

# Specification

## G070VVN01.1

**Note: This specification is subject to change without prior notice**

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## Record of Revision

| Version | Revise Date | Page  | Old description  |
|---------|-------------|-------|--|
| 0.0     | 2013/3/27   | -     | First draft of preliminary specification.  |
| 0.1     | 2013/4/8    | 5     | Revise 2.2 Display Characteristics   |
|         |             | 20    | Add 8. Mechanical Characteristics  |
| 1.0     | 2013/08/19  | 5     | Typical Power Consumption : 2688mW   |
|         |             | 6     | Color / Chromaticity Coordinates (CIE 1931) : TBD<br>Contrast Ratio : TBD (min.)   |
|         |             | 11    | VDD Current/VDD Power : TBD  |
|         |             | 16    | Modify Power on sequence : Add internal power  |
|         |             | 21    | SN Lable: C070FW01 V0  |
|         |             | 21    | Packing information<br>Max. capacity: 45 pieces TFT-LCD module per carton<br>Max. weight: 13.0 kg per carton<br>Outside dimension of carton: 600(L)mm* 353(W)mm* 210(H)mm<br>Pallet : 1230(L)mm* 1110(W)mm* 135(H)mm |
| 1.1     | 2013/8/27   | 21    | Enlarge 9.1 Shipping Label (on the rear side of TFT-LCD display)   |
| 1.2     | 2013/8/28   | 10    | Update 4.1 Absolute Ratings of Driving Condition   |
| 1.3     | 2013/9/9    | 14,15 | Modify 6.4 TFT- LCD Pin Assignment Description   |
| 1.4     | 2013/10/17  | 21    | Modify 9.1 Shipping Label (on the rear side of TFT-LCD display)  |
|         |             | All   | Modify module name from G070VFN01.1 to G070VFN01.100   |
| 1.5     | 2013/10/29  | 21    | Modify 9.1 Shipping Label (on the rear side of TFT-LCD display)  |
|         |             |       |  |
|         |             |       |  |
|         |             |       |  |
|         |             |       |  |
|         |             |       |  |
|         |             |       |  |

## 1. Operating Precautions

- 1) Display area (Polarizer) of TFT-LCD Module is easily to be damaged, please be cautious and not to scratch it.
- 2) Be sure to power off your machine before connecting or disconnecting your signal cable to TFT-LCD Module.
- 3) Wipe off water drop on display area immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or soft cloth.
- 5) Display area (Glass) of TFT-LCD Module may be broken or cracked if bump Module against hard object.
- 6) To avoid ESD (Electro Static Discharge) damage, be sure to ground yourself before handling TFT-LCD Module.
- 7) Do not open nor modify the TFT-LCD module assembly.
- 8) Do not press the reflector sheet at the back of the module to any direction.
- 9) In case if TFT-LCD module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED Reflector edge. Instead, press at the far ends of the LED Reflector edge softly. Otherwise the TFT-LCD Module may be damaged.
- 10) When inserting or removing of your signal cable to TFT-LCD Module, be sure not to apply abnormal force (rotate, tilt...etc.) to the Connector of the TFT-LCD Module.
- 11) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.
- 12) Small amount of materials without flammability grade are used in the TFT-LCD module. The TFT-LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
- 13) Severe temperature condition may result in different luminance, response time.
- 14) Continuous operating TFT-LCD Module under high temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.
- 15) The data on this specification sheet is applicable when TFT-LCD module is placed in landscape position.
- 16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or moving content periodically if fixed pattern is displayed on the screen.

## 2. General Description

This specification applies to the 7.0 inch color TFT LCD with AMVA (Advanced MVA) technology module G070VFN01.100. It composed of a TFT-LCD panel, driver ICs, PCB with power supply circuit and backlight unit.

The screen format is intended to support the WVGA (800(H) x 480(V)) screen and 16.2M (8-bits) or 262k colors (6-bits) by digital RGB interface.

### 2.1 Features

- 7.0 inch (15:9) display
- WVGA (800 × 480) resolution
- Digital parallel RGB 6/8bit interface
- San direction reversible
- High brightness
- High Contrast ratio
- Wide viewing angle with Advanced MVA technology
- RoHs compliance

### 2.2 Display Characteristics

The following items are G070VFN01.100 characteristics summary at 25 • (Room Temperature).

| Items                     |                        | Unit | Specifications                    |
|---------------------------|------------------------|------|-----------------------------------|
| Screen Diagonal           |                        | inch | 7.0                               |
| Outline Dimension         |                        | mm   | 164.55(H) × 104.71(V) × 8(T)      |
| Active Area Size          |                        | mm   | 152.4(H)×91.44(V)                 |
| Resolution                |                        | dots | 800RGB(H)×480(V)                  |
| Pixel Pitch               |                        | mm   | 0.1905(H)×0.1905(V)               |
| Pixel Arrangement         |                        | • •  | R.G.B. Vertical Stripe            |
| Display Mode              |                        | • •  | AMVA, Normally Black              |
| Color Depth               |                        | • •  | 16.2M (8bit) / 262K (6bit) colors |
| Nominal Input Power       | LCD                    | V    | 3.3                               |
|                           | Backlight              | mA   | 120                               |
| Typical Power Consumption |                        | mW   | 3216 (Typ.)                       |
| Typical Weight            |                        | g    | 143                               |
| Surface Treatment         |                        | • •  | Anti-Glare, Hardness 3H           |
| Temperature Range         | Operating              | °C   | -20 to +70                        |
|                           | Storage(Non-Operating) | °C   | -30 to +80                        |

## 2.3 Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C (Room Temperature).

| Item  | Conditions                                   |              | Min.  | Typ.  | Max.  | Unit              | Remark    |
|---|--|--------------|-------|-------|-------|-------------------|-----------|
| White Luminance                             | $\Theta_x = 0^\circ$ ; $\Theta_y = 0^\circ$  |              | 390   | 450   | • •   | cd/m <sup>2</sup> | Note 1    |
| Contrast Ratio                              |  |              | 800   | 1500  | • •   |                   | Note 1, 2 |
| Response Time                               | $\Theta_x = 0^\circ$<br>$\Theta_y = 0^\circ$ | Rising (Tr)  | • •   | 10    | 15    | ms                | Note 1, 3 |
|   |  | Falling (Tf) | • •   | 25    | 30    |                   |           |
|   |  | Tr + Tf      | • •   | 35    | 45    |                   |           |
| Viewing Angle                               | Horizontal<br>CR $\geq 10$                   | Right        | 75    | 80    | • •   | degree            | Note 1, 4 |
|   |  | Left         | 75    | 80    | • •   |                   |           |
|   | Vertical<br>CR $\geq 10$                     | Top          | 75    | 80    | • •   |                   |           |
|   |  | Bottom       | 75    | 80    | • •   |                   |           |
| Color / Chromaticity Coordinates (CIE 1931) | White x                                      |              | 0.263 | 0.313 | 0.363 |                   | Note 1    |
|   | White y                                      |              | 0.259 | 0.309 | 0.359 |                   |           |
|   | Red x  |              | 0.536 | 0.586 | 0.636 |                   |           |
|   | Red y  |              | 0.275 | 0.325 | 0.375 |                   |           |
|   | Green x                                      |              | 0.265 | 0.315 | 0.365 |                   |           |
|   | Green y                                      |              | 0.536 | 0.586 | 0.636 |                   |           |
|   | Blue x                                       |              | 0.103 | 0.153 | 0.203 |                   |           |
|   | Blue y                                       |              | 0.058 | 0.108 | 0.158 |                   |           |
| Color Gamut                                 |  |              | • •   | 50    | • •   | %                 | Note 1    |
| Uniformity                                  | 9 Points                                     |              | 80    | •     | • • • | %                 | Note 1, 5 |

### Note 1 • • Measurement method and condition

|                   |   |
|-------------------|---|
| <b>Equipment</b>  | Pattern Generator, Power Supply, Digital Voltmeter, Topcon luminance meter BM-7   |
| <b>Test Point</b> | Aperture = 1° with 50cm viewing distance at center of active area   |
| <b>Condition</b>  | 1. Performed in the dark and windless room (Ambient light < 1 lux)<br>2. Measured after 10 minutes operation under backlight current $I_{LED} = 120\text{mA}$ . |

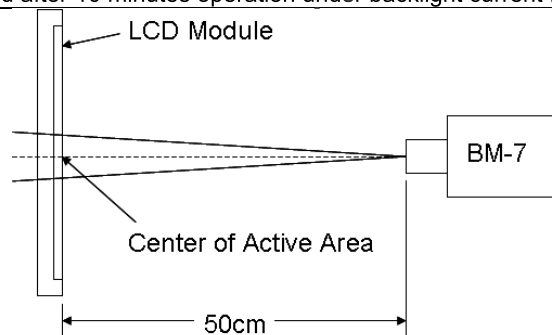


Fig. 2-1

# Note 2 • Definition of contrast ratio (CR)

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness @ "White" state}}{\text{Brightness @ "Black" state}}$$

# Note 3 • Definition of response time

The output signals of photo detector are measured when the input signals are changed from "White" to "Black" (falling time) and from "Black" to "White" (rising time), respectively. The response time interval definition is between 10% and 90% of amplitude. Please refer to the figure as below.

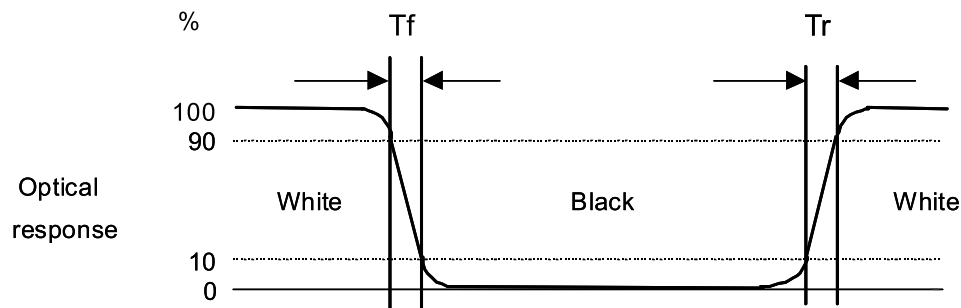


Fig. 2-2

# Note 4 • Definition of viewing angle

Viewing angle is the measurement of contrast ratio • 10, at the screen center, over 180° horizontal and 180° vertical range. The 180° horizontal ( $\theta_L$ ,  $\theta_R$ ) and 180° vertical ( $\phi_H$ ,  $\phi_L$ ) range are illustrated as following figure.

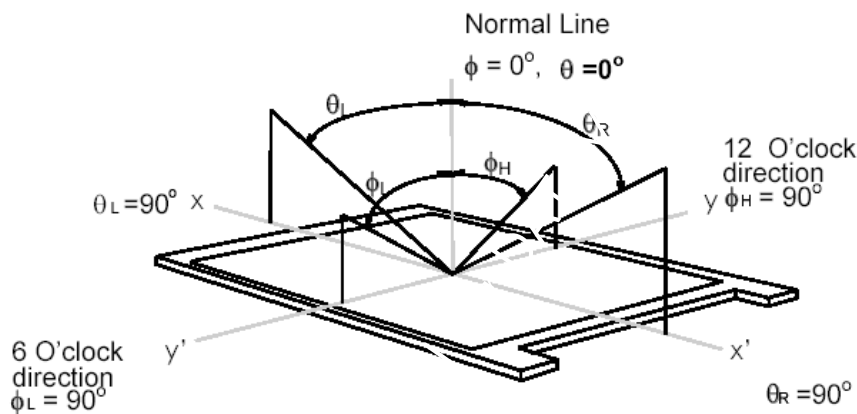


Fig. 2-3

**Note 5** • Definition of 9 points position on Active Area

The luminance uniformity of 9 points is defined by dividing the maximum luminance value by the minimum luminance value at full white condition.

$$\text{Luminance Uniformity (\%)} = \frac{\text{Maximum Brightness of nine points}}{\text{Minimum Brightness of nine points}}$$

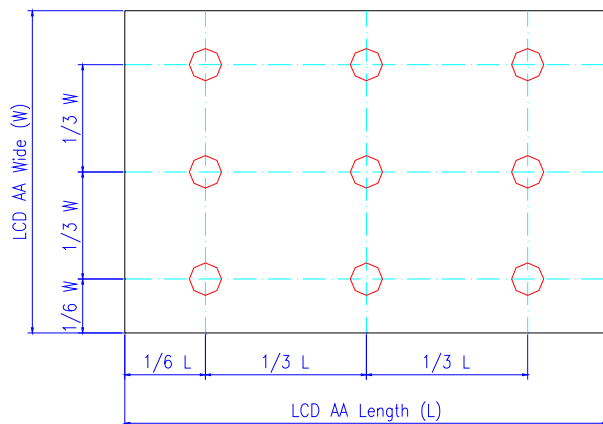


Fig.2-4



### 3. Functional Block Diagram

The following diagram shows the functional block of the G070VVN01.100 color TFT/LCD module.

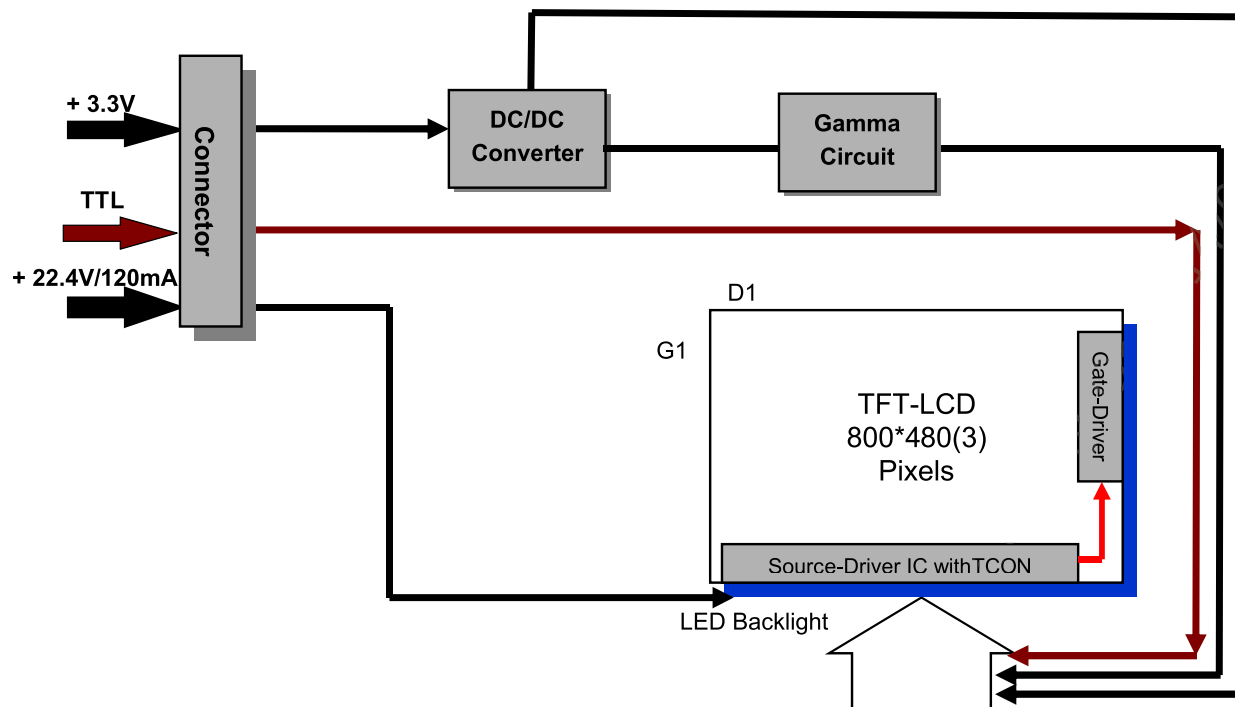


Fig. 3-1

## 4. Absolute Maximum Ratings

### 4.1 Absolute Ratings of Driving Condition

Following characteristics are measured under stable condition at 25• •(Room Temperature).

| Parameter                | Symbol           | Min  | Max | Unit | Remark |
|--------------------------|------------------|------|-----|------|--------|
| Logic/LCD Drive Voltage  | VDD              | -0.3 | 4.5 | V    |        |
| LCD Input Signal Voltage | VIN              | -0.3 | 4.5 | V    |        |
| LED BLU Drive Current    | V <sub>LED</sub> | • •  | 180 | mA   |        |

### 4.2 Absolute Ratings of Environment

| Parameter             | Symbol | Min | Max | Unit | Remark    |
|-----------------------|--------|-----|-----|------|-----------|
| Operating Temperature | TOP    | -20 | 70  | °C   | Note 1, 2 |
| Operation Humidity    | HOP    | 5   | 90  | %RH  | Note 1, 2 |
| Storage Temperature   | TST    | -30 | 80  | °C   | Note 1    |
| Storage Humidity      | HST    | 5   | 90  | %RH  | Note 1    |

**Note 1•** Maximum Wet-Bulb should be 39• •and no condensation.

**Note 2•** •Only operation is guaranteed. Optical performance should be evaluated at 25• •only.

## 5. Electrical Characteristics

### 5.1 TFT-LCD Driving Condition

Following characteristics are measured under stable condition at 25• •(Room Temperature).

| Parameter                | Symbol | Min | Typ | Max | Units | Remark    |
|--------------------------|--------|-----|-----|-----|-------|-----------|
| Analog/LCD Drive Voltage | VDD    | 3.0 | 3.3 | 3.6 | V     |           |
| VDD Current              | IVDD   | • • | 160 | 197 | mA    | Note 1, 2 |
| VDD Power                | PVDD   | • • | 528 | 650 | mW    |           |

**Note 1•** •Display all White pattern under VDD = 3.3V, frame frequency = 60Hz.

**Note 2•** •Input signals shall be low or Hi-Z state when VDDIO is off.

### 5.2 Backlight Unit Driving Condition

Following characteristics are measured under stable condition at 25• •(Room Temperature).

| Parameter         | Symbol           | Min   | Typ   | Max   | Units | Remark |
|-------------------|------------------|-------|-------|-------|-------|--------|
| Input Voltage     | V <sub>LED</sub> | • •   | 22.4  | 25.2  | V     |        |
| Input Current     | I <sub>LED</sub> | • •   | 120   | • •   | mA    |        |
| Power Consumption | P <sub>LED</sub> | • •   | 2.688 | 3.024 | W     |        |
| LED Lifetime      | LED <sub>L</sub> | 30000 | •     | • • • | Hrs   |        |

**Note 1•** •Backlight unit composed of 14 LEDs. (2 stings, 7 pcs for each string)

**Note 2•** •The definition of LED lifetime is when B/L continues to operate under typical driving current, duty 100% and ambient temperature = 25• •until the brightness becomes • •50% of its original value.

**Note 3•** •Operating LED under high temperature, humidity environment and driving current will reduce lifetime and lead to color shift.



Fig. 5-1

## 6. Signal Characteristic

### 6.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.

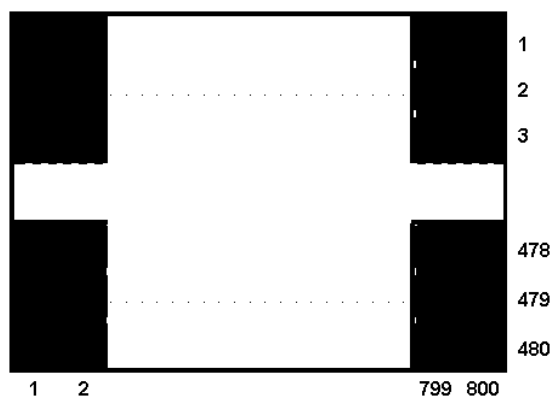
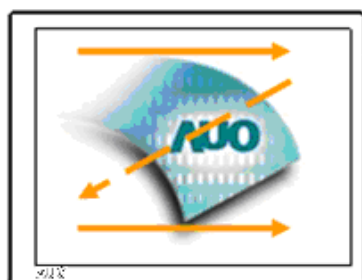


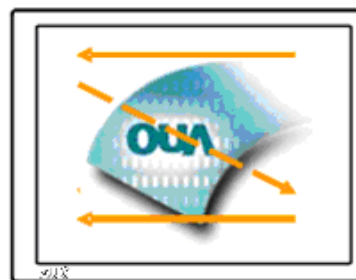
Fig. 6-1

### 6.2 Scanning Direction

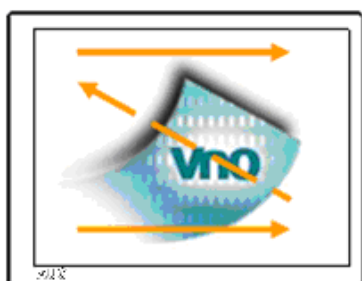
The following figures show the image seen from the front view. The arrow indicates the direction of scan.



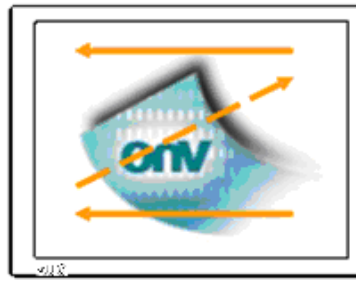
SHLR = High; UPDN = Low



SHLR = Low; UPDN = Low



SHLR = High; UPDN = High



SHLR = Low; UPDN = High

Fig. 6-2

Note 1: TFT-LCD interface signal description is shown in section

### 6.3 The Input Data Format

This product displays 16.2M colors in terms of the 256 grey levels on RGB respectively.

| Display colors  |         | Data signal (0 : Low level, 1: High 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 colors    | Black   | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | Blue    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                 | Red     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | Magenta | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                 | Green   | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | Cyan    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|                 | Yellow  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | White   | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| Red grayscale   | Black   | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | Dark    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | ↑<br>↓  |  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|                 | bright  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 |         | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | Red     | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Green grayscale | Black   | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | Dark    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | ↑<br>↓  |  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|                 | bright  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 |         | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | Green   | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| Blue grayscale  | Black   | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|                 | Dark    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  |
|                 | ↑<br>↓  |  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|                 | bright  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 1  |
|                 |         | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  |
|                 | Blue    | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |

## 6.4 TFT- LCD Pin Assignment Description

Recommended connector: FA5B050HP1

| Pin no | Symbol | I/O | Description  | Remark |
|--------|--------|-----|--|--------|
| 1      | VDD    | P   | Power supply, 3.3V(typical)  |        |
| 2      | VDD    | P   | Power supply, 3.3V(typical)  |        |
| 3      | NC     | -   | No connection. Please leave it open or connect to ground   |        |
| 4      | GND    | G   | Power ground   |        |
| 5      | RSTB   | I   | Global reset. Active Low to enter Reset State. (Normally pull high)<br>Suggest to connecting with an RC reset circuit for stability.<br>Normally pull high.  | Note2  |
| 6      | STBYB  | I   | Standby mode. Normally pulled high.<br>STBYB = "H", normal operation<br>STBYB = "L", timing controller, source driver will turn off, all output are high-Z.  |        |
| 7      | GND    | I   | Power ground   |        |
| 8      | UPDN   | I   | Gate up or down scan control. Normally pulled low.<br>UPDN = "H", up shift: G480 → ... → G2 → G1.<br>UPDN = "L", down shift: G1 → G2 → ... → G480.   |        |
| 9      | SHLR   | I   | Source right or left control. Normally pulled high.<br>SHLR = "H", Shift right: first data = S1 → S2 → ... → S800 = last data.<br>SHLR = "L", Shift left: last data = S1 ← S2 ← ... ← S800 = first data. |        |
| 10     | DITHB  | I   | Dithering function enable control. Normally pulled high.<br>DITHB = "H", Disable internal dithering function.<br>DITHB = "L", Enable internal dithering function.  |        |
| 11     | MODE   | I   | DE/SYNC mode select. Normally pulled high.<br>MODE = "H" : DE mode.<br>MODE = "L" : HSD/VSD mode.  |        |
| 12     | GND    | G   | Power ground   |        |
| 13     | R0     | I   | Red data (LSB)   |        |
| 14     | R1     | I   | Red data   |        |
| 15     | R2     | I   | Red data   |        |
| 16     | R3     | I   | Red data   |        |
| 17     | R4     | I   | Red data   |        |
| 18     | R5     | I   | Red data   |        |
| 19     | R6     | I   | Red data   |        |
| 20     | R7     | I   | Red data (MSB)   |        |
| 21     | GND    | G   | Power ground   |        |
| 22     | G0     | I   | Green data (LSB)   |        |
| 23     | G1     | I   | Green data   |        |
| 24     | G2     | I   | Green data   |        |
| 25     | G3     | I   | Green data   |        |
| 26     | G4     | I   | Green data   |        |
| 27     | G5     | I   | Green data   |        |
| 28     | G6     | I   | Green data   |        |
| 29     | G7     | I   | Green data (MSB)   |        |

|    |       |   |   |  |
|----|-------|---|---|--|
| 30 | GND   | G | Power ground  |  |
| 31 | B0    | I | Blue data (LSB)   |  |
| 32 | B1    | I | Blue data   |  |
| 33 | B2    | I | Blue data   |  |
| 34 | B3    | I | Blue data   |  |
| 35 | B4    | I | Blue data   |  |
| 36 | B5    | I | Blue data   |  |
| 37 | B6    | I | Blue data   |  |
| 38 | B7    | I | Blue data (MSB)   |  |
| 39 | GND   | G | Power ground  |  |
| 40 | CLKIN | I | Pixel clock• rising latch   |  |
| 41 | GND   | G | Power ground  |  |
| 42 | DEN   | I | Data input enable. Active high to enable the data input bus under "DE mode". Normally pulled Low. |  |
| 43 | GND   | G | Power ground  |  |
| 44 | HSD   | I | Horizontal sync input. Negative polarity.   |  |
| 45 | GND   | G | Power ground  |  |
| 46 | VSD   | I | Vertical sync input. Negative polarity.   |  |
| 47 | GND   | G | Power ground  |  |
| 48 | NC    | - | No connection. Please leave it open or connect to ground  |  |
| 49 | LED+  | P | Power supply for LED  |  |
| 50 | LED-  | P | Power supply for LED  |  |

**Note•** •I: Digital signal input pin; P: Power pin; G: Ground pin;

**Note2•** •Global reset normally pulled high. Suggest to connecting with an RC (R=10K ohm, C=1uF) reset circuit for stability.



Fig. 6-3 Active Low

## 6.5 Power on/off sequence

The LCD adopts high voltage driver IC, so it could be permanently damaged under a wrong power on/off sequence. The suggested LCD power sequence is below:

### Power on sequence:

**VDD → RSTB → STBYB → Digital input (Data/DCLK/DE) → BLKEN**

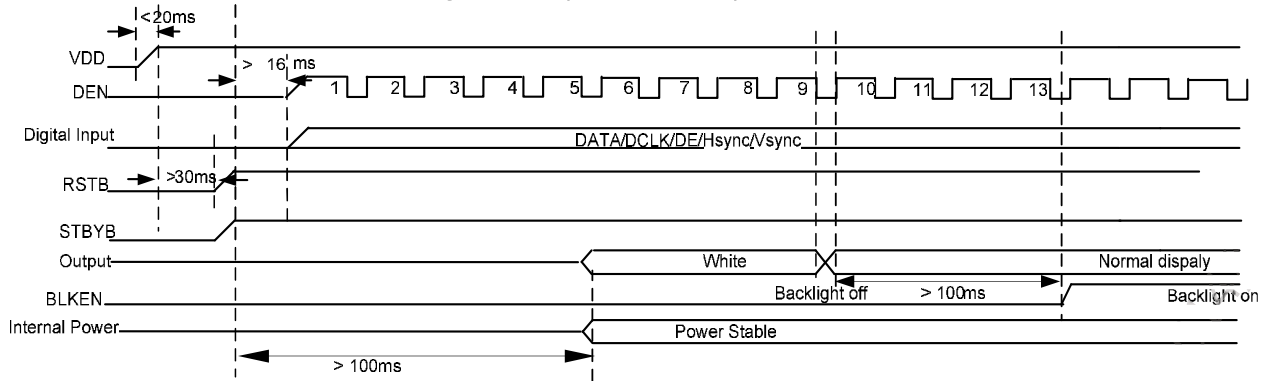


Fig. 6-4

### Power Off sequence

**STBYB → BLKEN → Digital input (Data/DCLK/DE)&Power**

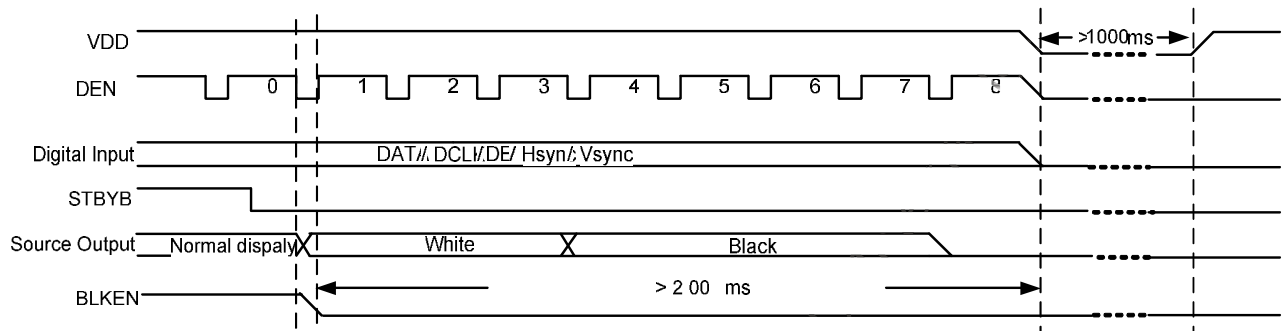


Fig. 6-5



## 6.6 TFT- LCD Driving Timing

### 6.6.1 Digital Signal Timing Characteristic

| Item                     | Symbol | Min | Typ  | Max  | Unit | Remark                  |
|--------------------------|--------|-----|------|------|------|-------------------------|
| Clock frequency          | dclk   | -   | 33.3 | 45   | MHZ  |                         |
| DCLK cycle time          | Tdclk  | 22  | 30   | -    | ns   |                         |
| DCLK pulse duty          | Tcwh   | 40  | 50   | 60   | %    |                         |
| Vertical display area    | Tvd    | 480 | 480  | 480  | H    |                         |
| Vertical period area     | Tv     | 517 | 525  | 712  | H    |                         |
| Vertical blanking area   | Tvb    | 42  | 45   | 232  | H    |                         |
| Vertical pulse width     | Tvw    | 1   | 1    | 3    | H    | Tvw+Tve=32H is fixed    |
| Vertical back porch      | Tve    | 31  | 31   | 29   | H    |                         |
| Vertical front porch     | Tvf    | 5   | 13   | 200  | H    |                         |
| Horizontal display area  | Thd    | 800 | 800  | 800  | dclk |                         |
| Horizontal period area   | Th     | 908 | 928  | 1088 | dclk |                         |
| Horizontal blanking area | Thb    | 108 | 128  | 288  | dclk |                         |
| Horizontal pulse width   | Thw    | 1   | 48   | 87   | dclk | Thw+The=88dclk is fixed |
| Horizontal back porch    | The    | 87  | 40   | 1    | dclk |                         |
| Horizontal front porch   | Thf    | 20  | 40   | 200  | dclk |                         |
| Data setup time          | Tds    | 8   | -    | -    | ns   |                         |
| Data hold time           | Tdh    | 8   | -    | -    | ns   |                         |

**Note** • Recommended frame rate is 60 Hz.

### 6.6.2 Digital Signal Timing Diagram

#### a. Clock and Data Timing of Input • •

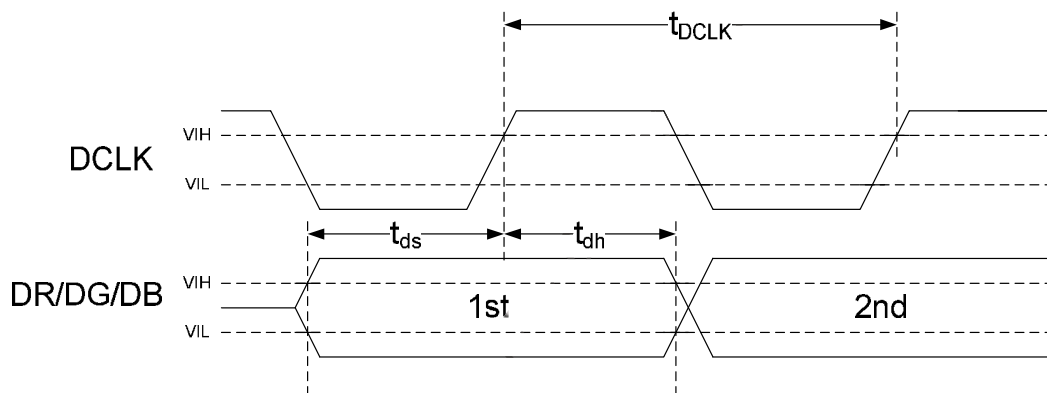


Fig. 6-6

## b. Vertical Timing of Input (DE Mode)

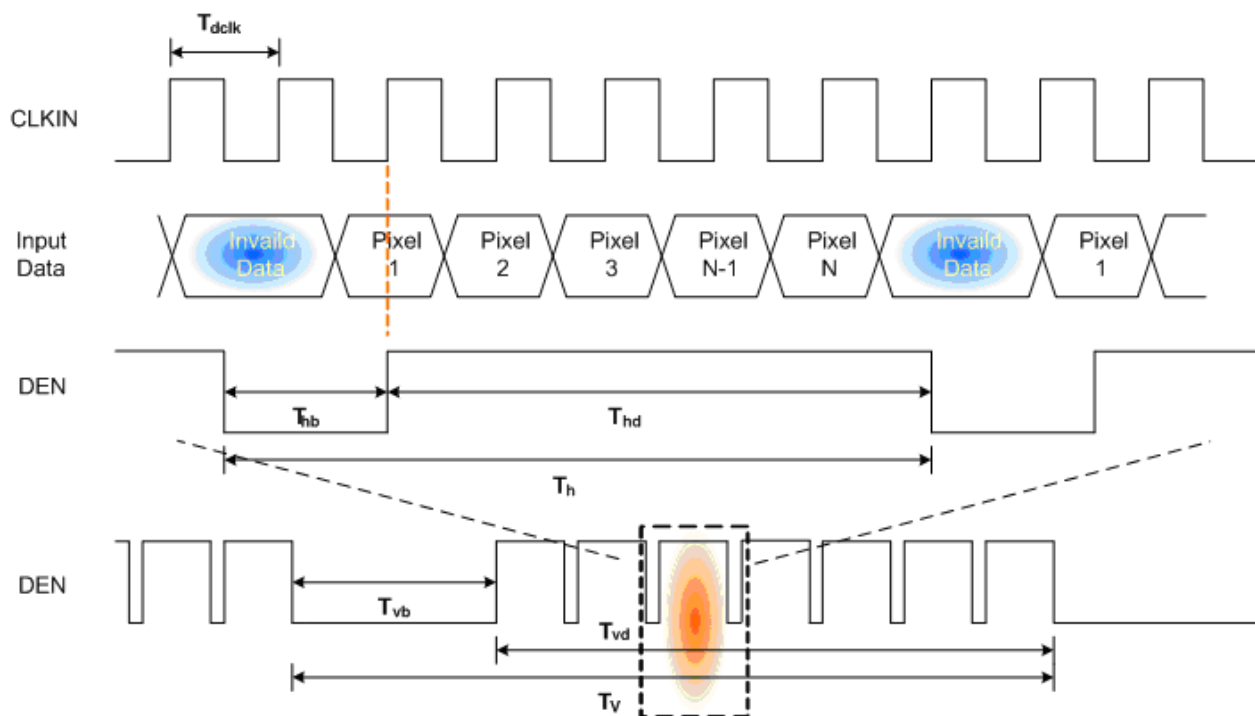


Fig. 6-7

## c. Vertical Timing of Input (HV Mode)

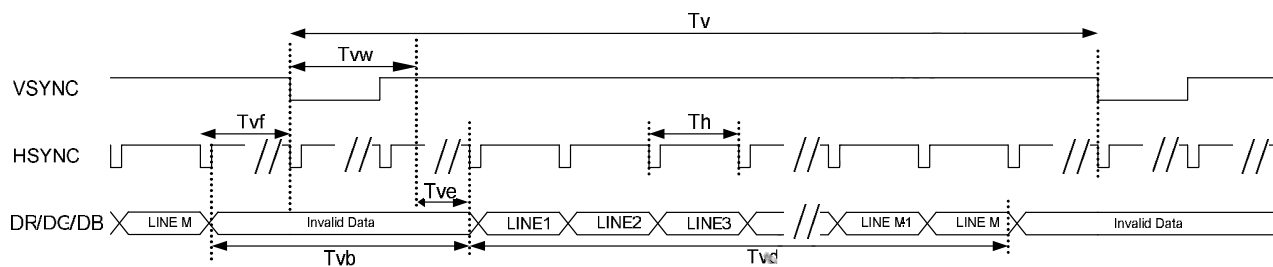


Fig. 6-8

## d. Horizontal Timing of Input (HV Mode)

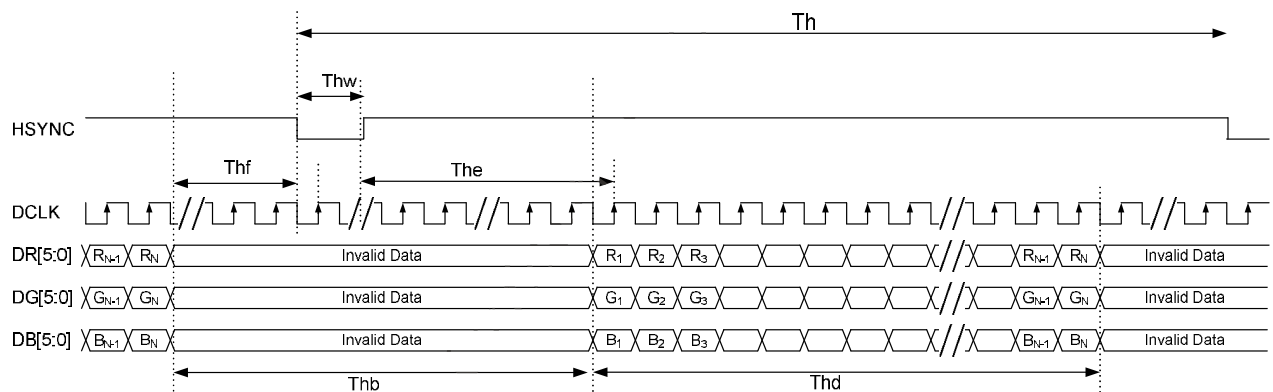


Fig. 6-9

## 7. Reliability Test Criteria

| Test Items                         | Required Condition   |          |               | Remark |
|------------------------------------|--|----------|---------------|--------|
| High Temperature Operation         | 70• •  | 240Hours | Operation     |        |
| Low Temperature Operation          | -20• •   | 240Hours | Operation     |        |
| High Temperature Storage           | 80• •  | 240Hours | Non-operation |        |
| Low Temperature Storage            | -30• •   | 240Hours | Non-operation |        |
| High temperature and high humidity | 60• ; 90% RH   | 240Hours | Operation     |        |
| Thermal Shock                      | -30• #60 min ,80• #60 min ,50cycles  |          | Non-operation |        |
| Mechanical shock                   | 50G, 20ms, Half-sine wave, Once for each direction. ( $\pm x$ , $\pm y$ , $\pm z$ )  |          | Non-operation |        |
| Vibration                          | 1.5G, 10~200~10Hz, Sine wave, 30min/axis (X, Y, Z)   |          | Non-operation |        |
| On/off                             | On/10 sec, off/10 sec, 30,000 cycles   |          |               |        |
| Electrostatic discharge            | Contact = $\pm 8$ kV, class B (R=330,C=150pF)<br>Air = $\pm 15$ kV, class B (R=330,C=150pF)<br>1sec, 8 points, 25times/point |          |               |        |

**Note 1•** •Each test is done by new TFT-LCD module. Don't use the same TFT-LCD module repeatedly for reliability test.

**Note 2•** •The reliability test is performed only to examine the TFT-LCD module capability.

**Note 3•** •In the standard condition, there is not display function NG issue occurred. All cosmetic specifications are judged before the reliability stress. To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.

**Note 4•** •There should be no condensation on the surface of module during test.

**Note 5•** •Short time operation between -20• ~-30• •doesn't provide full performance but a correct image on the LCD. The LCD is guaranteed to suffer no permanent damage.

**Note 6•** •The fixture of Vibration and Shock test should be hard and rigid enough in order to protect from module twisting or bending issue.

**Note 7•** •ESD criteria is as below• •

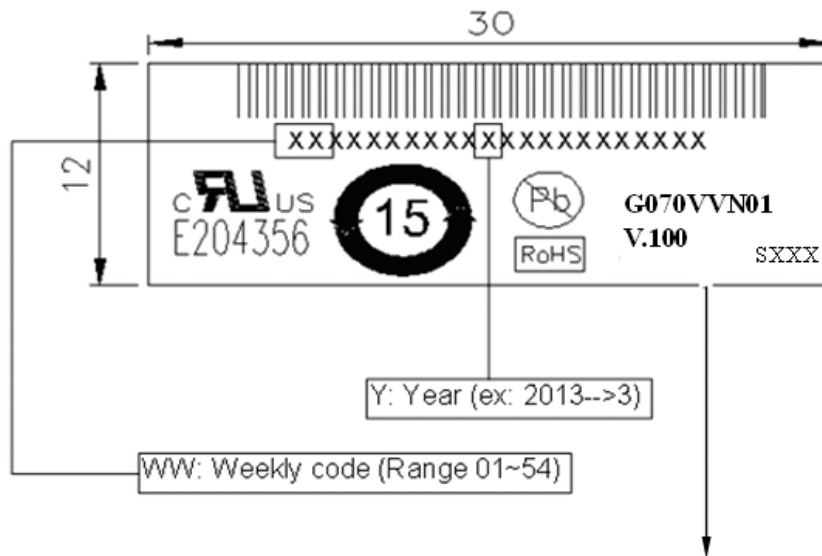
|         |  |
|---------|--|
| Class A | Normal operation. No degradation. No failures  |
| Class B | Some performance degradation allowed. No data lost. Self-recoverable. No hardware failures.  |
| Class C | Temporary performance degradation. Recovery by operator is acceptable. No hardware failures. |
| Class D | Hardware failures.   |

NOTE:  
1.GENERAL TOLERANCE:  $\pm 0.3\text{mm}$   
2.CONNECTOR 1 : 1/F CONNECTOR IS JAE "FA5B050HP1"  
CONNECTOR 2 : LED CONNECTOR IS ENTERY "H208K-P02N-02B"

Top View Dimensions:  
Overall Width: 164.55±0.50 (MODULE OUTLINE)  
Overall Height: 92.71±0.10 (MODULE OUTLINE)  
Bezel Opening Width: 154.21±0.3 (BEZEL OPENING)  
Active Area Width: 152.41±0.1 (ACTIVE AREA)  
Pin 1 to Pin 2 Distance: 9.71±0.10 (PITCH)  
Pin 1 to Pin 3 Distance: 93.84±0.10 (PITCH)  
Pin 1 to Pin 4 Distance: 104.71±0.50 (PITCH)  
Pin 1 to Pin 5 Distance: 115.58±0.50 (PITCH)  
Pin 1 to Pin 6 Distance: 126.45±0.50 (PITCH)  
Pin 1 to Pin 7 Distance: 137.32±0.50 (PITCH)  
Pin 1 to Pin 8 Distance: 148.19±0.50 (PITCH)  
Pin 1 to Pin 9 Distance: 159.06±0.50 (PITCH)  
Pin 1 to Pin 10 Distance: 169.93±0.50 (PITCH)  
Pin 1 to Pin 11 Distance: 180.80±0.50 (PITCH)  
Pin 1 to Pin 12 Distance: 191.67±0.50 (PITCH)  
Pin 1 to Pin 13 Distance: 202.54±0.50 (PITCH)  
Pin 1 to Pin 14 Distance: 213.41±0.50 (PITCH)  
Pin 1 to Pin 15 Distance: 224.28±0.50 (PITCH)  
Pin 1 to Pin 16 Distance: 235.15±0.50 (PITCH)  
Pin 1 to Pin 17 Distance: 246.02±0.50 (PITCH)  
Pin 1 to Pin 18 Distance: 256.89±0.50 (PITCH)  
Pin 1 to Pin 19 Distance: 267.76±0.50 (PITCH)  
Pin 1 to Pin 20 Distance: 278.63±0.50 (PITCH)  
Pin 1 to Pin 21 Distance: 289.50±0.50 (PITCH)  
Pin 1 to Pin 22 Distance: 300.37±0.50 (PITCH)  
Pin 1 to Pin 23 Distance: 311.24±0.50 (PITCH)  
Pin 1 to Pin 24 Distance: 322.11±0.50 (PITCH)  
Pin 1 to Pin 25 Distance: 332.98±0.50 (PITCH)  
Pin 1 to Pin 26 Distance: 343.85±0.50 (PITCH)  
Pin 1 to Pin 27 Distance: 354.72±0.50 (PITCH)  
Pin 1 to Pin 28 Distance: 365.59±0.50 (PITCH)  
Pin 1 to Pin 29 Distance: 376.46±0.50 (PITCH)  
Pin 1 to Pin 30 Distance: 387.33±0.50 (PITCH)  
Pin 1 to Pin 31 Distance: 398.20±0.50 (PITCH)  
Pin 1 to Pin 32 Distance: 409.07±0.50 (PITCH)  
Pin 1 to Pin 33 Distance: 419.94±0.50 (PITCH)  
Pin 1 to Pin 34 Distance: 430.81±0.50 (PITCH)  
Pin 1 to Pin 35 Distance: 441.68±0.50 (PITCH)  
Pin 1 to Pin 36 Distance: 452.55±0.50 (PITCH)  
Pin 1 to Pin 37 Distance: 463.42±0.50 (PITCH)  
Pin 1 to Pin 38 Distance: 474.29±0.50 (PITCH)  
Pin 1 to Pin 39 Distance: 485.16±0.50 (PITCH)  
Pin 1 to Pin 40 Distance: 496.03±0.50 (PITCH)  
Pin 1 to Pin 41 Distance: 506.90±0.50 (PITCH)  
Pin 1 to Pin 42 Distance: 517.77±0.50 (PITCH)  
Pin 1 to Pin 43 Distance: 528.64±0.50 (PITCH)  
Pin 1 to Pin 44 Distance: 539.51±0.50 (PITCH)  
Pin 1 to Pin 45 Distance: 550.38±0.50 (PITCH)  
Pin 1 to Pin 46 Distance: 561.25±0.50 (PITCH)  
Pin 1 to Pin 47 Distance: 572.12±0.50 (PITCH)  
Pin 1 to Pin 48 Distance: 582.99±0.50 (PITCH)  
Pin 1 to Pin 49 Distance: 593.86±0.50 (PITCH)  
Pin 1 to Pin 50 Distance: 604.73±0.50 (PITCH)  
Pin 1 to Pin 51 Distance: 615.60±0.50 (PITCH)  
Pin 1 to Pin 52 Distance: 626.47±0.50 (PITCH)  
Pin 1 to Pin 53 Distance: 637.34±0.50 (PITCH)  
Pin 1 to Pin 54 Distance: 648.21±0.50 (PITCH)  
Pin 1 to Pin 55 Distance: 659.08±0.50 (PITCH)  
Pin 1 to Pin 56 Distance: 669.95±0.50 (PITCH)  
Pin 1 to Pin 57 Distance: 680.82±0.50 (PITCH)  
Pin 1 to Pin 58 Distance: 691.69±0.50 (PITCH)  
Pin 1 to Pin 59 Distance: 702.56±0.50 (PITCH)  
Pin 1 to Pin 60 Distance: 713.43±0.50 (PITCH)  
Pin 1 to Pin 61 Distance: 724.30±0.50 (PITCH)  
Pin 1 to Pin 62 Distance: 735.17±0.50 (PITCH)  
Pin 1 to Pin 63 Distance: 746.04±0.50 (PITCH)  
Pin 1 to Pin 64 Distance: 756.91±0.50 (PITCH)  
Pin 1 to Pin 65 Distance: 767.78±0.50 (PITCH)  
Pin 1 to Pin 66 Distance: 778.65±0.50 (PITCH)  
Pin 1 to Pin 67 Distance: 789.52±0.50 (PITCH)  
Pin 1 to Pin 68 Distance: 800.39±0.50 (PITCH)  
Pin 1 to Pin 69 Distance: 811.26±0.50 (PITCH)  
Pin 1 to Pin 70 Distance: 822.13±0.50 (PITCH)  
Pin 1 to Pin 71 Distance: 833.00±0.50 (PITCH)  
Pin 1 to Pin 72 Distance: 843.87±0.50 (PITCH)  
Pin 1 to Pin 73 Distance: 854.74±0.50 (PITCH)  
Pin 1 to Pin 74 Distance: 865.61±0.50 (PITCH)  
Pin 1 to Pin 75 Distance: 876.48±0.50 (PITCH)  
Pin 1 to Pin 76 Distance: 887.35±0.50 (PITCH)  
Pin 1 to Pin 77 Distance: 898.22±0.50 (PITCH)  
Pin 1 to Pin 78 Distance: 909.09±0.50 (PITCH)  
Pin 1 to Pin 79 Distance: 919.96±0.50 (PITCH)  
Pin 1 to Pin 80 Distance: 930.83±0.50 (PITCH)  
Pin 1 to Pin 81 Distance: 941.70±0.50 (PITCH)  
Pin 1 to Pin 82 Distance: 952.57±0.50 (PITCH)  
Pin 1 to Pin 83 Distance: 963.44±0.50 (PITCH)  
Pin 1 to Pin 84 Distance: 974.31±0.50 (PITCH)  
Pin 1 to Pin 85 Distance: 985.18±0.50 (PITCH)  
Pin 1 to Pin 86 Distance: 996.05±0.50 (PITCH)  
Pin 1 to Pin 87 Distance: 1006.92±0.50 (PITCH)  
Pin 1 to Pin 88 Distance: 1017.79±0.50 (PITCH)  
Pin 1 to Pin 89 Distance: 1028.66±0.50 (PITCH)  
Pin 1 to Pin 90 Distance: 1039.53±0.50 (PITCH)  
Pin 1 to Pin 91 Distance: 1050.40±0.50 (PITCH)  
Pin 1 to Pin 92 Distance: 1061.27±0.50 (PITCH)  
Pin 1 to Pin 93 Distance: 1072.14±0.50 (PITCH)  
Pin 1 to Pin 94 Distance: 1083.01±0.50 (PITCH)  
Pin 1 to Pin 95 Distance: 1093.88±0.50 (PITCH)  
Pin 1 to Pin 96 Distance: 1104.75±0.50 (PITCH)  
Pin 1 to Pin 97 Distance: 1115.62±0.50 (PITCH)  
Pin 1 to Pin 98 Distance: 1126.49±0.50 (PITCH)  
Pin 1 to Pin 99 Distance: 1137.36±0.50 (PITCH)  
Pin 1 to Pin 100 Distance: 1148.23±0.50 (PITCH)  
Pin 1 to Pin 101 Distance: 1159.10±0.50 (PITCH)  
Pin 1 to Pin 102 Distance: 1169.97±0.50 (PITCH)  
Pin 1 to Pin 103 Distance: 1180.84±0.50 (PITCH)  
Pin 1 to Pin 104 Distance: 1191.71±0.50 (PITCH)  
Pin 1 to Pin 105 Distance: 1202.58±0.50 (PITCH)  
Pin 1 to Pin 106 Distance: 1213.45±0.50 (PITCH)  
Pin 1 to Pin 107 Distance: 1224.32±0.50 (PITCH)  
Pin 1 to Pin 108 Distance: 1235.19±0.50 (PITCH)  
Pin 1 to Pin 109 Distance: 1246.06±0.50 (PITCH)  
Pin 1 to Pin 110 Distance: 1256.93±0.50 (PITCH)  
Pin 1 to Pin 111 Distance: 1267.80±0.50 (PITCH)  
Pin 1 to Pin 112 Distance: 1278.67±0.50 (PITCH)  
Pin 1 to Pin 113 Distance: 1289.54±0.50 (PITCH)  
Pin 1 to Pin 114 Distance: 1300.41±0.50 (PITCH)  
Pin 1 to Pin 115 Distance: 1311.28±0.50 (PITCH)  
Pin 1 to Pin 116 Distance: 1322.15±0.50 (PITCH)  
Pin 1 to Pin 117 Distance: 1333.02±0.50 (PITCH)  
Pin 1 to Pin 118 Distance: 1343.89±0.50 (PITCH)  
Pin 1 to Pin 119 Distance: 1354.76±0.50 (PITCH)  
Pin 1 to Pin 120 Distance: 1365.63±0.50 (PITCH)  
Pin 1 to Pin 121 Distance: 1376.50±0.50 (PITCH)  
Pin 1 to Pin 122 Distance: 1387.37±0.50 (PITCH)  
Pin 1 to Pin 123 Distance: 1398.24±0.50 (PITCH)  
Pin 1 to Pin 124 Distance: 1409.11±0.50 (PITCH)  
Pin 1 to Pin 125 Distance: 1419.98±0.50 (PITCH)  
Pin 1 to Pin 126 Distance: 1430.85±0.50 (PITCH)  
Pin 1 to Pin 127 Distance: 1441.72±0.50 (PITCH)  
Pin 1 to Pin 128 Distance: 1452.59±0.50 (PITCH)  
Pin 1 to Pin 129 Distance: 1463.46±0.50 (PITCH)  
Pin 1 to Pin 130 Distance: 1474.33±0.50 (PITCH)  
Pin 1 to Pin 131 Distance: 1485.20±0.50 (PITCH)  
Pin 1 to Pin 132 Distance: 1496.07±0.50 (PITCH)  
Pin 1 to Pin 133 Distance: 1506.94±0.50 (PITCH)  
Pin 1 to Pin 134 Distance: 1517.81±0.50 (PITCH)  
Pin 1 to Pin 135 Distance: 1528.68±0.50 (PITCH)  
Pin 1 to Pin 136 Distance: 1539.55±0.50 (PITCH)  
Pin 1 to Pin 137 Distance: 1550.42±0.50 (PITCH)  
Pin

## 9. Label and Packaging

### 9.1 Shipping Label (on the rear side of TFT-LCD display)



| 1                                       | 2                  | 3 | 4 | 5                                | 6                   | 7                           | 8          | 9 | 10 | 11                      |
|---|--------------------|---|---|----------------------------------|---------------------|-----------------------------|------------|---|----|-------------------------|
| G                                       | 0                  | 7 | 0 | V                                | V                   | N                           | 0          | 1 | V  | 100                     |
| Application<br>A: AV<br>C: Car<br>G: GD | Size<br>(7.0 inch) |   |   | Resolution<br>(WVGA,<br>800×480) | Technology<br>(MVA) | Product Feature<br>(Normal) | Serial No. |   | NA | Version &Part<br>Number |

Fig. 9-1 SN Label

## 9.2 Packing form

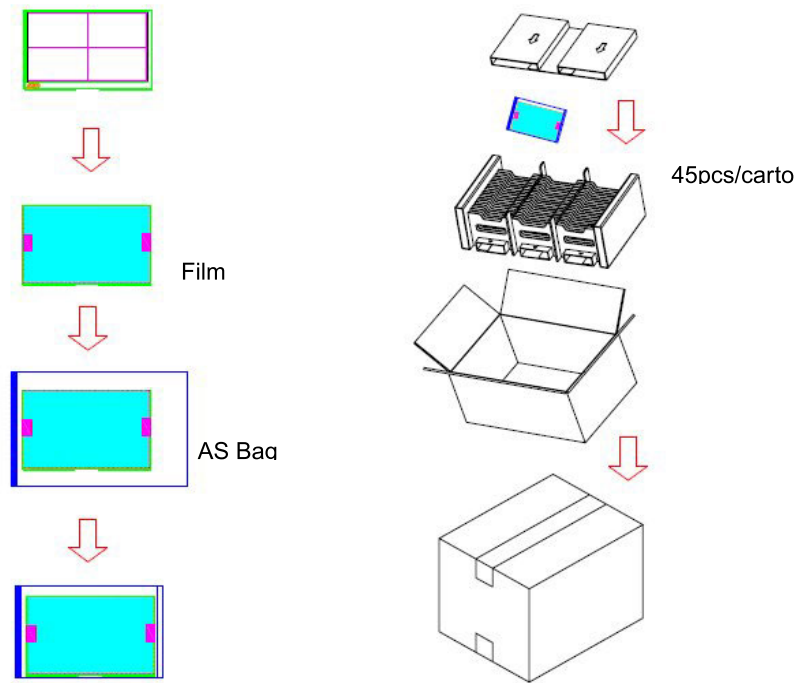


Fig. 9-2

Max capacity• 45 TFT-LCD module per carton

Max weight: 10.0 kg per carton

Outside dimension of carton: 608mm(L)\* 361mm(W)\*226mm(H)

Pallet size: 1230 mm \* 1110 mm \* 135mm

## 9.3 Palletizing sequence

|                 | pcs / box | box / layer | layer / pallet | pcs / pallet |
|-----------------|-----------|-------------|----------------|--------------|
| Shipping by air | 45        | 6           | 5              | 1350         |
| Shipping by sea | 45        | 6           | 5              | 1350         |

## **10 Safety**

### **10.1 Standard**

The TFT-LCD Module will be satisfied all requirements for compliance with UL 60950 (U.S.A. Information Technology Equipment).

#### **10.1.1 Keen Edge Requirements**

There will be no keen edges or corners on the display assembly that could cause injury.

#### **10.1.2 Flammability**

All components including electrical components that do not meet the flammability grade UL94-V1 in the TFT-LCD Module.

The critical components of safety will be compliance with UL 60950 requirement exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

### **10.2 Capacitors**

If any polarized capacitors are used in the TFT-LCD module, provisions will be made to keep them from being inserted backwards.

### **10.3 National Test Lab Requirement**

The TFT-LCD Module will satisfy all requirements for compliance to UL 60950 (U.S.A. Information Technology Equipment).