



# FORMIKE ELECTRONIC CO.,LTD

## PRDUCT SPECIFICATON

### TFT LCD MODULE

MODEL : KWH043GM08-F01 Ver 01

【   】 Preliminary Specification

【 ♦ 】 Finally Specification

|                     |          |
|---------------------|----------|
| CUSTOMER'S APPROVAL |          |
| SIGNATURE:          | DATE:    |
| <br><br>            | <br><br> |

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## TABLE OF CONTENTS

|                                                 |           |
|-------------------------------------------------|-----------|
| <b>1. GENERAL DESCRIPTION .....</b>             | <b>5</b>  |
| <b>2. FEATURES .....</b>                        | <b>5</b>  |
| <b>3. MECHANICAL SPECIFICATION .....</b>        | <b>5</b>  |
| <b>4. MECHANICAL DIMENSION.....</b>             | <b>6</b>  |
| <b>5. MAXIMUM RATINGS .....</b>                 | <b>7</b>  |
| <b>6. ELECTRICAL CHARACTERISTICS .....</b>      | <b>8</b>  |
| 6.1. TFT LCD Characteristic .....               | 8         |
| 6.2. Backlight Characteristic .....             | 8         |
| <b>7. MODULE FUNCTION DESCRIPTION .....</b>     | <b>9</b>  |
| 7.1. PIN Description .....                      | 9         |
| 7.2. Timing characteristics .....               | 11        |
| <b>8. TOUCH PANEL .....</b>                     | <b>13</b> |
| 8.1. Electrical Characteristics.....            | 13        |
| 8.2. Mech. & Reliability Characteristics.....   | 13        |
| 8.3. Integration Design Guide .....             | 14        |
| <b>9. ELECTRO-OPTICAL CHARACTERISTICS .....</b> | <b>15</b> |
| <b>10. RELIABILITY.....</b>                     | <b>17</b> |
| 10.1. TESTS.....                                | 17        |
| 10.2. Color Performance .....                   | 17        |
| <b>11. ROHS COMPLIANT WARRANTY.....</b>         | <b>20</b> |
| <b>12. PRECAUTIONS FOR USE .....</b>            | <b>20</b> |
| 12.1. Safety .....                              | 20        |
| 12.2. Storage Conditions.....                   | 20        |
| 12.3. Installing LCD Module .....               | 20        |



|       |                                 |    |
|-------|---------------------------------|----|
| 12.4. | Precautions For Operation ..... | 21 |
| 12.5. | Handling Precautions .....      | 21 |
| 12.6. | Warranty.....                   | 21 |



## 1. GENERAL DESCRIPTION

KWH043GM08-F01 is a Transmissive type color active matrix liquid crystal display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, driver ICs, FPC, touch panel and a backlight unit. The following table described the features of KWH043GM08-F01

## 2. FEATURES

|                        |                                    |
|------------------------|------------------------------------|
| Display Mode           | Transmissive Type                  |
|                        | TFT LCD, Normally white            |
| Display Format         | RGB Strip type                     |
| Color                  | 16.7M color                        |
| Interface              | RGB data bus, 24 bit parallel data |
| Viewing Direction      | 6 O'clock                          |
| Backlight type / color | LED / White                        |
| Touch panel            | 4 Wire Analog Type (Haze:8)        |

## 3. MECHANICAL SPECIFICATION

| Item                | Specifications                  | Unit |
|---------------------|---------------------------------|------|
| Dimensional outline | 105.5 (W) × 67.2 (H) × 4.2 (D)* | mm   |
| Resolution          | 480×3(R,G,B)×272                | dot  |
| Active area         | 95.04 (W) × 53.856 (H)          | mm   |
| Pixel pitch         | 0.198 (W) × 0.18 (H)            | mm   |

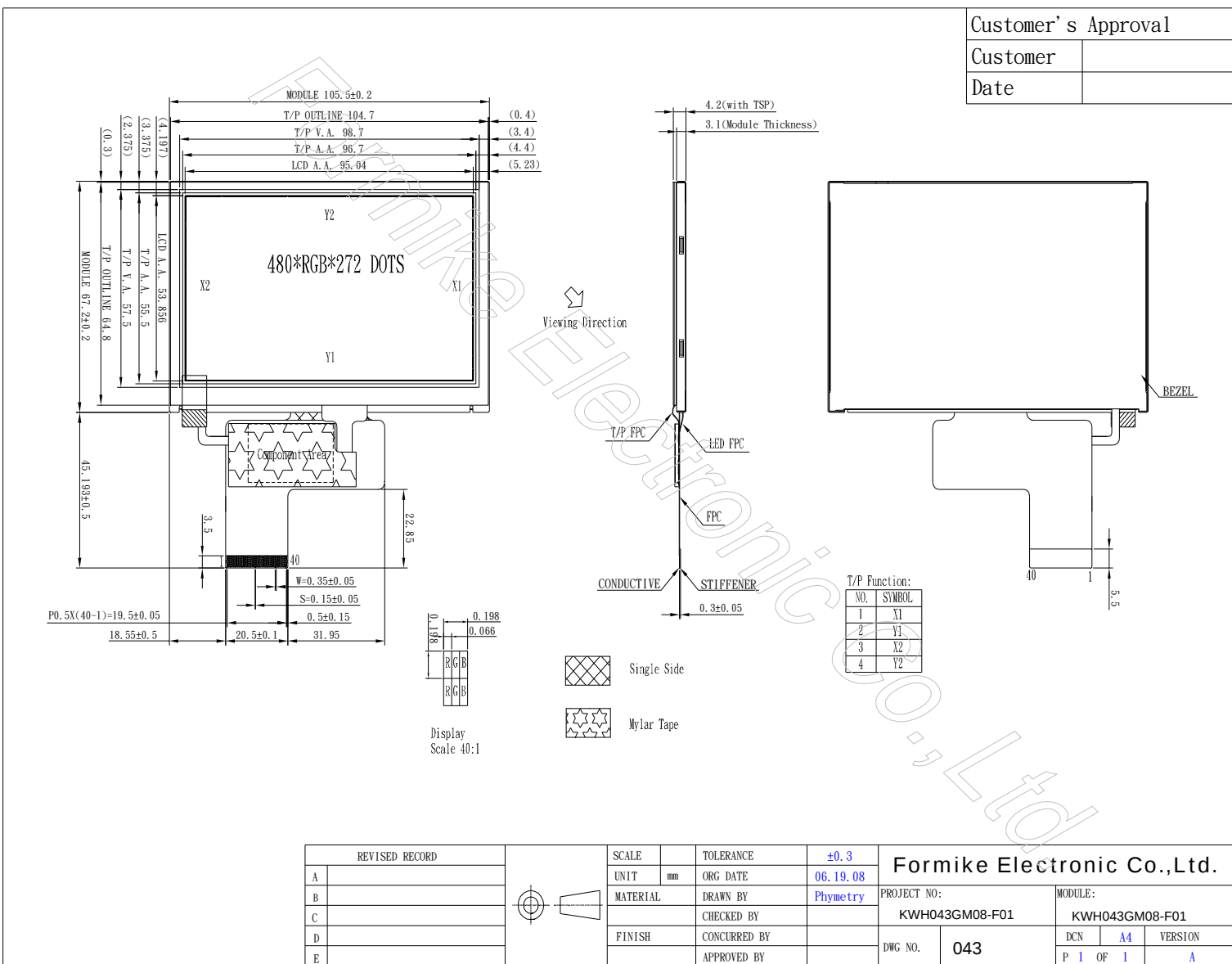
\* Exclude FPC



FORMIKE

Model No. KWH043GM08-F01

## 4. MECHANICAL DIMENSION





## 5. MAXIMUM RATINGS

| ITEM                       | SYMBOL           | MIN. | MAX. | UNIT |
|----------------------------|------------------|------|------|------|
| Digital supply voltage     | VDDIO            | -0.3 | +4.5 | V    |
| Power Supply for Pump      | VDD              | -0.3 | +4.5 | V    |
| Analog supply voltage      | VDD2             | -0.3 | +7.0 | V    |
| Operation Temperature      | T <sub>A</sub>   | -20  | 70   | °C   |
| Storage Temperature        | T <sub>stg</sub> | -30  | 80   | °C   |
| Singal LED forward current | I <sub>F</sub>   | -    | (40) | mA   |
| Singal LED reverse voltage | V <sub>R</sub>   | -    | (5)  | V    |
| Humidity                   | -                | -    | (90) | %RH  |

Note:

- All of voltage listed above are with respect to GND=VSS=0V.
- Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.
- T<sub>A</sub> ≤ 40°C Without dewing.
- 單串為 20mA The LED

## 6. ELECTRICAL CHARACTERISTICS

### 6.1.TFT LCD Characetristic

Typical operating conditions

(GND=AVSS=0V)

| Item                        | Symbol | Min.     | Typ.            | Max. | Unit            | Note |
|-----------------------------|--------|----------|-----------------|------|-----------------|------|
| Power supply                | VDD    | 3.0      | 3.3             | 3.6  | V               |      |
|                             | AVDD   | 4.8      | 5.0             | 5.2  | V               |      |
| Current                     | ICC    | -        | (40)            | -    | mA              |      |
| Driver Input signal voltage | H      | $V_{IH}$ | $0.7 \cdot VDD$ | -    | VDD             | V    |
|                             | L      | $V_{IL}$ | 0               | -    | $0.3 \cdot VDD$ | V    |

### 6.2.Backlight Characteristic

| Item              | Symbol    | Values |       |      | Unit | Remark            |
|-------------------|-----------|--------|-------|------|------|-------------------|
|                   |           | Min.   | Typ.  | Max. |      |                   |
| Power Consumption | $P_{LED}$ | -      | (660) | -    | mW   |                   |
| LED Current       | $I_L$     | -      | (40)  | -    | mA   | 5 串 *2 並<br>=40mA |
| LED Voltage       | $V_L$     | -      | 16.5  | -    | V    |                   |

**Note1:** FORMIKE suggest using constant current driving this backlight unit.



## 7. MODULE FUNCTION DESCRIPTION

### 7.1.PIN Description

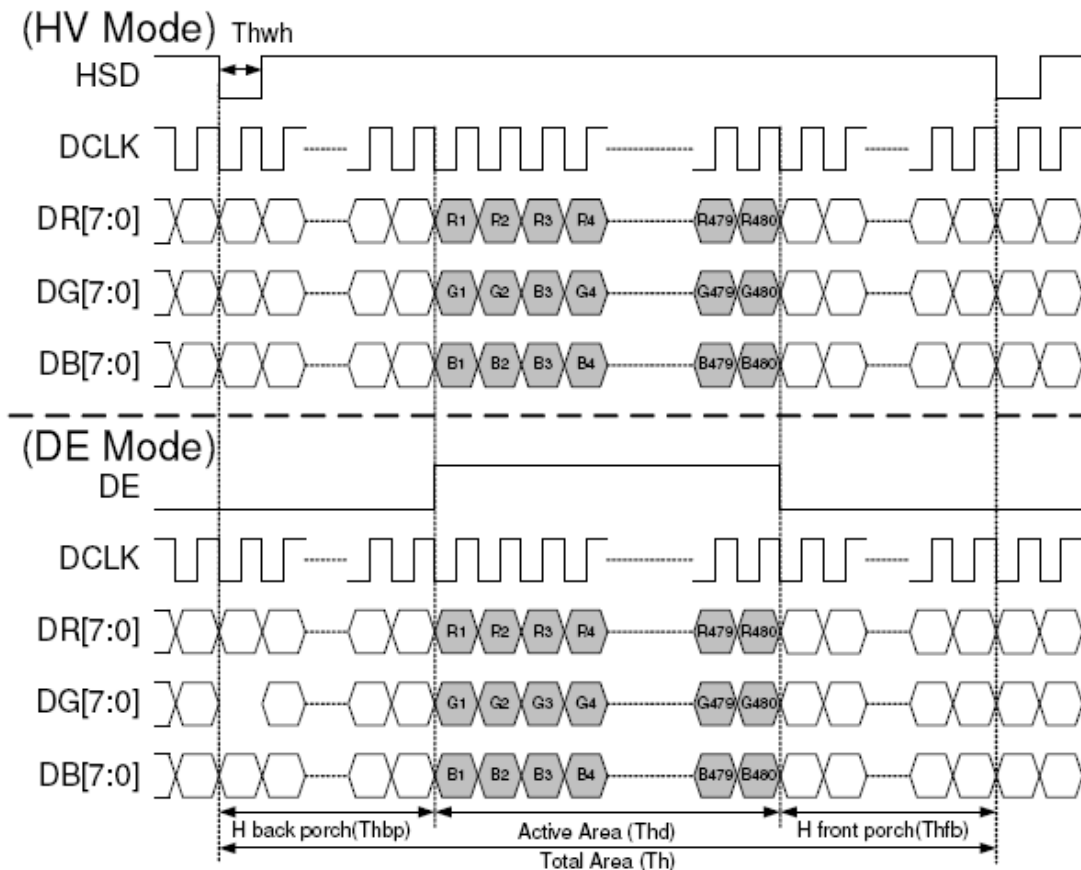
| Pin | Symbol | Description      | Remark |
|-----|--------|------------------|--------|
| 1   | VLED-  | Power for LED    |        |
| 2   | VLED+  | Power for LED    |        |
| 3   | GND    | Power ground     |        |
| 4   | VDD    | Power supply     |        |
| 5   | R0     | Red data (LSB)   |        |
| 6   | R1     | Red data         |        |
| 7   | R2     | Red data         |        |
| 8   | R3     | Red data         |        |
| 9   | R4     | Red data         |        |
| 10  | R5     | Red data         |        |
| 11  | R6     | Red data         |        |
| 12  | R7     | Red data (MSB)   |        |
| 13  | G0     | Green data (LSB) |        |
| 14  | G1     | Green data       |        |
| 15  | G2     | Green data       |        |
| 16  | G3     | Green data       |        |
| 17  | G4     | Green data       |        |
| 18  | G5     | Green data       |        |
| 19  | G6     | Green data       |        |
| 20  | G7     | Green data (MSB) |        |
| 21  | B0     | Blue data (LSB)  |        |
| 22  | B1     | Blue data        |        |
| 23  | B2     | Blue data        |        |
| 24  | B3     | Blue data        |        |
| 25  | B4     | Blue data        |        |
| 26  | B5     | Blue data        |        |
| 27  | B6     | Blue data        |        |
| 28  | B7     | Blue data (MSB)  |        |
| 29  | GND    | Power ground     |        |



|    |       |                            |  |
|----|-------|----------------------------|--|
| 30 | PCLK  | Pixel clock                |  |
| 31 | DISP  | Display on/off             |  |
| 32 | HSYNC | Horizontal sync signal     |  |
| 33 | VSYNC | Vertical sync signal       |  |
| 34 | DE    | Data enable                |  |
| 35 | AVDD  | Power supply(+5V)          |  |
| 36 | GND   | Power ground               |  |
| 37 | X1    | Right side of touch panel  |  |
| 38 | Y1    | Bottom side of touch panel |  |
| 39 | X2    | Left side of touch panel t |  |
| 40 | Y2    | Up side of touch panel     |  |

## 7.2.Timing characteristics

### 7.2.1.Timing Chart.



### 7.2.2.Timing Specification

| Parameter        | Symbol    | Value |      |      | Unit |
|------------------|-----------|-------|------|------|------|
|                  |           | Min.  | Typ. | Max. |      |
| DCLK frequency   | fclk      | 5     | 9    | 12   | MHz  |
| VSD period time  | $T_v$     | 277   | 288  | 400  | H    |
| VSD display area | $T_{vd}$  | 272   |      |      | H    |
| VSD back porch   | $T_{vb}$  | 3     | 8    | 31   | H    |
| VSD front porch  | $T_{vfp}$ | 2     | 8    | 93   | H    |
| HSD period time  | $T_h$     | 520   | 525  | 800  | DCLK |
| HSD display area | $T_{hd}$  | 480   |      |      | DCLK |
| HSD back porch   | $T_{hbp}$ | 36    | 40   | 255  | DCLK |
| HSD front porch  | $T_{hfp}$ | 4     | 5    | 65   | DCLK |



## 7.2.3.Color data Assignment

| COLOR       | INPUT DATA | R DATA |    |    |    |    |     | G DATA |    |    |    |    |     | B DATA |    |    |    |    |     |
|-------------|------------|--------|----|----|----|----|-----|--------|----|----|----|----|-----|--------|----|----|----|----|-----|
|             |            | R5     | R4 | R3 | R2 | R1 | R0  | G5     | G4 | G3 | G2 | G1 | G0  | B5     | B4 | B3 | B2 | B1 | B0  |
|             |            | MSB    |    |    |    |    | LSB | MSB    |    |    |    |    | LSB | MSB    |    |    |    |    | LSB |
| BASIC COLOR | BLACK      | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(63)    | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(63)  | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | BLUE(63)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   |
|             | CYAN       | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   | 1      | 1  | 1  | 1  | 1  | 1   |
|             | MAGENTA    | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   |
|             | YELLOW     | 1      | 1  | 1  | 1  | 1  | 1   | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | WHITE      | 1      | 1  | 1  | 1  | 1  | 1   | 1      | 1  | 1  | 1  | 1  | 1   | 1      | 1  | 1  | 1  | 1  | 1   |
| RED         | RED(0)     | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(1)     | 0      | 0  | 0  | 0  | 0  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(2)     | 0      | 0  | 0  | 0  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             | RED(62)    | 1      | 1  | 1  | 1  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | RED(63)    | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
| GREEN       | GREEN(0)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(1)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 1   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(2)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             | GREEN(62)  | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | GREEN(63)  | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   | 0      | 0  | 0  | 0  | 0  | 0   |
| BLUE        | BLUE (0)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   |
|             | BLUE (1)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 1   | 0      | 0  | 0  | 0  | 0  | 1   |
|             | BLUE (2)   | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 1  | 0   | 0      | 0  | 0  | 0  | 1  | 0   |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             |            |        |    |    |    |    |     |        |    |    |    |    |     |        |    |    |    |    |     |
|             | BLUE (62)  | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 0   |
|             | BLUE (63)  | 0      | 0  | 0  | 0  | 0  | 0   | 0      | 0  | 0  | 0  | 0  | 0   | 1      | 1  | 1  | 1  | 1  | 1   |

[NOTE] :

- 1) Definition of Gray level : Color(n) : n to show the Gray level , n is the more high and the light more bright.
- 2) Data:1-High, 0-Low.

## 8. TOUCH PANEL

### 8.1.Electrical Characteristics

| Item                         | Min. | Typ. | Max. | Unit     | Note           |
|------------------------------|------|------|------|----------|----------------|
| Linearity                    | -    | -    | 1.5  | %        |                |
| Resistance between terminals | 100  | -    | 900  | $\Omega$ | X (Film side)  |
|                              | 100  | -    | 900  | $\Omega$ | Y (Glass side) |
| Insulation resistance        | 20M  | -    | -    | $\Omega$ |                |
| Operation voltage            | -    | -    | 5    | V        |                |
| Response time                | -    | -    | 10   | ms       |                |
| Transmittance                | -    | 80   | -    | %        |                |
| Haze                         | -    | 8    | -    | %        |                |

### 8.2.Mech. & Reliability Characteristics

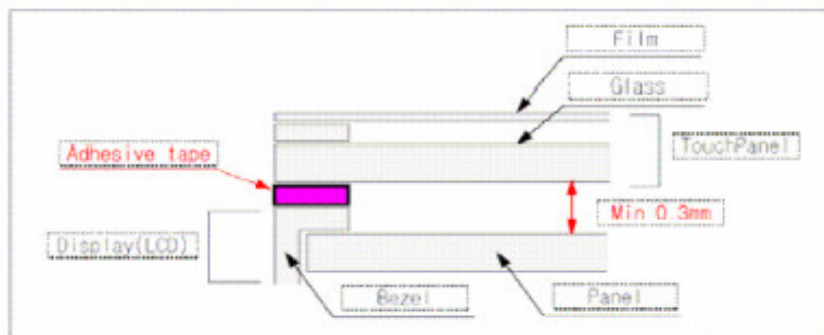
| Item                       | Min              | Typ. | Max. | Unit       | Note      |
|----------------------------|------------------|------|------|------------|-----------|
| Activation force           | -                | -    | 80   | G          | Note 1    |
| Surface hardness           | 3                | -    | -    | H          | JIS-K5400 |
| Durability-surface Sliding | Write<br>100,000 | -    | -    | Characters | Note 2    |
| Durability-surface Hitting | 1000,000         | -    | -    | Touches    | Note 3    |

Note:

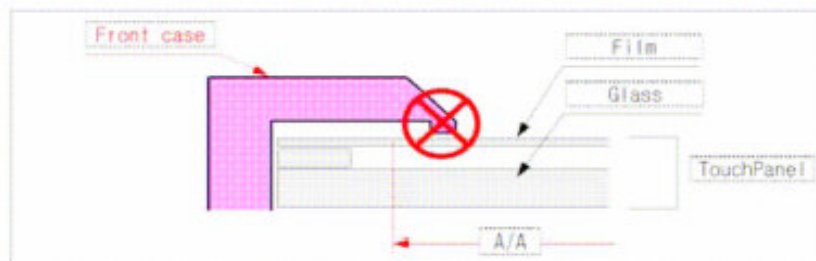
1. Stylus pen input: R 0.8mm polyacetal pen or finger.
2. Writing with R0.8mm plastic stylus pen, load 250gf in active area, Speed is 60mm/sec, each sliding length 30mm.
3. Writing with R8.0mm plastic stylus pen; load 250gf in active area, Speed is 3 times/sec.

### 8.3.Integration Design Guide

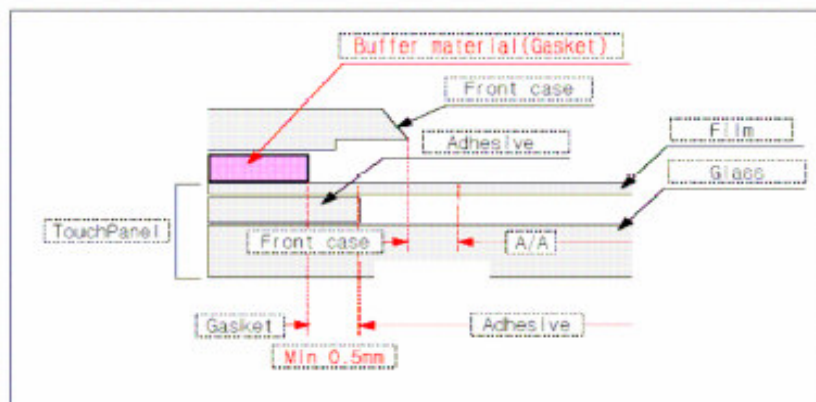
- Give enough clearance(over 0.3mm) between the touch-panel and a display to protect a display.



- Avoid the design that Front-case overlap and press on the active area of the touch-panel.
- Give enough gap (over 0.5mm at compressed) between the front case and touch-panel to protect wrong operating.



- Use a buffer material(Gasket) between the touch-panel and Front-case to protect damage and wrong operating.
- Avoid the design that buffer material overlap and press on the inside of touch-panel viewing area.



## 9. ELECTRO-OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in dark room or equivalent state with the methods shown in Note 1.

| Item                     |            | Symbol    | Condition                   | Min     | Typ     | Max     | Unit              | Remark |
|--------------------------|------------|-----------|-----------------------------|---------|---------|---------|-------------------|--------|
| Brightness(W/O T/P)      |            |           |                             | 320     | 350     | -       | cd/m <sup>2</sup> |        |
| Response time            |            | $T_R+T_F$ | $\Theta=0$                  | -       | 25      | -       | ms                | Note 2 |
| Contrast ratio (W/O T/P) |            | CR        | At the center point of A.A. | -       | 300     | -       |                   | Note 3 |
| Color Chromaticity       | White      | $W_x$     | $\Theta=0$                  | (0.273) | (0.313) | (0.353) |                   | Note 4 |
|                          |            | $W_y$     |                             | (0.289) | (0.329) | (0.369) |                   |        |
| Viewing Angle            | Horizontal |           | $CR \geq 10$                | -       | 130     | -       | Degree            | Note 5 |
|                          | Vertical   |           |                             | -       | 120     | -       |                   |        |

$T_a=25\pm 2^{\circ}\text{C}$

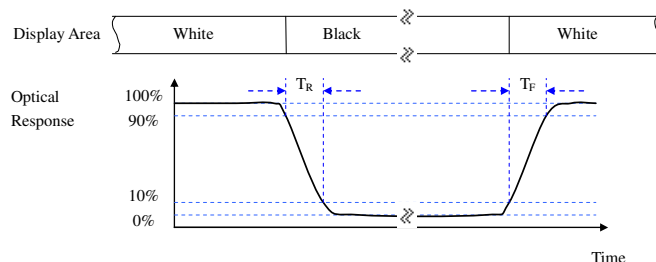
Note:

Test equipment setup

After stabilizing and leaving the panel alone at a given temperature for 30 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-5A with a viewing angle of 2° at a distance of 50cm and normal direction.

Definition of response time:  $T_R$  and  $T_F$

The figure below is the output signal of the photo detector.



Definition of contrast ratio:

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

White  $V_i = V_{i50\%} \pm 1.5V$

Black  $V_i = V_{i50\%} \mp 2.0V$

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

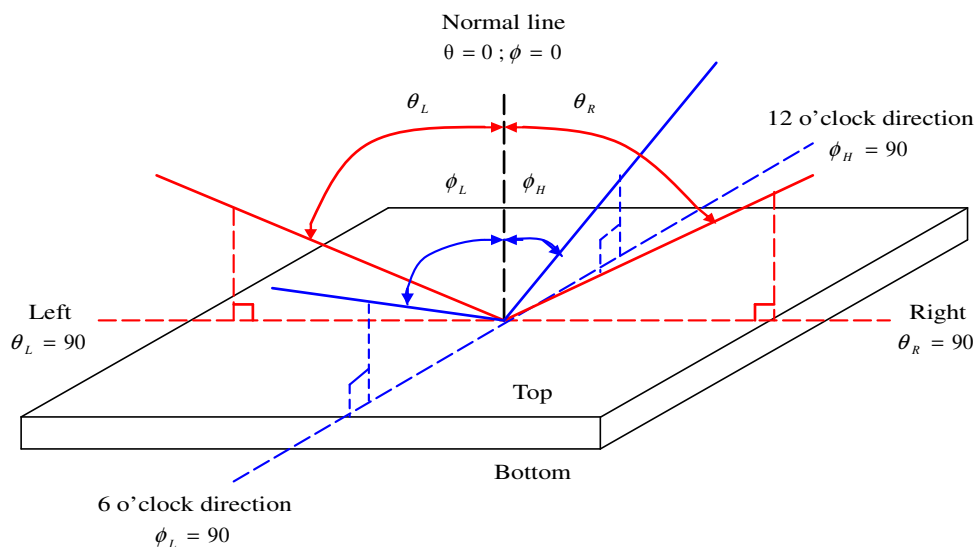
" $\mp$ " means that the analog input signal swings out of phase with VCOM signal.

$V_{i50\%}$ : The analog input voltage when transmission is 50%.

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

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

#### 5. Definition of viewing angle:





## 10.RELIABILITY

### 10.1.TESTS

| NO. | ITEM                                     | CONDITION                                    | CRITERION                                                              |
|-----|------------------------------------------|----------------------------------------------|------------------------------------------------------------------------|
| 1   | High Temperature Operating               | 70℃ 240 hrs                                  | ◦ No Defect Of Operational Function In Room Temperature Are Allowable. |
| 2   | Low Temperature Operating                | -20℃ 240 hrs                                 |                                                                        |
| 3   | High Temperature/ Humidity Non-Operating | 60℃ ,90%RH ,240 hrs (No condensation)        |                                                                        |
| 4   | High Temperature Non-Operating           | 80℃ 240 hrs                                  |                                                                        |
| 5   | Low Temperature Non-Operating            | -30℃ 240 hrs                                 |                                                                        |
| 6   | Temperature Shock Non-Operating          | -30℃ (30min) ↔ 80℃ (30min) (5min) 100 CYCLES |                                                                        |
| 7   | Electro-static Discharge                 | HBM : ±2kv                                   |                                                                        |

Note 1: Test after 24 hours in room temperature.

Note 2: The sampling above is individually for each reliability testing condition.

Note 3: The color fading of polarizing filter should not care.

Note 4: All of the reliability testing chamber above, is using D.I. water.(Min value:1.0 MΩ -cm)

Note 5: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

### 10.2.Color Performance

| No. | ITEM           | Criterion (initial) |
|-----|----------------|---------------------|
| 1   | Luminance      | >50%                |
| 2   | NTSC           | >70%                |
| 3   | Contrast Ratio | >50%                |

## 13. RoHS COMPLIANT WARRANTY

RoHS Hazardous substances including:

- Cd < 100 ppm
- Pb < 1000 ppm
- Hg < 1000 ppm
- Cr +6 < 1000 ppm
- PBDE < 1000 ppm
- PBB < 1000 ppm

## 14. PRECAUTIONS FOR USE

### 14.1. Safety

- (1) Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
- (2) If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
- (3) If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

### 14.2. Storage Conditions

- (1) Store the panel or module in a dark place where the temperature is  $23\pm 5^{\circ}\text{C}$  and the humidity is below  $50\pm 20\%\text{RH}$ .
- (2) Store in anti-static electricity container.
- (3) Store in clean environment, free from dust, active gas, and solvent.
- (4) Do not place the module near organics solvents or corrosive gases.
- (5) Do not crush, shake, or jolt the module.
- (6) Do not exposed to direct sun light of fluorescent lamps.

### 14.3. Installing LCD Module

Attend to the following items when installing the LCM.

- (1) Cover the surface with a transparent protective plate or touch panel to protect the polarizer and LC cell.
- (2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be  $\pm 0.1\text{mm}$ .



## 14.4. Precautions For Operation

- (1) Viewing angle varies with the change of liquid crystal driving voltage ( $V_o$ ). Adjust  $V_o$  to show the best contrast.
- (2) Driving the LCD in the voltage above the limit will shorten its lifetime.
- (3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (4) When turning the power on, input each signal after the positive/negative voltage becomes stable.
- (5) Do not apply water or any liquid on product which composed of T/P.

## 14.5. Handling Precautions

- (1) Avoid static electricity which can damage the CMOS LSI; please wear the wrist strap when handling.
- (2) The polarizing plate of the display is very fragile. so, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface; it may cause display abnormal .
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.
- (9) Do not apply water or any liquid on product, which composed of T/P.

## 14.6. Warranty

- (1) The period is within 12 months since the date of shipping out under normal using and storage conditions.
- (2) The warranty will be avoided in case of defect induced by customer.