# HT15X33-300
# Product Specification

**Rev. O**

BOE-HYDIS TECHNOLOGY CO.,LTD.

# REVISION HISTORY

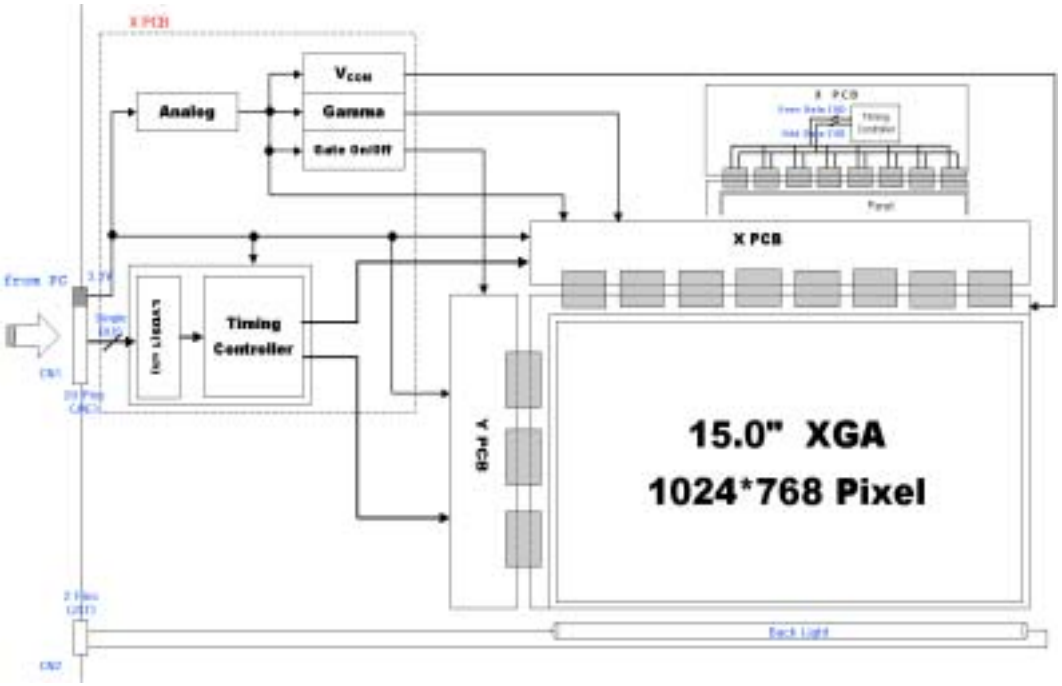
| REV. | ECN NO. | DESCRIPTION OF CHANGES | DATE | PREPARED |
|---|---|---|---|---|
| O | | Initial Release | 03/02/26 | H.C. JUNG |

# Contents

## 1.0 GENERAL DESCRIPTION

### 1.1 Introduction

HT15X33-300 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 15.0 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. Therefore, this module is suitable for Notebook PC. The DC/AC inverter for back-light driving is not built in this model.




### 1.2 Features

- Low driving voltage and low power consumption
- Thin and light weight
- 3.3 V power supply
- 1 Channel LVDS Interface
- Single CCFL (Bottom side/Horizontal Direction)
- 262,144 colors
- Data enable signal mode
- Side Mounting Frame
- Glare Pol (C/F)

1.3 General Specifications

The followings are general specifications at the model HT15X33-300. (listed in Table 1.)

<Table 1. General Specifications>

| Parameter | Specifications | Unit | Remarks |
|---|---|---|---|
| Active area | 304.128(H) * 228.096(V) | mm | |
| Number of pixels | 1024(H) * 768(V) | Pixels | |
| Pixel pitch | 0.297(H) * 0.297(V) | mm | |
| Pixel arrangement | RGB Vertical stripe | | |
| Display colors | 262,144 | Colors | |
| Display mode | Normally white | | |
| Dimensional outline | 315.8(W) * 240.5(V) * 7.0(D)max. | mm | Note 1 |
| Weight | 650 typ. / 670 max. | g | |
| Back-light | CCFL, Horizontal-lamp type | | Note 2 |

Note 1. All : ±0.3 [mm] (For only I/F connector [FI-SEB20P-HF10] block: 7.1[mm] typ.)

2. CCFL (Cold Cathode Fluorescent Lamp)

**2.0 ABSOLUTE MAXIMUM RATINGS**

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings>

| Parameter | Symbol | Min. | Max. | Unit | Remarks |
|---|---|---|---|---|---|
| Logic Power Supply | $V_{DD}$ | VSS-0.3 | 4.0 | V | Ta = 25 ±2 ℃ |
| Logic Input Voltage | $V_{IN}$ | VSS-0.3 | $V_{DD}$+0.3 | V | |
| Back-light Lamp Current | IBL | 2.0 | 6.5 | mA | |
| Back-light Frequency | FBL | 40 | 80 | KHz | |
| Operating Temperature | $T_{OP}$ | 0 | +50 | ℃ | Note 1 |
| Storage Temperature | $T_{SP}$ | -20 | +60 | ℃ | |

Note 1. Temperature and relative humidity range are shown in the figure below.

* 95 [%] RH Max. (40℃ ≥Ta)

* Maximum wet-bulb temperature at 39 ℃ or less.(Ta 〉40℃ ) No condensation

## 3.0 ELECTRICAL SPECIFICATIONS

### 3.1 Electrical Specifications

< Table 3. Electrical specifications >

Ta = 25 ±2 ℃

| Parameter | | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|
| Power Supply Voltage | $V_{DD}$ | 3.0 | 3.3 | 3.6 | V | Note 1. |
| Power Supply Current | $I_{DD}$ | - | 463 | 660 | mA | Max(@Ver. 2-Line Skip(L14)) |
| Differential Input Voltage | $V_{IH}$ | - | - | +100 | mV | Note 2. |
| | $V_{IL}$ | -100 | - | - | mV | |
| Lamp Current | $I_{BL}$ | 2.0 | 6.0 | 6.5 | $mA_{rms}$ | At $I_{BL}$ = 6.0 mA, |
| Lamp Voltage | $V_{BL}$ | - | 660 | - | $V_{rms}$ | Note 3. |
| Lamp operating frequency | $F_L$ | 40 | 60 | 80 | KHz | Note 4. |
| Lamp Starting Voltage | Ta = 25℃ | - | - | 1080 | $V_{rms}$ | Note 5. |
| | Ta = 0℃ | - | - | 1520 | $V_{rms}$ | |
| Lamp Life Time | | 10,000 | 15,000 | - | Hrs | Note 6. |
| Power Consumption | $P_D$ | - | 1.6 | - | W | Typ. @ Color Bar |
| | $P_{BL}$ | - | 4.0 | - | W | Note 7. |
| | $P_{total}$ | - | 5.6 | - | W | |

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℃ .

2. LVDS common mode voltage, VCM = 1.2 [V].

3. Reference value, which is measured with Samsung Electric SIC130 Inverter.
($V_{BLMIN}$ is value at $I_{BLMIN}$ and $V_{BLMAX}$ is at $I_{BLMAX}$)

4. The lamp frequency should be selected as different as possible from the horizontal synchronous frequency and its harmonics to avoid interference which may cause line flow on the display

5. The inverter open voltage should be supply more than the maximum value of lamp starting voltage.

6. Life Time (Hr) of a lamp can be defined as the time in witch it continues to operate under the condition Ta = 25 ±2 [℃ ] and Il = 6.0[mArms] until one of the following event occurs.
* When the brightness becomes 50[%] or lower than it's original.
* When the effective ignition length becomes 80[%] or lower than it's original value.

7. Refer to $V_{BL} \times I_{BL\ to\ Calculate}$. (at $I_{BL}$ = 6.0 [mA])

## 4.0 OPTICAL SPECIFICATIONS

### 4.1 Overview

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 $\theta$ and $\phi$ equal to 0°. We refer to $\theta_{Ø=0}$ (=$\theta_3$) as the 3 o'clock direction (the "right"), $\theta_{Ø=90}$ (= $\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta_{Ø=180}$ (= $\theta_9$) as the 9 o'clock direction ("left") and $\theta_{Ø=270}$ (= $\theta_6$) as the 6 o'clock direction ("bottom"). While scanning $\theta$ and / or Ø, the center of the measuring spot on the Display surface shall stay fixed. The measurement shall be executed 30 minutes after lighting at rating with the back-light CCFL being run at a 4.5mArms current after 30 minutes warm-up period. VDD shall be 3.3+/- 0.15V at 25°C. Optimum viewing angle direction is 6 o'clock.

### 4.2 Optical Specifications

<Table 4. Optical Specifications>

| Parameter | | Symbol | Conditions | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Viewing Angle range | Horizontal | $\Theta_3$ | CR > 10 | 40 | 45 | - | Deg. | Note 1 |
| | | $\Theta_9$ | | 40 | 45 | - | Deg. | |
| | Vertical | $\Theta_{12}$ | | 10 | 15 | - | Deg. | |
| | | $\Theta_6$ | | 25 | 30 | - | Deg. | |
| Luminance Contrast ratio | | CR | $\Theta$ = 0° | 150 | 200 | - | - | Note 2 |
| Average Luminance of white | | $Y_w$ | $\Theta$ = 0° | 170 | 200 | | cd/m$^2$ | Note 3 |
| White luminance uniformity | | $\Delta$ Y | IBL = 6mA | - | 1.1 | 1.33 | | Note 4 |
| White Chromaticity | | $x_w$ | $\Theta$ = 0° | 0.274 | 0.304 | 0.334 | | Note 5 |
| | | $y_w$ | | 0.305 | 0.335 | 0.365 | | |
| Reproduction of color | Red | $x_R$ | | 0.534 | 0.564 | 0.594 | | |
| | | $y_R$ | | 0.307 | 0.337 | 0.367 | | |
| | Green | $x_G$ | | 0.267 | 0.297 | 0.327 | | |
| | | $y_G$ | | 0.500 | 0.530 | 0.560 | | |
| | Blue | $x_B$ | | 0.123 | 0.153 | 0.183 | | |
| | | $y_B$ | | 0.109 | 0.139 | 0.169 | | |
| Response Time | Rise($T_r$) | $T_r + T_d$ | | | 30 | 50 | ms | Note 6 |
| | Decay($T_d$) | | | | | | | |
| Cross Talk | | CT | | - | - | 2.0 | % | Note 7 |

Note:

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles 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 FIGURE1 shown in Appendix).
2. Contrast measurements shall be made at viewing angle of $\Theta = 0°$ 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 FIGURE1 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically as CR = Luminance when displaying a white raster / Luminance when displaying a black raster.
3. Average Luminance of white is defined as arithmetic center of one 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.

   The average Luminance of white is varied by the Back-light Current, IBL.

   (IBL = 6.0 mArms, FL = 63 KHz)
4. The White luminance uniformity on LCD surface is then expressed as : $\Delta$ Y = Maximum Luminance of five points / Minimum Luminance of five points

   (see FIGURE .3).
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 shown in FIGURE 4 (shown in Appendix) by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Td and 90% to 10% is Tr.
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 (Refer to FIGURE 5).

## 5.0 INTERFACE CONNECTION

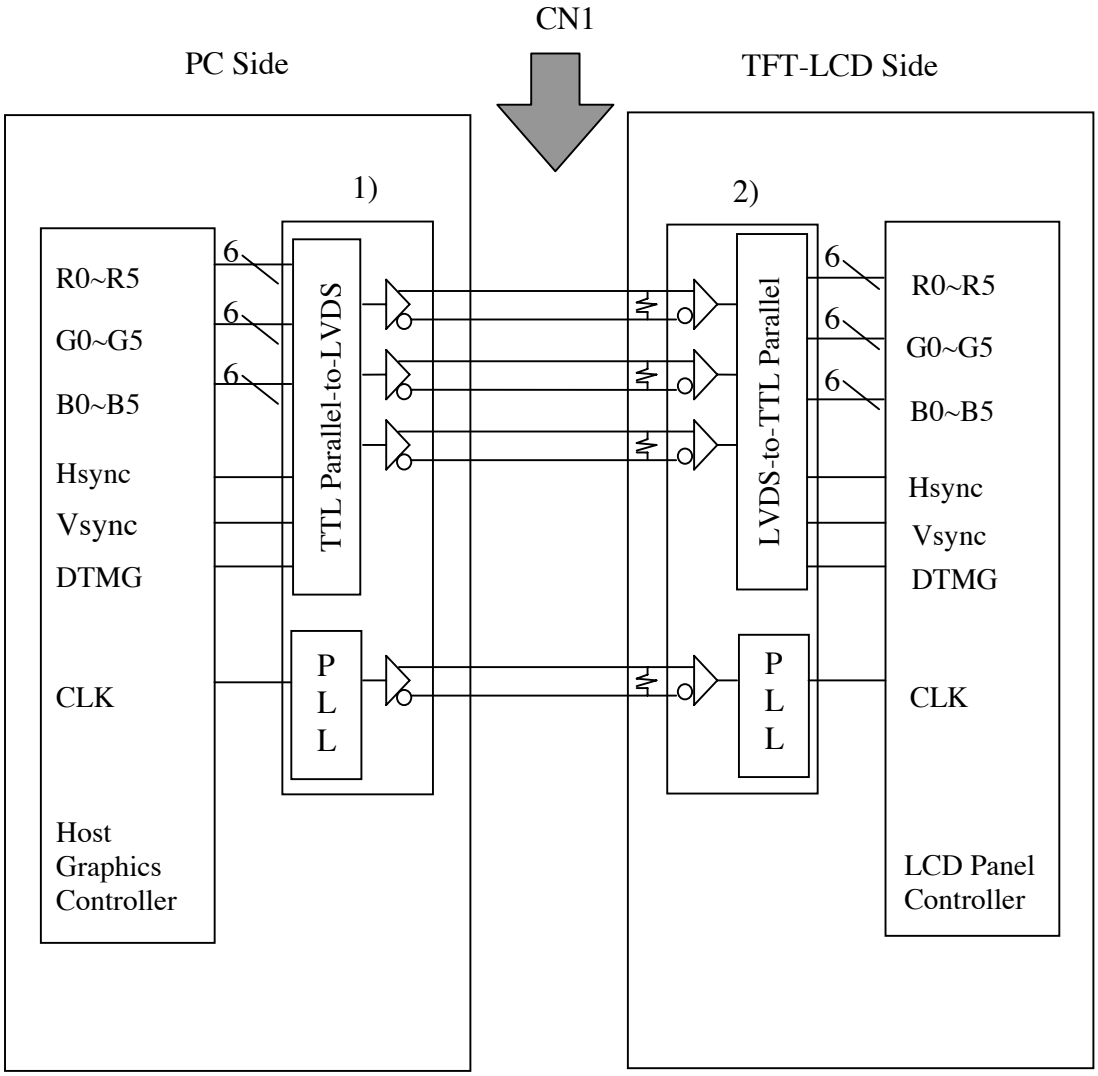
### 5.1 Electrical Interface Connection

The electronics interface connector is a model FI-SEB20P-HF10 manufactured by JAE or equivalent. The mating connector part number is FI-SEB20M-HF or equivalent. The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignment for the Interface Connector>

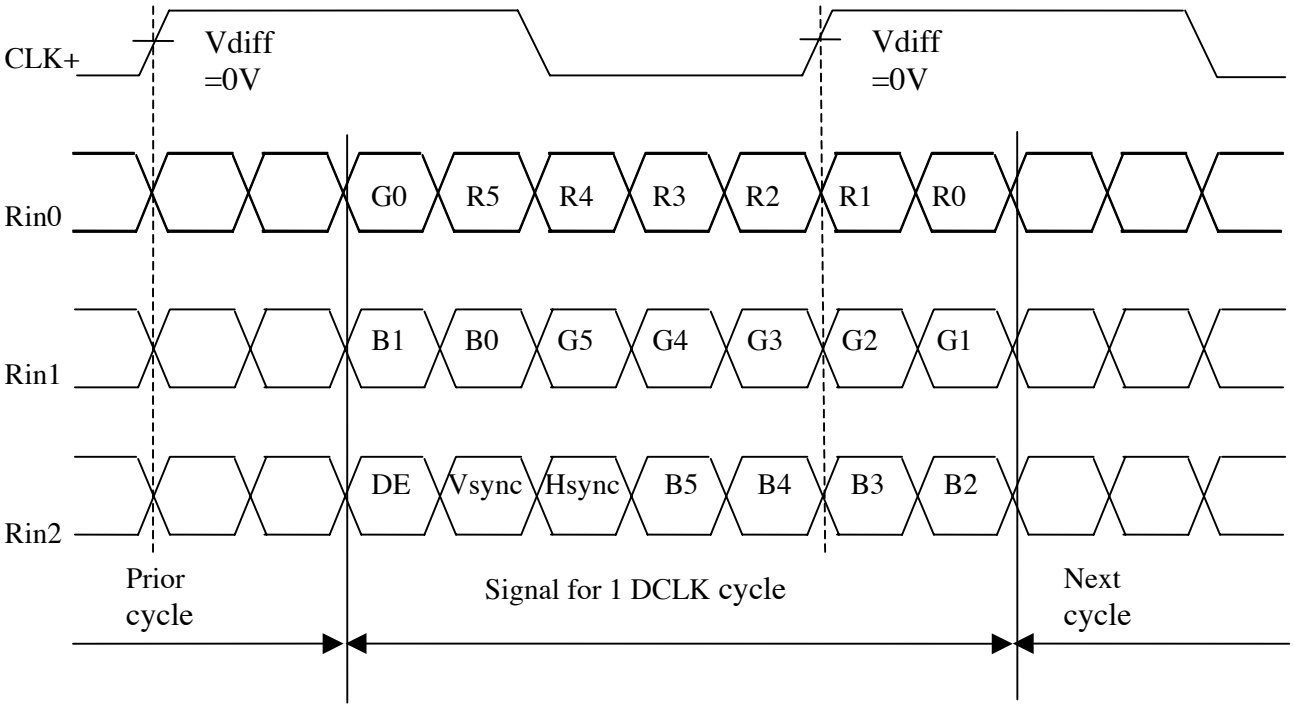
| Terminal | Symbol | Functions |
|---|---|---|
| 1 | VDD1 | Power Supply : +3.3V |
| 2 | VDD2 | Power Supply : +3.3V |
| 3 | VSS1 | Ground |
| 4 | VSS2 | Ground |
| 5 | RIN0- | Transmission Data of 0 Negative - |
| 6 | RIN0+ | Transmission Data of 0 Positive + |
| 7 | VSS3 | Ground |
| 8 | RIN1- | Transmission Data of 1 Negative - |
| 9 | RIN1+ | Transmission Data of 1 Positive + |
| 10 | VSS4 | Ground |
| 11 | RIN2- | Transmission Data of 2 Negative - |
| 12 | RIN2+ | Transmission Data of 2 Positive + |
| 13 | VSS5 | Ground |
| 14 | CLK- | Sampling Clock of Negative - |
| 15 | CLK+ | Sampling Clock of Positive + |
| 16 | VSS6 | Ground |
| 17 | NC1 | No Connection |
| 18 | NC2 | No Connection |
| 19 | VSS7 | Ground |
| 20 | VSS8 | Ground |

5.2 LVDS Interface




NOTE 1. LVDS cable impedance is 100 ohms per signal line
when two are used differentially…
2. Transmitter: TI SN75LVDS84, or equivalent.
Transmitter is not contained in Module.

5.3 LVDS Input signal




Pin connection in case of using
TI SN75LVDS84

| Input signal | Transmitter | Input signal | Transmitter |
|---|---|---|---|
| DCLK | CLK IN(26) | G4 | IN10(10) |
| R0 | IN0(44) | G5 | IN11(12) |
| R1 | IN1(45) | B0 | IN12(13) |
| R2 | IN2(47) | B1 | IN13(15) |
| R3 | IN3(48) | B2 | IN14(16) |
| R4 | IN4(1) | B3 | IN15(18) |
| R5 | IN5(3) | B4 | IN16(19) |
| G0 | IN6(4) | B5 | IN17(20) |
| G1 | IN7(6) | Hsync | IN18(22) |
| G2 | IN8(7) | Vsync | IN19(23) |
| G3 | IN9(9) | DTMG | IN20(25) |

5.4 Back-light Interface

The Back-light interface connector is a model BHSR-02VS-1 manufactured by JST or equivalent. The connector interface pin assignments are listed in Table 7.

<Table 7. Back-light Electrical Interface>

| Terminal | Symbol | Function |
|---|---|---|
| 1 | VL | CCFL Power Supply(High Voltage) |
| 2 | GL | CCFL Power Supply(GND Side) |

## 6.0 SIGNAL TIMING SPECIFICATION

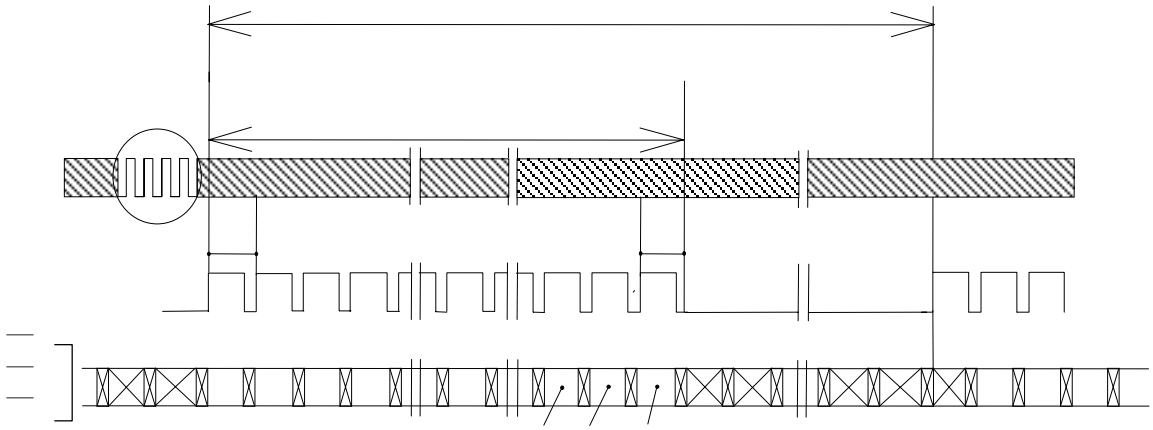
The specification of the signal timing parameter is listed in Table 8.

<Table 8. Signal Timing Specification>

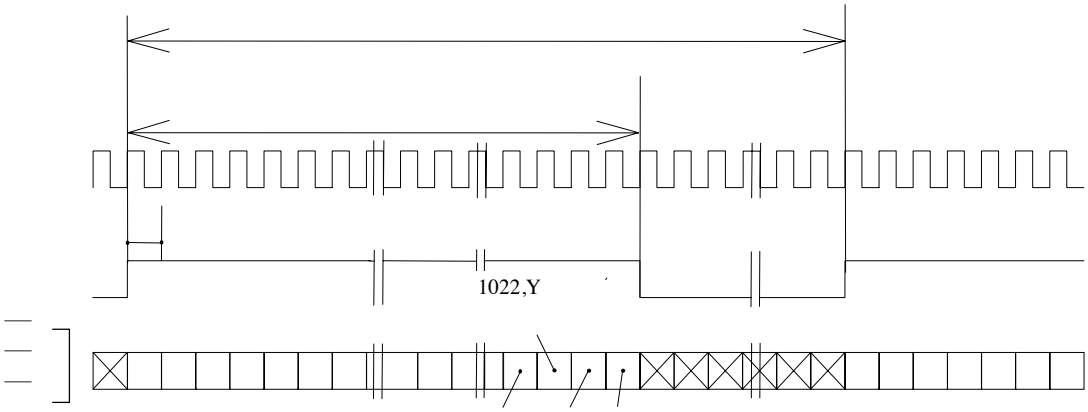
| Items | Symbol | Min. | Typ. | Max. | Unit | Remarks |
|---|---|---|---|---|---|---|
| Frame Period | t1 | 771*t3 | 806*t3<br>16.67 | 1500*t3 | Line<br>ms | <br>60 [Hz] |
| Vertical Display Term | t2 | 768*t3 | 768*t3<br>15.88 | 768*t3 | Line<br>ms | |
| One Line Scanning Time | t3 | 1064*t5 | 1344*t5<br>20.67 | 1600*t5 | Clock<br>us | |
| Horizontal Display Term | t4 | 1024*t5 | 1024*t5<br>15.75 | 1024*t5 | Clock<br>us | |
| Clock Period | t5 | 14.7 | 15.38 | 31.25 | ns | 65 [MHz] |
| Clock “L” Time | t6 | (5.0) | | | | |
| Clock “H” Time | t7 | (5.0) | | | | |
| Setup Time | t8 | 4.0 | | | | |
| Hold Time | t9 | 0.0 | | | | |

## 7.0 SIGNAL TIMING WAVEFORMS

7.1 Vertical Timing Waveforms
(t1 ~ t5 : referenced by table 8.)



7.2 Horizontal Timing Waveforms



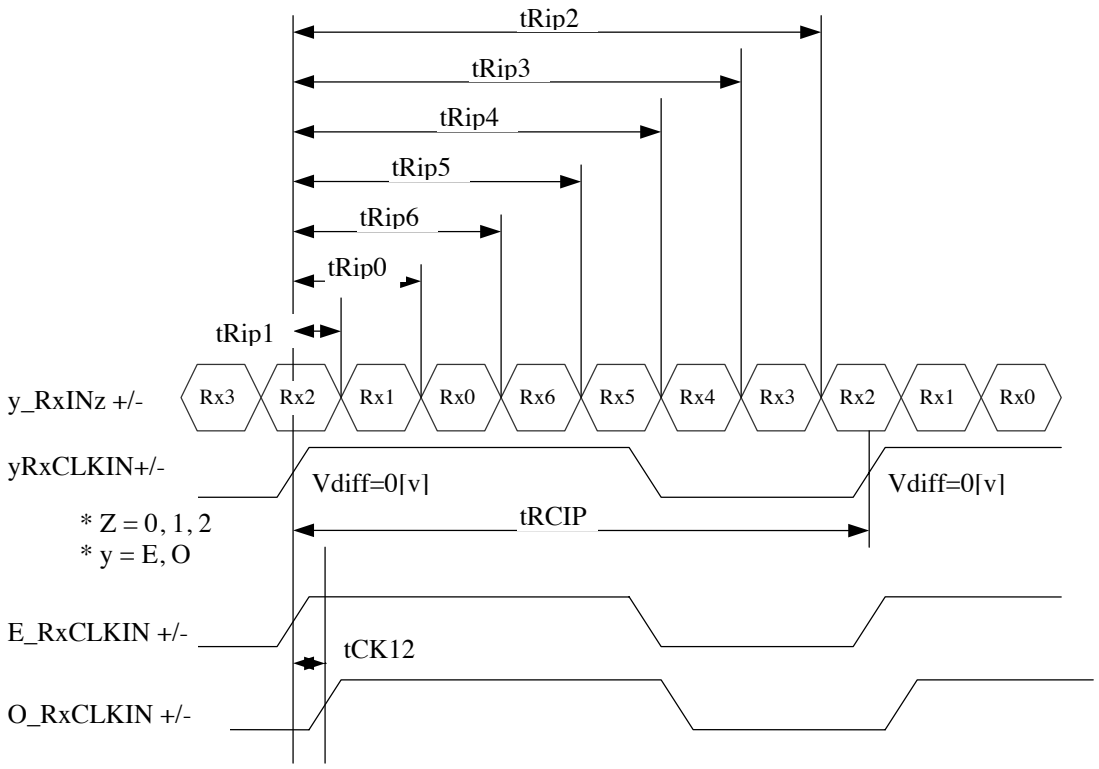
7.3 LVDS Rx Interface Timing Parameter

The specification of the LVDS Tx interface timing parameter is listed in Table 9.

<Table 9. LVDS Rx Interface Timing Specification>

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|
| PLL Set | tRPLL | - | - | 10.0 | Msec | |
| CLKIN Period | tRCIP | 14.7 | 15.38 | 31.25 | Nsec | |
| Skew Time | tCK12 | - | - | TBD | Nsec | Note 1 |
| Input Data 0 | tRIP1 | -0.2 | 0.0 | +0.2 | Nsec | |
| Input Data 1 | tRIP0 | tRICP/7-0.2 | tRICP/7 | tRICP/7+0.2 | Nsec | |
| Input Data 2 | tRIP6 | 2*tRICP/7-0.2 | tRICP/7 | 2*tRICP/7+0.2 | Nsec | |
| Input Data 3 | tRIP5 | 3*tRICP/7-0.2 | tRICP/7 | 3*tRICP/7+0.2 | Nsec | |
| Input Data 4 | tRIP4 | 4*tRICP/7-0.2 | tRICP/7 | 4*tRICP/7+0.2 | Nsec | |
| Input Data 5 | tRIP3 | 5*tRICP/7-0.2 | tRICP/7 | 5*tRICP/7+0.2 | Nsec | |
| Input Data 6 | tRIP2 | 6*tRICP/7-0.2 | tRICP/7 | 6*tRICP/7+0.2 | Nsec | |

Note 1: Skew Time Between E_RxCLKIN+/- and O_RxCLKIN+/-



## 8.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

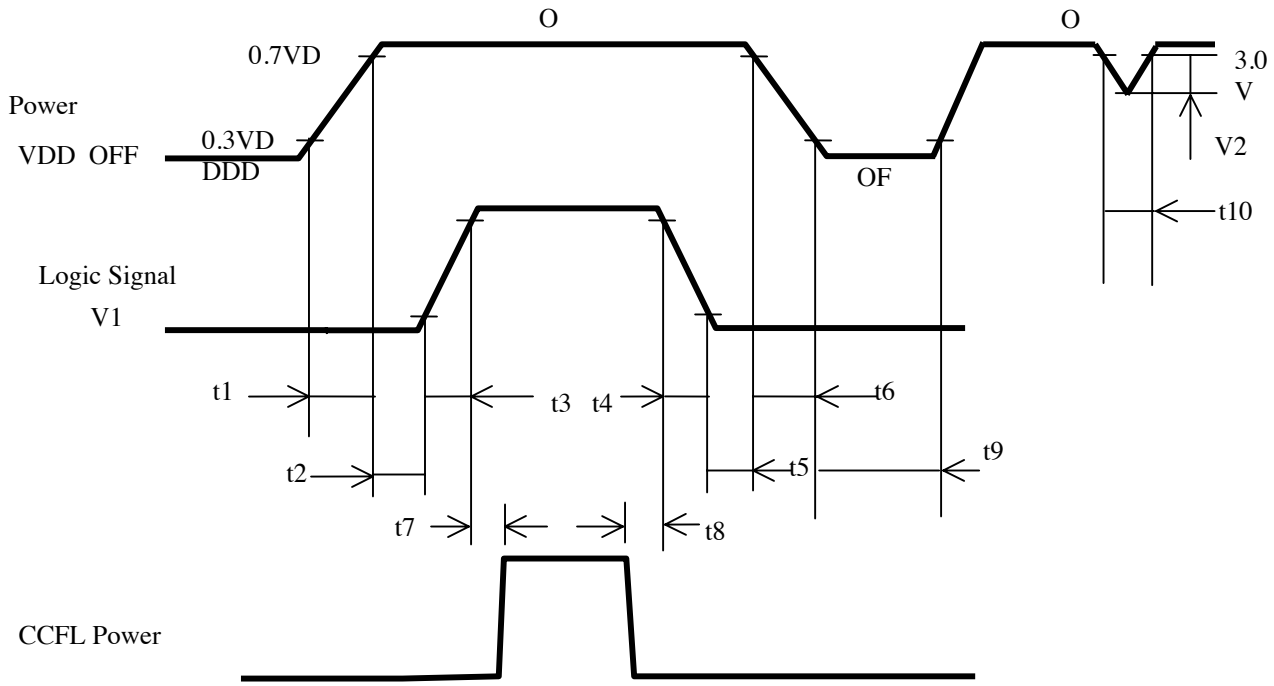
Each color is displayed in sixty-four gray scales from a 6 bit data signal input. A total of 262,144 colors are derived from the resultant 18 bit data. Table 9. shows the input signals, basic display colors and gray scale for each color.

<Table 9. Input signals, Basic display colors and Gray scale for each color.>

| | Colors & Gray scale | Data signal | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R0 | R1 | R2 | R3 | R4 | R5 | G0 | G1 | G2 | G3 | G4 | G5 | B0 | B1 | B2 | B3 | B4 | B5 |
| 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 |
| | Light Blue | 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 |
| | Purple | 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 |
| | △ | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ ↓ ▽ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | Brighter | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 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 |
| | 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 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | △ ↓ ▽ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | Brighter | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | ▽ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 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 | 1 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | △ ↓ ▽ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | Brighter | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 |
| | ▽ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 |
| | 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 |
| | △ | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| | Darker | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| | △ ↓ ▽ | ↓ | | | | | | ↓ | | | | | | ↓ | | | | | |
| | Brighter | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 |
| | ▽ | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

**9.0 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




| | |
|---|---|
| t1 ≤ 10 ms | 0 ≤ t4 ≤ 50 ms |
| 0 ≤ t2 ≤ 50 ms | 0 ≤ t5 ≤ 50 ms |
| 0 ≤ t3 ≤ 50 ms | t6 ≤ 10 ms |
| t7 ≥ 100 ms | t8 ≥ 200 ms |
| t9 ≥ 200ms | t10 ≤ 10 ms ( Note2. ) |

2.4 V ≤ V2 ≤ 3.0V ( Note3. )

* SET 0V ≤ V1(t) ≤ VDD(t)
HERE, V1(t), VDD(t) indicate the transitive state of V1, VDD
when the power supply is turned ON or OFF
Note1. : Do not keep the interface signal high-impedance when power is on.
Note2. : Momentary Voltage Drop Time.
Note3. : Momentary Drop Voltage.

## 10.0 MECHANICAL CHARACTERISTICS

### 10.1 Dimensional Requirements

FIGURE 6 (located in Appendix) shows mechanical outlines for the model 15.0" XGA Coral. Other parameters are shown in Table 10.

<Table 10. Dimensional Parameters.>

| Parameter | Specification | Unit |
|---|---|---|
| Active area | 304.128(H) * 228.096(V) | mm |
| Number of pixels | 1024(H)*768(V) | pixels |
| | (1 pixel = R + G + B dots) | |
| Pixel pitch | 0.297(H)*0.297(V) | mm |
| Pixel arrangement | RGB Vertical stripe | |
| Display colors | 262,144 | colors |
| Display mode | Normally white | |
| Dimensional outline | 315.8±0.5(W) * 240.5±0.5(V) * 6.7 ±0.3 (D) | mm |
| Weight | 650 Typ. / 670 Max. | g |
| Back-light | CCFL, Horizontal-lamp type | |

### 10.2 Mounting

See FIGURE 7. (shown in Appendix)

### 10.3 Glare and Polarizer Hardness.

The surface of the LCD has an AR coating to minimize reflection and a coating to reduce scratching. (Nitto Denko : ARCHCT)

### 10.4 Light Leakage

There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 350lux. The manufacture shall furnish limit samples of the panel showing the most light leakage acceptable.

**11.0 RELIABILITY TEST**

The Reliability test items and its conditions are shown in below.

<Table 12. Reliability test>

| No | Test Items | Conditions |
|---|---|---|
| 1 | High temperature storage test | Ta = 60 ℃ , 240 hrs |
| 2 | Low temperature storage test | Ta = -20 ℃ , 240 hrs |
| 3 | High temperature & high humidity operation test | Ta = 50 ℃ , 80 %RH, 240 hrs |
| 4 | High temperature operation test | Ta = 50 ℃ , 240 hrs |
| 5 | Room temperature operation test | Ta = 25 ℃ , 240 hrs |
| 6 | Low temperature operation test | Ta = 0 ℃ , 240 hrs |
| 7 | On/Off operation test | Ta = 25 ℃ , 1 min. On/Off, 3000 cycle |
| 8 | Thermal shock | Ta = -20 ℃ ↔ 60 ℃ (0.5 hr), 100 cycle |
| 9 | Vibration test (non-operating) | Frequency : 10 ~ 500 Hz<br>Gravity/AMP : 1.5G X,Y,Z<br>Period : 30 min. |
| 10 | Shock test (non-operating) | Gravity : 220G<br>Pulse width : 2 ms, half sine wave<br>Direction : ±X, ±Y, ±Z<br>Once for each direction |
| 11 | Electrostatic discharge test | Air : 150 pF, 330Ω, 15 KV<br>Contact : 150 pF, 330Ω, 8 KV |

**12.0 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

- 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.
- As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Do not pull the interface connector in or out while the LCD module is operating.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

12.3 Cautions for the operation

- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

12.4 Cautions for the atmosphere

- Dew drop atmosphere should be avoided.
- 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

- Do not apply fixed pattern data signal to the LCD module at product aging.
- Applying fixed pattern for a long time may cause image sticking.

12.6 Other cautions

- Do not disassemble and/or re-assemble LCD module.
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

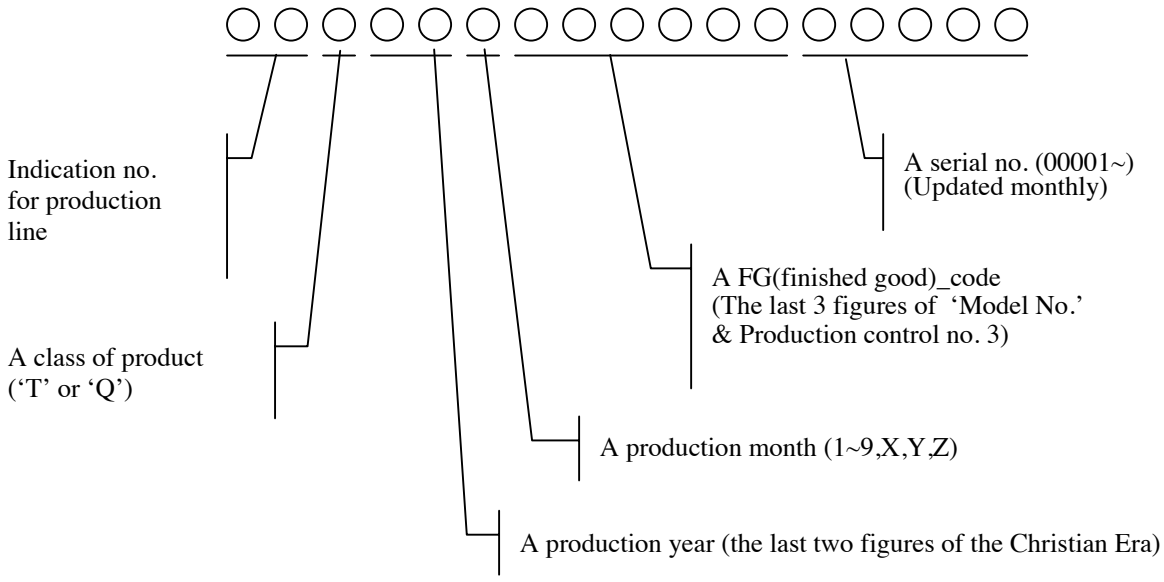
**13.0 Environment & Safety**

13.1 Mercury Disposal

| | |
|---|---|
| Cold cathode fluorescent lamp in LCD panel contains a small amount of mercury, Please follow local ordinances or regulation for disposal. | 該液晶ディスプレイパネルは　光管が組み　まれていますので、地方自治の　例又は規則に　って　棄して下さい。 |

13.2 Safety Label (Product Label)


How to express 'Lot No.'



**14.0 APPENDIX**

**Figure 1. Measurement Set Up**

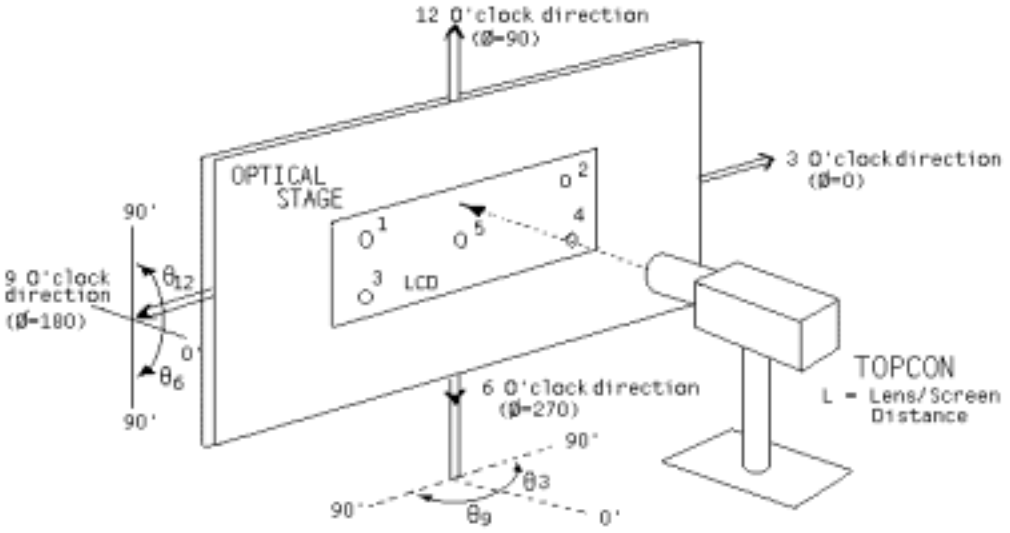



**Figure 2, 3. Average Luminance Measurement & Uniformity Measurement Locations**

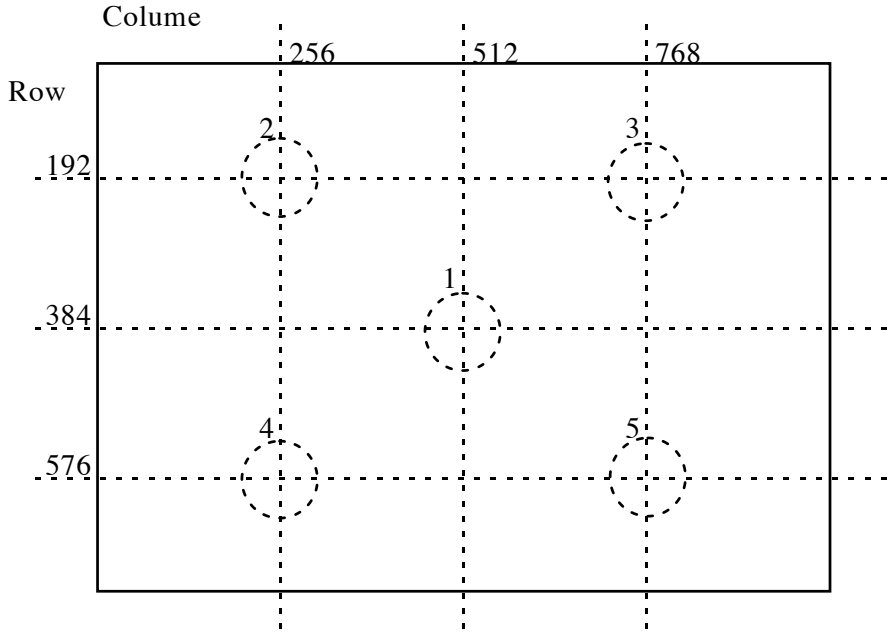


**Figure 4. Response Time Testing**

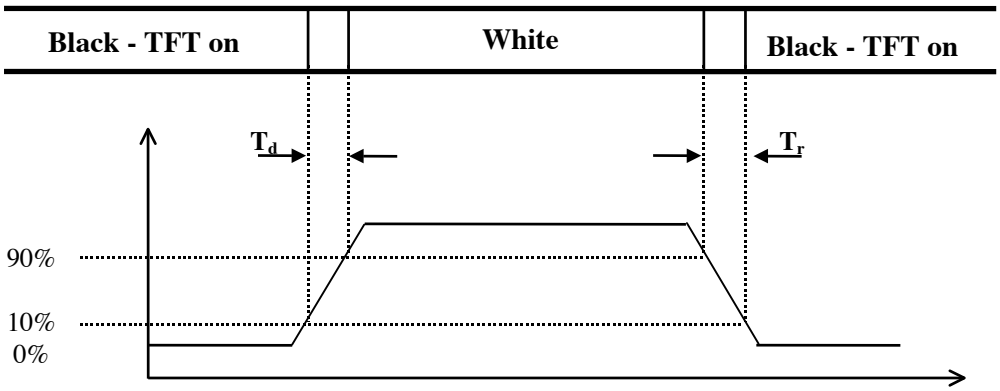
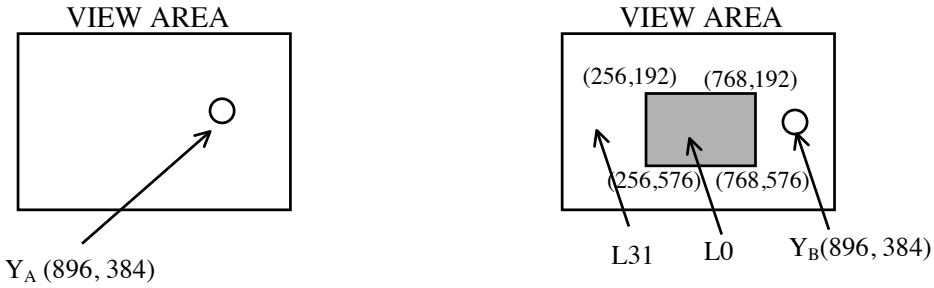



**Figure 5. Cross Modulation Test Description**




$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_B} \right| \times 100$$

Where:

$Y_A$ = Initial luminance of measured area ($cd/m^2$)

$Y_B$ = Subsequent luminance of measured area ($cd/m^2$)

The location measured will be exactly the same in both patterns

**Figure 6. TFT-LCD Module Outline Dimensions (Front view)**

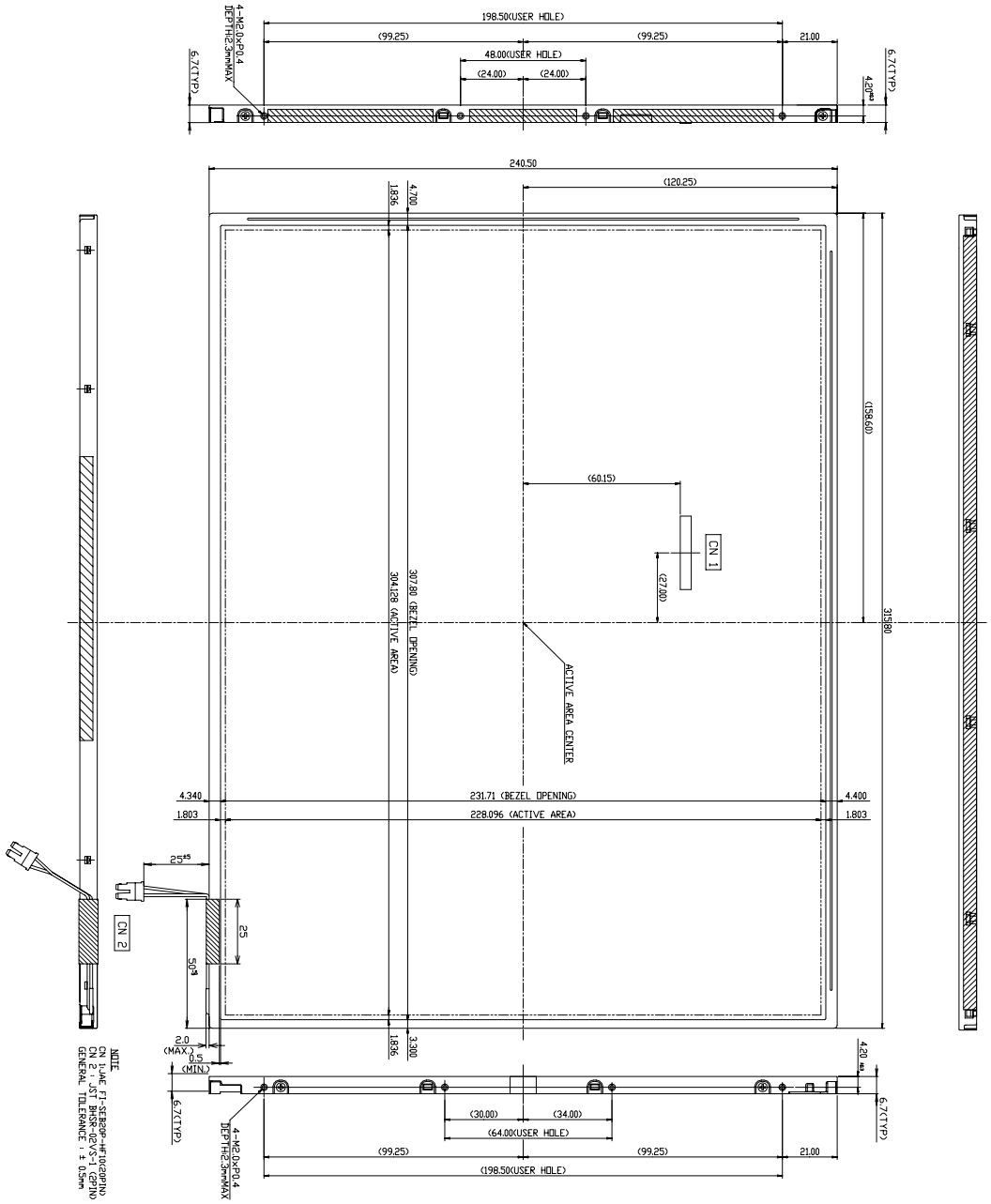


**Figure 7. TFT-LCD Module Outline Dimensions (Rear view)**