

() Preliminary Specification

(V) Final Specification

Module 19" SXGA TFT-LCD Module

Module Name JX-G190ETN01.0

CUSTOMER:

| |
|--|
| Customer Approval |
| Note: This Specification is subject to change without notice |

JING XI:

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|-------------|-------------|
| Approved by | Prepared by |
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Date:

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Record of Revision

| Version&Date | Page | Old description | New Description | Remark |
|----------------|------|-----------------|--------------------------|--------|
| 0.0 2011/09/13 | ALL | Frist Draft | | |
| 0.1 2011/11/10 | 23 | | Update Label and Packing | |
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1. Handling 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) To avoid ESD (Electro Static Discharge) damage, be sure to ground yourself before handling TFT-LCD Module
- 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 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) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in 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 or UL 1950), or be applied exemption.
- 13) Severe temperature condition may result in different luminance, response time and lamp ignition voltage
- 14) Continuous operating TFT-LCD display under low temperature environment may accelerate lamp exhaustion and reduce luminance dramatically.
- 15) The data on this specification sheet is applicable when LCD module is placed in landscape position.
- 16) 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

G190ETN01.0 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD panel, driver circuit, and a backlight system. The screen format is intended to support the SXGA (1280(H) x 1024(V)) screen and 16.7M colors (RGB 6-bits + HiFRC data). All input signals are 2-channel LVDS interface.

2.1 Display Characteristics

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

| Items | Unit | Specifications |
|---------------------------|----------------------|--|
| Screen Diagonal | [mm] | 482.6 (19.0") |
| Active Area | [mm] | 376.32 (H) x 301.06 (V) |
| Pixels H x V | | 1280(x3) x 1024 |
| Pixel Pitch | [mm] | 0.294 (per one triad) x 0.294 |
| Pixel Arrangement | | R.G.B. Vertical Stripe |
| Display Mode | | Normally White |
| White Luminance | [cd/m ²] | 1200 (Typ) 2 组 240M A |
| Contrast Ratio | | 1000 : 1 (Typ) |
| Optical ResponseTime | [msec] | 5 ms(Typ, on/off) |
| Nominal Input Voltage VDD | [Volt] | +5.0 V |
| Power Consumption | [Watt] | 14.5 W (Typ) (PDD= 4.7 W, PLED=9.8 W) |
| Weight | [Grams] | 1800 (Typ) |
| Physical Size (H x V x D) | [mm] | 396 (H) x 324 (V) x 11.2(D) (Typ) |
| Electrical Interface | | Dual channel LVDS |
| Surface Treatment | | Hard-coating (3H), Non-Glare treatment |
| Support Color | | 16.7M colors (RGB 6-bit + Hi_FRC) |
| Temperature Range | | |
| Operating | [°C] | 0 to +50 |
| Storage (Non-Operating) | [°C] | -20 to +60 |
| RoHS Compliance | | RoHS Compliance |

2.2 Optical Characteristics

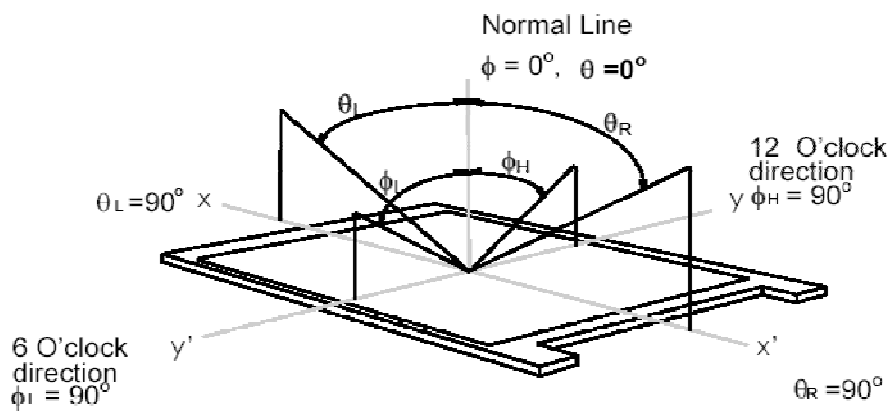
The optical characteristics are measured under stable conditions at 25°C (Room Temperature).

| Item | Unit | Conditions | Min. | Typ. | Max. | Note |
|--|----------------------|--------------------------------------|----------|----------|-------|------|
| Viewing Angle | [degree] | Horizontal (Right) (Left) CR = 10 | 75 75 | 85 85 | - | 2 |
| | | Vertical (Up) (Down) CR = 10 | 70 70 | 80 80 | - | |
| Contrast Ratio | | Normal Direction | 600 | 1000 | - | 3 |
| Optical Response Time | [msec] | Raising Time (TrR) | - | 3.6 | 5.7 | 4 |
| | | Falling Time (TrF) | - | 1.4 | 2.3 | |
| | | Rising + Falling | - | 5 | 8 | |
| Color / Chromaticity Coordinates (CIE) | | Red x | 0.589 | 0.639 | 0.689 | 5 |
| | | Red y | 0.296 | 0.346 | 0.396 | |
| | | Green x | 0.274 | 0.324 | 0.374 | |
| | | Green y | 0.577 | 0.627 | 0.677 | |
| | | Blue x | 0.104 | 0.154 | 0.204 | |
| | | Blue y | 0.004 | 0.054 | 0.104 | |
| | | White x | 0.263 | 0.313 | 0.363 | |
| White y | 0.279 | 0.329 | 0.379 | | | |
| Central Luminance | [cd/m ²] | | 960 | 1200 | - | 6 |
| Luminance Uniformity | [%] | 9 Points | 75 | 80 | - | 7 |
| NTSC | [%] | | | 72 | | |

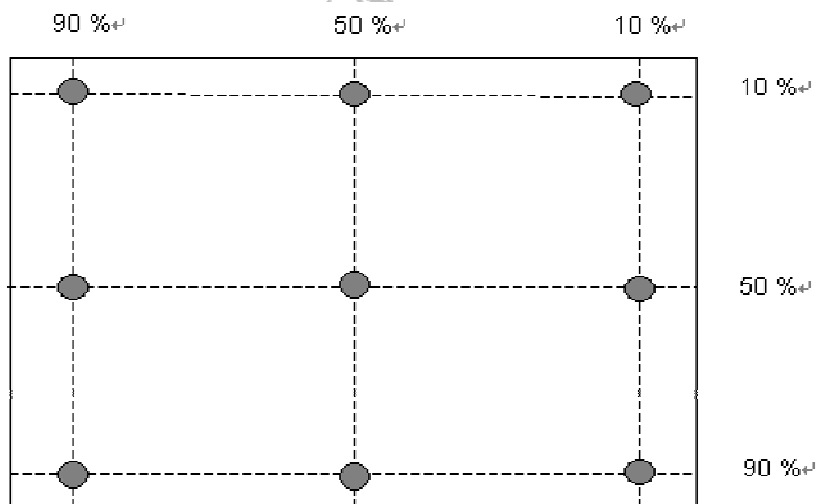
Optical Equipment: BM-5A, BM-7, PR880, or equivalent

Note 1: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≥ 10 , or ≥ 5 , 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 2: 9 points position

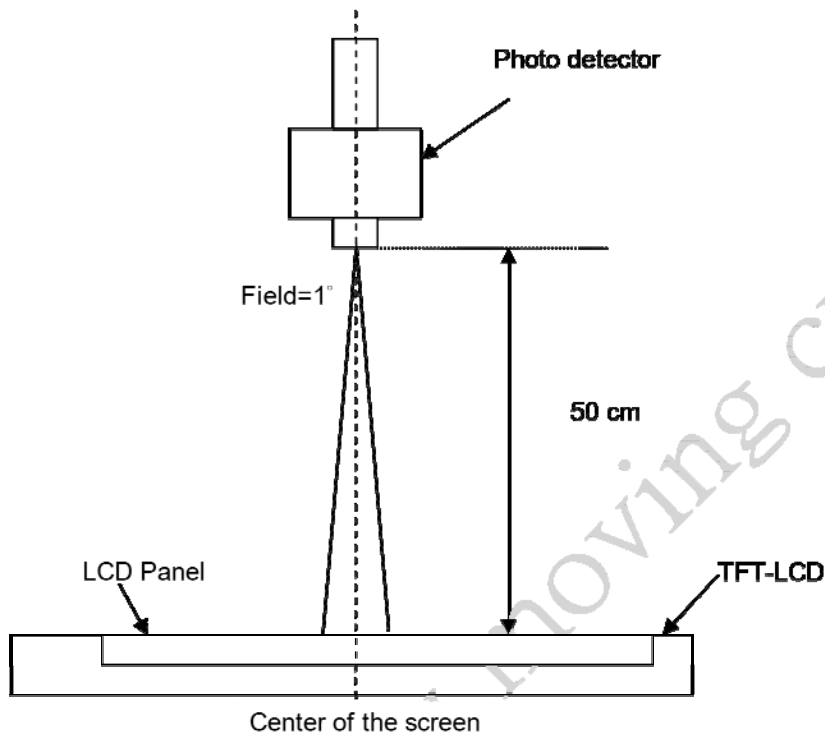


Note 3:

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

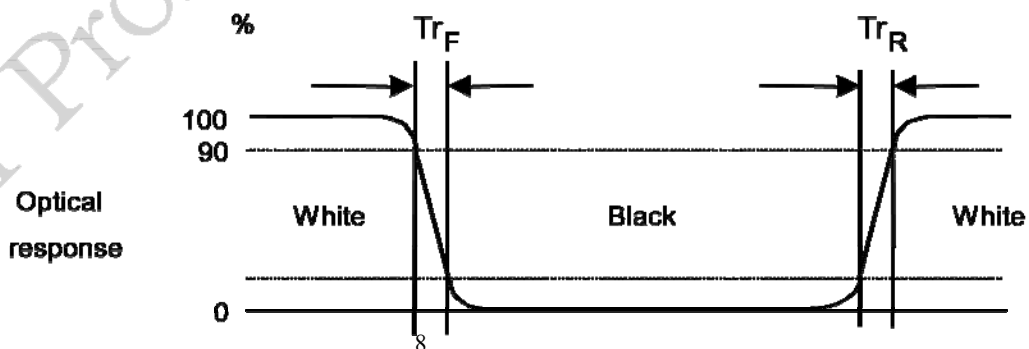
Note 4: Measurement method

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



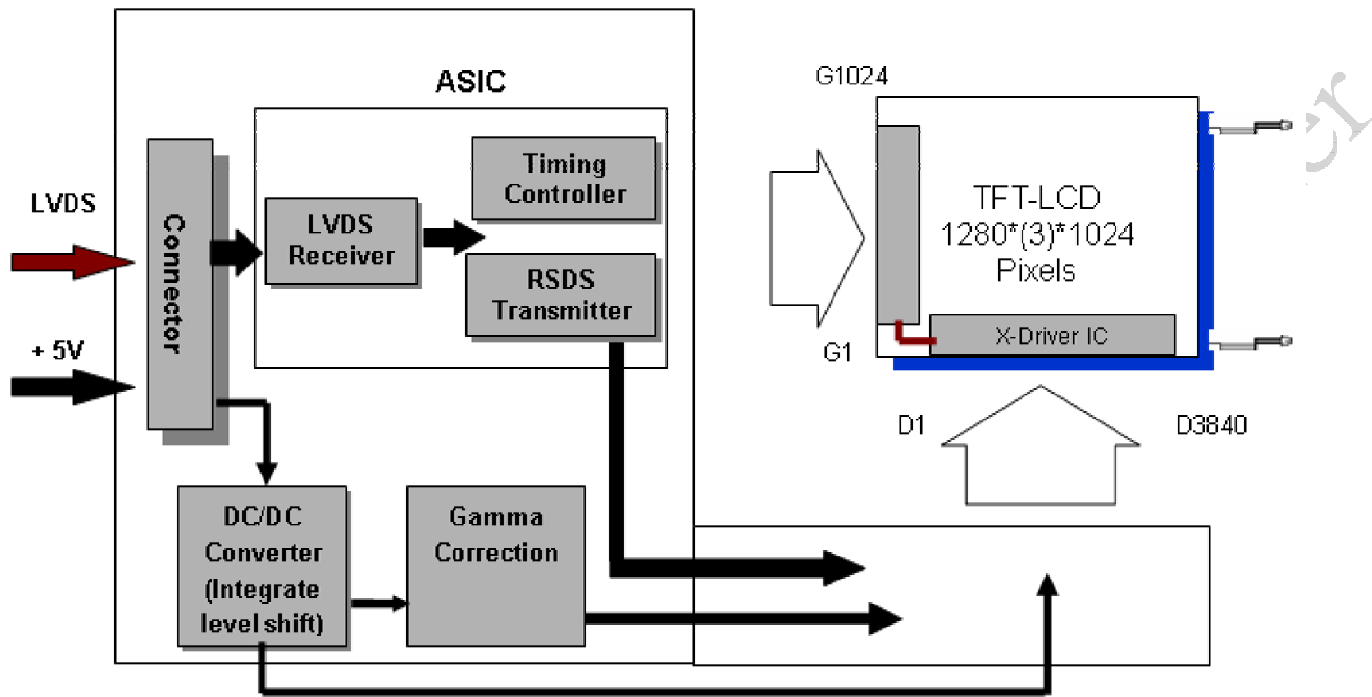
Note 5: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time), and from "Full White" to "Full Black" (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes. Please refer to the figure as below.



3. Functional Block Diagram

The following diagram shows the functional block of the 19.0 inches wide Color TFT-LCD Module:



4. 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 | -0.3 | +6.0 | [Volt] | Note 1,2 |

4.2 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] | Note 3, Note 4 |
| Operation Humidity | HOP | 5 | 90 | [%RH] | Note 3 |
| Storage Temperature | TST | -20 | +60 | [°C] | |
| Storage Humidity | HST | 5 | 90 | [%RH] | |

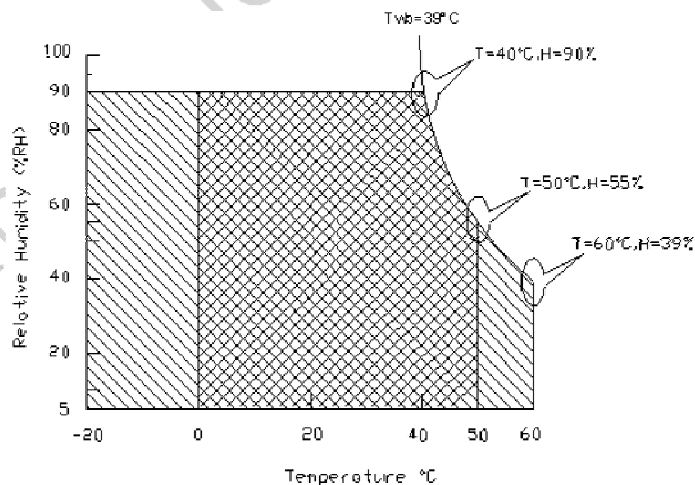
Note 1: With in Ta (25°C)

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 ≤ 39°C)
2. Max wet-bulb temperature at 39°C or less. (Ta ≤ 39°C)
3. No condensation

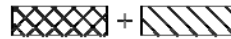
Note 4: Function Judged only



Operating Range



Storage Range



5. Electrical characteristics

5.1 TFT LCD Module

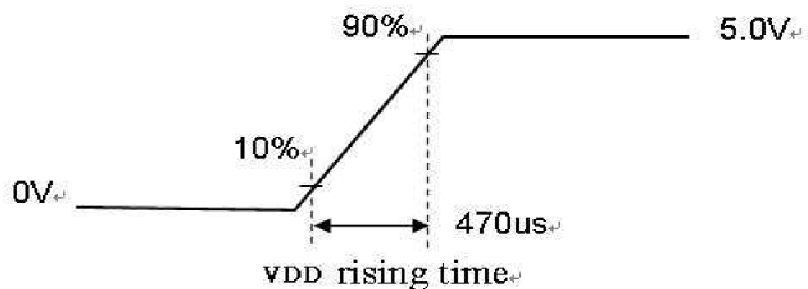
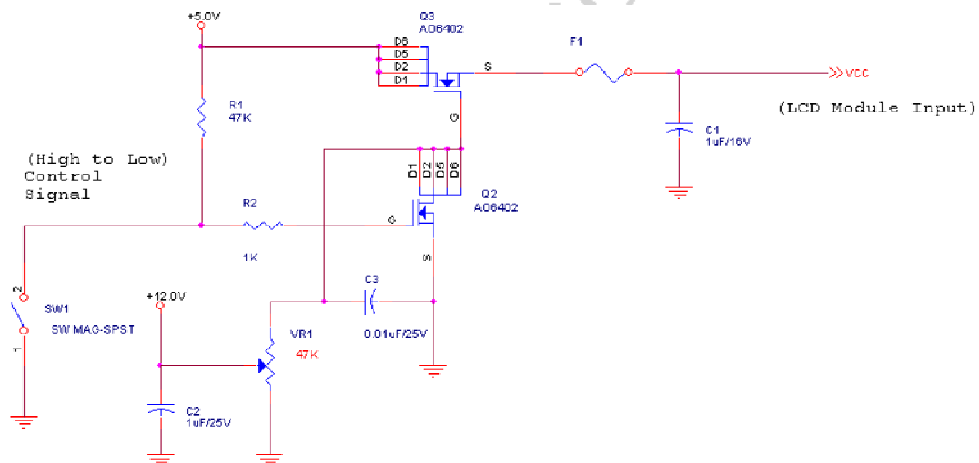
5.1.1 Power Specification

Input power specifications are as follows:

| Symbol | Parameter | Min | Typ | Max | Unit | Conditions |
|--------|--|-----|------|-----|----------|---------------------------------------|
| VDD | Logic/LCD Drive Voltage | 4.5 | 5.0 | 5.5 | [Volt] | +/-10% |
| IDD | Input Current | - | 0.94 | 1.1 | [A] | VDD= 5.0V, All Black Pattern At 60Hz, |
| PDD | VDD Power | - | 4.7 | 5.5 | [Watt] | VDD= 5.0V, All Black Pattern At 60Hz |
| IRush | Inrush Current | - | - | 3.0 | [A] | Note 1 |
| VDDrp | Allowable Logic/LCD Drive Ripple Voltage | - | - | 100 | [mV] p-p | VDD= 5.0V, All Black Pattern At 75Hz |

Note 1: Measurement conditions:

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



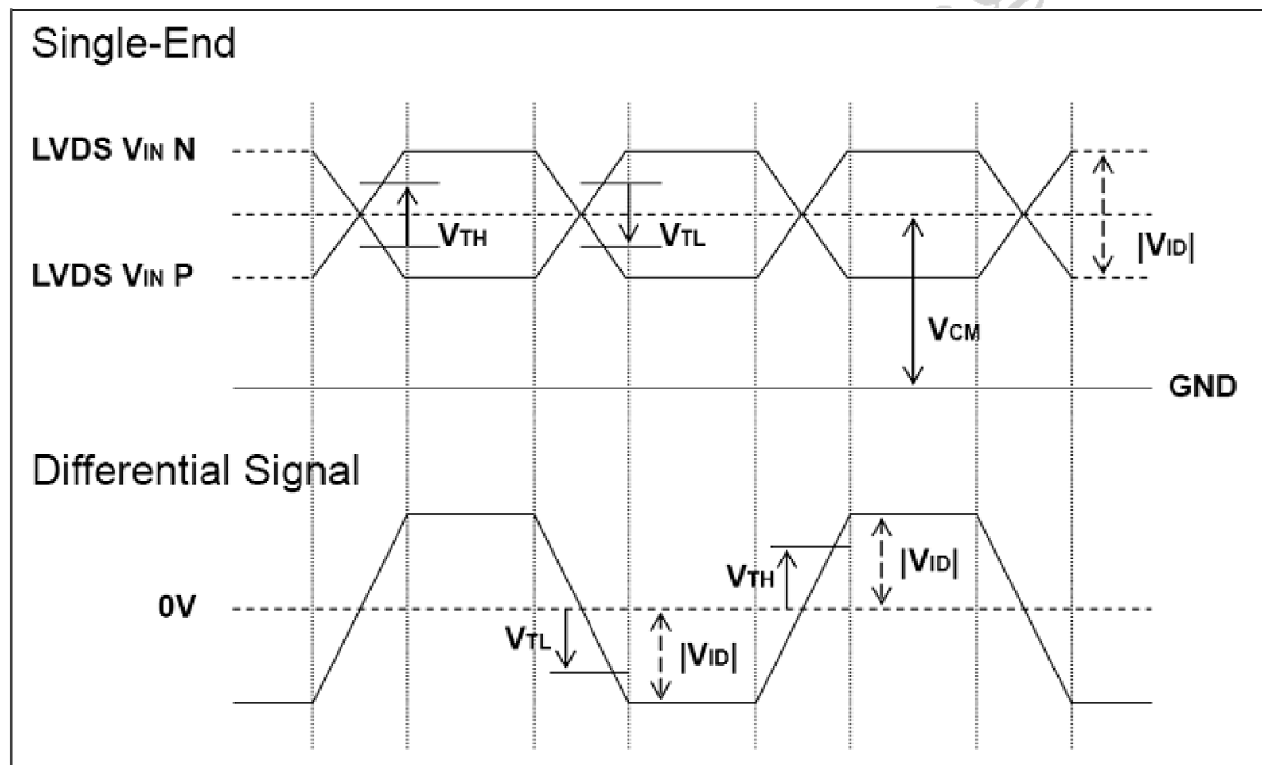
5.1.2 Signal Electrical Characteristics

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

Each signal characteristics are as follows;

| Symbol | Parameter | Min | Typ | Max | Units | Condition |
|----------|--|------|------|------|-------|--|
| 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_D $ | Input Differential Voltage | 100 | 400 | 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 |

Note1: LVDS Signal Waveform



5.1.3 Backlight unit

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

| Symbol | Parameter | Min. | Typ. | Max. | Unit | Note |
|---------------|---|--------|--------|------|------------------|--------------------------------------|
| $I_{R_{LED}}$ | LED Operation Current | - | 240*2 | - | [mA] Note 1 | Operating with fixed driving current |
| V_{LB} | Light Bar Operation Voltage (for reference) | - | 41 | 43.2 | [Volt] Note 2 | |
| P_{BLU} | BLU Power consumption (for reference) | - | 9.8*2 | - | [Watt] | |
| LT_{LED} | LED life Time (Typical) | 25,000 | 30,000 | - | [Hour] Note 3 | |

Note 1 :The specified current is input LED chip 100% duty current.

Note 2 : The value showed in the table is one light bar's operation voltage.

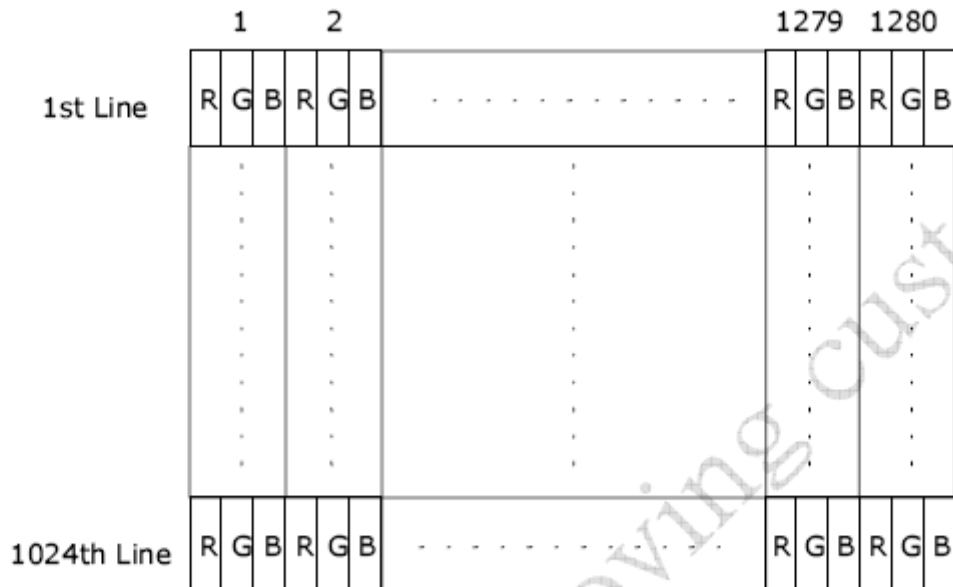
Note 3 : Definition of life time : brightness becomes 50% of its original value. The minimum life time of LED unit is on the condition of $I_{R_{LED}} = 60\text{mA}$ and $25\pm 2^\circ\text{C}$ (Room temperature).

Note 4: Each LED light bar consists of 2 組 56PCS LED package (4 strings * 14PCS/string)

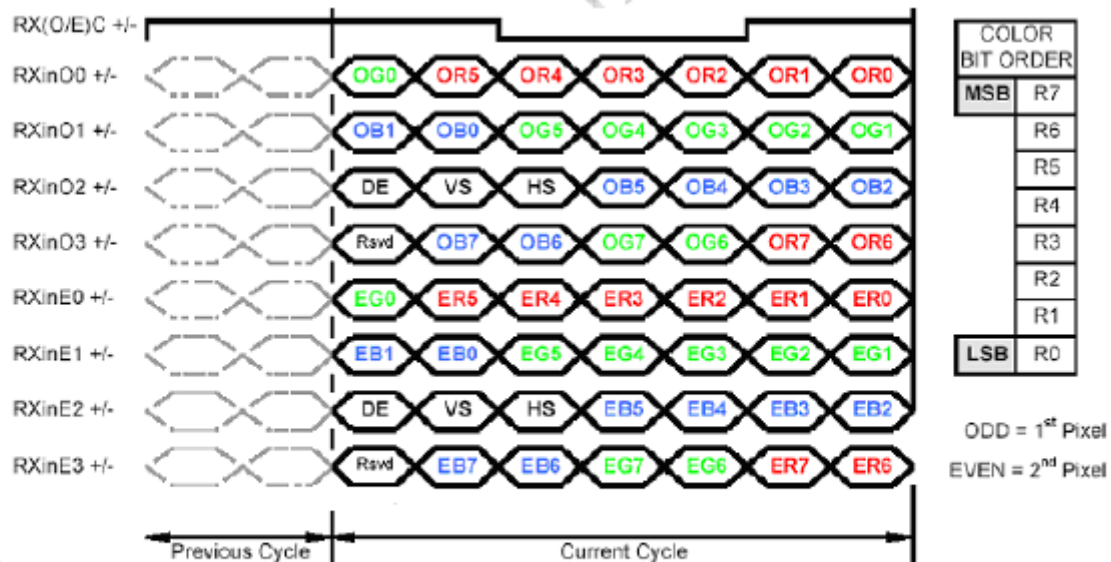
6. Signal Characteristic

6.1 Pixel Format Image

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



6.2 The Input Data Format



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

Note2: Please follow PSWG.

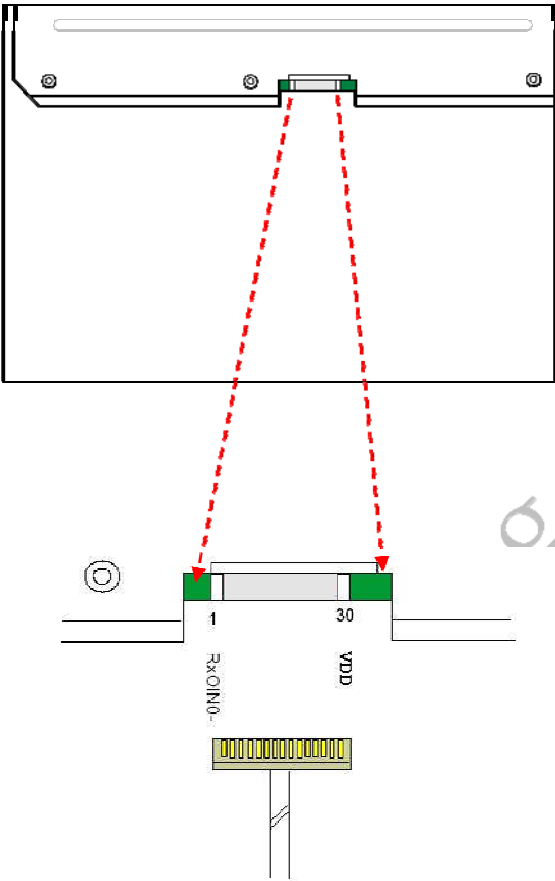
Note3: 8-bit in

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 | RxOIN0- | Negative LVDS differential data input (Odd data) |
| 2 | RxOIN0+ | Positive LVDS differential data input (Odd data) |
| 3 | RxOIN1- | Negative LVDS differential data input (Odd data) |
| 4 | RxOIN1+ | Positive LVDS differential data input (Odd data) |
| 5 | RxOIN2- | Negative LVDS differential data input (Odd data, DSPTMG) |
| 6 | RxOIN2+ | Positive LVDS differential data input (Odd data, DSPTMG) |
| 7 | GND | Power Ground |
| 8 | RxOCLKIN- | Negative LVDS differential clock input (Odd clock) |
| 9 | RxOCLKIN+ | Positive LVDS differential clock input (Odd clock) |
| 10 | RxOIN3- | Negative LVDS differential data input (Odd data) |
| 11 | RxOIN3+ | Positive LVDS differential data input (Odd data) |
| 12 | RxEIN0- | Negative LVDS differential data input (Even data) |
| 13 | RxEIN0+ | Positive LVDS differential data input (Even data) |
| 14 | GND | Power Ground |
| 15 | RxEIN1- | Positive LVDS differential data input (Even data) |
| 16 | RxEIN1+ | Negative LVDS differential data input (Even data) |
| 17 | GND | Power Ground |
| 18 | RxEIN2- | Negative LVDS differential data input (Even data) |
| 19 | RxEIN2+ | Positive LVDS differential data input (Even data) |
| 20 | RxECLKIN- | Negative LVDS differential clock input (Even clock) |
| 21 | RxECLKIN+ | Positive LVDS differential clock input (Even clock) |
| 22 | RxEIN3- | Negative LVDS differential data input (Even data) |
| 23 | RxEIN3+ | Positive LVDS differential data input (Even data) |
| 24 | GND | Power Ground |
| 25 | GND | Power Ground |
| 26 | NC | No connection (for AUO test) |
| 27 | NC | No connection (for AUO test) |
| 28 | POWER | Power +5V |
| 29 | POWER | Power +5V |
| 30 | POWER | Power +5V |

Note1: Start from left side



Note2: Input signals of odd and even clock shall be the same timing.

6.4 Interface Timing

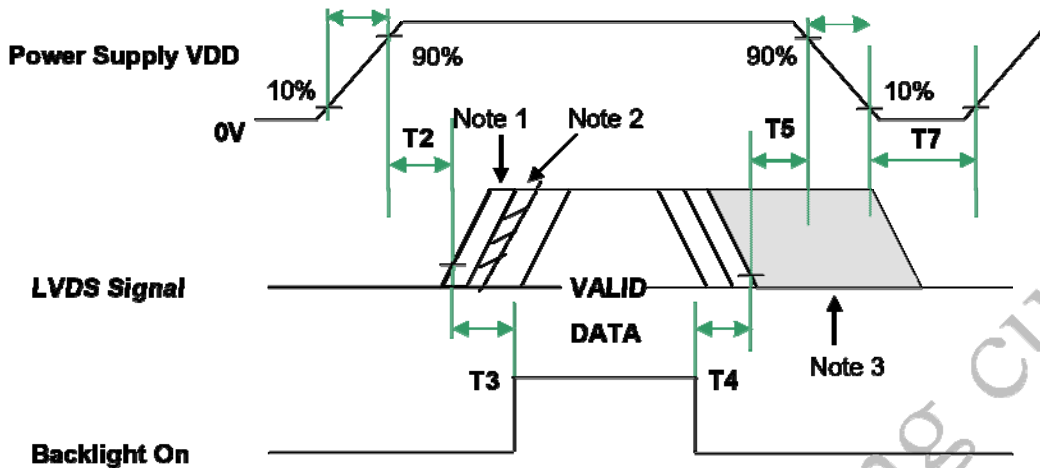
6.4.1 Timing Characteristics

| Signal | Item | Symbol | Min | Typ | Max | Unit |
|--------------------|-----------|--------------------|------|-------|-------|------|
| Vertical Section | Period | Tv | 1032 | 1066 | 1150 | Th |
| | Active | Tdisp(v) | 1024 | 1024 | 1024 | Th |
| | Blanking | Tbp(v)+Tfp(v)+PWvs | 8 | 42 | 126 | Th |
| Horizontal Section | Period | Th | 780 | 844 | 2047 | Tclk |
| | Active | Tdisp(h) | 640 | 640 | 640 | Tclk |
| | Blanking | Tbp(h)+Tfp(h)+PWhs | 140 | 204 | - | Tclk |
| Clock | Period | Tclk | 22.2 | 18.52 | 14.81 | ns |
| | Frequency | Freq. | 45 | 54 | 67.5 | MHz |
| Frame Rate | Frequency | 1/Tv | 50 | 60 | 75 | Hz |

Note: DE mode only

6.5 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: insert a white pattern 360ms

Note2: insert a black pattern

Note3 :insert a white pattern after valid data and last until VDD falls to 10%.

Note4 :when AC on/off, timing rule of logo power on/off is the same as above.

| Power Sequence Timing | | | | |
|-----------------------|-------|------|------|-------|
| Parameter | Value | | | Units |
| | Min. | Typ. | Max. | |
| T1 | 0.5 | - | 10 | ms |
| T2 | 0 | 40 | 50 | |
| T3 | 500 | - | - | |
| T4 | 300 | - | - | |
| T5 | 40 | 1500 | - | |
| T6 | - | - | - | |
| T7 | 1000 | - | - | |

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

7.1.1 Connector

| | |
|------------------------------|--------------------------------------|
| Connector Name / Designation | Interface Connector / Interface card |
| Manufacturer | P-TWO / JAE |
| Type Part Number | 187034-30091 / FI-XB30SSLA-HF15 |
| Mating Housing Part Number | FI-X30HL FI-X30H (Unlocked Type) |

7.1.2 Pin Assignment

| 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- |
| 13 | RxEIN0+ | 14 | GND |
| 15 | RxEIN1- | 16 | RxEIN1+ |
| 17 | GND | 18 | RxEIN2- |
| 19 | RxEIN2+ | 20 | RxECLKIN- |
| 21 | RxECLKIN+ | 22 | RxEIN3- |
| 23 | RxEIN3+ | 24 | GND |
| 25 | GND | 26 | NC |
| 27 | NC | 28 | POWER |
| 29 | POWER | 30 | POWER |

4-4 Backlight Unit

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

7.2.1 Connector

| | |
|------------------------------|----------------------------|
| Connector Name / Designation | Light Bar Connector |
| Manufacturer | ENTERY INDUSTRIAL CO., LTD |
| Type Part Number | 3707K-S06N-01R |

7.2.2 Pin Assignment

| Pin no. | Signal name |
|---------|---------------------|
| 1 | IRLED (current out) |
| 2 | VLED (voltage in) |

8. Reliability Test

Environment test conditions are listed as following table.

| Items | Required Condition | Note |
|-----------------------------------|---|------|
| Temperature Humidity Bias (THB) | Ta= 50°C, 80%RH, 300hours | |
| High Temperature Operation (HTO) | Ta= 50°C, 50%RH, 300hours | |
| Low Temperature Operation (LTO) | Ta= 0°C, 300hours | |
| High Temperature Storage (HTS) | Ta= 60°C, 300hours | |
| Low Temperature Storage (LTS) | Ta= -20°C, 300hours | |
| Vibration Test (Non-operation) | Acceleration: 1.5 G Wave: Random Frequency: 10 - 200 - 10 Hz Sweep: 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: 60 cm, package test | |
| Thermal Shock Test (TST) | -20°C/30min, 60°C/30min, 100 cycles | |
| On/Off Test | On/10sec, Off/10sec, 30,000 cycles | |
| ESD (Electro Static Discharge) | Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 9 points, 25 times/ point. | 1 |
| | Air Discharge: ± 15KV, 150pF(330Ω) 1sec 9 points, 25 times/ point. | |
| Altitude Test | Operation:10,000 ft Non-Operation:30,000 ft | |

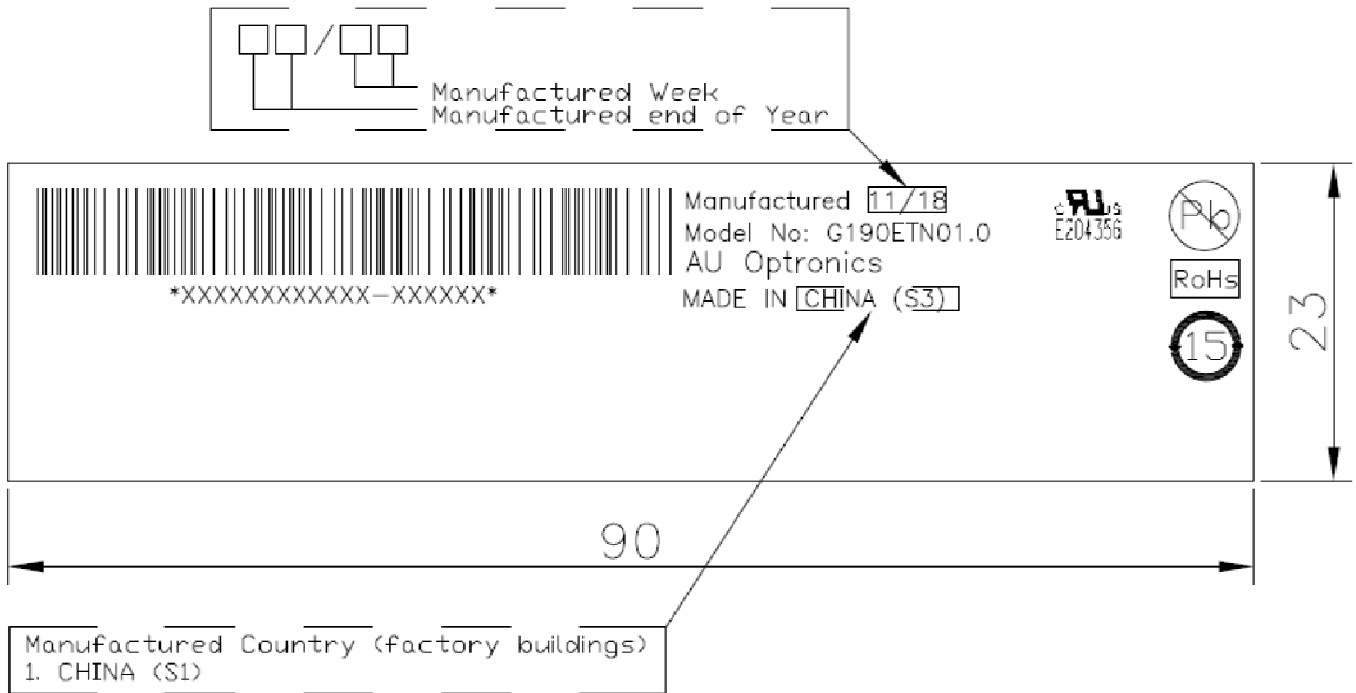
Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost
Self-recoverable. No hardware failures.

Note2:

- 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.

9. Label and Packing

9.1. Shipping Label



9.2 Packing Form

Max. capacity: 13 pieces TFT-LCD module per carton

Max. weight: 26.69 kg per carton

Outside dimension of carton: 409(L)mm* 367(W)mm* 475(H)mm

Pallet : 1140(L)mm*830 (W)mm* 1560(H)mm

9.3 Palletizing sequence

| | pcs / box | box / layer | layer / pallet | pcs / pallet |
|-----------------|-----------|-------------|----------------|--------------|
| Shipping by air | 13 | 6 | 3 | 234 |
| Shipping by sea | 13 | 6 | 3 | 234 |

10.Outling Drawing

