

# APPROVAL

| PART NO.         | DESCRIPTION                           | REMARKS                         |
|------------------|---------------------------------------|---------------------------------|
| <b>HS5701L-T</b> | <b>LCD MODULE</b><br>(320 x RGBx 240) | * <b>This is ROHS compliant</b> |

|                          |  |
|--------------------------|--|
| CUSTOMER APPLICATION P/N |  |
| APPROVED BY              |  |
| DATE                     |  |

PLEASE KINDLY FIND AND APPROVE THE SPECIFICATIONS INSERTED  
HEREIN AND RETURN ONE COPY HERE OF WITH YOUR SIGNATURE OF APPROVAL.

| PERPARED BY | CHECKED BY | CONFIRMED BY |
|-------------|------------|--------------|
|             |            |              |



**HYES Optoelectronics, Inc.**

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## 1. BASIC SPECIFICATION

### 1.1 Mechanical specifications

| Items                   | Nominal Dimension    | Unit |
|-------------------------|----------------------|------|
| Dot Matrix              | 320*RGB*240          | dots |
| Module Size (W x H x T) | 154.6 x 114.8 x 9.85 | mm   |
| Viewing Area (W x H)    | 118.18 x 89.38       | mm   |
| Active Area (W x H)     | 115.18 x 86.38       | mm   |
| Dot Size (W x H)        | 0.105 x 0.345        | mm   |
| Dot Pitch (W x H)       | 0.12 x 0.36          | mm   |
| Driving method          | 1/240                | Duty |
|                         | 1/16                 | Bias |
| Driving IC Package      | TAB                  |      |

\* Expose the driver IC under blaze ( luminosity over than 1 cd ) when using the LCM may cause IC operating failure.

### 1.2 Display specification

| Display              | Descriptions        | Note |
|----------------------|---------------------|------|
| LCD Type             | 5.7" Color STN      |      |
| LCD Mode             | Negative            |      |
| Polarizer Mode       | Transmissive        |      |
| Polarizer UV-Cutting | With                |      |
| Polarizer Surface    | Normal              |      |
| Background Color     | Black               |      |
| Backlight Type       | LED                 |      |
| Backlight Color      | White               |      |
| Viewing Direction    | 6 O'clock Direction |      |

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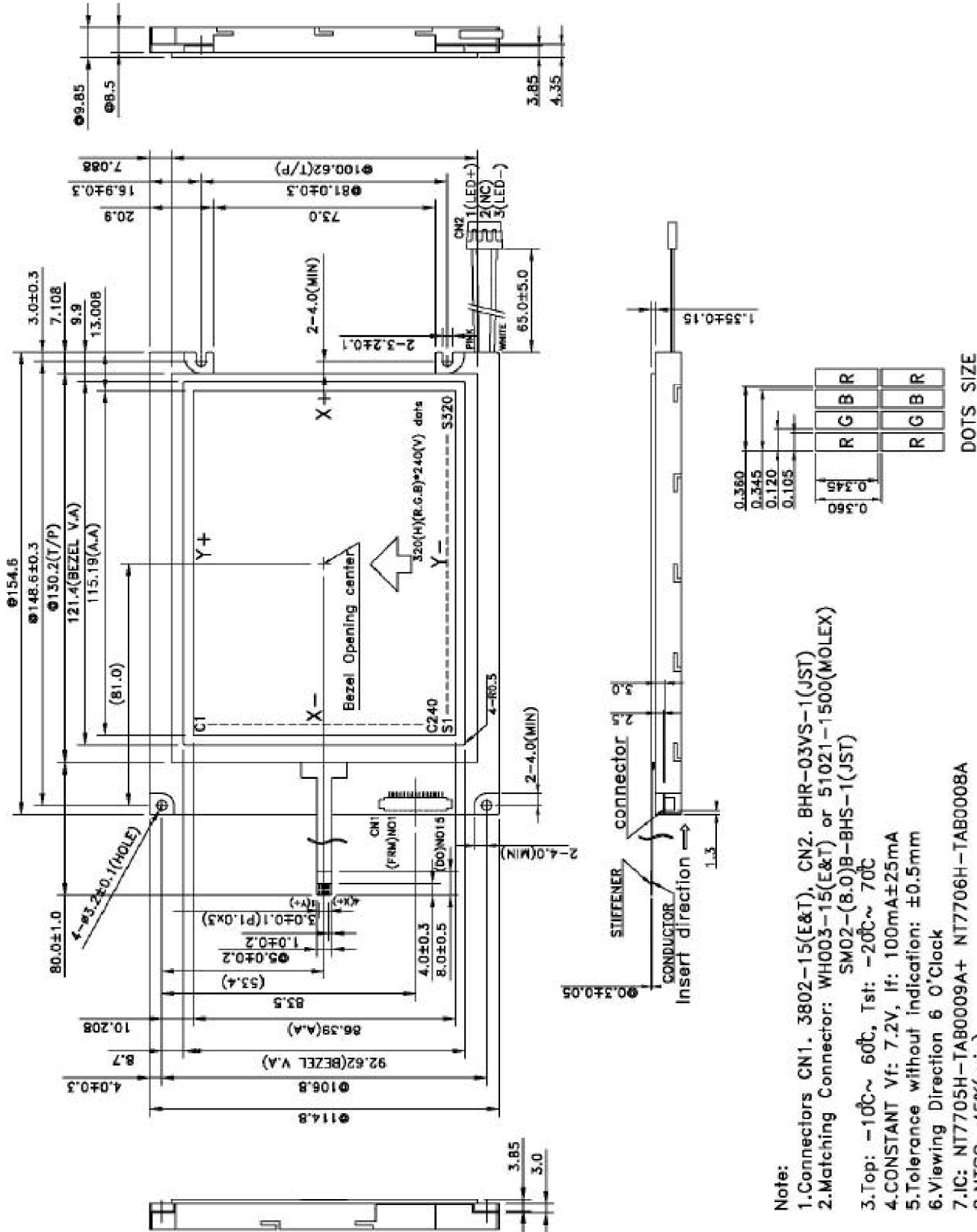
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### 1.3 Outline dimension



- Note:**
- 1.Connectors CN1. 3802-15(E&T), CN2. BHR-03VS-1(JST)
  - 2.Matching Connector: WH003-15(E&T) or 51021-1500(MOLEX) SM02-(8.0)B-BHS-1(JST)
  - 3.Top: -10°C ~ 60°C, Tst: -20°C ~ 70°C
  - 4.CONSTANT Vf: 7.2V, If: 100mA±25mA
  - 5.Tolerance without indication: ±0.5mm
  - 6.Viewing Direction 6 O'Clock
  - 7.IC: NT7705H-TAB0009A+ NT7706H-TAB0008A
  - 8.NTSC: 45%(min)
  - 9.RoHS Compatible
  - 10.φ: KEY DIMENSION

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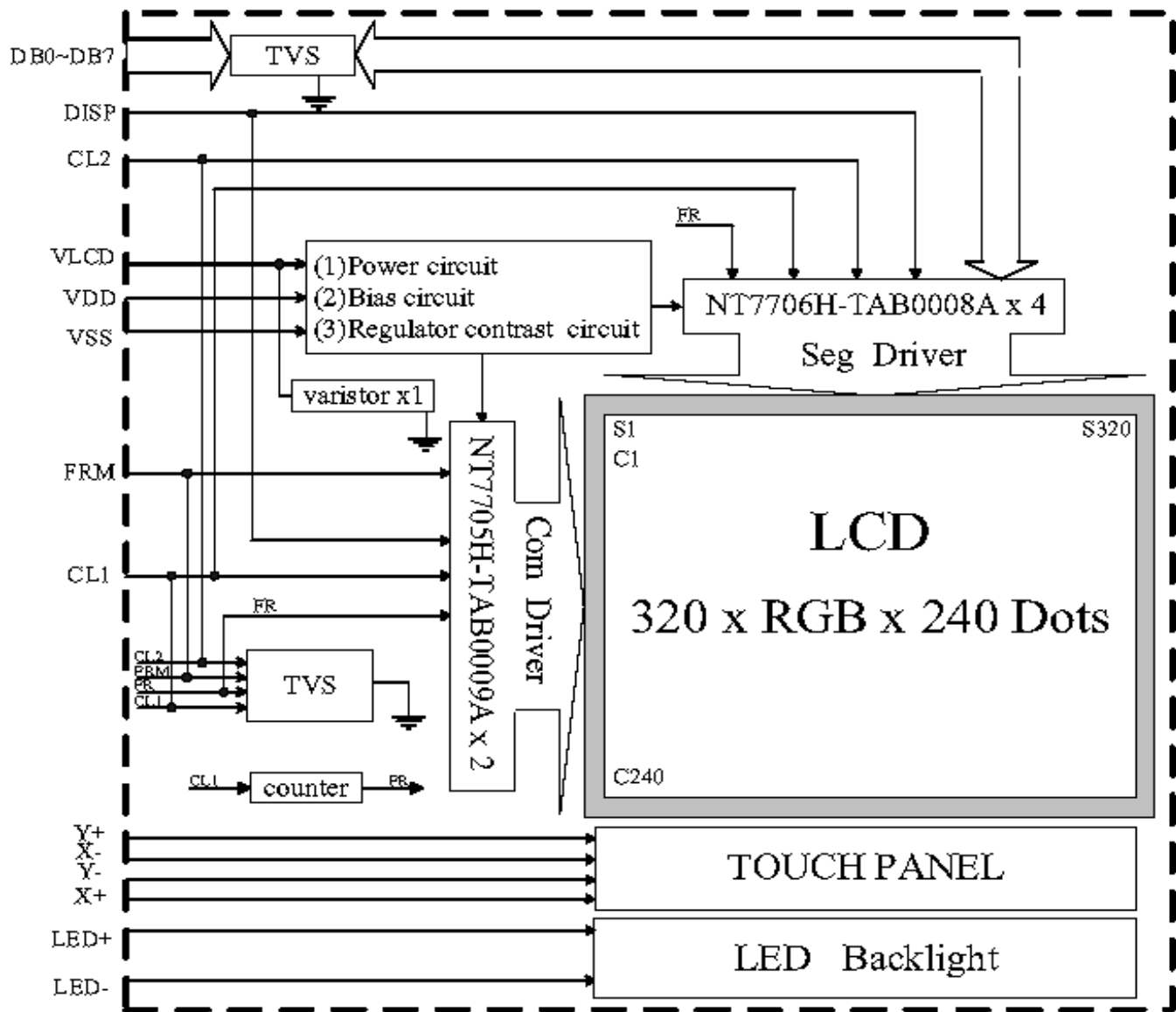


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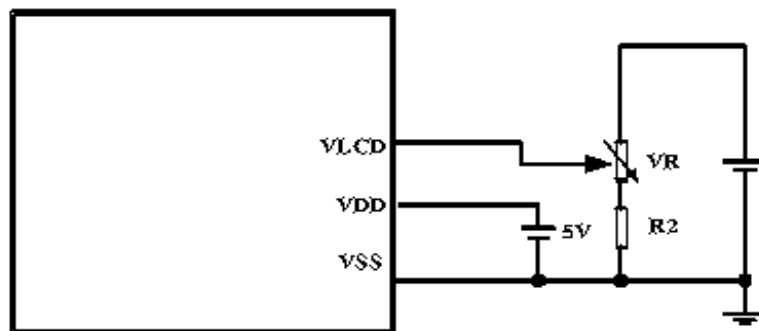
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### 1.4 Block diagram:



□ Example of Power Supply for LCM :



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## 1-5 Interface Pin :

| Pin No. | Pin Symbol | I/O | Description   |
|---------|------------|-----|---|
| 1       | FRM        | I   | It is active during the last line of each frame, and is shifted through the CCM drivers one by one, to scan the display's common connections. |
| 2       | CL1        | I   | Latch pulse input pin for display data.<br>Data is latched on the falling edge of the clock pulse.  |
| 3       | CL2        | I   | Display data shift clock input pin for taking display data.<br>Data is read on the falling edge of the clock pulse.                           |
| 4       | DISP       | I   | Control input for deselection output level. H (On), L (Off)   |
| 5       | VDD        | P   | Power supply input pin for the circuit system. (+5.0V)  |
| 6       | VSS        | P   | Ground pin for the circuit system.  |
| 7       | VLCD       | P   | Power supply for LCD driving voltage.   |
| 3~15    | DB7~D30    | I   | Display data input  |

## Touch panel interface pin :

| Pin No. | Pin Symbol | I/O | Description   |
|---------|------------|-----|---------------|
| 1       | Y+         | -   | Touch screen. |
| 2       | X-         | -   | Touch screen. |
| 3       | Y-         | -   | Touch screen. |
| 4       | X+         | -   | Touch screen. |

## Backlight interface pin :

| Pin No. | Pin Symbol | I/O | Description               |
|---------|------------|-----|---------------------------|
| 1       | LED+       | P   | Power supply for LED B/L. |
| 2       | NC         | -   | No connect.               |
| 3       | LED-       | P   | Ground.                   |

## 2. ELECTRICAL CHARACTERISTICS

### 2.1 Absolute Maximum Ratings

| Items                          | Symbol          | Min. | Max.    | Unit |
|--------------------------------|-----------------|------|---------|------|
| Supply voltage for logics      | VDD             | -0.3 | 7.0     | V    |
| Supply voltage for driving LCD | VLCD            | -0.3 | 40      | V    |
| Input voltage                  | V <sub>I</sub>  | -0.3 | VDD+0.3 | V    |
| Operate temperature range      | T <sub>OP</sub> | -10  | 60      | °C   |
| Storage temperature range      | T <sub>ST</sub> | -20  | 70      | °C   |

## 2.2 DC Characteristics

| Items   | Symbol          | Min.    | Typ.   | Max.   | Unit | Condition       |
|---|-----------------|---------|--------|--------|------|-----------------|
| Supply voltage (Logic)                                | VDD             | 2.5     | 5      | 5.5    | V    | -               |
| Supply voltage (LCD)                                  | VLCD            | -       | (25.3) | -      | V    | Top = 60°C      |
|   |                 | 25.5    | 26.5   | 27.5   | V    | *NOTE1          |
|   |                 | -       | (27.1) | -      | V    | Top = -10°C     |
| Input high level voltage                              | V <sub>IH</sub> | 0.8VDD  | -      | -      | V    | -               |
| Input low level voltage                               | V <sub>IL</sub> | -       | -      | 0.2VDD | V    | -               |
| Output high level voltage                             | V <sub>OH</sub> | VDD-0.4 | -      | -      | V    | -               |
| Output low level voltage                              | V <sub>OL</sub> | -       | -      | 0.4    | V    | -               |
| Display data shift clock                              | KCK             | -       | 2.268  | -      | MHZ  | -               |
| AC-converting signal input for LCD driver waveform(1) | FRAME           | 70      | -      | 90     | HZ   | For 256 colors  |
| AC-converting signal input for LCD driver waveform(2) | FRAME           | 120     | -      | 150    | HZ   | For 4096 colors |
| AC-converting signal input for LCD driver waveform(3) | FRAME           | 160     | -      | 240    | HZ   | For 65K colors  |
| Power supply current                                  | IDD             | -       | 0.5    | 1      | mA   | *NOTE1          |
| Power supply current(LCD)                             | LCD             | -       | 7      | 14     | mA   | *NOTE1          |

\*NOTE1 : Min. and Max. voltage is mean within the range will has optimum contrast at Ta=25°C

Typ Voltage is specified as module driving condition: Ta=25°C, V<sub>OP</sub> at Optimum Contrast,

the measuring condition as below, this value is **HYES** recommer.d when customer change the set

condition , the VLCD will be change.

NOTE2 :

Measuring Condition :

Standard Value MAX.

Ta = 25°C

VDD-VSS = 5.0V

VLCD - GND = V<sub>OP</sub> at optimum Contrast

Bias = 1/16

Duty = 1/240

Display Patten = Checkered pattern

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### 2.3 Back-light Specification

| PARAMETER      | SYMBOL | MIN | TYP   | MAX | Unit              | Test Condition                   | NOTE |
|----------------|--------|-----|-------|-----|-------------------|----------------------------------|------|
| Supply Current | If     | 75  | 100   | 125 | mA                | Ta=25°C                          | -    |
| Supply Voltage | Vs     | -   | 7.2   | -   | V                 | Ta=25°C                          | -    |
| Brightness     | Br     | 900 | -     | -   | cd/m <sup>2</sup> | Ta=25°C<br>I <sub>f</sub> =100mA | -    |
| Half-Life Time | Lf     | -   | 10000 | -   | hrs               | I <sub>f</sub> =100mA            | 3    |

Note 3 : The " Half-Life Time " is defined as the LED chip brightness decrease to 50% original brightness . Base on Ta=25±2°C , 50±10%RH condition.

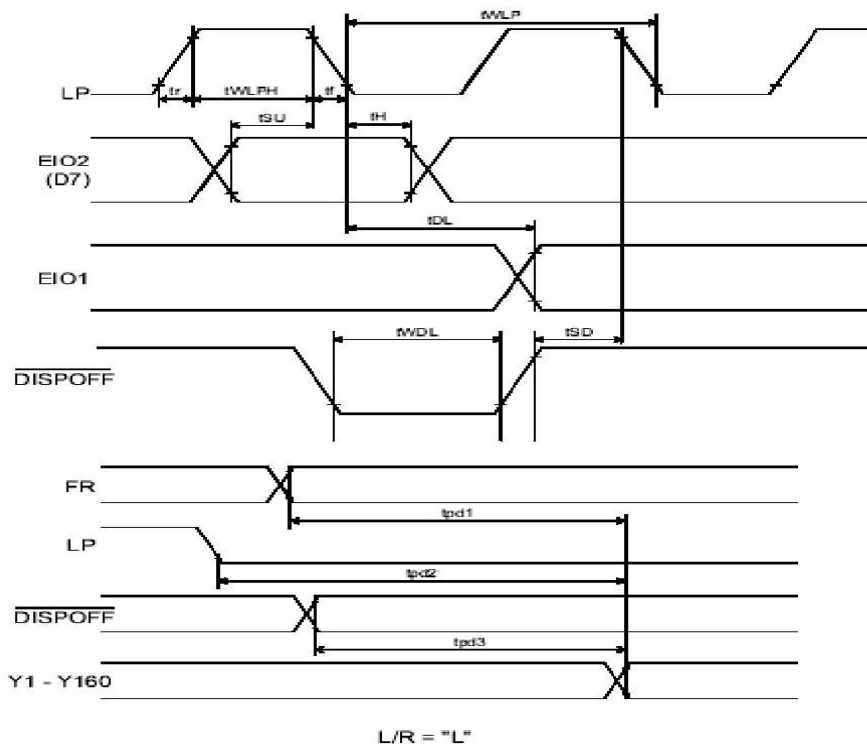
## 2.4 AC Characteristics

### NT7705

Common Mode ( $V_{SS} = V_5 = 0V$ ,  $V_{DD} = 2.5 - 5.5V$ ,  $V_0 = 15$  to  $40V$  and  $T_A = -30$  to  $+85^\circ C$ , unless otherwise noted)

| Parameter                               | Symbol                              | Min. | Typ. | Max. | Unit    | Condition                 |
|---|-------------------------------------|------|------|------|---------|---------------------------|
| Shift clock period                      | tWLP                                | 250  | -    | -    | ns      | $t_r, t_f \leq 20ns$      |
| Shift clock "H" pulse width             | tWLPH                               | 15   | -    | -    | ns      | $V_{DD} = +5.0V \pm 10\%$ |
|   |                                     | 30   | -    | -    | ns      | $V_{DD} = +2.5 - +4.5V$   |
| Data setup time                         | tSU                                 | 30   | -    | -    | ns      |                           |
| Data hole time                          | tH                                  | 50   | -    | -    | ns      |                           |
| Input signal rise time                  | t <sub>r</sub>                      |      | -    | 50   | ns      |                           |
| Input signal fall time                  | t <sub>f</sub>                      |      | -    | 50   | ns      |                           |
| $\overline{DISPOFF}$ Removal time       | tSD                                 | 100  | -    | -    | ns      |                           |
| $\overline{DISPOFF}$ enable pulse width | tWDL                                | 1.2  | -    | -    | $\mu s$ |                           |
| Output delay time (1)                   | tDL                                 | -    | -    | 200  | ns      | $C_L = 15pF$              |
| Output delay time (2)                   | t <sub>pd1</sub> , t <sub>pd2</sub> | -    | -    | 1.2  | $\mu s$ | $C_L = 15pF$              |
| Output delay time (3)                   | t <sub>pd3</sub>                    | -    | -    | 1.2  | $\mu s$ | $C_L = 15pF$              |

#### Timing Characteristics of Common Mode



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# NT7706

Segment Mode 1 ( $V_{SS} = V_5 = 0V$ ,  $V_{DD} = 4.5 - 5.5V$ ,  $V_0 = 15$  to  $40V$ , and  $T_A = -30$  to  $+85^\circ C$ , unless otherwise noted)

| Parameter                                      | Symbol                              | Min. | Typ. | Max. | Unit    | Condition                  |
|--|-------------------------------------|------|------|------|---------|----------------------------|
| Shift clock period                             | twck                                | 50   | -    |      | ns      | tr, tf $\leq$ 10ns, Note 1 |
| Shift clock "H" pulse width                    | twckH                               | 15   | -    |      | ns      |                            |
| Shift clock "L" pulse width                    | twckL                               | 15   | -    |      | ns      |                            |
| Data setup time                                | tDS                                 | 10   | -    |      | ns      |                            |
| Data hole time                                 | tDH                                 | 12   | -    |      | ns      |                            |
| Latch pulse "H" pulse width                    | twLPH                               | 15   | -    |      | ns      |                            |
| Shift clock rise to Latch pulse rise time      | tLD                                 | 0    | -    |      | ns      |                            |
| Shift clock fall to Latch pulse fall time      | tSL                                 | 30   | -    |      | ns      |                            |
| Latch pulse rise to Shift clock rise time      | tLS                                 | 25   | -    |      | ns      |                            |
| Latch pulse fall to Shift clock rise time      | tLH                                 | 25   | -    |      | ns      |                            |
| Input signal rise time                         | tr                                  |      | -    | 50   | ns      | Note 2                     |
| Input signal fall time                         | tr                                  |      | -    | 50   | ns      | Note 2                     |
| Enable setup time                              | tS                                  | 10   | -    |      | ns      |                            |
| $\overline{\text{DISPOFF}}$ Removal time       | tSD                                 | 100  | -    |      | ns      |                            |
| $\overline{\text{DISPOFF}}$ enable pulse width | tWDL                                | 1.2  | -    |      | $\mu s$ |                            |
| Output delay time (1)                          | tD                                  |      | -    | 30   | ns      | CL = 15pF                  |
| Output delay time (2)                          | t <sub>pd1</sub> , t <sub>pd2</sub> |      | -    | 1.2  | $\mu s$ | CL = 15pF                  |
| Output delay time (3)                          | t <sub>pd3</sub>                    |      | -    | 1.2  | $\mu s$ | CL = 15pF                  |

## Note

1. Take the cascade connection into consideration.
2.  $(t_{CK} - tw_{ckH} - tw_{ckL})/2$  is the maximum in the case of high speed operation.

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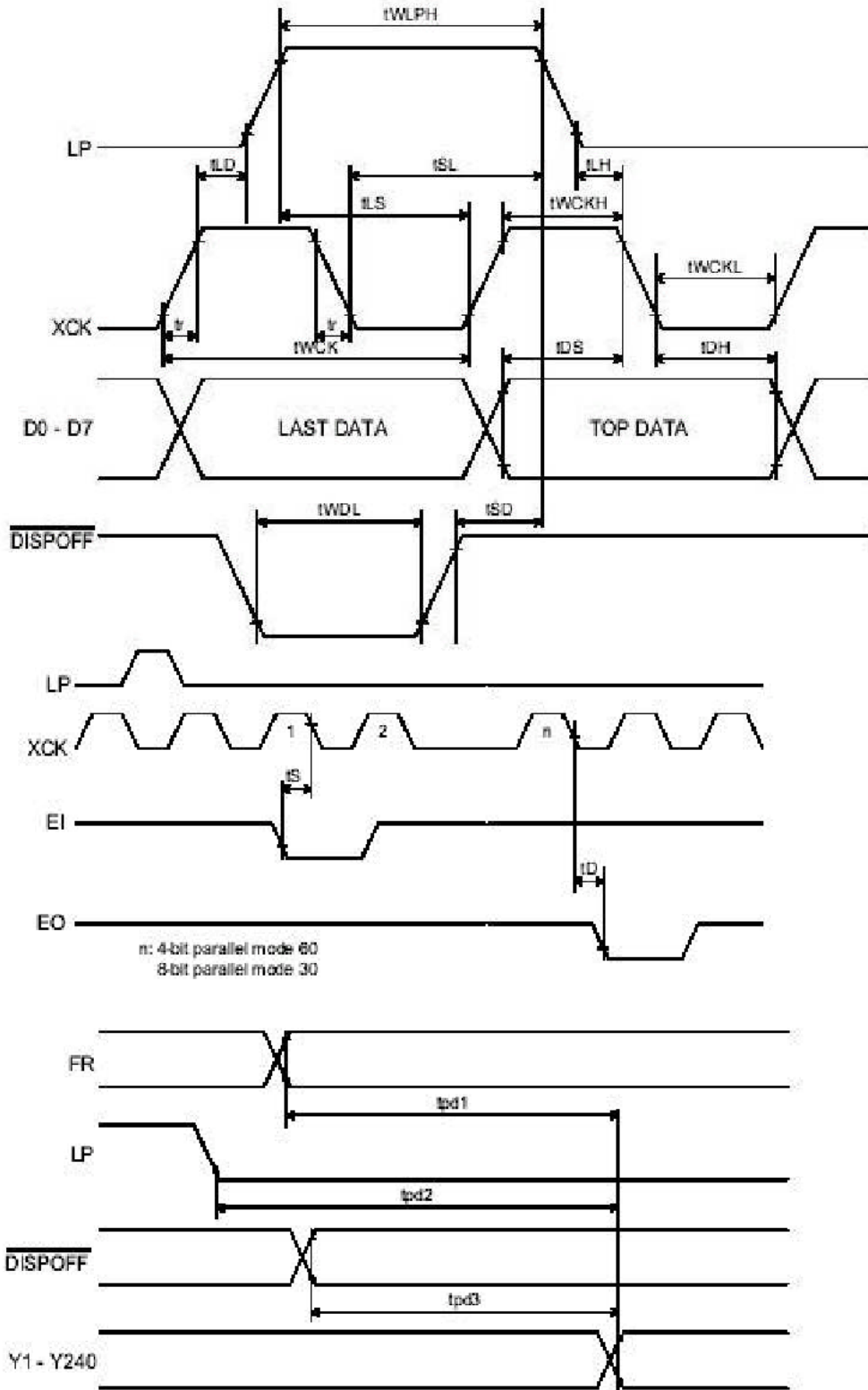
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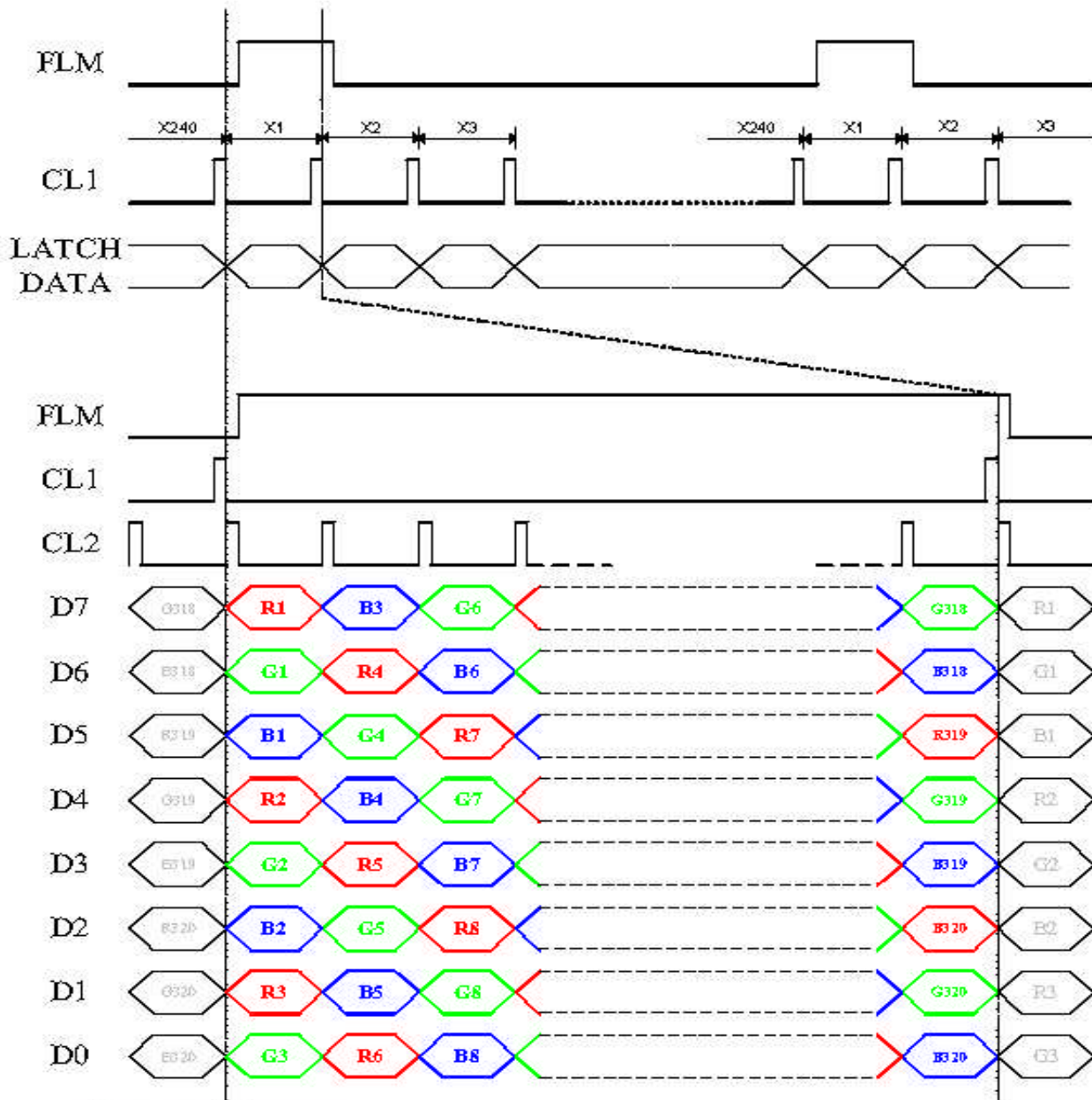
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Timing waveform of the Segment Mode



## 2-5 Interface Timing Chart



### Data and Screen

| X1   | Y1 |    |    | Y2 |    |    | Y3 |    |    | Y320 |  |      |      |      |
|------|----|----|----|----|----|----|----|----|----|------|--|------|------|------|
|      | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | D7 |      |  | D2   | D1   | D0   |
|      | R1 | G1 | B1 | R2 | G2 | B2 | R3 | G3 | B3 |      |  | R320 | G320 | B320 |
| X240 | Y1 |    |    | Y2 |    |    | Y3 |    |    | Y320 |  |      |      |      |
|      | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | D7 |      |  | D2   | D1   | D0   |
|      | R1 | G1 | B1 | R2 | G2 | B2 | R3 | G3 | B3 |      |  | R320 | G320 | B320 |

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## 2-6 Power Supply Sequence

Be careful when connecting or disconnecting the power

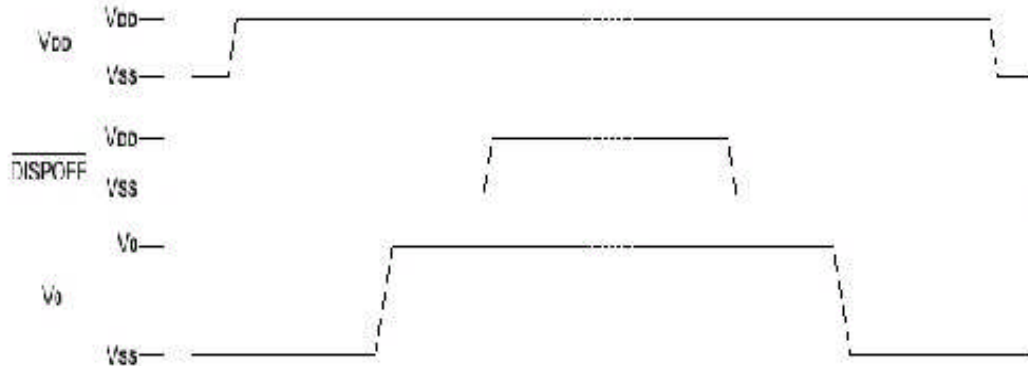
This LSI has a high-voltage LCD driver, so it may be permanently damaged by a high current, which may occur, if a voltage is supplied to the LCD driver power supply while the logic system power supply is floating.

The details are as follows:

- When connecting the power supply, connect the LCD driver power after connecting the logic system power. Furthermore, when disconnecting the power, disconnect the logic system power after disconnecting the LCD driver power.
- We recommend that you connect a serial resistor (50-100Ω) or fuse to the LCD driver power  $V_0$  of the system as a current limiting device. Also, set a suitable value for the resistor in consideration of the LCD display grade.

In addition, when connecting the logic power supply, the logic condition of the LSI inside is insecure. Therefore connect the LCD driver power supply after resetting logic condition of this LSI inside on  $\overline{\text{DISPOFF}}$  function. After that, the  $\overline{\text{DISPOFF}}$  cancel the function after the LCD driver power supply has become stable. Furthermore, when disconnecting the power, set the LCD driver output pins to level  $V_{SS}$  on the  $\overline{\text{DISPOFF}}$  function. After that, disconnect the logic system power after disconnecting the LCD driver power.

When connecting the power supply, follow the recommended sequence shown.



### 3. OPTICAL CHARACTERISTICS

#### 3.1 Characteristics

Driving condition

| Item  | Duty  | Bias | Note |
|-------|-------|------|------|
| Value | 1/240 | 1/16 | 1    |

Electrical and Optical Characteristics

| No. | Item                  | symbol / temp. | Min.       | Typ.              | Max. | Unit | Note |        |                   |
|-----|-----------------------|----------------|------------|-------------------|------|------|------|--------|-------------------|
| 1   | Response Time         | Tr             | 25 °C      | -                 | 260  | 520  | ms   | 2      |                   |
|     |                       | Tf             | 25 °C      | -                 | 100  | 200  |      |        |                   |
| 2   | Viewing Angle         | Front-Rear     | $\Theta 1$ | $\Phi = 90^\circ$ | -10  | -    | 30   | degree | 3                 |
|     |                       | Left-Right     | $\Theta 2$ |                   | -30  | -    | 30   |        |                   |
| 3   | Contrast Ratio        | Cr             | 25 °C      | -                 | 35   | -    | -    | 4      |                   |
| 4   | Red x-code            | Rx             | 25 °C      | 0.52              | 0.57 | 0.62 | -    | 5      |                   |
|     | Red y-code            | Ry             |            | 0.32              | 0.37 | 0.42 |      |        |                   |
|     | Green x-code          | Gx             |            | 0.24              | 0.29 | 0.34 |      |        |                   |
|     | Green y-code          | Gy             |            | 0.56              | 0.61 | 0.66 |      |        |                   |
|     | Blue x-code           | Bx             |            | 0.10              | 0.15 | 0.20 |      |        |                   |
|     | Blue y-code           | By             |            | 0.06              | 0.11 | 0.16 |      |        |                   |
|     | White x-code          | Wx             |            | 0.24              | 0.29 | 0.34 |      |        |                   |
|     | White y-code          | Wy             |            | 0.31              | 0.36 | 0.41 |      |        |                   |
|     | Brightness            | Y              |            | 50                | 80   | -    |      |        | cd/m <sup>2</sup> |
| 5   | Brightness Uniformity |                | 25 °C      | 80                | -    | -    | %    | 6      |                   |

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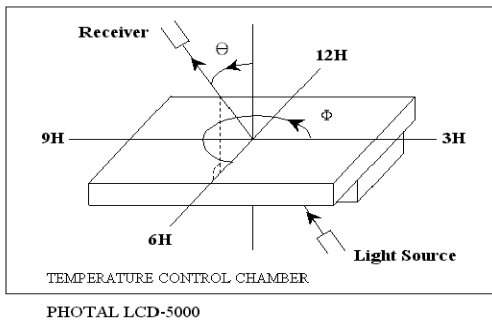
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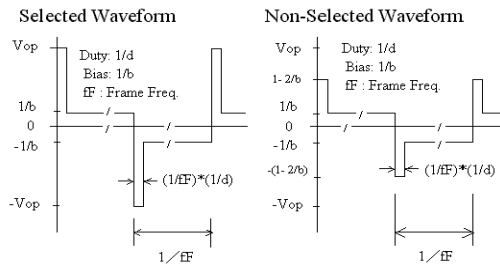
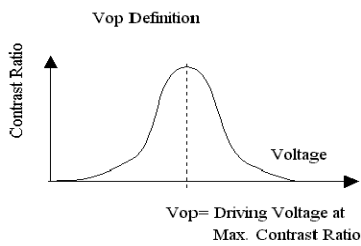
### 3.2 Definition of optical characteristics

Measurement condition :

Transmissive and Transflective type

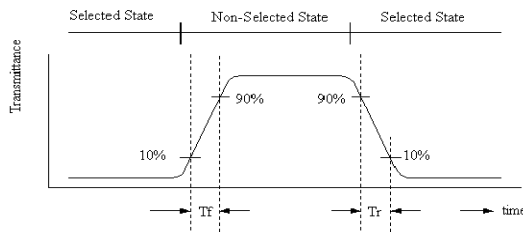


[Note 1] Definition of LCD Driving Vop and Waveform :



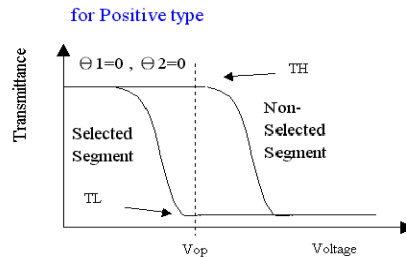
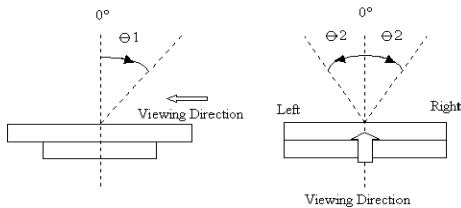
[Note 2] Definition of Response Time

for Positive type :



[Note 3] Definition of Viewing Angle :

[Note 4] Definition of Contrast Ratio :



$$\text{Contrast Ratio} = \frac{T_H}{T_L}$$

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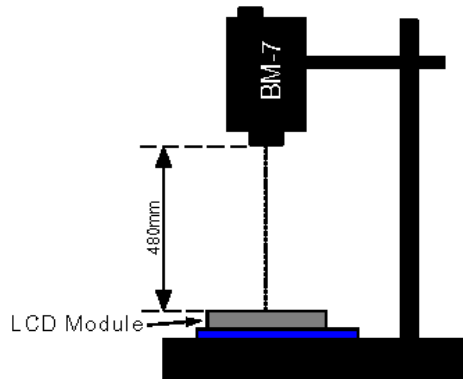
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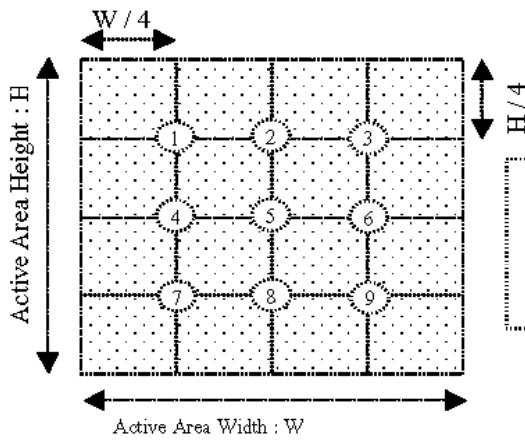
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**[Note 5] Definition of measurement of Color Chromaticity and Brightness**

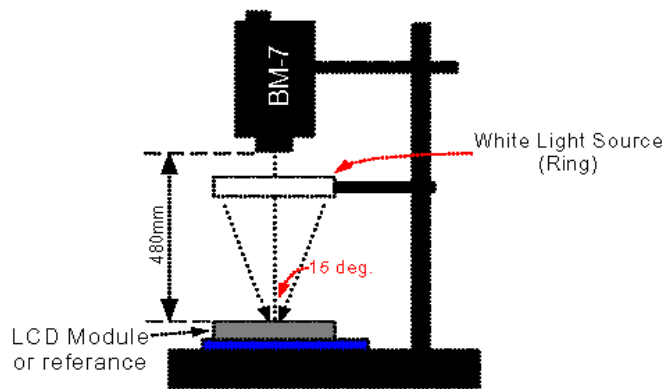


**[Note 6] Definition of Brightness Uniformity**



$$\text{Brightness Uniformity} = \frac{\text{Minimum Brightness of Point 1~9}}{\text{Maximum Brightness of Point 1~9}}$$

**[Note 7] Definition of Measurement of Reflectance**



#### 4. RELIABILITY :

| Item No | Items                               | Condition  | Remark                          |
|---------|-------------------------------------|--|---------------------------------|
| 1       | High temperature operating          | 60 °C , 200 hours  | Finish product (With polarizer) |
| 2       | Low temperature operating           | -10 °C , 200 hours   | Finish product (With polarizer) |
| 3       | High temperature storage            | 70 °C , 200 hours  | Finish product (With polarizer) |
| 4       | Low temperature storage             | -20 °C , 200 hours   | Finish product (With polarizer) |
| 5       | High temperature & humidity storage | 60°C, 90%RH, 100 hours   | Finish product (With polarizer) |
| 6       | Thermal Shock storage               | -20°C, 30min.<=> 70°C, 30min.<br>10 Cycles   | Finish product (With polarizer) |
| 7       | Vibration test                      | 10 => 55 =>10 => 55 => 10 Hz ,<br>within 1 minute<br>Amplitude : 1.5mm.<br>15 minutes for each Direction ( X,Y,Z ) | Finish product (With polarizer) |
| 8       | Drop test                           | Packed, 100CM free fall,<br>6 sides, 1 corner, 3edges  | Finish product (With polarizer) |
| 9       | Life time                           | 50,000 hours<br>25°C , 70%RH below ,<br>specification condition driving  | Finish product (With polarizer) |

\* One single product test for only one item.

\* Judgment after test : keep in room temperature for more than 2 hours.

- Current consumption < 2 times of initial value
- Contrast > 1/2 initial value
- Function : work normally

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## 5. PRODUCT HANDLING AND APPLICATION

### PRECAUTION FOR HANDLING LCM

- The LCD module contains a C-MOS LSI. People who operate the LCM should wear ESD protection equipment to prevent ESD hurt on products.
- Do not input any signal before power is turned on.
- Do not take LCM from its packaging bag until it is assembled.
- Peel off the LCM protective film slowly since static electricity may be generated.
- Pay attention to the humidity of the work shop, 50~60%RH is satisfactory.
- Use a non-leak iron for soldering LCM.
- Do not touch the display surface or connection terminals area with bare hands. Smudges on the display surface reduce the insulation between terminals.
- Cautions for soldering to LCM:  
Condition for soldering I/O terminals:  
Temperature at iron tip :280°C±10°C.  
Soldering time : 3~4sec./ terminals.  
Type of solder : Eutectic solder(rosin flux filled).

### PRECAUTION IN USE OF LCD

- Do not contact or scratch the front surface and the contact pads of a LCD panel with hard materials such as metal or glass or with one's nail.
- To clean the surface , wipe it gently with soft cloth dampened by alcohol.
- Do not attempt to wipe off the contact pads.
- Keep LCD panels away from direct sunlight , also avoid them in high-temperature & high humidity environment for a long period.
- Do not drive LCD panels by DC voltage.
- Do not expose LCD panels to organic solvent.
- Liquid in LCD is hazardous substance. In case a contact with liquid crystal material is occurred, be sure to immediately wash such material away by soap and water.
- The polarizer is easily damaged and should be handle with special care. Don't press or rub it with hard objects.

### PRECAUTION FOR STORING LCM

- To avoid degradation of the device , do not store the module under the conditions of direct sunlight , high temperature or high humidity . Keep the module in bags designed to prevent static electricity charging under low temperature / normal humidity conditions(avoid high temperature / high humidity and low temperature below 0°C)

### USING ON MEDICAL CARE , SAFETY OR HAZARDOUS APPLICATION OR SYSTEM

- For the application in medical care, safety and hazardous products or systems, an authorization from **HYES** is required. **HYES** will not responsible for any damage or loss which caused by the products without any authorization given by **HYES**.
- This product is not allowed to be designed and used for military application and/or purpose.
- The delivery of this product to the countries and/or regions where the embargoes are imposed by U.N. is prohibited.

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## 6. DATE CODE OF PRODUCTS

- Date code will be shown on each product :

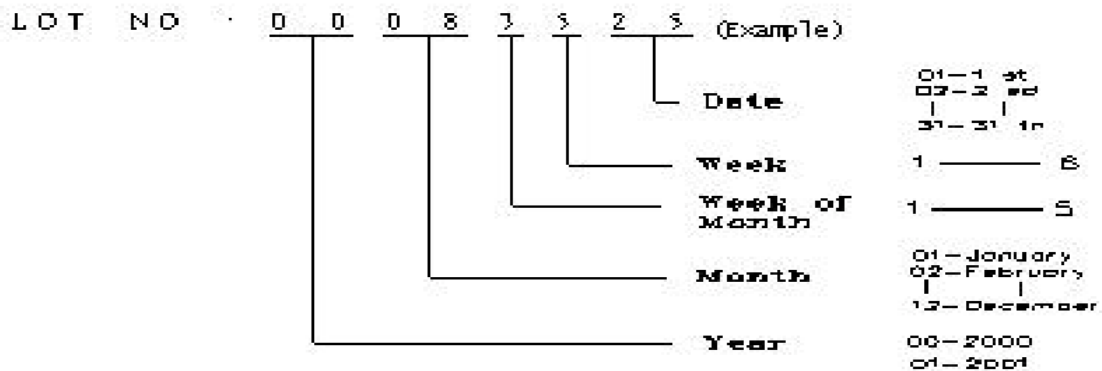
- **Y MM DD - XXX**

Year Month Day - Production lots

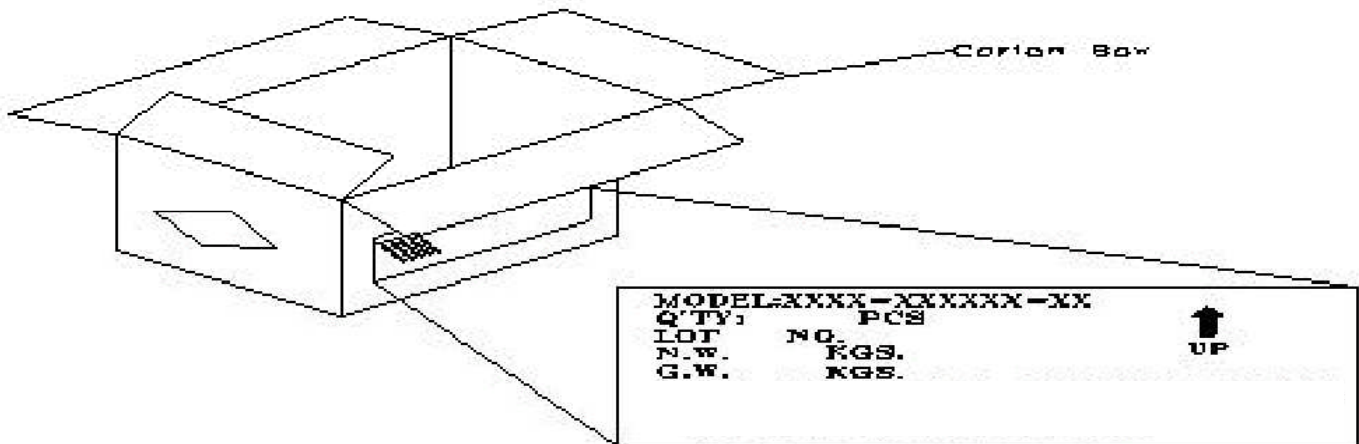
- Example: 2 1 2 2 3 - 0 0 3 ==>Year 2002, Dec.,23rd , Batch no.03

## 7. PACKING

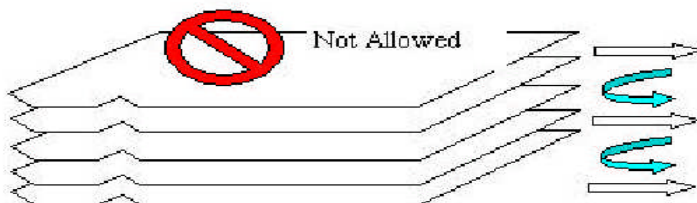
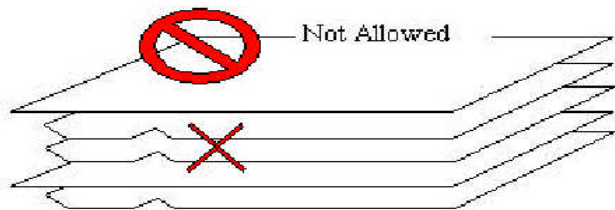
Instruction of lot number:



Label of carton:



Packing tray must be stacked with alternated direction to each others.  
 To tacks packing trays in same direction will cause product damaged.



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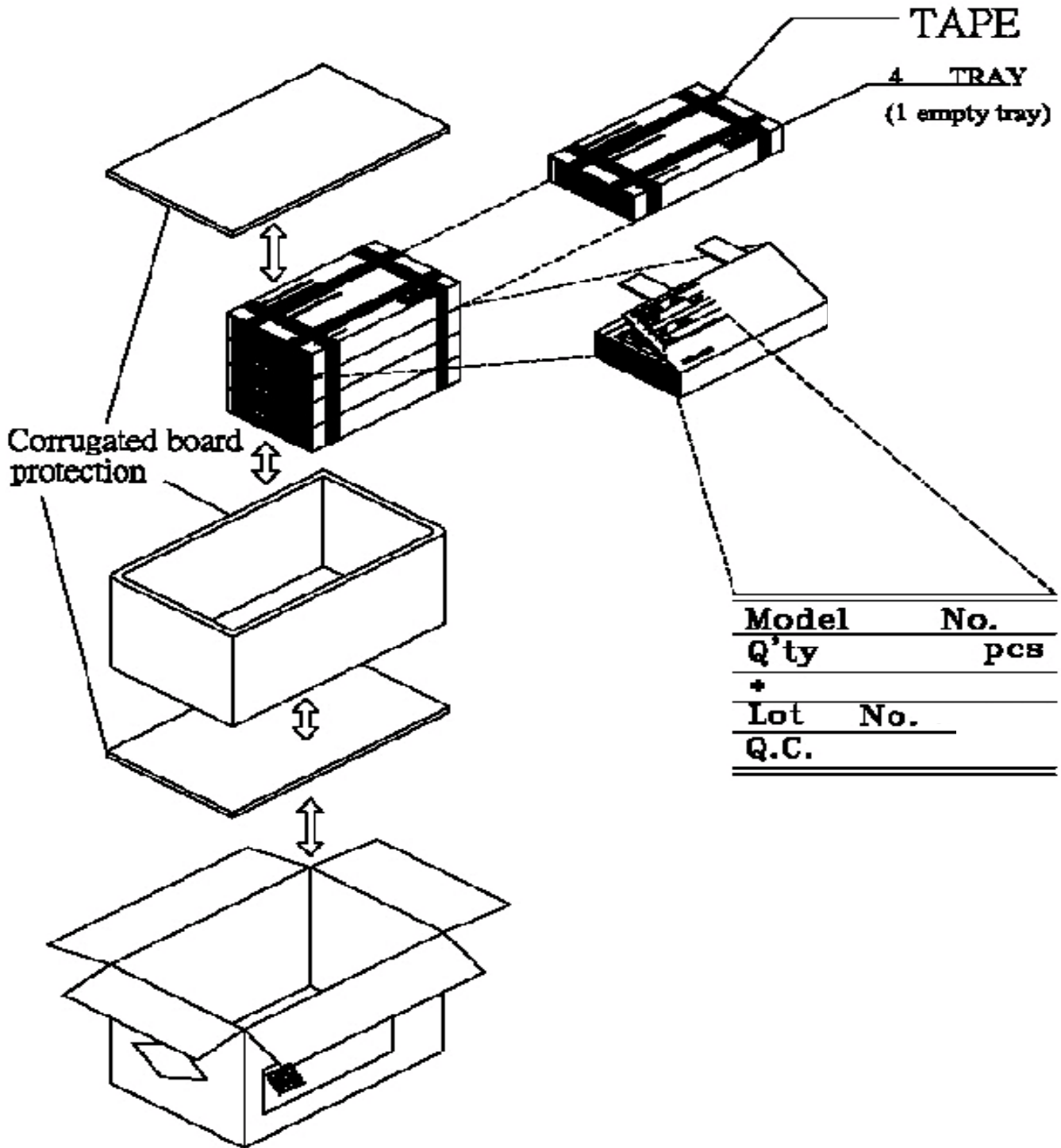
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**NOTE:**

Be warned ,the direction of the tray has to turn it by 180 degree before stack it up. Otherwise, it will be packager's responsibility!!

- 4 pcs / Tray
- 4 Tray / Box
- 4 Box / Carton
- 64 pcs / Carton



|              |            |
|--------------|------------|
| <b>Model</b> | <b>No.</b> |
| <b>Q'ty</b>  | <b>pcs</b> |
| *            |            |
| <b>Lot</b>   | <b>No.</b> |
| <b>Q.C.</b>  |            |

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## 8. INSPECTION STANDARD

### 8.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

#### 8.1.1. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM **HYES** TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT -10 °C ~ 40 °C ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

#### 8.1.2. INCOMING INSPECTION

##### (A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

##### (B) THE STANDARD OF QUALITY

ISO-2859-1 ( or MIL-STD-105D ) , LEVEL II SINGLE PLAN.

| CLASS    | AQL(%) |
|----------|--------|
| CRITICAL | 0.4 %  |
| MAJOR    | 0.65 % |
| MINOR    | 1.5 %  |
| TOTAL    | 1.5 %  |

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

##### (C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

#### 8.1.3. WARRANTY POLICY

**HYES** WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. **HYES** WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCTS WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF **HYES**.

## 8.2. CHECKING CONDITION

8.2.1. CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO FACE THE SAMPLE.

8.2.2. CHECKER SHALL SEE OVER 30 cm. WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

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### 8.3. INSPECTION PLAN :

| CLASS              | ITEM  | JUDGEMENT  | CLASS    |
|--------------------|---|--|----------|
| PACKING & INDICATE | 1. OUTSIDE AND INSIDE PACKAGE   | "MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.   | Minor    |
|                    | 2. MODEL MIXED AND QUANTITY   | OTHER MODEL MIXED.....REJECTED<br>QUANTITY SHORT OR OVER.....REJECTED  | Critical |
|                    | 3. PRODUCT INDICATION   | "MODEL NO." SHOULD INDICATE ON THE PRODUCT   | Major    |
| ASSEMBLY           | 4. DIMENSION,<br>LCD GLASS SCRATCH<br>AND SCRIBE DEFECT.                                      | ACCORDING TO SPECIFICATION OR DRAWING.   | Major    |
| APPEARANCE         | 5. VIEWING AREA   | POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA<br>.....REJECTED   | Minor    |
|                    | 6. BLEMISH , BLACK SPOT ,<br>WHITE SPOT IN THE LCD<br>AND LCD GLASS CRACKS                    | ACCORDING TO STANDARD OF VISUAL INSPECTION ( INSIDE VIEWING AREA )   | Minor    |
|                    | 7. BLEMISH , BLACK SPOT<br>WHITE SPOT AND SCRATCH<br>ON THE POLARIZER                         | ACCORDING TO STANDARD OF VISUAL INSPECTION ( INSIDE VIEWING AREA )   | Minor    |
|                    | 8. BUBBLE IN POLARIZER  | ACCORDING TO STANDARD OF VISUAL INSPECTION ( INSIDE VIEWING AREA )   | Minor    |
|                    | 9. LCD'S RAINBOW COLOR  | STRONG DEVIATION COLOR ( OR NEWTON RING) OF LCD.....REJECTED.<br>OR ACCORDING TO LIMITED SAMPLE ( IF NEEDED, AND INSIDE VIEWING AREA ) | Minor    |
| ELECTRICAL         | 10. ELECTRICAL AND OPTICAL<br>CHARACTERISTICS<br>( CONTRAST , VOP ,<br>CHROMATICITY ... ETC ) | ACCORDING TO SPECIFICATION OR DRAWING . ( INSIDE VIEWING AREA )  | Critical |
|                    | 11. MISSING PATTERN   | MISSING DOT , LINE , CHARACTER<br>.....REJECTED  | Critical |
|                    | 12. SHORT CIRCUIT ,<br>WRONG PATTERN DISPLAY  | NON DISPLAY , WRONG PATTERN<br>DISPLAY , CURRENT CONSUMPTION<br>OUT OF SPECIFICATION..... REJECTED                                     | Critical |
|                    | 13. PIN HOLE , PATTERN DEFORMITY  | ACCORDING TO STANDARD OF VISUAL INSPECTION   | Minor    |

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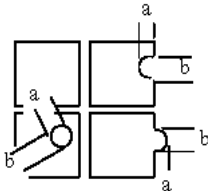
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### 8.4. STANDARD OF VISUAL INSPECTION

| NO.                    | CLASS                | ITEM   | JUDGEMENT  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
|------------------------|----------------------|--|--|----------------|-----------------|------------------|-----------------|------------------------|-----------|------------------------|----------------------|---------------|---------------|----------------------|---|-------|------------|-------------------|
| 8.4.1                  | MINOR                | · BLEMISH · BLACK SPOT ·<br>WHITE SPOT IN THE LCD.                     | <p>(A) ROUND TYPE: <span style="float: right;">unit : mm.</span></p> <table border="1"> <thead> <tr> <th>DIAMETER (mm.)</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.1</math></td> <td>DISREGARD</td> </tr> <tr> <td><math>0.1 &lt; \Phi \leq 0.2</math></td> <td>2</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.25</math></td> <td>1</td> </tr> <tr> <td><math>0.25 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table> <p>NOTE: <math>\Phi = (\text{LENGTH} + \text{WIDTH})/2</math></p>   | DIAMETER (mm.) | ACCEPTABLE Q'TY | $\Phi \leq 0.1$  | DISREGARD       | $0.1 < \Phi \leq 0.2$  | 2         | $0.2 < \Phi \leq 0.25$ | 1                    | $0.25 < \Phi$ | 0             |                      |   |       |            |                   |
|                        |                      | DIAMETER (mm.)   | ACCEPTABLE Q'TY  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $\Phi \leq 0.1$        | DISREGARD            |  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $0.1 < \Phi \leq 0.2$  | 2                    |  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $0.2 < \Phi \leq 0.25$ | 1                    |  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $0.25 < \Phi$          | 0                    |  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
|                        |                      | · BLEMISH · BLACK SPOT ·<br>WHITE SPOT AND SCRATCH<br>ON THE POLARIZER | <p>(B) LINER TYPE: <span style="float: right;">unit : mm.</span></p> <table border="1"> <thead> <tr> <th>LENGTH</th> <th>WIDTH</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td>-----</td> <td><math>W \leq 0.03</math></td> <td>DISREGARD</td> </tr> <tr> <td><math>L \leq 5.0</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> <td>3</td> </tr> <tr> <td><math>L \leq 5.0</math></td> <td><math>0.05 &lt; W \leq 0.07</math></td> <td>1</td> </tr> <tr> <td>-----</td> <td><math>0.07 &lt; W</math></td> <td>FOLLOW ROUND TYPE</td> </tr> </tbody> </table>  | LENGTH         | WIDTH           | ACCEPTABLE Q'TY  | -----           | $W \leq 0.03$          | DISREGARD | $L \leq 5.0$           | $0.03 < W \leq 0.05$ | 3             | $L \leq 5.0$  | $0.05 < W \leq 0.07$ | 1 | ----- | $0.07 < W$ | FOLLOW ROUND TYPE |
| LENGTH                 | WIDTH                | ACCEPTABLE Q'TY  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| -----                  | $W \leq 0.03$        | DISREGARD  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $L \leq 5.0$           | $0.03 < W \leq 0.05$ | 3  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $L \leq 5.0$           | $0.05 < W \leq 0.07$ | 1  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| -----                  | $0.07 < W$           | FOLLOW ROUND TYPE  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| 8.4.2                  | MINOR                | BUBBLE IN POLARIZER  | <p style="text-align: right;">unit : mm.</p> <table border="1"> <thead> <tr> <th>DIAMETER</th> <th>ACCEPTABLE Q'TY</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.15</math></td> <td>DISREGARD</td> </tr> <tr> <td><math>0.15 &lt; \Phi \leq 0.5</math></td> <td>2</td> </tr> <tr> <td><math>0.5 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table>  | DIAMETER       | ACCEPTABLE Q'TY | $\Phi \leq 0.15$ | DISREGARD       | $0.15 < \Phi \leq 0.5$ | 2         | $0.5 < \Phi$           | 0                    |               |               |                      |   |       |            |                   |
| DIAMETER               | ACCEPTABLE Q'TY      |  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $\Phi \leq 0.15$       | DISREGARD            |  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $0.15 < \Phi \leq 0.5$ | 2                    |  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $0.5 < \Phi$           | 0                    |  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| 8.4.3                  | MINOR                | PIN HOLE ·<br>PATTERN DEFORMITY  | <div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="2">DIAMETER</th> <th>ACC. Q'TY</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.1</math></td> <td></td> <td>DISREGARD</td> </tr> <tr> <td><math>0.1 &lt; \Phi \leq 0.25</math></td> <td></td> <td>3</td> </tr> <tr> <td><math>0.25 &lt; \Phi</math></td> <td></td> <td>0</td> </tr> </tbody> </table> <p style="text-align: center;"><math>\Phi = (a+b)/2</math></p> </div> <p style="text-align: right;">unit : mm.</p> | DIAMETER       |                 | ACC. Q'TY        | $\Phi \leq 0.1$ |                        | DISREGARD | $0.1 < \Phi \leq 0.25$ |                      | 3             | $0.25 < \Phi$ |                      | 0 |       |            |                   |
| DIAMETER               |                      | ACC. Q'TY  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $\Phi \leq 0.1$        |                      | DISREGARD  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $0.1 < \Phi \leq 0.25$ |                      | 3  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |
| $0.25 < \Phi$          |                      | 0  |  |                |                 |                  |                 |                        |           |                        |                      |               |               |                      |   |       |            |                   |

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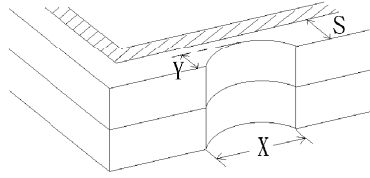
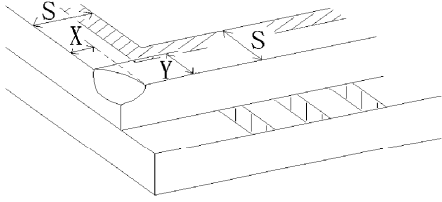
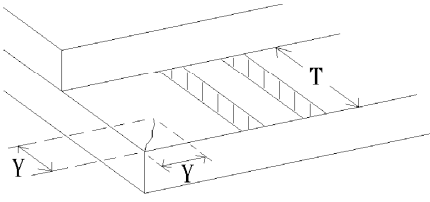
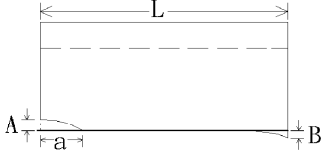
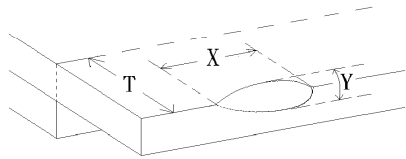
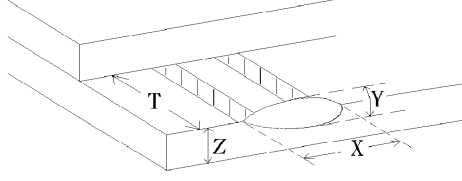
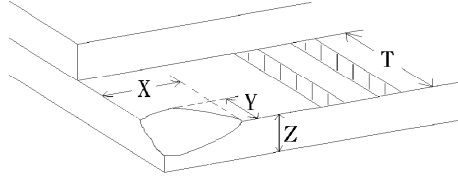
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| NO.    | CLASS | ITEM                                    | JUDGEMENT  |
|--------|-------|---|--|
| 8.4.4  | MINOR | CHIPPING                                |  $Y > S$<br><b>REJ.</b>  |
| 8.4.5  | MINOR | CHIPPING                                |  $X \text{ or } Y > S$<br><b>REJ.</b>  |
| 8.4.6  | MAJOR | GLASS CRACK                             |  $Y > (1/2) T$<br><b>REJ.</b>  |
| 8.4.7  | MAJOR | SCRIBE DEFECT                           |  <ol style="list-style-type: none"> <li><math>a &gt; L/3</math>, <math>A &gt; 1.5\text{mm}</math>.<br/><b>REJ.</b></li> <li>B : ACCORDING TO DIMENSION</li> </ol> |
| 8.4.8  | MINOR | CHIPPING<br>( ON THE TERMINAL AREA )    |  $\Phi = (x+y)/2 > 2.5 \text{ mm}$<br><b>REJ.</b>  |
| 8.4.9  | MINOR | CHIPPING<br>( ON THE TERMINAL SURFACE ) |  $Y > (1/3) T$<br><b>REJ.</b>  |
| 8.4.10 | MINOR | CHIPPING                                |  $Y > T$ <b>REJ.</b>   |

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