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

| | |
|---|---|
| **Module** | 18.5” Color TFT-LCD |
| **Model Name** | M185XW01 V6 |

| **Customer** | **Date** | **Approved by** | **Date** |
|---|---|---|---|
| | | Sean Chen | 2009/9/4 |
| **Approved by** | | **Prepared by** | |
| | | *Stanley Su* | 2009/9/4 |

Note: This Specification is subject to change without notice.

Desktop Display Business Group / AU Optronics corporation

## Contents

# Record of Revision

| Version and Date | Page | Old description | New Description | Remark |
|---|---|---|---|---|
| 0.1 2009/6/8 | All | First Edition for Customer | N/A | |
| 1.0 2009/7/2 | 5 | **2.1 Display Characteristics**<br>Weight<br>1330 | **2.1 Display Characteristics**<br>Weight<br>1330±50g | |
| 1.0 2009/7/2 | 10 | **I/F PCB Interface:**<br>FI-XB30SSRL-HF16(JAE)/MSCKT2407P30HB(信盛) | **I/F PCB Interface:**<br>FI-XB30SRL-HF11(JAE) /<br>093F30-B0T01A(CHIEF LAND) | |
| 1.0 2009/7/2 | 11 | **4.2 Backlight Unit**<br>LED current<br>Min:n/a Max:20 | **4.2 Backlight Unit**<br>LED current<br>Min: 19 Max:21 | |
| 1.0 2009/7/2 | 12 | **5.1.1 Power Specification**<br>Input Current<br>Typ:0.6 Max:0.7<br>Allowable Logic/LCD Drive Ripple Voltage<br>Max:200 | **5.1.1 Power Specification**<br>Input Current<br>Typ:0.84 Max:1<br>Allowable Logic/LCD Drive Ripple Voltage<br>Max:350 | |
| 1.0 2009/7/2 | 14 | **5.2 Backlight Unit**<br>LED Operation Current<br>Min:n/a Typ:n/a Max:20<br>LED Operation Voltage<br>Typ:42.9 Max:44.2<br>BLU Power consumption<br>Typ:5.5 Max:5.7<br>LED life Time<br>Typ:n/a | **5.2 Backlight Unit**<br>LED Operation Current<br>Min:19 Typ:20 Max:21<br>LED Operation Voltage<br>Typ:44.8 Max:47.6<br>BLU Power consumption<br>Typ:5.4 Max:6.0<br>LED life Time<br>Typ:25,000 | |
| 1.0 2009/7/2 | 18 | **6.3 Signal Description**<br>Signal Drawing<br>Plus FFC drawing | **6.3 Signal Description**<br>Signal Drawing<br>Remove FFC drawing | |
| 1.0 2009/7/2 | 19 | **H-section**<br>Blanking<br>Min:50<br>Period<br>Min:1482<br>***Note2 :***<br>Clock Frequency 90MHz(Max.)=<br>1416(H)*847(V)*75Hz | **H-section**<br>Blanking<br>Min:104<br>Period<br>Min:1470<br>***Note2 :***<br>Clock Frequency 90MHz(Max.)=<br>1470(H)*816(V)*75Hz | |
| 1.1 2009/9/4 | 14 | **$V_{LB}$**<br>Light Bar Operation Voltage<br>Min:--<br>BLU Power consumption<br>Min:n/a | **$V_{LB}$**<br>Light Bar Operation Voltage<br>Min:39.2<br>BLU Power consumption<br>Min:4.4 | |

## 1.0 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, do not press the center of the LED lightbar edge. Instead, press at the far ends of the LED light bar 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.

## 2.0 General Description

This specification applies to the 18.5 inch-wide Color a-Si TFT-LCD Module M185XW01.The display supports the WXGA - 1366(H) x 768(V) screen format and 16.7M colors (RGB 6-bits + Hi-FRC data). All input signals are 1-channel LVDS interface and this module doesn't contain an inverter board for backlight.

## 2.1 Display Characteristics

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

| ITEMS | Unit | SPECIFICATIONS |
|---|---|---|
| Screen Diagonal | [mm] | 470.1(18.51") |
| Active Area | [mm] | 409.8 (H) x 230.4 (V) |
| Pixels H x V | | 1366(x3) x 768 |
| Pixel Pitch | [um] | 300 (per one triad) × 300 |
| Pixel Arrangement | | R.G.B. Vertical Stripe |
| Display Mode | | TN Mode, Normally White |
| White Luminance ( Center ) | [cd/m$^2$] | 250 cd/m$^2$ (Typ.) |
| Contrast Ratio | | 1000 (Typ.) |
| Optical Response Time | [msec] | 5ms (Typ., on/off) |
| | | |
| Nominal Input Voltage VDD | [Volt] | +5.0 V (Typ) |
| Power Consumption<br>(VDD line + LED line) | [Watt] | 10W (Typ.)<br>(without inverter, all black pattern) |
| Weight | [Grams] | 1330±50g |
| Physical Size | [mm] | 430.4 (W) x 254.6 (H) Typ. x 9.9 (D) Typ |
| `` | | One channel LVDS |
| Support Color | | 16.7M colors (RGB 6-bit + Hi_FRC ) |
| Surface Treatment | | Anti-Glare, 3H |
| Temperature Range<br>Operating<br>Storage (Shipping) | <br>[°C]<br>[°C] | <br>0 to +50<br>-20 to +60 |
| RoHS Compliance | | RoHS Compliance |

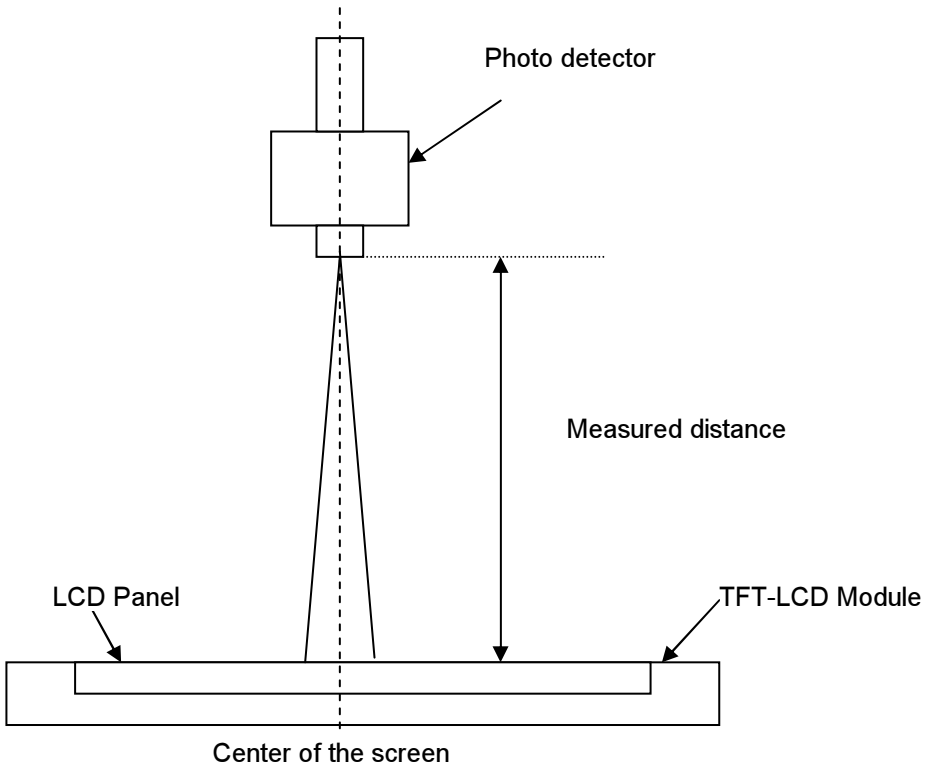
## 2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25℃:

| Item | Unit | Conditions | Min. | Typ. | Max. | Note |
|---|---|---|---|---|---|---|
| Viewing Angle | [degree] | Horizontal (Right)<br>CR = 10 (Left) | 150 | 170 | -<br>- | *2* |
| | | Vertical (Up)<br>CR = 10 (Down) | 140 | 160 | -<br>- | |
| Contrast ratio | | Normal Direction | 600 | 1000 | - | *3* |
| Response Time | [msec] | Raising Time ($T_{rR}$) | - | 3.6 | 5.7 | *4* |
| | | Falling Time ($T_{rF}$) | - | 1.4 | 2.3 | |
| | | Raising + Falling | - | 5 | 8 | |
| Color / Chromaticity Coordinates (CIE) | | Red x | 0.603 | 0.633 | 0.663 | *5* |
| | | Red y | 0.316 | 0.346 | 0.376 | |
| | | Green x | 0.294 | 0.324 | 0.354 | |
| | | Green y | 0.582 | 0.612 | 0.642 | |
| | | Blue x | 0.118 | 0.148 | 0.178 | |
| | | Blue y | 0.036 | 0.066 | 0.096 | |
| Color Coordinates (CIE) White | | White x | 0.283 | 0.313 | 0.343 | |
| | | White y | 0.299 | 0.329 | 0.359 | |
| Central Luminance | [cd/m$^2$] | | 200 | 250 | - | *6* |
| Luminance Uniformity | [%] | | 65 | 70 | - | *7* |
| Crosstalk (in 60Hz) | [%] | | | | 1.5 | *8* |
| Flicker | dB | | | | -20 | *9* |

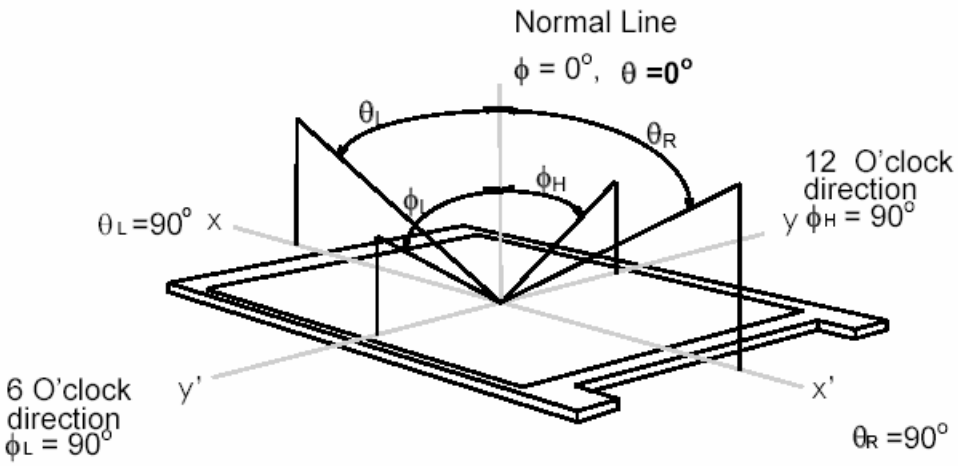
***Note 1:*** **Measurement method**

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring (at surface 35□). In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.




***Note 2:*** **Definition of viewing angle** measured by ELDIM (EZContrast 88)

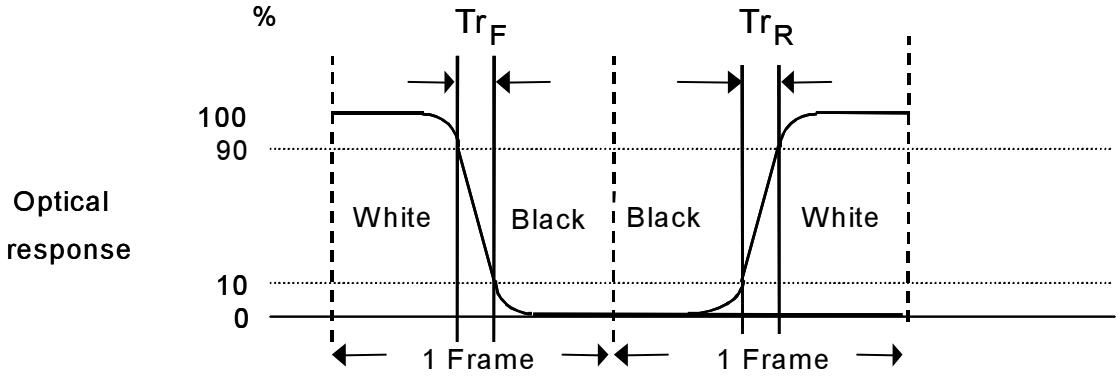
Viewing angle is the measurement of contrast ratio ≧10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90° (θ) horizontal left and right and 90° (Φ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.



***Note 3:*** **Contrast ratio is** measured by TOPCON SR-3

***Note 4:*** **Definition of Response time** measured by Westar TRD-100A

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time, $Tr_R$), and from "Full White" to "Full Black" (falling time, $Tf_F$), respectively. The response time is interval between the 10% and 90% (1 frame at 60 Hz) of amplitudes.

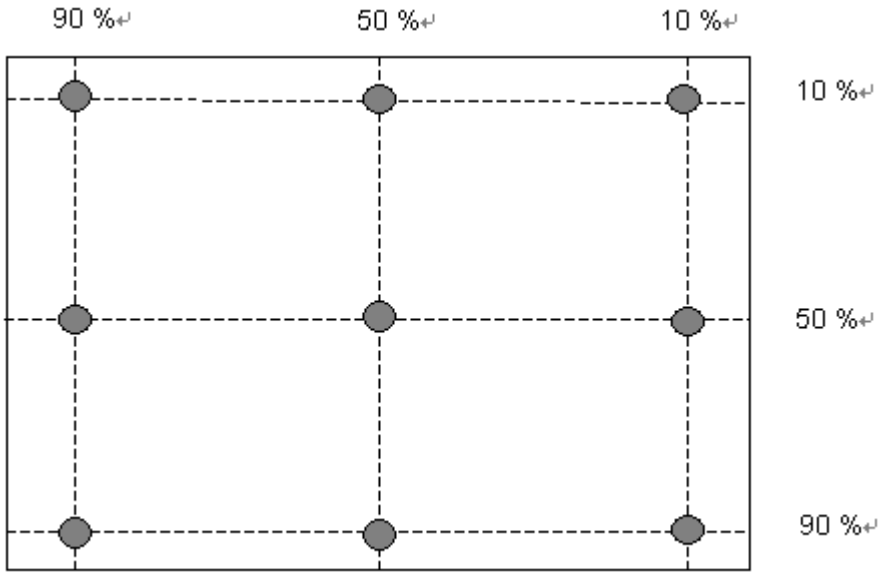



$Tr_R + Tf_F$ = 5 msec (typ.).

***Note 5:*** **Color chromaticity and coordinates (CIE) is** measured by TOPCON SR-3

***Note 6*****: Central luminance is** measured by TOPCON SR-3

***Note 7:*** **Luminance uniformity of these 9 points is defined as below and** measured by TOPCON SR-3




$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 points (1 - 9)}}{\text{Maximum Luminance in 9 Points (1 - 9)}}$$

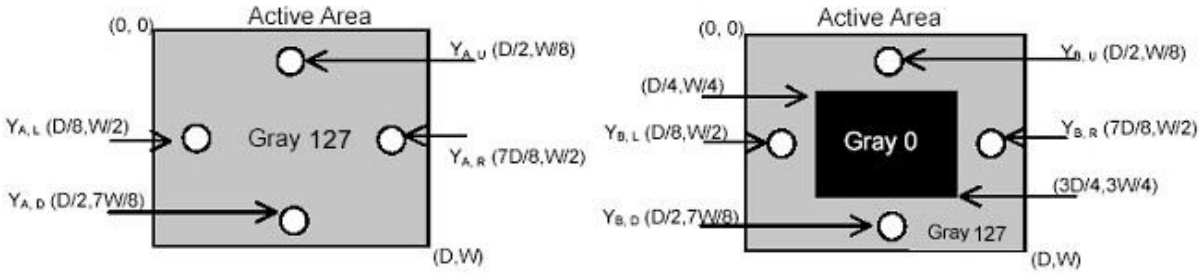
***Note 8:*** **Crosstalk is defined as below and** measured by TOPCON SR-3

CT = | YB – YA | / YA × 100 (%)

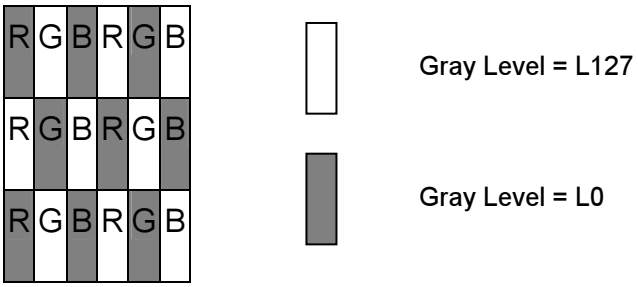
Where

YA = Luminance of measured location without gray level 0 pattern (cd/m2)

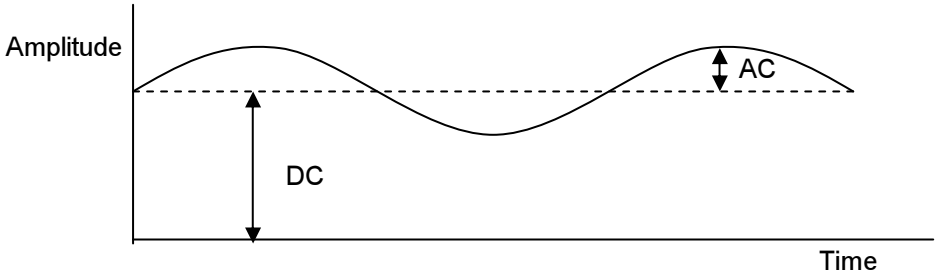
YB = Luminance of measured location with gray level 0 pattern (cd/m2)




***Note 9:*** **Test Patern: Subchecker Pattern** measured by TOPCON SR-3



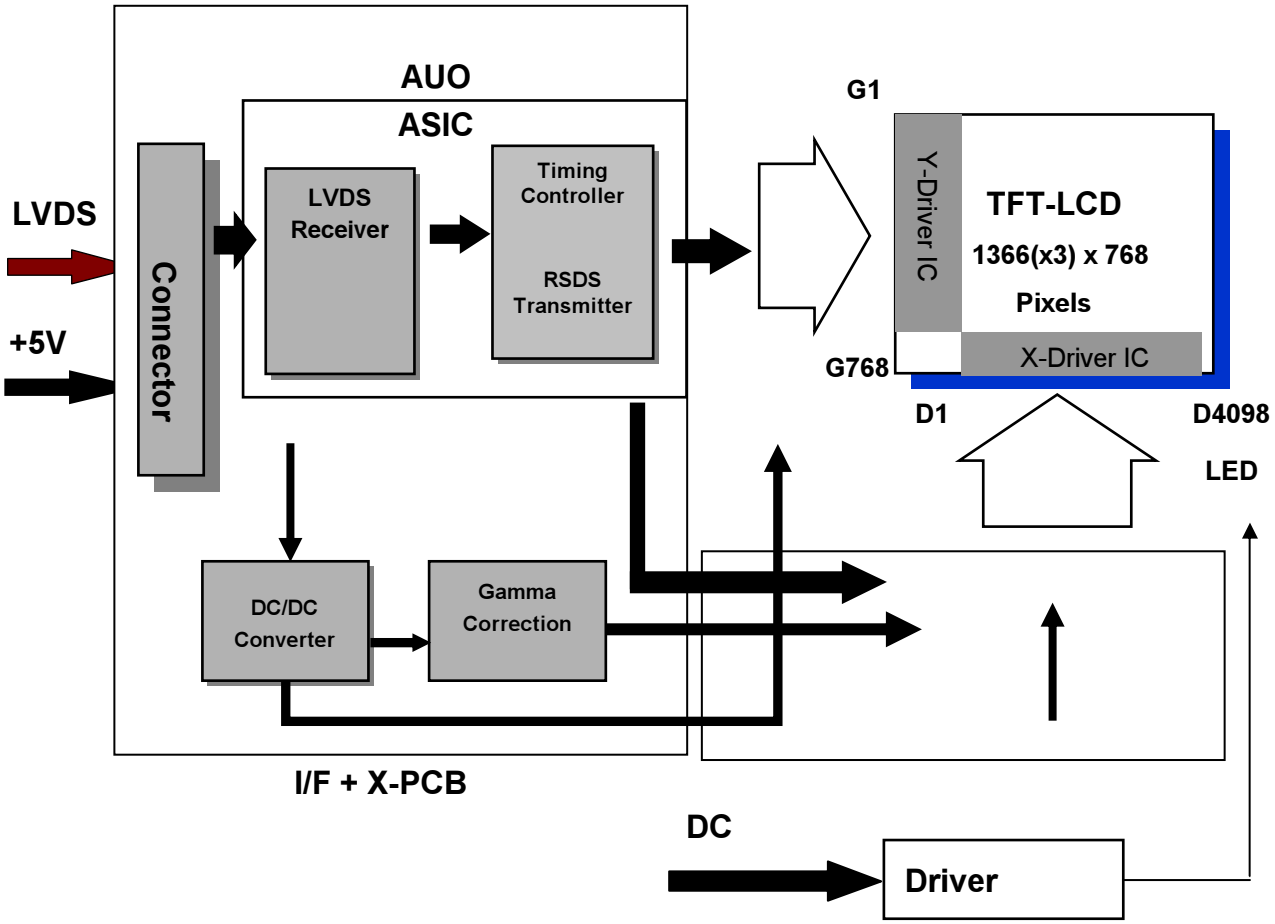

Method: Record dBV & DC value with TRD-100




$$\text{Flicker (dB)} = 20\log\frac{\text{AC Level(at 30 Hz)}}{\text{DC Level}}$$

### 3.0 Functional Block Diagram

The following diagram shows the functional block of the 18.5 inch Color TFT-LCD Module:




**I/F PCB Interface:**

FI-XB30SRL-HF11(JAE) / 093F30-B0T01A(CHIEF LAND)

**Mating Type:**

FI-X30HL (JAE)(Locked Type)

## 4.0 Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

### 4.1 TFT LCD Module

| Item | Symbol | Min | Max | Unit | Conditions |
|---|---|---|---|---|---|
| Logic/LCD Drive Voltage | VDD | 4.5 | +5.5 | [Volt] | ***Note 1,2*** |

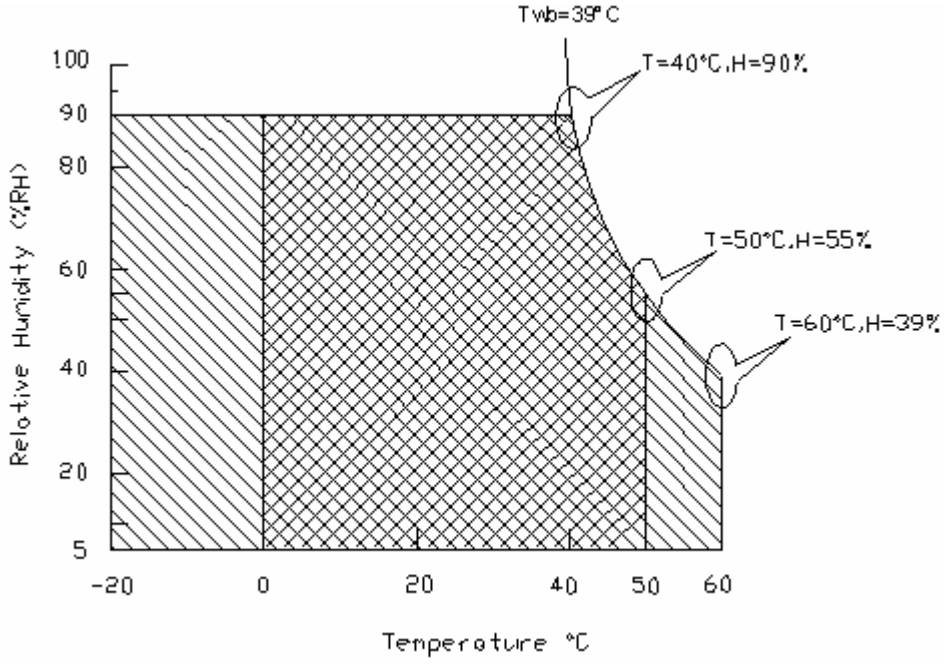
### 4.2 Backlight Unit

| Item | Symbol | Min | Max | Unit | Conditions |
|---|---|---|---|---|---|
| LED Current | ILED | 19 | 21 | [mA] | ***Note 1,2*** |

### 4.3 Absolute Ratings of Environment

| Item | Symbol | Min. | Max. | Unit | Conditions |
|---|---|---|---|---|---|
| Operating Temperature | TOP | 0 | +50 | [°C] | ***Note 3*** |
| Operation Humidity | HOP | 5 | 90 | [%RH] | |
| Storage Temperature | TST | -20 | +60 | [°C] | |
| Storage Humidity | HST | 5 | 90 | [%RH] | |

***Note 1:*** With in Ta (25℃)
***Note 2:*** Permanent damage to the device may occur if exceeding maximum values
***Note 3:*** For quality perfermance, please refer to AUO IIS(Incoming Inspection Standard).




Operating Range Storage Range

## 5.0 Electrical characteristics

## 5.1 TFT LCD Module

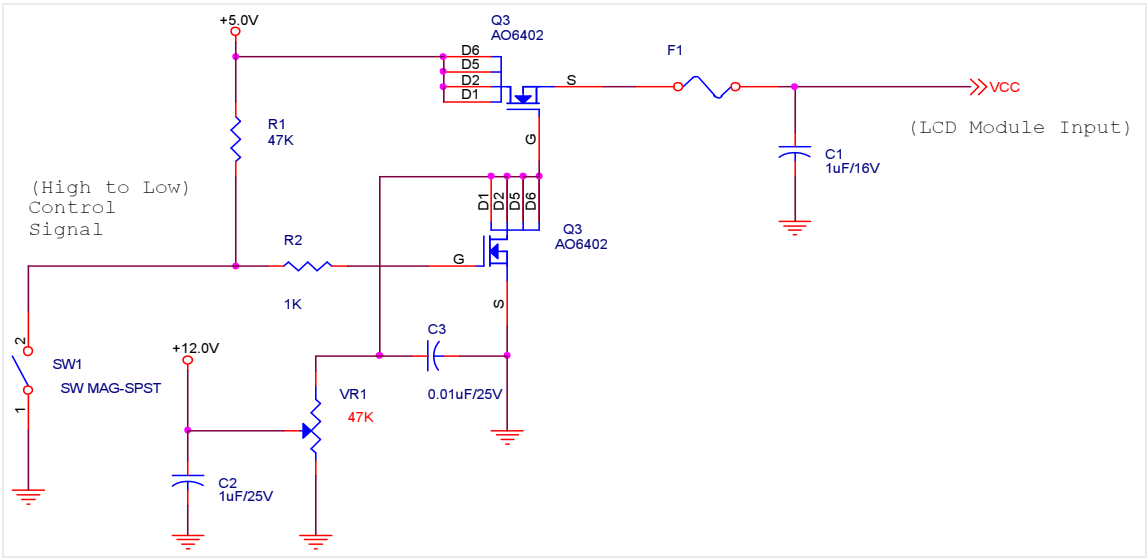
### 5.1.1 Power Specification

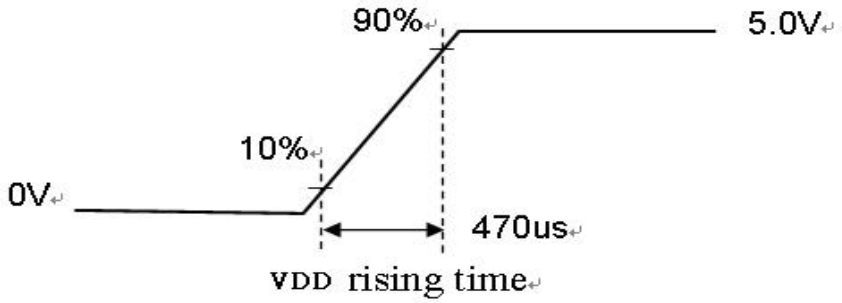
Input power specifications are as following:

| Symbol | Parameter | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| VDD | Logic/LCD Drive Voltage | 4.5 | 5.0 | 5.5 | [Volt] | +/-10% |
| IDD | Input Current | _ | 0.84 | 1 | [A] | VDD= 5.0V, All Black Pattern At 60Hz, |
| PDD | VDD Power | _ | 4.2 | 5 | [Watt] | VDD= 5.0V, All Black Pattern At 60Hz |
| IRush | Inrush Current | _ | - | 3 | [A] | Note 1 |
| VDDrp | Allowable Logic/LCD Drive Ripple Voltage | - | - | 350 | [mV] p-p | VDD= 5.0V, All Black Pattern At 60Hz |

***Note 1:*** Measurement conditions:

The duration of rising time of power input is 470us.



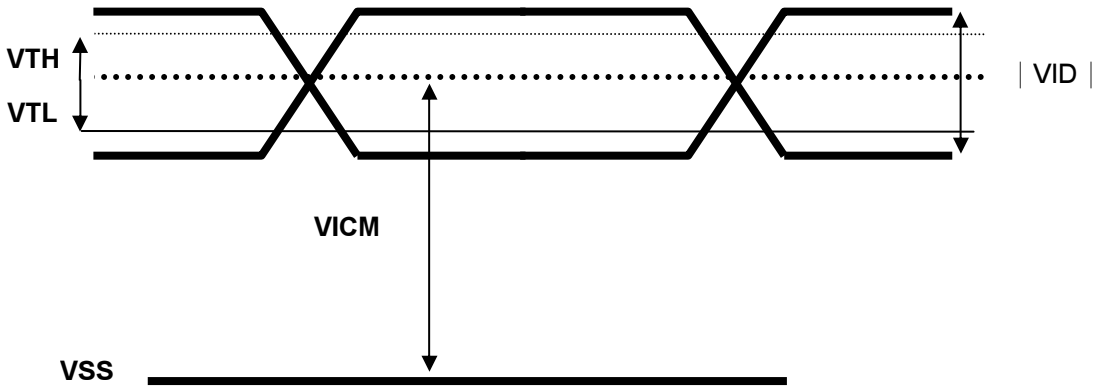
### 5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off. Please refer to specifications of SN75LVDS82DGG (Texas Instruments) in detail.

Characteristics of each signal are as following:

| Symbol | Parameter | Min | Typ | Max | Units | Condition |
|---|---|---|---|---|---|---|
| VTH | Differential Input High Threshold | - | +50 | +100 | [mV] | VICM = 1.2V<br>***Note 1*** |
| VTL | Differential Input Low Threshold | -100 | -50 | - | [mV] | VICM = 1.2V<br>***Note 1*** |
| \| VID \| | Input Differential Voltage | 100 | 400 | 600 | [mV] | ***Note 1*** |
| VICM | Differential Input Common Mode Voltage | +1.0 | +1.2 | +1.4 | [V] | VTH-VTL = 200MV (max)<br>***Note 1*** |

***Note 1:*** LVDS Signal Waveform



## 5.2 Backlight Unit

Parameter guideline for LED driving is under stable conditions at 25℃ (Room Temperature):

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| $IR_{LED}$ | LED Operation Current | 19 | 20 | 21 | [mA] | **Operating with fixed driving current** |
| $V_{LB}$ | Light Bar Operation Voltage (for reference) | 39.2 | 44.8 | 47.6 | [Volt] Note 1 | |
| $P_{BLU}$ | BLU Power consumption (for reference) | 4.4 | 5.4 | 6.0 | [Watt] | |
| $LT_{LED}$ | LED life Time | -- | 25,000 | -- | [Hour] Note 2 | |

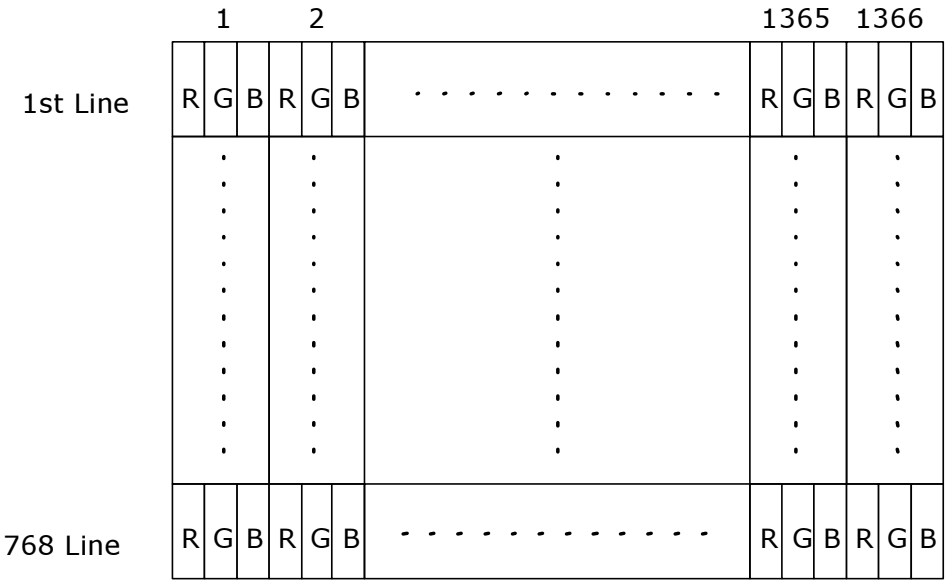
Note 1 : The value showed in the table is one light bar's operation voltage.

**Note 2 : Based on the operating current is 20mA.**

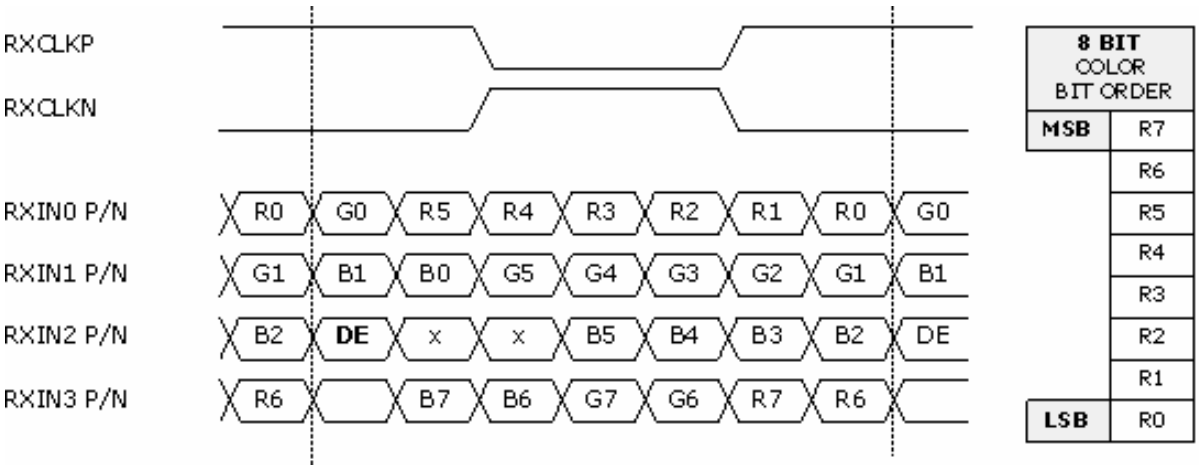
## 6.0 Signal Characteristic

### 6.1 Pixel Format Image

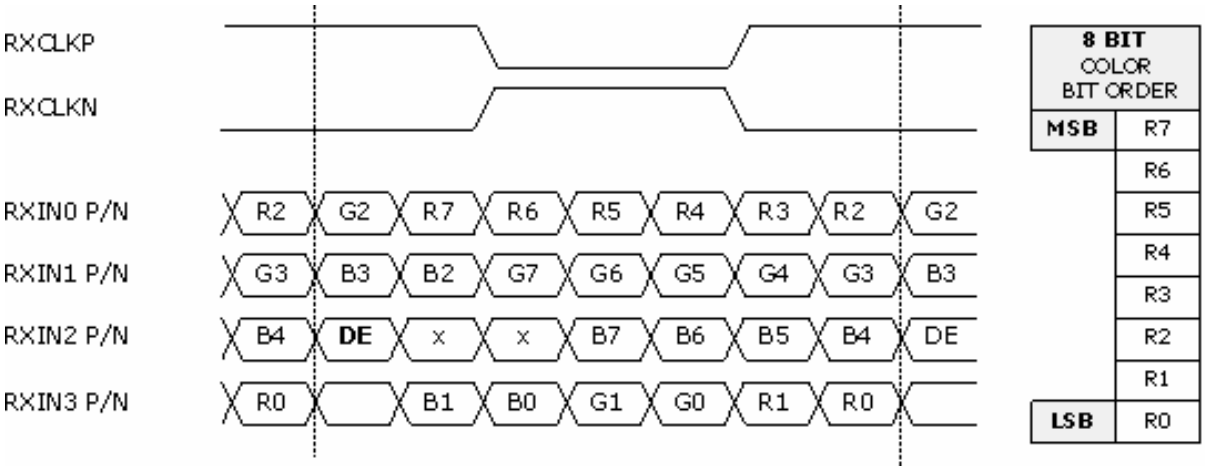
Following figure shows the relationship of the input signals and LCD pixel format.



## 6.2 The input data format




LVDS Data Mapping of NS Format




LVDS Data Mapping of JEIDA Format

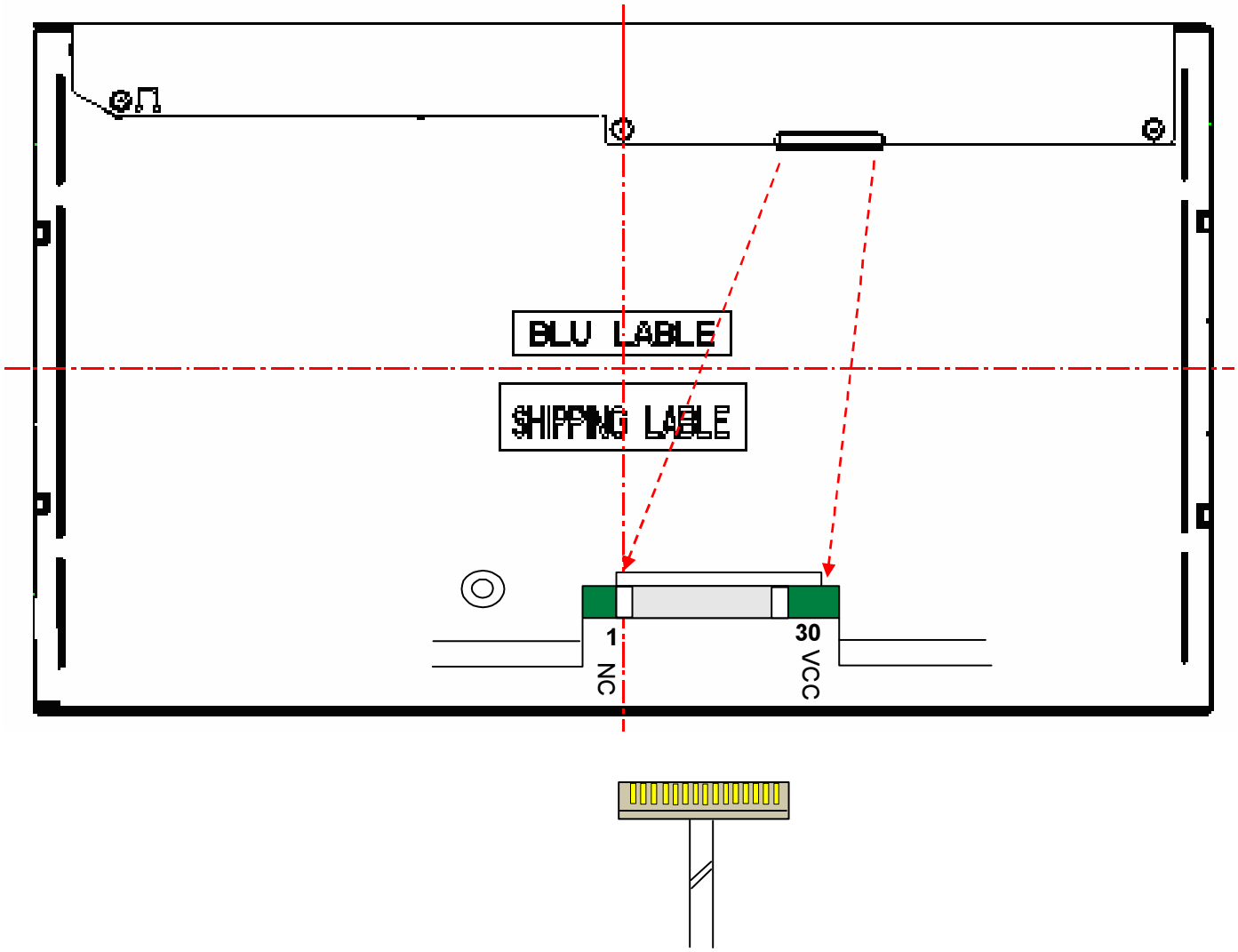
Note1: Normally, DE, VS, HS on EVEN channel are not used.
Note2: 8-bits signal input.

### 6.3 Signal Description

The module using one LVDS receiver SN75LVDS82(Texas Instruments). LVDS is a differential signal technology for LCD interface and high speed data transfer device. LVDS transmitters shall be SN75LVDS83(negative edge sampling). The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

| PIN # | SIGNAL NAME | DESCRIPTION |
|---|---|---|
| 1 | NC | No contact (For AUO internal use) |
| 2 | NC | No contact (For AUO internal use) |
| 3 | NC | No contact (For AUO internal use) |
| 4 | GND | Power Ground |
| 5 | RXIN0- | Negative LVDS differential data input (0) |
| 6 | RXIN0+ | Positive LVDS differential data input (0) |
| 7 | GND | Power Ground |
| 8 | RXIN1- | Negative LVDS differential data input (1) |
| 9 | RXIN1+ | Positive LVDS differential data input (1) |
| 10 | GND | Power Ground |
| 11 | RXIN2- | Negative LVDS differential data input (2) |
| 12 | RXIN2+ | Positive LVDS differential data input (2) |
| 13 | GND | Power Ground |
| 14 | RXCLKIN- | Negative LVDS differential clock input (clock) |
| 15 | RXCLKIN+ | Positive LVDS differential data input (clock) |
| 16 | GND | Power Ground |
| 17 | RXIN3- | Negative LVDS differential data input (3) |
| 18 | RXIN3+ | Positive LVDS differential data input (3) |
| 19 | GND | Power Ground |
| 20 | NC | No contact (For AUO internal use) |
| 21 | NC | No contact (For AUO internal use) |
| 22 | NC | No contact (For AUO internal use) |
| 23 | GND | Power Ground |
| 24 | GND | Power Ground |
| 25 | GND | Power Ground |
| 26 | VCC | +5V power supply |
| 27 | VCC | +5V power supply |
| 28 | VCC | +5V power supply |
| 29 | VCC | +5V power supply |
| 30 | VCC | +5V power supply |

***Note1:*** Start from left side




*Note2:* Input signals of clock shall be the same timing.

*Note3:* Please follow TV VESA Pin Assignment.

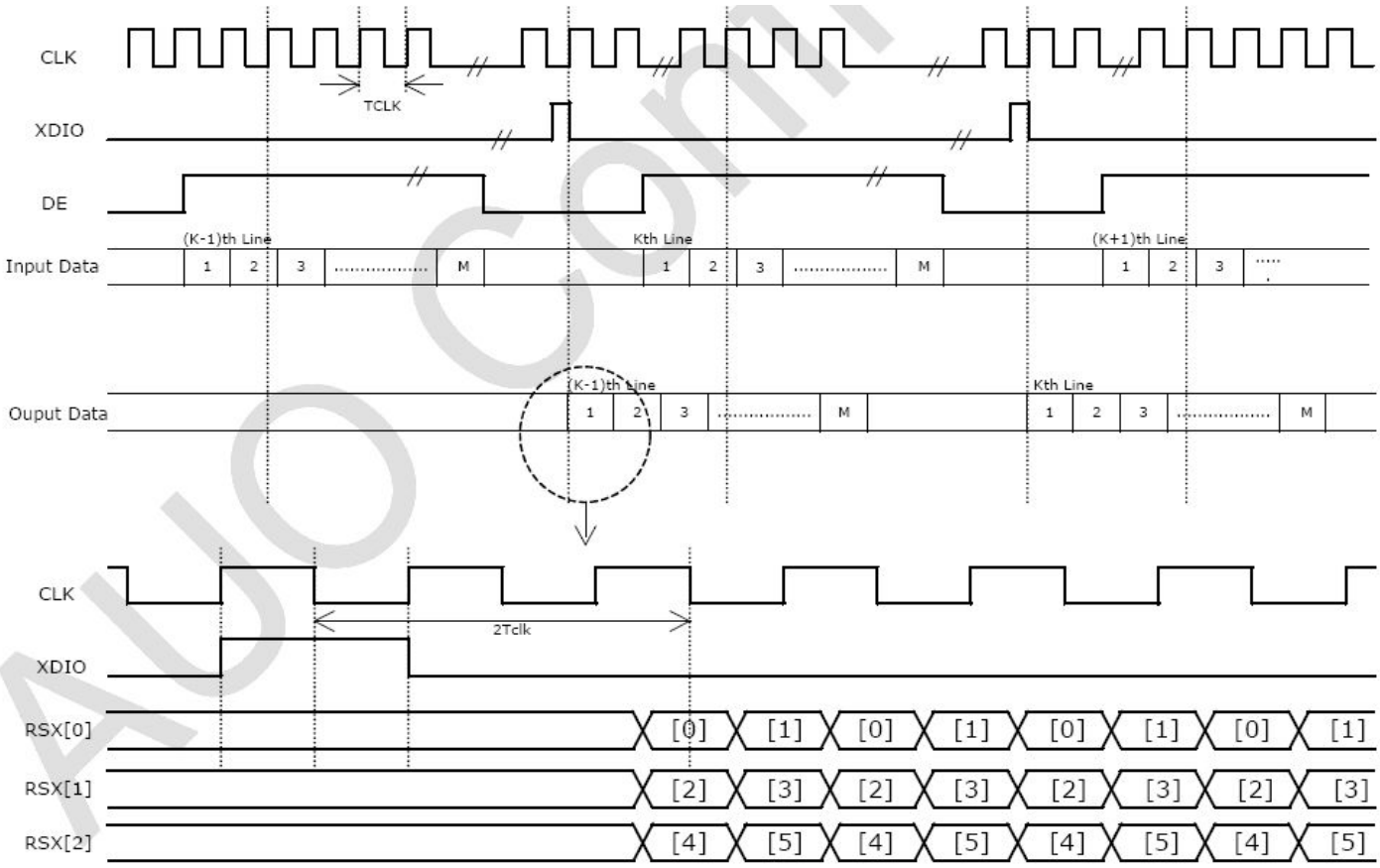
### 6.4 Timing Characteristics

Basically, interface timing described here is not actual input timing of LCD module but close to output timing of SN75LVDS82DGG (Texas Instruments) or equivalent.

| Signal | Item | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| V-section | Period | Tv | 776 | 808 | 1023 | Th |
| | Active | Tdisp(v) | 768 | 768 | 768 | Th |
| | Blanking | Tblk(v) | 8 | 40 | 255 | Th |
| H-section | Period | Th | 1470 | 1606 | 2047 | Tclk |
| | Active | Tdisp(h) | 1366 | 1366 | 1366 | Tclk |
| | Blanking | Tblk(h) | 104 | 240 | 681 | Tclk |
| Clock | Period | Tclk | - | 12.8 | - | ns |
| | Frequency | Freq | - | 78 | 90 | MHz |
| Frame Rate | Frame Rate | F | 50 | 60 | 75 | Hz |

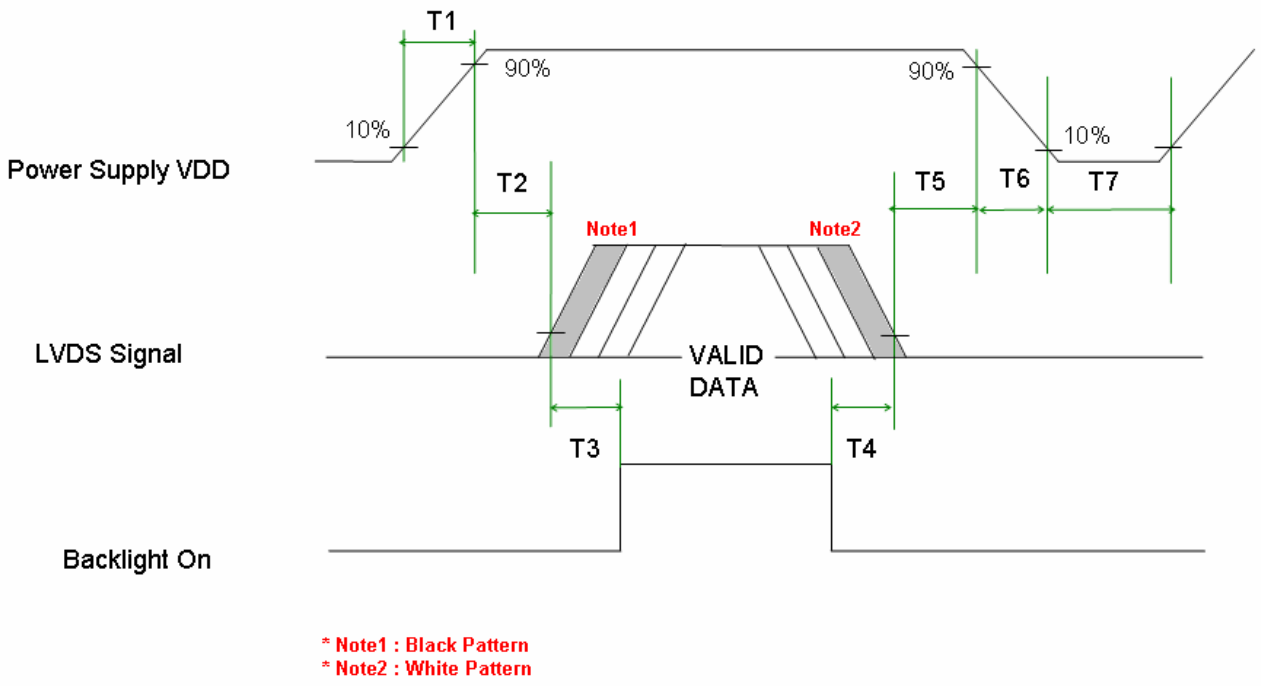
***Note1 :*** DE mode only
***Note2 :*** Clock Frequency 90MHz(Max.)= 1470(H)*816(V)*75Hz

## 6.5 Timing diagram



### 6.6 Power ON/OFF Sequence

VDD power and lamp on/off sequence are 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.




* Note1 : Black Pattern
* Note2 : White Pattern

| Parameter | Value | | | Unit |
|---|---|---|---|---|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | [msec] |
| T2 | 0 | 40 | 50 | [msec] |
| T3 | 200 | - | - | [msec] |
| T4 | 200 | - | - | [msec] |
| T5 | 0.5 | 16 | 50 | [msec] |
| T6 | - | - | 100 | [msec] |
| T7 | 1000 | - | - | [msec] |

## 7.0 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

| Connector Name / Designation | Interface Connector / Interface card |
|---|---|
| Manufacturer | JAE or CHIEF LAND |
| Type Part Number | FI-XB30SRL-HF11(JAE) / 093F30-B0T01A(CHIEF LAND) |
| Mating Housing Part Number | FI-X30HL(JAE) (Locked Type)<br>FI-X30H (JAE)(Unlocked Type) |

### 7.1.1 Pin Assignment

| Pin# | Signal Name | Pin# | Signal Name |
|---|---|---|---|
| 1 | NC | 2 | NC |
| 3 | NC | 4 | GND |
| 5 | RXIN0- | 6 | RXIN0+ |
| 7 | GND | 8 | RXIN1- |
| 9 | RXIN1+ | 10 | GND |
| 11 | RXIN2- | 12 | RXIN2+ |
| 13 | GND | 14 | RXCLKIN- |
| 15 | RXCLKIN+ | 16 | GND |
| 17 | RXIN3- | 18 | RXIN3+ |
| 19 | GND | 20 | NC |
| 21 | NC | 22 | NC |
| 23 | GND | 24 | GND |
| 25 | GND | 26 | VCC |
| 27 | VCC | 28 | VCC |
| 29 | VCC | 30 | VCC |

### 7.2 Recommend connector for Backlight Unit

This connector is mounted on the monitor system board for LED light-bar FFC mating.

| | |
|---|---|
| Connector Name / Designation | Driver Board Connector |
| Manufacturer | ENTERY INDUSTRIAL CO., LTD |
| Mating Type Part Number | **7083K-F10Y-00** |

#### 7.2.1 Pin assignment

| Pin no. | Signal name |
|---|---|
| 1 | No contact |
| 2 | IRLED (current out) |
| 3 | IRLED (current out) |
| 4 | IRLED (current out) |
| 5 | VLED (voltage in) |
| 6 | VLED (voltage in) |
| 7 | IRLED (current out) |
| 8 | IRLED (current out) |
| 9 | IRLED (current out) |
| 10 | No contact |

## 8.0 Reliability Test

Environment test conditions are listed as following table.

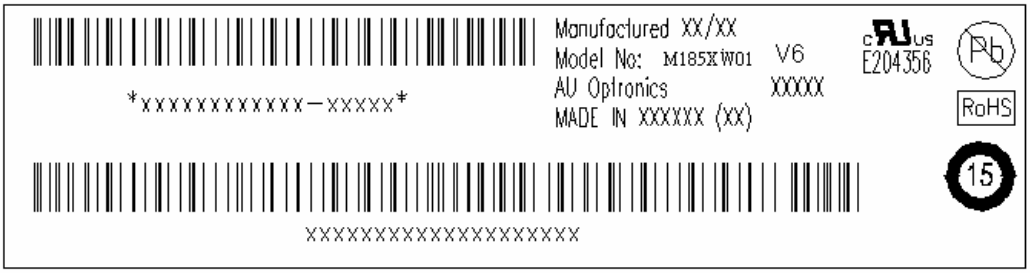
| Items | Required Condition | Note |
|---|---|---|
| Temperature Humidity Bias (THB) | Ta= 50□, 80%RH, 300hours | |
| High Temperature Operation (HTO) | Ta= 50□, 50%RH, 300hours | |
| Low Temperature Operation (LTO) | Ta= 0□, 300hours | |
| High Temperature Storage (HTS) | Ta= 60□, 300hours | |
| Low Temperature Storage (LTS) | Ta= -20□, 300hours | |
| Vibration Test<br>(Non-operation) | Acceleration: 1.5 Grms<br>Wave: Random<br>Frequency: 10 - 200 Hz<br>Sweep: 30 Minutes each Axis (X, Y, Z) | |
| Shock Test<br>(Non-operation) | Acceleration: 50 G<br>Wave: Half-sine<br>Active Time: 20 ms<br>Direction: ±X, ±Y, ±Z (one time for each Axis) | |
| Drop Test | Height: 60 cm, package test | |
| Thermal Shock Test (TST) | -20□/30min, 60□/30min, 100 cycles | ***1*** |
| On/Off Test | On/10sec, Off/10sec, 30,000 cycles | |
| ESD (Electro Static Discharge) | Contact Discharge: ± 8KV, 150pF(330Ω ) 1sec,<br>8 points, 25 times/ point. | ***2*** |
| | Air Discharge: ± 15KV, 150pF(330Ω ) 1sec<br>8 points, 25 times/ point. | |
| Altitude Test | Operation:10,000 ft<br>Non-Operation:30,000 ft | |

***Note 1***: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20℃ to 60℃, and back again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

***Note 2***: EN61000-4-2, ESD class B: Certain performance degradation allowed
No data lost
Self-recoverable
No hardware failures.

## 9.0 Shipping Label

The label is on the panel as shown below:



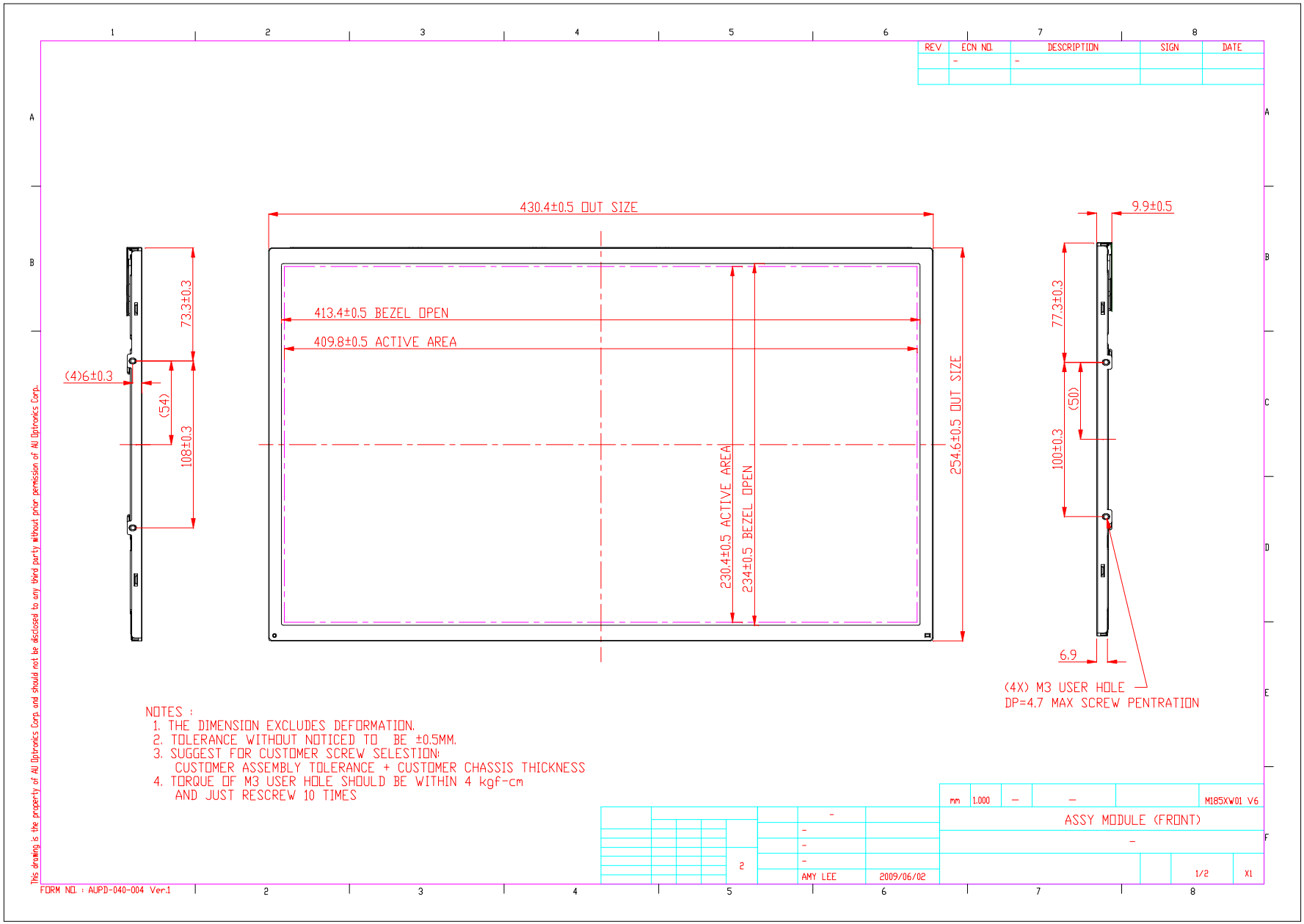

***Note 1:*** For Pb Free products, AUO will add for identification.

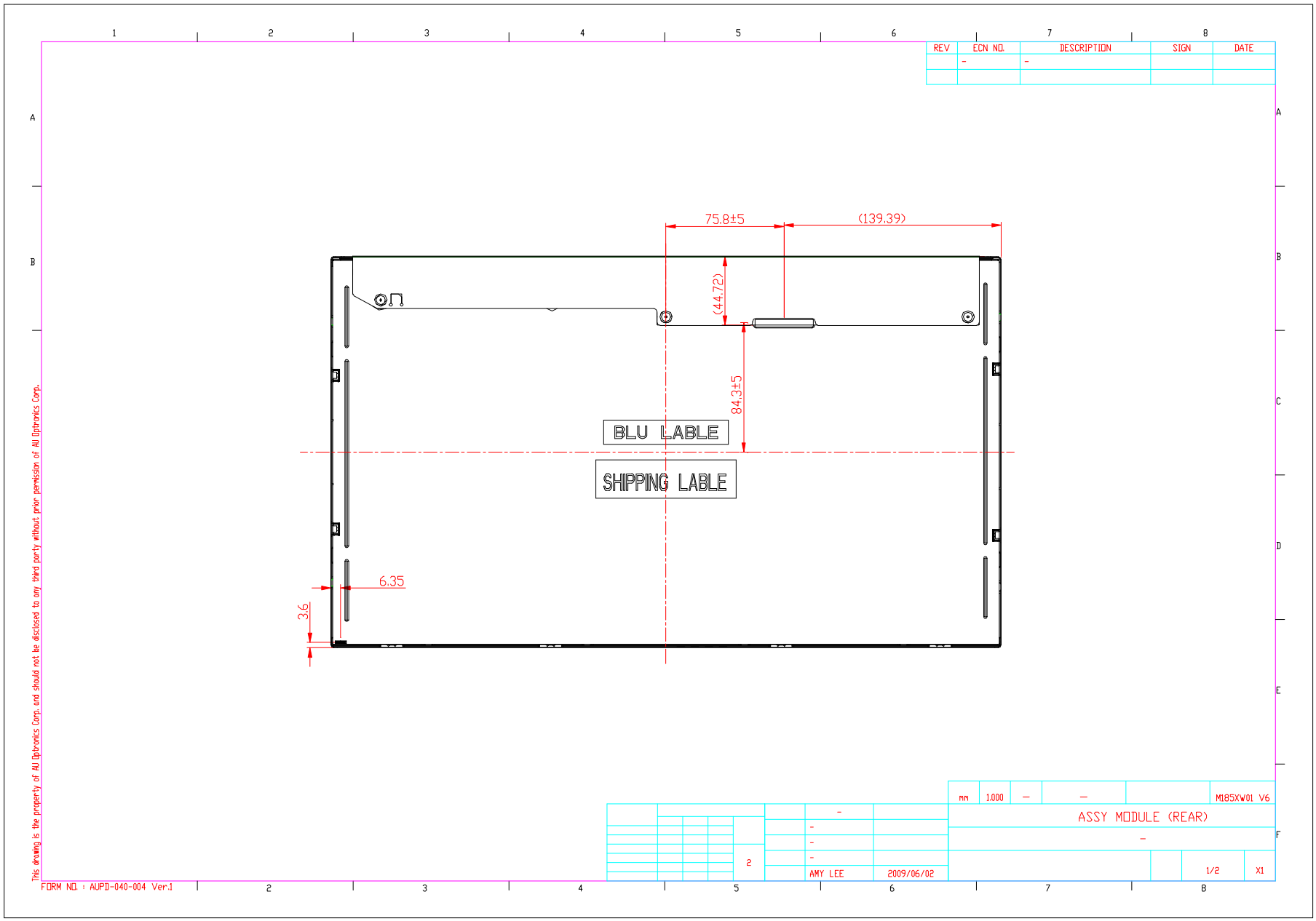
***Note 2:*** For RoHS compatible products, AUO will add for identification.

***Note 3:*** For China RoHS compatible products, AUO will add for identification.

***Note 4:*** The Green Mark will be presented only when the green documents have been ready by AUO Internal Green Team.

## 10.0 Mechanical Characteristics




REV
ECN NO.
DESCRIPTION
SIGN
DATE
75.8±5
(139.39)
(44.72)
84.3±5
BLU LABLE
SHIPPING LABLE
6.35
3.6
This drawing is the property of AU Optronics Corp. and should not be disclosed to any third party without prior permission of AU Optronics Corp.
FORM NO. : AUPD-040-004 Ver.1
mm
1.000
M185XW01 V6
ASSY MODULE (REAR)
AMY LEE
2009/06/02
1/2
X1

Ver 0.1