



Product Specification

M240UW01 V0

AU OPTRONICS CORPORATION

(V) Preliminary Specification
() Final Specification

| | |
|------------|---------------------------|
| Module | 24.0" WUXGA Color TFT-LCD |
| Model Name | M240UW01 V0 |

Customer

Date

Approved by

Note: This Specification is subject to change without notice.

Prepared by

Date

Approved by

Desktop Display Business Group /
AU Optronics corporation

Contents

| | |
|--|-----------|
| 1.0 Handling Precautions | 4 |
| 2.0 General Description | 5 |
| 2.1 Display Characteristics | 5 |
| 2.2 Optical Characteristics | 6 |
| 3.0 Functional Block Diagram | 10 |
| 4.0 Absolute Maximum Ratings..... | 11 |
| 4.1 TFT LCD Module | 11 |
| 4.2 Backlight Unit..... | 11 |
| 4.3 Absolute Ratings of Environment | 11 |
| 5.0 Electrical characteristics | 12 |
| 5.1 TFT LCD Module..... | 12 |
| 5.1.1 Power Specification | 12 |
| 5.1.2 Signal Electrical Characteristics..... | 13 |
| 6.0 Signal Characteristic | 15 |
| 6.1 Pixel Format Image | 15 |
| 6.2 The input data format | 15 |
| 6.3 Signal Description | 16 |
| 6.4 Timing Characteristics..... | 17 |
| 6.5 Timing diagram..... | 18 |
| 6.6 Power ON/OFF Sequence | 19 |
| 7.0 Connector & Pin Assignment..... | 20 |
| 7.1 TFT LCD Module..... | 20 |
| 7.1.1 Pin Assignment | 20 |
| 7.2 Backlight Unit..... | 21 |
| 7.2.1 Signal for Lamp connector | 21 |
| 8.0 Reliability Test | 22 |
| 9.0 Shipping Label | 23 |
| 10.0 Mechanical Characteristics..... | 24 |

Record of Revision

| Version and Date | Page | Old description | New Description | Remark | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------|--------|---|--|----------|------------|------|------|------|---------------|--------|--------------|---|---|--|--------|--------------|---|---|--|--------|-------------------|---|----|--|--------|--------------|---|---|---|--|------|------|------------|------|------|------|---------------|--------|--------------|---|----|--|--------|--------------|---|---|--|--------|-------------------|---|----|----|--------|--------------|---|---|----|----------|
| 0.1 2005/12/15 | All | First Edition for Customer | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.2 2006/3/10 | 5,6 | Response Time TBD (Typ., GTG) | Response Time 8ms (Typ., GTG) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 11 | 4.3 Absolute Ratings of Environment T=40℃,H=95% | 4.3 Absolute Ratings of Environment T=40℃, H=90% | Modified | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 17 | 6.4 Timing Characteristics Max. Frame Rate: Vsync= TBD Min. Frame Rate: Vsync= TBD | 6.4 Timing Characteristics Max. Frame Rate: Vsync= 47Hz Min. Frame Rate: Vsync= 65Hz | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.3 2006/5/2 | 5,6,7 | Response Time 12ms(Typ., on/off); Raising 7ms and Falling 5ms; Response Time 8ms (AVG., GTG); Level A - Level B ≥ 16 2.2 Optical Characteristics <table><tr><th>Item</th><th>Unit</th><th>Conditions</th><th>Min.</th><th>Typ.</th><th>Max.</th></tr><tr><td rowspan="4">Response Time</td><td>[msec]</td><td>Raising Time</td><td>-</td><td>7</td><td></td></tr><tr><td>[msec]</td><td>Falling Time</td><td>-</td><td>5</td><td></td></tr><tr><td>[msec]</td><td>Raising + Falling</td><td>-</td><td>12</td><td></td></tr><tr><td>[msec]</td><td>Gray to Gray</td><td>-</td><td>8</td><td>-</td></tr></table> | Item | Unit | Conditions | Min. | Typ. | Max. | Response Time | [msec] | Raising Time | - | 7 | | [msec] | Falling Time | - | 5 | | [msec] | Raising + Falling | - | 12 | | [msec] | Gray to Gray | - | 8 | - | Response Time 16ms (Typ., on/off); Raising 10ms and Falling 6ms ; Response Time 6ms (AVG., GTG); Level A - Level B ≥ 32 ;Max. 10ms 2.2 Optical Characteristics <table><tr><th>Item</th><th>Unit</th><th>Conditions</th><th>Min.</th><th>Typ.</th><th>Max.</th></tr><tr><td rowspan="4">Response Time</td><td>[msec]</td><td>Raising Time</td><td>-</td><td>10</td><td></td></tr><tr><td>[msec]</td><td>Falling Time</td><td>-</td><td>6</td><td></td></tr><tr><td>[msec]</td><td>Raising + Falling</td><td>-</td><td>16</td><td>20</td></tr><tr><td>[msec]</td><td>Gray to Gray</td><td>-</td><td>6</td><td>10</td></tr></table> | Item | Unit | Conditions | Min. | Typ. | Max. | Response Time | [msec] | Raising Time | - | 10 | | [msec] | Falling Time | - | 6 | | [msec] | Raising + Falling | - | 16 | 20 | [msec] | Gray to Gray | - | 6 | 10 | Modified |
| Item | Unit | Conditions | Min. | Typ. | Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Response Time | [msec] | Raising Time | - | 7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | [msec] | Falling Time | - | 5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | [msec] | Raising + Falling | - | 12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | [msec] | Gray to Gray | - | 8 | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Item | Unit | Conditions | Min. | Typ. | Max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Response Time | [msec] | Raising Time | - | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | [msec] | Falling Time | - | 6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | [msec] | Raising + Falling | - | 16 | 20 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | [msec] | Gray to Gray | - | 6 | 10 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 12 | LCD Inrush Curent TBD | LCD Inrush Curent 5 A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 14 | CCFL Frequency: Min 48KHz; Max 58KHz | CCFL Frequency: Min 40KHz ; Max 60KHz | Modified | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

1.0 Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open or modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of the CCFL reflector edge. Instead, press at the far ends of the CCFL 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, 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 CCFL in it is supplied by Limited Current Circuit (IEC60950 or UL1950). Do not connect the CCFL in Hazardous Voltage Circuit.

2.0 General Description

This specification applies to the 24.0 inch Color a-Si TFT-LCD Module M240UW01.

The display supports the WUXGA (1920(H) x 1200(V)) screen format and 16.7M colors (RGB 8-bits data).

All input signals are 2 channel LVDS interface compatible.

This module doesn't contain an inverter board for backlight.

2.1 Display Characteristics

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

| ITEMS | Unit | SPECIFICATIONS |
|---|----------------------|--|
| Screen Diagonal | [mm] | 611.32(24") |
| Active Area | [mm] | 518.4 (H) x 324 (V) |
| Pixels H x V | | 1920(x3) x 1200 |
| Pixel Pitch | [mm] | 0.270 (per one triad) x 0.270 |
| Pixel Arrangement | | R.G.B. Vertical Stripe |
| Display Mode | | Normally Black |
| White Luminance (Center) | [cd/m ²] | 500 cd/m ² @ I _L =6mA (Typ.) |
| Contrast Ratio | | 1000 : 1 (Typ.) |
| Optical Response Time | [msec] | 16ms(Typ., on/off); 6ms(AVG., GTG) |
| Nominal Input Voltage VDD | [Volt] | +5.0 V |
| Power Consumption (VDD line + CCFL line) | [Watt] | 74 W (Typ.) (without inverter) |
| Weight | [Grams] | 3250 (Max) |
| Physical Size | [mm] | 546.4(W) x 352(H) x 35.8(D) (Typ.) |
| Electrical Interface | | Even/Odd R/G/B data, clock LVDS |
| Support Color | | 16.7M colors (RGB 8-bit data) |
| Surface Treatment | | Anti-Glare, 3H |
| Temperature Range | | |
| Operating | [°C] | 0 to +50 |
| Storage (Shipping) | [°C] | -20 to +60 |
| RoHS Compliance | | RoHS Compliance |

2.2 Optical Characteristics

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

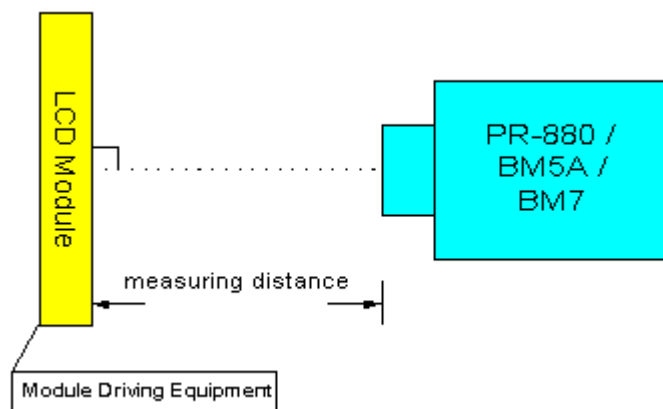
| Item | Unit | Conditions | Min. | Typ. | Max. | Note |
|--|----------------------|--------------------|-------|-------|-------|---------------|
| Viewing Angle | [degree] | Horizontal (Right) | 75 | 89 | - | |
| | [degree] | CR = 10 (Left) | 75 | 89 | - | |
| | [degree] | Vertical (Up) | 75 | 89 | - | |
| | [degree] | CR = 10 (Down) | 75 | 89 | - | |
| Contrast ratio | | Normal Direction | 700 | 1000 | - | |
| Response Time | [msec] | Raising Time | - | 10 | - | Note 1 |
| | [msec] | Falling Time | - | 6 | - | Note 1 |
| | [msec] | Raising + Falling | - | 16 | 20 | Note 1 |
| | [msec] | Gray to Gray | - | 6 | 10 | Note 2 |
| Color / Chromaticity Coordinates (CIE) | | Red x | 0.623 | 0.653 | 0.683 | |
| | | Red y | 0.307 | 0.337 | 0.367 | |
| | | Green x | 0.265 | 0.295 | 0.325 | |
| | | Green y | 0.577 | 0.607 | 0.637 | |
| | | Blue x | 0.114 | 0.144 | 0.174 | |
| | | Blue y | 0.045 | 0.075 | 0.105 | |
| Color Coordinates (CIE) White | | White x | 0.283 | 0.313 | 0.343 | |
| | | White y | 0.299 | 0.329 | 0.359 | |
| Central Luminance ($I_L=6mA$) | [cd/m ²] | | 400 | 500 | - | |
| Luminance Uniformity | [%] | | 75 | 80 | - | Note 3 |
| Crosstalk (in60Hz) | [%] | | | | 1.5 | Note 4 |
| Flicker | dB | | | | -20 | Note 5 |
| | | | | | | |

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (PR 880, BM-5A , BM 7 ,CS-1000, & EZContrast*)

Aperture 1° with 100cm VD or 2° with 50cm viewing distance

Test Point Center (VESA point 9)

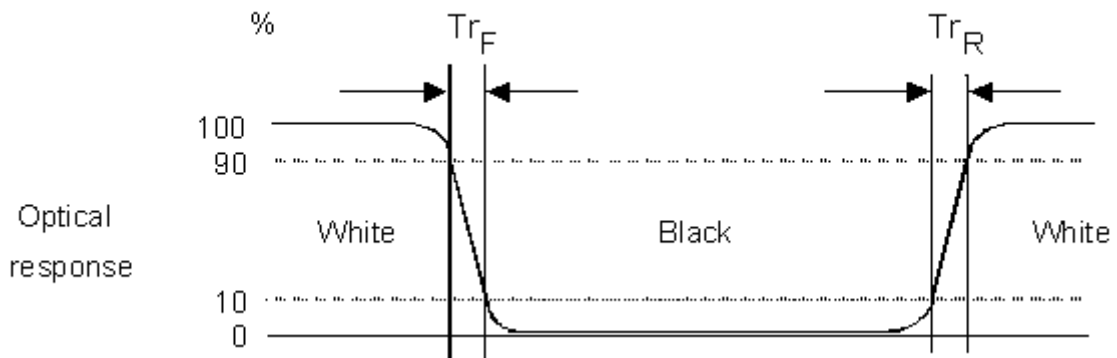
Environment < 1 lux



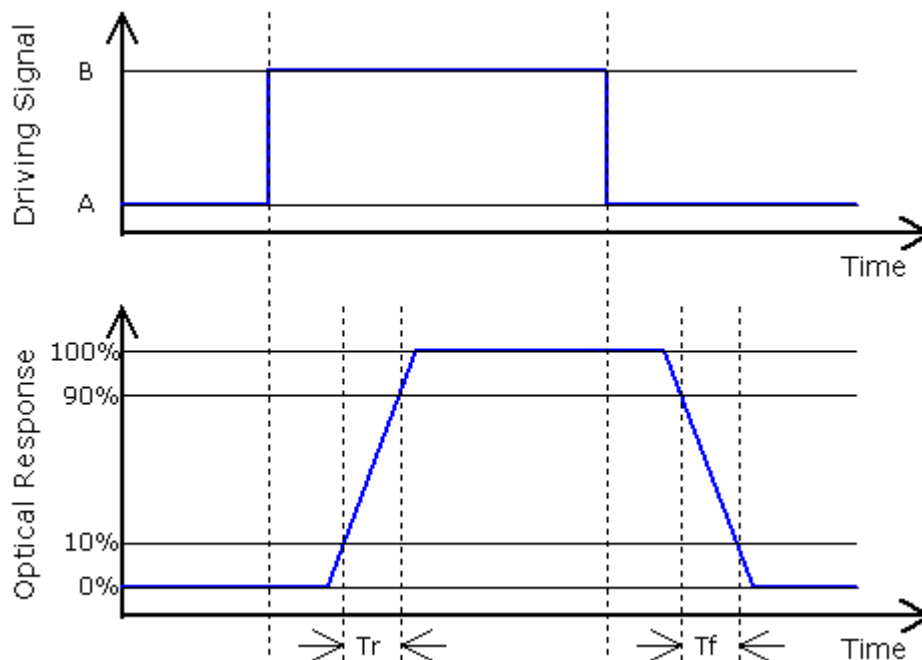
* EZ Contrast is different measurement tool with very close viewing distance.

Note 1: Definition of Response time

The output signals of photodetector are measured when the input signals are changed from “Black” to “White” (rising time), and from “White” to “Black” (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes.



Note 2: Over-Drive and Response time:

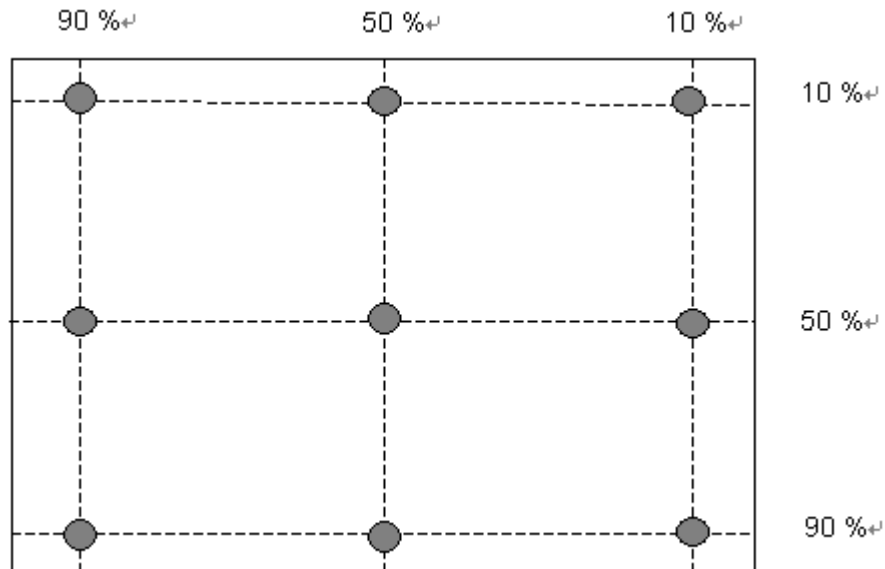


Algorithm:

| Level A - Level B | ≥ 32 then the average of Grey-to-Grey response time is 6 ms. (F = 60 Hz).

Tr (rising time; from “Black” to “White”) + Tf (Falling time; from “White” to “Black”) = 16 ms(typ).

Note 3: Luminance uniformity of these 9 points is defined as below



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

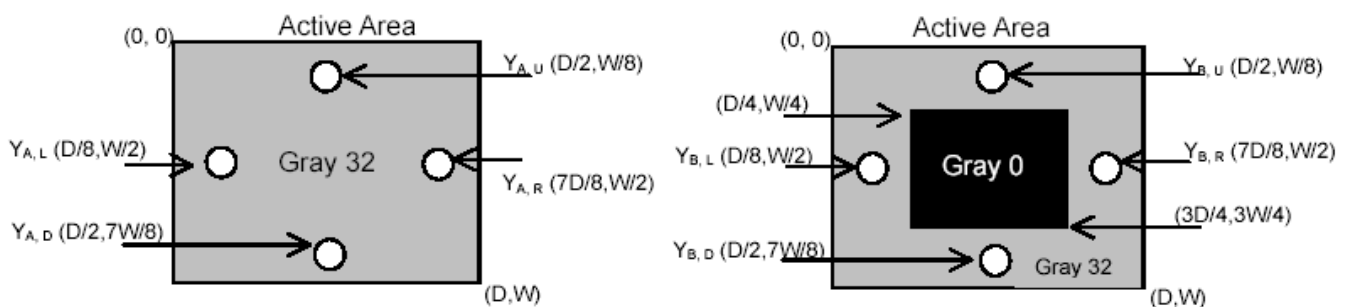
Note 4: Crosstalk is defined as below :

$$\text{CT} = |Y_B - Y_A| / Y_A \times 100 (\%)$$

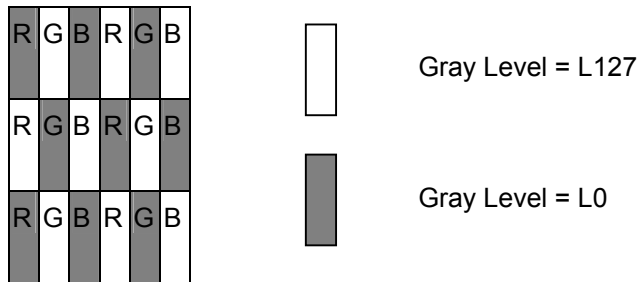
Where

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

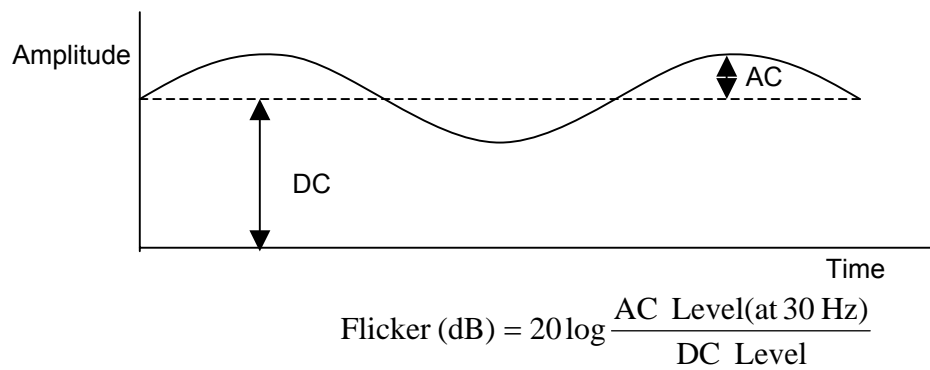
YB = Luminance of measured location with gray level 0 pattern (cd/m2)



Note 5: Test Patern: Subchecker Pattern

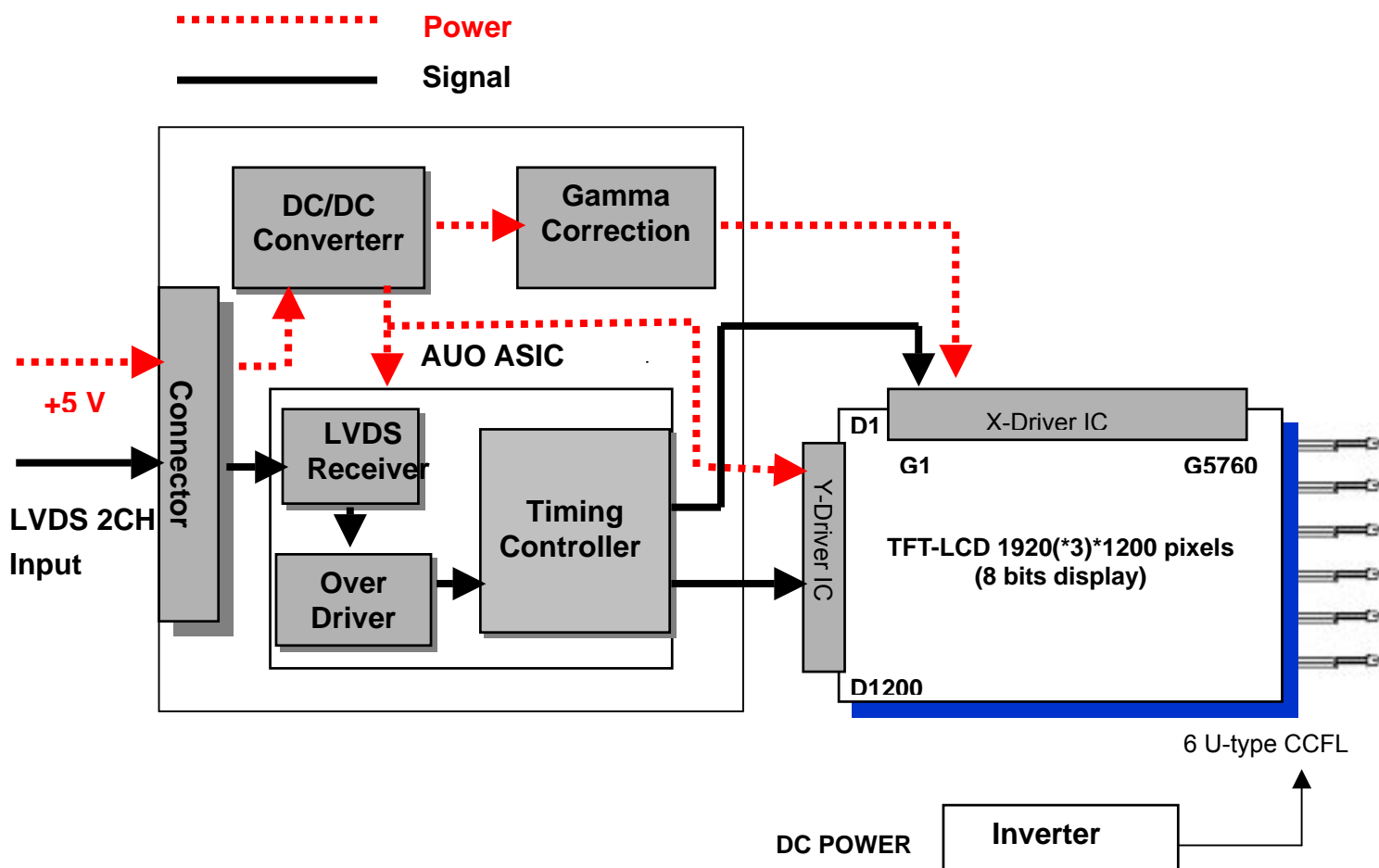


Method: Record dBV & DC value with (WESTAR)TRD-100



3.0 Functional Block Diagram

The following diagram shows the functional block of the 24.0 inch Color TFT-LCD Module:



I/F PCB Interface:

JA E FI-XB30SSL-HF15 or compatible

Mating Type:

FI-X30HL-T (Locked Type)

FI-X30S-H (Unlocked Type)

4.0 Absolute Maximum Ratings

Absolute maximum ratings of the module is as following:

4.1 TFT LCD Module

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

4.2 Backlight Unit

| Item | Symbol | Min | Max | Unit | Conditions |
|--------------|--------|-----|-----|----------|-----------------|
| CCFL Current | ICFL | 2.0 | 8.0 | [mA] rms | Note 1,2 |

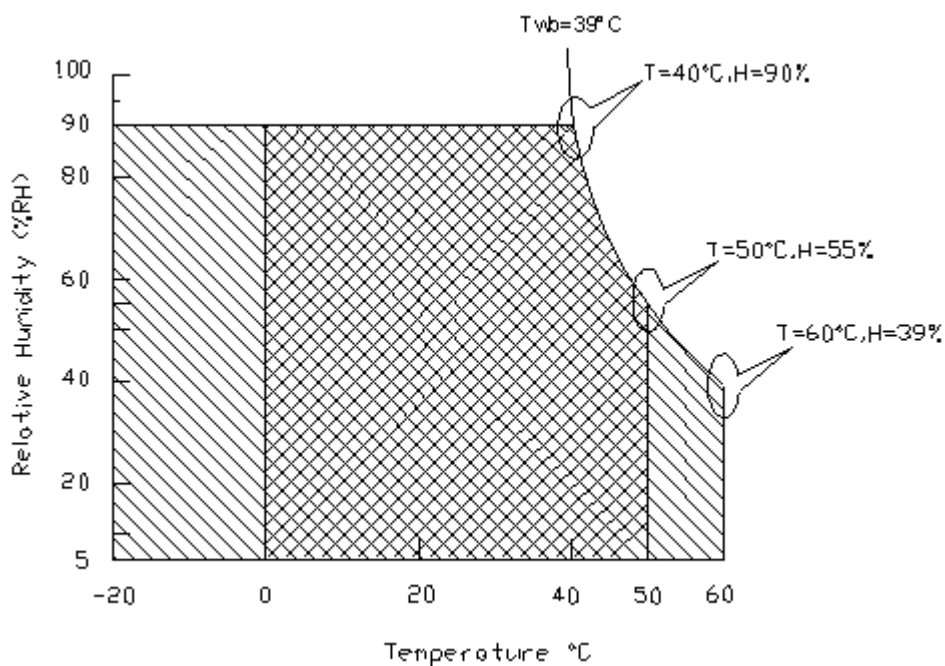
4.3 Absolute Ratings of Environment

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

Note 1: With in $T_a = 25^{\circ}\text{C}$

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

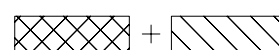
Note 3: For quality performance, please refer to AUO IIS(Incoming Inspection Standard).



Operating Range



Storage Range



5.0 Electrical characteristics

5.1 TFT LCD Module

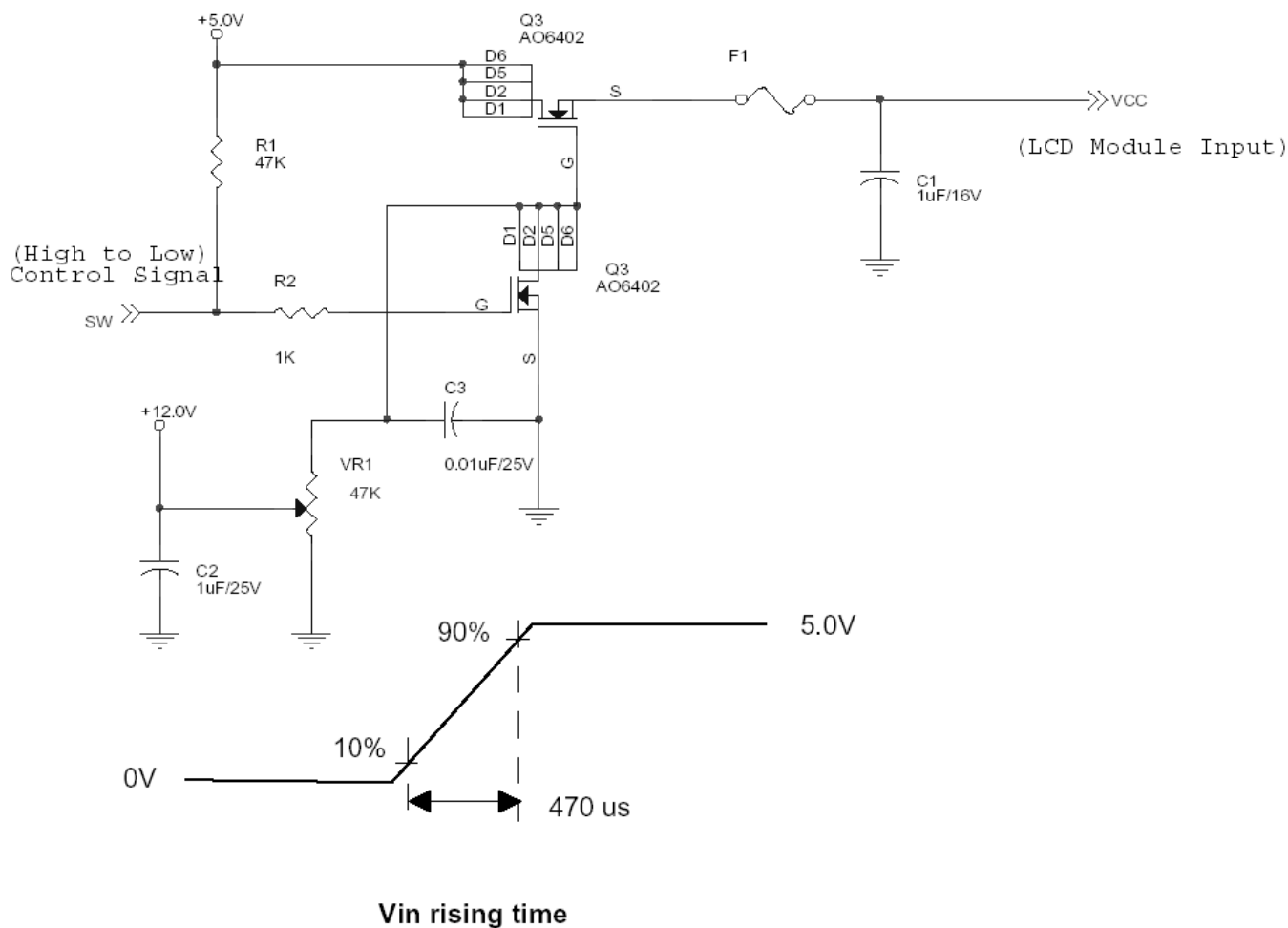
5.1.1 Power Specification

Input power specifications are as follows;

| Symbol | Parameter | Min | Typ | Max | Units | Condition |
|--------|-------------------------|-----|-----|-----|--------|--|
| VDD | Logic/LCD Drive Voltage | 4.5 | 5.0 | 5.5 | [Volt] | ± 10% |
| IDD | VDD current | - | 1.8 | 2.2 | [A] | VDD=5V , All White Pattern, at frame rate 60Hz |
| Irush | LCD Inrush Current | - | - | 5 | [A] | Note |
| PDD | VDD Power | - | 9 | 11 | [Watt] | VDD=5V , All White Pattern, at 60Hz |

Note: Measurement conditions:

The duration of rush current is about 2ms and rising time of power input is 1ms(min.).



5.1.2 Signal Electrical Characteristics

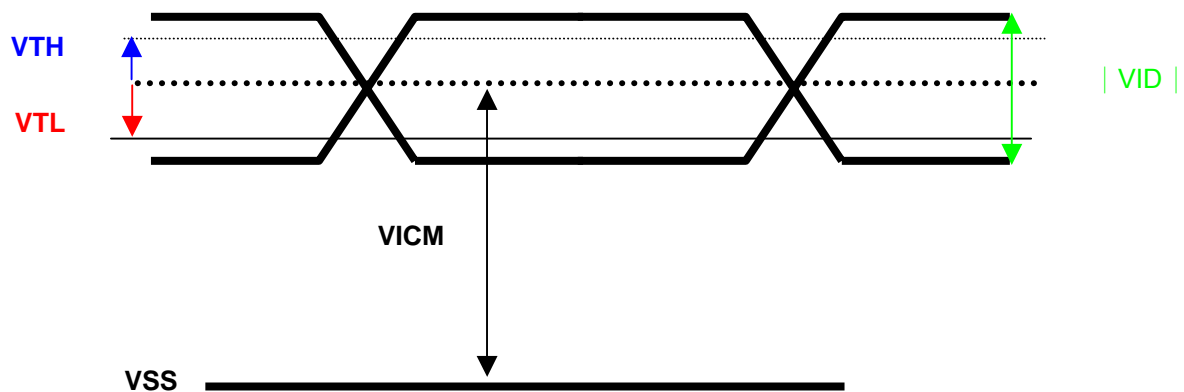
Input signals shall be low or Hi-Z state when Vin is off

It is recommended to refer the specifications of SN75LVDS82DGG (Texas Instruments) in detail.

Each signal characteristics are as follows;

| Symbol | Parameter | Min | Typ | Max | Units | Condition |
|--------|--|------|------|------|-------|--------------------------------|
| VTH | Differential Input High Threshold | - | +50 | +100 | [mV] | VICM = 1.2V Note |
| VTL | Differential Input Low Threshold | -100 | -50 | - | [mV] | VICM = 1.2V Note |
| VID | Input Differential Voltage | 100 | - | 600 | [mV] | Note |
| VICM | Differential Input Common Mode Voltage | +1.0 | +1.2 | +1.5 | [V] | VTH-VTL = 200MV Note |

Note: LVDS Signal Waveform



5.2 Backlight Unit

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

| Parameter | Min. | Typ. | Max. | Unit | Condition |
|--------------------------------------|--------|-----------------|------|------------|-----------|
| CCFL Operation Current(IRCFL) | 2.0 | 6.0 | 8.0 | [mA] rms | Note 2 |
| CCFL Frequency(FCFL) | 40 | 53 | 60 | [KHz] | Note 3,4 |
| CCFL Ignition Voltage(ViCFL, Ta=0°C) | 2850 | - | - | [Volt] rms | Note 5 |
| CCFL Ignition Voltage(ViCF, Ta=25°C) | 2280 | - | - | [Volt] rms | |
| CCFL Operation Voltage (VCFL) | - | 1800 (@ 6mA) | - | [Volt] rms | Note 6 |
| CCFL Power Consumption(PCFL) | - | 64.8 | - | [Watt] | Note 6 |
| CCFL Life Time(LTCFL) | 40,000 | 50,000 | - | [Hour] | Note 7 |

Note 1: Typ. are AUO recommended design points.

- *1 All of characteristics listed are measured under the condition using the AUO test inverter.
- *2 In case of using an inverter other than listed, it is recommended to check the inverter carefully. Sometimes, interfering noise stripes appear on the screen, and substandard luminance or flicker at low power may happen.
- *3 In designing an inverter, it is suggested to check safety circuit very carefully. Impedance of CCFL, for instance, becomes more than 1 [M ohm] when CCFL is damaged.
- *4 Generally, CCFL has some amount of delay time after applying kick-off voltage. It is recommended to keep on applying kick-off voltage for 1 [Sec] until discharge.
- *5 Reducing CCFL current increases CCFL discharge voltage and generally increases CCFL discharge frequency. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.

Note 2: CCFL standard current is measured at 25±2°C.

Note 3: CCFL discharge frequency should be carefully determined to avoid interference between inverter and TFT LCD.

Note 4: The frequency range will not affect to lamp life and reliability characteristics.

Note 5: CCFL inverter should be able to give out a power that has a generating capacity of over 2850 voltage. Lamp units need 2850 voltage minimum for ignition.

Note 6: The variance of CCFL power consumption is ±10%. Calculator value for reference (IRCFL × VCFL × 6 = PCFL)

Note 7: Definition of life: brightness becomes 50% or less than the minimum luminance value of CCFL. The typical life time of CCFL is on the condition at 6 mA lamp current.

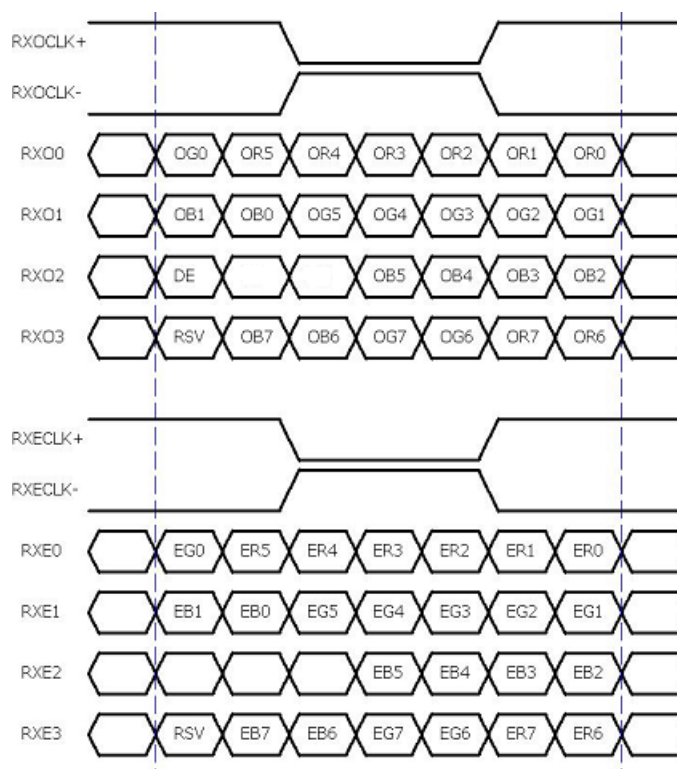
6.0 Signal Characteristic

6.1 Pixel Format Image

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

| | 1 | | | | | | | | | | | | | | | | 1919 | | | | | | 1920 | | | | | |
|-----------|---|---|---|---|---|---|-----------|--|--|--|--|--|--|--|--|--|------|---|---|---|---|---|------|---|---|---|---|---|
| 1st Line | R | G | B | R | G | B | · · · · · | | | | | | | | | | R | G | B | R | G | B | R | G | B | R | G | B |
| | - | | | - | | | · | | | | | | | | | | - | | | - | | | - | | | - | | |
| | · | | | · | | | · | | | | | | | | | | · | | | · | | | · | | | · | | |
| | · | | | · | | | · | | | | | | | | | | · | | | · | | | · | | | · | | |
| | · | | | · | | | · | | | | | | | | | | · | | | · | | | · | | | · | | |
| | · | | | · | | | · | | | | | | | | | | · | | | · | | | · | | | · | | |
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| | · | | | · | | | · | | | | | | | | | | · | | | · | | | · | | | · | | |
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| | · | | | · | | | · | | | | | | | | | | · | | | · | | | · | | | · | | |
| 1200 Line | R | G | B | R | G | B | · · · · · | | | | | | | | | | R | G | B | R | G | B | R | G | B | R | G | B |

6.2 The input data format



Note 1: R/G/B data 7:MSB, R/G/B data 0:LSB

O = "First Pixel Data"

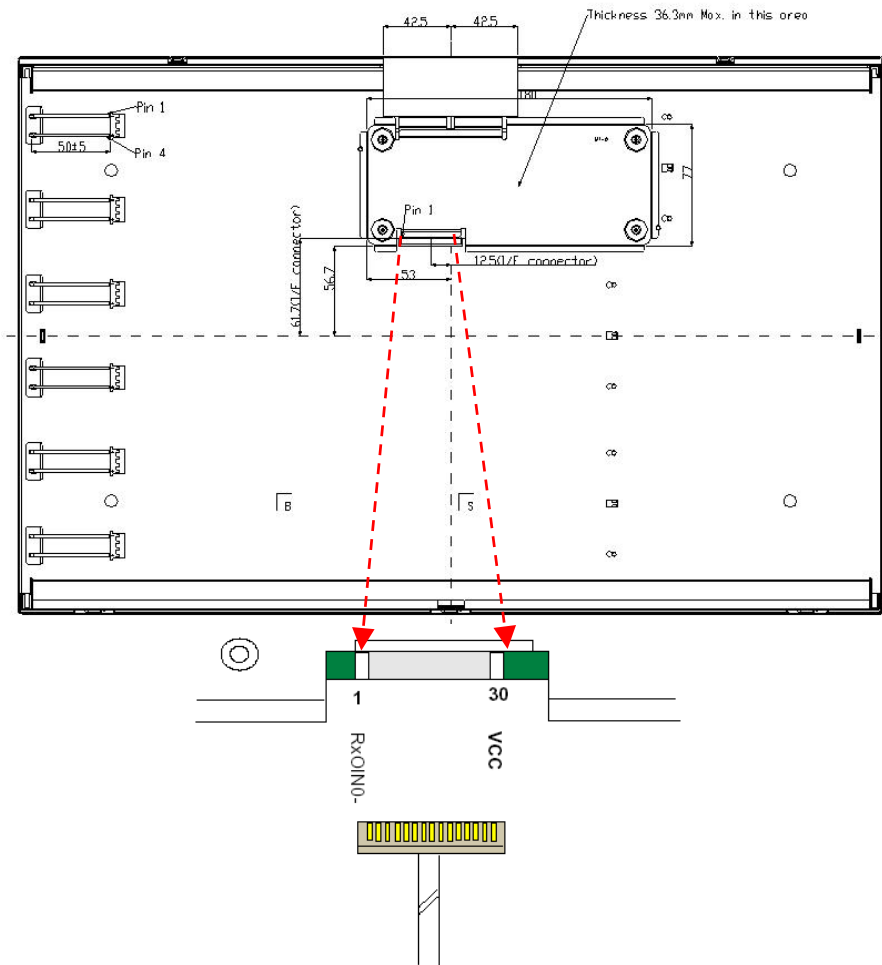
E = "Second Pixel Data"

6.3 Signal Description

The module using one 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.

| 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 | RxOCLK- | Negative LVDS differential clock input (Odd clock) |
| 9 | RxOCLK+ | 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 | RxECLK- | Negative LVDS differential clock input (Even clock) |
| 21 | RxECLK+ | 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 | NC | No connection |
| 26 | NC | No connection |
| 27 | VDD | Power +5V |
| 28 | VDD | Power +5V |
| 29 | VDD | Power +5V |
| 30 | VDD | Power +5V |

Note1: Start from left side



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

6.4 Timing Characteristics

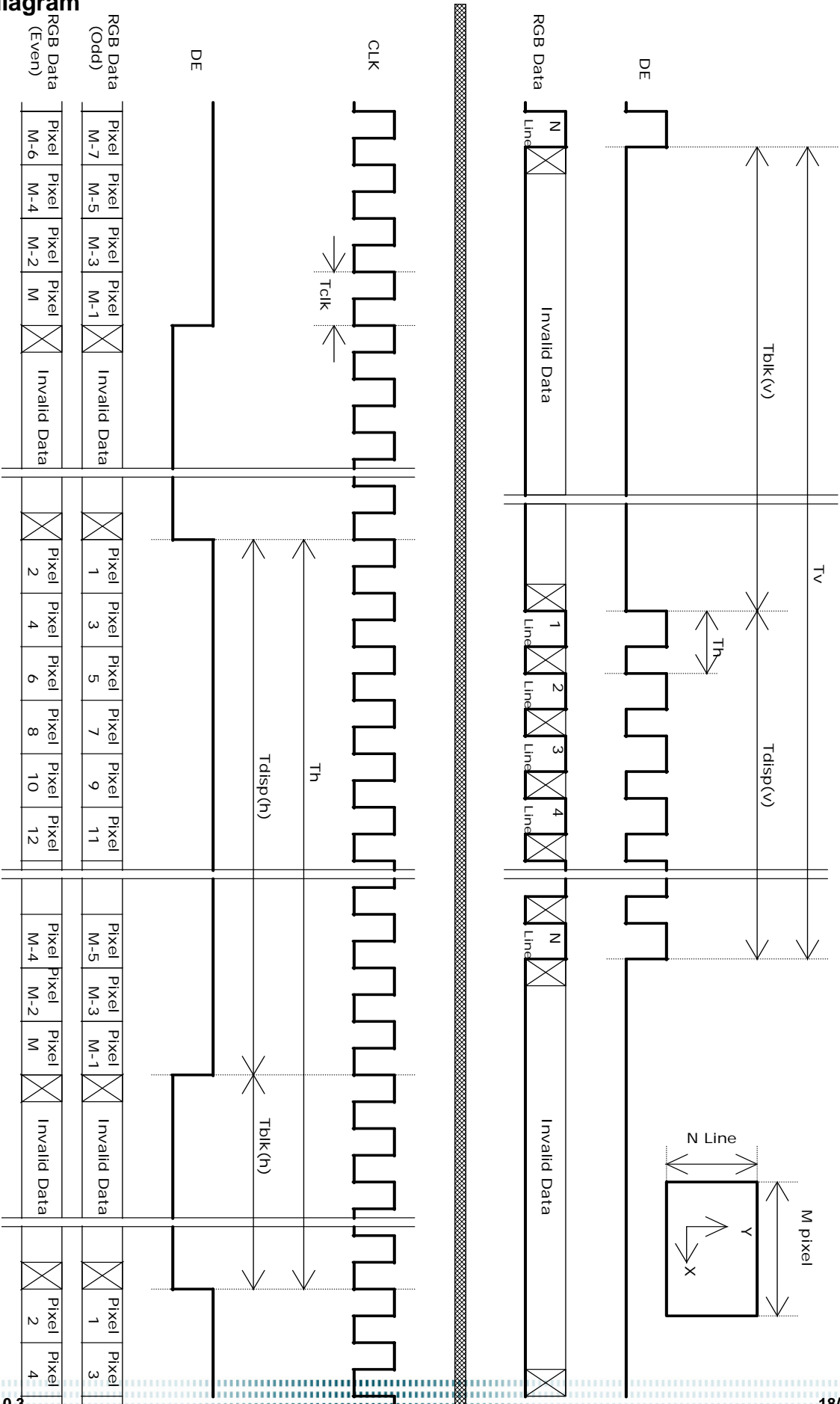
Basically, interface timings described here is not actual input timing of LCD module but output timing of SN75LVDS82DGG (Texas Instruments) or equivalent.

Note: Typical value refer to VESA STANDARD

| Signal | Item | Symbol | Min | Typ | Max | Unit |
|--------------------|-----------|----------|-------|------|------|------|
| Vertical Section | Period | Tv | 1211 | 1212 | 2048 | Th |
| | Active | Tdisp(v) | 1200 | 1200 | 1200 | Th |
| | Blanking | Tblk(v) | 11 | 12 | - | Th |
| Horizontal Section | Period | Th | 1040 | 1072 | 2048 | Tclk |
| | Active | Tdisp(h) | 960 | 960 | 960 | Tclk |
| | Blanking | Tblk(h) | 80 | 112 | - | Tclk |
| Clock | Period | Tclk | 11.76 | - | - | ns |
| | Frequency | Freq | - | - | 85 | MHz |
| Frame Rate | Frequency | Vsync | 47 | 60 | 65 | Hz |

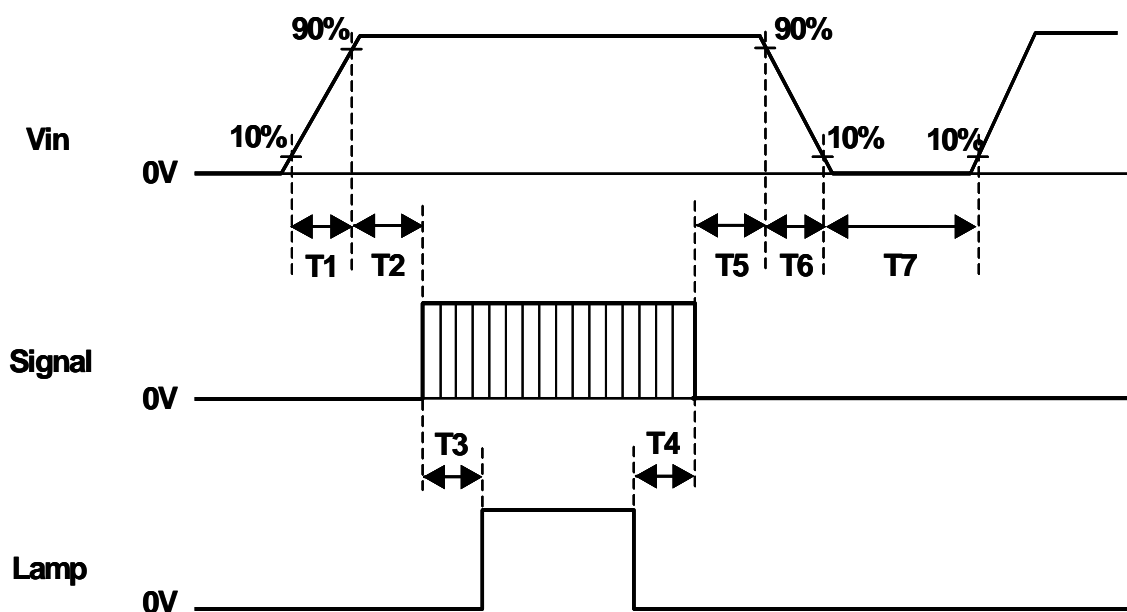
Note : DE mode only

6.5 Timing diagram



6.6 Power ON/OFF Sequence

Vin power and lamp on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when Vin is off.



| Symbol | Values | | | Unit |
|--------|--------|-----|-----|------|
| | Min | Typ | Max | |
| T1 | 0.3 | - | 10 | [ms] |
| T2 | 0.5 | 40 | 50 | [ms] |
| T3 | 300 | - | - | [ms] |
| T4 | 300 | - | - | [ms] |
| T5 | 0.5 | 16 | 50 | [ms] |
| T6 | 0.5 | - | 60 | [ms] |
| T7 | 1000 | - | - | [ms] |

7.0 Connector & Pin Assignment

Physical interface is described as for the connector on module.

These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module

| Connector Name / Designation | Interface Connector / Interface card |
|------------------------------|--------------------------------------|
| Manufacturer | JAE or compatible |
| Type Part Number | FI-XB30SSL-HF15 |
| Mating Housing Part Number | FI-X30HL-T (Locked Type) |
| | FI-X30S-H (Unlocked Type) |

7.1.1 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 | NV | 26 | NC |
| 27 | VDD | 28 | VDD |
| 29 | VDD | 30 | VDD |

7.2 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.

| Connector Name / Designation | Lamp Connector / Backlight lamp |
|------------------------------|---------------------------------|
| Manufacturer | JST |
| Type Part Number | BHR-04VS-1 |
| Mating Type Part Number | SM02(12)B-BH |

7.2.1 Signal for Lamp connector

| Connector | Pin No. | Input | Color | Function |
|-----------|---------|-------|-------|--------------|
| CN1 | 1 | Hot | Pink | High Voltage |
| | 4 | Hot | White | High Voltage |
| CN2 | 1 | Hot | Pink | High Voltage |
| | 4 | Hot | White | High Voltage |
| CN3 | 1 | Hot | Pink | High Voltage |
| | 4 | Hot | White | High Voltage |
| CN4 | 1 | Hot | Pink | High Voltage |
| | 4 | Hot | White | High Voltage |
| CN5 | 1 | Hot | Pink | High Voltage |
| | 4 | Hot | White | High Voltage |
| CN6 | 1 | Hot | Pink | High Voltage |
| | 4 | Hot | White | High Voltage |

8.0 Reliability Test

Environment test conditions are listed as following table.

| Items | Required Condition | Note |
|----------------------------------|---|------|
| Temperature Humidity Bias (THB) | Ta= 50℃ , 80%RH, 300hours | |
| High Temperature Operation (HTO) | Ta= 50℃ , 50%RH, 300hours | |
| Low Temperature Operation (LTO) | Ta= 0℃ , 300hours | |
| High Temperature Storage (HTS) | Ta= 60℃ , 300hours | |
| Low Temperature Storage (LTS) | Ta= -20℃ , 300hours | |
| Vibration Test (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℃/30min, 60℃/30min, 100 cycles | 1 |
| On/Off Test | On/10sec, Off/10sec, 30,000 cycles | |
| ESD (ElectroStatic Discharge) | Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point. | 2 |
| | Air Discharge: ± 15KV, 150pF(330Ω) 1sec 8 points, 25 times/ point. | |
| Altitude Test | Operation:10,000 ft Non-Operation:30,000 ft | |

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

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

9.0 Shipping Label

The label is on the panel as shown below:



10.0 Mechanical Characteristics

