

Display Elektronik GmbH

# DATA SHEET

***TFT MODULE***

**DEM 800480R TMH-PW-N**

**5,0“ TFT**  
**with MPU-Interface**

Product Specification

Ver.: 0

**08.10.2015**

## Revision History

| VERSION | DATE       | REVISED PAGE NO. | Note        |
|---------|------------|------------------|-------------|
| 0       | 08.10.2015 |                  | First Issue |

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## **1. Summary**

This technical specification applies to 5.0' color TFT-LCD panel. The 5.0' color TFT-LCD panel is designed for camcorder, digital camera application and other electronic products which require high quality flat panel displays. This module follows RoHS.

## **2. General Specifications**

|                                   |                                    |
|-----------------------------------|------------------------------------|
| ■ Size:                           | 5.0 Inch                           |
| ■ Dot Matrix:                     | 800 x RGB x 480 dots               |
| ■ Module Dimension:               | 120.70 x 75.80 x 6.40 mm           |
| ■ Active Area:                    | 108.00 x 64.80 mm                  |
| ■ Dot Pitch:                      | 0.045 x 0.135 mm                   |
| ■ LCD Type:                       | TFT, Normally White, Transmissive  |
| ■ View Direction:                 | 12 o'clock                         |
| ■ Gray Scale Inversion Direction: | 6 o'clock                          |
| ■ Backlight Type:                 | LED, Lightguide, Normally White    |
| ■ Controller IC:                  | SSD1963                            |
| ■ Interface:                      | Digital 8080 family MPU 8bit/16bit |
| ■ With /Without TP:               | without TP                         |
| ■ Surface:                        | Anti-Glare                         |

\*Color tone slight changed by temperature and driving voltage.

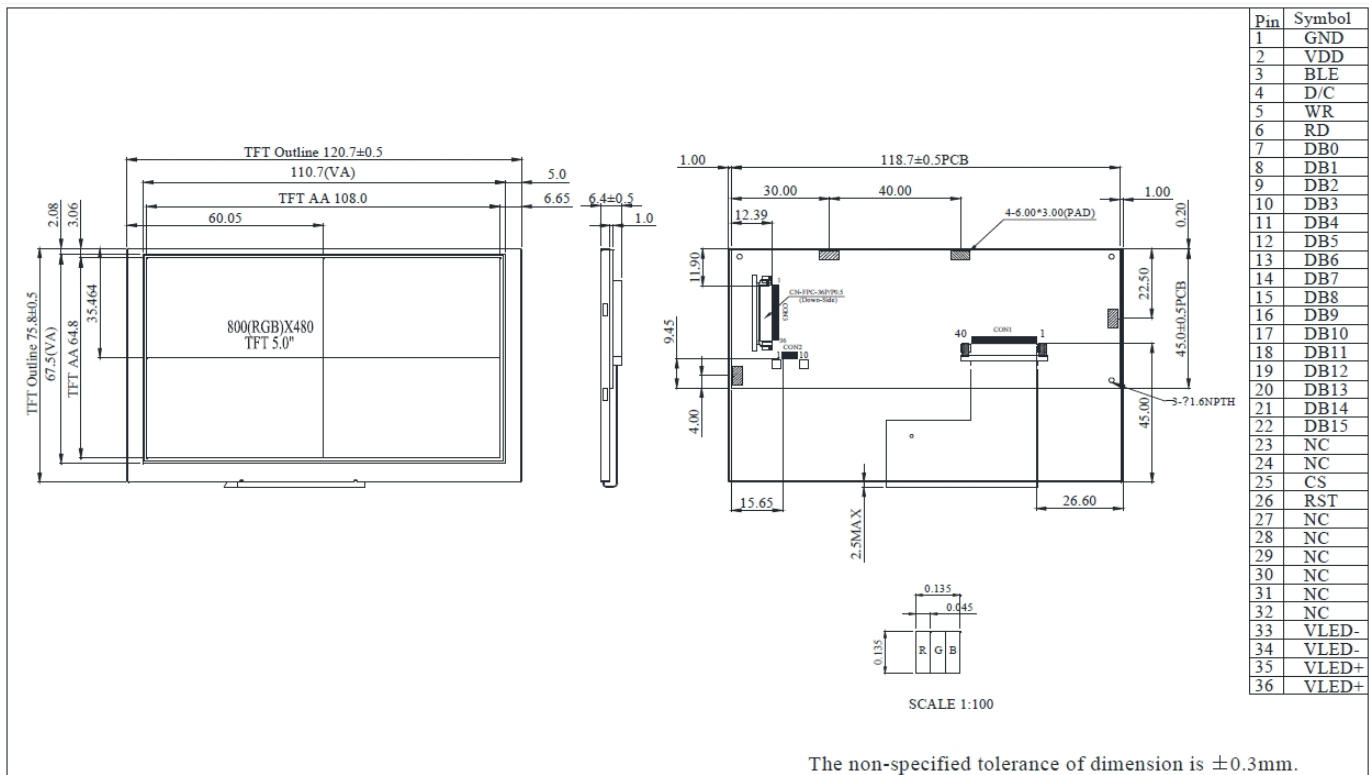
### 3. Interface

#### 3.1. LCM PIN Definition (CON3)

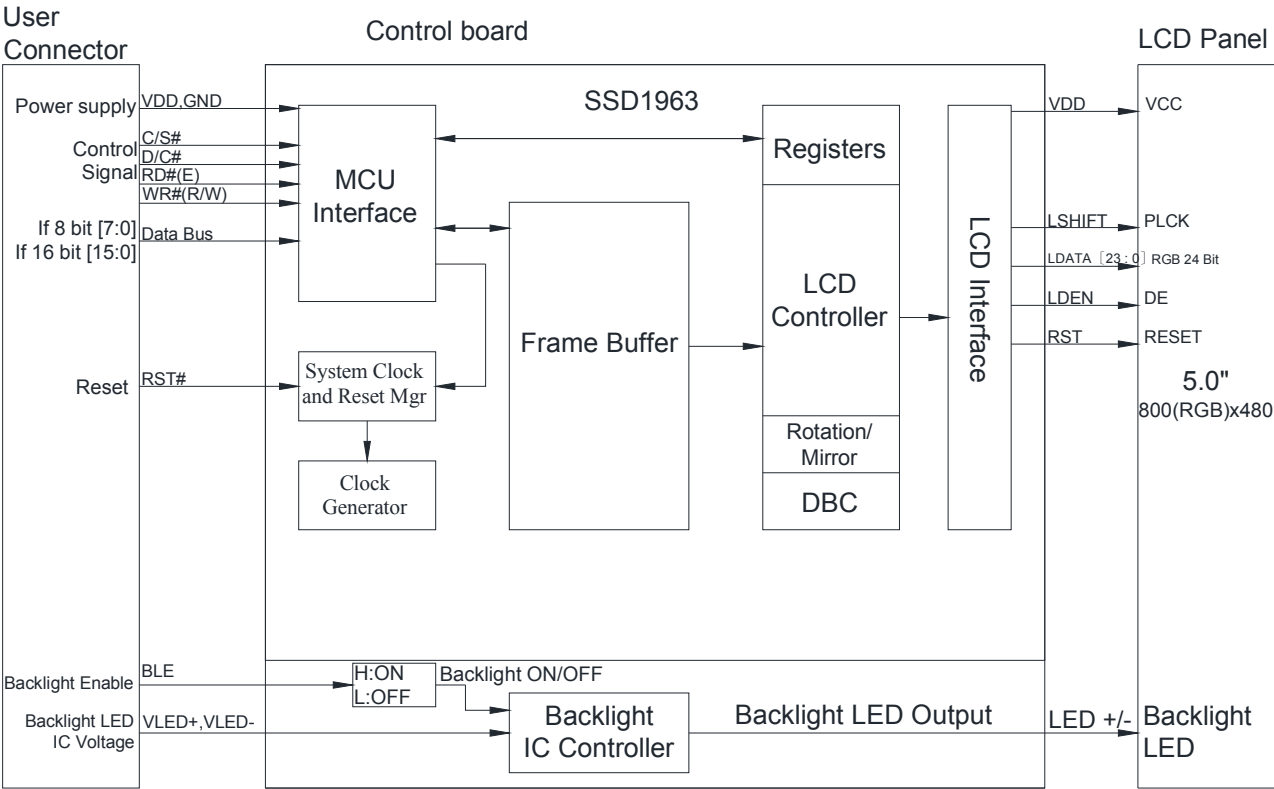
| Pin | Symbol | Function                                                 | Remark |
|-----|--------|----------------------------------------------------------|--------|
| 1   | GND    | System round pin of the IC.<br>Connect to system ground. |        |
| 2   | VDD    | Power Supply : +3.3V                                     |        |
| 3   | BL_E   | Backlight control signal , H: On \ L: Off                |        |
| 4   | D/C    | Data/Command select                                      |        |
| 5   | WR     | Write strobe signal                                      |        |
| 6   | RD     | Read strobe signal                                       |        |
| 7   | DB0    | Data bus                                                 |        |
| 8   | DB1    | Data bus                                                 |        |
| 9   | DB2    | Data bus                                                 |        |
| 10  | DB3    | Data bus                                                 |        |
| 11  | DB4    | Data bus                                                 |        |
| 12  | DB5    | Data bus                                                 |        |
| 13  | DB6    | Data bus                                                 |        |
| 14  | DB7    | Data bus                                                 |        |
| 15  | DB8    | Data bus (When select 8bits mode, this pin is NC)        | Note1  |
| 16  | DB9    | Data bus (When select 8bits mode, this pin is NC)        | Note1  |
| 17  | DB10   | Data bus (When select 8bits mode, this pin is NC)        | Note1  |
| 18  | DB11   | Data bus (When select 8bits mode, this pin is NC)        | Note1  |
| 19  | DB12   | Data bus (When select 8bits mode, this pin is NC)        | Note1  |
| 20  | DB13   | Data bus (When select 8bits mode, this pin is NC)        | Note1  |
| 21  | DB14   | Data bus (When select 8bits mode, this pin is NC)        | Note1  |
| 22  | DB15   | Data bus (When select 8bits mode, this pin is NC)        | Note1  |
| 23  | NC     | No connection                                            |        |
| 24  | NC     | No connection                                            |        |
| 25  | CS     | Chip select                                              |        |
| 26  | RST    | Hardware reset                                           |        |
| 27  | NC     | No connection                                            |        |
| 28  | NC     | No connection                                            |        |
| 29  | NC     | No connection                                            |        |
| 30  | NC     | No connection                                            |        |
| 31  | NC     | No connection                                            |        |
| 32  | NC     | No connection                                            |        |
| 33  | VLED-  | VLED- for B/L LED inverter (GND)                         |        |
| 34  | VLED-  | VLED- for B/L LED inverter (GND)                         |        |
| 35  | VLED+  | VLED+ for B/L LED inverter (+3.3V)                       |        |
| 36  | VLED+  | VLED+ for B/L LED inverter (+3.3V)                       |        |

Note1: When select 8bit mode, DB0~DB7 be used, DB8~DB15 no connect  
When select 16bit mode, DB0~DB15 be used

4. Counter Drawing



5. Block Diagram

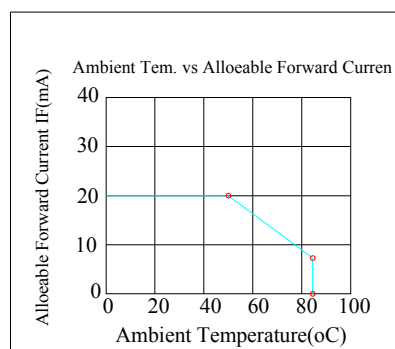


## 6. Absolute Maximum Ratings

| Item                  | Symbol | Min | Typ | Max | Unit |
|-----------------------|--------|-----|-----|-----|------|
| Operating Temperature | TOP    | -20 | —   | +70 | °C   |
| Storage Temperature   | TST    | -30 | —   | +80 | °C   |

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

- Temp.  $\leq 60^{\circ}\text{C}$ , 90% RH MAX. Temp.  $> 60^{\circ}\text{C}$ , Absolute humidity shall be less than 90% RH at  $60^{\circ}\text{C}$



## 7. Electrical Characteristics

### 7.1. Operating Conditions: (CON3.Pin1=GND, Pin2=VDD)

| Item                   | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|------------------------|--------|-----------|-----|-----|-----|------|--------|
| Supply Voltage For LCM | VDD    | —         | 3.0 | 3.1 | 3.3 | V    | -      |
| Supply Current For LCM | IDD    | —         | —   | 160 | 240 | mA   | Note1  |

Note 1 : This value is test for VDD =3.3V , Ta=25°C only

### 7.2. Backlight Driving Conditions (CON3.Pin33,34=VLED-, Pin35,36=VLED+)

| Parameter                        | Symbol     | Min.   | Typ. | Max. | Unit | Remark     |
|----------------------------------|------------|--------|------|------|------|------------|
| Operation Current For LED Driver | VLED+=3.3V | 30     | 40   | 50   | mA   | Note 1,2   |
| Power Consumption                | VLED+=3.3V | 522    | -    | 1050 | mW   | Note 1,2   |
| Supply Voltage For LED Driver    | VLED+      | 17.4   | 19.8 | 21   | V    | Note 1,2   |
| LED Lifetime                     |            | 20,000 | -    | -    | Hr   | Note 2,3,4 |

Note 1 : Base on VLED= 3.3V for the back light driver IC specification

Note 2 : Ta = 25°C

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

**8. DC CHARATERISTICS**

| Parameter                | Symbol          | Rating |     |        | Unit | Condition |
|--------------------------|-----------------|--------|-----|--------|------|-----------|
|                          |                 | Min    | Typ | Max    |      |           |
| Low Level Input Voltage  | V <sub>IL</sub> | 0      | -   | 0.3VDD | V    |           |
| High Level Input Voltage | V <sub>IH</sub> | 0.7VDD | -   | VDD    | V    |           |

## 9. Interface timing

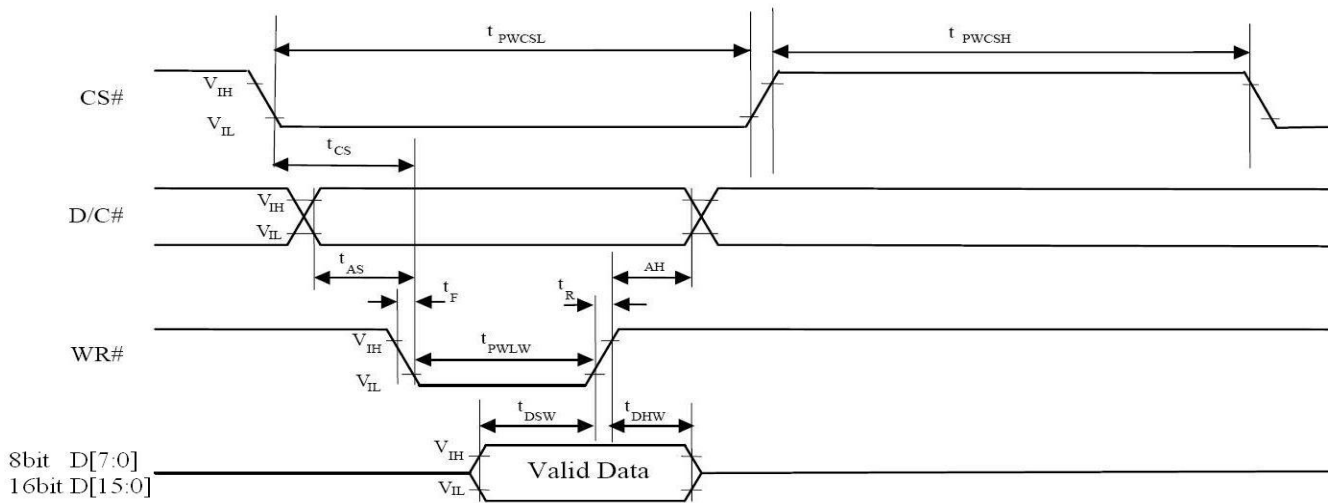
### 9.1. 8080 Mode 8bit/16bit

The 8080 mode MCU interface consist of CS#, D/C#, RD#, WR#, Data Bus signals. This interface use WR# to define a write cycle and RD# for read cycle. If the WR# goes low when the CS# signal is low, the data or command will be latched into the system at the rising edge of WR#. Similarly, the read cycle will start when RD# goes low and end at the rising edge of RD#.

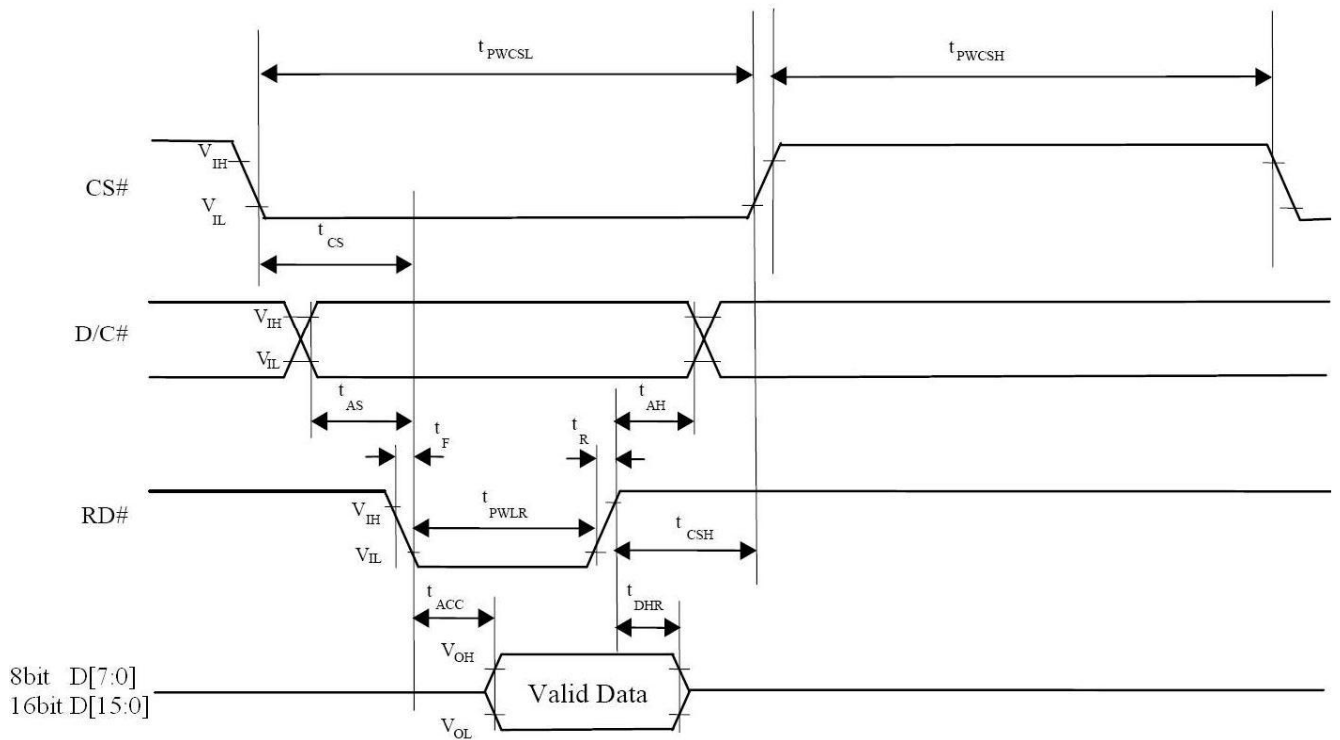
### 9.2. 8080 Mode Write Cycle

| Symbol | Parameter                                                                                    | Min            | Typ                                | Max | Unit |
|--------|----------------------------------------------------------------------------------------------|----------------|------------------------------------|-----|------|
| fMCLK  | System Clock Frequency                                                                       | 1              | -                                  | 110 | MHz  |
| tMCLK  | System Clock Period                                                                          | 1/ fMCLK       | -                                  | -   | ns   |
| tPWCSH | Control Pulse High Width    Write<br>Read                                                    | 13<br>30       | 1.5* tMCLK<br>3.5* tMCLK           | -   | ns   |
| tPWCSL | Control Pulse Low Width    Write (next write<br>cycle)<br>Write (next read<br>cycle)<br>Read | 13<br>80<br>80 | 1.5* tMCLK<br>9* tMCLK<br>9* tMCLK | -   | ns   |
| tAS    | Address Setup Time                                                                           | 1              | -                                  | -   | ns   |
| tAH    | Address Hold Time                                                                            | 2              | -                                  | -   | ns   |
| tDSW   | Write Data Setup Time                                                                        | 4              |                                    |     | ns   |
| tDHW   | Write Data Hold Time                                                                         | 1              | -                                  | -   | ns   |
| tPWLW  | Write Low Time                                                                               | 12             |                                    |     | ns   |
| tDHR   | Read Data Hold Time                                                                          | 1              | -                                  | -   | ns   |
| tACC   | Access Time                                                                                  | 32             |                                    |     | ns   |
| tPWLR  | Read Low Time                                                                                | 36             | -                                  | -   | ns   |
| tR     | Rise Time                                                                                    | -              |                                    | 0.5 | ns   |
| tF     | Fall Time                                                                                    | -              | -                                  | 0.5 | ns   |
| tCS    | Chip select setup time                                                                       | 2              |                                    | -   | ns   |
| tCSH   | Chip select hold time to read signal                                                         | 3              | -                                  | -   | ns   |

## 9.3. Parallel 8080-series Interface Timing Diagram (Write Cycle)



## 9.4. Parallel 8080-series Interface Timing Diagram (Read Cycle)



## 9.5. Pixel Data Format

| Interface            | Cycle           | D[15] | D[14] | D[13] | D[12] | D[11] | D[10] | D[9] | D[8] | D[7] | D[6] | D[5] | D[4] | D[3] | D[2] | D[1] | D[0] |
|----------------------|-----------------|-------|-------|-------|-------|-------|-------|------|------|------|------|------|------|------|------|------|------|
| 16 bits (565 format) | 1 <sup>st</sup> | R5    | R4    | R3    | R2    | R1    | G5    | G4   | G3   | G2   | G1   | G0   | B5   | B4   | B3   | B2   | B1   |
| 16 bits              | 1 <sup>st</sup> | R7    | R6    | R5    | R4    | R3    | R2    | R1   | R0   | G7   | G6   | G5   | G4   | G3   | G2   | G1   | G0   |
|                      | 2 <sup>nd</sup> | B7    | B6    | B5    | B4    | B3    | B2    | B1   | B0   | R7   | R6   | R5   | R4   | R3   | R2   | R1   | R0   |
|                      | 3 <sup>rd</sup> | G7    | G6    | G5    | G4    | G3    | G2    | G1   | G0   | B7   | B6   | B5   | B4   | B3   | B2   | B1   | B0   |
| 8 bits               | 1 <sup>st</sup> |       |       |       |       |       |       |      |      | R7   | R6   | R5   | R4   | R3   | R2   | R1   | R0   |
|                      | 2 <sup>nd</sup> |       |       |       |       |       |       |      |      | G7   | G6   | G5   | G4   | G3   | G2   | G1   | G0   |
|                      | 3 <sup>rd</sup> |       |       |       |       |       |       |      |      | B7   | B6   | B5   | B4   | B3   | B2   | B1   | B0   |

## 10. Optical Characteristics

| Item               |       | Symbol     | Condition.                            | Min  | Typ. | Max. | Unit                  | Remark            |
|--------------------|-------|------------|---------------------------------------|------|------|------|-----------------------|-------------------|
| Response Time      |       | Tr         | $\theta=0^{\circ}$ 、 $\phi=0^{\circ}$ | -    | 10   | 20   | .ms                   | Note 3,5          |
|                    |       | Tf         |                                       | -    | 10   | 20   | .ms                   |                   |
| Contrast Ratio     |       | CR         | At optimized viewing angle            | 500  | 700  | -    | -                     | Note 4,5          |
| Color Chromaticity | White | Wx         | $\theta=0^{\circ}$ 、 $\phi=0$         | 0.26 | 0.31 | 0.36 |                       | Note 2,6,7        |
|                    |       | Wy         |                                       | 0.28 | 0.33 | 0.38 |                       |                   |
| Viewing Angle      | Hor.  | $\Theta_R$ | $CR \geq 10$                          | 60   | 70   | -    | Deg.                  | Note 1            |
|                    |       | $\Theta_L$ |                                       | 60   | 70   | -    |                       |                   |
|                    | Ver.  | $\Phi_T$   |                                       | 40   | 50   | -    |                       |                   |
|                    |       | $\Phi_B$   |                                       | 60   | 70   | -    |                       |                   |
| Brightness         |       | -          | -                                     | 400  | 450  | -    | cd/<br>m <sup>2</sup> | Center of display |

Ta=25±2°C

Note 1: Definition of viewing angle range

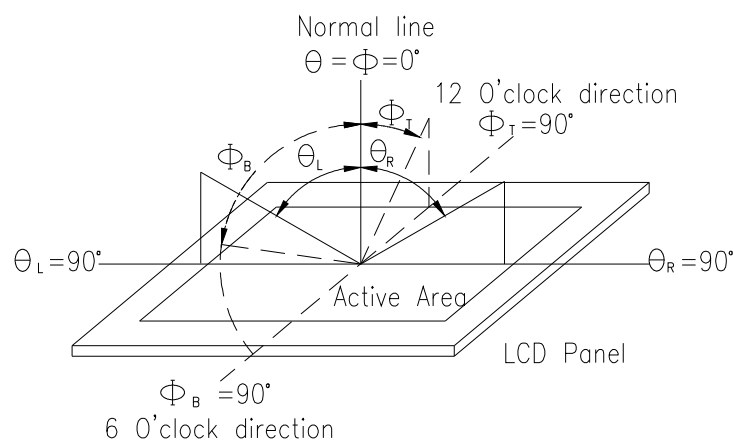


Fig. 10.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

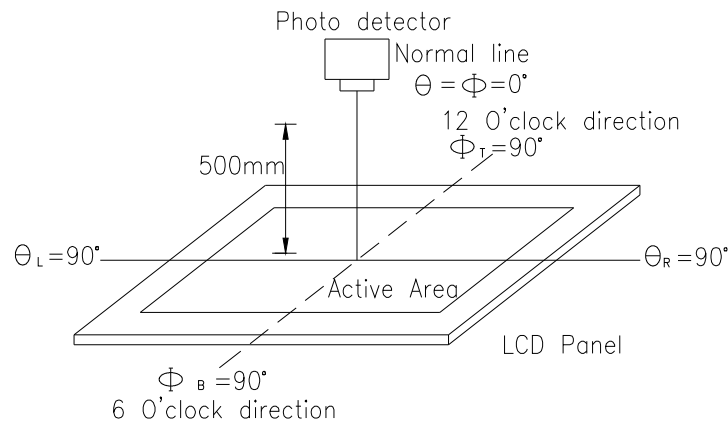
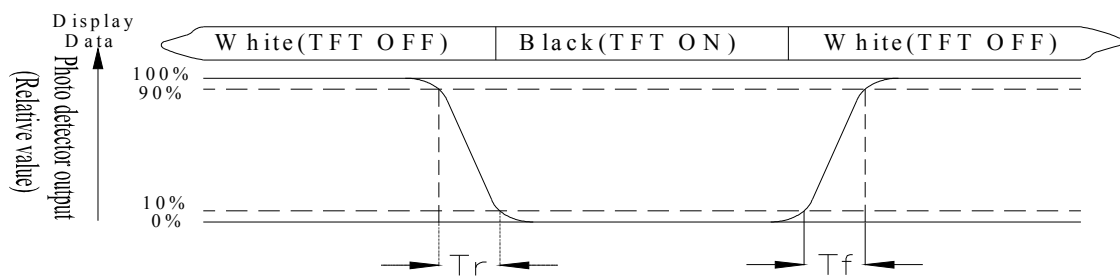


Fig. 10.2. Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time,  $T_r$ , is the time between photo detector output intensity changed from 90% to 10%. And fall time,  $T_f$ , is the time between photo detector output intensity changed from 10% to 90%.



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White  $V_i = V_{i50} \pm 1.5V$

Black  $V_i = V_{i50} \pm 2.0V$

" $\pm$ " means that the analog input signal swings in phase with VCOM signal.

" $\pm$ " means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

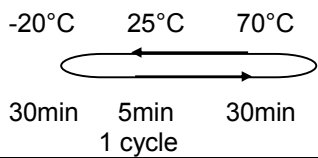
Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

## 11. Reliability

### Content of Reliability Test (Wide temperature, -20°C~70°C)

| Environmental Test                      |                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                     |      |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Test Item                               | Content of Test                                                                                                                                                                                                                                                                                                               | Test Condition                                                                                                                                      | Note |
| High Temperature storage                | Endurance test applying the high storage temperature for a long time.                                                                                                                                                                                                                                                         | 80°C<br>200hrs                                                                                                                                      | 2    |
| Low Temperature storage                 | Endurance test applying the low storage temperature for a long time.                                                                                                                                                                                                                                                          | -30°C<br>200hrs                                                                                                                                     | 1,2  |
| High Temperature Operation              | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.                                                                                                                                                                                                        | 70°C<br>200hrs                                                                                                                                      | —    |
| Low Temperature Operation               | Endurance test applying the electric stress under low temperature for a long time.                                                                                                                                                                                                                                            | -20°C<br>200hrs                                                                                                                                     | 1    |
| High Temperature/<br>Humidity Operation | The module should be allowed to stand at 60□,90%RH max                                                                                                                                                                                                                                                                        | 60°C,90%RH<br>96hrs                                                                                                                                 | 1,2  |
| Thermal shock resistance                | <p>The sample should be allowed stand the following 10 cycles of operation</p>  <p style="text-align: center;">-20°C    25°C    70°C</p> <p style="text-align: center;">30min   5min   30min</p> <p style="text-align: center;">1 cycle</p> | -20°C/70°C<br>10 cycles                                                                                                                             | —    |
| Vibration test                          | Endurance test applying the vibration during transportation and using.                                                                                                                                                                                                                                                        | Total fixed amplitude : 3<br>15mm<br>Vibration Frequency :<br>10~55Hz<br>One cycle 60<br>seconds to 3<br>directions of X,Y,Z for<br>Each 15 minutes | 3    |
| Static electricity test                 | Endurance test applying the electric stress to the terminal.                                                                                                                                                                                                                                                                  | VS=800V,<br>RS=1.5kΩ<br>CS=100pF<br>1 time                                                                                                          | —    |

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.