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To :

Date : OCT.20.2003

Product Information

**Model : HSD150MX15
- B**

- Note:
1. Please contact HannStar Display Corp. before designing your product based on this module specification.
 2. The information contained herein is presented merely to indicate the characteristics and performance of our products. HannStar assumes no responsibility for any intellectual property claims or other problems that may result from application based on the module described herein.



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Record of Revisions

| Rev. | Updated No. | Date | Description of change |
|------|-------------|-------------|--|
| 01 | — | OCT.20.2003 | Specification for HSD150MX15-B was first issued. |



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1.0 GENERAL DESCRIPTIONS

1.1 Introduction

HannStar Display model **HSD150MX15-B** is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, the voltage reference, common voltage, DC-DC converter, column, and row driver circuit. This TFT LCD has a 15-inch diagonally measured active display area with XGA resolution (768 vertical by 1024 horizontal pixel array).

1.2 Features

- 15" XGA TFT LCD panel
- 2 CCFLs Backlight system
- Supported XGA (V: 768 lines, H: 1024 pixels) resolution
- Supported to 75Hz refresh rate
- With LCD Timing Controller

1.3 General information

| Item | Specification | Unit |
|------------------------------|--|--------|
| Outline dimension | 321.0×249.0×10.3 (typ.) | Mm |
| Display area | 304.1(H) x 228.1(V) (15.0" diagonal) | Mm |
| Number of Pixel | 1024(H) x 768(V) | Pixels |
| Pixel pitch | 0.297(H) x 0.297(V) | Mm |
| Pixel arrangement | RGB Vertical stripe | |
| Display color | 16 million (6 bit + FRC) | |
| Display mode | Normally white | |
| Surface treatment | Antiglare, Hard-Coating (3H) | |
| Weight | 900(typ.) | G |
| Back-light | 2-CCFLs, Top & bottom edge side | |
| Input signal | Source and Gate Driver control signals | |
| Power consumption (with B/L) | 12 W (typ.), with back light | W |
| Optimum viewing direction | 6 o'clock | |

1.4 Applications

- Desktop monitors
- Display terminals for AV applications
- Monitors for industrial applications

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1.5 Mechanical Information

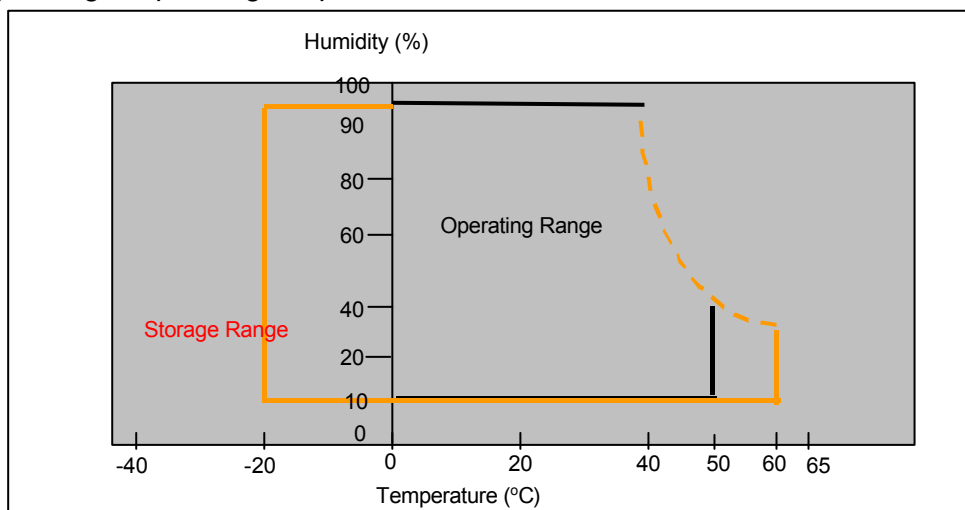
| Item | | Min. | Typ. | Max. | Unit |
|-------------------------------|---------------|-------|-------|-------|--------|
| Module Size | Horizontal(H) | 320.5 | 321.0 | 321.5 | mm |
| | Vertical(V) | 248.5 | 249.0 | 249.5 | mm |
| | Depth(D) | -- | 10.3 | 10.6 | mm |
| Weight (without inverter) | | -- | 900 | 950 | g |
| Torque of customer screw hole | | | | 3.0 | Kgf*Cm |

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Absolute Rating of Environment

| Item | Symbol | Min. | Max. | Unit | Note |
|-----------------------------|-------------------|------|------|------|------|
| Storage temperature | T _{STG} | -20 | 60 | °C | |
| Operating temperature | T _{OPR} | 0 | 50 | °C | (1) |
| Vibration(non-operating) | V _{NOP} | -- | 1.5 | G | (2) |
| Shock(non-operating) | S _{NOP} | -- | 70 | G | (3) |
| Storage humidity | H _{STG} | 10 | 90 | %RH | (3) |
| Operating humidity | H _{OP} | 10 | 80 | %RH | (4) |
| Low pressure(operating) | P _{LOP} | 697 | -- | HPa | (5) |
| Low pressure(non-operating) | P _{LNOP} | 116 | -- | HPa | (6) |

Note (1) Storage /Operating temperature



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- (2) **5-500-5**Hz sine wave, X, Y, Z each directions, 30 min/cycle.
- (3) 11ms, $\pm X$, $\pm Y$, $\pm Z$ direction, one time each. For this shock test, It is necessary to fill the silicon rubber between the shock jig as buffer.
- (4) Max wet bulb temp. =39°C
- (5) **2** hrs. (10000 feet)
- (6) 24hrs. (50000 feet)

2.2 Electrical Absolute Rating:

2.2.1 TFT LCD Module:

| Item | Symbol | Min. | Max. | Unit. | Note |
|----------------------|-----------|------|---------------|--------|--------|
| Power supply Voltage | V_{DD} | +3.0 | +3.6 | V (DC) | (1)(2) |
| Logic input voltage | V_{SIG} | -0.3 | $V_{DD} +0.3$ | V | (1)(2) |

2.2.2 Back Light Unit:

| Item | Symbol | Min. | Max. | Unit | Note |
|----------------|--------|------|------|--------|--------|
| Lamp voltage | V_L | 0 | 2000 | V(rms) | (1)(2) |
| Lamp current | I_L | — | 9.0 | mA | (1)(2) |
| Lamp frequency | f_l | 0 | 80 | KHz | (1)(2) |

Note: (1) Permanent damage may occur to the LCD module if beyond this specification.

Functional operation should be restricted to the conditions described under Normal Operating Conditions.

(2) Within $T_a=25\pm 2^\circ C$

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3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit | Note | |
|---------------------------------------|-----------|--|--------|-------|-------|-------------------|-------------------------|--------|
| Contrast | CR | $\theta = 0^\circ$ $\phi = 0^\circ$ Normal viewing angle | 400 | 500 | -- | | (1)(2) | |
| Response time | Rising | | TR +TF | -- | 25 | 35 | msec | (1)(3) |
| | Falling | | | | | | | |
| White luminance (center of screen) | Y_L | | 200 | 250 | | cd/m ² | (1)(4)(5) (IL=8.0mA) | |
| Color chromaticity (CIE1931) | Red | Rx | 0.604 | 0.634 | 0.664 | | (1)(4) | |
| | | Ry | 0.309 | 0.339 | 0.369 | | | |
| | Green | Gx | 0.255 | 0.285 | 0.315 | | | |
| | | Gy | 0.557 | 0.587 | 0.617 | | | |
| | Blue | Bx | 0.114 | 0.144 | 0.174 | | | |
| | | By | 0.045 | 0.075 | 0.105 | | | |
| | White | Wx | 0.280 | 0.310 | 0.340 | | | |
| | | Wy | 0.300 | 0.330 | 0.360 | | | |
| Viewing angle | Hor. | θ_L | 55 | 65 | -- | | | |
| | | θ_R | 55 | 65 | -- | | | |
| | Ver. | θ_H | 35 | 45 | -- | | | |
| | | θ_L | 45 | 55 | -- | | | |
| Viewing angle | Hor. | θ_L | 70 | 80 | -- | | | |
| | | θ_R | 70 | 80 | -- | | | |
| | Ver. | θ_H | 45 | 50 | -- | | | |
| | | θ_L | 60 | 65 | -- | | | |
| Brightness uniformity | B_{UNI} | $\theta = 0^\circ$ | 73 | 80 | -- | % | (6) | |
| Crosstalk | CT(n) | $\phi = 0^\circ$ | -- | -- | 1.3 | % | (7) | |

3.2 Measuring Condition

Measuring surrounding: dark room

Lamp current I_{BL} : (8.0)±0.1mA, lamp freq. F_L =55 KHz, Inverter: HIU-766 (11pf)

V_{DD1} =3.3V, f_V =60Hz, f_{DCLK} =65MHz

Surrounding temperature: 25±2°C

30min. Warm-up time.

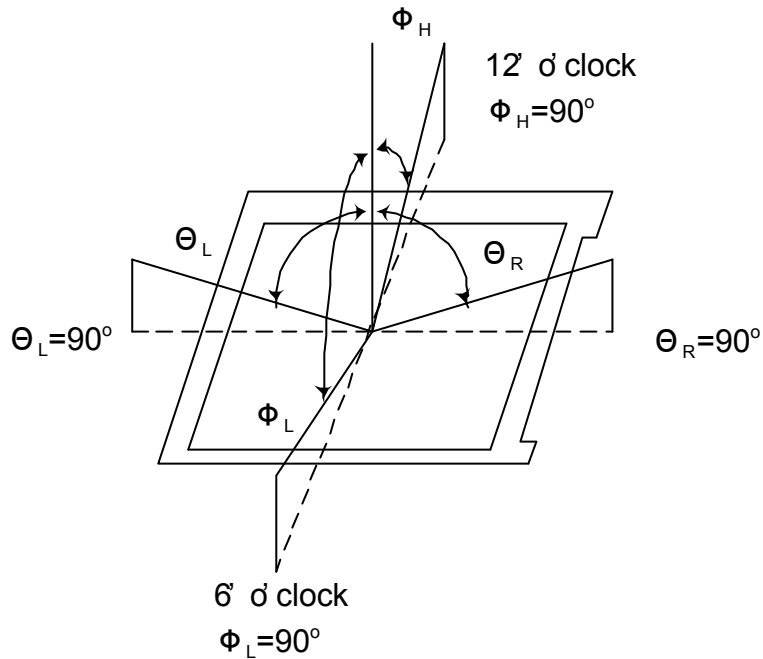
3.3 Measuring Equipment

LCD-7000 of Otsuka Electric Corp., which utilized MCPD-7000 for Chromaticity and BM-5A for other optical characteristics.

Measuring spot size: 10~12mm

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Note (1) Definition of Viewing Angle:

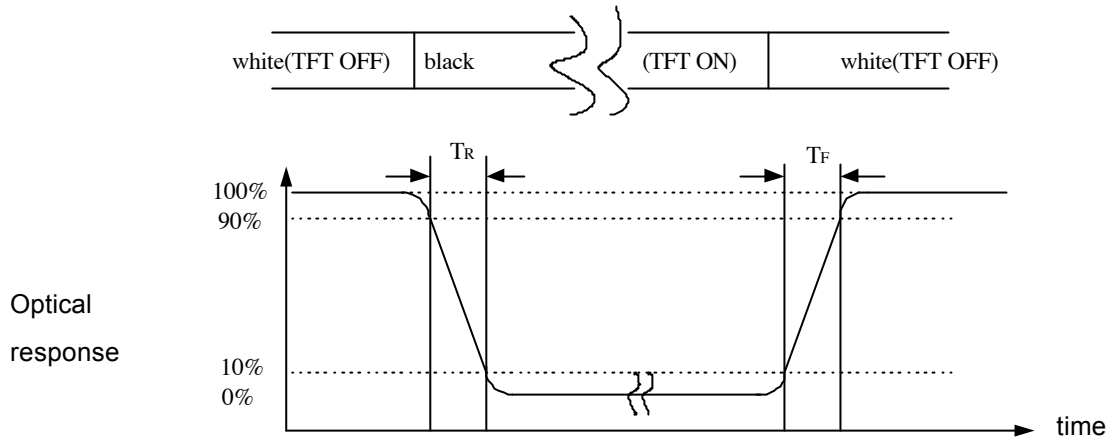


Note (2) Definition of Contrast Ratio (CR) :
 measured at the center point of panel

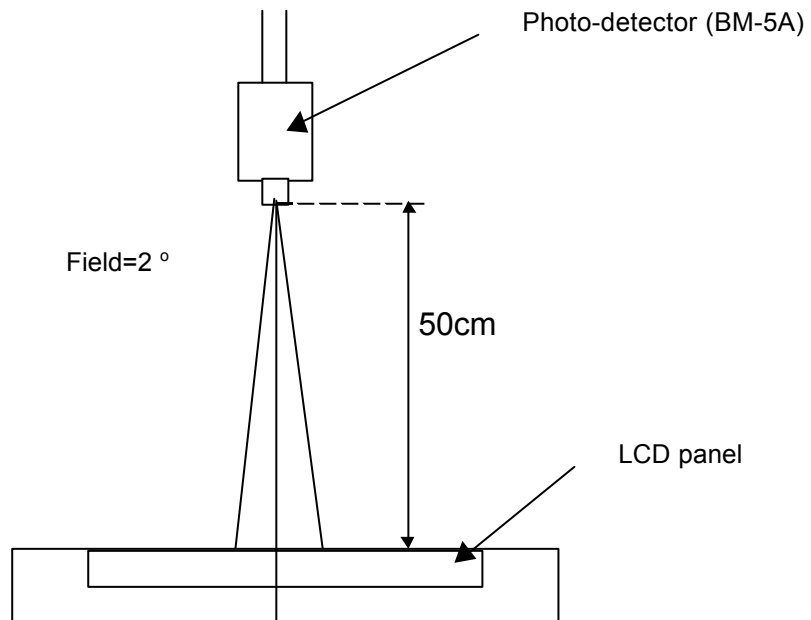
$$CR = \frac{\text{Luminance with all pixels white (L}_{255}\text{)}}{\text{Luminance with all pixels black (L}_0\text{)}}$$

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Note (3) Definition of Response Time: Sum of T_R and T_F



Note (4) Optical characteristic measurement setup



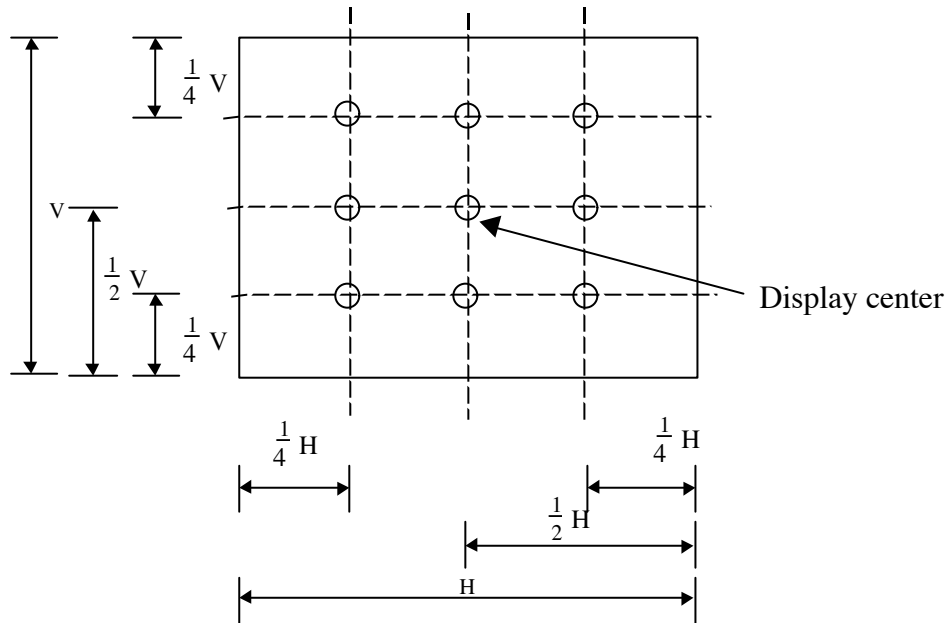
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Note (5) Definition of Average Luminance of White (5 Point)

$$\text{Average Luminance} = \frac{Y1+Y2+Y3+Y4+Y5}{5}$$

Note (6) Definition of brightness uniformity

$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$



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Note (7) Definition of crosstalk CT (1) ~ CT (4)

$$CT(n) = \frac{|L(n) - LB(n)|}{L(n)} \times 100\% , n = 1 \sim 4$$

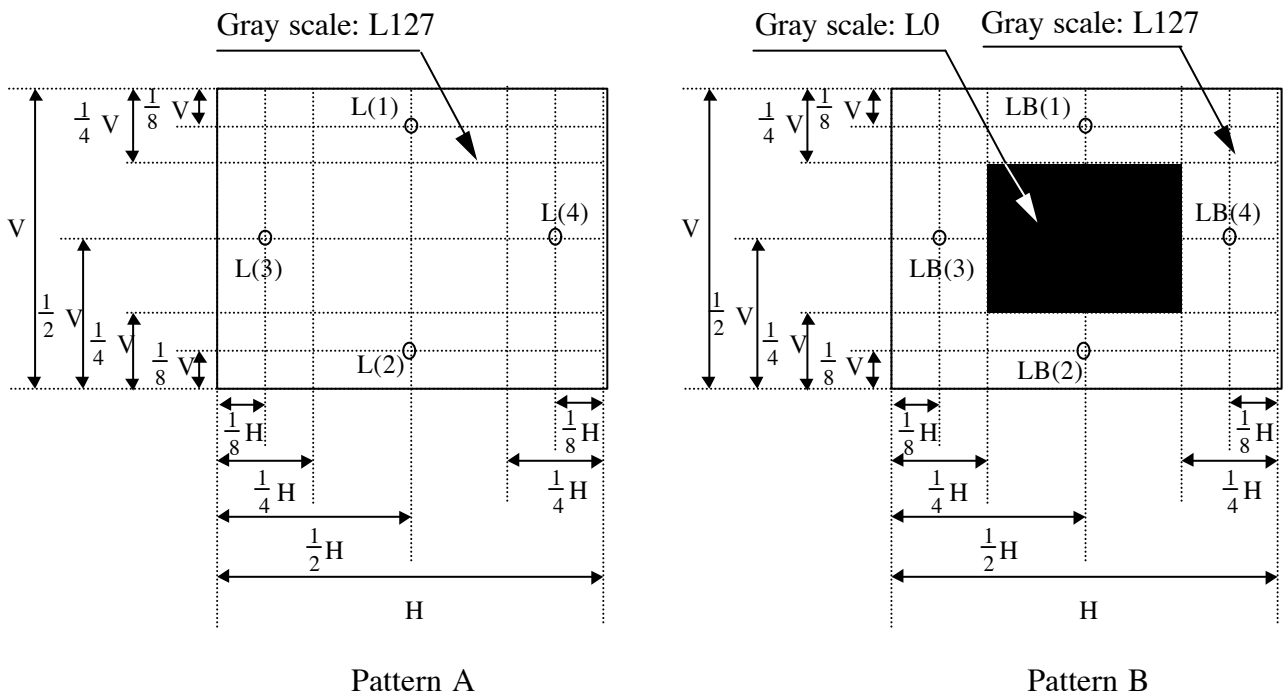
Where L(n) = Luminance of point "n" at pattern A (cd/m²) , n=1~4

LB(n) = Luminance of point "n" at pattern B (cd/m²) , n=1~4

The location measured will be exactly the same in both patterns.

L0: Luminance with all pixels black

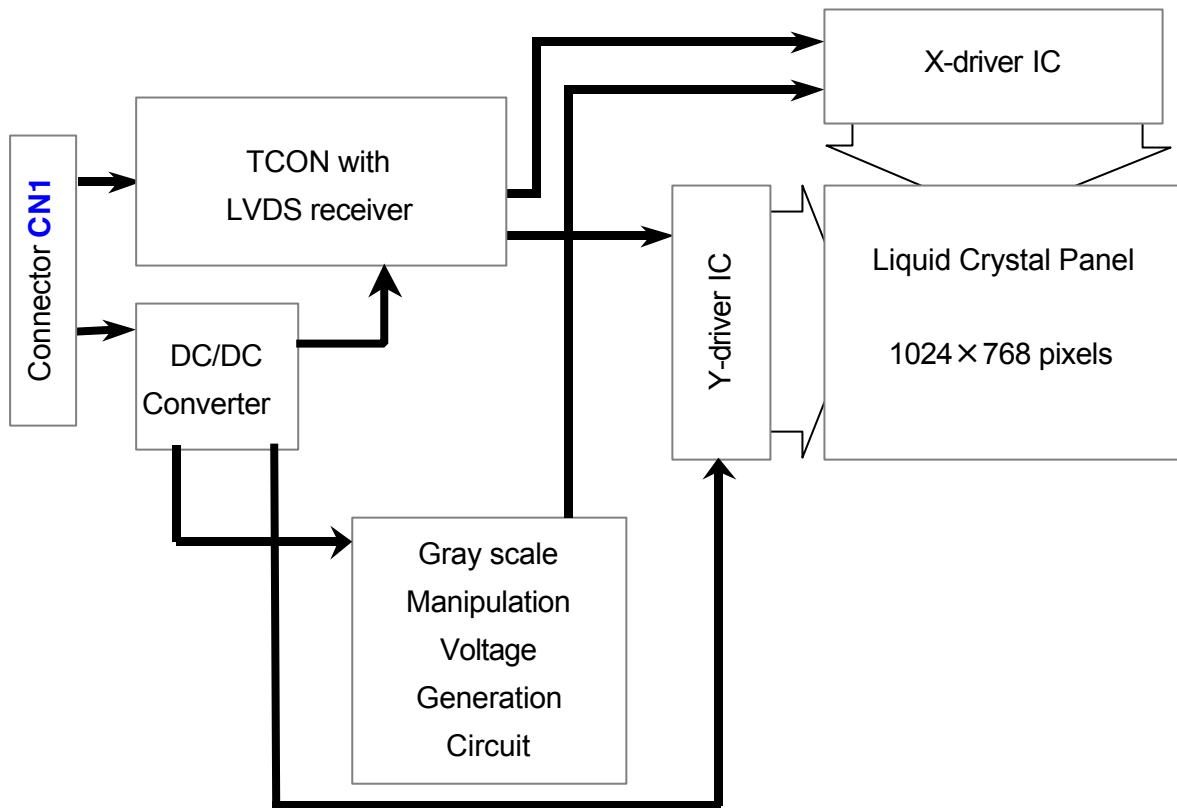
L255: Luminance with all pixels white



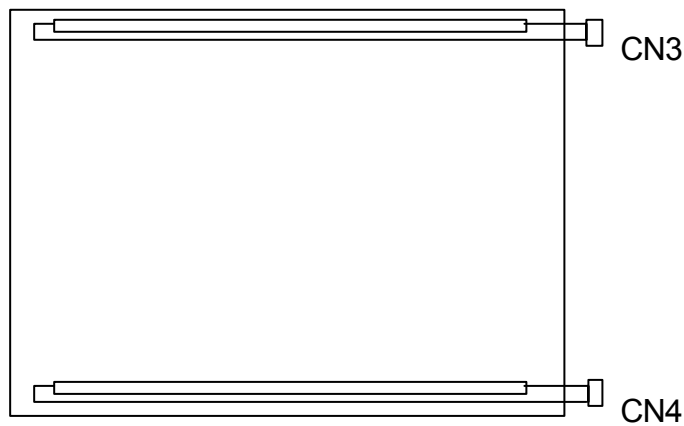
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4.0 BLOCK DIAGRAM

4.1 LCD Module Block Diagram:

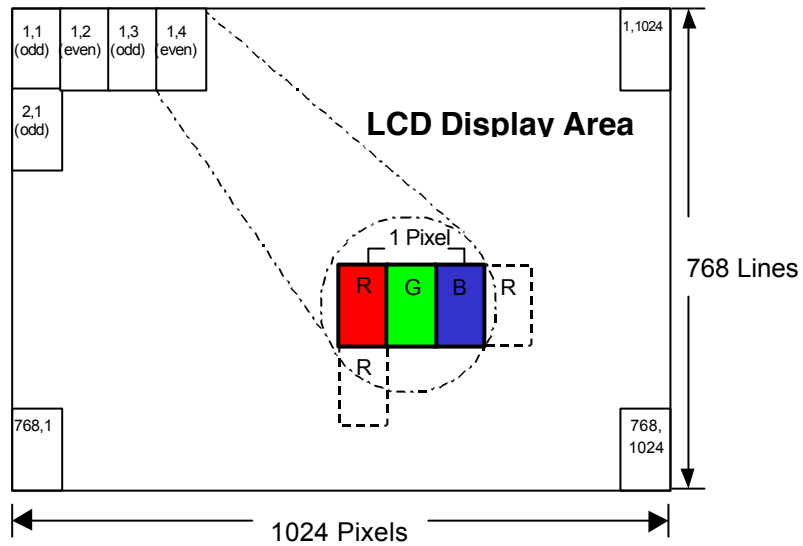


4.2 Back Light Unit



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4.3 Pixel Format



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4.4 Relationship between Displayed Color and Input Data

| | Display | MSB | | | | | | LSB | | | | | | Gray scale level | | | | | | | |
|-------------------------------|------------|-----|----|----|----|----|----|-----|----|----|----|----|----|------------------|----|----|----|----|-----------|----------|-----|
| | | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | | B5 | B4 | B3 | B2 | B1 | B0 | |
| Basic color | Black | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | - | |
| | Blue | L | L | L | L | L | L | L | L | L | L | L | L | H | H | H | H | H | H | - | |
| | Green | L | L | L | L | L | L | H | H | H | H | H | H | L | L | L | L | L | L | - | |
| | Light Blue | L | L | L | L | L | L | H | H | H | H | H | H | H | H | H | H | H | H | - | |
| | Red | H | H | H | H | H | H | L | L | L | L | L | L | L | L | L | L | L | L | - | |
| | Purple | H | H | H | H | H | H | L | L | L | L | L | L | H | H | H | H | H | H | - | |
| | Yellow | H | H | H | H | H | H | H | H | H | H | H | H | L | L | L | L | L | L | - | |
| White | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | - | | |
| Gray scale of Red | Black | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L0 | |
| | Dark | L | L | L | L | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L1 | |
| | | L | L | L | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L2 | |
| | Light | : | | | | | | : | | | | | | : | | | | | | L3 ..L63 | |
| | | : | | | | | | : | | | | | | : | | | | | | L3 ..L63 | |
| | | | H | H | H | H | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L61 |
| | | | H | H | H | H | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L62 |
| Red | H | H | H | H | H | H | L | L | L | L | L | L | L | L | L | L | L | L | Red L63 | | |
| Gray scale of Green | Black | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L0 | |
| | Dark | L | L | L | L | L | L | L | L | L | L | L | H | L | L | L | L | L | L | L1 | |
| | | L | L | L | L | L | L | L | L | L | L | H | L | L | L | L | L | L | L | L2 | |
| | Light | : | | | | | | : | | | | | | : | | | | | | L3 ..L60 | |
| | | : | | | | | | : | | | | | | : | | | | | | L3 ..L60 | |
| | | | L | L | L | L | L | L | H | H | H | H | L | H | L | L | L | L | L | L | L61 |
| | | | L | L | L | L | L | L | H | H | H | H | H | L | L | L | L | L | L | L | L62 |
| Green | L | L | L | L | L | L | H | H | H | H | H | H | L | L | L | L | L | L | Green L63 | | |
| Gray scale of Blue | Black | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L0 | |
| | Dark | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L | L1 | |
| | | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L | L2 | |
| | Light | : | | | | | | : | | | | | | : | | | | | | L3 ..L60 | |
| | | : | | | | | | : | | | | | | : | | | | | | L3 ..L60 | |
| | | | L | L | L | L | L | L | L | L | L | L | L | L | H | H | H | H | L | H | L61 |
| | | | L | L | L | L | L | L | L | L | L | L | L | L | H | H | H | H | H | L | L62 |
| Blue | L | L | L | L | L | L | L | L | L | L | L | L | L | H | H | H | H | H | Blue L63 | | |
| Gray scale of White and Black | Black | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L0 | |
| | Dark | L | L | L | L | L | H | L | L | L | L | L | H | L | L | L | L | L | H | L1 | |
| | | L | L | L | L | H | L | L | L | L | L | H | L | L | L | L | L | H | L | L2 | |
| | Light | : | | | | | | : | | | | | | : | | | | | | L3 ..L60 | |
| | | : | | | | | | : | | | | | | : | | | | | | L3 ..L60 | |
| | | | H | H | H | H | L | H | H | H | H | H | L | H | H | H | H | H | L | H | L61 |
| | | | H | H | H | H | H | L | H | H | H | H | H | L | H | H | H | H | H | L | L62 |
| White | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | H | White L63 | | |

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5.0 I/O CONNECTION PIN ASSIGNMENT

5.1 Interface Connector (20-pins x 1) (Hirose: DF14H-20P-1.25H)

| I/F Connector (CH11) | | |
|----------------------|--------|--|
| Pin No. | Symbol | Description |
| 1 | VDD | Power Supply, 3.3v (typical) |
| 2 | VDD | Power Supply, 3.3v (typical) |
| 3 | VSS | Ground |
| 4 | VSS | Ground |
| 5 | Rin0- | -LVDS differential data input(R0-R5, G0) |
| 6 | Rin0+ | +LVDS differential data input(R0-R5, G0) |
| 7 | VSS | Ground |
| 8 | Rin1- | -LVDS differential data input(G1-G5, B0-B1) |
| 9 | Rin1+ | +LVDS differential data input(G1-G5, B0-B1) |
| 10 | VSS | Ground |
| 11 | Rin2- | -LVDS differential data input(B2-B5, HS, VS, DE) |
| 12 | Rin2+ | +LVDS differential data input(B2-B5, HS, VS, DE) |
| 13 | VSS | Ground |
| 14 | ClkIN- | -LVDS differential clock input |
| 15 | ClkIN+ | +LVDS differential clock input |
| 16 | VSS | Ground |
| 17 | Rin3- | -LVDS differential data input(R6-R7, G6-G7, B6-B7) |
| 18 | Rin3+ | +LVDS differential data input(R6-R7, G6-G7, B6-B7) |
| 19 | VSS | Ground |
| 20 | VSS | Ground |

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5.1 Back Light Unit (CCFL) Connectors:

CN3, 4: CCFL Power Source (BHR-03VS-1/Japan Solderless Terminal MFG Co., LTD)
 Mating connector: SM02 (8.0) B-BHS-1/ Japan Solderless Terminal MFG Co., LTD

| Terminal No. | Symbol | Function |
|--------------|--------|----------------------------------|
| 1 | VL | CCFL power supply (high voltage) |
| 2 | NC | No connection |
| 3 | GL | CCFL power supply (low voltage) |

Note: Please connects NC pin to nothing. Don' t connect it to ground nor to other signal Input. (NC pin should be open.)

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module:

| Item | Symbol | Min. | Typ. | Max. | Unit | Note | |
|-------------------------|------------|-----------|-------|------|------|--------|--------|
| Voltage of power supply | V_{DD} | 3.0 | 3.3 | 3.6 | V | | |
| Current of power supply | V-Color | I_{DD1} | 260 | 360 | 460 | mA | (1)(3) |
| | Mosaic | I_{DD2} | 290 | 390 | 490 | mA | (1)(3) |
| Vsync frequency | f_V | - | 60 | 75 | Hz | (2)(3) | |
| Hsync frequency | f_H | - | 48.36 | 75 | KHz | | |
| Frequency | f_{DCLK} | - | 65.00 | 80 | MHz | | |
| Input rush current | I_{RUSH} | --- | --- | 1.5 | A | (3)(4) | |

Note (1)

1). V-Color :



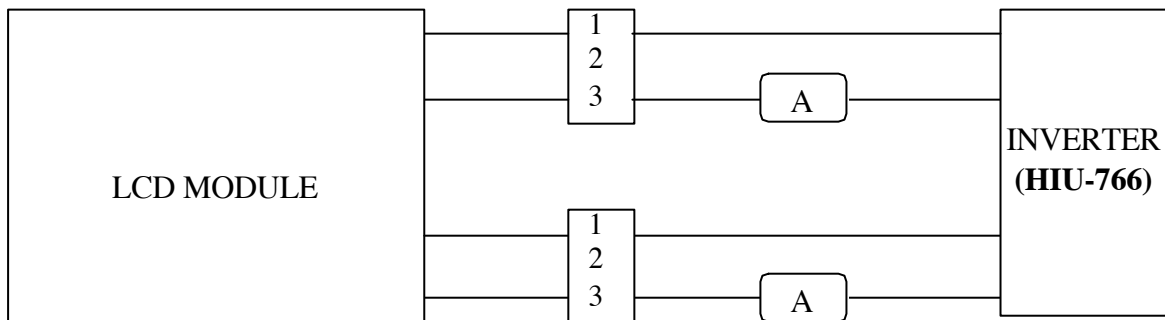
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6.2 Back-Light Unit

The backlight system is an edge-lighting type with 2 CCFL (Cold Cathode Fluorescent Lamp). The characteristics of the lamp are shown in the following tables.

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------------------------|--------|--------|------|------|---------|-------------|
| Lamp current | IL | 3.0 | 8.0 | 9.0 | mA(rms) | (1) |
| Lamp voltage | VL | 576 | 640 | 700 | V(rms) | $I_L=8.0mA$ |
| Frequency | fL | 50 | 55 | 80 | KHz | (2) |
| Operating lamp life time | Hr | 30,000 | -- | -- | Hour | (3) |
| Startup voltage | Vs | 1040 | -- | -- | V(rms) | at 25°C |
| | | 1350 | | | | at 0°C |

Note (1) Lamp current is measured with current meter for high frequency as shown below. Specified valued are for a lamp.



(2) Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

(3) Life time (Hr) can be defined as the time in which it continues to operate under the condition: Temp. =25±3°C, $I_L=8.0mA(rms.)$ and $f_L=55 KHz$ until one of the following event occurs:

1. When the brightness becomes 50%.
2. When the startup voltage (Vs) at 0°C becomes higher than the maximal value of Vs specified above.

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6.3 AC Electrical Characteristics:

6.3.1 Timing Parameters (Hsync, Vsync and DE mode)

| Item | Symbol | Min. | Typ. | Max. | Unit | Remarks | |
|-------------------------|---------------|------|--------------|------------------|--------------|---------|-----------------|
| Vertical display term | Period | t1 | 778×t4 — | 806×t4 16.67 | 860×t4 — | — ms | ¹⁾⁵⁾ |
| | Active | t2 | — | 768×t4 15.88 | — | — ms | ¹⁾ |
| | Display start | t3 | 8×t4 — | — | — | — ms | ¹⁾ |
| Horizontal display term | Period | t4 | 1180×t7 — | 1344×t7 20.68 | 1400×t7 — | — μs | ¹⁾⁵⁾ |
| | Active | t5 | — | 1024×t7 15.76 | — | — μs | ¹⁾ |
| | Display Start | t6 | 32×t7 — | — | — | — μs | ¹⁾ |
| Clock | Period | t7 | 12.50 | 15.38 | — | ns | ⁵⁾ |
| | Low time | t8 | 5 | — | — | ns | |
| | High time | t9 | 5 | — | — | ns | |
| Data | Setup time | t10 | 2 | — | — | ns | |
| | Hold time | t11 | 5 | — | — | ns | |

Note 1) Refer to TIMING CHART at page19, 20 and 21.

Note 2) In case of using the long frame period, the deterioration of display quality, noise etc. may be occurred.

Note 3) When ENAB is fixed to “L” level after NCLK input, the panel is displayed as black. However, a flicker may be occurred on the display. When ENAB is fixed to “H” level after NCLK input, the panel will be damaged.

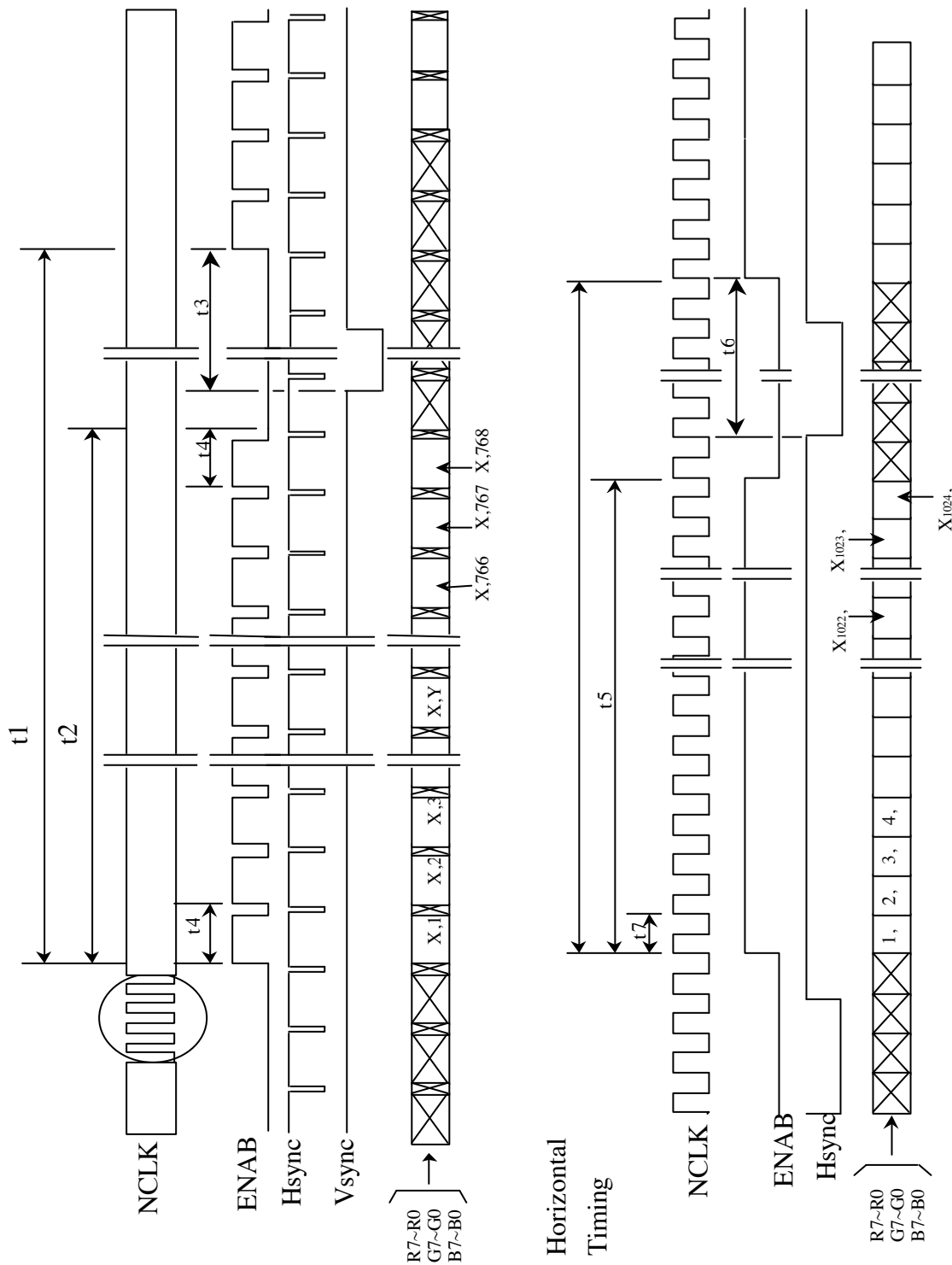
Note 4) Do not fix NCLK to “H” or “L” level while the V_{DD} (+3.3V) is supplied. If NCLK is fixed to “H” level or “L” level for certain period while the V_{DD} (+3.3V) is supplied, the panel may be damaged.

Note 5) Do not change t1 and t4 values in the operation. When t1 or t4 is changed, the panel is displayed as black.

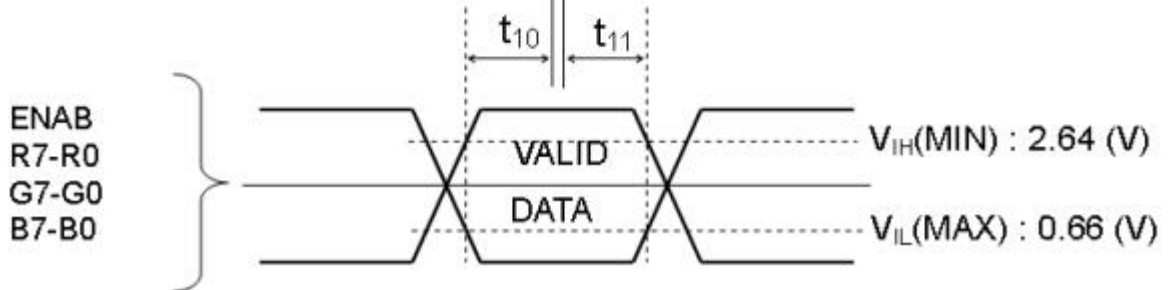
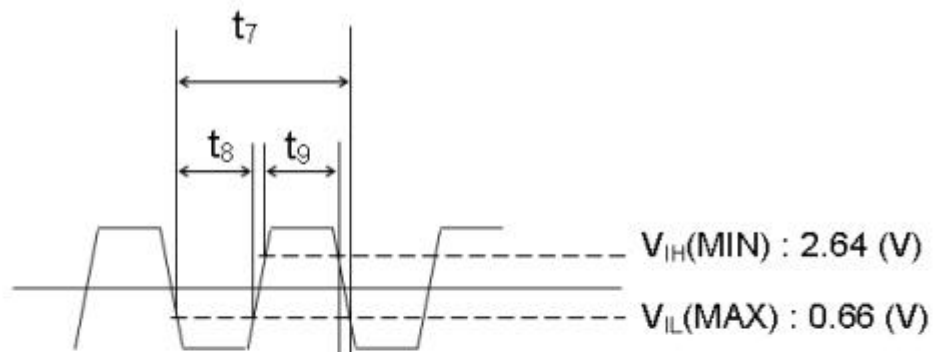
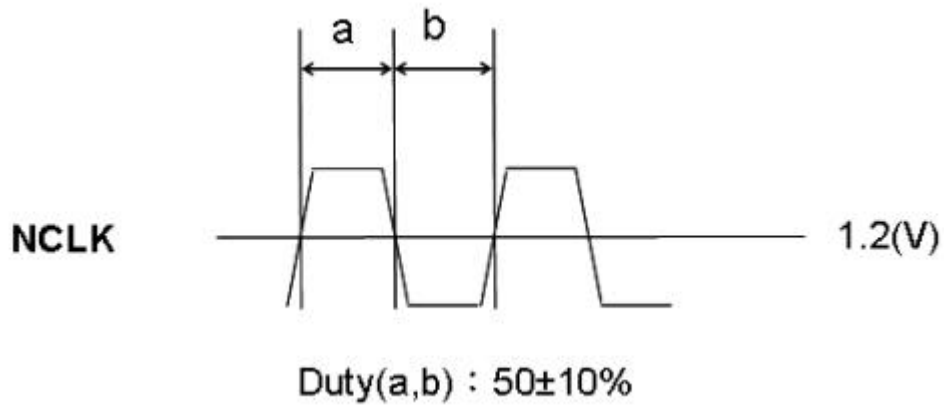
Note 6) Please adjust LCD operating signal timing and FL driving frequency, to optimize the display quality. There is a possibility that flicker is observed by the interference of LCD operating signal timing and FL driving condition (especially driving frequency).

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**6.3.2 Timing Diagram of Interface Signal (Hsync, Vsync and DE mode)
24 Bit two pixel/clock input mode**

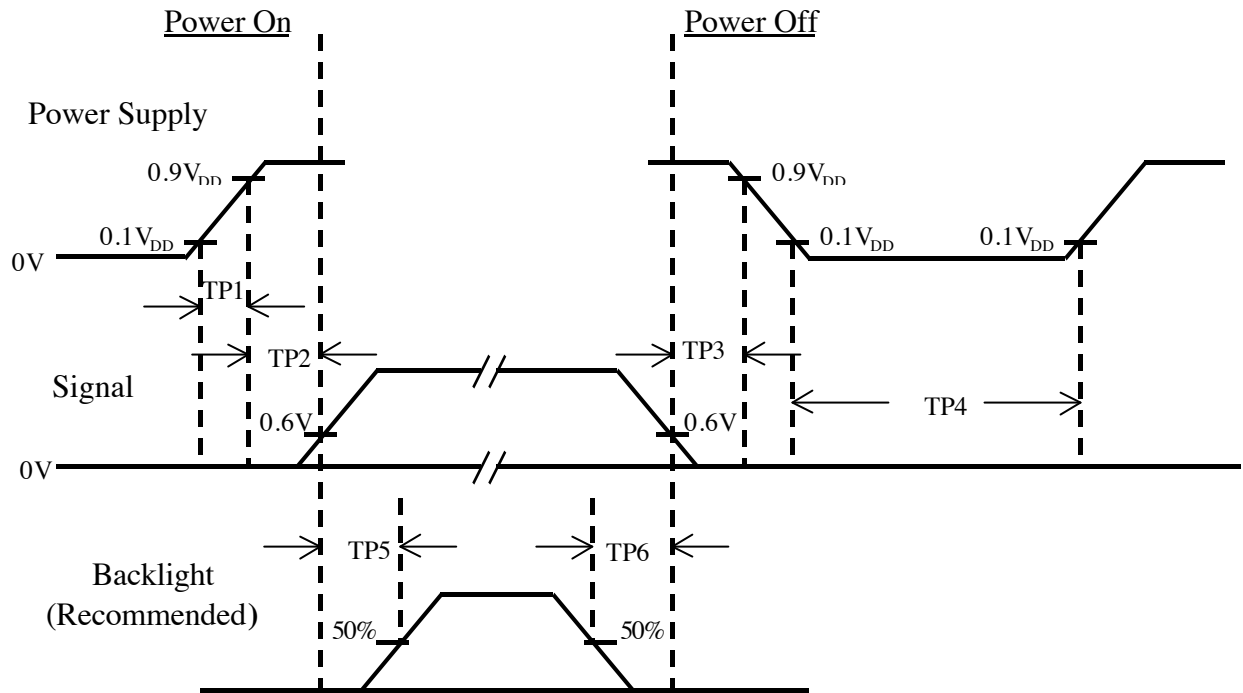


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6.4 Power On / Off Sequence :

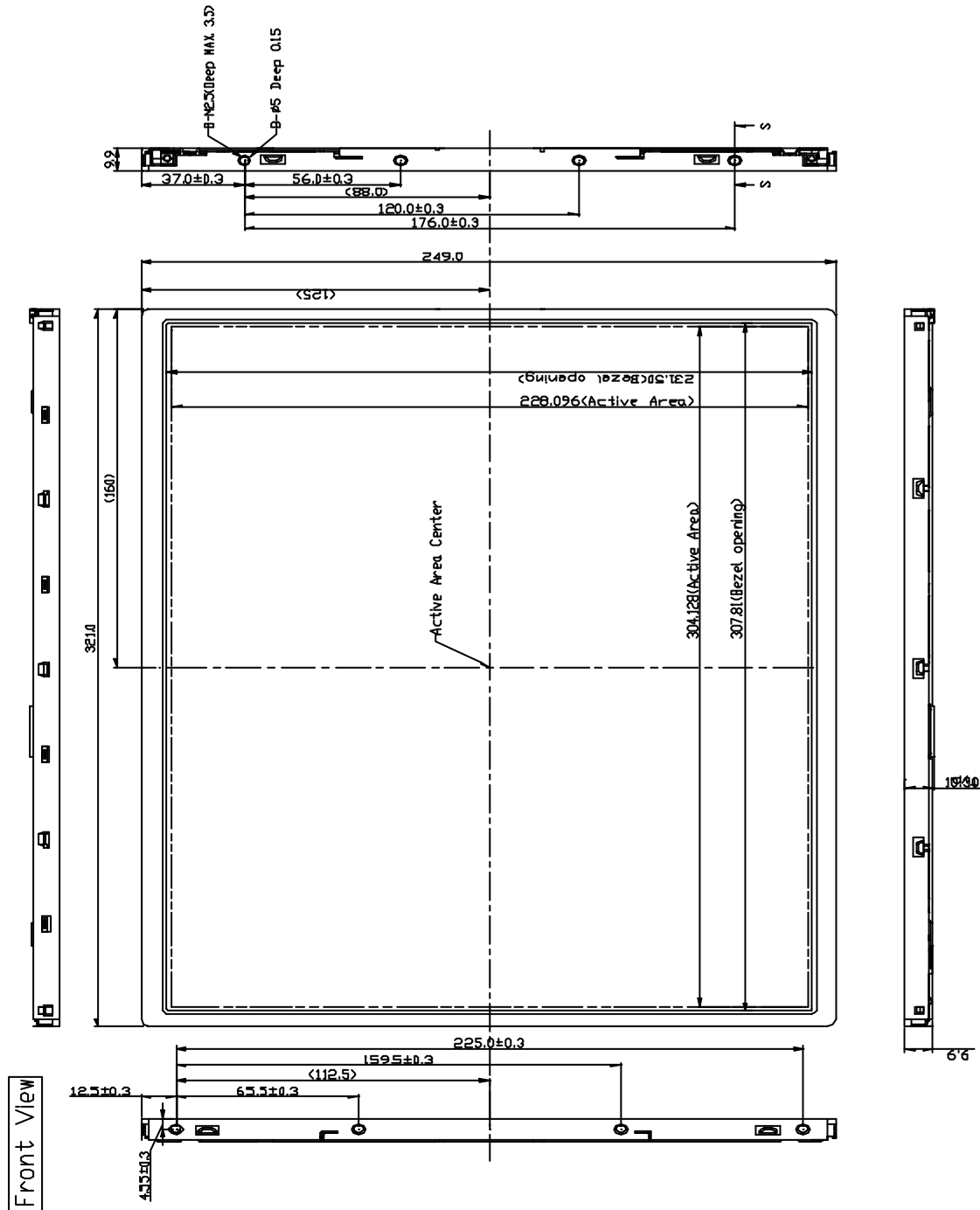


| Item | Min. | Typ. | Max. | Unit | Remark |
|------|------|------|------|------|--------|
| TP1 | 0.47 | — | 10 | msec | |
| TP2 | 0 | — | 50 | msec | |
| TP3 | 0 | — | 50 | msec | |
| TP4 | 1 | — | — | sec | |
| TP5 | 200 | — | — | msec | |
| TP6 | 200 | — | — | msec | |

- Note :
- (1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD} .
 - (2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.
 - (3) In case of V_{DD} = off level, please keep the level of input signal on the low or keep a high impedance.
 - (4) T4 should be measured after the module has been fully discharged between power off and on period.
 - (5) Interface signal shall not be kept at high impedance when the power is on.

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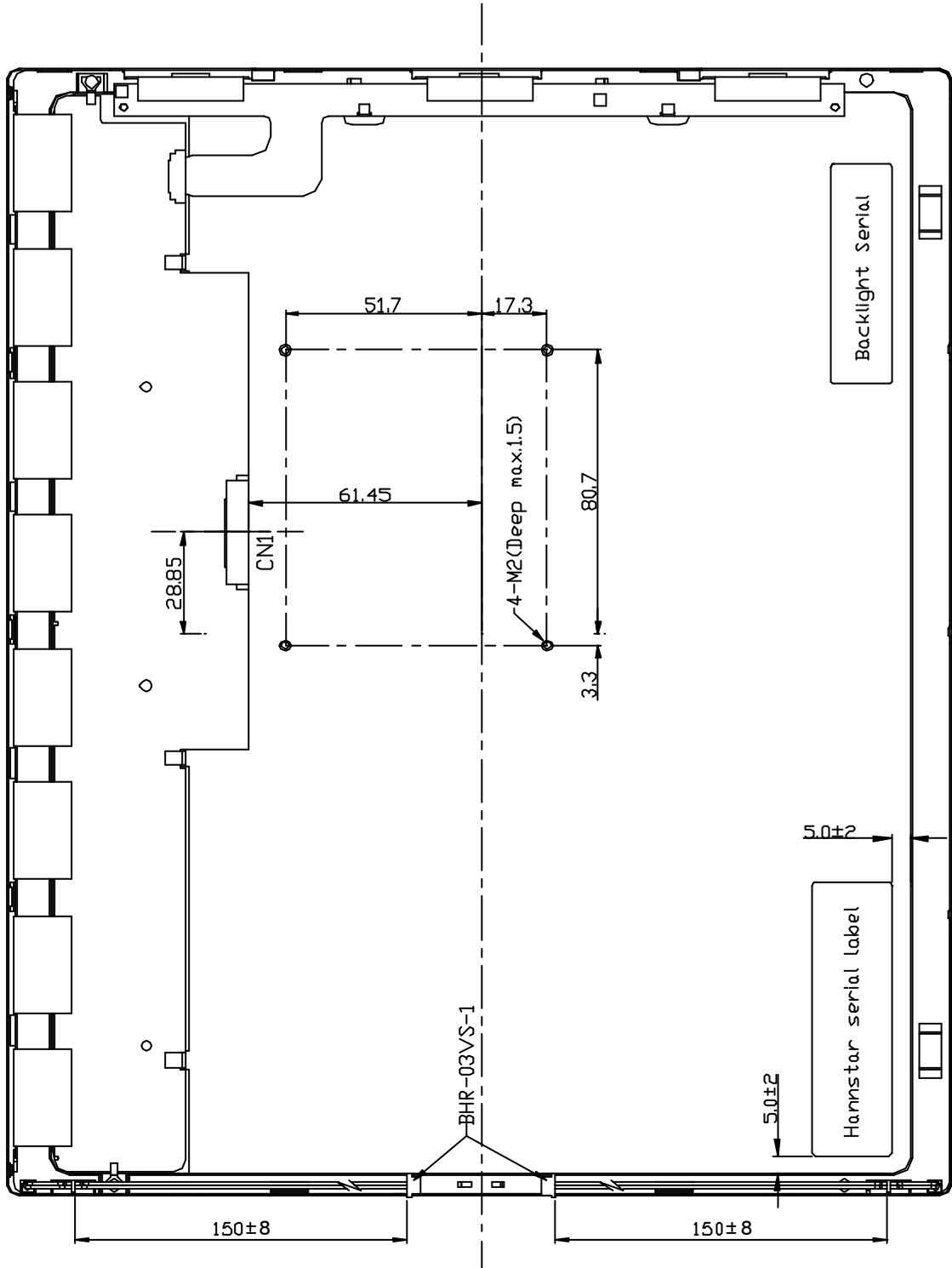
7.0 OUTLINE DIMENSION



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8.2 Back View:

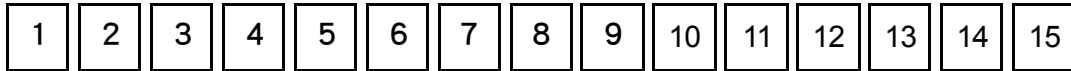
Date: 2003.0.08



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9.0 LOT MARK

9.1 Lot Mark



code 1,2,3,4,5,6: HannStar internal flow control code.

code 7: production location.

code 8: production year.

code 9: production month.

code 10,11,12,13,14,15: serial number.

Note (1) Production Year

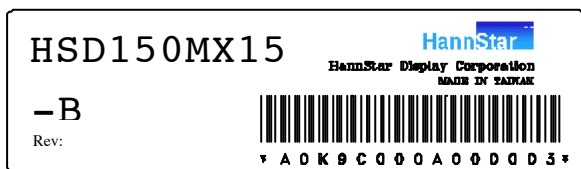
| | | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|------|
| Year | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
| Mark | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

Note (2) Production Month

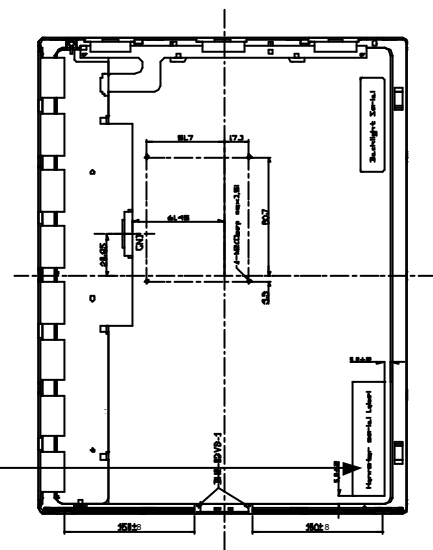
| | | | | | | | | | | | | |
|-------|------|------|------|------|------|------|------|------|------|------|------|------|
| Month | Jan. | Feb. | Mar. | Apr. | May. | Jun. | Jul. | Aug. | Sep. | Oct. | Nov. | Dec. |
| Mark | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C |

9.2 Location of Lot Mark

- (1) The label is attached to the backside of the LCD module.
- (2) This is subject to change without prior notice.



Lot mark



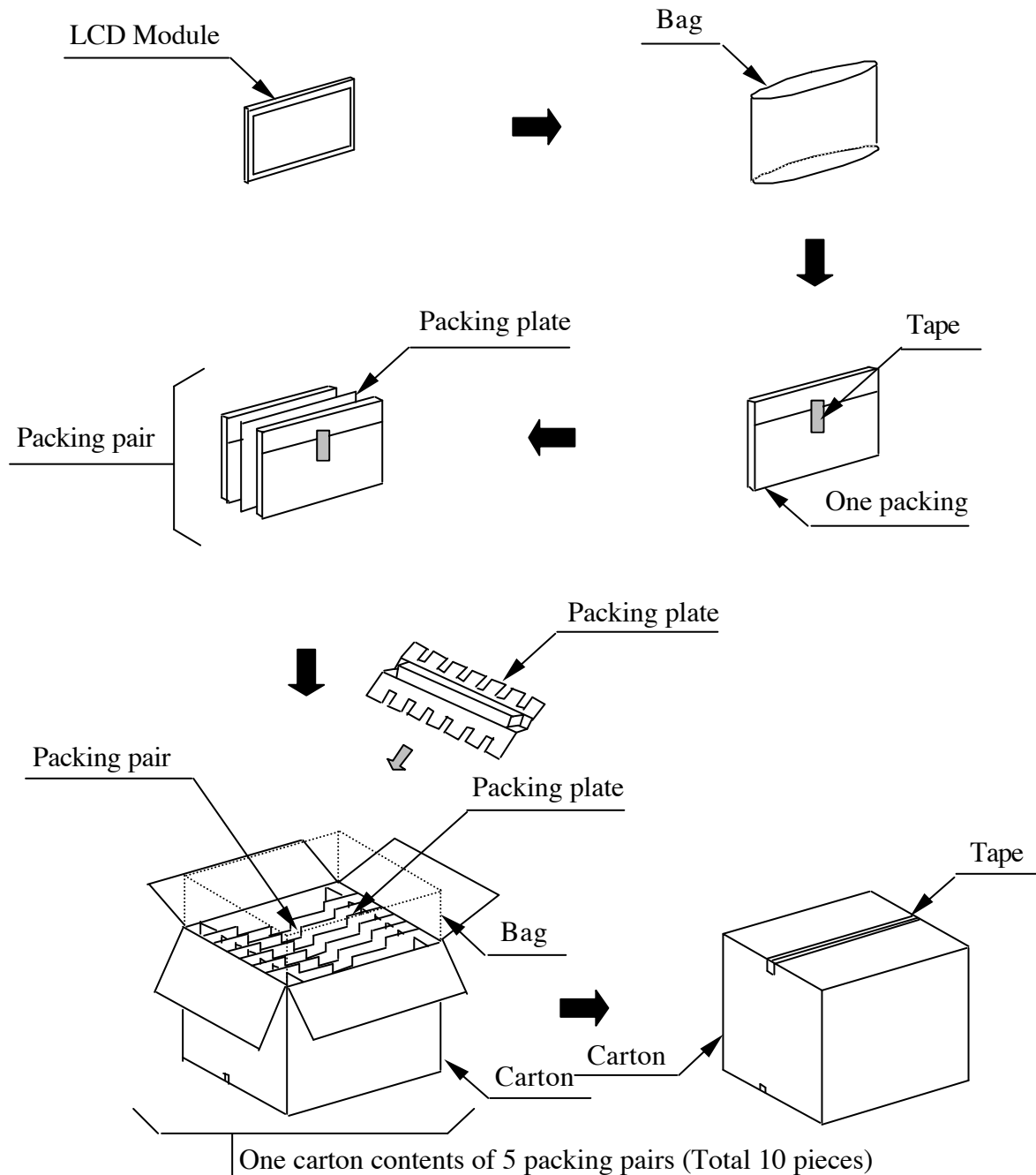
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10.0 PACKAGE SPECIFICATION

10.1 packing form

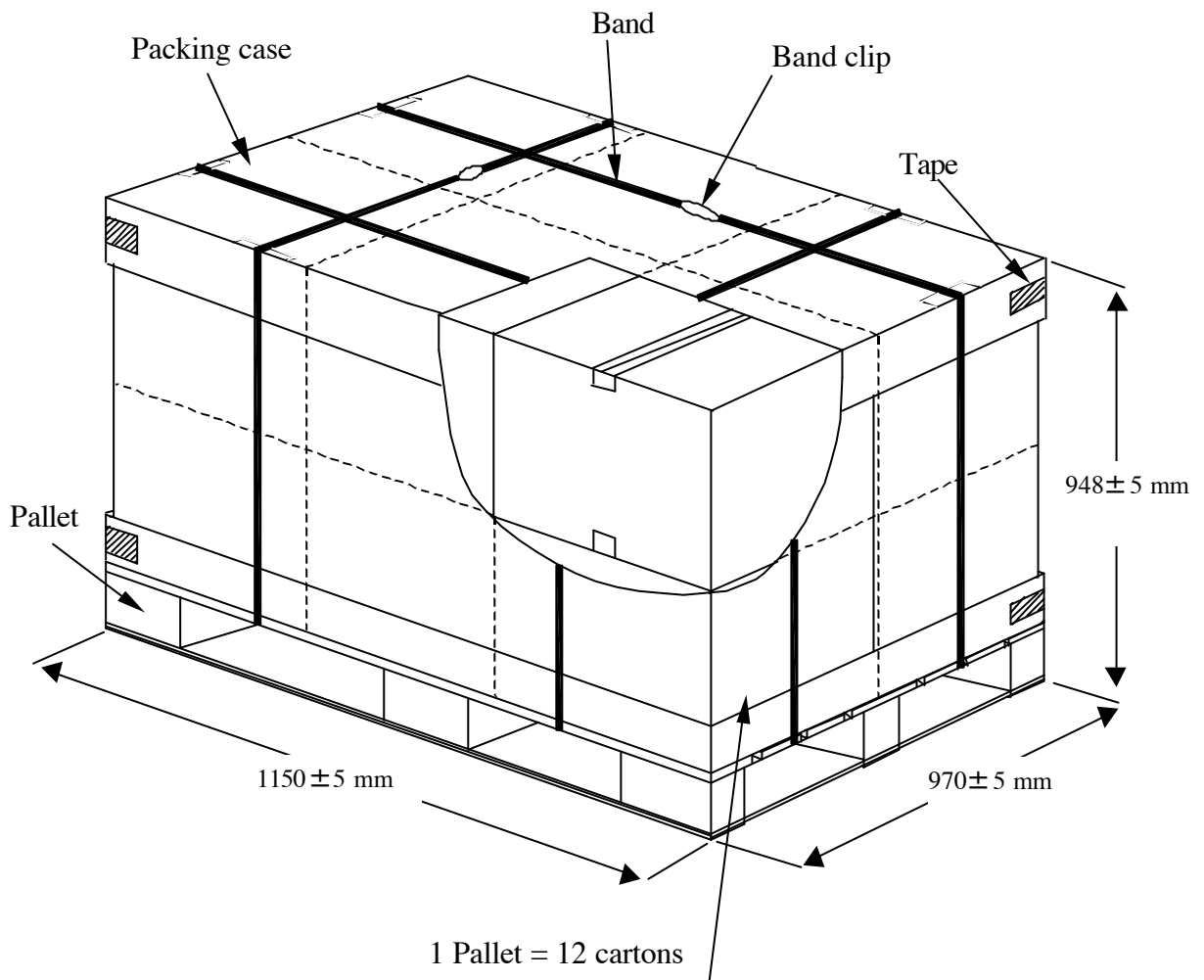
- (1) Package quantity in one carton: 10 pieces.
- (2) carton size: $453 \pm 3 \text{ mm} \times 360 \pm 3 \text{ mm} \times 403 \pm 3 \text{ mm}$.
- (3) For domestic transportation only.

10.2 packing assembly drawings



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10.3 Pallet transportation specification



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11.0 GENERAL PRECAUTION

11.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life threatening or otherwise catastrophic.

11.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

11.3 Breakage of LCD Panel

11.3.1 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

11.3.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.

11.3.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

11.3.4 Handle carefully with chips of glass that may cause injury, when the glass is broken.

11.4 Electric Shock

11.4.1 Disconnect power supply before handling LCD module.

11.4.2 Do not pull or fold the CCFL cable.

11.4.3 Do not touch the parts inside LCD modules and the fluorescent lamp's connector or cables in order to prevent electric shock.

11.5 Absolute Maximum Ratings and Power Protection Circuit

11.5.1 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

11.5.2 Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

11.5.3 It's recommended employing protection circuit for power supply.

11.6 Operation

11.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

Use fingerstalls of soft gloves in order to keep clean display quality, when persons

11.6.2 handle the LCD module for incoming inspection or assembly.

11.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

11.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

11.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

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11.7 Mechanism

Please mount LCD module by using mounting holes arranged in four corners tightly.

11.8 Static Electricity

11.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

11.8.2 Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.

11.8.3 Persons who handle the module should be grounded through adequate methods.

11.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

11.10 Disposal

When disposing LCD module, obey the local environmental regulations.