

**( V ) Preliminary Specification****( ) Final Specification**

|            |                               |
|------------|-------------------------------|
| Module     | TFT-LCD 7" WVGA LED Backlight |
| Model Name | FT070-EDC02 V.0 (G070VW01 V0) |

|                    |             |
|--------------------|-------------|
| <b>Customer</b>    | <b>Date</b> |
| _____              | _____       |
| <b>Approved by</b> |             |
| _____              | _____       |

|                                  |             |
|----------------------------------|-------------|
| <b>Checked &amp; Approved by</b> | <b>Date</b> |
| _____                            | _____       |
| <b>Prepared by</b>               |             |
| <b>Ansi</b>                      |             |
| _____                            | _____       |

Note: This Specification is subject to change  
without notice.



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## Record of Revision

| Version & Date | Page | Old Description | New Description | Remark |
|----------------|------|-----------------|-----------------|--------|
| V.0 2010/03    | All  | First Edition   | All             |        |
|                |      |                 |                 |        |
|                |      |                 |                 |        |
|                |      |                 |                 |        |
|                |      |                 |                 |        |



## 1. Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open or modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, please press at the far ends of the LED light bar reflector edge softly. Otherwise the TFT Module may be damaged.
- 10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 11) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.
- 12) Small amount of materials having no flammability grade is used in the LCD module. The LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.



## 2. General Description

A Color Active Matrix Liquid Crystal Display composed of a TFT-LCD panel, a driver circuit, and backlight system. The screen format is intended to support the WVGA (800(H) x 480(V)) screen and 16.2M colors (RGB 8-bits) or 262k colors (RGB 6-bits). All input signals are LVDS interface compatible. Driver board of backlight is not included. From modification by AUO G070VW01 V.0 .

### 2.1 Display Characteristics

The following items are characteristics summary on the table under 25 °C condition:

| Items                     | Unit    | Specifications                      |
|---------------------------|---------|-------------------------------------|
| Screen Diagonal           | [inch]  | 7.0 ( 177.8mm )                     |
| Active Area               | [mm]    | 152.40(H) x 91.44(V)                |
| Pixels H x V              |         | 800x3(RGB) x 480                    |
| Pixel Pitch               | [mm]    | 0.1905x 0.1905                      |
| Pixel Arrangement         |         | R.G.B. Vertical Stripe              |
| Display Mode              |         | TN, Normally White                  |
| Nominal Input Voltage VDD | [Volt]  | 3.3 typ.                            |
| Typical Power Consumption | [Watt]  | 3.86 (PDD=0.8+PLED=3.06)            |
| Weight                    | [Grams] | 165 (typ.)                          |
| Physical Size             | [mm]    | 170.0(W) x 111.0(H) x 7.5(D) (typ.) |
| Electrical Interface      |         | 1 channel LVDS                      |
| Surface Treatment         |         | Anti - Glare , Hardness 3H          |
| Support Color             |         | 262K(6-bit) / 16.2M(8-bit)          |
| Temperature Range         |         |                                     |
| Operating                 | [°C]    | -30 to +85                          |
| Storage (Non-Operating)   | [°C]    | -30 to +85                          |
| RoHS Compliance           |         | RoHS Compliance                     |



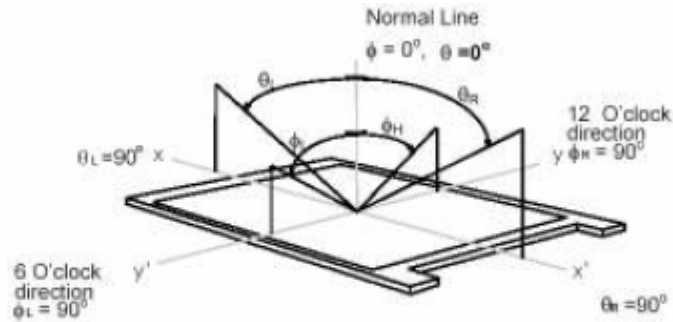
## 2.2 Optical Characteristics

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

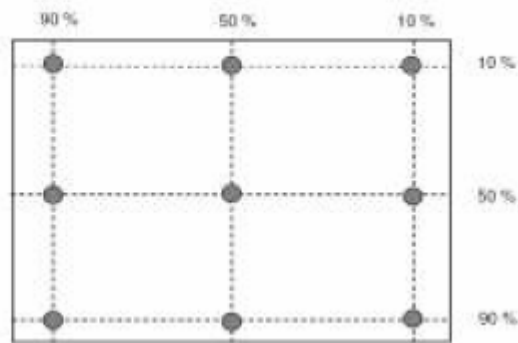
| Item                                      | Unit                 | Conditions                           | Min. | Typ.     | Max. | Note |
|---|----------------------|--------------------------------------|------|----------|------|------|
| Viewing Angle                             | [degree]             | Horizontal (Right)<br>CR = 10 (Left) | 70   | 80<br>80 | -    | 1    |
|   |                      | Vertical (Upper)<br>CR = 10 (Down)   | 70   | 80<br>80 | -    |      |
| Luminance Uniformity                      | [%]                  | 9 Points                             | 80   | 85       | -    | 2, 3 |
| Optical Response Time                     | [msec]               | Rising                               | -    | 20       | 30   | 5    |
|   |                      | Falling                              | -    | 10       | 20   |      |
|   |                      | Rising + Falling                     | -    | 30       | 50   |      |
| Color/Chromaticity Coordinates (CIE 1931) |                      | White x                              | -    | 0.3162   | -    | 4    |
|   |                      | White y                              | -    | 0.3265   | -    |      |
| Color Temp.                               | K                    |                                      | 6000 | 6500     |      |      |
| White Luminance(Center)                   | [cd/m <sup>2</sup> ] |                                      | 900  | 1000     | -    | 4    |
| Contrast Ratio                            |                      |                                      | 900  | 1000     | -    | 4    |

### Note 1: Definition of viewing angle

Viewing angle is the measurement of contrast ratio  $\geq 10$ , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° ( $\theta$ ) ° horizontal left and right, and 90° ( $\Phi$ ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.



**Note 2:** 9 points position

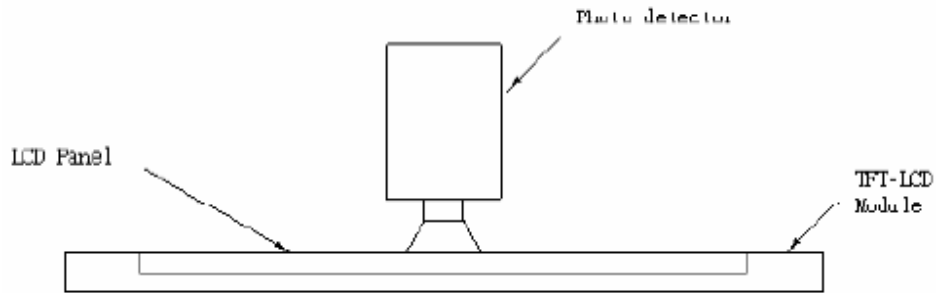


**Note 3:** The luminance uniformity of 9 points is defined by dividing the maximum luminance values by the minimum test point luminance

$$\frac{\text{Luminance of 9 points} - \text{Minimum Luminance of 9 points}}{\text{Luminance of 9 points} - \text{Maximum Luminance of 9 points}} = \frac{L_{\text{min}}}{L_{\text{max}}}$$

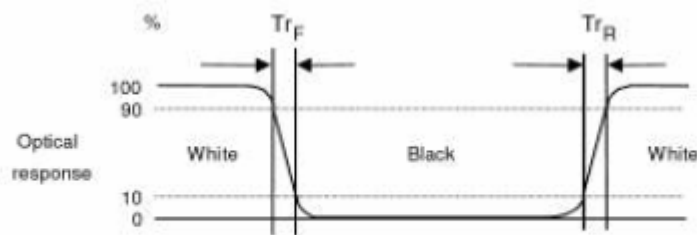
**Note 4:** Measurement method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room. Optical Equipment: DT-100, or equivalent .



**Note 5:** Definition of response time:

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

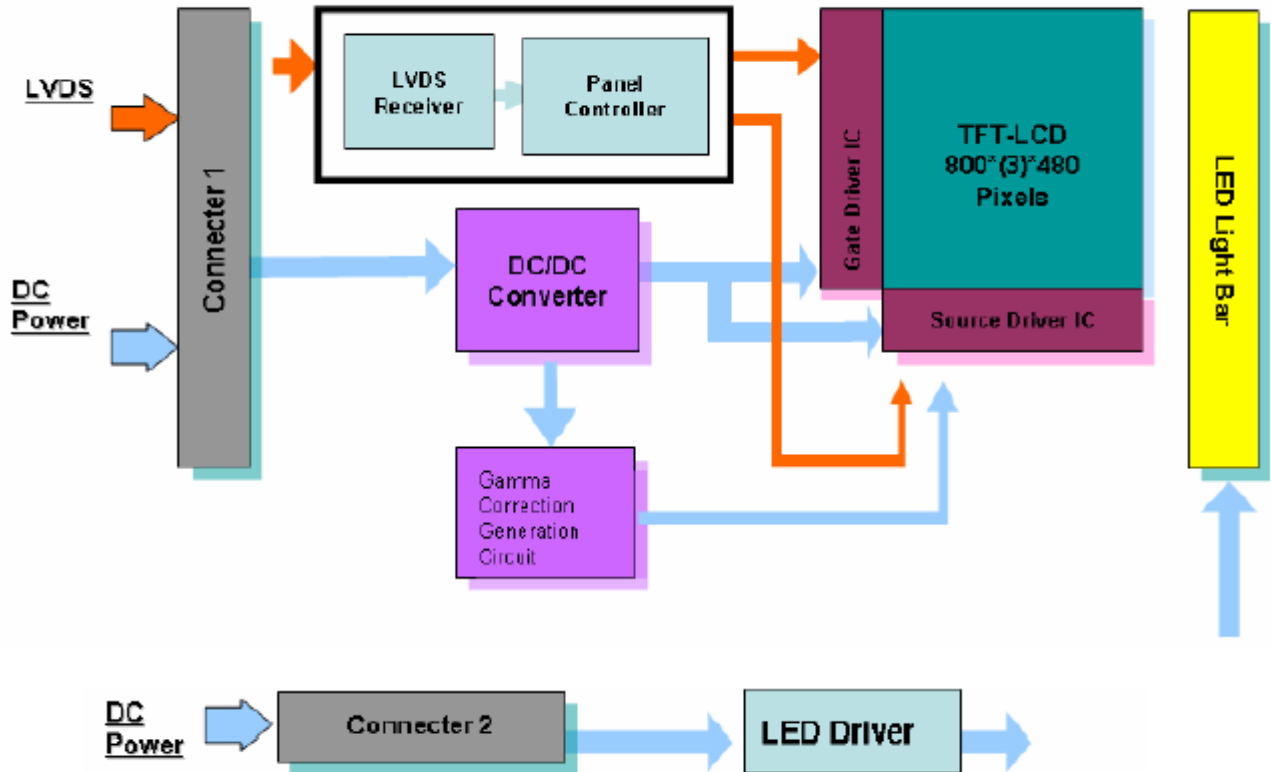






### 3. Functional Block Diagram

The following diagram shows the functional block of the 7 inches Color TFT-LCD Module :





#### 4. Absolute Maximum Ratings

Absolute maximum ratings of the module is as following:

##### 4.1 Absolute Ratings of TFT LCD Module

| Item                    | Symbol          | Min. | Max. | Unit   | Conditions |
|-------------------------|-----------------|------|------|--------|------------|
| Logic/LCD Drive Voltage | V <sub>in</sub> | -0.3 | +3.6 | [Volt] | Note 1, 2  |

##### 4.2 Absolute Ratings of Backlight Unit

| Item                  | Symbol           | Min. | Max. | Unit | Conditions |
|-----------------------|------------------|------|------|------|------------|
| LED Light Bar Current | I <sub>Led</sub> | -    | 170  | [mA] | Note 1, 2  |

##### 4.3 Absolute Ratings of Environment

| Item                  | Symbol | Min. | Max. | Unit  | Conditions |
|-----------------------|--------|------|------|-------|------------|
| Operating Temperature | TOP    | -30  | +85  | [°C]  | Note 3     |
| Operation Humidity    | HOP    | 8    | 95   | [%RH] |            |
| Storage Temperature   | TST    | -30  | +85  | [°C]  |            |
| Storage Humidity      | HST    | 5    | 95   | [%RH] |            |

**Note 1:** With in Ta= 25°C

**Note 2:** Permanent damage to the device may occur if exceed maximum values

**Note 3:** For quality performance, please refer to AUO IIS (Incoming Inspection Standard).



## 5. Electrical characteristics

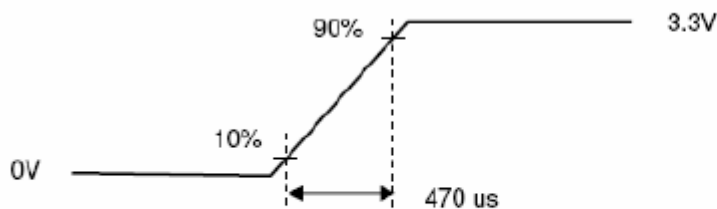
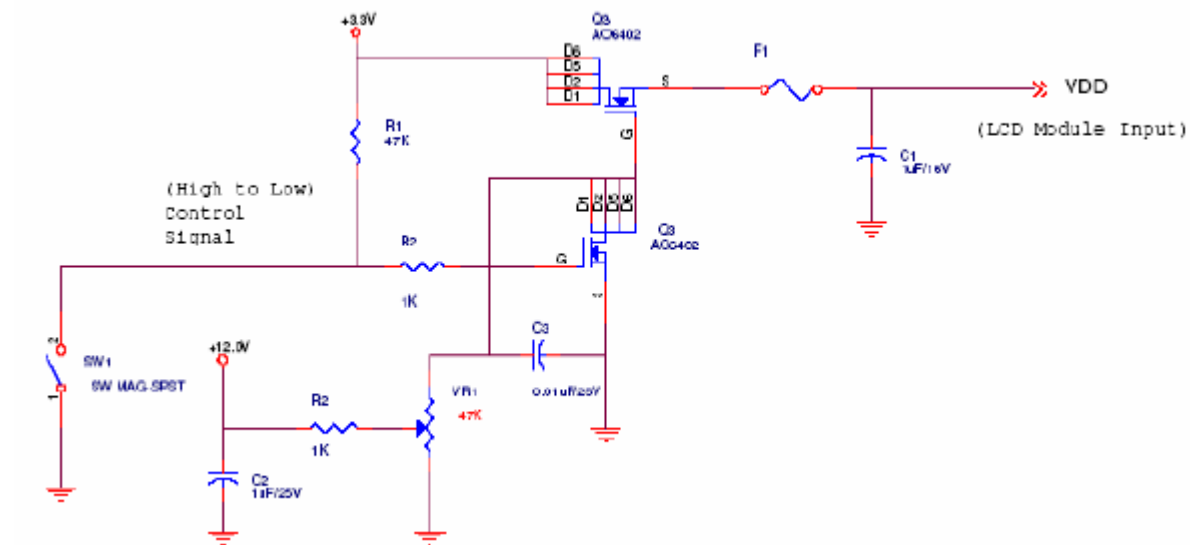
### 5.1 TFT LCD Module :

#### 5.1.1 Power Specification

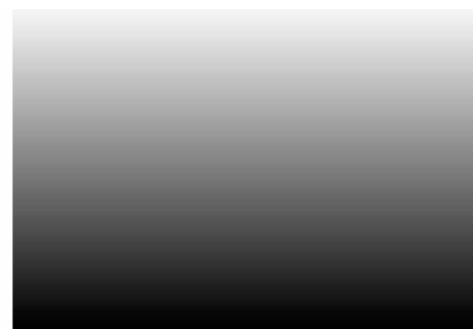
Input power specifications are as follows:

| Symbol | Parameter               | Min. | Typ. | Max. | Unit   | Condition                               |
|--------|-------------------------|------|------|------|--------|---|
| VDD    | Logic/LCD Drive Voltage | 3.0  | 3.3  | 3.6  | [Volt] | ±10%                                    |
| IDD    | Input Current           | -    | 240  | 260  | [mA]   | 64 Gray Bar Pattern (VDD=3.3V, at 60Hz) |
| PDD    | VDD Power               | -    | 0.8  | 0.96 | [Watt] | 64 Gray Bar Pattern (VDD=3.3V, at 60Hz) |
| IRush  | Inrush Current          | -    | -    | 3    | [A]    | Note 1                                  |

**Note 1:** Measurement condition:



VDD rising time

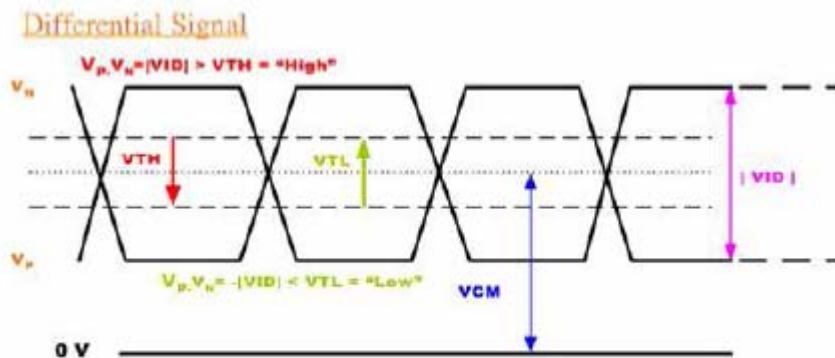


64 Gray pattern

**5.1.2 Signal Electrical Characteristics**

Input signals shall be low or Hi-Z state when VDD is off.

| Symble | Parameter                              | Min. | Typ. | Max. | Unit | Condition          |
|--------|--|------|------|------|------|--------------------|
| VTH    | Differential Input High Threshold      | -    | -    | 100  | [mV] | VCM=1.2V           |
| VTL    | Differential Input Low Threshold       | -100 | -    | -    | [mV] | VCM=1.2V           |
| VID    | Input Differential Voltage             | 100  | 400  | 600  | [mV] |                    |
| VICM   | Differential Input Common Mode Voltage | 1.1  | -    | 1.6  | [V]  | VTH / VTL = ±100mV |

**Note:** LVDS Signal Waveform.



## 5.2 Backlight Driving Conditions

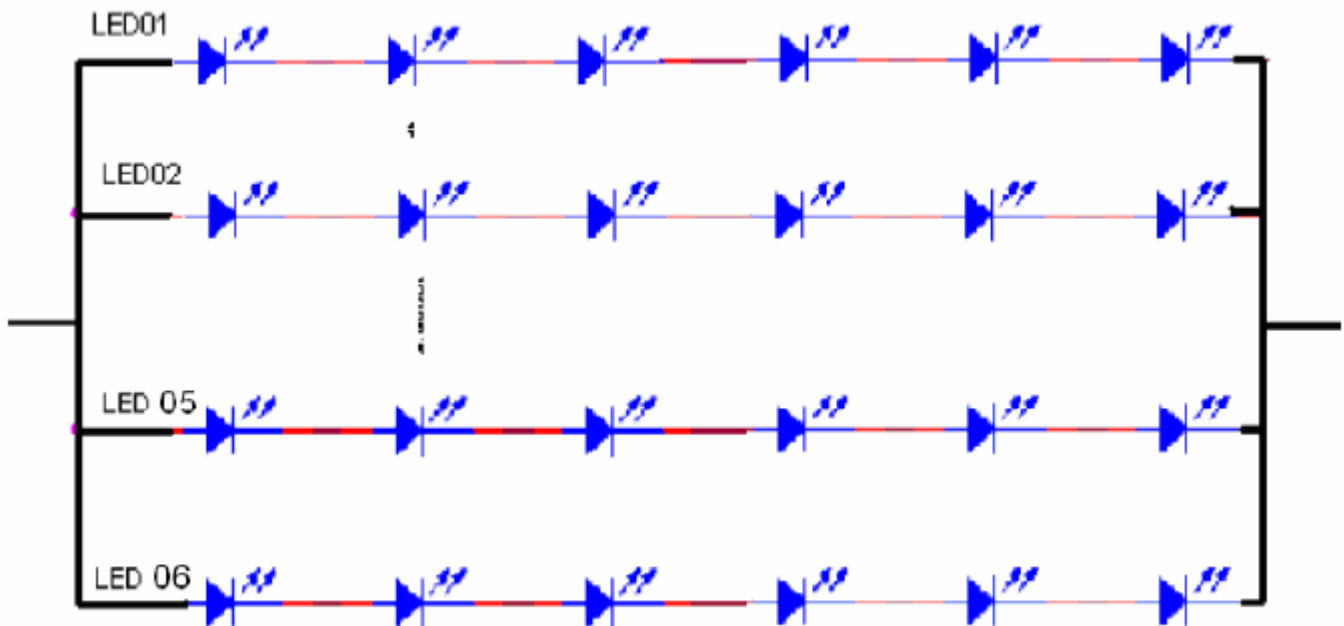
Parameter guideline for LED Light Bar Driver is under stable conditions at 25°C (Room Temperature):

| Item          | Symbol | Values |      |      | Unit | Condition |
|---------------|--------|--------|------|------|------|-----------|
|               |        | Min.   | Typ. | Max. |      |           |
| LED Voltage   | VL     | -      |      | 18   | V    | Note 2    |
| LED Current   | IL     | -      |      | 170  | mA   | Note 2    |
| LED life time | -      | 70,000 | -    | -    | Hr   | Note 1    |

**Note 1:** The "LED lift time" is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25°C and typical LED Current at 170mA.

**Note 2:** The LED driving condition is defined for each LED module.(6 LED Serial, a LED includes 1Chip)

**Note 2:** The LED driving condition is defined for each LED module.(6 LED Serial, a LED includes 1Chip)



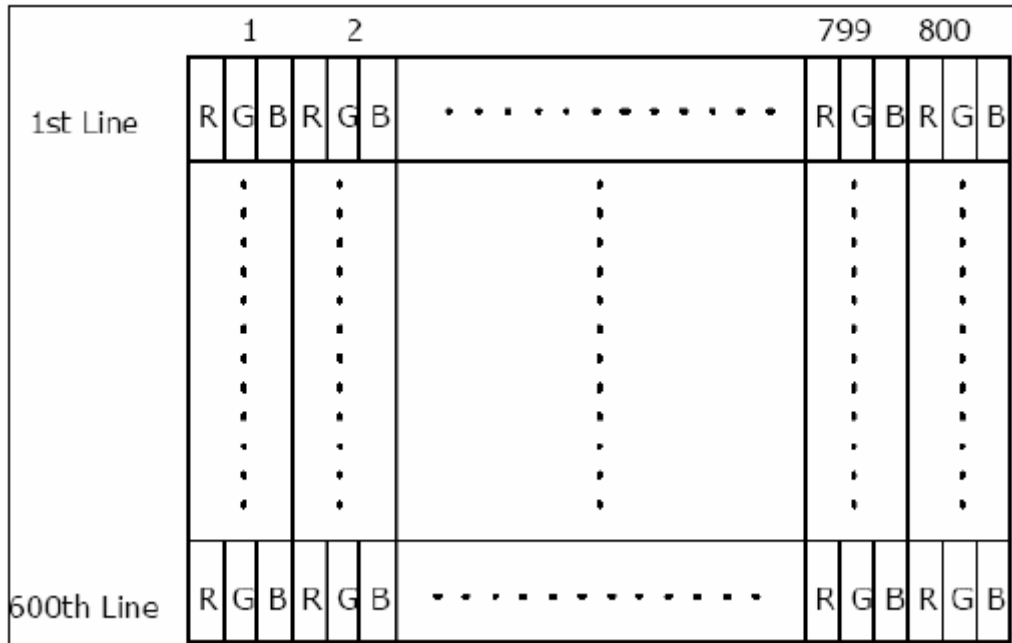
**Note 3:** The variance of LED Light Bar power consumption is  $\pm 10\%$ . Calculator value for reference ( $IL \times VL = P_{LED}$ )



## 6. Signal Characteristic

### 6.1 Pixel Format Image

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





## 6.2 Signal Description

LVDS is a differential signal technology for LCD interface and high speed data transfer device. The connector pin definition is as below.

| Pin No. | Signal   | Description   |
|---------|----------|---|
| 1       | VDD      | Power supply 3.3V(Typical)  |
| 2       | VDD      | Power supply 3.3V(Typical)  |
| 3       | UD       | Vertical reverse scan control<br>Low or NC→ Normal mode<br>High → Vertical reverse scan(Note)       |
| 4       | LR       | Vertical reverse scan control<br>Low or NC→ Normal mode<br>High → Vertical reverse scan(Note)       |
| 5       | RxIN0-   | LVDS differential data input Pair 0   |
| 6       | RxIN0+   |   |
| 7       | GND      | Ground  |
| 8       | RxIN1-   | LVDS differential data input Pair 1   |
| 9       | RxIN1+   |   |
| 10      | GND      | Ground  |
| 11      | RxIN2-   | LVDS differential data input Pair 2   |
| 12      | RxIN2+   |   |
| 13      | GND      | Ground  |
| 14      | RXCLKIN- | LVDS differential Clock input Pair  |
| 15      | RXCLKIN+ |   |
| 16      | GND      | Ground  |
| 17      | SEL68    | LVDS 6/8bit select function control<br>Low or NC→ 6 bit input mode<br>High → 8 bit input mode(Note) |
| 18      | NC       | NC  |
| 19      | RxIN3-   | LVDS differential data input Pair 3   |
| 20      | RxIN3+   |   |

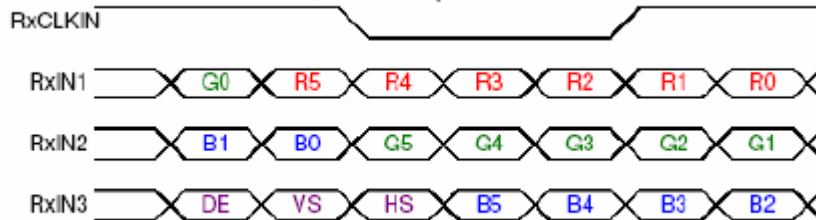
Note : "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connected."



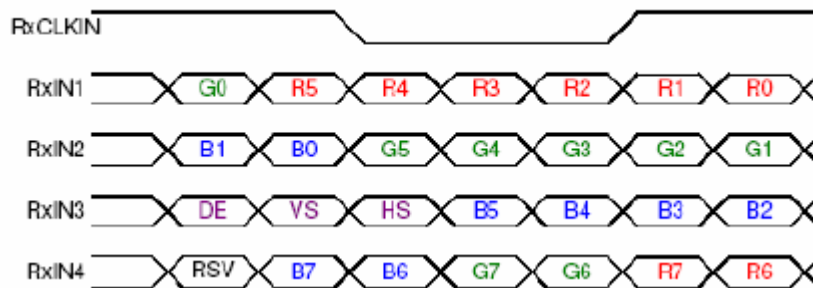
### 6.3 The Input Data Format

#### 6.3.1 SEL68

SEL68 = "Low" or "NC" for 6 bits LVDS Input



SEL68 = "High" for 8 bits LVDS Input



**Note1:** Please follow PSWG.

**Note2:** R/G/B data 7:MSB, R/G/B data 0:LSB

| Signal Name          | Description        | Remark  |
|----------------------|--------------------|---|
| R7                   | Red Data 7 (MSB)   | Red-pixel Data<br>Each red pixel's brightness data consists of these 8 bits pixel data.     |
| R6                   | Red Data 6         |   |
| R5                   | Red Data 5         |   |
| R4                   | Red Data 4         |   |
| R3                   | Red Data 3         |   |
| R2                   | Red Data 2         |   |
| R1                   | Red Data 1         |   |
| R0                   | Red Data 0 (LSB)   |   |
| G7                   | Green Data 7 (MSB) | Green-pixel Data<br>Each green pixel's brightness data consists of these 8 bits pixel data. |
| G6                   | GreenData 6        |   |
| G5                   | GreenData 5        |   |
| G4                   | GreenData 4        |   |
| G3                   | GreenData 3        |   |
| G2                   | GreenData 2        |   |
| G1                   | GreenData 1        |   |
| G0                   | GreenData 0 (LSB)  |   |
| B7                   | Blue Data 7 (MSB)  | Blue-pixel Data<br>Each blue pixel's brightness data consists of these 8 bits pixel data.   |
| B6                   | Blue Data 6        |   |
| B5                   | Blue Data 5        |   |
| B4                   | Blue Data 4        |   |
| B3                   | Blue Data 3        |   |
| B2                   | Blue Data 2        |   |
| B1                   | Blue Data 1        |   |
| B0                   | Blue Data 0 (LSB)  |   |
| RXCLKIN+<br>RXCLKIN- | LVDS Clock Input   |   |
| DE                   | Display Enable     |   |
| VS                   | Vertical Sync      |   |
| HS                   | Horizontal Sync    |   |

**Note:** Output signals from any system shall be low or Hi-Z state when VDD is off.



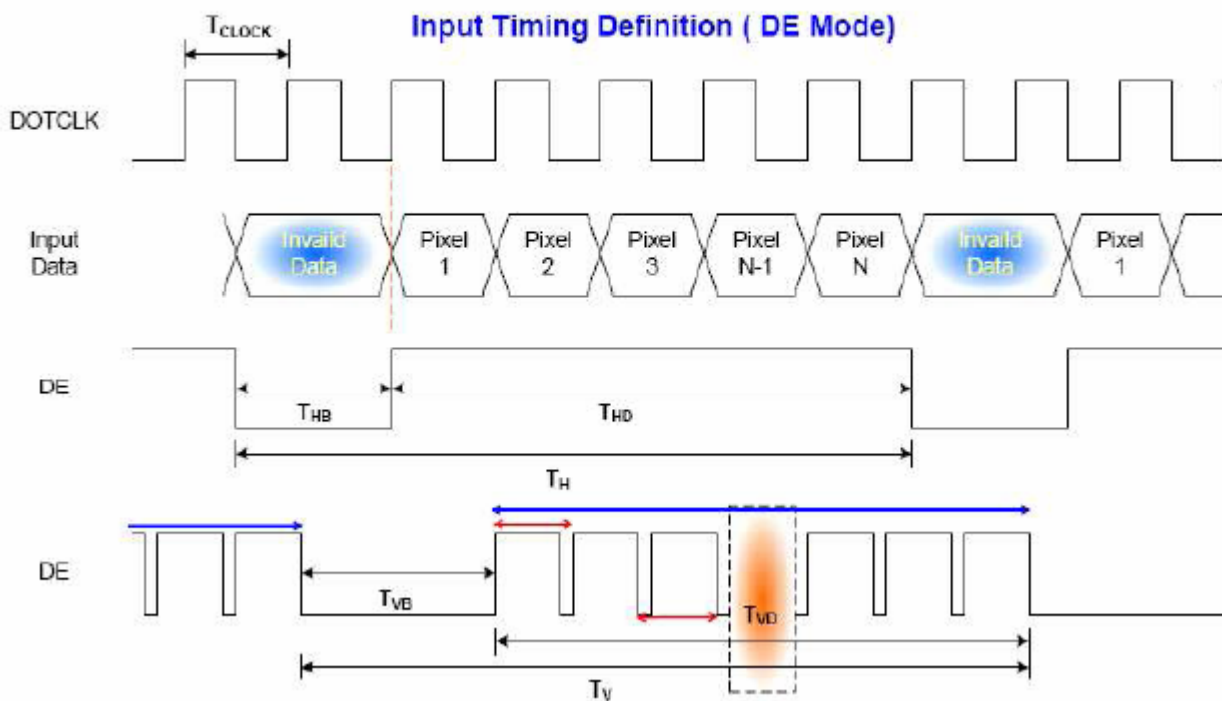


## 6.4 Interface Timing

### 6.4.1 Timing Characteristics

| Parameter          |          | Symbol        | Min. | Typ. | Max. | Unit        | Condition |
|--------------------|----------|---------------|------|------|------|-------------|-----------|
| Clock frequency    |          | $1/T_{Clock}$ | 33.6 | 39.8 | 48.3 | MHz         |           |
| Vertical Section   | Period   | $T_V$         | 608  | 628  | 650  | $T_H$       |           |
|                    | Active   | $T_{VD}$      | 600  | 600  | 600  |             |           |
|                    | Blanking | $T_{VB}$      | 8    | 28   | 50   |             |           |
| Horizontal Section | Period   | $T_H$         | 920  | 1056 | 1240 | $T_{Clock}$ |           |
|                    | Active   | $T_{HD}$      | 800  | 800  | 800  |             |           |
|                    | Blanking | $T_{HB}$      | 120  | 256  | 440  |             |           |

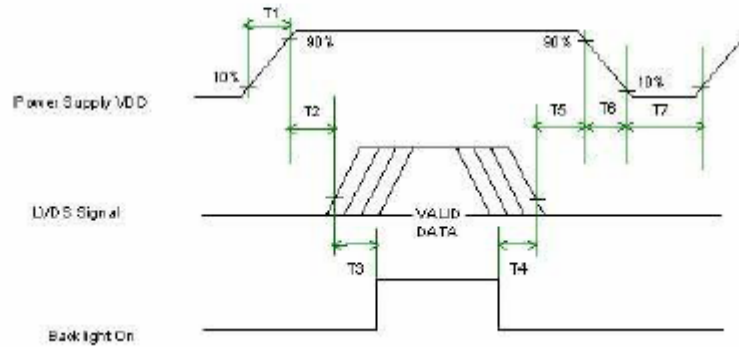
### 6.4.2 Input Timing Diagram





## 6.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



### Power Sequence Timing

| Parameter | Value |      |      | Unit |
|-----------|-------|------|------|------|
|           | Min.  | Typ. | Max. |      |
| T1        | 0.5   | -    | 10   | [ms] |
| T2        | 0     | 40   | 50   | [ms] |
| T3        | 200   | -    | -    | [ms] |
| T4        | 200   | -    | -    | [ms] |
| T5        | 0     | 16   | 50   | [ms] |
| T6        | -     | -    | 10   | [ms] |
| T7        | 1000  | -    | -    | [ms] |

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.



## 7. Connector & Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

### 7.1 TFT LCD Module

#### 7.1.1 Connector

| Connector Name / Designation | Signal Connector           |
|------------------------------|----------------------------|
| Manufacturer                 | STM                        |
| Connector Model Number       | MSB24013P20 or compatible. |
| Adaptable Plug               | P24013P20                  |

#### 7.1.2 Pin Assignment

| Pin No. | Signal Name | Pin No. | Signal Name |
|---------|-------------|---------|-------------|
| 1       | VDD         | 2       | VDD         |
| 3       | UD          | 4       | LR          |
| 5       | RxIN0-      | 6       | RxIN0+      |
| 7       | GND         | 8       | RxIN1-      |
| 9       | RxIN1+      | 10      | GND         |
| 11      | RxIN2-      | 12      | RxIN2+      |
| 13      | GND         | 14      | CKIN-       |
| 15      | CKIN+       | 16      | GND         |
| 17      | SEL68       | 18      | NC          |
| 19      | RxIN3+      | 20      | RxIN3-      |

## 7.2 Backlight Unit

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

|                              |  |
|------------------------------|--|
| Connector Name / Designation | LED Light Bar Connector / Backlight lamp |
| Manufacturer                 | TKP TERMINAL/ TKP HOVSING                |
| Type Part Number             | TKP TERMINAL 8820T/ TKP HOVSING 8821-03  |
| Mating Type Part Number      | Wire VL 1007 24 AWG                      |

### 7.2.1 Signal for LED light bar connector

|       | Connector No. | Pin No. | Input | Color | Function                        |
|-------|---------------|---------|-------|-------|---------------------------------|
| Lower | CN1           | 1       | HI 2  | Red   | Power supply for backlight unit |
|       |               | 2       | GND 2 | Black | Ground for backlight unit       |



REAR VIEW :

