

To : _____

| | |
|----------|--------------|
| SPEC No. | |
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SPECIFICATIONS

Product Type LZ9F Series 7000 Gates Gate Array

LZ9FC23

Model No. _____

※This specifications contains 23 pages including the cover and appendix.
If you have any objections, please contact us before issuing purchasing order.

CUSTOMERS ACCEPTANCE

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 - 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.

CONTENTS

| | Page |
|---|---------|
| 1. Introduction | 2 |
| 2. Feature | 2 |
| 3. Pin Assignments | 3 |
| 4. Function of Input/Output signal | 4 ~ 5 |
| 5. Absolute Maximum Ratings | 6 |
| 6. Electrical Specifications | 6 |
| 7. Timing Characteristics of Input/Output Signals | 7 |
| 8. Input/Output signal timing chart for above cases | 8 ~ 12 |
| 9. Package and packing specification | 13 ~ 21 |

1. Introduction

This data sheet is to introduce the specification of LZ9FC23, which is designed by Mobile Liquid Crystal Display Group Sharp Corporation, Timing Control IC for TFT-LCD module.

Applicable TFT-LCD module : QVGA (Portrait/Landscape) pixel type module

Functions: Timing Control IC for TFT-LCD module

(1) By inputting Clock signal, Horizontal sync. signal, Vertical sync. signal, the following signals synchronized with above signal are generated.

- | | |
|--|-------------------------|
| (A) The signal for driving a source driver | : CLK, SPL, SPR, LP, PS |
| (B) The signal for driving a gate driver | : CLS, SPS |
| (C) The signal for creating the voltage which applies to common electrode. | : REV |
| (D) The signal for creating standard voltage | : REVVO |

(2) Horizontal and Vertical reverse scanning function

Input/Output signal timing chart for above cases

: See Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5.

2. Feature

| | |
|--|----------------------------|
| Process | : CMOS |
| Wafer substrate | : P-type silicon substrate |
| Package | : 72QFP (0.5mm pin pitch) |
| Materials | : Plastics |
| Operating Temperature | : -30°C ~ +85°C |
| Propagation delay time | : 1.0ns/gate |
| (Condition : 2-input NAND, Fanout=2, wire length=2mm, supply voltage=3.3V, Operating temperature Topr=25°C) | |

*REMARK

Not designed or rated as radiation hardened.
You cannot rewrite the program.

3. Pin Assignments

| Pin No. | I/O | Signal Name | Pin No. | I/O | Signal Name |
|---------|------|-----------------|---------|------|-----------------|
| 1 | IC | DCLK | 37 | O3M | CLK |
| 2 | ICU | SETR | 38 | - | GND |
| 3 | IC | R0 | 39 | O2M | OB5 |
| 4 | IC | R1 | 40 | O2M | OB4 |
| 5 | IC | R2 | 41 | O2M | OB3 |
| 6 | IC | R3 | 42 | O2M | OB2 |
| 7 | IC | R4 | 43 | O2M | OB1 |
| 8 | IC | R5 | 44 | O2M | OB0 |
| 9 | - | GND | 45 | - | V _{DD} |
| 10 | ICU | SDRSEL | 46 | - | GND |
| 11 | IC | G0 | 47 | O2M | OG5 |
| 12 | IC | G1 | 48 | O2M | OG4 |
| 13 | IC | G2 | 49 | O2M | OG3 |
| 14 | IC | G3 | 50 | O2M | OG2 |
| 15 | IC | G4 | 51 | O2M | OG1 |
| 16 | IC | G5 | 52 | O2M | OG0 |
| 17 | ICU | TEST | 53 | - | GND |
| 18 | IC | B0 | 54 | O2M | OR5 |
| 19 | IC | B1 | 55 | O2M | OR4 |
| 20 | IC | B2 | 56 | O2M | OR3 |
| 21 | IC | B3 | 57 | O2M | OR2 |
| 22 | IC | B4 | 58 | O2M | OR1 |
| 23 | IC | B5 | 59 | O2M | OR0 |
| 24 | ICU | TEST | 60 | - | GND |
| 25 | ICU | HREV | 61 | TO2M | CLS |
| 26 | ICD | ENAB | 62 | TO2M | SPS |
| 27 | - | V _{DD} | 63 | - | V _{DD} |
| 28 | - | GND | 64 | - | GND |
| 29 | ICU | TEST | 65 | TO2M | UBL |
| 30 | O2M | REV | 66 | ICU | VREV |
| 31 | O2M | REVVO | 67 | IC | TEST |
| 32 | O2M | PS | 68 | IC | SIZECO |
| 33 | TO2M | SPR | 69 | O2M | MOD |
| 34 | O2M | LBR | 70 | ICU | REM |
| 35 | TO2M | SPL | 71 | IC | HS |
| 36 | O2M | LP | 72 | IC | VS |

IC :Input buffer CMOS level

ICU :Input buffer CMOS level with PULL UP resistance (R=300k Ω)

ICD :Input buffer CMOS level with PULL DOWN resistance (R=300k Ω)

O2M :Output buffer (I_{OL}=0.8mA)

O3M :Output buffer (I_{OL}=1.2mA)

TO2M :Tri-state Output buffer (I_{OL}=0.8mA)

V_{DD} :Power supply pin

GND :Earth pin

4. Function of Input/Output signal

| Pin No. | Signal Name | Explanation | I/O |
|---------|-----------------|---|-----|
| 1 | DCLK | Input terminal for data clock signal | I |
| 2 | SETR | Input terminal for control signal for PS (Effective only in SIZEC0="L") SETR="H" :PS signal serves as operation for specific models. SETR="L" :PS signal is normal operation. | I |
| 3 | R0 | Input terminal for red data signal (LSB) | I |
| 4 | R1 | Input terminal for red data signal | I |
| 5 | R2 | Input terminal for red data signal | I |
| 6 | R3 | Input terminal for red data signal | I |
| 7 | R4 | Input terminal for red data signal | I |
| 8 | R5 | Input terminal for red data signal (MSB) | I |
| 9 | GND | Ground | - |
| 10 | SDRSEL | Input terminal for control signal for CLK and DATA output timing SDRSEL="H" :Normal (Effective only in SIZEC0="L") SDRSEL="L" :4clk delay mode | I |
| 11 | G0 | Input terminal for green data signal (LSB) | I |
| 12 | G1 | Input terminal for green data signal | I |
| 13 | G2 | Input terminal for green data signal | I |
| 14 | G3 | Input terminal for green data signal | I |
| 15 | G4 | Input terminal for green data signal | I |
| 16 | G5 | Input terminal for green data signal (MSB) | I |
| 17 | TEST | Input terminal for test mode (Connect this terminal to "H") | I |
| 18 | B0 | Input terminal for blue data signal (LSB) | I |
| 19 | B1 | Input terminal for blue data signal | I |
| 20 | B2 | Input terminal for blue data signal | I |
| 21 | B3 | Input terminal for blue data signal | I |
| 22 | B4 | Input terminal for blue data signal | I |
| 23 | B5 | Input terminal for blue data signal (MSB) | I |
| 24 | TEST | Input terminal for test mode (Connect this terminal to "H") | I |
| 25 | HREV | Input terminal for setting up horizontal scan direction HREV="H" :Normal scan HREV="L" :Horizontal reversal scan | I |
| 26 | ENAB | Input terminal for signal to settle the Horizontal display position | I |
| 27 | V _{DD} | Input terminal for Power Supply voltage | - |
| 28 | GND | Ground | - |
| 29 | TEST | Input terminal for test mode (Connect this terminal to "H") | I |
| 30 | REV | Signal output for common electrode preparation | 0 |
| 31 | REVVO | Signal output for standard voltage preparation | 0 |
| 32 | PS | Control signal output for source driver | 0 |
| 33 | SPR | Start signal output for source driver When HREV="H" :SPR output is High impedance. When HREV="L" :SPR output is valid. | 0 |
| 34 | LBR | Output signal for source driver for setting up Horizontal scan direction When HREV="H", LBR="H" output. When HREV="L", LBR="L" output. | 0 |
| 35 | SPL | Start signal output for source driver When HREV="H" :SPL outout is valid. When HREV="L" :SPL outout is High impedance. | 0 |
| 36 | LP | Data transferring signal output for source driver | 0 |

| Pin No. | Signal Name | Explanation | I/O |
|---------|-----------------|---|-----|
| 37 | CLK | Clock signal output for source driver | 0 |
| 38 | GND | Ground | - |
| 39 | OB5 | Blue data signal output for source driver (MSB) | 0 |
| 40 | OB4 | Blue data signal output for source driver | 0 |
| 41 | OB3 | Blue data signal output for source driver | 0 |
| 42 | OB2 | Blue data signal output for source driver | 0 |
| 43 | OB1 | Blue data signal output for source driver | 0 |
| 44 | OB0 | Blue data signal output for source driver (LSB) | 0 |
| 45 | V _{DD} | Power Supply voltage | - |
| 46 | GND | Ground | - |
| 47 | OG5 | Green data signal output for source driver (MSB) | 0 |
| 48 | OG4 | Green data signal output for source driver | 0 |
| 49 | OG3 | Green data signal output for source driver | 0 |
| 50 | OG2 | Green data signal output for source driver | 0 |
| 51 | OG1 | Green data signal output for source driver | 0 |
| 52 | OG0 | Green data signal output for source driver (LSB) | 0 |
| 53 | GND | Ground | - |
| 54 | OR5 | Red data signal output for source driver (MSB) | 0 |
| 55 | OR4 | Red data signal output for source driver | 0 |
| 56 | OR3 | Red data signal output for source driver | 0 |
| 57 | OR2 | Red data signal output for source driver | 0 |
| 58 | OR1 | Red data signal output for source driver | 0 |
| 59 | OR0 | Red data signal output for source driver (LSB) | 0 |
| 60 | GND | Ground | - |
| 61 | CLS | Clock signal output for source driver | 0 |
| 62 | SPS | Start signal output for gate driver | 0 |
| 63 | V _{DD} | Power Supply voltage | - |
| 64 | GND | Ground | - |
| 65 | UBL | Output signal for gate driver for setting up Vertical scan direction When VREV="H", UBL="H" output When VREV="L", UBL="L" output | 0 |
| 66 | VREV | Input terminal for setting up vertical scan direction VREV="H" :Normal scan VREV="L" :Vertical reversal scan | I |
| 67 | TEST | Input terminal for test mode (Connect this terminal to "L") | I |
| 68 | SIZECO | Input terminal for setting up display resolution SIZECO="H" :Portrait QVGA (240RGB×320) SIZECO="L" :Landscape QVGA (320RGB×240) | I |
| 69 | MOD | Output signal for gate driver | 0 |
| 70 | REM | Input terminal for reset signal (Give the signal that becomes H level fixation from the L level at the time of the power supply input.) | I |
| 71 | HS | Input terminal for Horizontal sync. signal | I |
| 72 | VS | Input terminal for Vertical sync. signal | I |

5. Absolute Maximum Ratings

| Parameter | Symbol | Rating | | Unit |
|-----------------------|-----------|--------|----------------|------|
| Supply voltage | V_{DD} | -0.3 | ~ +6.0 | V |
| Input voltage | V_I | -0.3 | ~ $V_{DD}+0.3$ | V |
| Output voltage | V_O | -0.3 | ~ $V_{DD}+0.3$ | V |
| Operating temperature | T_{opr} | -30 | ~ +85 | °C |
| Storage temperature | T_{stg} | -55 | ~ +150 | °C |

6. Electrical Specifications

6-1. Operating Conditions

| Parameter | Symbol | MIN. | TYP. | MAX. | Unit |
|-----------------------|-----------|------|------|------|------|
| Supply voltage | V_{DD} | +2.7 | +3.3 | +3.6 | V |
| Operating temperature | T_{opr} | -30 | | +85 | °C |

6-2. Electrical Characteristics

($V_{DD}=+2.7\sim+3.6V$, $T_{opr}=-30\sim+85^{\circ}C$)

| Parameter | Symbol | Test conditions | MIN. | TYP. | MAX. | Unit | # |
|------------------------|-----------|----------------------|---------------------|------|---------------------|---------|---|
| Input "Low" voltage | V_{IL} | | | | $0.3 \times V_{DD}$ | V | 1 |
| Input "High" voltage | V_{IH} | | $0.7 \times V_{DD}$ | | | V | |
| Input "High" current | I_{IH1} | $V_I = V_{DD}$ | | | 1.0 | μA | 2 |
| Input "Low" current | I_{IL1} | $V_I = 0V$ | | | 1.0 | μA | |
| Input "High" current | I_{IH2} | $V_I = V_{DD}$ | | | 1.0 | μA | 3 |
| Input "Low" current | I_{IL2} | $V_I = 0V$ | 2.0 | | 36.0 | μA | |
| Input "High" current | I_{IH3} | $V_I = V_{DD}$ | 2.0 | | 36.0 | μA | |
| Input "Low" current | I_{IL3} | $V_I = 0V$ | | | 1.0 | μA | 4 |
| Output "Low" voltage | V_{OL1} | $I_{OL} = 0.8mA$ | | | 0.4 | V | 5 |
| Output "High" voltage | V_{OH1} | $I_{OH} = -0.4mA$ | $V_{DD}-0.5$ | | | V | |
| Output "Low" voltage | V_{OL2} | $I_{OL} = 1.2mA$ | | | 0.4 | V | 6 |
| Output "High" voltage | V_{OH2} | $I_{OH} = -0.6mA$ | $V_{DD}-0.5$ | | | V | |
| Output Leakage Current | I_{OZ} | High-impedance state | | | 1.0 | μA | 7 |

#1: Applied to Input pins (IC, ICU, ICD).

#2: Applied to Input pins (IC).

#3: Applied to Input pins (ICU).

#4: Applied to Input pin (ICD).

#5: Applied to Output pins (O2M, TO2M).

#6: Applied to Output pin (O3M).

#7: Applied to Output pins (TO2M).

7. Timing Characteristics of Input/Output Signals

Input Timing Characteristics

(1) Portrait QVGA (240RGBx320):SIZE0="H"

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|----------------|------------|----------------|------|----------------|------|
| DCLK frequency | f_{DCLK} | 4.5 | | 6.8 | MHz |
| HS frequency | f_{HS} | $f_{DCLK}/330$ | | $f_{DCLK}/254$ | kHz |
| | | 15 | | 26 | kHz |
| VS frequency | f_{VS} | $f_{HS}/440$ | | $f_{HS}/332$ | Hz |
| | | 50 | | 80 | Hz |

(2) Landscape QVGA (320RGBx240):SIZE0="L"

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|----------------|------------|----------------|------|----------------|------|
| DCLK frequency | f_{DCLK} | 4.5 | | 6.8 | MHz |
| HS frequency | f_{HS} | $f_{DCLK}/440$ | | $f_{DCLK}/334$ | kHz |
| | | 12.5 | | 20 | kHz |
| VS frequency | f_{VS} | $f_{HS}/330$ | | $f_{HS}/248$ | Hz |
| | | 50 | | 82 | Hz |

8. Input/Output signal timing chart for above cases
 Horizontal Timing Portrait Type QVGA (240RGB × 320) (SIZEC0 = "H", ENAB : Valid)

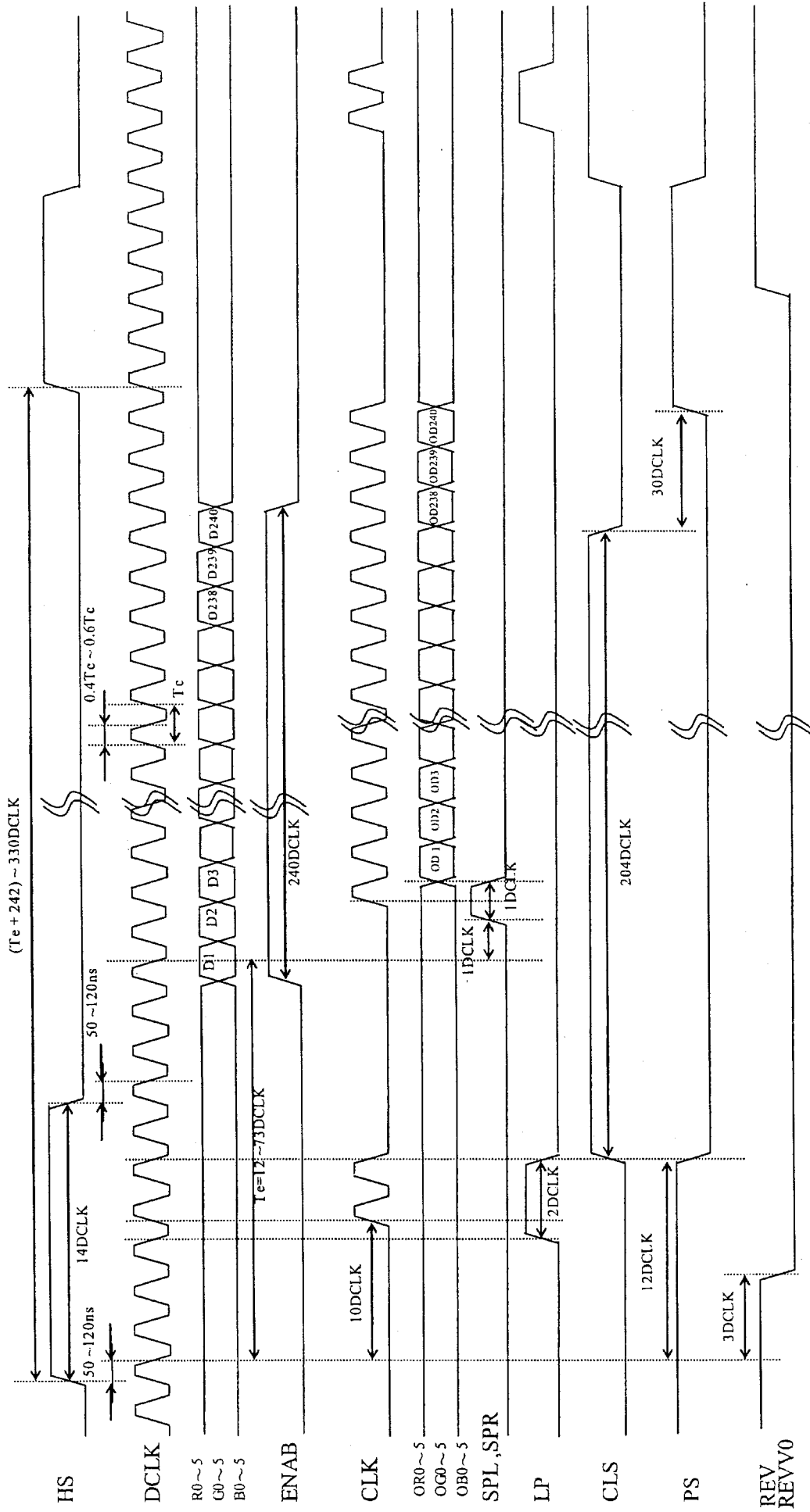


Fig. 1

Horizontal Timing Portrait Type QVGA (240RGB × 320) (SIZEC0 = "H", ENAB = "L" fixed)

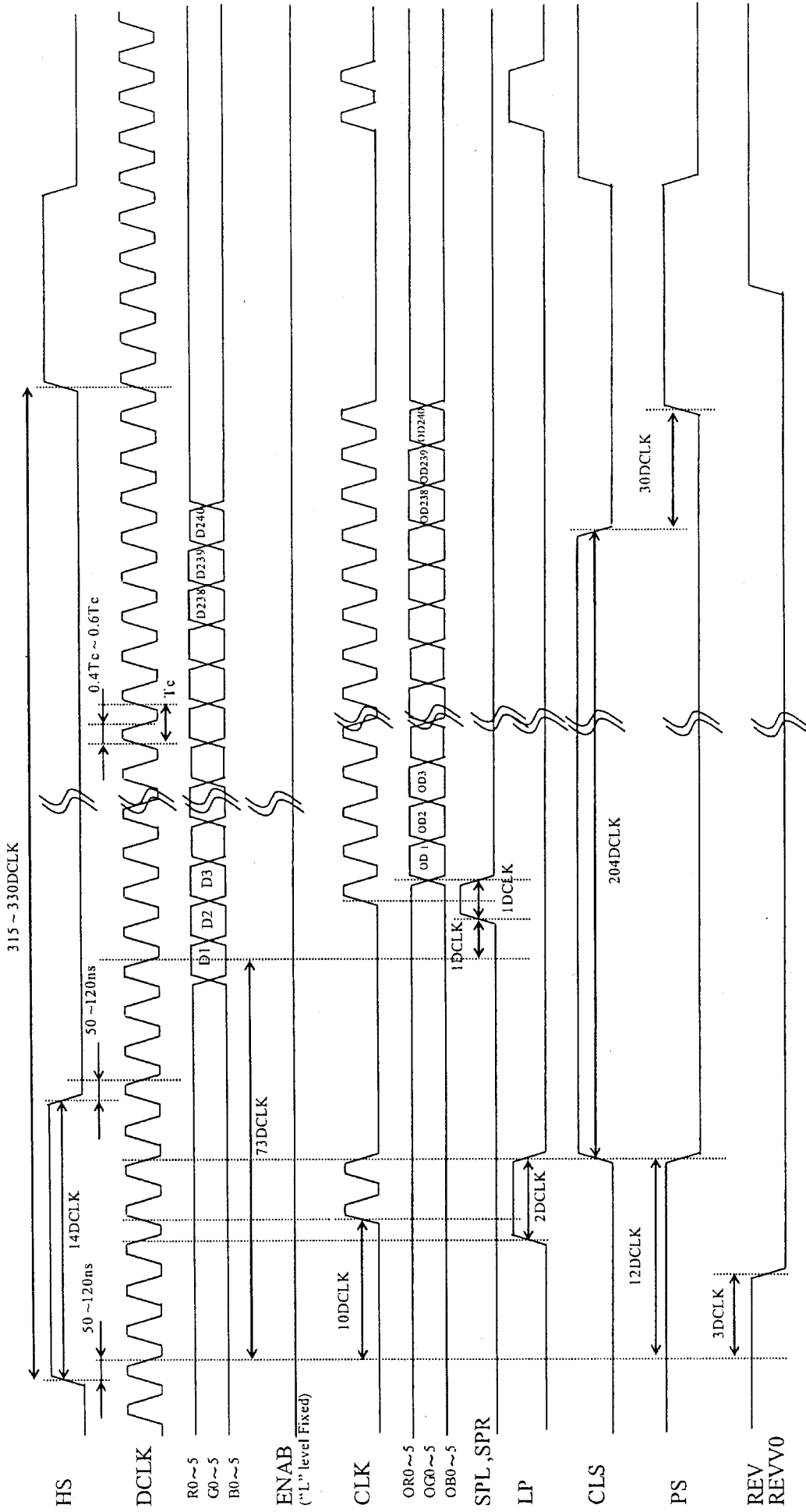


Fig. 2

Horizontal Timing Landscape Type QVGA (320RGB × 240) (SIZEC0 = "L", ENAB : Valid)

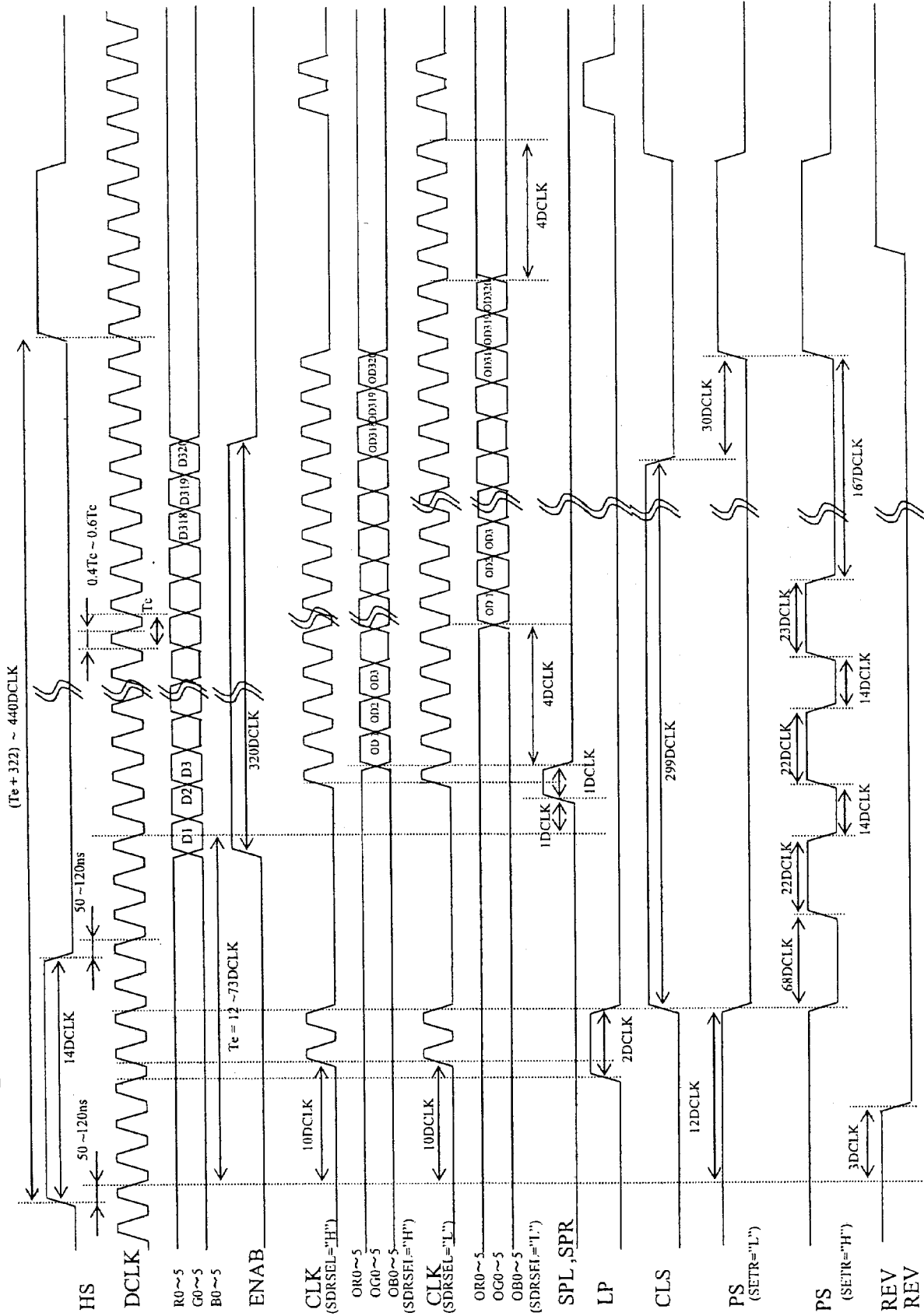


Fig. 3

Horizontal Timing Landscape Type QVGA (320RGB x 240) (SIZEC0 = "L", ENAB = "L" fixed)

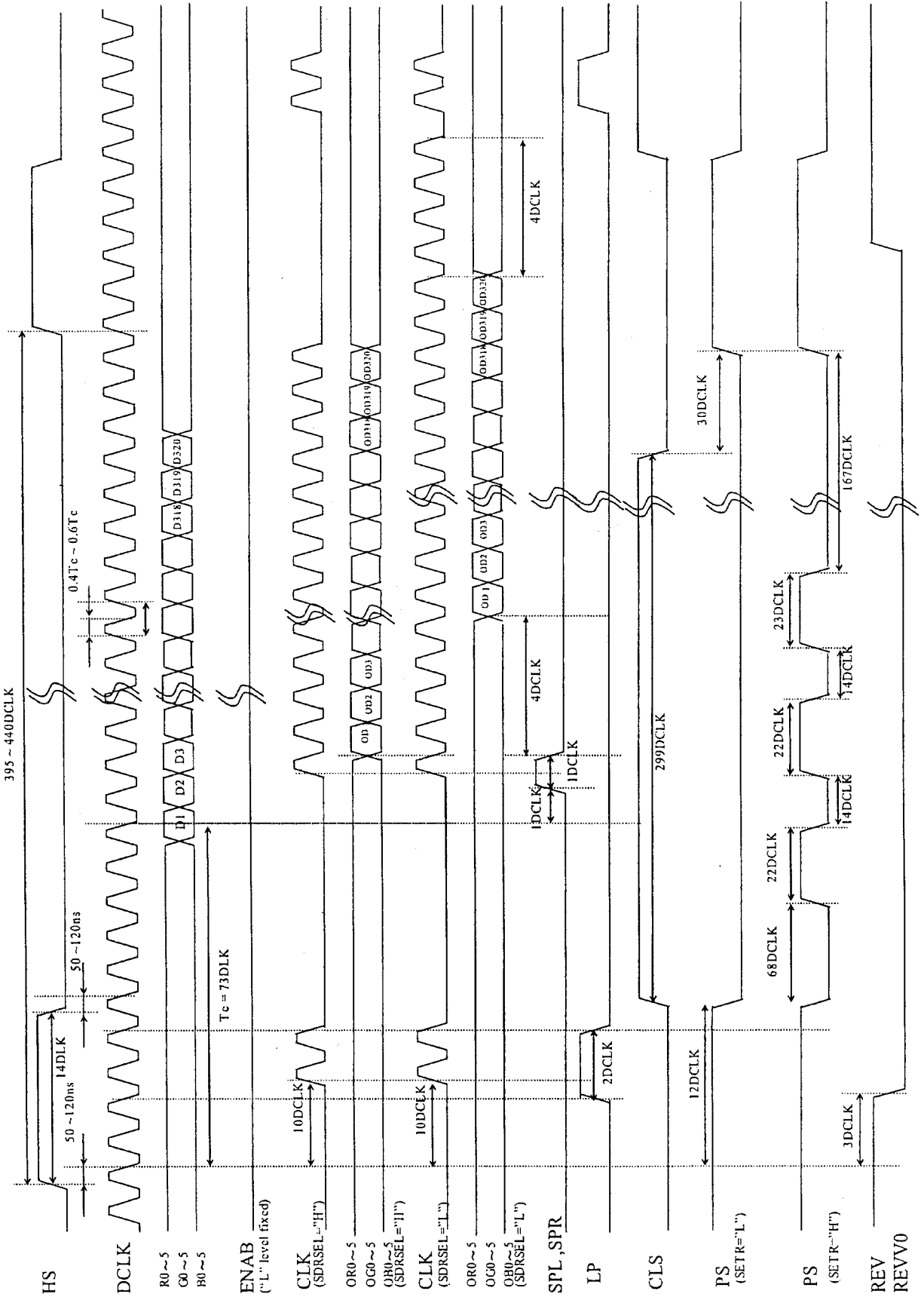


Fig. 4

Vertical Timing Portrait Type & Landscape Type

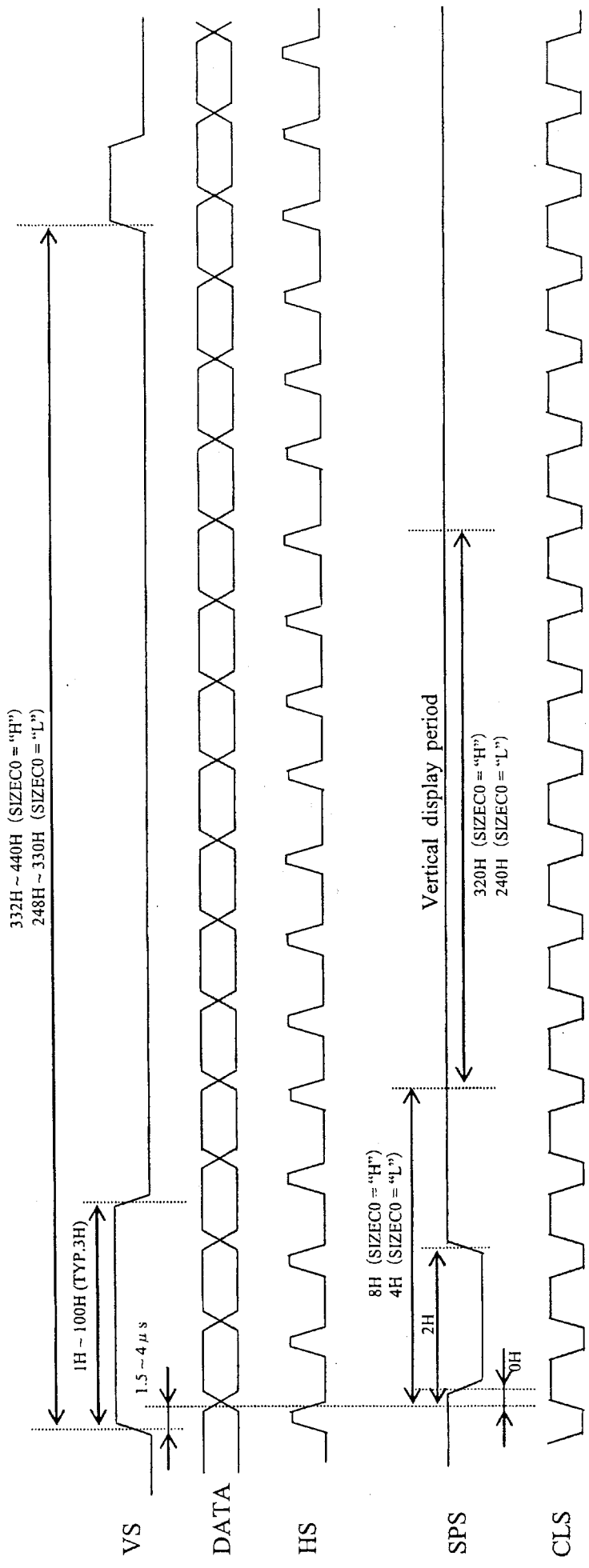


Fig. 5

9 Package and packing specification

[Applicability]

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

1. Storage Conditions.

1-1. Storage conditions required before opening the dry packing.

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

1-2. Storage conditions required after opening the dry packing.

In order to prevent moisture absorption after opening, ensure the following storage conditions apply:

- (1) Storage conditions for one-time soldering. (Convection reflow^{*1}, IR/Convection reflow.^{*1}, or Manual soldering.)
 - Temperature : 5~25°C
 - Humidity : 60% max.
 - Period : 168 hours max. after opening.
- (2) Storage conditions for two-time soldering. (Convection reflow^{*1}, IR/Convection reflow.^{*1})
 - a. Storage conditions following opening and prior to performing the 1st reflow.
 - Temperature : 5~25°C
 - Humidity : 60% max.
 - Period : 96 hours max. after opening.
 - b. Storage conditions following completion of the 1st reflow and prior to performing the 2nd reflow.
 - Temperature : 5~25°C
 - Humidity : 60% max.
 - Period : 96 hours max. after completion of the 1st reflow.

^{*1}: Air or nitrogen environment.

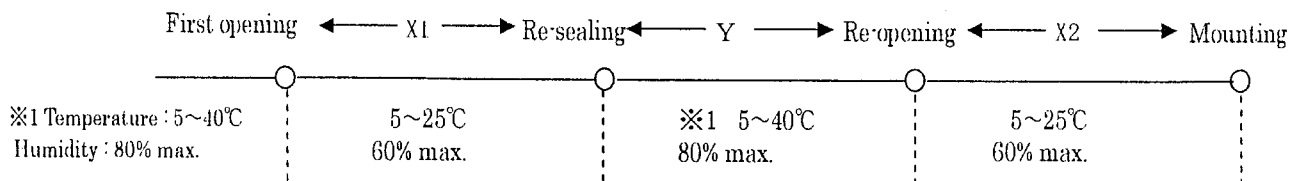
1-3. Temporary storage after opening.

To re-store the devices before soldering, do so only once and use a dry box or place desiccant (with a blue humidity indicator) with the devices and perform dry packing again using heat-sealing.

The storage period, temperature and humidity must be as follows :

(1) Storage temperature and humidity.

※1 : External atmosphere temperature and humidity of the dry packing.



(2) Storage period.

- X1 + X2 : Refer to Section 1-2(1) and (2)a , depending on the mounting method.
- Y : Two weeks max.

2. Baking Condition.

- (1) Situations requiring baking before mounting.
 - Storage conditions exceed the limits specified in Section 1-2 or 1-3.
 - Humidity indicator in the desiccant was already red (pink) when opened.
(Also for re-opening.)
- (2) Recommended baking conditions.
 - Baking temperature and period :
120°C for 16~24 hours.
 - The above baking conditions apply since the trays are heat-resistant.
- (3) Storage after baking.
 - After baking, store the devices in the environment specified in Section 1-2 and mount immediately.

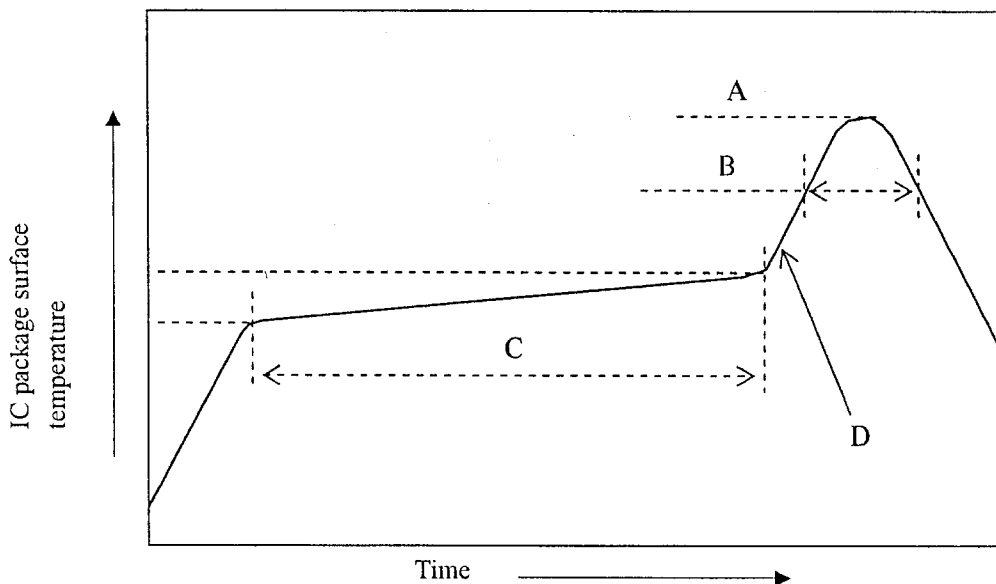
3. Surface mount conditions.

The following soldering condition are recommended to ensure device quality.

3-1. Soldering.

- (1) Convection reflow or IR/Convection. (one-time soldering or two-time soldering in air or nitrogen environment)
 - Temperature and period :

| | |
|-------------------------------|---|
| A) Peak temperature. | 250°C max. |
| B) Heating temperature. | 40 to 60 seconds as 220°C |
| C) Preheat temperature. | It is 150 to 200°C, and is 120±30 seconds |
| D) Temperature increase rate. | It is 1 to 3°C/seconds |
 - Measuring point : 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 : LZ9FC23
- (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.

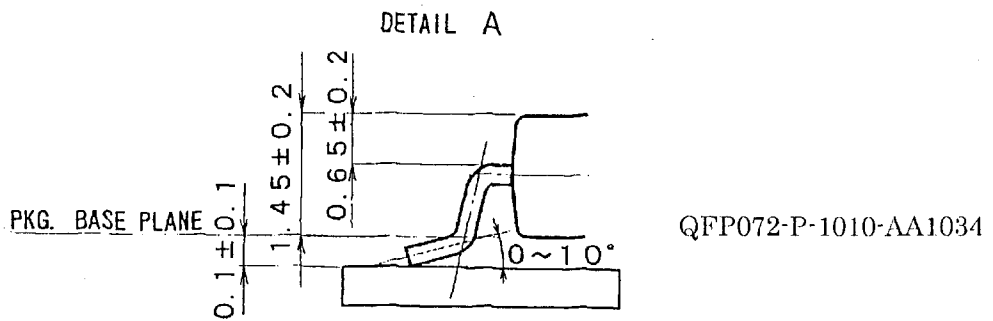
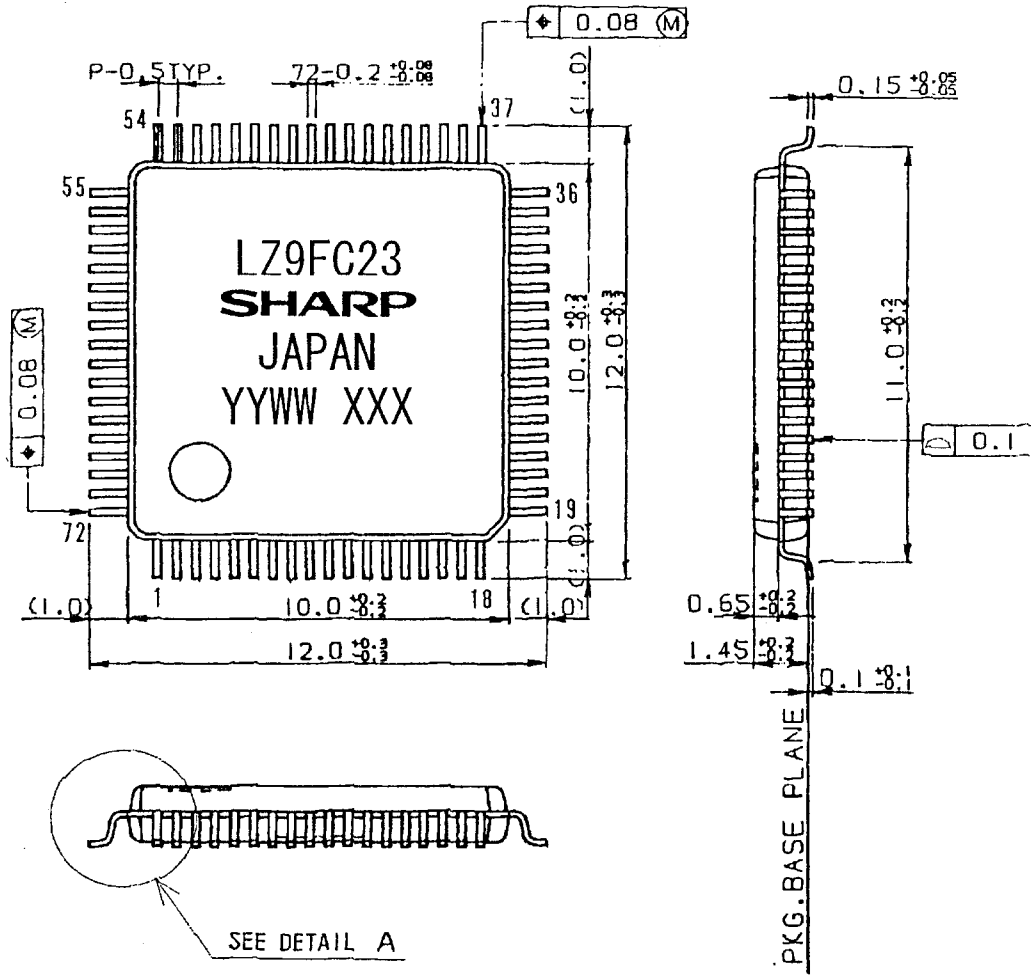
The layout is shown in the attached drawing.

(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.



QFP072-P-1010-AA1034

| | | | | |
|-------------|---------------|------|---------------|--|
| LEAD TYPE | LEAD FINISH | | LEAD MATERIAL | |
| | Sn-Bi PLATING | | 42Alloy | |
| NAME | QFP072-P-1010 | | | NOTE : Plastic body dimensions do not include burr of resin. |
| DRAWING NO. | AA1034 | UNIT | mm | |

7. Packing Specifications (Dry packing for surface mount packages.)

7-1. Packing materials.

| Material name | Material specifications | Purpose |
|------------------------|--|---|
| Inner carton | Cardboard (800 devices / inner carton max.) | Packing the devices. (10 trays / inner carton) |
| Tray | Conductive plastic (80 devices / tray) | Securing the devices. |
| Upper cover tray | Conductive plastic (1 tray / inner carton) | Securing the devices. |
| Laminated aluminum bag | Aluminum polyethylene | Keeping the devices dry. |
| Desiccant | Silica gel | Keeping the devices dry. |
| Label | Paper | Indicates part number, quantity, and packed date. |
| PP band | Polypropylene (3 pcs. / inner carton) | Securing the devices. |
| Outer carton | Cardboard (3200 devices / outer carton max.) | Outer packing. |

(Devices must be placed on the tray in the same direction.)

7-2. Outline dimension of tray.

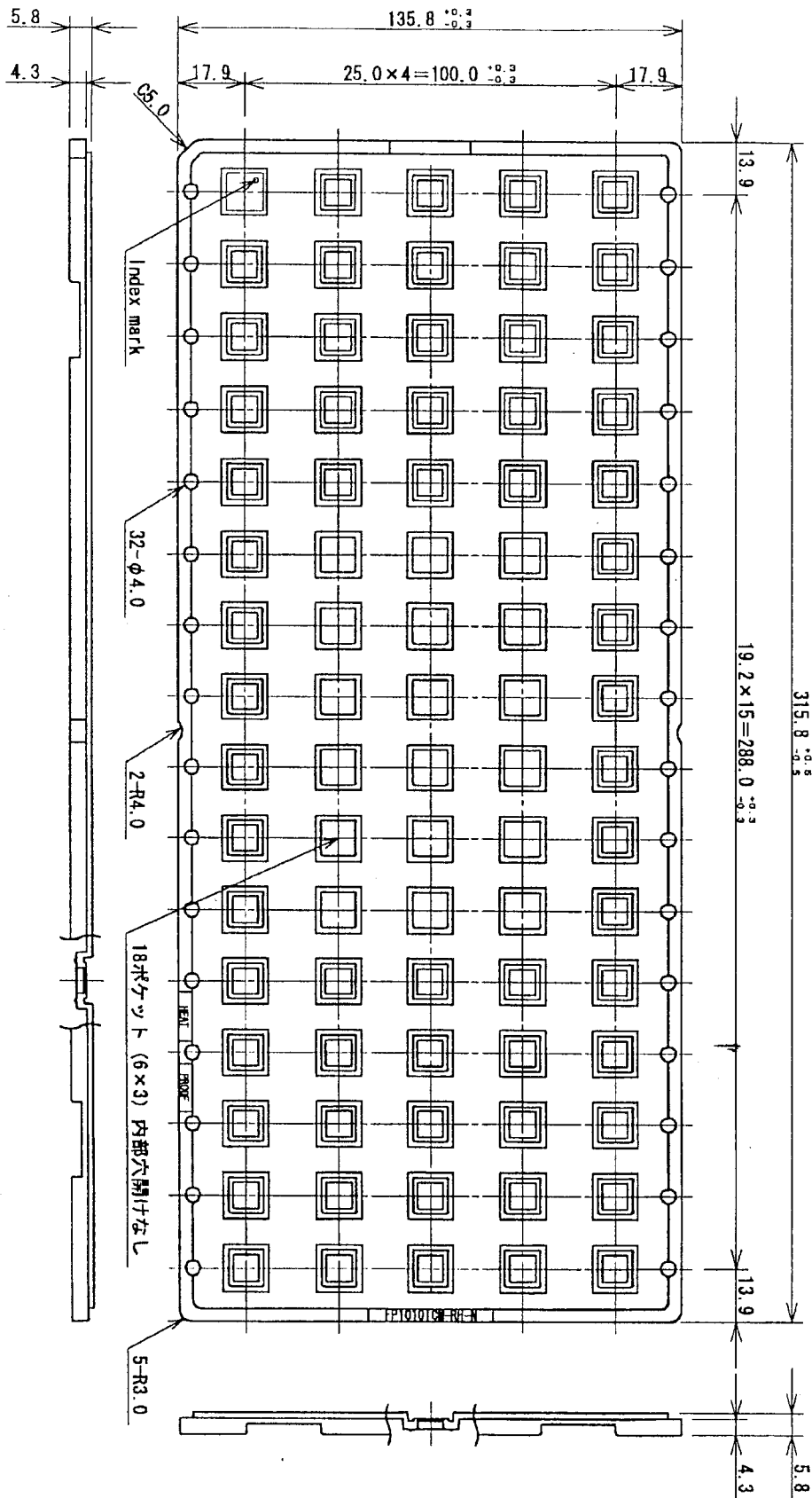
Refer to the attached drawing.

7-3. Outline dimension of carton.

Refer to the attached drawing.

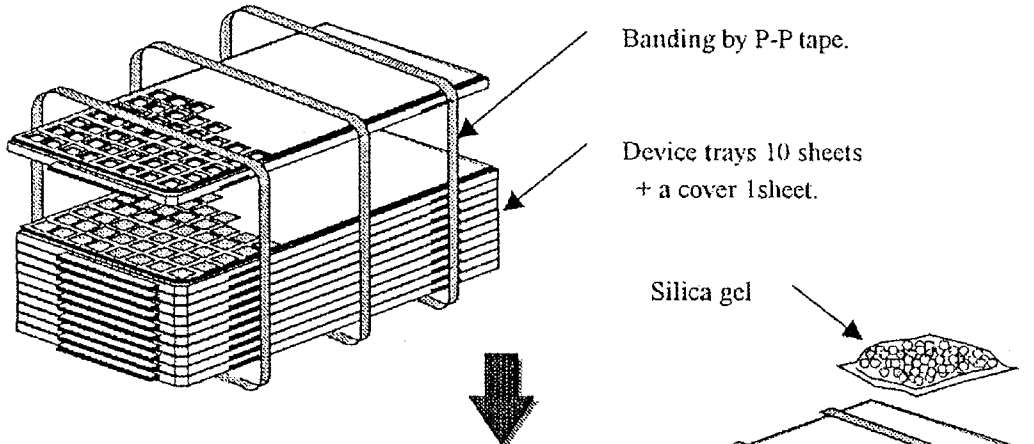
8. Precautions for use.

- (1) Opening must be done on an anti-ESD treated workbench.
All workers must also have undergone anti-ESD treatment.
- (2) The trays have undergone either conductive or anti-ESD treatment.
If another tray is used, make sure it has also undergone conductive or anti-ESD treatment.
- (3) The devices should be mounted within one year of the date of delivery.

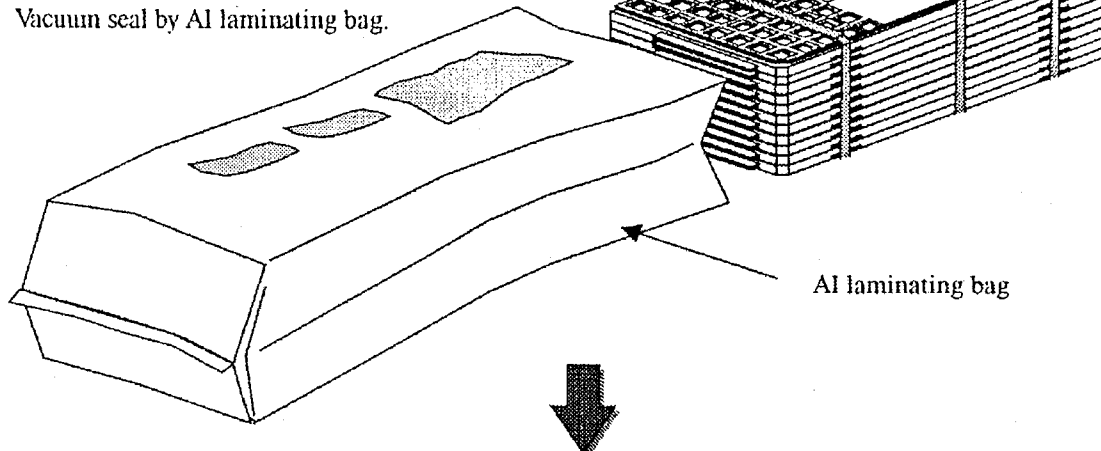


| | | |
|-------------|----------------|---------------|
| 名称 NAME | FP1010TCM-RH-N | 備考 NOTE |
| DRAWING NO. | CV830 | 単位 UNIT mm |

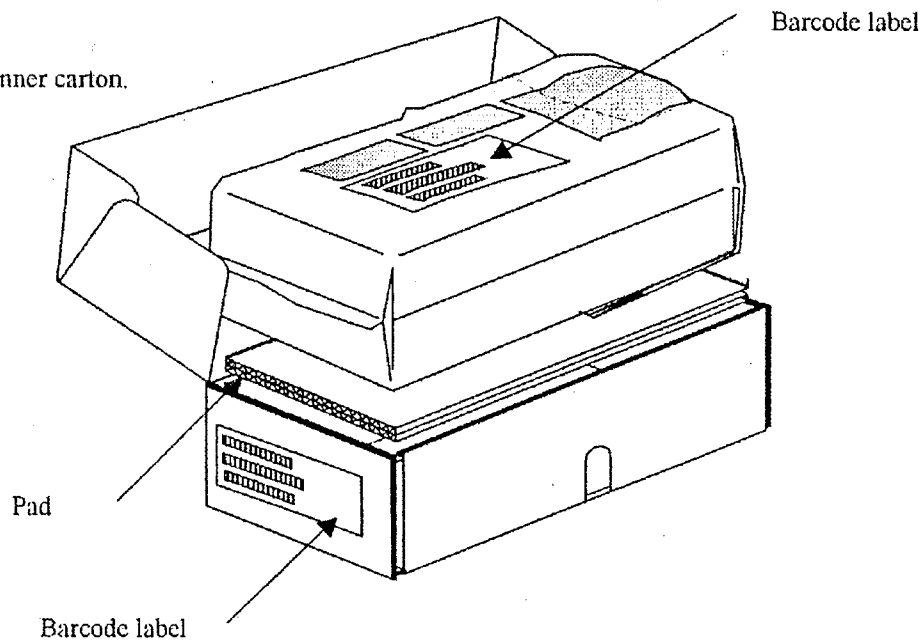
(1) Banding device tray together.



(2) Vacuum seal by Al laminating bag.

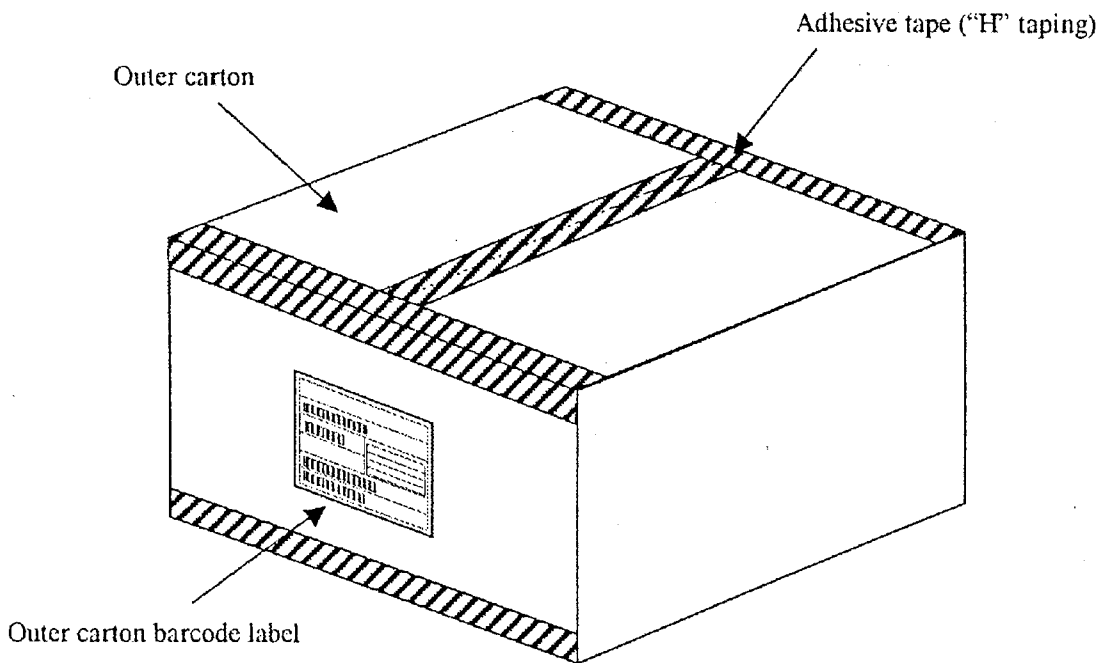
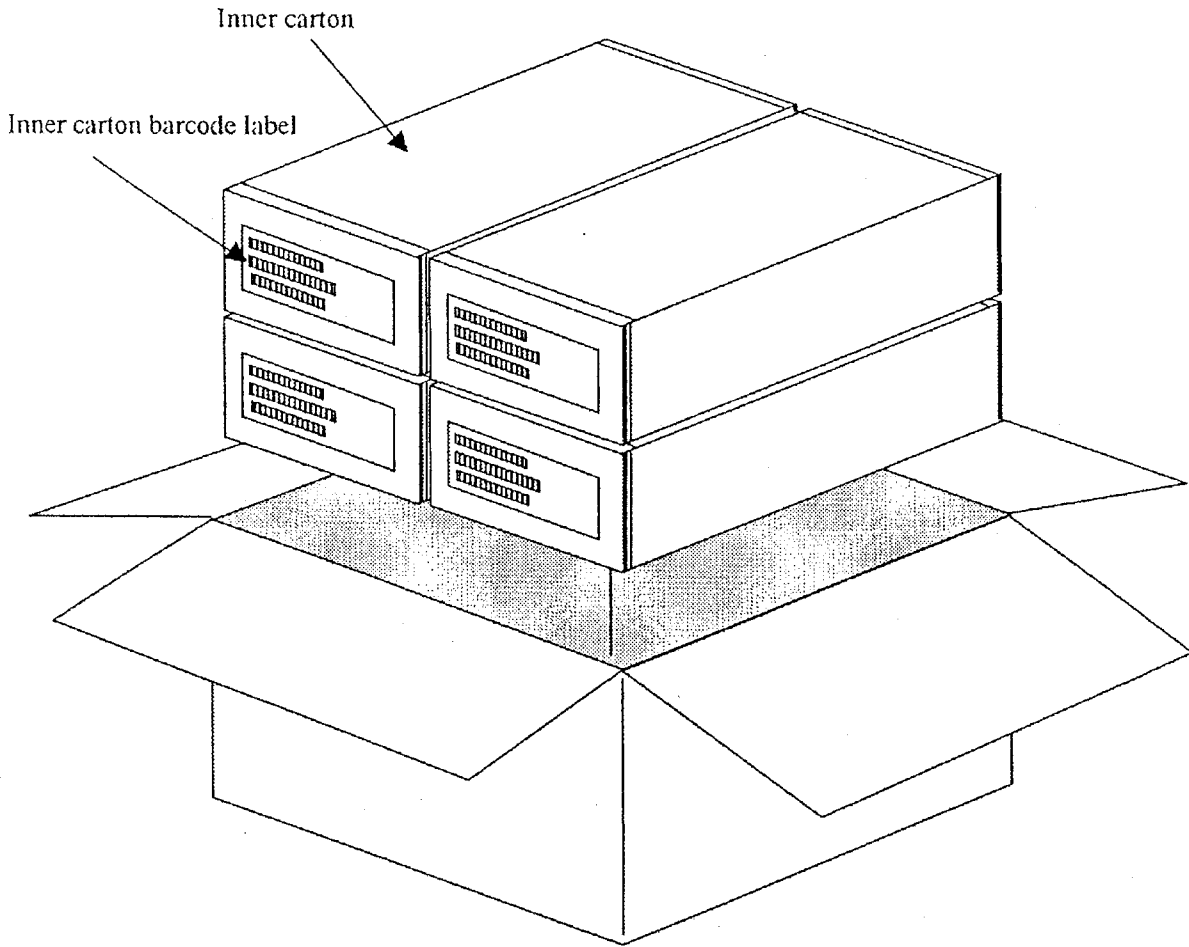


(3) Packing by Inner carton.



| | | | |
|-------------|------------------------|------|----|
| NAME | Packing specifications | | |
| DRAWING NO. | BJ433c | UNIT | mm |

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



L × W × H

Inner carton - Outer dimensions : 360×150×95

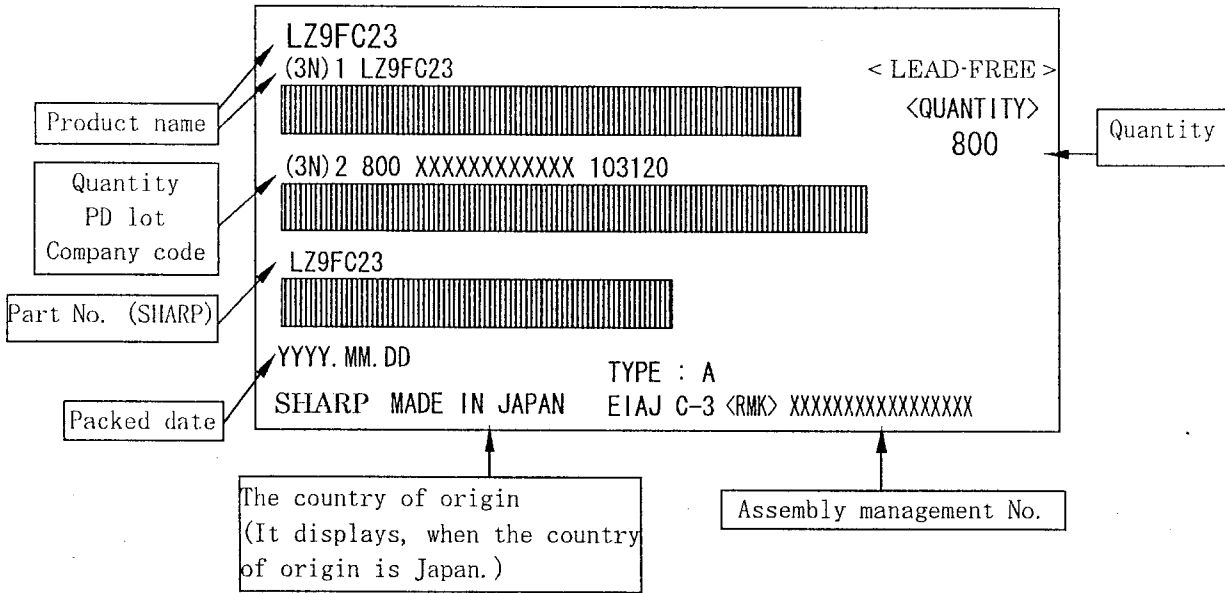
Outer carton - Outer dimensions : 390×335×230

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

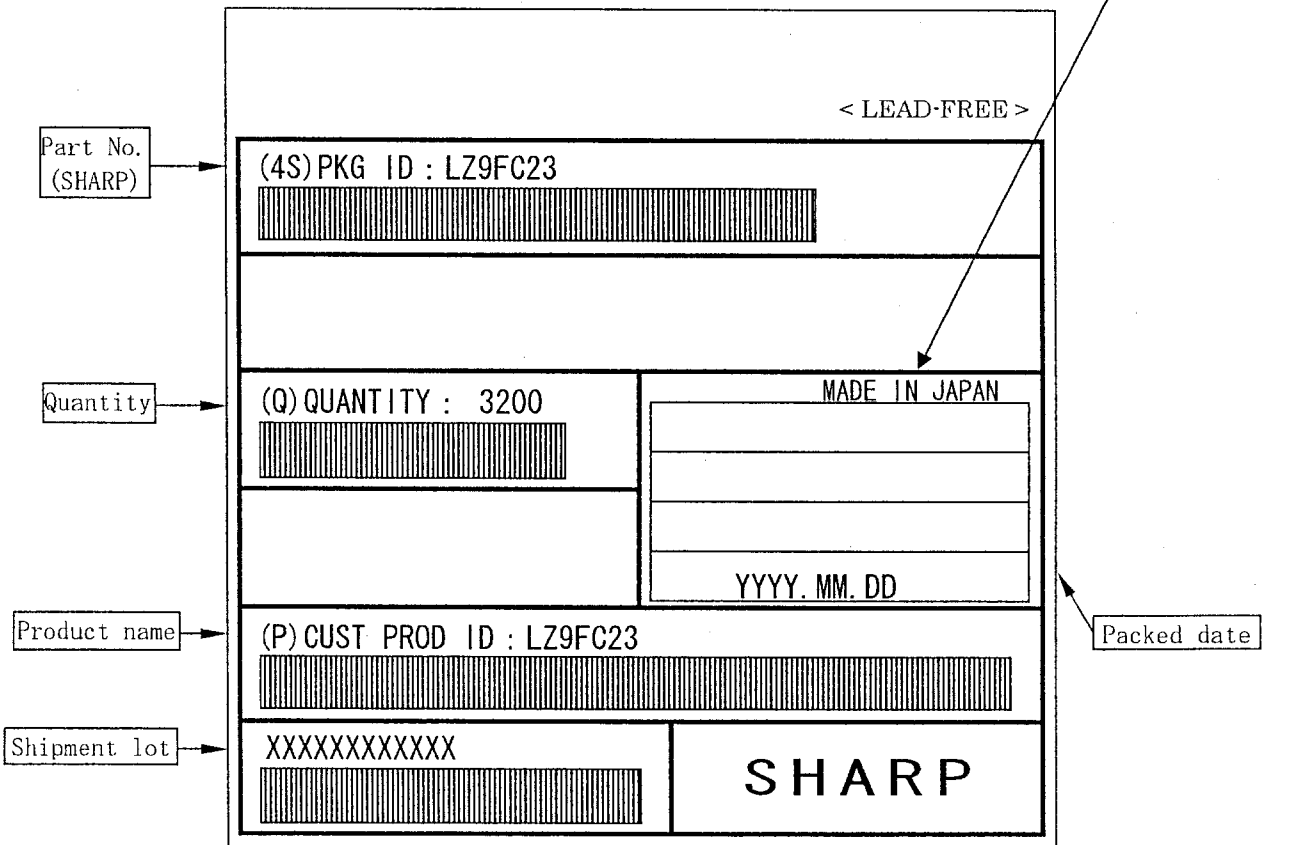
| | | | |
|-------------|------------------------|------|----|
| NAME | Packing specifications | | |
| DRAWING NO. | BJ433d | UNIT | mm |

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

Inner carton label



Outer carton label



(Former) EIAJ B Standard conforming