# TFT LCD Approval Specification

# MODEL NO.: M170E6 -L02

Customer :_____

Approved by : _____

Note :

| Liquid Crystal Display Division | | |
|---|---|---|
| QRA Dept. | TDD I Dept. | PDD I Dept. |
| Approval | Approval | Approval |
| 林 92.3.14 敏芳 代 | 李汪洋 92.3.13 | 林 92.3.13 添仁 |

- CONTENTS -

## REVISION HISTORY

| Version | Date | Section | Description |
|---|---|---|---|
| Ver 0.0 | Nov., 20 '02 | - | M170E6-L02 Specifications was first issued. |
| Ver 1.0 | Jan., 14 '03 | 1.5 | Weight：TBD(Max.)→1950(Max.) |
| | | 3.1 | Power Supply Current→ |
| | | | White：1100(Typ.)/1450(Max.)→1030(Typ.)/1350(Max.) |
| | | | Black：570(Typ.)/800(Max.)→520(Typ.)/700(Max.) |
| | | | Vertical Stripe：950(Typ.)/1300(Max.)→930(Typ.)/1250(Max.) |
| | | 3.2 | Lamp Input Voltage： |
| | | | (616)(Min.)/(685)(Typ.)/(754)(Max.)→ 585(Min.)/650(Typ.)/715(Max.) |
| | | | Lamp Turn On Voltage ： (1056)(25℃)/(1674)(0℃)→ 1290(25℃)/1500(0℃) |
| | | | Power Consumption：(17.8)(Typ.)→16.9(Typ.) |
| | | | Modify Note (1) Lamp Drawing |
| | | 5.1 | Connector Part No.: FI-XB30SRL-HF11 (JAE) or Equivalent |
| | | 7.2 | White Variation：(1.18)(Typ.)/(1.25)(Max.)→1.25(Typ.)/1.40(Max.) |
| | | | Color Chromaticity → |
| | | | Red：Rx (0.643)(Typ.)/Ry (0.357)(Typ.)→ Rx 0.641(Typ.)/Ry 0.355(Typ.) |
| | | | Green：Gx (0.287)(Typ.)/Gy (0.598)(Typ.)→ Gx 0.285(Typ.)/Gy 0.597(Typ.) |
| | | | Blue：Bx (0.139)(Typ.)/By (0.067)(Typ.)→ Bx 0.142(Typ.)/By 0.071(Typ.) |
| | | | Color Chromaticity Red/Green/Blue (Min.)→Typ - 0.03 |
| | | | Color Chromaticity Red/Green/Blue (Max.)→Typ + 0.03 |
| Ver 2.0 | Mar., 12 '03 | 3.2 | Operating Frequency：45(Min.)/50(Typ.)→40(Min.)/55(Typ.) |
| | | 6.1 | Horizontal Active Display Term：144(Min.)→40(Min.) |

# 1. GENERAL DESCRIPTION

## 1.1 OVERVIEW

The M170E6-L02 model is a 17.0" TFT-LCD module with a 4-CCFL Backlight Unit and a 30-pin 2ch-LVDS interface. This module supports 1280 x 1024 SXGA mode and displays 16.7M colors. The inverter module for the Backlight Unit is not built in.

## 1.2 FEATURES

- Wide viewing angle
- High contrast ratio
- Fast response time
- High color saturation (EBU Like Specifications)
- SXGA (1280 x 1024 pixels) resolution
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface

## 1.3 APPLICATION

- TFT LCD Monitor

## 1.4 GENERAL SPECIFICATIONS

| Item | Specification | Unit | Note |
|---|---|---|---|
| Active Area | 337.92 (H) x 270.34 (V) (17.0" diagonal) | mm | (1) |
| Bezel Opening Area | 341.9 (H) x 274.4 (V) | mm | |
| Driver Element | a-Si TFT active matrix | - | - |
| Pixel Number | 1280 x R.G.B. x 1024 | pixel | - |
| Pixel Pitch | 0.264 (H) x 0.264 (V) | mm | - |
| Pixel Arrangement | RGB vertical stripe | - | - |
| Display Colors | 16.7M | color | - |
| Transmissive Mode | Normally black | - | - |
| Surface Treatment | Hard coating (3H), Anti-glare (Haze 25) | - | - |

## 1.5 MECHANICAL SPECIFICATIONS

| Item | | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Module Size | Horizontal(H) | 358.0 | 358.5 | 359.0 | mm | (1) |
| | Vertical(V) | 296.0 | 296.5 | 297.0 | mm | |
| | Depth(D) | - | 17.0 | 17.5 | mm | |
| Weight | | - | - | 1950 | g | - |

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

## 2. ABSOLUTE MAXIMUM RATINGS

### 2.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Storage Temperature | $T_{ST}$ | (-20) | (+60) | ºC | (1) |
| Operating Ambient Temperature | $T_{OP}$ | 0 | (+50) | ºC | (1), (2) |
| Shock (Non-Operating) | $S_{NOP}$ | - | 50 | G | (3), (5) |
| Vibration (Non-Operating) | $V_{NOP}$ | - | 1.5 | G | (4), (5) |

Note (1) Temperature and relative humidity ranges are shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

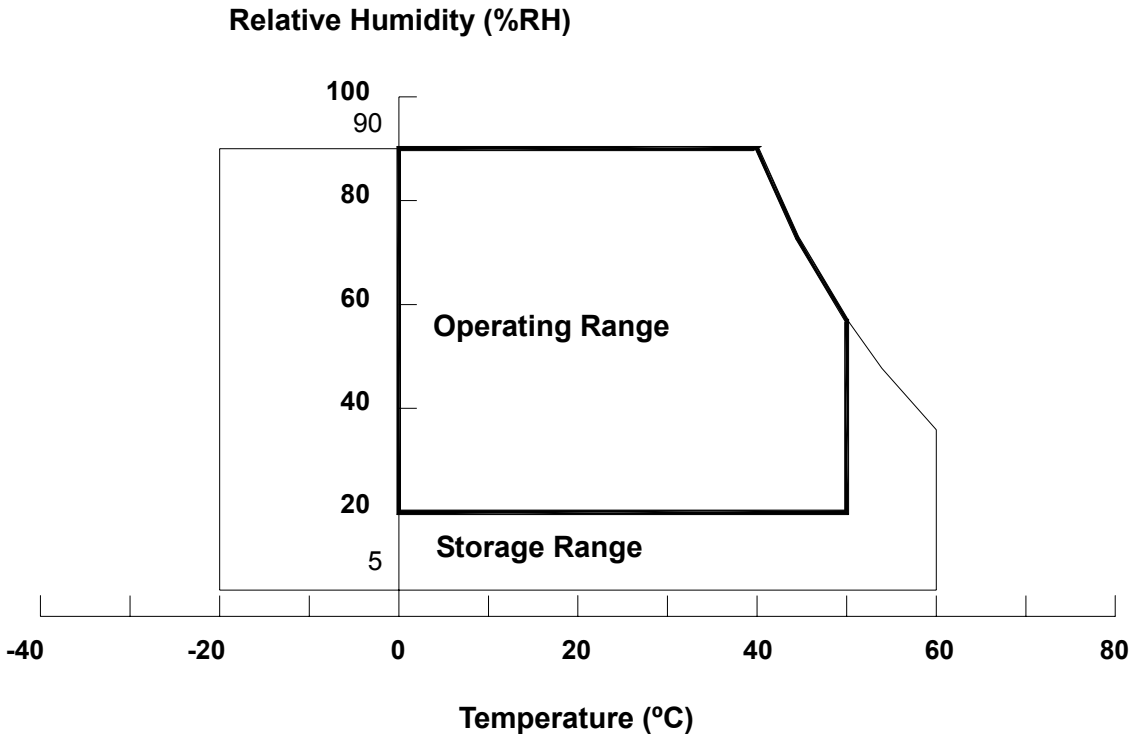
(c) No condensation.

Note (2) The temperature of panel surface should be 0 ºC Min. and 60 ºC Max.

Note (3) 11ms, half-sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 300 Hz, sweep rate 10 min, 30 min for X, Y, Z. axis

Note (5) Upon the Vibration and Shock tests, the fixture used to hold the module must be firm and rigid enough to prevent the module from twisting or bending by the fixture.



## 2.2 ELECTRICAL ABSOLUTE RATINGS

### 2.2.1 TFT LCD MODULE

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power Supply Voltage | Vcc | -0.3 | +6.0 | V | (1) |
| Logic Input Voltage | $V_{IN}$ | -0.3 | 4.3 | V | |

### 2.2.2 BACKLIGHT UNIT

| Item | Symbol | Value | | Unit | Note |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Lamp Voltage | $V_L$ | - | 2.5K | $V_{RMS}$ | (1), (2), $I_L$ = 6.5 mA |
| Lamp Current | $I_L$ | - | 7.0 | $mA_{RMS}$ | (1), (2) |
| Lamp Frequency | $F_L$ | - | 80 | KHz | |

Note (1) Permanent damage might occur if the module is operated at conditions exceeding the maximum values.

Note (2) Specified values are for lamps (Refer to 3.2 for further information).

## 3. ELECTRICAL CHARACTERISTICS

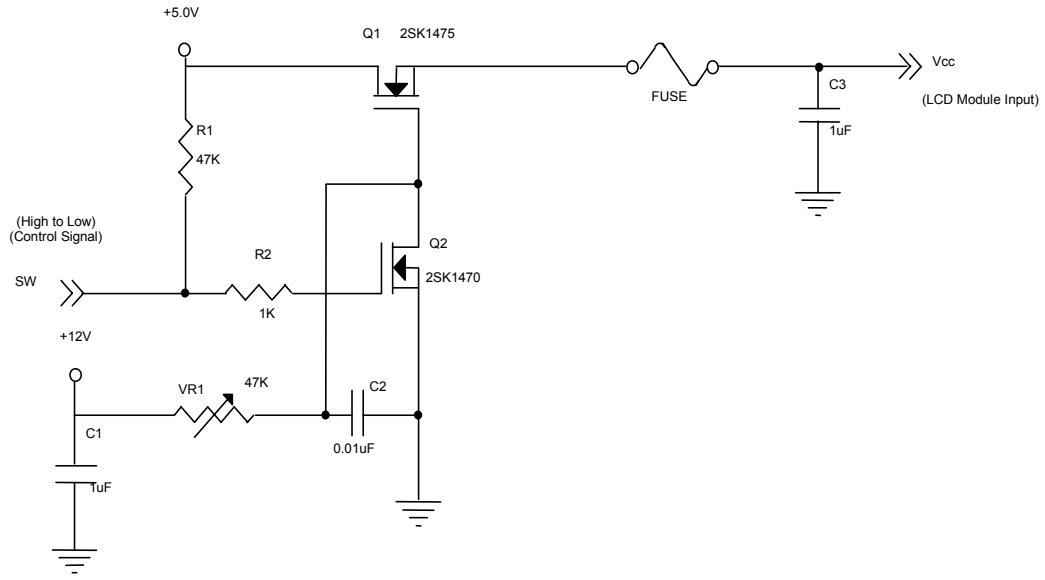
### 3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

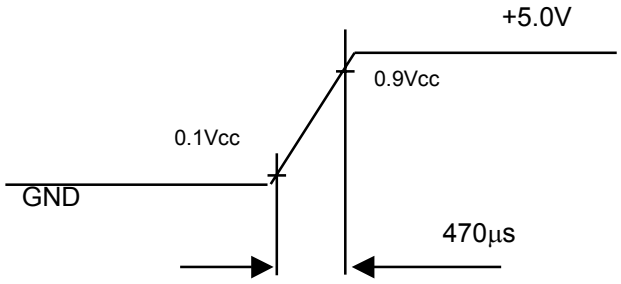
| Parameter | | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | | |
| Power Supply Voltage | | Vcc | 4.5 | 5.0 | 5.5 | V | - |
| Ripple Voltage | | $V_{RP}$ | - | - | 100 | mV | - |
| Rush Current | | $I_{RUSH}$ | - | - | 3.8 | A | (2) |
| Power Supply Current | White | Icc | - | 1030 | 1350 | mA | (3)a |
| | Black | | - | 520 | 700 | mA | (3)b |
| | Vertical Stripe | | - | 930 | 1250 | mA | (3)c |
| LVDS differential input voltage | | Vid | 100 | - | +100 | mV | |
| LVDS common input voltage | | Vic | - | 1.2 | - | V | |
| Logic “L” input voltage (SELLVDS) | | Vil | Vss | - | 0.8 | V | |

Note (1) The module is recommended to operate within specification ranges listed above for normal function.

Note (2) Measurement Conditions:




**Vcc rising time is 470μs**



Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 ºC, $f_v$ = 60 Hz, whereas a power dissipation check pattern below is displayed.

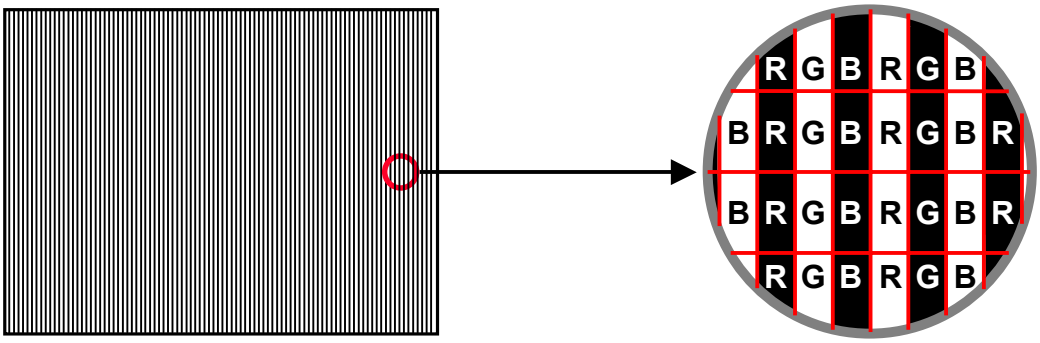
a. White Pattern

Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern

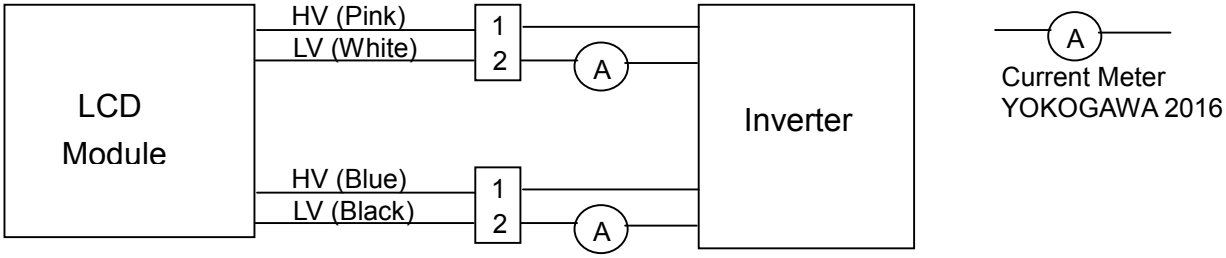



Active Area

### 3.2 BACKLIGHT UNIT

| Parameter | Symbol | Value | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Lamp Input Voltage | $V_L$ | 585 | 650 | 715 | $V_{RMS}$ | $I_L$ = 6.5 mA |
| Lamp Current | $I_L$ | 2.0 | 6.5 | 7.0 | $mA_{RMS}$ | (1) |
| Lamp Turn On Voltage | $V_S$ | - | - | 1290 (25 °C) | $V_{RMS}$ | (2) |
| | | - | - | 1500(0 °C) | $V_{RMS}$ | (2) |
| Operating Frequency | $F_L$ | 40 | 55 | 80 | KHz | (3) |
| Lamp Life Time | $L_{BL}$ | 50,000 | - | - | Hrs | (5) |
| Power Consumption | $P_L$ | - | 16.9 | - | W | (4), $I_L$ = 6.5 mA |

Note (1) Lamp current is measured by utilizing high-frequency current meters as shown below:



Note (2) The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise, the lamp may not be turned on normally.

Note (3) The lamp frequency may produce interference with horizontal synchronization frequency from the display, which might cause line flow on the display. In order to avoid interference, the lamp frequency should be detached from the horizontal synchronization frequency and its harmonics as far as possible.

Note (4) $P_L = I_L \times V_L$

Note (5) The lifetime of lamp can be defined as the time in which it continues to operate under the condition of Ta = 25 $\pm 2\ ^{o}C$ and $I_L$ = (2.0) ~ (6.5) mArms until one of the following events occurs:

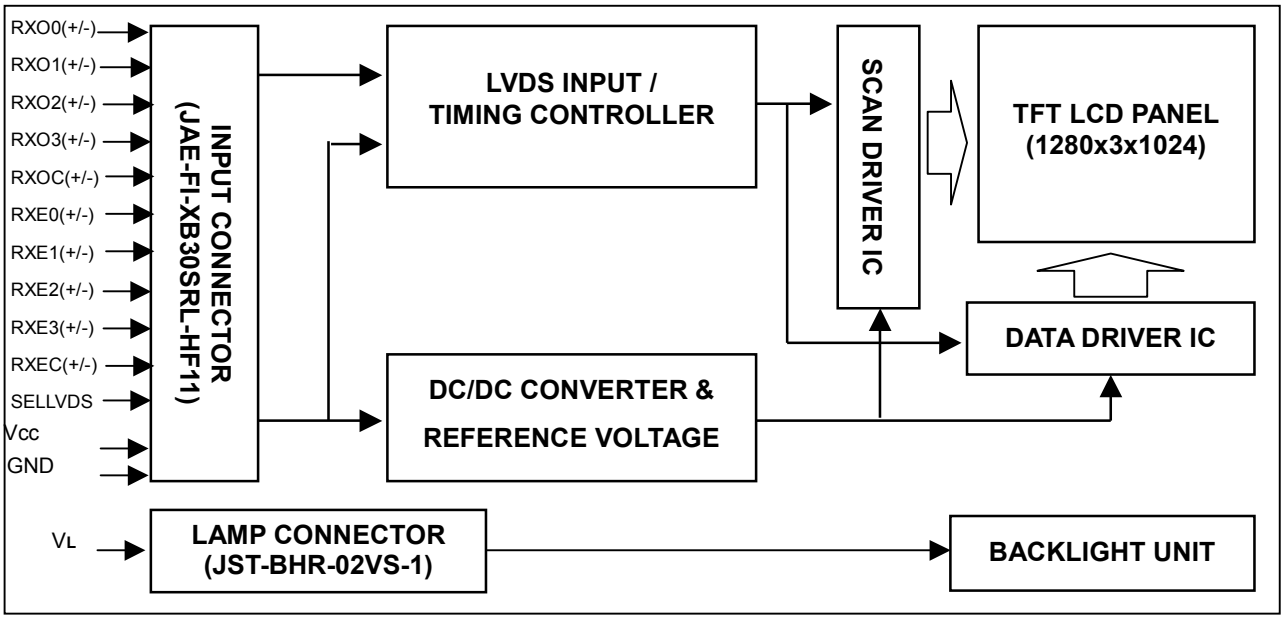
(a) When the brightness becomes lower than 50% of its original value.

(b) When the effective ignition length becomes lower than 80% of its original value. (Effective ignition length is defined as an area that has more than 70% of brightness compared to the brightness in the center point.)

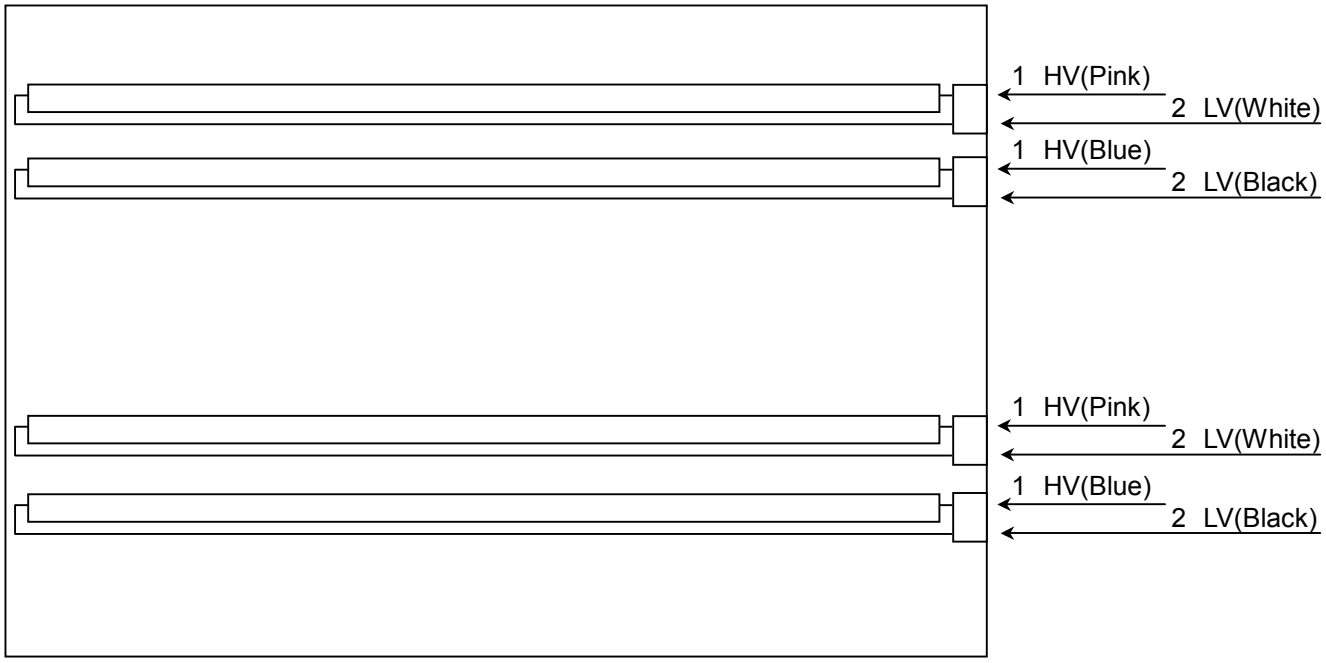
Note (6) The waveform of the voltage output of inverter must be area-symmetric and the design of the inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be designed carefully to avoid producing too much current leakage from high voltage output of the inverter. When designing or ordering the inverter, please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should operate in the same manner when it is installed to your instrument.

# 4. BLOCK DIAGRAM

## 4.1 TFT LCD MODULE




## 4.2 BACKLIGHT UNIT



## 5. INPUT TERMINAL PIN ASSIGNMENT

### 5.1 TFT LCD MODULE

| Pin | Name | Description |
|---|---|---|
| 1 | RXE0- | Negative LVDS differential data input. Channel E0 (even) |
| 2 | RXE0+ | Positive LVDS differential data input. Channel E0 (even) |
| 3 | RXE1- | Negative LVDS differential data input. Channel E1 (even) |
| 4 | RXE1+ | Positive LVDS differential data input. Channel E1 (even) |
| 5 | RXE2- | Negative LVDS differential data input. Channel E2 (even) |
| 6 | RXE2+ | Positive LVDS differential data input. Channel E2 (even) |
| 7 | GND | Ground |
| 8 | RXEC- | Negative LVDS differential clock input. (even) |
| 9 | RXEC+ | Positive LVDS differential clock input. (even) |
| 10 | RXE3- | Negative LVDS differential data input. Channel E3(even) |
| 11 | RXE3+ | Positive LVDS differential data input. Channel E3 (even) |
| 12 | RXO0- | Negative LVDS differential data input. Channel O0 (odd) |
| 13 | RXO0+ | Positive LVDS differential data input. Channel O0 (odd) |
| 14 | GND | Ground |
| 15 | RXO1- | Negative LVDS differential data input. Channel O1 (odd) |
| 16 | RXO1+ | Positive LVDS differential data input. Channel O1 (odd) |
| 17 | GND | Ground |
| 18 | RXO2- | Negative LVDS differential data input. Channel O2 (odd) |
| 19 | RXO2+ | Positive LVDS differential data input. Channel O2 (odd) |
| 20 | RXOC- | Negative LVDS differential clock input. (odd) |
| 21 | RXOC+ | Positive LVDS differential clock input. (odd) |
| 22 | RXO3- | Negative LVDS differential data input. Channel O3 (odd) |
| 23 | RXO3+ | Positive LVDS differential data input. Channel O3 (odd) |
| 24 | GND | Ground |
| 25 | TEST | Test pin should be tied to ground or open. |
| 26 | NC | Not connection. |
| 27 | SELLVDS | SELLVDS pin should be tied to ground or open. |
| 28 | VCC | +5.0V power supply |
| 29 | VCC | +5.0V power supply |
| 30 | VCC | +5.0V power supply |

Note (1) Connector Part No.: FI-XB30SRL-HF11 (JAE) or Equivalent

Note (2) The first pixel is EVEN.

Note (3) Input signal of even and odd clock should be the same timing.

| SELLVDS = Low or Open | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| LVDS Channel E0 | LVDS output | D7 | D6 | D4 | D3 | D2 | D1 | D0 |
| | Data order | EG0 | ER5 | ER4 | ER3 | ER2 | ER1 | ER0 |
| LVDS Channel E1 | LVDS output | D18 | D15 | D14 | D13 | D12 | D9 | D8 |
| | Data order | EB1 | EB0 | EG5 | EG4 | EG3 | EG2 | EG1 |
| LVDS Channel E2 | LVDS output | D26 | D25 | D24 | D22 | D21 | D20 | D19 |
| | Data order | DE | NA | NA | EB5 | EB4 | EB3 | EB2 |
| LVDS Channel E3 | LVDS output | D23 | D17 | D16 | D11 | D10 | D5 | D27 |
| | Data order | NA | EB7 | EB6 | EG7 | EG6 | ER7 | ER6 |
| LVDS Channel O0 | LVDS output | D7 | D6 | D4 | D3 | D2 | D1 | D0 |
| | Data order | OG0 | OR5 | OR4 | OR3 | OR2 | OR1 | OR0 |
| LVDS Channel O1 | LVDS output | D18 | D15 | D14 | D13 | D12 | D9 | D8 |
| | Data order | OB1 | OB0 | OG5 | OG4 | OG3 | OG2 | OG1 |
| LVDS Channel O2 | LVDS output | D26 | D25 | D24 | D22 | D21 | D20 | D19 |
| | Data order | DE | NA | NA | OB5 | OB4 | OB3 | OB2 |
| LVDS Channel O3 | LVDS output | D23 | D17 | D16 | D11 | D10 | D5 | D27 |
| | Data order | NA | OB7 | OB6 | OG7 | OG6 | OR7 | OR6 |

## 5.2 BACKLIGHT UNIT

CONN. 1

| Pin | Symbol | Description | Remark |
|---|---|---|---|
| 1 | HV1 | High Voltage | Pink |
| 2 | LV | Ground | White |

CONN. 2

| Pin | Symbol | Description | Remark |
|---|---|---|---|
| 1 | HV1 | High Voltage | BLUE |
| 2 | LV | Ground | Black |

Note (1) Connector Part No.: BHR-02VS-1 (JST) or equivalent

Note (2) User's connector Part No.: SM02B-BHSS-1-TB (JST) or equivalent

### 5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

| Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red | | | | | | | | Green | | | | | | | | Blue | | | | | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale Of Red | Red(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(2) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(253) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(254) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Green | Green(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Blue | Blue(0) / Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Note (1) 0: Low Level Voltage, 1: High Level Voltage

## 6. INTERFACE TIMING

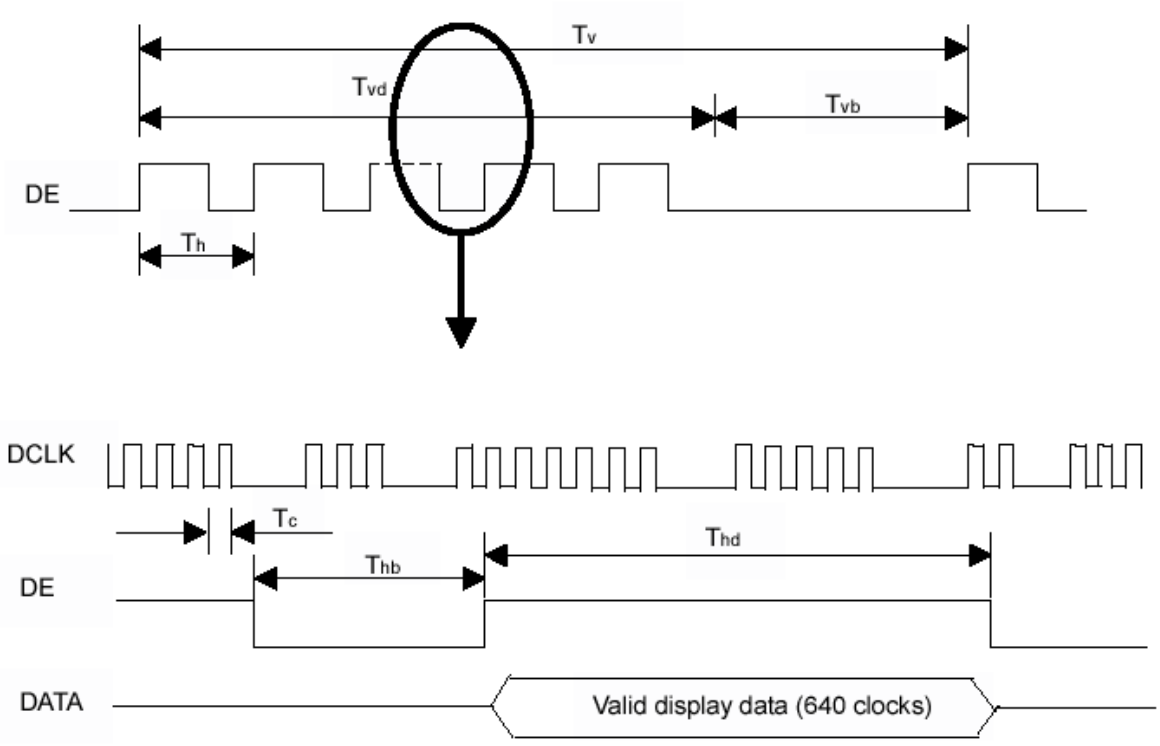
### 6.1 INPUT SIGNAL TIMING SPECIFICATIONS

The input signal timing specifications are shown in the following table and timing diagram.

| Signal | Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| LVDS Clock | Frequency | Fc | - | 54 | 67.5 | MHz | - |
| | Period | Tc | 14.8 | 18.5 | - | ns | |
| | High Time | Tch | - | 4/7 | - | Tc | - |
| | Low Time | Tcl | - | 3/7 | - | Tc | - |
| LVDS Data | Setup Time | Tlvs | 600 | - | - | ps | - |
| | Hold Time | Tlvh | 600 | - | - | ps | - |
| Vertical Active Display Term | Frame Rate | Fr | 56 | 60 | 75 | Hz | Tv=Tvd+Tvb |
| | Total | Tv | 1034 | 1066 | 1100 | Th | - |
| | Display | Tvd | 1024 | 1024 | 1024 | Th | - |
| | Blank | Tvb | 10 | 42 | Tv-Tvd | Th | - |
| Horizontal Active Display Term | Total | Th | 680 | 844 | 960 | Tc | Th=Thd+Thb |
| | Display | Thd | 640 | 640 | 640 | Tc | - |
| | Blank | Thb | 40 | 204 | Th-Thd | Tc | - |

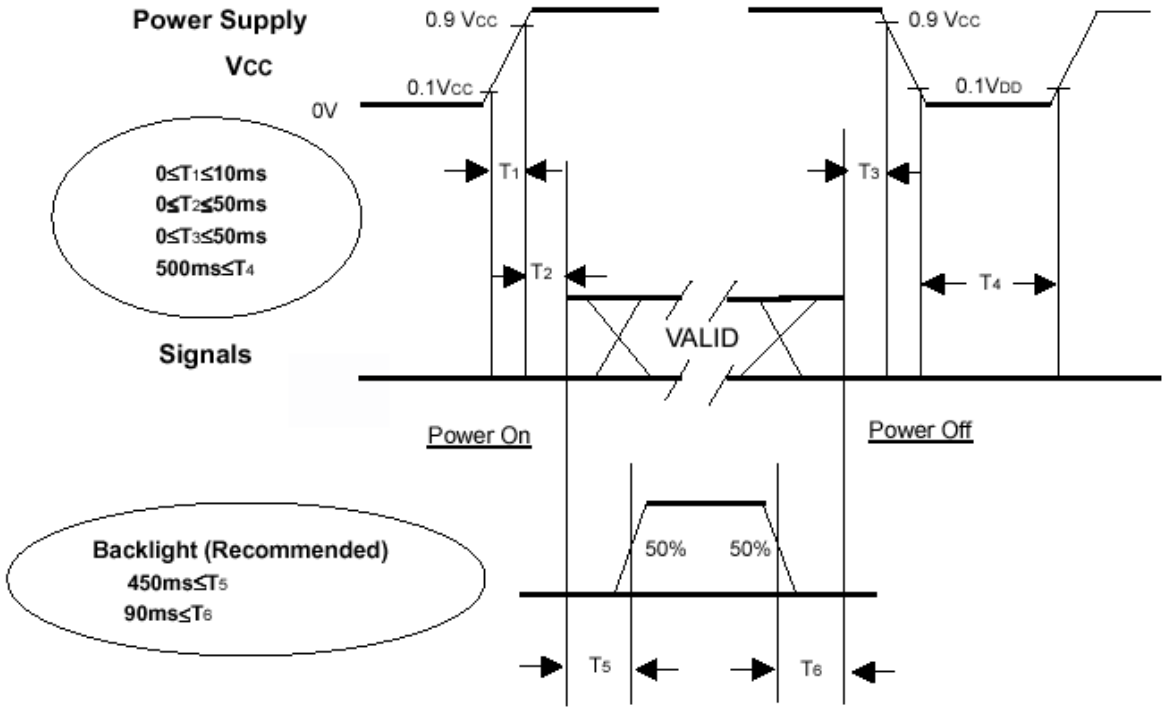
Note: For this module is operated under DE-only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

**INPUT SIGNAL TIMING DIAGRAM**



### 6.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should follow the conditions shown in the following diagram.




**Power ON/OFF Sequence**

Note.

(1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

(2) Please apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation of the LCD turns off, the display may, instantly, function abnormally.

(3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

(4) T4 should be measured after the module has been fully discharged between power on/off periods.

(5) Interface signal should not be kept at high impedance when the power is on.

# 7. OPTICAL CHARACTERISTICS

## 7.1 TESTING CONDITIONS

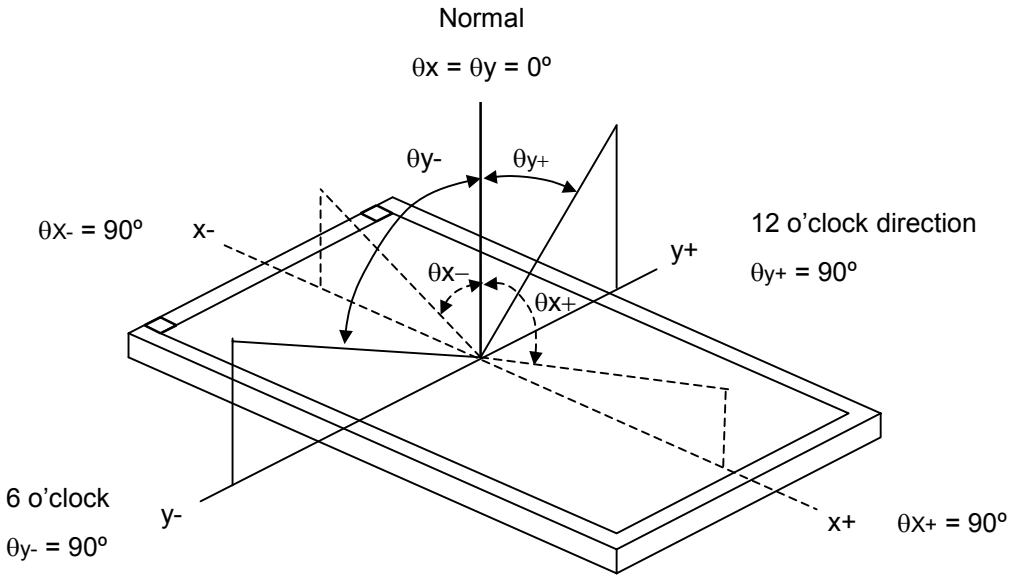
| Item | Symbol | Value | Unit |
|---|---|---|---|
| Ambient Temperature | Ta | 25±2 | °C |
| Ambient Humidity | Ha | 50±10 | %RH |
| Supply Voltage | $V_{CC}$ | 5.0 | V |
| Input Signal | According to typical value in "3. ELECTRICAL CHARACTERISTICS" | | |
| Inverter Current | $I_L$ | 6.5 | mA |
| Inverter Driving Frequency | $F_L$ | 50 | KHz |

## 7.2 OPTICAL SPECIFICATIONS

The measurement methods for the optical characteristics are explained in this section. The following items should be measured following the testing conditions described in section 7.1 under stable environment shown in Note (6).

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | $\theta_x$=0°, $\theta_Y$ =0° Viewing Normal Angle | 350 | 500 | - | - | (2), (6) |
| Response Time | | $T_R$ | | - | 15 | 30 | ms | (3) |
| | | $T_F$ | | - | 10 | 25 | ms | |
| Center Luminance of White | | $L_C$ | | 200 | 250 | - | cd/m$^2$ | (4), (6) |
| White Variation | | δW | | - | 1.25 | 1.40 | - | (6), (7) |
| Cross Talk | | CT | | - | - | 5.0 | % | (5), (6) |
| Color Chromaticity | Red | Rx | | 0.611 | 0.641 | 0.671 | - | (1), (6) |
| | | Ry | | 0.325 | 0.355 | 0.985 | - | |
| | Green | Gx | | 0.255 | 0.285 | 0.315 | - | |
| | | Gy | | 0.567 | 0.597 | 0.627 | - | |
| | Blue | Bx | | 0.112 | 0.142 | 0.172 | - | |
| | | By | | 0.041 | 0.071 | 0.101 | - | |
| | White | Wx | | 0.283 | 0.313 | 0.343 | - | |
| | | Wy | | 0.299 | 0.329 | 0.359 | - | |
| Viewing Angle | Horizontal | $\theta_x$+ | CR≥10 | 80 | 85 | - | Deg. | (1), (6) |
| | | $\theta_x$- | | 80 | 85 | - | | |
| | Vertical | $\theta_Y$+ | | 80 | 85 | - | | |
| | | $\theta_Y$- | | 80 | 85 | - | | |

Note (1) Definition of Viewing Angle (θx, θy):




Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

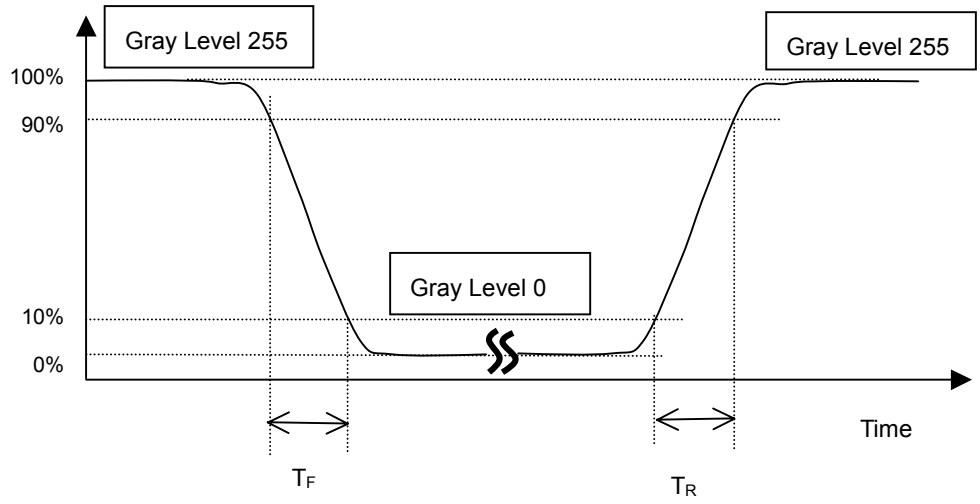
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (7).

Note (3) Definition of Response Time ($T_R$, $T_F$):



Note (4) Definition of Luminance of White ($L_C$):

Measure the luminance of gray level 255 at center point

$L_C = L (5)$

L (x) is corresponding to the luminance of the point X at Figure in Note (7).

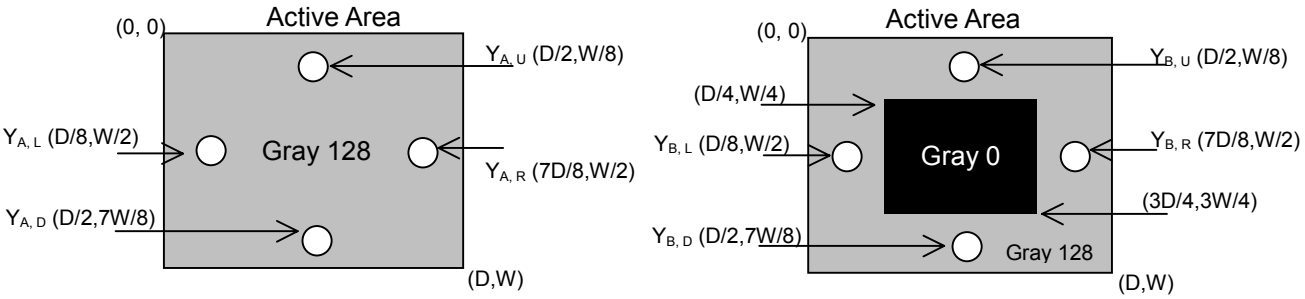
Note (5) Definition of Cross Talk (CT):

$CT = | Y_B – Y_A | / Y_A \times 100 (\%)$

Where:

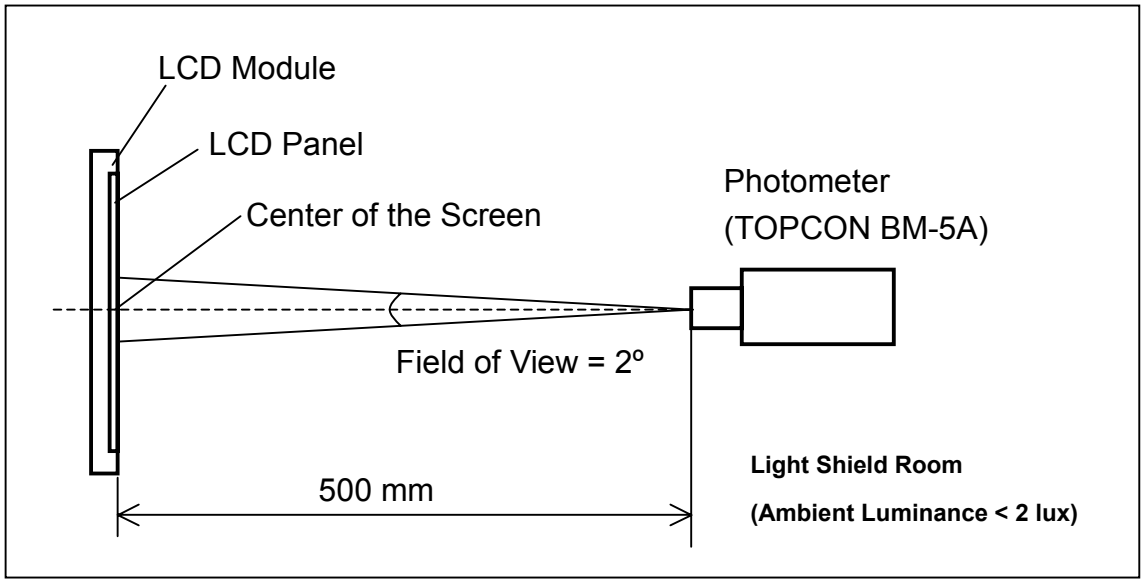
$Y_A$ = Luminance of measured location without gray level 0 pattern ($cd/m^2$)

$Y_B$ = Luminance of measured location with gray level 0 pattern ($cd/m^2$)




Note (6) Measurement Setup:

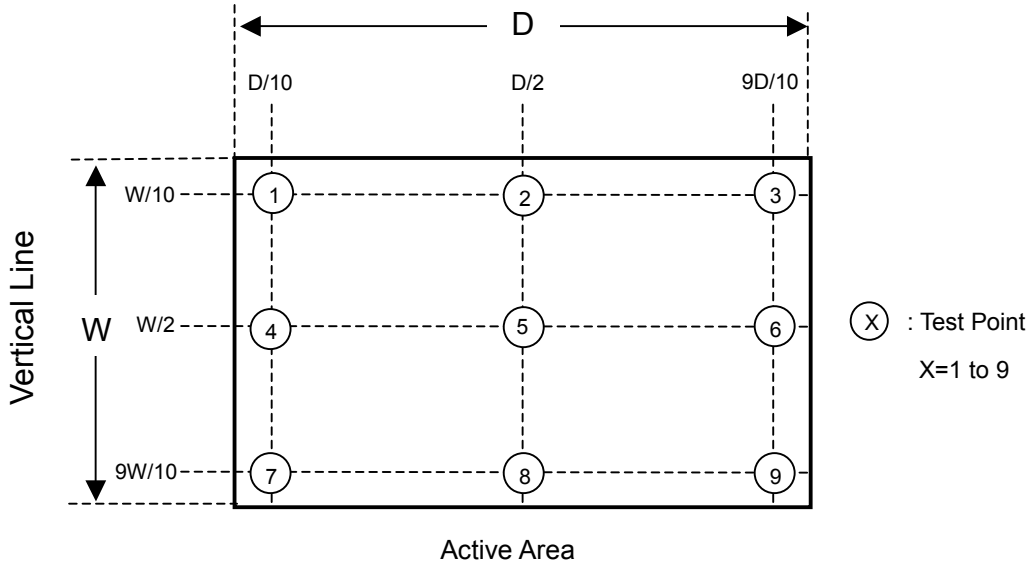
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measurement. In order to stabilize the luminance, the measurement should be executed after lighting backlight unit for 20 minutes in a windless room.



Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 9 points

$$\delta W = \frac{\text{Maximum [L (1), L (2), L (3), L (4), L (5), L (6), L (7), L (8), L (9)]}}{\text{Minimum [L (1), L (2), L (3), L (4), L (5), L (6), L (7), L (8), L (9)]}}$$



# 8. PRECAUTIONS

## 8.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Bending or twisting forces to the module during assembly should be avoided.

(2) Please assemble the module into user's systems in clean working areas to prevent dusts and oils from causing electrical short-circuiting and from worsening the polarizer.

(3) It's not permitted to have pressure or impulse on the module because the LCD panel and Backlight will be damaged.

(4) Always follow the correct power sequence when LCD module is connecting and operating. This can prevent damage to the CMOS LSI chips during latch-up.

(5) Do not pull the I/F connector in or out while the module is operating.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) It is dangerous that moisture come into or contacted the LCD module, because moisture may damage LCD module when it is operating.

(9) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.

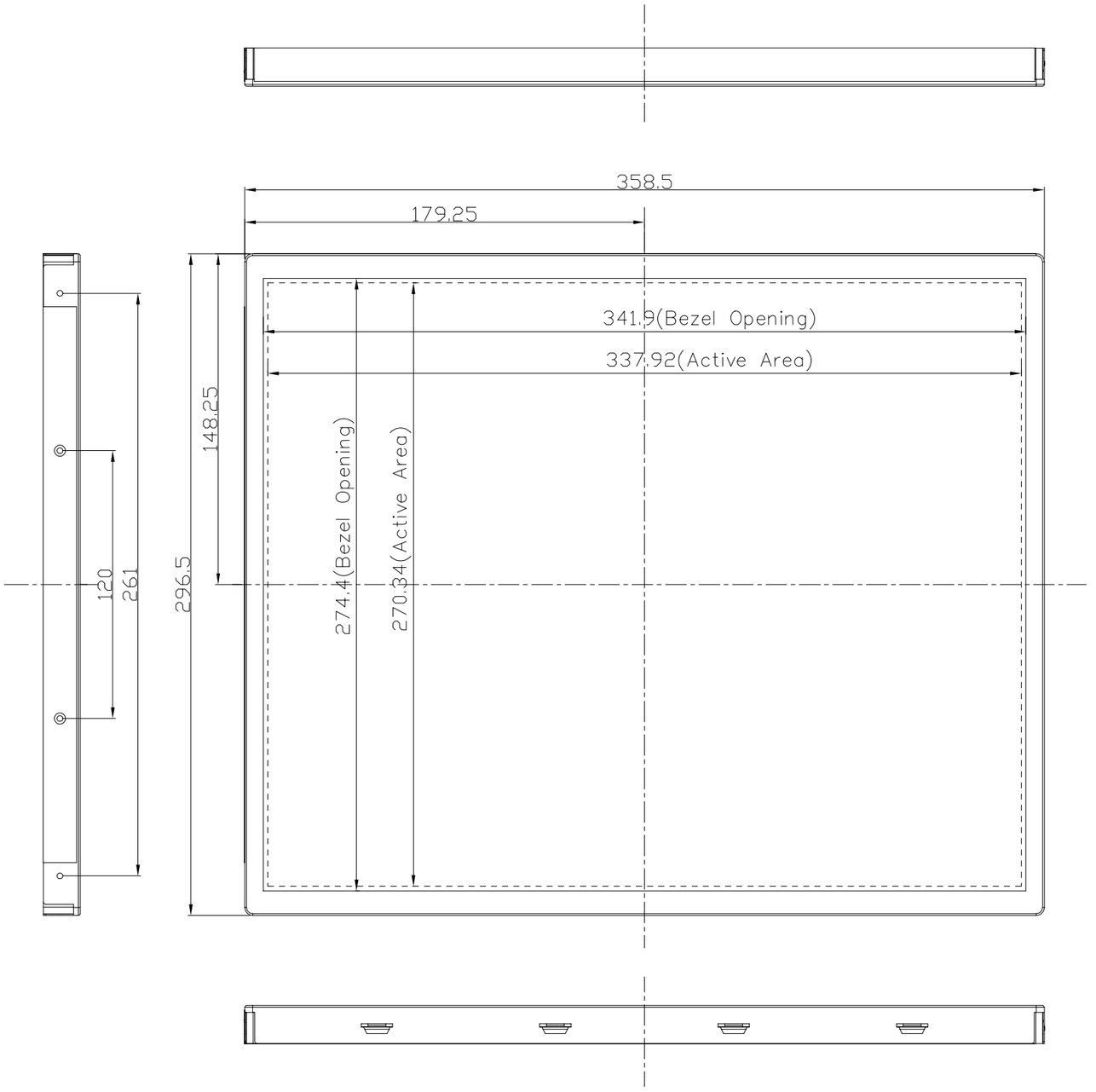
(10) When ambient temperature is lower than 10ºC may reduce the display quality. For example, the response time will become slowly, and the starting voltage of CCFL will be higher than room temperature.

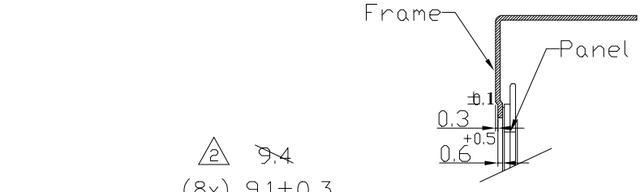
## 8.2 SAFETY PRECAUTIONS

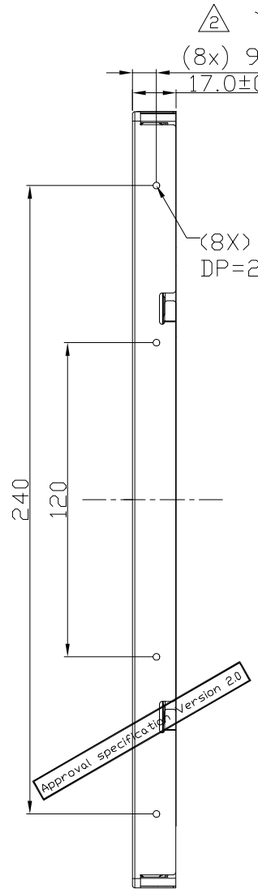
(1) The startup voltage of Backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the Backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(3) After the module's end of life, it is not harmful in case of normal operation and storage.



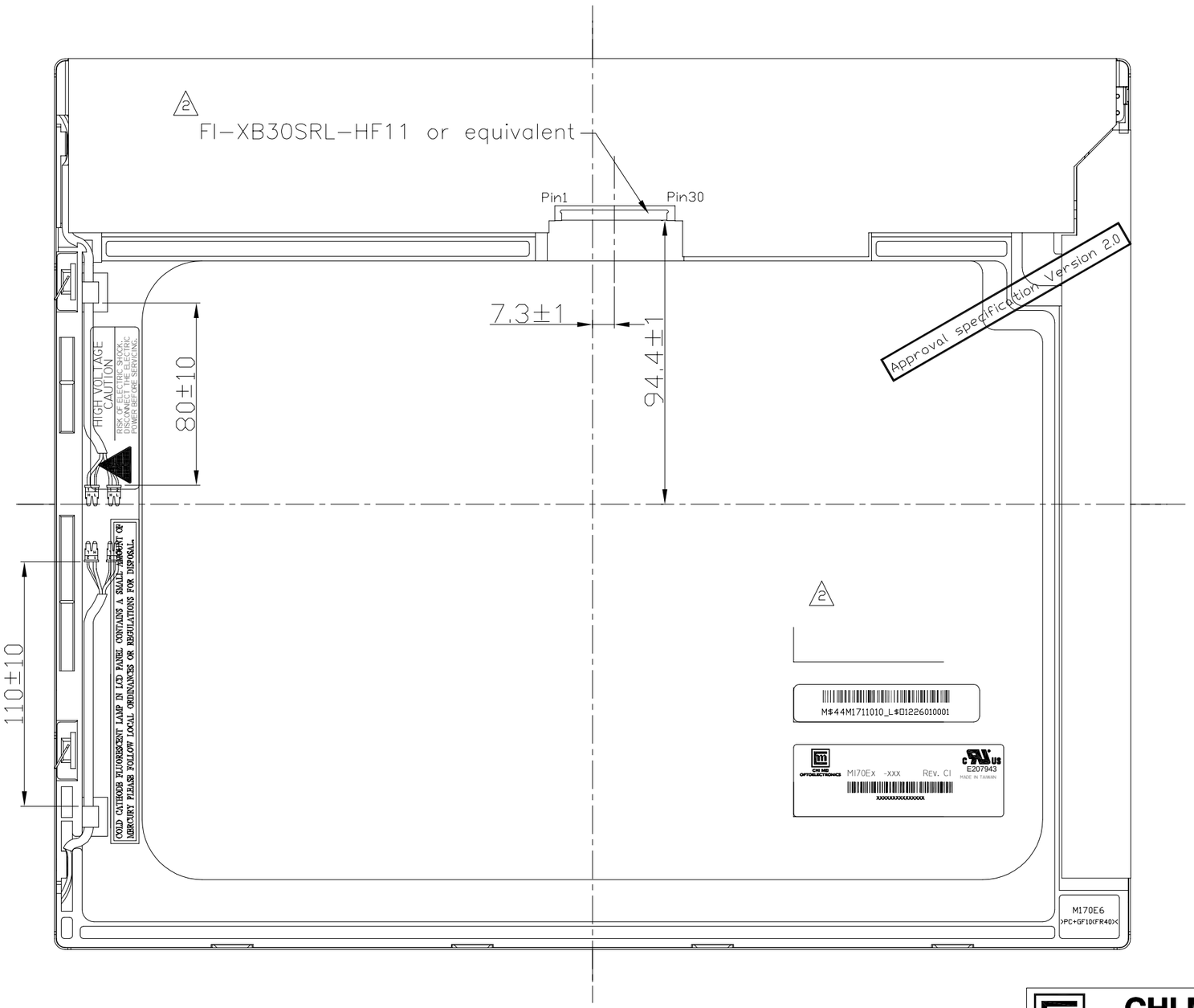




NOTES:
1. GENERAL TOLERANCE:±0.5
2. SIDE MOUNT SCREW TORQUE: 6(Max.) kg-cm

| MARK | DESCRIPTION | DATE | CHANGE BY | APPROVAL BY | ECN NO. |
|---|---|---|---|---|---|
| 2 | Modify the Side Mount Hole | 12/25/2002 | Cliff Tsai | | |

CHI MEI OPTOELECTRONICS CORP. 奇美電子股份有限公司

| | | | | | |
|---|---|---|---|---|---|
| APPROVED: Davis Wang | DWG NO.: M170741022 | | | | |
| CHECKED: Jemmy Chang | DATE: 12/25/2002 | | | | |
| DESIGNER: Cliff Tsai | PART NO.: | | | | |
| DRAWER: Cliff Tsai | REV.: 2 | UNIT: | SCALE: | SHEET: | |
| TITLE: Outline M170E6_L02 | | MM | | 1/2 | |




BHR-02VS-1(JST)
Connector1:
Pin 1 Pink(HV)
Pin 2 White(LV)
Connector2:
Pin 1 Blue(HV)
Pin 2 Black(LV)

| MARK | DESCRIPTION | DATE | CHANGE BY | APPROVAL BY | ECN NO. |
|---|---|---|---|---|---|
| 2 | Modify the Label's Position and Conn.Type | 12/25/2002 | Cliff Tsai | | |

CHI MEI OPTOELECTRONICS CORP. 奇美電子股份有限公司

| | | | | | |
|---|---|---|---|---|---|
| APPROVED: Davis Wang | DWG NO.: M170741022 | | | | |
| CHECKED: Jemmy Chang | DATE: 12/25/2002 | | | | |
| DESIGNER: Cliff Tsai | PART NO.: | | | | |
| DRAWER: Cliff Tsai | REV.: 2 | UNIT: | SCALE: | SHEET: | |
| TITLE: Outline M170E6_L02 | | MM | | 2/2 | |