A Brighter Solution

# AMP DISPLAY INC.

## SPECIFICATIONS

## 10.4-in COLOR TFT MODULE

| | |
|---|---|
| CUSTOMER: | |
| CUSTOMER PART NO. | |
| AMP DISPLAY PART NO. | A M - 1 0 2 4 7 6 8 C T M Q W - 0 0 |
| APPROVED BY: | |
| DATE: | |

☐ APPROVED FOR SPECIFICATIONS

☐ APPROVED FOR SPECIFICATION AND PROTOTYPES

**AMP DISPLAY INC**

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## RECORD OF REVISION

| Revision Date | Page | Contents | Editor |
|---|---|---|---|
| 2009/6/25 | -- | New Release | Edward |

## 1. Features

10.4” AFFS+ TFT-LCD is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as active switching devices. This module has a 10.4 inch diagonally measured active area with XGA resolutions (1024 horizontal by 768 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 262,144 colors. The TFT-LCD panel used for this module is a low reflection and higher color type.

(1) 1Ch LVDS Interface with 1 pixel / clock
(2) 6-bit color depth, Display 262,144 colors
(3) High luminance and contrast ratio, low reflection and wide viewing angle
(4) Front Mounting Frame
(5) DE (Data Enable) mode only
(6) SLG (Single Level Gate) function use
(7) RoHS Product
(8) SMD LED Array
(9) On board EDID

## 2. PHYSICAL SPECIFICATIONS

| Item | Specifications | unit | Note |
|---|---|---|---|
| Active area | 210.432 X 157.824 | mm | |
| Number of pixels | 1024(H) × 768(V) | pixels | |
| Pixel pitch | 0.2055(H) × 0.2055(V) | mm | |
| Pixel arrangement | RGB Vertical stripe | | |
| Display colors | 262,144 | colors | |
| Display mode | Normally Black | | |
| Dimensional outline | 238.6±0.5(H) X 173.2±0.5(V) X 4.3max | mm | (1) |
| Weight | 225 Typ. / 235 Max. | gram | |
| Back-light | SMD LED Array | | |
| Surface treatment | Anti-Glare | | |

Note : 1. LCM Height : 4.3mm max. (LED), 6.8mm max. (Component)

## 3. ABSOLUTE MAX. RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

| Item | | Symbol | Values | | UNIT | Note |
|---|---|---|---|---|---|---|
| | | | Min. | Max. | | |
| Logic Power Supply | | VDD | VSS-0.3 | 4.0 | V | Ta = 25 ±2 ℃ |
| Logic Input Voltage | | VIN | VSS-0.3 | VDD+0.3 | V | |
| Back-light Power Supply Voltage | | HVDD | -0.3 | 40 | V | |
| Back-light LED Current | 25℃ | ILED | | 30 | mA | |
| | 50℃ | ILED | | 20 | mA | |
| Back-light LED Reverse Voltage | | VR | | 5 | V | |
| Operating Temperature | | TOP | -20 | +80 | ℃ | (1) |

Note1. As compromised, D-IC and Polarizer are excluded within the range of guarantee for Operating Temperature.

*T-CON : 0~70℃ / D-IC : -10~75℃ (Source) / -20~75℃(Gate)

# 4. ELECTRICAL CHARACTERISTICS

## 4-1 Typical Operation Conditions

| Item | Symbol | Values | | | Unit | Note |
|---|---|---|---|---|---|---|
| | | MIN | TYP | MAX | | |
| Logic Power Supply Voltage | VDD | 3.0 | 3.3 | 3.6 | V | (1) |
| Logic Power Supply Current | IDD | | 270 | | mA | (1) |
| Back-light Power Supply Voltage | HVDD | 7.0 | 12.0 | 20 | V | (2) |
| Back-light Power Supply Current | IHVDD | | 246 | 283 | mA | (2)(3) |
| Back-light Power Consumption | PBL | | 2.95 | 3.39 | W | (2)(3) |
| LED Driver's Efficiency | H | | 82 | | % | (2)(3) |
| Back-light PWM Frequency | FPWM | 200 | 320 | 350 | Hz | |
| High Level PWM Signal Voltage | VPWMH | 2.1 | 3.3 | 5.0 | V | |
| Low Level PWM Signal Voltage | VPWML | | 0 | 0.6 | V | |
| High Level Differential Input Signal Voltage | VIH | | | +100 | mV | VCM = 1.2V |
| Low Level Differential Input Signal Voltage | VIL | -100 | | | mV | |
| Back-light LED Voltage / Back-light LED Total Voltage | VLED /VBL | | 3.2 / 22.4 | 3.5 / 24.5 | V | (4) |
| Back-light LED Current / Back-light LED Total Current | ILED /IBL | | 18.0 /108.0 | 18.9 / 113.4 | mA | (4) |
| Life Time | | 12,000 | | | Hrs | (6) |
| Power Consumption | PD | | 0.9 | | W | (1) |
| | PLED | | 2.42 | 2.78 | W | (4) |
| | Ptotal | | 3.32 | | W | (1)(4) |

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for 3.3V at 25℃.

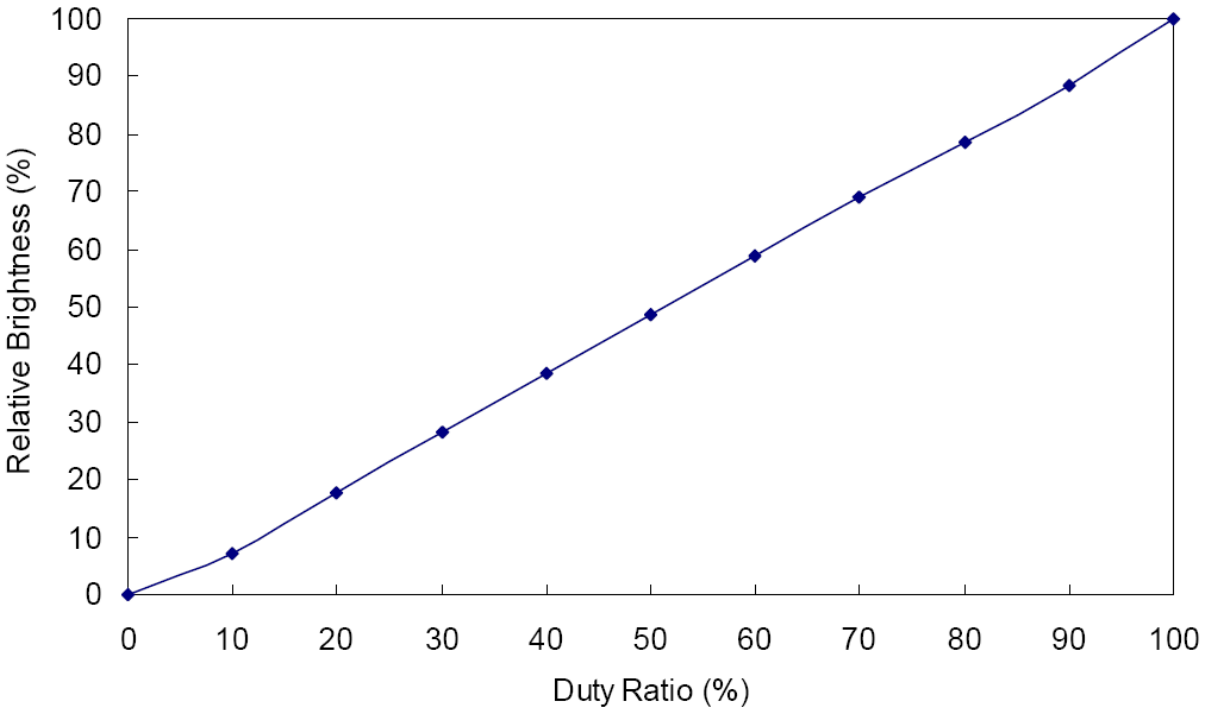
a) Typ : Window XP pattern, b) Max : Vertical Sub line pattern

c) EBL : Mosaic pattern ( 32 X 32 )

2. The power supply voltage and current is measured and specified at the interface connector of LCM including LED Driver.

3. Reference value, which is measured with LED Driver for 12V.
4. Reference value, which is measured without LED Driver.
5. Calculated value for reference (VLED × ILED × # of LEDs (42EA) ).
6. End of Life shall be determined by the time when any of the following is satisfied under continuous lighting at 25℃ and ILED = 18.0mA.
   - Intensity drops to 50% of the Initial Value (Luminance Spec.)
   - Based on LED

### 4-2 PWM Duty Ratio vs Brightness



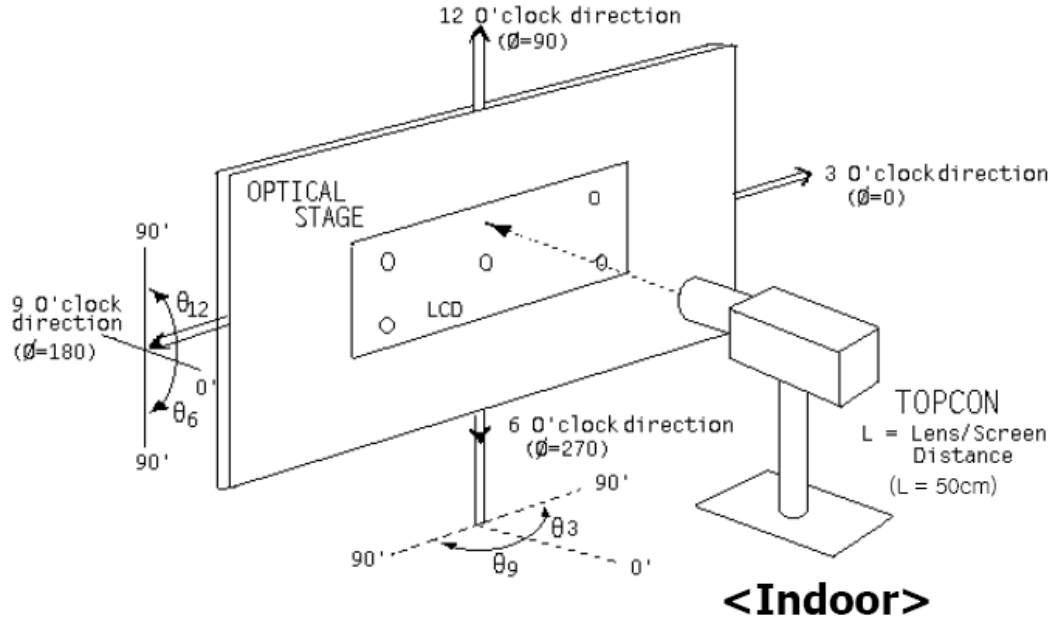
## 5. Optical Specifications

The test of Optical specifications shall be measured in a dark room (ambient luminance 1 lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCONE BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θØ=0 (=θ3 ) as the 3 o'clock direction (the right"), θØ=90 (= θ12 ) as the 12 o'clock direction ("upward"), θØ=180 (= θ9 ) as the 9 o'clock direction ("left") and θØ=270(= θ6 ) as the 6 o'clock direction ("bottom"). While scanning θand/or Ø the center of the measuring spot on the Display surface shall stay fixed
The backlight should be operating for 30 minutes prior to measurement. VDD shall be 3.3+/- 0.3V at 25°C.
Optimum viewing angle direction is 6 o'clock.

| Item | | Symbol | Condition | Values | | | Unit | Note |
|---|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | | |
| Viewing Angle Range | Horizontal | $\Theta_3$ | CR > 10 | | 89 | 90 | Deg. | (1) |
| | | $\Theta_9$ | | | 89 | 90 | | |
| | Vertical | $\Theta_{12}$ | | | 89 | 90 | | |
| | | $\Theta_6$ | | | 89 | 90 | | |
| Luminance Contrast ratio | | CR | Θ = 0° | 400 | 600 | | | (2) |
| Luminance of White | Center | $Y_w$ | Θ = 0° | 250 | 300 | | cd/m | (3) |
| White Luminance Uniformity | 5 Points | ΔY5 | | 80 | | | | (4) |
| | 13 Points | ΔY13 | | 65 | | | | |
| White Chromaticity | | $x_w$ | Θ = 0° | -0.04 | T.B.D. | +0.04 | | (5) |
| | | $y_w$ | | -0.04 | T.B.D. | +0.04 | | |
| Color Reproduction | | | | | 40 | | % | |
| Response Time | | $T_r+T_d$ | Ta= 25℃ Θ = 0° | | 36 | | ms | (6) |
| Cross Talk | | CT | Θ = 0° | | | 2.0 | % | (7) |

Note : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface. (see FIGURE 1)

**Figure 1. Measurement Set Up**

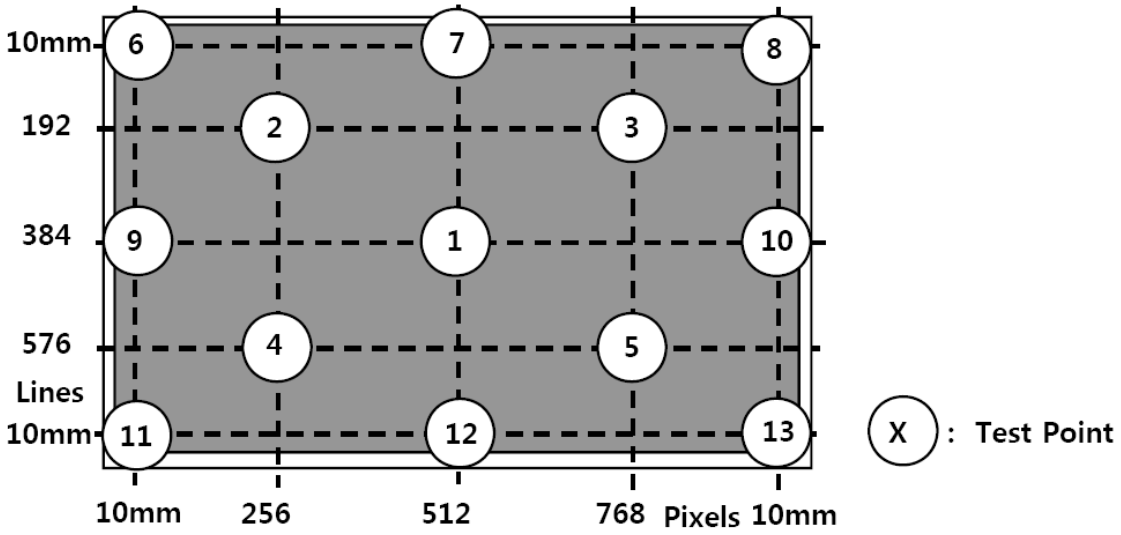



2. Contrast measurements shall be made at viewing angle of Θ= 0° and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state.
(See FIGURE 1)
Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Luminance of white is defined as a luminance value of a point across the LCD surface.
Luminance shall be measured with all pixels in the view field set first to white.
This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display.

**Figure 2. Average Luminance Measurement Locations & Uniformity Measurement Locations**



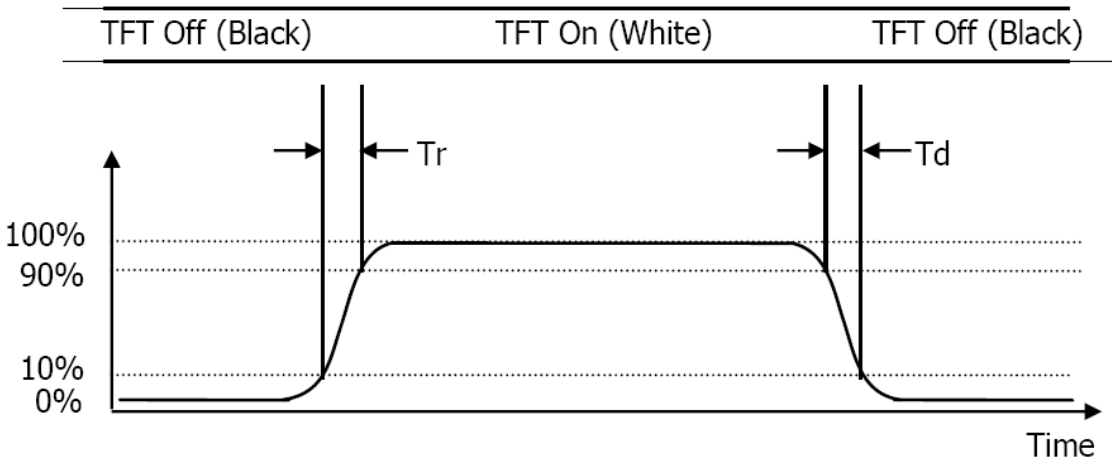

4. The White luminance uniformity on LCD surface is then expressed. (See FIGURE 2)

$$\text{Uniformity } \Delta Y = \frac{\text{Minimum Luminance of 5(or 13) points}}{\text{Maximum Luminance of 5(or 13) points}} \times 100\ (\%)$$

5. The color chromaticity coordinates specified in Table 4 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

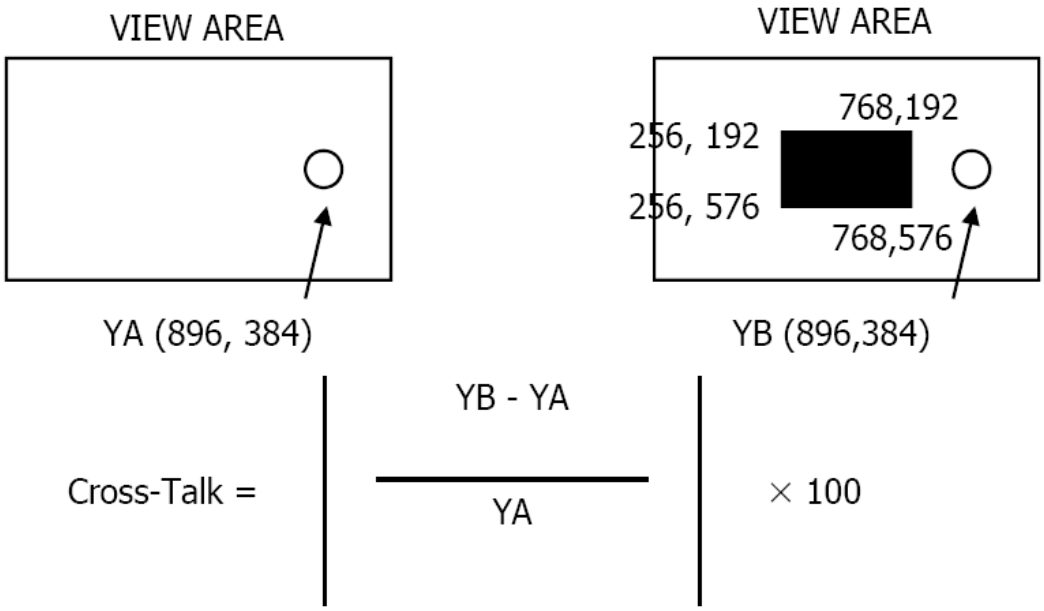
6. The electro-optical response time measurements shall be made as FIGURE 3 by switching the data input signal OFF and ON. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

**Figure 3. Response Time Testing**



7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark. (See FIGURE 4 ).

**Figure 4. Cross Modulation Test Description**




Where:
$Y_A$ = Initial luminance of measured area (cd/m²)
$Y_B$ = Subsequent luminance of measured area (cd/m²)
The location measured will be exactly the same in both patterns.

# 6. INTERFACE

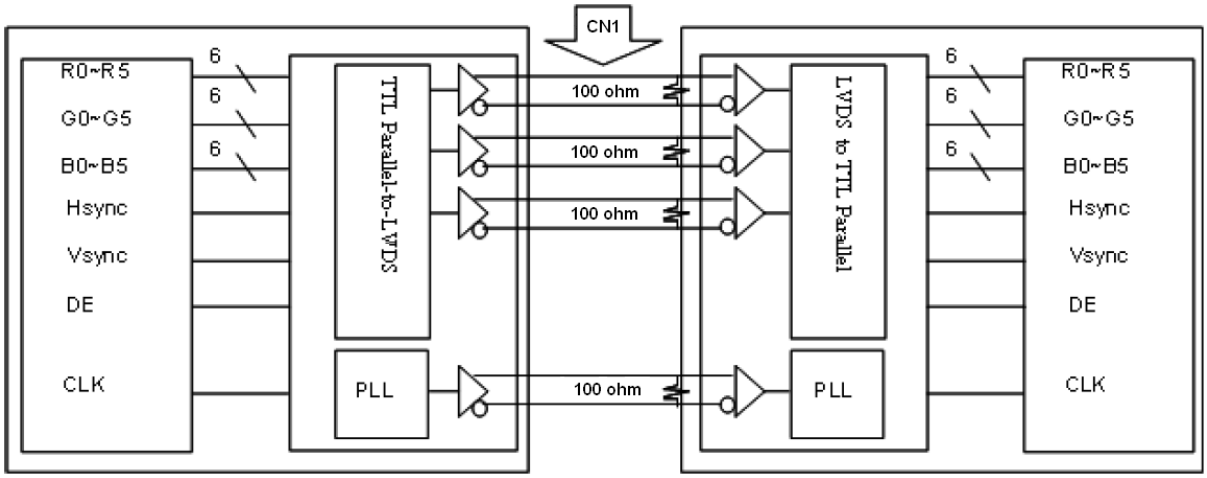
## 6.1 Electrical Interface Connection

CN1 : Interface Connector : FI-XB30S-HF10 (JAE) or equivalent

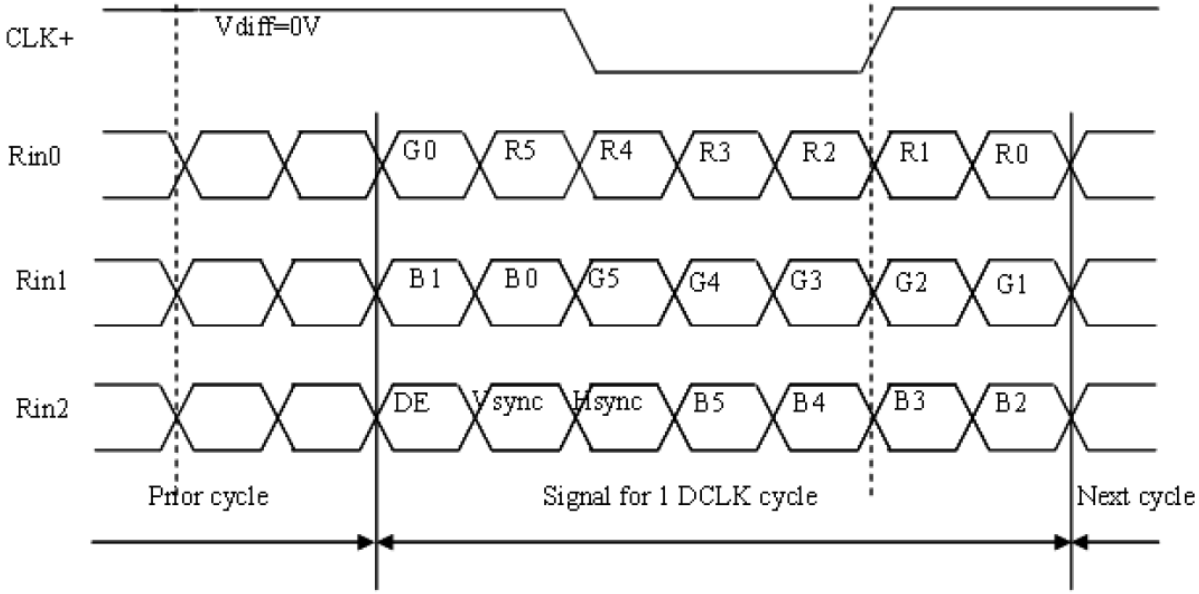
User side Connector : FI-X30S (JAE) or equivalent

| Pin No. | Symbol | Description | Note |
|---|---|---|---|
| 1 | VSS | Ground | |
| 2 | VDD1 | Power Supply: +3.3V | |
| 3 | VDD2 | Power Supply: +3.3V | |
| 4 | EDID 3.3V | EDID +3.3V | |
| 5 | NC | Reserved | |
| 6 | EDID CLK | EDID CLK | |
| 7 | EDID DATA | EDID DATA | |
| 8 | RIN0- | LVDS Negative data signal (-) | Tx pin # 48 |
| 9 | RIN0+ | LVDS Positive data signal (+) | Tx pin # 47 |
| 10 | VSS | Ground | |
| 11 | RIN1- | LVDS Negative data signal (-) | Tx pin # 46 |
| 12 | RIN1+ | LVDS Positive data signal (+) | Tx pin # 45 |
| 13 | VSS | Ground | |
| 14 | RIN2- | LVDS Negative data signal (-) | Tx pin # 42 |
| 15 | RIN2+ | LVDS Positive data signal (+) | Tx pin # 41 |
| 16 | VSS | Ground | |
| 17 | RCLKIN- | LVDS Negative clock signal (-) | Tx pin # 40 |
| 18 | RCLKIN+ | LVDS Positive clock signal (+) | Tx pin # 39 |
| 19 | VSS | Ground | |
| 20 | VDIM | PWM Brightness Control | |
| 21 | VSW | LED On/Off Control | |
| 22 | VSS | Ground | |
| 23 | VSS | Ground | |
| 24 | VSS | Ground | |
| 25 | VSS | Ground | |
| 26 | VCD1 | Back-light Power Supply: +12V | HVDD: 7~20V |
| 27 | VCD2 | Back-light Power Supply: +12V | |
| 28 | VCD3 | Back-light Power Supply: +12V | |
| 29 | VCD4 | Back-light Power Supply: +12V | |
| 30 | VSS | Ground | |

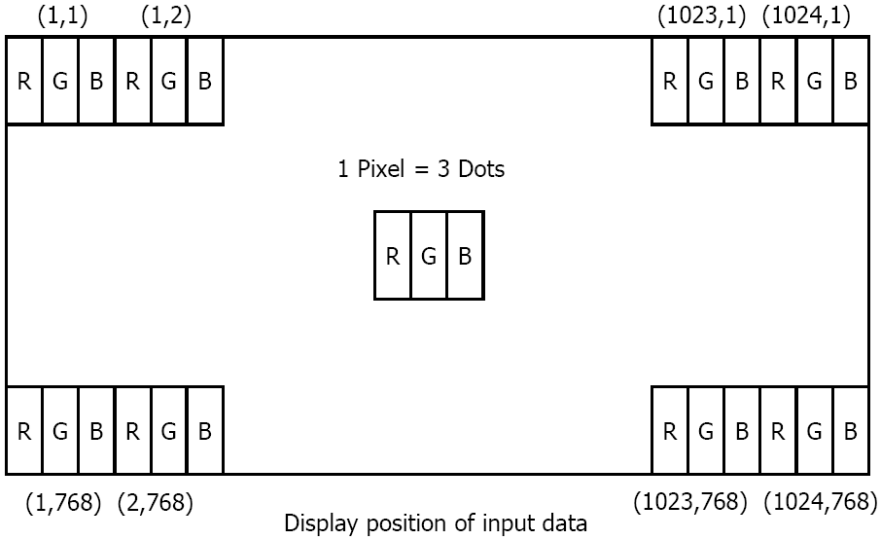
### 6.1.1 LVDS Block Diagram




### 6.1.2 Interface Connection




### 6.2 Data Input Format




Display position of input data

### 6.3 LVDS Interface

LVDS Transmitter : THC63LVDM83A or equivalent.

| Input Signal | Transmitter | | Interface | | FI-XB30S-HF10 | Note |
|---|---|---|---|---|---|---|
| | Pin No. | Pin No. | System(TX) | TFT-LCD(RX) | Pin No. | |
| R0 | 51 | 48<br>47 | OUT0-+<br>OUT0+ | IN0-<br>IN0+ | 8<br>9 | |
| R1 | 52 | | | | | |
| R2 | 54 | | | | | |
| R3 | 55 | | | | | |
| R4 | 56 | | | | | |
| R5 | 3 | | | | | |
| G0 | 4 | | | | | |
| G1 | 6 | 46<br>45 | OUT1-<br>OUT1+ | IN1-<br>IN1+ | 11<br>12 | |
| G2 | 7 | | | | | |
| G3 | 11 | | | | | |
| G4 | 12 | | | | | |
| G5 | 14 | | | | | |
| B0 | 15 | | | | | |
| B1 | 19 | | | | | |
| B2 | 20 | 42<br>41 | OUT2-<br>OUT2+ | IN2-<br>IN2+ | 14<br>15 | |
| B3 | 22 | | | | | |
| B4 | 23 | | | | | |
| B5 | 24 | | | | | |
| HSYNC | 27 | | | | | |
| VSYNC | 28 | | | | | |
| DE | 30 | | | | | |
| MCLK | 31 | 40 | CLKOUT- | CLKIN- | 17 | |
| | | 39 | CLKOUT+ | CLKIN+ | 18 | |

### 6.4 Back-light Interface

CN2 LED FPC Connector (20397-008E, Manufactured by I-PEX)

| Pin No. | Symbol | Function | Note |
|---|---|---|---|
| 1 | Anode1 | LED Anode Power Supply | LED Anode Power Supply<br>(3.2V X 7 EA =22.4V) |
| 2 | NC | Non-Connection | |
| 3 | Cathode1 | LED Cathode Power Supply | LED Cathode Power Supply |
| 4 | Cathode2 | LED Cathode Power Supply | |
| 5 | Cathode3 | LED Cathode Power Supply | |
| 6 | Cathode4 | LED Cathode Power Supply | |
| 7 | Cathode5 | LED Cathode Power Supply | |
| | Cathode6 | LED Cathode Power Supply | |

# 7. Signal Timing Specifications

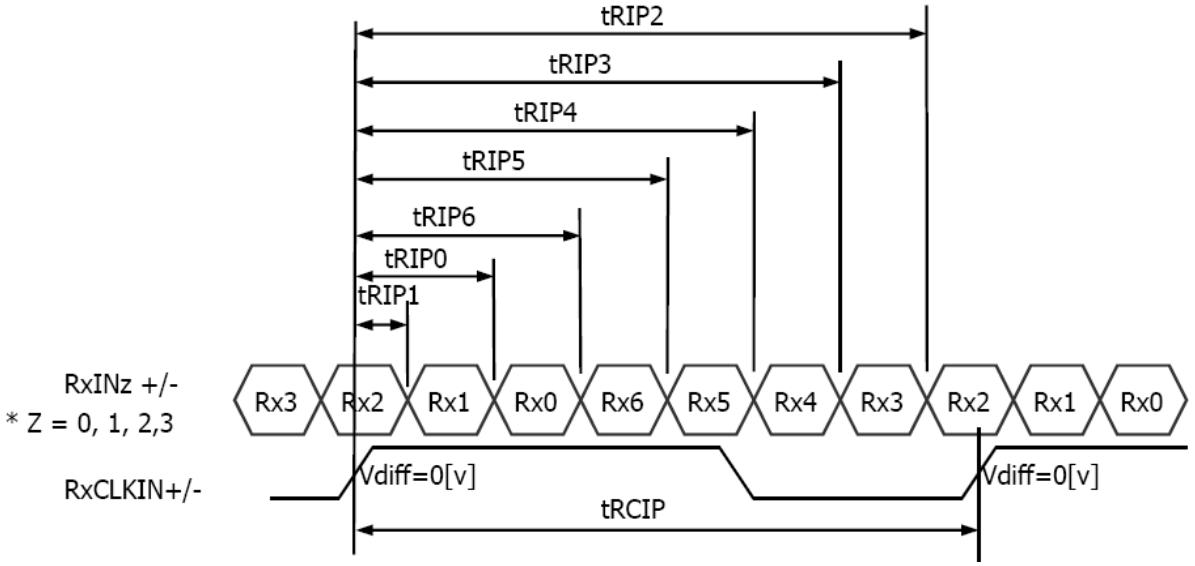
## 7-1 LVDS Transmitter Input

The 10.4” XGA LCM is operated by the only DE (Data enable) mode (LVDS Transmitter Input)

| ITEM | SYMBOL | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Frame Period | T1 | 772 | 806 | - | lines |
| Vertical Display Period | T2 | - | 768 | - | lines |
| One Line Scanning Period | T3 | 1100 | 1344 | - | clocks |
| Horizontal Display Period | T4 | - | 1024 | - | clocks |
| Clock Frequency | 1/T5 | - | 65 | 80 | MHz |

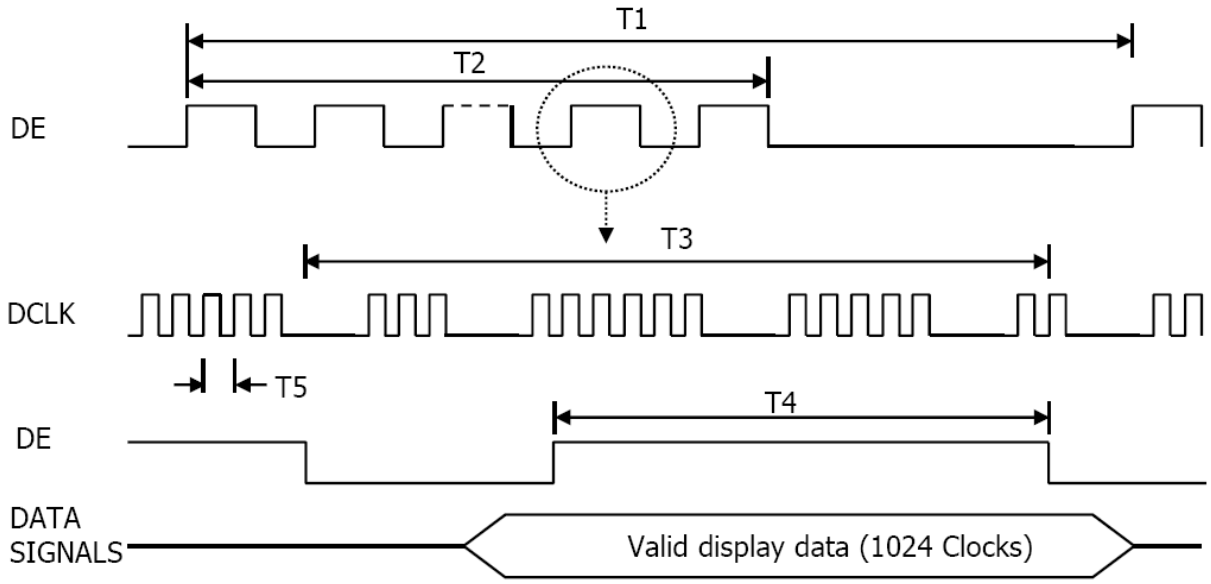
## 7-2 LVDS Rx Interface Timing Parameter

| ITEM | SYMBOL | MIN | TYP | MAX | UNIT | REMARK |
|---|---|---|---|---|---|---|
| CLKIN Period | tRCIP | 12.5 | 15.38 | - | nsec | |
| Input Data 0 | tRIP1 | -0.4 | 0.0 | +0.4 | nsec | |
| Input Data 1 | tRIP0 | tRICP/7-0.4 | tRICP/7 | tRICP/7+0.4 | nsec | |
| Input Data 2 | tRIP6 | 2 ×tRICP/7-0.4 | 2 ×tRICP/7 | 2 ×tRICP/7+0.4 | nsec | |
| Input Data 3 | tRIP5 | 3 ×tRICP/7-0.4 | 3 ×tRICP/7 | 3 ×tRICP/7+0.4 | nsec | |
| Input Data 4 | tRIP4 | 4 ×tRICP/7-0.4 | 4 ×tRICP/7 | 4 ×tRICP/7+0.4 | nsec | |
| Input Data 5 | tRIP3 | 5 ×tRICP/7-0.4 | 5 ×tRICP/7 | 5 ×tRICP/7+0.4 | nsec | |
| Input Data 6 | tRIP2 | 6 ×tRICP/7-0.4 | 6 ×tRICP/7 | 6 ×tRICP/7+0.4 | nsec | |



# 8. Signal Timing Waveforms Of Interface Signal (DE Mode)

## 8.1 Timing Waveforms of Interface Signal



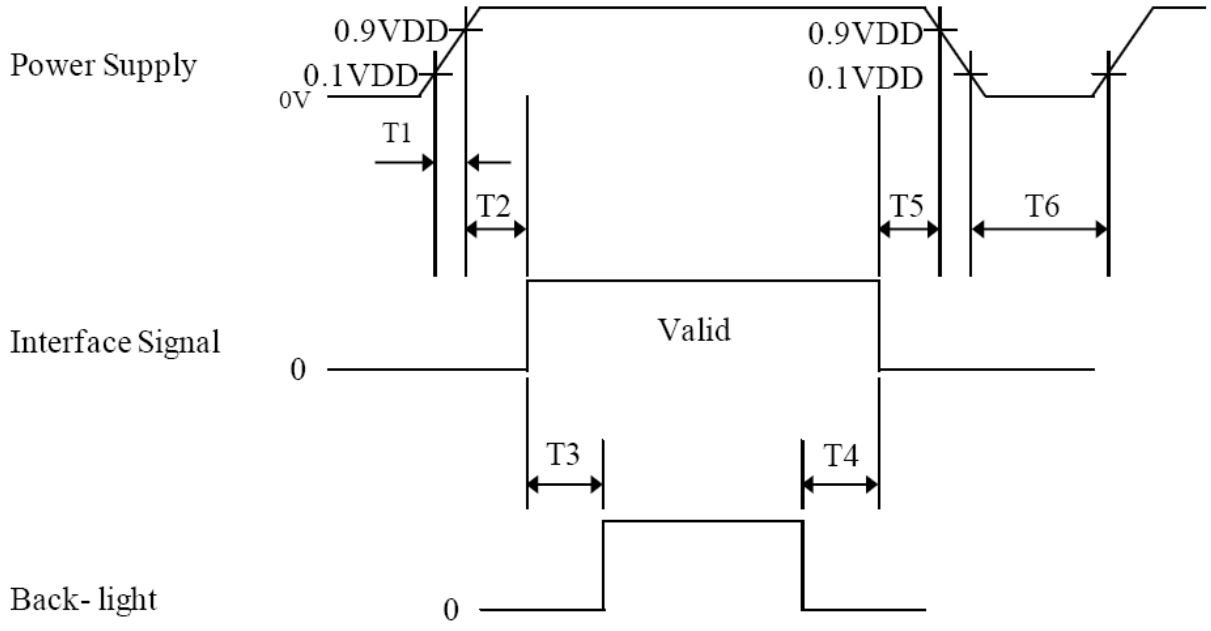
## 9. Input Signals, Basic Display Coors & Gray Scale Of Colors

Each color is displayed in sixty-four gray scales from a 6 bit data signal input. A total of 262,144 colors are derived from the resultant 18 bit data.

| COLORS & GRAY SCALE | | RED DATA | | | | | | GREEN DATA | | | | | | BLUE DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | 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 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 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 |
| Gray Scale Of Red | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | ▽ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | Brighter | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ▽ | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Green | 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 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | ▽ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | Brighter | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ▽ | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gray Scale Of Blue | 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 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | △ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | ▽ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | Brighter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| | ▽ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale Of White & Black | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Darker | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | △ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | ▽ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | Brighter | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | ▽ | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

## 10. Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below




| Parameter | Values | | | Units |
|---|---|---|---|---|
| | Min | Typ | Max | |
| T1 | 0 | -- | 10 | ms |
| T2 | 0 | -- | 50 | ms |
| T3 | 100 | -- | -- | ms |
| T4 | 100 | -- | -- | ms |
| T5 | 0 | -- | 50 | ms |
| T6 | 1 | -- | -- | Sec |

Notes :

1. When the power supply VDD is 0V, Keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on.
3. Back Light must be turn on after power for logic and interface signal are valid.

## 11. RELIABILITY TEST CONDITIONS

| Item | Test Conditions | Note |
|---|---|---|
| High temperature storage test | Ta = 80 °C, 240 hrs | |
| Low temperature storage test | Ta = -20 °C, 240 hrs | |
| High temperature & high humidity operation test | Ta = 60 ℃, 85%RH, 240hrs | |
| High temperature operation test | Ta = 80 °C, 240 hrs | |
| Low temperature operation test | Ta = 0 °C, 240 hrs | |
| Thermal shock | Ta = -20 °C ~ 80 °C (0.5H), 100 cycle | |
| Vibration test (non-operating) | Frequency : 10~500Hz<br>Gravity/AMP : 1.5G<br>Period : X,Y,Z 30min | |
| Shock test (non-operating) | Gravity : 220G<br>Pulse width : 2ms, half sine wave<br>±X, ±Y, ±Z Once for each direction | |
| Electro-Static Discharge Test (non-operating) | Air : 150pF 330ohm 15KV<br>Contact : 150pF, 330ohm, 8KV | |

## 12. HANDLING & CAUTIONS

**12.1 Cautions when taking out the module**

Pick the pouch only, when taking out module from a shipping package.

**12.2 Cautions for handling the module**

12.2.1 As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.

12.2.2 As the LCD panel and backlight element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.

12.2.3 As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.

12.2.4 Do not pull the interface connector in or out while the LCD module is operating.

12.2.5 Put the module display side down on a flat horizontal plane.

12.2.6 Handle connectors and cables with care.

**12.3 Cautions for the operation**

12.3.1 When the module is operating, do not lose MCLK, DE signals. If any one of these signals were lost, the LCD panel would be damaged.

12.3.2 Obey the supply voltage sequence. If wrong sequence were applied, the module would be damaged.

**12.4 Cautions for the atmosphere**

12.4.1 Dewdrop atmosphere should be avoided.

12.4.2 Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer-packing pouch and under relatively low temperature atmosphere is recommended.

**12.5 Cautions for the module characteristics**

12.5.1 Do not apply fixed pattern data signal to the LCD module at product aging.

12.5.2 Applying fixed pattern for a long time may cause image sticking.

**12.6 Other cautions**

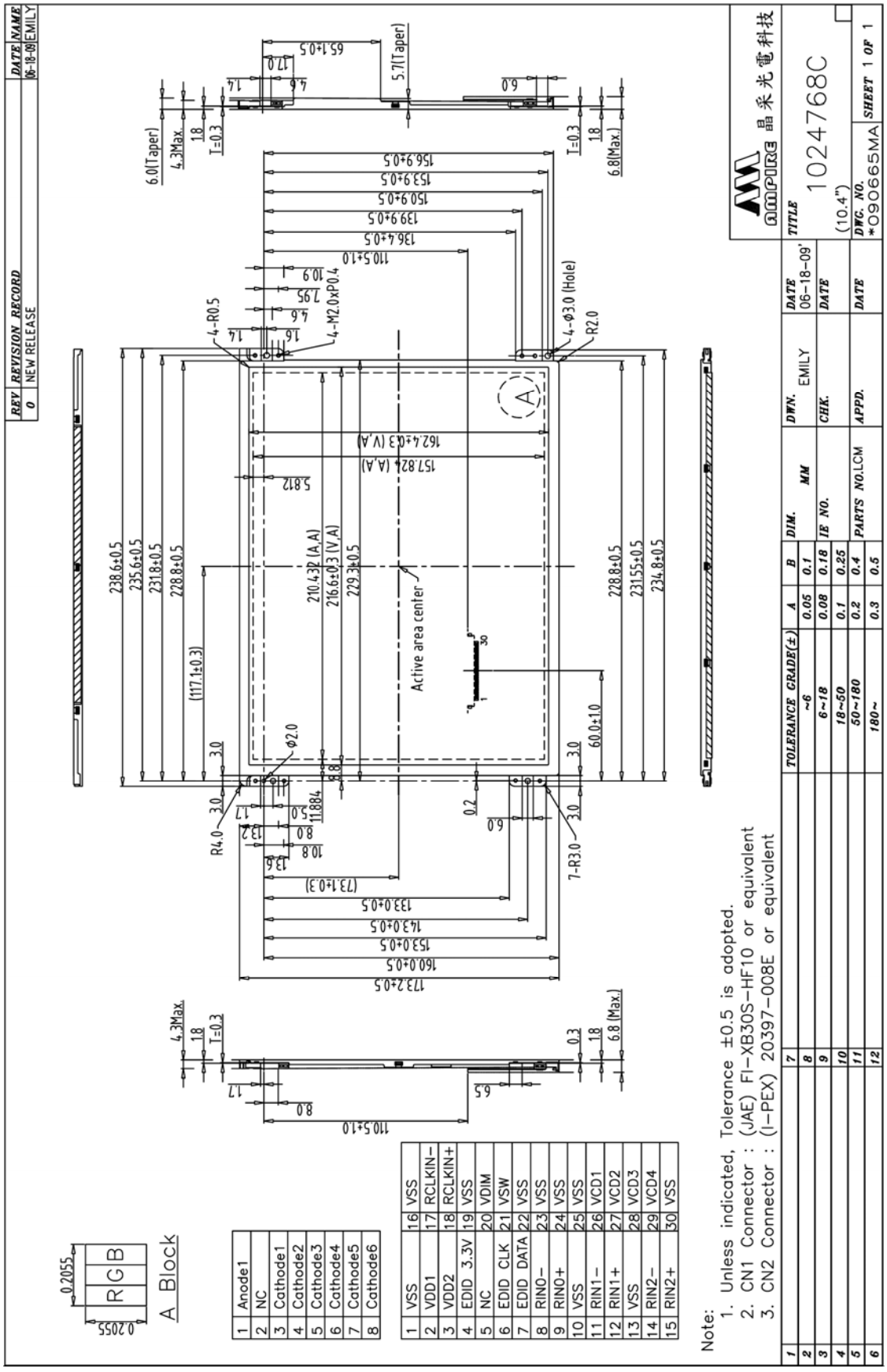
12.6.1 Do not disassemble and/or re-assemble LCD module.

12.6.2 Do not re-adjust variable resistor or switch etc.

12.6.3 When returning the module for repair or etc, please pack the module not to be broken. We recommend using the original shipping packages.

12.6.4 AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

## 13. OUTLINE DIMENSION




| | |
|---|---|
| 1 | Anode1 |
| 2 | NC |
| 3 | Cathode1 |
| 4 | Cathode2 |
| 5 | Cathode3 |
| 6 | Cathode4 |
| 7 | Cathode5 |
| 8 | Cathode6 |

| | | | |
|---|---|---|---|
| 1 | VSS | 16 | VSS |
| 2 | VDD1 | 17 | RCLKIN- |
| 3 | VDD2 | 18 | RCLKIN+ |
| 4 | EDID 3.3V | 19 | VSS |
| 5 | NC | 20 | VDIM |
| 6 | EDID CLK | 21 | VSW |
| 7 | EDID DATA | 22 | VSS |
| 8 | RIN0- | 23 | VSS |
| 9 | RIN0+ | 24 | VSS |
| 10 | VSS | 25 | VSS |
| 11 | RIN1- | 26 | VCD1 |
| 12 | RIN1+ | 27 | VCD2 |
| 13 | VSS | 28 | VCD3 |
| 14 | RIN2- | 29 | VCD4 |
| 15 | RIN2+ | 30 | VSS |

| REV | REVISION RECORD | DATE | NAME |
|---|---|---|---|
| 0 | NEW RELEASE | 06-18-09 | EMILY |

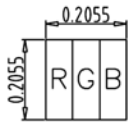
| TOLERANCE GRADE(±) | A | B |
|---|---|---|
| ~6 | 0.05 | 0.1 |
| 6~18 | 0.08 | 0.18 |
| 18~50 | 0.1 | 0.25 |
| 50~180 | 0.2 | 0.4 |
| 180~ | 0.3 | 0.5 |

DIM. MM | IE NO. | PARTS NO.LCM

DWN. EMILY DATE 06-18-09 | CHK. DATE | APPD. DATE

TITLE (10.4") | DWG. NO. *090665MA | SHEET 1 OF 1

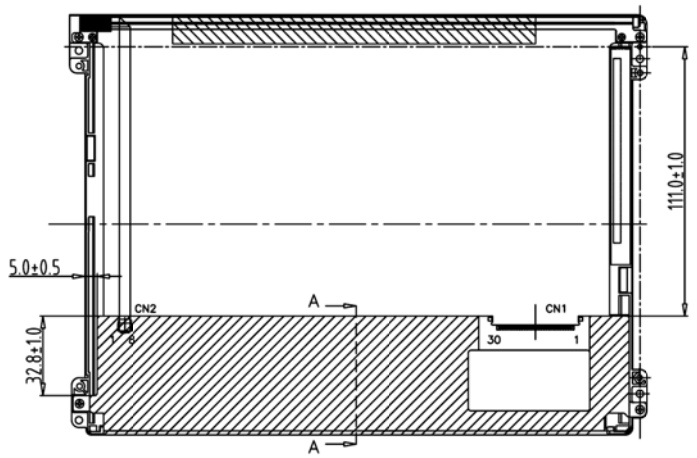
| REV | REVISION RECORD | DATE | NAME |
|---|---|---|---|
| 0 | NEW RELEASE | 06-18-09 | EMILY |



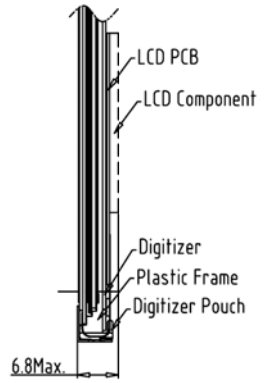

A Block

| | |
|---|---|
| 1 | Anode1 |
| 2 | NC |
| 3 | Cathode1 |
| 4 | Cathode2 |
| 5 | Cathode3 |
| 6 | Cathode4 |
| 7 | Cathode5 |
| 8 | Cathode6 |

| | | | |
|---|---|---|---|
| 1 | VSS | 16 | VSS |
| 2 | VDD1 | 17 | RCLKIN− |
| 3 | VDD2 | 18 | RCLKIN+ |
| 4 | EDID 3.3V | 19 | VSS |
| 5 | NC | 20 | VDIM |
| 6 | EDID CLK | 21 | VSW |
| 7 | EDID DATA | 22 | VSS |
| 8 | RIN0− | 23 | VSS |
| 9 | RIN0+ | 24 | VSS |
| 10 | VSS | 25 | VSS |
| 11 | RIN1− | 26 | VCD1 |
| 12 | RIN1+ | 27 | VCD2 |
| 13 | VSS | 28 | VCD3 |
| 14 | RIN2− | 29 | VCD4 |
| 15 | RIN2+ | 30 | VSS |




Back View




A−−−A

Note:
1. Unless indicated, Tolerance ±0.5 is adopted.
2. CN1 Connector : (JAE) FI−XB30S−HF10 or equivalent
3. CN2 Connector : (I−PEX) 20397−008E or equivalent

| | | | | TOLERANCE GRADE(±) | A | B | DIM. MM | DWN. EMILY | DATE 06-18-09' | TITLE 1024768C (10.4") |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 7 | | | | | | | | |
| 2 | | 8 | | ~6 | 0.05 | 0.1 | | | | |
| 3 | | 9 | | 6~18 | 0.08 | 0.18 | IE NO. | CHK. | DATE | |
| 4 | | 10 | | 18~50 | 0.1 | 0.25 | | | | |
| 5 | | 11 | | 50~180 | 0.2 | 0.4 | PARTS NO.LCM−1 | APPD. | DATE | DWG. NO. *090666MA |
| 6 | | 12 | | 180~ | 0.3 | 0.5 | | | | SHEET 1 OF 1 |

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## 14. EDID Data

| Add | Function | Hex | Input Value |
|---|---|---|---|
| 00 | Header | 00 | EDID |
| 01 | | FF | |
| 02 | | FF | |
| 03 | | FF | |
| 04 | | FF | |
| 05 | | FF | |
| 06 | | FF | |
| 07 | | 00 | |
| 08 | ID Manufacturer Name | 09 | ID |
| 09 | | E5 | |
| 0A | ID Product Code | | |
| 0B | | | |
| 0C | 32-bit serial No. | 00 | |
| 0D | | 00 | |
| 0E | | 00 | |
| 0F | | 00 | |
| 10 | Week of manufacture | 00 | 0 |
| 11 | Year of Manufacture | 13 | 2009 |
| 12 | EDID Structure Ver. | 01 | 1 |
| 13 | EDID revision # | 03 | 3 |
| 14 | Video input definition | 80 | |
| 15 | Max H image size | 1D | 29 |
| 16 | Max V image size | 11 | 17 |
| 17 | Display Gamma | 78 | 2.2 |
| 18 | Feature support | 0A | RGB mode |
| 19 | Red/Green low bits | F9 | |
| 1A | Blue/White low bits | C5 | |
| 1B | Red x high bits | | |
| 1C | Red y high bits | | |
| 1D | Green x high bits | | |
| 1E | Green y high bits | | |
| 1F | Blue x high bits | | |

| Add | Function | Hex | Input Value |
|---|---|---|---|
| 20 | BLue y high bits | | |
| 21 | White x high bits | 50 | 0.313 |
| 22 | White y high bits | 54 | 0.329 |
| 23 | Established timing 1 | 00 | |
| 24 | Established timing 2 | 00 | |
| 25 | Established timing 3 | 00 | |
| 26 | Standard timing #1 | 01 | Not Used |
| 27 | | 01 | |
| 28 | Standard timing #2 | 01 | Not Used |
| 29 | | 01 | |
| 2A | Standard timing #3 | 01 | Not Used |
| 2B | | 01 | |
| 2C | Standard timing #4 | 01 | Not Used |
| 2D | | 01 | |
| 2E | Standard timing #5 | 01 | Not Used |
| 2F | | 01 | |
| 30 | Standard timing #6 | 01 | Not Used |
| 31 | | 01 | |
| 32 | Standard timing #7 | 01 | Not Used |
| 33 | | 01 | |
| 34 | Standard timing #8 | 01 | Not Used |
| 35 | | 01 | |
| 36 | Detailed timing / monitor descriptor #1 | 28 | . Main clock : 64.99MHz<br>. Hor. Active : 1024<br>. Hor. Blanking : 320<br>. 4 bits of Hor. Active + 4 bits of Hor. Blanking<br>. Ver. Active : 768<br>. Ver. Blanking : 38<br>. 4 bits of Ver. Active + 4 bits of Ver. Blanking<br>. Hor. Sync Offset : 24<br>. H sync Pulse Width:136<br>. V sync Offset : 1 line<br>. V Sync Pulse width : 3 line |
| 37 | | 15 | |
| 38 | | 00 | |
| 39 | | 40 | |
| 3A | | 41 | |
| 3B | | 00 | |
| 3C | | 26 | |
| 3D | | 30 | |
| 3E | | 18 | |
| 3F | | 88 | |

| Add | Function | Hex | Input Value |
|---|---|---|---|
| 40 | Detailed timing / monitor descriptor #1 | 36 | . Horizontal Image Size : 210 mm (Low 8 bits)<br>. Vertical Image Size : 158 mm (Low 8 bits)<br>. 4 bits of Hor. Image Size + 4 bits of Ver. Image Size<br>. Hor. Border : 0 pixel<br>. Vertical Border : 0 line |
| 41 | | 00 | |
| 42 | | D2 | |
| 43 | | 9E | |
| 44 | | 00 | |
| 45 | | 00 | |
| 46 | | 00 | |
| 47 | | 19 | |
| 48 | Detailed timing / monitor descriptor #2 | 00 | |
| 49 | | 00 | |
| 4A | | 00 | |
| 4B | | FE | |
| 4C | | 00 | |
| 4D | | 0A | |
| 4E | | 20 | |
| 4F | | 20 | |
| 50 | | 20 | |
| 51 | | 20 | |
| 52 | | 20 | |
| 53 | | 20 | |
| 54 | | 20 | |
| 55 | | 20 | |
| 56 | | 20 | |
| 57 | | 20 | |
| 58 | | 20 | |
| 59 | | 20 | |
| 5A | Detailed timing / monitor descriptor #3 | 00 | |
| 5B | | 00 | |
| 5C | | 00 | |
| 5D | | FE | |
| 5E | | 00 | |
| 5F | | 48 | |

| Add | Function | Hex | Input Value |
|---|---|---|---|
| 60 | Detailed timing / monitor descriptor #3 | 59 | Company name : HYDIS |
| 61 | | 44 | |
| 62 | | 49 | |
| 63 | | 53 | |
| 64 | | 0A | |
| 65 | | 20 | |
| 66 | | 20 | |
| 67 | | 20 | |
| 68 | | 20 | |
| 69 | | 20 | |
| 6A | | 20 | |
| 6B | | 20 | |
| 6C | Detailed timing / monitor descriptor #4 | 00 | Model name : HX104X01 |
| 6D | | 00 | |
| 6E | | 00 | |
| 6F | | FE | |
| 70 | | 00 | |
| 71 | | 48 | |
| 72 | | 58 | |
| 73 | | 31 | |
| 74 | | 30 | |
| 75 | | 34 | |
| 76 | | 58 | |
| 77 | | 30 | |
| 78 | | 31 | |
| 79 | | 20 | |
| 7A | | 20 | |
| 7B | | 20 | |
| 7C | | 20 | |
| 7D | | 0A | |
| 7E | Extension flag | 00 | |
| 7F | Checksum | TBD | |