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TFT | CHARACTER | UWVD | FSC | SEGMENT | CUSTOM | REPLACEMENT

TFT Display Module

Part Number

E70RA-HW480-R

Overview:

- 7.0-inch TFT (165x100mm)
- 6/8-bit LVDS Interface
- 1024(RGB)x600 pixels
- 3.3V
- White LED back-light
- Transmissive/ Normally Black
- 4-wire Resistive Touch Screen
- 480 NITS
- Controller: EK73215/EK79001
- RoHS Compliant

Description

This is a color active matrix TFT (Thin Film Transistor) LCD (Liquid Crystal Display) that uses amorphous silicon TFT as a switching device. This model is composed of a transmissive type TFT-LCD Panel, driver circuit, 4-wire resistive touch screen, and backlight unit. The resolution of the 7.0" TFT-LCD contains 1024x600 pixels and can display up to 16.7M colors.

Features

Low Input Voltage: 3.3V (TYP)

Display Colors of TFT LCD: 262K/16.7M colors

TFT Interface: 6/8-bit LVDS

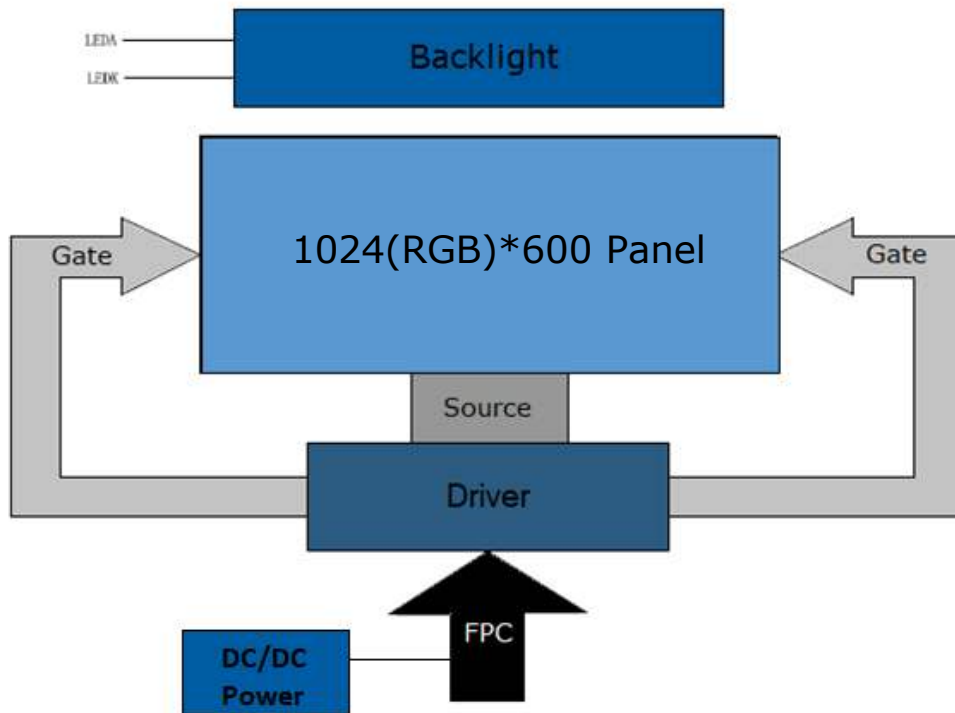
TFT Controller IC: EK73215/EK79001

| General Information Items | Specification | Unit | Note |
|---------------------------|---------------------------------|---------|------|
| | Main Panel | | |
| TFT Display area (AA) | 154.21(H) * 85.92(V) (7.0 inch) | mm | - |
| Driver element | TFT active matrix | - | - |
| Display colors | 262K/16.7M | colors | - |
| Number of pixels | 1024(RGB)*600 | dots | - |
| TFT Pixel arrangement | RGB vertical stripe | - | - |
| Pixel pitch | 0.1506 (H) x 0.1432 (V) | mm | - |
| Viewing angle | ALL | o'clock | - |
| TFT Controller IC | EK73215/EK79001 | - | - |
| LCM Interface | 6/8-bit LVDS | | |
| Display mode | Transmissive/ Normally Black | - | - |
| Operating temperature | -20~+70 | °C | - |
| Storage temperature | -30~+80 | °C | - |

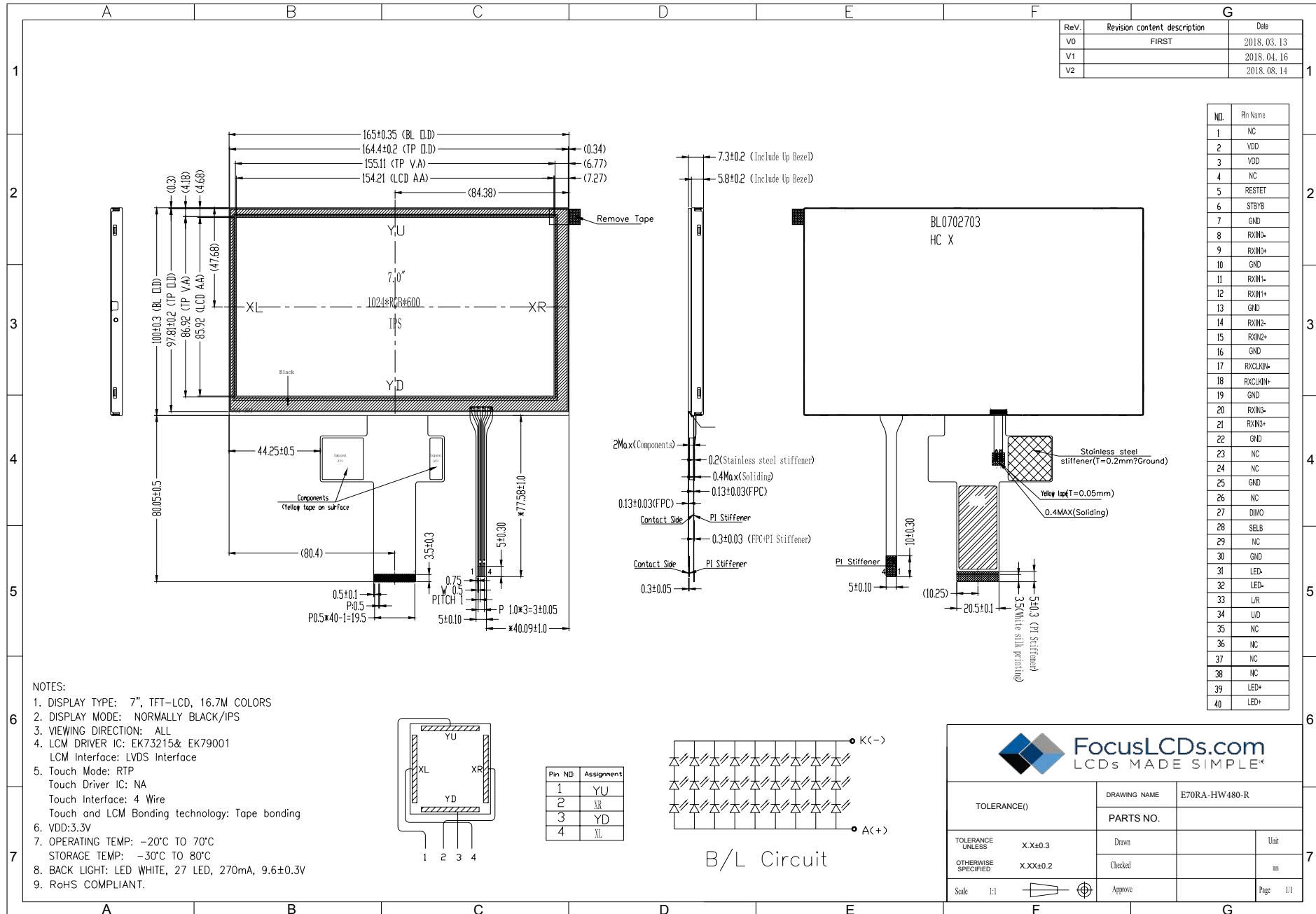
Mechanical Information

| Item | | Min | Typ. | Max | Unit | Note |
|-------------|---------------|-----|------|-----|------|------|
| Module size | Horizontal(H) | | 165 | | mm | - |
| | Vertical(V) | | 100 | | mm | - |
| | Depth(D) | | 7.3 | | mm | - |
| Weight | | | 192 | | g | - |

1. Block Diagram



2. Outline Dimensions



| ReV. | Revision content description | Date |
|------|------------------------------|--------------|
| V0 | FIRST | 2018. 03. 13 |
| V1 | | 2018. 04. 16 |
| V2 | | 2018. 08. 14 |

| NO. | Pin Name |
|-----|----------|
| 1 | NC |
| 2 | VDD |
| 3 | VDD |
| 4 | NC |
| 5 | RESET |
| 6 | STBYB |
| 7 | GND |
| 8 | RXIN- |
| 9 | RXIN+ |
| 10 | GND |
| 11 | RXIN- |
| 12 | RXIN+ |
| 13 | GND |
| 14 | RXIN- |
| 15 | RXIN+ |
| 16 | GND |
| 17 | RXCLIN- |
| 18 | RXCLIN+ |
| 19 | GND |
| 20 | RXIN- |
| 21 | RXIN+ |
| 22 | GND |
| 23 | NC |
| 24 | NC |
| 25 | GND |
| 26 | NC |
| 27 | DIM0 |
| 28 | SELB |
| 29 | NC |
| 30 | GND |
| 31 | LED- |
| 32 | LED- |
| 33 | LIR |
| 34 | LID |
| 35 | NC |
| 36 | NC |
| 37 | NC |
| 38 | NC |
| 39 | LED+ |
| 40 | LED+ |

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| | | | |
|----------------------------|--------------|---------------|----------|
| TOLERANCE() | DRAWING NAME | E70RA-HW480-R | |
| TOLERANCE UNLESS SPECIFIED | PARTS NO. | Drawn | Unit |
| X.X±0.3 | | Checked | mm |
| OTHERWISE SPECIFIED | | Approve | Page 1/1 |
| X.XX±0.2 | | | |

Scale 1:1

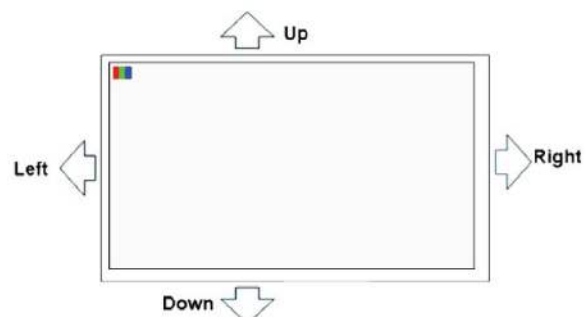
3. Input Terminal Pin Assignment

Recommended TFT Connector: FH12S-40S-0.5SH(55)

Recommended RTP Connector: FH33-4S-1SH(10)

| NO. | Symbol | Description | I/O |
|-------|---------|--|-----|
| 1 | NC | -- | -- |
| 2 | VDD | Power supply for digital circuits | P |
| 3 | VDD | Power supply for digital circuit | P |
| 4 | NC | -- | -- |
| 5 | RESET | Global reset pin. Active low to enter reset state | I |
| 6 | STBYB | Standby mode normally pulled high. STBYB='1', normal operation, STBYB='0', timing controller, source driver will turn off, all outputs are High-Z | I |
| 7 | GND | Ground | P |
| 8 | RXIN0- | - LVDS differential data input | I |
| 9 | RXIN0+ | +LVDS differential data input | I |
| 10 | GND | Ground | P |
| 11 | RXIN1- | - LVDS differential data input | I |
| 12 | RXIN1+ | + LVDS differential data input | I |
| 13 | GND | Ground | P |
| 14 | RXIN2- | - LVDS differential data input | I |
| 15 | RXIN2+ | + LVDS differential data input | I |
| 16 | GND | Ground | P |
| 17 | RXCLKN- | - LVDS differential clock input | I |
| 18 | RXCLKN+ | + LVDS differential data input | I |
| 19 | GND | Ground | P |
| 20 | RXIN3- | - LVDS differential data input | I |
| 21 | RXIN3+ | + LVDS differential data input | I |
| 22 | GND | Ground | P |
| 23 | NC | -- | -- |
| 24 | NC | -- | -- |
| 25 | GND | Ground | P |
| 26 | NC | -- | -- |
| 27 | DIMO | Backlight dimmer signal for external controller. DIMO='0', Turn off external backlight. DIMI='1', Logical control signal to turn on external backlight. If CABC off, DIMO=DIMI, else DIMO is controlled by CABC. If not used leave open. | O |
| 28 | SELB | Input data format selection. SLEB=0, 8-bit LVDS. SLEB=1, 6-bit LVDS | I |
| 29 | NC | -- | -- |
| 30 | GND | Ground | P |
| 31-32 | LED- | LED Cathode | P |
| 33 | L/R | Horizontal shift direction (source output) selection (see note 1) | I |
| 34 | U/D | Vertical shift direction (gate output) selection (see note 1) | I |
| 35-38 | NC | -- | -- |
| 39-40 | LED+ | LED Anode | P |

Note 1: When L/R='0', set right to left scan direction.
 When L/R='1', set left to right scan direction.
 When U/D='0', set top to bottom scan direction.
 When U/D='1', set bottom to top scan direction.



4. LCD Optical Characteristics

4.1 Optical Specifications

| Item | Symbol | Condition | Min | Typ. | Max | Unit | Note | |
|------------------------------|---------|--|----------------|--------|--------|--------|--------|--------|
| Contrast Ratio | CR | $\theta = \phi = 0$ Normal viewing angle | 600 | 800 | -- | | (2) | |
| Response time | Rising | | TR+TF | -- | 25 | 40 | msec | (4) |
| | Falling | | | | | | | |
| Color Gamut | S (%) | | -- | 50 | -- | % | (5) | |
| Color Filter Chromaticity | White | | W _X | 0.2668 | 0.3068 | 0.3468 | | (5)(6) |
| | | | W _Y | 0.2984 | 0.3384 | 0.3784 | | |
| | Red | | R _X | 0.5758 | 0.6158 | 0.6558 | | |
| | | | R _Y | 0.2915 | 0.3315 | 0.3715 | | |
| | Green | | G _X | 0.2907 | 0.3307 | 0.3707 | | |
| | | | G _Y | 0.5345 | 0.5745 | 0.6145 | | |
| | Blue | B _X | 0.1066 | 0.1466 | 0.1866 | | | |
| | | B _Y | 0.0738 | 0.1138 | 0.1538 | | | |
| Viewing angle | Hor. | θ_L | -- | 85 | -- | | (1)(6) | |
| | | θ_R | -- | 85 | -- | | | |
| | Ver. | θ_U | -- | 85 | -- | | | |
| | | θ_D | -- | 85 | -- | | | |
| Option View Direction | ALL | | | | | | (1) | |

4.2 Measuring Condition

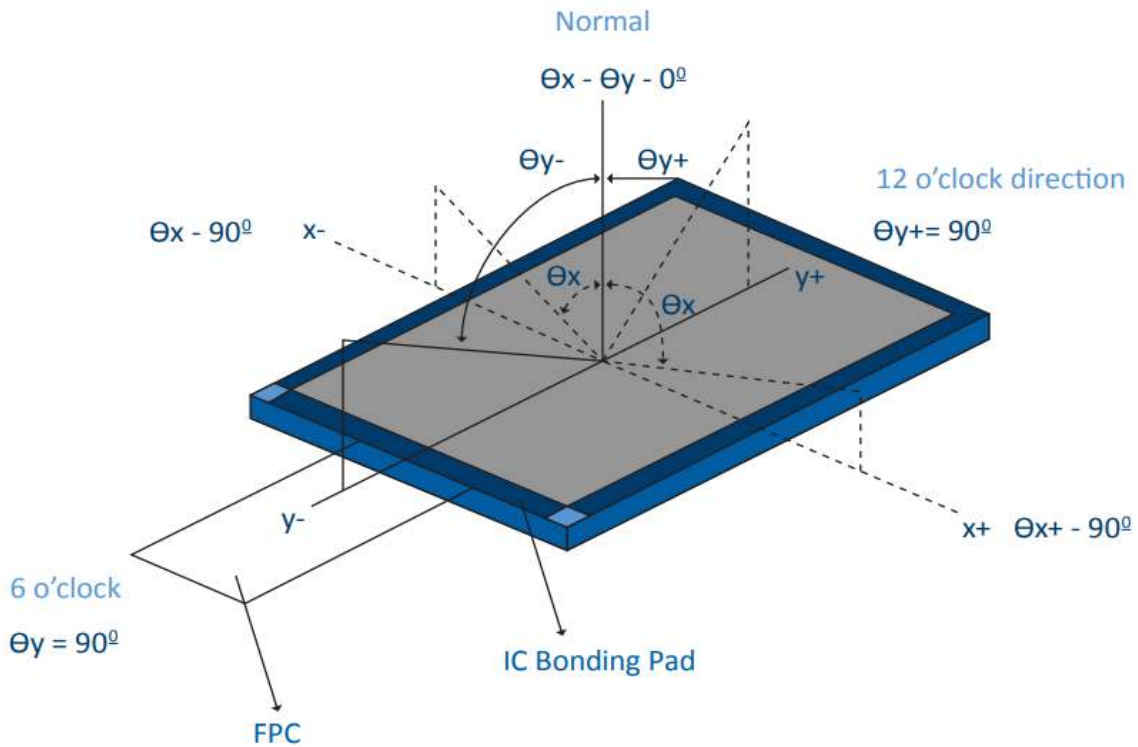
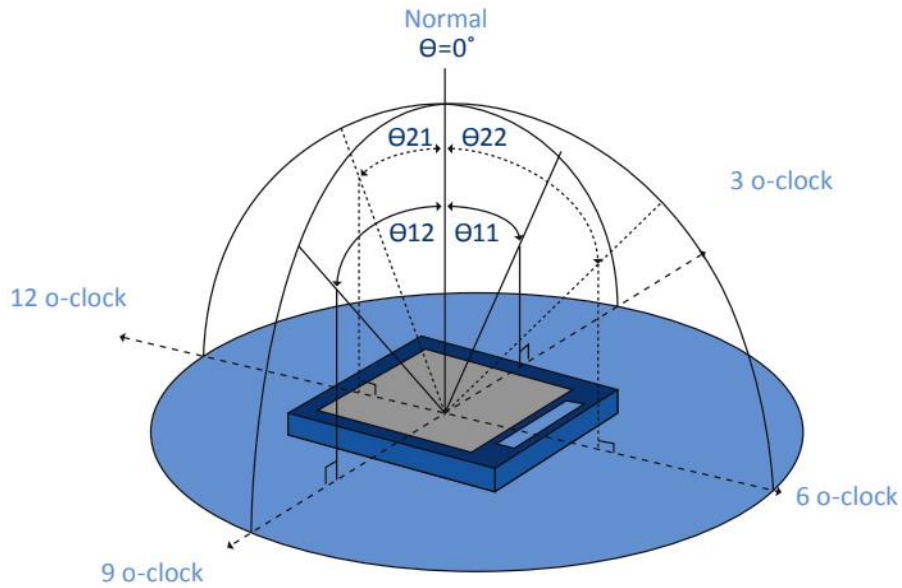
VDD = 3.3V, IL = 20mA (Backlight current)

Ambient temperature: 25 ± 2°C

15min. warm-up time

Optical Specification Reference Notes:

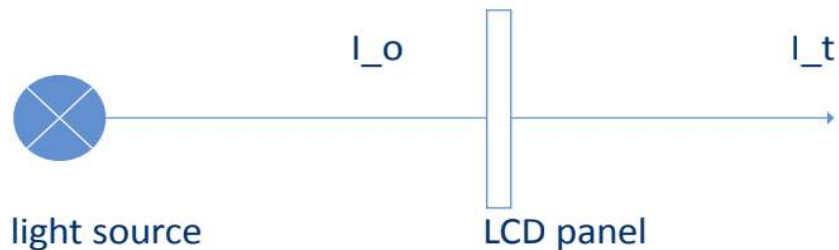
(1) Definition of Viewing Angle: The viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3,9 o'clock direction and the vertical or 6,12 o'clock direction with respect to the optical axis which is normal to the LCD surface.



(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

$$Cr = \frac{L_w}{L_d}$$

(3) Definition of transmittance (T%): The transmittance of the panel including the polarizers is measured with electrical driving.



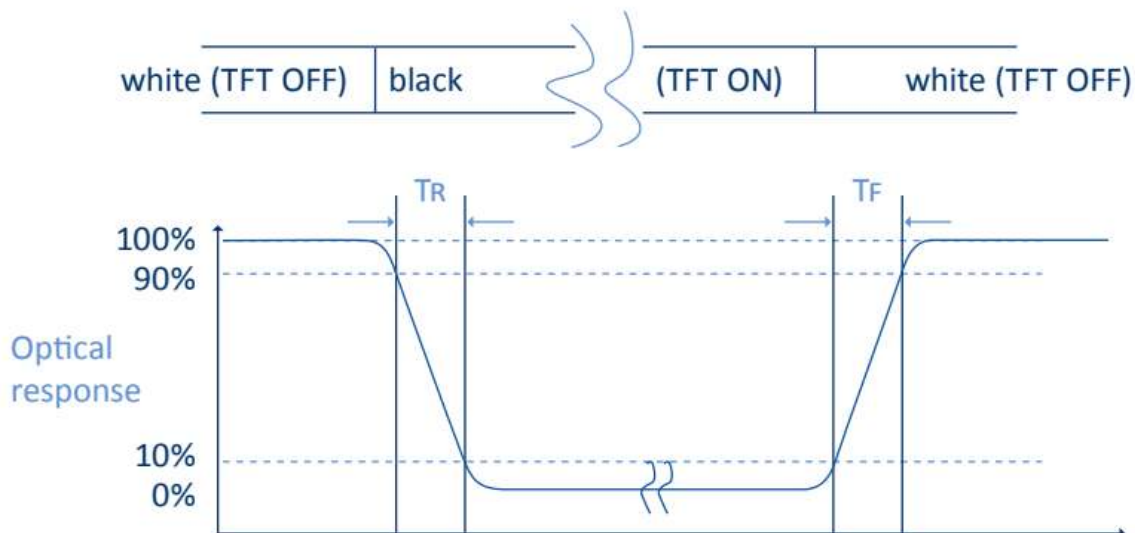
The transmittance is defined as:

$$Tr = \frac{I_t}{I_o} \times 100\%$$

I_o = the brightness of the light source.

I_t = the brightness after panel transmission

(4) Definition of Response Time (Tr, Tf): The rise time 'Tr' is defined as the time for luminance to change from 90% to 10% as a result of a change of the electrical condition. The fall time 'Tf' is defined as the time for luminance to change from 10% to 90% as a result of a change of the electrical condition.



(5) Definition of Color Gamut: Measuring machine CFT-01. NTSC's Primaries: R(x,y,Y),G(x,y,Y), B(x,y,Y). FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

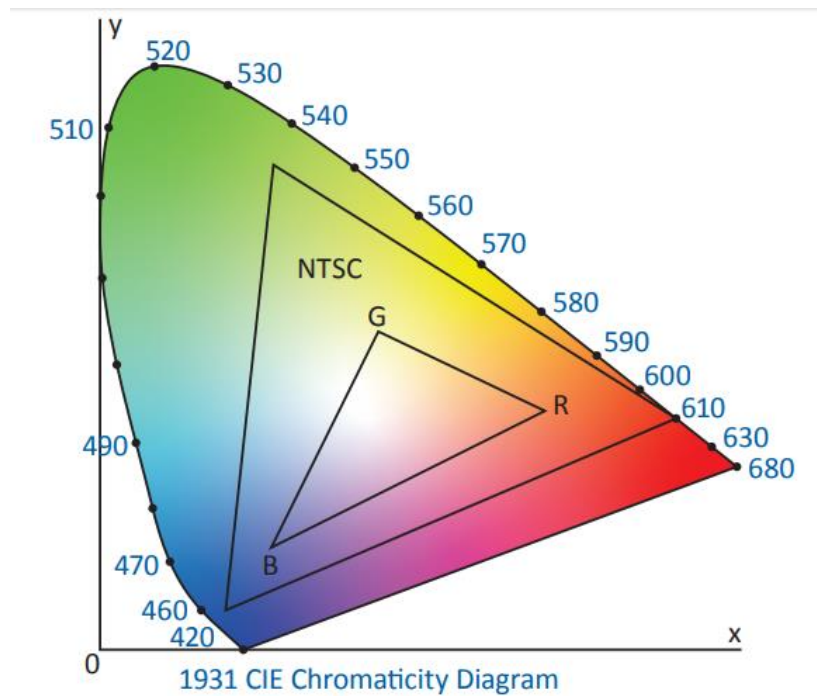
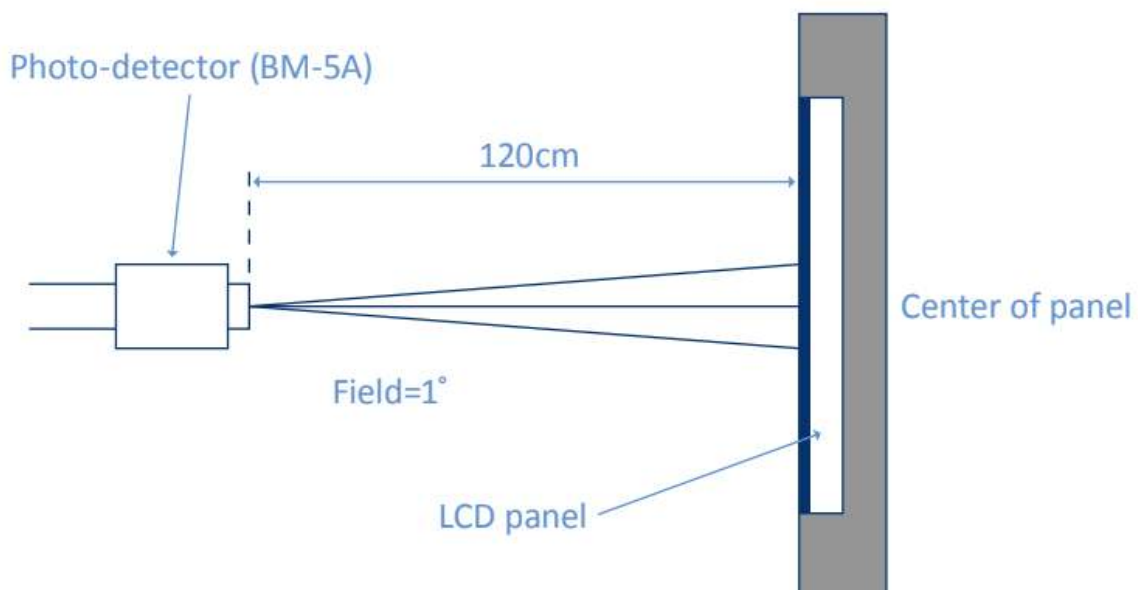


Fig. 1931 CIE chromacity diagram

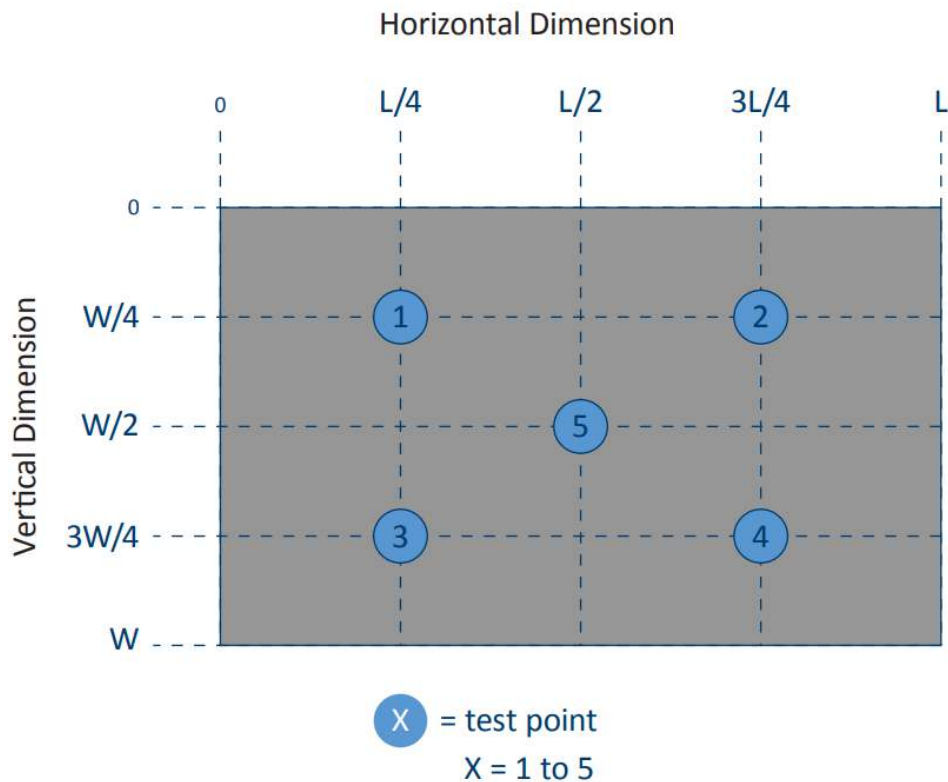
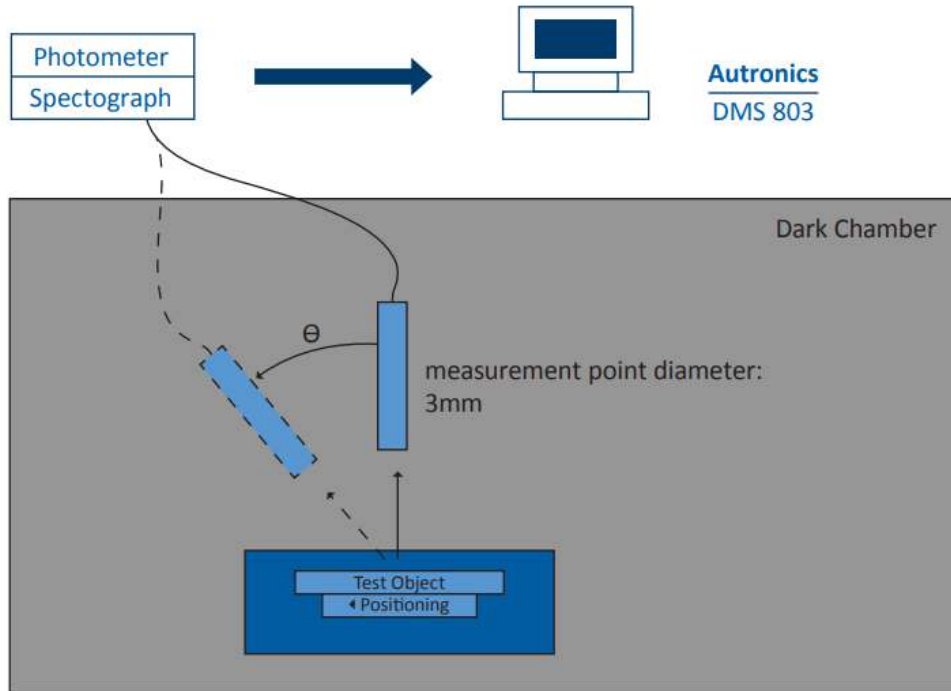
$$\text{Color gamut: } S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$

(6) Definition of Optical Measurement Setup:



(6) Optical Measurement Setup Continued:

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



5. Electrical Characteristics

5.1 Absolute Maximum Rating

| Characteristics | Symbol | Min | Max | Unit |
|------------------------|--------|------|-----|------|
| Digital Supply Voltage | VDD | -0.3 | 4.6 | V |
| Operating temperature | TOP | -20 | +70 | °C |
| Storage temperature | TST | -30 | +80 | °C |

NOTE: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5.2 DC Electrical Characteristics

| Characteristics | Symbol | Min | Typ. | Max | Unit | Note |
|---------------------------------|--------|---------|------|--------|------|------|
| Digital Supply Voltage | VDD | 3.0 | 3.3 | 3.6 | V | |
| Normal Mode Current Consumption | IDD | -- | 120 | -- | mA | |
| Level input voltage | VIH | 0.7VDD | -- | VDD | V | |
| | VIL | 0 | -- | 0.3VDD | V | |
| Level output voltage | VOH | VDD-0.4 | -- | -- | V | |
| | VOL | 0 | -- | 0.4 | V | |

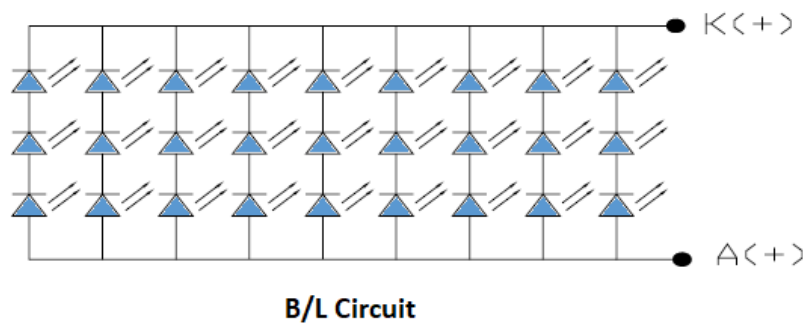
5.3 LED Backlight Characteristics

The backlight system is edge lighting type with 27 chips LED.

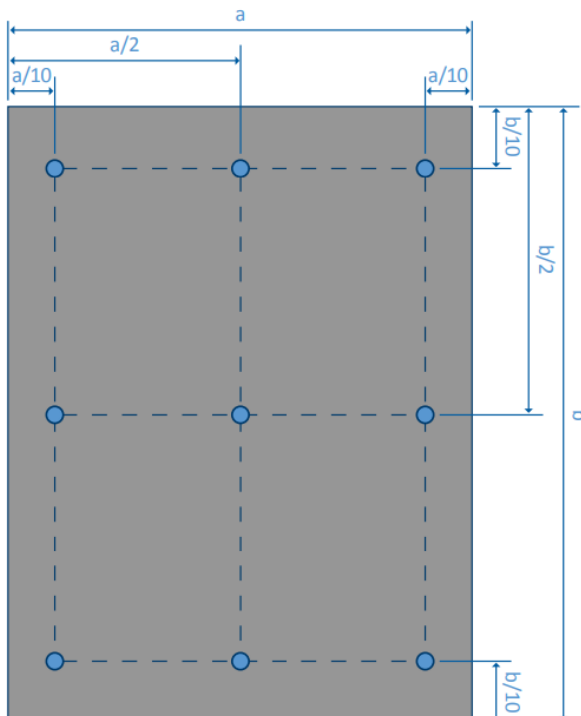
| Item | Symbol | Min | Typ. | Max | Unit | Note |
|--------------------------|--------|-----|-------|-----|-------|--------|
| Forward Current | IF | 180 | 270 | -- | mA | |
| Forward Voltage | VF | -- | 9.6 | -- | V | |
| LCM Luminance (IF=180mA) | LV | 310 | 360 | -- | cd/m2 | (3) |
| LCM Luminance (IF=270mA) | LV | 430 | 480 | -- | cd/m2 | (3) |
| LED lifetime | Hr | -- | 50000 | -- | Hour | (1)(2) |
| Uniformity | Avg | 80 | -- | -- | % | (3) |

Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25 ±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The “LED lifetime” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL = 270mA. The LED lifetime could be decreased if operating IL is larger than 270mA. The constant current driving method is suggested.



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



$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points(1-9)}}{\text{maximum luminance in 9 points(1-9)}}$$

6. Timing Characteristics

6.1 AC Electrical Characteristics

| Parameter | Symbol | Min | Typ. | Max | Unit | Note |
|------------------------|------------|------|--------------------|------|------|------|
| Clock Frequency | R_{xFLK} | 40.8 | 51.2 | 67.2 | MHz | -- |
| Input data skew margin | T_{RSKM} | 500 | -- | -- | ps | -- |
| Clock high time | T_{LVCH} | -- | $4/(7 * R_{xFLK})$ | -- | ns | -- |
| Clock low time | T_{LVCL} | -- | $3/(7 * R_{xFLK})$ | -- | ns | -- |

6.2 Input Clock and Data Timing Diagram

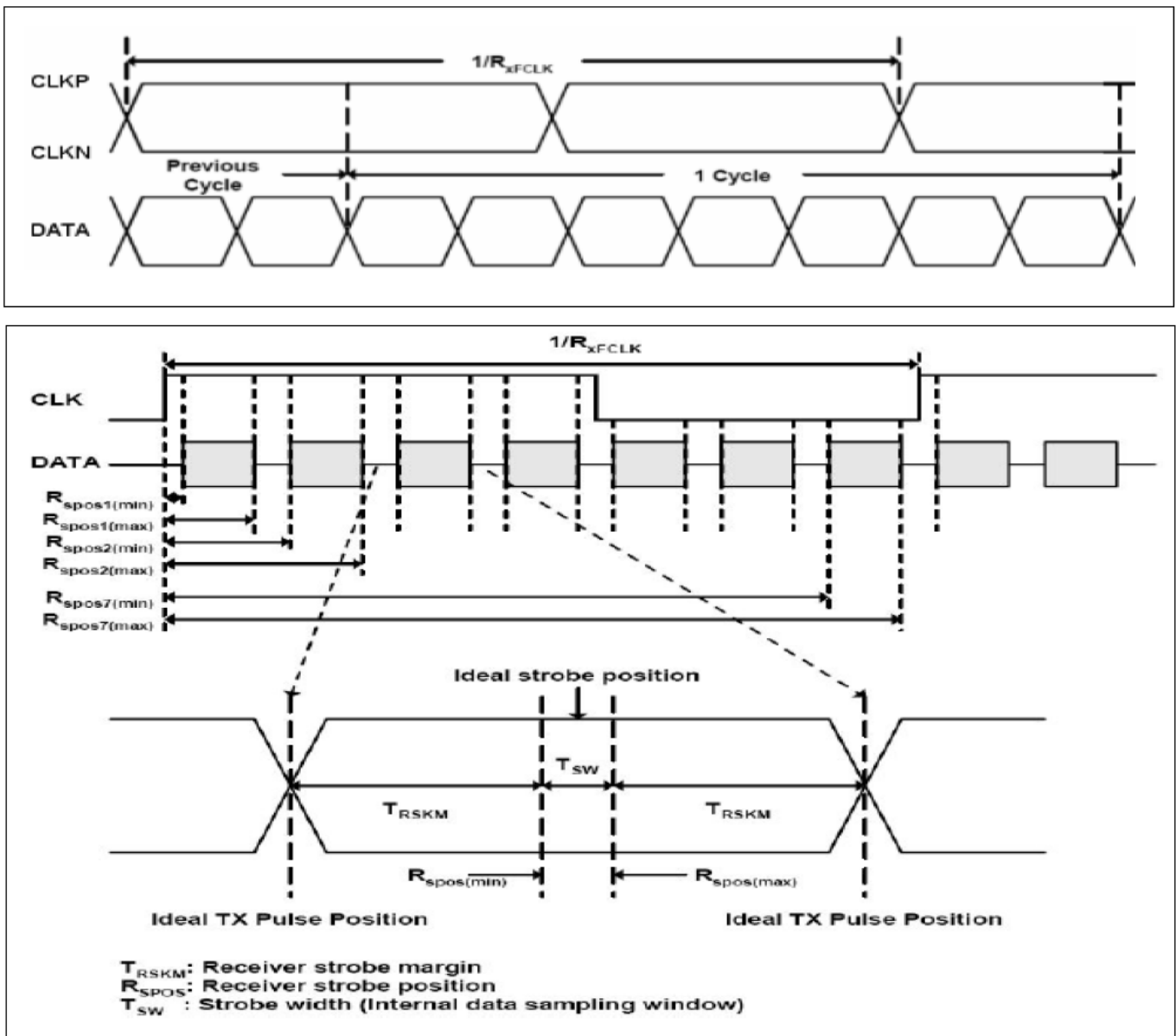


Figure 6.1: Clock and Data Input Diagram

6.3 DC Electrical Characteristics

| Parameter | Symbol | Min | Typ. | Max | Unit | Note |
|---|--------------------|---------------------|------|--------------------------|------|-------------------------|
| Differential Input High Threshold Voltage | R _{xVTH} | -- | -- | +0.1 | V | R _{xVCM} =1.2V |
| Differential Input Low Threshold Voltage | R _{xVTL} | -0.1 | -- | -- | V | |
| Input Voltage Range (single ended) | R _{xVIN} | 0 | -- | 2.4 | V | -- |
| Differential Input Common Mode Voltage | R _{xVCM} | V _{ID} /2 | -- | 2.4- V _{ID} /2 | V | -- |
| Differential Voltage | V _{ID} | 0.2 | -- | 0.6 | V | -- |
| Differential Input Leakage Current | R _{Vxliz} | -10 | -- | +10 | uA | -- |

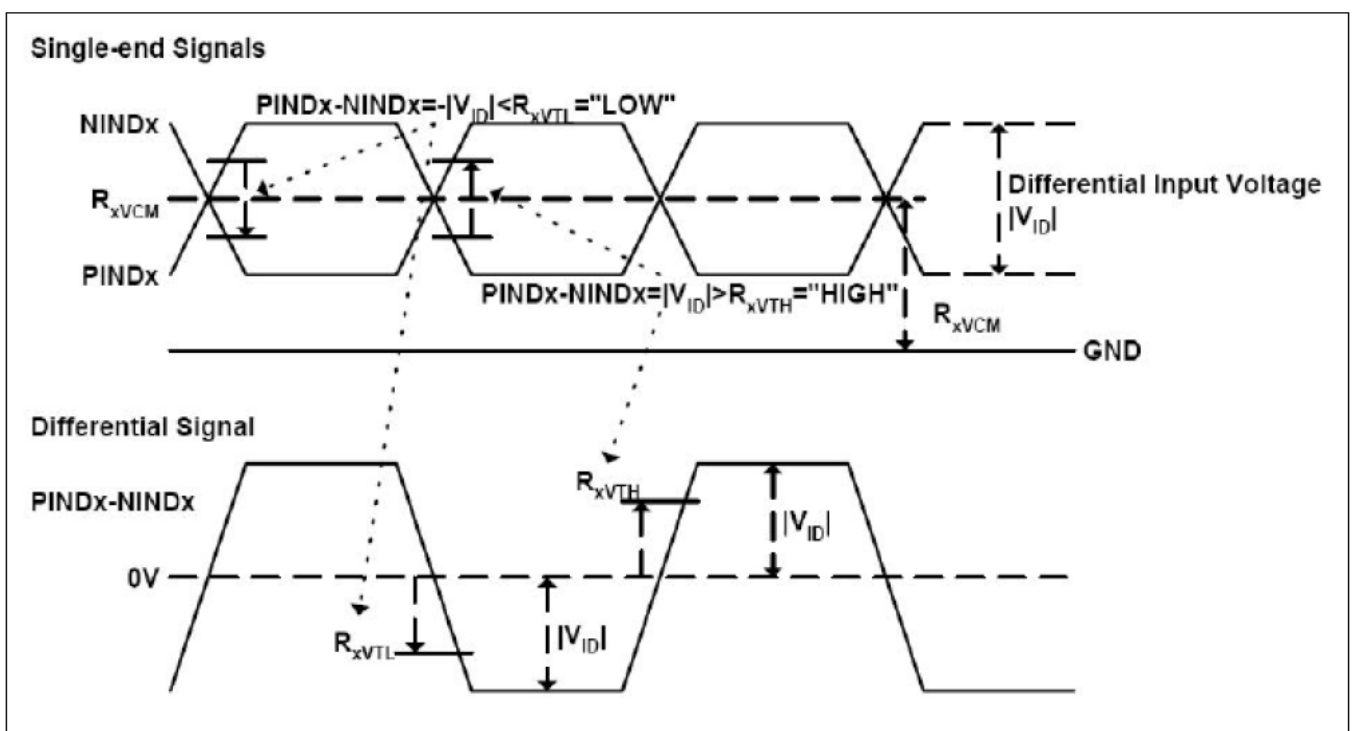


Figure 6.2: Single-End and Differential Signals Diagram

6.4 Horizontal and Vertical Timing Characteristics

| Parameter | Symbol | Min | Typ. | Max | Unit | Note |
|-------------------------|--------|------|------|------|------|-------------------|
| Clock Frequency | fclk | 40.8 | 51.2 | 67.2 | MHz | Frame rate = 60Hz |
| Horizontal Display Area | thd | 1024 | 1024 | 1024 | DCLK | -- |
| HS Period Time | th | 1114 | 1344 | 1400 | DCLK | -- |
| HS Blanking | thb | 90 | 320 | 376 | DCLK | -- |
| Vertical Display Area | tvd | 600 | 600 | 699 | H | -- |
| VS Period Time | tv | 610 | 635 | 800 | H | -- |
| VS Blanking | thb | 10 | 35 | 200 | H | -- |

6.5 Data Input Format

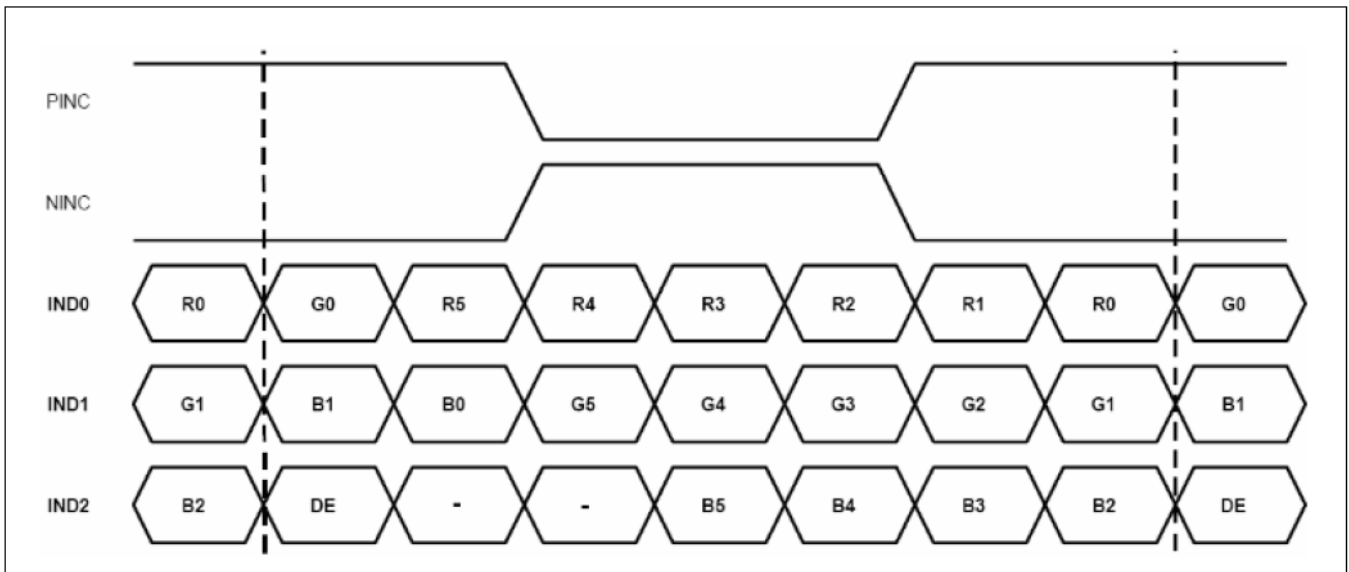


Figure 6.3: 6-bit LVDS Input Format Diagram

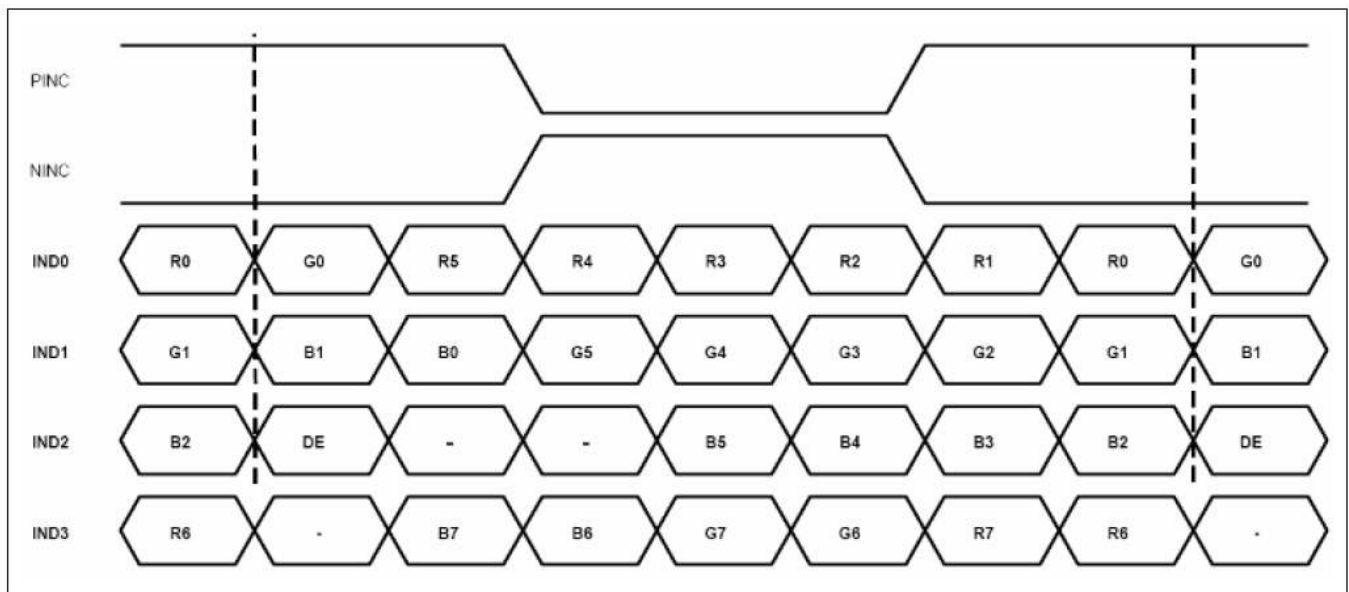


Figure 6.4: 8-bit LVDS Input Format Diagram

Note: Support DE timing mode only. Sync mode is not supported.

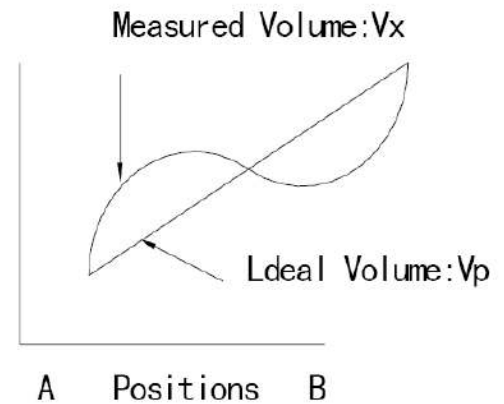
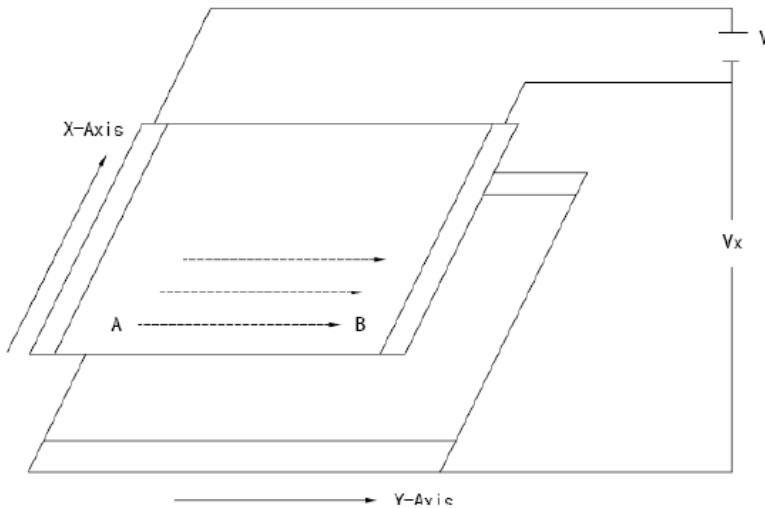
7. TP Feature

7.1 Conditions of Use and Storage

| Item | Condition | Note |
|----------------------------------|--|-----------------------|
| Temperature range upon operation | Humidity: 20%-90% non-dew, condensation -20°C~70°C | In a simple substance |
| Temperature range upon storage | Humidity: 20%-90% non-dew, condensation -30°C~80°C | In a simple substance |

7.2 Electrical Property

| Item | Value | Note |
|-----------------------------|--|---|
| Maximum voltage | DC 5V | |
| Resistance between terminal | X direction (film side): 200-600 Ω | |
| | Y direction (glass side): 300-900 Ω | |
| Insulation resistance | DC 25V, 20M Ω or above | Connect X + ~X and Y+ ~Y, apply 25V DC Between X and Y for perform measurements |
| Chattering | 10ms or below | |
| Rating | Voltage is 5V DC | |



7.3 Mechanical Property

| Item | Value | | Note |
|---------------------|------------------------------------|------------------|---|
| Input method | Used of an exclusive pen or finger | | |
| Load upon operation | Exclusive pen | 60-100g or below | Operation and measurement with a pen must be carried out under the following tip conditions: Stylus pen material: POM (polyacetal) Tip: Diameter 3.0mm, SR 0.8 mm |
| | Finger | 60-100g or below | Operation and measurement with a pen must be carried out under the following tip conditions: Stylus pen material: Silicon rubber (Hardness: 30°Hs) Tip: Diameter 12.0mm, SR 12.5 mm |
| Surface hardness | Pencil hardness: 3H or above | | It complies with the way of test method JIS K5400 |

7.4 Optical Property

| Item | Performance | Note |
|---------------------------|--|-----------|
| Total light transmittance | 80% or above | JIS K7105 |
| Haze | 5% or below | JIS K7136 |
| Film specification | Polished type with hard coated surface | |

8. Cautions and Handling Precautions

8.1 Handling and Operating the Module

1. When the module is assembled, it should be attached to the system firmly. Do not warp or twist the module during assembly work.
2. Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
3. Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
4. Do not allow drops of water or chemicals to remain on the display surface. If you have the droplets for a long time, staining and discoloration may occur.
5. If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
6. The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
7. 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, legs, or clothes, it must be washed away thoroughly with soap.
8. Protect the module from static; it may cause damage to the CMOS ICs.
9. Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
10. Do not disassemble the module.
11. Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
12. Pins of I/F connector shall not be touched directly with bare hands.
13. Do not connect, disconnect the module in the "Power ON" condition.
14. Power supply should always be turned on/off by the item Power On Sequence & Power Off Sequence.

8.2 Storage and Transportation

1. Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%
2. Do not store the TFT-LCD module in direct sunlight.
3. The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
4. It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module. In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
5. This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.