**(V ) Preliminary Specifications**
**( ) Final Specifications**

| | |
|---|---|
| **Module** | 15 Inch Color TFT-LCD |
| **Model Name** | G150XG01 V1 |

| **Customer** | **Date** | **Approved by** | **Date** |
|---|---|---|---|
| | | Debbie Chiu | 2007/05/15 |
| **Checked & Approved by** | | **Prepared by** | |
| | | Danny Wang | 2007/05/15 |
| Note: This Specification is subject to change without notice. | | General Display Business Division / AU Optronics corporation | |

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# Record of Revision

| Version and Date | Page | Old description | New Description |
|---|---|---|---|
| 0.0 2007/05/15 | All | First Edition | |
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## 1. Operating Precautions

1) Since front polarizer is easily damaged, please be cautious and 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 soft cloth.
5) Since the panel is made of glass, it may be broken or cracked 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 nor modify the module assembly.
8) Do not press the reflector sheet at the back of the module to any direction.
9) In case if a 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 CCFL Reflector edge. Instead, press at the far ends of the CFL 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 (Notebook PC Bezel, for example), 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) Cold cathode fluorescent lamp in LCD contains a small amount of mercury. Please follow local ordinances or regulations for disposal.
13) 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.
14) The LCD module is designed so that the CFL in it is supplied by Limited Current Circuit (IEC60950 or UL1950). Do not connect the CFL in Hazardous Voltage Circuit.
15) Severe temperature condition may result in different luminance, response time and lamp ignition voltage.
16) Continuous operating TFT-LCD display under low temperature environment may accelerate lamp exhaustion and reduce luminance dramatically.
17) The data on this specification sheet is applicable when LCD module is placed in landscape position.
18) Continuous displaying fixed pattern may induce image sticking. It’s recommended to use screen saver or shuffle content periodically if fixed pattern is displayed on the screen.

## 2. General Description

G150XG01 V1 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display, a driver circuit, and a backlight system. The screen format is intended to support XGA (1024(H) x 768(V)) screen and 16.2M (RGB 8-bits) or 262k colors (RGB 6-bits). All input signals are LVDS interface compatible. Inverter card of backlight is not included. All design rules of this module can correspond to PSWG standard.

G150XG01 V1 is designed for industrial display applications.

### 2.1 Display Characteristics

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

| Items | Unit | Specifications |
|---|---|---|
| Screen Diagonal | [inch] | 15 |
| Active Area | [mm] | 304.128(H) x 228.096(V) |
| Pixels H x V | | 1024x3(RGB) x 768 |
| Pixel Pitch | [mm] | 0.297 x 0.297 |
| Pixel Arrangement | | R.G.B. Vertical Stripe |
| Display Mode | | TN, Normally White |
| Nominal Input Voltage VDD | [Volt] | 3.3 typ. |
| Typical Power Consumption | [Watt] | 8.9 ( 64 Gray Bar Pattern , exclude inverter) |
| Weight | [Grams] | 1100g (typ.) |
| Physical Size | [mm] | 326.5(H)x 253.5(V) x 12.0(D) (typ.) |
| Electrical Interface | | 1 channel LVDS |
| Surface Treatment | | Anti-glare, Hardness 3H |
| Support Color | | 16.2M / 262K colors |
| Temperature Range<br>Operating<br>Storage (Non-Operating) | <br>[$^{o}$C]<br>[$^{o}$C] | <br>0 to +65 (+65 $^{o}$C as panel surface temperature)<br>-20 to +65 |
| RoHS Compliance | | RoHS Compliance |

## 2.2 Optical Characteristics

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

| Item | Unit | Conditions | Min. | Typ. | Max. | Note |
|---|---|---|---|---|---|---|
| White Luminance | [cd/m2] | IRCFL= 5.5mA (center point) | 300 | 350 | - | 1 |
| Uniformity | % | 9 Points | 75 | 80 | - | 1, 2, 3 |
| Contrast Ratio | | | 400 | 700 | - | 4 |
| Cross talk | % | | - | 1.2 | 1.5 | 5 |
| Response Time | [msec] | Rising | - | 5.7 | | 6 |
| | [msec] | Falling | - | 2.3 | | |
| | [msec] | Raising + Falling | - | 8 | | |
| Viewing Angle | [degree] | Horizontal (Right) CR = 10 | 60 | 70 | - | 7 |
| | [degree] | (Left) | 60 | 70 | - | |
| | [degree] | Vertical (Upper) CR = 10 | 55 | 65 | - | |
| | [degree] | (Lower) | 50 | 60 | - | |
| Color / Chromaticity Coordinates (CIE 1931) | | Red x | 0.612 | 0.642 | 0.672 | |
| | | Red y | 0.307 | 0.337 | 0.367 | |
| | | Green x | 0.276 | 0.306 | 0.336 | |
| | | Green y | 0.551 | 0.581 | 0.611 | |
| | | Blue x | 0.114 | 0.144 | 0.174 | |
| | | Blue y | 0.071 | 0.101 | 0.131 | |
| | | White x | 0.283 | 0.313 | 0.343 | |
| | | White y | 0.299 | 0.329 | 0.359 | |

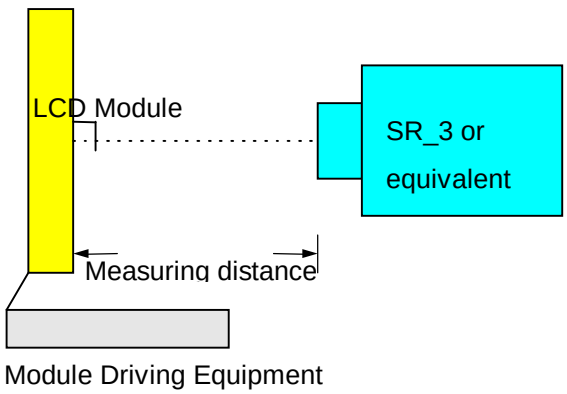
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

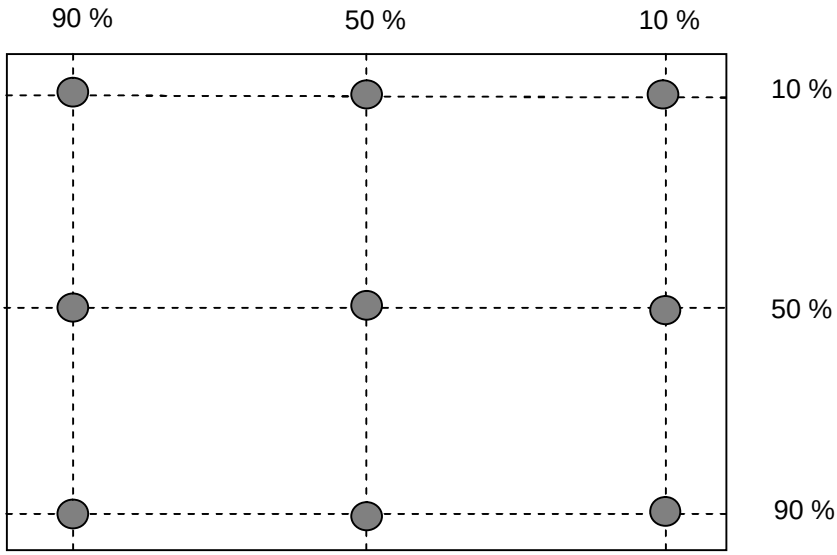
Aperture 1° with 50cm viewing distance

Test Point Center

Environment *< 1 lux*



Note 2: Definition of 9 points position (Display active area : 304.128(H) x 228.096(V))




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

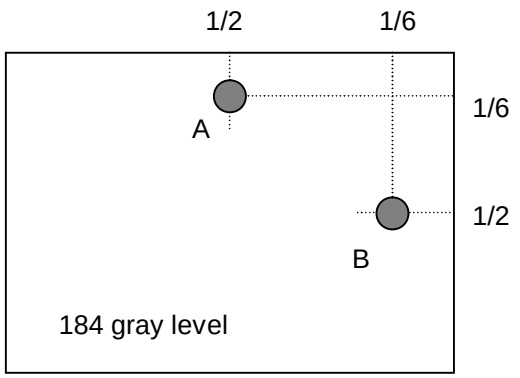
$$\delta_{W9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

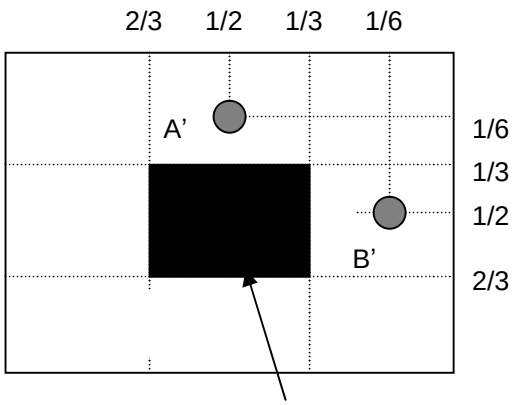
Note 4： Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the “White” state}}{\text{Brightness on the “Black” state}}$$

Note 5： Definition of cross talk (CT)

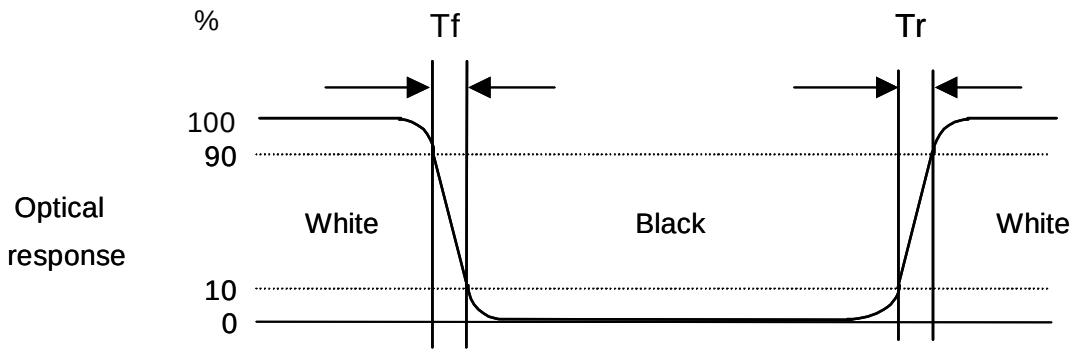
CT = | YB – YA | / YA × 100 (%)
Where
YA = Luminance of measured location without gray level 0 pattern (cd/m2)
YB = Luminance of measured location with gray level 0 pattern (cd/m2)



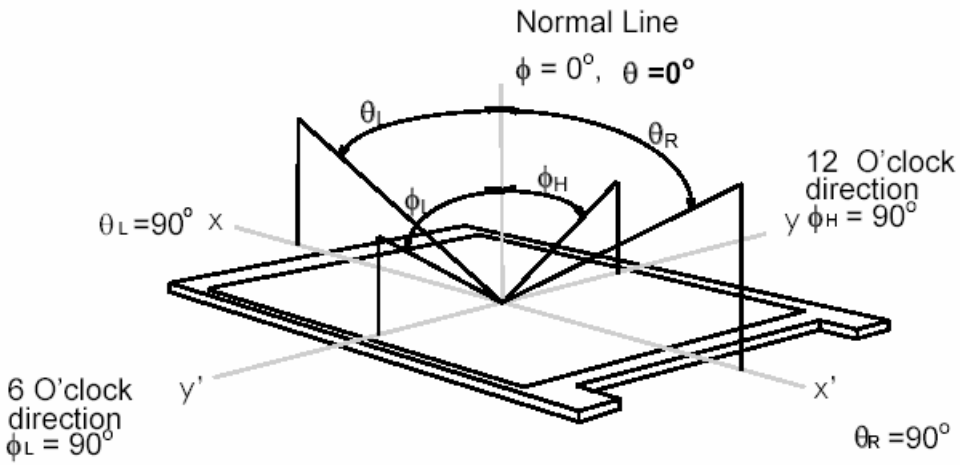
Note 6: Definition of response time:

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 is between 10% and 90% of amplitudes. Please refer to the figure as below.



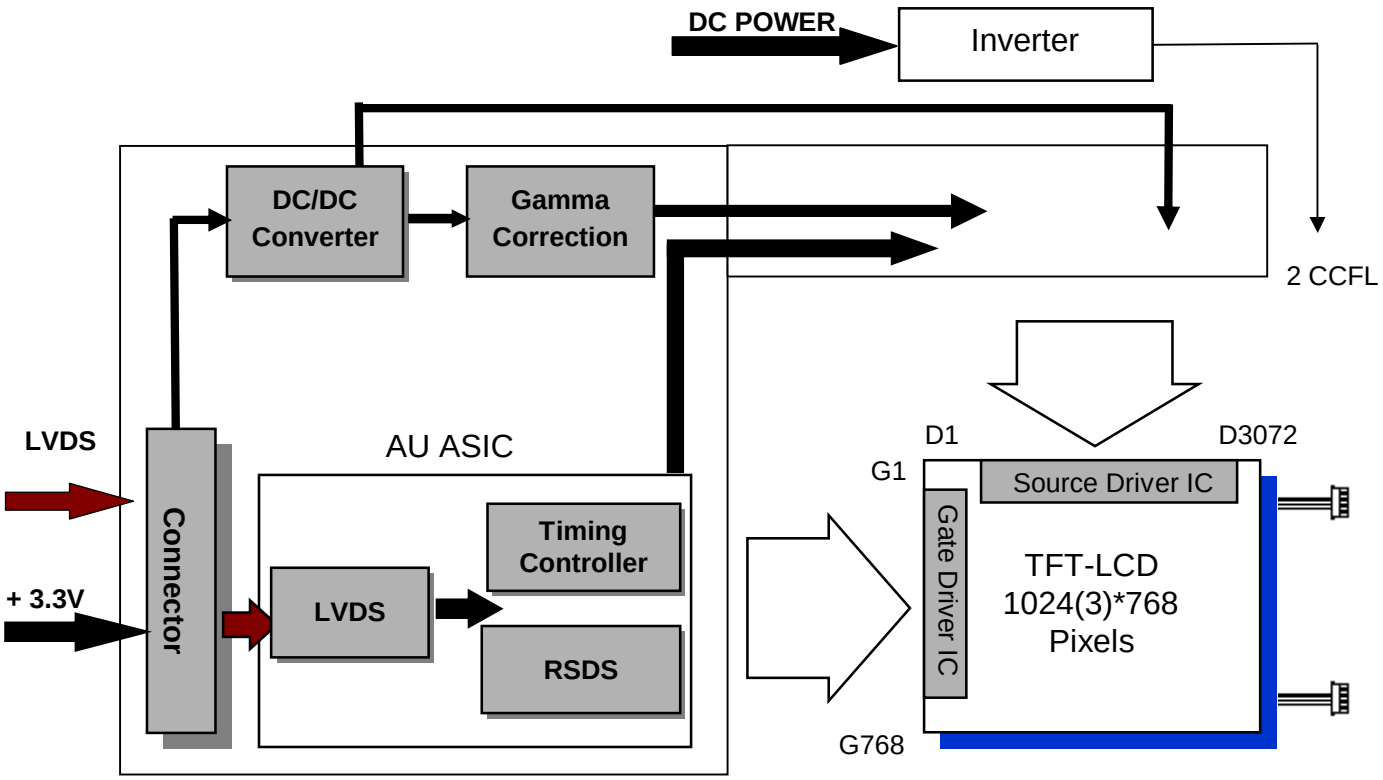

Note 7: Definition of viewing angle

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 below: 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 to its center to develop the desired measurement viewing angle.



## 3. Functional Block Diagram

The following diagram shows the functional block of the 15 inch color TFT/LCD module:




3804-F20N-06R / MSB240420E

JST-BHR-03VS-1

**Mating Type**: HRS DF14-20S-1.25C

SM02(8.0)B-BHS-1-TB

# 4. Absolute Maximum Ratings

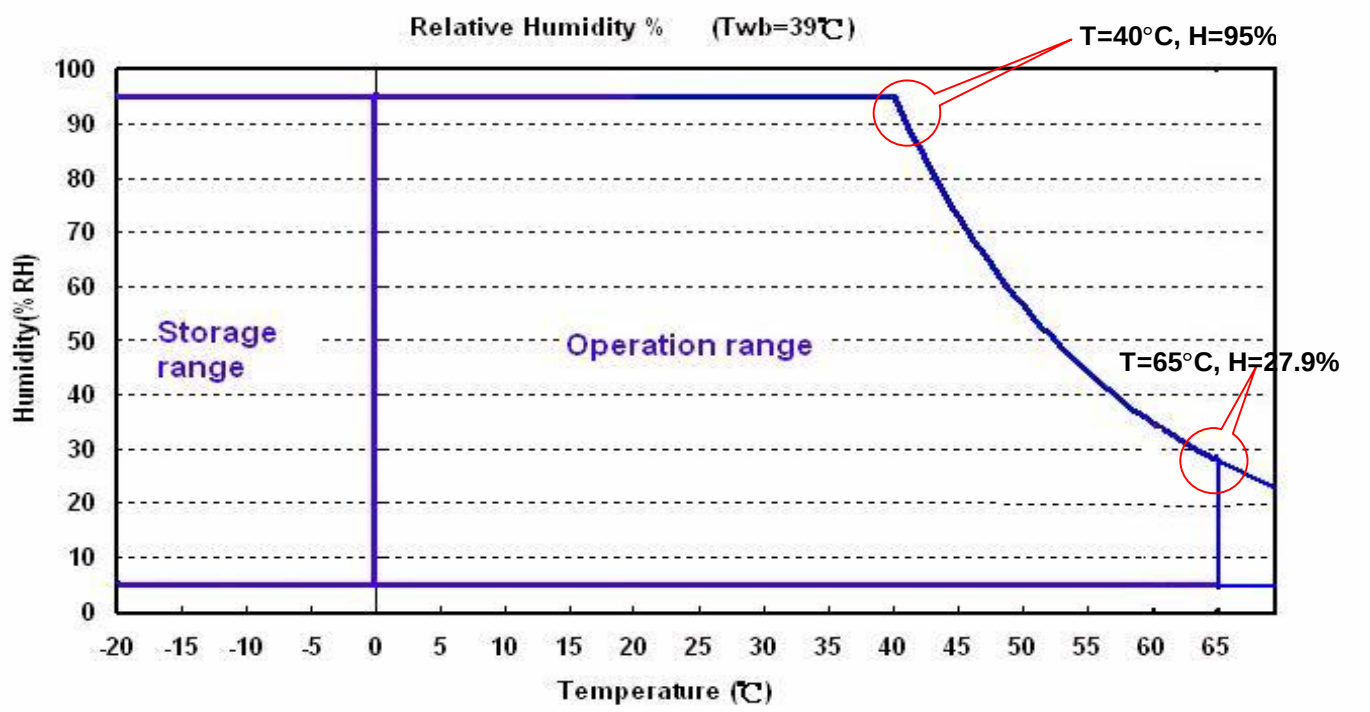
## 4.1 Absolute Ratings of TFT LCD Module

| Item | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Logic/LCD Drive | Vin | 0.3 | +3.6 | [Volt] |

## 4.2 Absolute Ratings of Environment

| Item | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Operating Temperature | TOP | 0 | +60 | [°C] |
| Operation Humidity | HOP | 8 | 90 | [%RH] |
| Storage Temperature | TST | -20 | +65 | [°C] |
| Storage Humidity | HST | 8 | 90 | [%RH] |

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



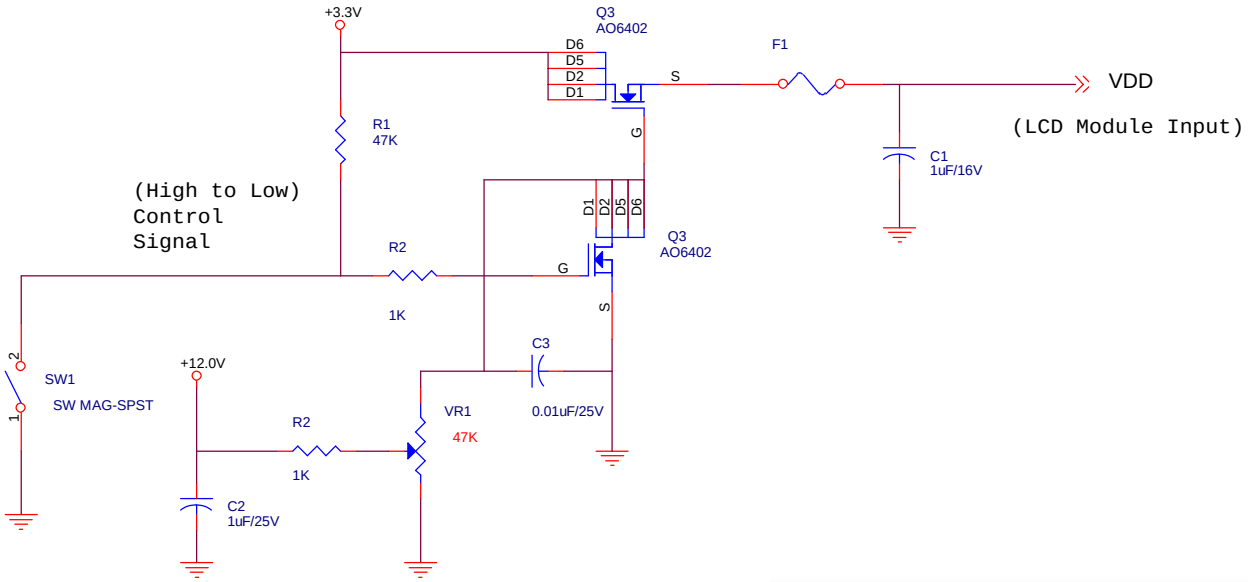
# 5. Electrical Characteristics

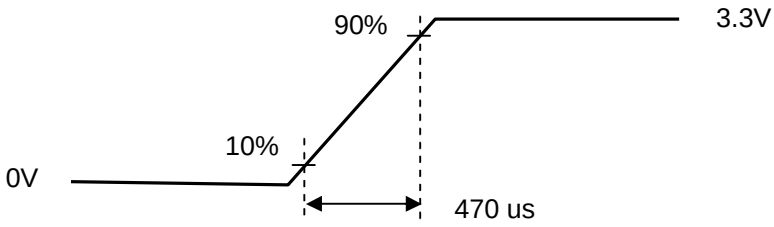
## 5.1 TFT LCD Module

### 5.1.1 Power Specification

| Symbol | Parameter | Min | Typ | Max | Units | Remark |
|---|---|---|---|---|---|---|
| VDD | Logic/LCD Drive Voltage | 3.0 | 3.3 | 3.6 | [Volt] | ±10% |
| IDD | VDD Current | - | 550 | 660 | [mA] | 64 Gray Bar Pattern (VDD=3.3V, at 60Hz) |
| Irush | LCD Inrush Current | - | - | 3 | [A] | Note 1 |
| PDD | VDD Power | - | 1.9 | 2.2 | [Watt] | 64 Gray Bar Pattern (VDD=3.3V, at 60Hz) |

Note 1: Measurement condition:




**VDD rising time**



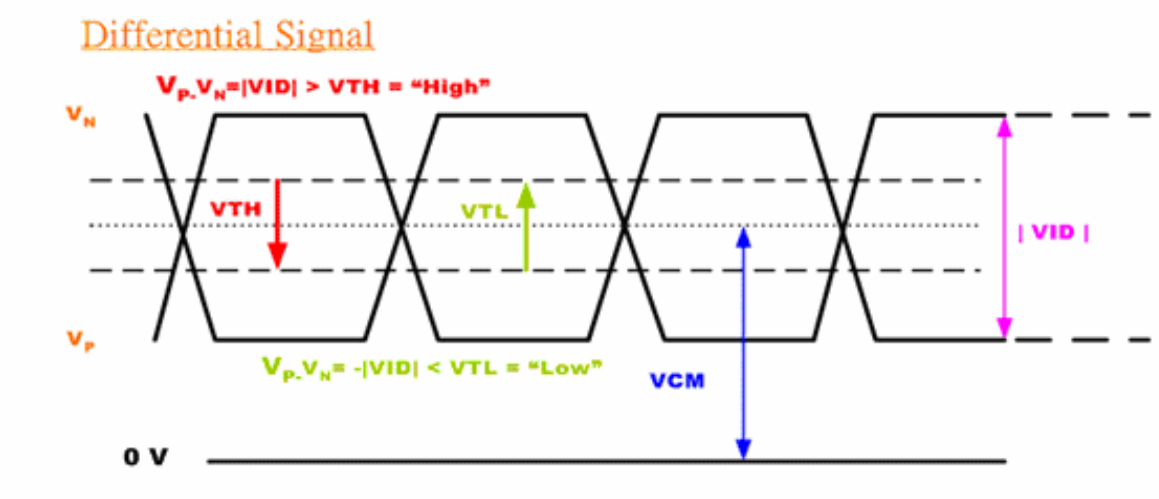
64 Gray pattern

### 5.1.2 Signal Electrical Characteristics

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

| Symbol | Item | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| 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 | | 1.45 | [V] | VTH/VTL=±100mV |

Note: LVDS Signal Waveform.



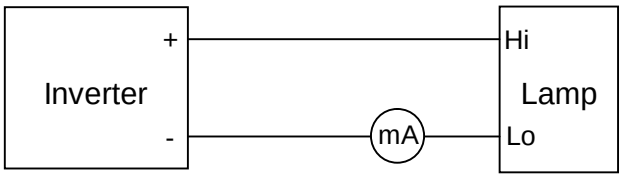
## 5.2 Backlight Unit

### 5.2.1 Parameter guideline for CCFL

Following characteristics are measured under a stable condition using an inverter at 25℃ (Room Temperature):

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|
| IRCFL | CCFL operation range | 2.5 | 5.5 | 6.5 | [mA] rms | (Ta=25°C) Note 1 |
| FCFL | CCFL Frequency | 40 | 46 | 65 | [KHz] | (Ta=25°C) Note 2 |
| ViCFL (0°C) (reference) | CCFL Ignition Voltage | - | 1180 | 1480 | [Volt] rms | (Ta= 0°C) |
| ViCFL (25°C) (reference) | CCFL Ignition Voltage | - | 910 | 1140 | [Volt] rms | (Ta=25°C) |
| VCFL | CCFL Discharge Voltage | 567 | 630 | 693 | [Volt] rms | (Ta=25°C) Note 3 IRCFL=5.5mA VCFL = Typ±10% |
| PCFL | CCFL Power consumption (inverter excluded) | - | 6.93 | - | [Watt] | (Ta=25°C) Note 3 IRCFL=5.5mA |
| Lamp Life | | 50,000 | - | | Hrs | (Ta=25°C) Note 4 IRCFL = 5.5mA |

Note 1: IRCFL is defined as the return current of an inverter. (In Figure. 1)




(Figure. 1: Measurement of return current)

A stable IRCFL is a current without flicker or biasing waveform provided by inverter that ensures the backlight perform to its specification. The ideal sine waveform should be symmetric in positive and negative polarities and the asymmetry rate of the inverter waveform should be below 10%.

It is recommended to use the inverter with detection circuit to avoid overvoltage, overcurrent, or mismatching waveform. The purpose is to avoid current flow into only one of the lamps when the other one is not in operation.

Note 2: CCFL frequency should be carefully determined to avoid interference between inverter and TFT LCD. Higher frequency will induce higher leakage current and further impact lamp life.

Note 3: Calculator value for reference (IRCFLxVCFLx2=PCFL).

Note 4: The definition of lamp life means when any of following conditions happen:

a) Luminance falls to 50% or less of the initial value.

b) Normal lighting is no more available (flickering, pink lighting, no lighting, etc.)

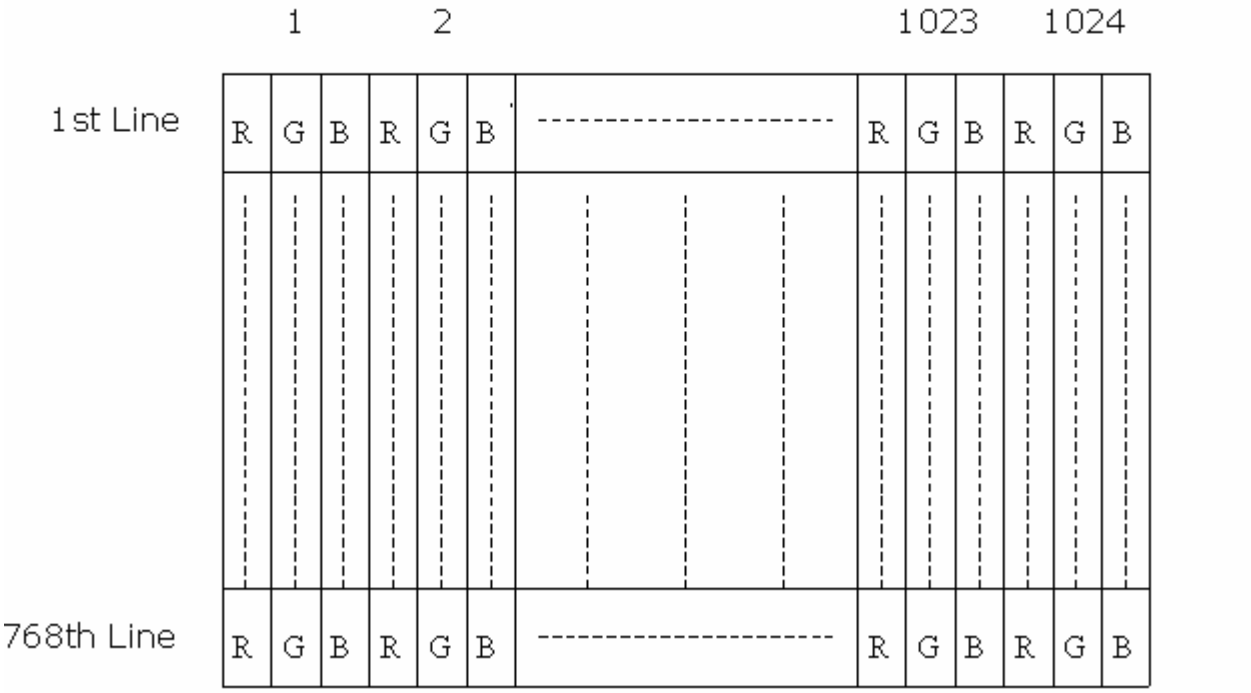
c) Lamp voltage or lighting start voltage exceeds the specified value.

Note 5: The display is with dual lamp design, and the CCFL current in above table refers to each lamp

# 6. Signal Characteristic

## 6.1 Pixel Format Image

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




## 6.2 Scanning Direction

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

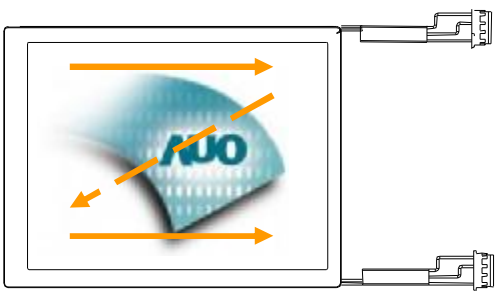


Fig. 1 Normal scan (Pin4, REV = Low or NC)

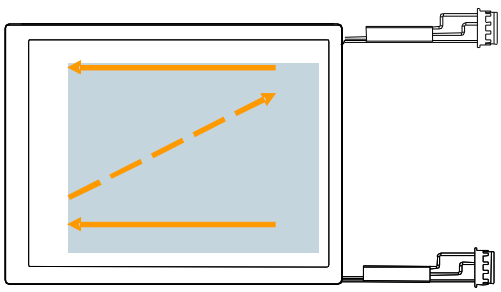


Fig. 2 Reverse scan (Pin4, REV = High)

## 6.3 Signal Description

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

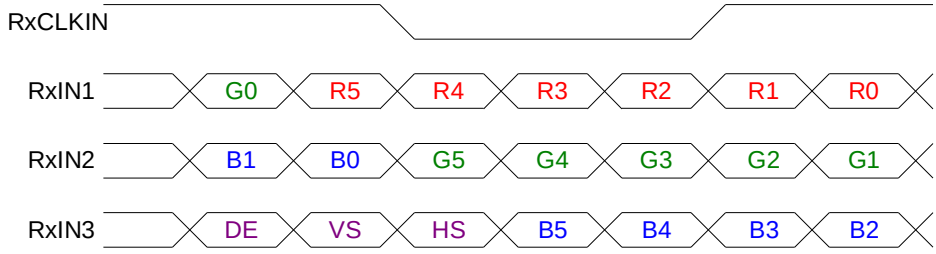
| **3804-F20N-06R (E&T) / MSB240420E(STM)** | | |
|---|---|---|
| **Pin No.** | **Symbol** | **Description** |
| 1 | VDD | Power Supply, 3.3V (typical) |
| 2 | VDD | Power Supply, 3.3V (typical) |
| 3 | VSS | Ground |
| 4 | REV | Reverse Scan selection *.Note1 |
| 5 | Rin0- | - LVDS differential data input (R0-R5, G0) |
| 6 | Rin0+ | + LVDS differential data input (R0-R5, G0) |
| 7 | VSS | Ground |
| 8 | Rin1- | - LVDS differential data input (G1-G5, B0-B1) |
| 9 | Rin1+ | + LVDS differential data input (G1-G5, B0-B1) |
| 10 | VSS | Ground |
| 11 | Rin2- | - LVDS differential data input (B2-B5, HS, VS, DE) |
| 12 | Rin2+ | + LVDS differential data input (B2-B5, HS, VS, DE) |
| 13 | VSS | Ground |
| 14 | ClkIN- | - LVDS differential clock input |
| 15 | ClkIN+ | + LVDS differential clock input |
| 16 | GND | Ground |
| 17 | Rin3- | - LVDS differential data input (R6-R7, G6-G7,B6-B7) |
| 18 | Rin3+ | - LVDS differential data input (R6-R7, G6-G7,B6-B7) |
| 19 | VSS | Ground |
| 20 | SEL68 | Selection for 6 bits/8bits LVDS data input ***Note1** |

Note 1: Input signals shall be in low status when VDD is off.

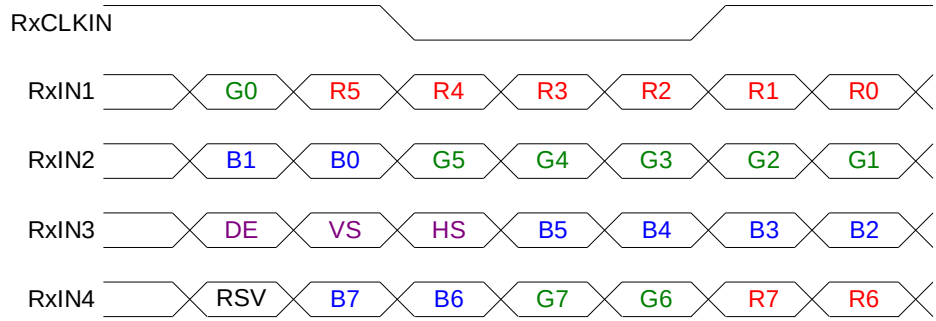
## 6.4 The Input Data Format

### 6.4.1 SEL68

**SEL68 = ”High” or “NC” for 6 bits LVDS Input**




**SEL68 = “Low” 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 | Red-pixel Data |
| R6 | Red Data 6 | |
| R5 | Red Data 5 | For 8Bits LVDS input |
| R4 | Red Data 4 | MSB: R7 ; LSB: R0 |
| R3 | Red Data 3 | |
| R2 | Red Data 2 | For 6Bits LVDS input |
| R1 | Red Data 1 | MSB: R5 ; LSB: R0 |
| R0 | Red Data 0 | |
| G7 | Green Data 7 | Green-pixel Data |
| G6 | Green Data 6 | |
| G5 | Green Data 5 | For 8Bits LVDS input |
| G4 | Green Data 4 | MSB: G7 ; LSB: G0 |
| G3 | Green Data 3 | |
| G2 | Green Data 2 | For 6Bits LVDS input |
| G1 | Green Data 1 | MSB: G5 ; LSB: G0 |
| G0 | Green Data 0 | |
| B7 | Blue Data 7 | Blue-pixel Data |
| B6 | Blue Data 6 | |
| B5 | Blue Data 5 | For 8Bits LVDS input |
| B4 | Blue Data 4 | MSB: B7 ; LSB: B0 |
| B3 | Blue Data 3 | |
| B2 | Blue Data 2 | For 6Bits LVDS input |
| B1 | Blue Data 1 | MSB: B5 ; LSB: B0 |
| B0 | Blue Data 0 | |
| RxCLKIN | LVDS Data Clock | |
| DE | Data Enable Signal | When the signal is high, the pixel data shall be valid to be displayed. |
| VS | Vertical Synchronous Signal | |
| HS | Horizontal Synchronous Signal | |

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

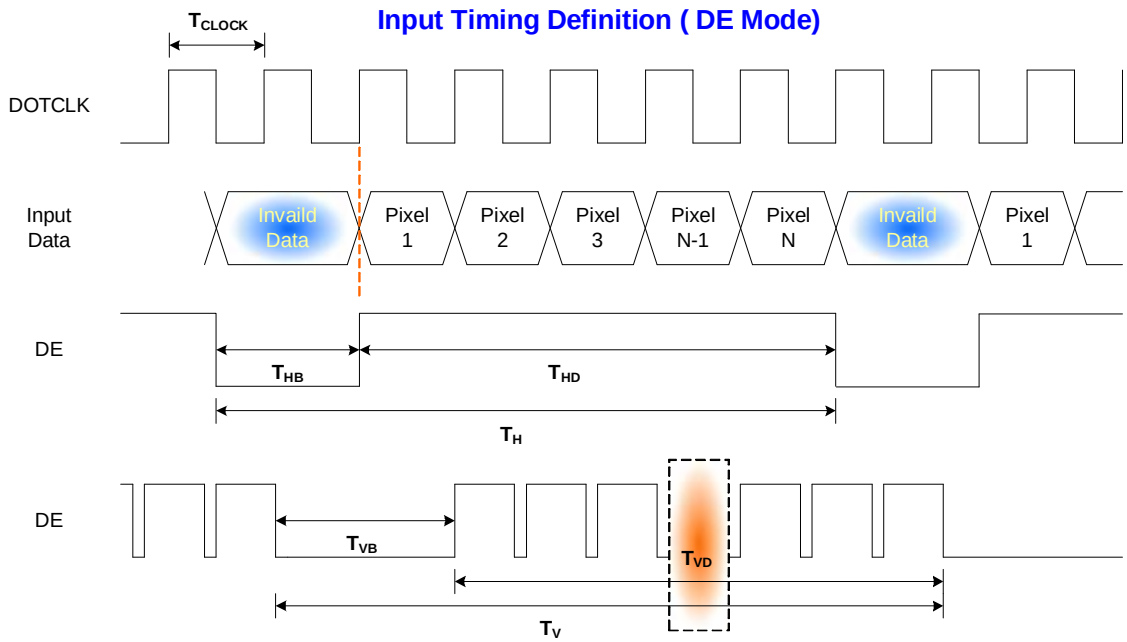
## 6.5 Interface Timing

### 6.5.1 Timing Characteristics

| Signal | Parameter | | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Clock Timing | Clock frequency | | 1/ $T_{Clock}$ | 50 | 65 | 81 | MHz |
| Vsync Timing | Vertical Section | Period | $T_V$ | 776 | 806 | 1024 | $T_{Line}$ |
| | | Active | $T_{VD}$ | 768 | 768 | 768 | |
| | | Blanking | $T_{VB}$ | 8 | 38 | 256 | |
| Hsync Timing | Horizontal Section | Period | $T_H$ | 1054 | 1344 | 2048 | $T_{Clock}$ |
| | | Active | $T_{HD}$ | 1024 | 1024 | 1024 | |
| | | Blanking | $T_{HB}$ | 30 | 320 | 1024 | |

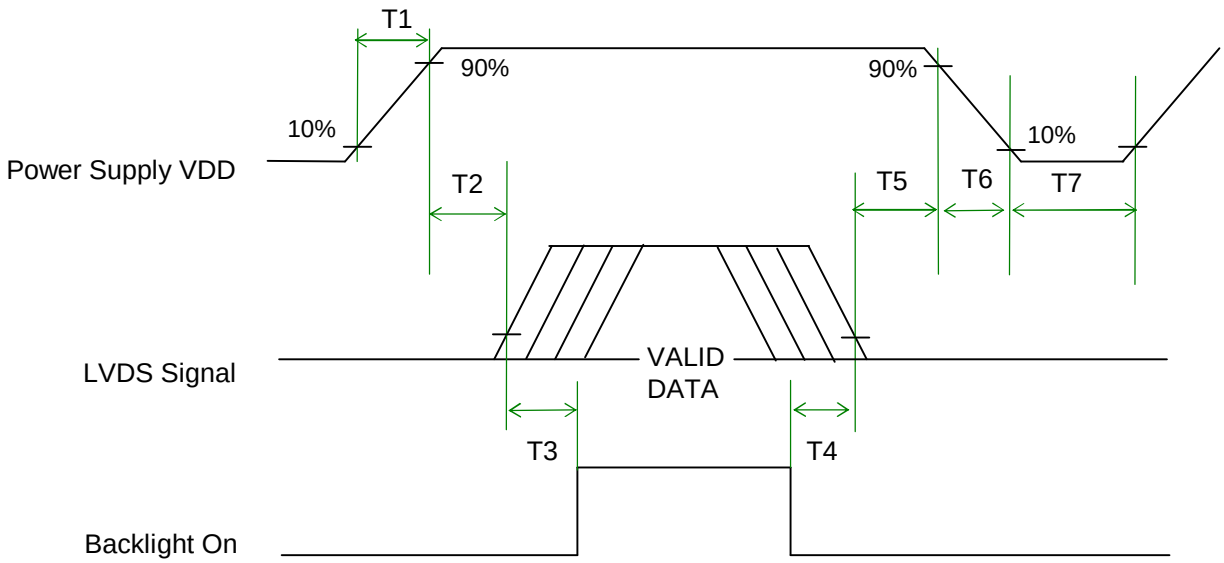
Note: Frame rate is 60 Hz.
Note: DE mode.
Note : Typical value refer to VESA STANDARD

### 6.5.2 Input Timing Diagram



## 6.6 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as below. 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 ON/OFF sequence timing

| Parameter | Value | | | Units |
|---|---|---|---|---|
| | 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** | 0 | - | 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

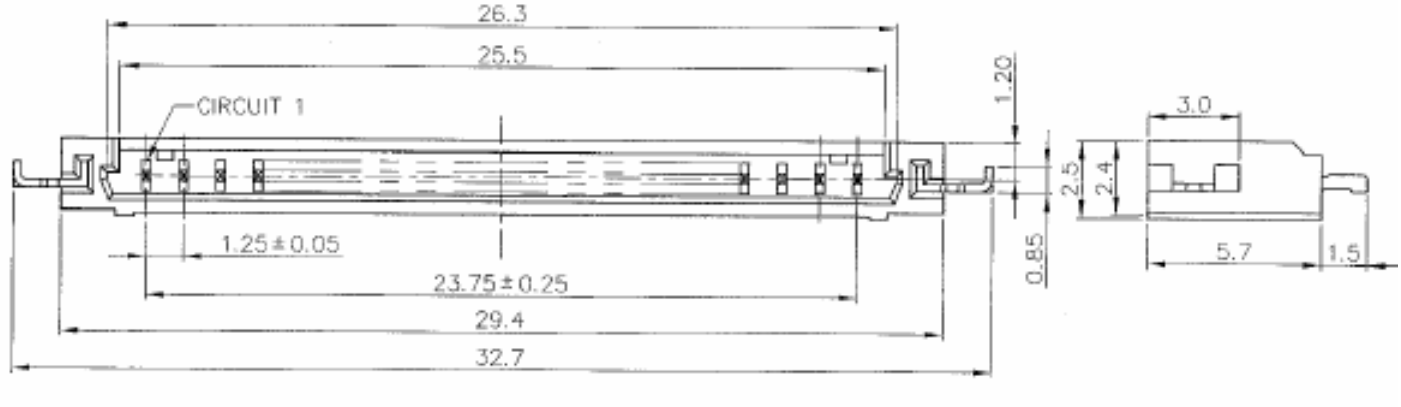
Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

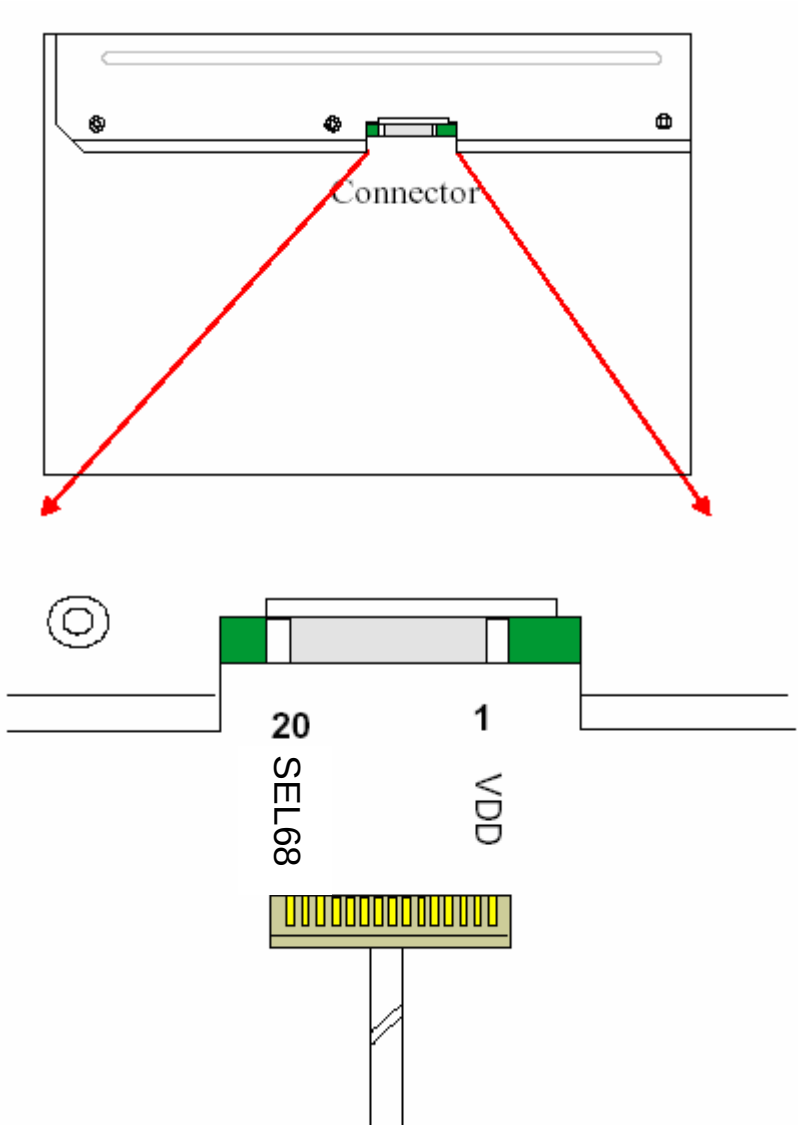
## 7.1 TFT LCD Module: LVDS Connector

| Connector Name / Designation | Signal Connector |
|---|---|
| Manufacturer | E&T or compatible |
| Connector Model Number | 3804-F20N-06R / MSB240420E |
| Adaptable Plug | HRS DF14-20S-1.25C |

| Pin# | Signal Name | Pin# | Signal Name |
|---|---|---|---|
| 1 | VDD | 2 | VDD |
| 3 | VSS | 4 | REV |
| 5 | Rin0- | 6 | Rin0+ |
| 7 | VSS | 8 | Rin1- |
| 9 | Rin1+ | 10 | VSS |
| 11 | Rin2- | 12 | Rin2+ |
| 13 | VSS | 14 | ClkIN- |
| 15 | ClkIN+ | 16 | GND |
| 17 | Rin3- | 18 | Rin3+ |
| 19 | VSS | 20 | SEL68 |

### 7.1.1 Connector Illustration



## 7.2 Backlight Unit: Lamp Connector

| Connector Name / Designation | Lamp Connector |
|---|---|
| Manufacturer | JST or compatible |
| Connector Model Number | BHR-03VS-1 or compatible |
| Mating Model Number | SM02(8.0)B-BHS-1-TB or compatible |

## 7.3 Lamp Connector Pin Assignment

| Pin# | Symbol | Cable color | Signal Name |
|---|---|---|---|
| 1 | HV | Pink | Lamp High Voltage |
| 2 | NC | NC | No Connection |
| 3 | LV | White | Ground |

- Cable length: 140 ± 5 mm
- Connector-output position: right side (front view)
- Lamp assembly design shall be easy for replacement and repair

# 8. Reliability Test Criteria

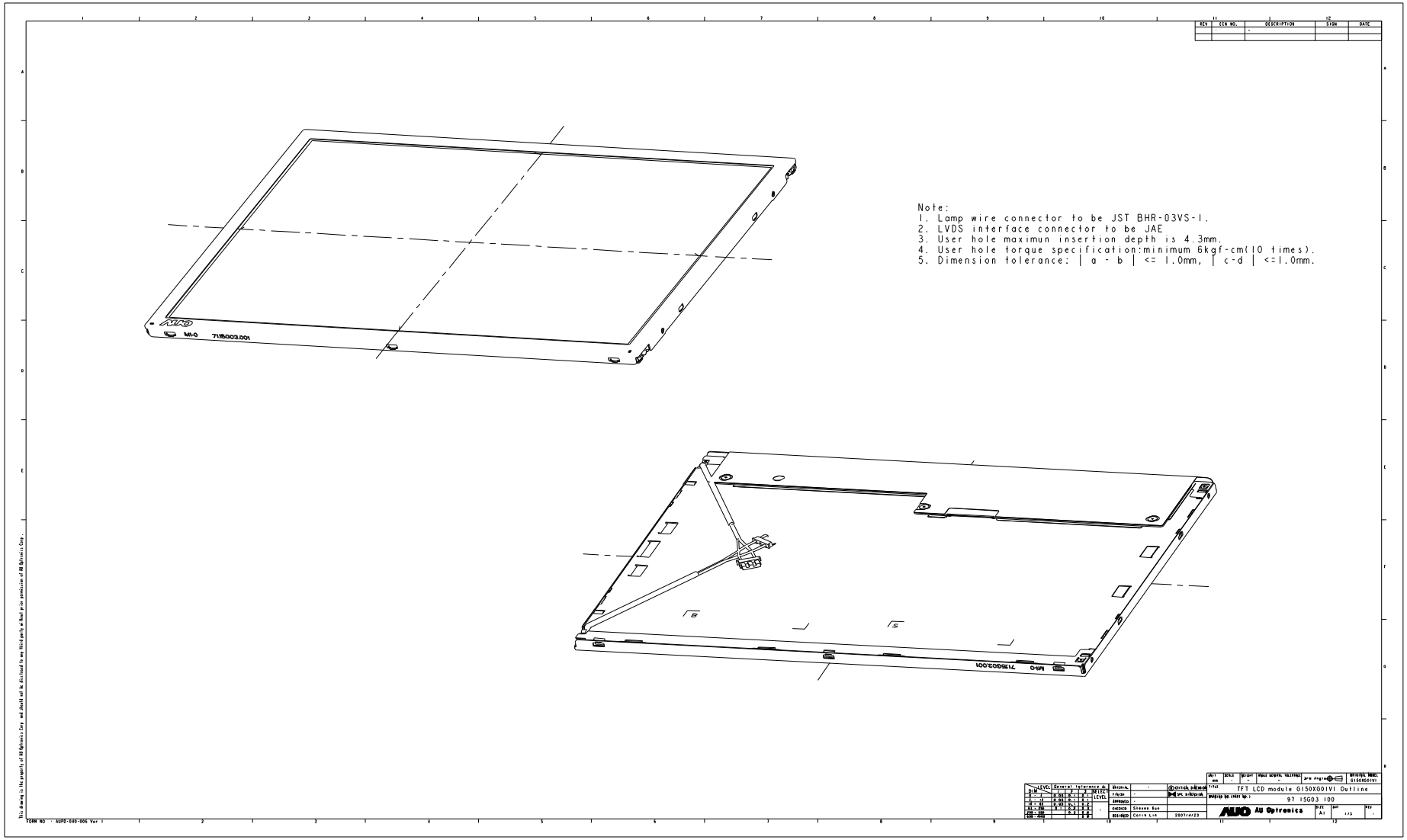
| Items | Required Condition | Note |
|---|---|---|
| Temperature Humidity Bias | 50℃/80%,300 hours | |
| High Temperature Operation | 60℃,300 hours | |
| Low Temperature Operation | 0℃,300 hours | |
| Hot Storage | 60℃,300 hours | |
| Cold Storage | -20℃,300 hours | |
| Thermal Shock Test | -20℃/30 min ,60℃/30 min ,100cycles | |
| Shock Test (Non-Operating) | 50G,20ms,Half-sine wave,( ±X, ±Y, ±Z) | |
| Vibration Test (Non-Operating) | 1.5G, (10~200Hz, P-P)<br>30 mins/axis (X, Y, Z) | |
| On/off test | On/10 sec, Off/10 sec, 30,000 cycles | |
| ESD | Contact Discharge: ± 8KV, 150pF(330Ω ) 1sec, 8 points, 25 times/ point<br>Air Discharge: ± 15KV, 150pF(330Ω ) 1sec, 8 points, 25 times/ point | Note 1 |

Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost

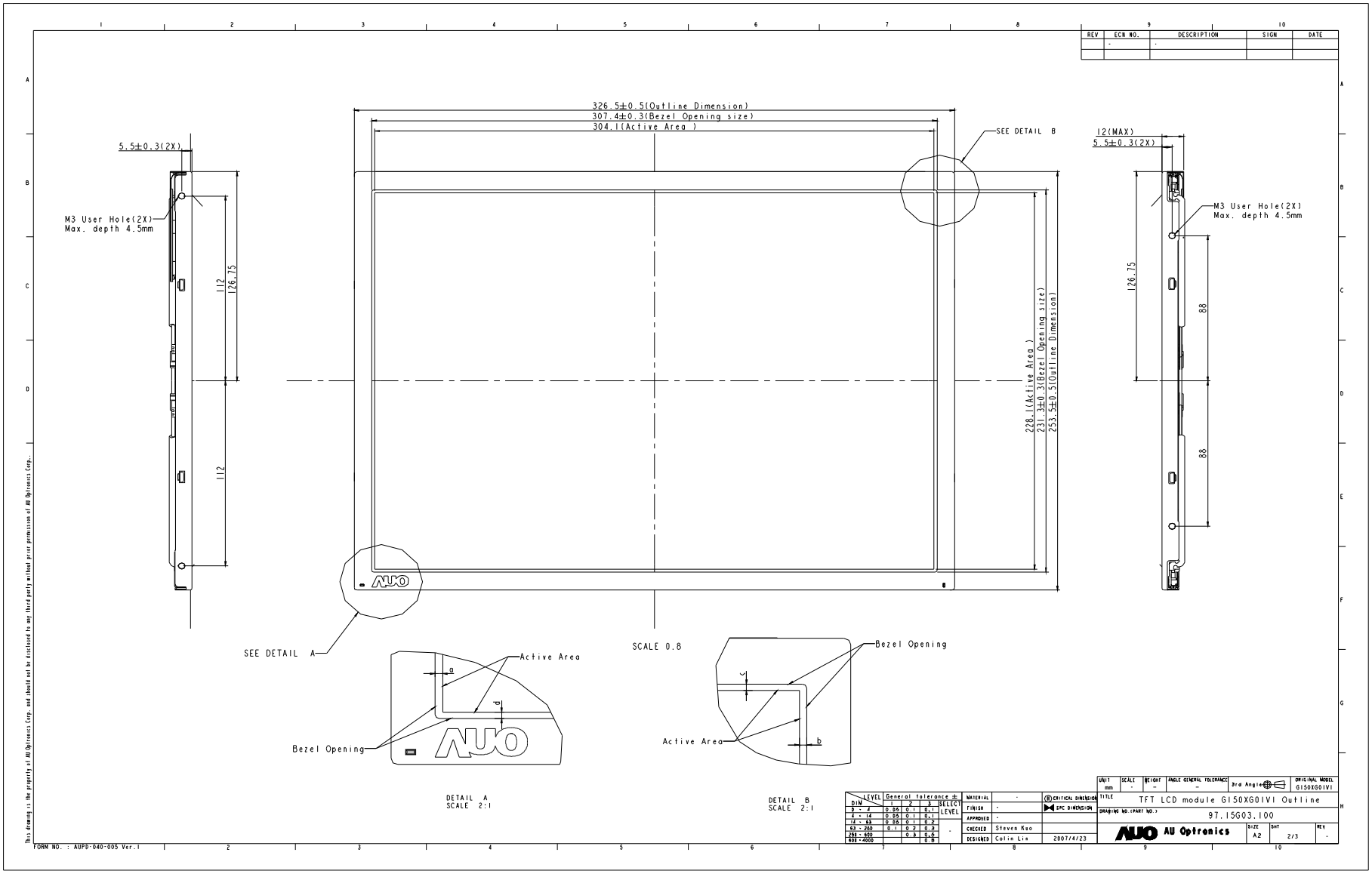
. Self-recoverable. No hardware failures.

# 9. Mechanical Characteristics

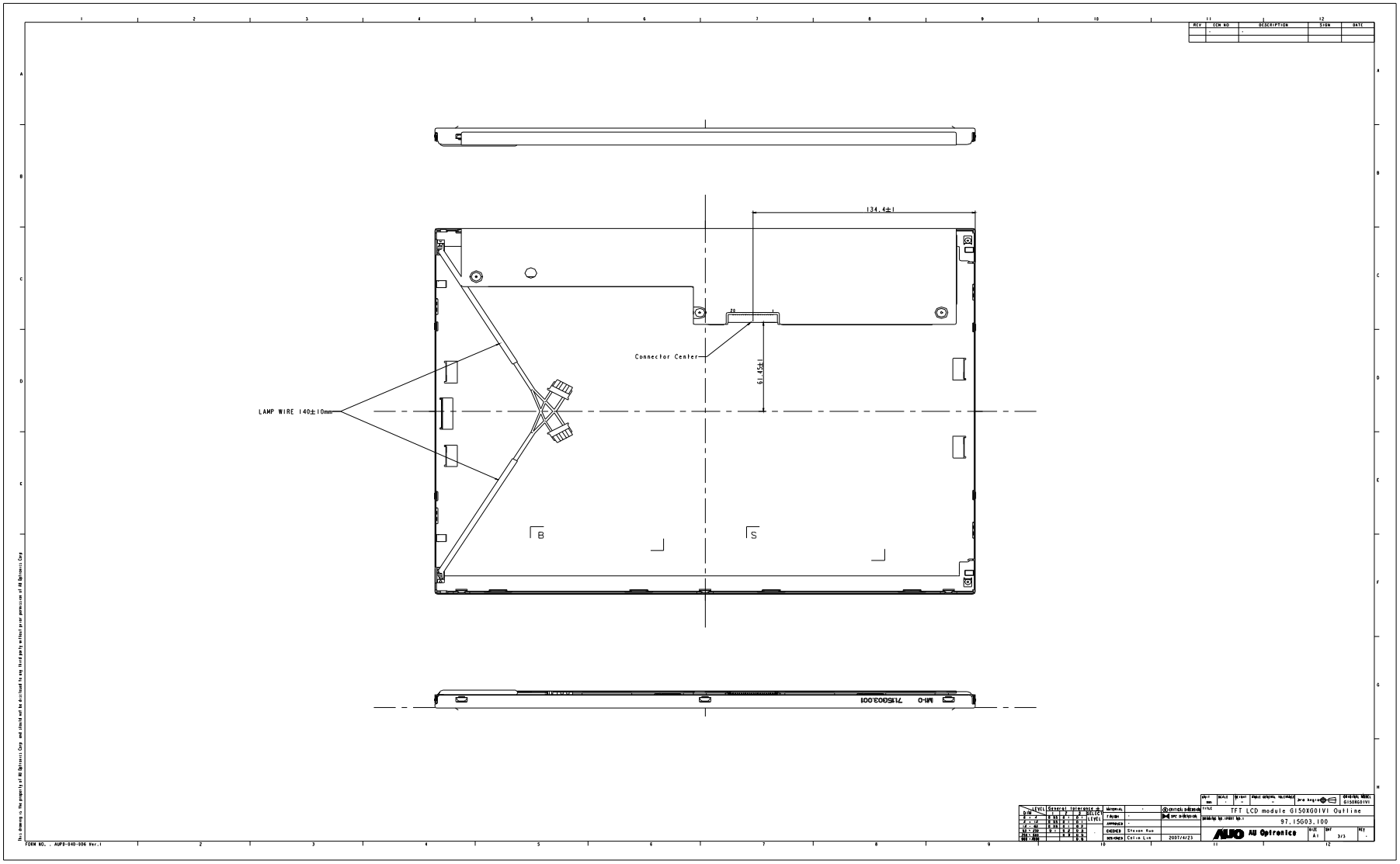
## 9.1 LCM Front View and Rear View



## 9.2 LCM Outline Dimension (Front View)

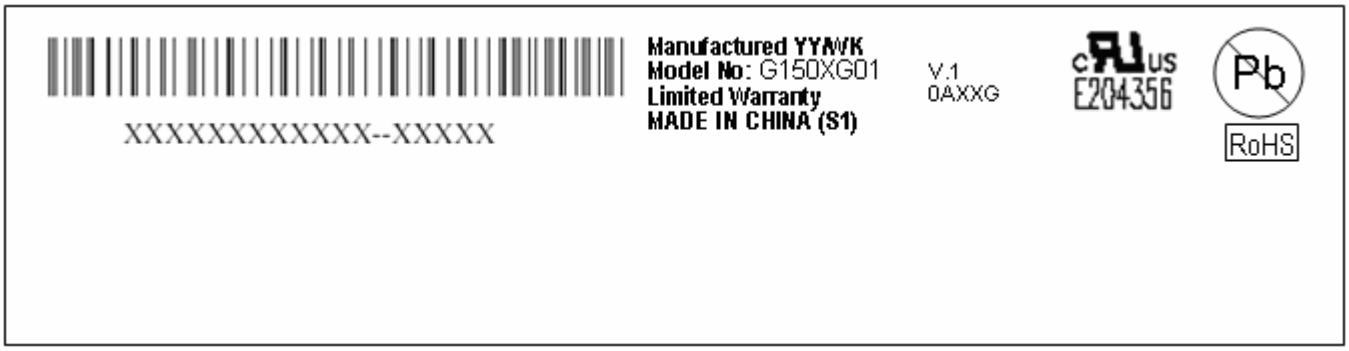


## 9.3 LCM Outline Dimension (Rear View)



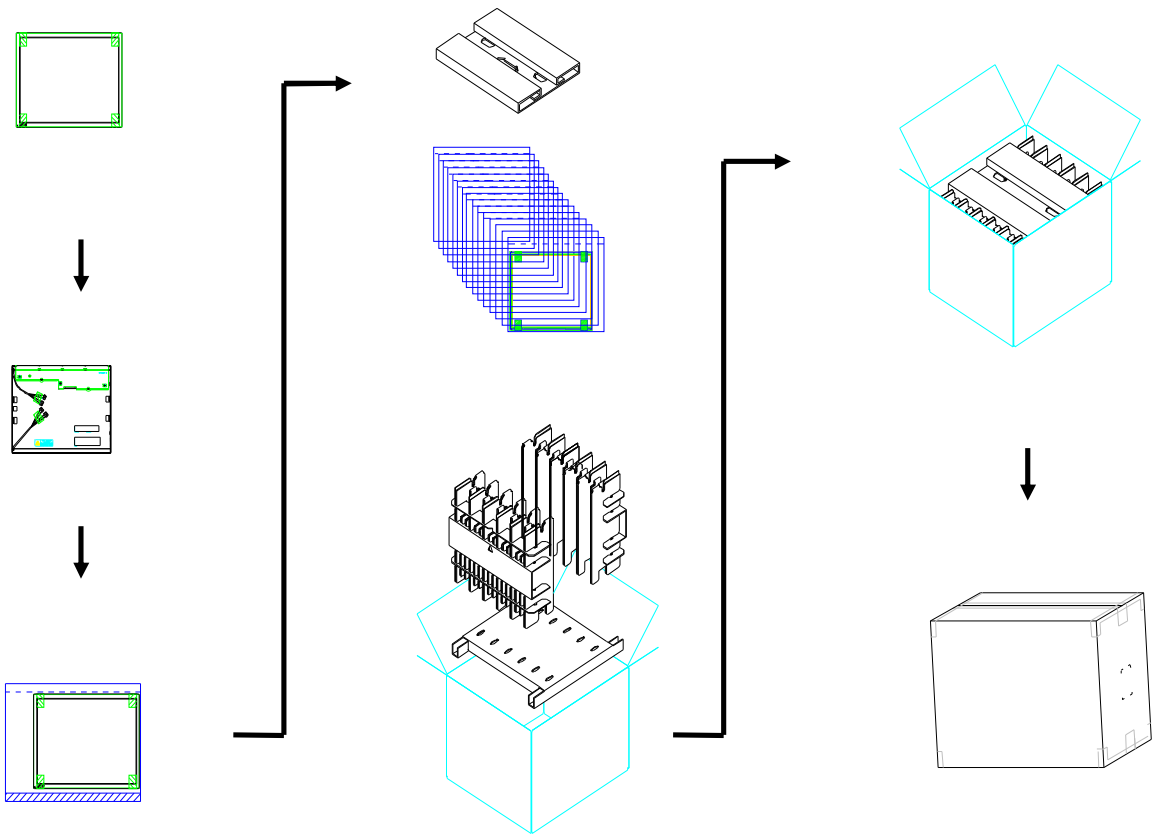
# 10. Label and Packaging

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




## 10.2 Carton Package

Max capacity: 15 TFT-LCD module per carton (15pcs * 1 layers)
Max weight: 20 kg per carton
Outside dimension of carton: 375(L)mm* 430(W)mm* 360(H)mm



# 11 Safety

## 11.1 Sharp Edge Requirements

There will be no sharp edges or comers on the display assembly that could cause injury.

## 11.2 Materials

### 11.2.1 Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

### 11.2.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating 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.

## 11.3 Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

## 11.4 National Test Lab Requirement

The display module will satisfy all requirements for compliance to:

| | |
|---|---|
| **UL 1950, First Edition** | U.S.A. Information Technology Equipment |