G150XTN06.0

() Preliminary Specifications
(V) Final Specifications

| Module | 15 Inch Color TFT-LCD |
|---|---|
| Model Name | G150XTN06.0 |

| Customer | Date |
|---|---|
| | |
| **Checked & Approved by** | |
| _____ | _____ |

| Approved by | Date |
|---|---|
| Crystal Hsieh | 2014/09/26 |
| **Prepared by** | |
| Jason Hsieh | 2014/09/26 |

Note: This Specification is subject to change without notice.

General Display Business Division / AU Optronics corporation

# Contents

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## Record of Revision

| Version and Date | Page | Old description | New Description |
|---|---|---|---|
| 0.0 2014/01/20 | All | First Edition | |
| 0.1 2014/05/07 | 5 | White Luminance: 320(min.), 400(typ.) | 360(min.), 450(typ.) |
| | 13 | LED Forward Current: 50(typ.) | 40(typ.) |
| | 15 | Pin 20: H or NC: 8bit/L: 6bit | H or NC: 6bit/L: 8bit |
| | 16 | "L" for 6 bits LVDS Input | "H" or NC for 6 bits LVDS Input |
| | | "H" or NC for 8 bits LVDS Input | "L" for 8 bits LVDS Input |
| 1.0 2014/09/26 | 5 | Typical Power Consumption: TBD | 12W |
| | | Weight: TBD | 1000g (max.) |
| | 6 | Contrast Ratio: 700(typ.) | 800(typ.) |
| | | Vertical(Upper): 60(typ.) | 70(typ.) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Red x | | TBD | | | Red x | 0.567 | 0.617 | 0.667 |
| Red y | | TBD | | | Red y | 0.296 | 0.346 | 0.396 |
| Green x | | TBD | | | Green x | 0.286 | 0.336 | 0.386 |
| Green y | | TBD | | | Green y | 0.562 | 0.612 | 0.662 |
| Blue x | | TBD | | | Blue x | 0.109 | 0.159 | 0.209 |
| Blue y | | TBD | | | Blue y | 0.015 | 0.065 | 0.115 |
| White x | 0.263 | 0.313 | 0.363 | | White x | 0.261 | 0.311 | 0.361 |
| White y | 0.279 | 0.329 | 0.379 | | White y | 0.272 | 0.322 | 0.372 |

| Version and Date | Page | Old description | New Description |
|---|---|---|---|
| | 11 | IDD:TBD | 450(typ), 750(max) |
| | | Irush TBD | 2(max) |
| | | PDD: TBD | 1.49(typ), 2.48(max) |
| | 13 | Ivcc: TBD | 0.75 (typ.) |
| | | PLED: TBD | 9 (typ.) |
| | | LED life: - | 70,000(typ.) |
| | 18 | T9: 100(min.) | T9: 10(max.) |
| | 20 | | Modify note 2 |
| | 24 | | Modify packing |
| | | | |
| | | | |
| | | | |

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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 LED Reflector edge. Instead, press at the far ends of the LED 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) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.

12) Small amount of materials without flammability grade are used in the TFT-LCD module. The TFT-LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950-1 or UL60950-1), or be applied exemption.

13) Severe temperature condition may result in different luminance, response time.

14) Continuous operating TFT-LCD Module under high temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.

15) The data on this specification sheet is applicable when TFT-LCD module is placed in landscape position.

16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or moving content periodically if fixed pattern is displayed on the screen.

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## 2. General Description

G150XTN06.0 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 or 262K colors. All input signals are LVDS interface compatible. All design rules of this module can correspond to PSWG standard.

G150XTN06.0 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] | 12W |
| Weight | [Grams] | 1000g (max.) |
| Physical Size | [mm] | 326.5(H)x 253.5(V) x 12.0(D) (max.) |
| Electrical Interface | | LVDS |
| Surface Treatment | | Anti-glare |
| Support Color | | 16.2M/262K |
| Temperature Range<br>   Operating<br>   Storage (Non-Operating) | [  ]<br>[  ] | -30 to +85<br>-30 to +85 |
| RoHS Compliance | | RoHS Compliance |
| Light Bar Unit | | LED, Replaceable |

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## 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] | | | 360 | 450 | - | 1 |
| Uniformity | % | 9 Points | | 75 | 80 | - | 1, 2, 3 |
| Contrast Ratio | | | | 400 | 800 | - | 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) | 70 | 80 | - | 7 |
| | [degree] | CR = 10 | (Left) | 70 | 80 | - | |
| | [degree] | Vertical | (Upper) | 50 | 70 | - | |
| | [degree] | CR = 10 | (Lower) | 70 | 80 | - | |
| Color / Chromaticity Coordinates (CIE 1931) | | Red x | | 0.567 | 0.617 | 0.667 | |
| | | Red y | | 0.296 | 0.346 | 0.396 | |
| | | Green x | | 0.286 | 0.336 | 0.386 | |
| | | Green y | | 0.562 | 0.612 | 0.662 | |
| | | Blue x | | 0.109 | 0.159 | 0.209 | |
| | | Blue y | | 0.015 | 0.065 | 0.115 | |
| | | White x | | 0.261 | 0.311 | 0.361 | |
| | | White y | | 0.272 | 0.322 | 0.372 | |
| Color Gamut | % | | | | 60 | - | |

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

G150XTN06.0
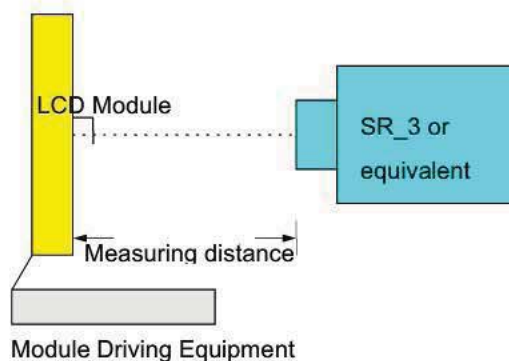
Note 2: Definition of 9 points position (Display active area : 304.128(H) x 228.096(V))
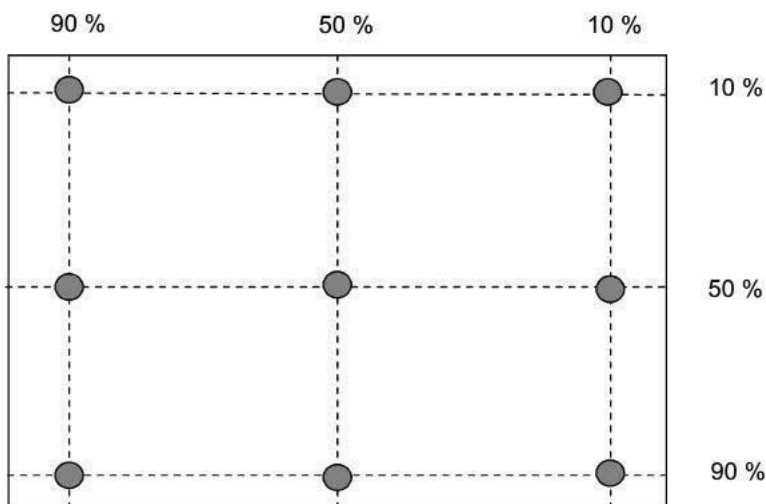


Note 3: The luminance uniformity of 9 points is defined by dividing the minimum luminance values by the maximum test point luminance

$$W_9 = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

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)

$CT = | YB - YA | / YA \times 100$ (%)

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)

G150XTN06.0
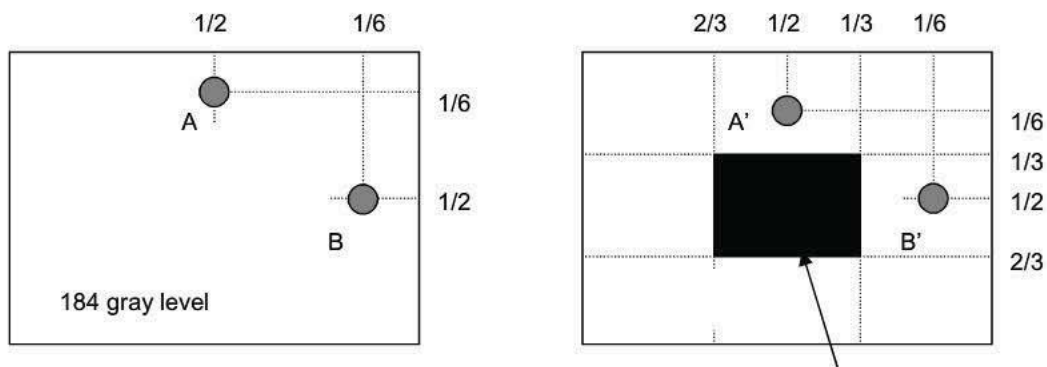
Note 6: Definition of response time:

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.
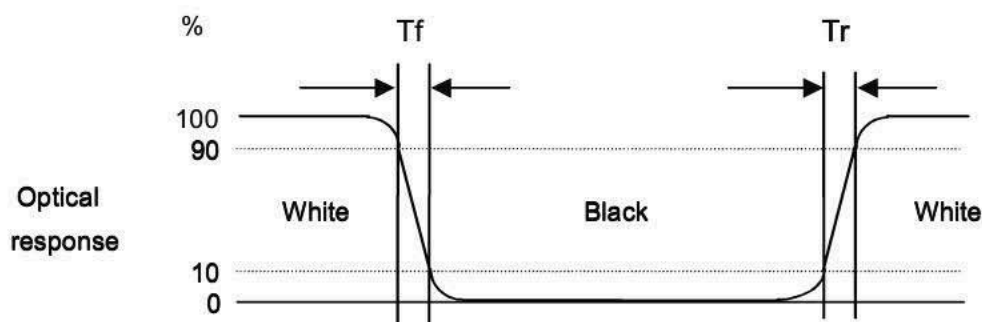


Note 7: Definition of viewing angle

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 （　） horizontal left and right, and 90 （　） 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.
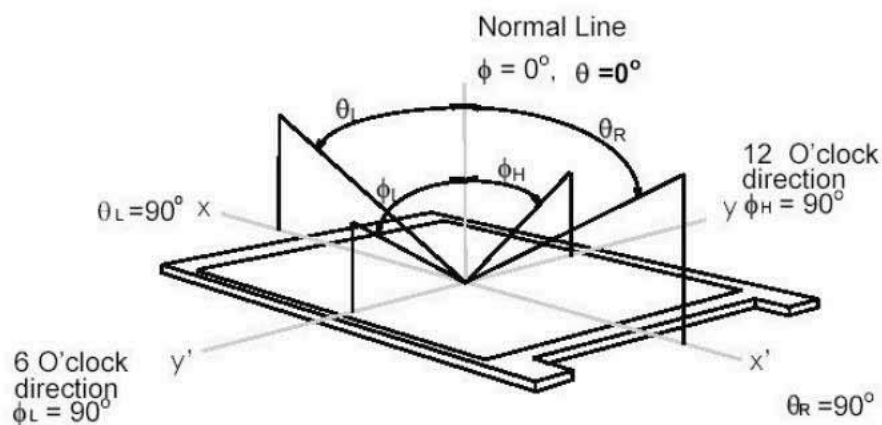
## 3. Functional Block Diagram

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

G150XTN06.0
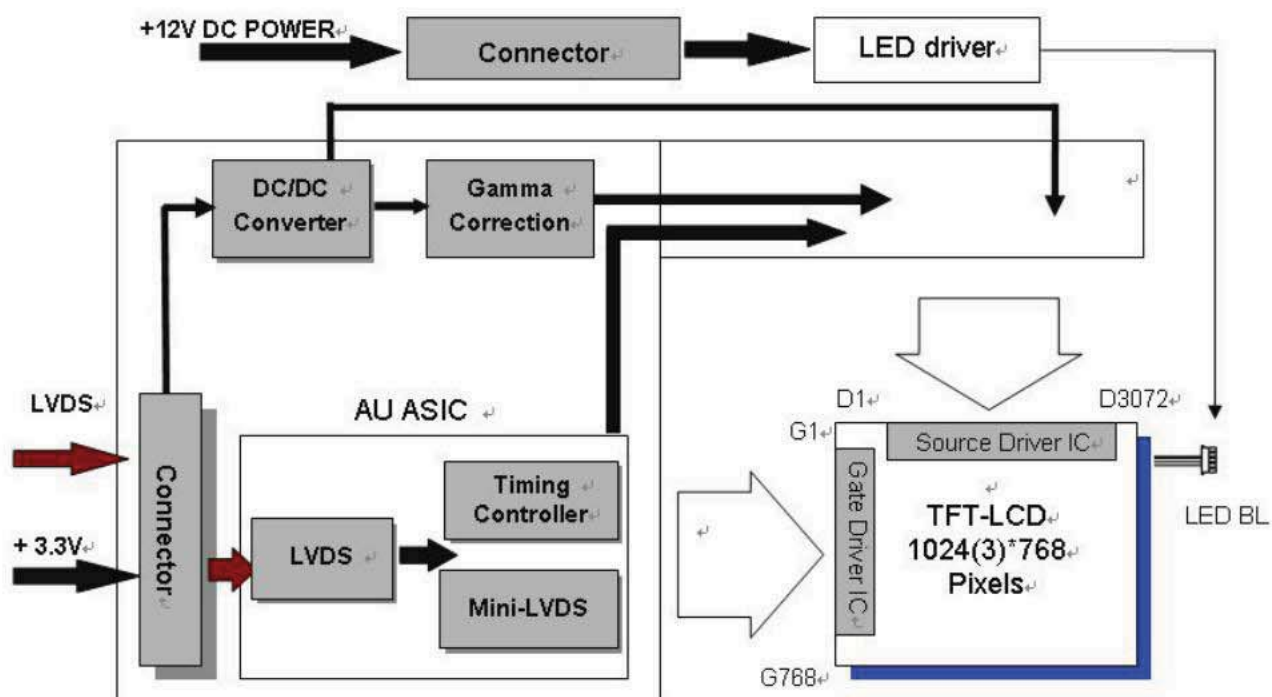
## 4. Absolute Maximum Ratings

### 4.1 Absolute Ratings of TFT LCD Module

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

### 4.2 Absolute Ratings of Environment

| Item | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Operating Temperature | TOP | -30 | +85 | [$^o$C] |
| Operation Humidity | HOP | 8 | 90 | [%RH] |
| Storage Temperature | TST | -30 | +85 | [$^o$C] |
| Storage Humidity | HST | 8 | 90 | [%RH] |

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

G150XTN06.0
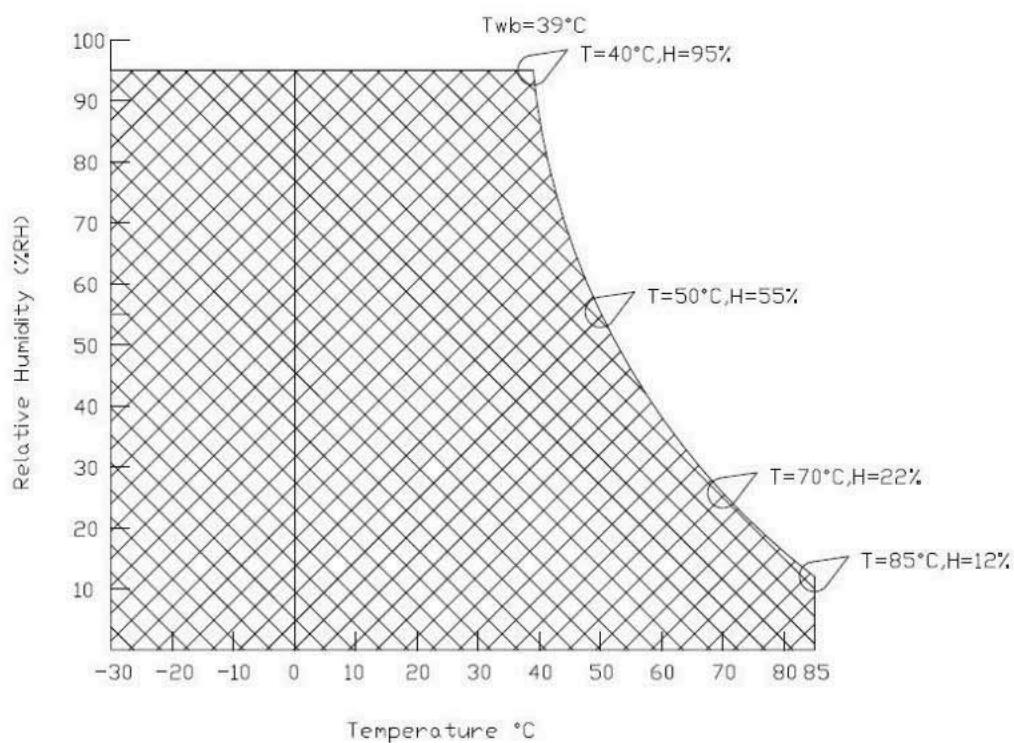
## 5. Electrical Characteristics

### 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 | - | 450 | 750 | [mA] | 64 Gray Bar Pattern (VDD=3.3V, at 60Hz) |
| Irush | LCD Inrush Current | - | - | 2 | [A] | Note 1 |
| PDD | VDD Power | - | 1.49 | 2.48 | [Watt] | 64 Gray Bar Pattern (VDD=3.3V, at 60Hz) |

Note 1: Measurement condition:

**VDD rising time**

**64 Gray pattern**
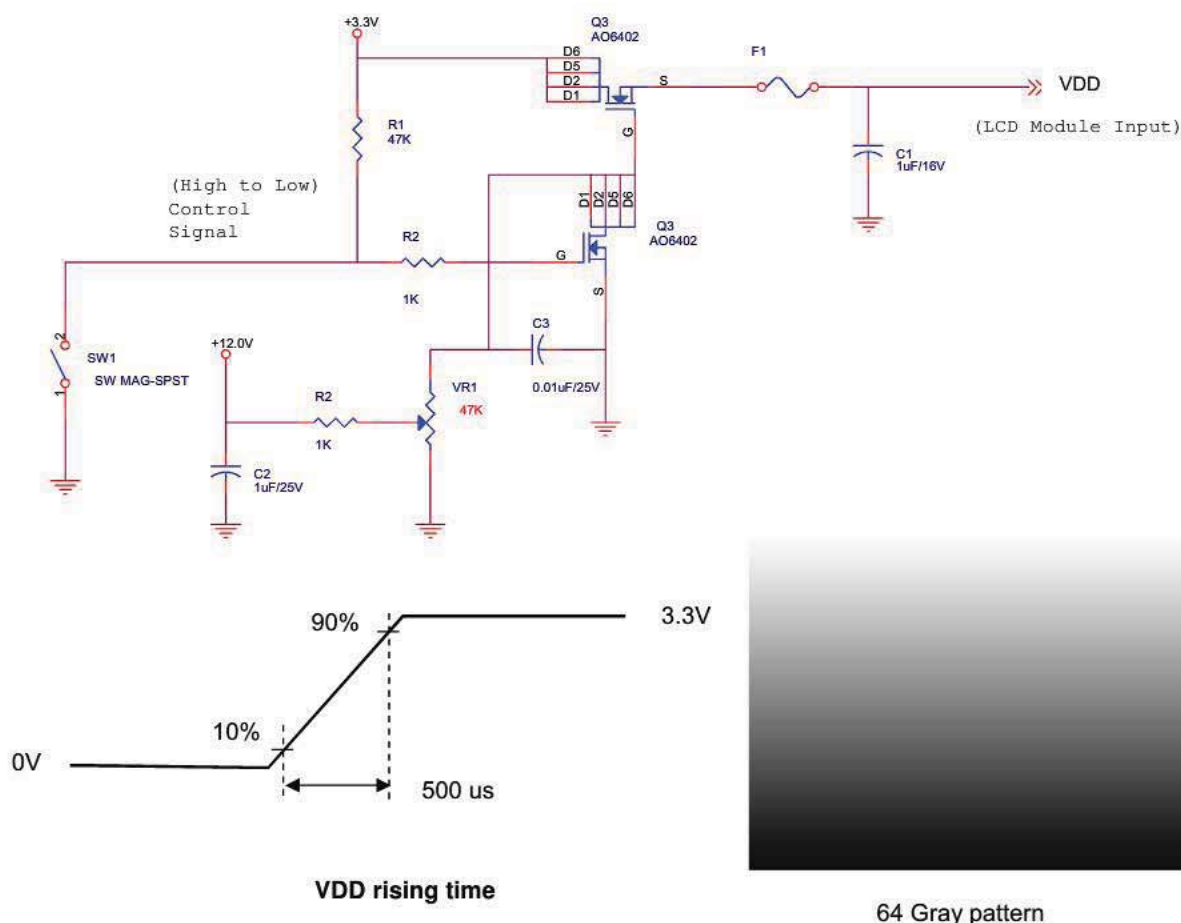
## 5.1.2 Signal Electrical Characteristics

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 | 1.15 | 1.2 | 1.45 | [V] | VTH/VTL= 100mV |

Note: LVDS Signal Waveform.
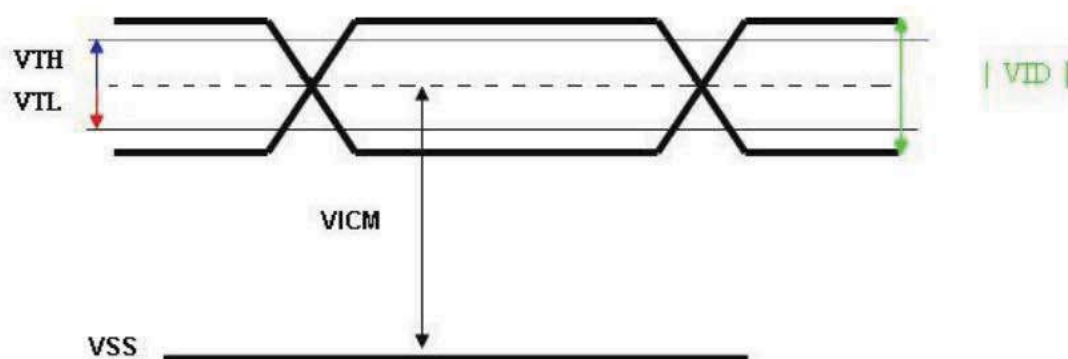
## 5.2 Backlight Unit

### 5.2.1 Parameter guideline for LED

Following characteristics are measured under stable condition using a LED driving board at 25 (Room

Temperature).

| Symbol | Parameter | Min | Typ | Max | Unit | Remark |
|--------|-----------|-----|-----|-----|------|--------|
| Vcc | Input Voltage | 10.8 | 12 | 13.2 | Volt | |
| Ivcc | Input Current | - | 0.75 | - | A | 100% Dimming |
| PLED | Power Consumption | - | 9 | - | Watt | 100% Dimming |
| Irush | Inrush Current | - | | 2 | A | |
| VLED on/off | On Control Voltage | 3.0 | | 5.5 | Volt | |
| | Off Control Voltage | - | | 0.8 | Volt | |
| FPWM | PWM Dimming Frequency | 200 | - | 20k | Hz | |
| | High Voltage | 3.0 | | 5.5 | Volt | |
| | Low Voltage | - | | 0.8 | Volt | |
| | Dimming Duty Cycle | 5 | - | 100 | % | |
| $I_F$ | LED Forward Current | - | 40 | | mA | Ta = 25°C |
| LED Life | | 50,000 | 70,000 | - | Hrs | Ta = 25°C |

Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: If G150XTN06.0 module is driven at high ambient temperature & humidity condition. The operating life will be
reduced.

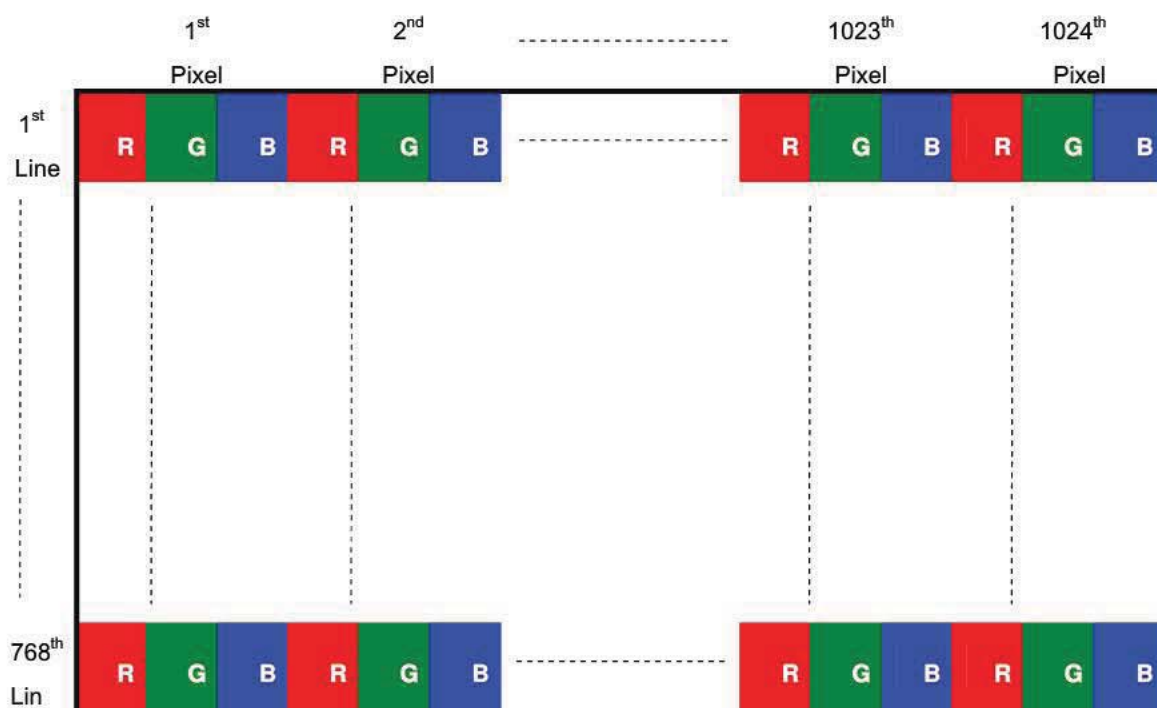Note 3: LED life means brightness goes down to 50% initial brightness. Min. operating life time is estimated data.

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## 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.

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## 6.3 Signal Description

LVDS is a differential signal technology for LCD interface and high speed data transfer device.

| Pin No. | Symbol | Description |
|---|---|---|
| 1 | VDD | Power Supply, 3.3V (typical) |
| 2 | VDD | Power Supply, 3.3V (typical) |
| 3 | NC | No Connect |
| 4 | NC | No Connect |
| 5 | Rin1- | - LVDS differential data input |
| 6 | Rin1+ | + LVDS differential data input |
| 7 | VSS | Ground |
| 8 | Rin2- | - LVDS differential data input |
| 9 | Rin2+ | + LVDS differential data input |
| 10 | VSS | Ground |
| 11 | Rin3- | - LVDS differential data input |
| 12 | Rin3+ | + LVDS differential data input |
| 13 | VSS | Ground |
| 14 | ClkIN- | - LVDS differential clock input |
| 15 | ClkIN+ | + LVDS differential clock input |
| 16 | VSS | Ground |
| 17 | Rin4- | - LVDS differential data input |
| 18 | Rin4+ | - LVDS differential data input |
| 19 | VSS | Ground |
| 20 | SEL LVDS | H or NC: 6bit/L: 8bit |

## 6.4 The Input Data Format

**SEL LVDS = "H" or NC for 6 bits LVDS Input**
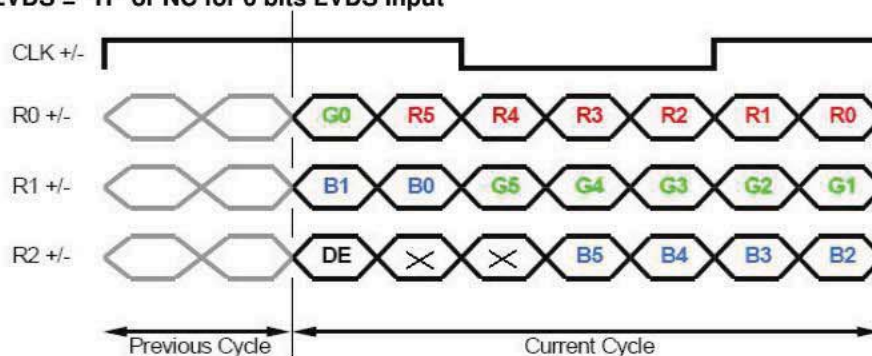


**SEL LVDS = "L" for 8 bits LVDS Input**
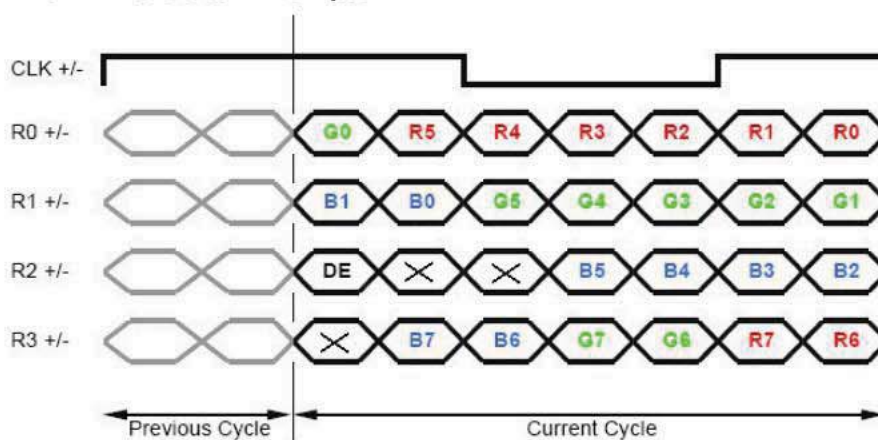


Note1: Please follow PSWG.
Note2: R/G/B data 7:MSB, R/G/B data 0:LSB

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## 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 | 80 | MHz |
| Vsync Timing | Vertical Section | Period | $T_V$ | 776 | 806 | 990 | Vsync Timing |
| | | Active | $T_{VD}$ | - | 768 | - | |
| | | Blanking | $T_{VB}$ | 8 | 38 | 222 | |
| Hsync Timing | Horizontal Section | Period | $T_H$ | 1094 | 1344 | 1720 | Hsync Timing |
| | | Active | $T_{HD}$ | - | 1024 | - | |
| | | Blanking | $T_{HB}$ | 70 | 320 | 696 | |
| Frame Rate | | | F | 50 | 60 | 75 | Hz |

Note: DE mode only.
Note : Typical value refer to VESA STANDARD

### 6.5.2 Input Timing Diagram

G150XTN06.0
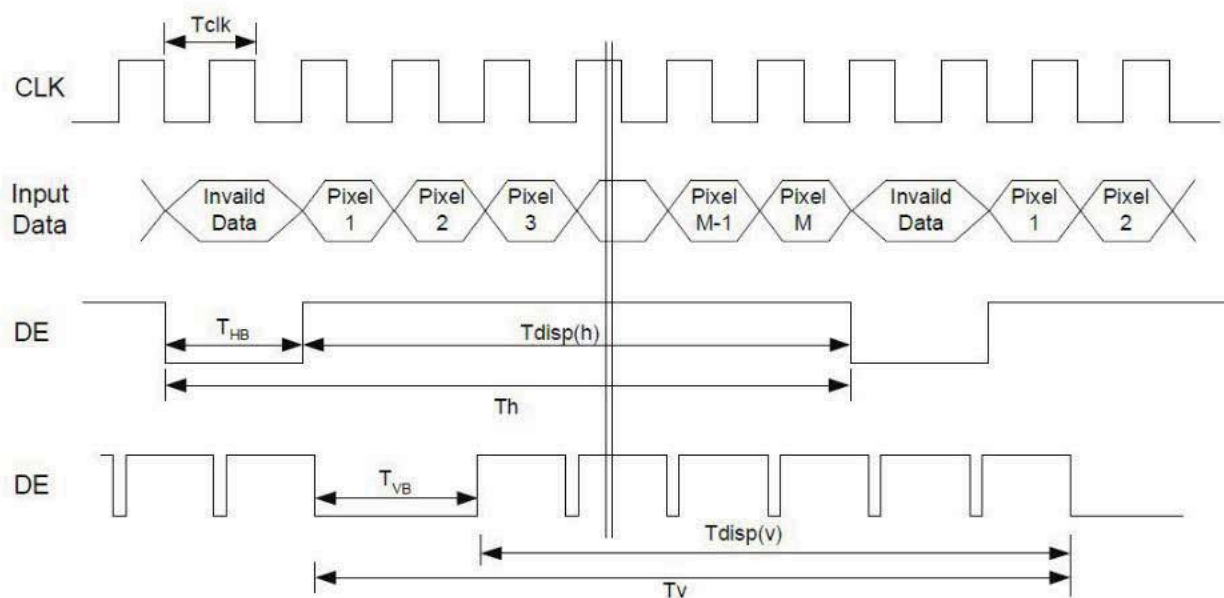
## 6.6 Power ON/OFF Sequence

VDD power and LED 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

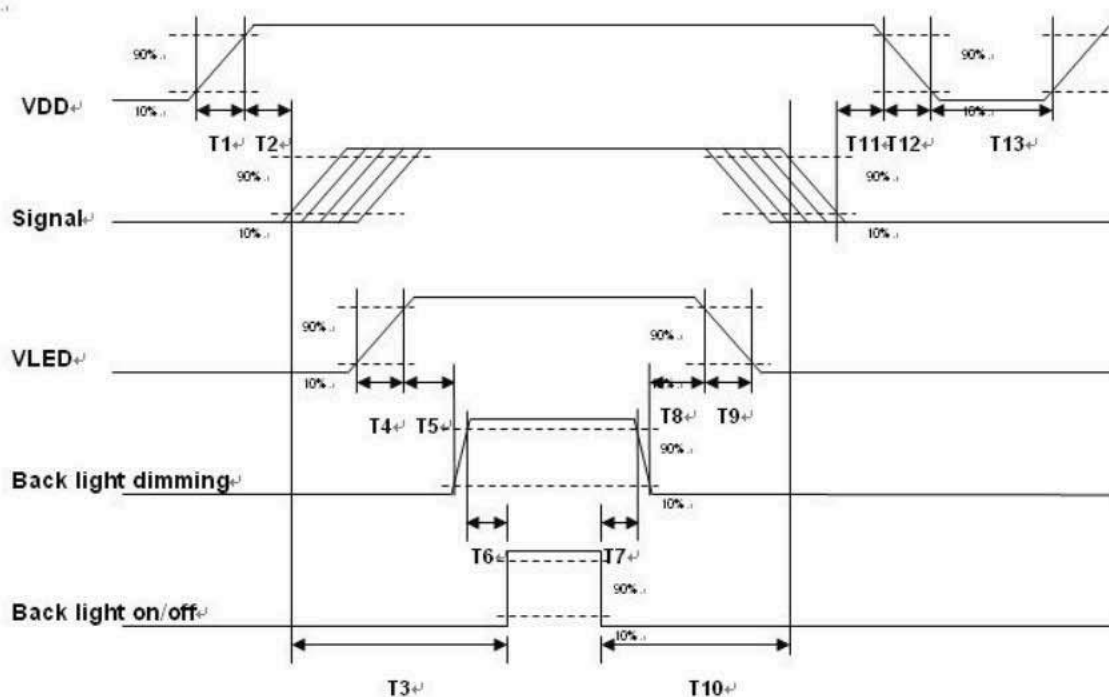| Parameter | Value | | | Units |
|:---:|:---:|:---:|:---:|:---:|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | [ms] |
| T2 | 30 | 40 | 50 | [ms] |
| T3 | 220 | - | - | [ms] |
| T4 | 0.5 | - | 10 | [ms] |
| T5 | 10 | - | - | [ms] |
| T6 | 10 | - | - | [ms] |
| T7 | 0 | - | - | [ms] |
| T8 | 10 | - | - | [ms] |
| T9 | - | - | 10 | [ms] |
| T10 | 110 | - | - | [ms] |
| T11 | 0 | 16 | 50 | [ms] |
| T12 | - | - | 10 | [ms] |
| T13 | 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.

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## 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 | STM or compatible |
| Connector Model Number | MSB240420E or compatible |
| Mating Model Number | P240420 or compatible |

| Pin# | Signal Name | Pin# | Signal Name |
|---|---|---|---|
| 1 | VDD | 2 | VDD |
| 3 | NC | 4 | NC |
| 5 | Rin1- | 6 | Rin1+ |
| 7 | VSS | 8 | Rin2- |
| 9 | Rin2+ | 10 | VSS |
| 11 | Rin3- | 12 | Rin3+ |
| 13 | VSS | 14 | ClkIN- |
| 15 | ClkIN+ | 16 | VSS |
| 17 | Rin4- | 18 | Rin4+ |
| 19 | VSS | 20 | SEL68 |

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## 7.1.1 Connector Illustration



**LVDS(CN1):**



20　SEL68

1　VDD

**BLU Power in(CN2):**



pin1　pin5

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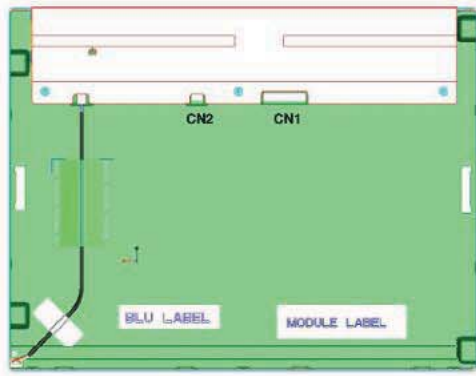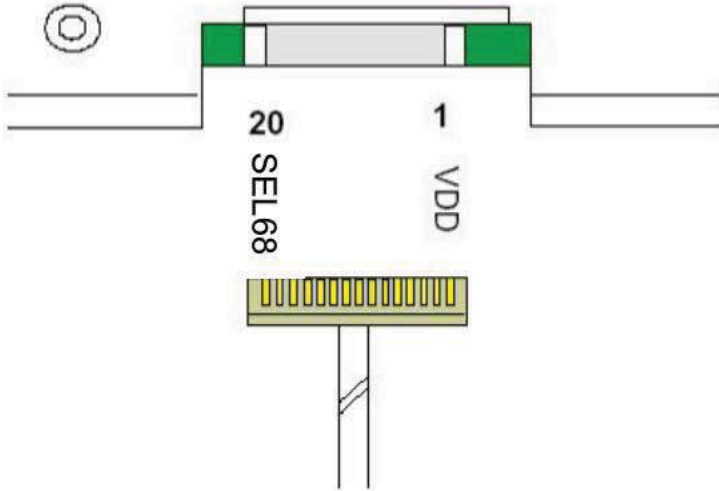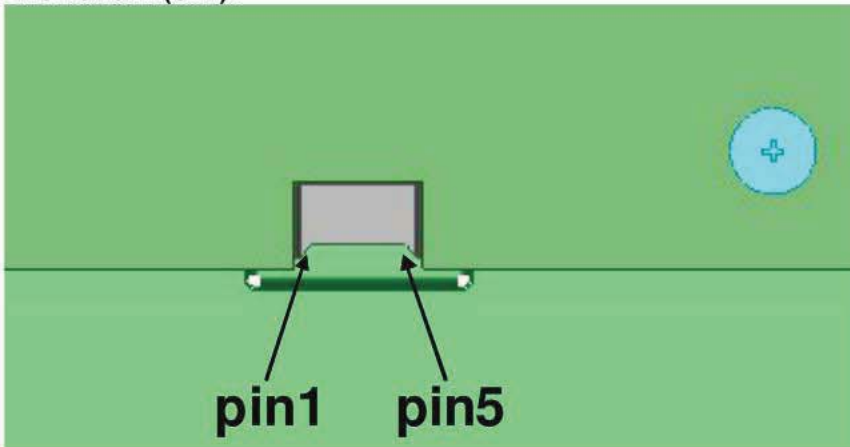
## 7.2 Backlight Unit: LED Driver Connector

| Connector Name / Designation | LED Driver Connector |
|---|---|
| Manufacturer | ENTERY or compatible |
| Connector Model Number | 3808K-F05N-12R or compatible |
| Mating Model Number | H208K-P05N-02B or compatible |

## 7.3 LED Connector Pin Assignment

| Pin# | Symbol | Signal Name |
|---|---|---|
| 1 | Vcc | 12V |
| 2 | GND | GND |
| 3 | Enable | $V_{LED}$ On/Off |
| 4 | Dimming | PWM Dimming |
| 5 | NC | NC |

## 8. Reliability Test Criteria

| Items | Required Condition | Note |
|---|---|---|
| Temperature Humidity Bias | 50 /80%,300 hours | |
| High Temperature Operation | 85 ,300 hours | |
| Low Temperature Operation | -30 ,300 hours | |
| Hot Storage | 85 ,300 hours | |
| Cold Storage | -30 ,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) 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 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.

Note 2:

● Water condensation is not allowed for each test items.

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

● The reliability test is performed only to examine the TFT-LCD module capability.

● To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.

● No function failure occurs. Mura shall be ignored after high temperature reliability test

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## 9. Mechanical Characteristics

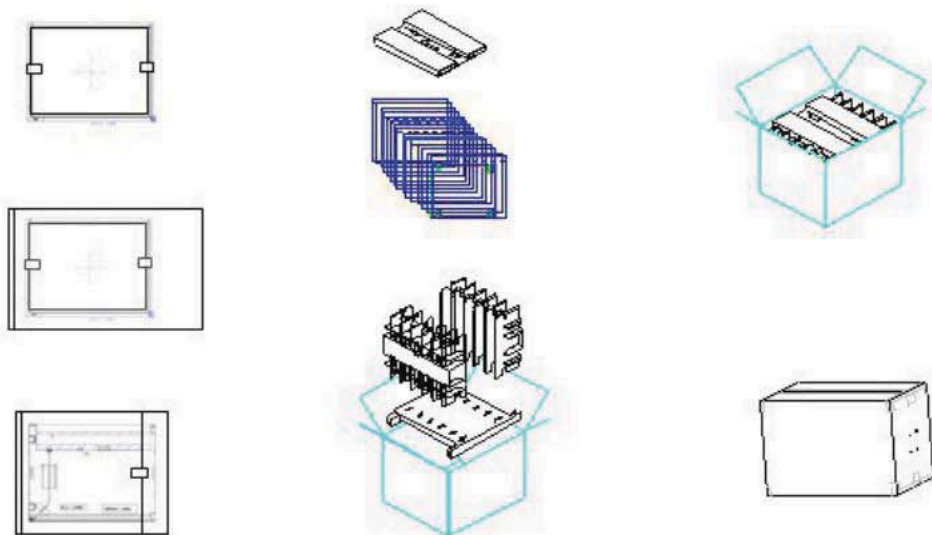### 9.1 LCM Outline Dimension (Front View and back view)
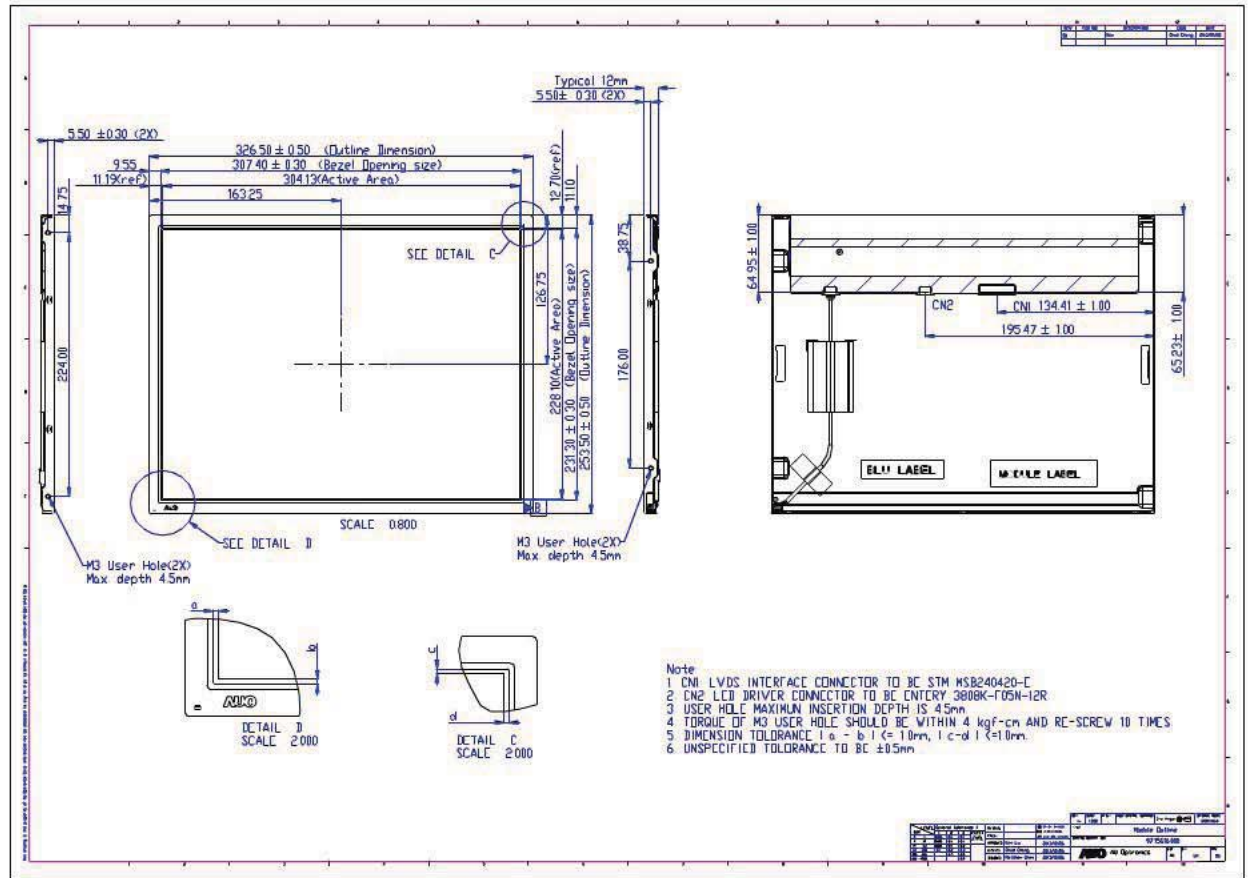
## 10. Label and Packaging

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



```
Manufactured XX/XX
Model No:  G150XTN06.0
AU Optronics
MADE IN  XXXXX(XXX)
```

### 10.2 Carton Package



Max capacity    15pcs TFT-LCD module per carton
Max weight: 18.5 kg per carton
Outside dimension of carton: 434(L) mm x 380(W) mm x 353(H) mm
Pallet size    1140 mm * 890 mm * 135 mm

* Palletizing

Module by air    (2 *3) *4 layers    one pallet put 24 boxes    total 360pcs module
Module by sea    (2 *3) *4 layers+ (2 *3) *1 layers , two pallet put 30 boxes    total 450pcs module
Module by sea_HQ    (2 *3) *4 layers+ (2 *3) *2 layers , two pallet put 36 boxes    total 540pcs module

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# 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 60950-1, Second Edition**　　　　U.S.A. Information Technology Equipment