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

TFT Display Module

Part Number

E43RG63248LW2M170-R

Overview:

- 4.3-inch TFT: 480x272 (105.5x67.2)
- 16/18/24-bit RGB Interface
- 3.3V
- 65K/262K/16.7M colors
- White LED back-light
- Transmissive/ Normally White
- 4-wire Resistive Touch Screen
- 170 NITS
- Controller: OTA5180A
- 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 and back-light unit. The resolution of a 4.3" TFT-LCD contains 480x272 pixels and can display up to 65K/262K/16.7M colors.

Features

Low Input Voltage: 3.3V (TYP)

Display Colors of TFT LCD: 65K/262K/16.7M colors

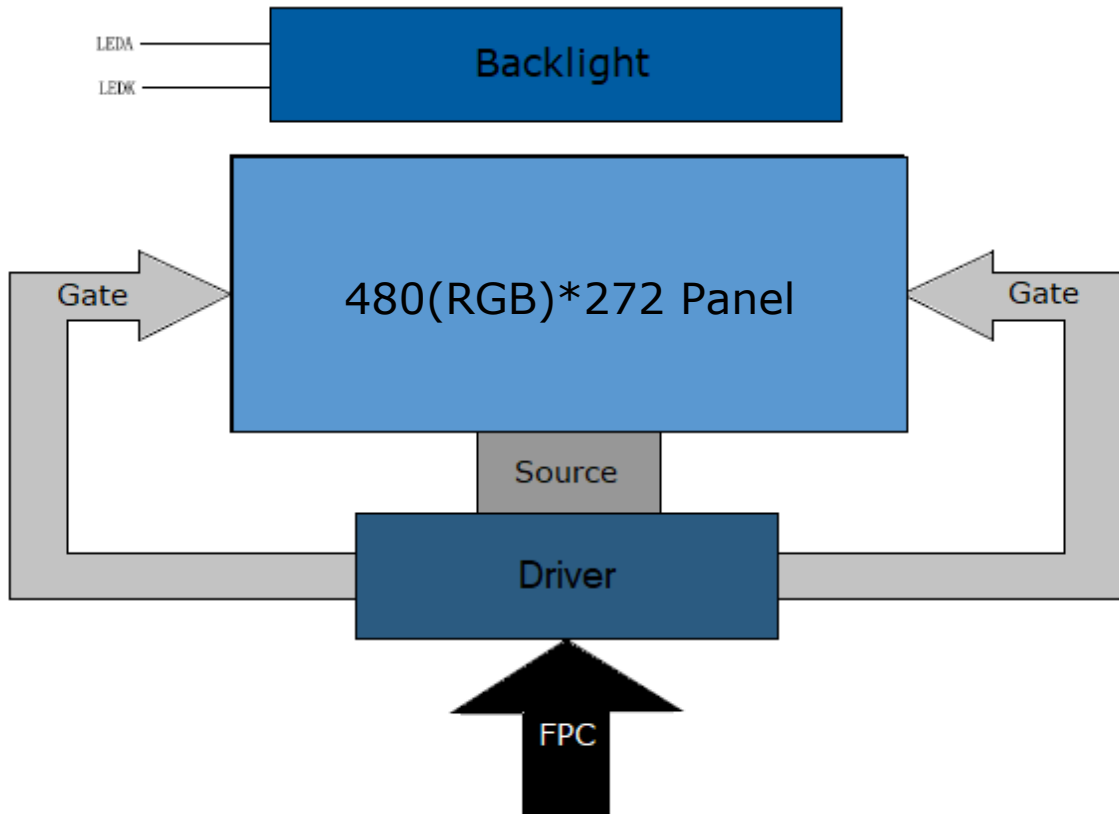
TFT Interface: 16/18/24-bit RGB

| General Information Items | Specification | Unit | Note |
|---------------------------|-------------------------------|---------|------|
| | Main Panel | | |
| Display area (AA) | 95.04(H) *53.86(V) (4.3 inch) | mm | - |
| Driver element | TFT active matrix | - | - |
| Display colors | 65K/262K/16.7M | colors | - |
| Number of pixels | 480(RGB)*272 | dots | - |
| TFT Pixel arrangement | RGB vertical stripe | - | - |
| Pixel pitch | 0.198 (H) x 0.198 (V) | mm | - |
| Viewing angle | 12:00 | o'clock | - |
| TFT Controller IC | OTA5180A | - | - |
| Display mode | Transmissive/ Normally White | - | - |
| Operating temperature | -20~+70 | °C | - |
| Storage temperature | -30~+80 | °C | - |

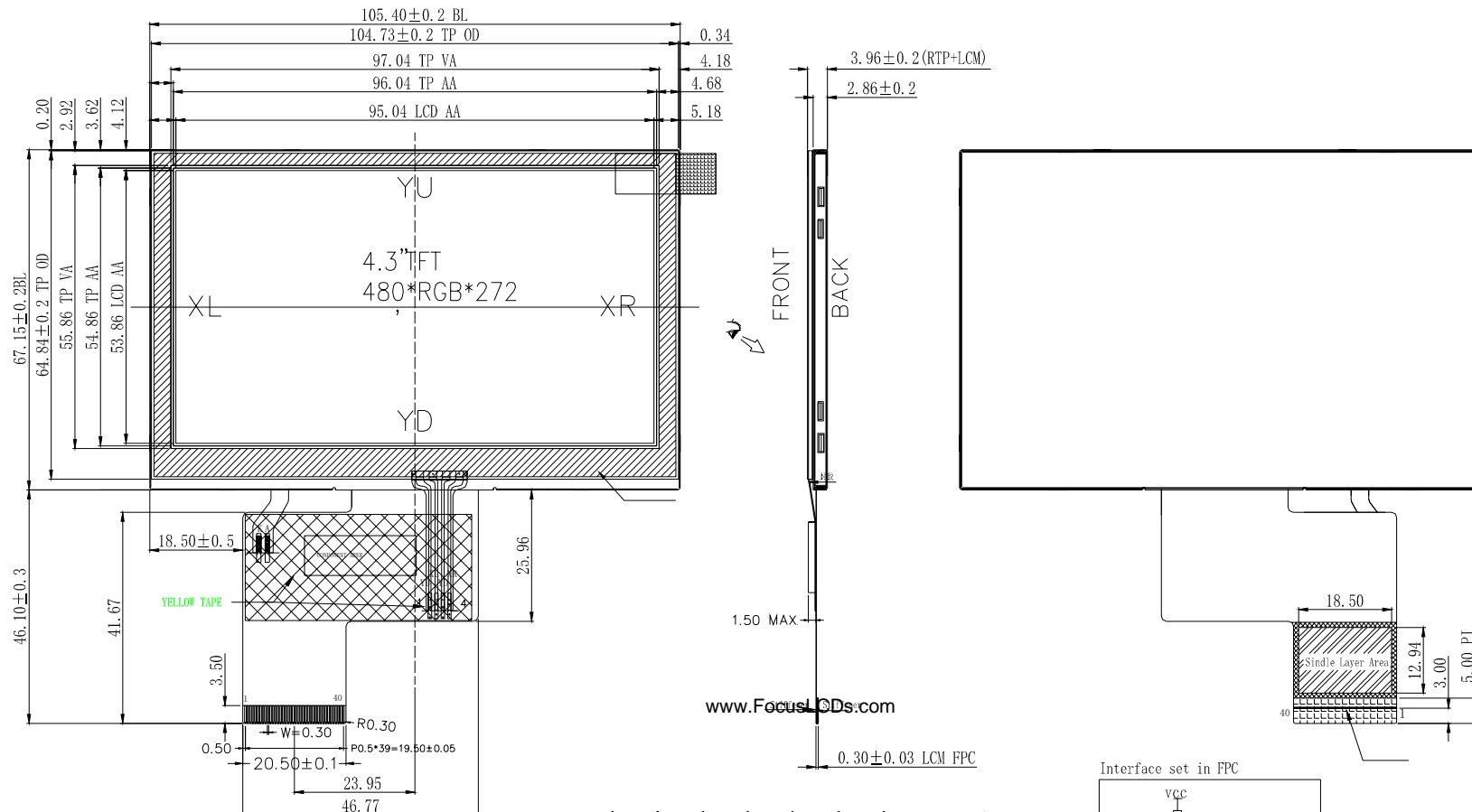
Mechanical Information

| Item | | Min | Typ. | Max | Unit | Note |
|-------------|---------------|-----|-------|-----|------|------|
| Module size | Horizontal(H) | | 105.4 | | mm | - |
| | Vertical(V) | | 67.15 | | mm | - |
| | Depth(D) | | 3.96 | | mm | - |
| Weight | | | TBD | | g | - |

1. Block Diagram

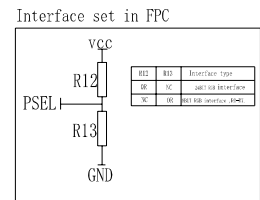
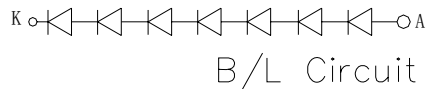


2. Outline dimensions

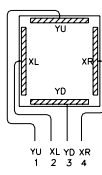


| Pin | Name |
|-----|-------|
| 1 | VLED- |
| 2 | VLED+ |
| 3 | GND |
| 4 | VDD |
| 5 | RO |
| 6 | R1 |
| 7 | R2 |
| 8 | R3 |
| 9 | R4 |
| 10 | R5 |
| 11 | R6 |
| 12 | R7 |
| 13 | G0 |
| 14 | G1 |
| 15 | G2 |
| 16 | G3 |
| 17 | G4 |
| 18 | G5 |
| 19 | G6 |
| 20 | G7 |
| 21 | B0 |
| 22 | B1 |
| 23 | B2 |
| 24 | B3 |
| 25 | B4 |
| 26 | B5 |
| 27 | B6 |
| 28 | B7 |
| 29 | GND |
| 30 | PCLK |
| 31 | DISP |
| 32 | HSYNC |
| 33 | VSYNC |
| 34 | DE |
| 35 | NC |
| 36 | GND |
| 37 | XR |
| 38 | YD |
| 39 | XL |
| 40 | YU |

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- NOTES:
1. DISPLAY TYPE: 4.3", TFT-LCD, 65K/262K/16.7M COLORS
 2. DISPLAY MODE: T/N NORMALLY WHITE
 3. VIEWING DIRECTION: 12:00
 4. DRIVER IC: OTA5180A (COG)
 5. INTERFACE: 24BIT-RGB
 6. VCI: 3.3V(TYP)
 7. OPERATING TEMP: -20°C TO 70°C
STORAGE TEMP: -30°C TO 80°C
 8. BACK LIGHT: LED WHITE, 7 LED, 20mA, 22.4±0.3V
 9. RoHS COMPLIANT.



| Pin NO. | Assignment |
|---------|------------|
| 1 | YU |
| 2 | XL |
| 3 | YD |
| 4 | XR |

| Rev | Revision content description |
|-----|------------------------------|
| | |
| | |
| | |
| | |



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| | |
|-------------------------------|----------|
| PARTS NO. E43RG63248LW2M170-R | |
| Drawn | Unit |
| Checked | mm |
| Approve | Page 1/1 |

TOLERANCE: UNLESS OTHERWISE SPECIFIED X.X±0.3 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 | LEDK | Cathode pin of backlight | P |
| 2 | LEDA | Anode pin of backlight | P |
| 3 | GND | Ground | P |
| 4 | VDD | Supply voltage (3.3V) | P |
| 5 | R0 | Red data input | I |
| 6 | R1 | Red data input | I |
| 7 | R2 | Red data input | I |
| 8 | R3 | Red data input | I |
| 9 | R4 | Red data input | I |
| 10 | R5 | Red data input | I |
| 11 | R6 | Red data input | I |
| 12 | R7 | Red data input | I |
| 13 | G0 | Green data input | I |
| 14 | G1 | Green data input | I |
| 15 | G2 | Green data input | I |
| 16 | G3 | Green data input | I |
| 17 | G4 | Green data input | I |
| 18 | G5 | Green data input | I |
| 19 | G6 | Green data input | I |
| 20 | G7 | Green data input | I |
| 21 | B0 | Blue data input | I |
| 22 | B1 | Blue data input | I |
| 23 | B2 | Blue data input | I |
| 24 | B3 | Blue data input | I |
| 25 | B4 | Blue data input | I |
| 26 | B5 | Blue data input | I |
| 27 | B6 | Blue data input | I |
| 28 | B7 | Blue data input | I |
| 29 | GND | Ground | P |
| 30 | PCLK | Clock signal. Latching data at falling edge. | I |
| 31 | DISP | Standby setting for testing. Connect to VDDIO in normal operation mode. If connected to GND, the IC is in standby mode. | I |
| 32 | HYSYNC | Horizontal sync input. Negative polarity. | I |
| 33 | VSYNC | Vertical sync input. Negative polarity. | I |
| 34 | DE | Data input enable. Active high to enable the data input. Active high to enable the data input bus under "DE mode" | I |
| 35 | NC | | |
| 36 | GND | Ground | P |
| 37 | XR(NC) | Touch panel right glass terminal | A/D |
| 38 | YD(NC) | Touch panel bottom film terminal | A/D |
| 39 | XL(NC) | Touch panel left glass terminal | A/D |
| 40 | YU(NC) | Touch panel top film terminal | A/D |

4. LCD Optical Characteristics

4.1 Optical Specifications

| Item | Symbol | Condition | Min | Typ. | Max | Unit | Note |
|---------------------------|---------------|----------------------|-------|-------|-------|------|--------|
| Contrast Ratio | CR | $\theta = \phi = 0$ | | 250 | -- | | (2) |
| Response time | Rising | Normal viewing angle | -- | 30 | 45 | msec | (4) |
| | Falling | | -- | | | | |
| Color gamut | S(%) | | -- | 40 | -- | % | (5) |
| Color Filter Chromaticity | White | W_x | 0.230 | 0.270 | 0.310 | | (5)(6) |
| | | W_y | 0.232 | 0.272 | 0.312 | | |
| | Red | R_x | 0.473 | 0.493 | 0.513 | | |
| | | R_y | 0.278 | 0.298 | 0.318 | | |
| | Green | G_x | 0.307 | 0.327 | 0.347 | | |
| | | G_y | 0.526 | 0.546 | 0.566 | | |
| | Blue | B_x | 0.138 | 0.158 | 0.178 | | |
| | | B_y | 0.063 | 0.083 | 0.103 | | |
| Viewing angle | Hor. | θ_L | -- | 40 | -- | | (1)(6) |
| | | θ_R | -- | 40 | -- | | |
| | Ver. | θ_U | -- | 30 | -- | | |
| | | θ_D | -- | 40 | -- | | |
| Option View Direction | 12:00 o'clock | | | | | | (1) |

4.2 Measuring Condition

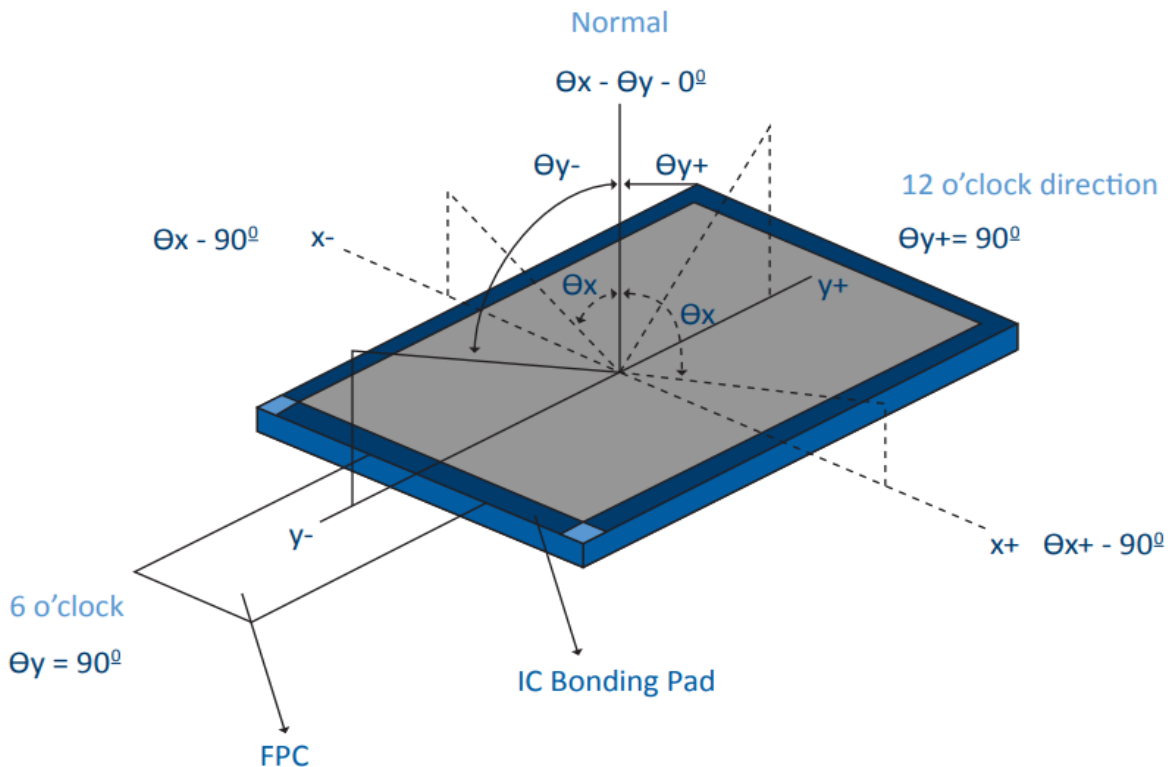
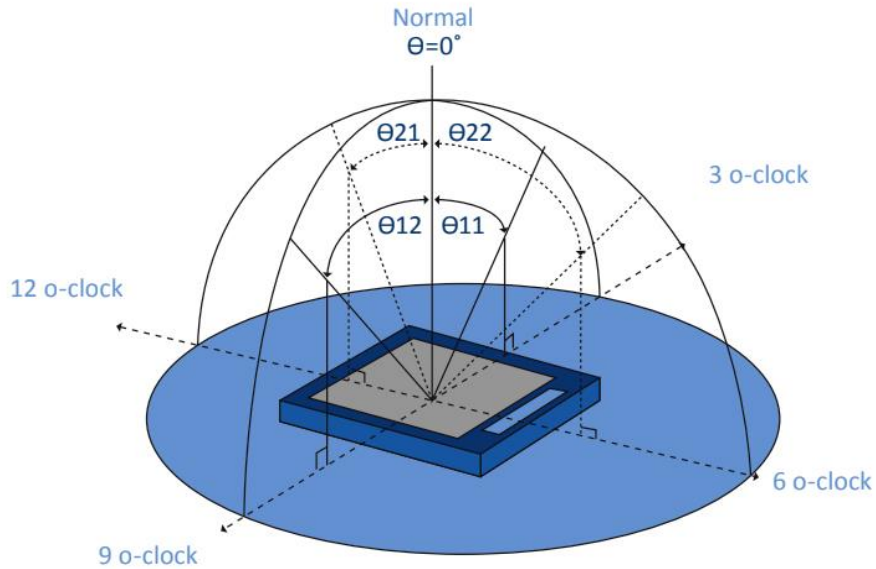
VDD = 3.3V, IL = 20mA (Backlight current)

Ambient temperature: $25 \pm 2^\circ\text{C}$

15min. warm-up time

Optical Specification Reference Notes:

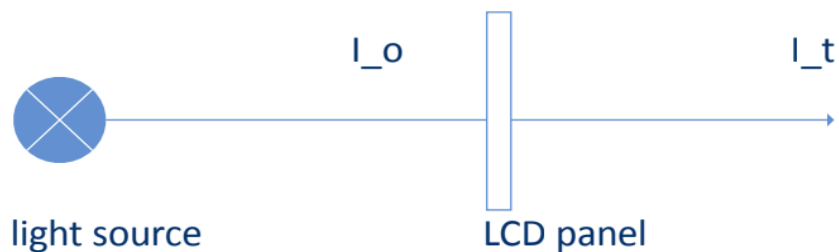
(1) Definition of Viewing Angle: The viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3,9 o'clock direction and the vertical or 6,12 o'clock direction with respect to the optical axis which is normal to the LCD surface.



(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.



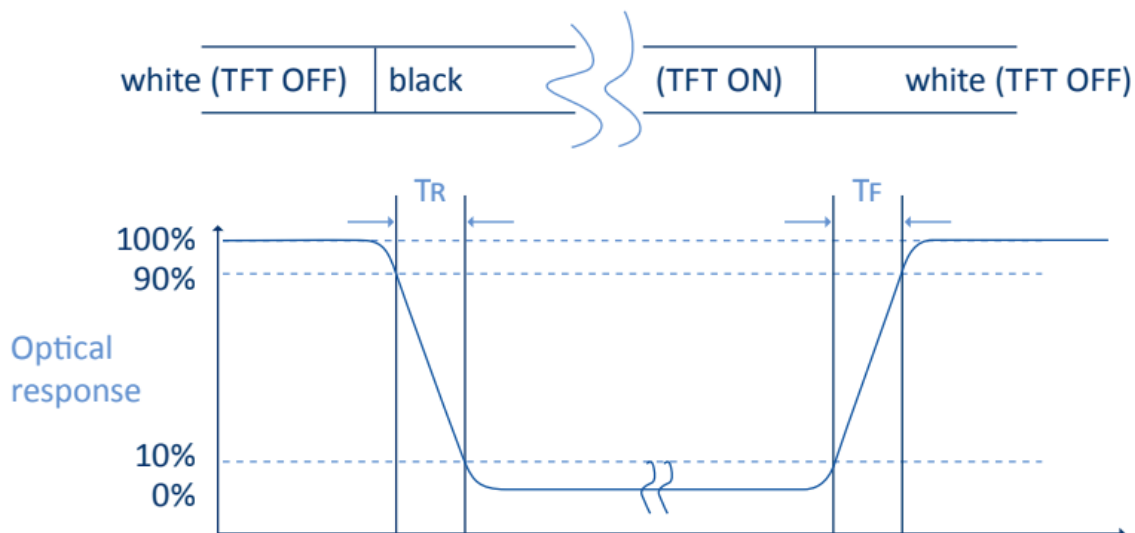
The transmittance is defined as:

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

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.

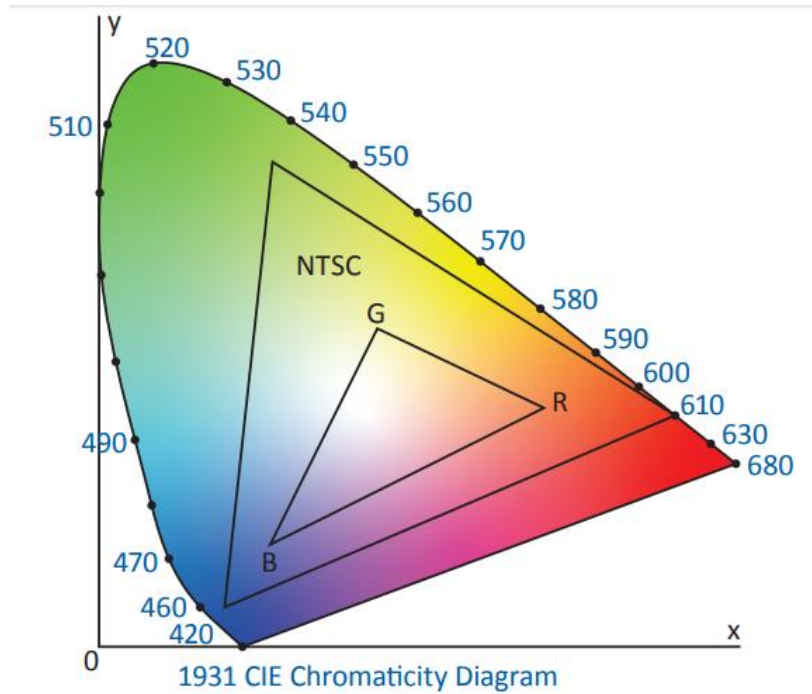
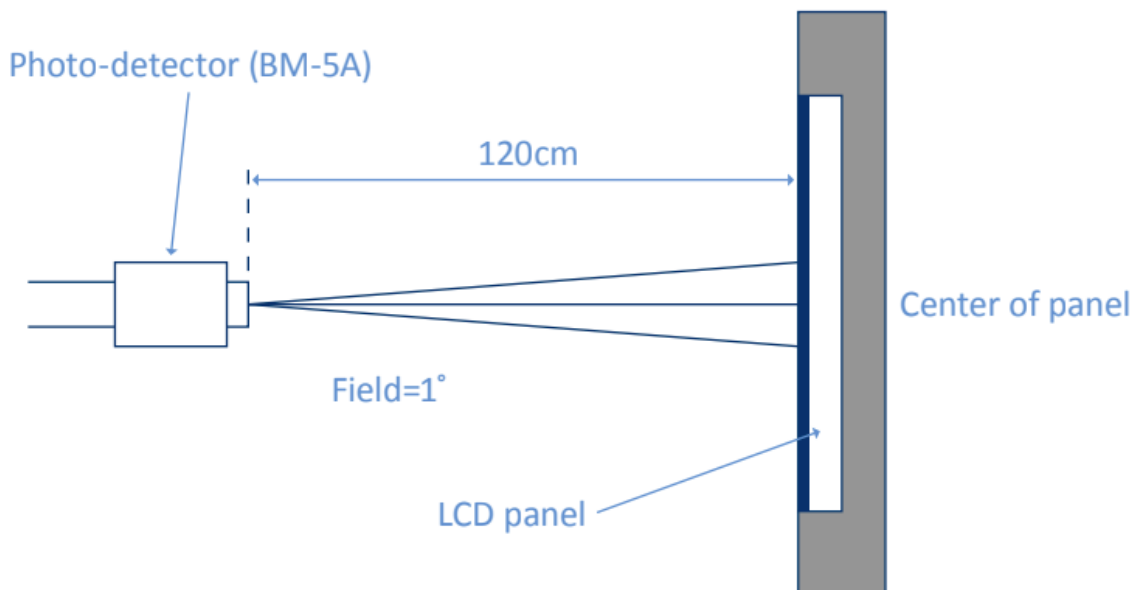


Fig. 1931 CIE chromacity diagram

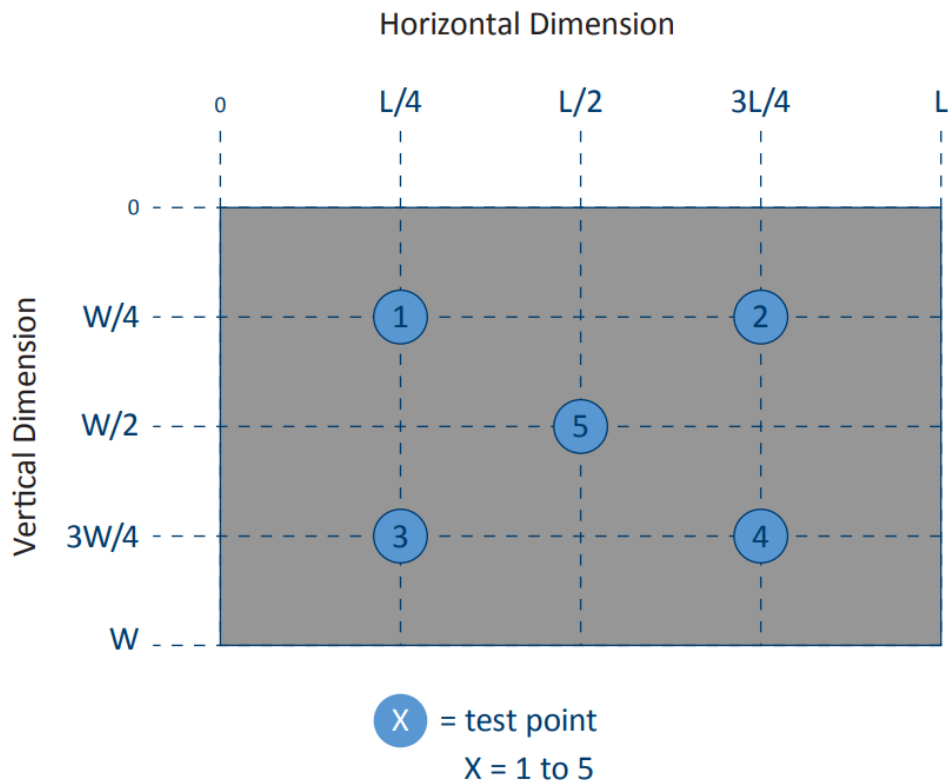
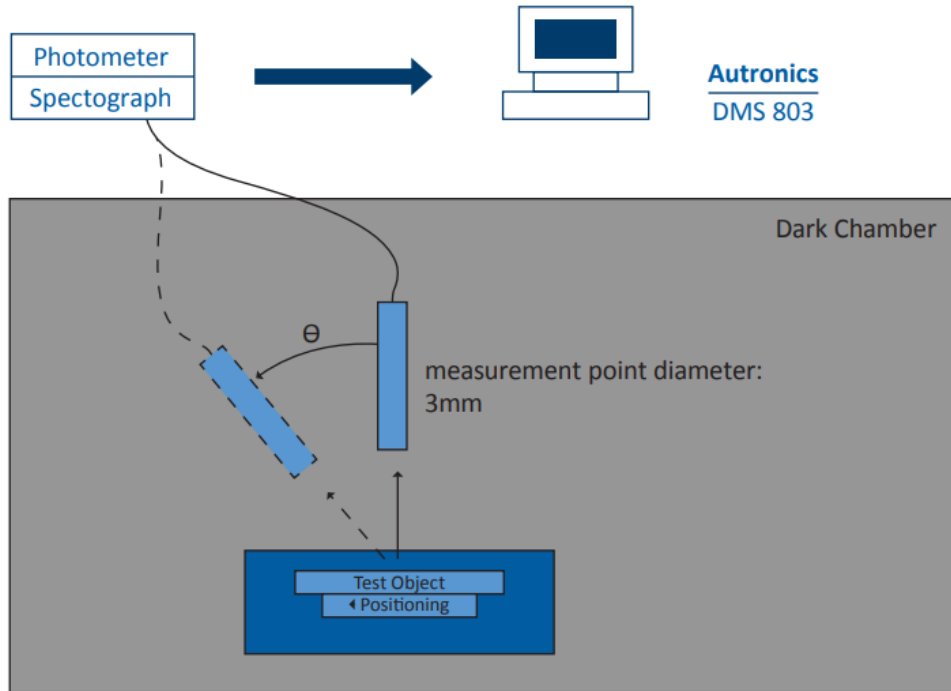
$$\text{Color gamut: } S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$

(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 (Ta=25 VSS=0V)

| Characteristics | Symbol | Min | Max | Unit |
|------------------------|-----------------|------|-----|------|
| Digital Supply Voltage | VDD | -0.3 | 7.0 | V |
| Operating temperature | T _{OP} | -20 | +70 | °C |
| Storage temperature | T _{ST} | -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 | -- | 25 | -- | mA | |
| Level input voltage | V _{IH} | 0.7 VDDIO | | VDD | V | |
| | V _{IL} | GND | | 0.3 VDD | V | |
| Level output voltage | V _{OH} | 0.8 VDDIO | | VDD | V | |
| | V _{OL} | GND | | 0.2 VDDIO | V | |

5.3 LED Backlight Characteristics

| Item | Symbol | Min | Typ. | Max | Unit | Note |
|-----------------|--------|-------|------|-----|-------|-----------|
| Forward Current | IF | 15 | 20 | -- | mA | |
| Forward Voltage | VF | -- | 22.4 | -- | V | |
| LCM Luminance | LV | 130 | 170 | -- | cd/m2 | Note 3 |
| LED lifetime | Hr | 50000 | -- | -- | hour | Note1 & 2 |
| Uniformity | AVg | 80 | -- | -- | % | Note 3 |

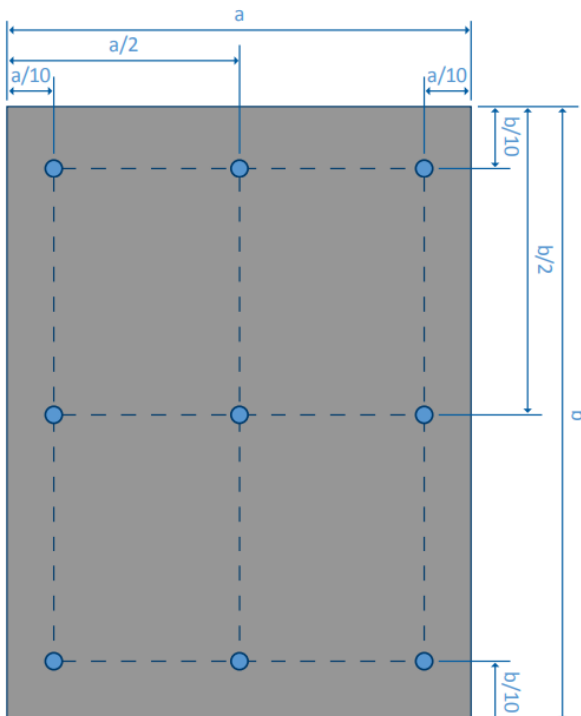
The back-light system is edge-lighting type with 7 chips White LED

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= 20mA. The LED lifetime could be decreased if operating IL is larger than 20mA. The constant current driving method is suggested.



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



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

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

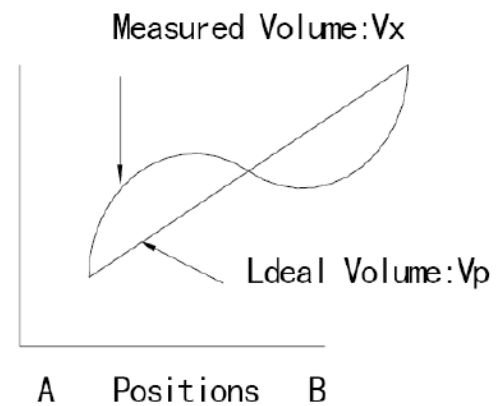
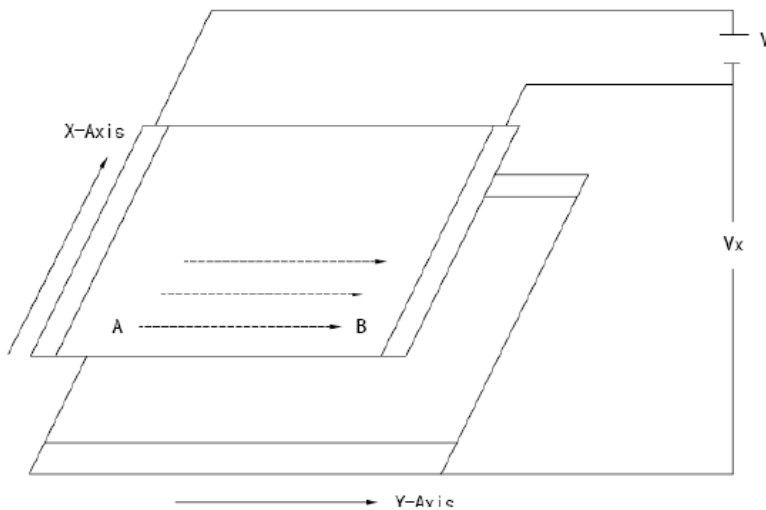
6. TP Feature

6.1 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 |

6.2 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 | |



6.3 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 |

6.4 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 | |

7. AC Characteristics

7.1 Input Signal Characteristics

| Parameters | Symbol | Min | Typ. | Max | Unit | Condition |
|------------------------------|------------------|-----|------|------|------|-----------|
| CLK pulse duty | T _{clk} | 40 | 50 | 60 | % | |
| Hsync width | T _{hw} | 1 | -- | -- | DCLK | |
| Hsync period | T _h | 55 | 60 | 65 | us | |
| Vsync setup time | T _{vst} | 12 | -- | -- | ns | |
| Vsync hold time | T _{vhd} | 12 | -- | -- | ns | |
| Hsync setup time | T _{hst} | 12 | -- | -- | ns | |
| Hsync hold time | T _{hhd} | 12 | -- | -- | ns | |
| Data setup time | T _{dsu} | 12 | -- | -- | ns | |
| Data hold time | T _{dhd} | 12 | -- | -- | ns | |
| SD output stable time | T _{st} | -- | 10 | 12 | us | |
| GD output rise and fall time | T _{gst} | -- | 500 | 1000 | us | |
| 3-wire serial communication | | | | | | |
| Delay between CSB and Vsync | T _{cv} | 1 | | | us | |
| CS input setup time | T _{s0} | 50 | | | ns | |
| Serial data input setup time | T _{s1} | 50 | | | ns | |
| CS input hold time | T _{h0} | 50 | | | ns | |
| Serial data input hold time | T _{h1} | 50 | | | ns | |
| SCL pulse high width | T _{wh1} | 50 | | | ns | |
| SCL pulse low width | T _{wl1} | 50 | | | ns | |
| CS pulse high width | T _{w2} | 400 | | | ns | |

Table 7.1: AC Input Signal Timing Characteristics

7.2 RGB Interface Timing Characteristics

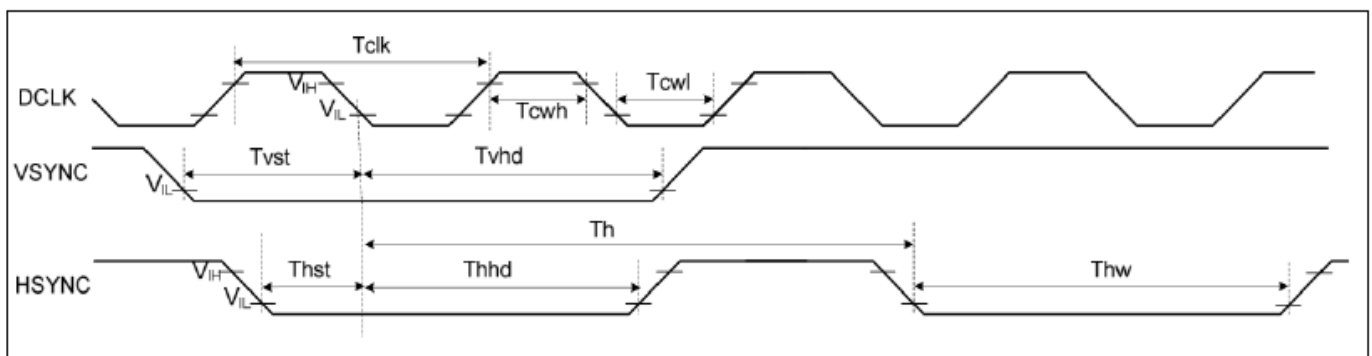
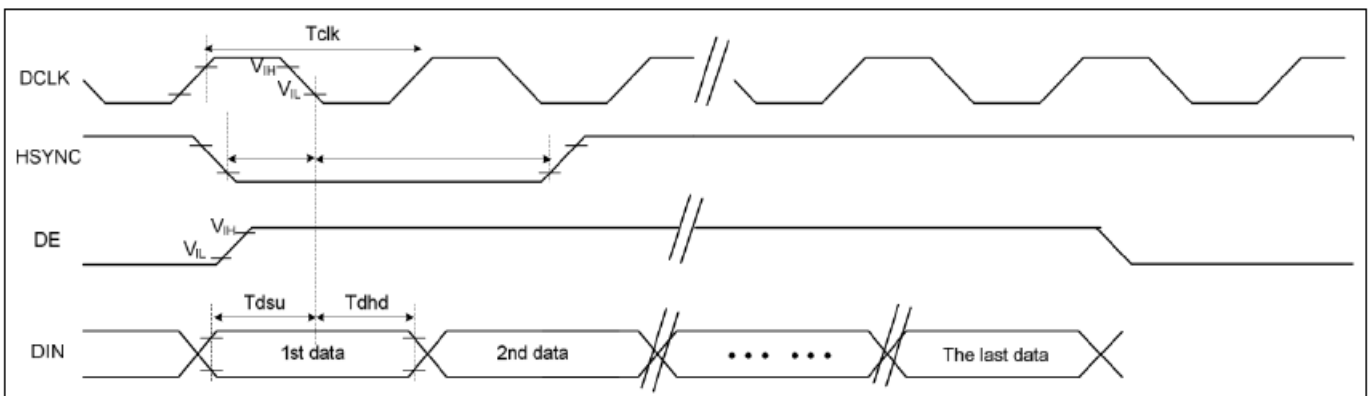


Figure 7.1: RGB Interface Timing Diagram

7.3 RGB Input Timing Tables

| Parameters | | Symbol | Min | Typ. | Max | Unit | Condition |
|-----------------|----------------|--------|-----|------|-----|------|-----------------------|
| DCLK frequency | | Fclk | 8 | 9 | 12 | MHz | |
| DCLK cycle time | | Tclk | 83 | 111 | 125 | ns | |
| Hsync | Period time | Th | 485 | 525 | 532 | DCLK | |
| | Display period | Thdisp | | 480 | | DCLK | |
| | Back porch | Thbp | 3 | 43 | 50 | DCLK | By H_blanking setting |
| | Front porch | Thfp | 2 | 2 | 2 | DCLK | |
| | Pulse width | Thw | 1 | 1 | 1 | DCLK | |
| Vsync | Period time | Tv | 275 | 285 | 303 | H | |
| | Display period | Tvdisp | | 272 | | H | |
| | Back porch | Tvbp | 2 | 12 | 30 | H | By V_blanking setting |
| | Front porch | Tvlp | 1 | 1 | 1 | H | |
| | Pulse width | Tvw | 1 | 1 | 1 | H | |

Table 7.2: Parallel 24-bit RGB Timing Characteristics

| Parameters | | Symbol | Min | Typ. | Max | Unit | Condition |
|-----------------|----------------|--------|------|------|------|------|-----------------------|
| DCLK frequency | | Fclk | 24 | 27 | 30 | MHz | |
| DCLK cycle time | | Tclk | 33 | 37 | 42 | ns | |
| Hsync | Period time | Th | 1560 | 1716 | 1900 | DCLK | |
| | Display period | Thdisp | | 1440 | | DCLK | |
| | Back porch | Thbp | 108 | 129 | 255 | DCLK | By H_blanking setting |
| | Front porch | Thfp | 12 | 147 | 205 | DCLK | |
| | Pulse width | Thw | 1 | 1 | 50 | DCLK | |
| Vsync | Period time | Tv | 274 | 288 | 335 | H | |
| | Display period | Tvdisp | | 272 | | H | |
| | Back porch | Tvbp | 1 | 12 | 32 | H | By V_blanking setting |
| | Front porch | Tvlp | 1 | 4 | 31 | H | |
| | Pulse width | Tvw | 1 | 10 | 30 | H | |

Table 7.3: Series 8-bit RGB Timing Characteristics

7.4 Sync Mode Input Timing Diagrams

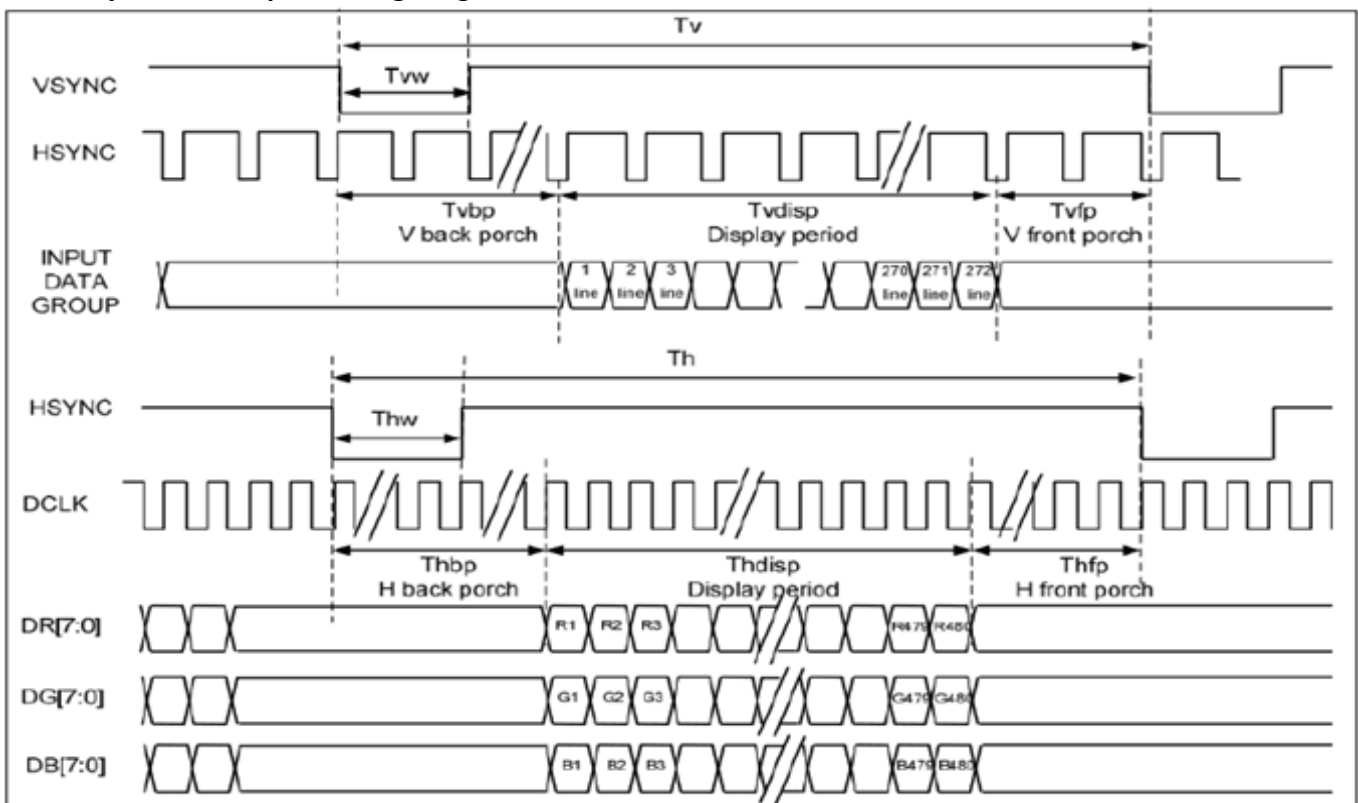


Figure 7.2: Sync Mode Timing Diagram

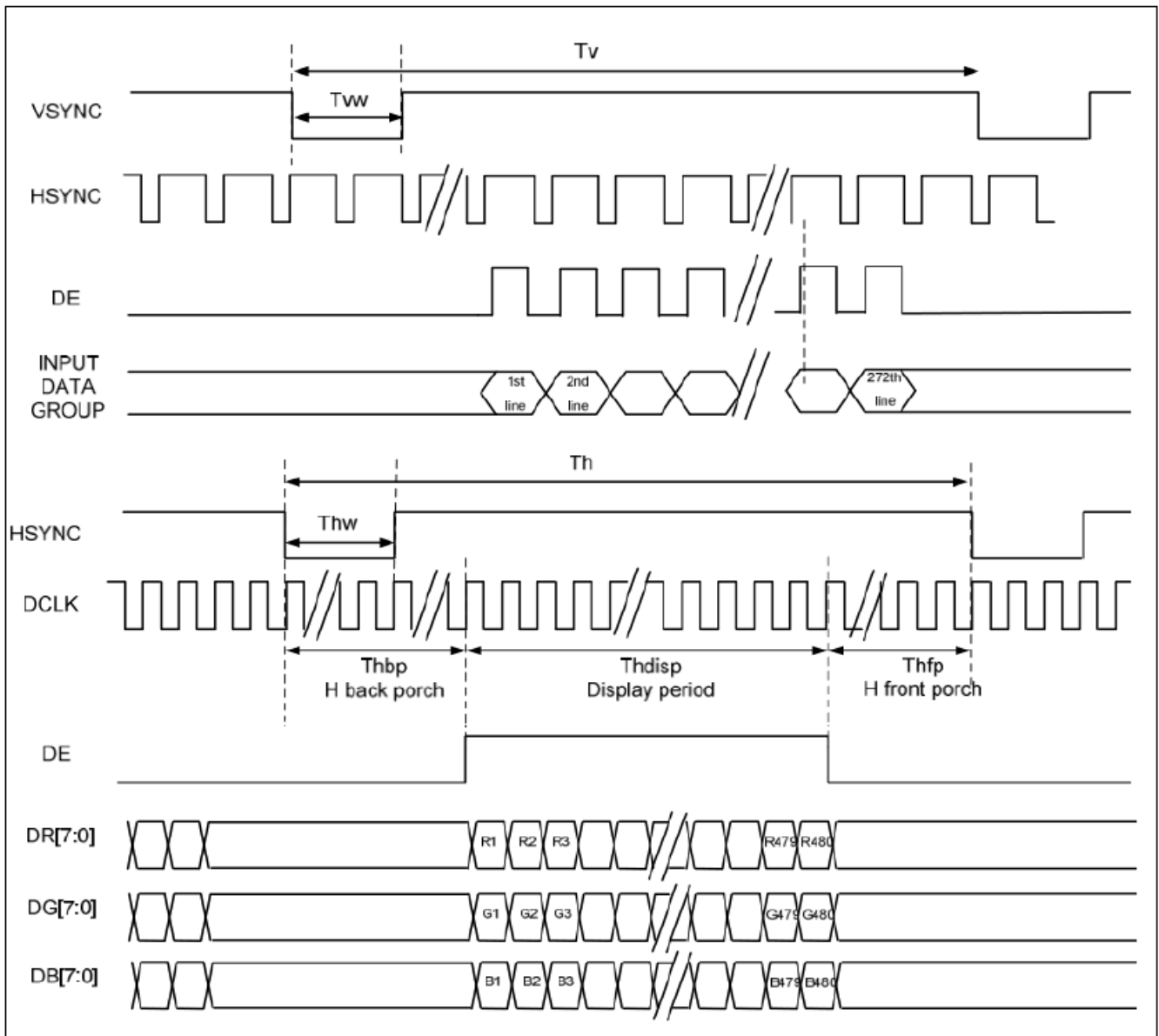


Figure 7.3: Sync-DE Mode Timing Diagram

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.