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Datasheet

AUO

M270HVN02.1

UP-02-102

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Product Specification

M270HVN02.1

AU OPTRONICS CORPORATION

- () Preliminary Specification
- (V) Final Specification

| | |
|------------|---------------------|
| Module | 27.0" Color TFT-LCD |
| Model Name | M270HVN02.1 |

| | |
|---|-------|
| Customer | Date |
| _____ | _____ |
| Approved by | |
| _____ | _____ |
| Note: This Specification is subject to change without notice. | |

| | |
|--|------------------|
| Approved by | Date |
| <u>Howard Lee</u> | <u>2013/4/22</u> |
| Prepared by | |
| <u>Derec Yang</u> | <u>2013/4/18</u> |
| Desktop Display Business Group / AU Optronics Corporation | |

Content

| | | |
|-------|---|----|
| 1 | HANDLING PRECAUTIONS | 4 |
| 2 | GENERAL DESCRIPTION | 5 |
| 2.1 | Display Characteristics | 5 |
| 2.2 | Optical Characteristics | 6 |
| 3 | FUNCTIONAL BLOCK DIAGRAM | 10 |
| 4 | ABSOLUTE MAXIMUM RATINGS | 11 |
| 4.1 | TFT LCD Module | 11 |
| 4.2 | Backlight Unit | 11 |
| 4.3 | Absolute Ratings of Environment | 11 |
| 5 | ELECTRICAL CHARACTERISTICS | 13 |
| 5.1 | TFT LCD Module | 13 |
| 5.1.1 | Power Specification | 13 |
| 5.1.2 | Signal Electrical Characteristics | 15 |
| 5.2 | Backlight Unit | 17 |
| 6 | SIGNAL CHARACTERISTICS | 18 |
| 6.1 | Pixel Format Definition | 18 |
| 6.2 | Input Data Format Definition | 18 |
| 6.3 | Signal Description | 19 |
| 6.4 | Timing Characteristics | 21 |
| 6.5 | Timing Diagram | 22 |
| 6.6 | Power ON/OFF Sequence | 23 |
| 7 | CONNECTOR AND PIN ASSIGNMENT | 24 |
| 7.1 | TFT LCD Module | 24 |
| 7.1.1 | Pin Assignment | 24 |
| 7.2 | LED Connector on Backlight Unit | 25 |
| 7.2.1 | LED Pin assignment | 25 |
| 7.2.2 | LED Connector Dimension | 26 |
| 7.2.3 | LED Mating housing dimension | 26 |
| 8 | RELIABILITY TEST | 27 |
| 9 | SHIPPING LABEL | 28 |
| 10 | MECHANICAL CHARACTERISTICS | 29 |
| 11 | PACKING SPECIFICATION | 32 |
| 11.1 | Packing Flow | 32 |
| 11-2 | Pallet and shipment information | 33 |

Records of Revision

| Version and Date | Page | Old description | New Description | Remark | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------|---|---|--|-------------|--------|---------------------|--------|---------|--------|---------|---|---|--------|-------------|--------|---------------------|--------|---------|--------|-------|---|-----------|---|-----------|----|---------|----|---------|----|---------|---|------|-------------|------|-------------|---|-------|---|-------|---|-------|---|-------|---|-------|---|-------|---|-----|---|---------|---|---------|----|-------|----|-------|----|-------|--|
| 0.1 2012/10/18 | | First Version | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.2 2012/11/9 | 17 | LED Forward Current 120mA | Update LED Forward current as 110mA | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.0 final 2012/12/06 | 17 | | Re-define the LED symbol name | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 19/20/24 | <table border="1"> <thead> <tr> <th>Pin#</th> <th>Signal Name</th> <th>Pin#</th> <th>Signal Name</th> </tr> </thead> <tbody> <tr><td>1</td><td>RxOIN0-</td><td>2</td><td>RxOIN0+</td></tr> <tr><td>3</td><td>RxOIN1-</td><td>4</td><td>RxOIN1+</td></tr> <tr><td>5</td><td>RxOIN2-</td><td>6</td><td>RxOIN2+</td></tr> <tr><td>7</td><td>GND</td><td>8</td><td>RxOCLKIN-</td></tr> <tr><td>9</td><td>RxOCLKIN+</td><td>10</td><td>RxOIN3-</td></tr> <tr><td>11</td><td>RxOIN3+</td><td>12</td><td>RxEIN0-</td></tr> </tbody> </table> | Pin# | Signal Name | Pin# | Signal Name | 1 | RxOIN0- | 2 | RxOIN0+ | 3 | RxOIN1- | 4 | RxOIN1+ | 5 | RxOIN2- | 6 | RxOIN2+ | 7 | GND | 8 | RxOCLKIN- | 9 | RxOCLKIN+ | 10 | RxOIN3- | 11 | RxOIN3+ | 12 | RxEIN0- | Re-named the LVDS Signal <table border="1"> <thead> <tr> <th>Pin#</th> <th>Signal Name</th> <th>Pin#</th> <th>Signal Name</th> </tr> </thead> <tbody> <tr><td>1</td><td>RxO0-</td><td>2</td><td>RxO0+</td></tr> <tr><td>3</td><td>RxO1-</td><td>4</td><td>RxO1+</td></tr> <tr><td>5</td><td>RxO2-</td><td>6</td><td>RxO2+</td></tr> <tr><td>7</td><td>GND</td><td>8</td><td>RxOCLK-</td></tr> <tr><td>9</td><td>RxOCLK+</td><td>10</td><td>RxO3-</td></tr> <tr><td>11</td><td>RxO3+</td><td>12</td><td>RxE0-</td></tr> </tbody> </table> | Pin# | Signal Name | Pin# | Signal Name | 1 | RxO0- | 2 | RxO0+ | 3 | RxO1- | 4 | RxO1+ | 5 | RxO2- | 6 | RxO2+ | 7 | GND | 8 | RxOCLK- | 9 | RxOCLK+ | 10 | RxO3- | 11 | RxO3+ | 12 | RxE0- | |
| Pin# | Signal Name | Pin# | Signal Name | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | RxOIN0- | 2 | RxOIN0+ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | RxOIN1- | 4 | RxOIN1+ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | RxOIN2- | 6 | RxOIN2+ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | GND | 8 | RxOCLKIN- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | RxOCLKIN+ | 10 | RxOIN3- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | RxOIN3+ | 12 | RxEIN0- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pin# | Signal Name | Pin# | Signal Name | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | RxO0- | 2 | RxO0+ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | RxO1- | 4 | RxO1+ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | RxO2- | 6 | RxO2+ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | GND | 8 | RxOCLK- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | RxOCLK+ | 10 | RxO3- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | RxO3+ | 12 | RxE0- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 33 | | Fulfill Pallet and shipment information | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1 2012/12/25 | 24 | | New add Connector STARCONN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 11/17/25 | Old naming <table border="1"> <thead> <tr> <th>Symbol</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>IRLED1</td><td rowspan="4">LED Forward Current</td></tr> <tr><td>IRLED2</td></tr> <tr><td>IRLED3</td></tr> <tr><td>IRLED4</td></tr> <tr><td>VLB</td><td>Light Bar Operation Voltage (for reference)</td></tr> </tbody> </table> | Symbol | Description | IRLED1 | LED Forward Current | IRLED2 | IRLED3 | IRLED4 | VLB | Light Bar Operation Voltage (for reference) | New naming : <table border="1"> <thead> <tr> <th>Symbol</th> <th>Description</th> </tr> </thead> <tbody> <tr><td>IFLED1</td><td rowspan="4">LED Forward Current</td></tr> <tr><td>IFLED2</td></tr> <tr><td>IFLED3</td></tr> <tr><td>IFLED4</td></tr> <tr><td>VSLED</td><td>Light Bar Operation Voltage (for reference)</td></tr> </tbody> </table> | Symbol | Description | IFLED1 | LED Forward Current | IFLED2 | IFLED3 | IFLED4 | VSLED | Light Bar Operation Voltage (for reference) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Symbol | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IRLED1 | LED Forward Current | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IRLED2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IRLED3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IRLED4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VLB | Light Bar Operation Voltage (for reference) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Symbol | Description | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IFLED1 | LED Forward Current | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IFLED2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IFLED3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| IFLED4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VSLED | Light Bar Operation Voltage (for reference) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.2 2013/1/14 | 5/33 | | Modify the physical size as below 630(H)x368.2(V)x10.0(D) (Typ.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.3 2013/2/26 | 29/30 | | To modify the label position | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 6 | | To define the maximum value of response time | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.4 2013/4/12 | 19/24 | Pin25/Pin 27 is ground pin | Re-define the Pin assignment Pin25/Pin27 as NC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 29/30 | | To shorten the mylar size | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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1 Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open or modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of LED light bar 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.
- 13) Avoid touching COF position while doing mechanical design.
- 14) While storing modules as spares for a long time, the following precautions are necessary:
 - Store modules in a dark place. Do not expose them to sunlight or fluorescent light.
 - Keep the temperature between 5°C and 35°C at normal humidity.

2 General Description

This specification applies to the 27 inch-FHD color a-Si TFT-LCD Module M270HVN02.1. The display supports the FHD - 1920(H) x 1080(V) screen format and 16.7M colors (RGB 8-bit data). The light source of this TFT-LCD module is W-LED. All input signals are 2-channel LVDS interface and this module doesn't contain a driver for backlight.

2.1 Display Characteristics

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

| Items | Unit | Specification |
|--|----------------------|--|
| Screen Diagonal | [mm] | 685.65(27.0") |
| Active Area | [mm] | 597.6 (H) x 336.15 (V) |
| Pixels H x V | | 1920(x3) x 1080 |
| Pixel Pitch | [um] | 311.25 (per one triad) x 311.25 |
| Pixel Arrangement | | R.G.B. Vertical island |
| Display Mode | | VA Mode, Normally Black |
| White Luminance (Center) | [cd/m ²] | 300 cd/m ² (Typ.) |
| Contrast Ratio | | 3000 (Typ.) |
| Optical Response Time | [msec] | 12ms (Typ., on/off) |
| Nominal Input Voltage VDD | [Volt] | 5 V (Typ) |
| Power Consumption (VDD line + LED line) | [Watt] | 26.88 watt VDD line : PDD (typ), All white pattern at 60Hz = 5.1 W LED line : PBLU (typ) = 21.78 W@110mA |
| Weight | [g] | 2300 gram (Typ.) |
| Physical Size | [mm] | 630(H)x368.2(V)x10.0(D) (Typ.) |
| Electrical Interface | | Dual channel LVDS |
| Support Color | | 16.7M colors (RGB 8-bit) |
| Surface Treatment | | Anti-Glare 3H |
| Temperature Range | | |
| Operating | [°C] | 0 to +50 |
| Storage (Shipping) | [°C] | -20 to +60 |
| RoHS Compliance | | RoHS Compliance |
| TCO Compliance | | TCO 6.0 Compliance |

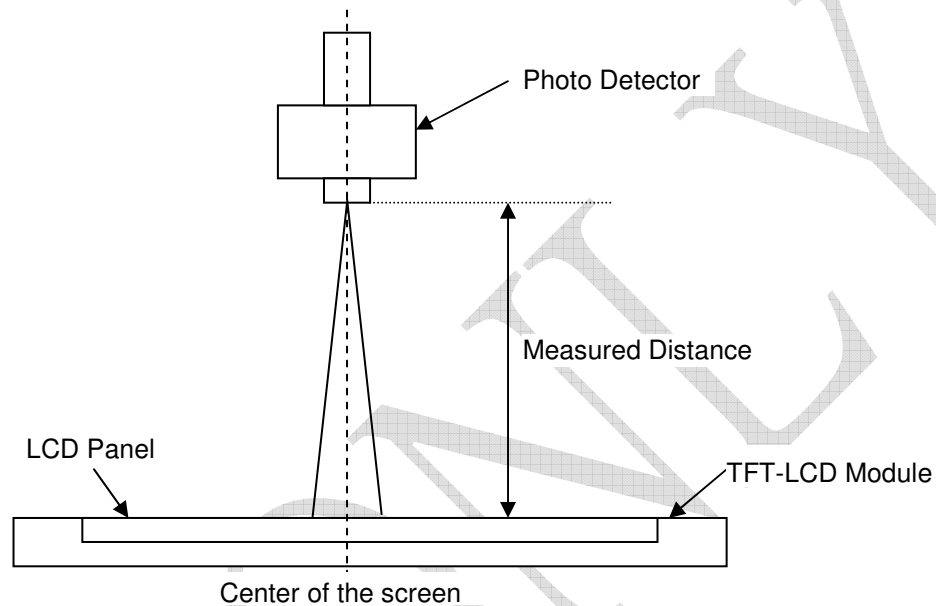
2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C:

| Item | Unit | Conditions | Min. | Typ. | Max. | Note |
|--|----------------------|--------------------------------------|-------|-------|--------|------|
| Viewing Angle | [degree] | Horizontal (Right) CR = 10 (Left) | 150 | 178 | - - | 2 |
| | | Vertical (Up) CR = 10 (Down) | 150 | 178 | - - | |
| Contrast ratio | | Normal Direction | 1800 | 3000 | - | 3 |
| Response Time | [msec] | Raising Time (T _{rR}) | - | 7 | 17 | 4 |
| | | Falling Time (T _{rF}) | - | 5 | 7 | |
| | | Raising + Falling | - | 12 | 24 | |
| Color / Chromaticity Coordinates (CIE) | | Red x | 0.615 | 0.645 | 0.675 | 5 |
| | | Red y | 0.300 | 0.330 | 0.360 | |
| | | Green x | 0.285 | 0.315 | 0.345 | |
| | | Green y | 0.590 | 0.620 | 0.650 | |
| | | Blue x | 0.124 | 0.154 | 0.184 | |
| | | Blue y | 0.034 | 0.064 | 0.094 | |
| 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] | | 240 | 300 | - | 6 |
| Luminance Uniformity | [%] | | 75 | 80 | - | 7 |
| Crosstalk (in 60Hz) | [%] | | | | 1.5 | 8 |
| Flicker | dB | | | | -20 | 9 |

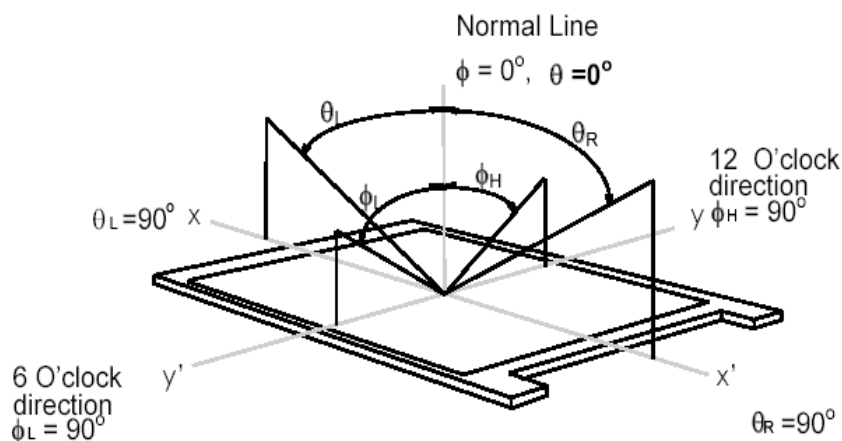
Note 1: Measurement Method

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring (at surface 35°C). 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)

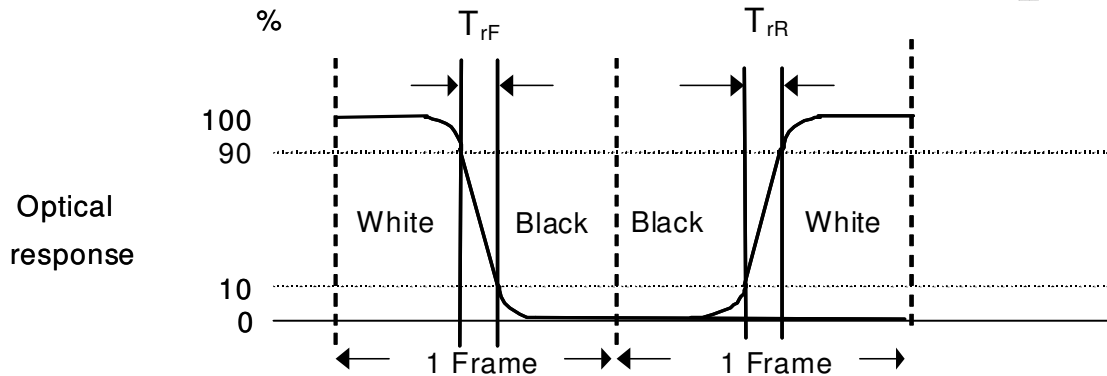
Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows; 90° (θ) horizontal left and right and 90° (ϕ) vertical, high (up) and low (down). The measurement 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 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, T_{rR}), and from “Full White” to “Full Black” (falling time, T_{rF}), respectively. The response time is interval between the 10% and 90% (1 frame at 60 Hz) of amplitudes.

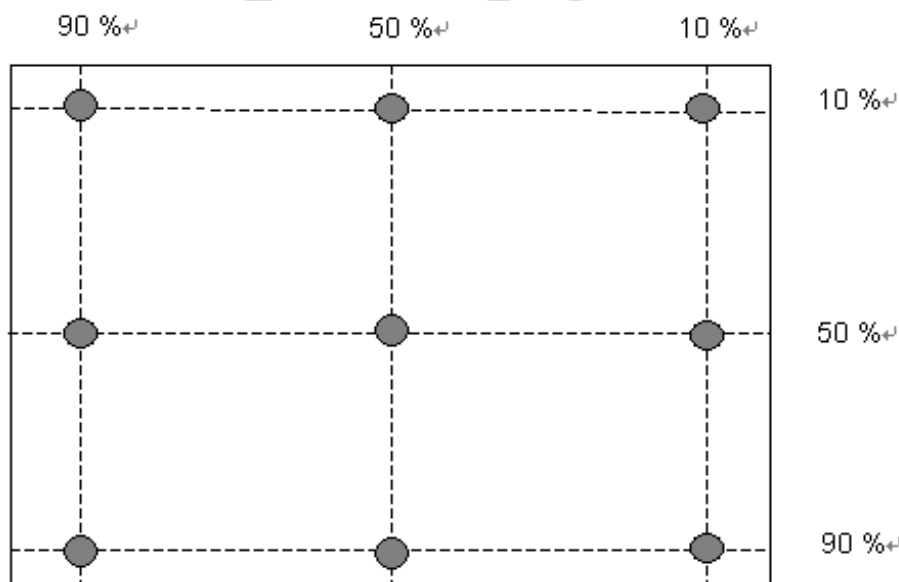


$T_{rR} + T_{rF} = 12 \text{ msec (typ.)}$.

Note 5: Color Chromaticity and Coordinates (CIE) measured by TOPCON SR-3

Note 6: Central Luminance measured by TOPCON SR-3

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



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

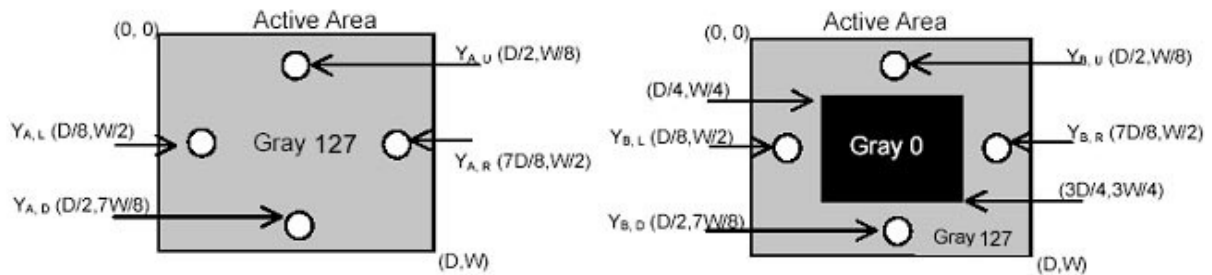
Note 8: Crosstalk defined as below and measured by TOPCON SR-3

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

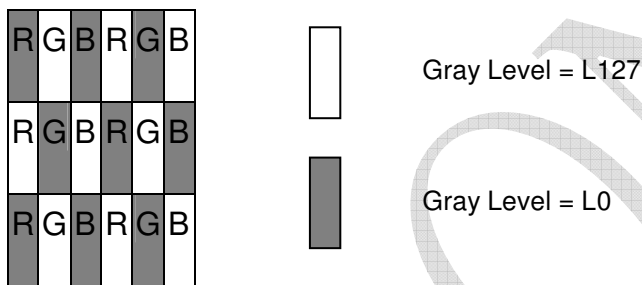
Where

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

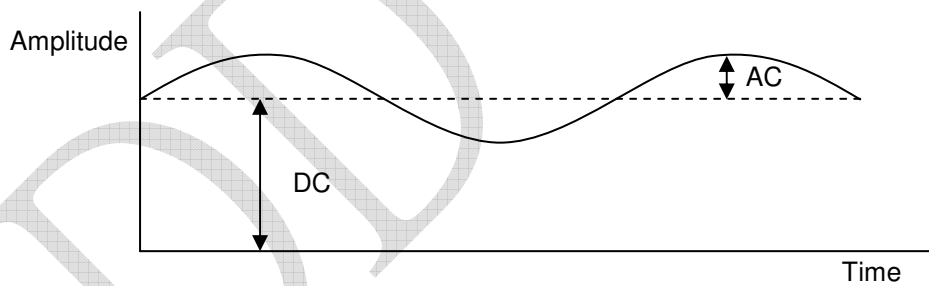
YB = Luminance of measured location with gray level 0 pattern (cd/m²)



Note 9: Test Pattern Sub-checker Pattern measured by TOPCON SR-3



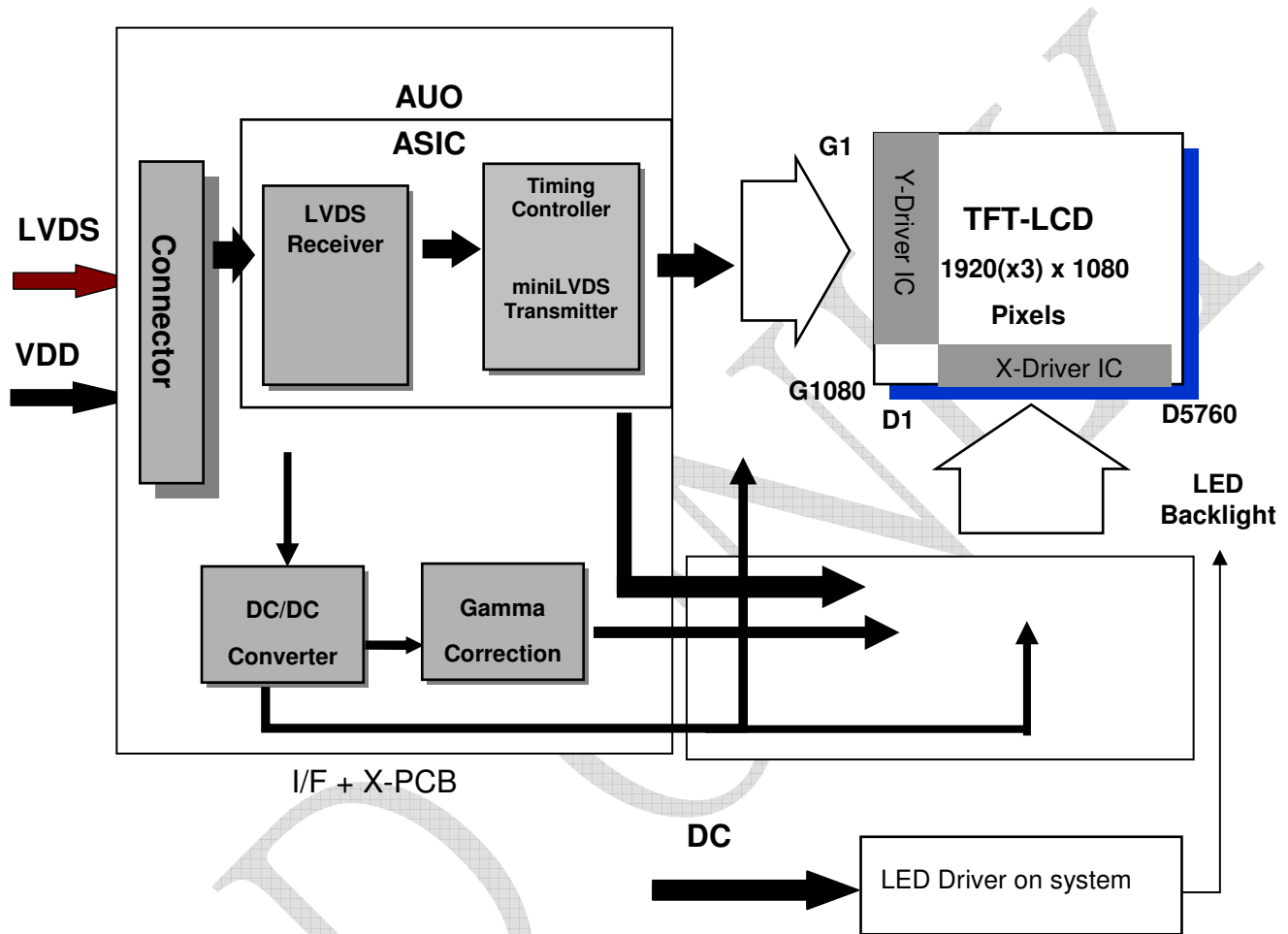
Method: Record dBV & DC value with TRD-100



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

3 Functional Block Diagram

The following diagram shows the functional block of the 27.0 inch Color TFT-LCD Module:



4 Absolute Maximum Ratings

Absolute maximum ratings of the module are listed as follows:

4.1 TFT LCD Module

| Item | Symbol | Min | Max | Unit | Conditions |
|-----------------|--------|------|-----|--------|------------|
| Logic/LCD Drive | VDD | -0.3 | 6.0 | [Volt] | Note 1, 2 |

4.2 Backlight Unit

| Item | Symbol | Min | Max | Unit | Conditions |
|---|--------------|-----|-----|--------|--|
| LED Forward Current | IFLED1 | 0 | 150 | [mA] | Note 1,2,5 100% duty |
| | IFLED2 | | | | |
| | IFLED3 | | | | |
| | IFLED4 | | | | |
| LED Pulse Forward Current | IPLED1 | - | 210 | [mA] | Note 1,2,5 Pulse width \leq 10msec and duty \leq 10% |
| | IPLED2 | | | | |
| | IPLED3 | | | | |
| | IPLED4 | | | | |
| LED forward Voltage variation (per string variation) | ΔV_f | - | 3 | [Volt] | Note 1,2,6 |

4.3 Absolute Ratings of Environment

| Item | Symbol | Min. | Max. | Unit | Conditions |
|--|--------|------|------|-------|----------------|
| Operating Temperature | TOP | 0 | +50 | [°C] | Note 3 |
| Glass Surface Temperature (Operation) | TGS | 0 | +65 | [°C] | Note3 Note4 |
| Operation Humidity | HOP | 5 | 90 | [%RH] | Note 3 |
| Storage Temperature | TST | -20 | +60 | [°C] | |
| Storage Humidity | HST | 5 | 90 | [%RH] | |

Note 1: With in Ta (25 °C)

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

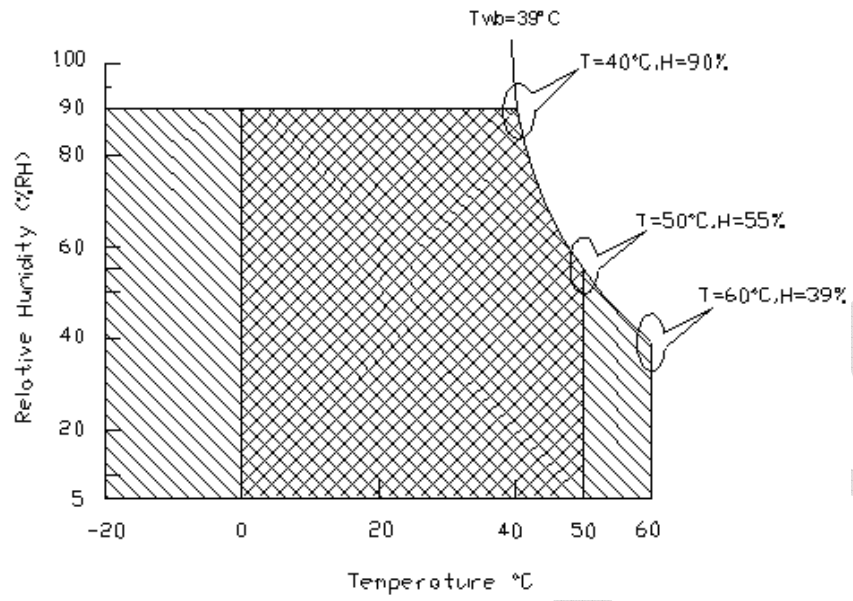
Note 3: Temperature and relative humidity range are shown as the below figure.




1. 90% RH Max (Ta \leq 39°C)
2. Max wet-bulb temperature at 39°C or less. (Ta \leq 39°C)
3. No condensation

Note 4: Function Judged only

Note 5: IFLED1,2,3,4 and IPLED1,2,3,4 define as per strings LED current.

Note 6 : LED forward Voltage variation is define as voltage drop difference of each LED string in single LCD module.



Operating Range  Storage Range  + 

5 Electrical Characteristics

5.1 TFT LCD Module

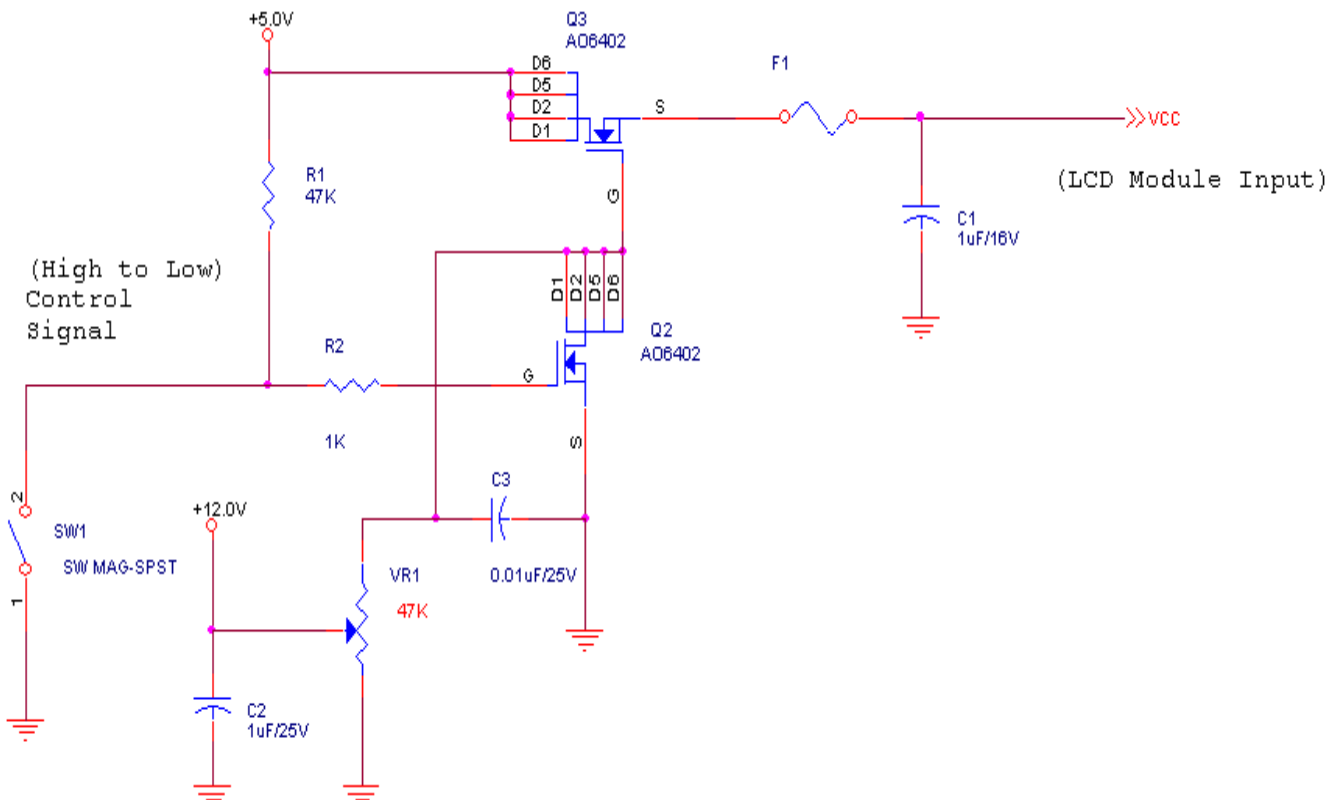
5.1.1 Power Specification

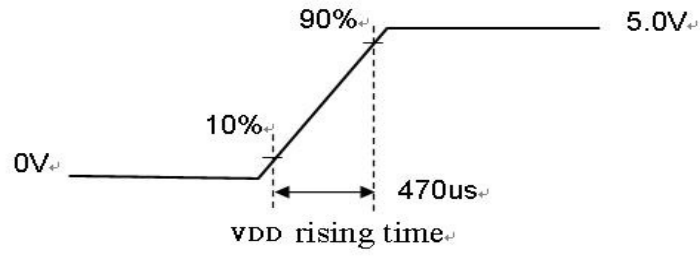
Input power specifications are listed as follows:

| Symbol | Description | Min | Typ. | Max | Unit | Conditions |
|--------|--|-----|------|------|----------|---------------------------------------|
| VDD | Logic/LCD Drive Voltage | 4.5 | 5.0 | 5.5 | [Volt] | +/-10% |
| IDD1 | Input Current | - | 1.02 | 1.22 | [A] | VDD= 5.0V, All white Pattern at 60 Hz |
| | | - | 1.21 | 1.45 | [A] | VDD= 5.0V, All white Pattern at 75 Hz |
| PDD1 | VDD Power | - | 5.1 | 6.12 | [Watt] | VDD= 5.0V, All white Pattern at 60 Hz |
| | | - | 6.05 | 7.26 | [Watt] | VDD= 5.0V, All white Pattern at 75 Hz |
| IRush | Inrush Current | - | - | 3 | [A] | Note 1 |
| VDDrp | Allowable Logic/LCD Drive Ripple Voltage | - | - | 500 | [mV] p-p | VDD= 5.0V, All white Pattern at 75 Hz |

Note 1: Measurement Conditions:

The duration of rising time of power input is 470 μ s.





DD ONLY

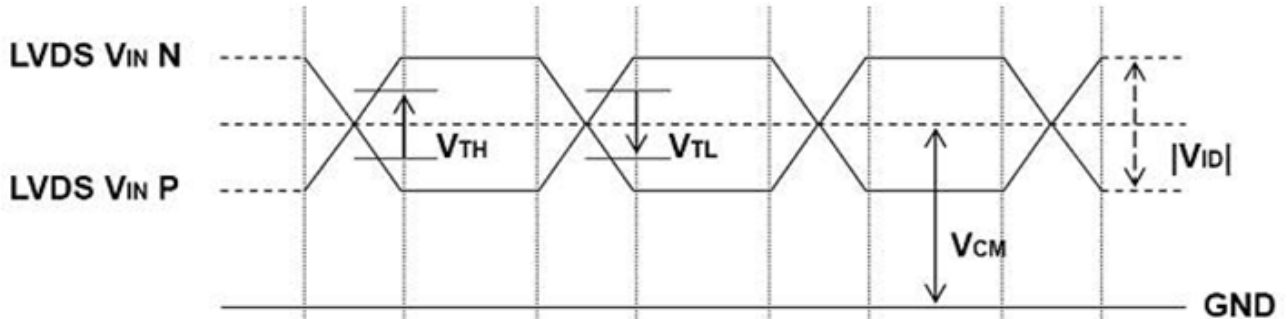
5.1.2 Signal Electrical Characteristics

(1) DC Characteristics of each signal are as following:

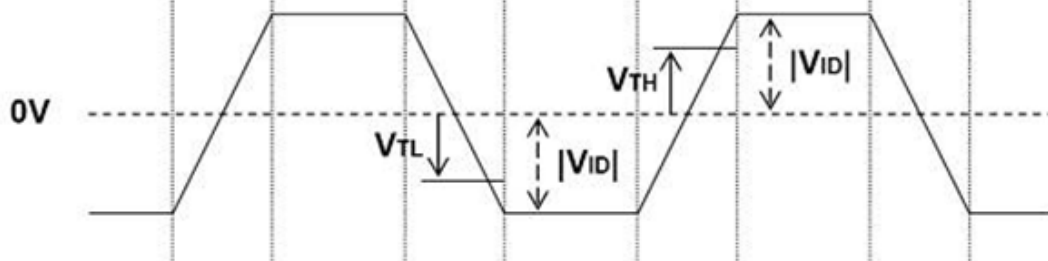
| Symbol | Description | Min | Typ | Max | Units | Conditions |
|------------|--|------|------|------|-------|---|
| V_{TH} | Differential Input High Threshold | - | - | +100 | [mV] | $V_{CM} = 1.2V$ Note 1 |
| V_{TL} | Differential Input Low Threshold | -100 | - | - | [mV] | $V_{CM} = 1.2V$ Note 1 |
| $ V_{ID} $ | Input Differential Voltage | 100 | - | 600 | [mV] | Note 1 |
| V_{CM} | Differential Input Common Mode Voltage | +1.0 | +1.2 | +1.5 | [V] | $V_{TH}-V_{TL} = 200MV$ (max) Note 1 |

Note 1: LVDS Signal Waveform

Single-End

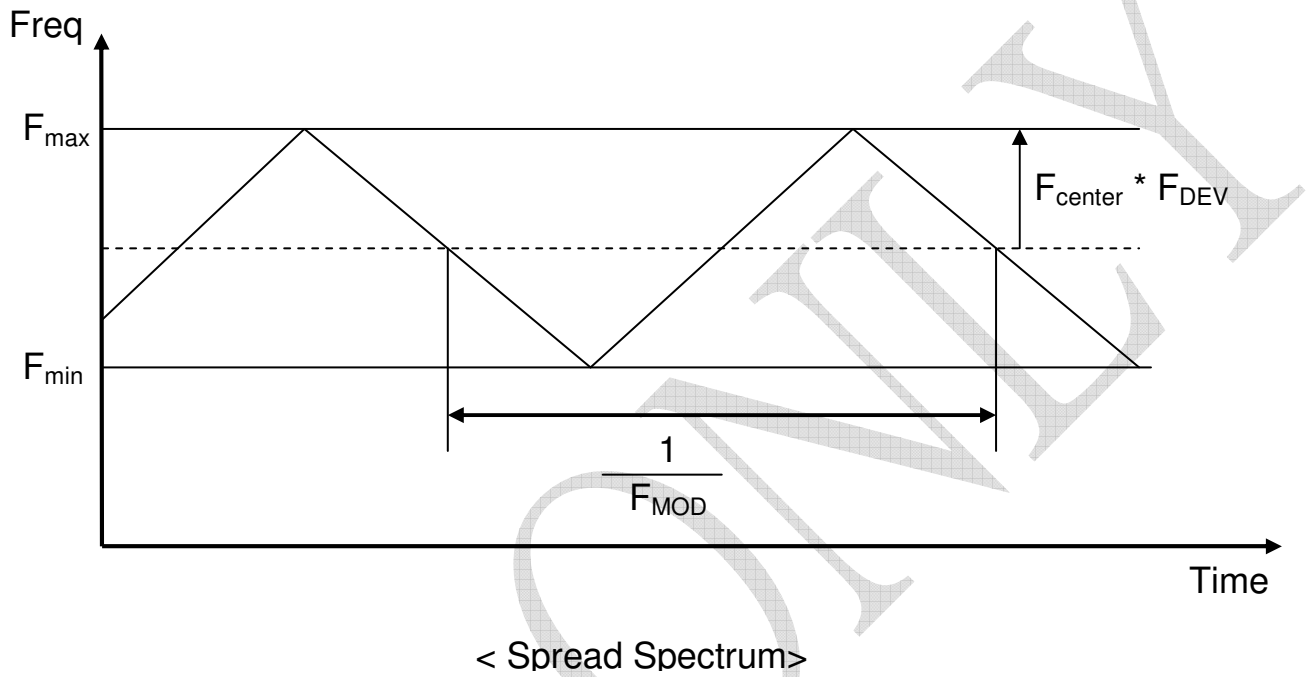


Differential Signal



(2) AC Characteristics

| Symbol | Description | Min | Max | Units | Conditions |
|-----------|--|-----|---------|-------|------------|
| F_{DEV} | Maximum deviation of input clock frequency during SSC | - | ± 3 | % | |
| F_{MOD} | Maximum modulation frequency of input clock during SSC | - | 200 | KHz | |



5.2 Backlight Unit

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

| Symbol | Description | Min. | Typ. | Max. | Unit | Note |
|--------|--|--------|-------|-------|--------|---------------|
| IFLED1 | LED Forward Current | - | 110 | 115.5 | [mA] | <i>Note 1</i> |
| IFLED2 | | | | | | |
| IFLED3 | | | | | | |
| IFLED4 | | | | | | |
| VSLED | Light Bar Operation Voltage (for reference) | 44.25 | 49.5 | 54 | [Volt] | <i>Note 2</i> |
| PBLU | BLU Power Consumption (for reference) | - | 21.78 | 24.95 | [Watt] | <i>Note 3</i> |
| LTLED | LED Life Time (Typical) | 30,000 | - | - | [Hour] | <i>Note 4</i> |

Each module consists of 60 pcs LED (4 strings x 15 pcs / string)

Note 1: The specified current is 100% duty of LED chip input current, IFLED1,2,3,4 define as per strings LED current.

Note 2: The value showed is one string operation voltage.

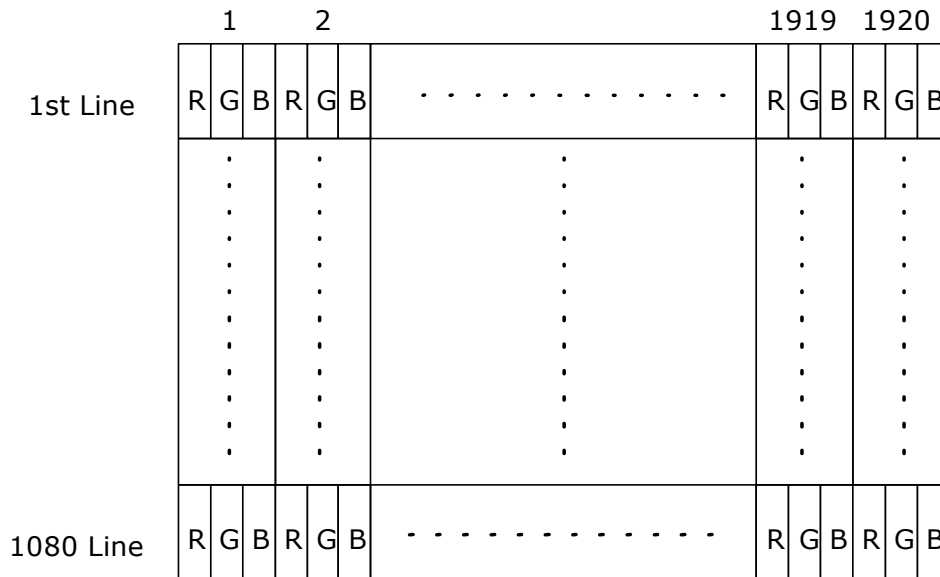
Note 3: $PBLU = VSLED * (IFLED1 + IFLED2 + IFLED3 + IFLED4)$

Note 4: Definition of life time: Brightness becomes to 50% of its original value. The minimum life time of LED unit is on the condition of IFLED = 110mA and 25±2 °C (Room Temperature).

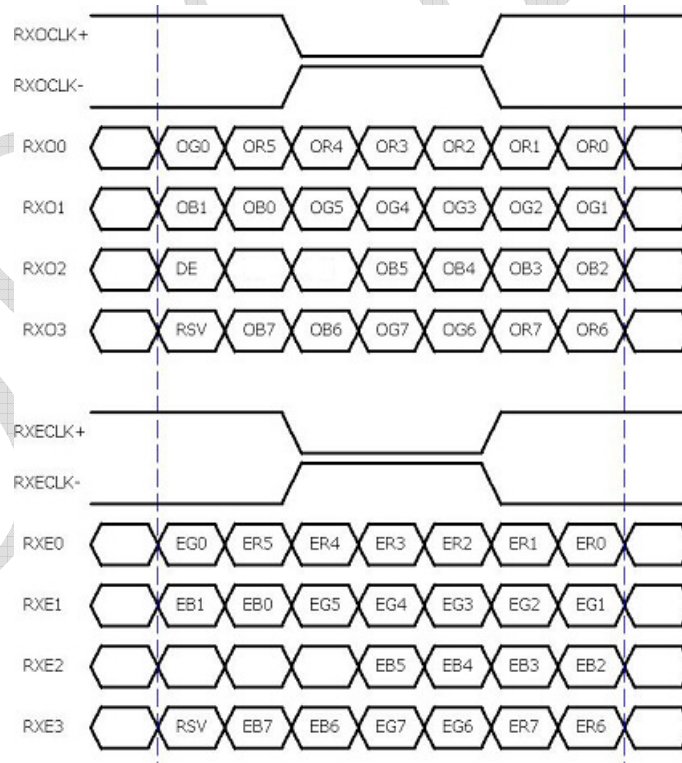
6 Signal Characteristics

6.1 Pixel Format Definition

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



6.2 Input Data Format Definition



Note1: Normally, DE, VS, HS on EVEN channel are not used.

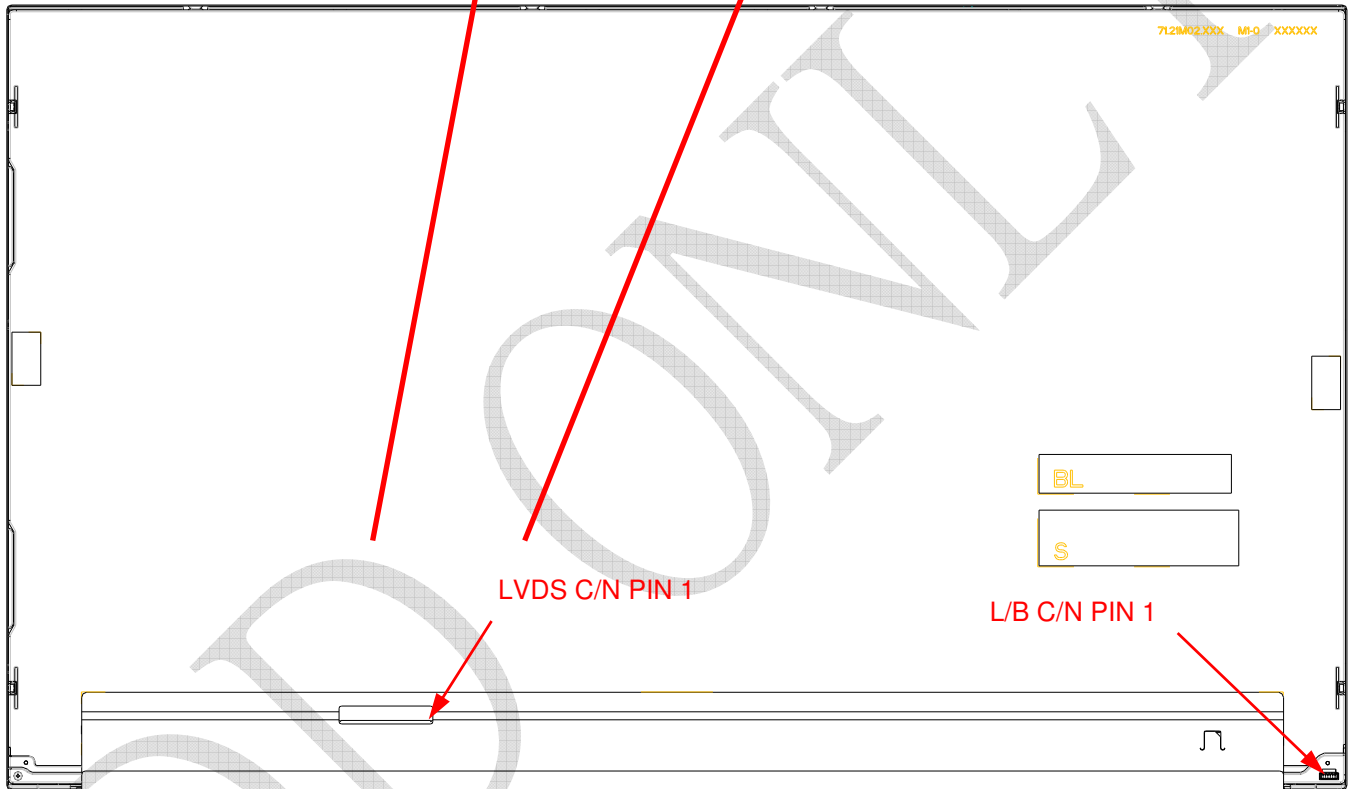
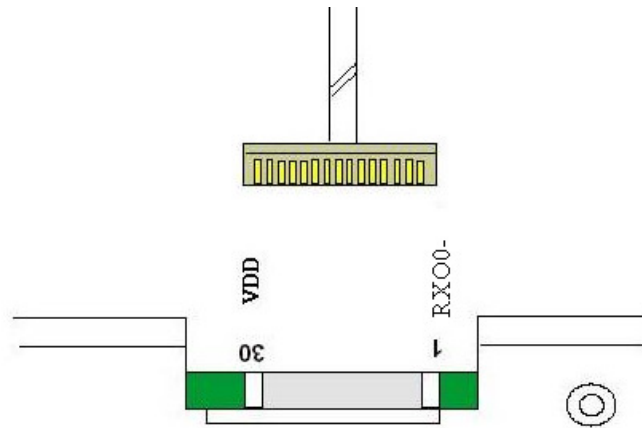
Note2: Please follow PSWG.

Note3: 8-bit in

6.3 Signal Description

| PIN # | SIGNAL | DESCRIPTION |
|-------|---------|--|
| 1 | RXO0- | Negative LVDS differential data input (Odd data) |
| 2 | RXO0+ | Positive LVDS differential data input (Odd data) |
| 3 | RXO1- | Negative LVDS differential data input (Odd data) |
| 4 | RXO1+ | Positive LVDS differential data input (Odd data) |
| 5 | RXO2- | Negative LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG) |
| 6 | RXO2+ | Positive LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG) |
| 7 | GND | Power Ground |
| 8 | RXOCLK- | Negative LVDS differential clock input (Odd clock) |
| 9 | RXOCLK+ | Positive LVDS differential clock input (Odd clock) |
| 10 | RXO3- | Negative LVDS differential data input (Odd data) |
| 11 | RXO3+ | Positive LVDS differential data input (Odd data) |
| 12 | RXE0- | Negative LVDS differential data input (Even data) |
| 13 | RXE0+ | Positive LVDS differential data input (Even data) |
| 14 | GND | Power Ground |
| 15 | RXE1- | Negative LVDS differential data input (Even data) |
| 16 | RXE1+ | Positive LVDS differential data input (Even data) |
| 17 | GND | Power Ground |
| 18 | RXE2- | Negative LVDS differential data input (Even data) |
| 19 | RXE2+ | Positive LVDS differential data input (Even data) |
| 20 | RXECLK- | Negative LVDS differential clock input (Even clock) |
| 21 | RXECLK+ | Positive LVDS differential clock input (Even clock) |
| 22 | RXE3- | Negative LVDS differential data input (Even data) |
| 23 | RXE3+ | Positive LVDS differential data input (Even data) |
| 24 | GND | Power Ground |
| 25 | NC | No contact |
| 26 | NC | No contact |
| 27 | NC | No contact |
| 28 | VDD | +5.0V Power Supply |
| 29 | VDD | +5.0V Power Supply |
| 30 | VDD | +5.0V Power Supply |

Note 1: Input signals of odd and even clock shall be the same timing.



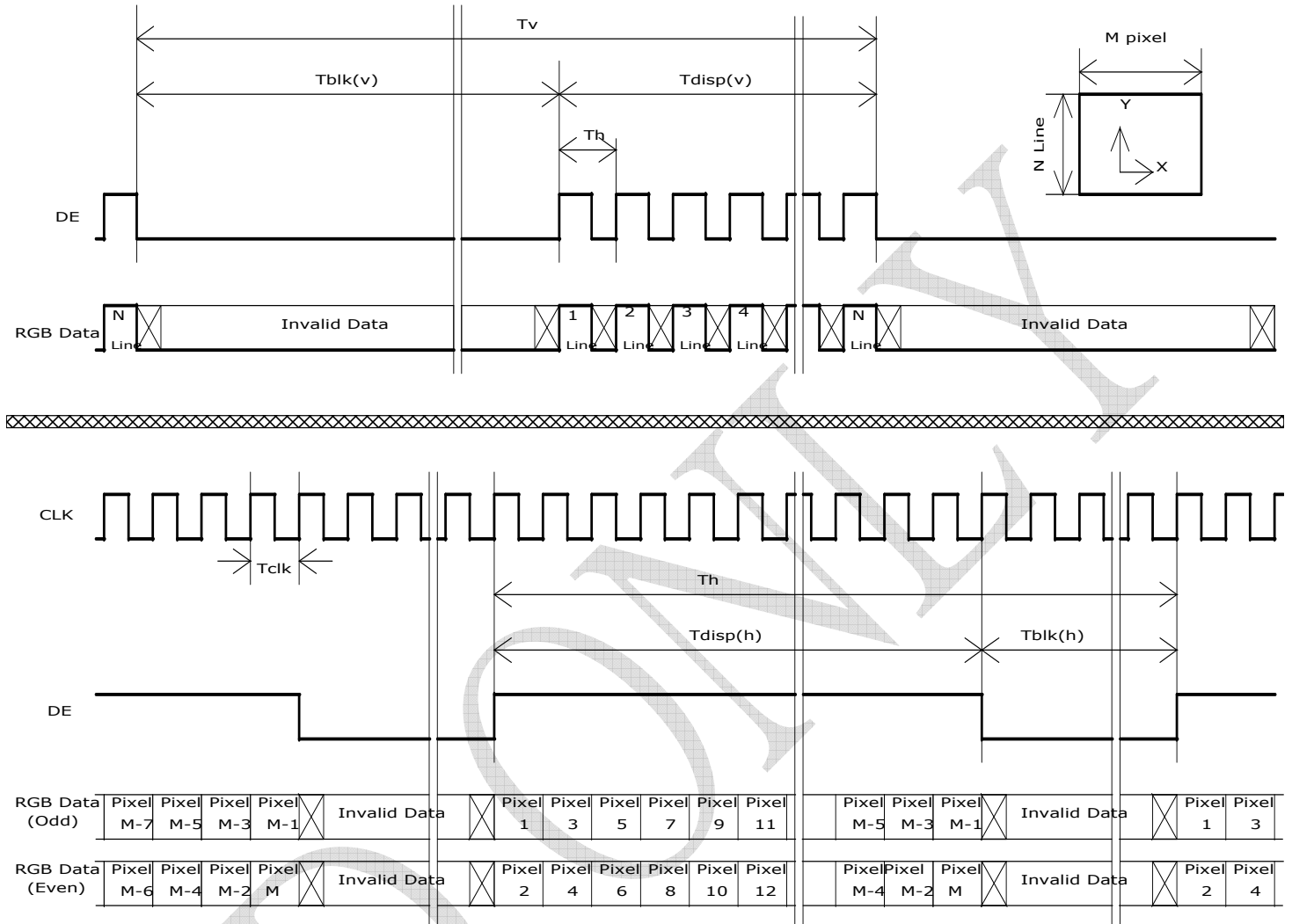
6.4 Timing Characteristics

The input signal timing specifications are shown as the following table

| Signal | Item | Symbol | Min | Typ | Max | Unit |
|--------------------|-----------------|----------|------|------|------|------|
| Vertical Section | Period | Tv | 1092 | 1130 | 1793 | Th |
| | Active | Tdisp(v) | 1080 | 1080 | 1080 | Th |
| | Blanking | Tblk(v) | 12 | 50 | 713 | Th |
| Horizontal Section | Period | Th | 1004 | 1050 | 1100 | Tclk |
| | Active | Tdisp(h) | 960 | 960 | 960 | Tclk |
| | Blanking | Tblk(h) | 44 | 90 | 140 | Tclk |
| Clock | Period | Tclk | 11.1 | 14.0 | 18.2 | ns |
| | Frequency | Freq | 54.8 | 71.2 | 90.0 | MHz |
| Frame rate | Frame rate | VFreq | 50 | 60 | 76 | Hz |
| Hsync Frequency | Hsync Frequency | HFreq | 55 | 68 | 90 | KHz |

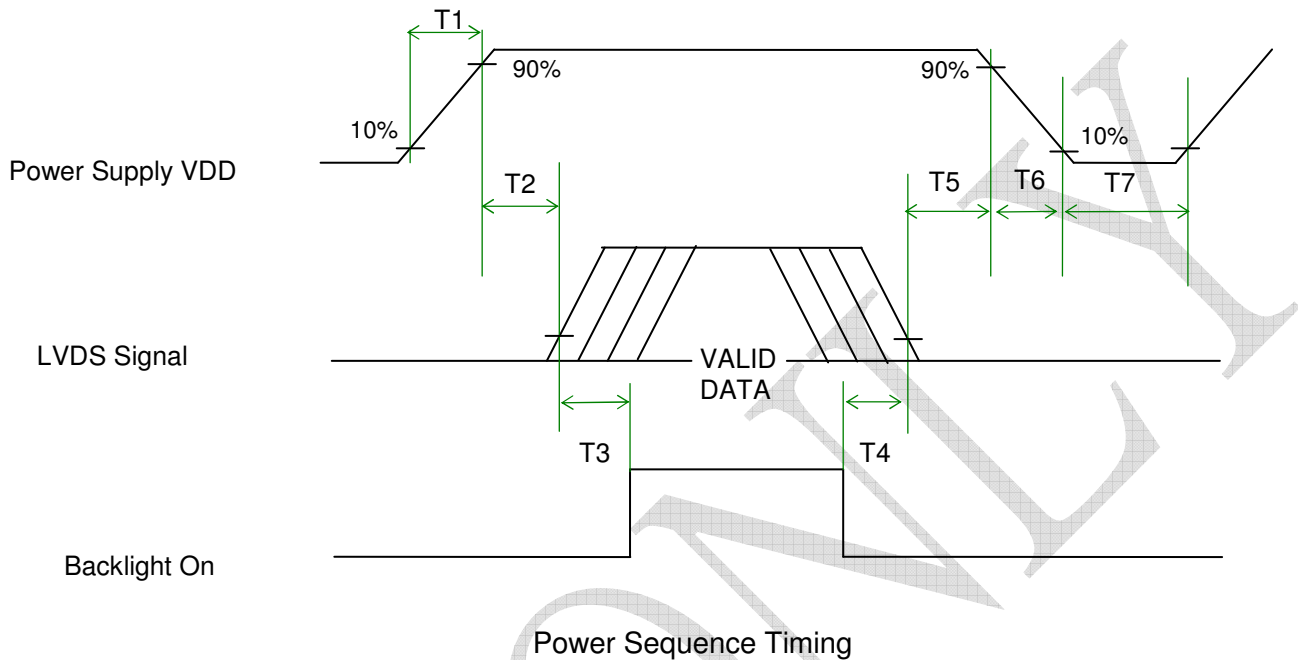
Note 1: DE mode only

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 when VDD is off.



| Parameter | Value | | | Unit |
|-----------|-------|------|------|------------------------|
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | [ms] |
| T2 | 0 | - | 50 | [ms] |
| T3 | 500 | - | - | [ms] |
| T4 | 100 | - | - | [ms] |
| T5 | 0 | - | 50 | [ms] <i>Note1,2</i> |
| T6 | 5 | - | 100 | [ms] <i>Note1,2</i> |
| T7 | 1000 | - | - | [ms] |

Note1 : Recommend setting T5 = 0ms to avoid electronic noise when VDD is off.

Note2 : During T5 and T6 period , please keep the level of input LVDS signals with Hi-Z state.

7 Connector and 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 | STM P-TWO STARCONN |
| Type Part Number | MSCKT2407P30HB AL230F-A0G1D-P 093G30-02001A-M4 |
| Mating Housing Part Number | FI-X30HL (Locked Type) |

7.1.1 Pin Assignment

| Pin# | Signal Name | Pin# | Signal Name |
|------|-------------|------|-------------|
| 1 | RX00- | 2 | RX00+ |
| 3 | RX01- | 4 | RX01+ |
| 5 | RX02- | 6 | RX02+ |
| 7 | GND | 8 | RXOCLK- |
| 9 | RXOCLK+ | 10 | RX03- |
| 11 | RX03+ | 12 | RXE0- |
| 13 | RXE0+ | 14 | GND |
| 15 | RXE1- | 16 | RXE1+ |
| 17 | GND | 18 | RXE2- |
| 19 | RXE2+ | 20 | RXECLK- |
| 21 | RXECLK+ | 22 | RXE3- |
| 23 | RXE3+ | 24 | GND |
| 25 | NC | 26 | NC |
| 27 | NC | 28 | VDD |
| 29 | VDD | 30 | VDD |

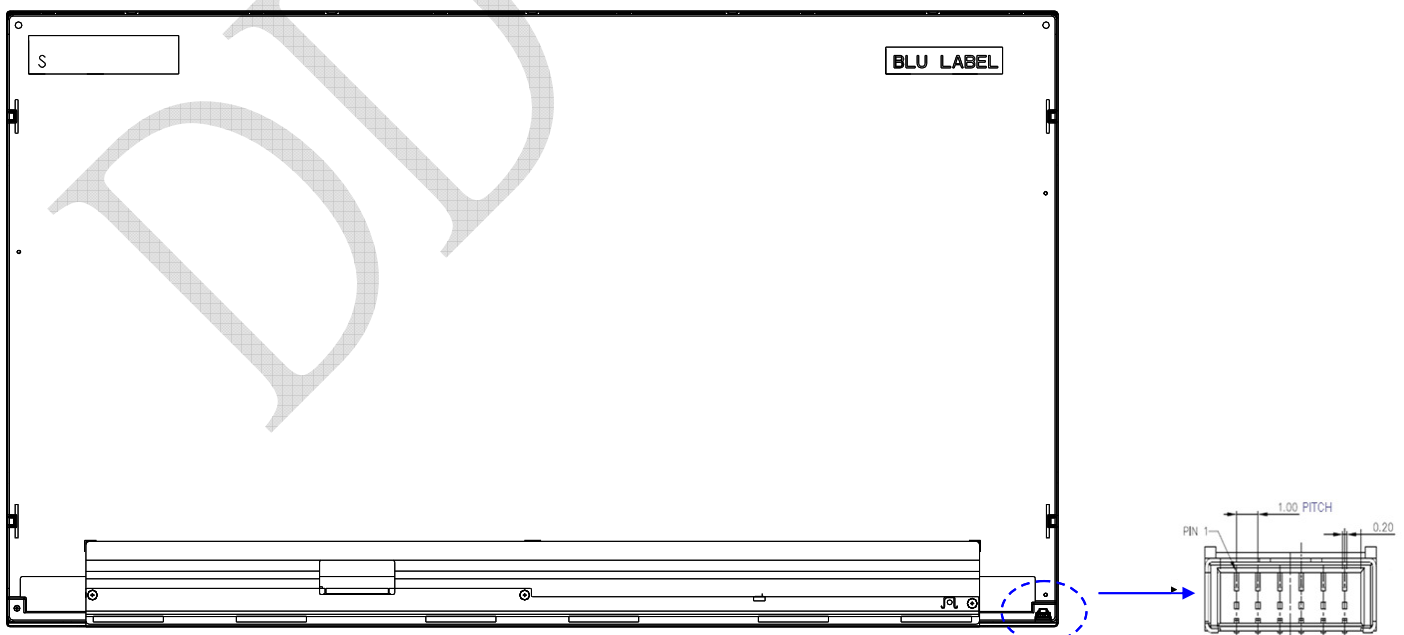
7.2 LED Connector on Backlight Unit

This connector is mounted on LED light bar.

| | |
|------------------------------|------------------------------|
| Connector Name / Designation | Light Bar Connector |
| Manufacturer | E&T(ENTERY) |
| Type Part Number | 3707K-S06N-21R |
| Mating Housing Part Number | H112K-P06N-13B (Locked Type) |

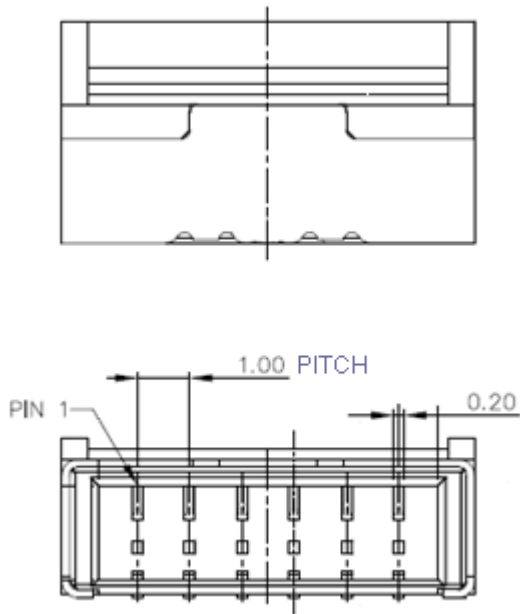
7.2.1 LED Pin assignment

| Pin# | Signal Name |
|------|------------------------|
| 1 | IFLED (current return) |
| 2 | IFLED (current return) |
| 3 | VSLED (voltage in) |
| 4 | VSLED (voltage in) |
| 5 | IFLED (current return) |
| 6 | IFLED (current return) |

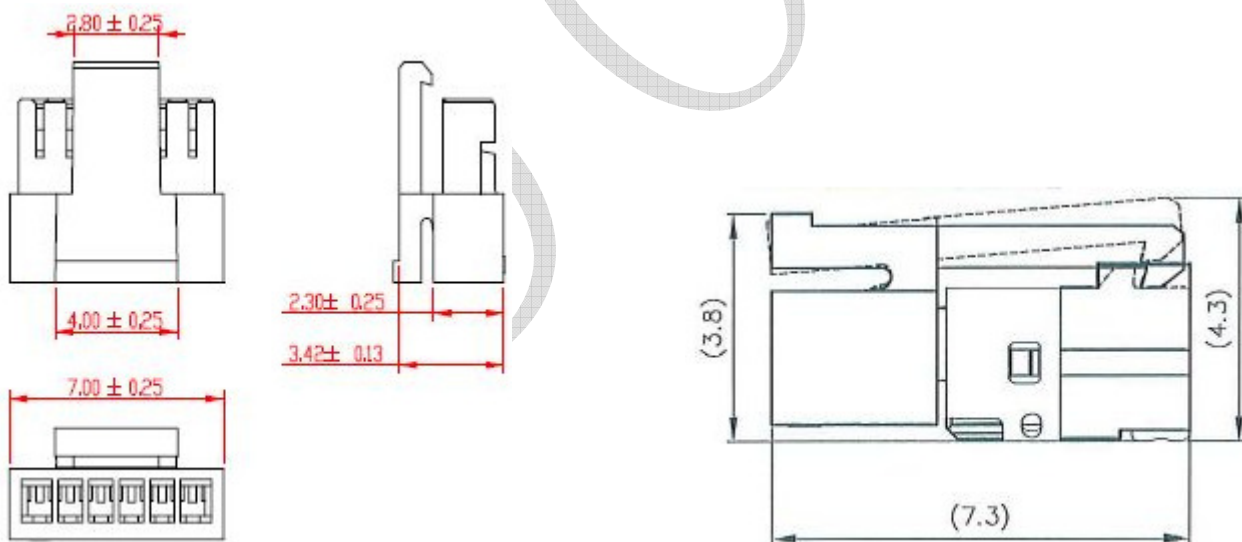


7.2.2 LED Connector Dimension

$H \times V \times D = 13.9 \times 3.00 \times 4.25$, Pitch = 1.0 (unit = mm)



7.2.3 LED Mating housing dimension



8 Reliability Test

Environment test conditions are listed as following table.

| Items | Required Condition | Note |
|-----------------------------------|---|--------|
| Temperature Humidity Bias (THB) | Ta= 50°C, 80%RH, 300 hours | |
| High Temperature Operation (HTO) | Ta= 50°C, 50%RH, 300 hours | |
| Low Temperature Operation (LTO) | Ta= 0°C, 300 hours | |
| High Temperature Storage (HTS) | Ta= 60°C, 300 hours | |
| Low Temperature Storage (LTS) | Ta= -20°C, 300 hours | |
| Vibration Test (Non-operation) | Acceleration: 1.5 Grms Wave: Random Frequency: 10 - 200 Hz Duration: 30 Minutes each Axis (X, Y, Z) | |
| Shock Test (Non-operation) | Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction: ±X, ±Y, ±Z (one time for each Axis) | |
| Drop Test | Height: 46 cm, package test | |
| Thermal Shock Test (TST) | -20°C/30min, 60°C/30min, 100 cycles | Note 1 |
| On/Off Test | On/10sec, Off/10sec, 30,000 cycles | |
| ESD (Electro Static Discharge) | Contact Discharge: ± 15KV, 150pF(330Ω) 1sec, 15 points, 25 times/ point | Note 2 |
| | Air Discharge: ± 15KV, 150pF(330Ω) 1sec 15 points, 25 times/ point | |
| Altitude Test | Operation: 18,000 ft Non-Operation: 40,000 ft | Note 3 |

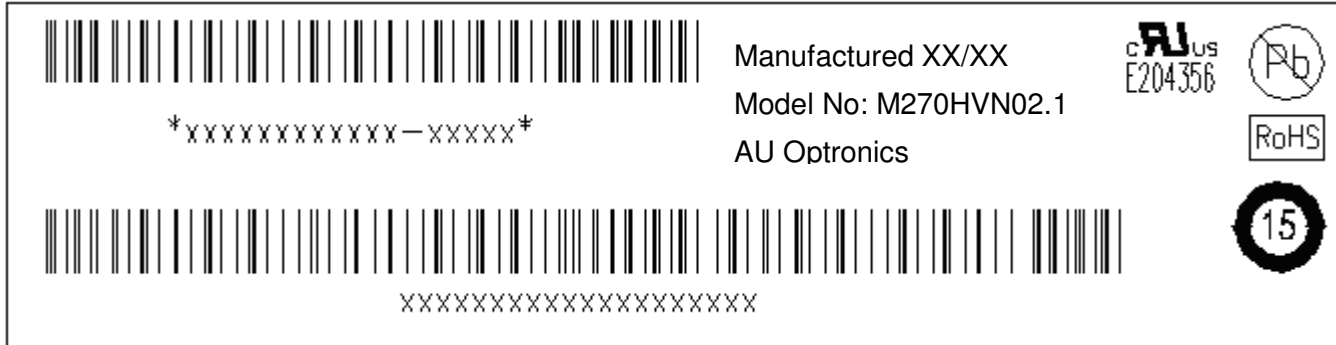
Note 1: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20°C to 60°C, and back again. Power is not applied during the test. After temperature cycling, the unit is 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 Shipping Label

The label on the panel is shown as below:



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

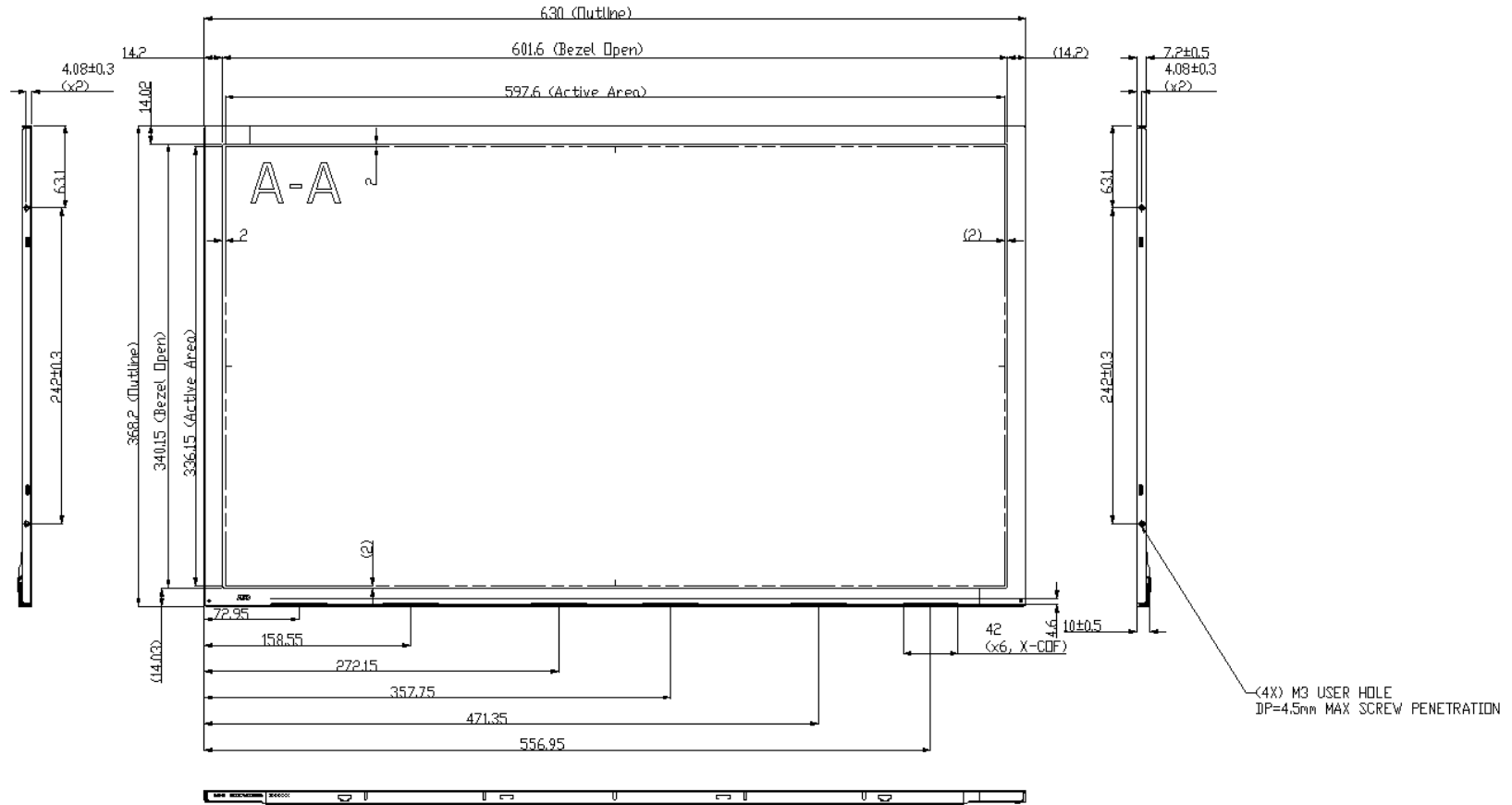
Note 2: For RoHS compatible products, AUO will add  for identification.

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

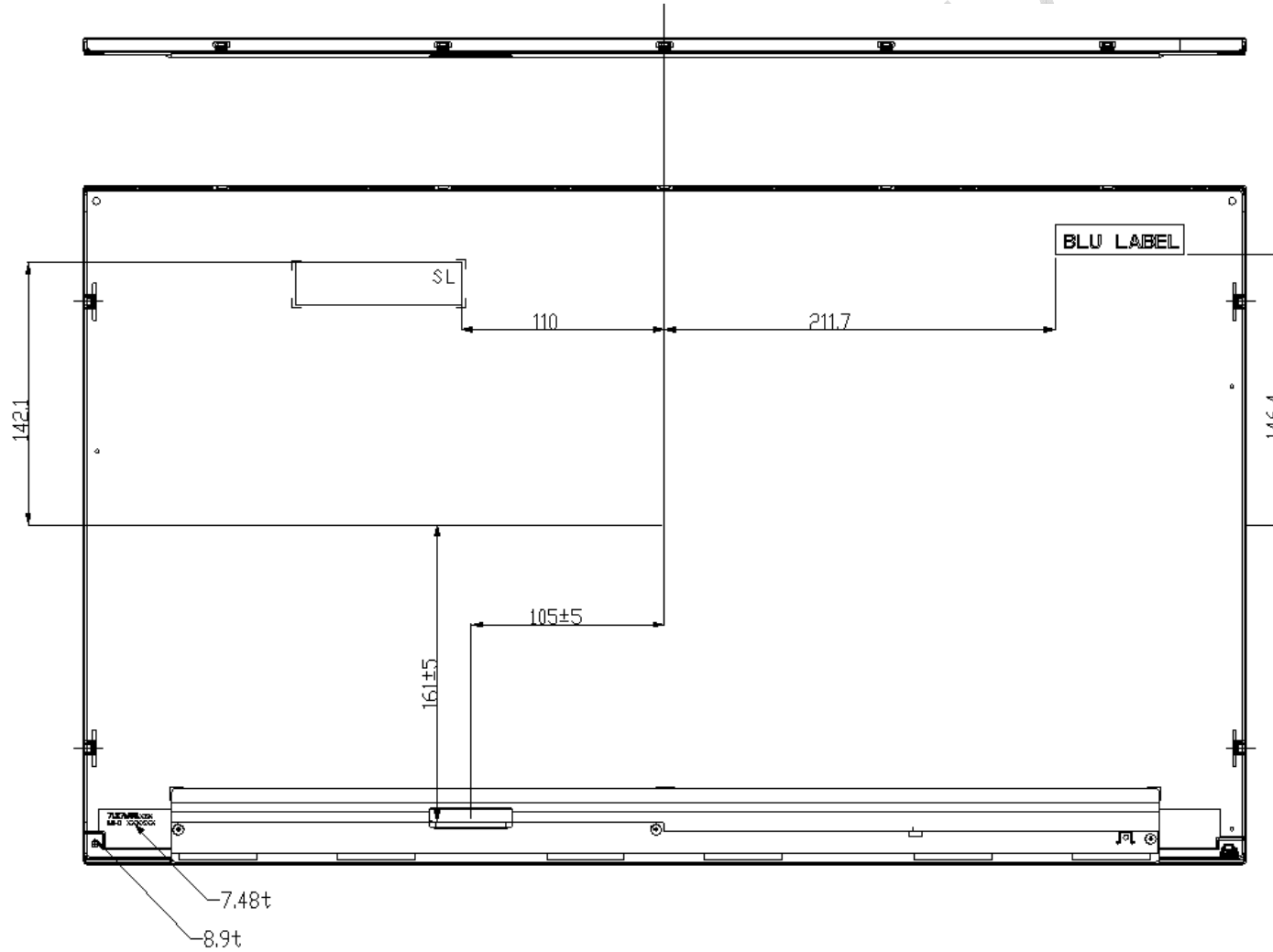
Note 4: The Green Mark will be presented only when the green documents have been ready by AUO Internal Green Team.

10 Mechanical Characteristics

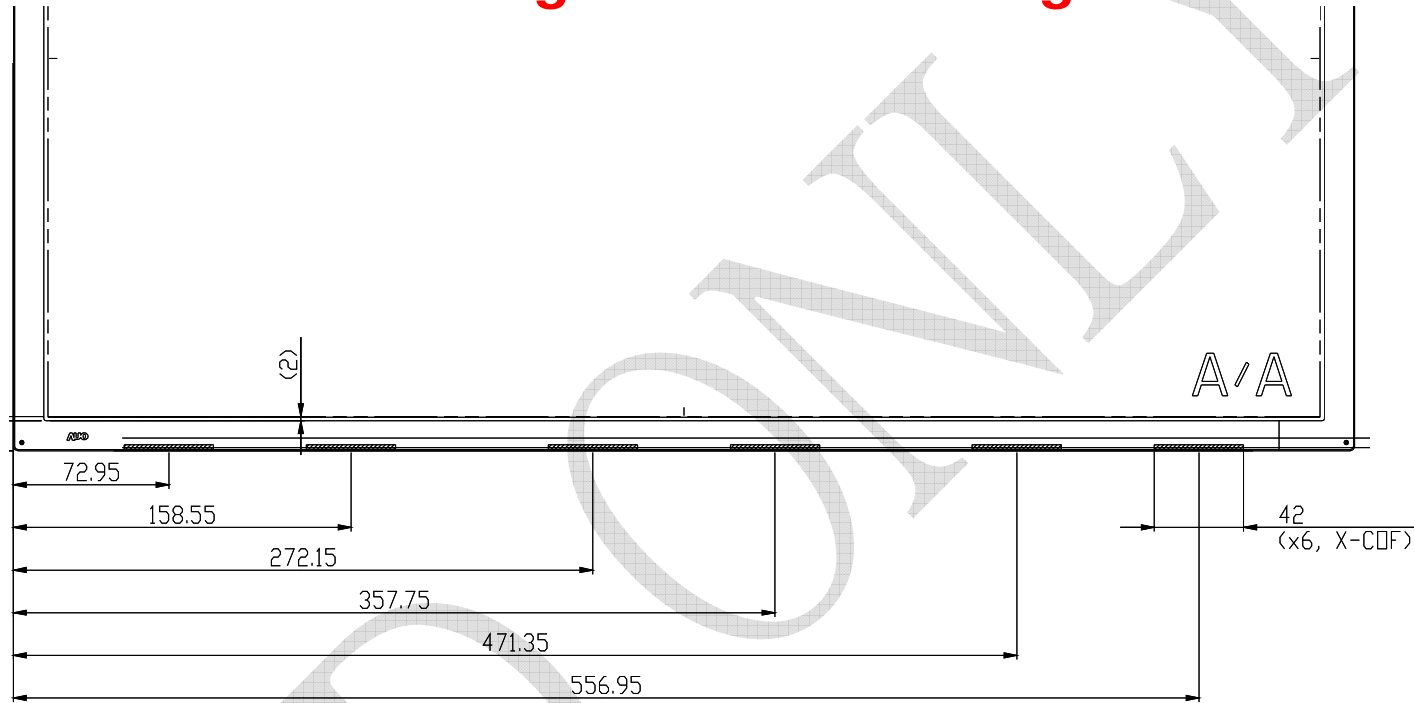
Front Face



Back Face:

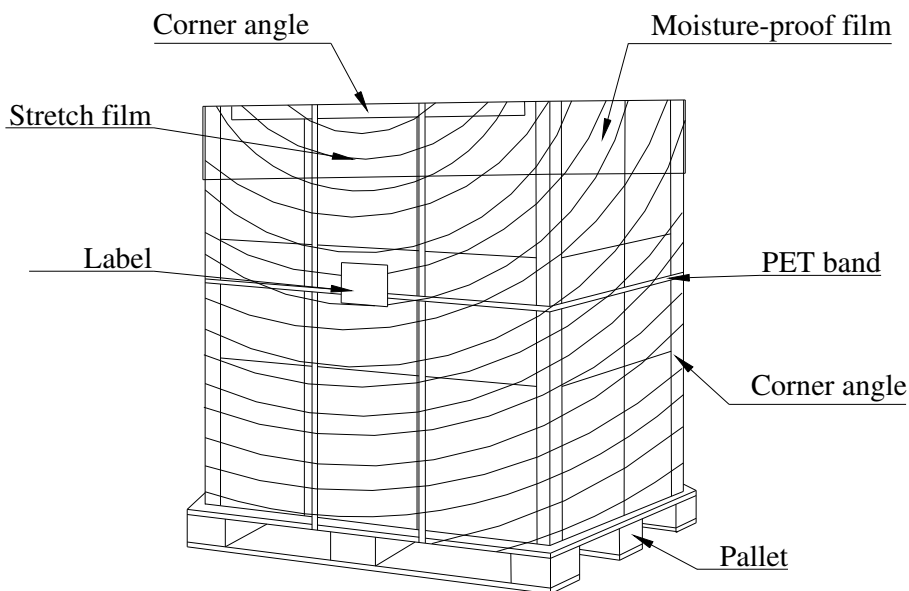
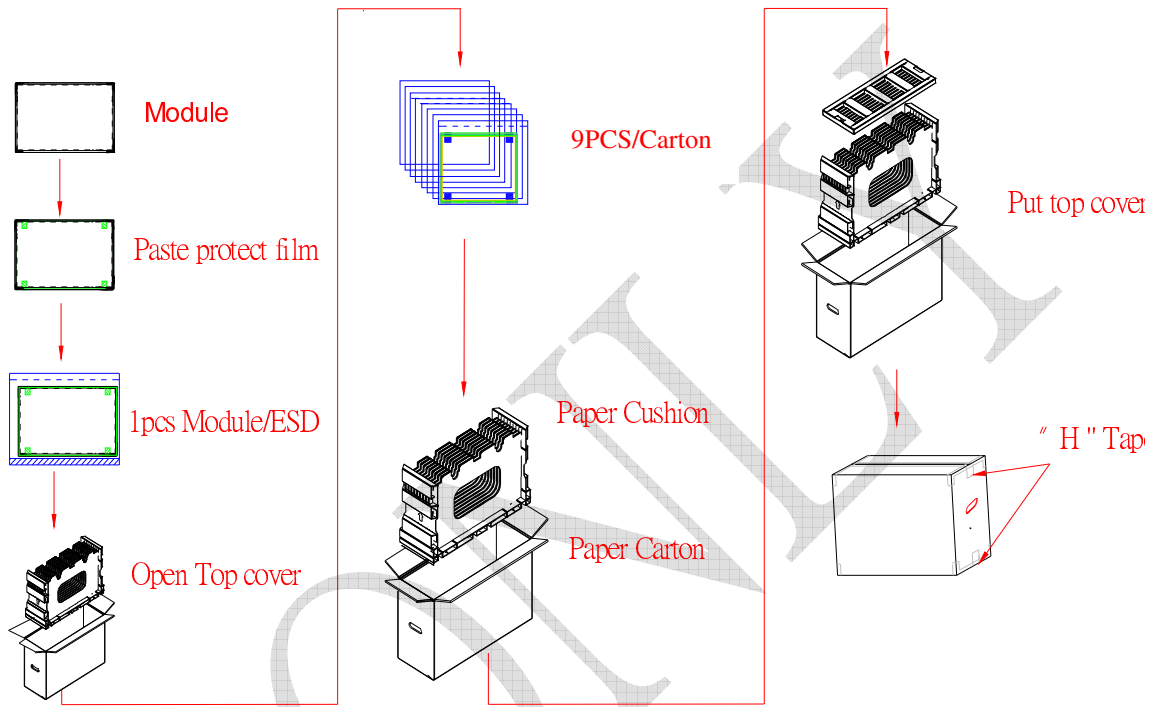


**Avoid touching COF position
when doing mechanical design**



11 Packing Specification

11.1 Packing Flow



11-2 Pallet and shipment information

| | Item | Specification | | | Remark |
|---|----------------------|----------------|---------------------------------|------------|-------------------------|
| | | Q'ty | Dimension | Weight(kg) | |
| 1 | Panel | 1 | 630mmx368.2mmx10.0mm | 2.3 | |
| 2 | Cushion | 1 | - | 4.41 | |
| 3 | Box | 1 | 720(L)mm x 264(W)mm x 460(H)mm | 1.35 | without Panel & cushion |
| 4 | Packing Box | 9 pcs/Box | 720(L)mm x 264(W)mm x 460(H)mm | 26.46 | with panel & cushion |
| 5 | Pallet | 1 | 1070(L)mm x 740(W)mm x 138(H)mm | 12.9 | |
| 6 | Pallet after Packing | 8 boxes/pallet | 1070(L)mm x 740(W)mm x 138(H)mm | 224.6 | |

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