# Model Name: T390XVN01.0

## Issue Date : 2013/06/10

## ( )Preliminary Specifications
## (＊)Final Specifications

| Customer Signature | Date | AUO | Date |
|---|---|---|---|
| Approved By | | Approval By PM Director<br>Kelly Hao | |
| Note | | Reviewed By RD Director<br>陳 [illegible] | |
| | | Reviewed By Project Leader<br>Effa Chou | |
| | | Prepared By PM<br>Telence Yang | |

 

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# RECORD OF REVISION

| Version | Date | Page | Description |
|---|---|---|---|
| 0.0 | 2013/04/24 | | First release |
| 0.1 | 2013/5/7 | 6 | Update DC Characteristics |
| | 2013/5/7 | 21 | Update Optical Specification |
| | 2013/5/7 | 14 | Max clock from 85 change to 82 |
| 1.0 | 2013/6/5 | 21 | Update Color Chromaticity |
| 1.0 | 2013/6/5 | 6 | Update DC Characteristics . Input Current , Power Consumption , Inrush Current |
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# 1. General Description

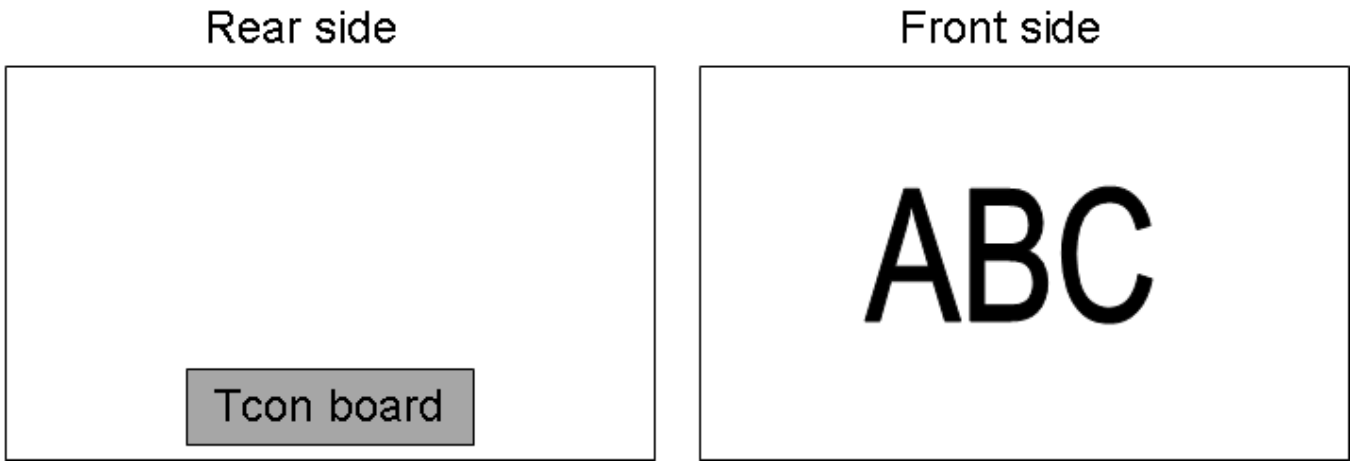
This specification applies to the 38.5 inch Color TFT-LCD SKD model T390XVN01.0. This Open Cell Unit has a TFT active matrix type liquid crystal panel 1,366x768 pixels, and diagonal size of 38.5 inch. This Open Cell Unit supports 1,366x768 mode. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot.

*** General Information**

| Items | Specification | Unit | Note |
|---|---|---|---|
| Active Screen Size | 38.5 | inch | |
| Display Area | 853.41(H) x 479.81(V) | mm | |
| Outline Dimension | 868.72(H) x 492.83 (V) x 1.385(D) | mm | D: cell thickness |
| Driver Element | a-Si TFT active matrix | | |
| Display Colors | 8 bit, 16.7M | Colors | |
| Number of Pixels | 1,366x768 | Pixel | |
| Pixel Pitch | 0.62475 (H) x 0.62475(W) | mm | |
| Pixel Arrangement | RGB vertical stripe | | |
| Display Operation Mode | Normally Black | | |
| Surface Treatment | Anti-Glare, 3H | | Haze=2% |
| Weight | 1300 | g | |
| Rotate Function | Unachievable | | Note 1 |
| Display Orientation | Signal input with “ABC” | | Note 2 |

Note 1: Rotate Function refers to LCD display could be able to rotate.

Note 2: LCD display as below illustrated when signal input with “ABC”.



# 2. Absolute Maximum Ratings

The followings are maximum values which, if exceeded, may cause faulty operation or damage to the unit

| Item | Symbol | Min | Max | Unit | Conditions |
|---|---|---|---|---|---|
| Logic/LCD Drive Voltage | $V_{DD}$ | -0.3 | 14 | $[Volt]_{DC}$ | Note 1 |
| Input Voltage of Signal | Vin | -0.3 | 4 | $[Volt]_{DC}$ | Note 1 |
| Operating Temperature | TOP | 0 | +50 | [°C] | Note 2 |
| Operating Humidity | HOP | 10 | 90 | [%RH] | Note 2 |
| Storage Temperature | TST | -20 | +60 | [°C] | Note 2 |
| Storage Humidity | HST | 10 | 90 | [%RH] | Note 2 |
| Panel Surface Temperature | PST | | 65 | [°C] | Note 3 |
| Electro Statistic Voltage | ESD | | ±2 | [KV] | Note 4 |

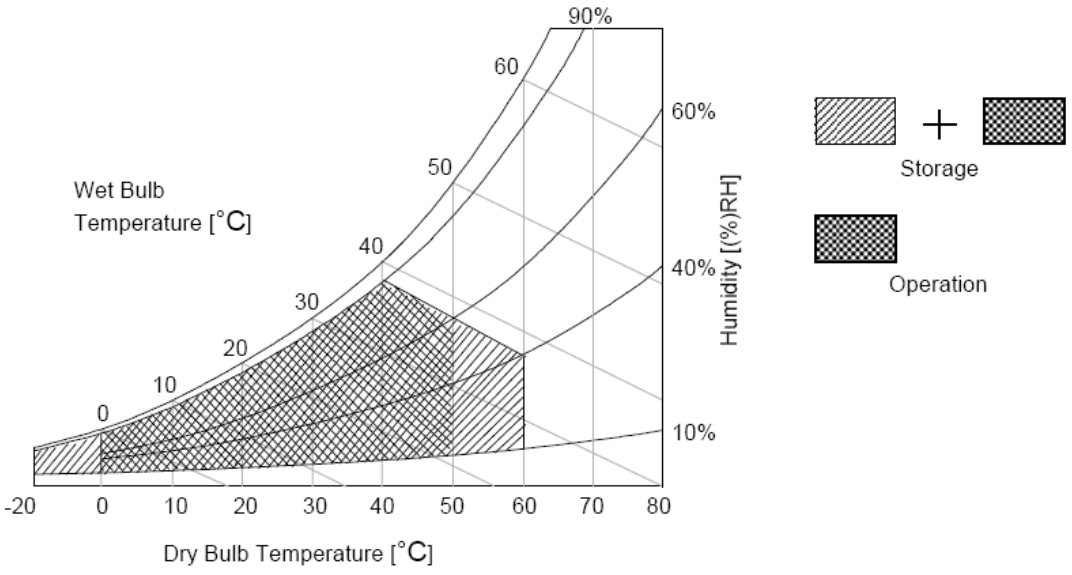
Note 1: Duration:50 msec.

Note 2 : Maximum Wet-Bulb should be 39℃ and No condensation.

The relative humidity must not exceed 90% non-condensing at temperatures of 40℃ or less. At temperatures greater than 40℃, the wet bulb temperature must not exceed 39℃.

Note 3: Surface temperature is measured at 50℃ Dry condition

Note 4: ESD protection procedure must be applied during production process; especially polarizer protection films remove process. Please directly contact AUO if module process advice is required.



# 3. Electrical Specification

The T390XVN01.0 Open Cell Unit requires power input which is employed to power the LCD electronics and to drive the TFT array and liquid crystal.

## 3.1 Electrical Characteristics

### 3.1.1 DC Characteristics

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max | | |
| LCD | | | | | | | |
| Power Supply Input Voltage | | $V_{DD}$ | 10.8 | 12 | 13.2 | $V_{DC}$ | |
| Power Supply Input Current | | $I_{DD}$ | -- | 0.435 | 0.522 | A | 1 |
| Power Consumption | | $P_C$ | -- | 5.22 | 6.264 | Watt | 1 |
| Inrush Current | | $I_{RUSH}$ | -- | -- | 0.94 | A | 2 |
| Permissible Ripple of Power Supply Input Voltage | | $V_{RP}$ | -- | -- | $V_{DD}$ * 5% | $mV_{pk-pk}$ | 3 |
| LVDS Interface | Input Differential Voltage | $\|V_{ID}\|$ | 200 | 400 | 600 | $mV_{DC}$ | 4 |
| | Differential Input High Threshold Voltage | $V_{TH}$ | +100 | -- | +300 | $mV_{DC}$ | 4 |
| | Differential Input Low Threshold Voltage | $V_{TL}$ | -300 | -- | -100 | $mV_{DC}$ | 4 |
| | Input Common Mode Voltage | $V_{ICM}$ | 1.1 | 1.25 | 1.4 | $V_{DC}$ | 4 |
| CMOS Interface | Input High Threshold Voltage | $V_{IH}$ (High) | 2.7 | -- | 3.3 | $V_{DC}$ | 5 |
| | Input Low Threshold Voltage | $V_{IL}$ (Low) | 0 | -- | 0.6 | $V_{DC}$ | 5 |

### 3.1.2 AC Characteristics

| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max | | |
| LVDS Interface | Input Channel Pair Skew Margin (only for TCON: 12403U1, 12405) | $t_{SKEW\ (CP)}$ | -500 | -- | +500 | ps | 6 |
| | Receiver Clock : Spread Spectrum Modulation range | Fclk_ss | Fclk -3% | -- | Fclk +3% | MHz | 7 |
| | Receiver Clock : Spread Spectrum Modulation frequency | Fss | 30 | -- | 200 | KHz | 7 |
| | Receiver Data Input Margin<br>Fclk = 85 MHz<br>Fclk = 65 MHz | tRMG | <br>-0.4<br>-0.5 | <br>--<br>-- | <br>0.4<br>0.5 | ns | 8 |
| I2C Interface | SCL clock frequency | $F_{SCL}$ | 0 | -- | 400 | KHZ | |
| | I2C clock high level | $T_{SCHi}$ | 0.6 | -- | -- | us | |
| | I2C clock low level | $T_{SCLo}$ | 1.2 | -- | -- | us | |
| | I2C data setup time | $T_{SDS}$ | 100 | -- | -- | ns | |
| | I2C data hold time | $T_{SDH}$ | 0 | -- | 900 | ns | |
| | SDA and SCL rise time | $T_R$ | -- | -- | 1000 | ns | |
| | SDA and SCL fall time | $T_F$ | -- | -- | 300 | ns | |

### 3.1.3 DRIVER CHARACTERISTICS

| Item | Symbol | Min | Max | Unit | condition |
|---|---|---|---|---|---|
| Driver Surface Temperature | DST | | 100 | [℃] | Note |

**Note : Any point on the driver surface must be less than 100℃ under any conditions.**

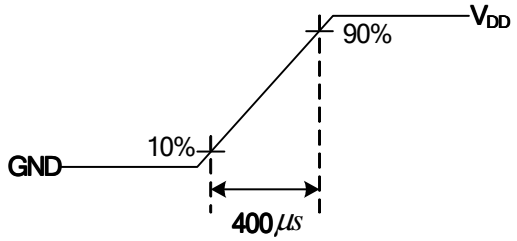
**Note :**

**1.** Test Condition:

(1) $V_{DD}$ = 12.0V
(2) Fv = Type Timing, 60Hz, 120Hz or Other
(3) Fclk= Max freq.
(4) Temperature = 25 ℃
(5) Typ. Input current : White Pattern
Max. Input current: Heavy loading pattern defined by AUO

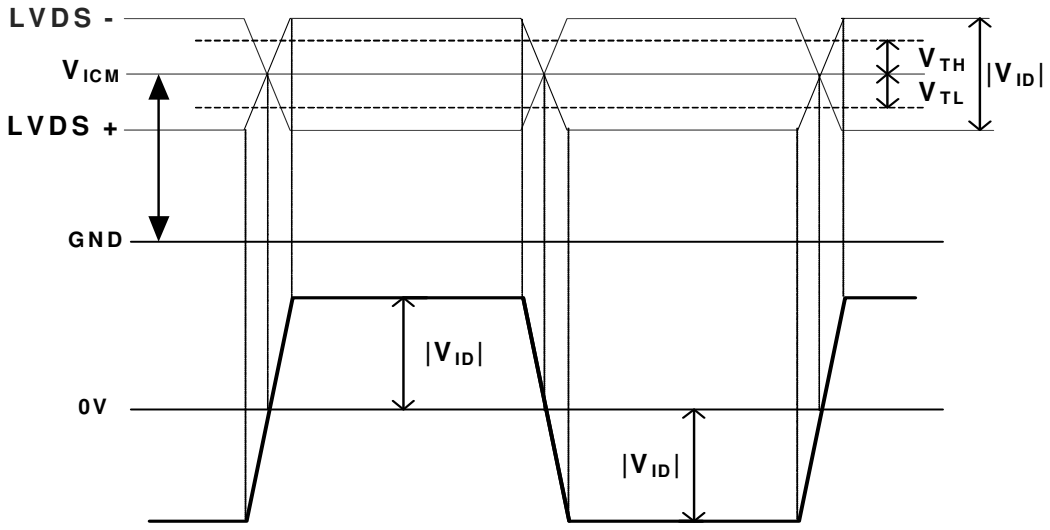
>> refer to "Section:3.3 Signal Timing Specification, Typical timing"

**2.** Measurement condition : Rising time = 400us




**3.** Test Condition:
(1) The measure point of $V_{RP}$ is in LCM side after connecting the System Board and LCM.
(2) Under Max. Input current spec. condition.

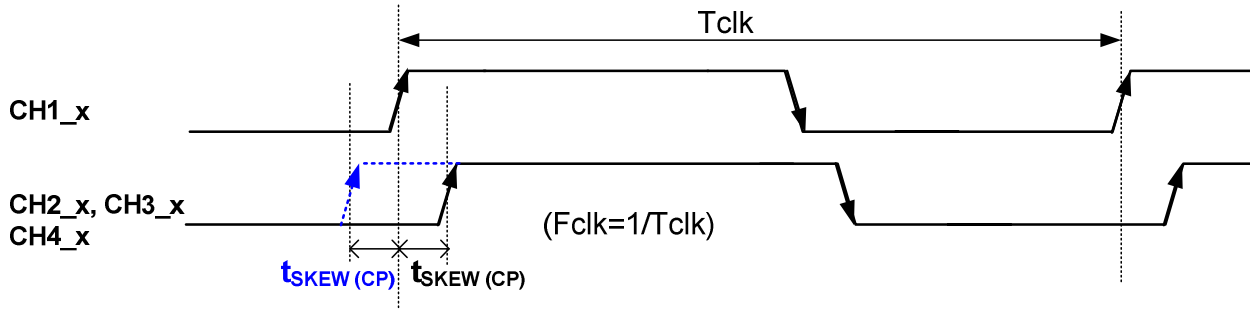
**4.** $V_{ICM}$ = 1.25V




**5.** The measure points of $V_{IH}$ and $V_{IL}$ are in LCM side after connecting the System Board and LCM.

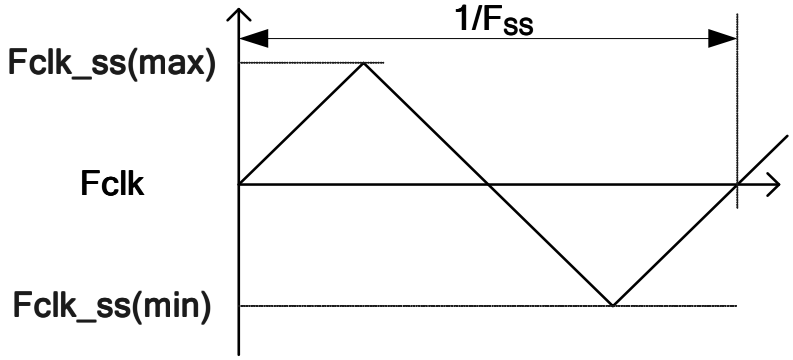
 

**6.** Input Channel Pair Skew Margin.




**Note: x = 0, 1, 2, 3, 4**

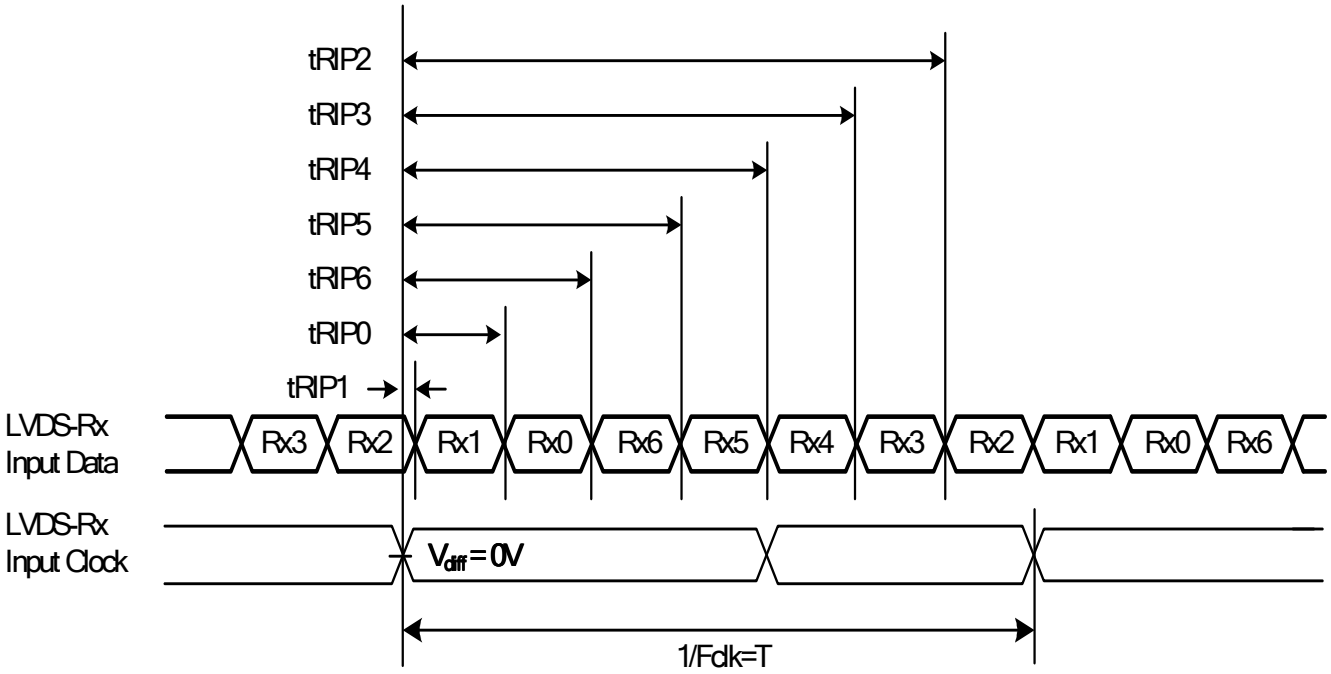
**7.** LVDS Receiver Clock SSCG (Spread spectrum clock generator) is defined as below figures.



**8.** Receiver Data Input Margin

| Parameter | Symbol | Rating | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min | Type | Max | | |
| Input Clock Frequency | Fclk | Fclk (min) | -- | Fclk (max) | MHz | **T=1/Fclk** |
| Input Data Position0 | tRIP1 | -\|tRMG\| | 0 | \|tRMG\| | ns | |
| Input Data Position1 | tRIP0 | T/7-\|tRMG\| | T/7 | T/7+\|tRMG\| | ns | |
| Input Data Position2 | tRIP6 | 2T/7-\|tRMG\| | 2T/7 | 2T/7+\|tRMG\| | ns | |
| Input Data Position3 | tRIP5 | 3T/7-\|tRMG\| | 3T/7 | 3T/7+\|tRMG\| | ns | |
| Input Data Position4 | tRIP4 | 4T/7-\|tRMG\| | 4T/7 | 4T/7+\|tRMG\| | ns | |
| Input Data Position5 | tRIP3 | 5T/7-\|tRMG\| | 5T/7 | 5T/7+\|tRMG\| | ns | |
| Input Data Position6 | tRIP2 | 6T/7-\|tRMG\| | 6T/7 | 6T/7+\|tRMG\| | ns | |



## 3.2 Interface Connections

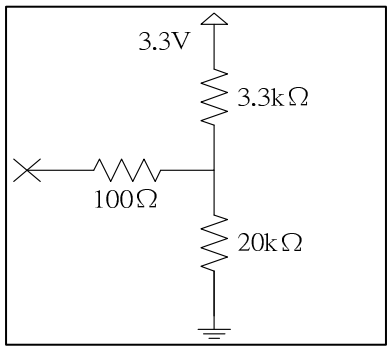
### 3.2.1 T-Con Board Pin Map

**LCD connector : 093G30-00001A-M4**

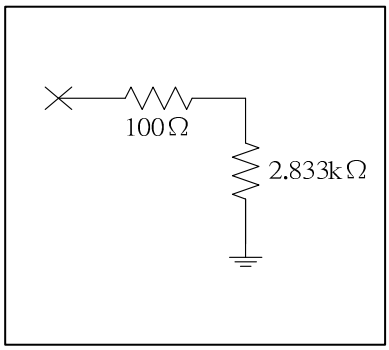
| PIN | Symbol | Description |
|---|---|---|
| 1 | $V_{DD}$ | Power Supply, +12V DC Regulated |
| 2 | $V_{DD}$ | Power Supply, +12V DC Regulated |
| 3 | $V_{DD}$ | Power Supply, +12V DC Regulated |
| 4 | $V_{DD}$ | Power Supply, +12V DC Regulated |
| 5 | GND | Ground |
| 6 | GND | Ground |
| 7 | GND | Ground |
| 8 | GND | Ground |
| 9 | LVDS_SEL | Open/High(3.3V) for NS, Low(GND) for JEIDA |
| 10 | N.C. | No connection (for AUO test only. Do not connect) |
| 11 | GND | Ground |
| 12 | CH1_0- | LVDS Channel 1, Signal 0- |
| 13 | CH1_0+ | LVDS Channel 1, Signal 0+ |
| 14 | GND | Ground |
| 15 | CH1_1- | LVDS Channel 1, Signal 1- |
| 16 | CH1_1+ | LVDS Channel 1, Signal 1+ |
| 17 | GND | Ground |
| 18 | CH1_2- | LVDS Channel 1, Signal 2- |
| 19 | CH1_2+ | LVDS Channel 1, Signal 2+ |
| 20 | GND | Ground |
| 21 | CH1_CLK- | LVDS Channel 1, Clock - |
| 22 | CH1_CLK+ | LVDS Channel 1, Clock + |
| 23 | GND | Ground |
| 24 | CH1_3- | LVDS Channel 1, Signal 3- |
| 25 | CH1_3+ | LVDS Channel 1, Signal 3+ |
| 26 | GND | Ground |
| 27 | SCL | EEPROM Serial Clock |
| 28 | SDA | EEPROM Serial Data |
| 29 | WP | EEPROM Write Protection<br>High(3.3V) for Protection,<br>Low(GND) for Writable |
| 30 | GND | Ground |

**Note: N.C. : please leave this pin unoccupied. It can not be connected by any signal (Low/GND/High). Note: Open / High(3.3V) / Low(GND) described in 3.2.1.3**

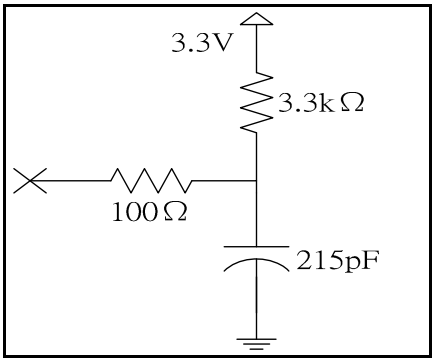
**Note * : Open/High(3.3V)**



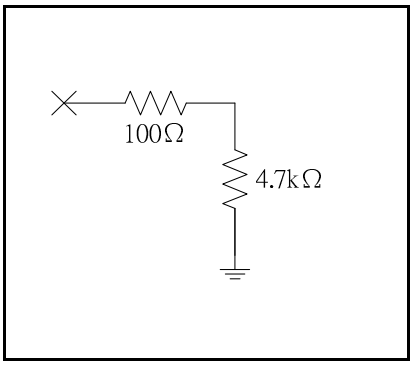

**Note ** : Open/Low(GND)**




**Note **** : SCL/SDA**



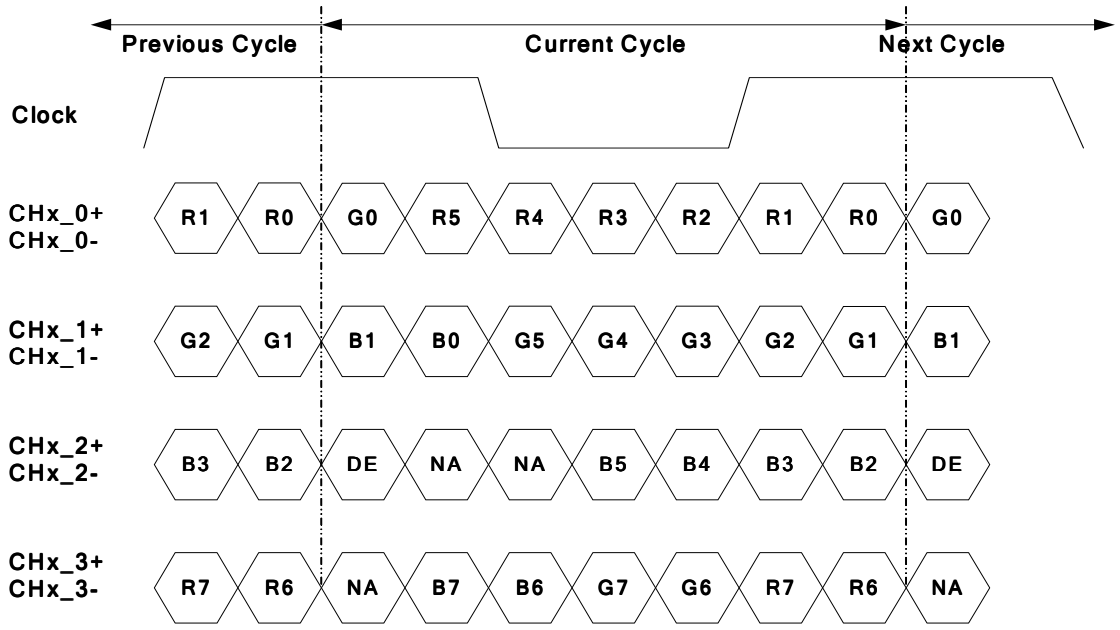

**Note ***** : WP**



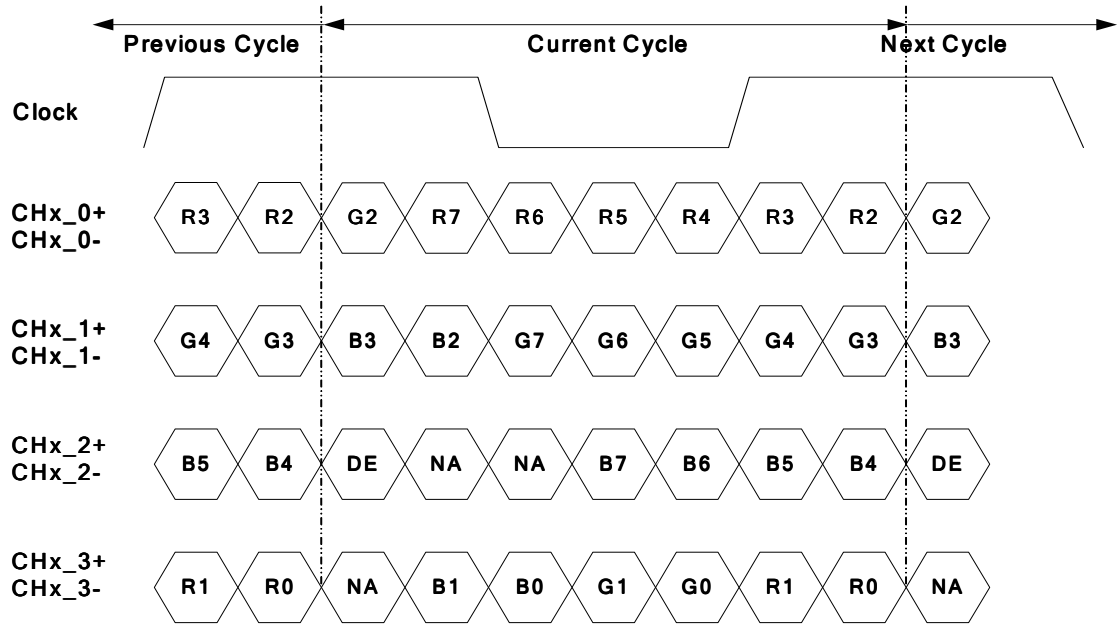
### 3.2.2 LVDS Option

**LVDS Option = High/Open➔NS**




**Note: x = 1, 2, 3, 4…**

**LVDS Option = Low➔JEIDA**




**Note: x = 1, 2, 3, 4…**

### 3.2.3 Signal Timing Specification

This is the signal timing required at the input of the user connector. All of the interface signal timing should be satisfied with the following specifications for its proper operation.

**Timing Table (DE only Mode)**

| Signal | Item | Symbol | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Vertical Section | Period | Tv | 788 | 810 | 1015 | Th |
| | Active | Tdisp (v) | | 768 | | Th |
| | Blanking | Tblk (v) | 20 | 42 | 247 | Th |
| Horizontal Section | Period | Th | 1460 | 1648 | 2000 | Tclk |
| | Active | Tdisp (h) | | 1366 | | Tclk |
| | Blanking | Tblk (h) | 94 | 282 | 634 | Tclk |
| Clock | Frequency | Fclk=1/Tclk | 53 | 80 | 82 | MHz |
| Vertical Frequency | Frequency | Fv | 47 | 60 | 63 | Hz |
| Horizontal Frequency | Frequency | Fh | 43 | 48 | 53 | KHz |

Notes:

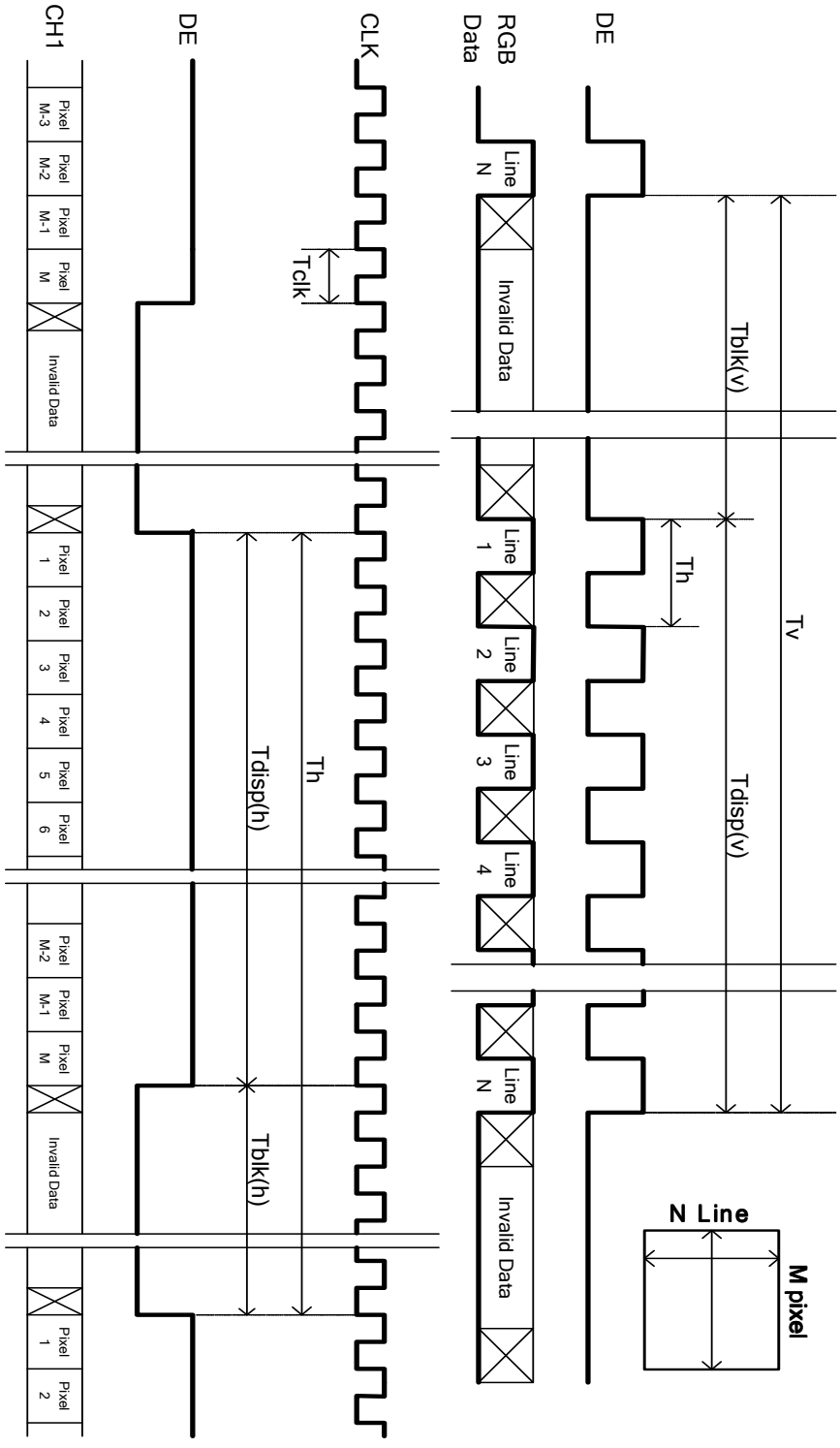
(1) Display position is specific by the rise of DE signal only.
Horizontal display position is specified by the rising edge of 1st DCLK after the rise of 1st DE, is displayed on the left edge of the screen.

(2)Vertical display position is specified by the rise of DE after a “Low” level period equivalent to eight times of horizontal period. The 1st data corresponding to one horizontal line after the rise of 1st DE is displayed at the top line of screen.

(3)If a period of DE “High” is less than 1366 DCLK or less than 768 lines, the rest of the screen displays black.

(4)The display position does not fit to the screen if a period of DE “High” and the effective data period do not synchronize with each other.

## 3.3 Signal Timing Waveforms



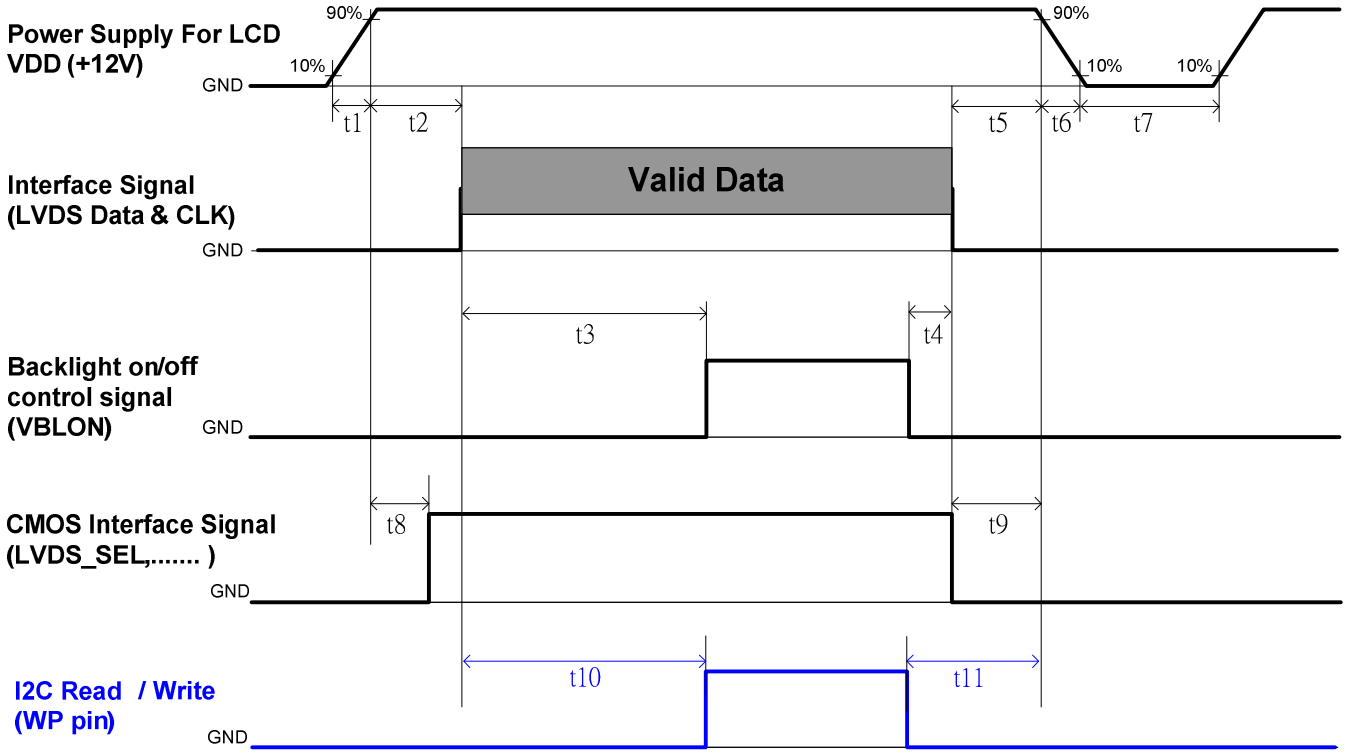

 

## 3.4 Color Input Data Reference

The brightness of each primary color (red, green and blue) is based on the 8 bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

| Color | | Input Color Data | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | RED | | | | | | | | GREEN | | | | | | | | BLUE | | | | | | | |
| | | MSB | | | | | | | LSB | MSB | | | | | | | LSB | MSB | | | | | | | LSB |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Color | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) | 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(255) | 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(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | 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 |
| | 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 |
| | 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 |
| R | RED(000) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | RED(001) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ---- | | | | | | | | | | | | | | | | | | | | | | | | |
| | RED(254) | 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(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| G | GREEN(000) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | GREEN(001) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ---- | | | | | | | | | | | | | | | | | | | | | | | | |
| | GREEN(254) | 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(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B | BLUE(000) | 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(001) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | ---- | | | | | | | | | | | | | | | | | | | | | | | | |
| | BLUE(254) | 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(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

## 3.5 Power Sequence for LCD




| Parameter | Values | | | Unit |
|---|---|---|---|---|
| | Min. | Type. | Max. | |
| t1 | 0.4 | --- | 30 | ms |
| t2 | 0.1 | --- | 50 | ms |
| t3 | 450 | --- | --- | ms |
| t4 | 0 *1 | --- | --- | ms |
| t5 | 0 | --- | --- | ms |
| t6 | --- | --- | --- *2 | ms |
| t7 | 500 | --- | --- | ms |
| t8 | 10 *3 | --- | 50 | ms |
| t9 | 0 | --- | --- | ms |
| t10 | 450 | --- | --- | ms |
| t11 | 150 | --- | --- | ms |

Note:

(1) t4=0 : concern for residual pattern before BLU turn off.

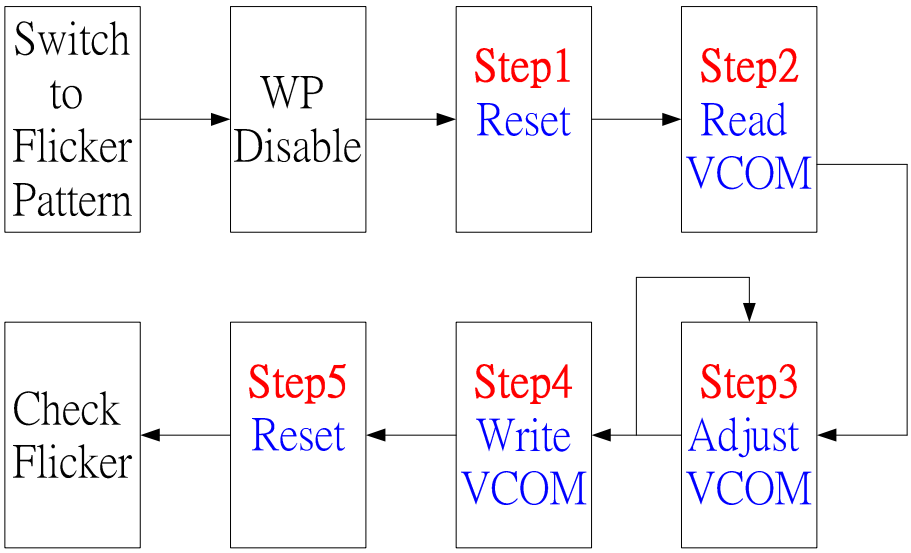
(2) t6 : voltage of VDD must decay smoothly after power-off. (customer system decide this value)

(3) When CMOS Interface signal is N.C. (no connection), opened in Transmitted end, t8 timing spec can be negligible.

## 3.6 VCOM Adjust SOP

If you need below pattern or more detail information, please directly contact AUO for engineer service.

### 3.6.1 VCOM I2C Tuning Step




### 3.6.2 Flicker Pattern


### 3.6.3 WP (Write Protect) Disable

| Disable | Enable | Default (NC) |
|---|---|---|
| H | L | L |

### 3.6.4 Adjust SOP

**Step1 Reset**

* Device Address is 0x74 (7Bits)

| S | Slave Address | W | A | Index Address 0 | A | Control Byte | A | P |
|---|---|---|---|---|---|---|---|---|
| | 1 1 1 0 1 0 0 0 | | | 0 0 0 0 0 0 0 0 | | 0 0 0 1 0 0 1 0 | | |
| | 0xE8 | | | 0x00 | | 0x12 | | |
| | Device Address + W | | | Control Address | | Reset + OUT_EN | | |

**Step2 Read VCOM**

* Data = 7Bits

| S | Slave Address | W | A | Index Address 1 | A | S | Slave Address | R | A | DATA | NA | P |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 1 1 0 1 0 0 0 | | | 0 0 0 0 0 0 0 1 | | | 1 1 1 0 1 0 0 1 | | | X X X X X X X X | | |
| | 0xE8 | | | 0x01 | | | 0xE9 | | | | | |
| | Device Address + W | | | VCOM Address | | | Device Address + R | | | Data | | |

**Step3 Adjust VCOM**

* DVCOM = 8Bits

| S | Slave Address | W | A | Index Address 1 | A | DVCOM | A | P |
|---|---|---|---|---|---|---|---|---|
| | 1 1 1 0 1 0 0 0 | | | 0 0 0 0 0 0 0 1 | | 0000000X~1111111X | | |
| | 0xE8 | | | 0x01 | | 0x00~0xFF | | |
| | Device Address + W | | | VCOM Address | | VCOM value | | |

**Step4 Write VCOM**

| S | Slave Address | W | A | Index Address 0 | A | Control Byte | A | P |
|---|---|---|---|---|---|---|---|---|
| | 1 1 1 0 1 0 0 0 | | | 0 0 0 0 0 0 0 0 | | 0 0 0 0 1 0 1 0 | | |
| | 0xE8 | | | 0x00 | | 0x0A | | |
| | Device Address + W | | | Control Address | | Write DAC to NVM+ OUT_EN | | |

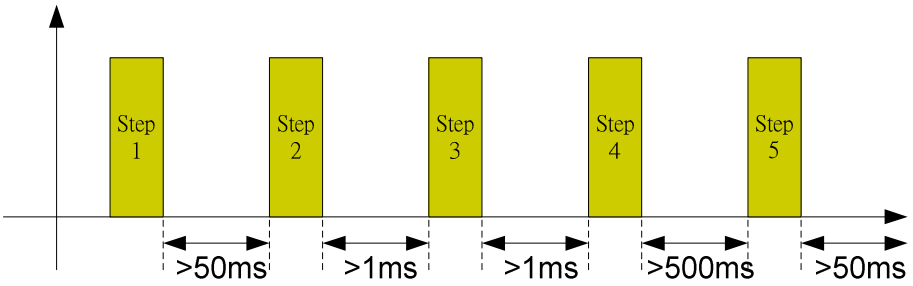
**Step5 Reset**

* Device Address is 0x74 (7Bits)

| S | Slave Address | W | A | Index Address 0 | A | Control Byte | A | P |
|---|---|---|---|---|---|---|---|---|
| | 1 1 1 0 1 0 0 0 | | | 0 0 0 0 0 0 0 0 | | 0 0 0 1 0 0 1 0 | | |
| | 0xE8 | | | 0x00 | | 0x12 | | |
| | Device Address + W | | | Control Address | | Reset + OUT_EN | | |

### 3.6.5 Interval of Step to Step

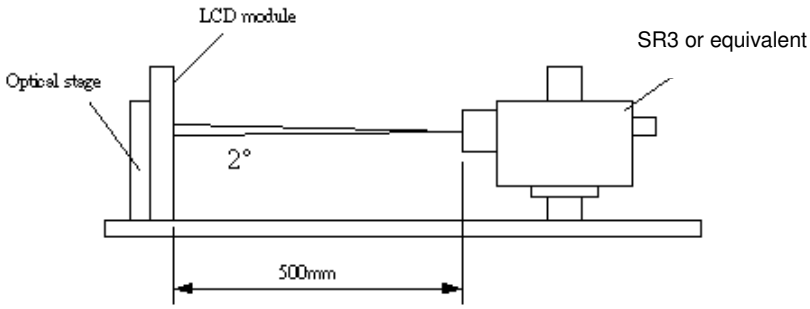
Step to step interval must follow below figure



# 4. Optical Specification

Optical characteristics are determined after the open cell unit and light source has been 'ON' and stable for approximately 45 minutes in a dark environment at 25℃. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of φ and θ equal to 0°.

**Fig.1 presents additional information concerning the measurement equipment and method.**




| Parameter | | Symbol | Condition | Values | | | Unit | Notes |
|---|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max | | |
| Contrast Ratio | | CR | With AUO Module | | 5000 | -- | | 1, 2 |
| White Variation | | $\delta_{WHITE(9P)}$ | | -- | -- | 1.33 | | 1, 3 |
| Response Time (G to G) | | $T_{\gamma}$ | | -- | 6.5 | -- | ms | 4 |
| Center Transmittance | | T% | | | 8 | | % | 1, 7 |
| Color Chromaticity | | | With CS-1000T Standard light source "C" | | | | | 5 |
| | Red | $R_X$ | | Typ.-0.03 | 0.654 | Typ.+0.03 | | |
| | | $R_Y$ | | | 0.327 | | | |
| | Green | $G_X$ | | | 0.277 | | | |
| | | $G_Y$ | | | 0.582 | | | |
| | Blue | $B_X$ | | | 0.142 | | | |
| | | $B_Y$ | | | 0.098 | | | |
| | White | $W_X$ | | | 0.298 | | | |
| | | $W_Y$ | | | 0.338 | | | |
| Viewing Angle | | | With AUO Module | | | | | 1, 6 |
| | x axis, right(φ=0°) | $\theta_r$ | | -- | 89 | -- | degree | |
| | x axis, left(φ=180°) | $\theta_l$ | | -- | 89 | -- | degree | |
| | y axis, up(φ=90°) | $\theta_u$ | | -- | 89 | -- | degree | |
| | y axis, down (φ=270°) | $\theta_d$ | | -- | 89 | -- | degree | |

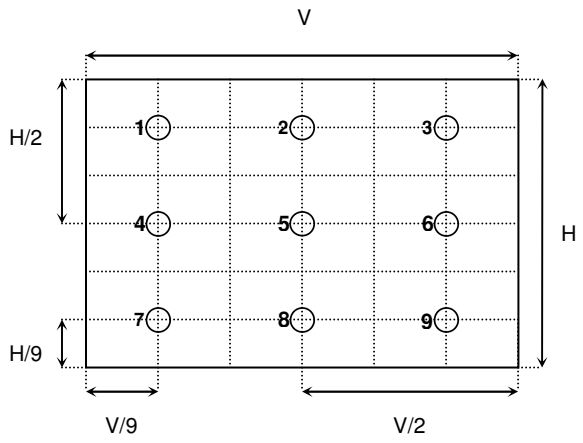
 

1. Light source here is the BLU of AUO T390XVN01.0 module.
2. Contrast Ratio (CR) is defined mathematically as:

$$\textbf{Contrast Ratio} = \frac{\textbf{Surface Luminance of } L_{on5}}{\textbf{Surface Luminance of } L_{off5}}$$

3. The white variation, δWHITE is defined as:

$\delta_{WHITE(9P)}$= Maximum($L_{on1}$, $L_{on2}$,…,$L_{on9}$)/ Minimum($L_{on1}$, $L_{on2}$,…$L_{on9}$)




4. Response time $T_r$ is the average time required for display transition by switching the input signal for five luminance ratio (0%,25%,50%,75%,100% brightness matrix) and is based on $F_v$=60Hz to optimize.

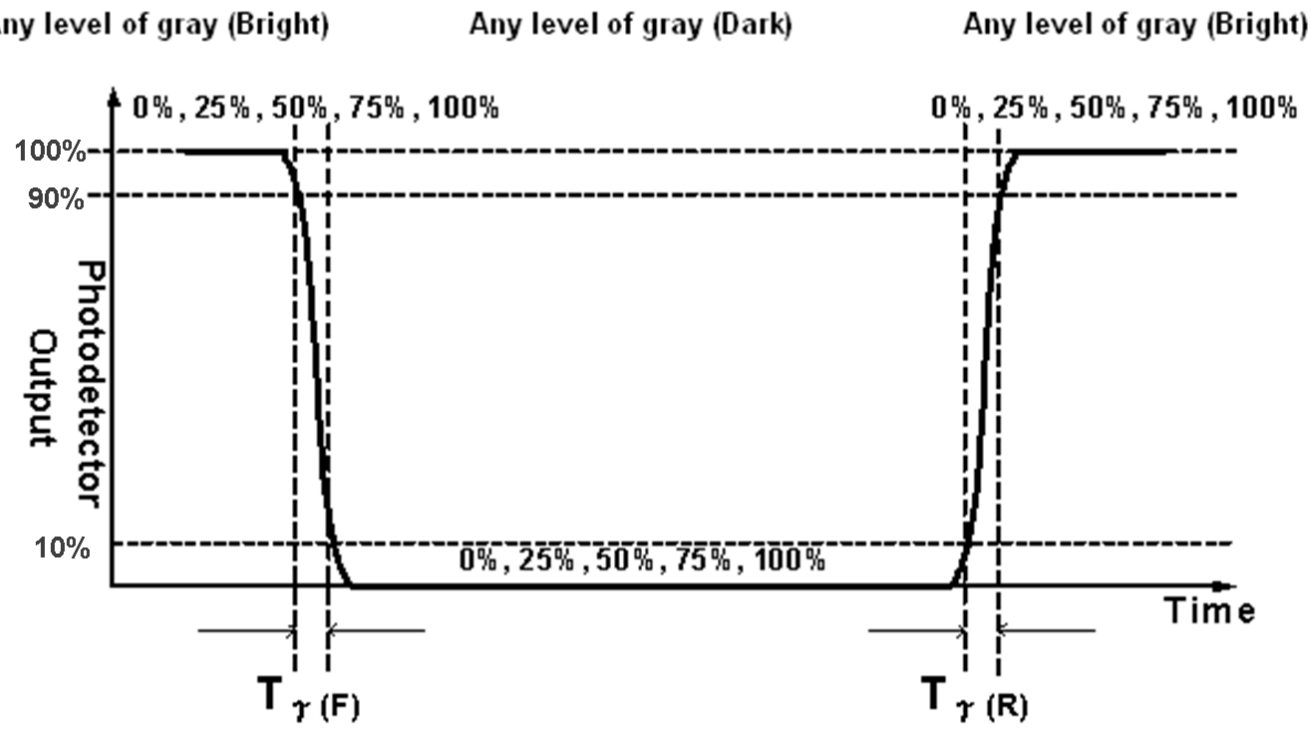
| Measured Response Time | | Target | | | | |
|---|---|---|---|---|---|---|
| | | 0% | 25% | 50% | 75% | 100% |
| Start | 0% | | 0% to 25% | 0% to 50% | 0% to 75% | 0% to 100% |
| | 25% | 25% to 0% | | 25% to 50% | 25% to 75% | 25% to 100% |
| | 50% | 50% to 0% | 50% to 25% | | 50% to 75% | 50% to 100% |
| | 75% | 75% to 0% | 75% to 25% | 75% to 50% | | 75% to 100% |
| | 100% | 100% to 0% | 100% to 25% | 100% to 50% | 100% to 75% | |

$T_\gamma$ is determined by 10% to 90% brightness difference of rising or falling period. (As illustrated)

The response time is defined as the following figure and shall be measured by switching the input signal for "any level of gray(bright) " and "any level of gray(dark)".

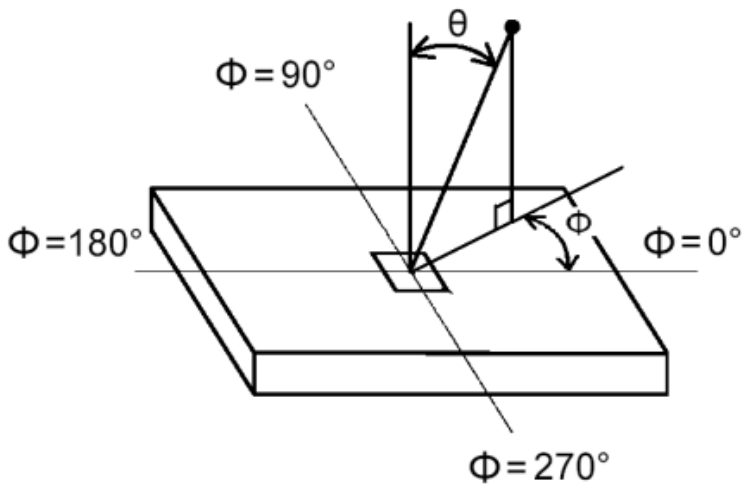
**FIG.3 Response Time**




5. Light source here is the standard light source “C” which is defined by CIE and driving voltages are based on suitable gamma voltages. The calculating method is as following：
   A. Measure the “Module” and “BLU” optical spectrums (W, R, G, B).
   B. Calculate cell spectrum from “Module” and “BLU” spectrums.
   C. Calculate color chromaticity by using cell spectrum and the spectrum of standard light source “C”.
6. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG4.

**FIG.4 Viewing Angle**



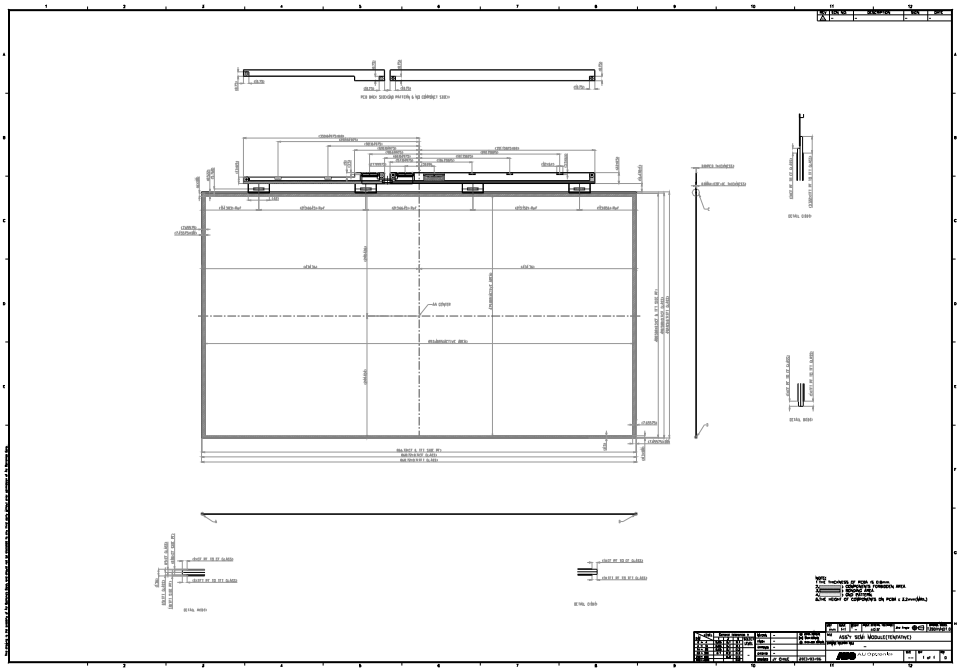

7. Definition of Transmittance (T%):

$$\text{Transmittance} = \frac{\text{Luminance of LCD module}}{\text{Luminance of backlight}} * 100\%$$

During transmittance measurement, the backlight of LCD module contains no brightness enhancement film. Two diffuser sheets which diffuse the light source uniformly are suggested to use for transmittance measurement.

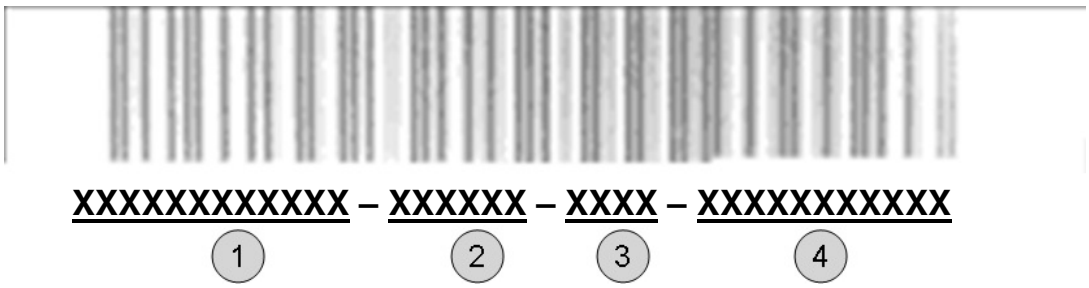
# 5. Mechanical Characteristics



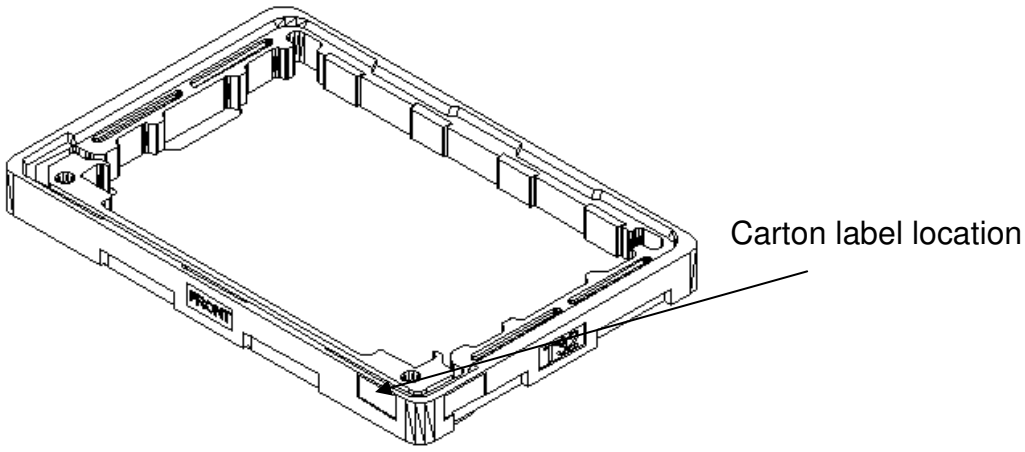
# 6. Packing

Open cell shipping label (35*7mm)



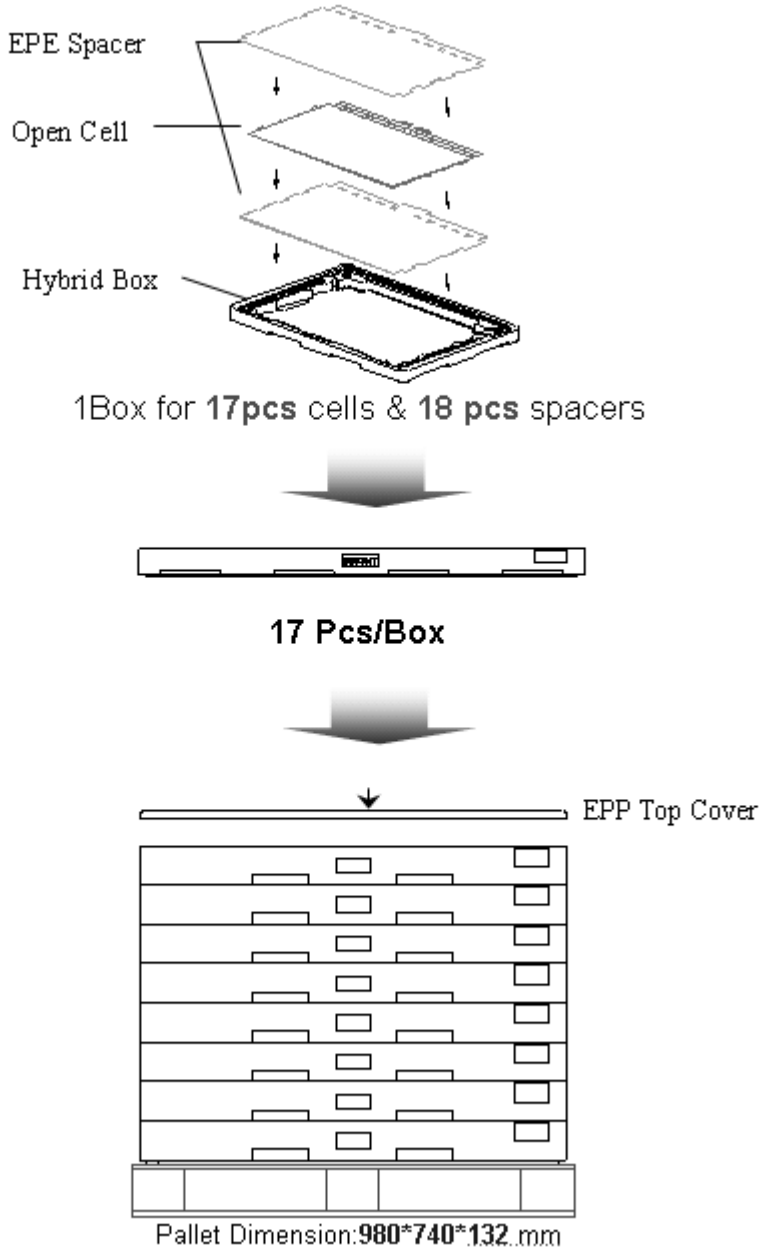

1. S/N Number
2. AUO internal use
3. Manufactured week
4. Model name

Carton Label:

**Packing Process:**




Box : 970(L)mm*720(W)mm*137(H)mm

Pallet: 980mm*740mm*132mm

# 7. Precautions

Please pay attention to the followings when you use this TFT LCD Open Cell unit and strongly recommended to contact AUO if module process advice is required.

## 7.1 Mounting Precautions

(1) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the cell. And the frame on which a cell is mounted should have sufficient strength so that external force is not transmitted directly to the cell.

(2) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.

(3) You should adopt radiation structure to satisfy the temperature specification.

(3) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(4) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
(5) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front/ rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(6) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(7) Do not open the case because inside circuits do not have sufficient strength.

## 7.2 Operating Precautions

(1) The open cell unit listed in the product specification sheets was designed and manufactured for TV application

(2) The spike noise causes the mis-operation of circuits. It should be lower than following voltage:
V=±200mV(Over and under shoot voltage)

(3) Response time depends on the temperature. (In lower temperature, it becomes longer.)

(4) Brightness/transmittance depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.

(5) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

(6) When fixed patterns are displayed for a long time, remnant image is likely to occur.

(7) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interface.

## 7.3 Electrostatic Discharge Control

Since a open cell unit is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

## 7.4 Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

## 7.5 Storage

When storing open cell units as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the open cell unit to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

## 7.6 Handling Precautions for Protection Film of Polarizer

The protection film of polarizer is still attached on the surface as you receive open cell units. When the protection film is peeled off, static electricity is easily generated on the polarizer surface. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.