TO :

Date : Jan. 28, 2013

# HannStar Product Specification

## (Formal)

## Model: **HSD070PFW3-D****

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. 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.
3. The mark "**" of Model means sub-model code.

# Record of Revisions

| Rev. | Date | Sub-Model | Description of change |
|---|---|---|---|
| 1.0 | Nov 30, 2012 | -D** | Formal Product Specification was first released. |
| 1.1 | Dec 11, 2012 | -D** | Modify Item 3.1 Optical Specification_ Color Chromaticity (P6) |
| 2.0 | Jan 28, 2013 | -D** | Modify Item 8.0 Outline Dimension_ Tolerance (P17,P18) |

# Contents

# 1.0 GENERAL DESCRIPTION

## 1.1 Introduction

HannStar Display model HSD070PFW3-D 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 7.0 (17:10) inch diagonally measured active display area with WSVGA (1024 horizontal by 600 vertical pixel) resolution.

## 1.2 Features

- 7 inch (17:10 diagonal) configuration
- 16.2M color by 6 bit+FRC R.G.B signal input
- RoHS/ Halogen Free Compliance

## 1.3 Applications

- Mobile NB
- Digital Photo frame
- Display terminal for AV application

## 1.4 TFT LCD General information

| Item | | Specification | Unit |
|---|---|---|---|
| Outline Dimension | | 167.25 x 104.65 (typ) | mm |
| Display area | | 153.6(H) x 90(V) | mm |
| Number of Pixel | | 1024 RGB (H) x 600(V) | pixels |
| Pixel pitch | | 0.15(H) x 0.15(V) | mm |
| Pixel arrangement | | RGB Vertical stripe | |
| Display mode | | Normally white | |
| NTSC | | 50 (typ.) | % |
| Surface treatment | | Hard coating with EWV Flim | |
| Weight | | 95 (Typ.) | g |
| Back-light | | White LED | |
| Power Consumption | Logic | 0.7 (typ) @ Black pattern w/o LED driver/ Frame rate:60Hz Vdd:3.3v | W |
| | BL System | 1.16 (typ) / 1.23(max.) | W |

## 1.5 Mechanical Information

| Item | | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| Module Size | Horizontal (H) | 167.05 | 167.25 | 167.45 | mm | |
| | Vertical (V) | 104.45 | 104.65 | 104.85 | mm | |
| | Depth (D) | — | 2.8 | 3.0 | mm | |
| Weight | | — | 95 | 100 | g | |

# 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 | $V_{DD}$ | -0.3 | 5.0 | V | |
| Logic Signal Input Level | $V_{DD}$ | -0.3 | 5.0 | V | |

### 2.1.2 Backlight unit

| Item | Symbol | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|
| LED current | $I_L$ | -- | 100 | mA | (1) (2)(3) |
| LED voltage | $V_L$ | 11.6 | 12 | V | (1) (2)(3) |
| LED reverse voltage | $V_R$ | -- | 5 | V | |
| LED forward current | $I_F$ | | 20 | mA | |

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) Ta =25±2℃

(3) Test Condition: LED current 100 mA. The LED lifetime could be decreased if operating IL is larger than 100mA.

### 2.1.3 Environment Absolute Rating

| Item | Symbol | Min. | Max. | Unit | Note |
|---|---|---|---|---|---|
| Operating Temperature | $T_{opa}$ | -20 | 60 | ℃ | |
| Storage Temperature | $T_{stg}$ | -30 | 70 | ℃ | |

## 3.0 OPTICAL CHARACTERISTICS

### 3.1 Optical specification

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast | | CR | Θ=0 Normal viewing angle | 600 | 800 | — | | (1)(2)(4) |
| Response time | | Tr | | — | 4 | 8 | msec | (1)(3) |
| | | Tf | | — | 12 | 22 | | |
| White luminance (Center) | | $Y_L$ | | 300 | 350 | — | $cd/m^2$ | (1)(4) |
| Color chromaticity (CIE1931) | Red | $R_x$ | | 0.567 | 0.597 | 0.627 | | |
| | | $R_Y$ | | 0.328 | 0.358 | 0.388 | | |
| | Green | $G_x$ | | 0.290 | 0.320 | 0.350 | | |
| | | $G_Y$ | | 0.532 | 0.562 | 0.592 | | |
| | Blue | $B_x$ | | 0.125 | 0.155 | 0.185 | | |
| | | $B_Y$ | | 0.070 | 0.100 | 0.130 | | |
| | White | $W_x$ | | 0.283 | 0.313 | 0.343 | | |
| | | $W_y$ | | 0.299 | 0.329 | 0.359 | | |
| Viewing angle | Hor. | $\Theta_L$ | CR>10 | 70 | 80 | — | | (1)(4) |
| | | $\Theta_R$ | | 60 | 70 | — | | |
| | Ver. | $\Theta_U$ | | 70 | 80 | — | | |
| | | $\Theta_D$ | | 70 | 80 | — | | |
| Brightness uniformity | | $B_{UNI}$ | Θ=0 (9point) | 72 | 80 | — | | (5) |
| View Direction | | 9 O' clock | | | | | | (6) |

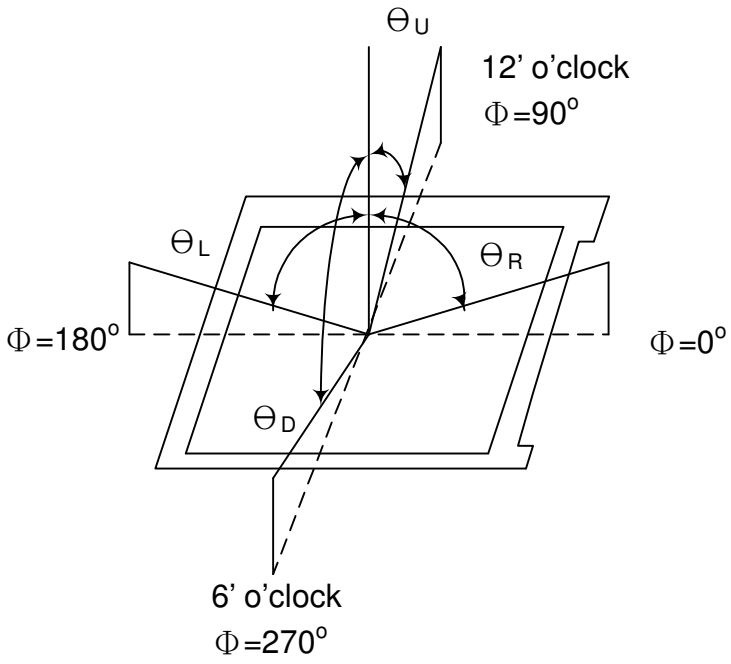
### 3.2 Measuring Condition

- Measuring surrounding：dark room
- LED current $I_L$: 100mA
- Ambient temperature：25±2°C
- 15min. warm-up time.

### 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

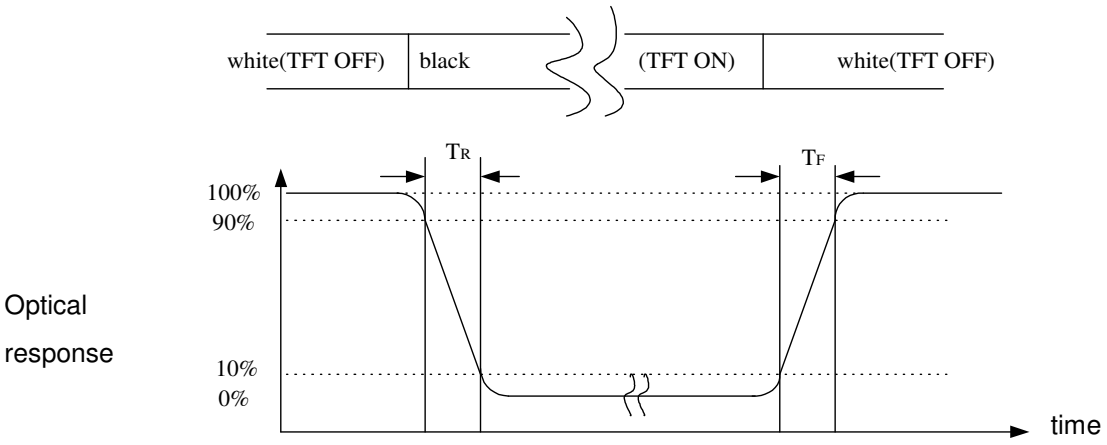
**Note (1)** Definition of Viewing Angle:



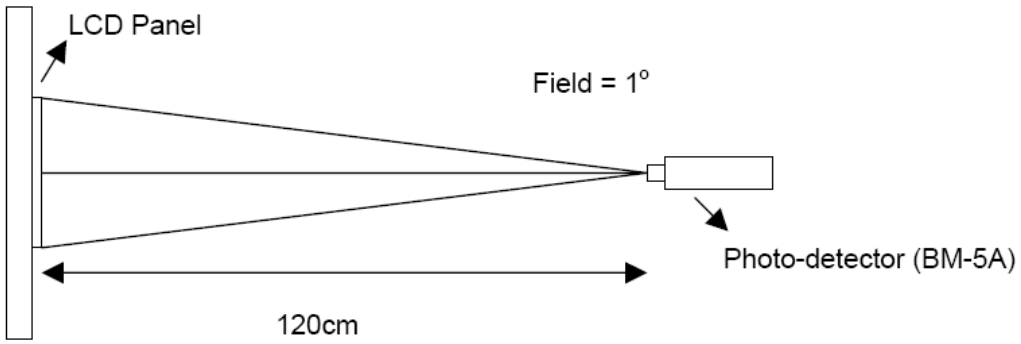

**Note (2)** Definition of Contrast Ratio (CR) :
measured at the center point of panel

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

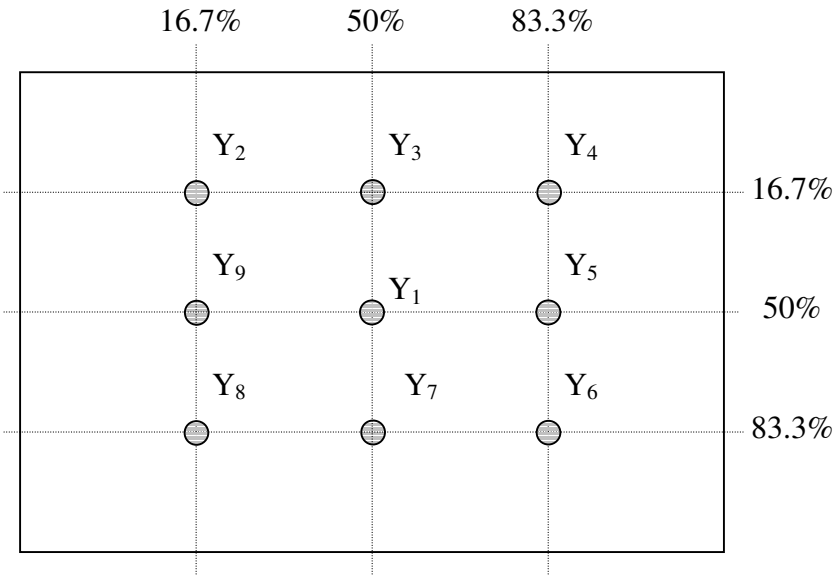
**Note (3)** Definition of Response Time : Sum of $T_R$ and $T_F$




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



**Note (5)** Definition of Average Luminance Uniformity of White (Center)
Definition of brightness uniformity

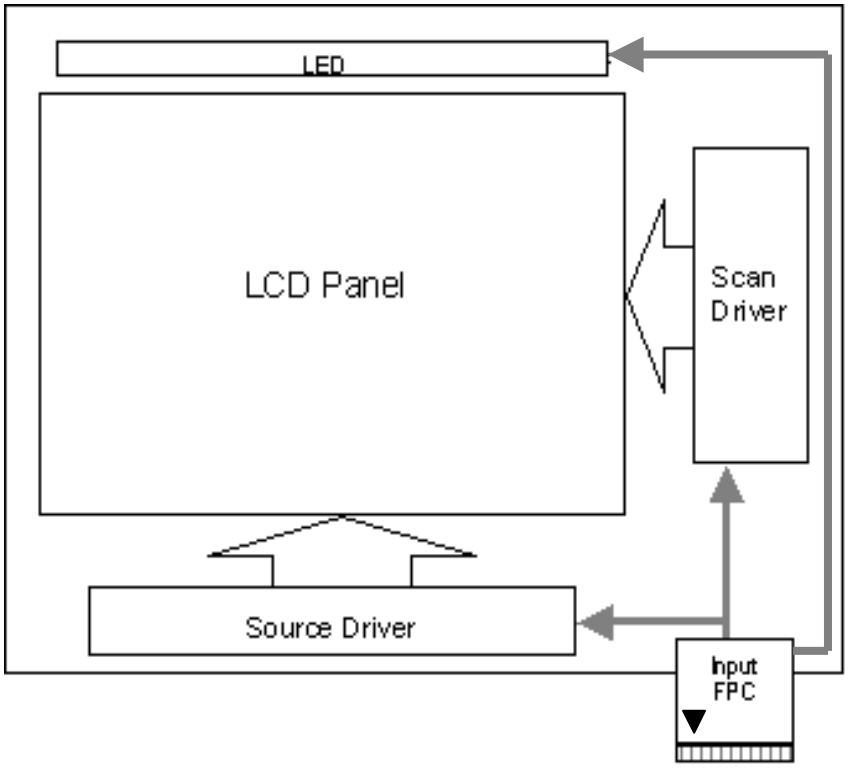



$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

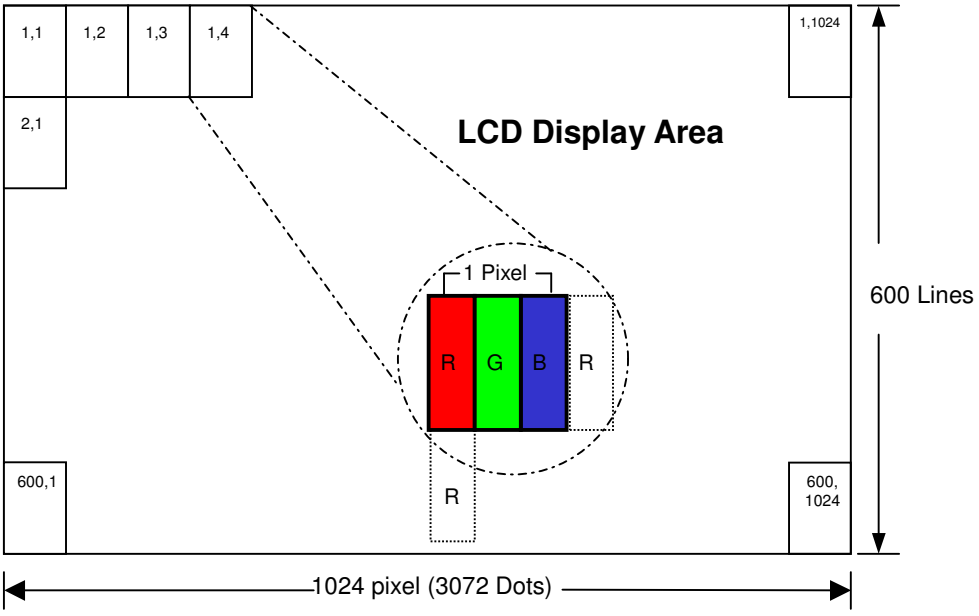
**Note (6)** Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction.)

# 4.0 BLOCK DIAGRAM

## 4.1 TFT LCD Module




## 4.2 Pixel Format



## Relationship Between Displayed Color and Input

### 4.2.1 8bit

| | Display | MSB R7 | R6 | R5 | R4 | R3 | R2 | R1 | LSB R0 | MSB G7 | G6 | G5 | G4 | G3 | G2 | G1 | LSB G0 | MSB B7 | B6 | B5 | B4 | B3 | B2 | B1 | LSB B0 | Gray scale Level |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | L | L | L | L | L | L | L | H | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L1 |
| | ↑ | L | L | L | L | L | L | H | L | 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 | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L | L | L | L | L | L | L | L | L1 |
| | ↑ | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | 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 | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | L1 |
| | ↑ | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | L | H | 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 | L | L | L | L | L | L | L | H | L | L | L | L | L | L | L | H | L | L | L | L | L | L | L | H | L1 |
| | ↑ | L | L | L | L | L | L | H | L | L | L | L | L | L | L | H | L | L | L | L | L | L | L | H | 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 | H | L | H | H | H | H | H | H | H | L | H | L253 |
| | | H | H | H | H | H | H | H | L | H | H | H | H | H | H | H | L | H | H | H | H | H | H | H | L | 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 |

## 5.0 INTERFACE PIN CONNECTION

FPC connector is used for electronics interface. The recommended model is AYF333135 manufactured by Panasonic

| Pin No. | Symbol | I/O | Function | Note |
|---|---|---|---|---|
| 1 | VDD 3.3V | P | Power Voltage for digital circuit | |
| 2 | VDD 3.3V | P | Power Voltage for digital circuit | |
| 3 | VDD 3.3V | P | Power Voltage for digital circuit | |
| 4 | NC | --- | No connection | |
| 5 | GND | P | Ground | |
| 6 | RXIN3+ | I | + LVDS differential data input | |
| 7 | RXIN3- | I | - LVDS differential data input | |
| 8 | GND | P | Ground | |
| 9 | RXIN2+ | I | + LVDS differential data input | |
| 10 | RXIN2- | I | - LVDS differential data input | |
| 11 | GND | P | Ground | |
| 12 | RXIN1+ | I | + LVDS differential data input | |
| 13 | RXIN1- | I | - LVDS differential data input | |
| 14 | GND | P | Ground | |
| 15 | RXIN0+ | I | + LVDS differential data input | |
| 16 | RXIN0- | I | - LVDS differential data input | |
| 17 | GND | P | Ground | |
| 18 | RXCLKIN+ | I | + LVDS differential clock input | |
| 19 | RXCLKIN- | I | - LVDS differential clock input | |
| 20 | GND | P | Ground | |
| 21 | LED_PWMI | I | LED PWM in | |
| 22 | CABC_EN0/SHLR | I | CABC_SEL | |
| 23 | Panel ID | I | Pull low | |
| 24 | CABC_EN1/UPDN | I | CABC_SEL | |
| 25 | LED_PWMO | O | LED PWM out | |
| 26 | GND | P | Ground | |
| 27 | VLED- | P | LED Cathode | |
| 28 | VLED- | P | LED Cathode | |
| 29 | NC | --- | No connection | |
| 30 | VLED+ | P | LED Anode | |
| 31 | VLED+ | P | LED Anode | |

I: input O: Output P: Power

# 6.0 ELECTRICAL CHARACTERISTICS

## 6.1 TFT LCD Module

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Supply Voltage | VDD | 3.0 | 3.3 | 3.6 | V | |
| Input signal voltage | ViH | 0.7 VDD | - | VDD | V | Note (1) |
| | ViL | 0 | - | 0.3 VDD | V | |
| Current of power supply | IDD | - | 109.3 | - | mA | VDD =3.3V |

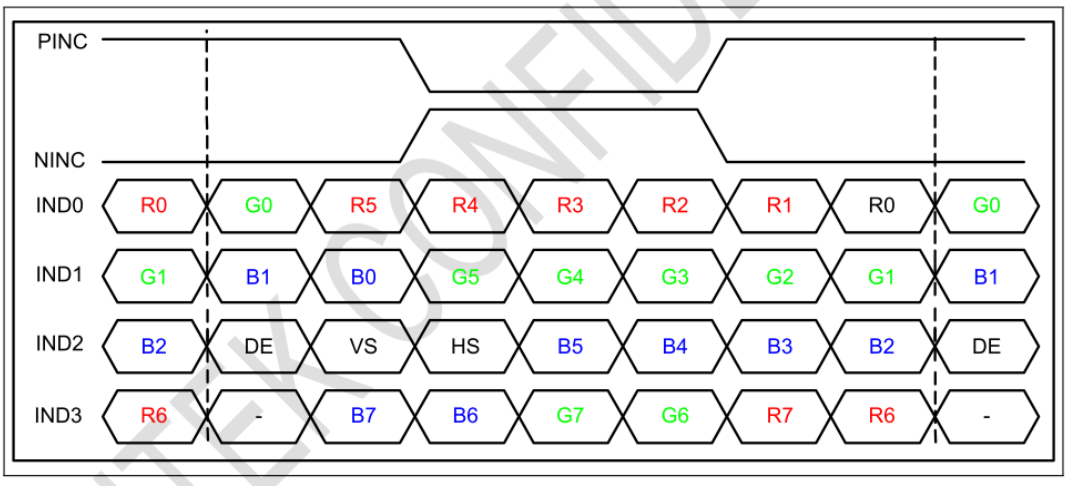
## 6.2 Switching Characteristics for LVDS Receiver

| Item | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| Differential Input High Threshold | Vth | — | — | 100 | mV | $V_{CM}$=1.2V |
| Differential Input Low Threshold | Vtl | -100 | — | — | mV | |
| Input Current | $I_{IN}$ | -10 | — | +10 | uA | |
| Differential input Voltage | $\|V_{ID}\|$ | 0.2 | — | 0.6 | V | |
| Common Mode Voltage Offset | $V_{CM}$ | 0.7 | 1.2 | 1.6 | V | |

## 6.3 Bit LVDS input

### 6.3.1 8bit LVDS input

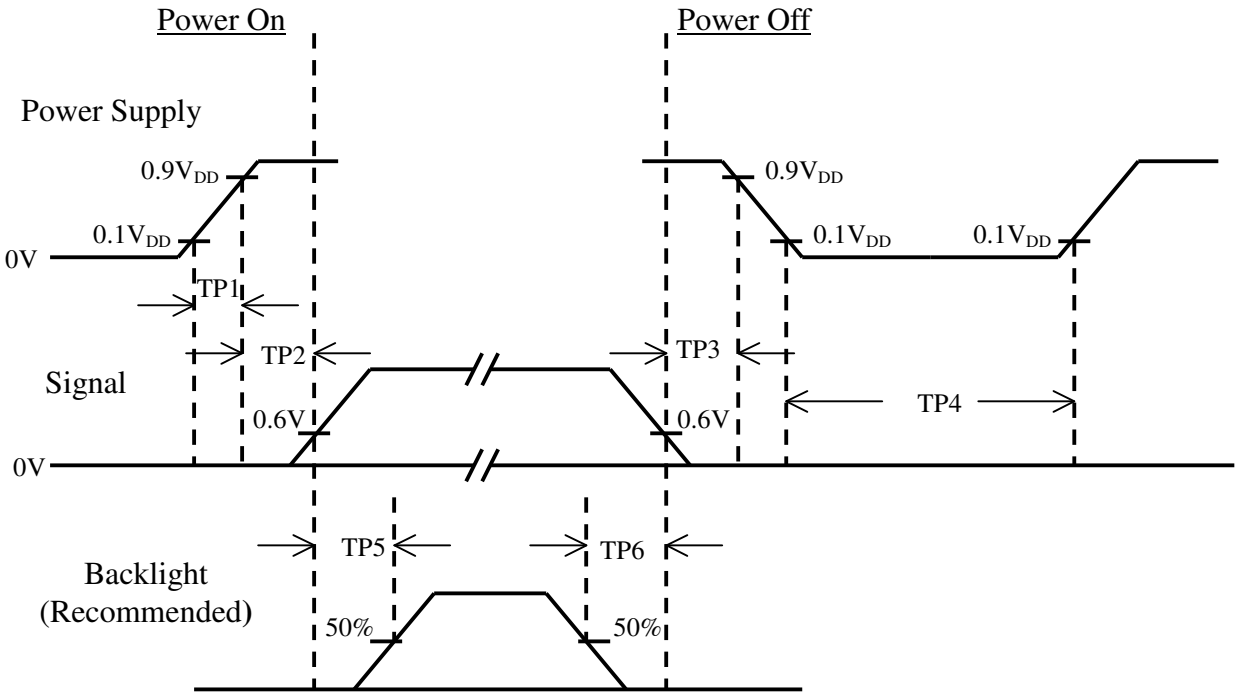
8bit LVDS input



### 6.4 Interface Timing (DE mode)

| Parameter | Symbol | Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| DCLK frequency @Frame rate=60hz | fclk | 40.8 | 51.2 | 67.2 | 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 | | 600 | | H |
| VSYNC period time | tv | 610 | 635 | 800 | H |
| VSYNC blanking | tvb+tvfp | 10 | 35 | 200 | H |

### 6.5 Power On / Off Sequence




| Item | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|
| TP1 | 0.5 | -- | 10 | msec | |
| TP2 | 0 | -- | 50 | msec | |
| TP3 | 0 | -- | 50 | msec | |
| TP4 | 500 | -- | -- | msec | |
| TP5 | 200 | -- | -- | msec | |
| TP6 | 200 | -- | -- | msec | |

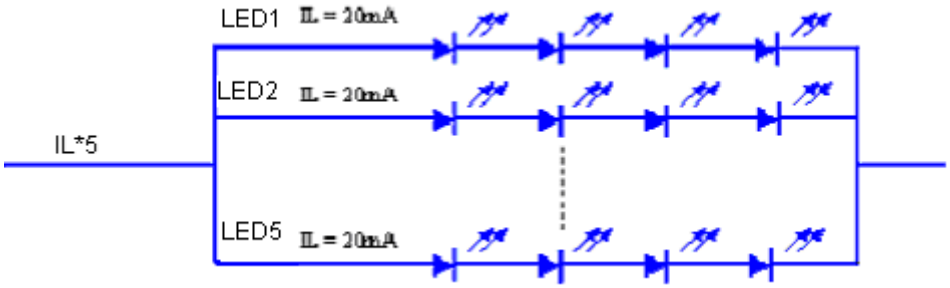
### 6.6 Backlight Unit

| Parameter | Symbol | Min | Typ | Max | Units | Condition |
|---|---|---|---|---|---|---|
| LED Current | $I_F$ | -- | -- | 100 | mA | Ta=25℃ |
| LED Voltage | $V_F$ | -- | 11.6 | 12 | Volt | Ta=25℃ |
| LED Life-Time | N/A | 20,000 | -- | -- | Hour | Ta=25℃<br>$I_F$=20mA<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℃ and IL=100mA. The LED lifetime could be decreased if operating IL is larger than 100mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit

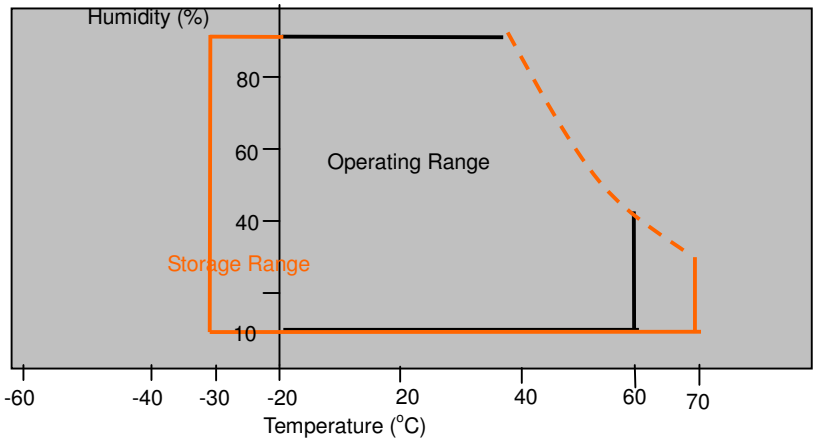


## 7.0 Reliability test items

| No. | Item | Conditions | Remark |
|---|---|---|---|
| 1 | High Temperature Storage | Ta=+70°C, 240hrs | |
| 2 | Low Temperature Storage | Ta=-30°C, 240hrs | |
| 3 | High Temperature Operation | Ta=+60°C, 240hrs | |
| 4 | Low Temperature Operation | Ta=-20°C, 240hrs | |
| 5 | Thermal Cycling Test (non operation) | -20°C(30min)→+60°C(30min),100 cycles | |
| 6 | Vibration | Sine Wave<br>1.5G, 5~500Hz, XYZ<br>30min/each direction | |
| 7 | Shock | Half-Sine, 200G, 2ms, ±XYZ, 1time | |

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

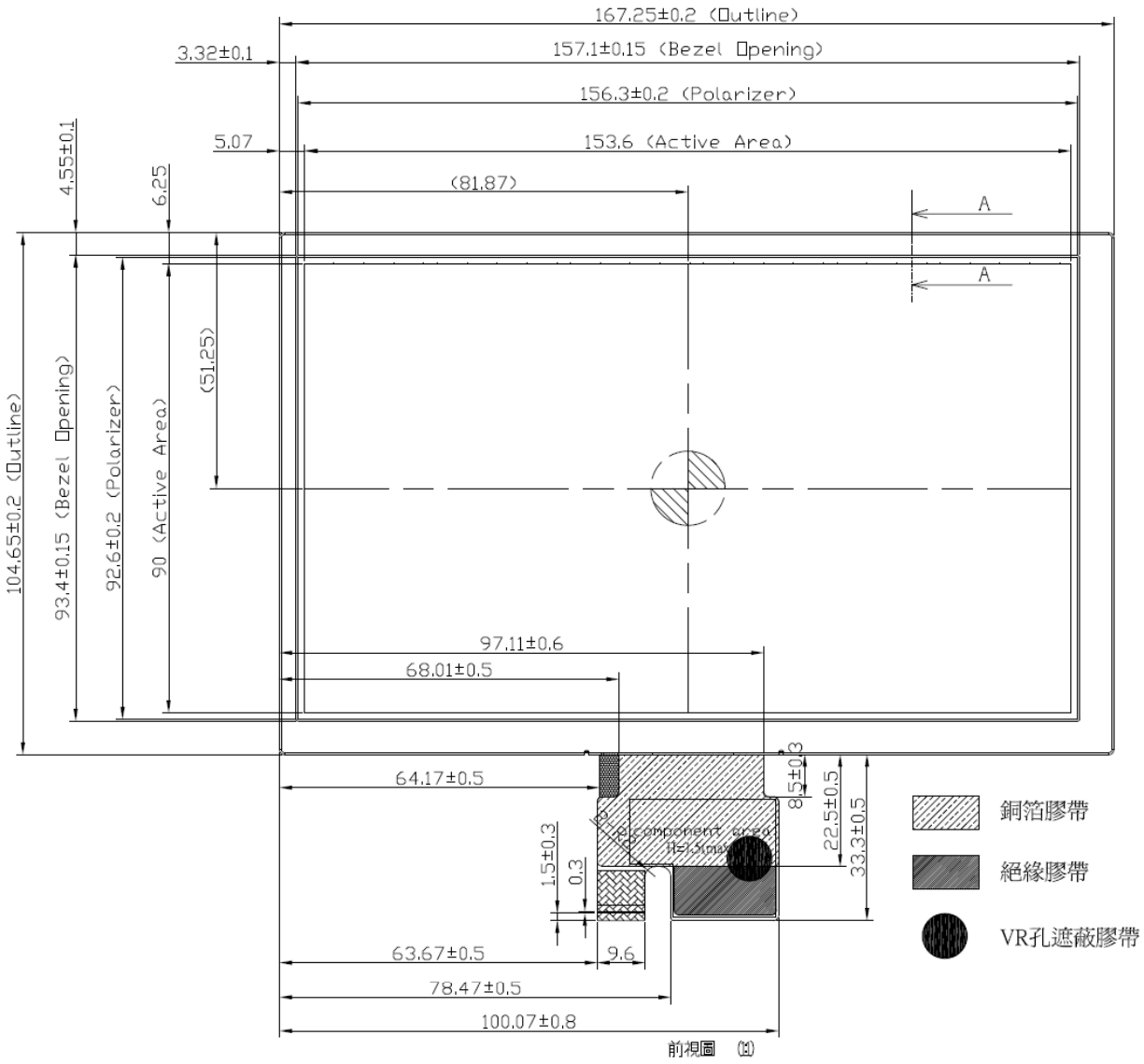
**Storage / Operating temperature**

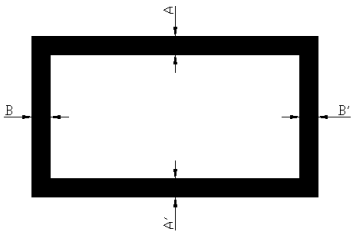



**Note .**Max wet bulb temp.=39°C

# 8.0 OUTLINE DIMENSION

## 8.1 Front View Outline Dimension



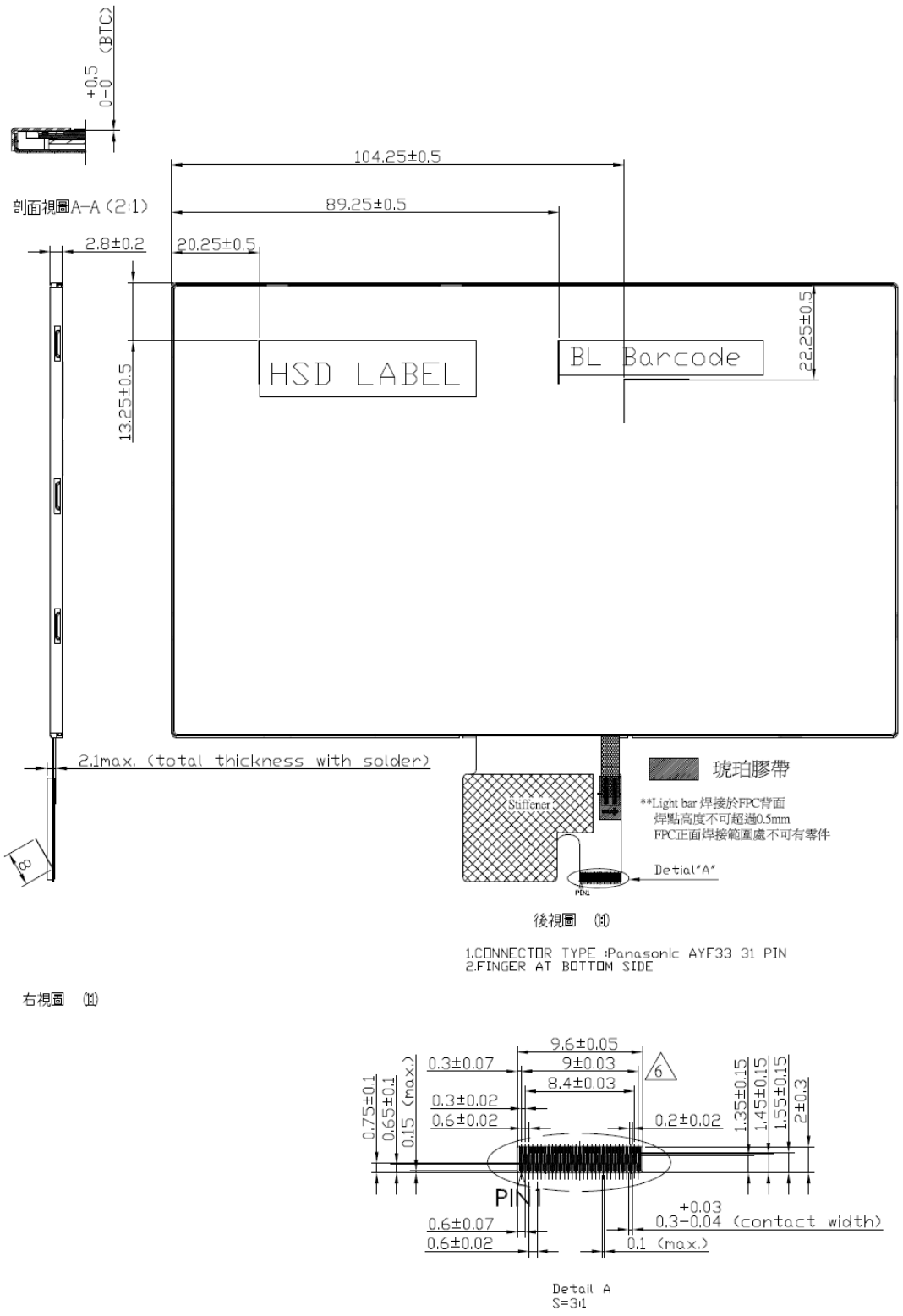




BM Assembly Tolerance

| A - A' | ≦ 1 (mm)

| B - B' | ≦ 1 (mm)

## 8.2 Back View Outline Dimension



## 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

| Year | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| 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 Location of Lot Mark

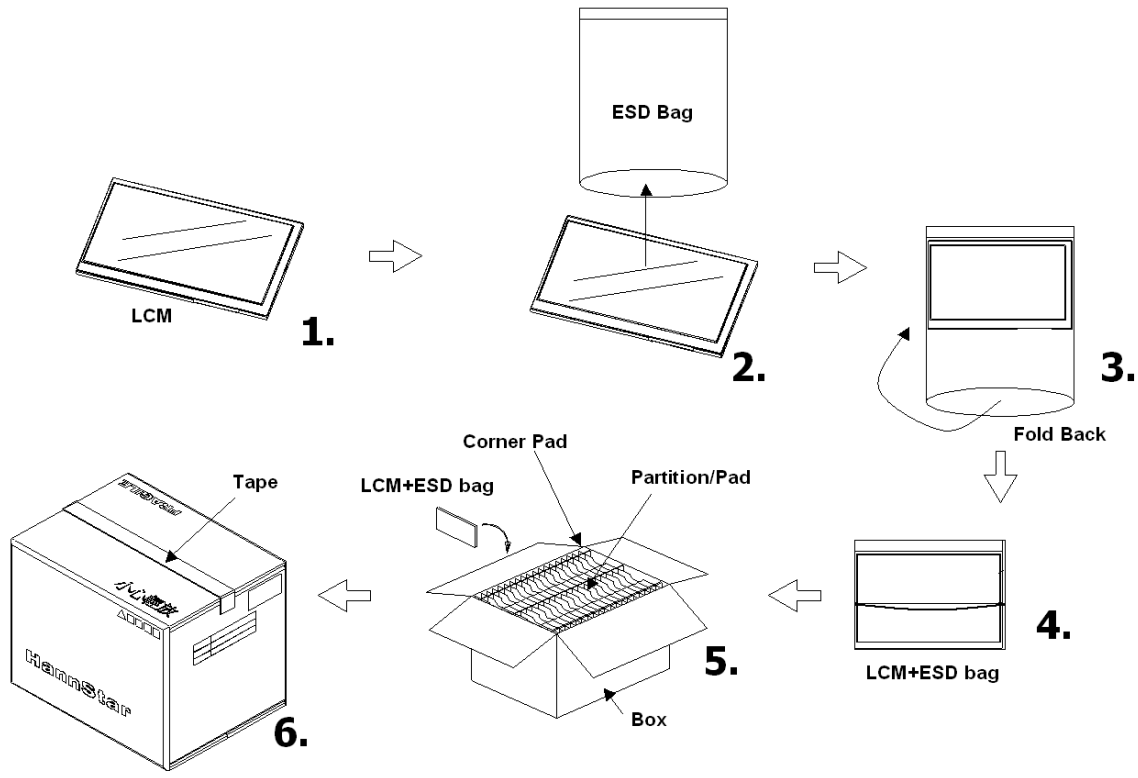
(1) Location : The lot mark is attched to the back side of the LCD module. See Product back view. ( Section 8.0 : OUTLINE DIMENSION )
(2) Detail of the Lot mark: Print 15 code as lot mark (see 9.1 Lot Mark)
(3) This is subject to change without prior notice.

# 10.0 PACKAGE SPECIFICATION

## 10.1 Packing form

| LCM Model | LCM Qty. in the box | Inner Box Size (mm) | Notice |
|---|---|---|---|
| HSD070PFW3-D** | 80pcs/box | 451mmx375mmx284mm | |

## 10.2 Packing assembly drawings




| | Material | Notice |
|---|---|---|
| Box | Corrugated Paper Board | (AB Flute) |
| Partition/Pad | Corrugated Paper Board | (B Flute) |
| Corner Pad | Corrugated Paper Board | (AB Flute) |
| ESD bag | PE | |

# 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.

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.