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TO : 拓浦光电 (TOPVIEW)

Date : Jan., 20, 2017

# **HannStar Product Specification** **(Tentative)**

## **10.4" Color TFT-LCD Module**

Model: **HSD104IXN1- A\*\***

- Note: 1.The information contained herein is tentative and may be changed without prior notices
- 2.Please contact HannStar Display Corp. before designing your product based on this module specification.
- 3.The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by HannStar for any intellectual property claims or other problems that may result from application based on the module described herein.
- 4.The mark " \*\* " of Model means sub-model code.



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## Record of Revisions

| Rev. | Date           | Sub-Model | Description of change                                                                                                                                                                                     |
|------|----------------|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.0  | Sep., 1, 2016  | A**       | Tentative Product Specification was first released.                                                                                                                                                       |
| 2.0  | Sep., 14, 2016 | A**       | Modify the weight of the MDL (P4)<br>Modify the outer dimension drawing information. (P21~22)                                                                                                             |
| 3.0  | Sep.,21, 2016  | A**       | Modify the reliability test items.(P20)                                                                                                                                                                   |
| 4.0  | Sep.,29, 2016  | A**       | Modify the outer dimension drawing information. (P21~22)                                                                                                                                                  |
| 5.0  | Jan., 20, 2017 | A**       | Modify the general description of the MDL (P4)<br>Modify the optical characteristics (P6)<br>Modify the electrical characteristics (P15~P19)<br>Modify the outer dimension drawing information. (P21~P22) |



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## 1.0 GENERAL DESCRIPTION

### 1.1 Introduction

HannStar Display model HSD104IXN1-A 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, a driving circuit and a back light system. This TFT LCD has a 10.4 inch diagonally measured active display area with HD (1024 horizontal by 768 vertical pixel) resolution.

### 1.2 Features

- 10.4 (4:3 diagonal) inch configuration
- 16.2M
- ROHS / Halogen Free Compliance

### 1.3 Applications

- Automobile

### 1.4 General information

| Item              |                              | Specification                            | Unit   |
|-------------------|------------------------------|------------------------------------------|--------|
| Outline Dimension |                              | 236 (H) x 174.3 (V) x 7.4 (D) (Typ)      | mm     |
| Display area      |                              | 211.2(H) x 158.4(V) (10.4" diagonal)     | mm     |
| Number of Pixel   |                              | 1024(H) x 768(V)                         | pixels |
| Pixel pitch       |                              | 0.20625(H) x 0.20625(V)                  | mm     |
| Pixel arrangement |                              | RGB Vertical Stripe                      |        |
| Display mode      |                              | Normally Black                           |        |
| NTSC              |                              | 70(Typ.)                                 | %      |
| Surface treatment |                              | Antiglare, Hard-Coating (3H)             |        |
| Weight            |                              | 314                                      | g      |
| Back-light        |                              | Single LED (Side-Light type)             |        |
| Power Consumption | Logic System (White Pattern) | Logic 2.0W(max) @V <sub>DVDD</sub> =3.3V | W      |
|                   | B/L System                   | 6.144(Max.)                              | W      |

### 1.5 Mechanical Information

| Item        |                | Min.  | Typ.  | Max.  | Unit |
|-------------|----------------|-------|-------|-------|------|
| Module Size | Horizontal (H) | 235.5 | 236   | 236.5 | mm   |
|             | Vertical (V)   | 174.0 | 174.3 | 174.6 | mm   |
|             | Depth (D)      | 6.4   | 6.7   | 7.0   | mm   |
| Weight      |                | —     | 314   | —     | g    |

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## 2.0 ABSOLUTE MAXIMUM RATINGS

### 2.1 Electrical Absolute Rating

#### 2.1.1 TFT LCD Module

| Item                     | Symbol                         | Min. | Max. | Unit | Note |
|--------------------------|--------------------------------|------|------|------|------|
| Power supply voltage     | $V_{DVDD}$                     | -0.3 | 5    | V    |      |
|                          | $V_{DVDD\_LVDS}$               |      |      |      |      |
|                          | $V_{AVDD}$                     | -0.5 | 15   | V    |      |
|                          | $V_{GH}$                       | -0.3 | 42   | V    |      |
|                          | $V_{GL}$                       | -20  | 0.3  | V    |      |
|                          | $V_{GH} - V_{GL}$              | -0.3 | 40   | V    |      |
| Logic Signal Input Level | $V_{DVDD}$<br>$V_{DVDD\_LVDS}$ | -0.3 | 5    | V    |      |

### 2.2 Environment Absolute Rating

| Item                  | Symbol    | Min. | Max. | Unit | Note |
|-----------------------|-----------|------|------|------|------|
| Operating Temperature | $T_{opa}$ | -20  | 70   | °C   |      |
| Storage Temperature   | $T_{stg}$ | -30  | 80   | °C   |      |

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### 3.0 OPTICAL CHARACTERISTICS

#### 3.1 Optical specification

| Item                         |         | Symbol     | Condition                          | Min.  | Typ.  | Max.  | Unit              | Note                      |
|------------------------------|---------|------------|------------------------------------|-------|-------|-------|-------------------|---------------------------|
| Contrast                     |         | CR         | $\Theta=0$<br>Normal viewing angle | 600   | 900   | —     |                   | (1)(2)                    |
| Response time                | Rising  | TR+TF      |                                    | —     | 30    | 40    | msec              | (1)(3)                    |
|                              | Falling |            |                                    |       |       |       |                   |                           |
| White luminance (Center)     |         | $Y_L$      |                                    | 500   | 600   | —     | cd/m <sup>2</sup> | (1)(4)<br>( $I_L=480mA$ ) |
| Color chromaticity (CIE1931) | White   | $W_x$      |                                    | 0.273 | 0.313 | 0.353 |                   | (1)(4)                    |
|                              |         | $W_y$      |                                    | 0.289 | 0.329 | 0.369 |                   |                           |
|                              | Red     | $R_x$      |                                    | 0.614 | 0.654 | 0.694 |                   |                           |
|                              |         | $R_y$      |                                    | 0.301 | 0.341 | 0.381 |                   |                           |
|                              | Green   | $G_x$      |                                    | 0.264 | 0.304 | 0.344 |                   |                           |
|                              |         | $G_y$      |                                    | 0.585 | 0.625 | 0.665 |                   |                           |
|                              | Blue    | $B_x$      |                                    | 0.104 | 0.144 | 0.184 |                   |                           |
|                              |         | $B_y$      |                                    | 0.05  | 0.090 | 0.13  |                   |                           |
| Viewing angle                | Hor.    | $\Theta_L$ | CR>10                              | 80    | 85    | —     |                   |                           |
|                              |         | $\Theta_R$ |                                    | 80    | 85    | —     |                   |                           |
|                              | Ver.    | $\Theta_U$ |                                    | 80    | 85    | —     |                   |                           |
|                              |         | $\Theta_D$ |                                    | 80    | 85    | —     |                   |                           |
| Brightness uniformity        |         | $B_{UNI}$  | $\Theta=0$                         | 70    | 80    | —     | %                 | (5)                       |
| Optima View Direction        |         | Free       |                                    |       |       |       |                   | (6)                       |

#### 3.2 Measuring Condition

- Measuring surrounding : dark room
- LED current  $I_L$  : 480mA
- Ambient temperature : 25±2°C
- 15min. warm-up time.

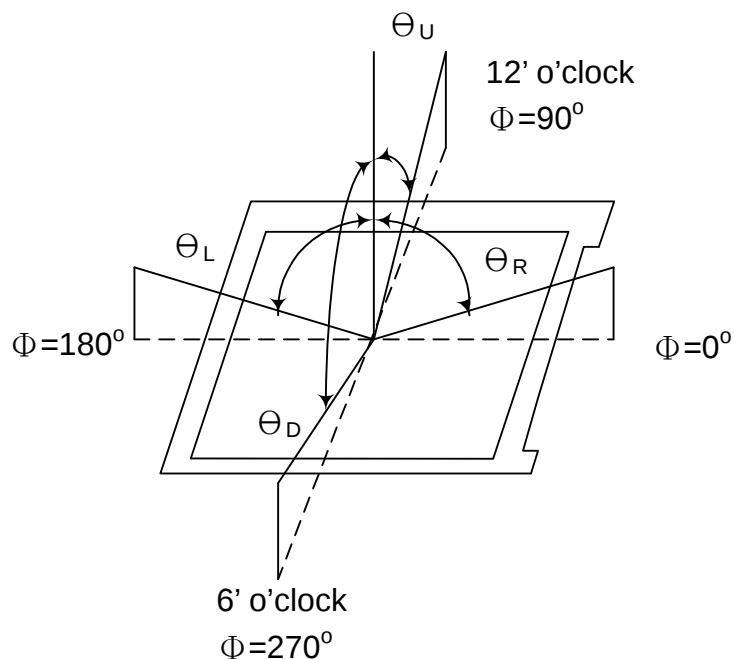
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### 3.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

- Measuring spot size : 20 ~ 21 mm

**Note (1)** Definition of Viewing Angle:

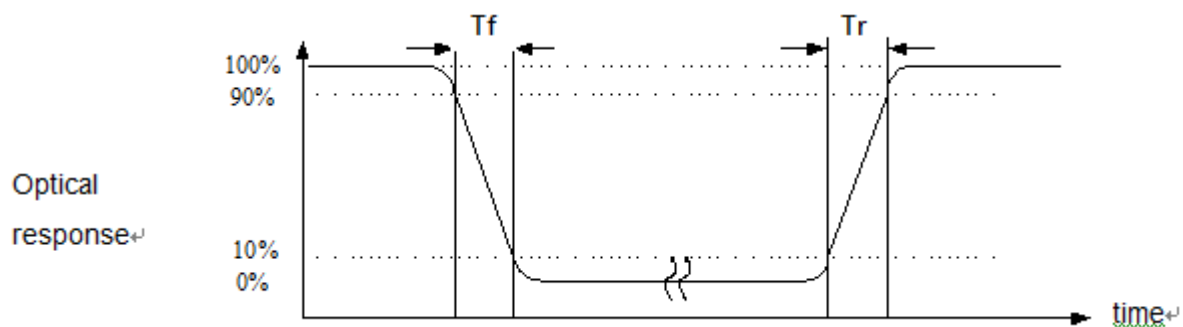


**Note (2)** Definition of Contrast Ratio (CR) :  
measured at the center point of panel

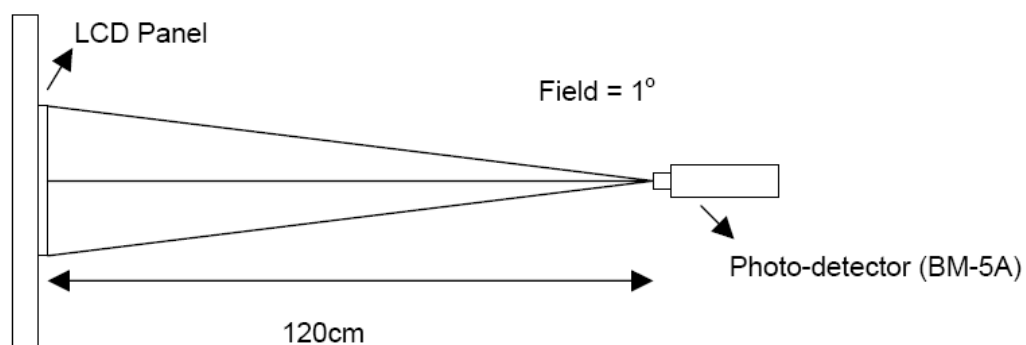
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

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

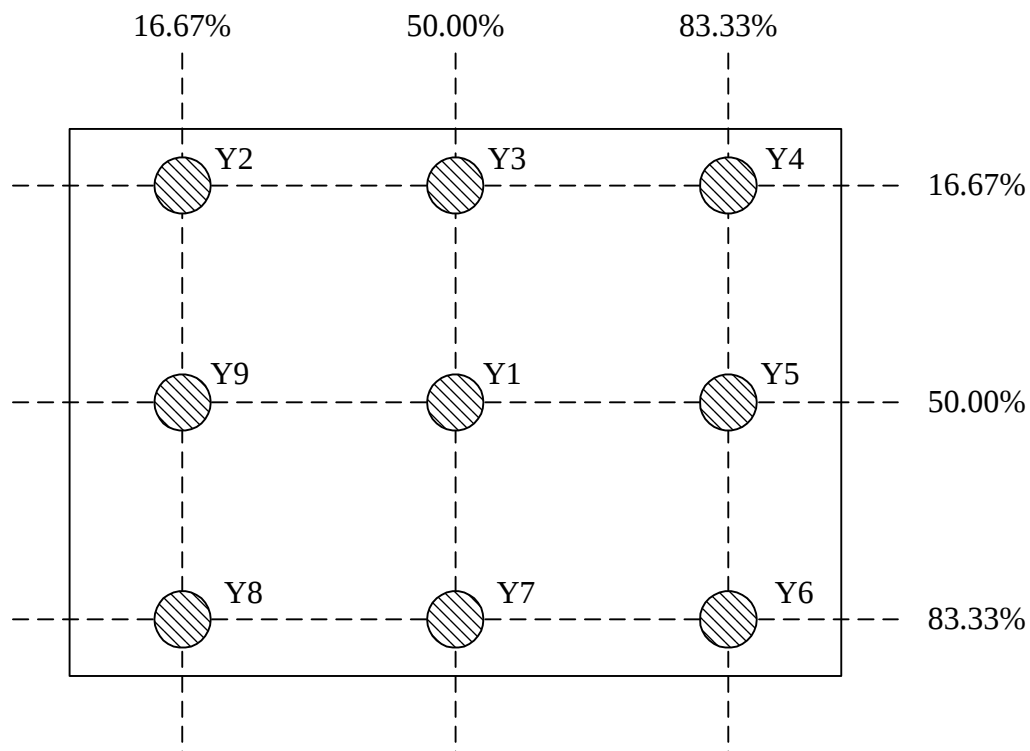


**Note (4)** Definition of optical measurement setup



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**Note (5)** Definition of brightness uniformity



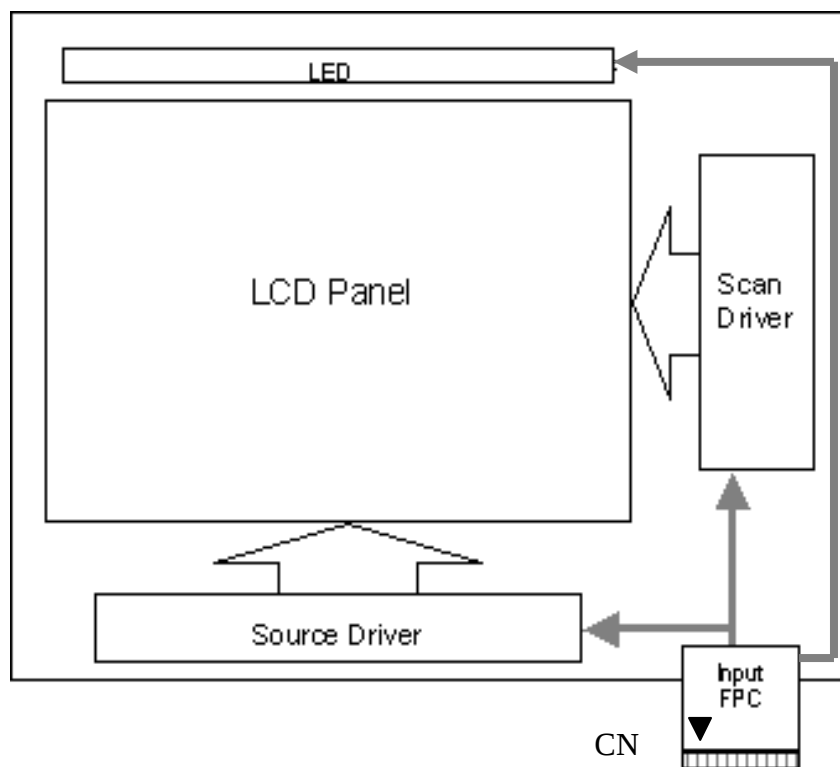
$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

**Note (6)** : Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.

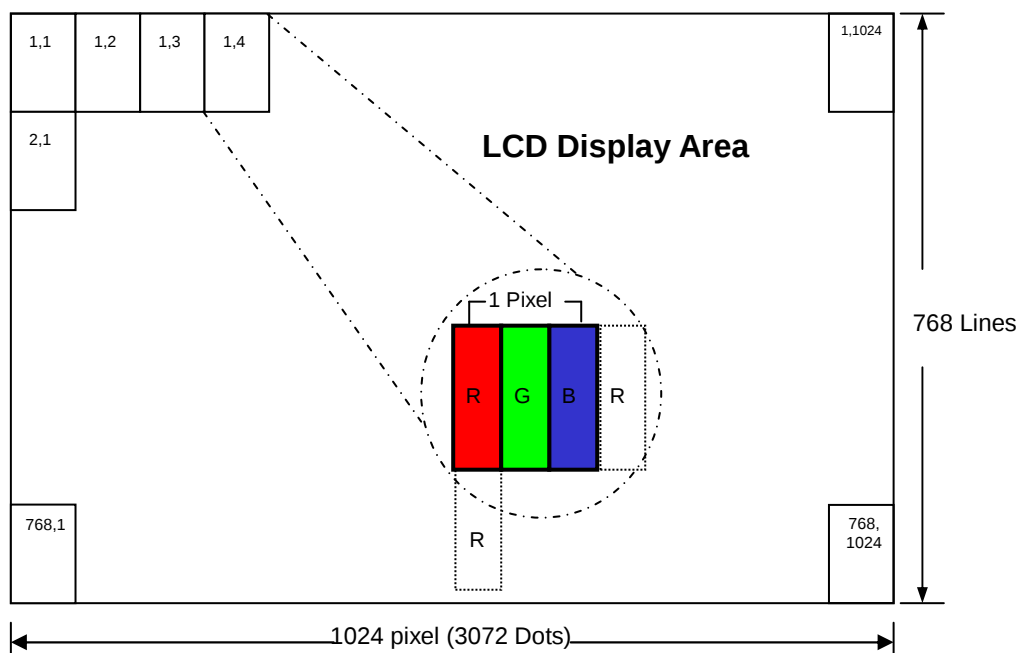
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## 4.0 BLOCK DIAGRAM

### 4.1 TFT LCD Module:



### 4.2 Pixel Format



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### 4.3 Relationship Between Displayed Color and Input

|                             | Display                 | MSB                      LSB |    |    |    |    |    |    |    | MSB                      LSB |    |    |    |    |    |    |    | MSB                      LSB |    |    |    |    |    |    |    | Gray scale Level |
|-----------------------------|-------------------------|------------------------------|----|----|----|----|----|----|----|------------------------------|----|----|----|----|----|----|----|------------------------------|----|----|----|----|----|----|----|------------------|
|                             |                         | R7                           | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7                           | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7                           | B6 | 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  | L  | L  | L  | L  | L  | L  | -                |
|                             | Blue                    | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | H  | H  | -                |
|                             | Green                   | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | H  | H  | L                            | L  | L  | L  | L  | L  | L  | L  | -                |
|                             | Light Blue              | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | H  | H  | H                            | H  | H  | H  | H  | H  | H  | H  | -                |
|                             | Red                     | H                            | H  | H  | H  | H  | H  | H  | H  | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | -                |
|                             | Purple                  | H                            | H  | H  | H  | H  | H  | H  | H  | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | H  | H  | -                |
|                             | Yellow                  | H                            | H  | H  | H  | H  | H  | H  | H  | H                            | H  | H  | H  | H  | H  | H  | H  | L                            | L  | 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  | 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  | L  | L  | L  | L  | L  | L  | L0               |
|                             | Dark<br>↑<br>↓<br>Light | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L1               |
|                             |                         | L                            | L  | L  | L  | L  | L  | L  | H  | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L2               |
|                             |                         | :                            |    |    |    |    |    |    |    | :                            |    |    |    |    |    |    |    | :                            |    |    |    |    |    |    |    | L3...L251        |
|                             |                         | H                            | H  | H  | H  | H  | H  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L252             |
|                             | Light                   | H                            | H  | H  | H  | H  | H  | L  | H  | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L253             |
|                             |                         | H                            | H  | H  | H  | H  | H  | H  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L254             |
|                             | Red                     | H                            | H  | H  | H  | H  | H  | H  | H  | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | Red L255         |
| Gray scale of Green         | Black                   | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L0               |
|                             | Dark<br>↑<br>↓<br>Light | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | H  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L1               |
|                             |                         | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | H  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L2               |
|                             |                         | :                            |    |    |    |    |    |    |    | :                            |    |    |    |    |    |    |    | :                            |    |    |    |    |    |    |    | L3...L251        |
|                             |                         | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L252             |
|                             | Light                   | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | L  | H  | L                            | L  | L  | L  | L  | L  | L  | L  | L253             |
|                             |                         | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | H  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L254             |
|                             | Green                   | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | H  | H  | L                            | L  | L  | L  | L  | L  | L  | L  | Green L255       |
| Gray scale of Blue          | Black                   | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L0               |
|                             | Dark<br>↑<br>↓<br>Light | L                            | L  | L  | L  | L  | L  | 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  | L                            | L  | L  | L  | H  | L  | L  | L  | L2               |
|                             |                         | :                            |    |    |    |    |    |    |    | :                            |    |    |    |    |    |    |    | :                            |    |    |    |    |    |    |    | L3...L251        |
|                             |                         | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | L  | L  | L252             |
|                             | Light                   | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | L  | H  | L253             |
|                             |                         | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | H  | L  | L254             |
|                             | Blue                    | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | H                            | H  | H  | H  | H  | H  | H  | H  | Blue L255        |
| Gray scale of White & Black | Black                   | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L                            | L  | L  | L  | L  | L  | L  | L  | L0               |
|                             | Dark<br>↑<br>↓<br>Light | L                            | L  | L  | L  | L  | L  | L  | H  | L                            | L  | L  | L  | L  | L  | H  | L  | L                            | L  | L  | L  | L  | L  | H  | L  | L1               |
|                             |                         | L                            | L  | L  | L  | L  | L  | H  | L  | L                            | L  | L  | L  | L  | H  | L  | L  | L                            | L  | L  | L  | L  | H  | L  | L  | L2               |
|                             |                         | :                            |    |    |    |    |    |    |    | :                            |    |    |    |    |    |    |    | :                            |    |    |    |    |    |    |    | L3...L251        |
|                             |                         | H                            | H  | H  | H  | H  | H  | L  | L  | H                            | H  | H  | H  | H  | H  | L  | L  | H                            | H  | H  | H  | H  | H  | L  | L  | L252             |
|                             | Light                   | H                            | H  | H  | H  | H  | H  | L  | H  | H                            | H  | H  | H  | H  | L  | H  | H  | H                            | H  | H  | H  | H  | L  | H  | H  | L253             |
|                             |                         | H                            | H  | H  | H  | H  | H  | H  | L  | H                            | H  | H  | H  | H  | H  | L  | H  | H                            | H  | H  | H  | H  | H  | L  | H  | L254             |
|                             | White                   | H                            | H  | H  | H  | H  | H  | H  | H  | H                            | H  | H  | H  | H  | H  | H  | H  | H                            | H  | H  | H  | H  | H  | H  | H  | White L255       |

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## 5.0 INTERFACE PIN CONNECTION

### 5.1 FPC Pin Assignment:

FPC connector is used for electronics interface. The recommended model is CN1 (Input signal): 089K60-000100-G2-R (STARCONN)

| Pin NO. | Symbol    | Description                            | Note |
|---------|-----------|----------------------------------------|------|
| 1       | AGND      | Analog ground                          |      |
| 2       | AVDD      | Analog power                           |      |
| 3       | DVDD      | Digital power                          |      |
| 4       | GND       | Digital ground                         |      |
| 5       | VCOM      | Not connect                            |      |
| 6       | DVDD      | Digital power                          |      |
| 7       | GND       | Digital ground                         |      |
| 8       | V14       | Not connect                            |      |
| 9       | V13       | Not connect                            |      |
| 10      | V12       | Not connect                            |      |
| 11      | V11       | Not connect                            |      |
| 12      | V10       | Not connect                            |      |
| 13      | V9        | Not connect                            |      |
| 14      | V8        | Not connect                            |      |
| 15      | GND       | Digital ground                         |      |
| 16      | DVDD_LVDS | LVDS power                             |      |
| 17      | GND       | Digital ground                         |      |
| 18      | PIND3     | Positive LVDS differential data input  |      |
| 19      | NIND3     | Negative LVDS differential data input  |      |
| 20      | GND       | Digital ground                         |      |
| 21      | PINC      | Positive LVDS differential clock input |      |
| 22      | NINC      | Negative LVDS differential clock input |      |
| 23      | GND       | Digital ground                         |      |
| 24      | PIND2     | Positive LVDS differential data input  |      |
| 25      | NIND2     | Negative LVDS differential data input  |      |
| 26      | GND       | Digital ground                         |      |
| 27      | PIND1     | Positive LVDS differential data input  |      |
| 28      | NIND1     | Negative LVDS differential data input  |      |
| 29      | GND       | Digital ground                         |      |
| 30      | PIND0     | Positive LVDS differential data input  |      |

|                |                                      |          |       |
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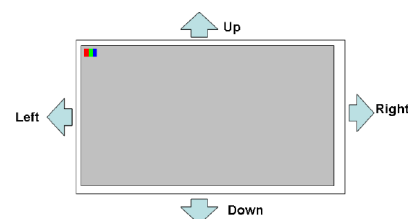
| Pin NO. | Symbol   | Description                                                                                                                                                 | Note   |
|---------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| 31      | NIND0    | Negative LVDS differential data input                                                                                                                       |        |
| 32      | GND      | Digital ground                                                                                                                                              |        |
| 33      | GND_LVDS | LVDS ground                                                                                                                                                 |        |
| 34      | GRB      | Global reset pin. Active low to enter reset state.<br>Suggest to connecting with an RC reset circuit for stability.<br>Normally pull high. (R=10KΩ,C=0.1uF) |        |
| 35      | STBYB    | Standby mode,normally pull high<br>STBYB= 1, normal operation<br>STBYB=0 ,timing control, source driver will turn off, all output are high-Z                |        |
| 36      | SHLR     | Left or right display control                                                                                                                               | Note 1 |
| 37      | DVDD     | Digital power                                                                                                                                               |        |
| 38      | UPDN     | Up / down display control                                                                                                                                   | Note 1 |
| 39      | AGND     | Analog ground                                                                                                                                               |        |
| 40      | AVDD     | Analog power                                                                                                                                                |        |
| 41      | VCOM     | Not connect                                                                                                                                                 |        |
| 42      | DITH     | Dithering function enable control.Normally pull low<br>DITHER= "1",Enable internal dithering function<br>DITHER= "0",Disable internal dithering function    |        |
| 43      | GND      | Digital ground                                                                                                                                              |        |
| 44      | DVDD     | Digital Power                                                                                                                                               |        |
| 45      | GND      | Digital ground                                                                                                                                              |        |
| 46      | V7       | Not connect                                                                                                                                                 |        |
| 47      | V6       | Not connect                                                                                                                                                 |        |
| 48      | V5       | Not connect                                                                                                                                                 |        |
| 49      | V4       | Not connect                                                                                                                                                 |        |
| 50      | V3       | Not connect                                                                                                                                                 |        |
| 51      | V2       | Not connect                                                                                                                                                 |        |
| 52      | V1       | Not connect                                                                                                                                                 |        |
| 53      | GND      | Digital ground                                                                                                                                              |        |
| 54      | DVDD     | Digital power                                                                                                                                               |        |

|                |                                      |          |       |
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| Pin NO. | Symbol | Description                                                                                            | Note   |
|---------|--------|--------------------------------------------------------------------------------------------------------|--------|
| 55      | SELB   | 6bit/8bit mode select,<br>SELB = "0", LVDS input data is 8bits<br>SELB = "1": LVDS input data is 6bits | Note 2 |
| 56      | VGH    | Positive power for TFT                                                                                 |        |
| 57      | DVDD   | Digital power for Gate IC                                                                              |        |
| 58      | VGL    | Negative power for TFT                                                                                 |        |
| 59      | GND    | Digital ground for Gate IC                                                                             |        |
| 60      | NC     | Not connect                                                                                            |        |

**Note 1 : UPDN and SHLR control function**

| UPDN | SHLR | Data shifting                                 |
|------|------|-----------------------------------------------|
| 0    | 1    | Normally display                              |
| 0    | 0    | Inverse Left and Right                        |
| 1    | 1    | Inverse Up and Down                           |
| 1    | 0    | Inverse Left and Right<br>Inverse Up and Down |



**Note 2 : If LVDS input data is 6 bits, SELB must be set to High**

**If LVDS input data is 8 bits, SELB must be set to Low**

**DITH and SELB control function**

| DITH | SELB | Data shifting  |
|------|------|----------------|
| 0    | 1    | Colors (262K)  |
| 0    | 0    | Colors (262K)  |
| 1    | 1    | Colors (262K)  |
| 1    | 0    | Colors (16.2M) |

|                |                                      |          |       |
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## 6.0 ELECTRICAL CHARACTERISTICS

### 6.1 TFT LCD Module

| Item                    | Symbol           | Min.    | Typ. | Max.   | Unit | Note                 |
|-------------------------|------------------|---------|------|--------|------|----------------------|
| Supply Voltage          | $V_{DVDD}$       | 3       | 3.3  | 3.6    | V    |                      |
|                         | $V_{DVDD\_LVDS}$ |         |      |        |      |                      |
|                         | VGH              | 24      | 25   | 26     | V    | Note (1)             |
|                         | VGL              | -9      | -10  | -11    | V    | Note (2)             |
|                         | AVDD             | 11.8    | 12.1 | 12.4   | V    |                      |
| Input signal voltage    | $V_{IH}$         | 0.8 VDD |      | VDD    | V    |                      |
|                         | $V_{IL}$         | 0       |      | 0.2VDD | V    |                      |
| Current of power supply | IDD              |         | 28   | 36.4   | mA   | VDD =3.3V/ Note (3)  |
|                         | Iavdd            |         | 75   | 95     | mA   | AVDD=12.1V/ Note (3) |
|                         | Ivgh             |         | 0.85 | 1.25   | mA   | VGH=25V/ Note (3)    |
|                         | Ivgl             |         | 1.95 | 2.54   | mA   | VGL=-10V/ Note (3)   |

Note :

- (1) : VGH is TFT Gate operating Voltage.
- (2) : VGL is TFT Gate operating Voltage.
- (3) : @ White Pattern & 60Hz °

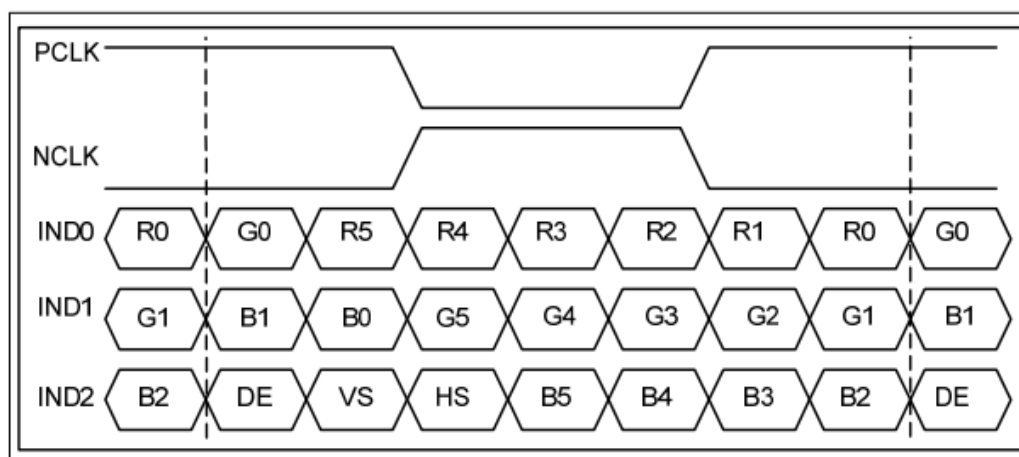
### 6.2 Switching Characteristics for LVDS Receiver

| Item                              | Symbol     | Min. | Typ. | Max. | Unit | Conditions    |
|-----------------------------------|------------|------|------|------|------|---------------|
| Differential Input High Threshold | $V_{th}$   |      |      | 100  | mV   | $V_{CM}=1.2V$ |
| Differential Input Low Threshold  | $V_{tl}$   | -100 |      |      | mV   |               |
| Input Current                     | $I_{IN}$   | -10  |      | 10   | uA   |               |
| Differential input Voltage        | $ V_{ID} $ | 0.1  |      | 0.6  | V    |               |
| Common Mode Voltage Offset        | $V_{CM}$   | 0.7  | 1.2  | 1.6  | V    |               |

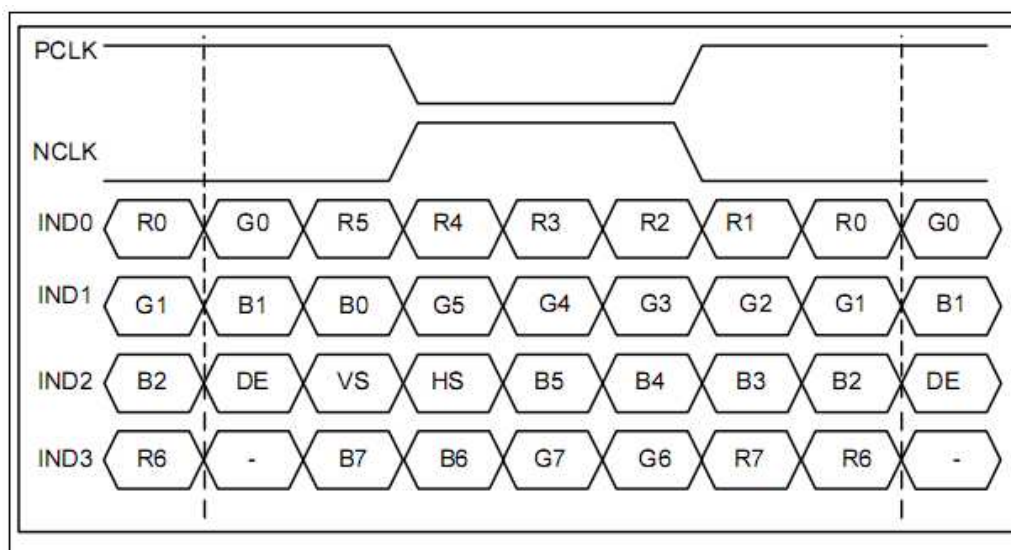
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### 6.3 Bit LVDS input

#### 6.3.1 6bit LVDS input



#### 6.3.2 8Bit LVDS input



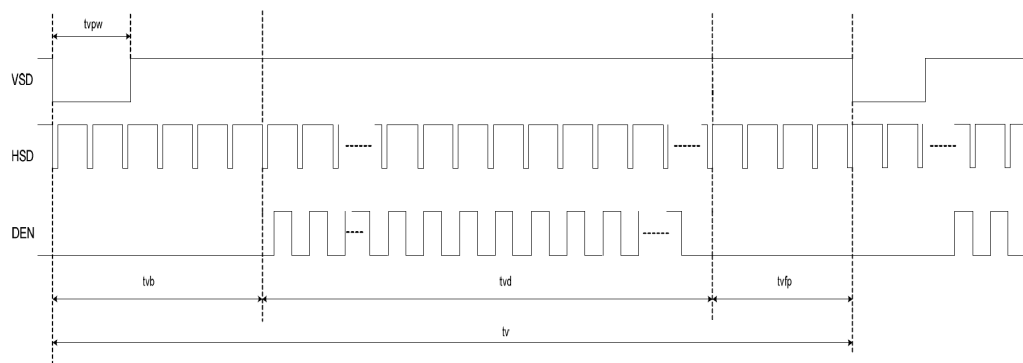
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## 6.4 Interface Timing (DE mode)

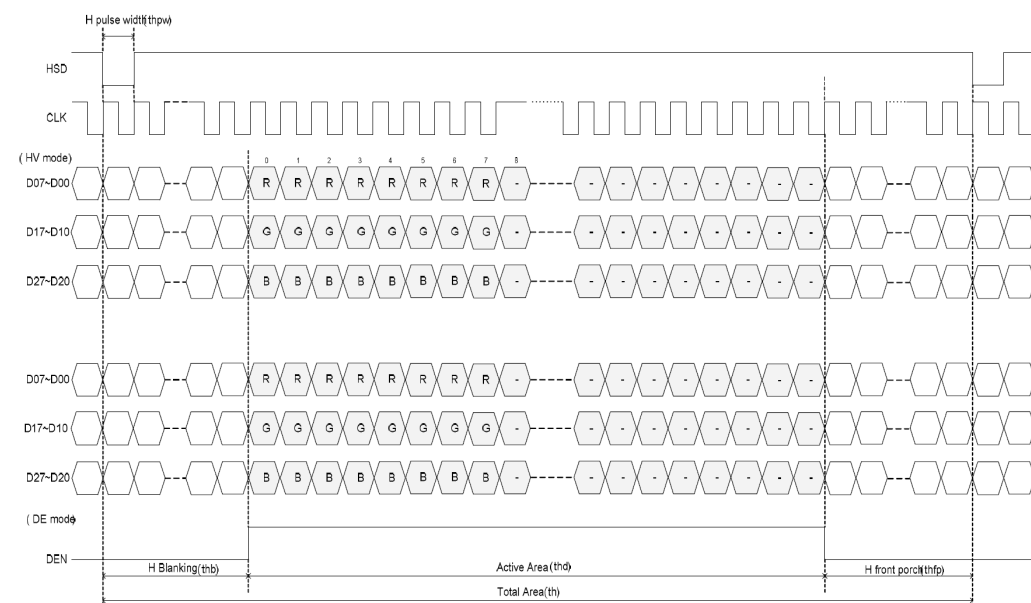
| DE mode                         |          |       |      |      |      |
|---------------------------------|----------|-------|------|------|------|
| Parameter                       | Symbol   | Value |      |      | Unit |
|                                 |          | Min.  | Typ. | Max. |      |
| DCLK frequency @Frame rate=60hz | fclk     | 52    | 65   | 71   | Mhz  |
| Horizontal display area         | thd      | 1024  |      |      | DCLK |
| HSYNC period time               | th       | 1114  | 1344 | 1400 | DCLK |
| HSYNC blanking                  | thb+thfp | 90    | 320  | 376  | DCLK |
| Vertical display area           | tvd      | 768   |      |      | H    |
| VSYNC period time               | tv       | 778   | 806  | 845  | H    |
| VSYNC blanking                  | tvb+tvfp | 10    | 38   | 77   | H    |

### Timing Diagram of Interface Signal (DE mode)

#### (1). Vertical input timing

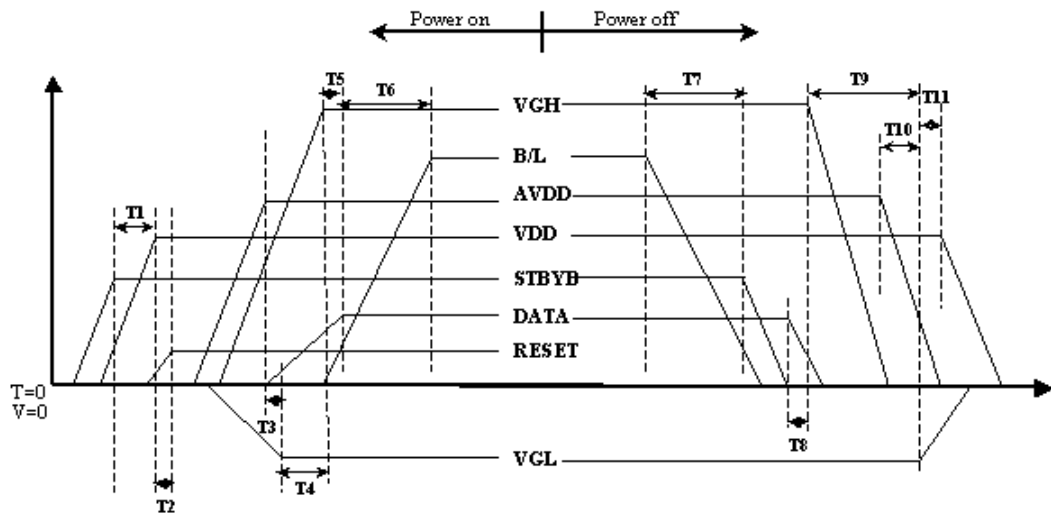


#### (2). Horizontal input timing



|                |                                      |          |       |
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## 6.5 Power On / Off Sequence



| Item | Min. | Typ. | Max. | Unit |
|------|------|------|------|------|
| T1   | 0    | --   | --   | ms   |
| T2   | 50   | --   | --   | ms   |
| T3   | 5    | --   | --   | ms   |
| T4   | 10   | --   | --   | ms   |
| T5   | 20   | --   | --   | ms   |
| T6   | 50   | --   | --   | ms   |
| T7   | 20   | --   | --   | ms   |
| T8   | 10   | --   | --   | ms   |
| T9   | 20   | --   | --   | ms   |
| T10  | 10   | --   | --   | ms   |
| T11  | 20   | --   | --   | ms   |

|                |                                      |          |       |
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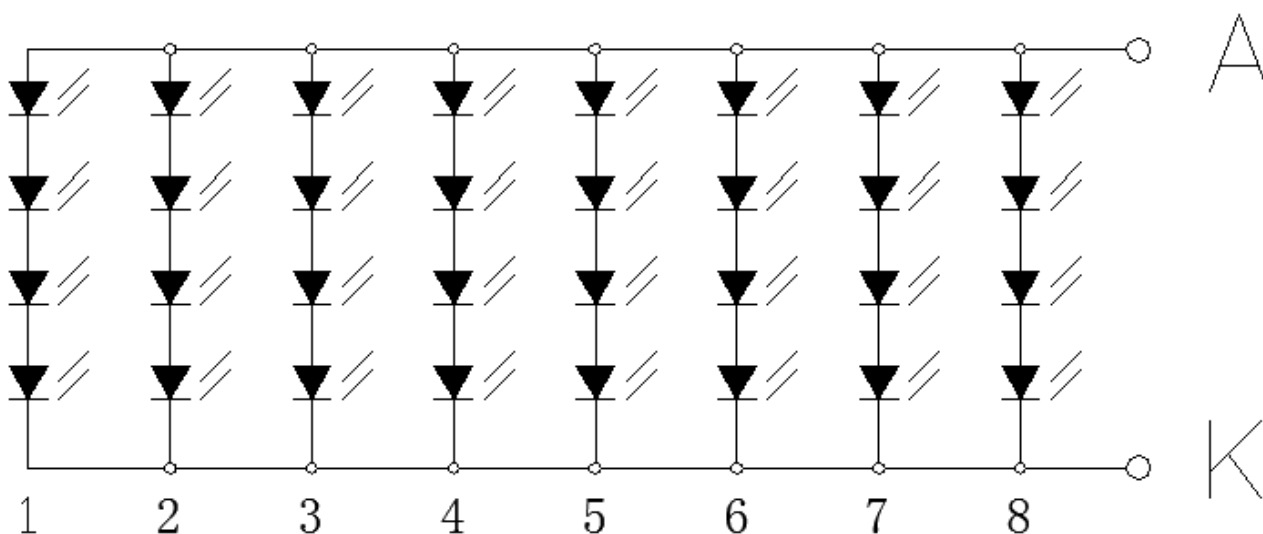
## 6.6 Backlight Unit

| Parameter     | Symbol | Min    | Typ  | Max  | Units | Condition                                |
|---------------|--------|--------|------|------|-------|------------------------------------------|
| LED Current   | $I_L$  | --     | 480  | --   | mA    | Ta=25°C                                  |
| LED Voltage   | $V_L$  | --     | 12.9 | 13.6 | Volt  | Ta=25°C                                  |
| LED Life-Time | N/A    | 30,000 | --   | --   | Hour  | Ta=25°C<br>$I_F=60\text{mA}$<br>Note (2) |

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=480mA. The LED lifetime could be decreased if operating IL is larger than 480mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit



## 6.7 Electrostatic Discharge:

| ITEM | CONDITON                                                  | NOTE  |
|------|-----------------------------------------------------------|-------|
| ESD  | Air 150pF , 330Ω , +/-15kV & Contact 150 pF , 330Ω +/-8kV | Note1 |
|      | 200pF , 0Ω , +/-200V contact test                         | Note2 |

Note: Measure

Note1: LCD glass and metal bezel

Note2: IF connector pins

|                |                                      |          |       |
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## 7.0 Reliability test items

| No. | Item                                           | Conditions                                                                                                                                                    | Remark |
|-----|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| 1   | High Temperature Storage                       | Ta=+80°C, 240hrs                                                                                                                                              |        |
| 2   | Low Temperature Storage                        | Ta=-30°C, 240hrs                                                                                                                                              |        |
| 3   | High Temperature Operation                     | Ta=+70°C, 240hrs                                                                                                                                              |        |
| 4   | Low Temperature Operation                      | Ta=-20°C, 240hrs                                                                                                                                              |        |
| 5   | High Temperature and High Humidity (operation) | Ta=+60°C, 90%RH, 240hrs                                                                                                                                       |        |
| 6   | Thermal Cycling Test (non operation)           | -30°C(30min) → +80°C(30min), 200 cycles                                                                                                                       |        |
| 7   | Electrostatic Discharge                        | ±200V,200pF(0Ω) 1 time/connector                                                                                                                              |        |
| 8   | Vibration                                      | 1.Random:<br>1.04G, 5~500Hz,<br>XYZ, 30min/each direction<br>2.Sine:<br>Freq.1.5G, 8~33.3Hz,<br>Stoke: 1.3mm<br>Sweep: 2.9G, 33.3~400Hz<br>X/Z: 2hrs, Y: 4hrs |        |
| 9   | Shock                                          | Half-Sine, 100G, 6ms, ±XYZ, 3time                                                                                                                             |        |
| 10  | Vibration (with carton)                        | Random: 0.015G <sup>2</sup> /Hz, 5~200Hz<br>-6dB/Octave, 200~400Hz<br>XYZ 各方向 2hrs                                                                            |        |
| 11  | Drop (with carton)                             | Drop height condition, basis on the product weight and follow QB100-0027<br>1 corner, 3 edges, 6 surfaces                                                     |        |

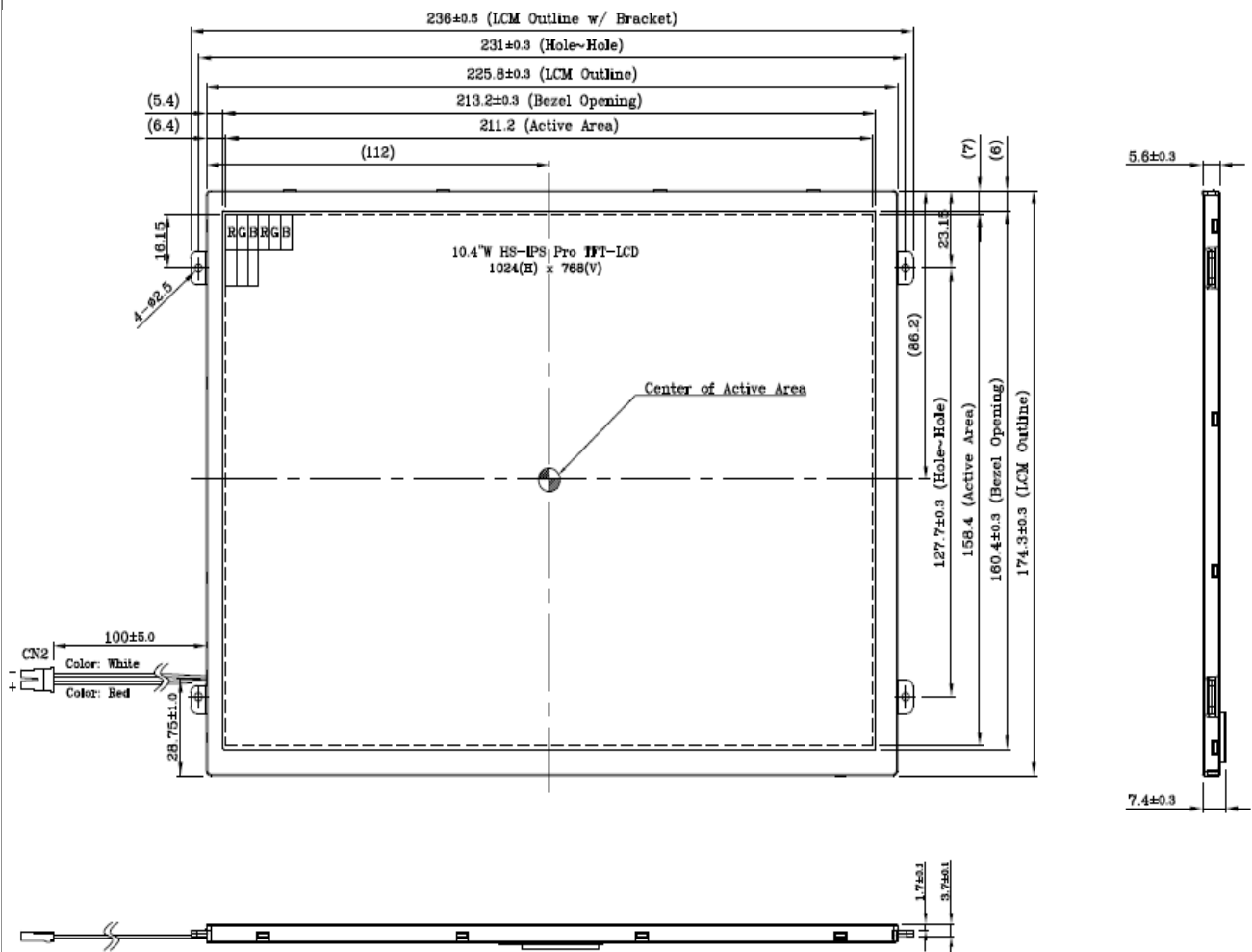
Note: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

|                |                                      |          |       |
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## 8.0 OUTLINE DIMENSION

Unit : mm

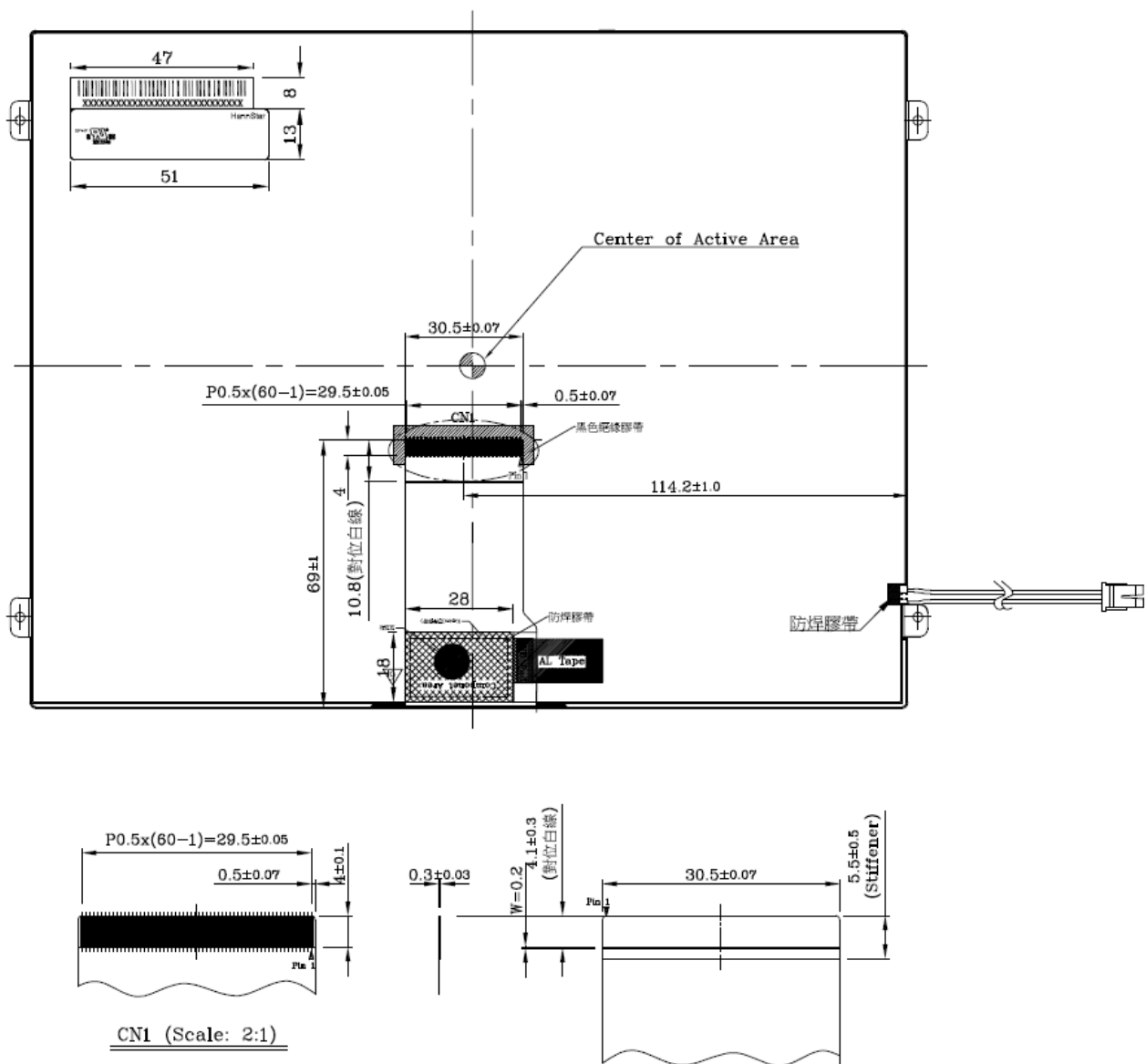
### 8.1 Front View:



General tolerance: ±0.3mm

|                |                                      |          |       |
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## 8.2 Rear View:



General tolerance:  $\pm 0.3\text{mm}$

|                |                                      |          |       |
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## 9.0 LOT MARK

### 9.1 Lot Mark

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|

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: Code 8 is defined by the last number of the year, for example

|      |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|------|
| Year | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
| Mark | 6    | 7    | 8    | 9    | 0    | 1    | 2    | 3    | 4    | 5    |

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 Detail of Lot Mark

- (1) Below label is attached on the backside of the LCD module. See Section 8.0: Outline Dimension.
- (2) The detail of Lot Mark is attached as below.
- (3) This is subject to change without prior notice.



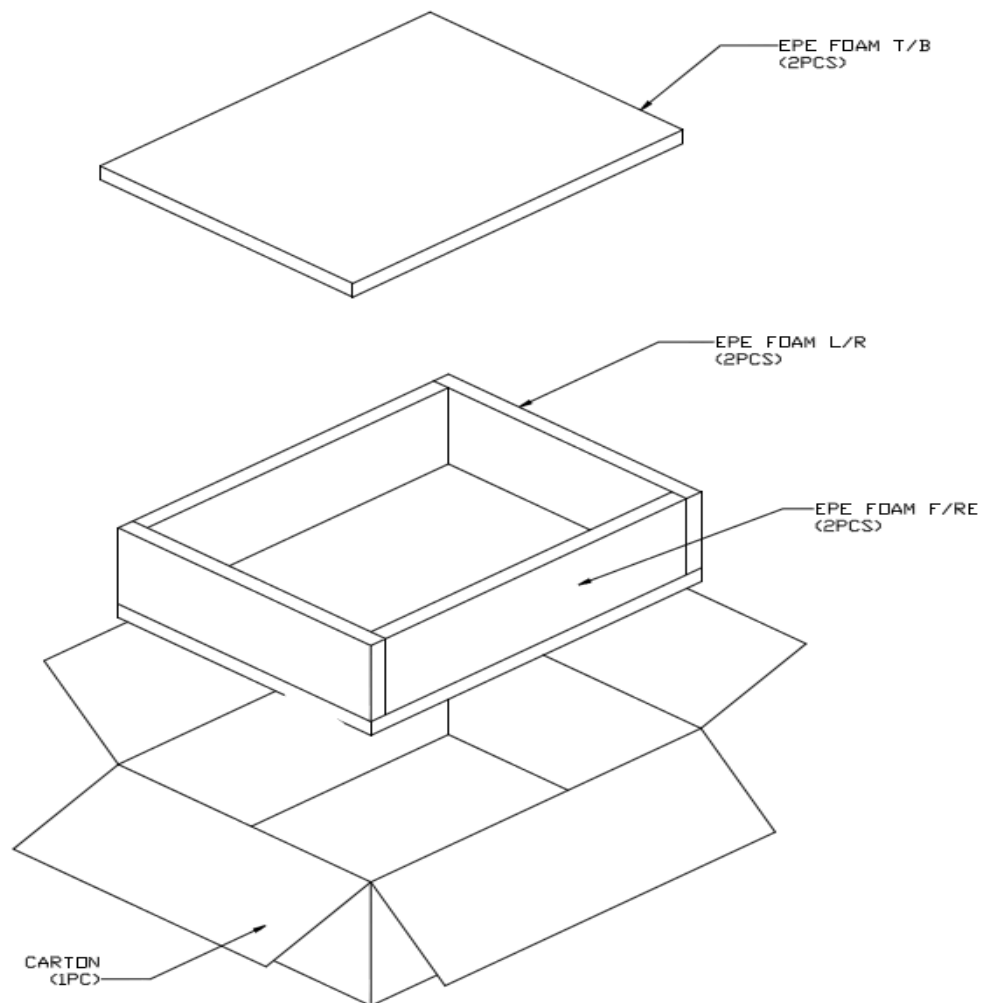
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## 10.0 PACKAGE SPECIFICATION

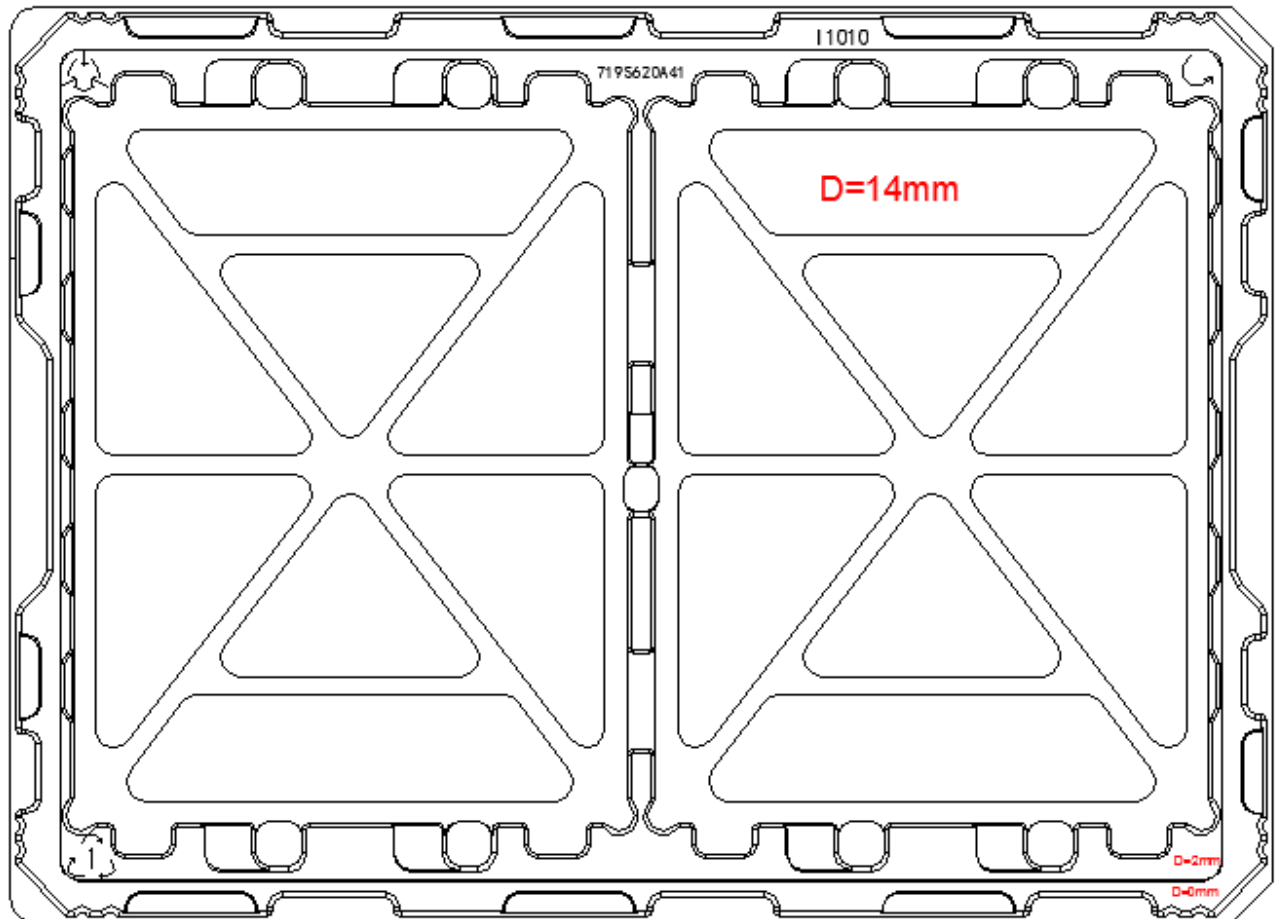
### 10.1 Packing form

| LCM Model      | Qty. in the Box | Inner Box Size(mm)                | Notice |
|----------------|-----------------|-----------------------------------|--------|
| HSD104IXN1-A00 | 20 pcs/Box      | Ref. 452 x 346 x 175 <sup>H</sup> | --     |

### 10.2 Packing assembly drawings



|                |                                      |          |       |
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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 LED cable.

11.4.3. Do not touch the parts inside LCD modules and the fluorescent LED'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 to employ 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.

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

|                |                                      |          |       |
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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 benzine or other adequate solvent.

#### **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 use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. 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.