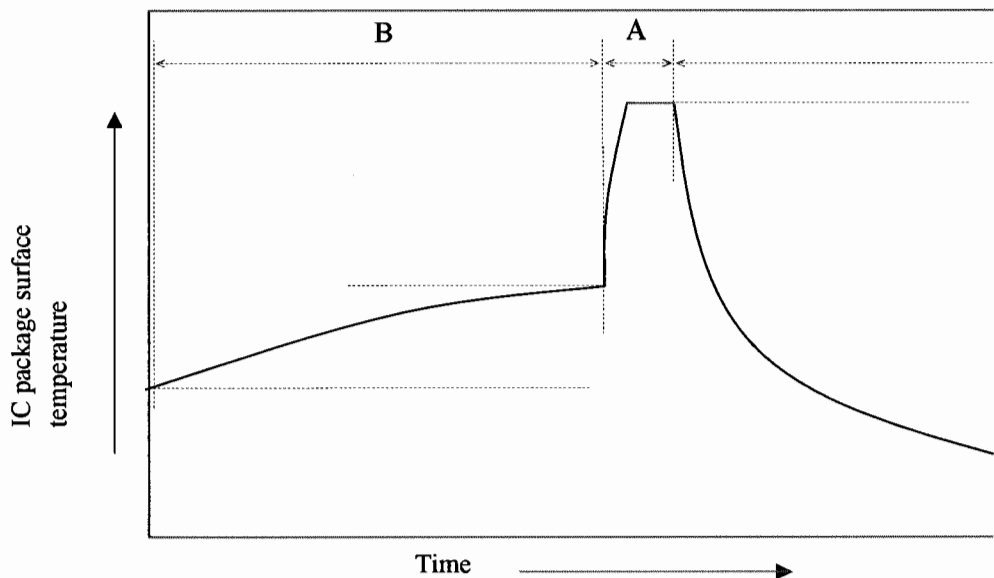
3. Mounting conditions.

Please mount the ICs as follows in order to prevent the IC quality deteriorating.

1-1. Soldering conditions. (The following conditions apply only to one-time soldering.)

(1) Solder dipping. (one-time dipping only)

- Temperature and period :
 - A) Peak temperature. 260°C max. for 10 seconds Max.
 - B) Preheat temperature of 120 to 150°C for 120±60 seconds
- Measuring point :
 - A) Solder bath.
 - B) IC package surface.
- Temperature profile :



(2) Manual soldering (soldering iron) (one-time soldering only)

Soldering iron should only touch the IC's outer leads.

- Temperature and period :
 - 350°C max. for 3 seconds / pin max.
 - (Soldering iron should only touch the IC's outer leads.)
- Measuring point : Soldering iron tip.

4. Condition for removal of residual flux.

- (1) Ultrasonic washing power : 25 watts / liter max.
- (2) Washing time : Total 1 minute max.
- (3) Solvent temperature : 15~40°C

5. Package outline specification.

Refer to the attached drawing.

(Plastic body dimensions do not include burr of resin.)

The contents of LEAD-FREE TYPE application of the specifications. (*2)

6. Markings.

6-1. Marking details. (The information on the package should be given as follows.)

- (1) Product name : LH5164A-10LF
- (2) Company name : SHARP
- (3) Date code : (Example) YYWW XXX
 - YY → Denotes the production year. (Last two digits of the year.)
 - WW → Denotes the production week. (01 · 02 · ~ · 52 · 53)
 - XXX → Denotes the production ref. code (1~3 digits).
- (4) "JAPAN" indicates the country of origin.

6-2. Marking layout.

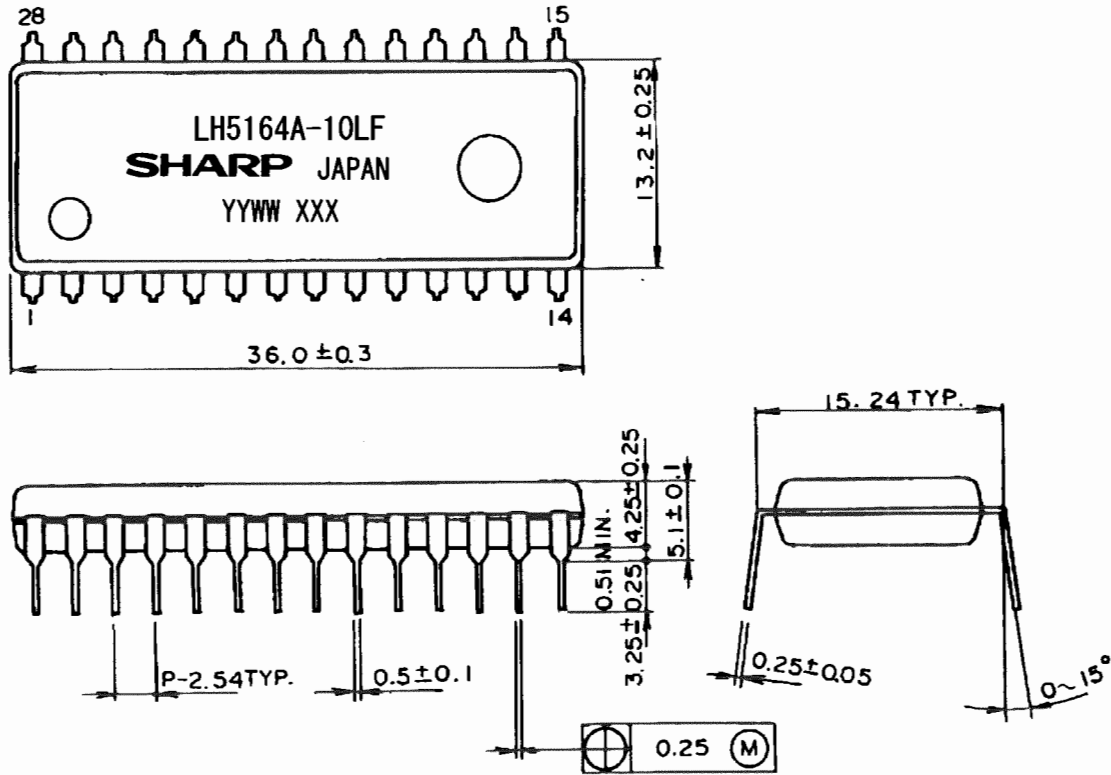
The layout is shown in the attached drawing.

(However, this layout does not specify the size of the marking character and marking position.)

*2 The contents of LEAD-FREE TYPE application of the specifications.

| | |
|--|-----------------------------------|
| LEAD FINISH or BALL TYPE | LEAD-FREE TYPE (Sn-Bi) |
| DATE CODE | They are those with an underline. |
| The word of " LEAD FREE" is printed on the packing label | Printed |

(Note) It is those with an underline printing in a date code because of a LEAD-FREE type.



DIP028-P-0600-AA852

| | | |
|--|---------------|---------------|
| LEAD TYPE | LEAD FINISH | LEAD MATERIAL |
| | Sn-Bi PLATING | 42Alloy |
| NAME | DIP028-P-0600 | |
| DRAWING NO. | AA852 | UNIT : mm |
| NOTE : Plastic body dimensions do not include burr of resin. | | |

7. Packing specifications.

7-1. Packing materials.

| Material name | Material specifications | Purpose |
|---------------|--|--|
| Magazine | Anti-static treated plastic (15 devices/magazine) | Packing of devices. |
| Stopper | Plastic or rubber | Securing of devices. |
| Label | Paper (1piece/inner carton) | Indication of product name, quantity and packed date. |
| Inner carton | Cardboard (600 devices/carton max.) | Packing the magazines. |
| Outer carton | Cardboard (2400 devices/carton max.) | Outer packing. |

(Devices must be inserted into the magazine in the same direction.)

7-2. Outline dimension of magazine.

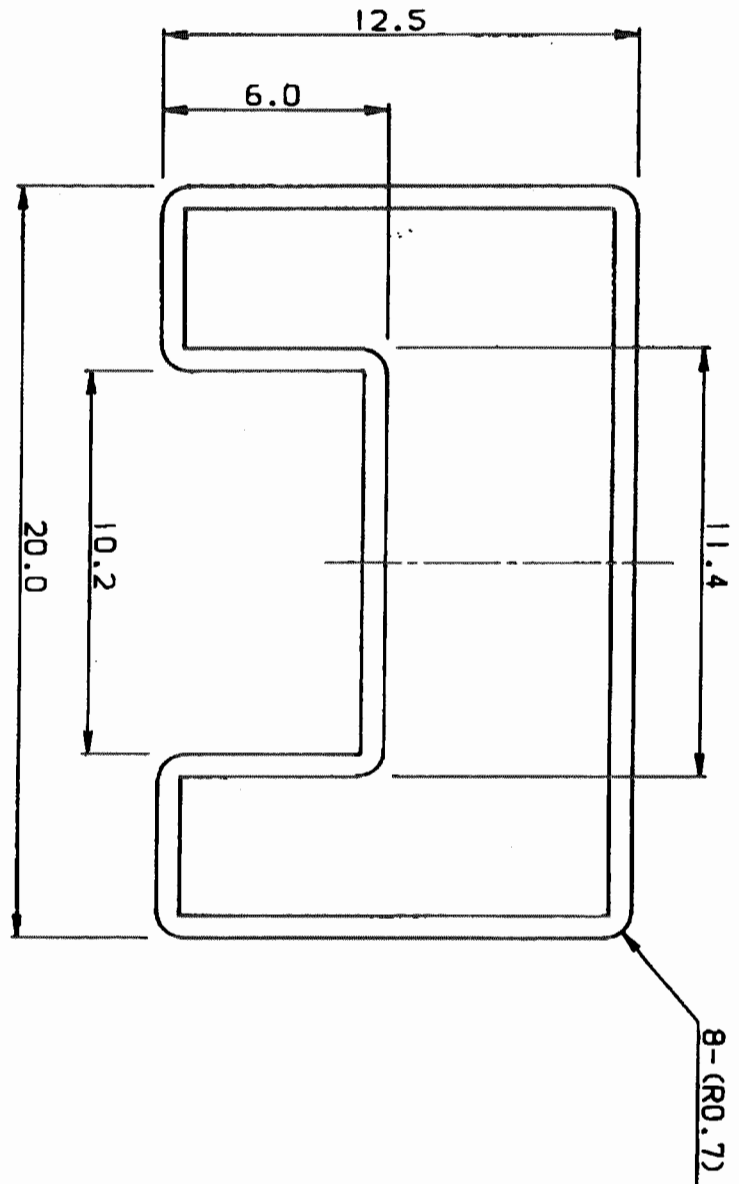
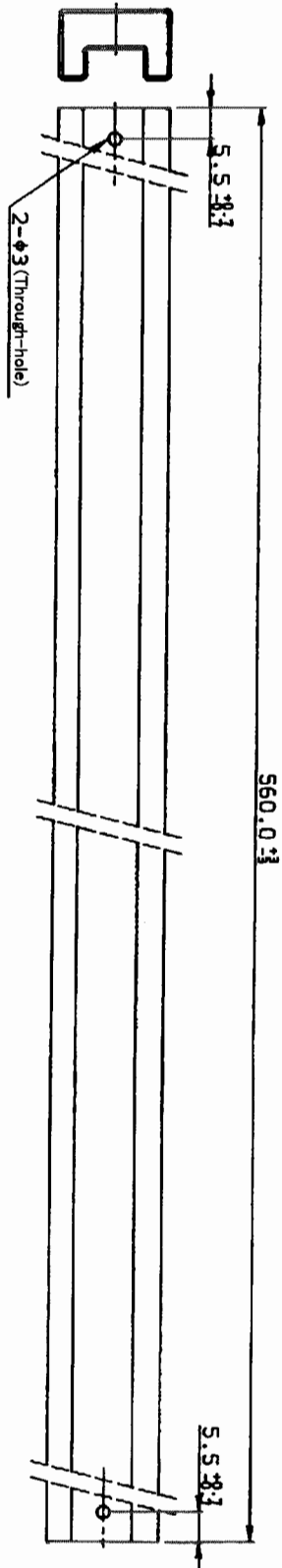
Refer to the attached drawing.

7-3. Outline dimension of carton.

Refer to the attached drawing.

8. Precautions for use.

- (1) Opening must be done on an anti-ESD treated workbench.
All workers must also have undergone anti-ESD treatment.
- (2) The magazines have undergone anti-ESD treatment.
- (3) Be sure to fit stoppers to both ends of the magazine when storing to prevent the devices from slipping out.
- (4) The devices should be stored at a temperature of 5~35°C (normal temperature) and maximum relative humidity of 75%, and should be mounted within one year of the date of delivery.

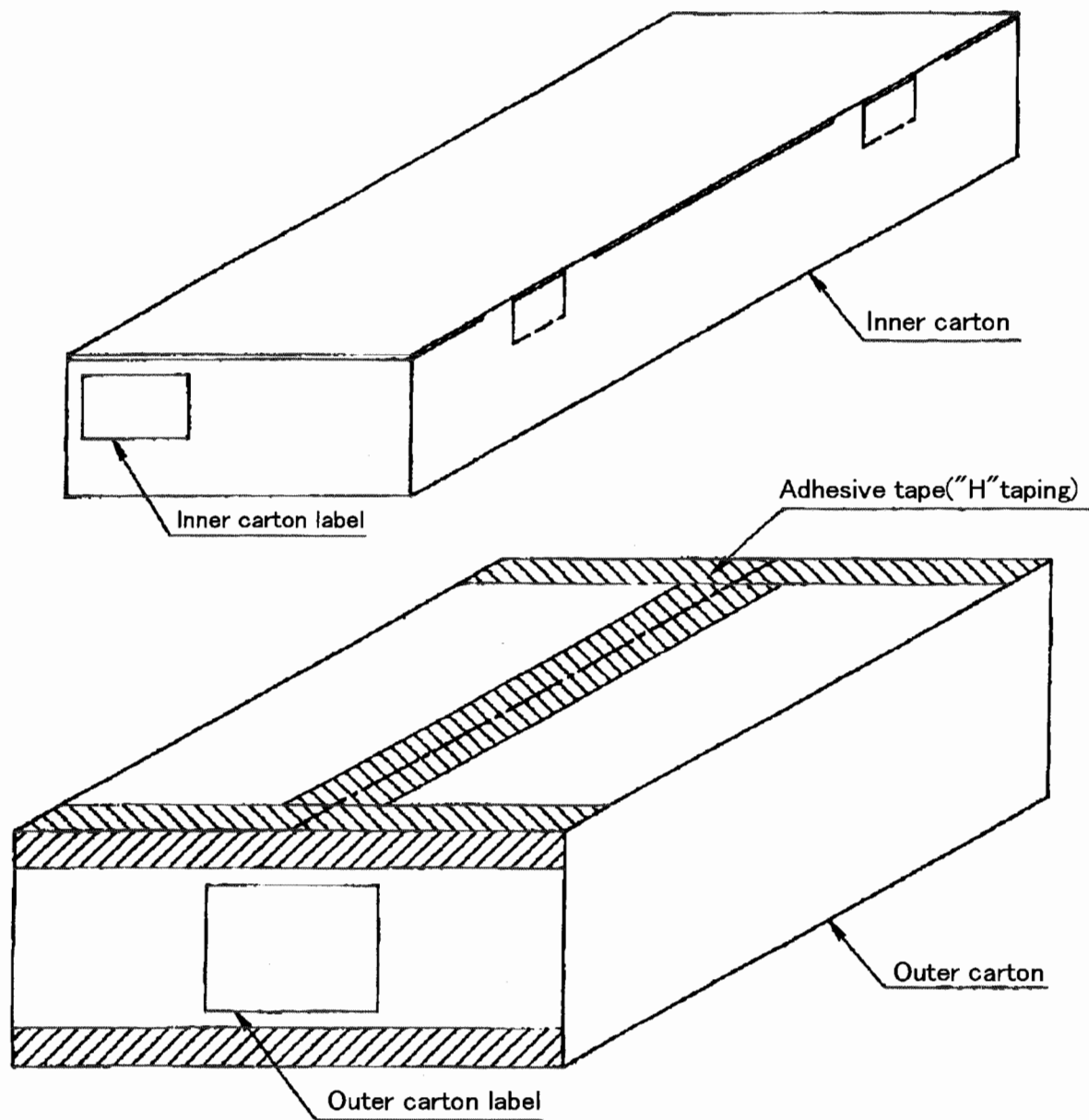


注記 : 片側ピンストッパー、片側ゴムストッパーとする。
指示無き寸法公差は全て±0.4mmとする。

NOTES : One end of the magazine(sleeve) is plugged by a rubber stopper, and the other end is plugged by plastic pin-stopper.

All tolerances are ±0.4mm unless otherwise specified.

| | | | | |
|-------------|-------------|------------|----|------------|
| 名称 Name | DP600SPK-A2 | | | 備考 Note |
| Drawing no. | CV651 | 単位 Unit | mm | |



L × W × H

Inner carton - Outer dimensions : 580 × 170 × 70

Outer carton - Outer dimensions : 600 × 360 × 185

名称

NAME

DIP 600 Packing specifications

備考 出荷数量が端数の場合、本仕様と異なることがあります。

NOTE There is a possibility different from this specification when the number of shipments is fractions.

DRAWING NO.

BJ383

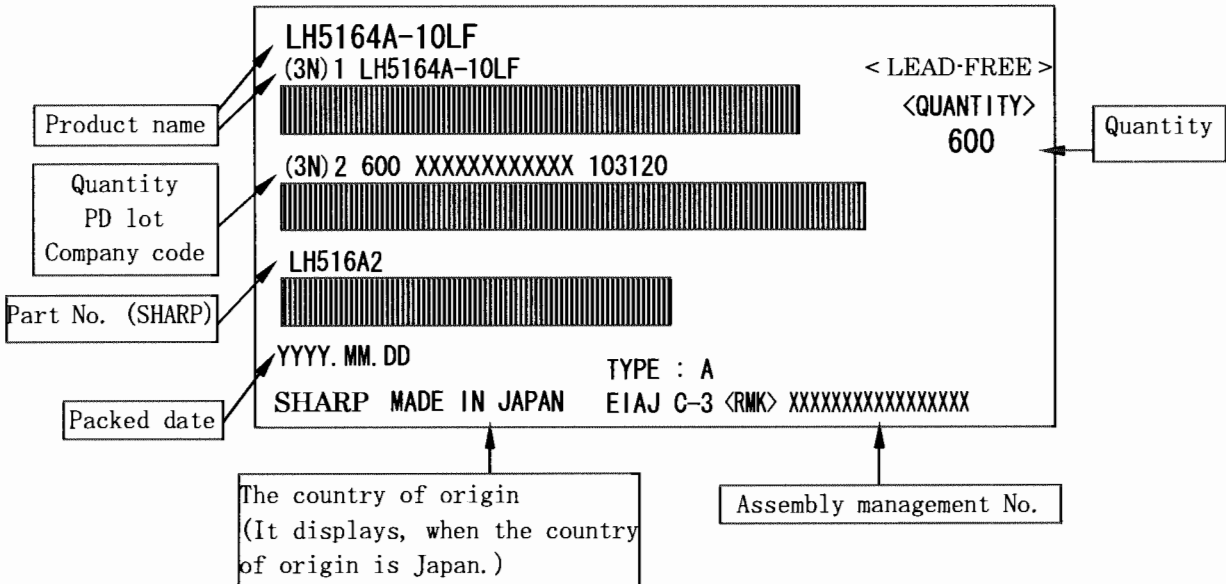
単位

UNIT

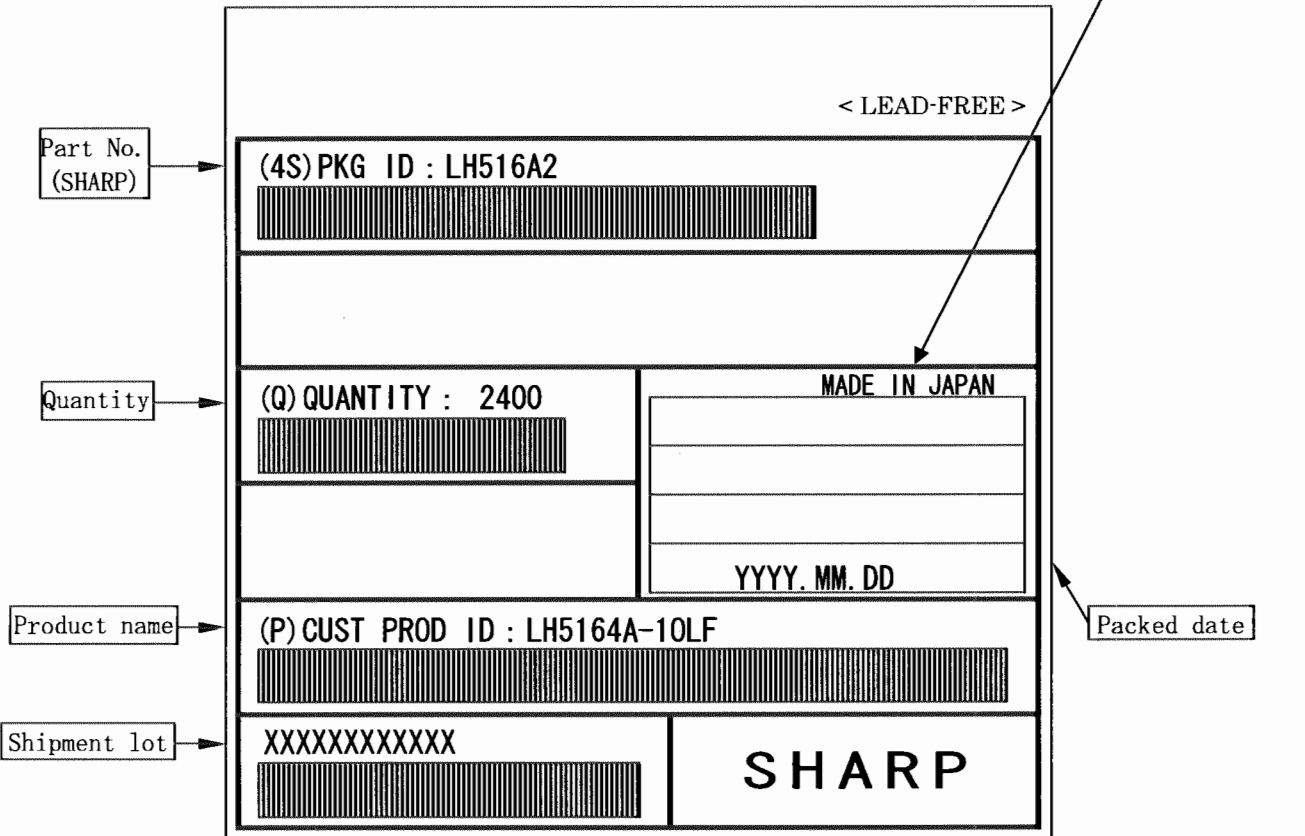
mm

(Note) The <LEAD-FREE> display shows a lead-free article.

Inner carton label



Outer carton label



(Former) EIAJ B Standard conforming

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