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TO :

Date : Jul.,03 , 2009

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

**Model: HSD101PFW3**  
**-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  | Jul., 03, 2009 | A**       | Tentative specification was first released |



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## 1.0 GENERAL DESCRIPTION

### 1.1 Introduction

HannStar Display model HSD101PFW3-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 10.1 (16:9) inch diagonally measured active display area with WSVGA (1024 horizontal by 600 vertical pixel) resolution.

### 1.2 Features

- 10.1 (16:9 diagonal) inch configuration
- One channel LVDS interface
- 262K color by 6 bit R.G.B signal input
- RoHS Compliance
- Halogen Free

### 1.3 Applications

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

### 1.4 General information

| Item              | Specification                     | Unit   |
|-------------------|-----------------------------------|--------|
| Outline Dimension | 243x 146.5 (typ) w/ Bracket & PCB | mm     |
| Display area      | 222.72(H) x 125.28(V)             | mm     |
| Number of Pixel   | 1024 RGB (H) x 600(V)             | pixels |
| Pixel pitch       | 0.2175(H) x 0.2088(V)             | mm     |
| Pixel arrangement | RGB Vertical stripe               |        |
| Display mode      | Normally white                    |        |
| NTSC              | 50                                | %      |
| Surface treatment | Glare, Hard-Coating (3H)          |        |
| Weight            | 160 (Max.)                        | g      |
| Back-light        | White LED                         |        |
| Power Consumption | 0.65 (Max)/Logic                  | W      |

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## 1.5 Mechanical Information

|             | Item           | Min.  | Typ.  | Max.  | Unit | Remark           |
|-------------|----------------|-------|-------|-------|------|------------------|
| Module Size | Horizontal (H) | 242.5 | 243   | 243.5 | mm   | W/ bracket & PCB |
|             | Vertical (V)   | 146   | 146.5 | 147   | mm   |                  |
|             | Depth (D)      | —     | 3.3   | 3.6   | mm   |                  |
| Weight      |                | —     | 152   | 160   | g    |                  |

## 2.0 ABSOLUTE MAXIMUM RATINGS

### 2.1 Electrical Absolute Rating

#### 2.1.1 TFT LCD Module

| Item                     | Symbol    | Min. | Max. | Unit | Note  |
|--------------------------|-----------|------|------|------|-------|
| LED Power Supply voltage | $V_{LED}$ | -0.3 | 6.0  | V    | GND=0 |
| Logic Supply voltage     | $V_{DD}$  | -0.3 | 6.0  | V    |       |

### 2.2 Environment Absolute Rating

| Item                  | Symbol    | Min. | Max. | Unit | Note |
|-----------------------|-----------|------|------|------|------|
| Operating Temperature | $T_{opa}$ | 0    | 50   | °C   |      |
| Storage Temperature   | $T_{stg}$ | -20  | 60   | °C   |      |

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### 3.0 OPTICAL CHARACTERISTICS

#### 3.1 Optical specification

| Item                               |       | Symbol           | Condition                         | Min.  | Typ.  | Max.  | Unit              | Note      |
|------------------------------------|-------|------------------|-----------------------------------|-------|-------|-------|-------------------|-----------|
| Contrast                           |       | CR               | Θ=0<br>Normal<br>viewing<br>angle | 400   | 500   | —     |                   | (1)(2)(4) |
| Response time                      |       | Tr               |                                   | —     | 4     | 8     | msec              | (1)(3)    |
|                                    |       | Tf               |                                   | —     | 12    | 24    |                   |           |
| White luminance<br>(5 point)       |       | Y <sub>L</sub>   |                                   | 160   | 180   | —     | cd/m <sup>2</sup> | (1)(4)(5) |
| Color<br>chromaticity<br>(CIE1931) | Red   | R <sub>x</sub>   |                                   | 0.555 | 0.605 | 0.655 |                   |           |
|                                    |       | R <sub>y</sub>   |                                   | 0.302 | 0.352 | 0.402 |                   |           |
|                                    | Green | G <sub>x</sub>   |                                   | 0.259 | 0.309 | 0.359 |                   |           |
|                                    |       | G <sub>y</sub>   |                                   | 0.487 | 0.537 | 0.587 |                   |           |
|                                    | Blue  | B <sub>x</sub>   |                                   | 0.099 | 0.149 | 0.199 |                   |           |
|                                    |       | B <sub>y</sub>   |                                   | 0.061 | 0.111 | 0.161 |                   |           |
|                                    | White | W <sub>x</sub>   | 0.263                             | 0.313 | 0.363 |       |                   |           |
|                                    |       | W <sub>y</sub>   | 0.279                             | 0.329 | 0.379 |       |                   |           |
| Viewing angle                      | Hor.  | Θ <sub>L</sub>   | CR>10                             | 40    | 45    | —     |                   | (1)(4)    |
|                                    |       | Θ <sub>R</sub>   |                                   | 40    | 45    | —     |                   |           |
|                                    | Ver.  | Θ <sub>U</sub>   |                                   | 10    | 15    | —     |                   |           |
|                                    |       | Θ <sub>D</sub>   |                                   | 30    | 35    | —     |                   |           |
| Brightness uniformity              |       | B <sub>UNI</sub> | Θ=0<br>(5point)                   | 80    | —     | —     | %                 | (5)       |
| Brightness Uniformity              |       | B <sub>UNI</sub> | Θ=0<br>(13 points)                | 70    | —     | —     | %                 | (6)       |

#### 3.2 Measuring Condition

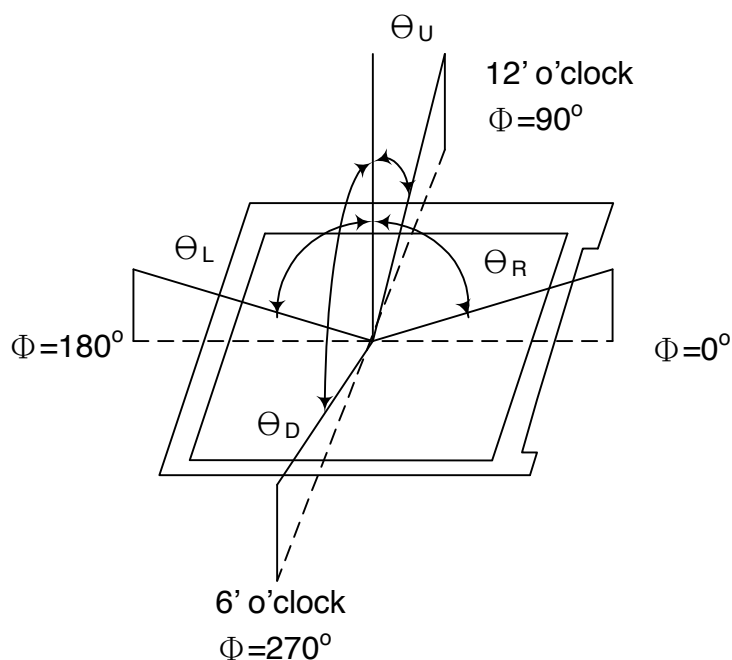
- Measuring surrounding : dark room
- Ambient temperature : 25±2°C
- 15min. warm-up time.

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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:

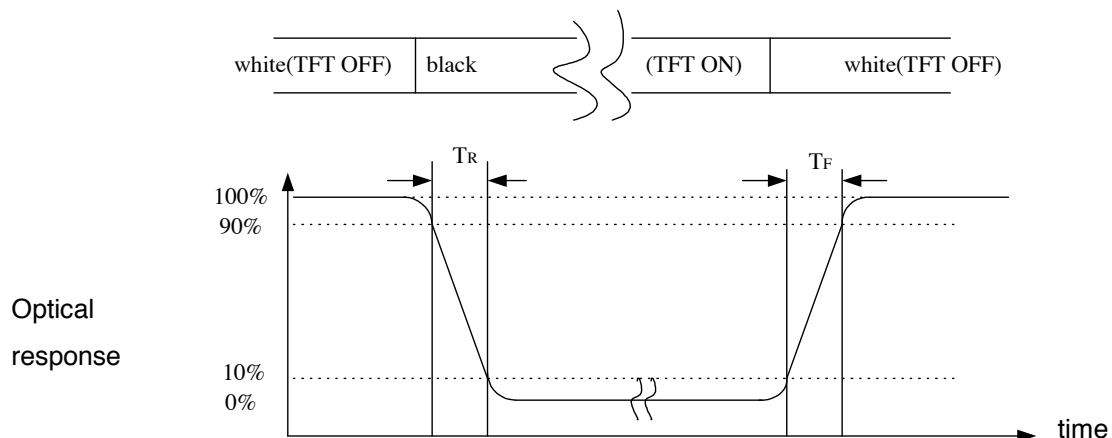


**Note (2)** Definition of Contrast Ratio (CR) :  
measured at the center point of panel

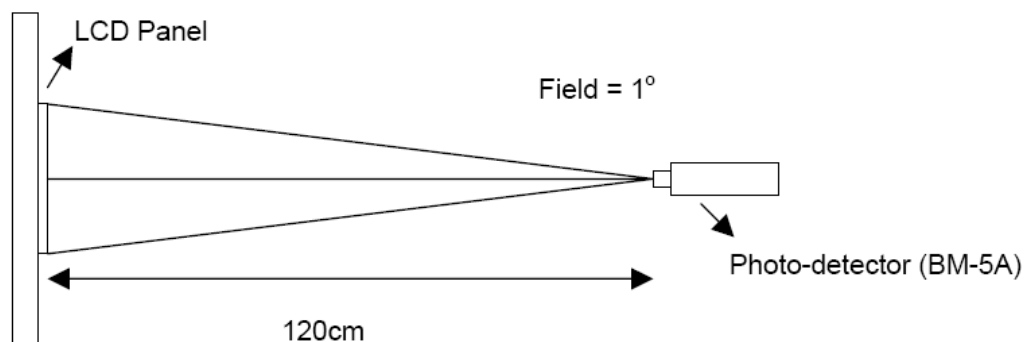
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

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



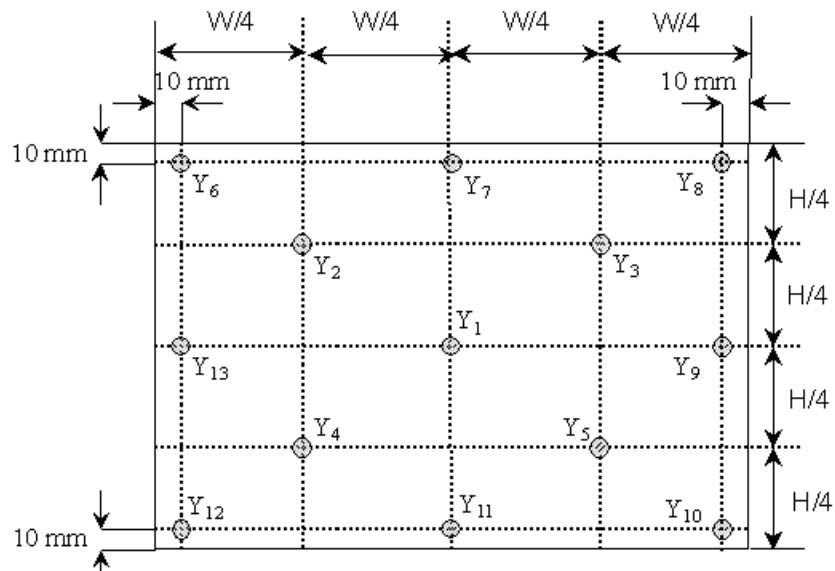
**Note (4)** Definition of optical measurement setup



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

$$\text{Average Luminance Uniformity} = \frac{Y_1 + Y_2 + Y_3 + Y_4 + Y_5}{5}$$



**Note (6)** Definition of brightness uniformity

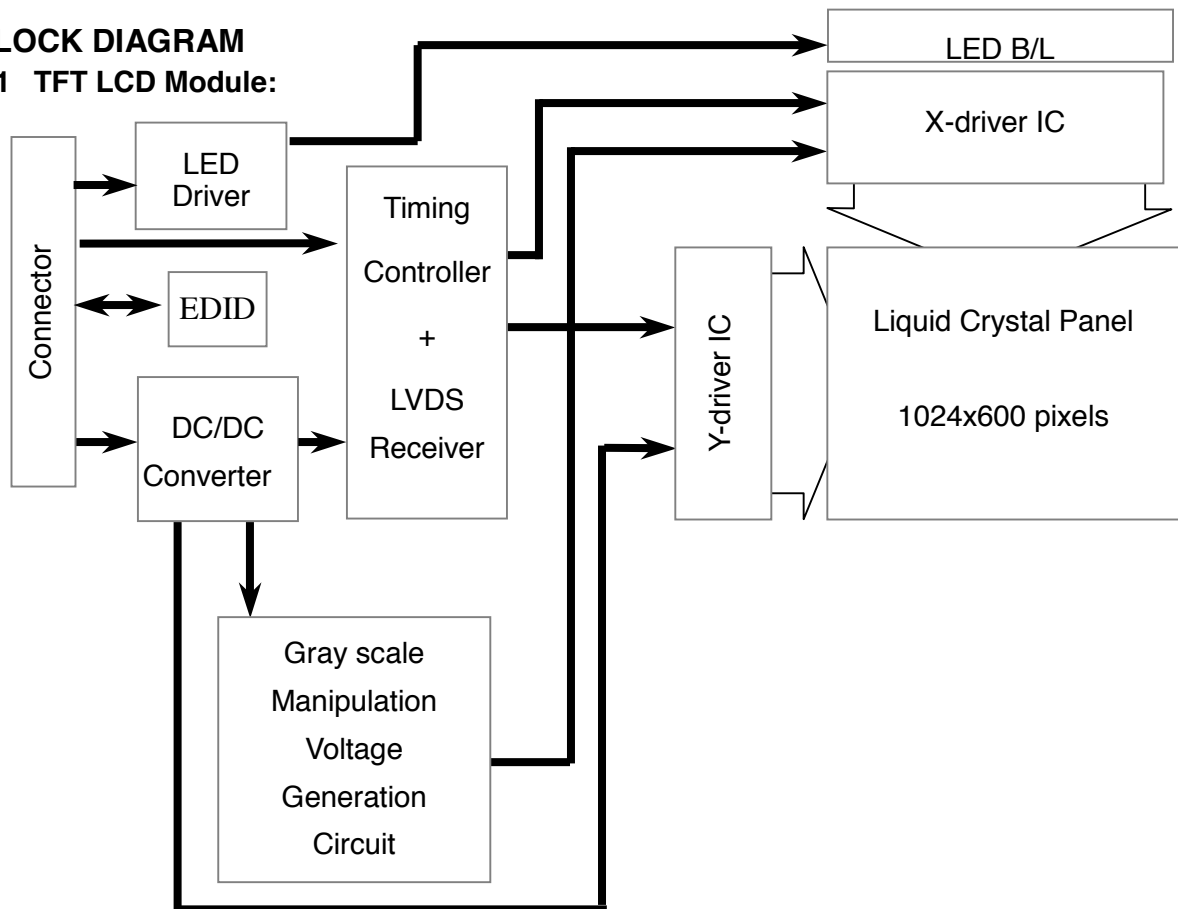
$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 5 points})}{(\text{Max Luminance of 5 points})} \times 100\%$$

$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 13 points})}{(\text{Max Luminance of 13 points})} \times 100\%$$

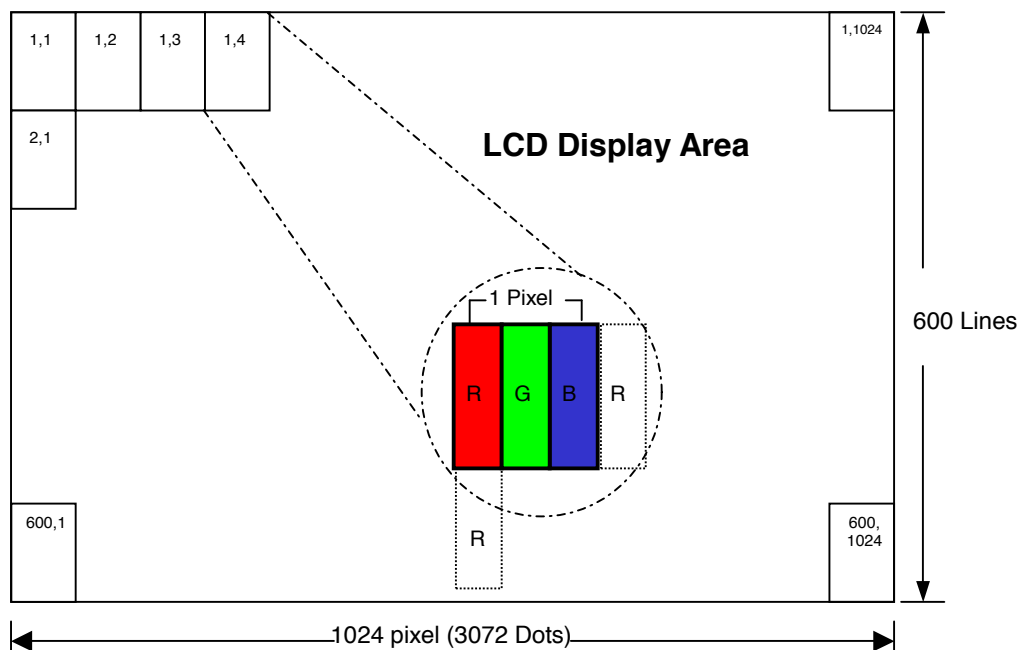
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## 4.0 BLOCK DIAGRAM

### 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       |     |  |  |  |  | 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  | L   | 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<br>↑<br>↓<br>Light     | L     | L  | L  | L  | L  | H  | L   | L  | L  | L  | L  | L  | L   | L  | L  | L  | L  | L   | L1        |     |  |  |  |  |                  |
|                         |                             | L     | L  | L  | L  | L  | H  | L   | L  | L  | L  | L  | L  | L   | L  | L  | L  | L  | L   | L         | L2  |  |  |  |  |                  |
|                         |                             | ⋮     |    |    |    |    |    | ⋮   |    |    |    |    |    | ⋮   |    |    |    |    |     | L3...L60  |     |  |  |  |  |                  |
|                         |                             | H     | H  | H  | H  | L  | H  | L   | 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   | 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<br>↑<br>↓<br>Light |                             | 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   | L         | L2  |  |  |  |  |                  |
|                         |                             | ⋮     |    |    |    |    |    | ⋮   |    |    |    |    |    | ⋮   |    |    |    |    |     | L3...L60  |     |  |  |  |  |                  |
|                         |                             | L     | L  | L  | L  | L  | L  | H   | H  | H  | H  | L  | H  | L   | 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   | 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<br>↑<br>↓<br>Light     | 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  | H  | L   | L         | L2  |  |  |  |  |                  |
|                         |                             | ⋮     |    |    |    |    |    | ⋮   |    |    |    |    |    | ⋮   |    |    |    |    |     | 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  | H   | H  | H  | H  | H  | H   | Blue L63  |     |  |  |  |  |                  |
|                         | Gray scale of White & Black | Black | 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  | H  | L   | L  | L  | L  | L  | H  | L   | L  | L  | L  | L  | H   | L1        |     |  |  |  |  |                  |
|                         |                             | L     | L  | L  | L  | L  | H  | L   | L  | L  | L  | H  | L  | L   | L  | L  | L  | H  | L   | L         | L2  |  |  |  |  |                  |
|                         |                             | ⋮     |    |    |    |    |    | ⋮   |    |    |    |    |    | ⋮   |    |    |    |    |     | L3...L60  |     |  |  |  |  |                  |
|                         |                             | H     | H  | H  | H  | L  | 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 INTERFACE PIN CONNECTION

### 5.1 TFT LCD Module : CN1 (Input signal): IPEX 20455-040E-12 (IPEX or equivalent)

| Pin | Signal   | Description                                        |
|-----|----------|----------------------------------------------------|
| 1   | GND      | Ground                                             |
| 2   | AVDD     | PowerSupply,3.3V(typical)                          |
| 3   | AVDD     | PowerSupply,3.3V(typical)                          |
| 4   | DVDD     | DDC3.3V power                                      |
| 5   | CABC_EN  | CABC function enable/disable<br>Default 0: Disable |
| 6   | SCL      | DDC Clock                                          |
| 7   | SDA      | DDC Data                                           |
| 8   | Rin0-    | - LVDSdifferential data input                      |
| 9   | Rin0+    | + LVDSdifferential data input                      |
| 10  | GND      | Ground                                             |
| 11  | Rin1-    | - LVDSdifferential data input                      |
| 12  | Rin1+    | + LVDSdifferential data input                      |
| 13  | GND      | Ground                                             |
| 14  | Rin2-    | - LVDSdifferential data input                      |
| 15  | Rin2+    | + LVDSdifferential data input                      |
| 16  | GND      | Ground                                             |
| 17  | ClkIN-   | - LVDSdifferential data input                      |
| 18  | ClkIN+   | + LVDSdifferential data input                      |
| 19  | GND      | Ground                                             |
| 20  | VDDA_EN  | VDDA on/off                                        |
| 21  | NC       | No Connection                                      |
| 22  | GND      | Ground                                             |
| 23  | NC       | No Connection                                      |
| 24  | NC       | No Connection                                      |
| 25  | GND      | Ground                                             |
| 26  | NC       | No Connection                                      |
| 27  | NC       | No Connection                                      |
| 28  | GND      | Ground                                             |
| 29  | NC       | No Connection                                      |
| 30  | NC       | No Connection                                      |
| 31  | VLED_GND | LED Ground                                         |
| 32  | VLED_GND | LED Ground                                         |
| 33  | VLED_GND | LED Ground                                         |
| 34  | NC       | No Connection                                      |
| 35  | PWM      | System PWM Signal Input                            |
| 36  | VLED_EN  | LED enable pin(+3.3V input)/VLED on/off            |

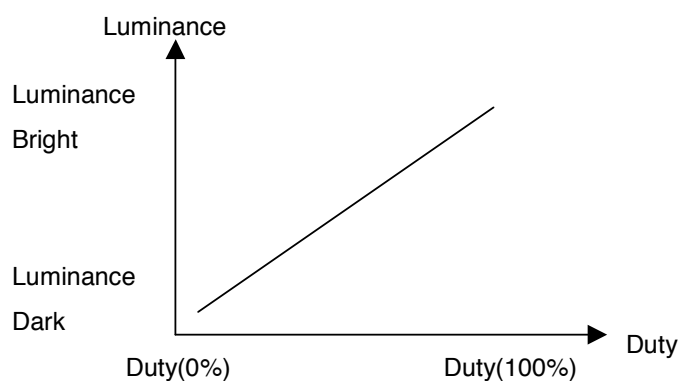
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|    |      |                    |
|----|------|--------------------|
| 37 | NC   | No Connection      |
| 38 | VLED | LED Power Supply5V |
| 39 | VLED | LED Power Supply5V |
| 40 | VLED | LED Power Supply5V |

**Note :** The brightness of LCD panel could be changed by adjusting PWM

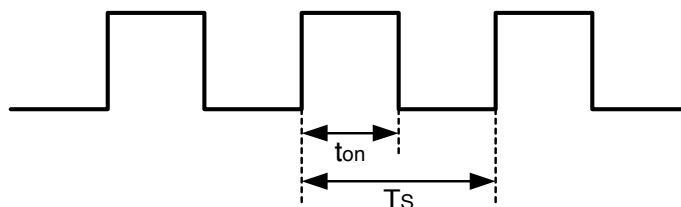
**[Note]**

**(1) ADJ can adjust brightness to control Pin. Pulse duty the bigger the brighter.**



**(2) ADJ Signal=0~3.3V , Operation Conditions :**

| Parameter            | Symbol     | Conditions | Min | Typ | Max | Unit |
|----------------------|------------|------------|-----|-----|-----|------|
| ADJ Logic-High Level | $V_{ADJH}$ |            | 1.8 | 3.3 | 3.6 | V    |
| ADJ Logic-Low Level  | $V_{ADJL}$ |            | 0   | 0   | 0.4 | V    |
| Dimming Frequency    | $F_{ADJ}$  |            | 18  | 20  | 22  | kHz  |
| Dimming Duty Cycle   | D          |            | 20  | --  | 100 | %    |



$$D = t_{on} / T_s \times 100\%$$

$$F_{ADJ} = 1 / T_s$$

|                |                                      |          |       |
|----------------|--------------------------------------|----------|-------|
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**(3) VLED\_EN & VDDA\_EN , Operation Conditions :**

| Parameter                                                       | Symbol      | Min | Typ | Max | Units | Remark  |
|-----------------------------------------------------------------|-------------|-----|-----|-----|-------|---------|
| LED enable pin<br>(control LED driver circuit<br>on/off)        | LED_EN (H)  | 3.0 | 3.3 | 3.6 | Volt  | LED on  |
|                                                                 | LED_EN (L)  | --  | 0   | 0.2 |       | LED off |
| VDD on/off signal<br>(control Panel VDD power<br>source on/off) | VDDA_EN (H) | 3.0 | 3.3 | 3.6 | Volt  | VDD on  |
|                                                                 | VDDA_EN (L) | --  | 0   | 0.2 |       | VDD off |

|                |                                      |          |       |
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## 6.0 ELECTRICAL CHARACTERISTICS

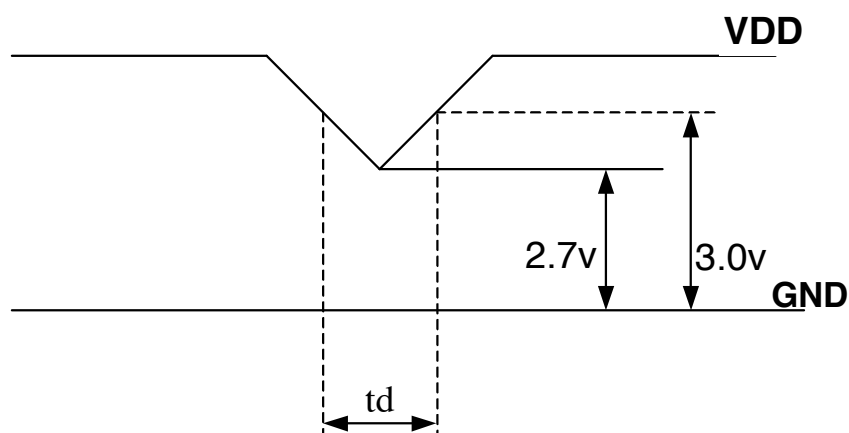
### 6.1 TFT LCD Module

| Item                    | Symbol     | Min. | Typ.   | Max. | Unit | Note                                                         |
|-------------------------|------------|------|--------|------|------|--------------------------------------------------------------|
| Supply Voltage          | $V_{DD}$   | 3.0  | 3.3    | 3.6  | V    | Note (1)                                                     |
| Current of power supply | $I_{DD}$   | -    | (0.19) | -    | A    | $V_{DD}=3.3V$<br>$T_a=25^{\circ}C$ $f_v=60Hz$<br>Note (2)(3) |
| Inrush current          | $I_{RUSH}$ | -    | -      | 1.50 | A    | Note (4)                                                     |

**Note** : (1)  $V_{DD}$ -dip condition :

When  $V_{DD}$  operating within  $2.7V \leq V_{DD} < 3.0V$  ,  $t_d \leq 10ms$  , the display may momentarily become abnormal .

$V_{DD} < 2.7V$ ,  $V_{DD}$  dip condition should also follow the Power On/Off conditions for supply voltage.

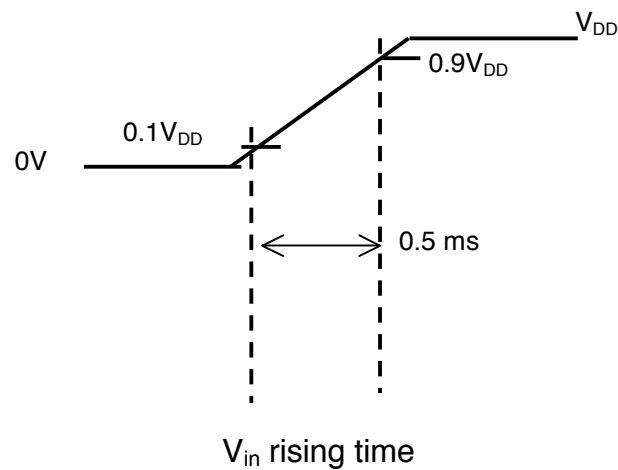
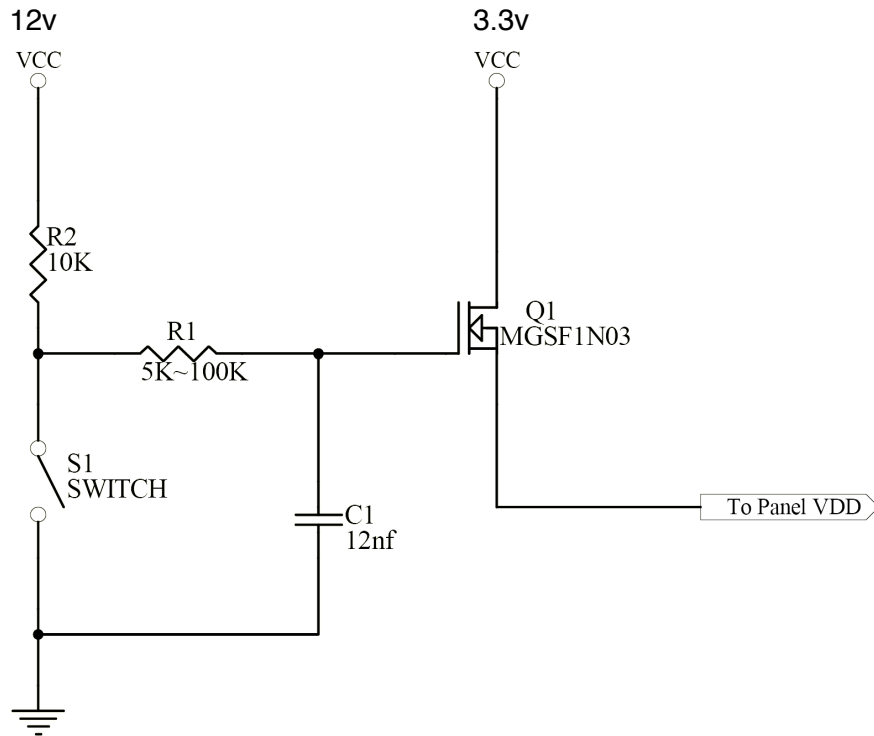


(2) Maximum Measurement Condition: Black Pattern

(3) Typical Measurement Condition: Mosaic Pattern

|                |                                      |          |       |
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#### (4) Power on Inrush current test circuit

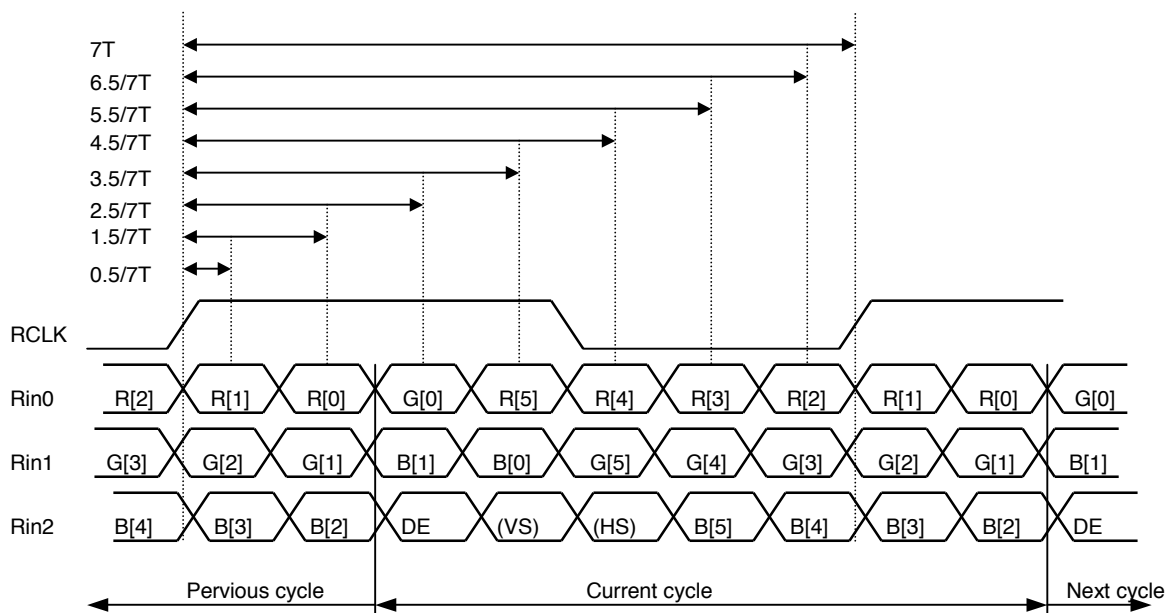


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## 6.2 Switching Characteristics for LVDS Receiver

| 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                    | $\mu A$ |               |
| Differential input Voltage        | $ V_{ID} $ | 0.1            | —    | 0.6                    | V       |               |
| Common Mode Voltage Offset        | $V_{CM}$   | $( V_{ID} /2)$ | 1.25 | $1.8-0.4-( V_{ID} /2)$ | V       |               |

## 6.3 Bit Mapping & Interface Definition



LVDS Receiver Input Timing Definition  
for 6bits LVDS input

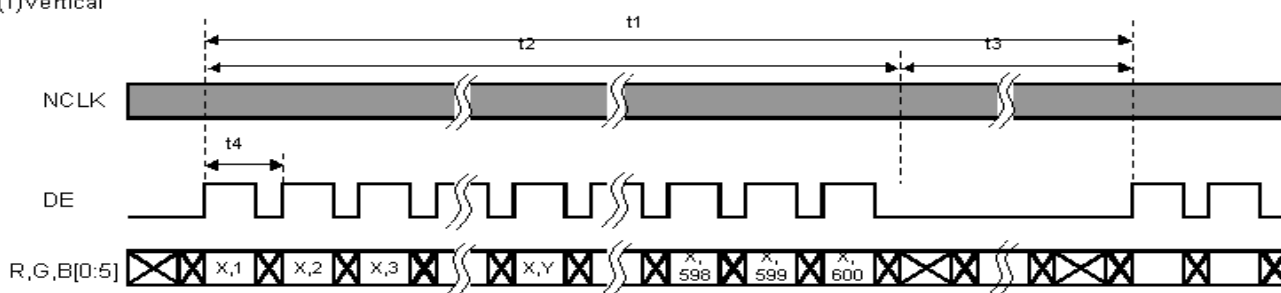
|                |                                      |          |       |
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#### 6.4 Interface Timing (DE mode)

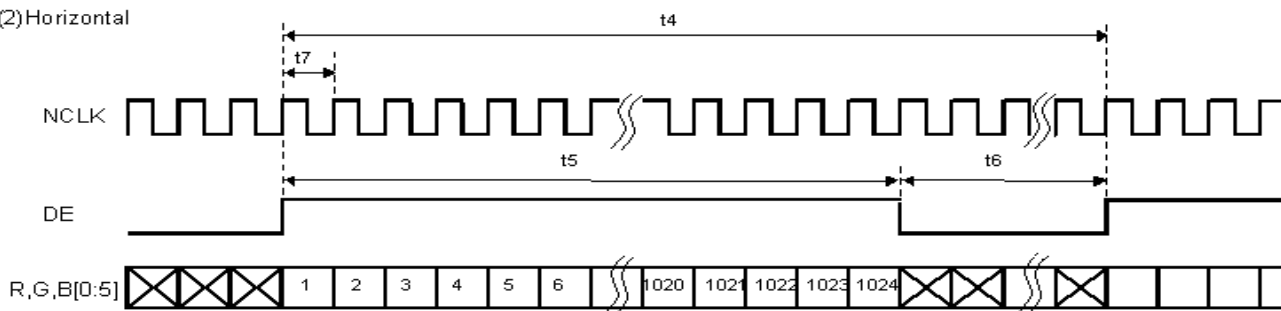
| Item                     | Symbol | Min. | Typ. | Max.  | Unit  |
|--------------------------|--------|------|------|-------|-------|
| Frame Rate               | --     | 55   | 60   | 65    | Hz    |
| Frame Period             | t1     | 612  | 625  | 638   | line  |
| Vertical Display Time    | t2     | 600  | 600  | 600   | line  |
| Vertical Blanking Time   | t3     | 12   | 25   | 38    | line  |
| 1 Line Scanning Time     | t4     | 1160 | 1200 | 1240  | clock |
| Horizontal Display Time  | t5     | 1024 | 1024 | 1024  | clock |
| Horizontal Blanking Time | t6     | 136  | 176  | 216   | clock |
| Clock Rate               | t7     | 39   | 45   | 51.42 | MHz   |

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

(1) Vertical

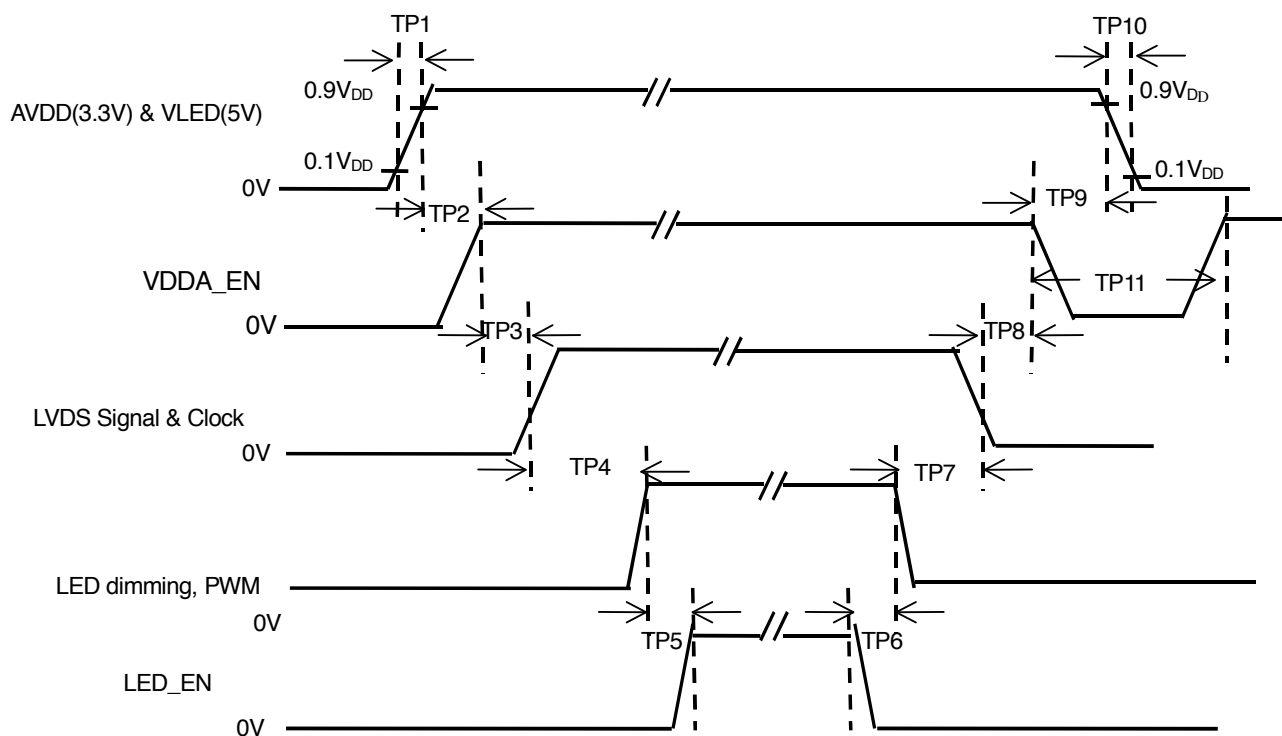


(2) Horizontal



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



| Item | Min. | Typ. | Max. | Unit | Remark        |
|------|------|------|------|------|---------------|
| TP1  | 0.5  | --   | 10   | msec |               |
| TP2  | 10   | --   | --   | msec |               |
| TP3  | 30   | 40   | 90   | msec |               |
| TP4  | 200  | --   | --   | msec |               |
| TP5  | 10   | --   | --   | msec |               |
| TP6  | 0    | --   | --   | msec |               |
| TP7  | 110  | --   | --   | msec |               |
| TP8  | 0    | 16   | 80   | msec |               |
| TP9  | 0    | --   | --   | msec | Must exceed 0 |
| TP10 | --   | 10   | 30   | msec |               |
| TP11 | 1000 | --   | --   | msec |               |

|                |                                      |          |       |
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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) TP4 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.

## 6.6 Backlight Unit

| Parameter             | Symbol    | Min    | Typ    | Max     | Units | Condition                                                 |
|-----------------------|-----------|--------|--------|---------|-------|-----------------------------------------------------------|
| LED Current           | $I_F$     | --     | (17.5) | (18.55) | mA    | $T_a=25^{\circ}\text{C}$                                  |
| LED Voltage           | $V_F$     | 3.0    | 3.2    | 3.4     | Volt  | $T_a=25^{\circ}\text{C}$                                  |
| LED Power consumption | $P_{LED}$ | --     | (1.34) | (1.51)  | Watt  | $T_a=25^{\circ}\text{C}$<br>Note (1)                      |
| LED Life-Time         | N/A       | 10,000 | --     | --      | Hour  | $T_a=25^{\circ}\text{C}$<br>$I_F=20\text{mA}$<br>Note (2) |

**Note (1):** Calculator value for reference  $P=I_F \times V_F \times N$  (LED Qty')

**Note (2):** The LED lifetime defines as the estimated time to 50% degradation of final luminous.

## 6.7 LED Driver

### 6.7.1 Absolute Maximum Ratings

| Item                     | Symbol            | Min. | Max. | Unit | Note |
|--------------------------|-------------------|------|------|------|------|
| LED Power Supply voltage | $V_{LED}$         | -0.3 | 6    | Volt |      |
| LED_EN, PWM pin Voltage  | $V_{EN}, V_{PWM}$ | --   | 5.5  | Volt |      |

|                |                                      |          |       |
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### 6.7.2 DC Electrical Characteristics

| Parameter                | Symbol     | Min | Typ | Max | Units | Remark |
|--------------------------|------------|-----|-----|-----|-------|--------|
| LED Power Supply Voltage | $V_{LED}$  | 4.5 | --  | 5.5 | Volt  |        |
| PWM High Threshold       | $V_{PWMH}$ | 3.0 | --  | --  | Volt  |        |
| PWM Low Threshold        | $V_{PWML}$ | --  | --  | 0.2 | Volt  |        |

### 6.8 Color engine and CABC DC Electrical Characteristics

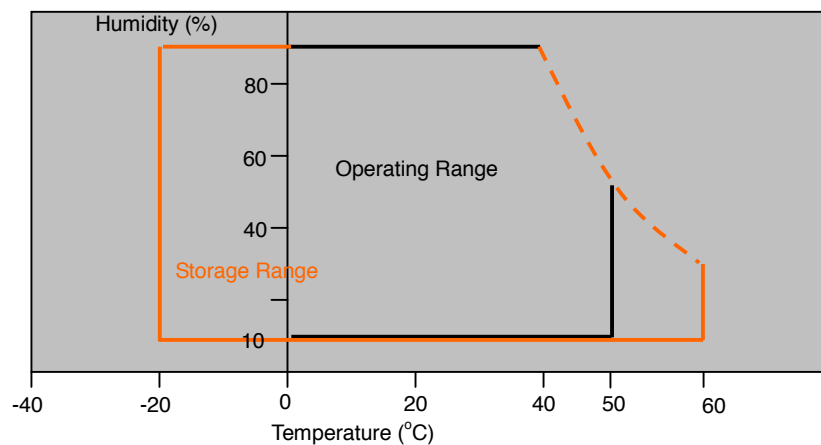
| Parameter              | Symbol      | Min         | Typ | Max         | Units | Remark |
|------------------------|-------------|-------------|-----|-------------|-------|--------|
| CABC_EN High Threshold | $V_{CABCH}$ | $0.7V_{DD}$ | --  | --          | Volt  |        |
| CABC_EN Low Threshold  | $V_{CABCL}$ | --          | --  | $0.3V_{DD}$ | Volt  |        |

|                |                                      |          |       |
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## 7.0 Reliability test items

| No. | Item                                 | Conditions                                              | Remark |
|-----|--------------------------------------|---------------------------------------------------------|--------|
| 1   | High Temperature Storage             | Ta=+60°C, 240hrs                                        |        |
| 2   | Low Temperature Storage              | Ta=-20°C, 240hrs                                        |        |
| 3   | High Temperature Operation           | Ta=+50°C, 500hrs                                        |        |
| 4   | Low Temperature Operation            | Ta=0°C, 500hrs                                          |        |
| 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                       |        |

### Storage / Operating temperature



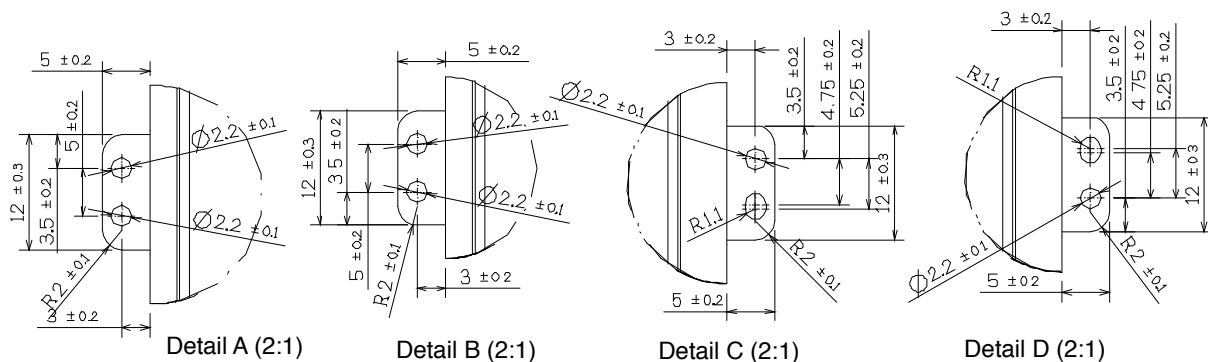
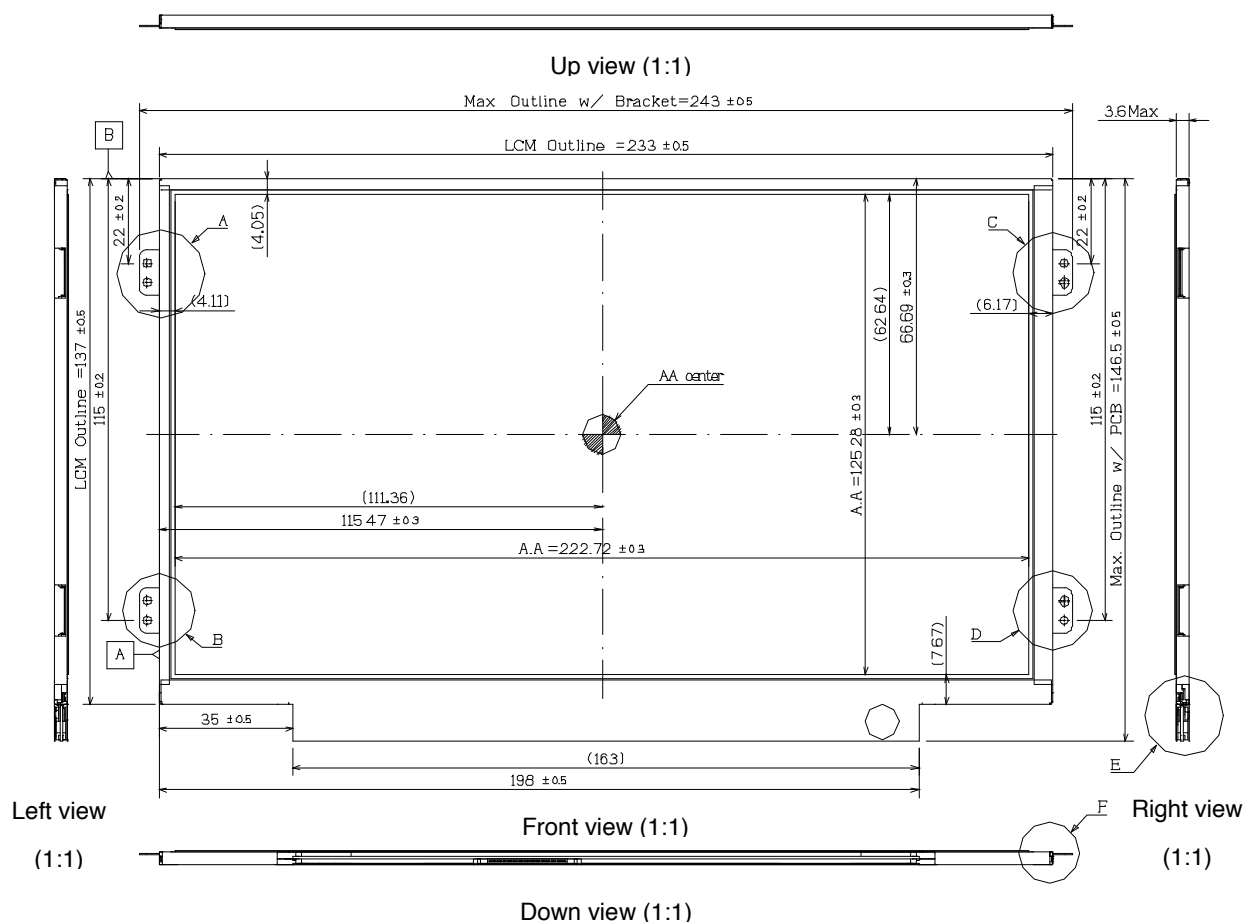
**Note** .Max wet bulb temp.=39°C

|                |                                      |          |       |
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## 8.0 OUTLINE DIMENSION

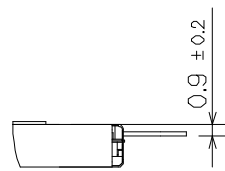
### 8.1 Front View Outline Dimension

**Unit : mm**

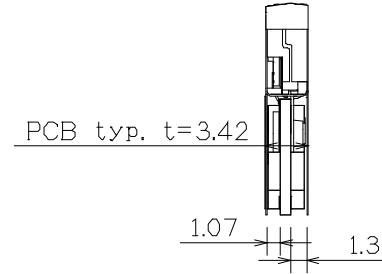


General tolerance: +/- 0.3

|                |                                      |          |       |
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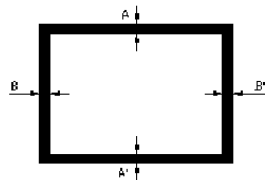
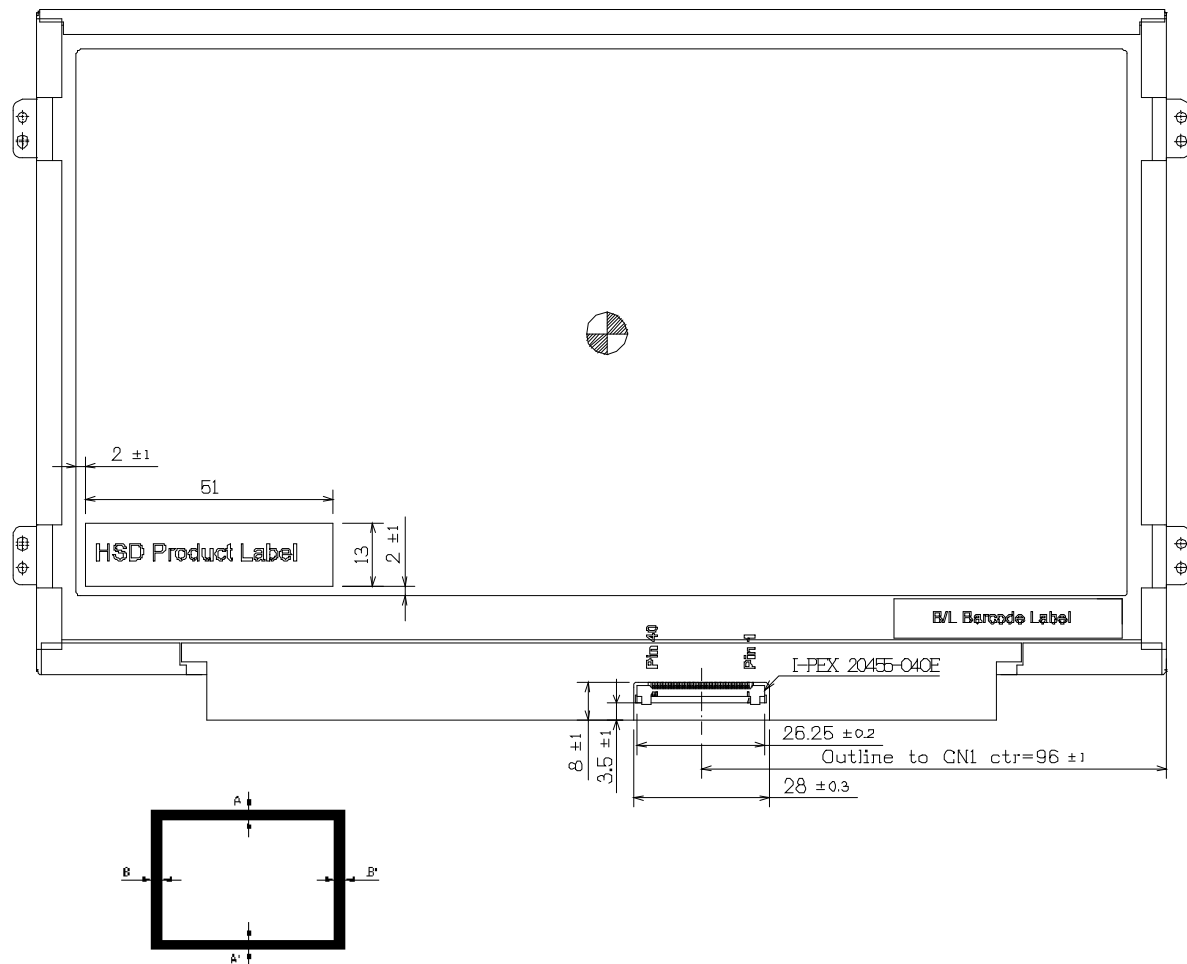


Detail F (2:1)



Detail E (2:1)

## 8.2 Back View Outline Dimension



BM Assembly Tolerance

 $|A-A'| \leq 1.0 \text{ (mm)}$ 
 $|B-B'| \leq 1.0 \text{ (mm)}$

|                |                                      |          |       |
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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

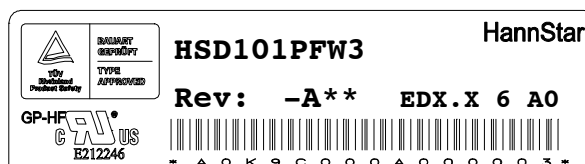
|      |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|------|
| Year | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
| Mark | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 0    |

#### 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 label is attached to the backside of the LCD module. See Product back view. ( Section 8.0 : OUTLINE DIMENSION )
- (2) Detail of the Mark : As attached below
- (3) This is subject to change without prior notice.



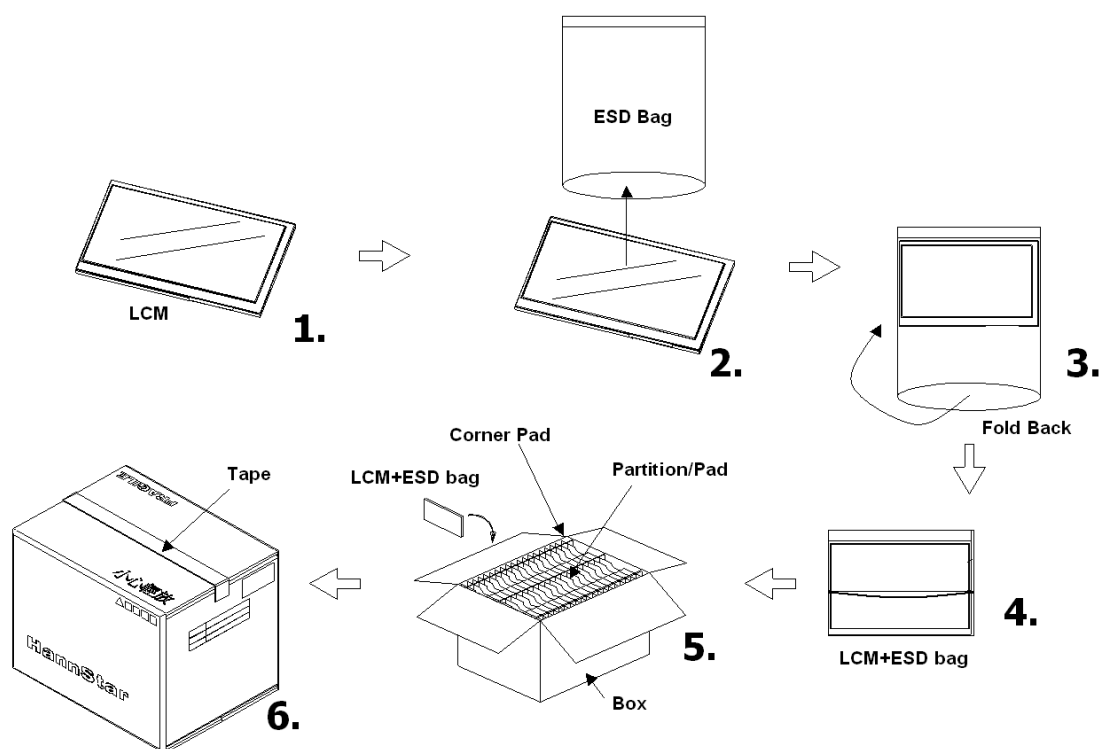
|                |                                      |          |       |
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## 10.0 PACKAGE SPECIFICATION

### 10.1 Packing form

| LCM Model    | LCM Qty. in the box | Inner Box Size (mm)       | Notice |
|--------------|---------------------|---------------------------|--------|
| HSD101PFW3-A | 40pcs/box           | 565x316 x240 <sup>H</sup> |        |

### 10.2 Packing assembly drawings



| HSD101PFW3-A  | Material               | Notice   |
|---------------|------------------------|----------|
| Box           | Corrugated Paper Board | AB Flute |
| Partition/Pad | Corrugated Paper Board | B Flute  |
| Pad           | Corrugated Paper Board | B Flute  |
| ESD bag       | PE                     | --       |

|                |                                      |          |       |
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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.