# MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

# LCD MODULE SPECIFICATION

## Model : MI0570PT-2

This module uses ROHS material

**For Customer's Acceptance:**

| | |
|---|---|
| Customer | |
| Approved | |
| Comment | |

| | | |
|---|---|---|
| This specification may change without prior notice in order to improve performance or quality. Please contact Multi-Inno for updated specification and product status before design for this product or release of this order. | Revision | 1.0 |
| | Engineering | |
| | Date | 2013-05-29 |
| | Our Reference | |

## REVISION RECORD

| REV NO. | REV DATE | CONTENTS | REMARKS |
|---|---|---|---|
| 1.0 | 2013-05-29 | First Release | |
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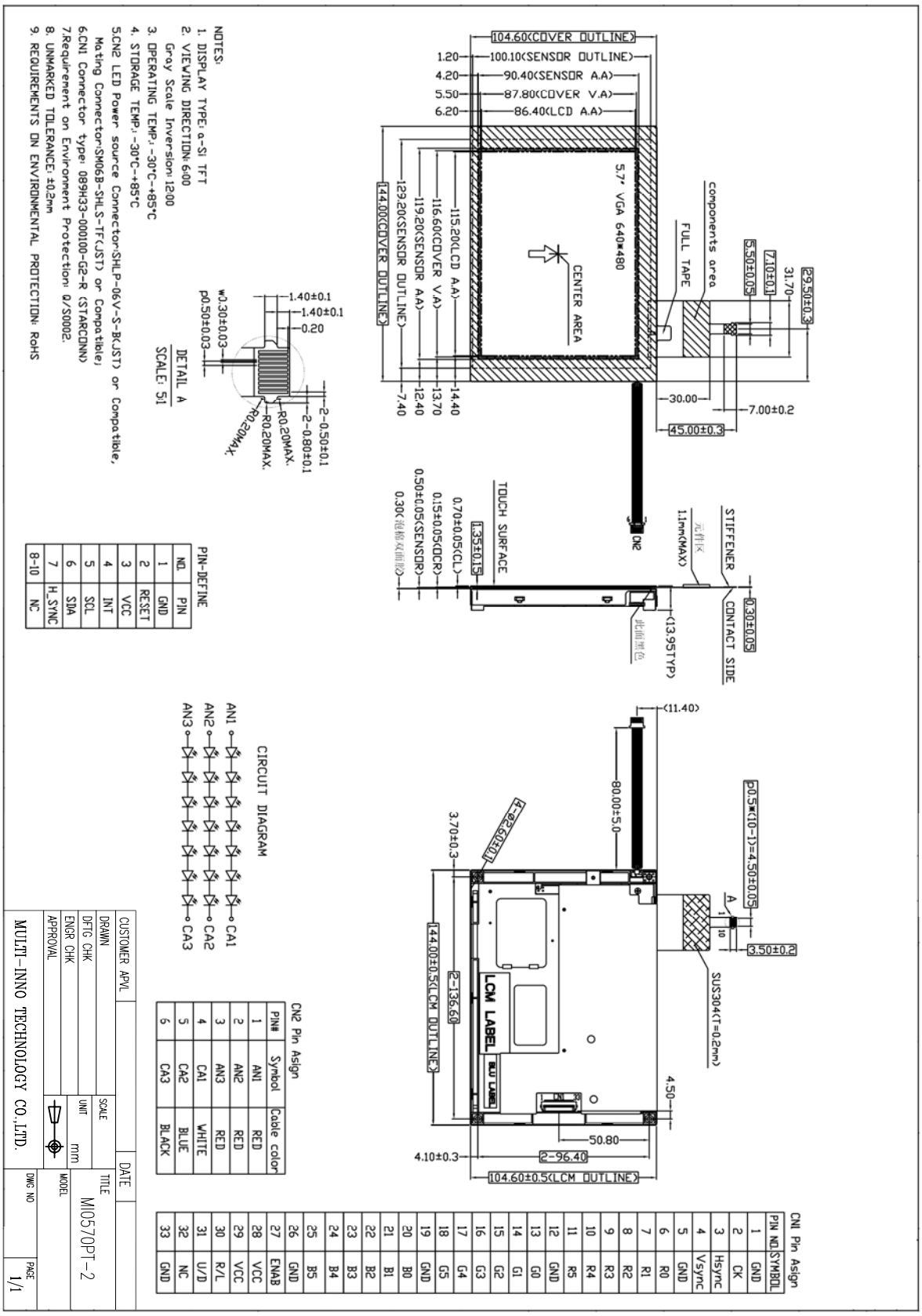
# CONTENTS

## ■ GENERAL INFORMATION

| Item | Contents | Unit |
|---|---|---|
| LCD type | TFT/Transmissive/Normally white | / |
| Size | 5.7 | Inch |
| Viewing direction | 6:00 | O'Clock |
| Gray scale inversion direction | 12:00 | O'Clock |
| LCM (W × H × D ) | 144.00×104.60×13.95 | $mm^3$ |
| LCD active area (W× H) | 115.20×86.40 | $mm^2$ |
| CTP active area (W × H) | 119.20×90.40 | $mm^2$ |
| Pixel pitch (W×H) | 0.360×0.360 | $mm^2$ |
| Number of dots | 320 (RGB) × 240 | / |
| LCM driver IC | NT39413 | / |
| CTP controller | NT11003 | / |
| Backlight type | 15 LEDs | / |
| TFT LCD interface type | RGB 18 bits | / |
| CTP interface type | I2C | / |
| Color depth | 262K | / |
| Pixel configuration | R.G.B vertical stripe | / |
| LCD surface treatment | AG(3H) | / |
| CTP surface treatment | 6H hardness | / |
| CTP touch method | Bare finger | / |
| CTP structure | Glass lens-Glass sensor | / |
| Number of simultaneous touches | 2 points | / |
| Minimum touch area | Φ6 | mm |
| Finger touch pitch | 15 | mm |
| Input voltage | 3.3 | V |
| With/Without TSP | With CTP | / |
| Weight | TBD | g |

Note 1:Viewing direction for best image quality is different from TFT definition, there is a 180 degree shift.
Note 2 : RoHS compliant;
Note 3: LCM weight tolerance: ± 5% .

## ■ EXTERNAL DIMENSIONS



## ■ABSOLUTE MAXIMUM RATINGS

| Parameter | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Power voltage | VCC(LCD) | -0.3 | 5.0 | V |
| | VDD(CTP) | -0.3 | 3.6 | V |
| | AN1,AN2,AN3(LED) | 0 | 25.9 | V |
| Operating temperature | TOP | -20 | 70 | °C |
| Storage temperature | TST | -30 | 80 | °C |
| Humidity | RH | - | 90%(Max60°C) | RH |

Note1: 80℃ is the surface temperature of module

## ■ELECTRICAL CHARACTERISTICS

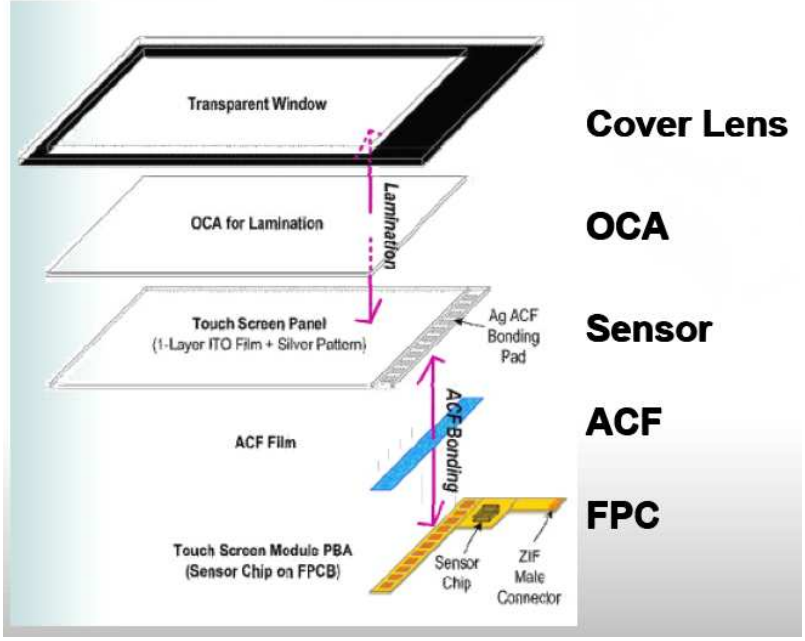
DC CHARACTERISTICS OF LCM

| Parameter | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Voltage for logic circuit | VCC | 3.0 | 3.3 | 3.6 | V |
| Power supply current | ICC | - | 145 | 225 | mA |
| Input voltage ' H ' level | VIH | 0.7VDD | - | VDD | V |
| Input voltage ' L ' level | VIL | 0 | - | 0.3VDD | V |

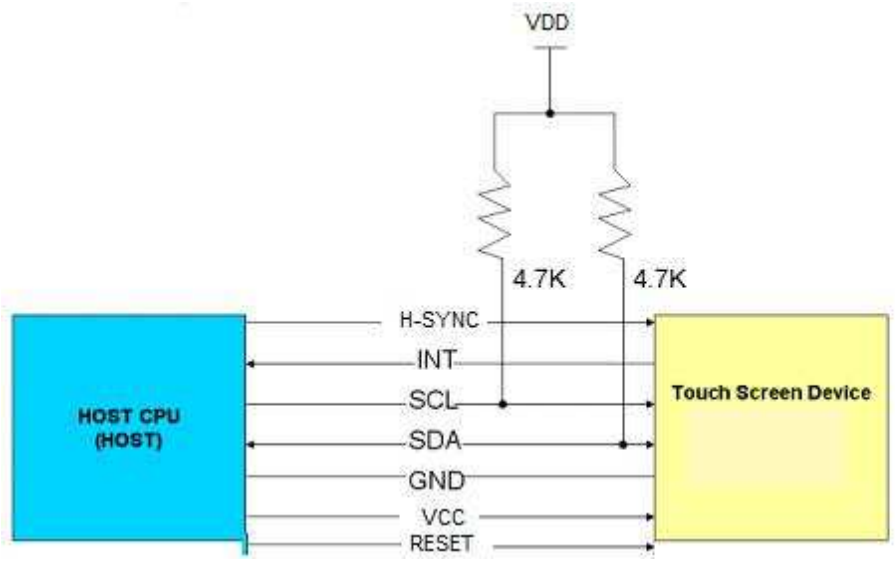
Note1: VIH and VIL:R0~R5,G0~G5,B0~B5,CK,DISP,HSYNC,VSYNC,ENAB,R/L,U/D.
Note2: To test the current dissipation, use “all Black Pattern”.

DC CHARACTERISTICS OF CTP

| Parameter | | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|
| power supply voltage | | 2.7 | 3.3 | 3.6 | V | DC(noise should be under 100mV) |
| Power supply current | | -- | 6 | 10 | mA | |
| Input Signal Voltage | Low Level | 0 | - | 0.3xVCC | V | RESET,SCL,SDA |
| | High Level | 0.7xVCC | - | VCC | V | |




**Structure of touch lens**

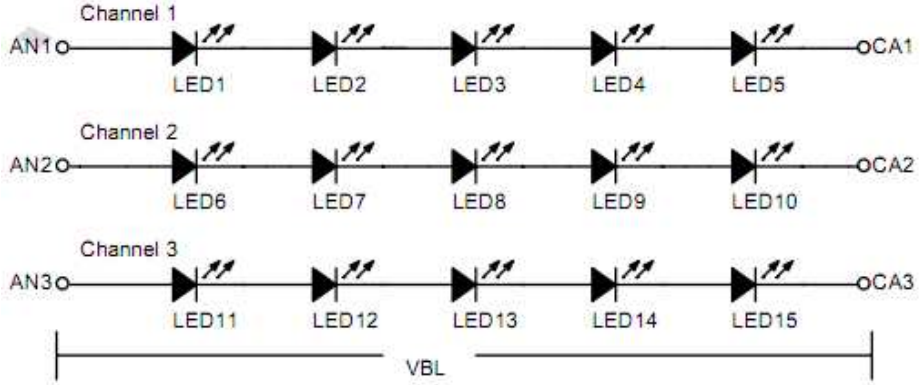



**Interface application**

## ■ BACKLIGHT CHARACTERISTICS

| Item | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Channel 1 | $I_{channel\ 1}$ | - | 25.0 | - | mA | Note 1 |
| Channel 2 | $I_{channel\ 2}$ | - | 25.0 | - | mA | |
| Channel 3 | $I_{channel\ 3}$ | - | 25.0 | - | mA | |
| Forward voltage | $V_{BL}$ | 14.85 | - | 18.15 | V | |
| Backlight power consumption | $W_{BL}$ | - | 1238 | - | mW | |
| Life time | - | 25000 | 50000 | - | Hrs | Note 3 |

Note 1: $I_F$ is defined for one channel LED. There are total three LED channels in back light unit.Under LCM operating, the stable forward current should be inputted.
Note 2: Optical performance should be evaluated at Ta=25℃ only.
Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.




**LED connection of backlight**

## ■ELECTRO-OPTICAL CHARACTERISTICS

| Item | | Symbol | Condition | Min | Typ | Max | Unit | Remark | Note |
|---|---|---|---|---|---|---|---|---|---|
| Response time | | Tr+Tf | θ=0° ∅=0° Ta=25℃ | - | 40 | 60 | ms | FIG 1. | 4 |
| Contrast ratio | | Cr | | 400 | 500 | - | --- | FIG 2. | 1 |
| Luminance uniformity | | δ WHITE | | 75 | 80 | - | % | FIG 2. | 3 |
| Surface Luminance | | Lv | | 300 | 400 | - | cd/m$^2$ | FIG 2. | 2 |
| Viewing angle range | | θ | ∅ = 90° | 60 | 70 | - | deg | FIG 3. | 6 |
| | | | ∅ = 270° | 50 | 60 | - | deg | FIG 3. | |
| | | | ∅ = 0° | 60 | 70 | - | deg | FIG 3. | |
| | | | ∅ = 180° | 60 | 70 | - | deg | FIG 3. | |
| CIE (x, y) chromaticity | Red | x | θ=0° ∅=0° Ta=25℃ | 0.566 | 0.616 | 0.666 | | FIG 2. | 5 |
| | | y | | 0.303 | 0.353 | 0.403 | | | |
| | Green | x | | 0.285 | 0.335 | 0.385 | | | |
| | | y | | 0.526 | 0.576 | 0.626 | | | |
| | Blue | x | | 0.086 | 0.136 | 0.186 | | | |
| | | y | | 0.076 | 0.126 | 0.176 | | | |
| | White | x | | 0.274 | 0.324 | 0.374 | | | |
| | | y | | 0.279 | 0.362 | 0.379 | | | |
| NTSC | - | - | - | 45 | 50 | - | % | - | - |
| Reflectivity | - | - | - | - | - | 4 | % | - | 8 |
| HAZE | - | - | - | - | - | 2 | % | - | 8 |

Note 1. Contrast Ratio(CR) is defined mathematically as For more information see FIG 2.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P 3,P4, P5)}}$$

Note 2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see FIG 2.

Lv = Average Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)

Note 3. The uniformity in surface luminance ， δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 2.

$$\delta\ \text{WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P 3, P4, P5)}}$$

Note 4. Response time is the time required for the display to transition from White to black(Rise Time, Tr) and from black to white(Decay Time, Tf). For additional information see FIG 1. The test equipment is Autronic-Melchers's ConoScope. Series.

Note 5. CIE (x, y) chromaticity, The x, y value is determined by measuring luminance at each test position 1 through 5,and then make average value.

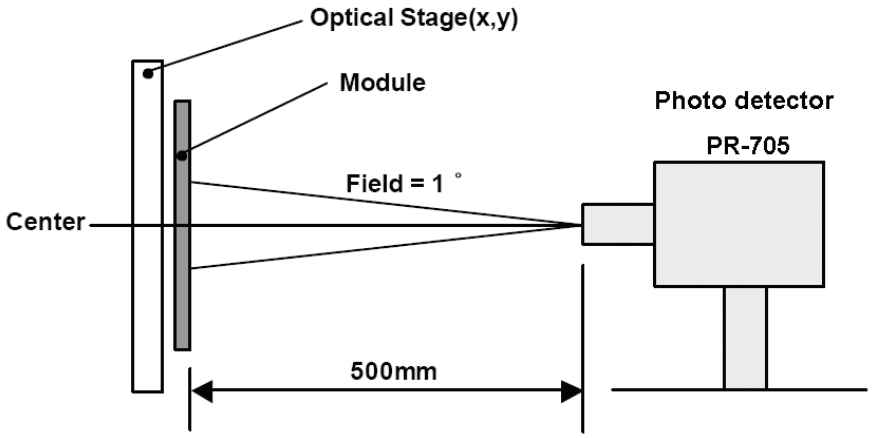
Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the conrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

Note 7. For viewing angle and response time testing, the testing data is base on Autronic-Melchers's ConoScope. Series Instruments For contrast ratio, Surface Luminance, Luminance uniformity, CIE The test data is base on TOPCON's BM-5 photo detector.

Note8: Measuring equipments: DMS-501, PR-705. @550nm

Measuring condition:

- After stabilizing and leaving the panel alone at a given temperature for 30 min, the measurement should be executed,
- Measuring surroundings: a stable, windless and dark room,
- Measuring temperature: Ta=25°C,
- 30 min after lighting the back-light.




Note2: conform to National standard GB2410—80 /ASTM D1003—61(1997)

**FIG. 1 The definition of Response Time**

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

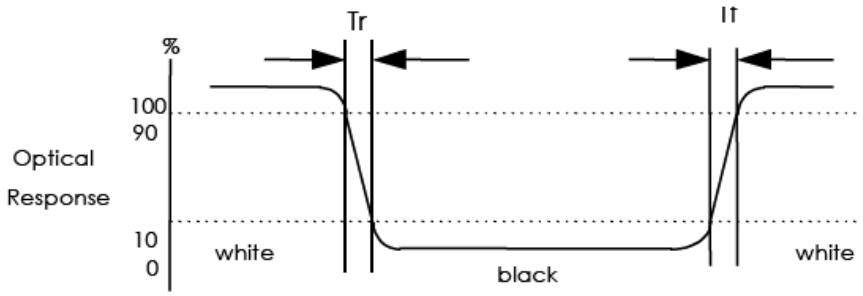
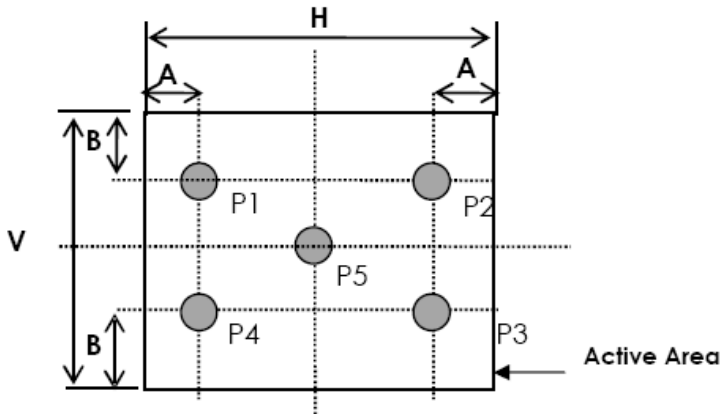
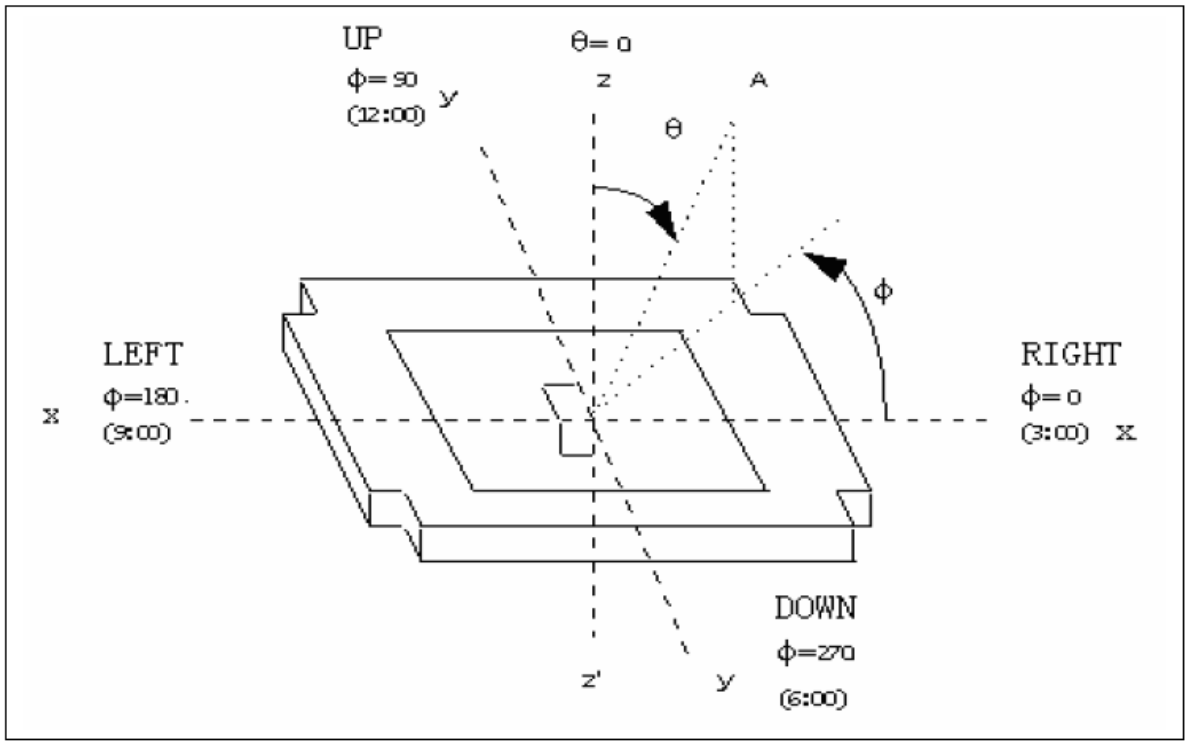



**FIG. 2 Measuring method for Contrast ratio, surface luminance, Luminance uniformity , CIE (x, y) chromaticity**




A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size ∅=7mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

**FIG. 3 The definition of viewing angle**



## ■INTERFACE DESCRIPTION

1. TFT LCD PIN ASSIGNMENT

Connector type: 089H33-000100-G2-R (STARCONN)

| No | Symbol | I/O | Description | Comment |
|---|---|---|---|---|
| 1 | GND | P | Ground | |
| 2 | DOTCLK | I | Dot clock. Latch data at falling edge of DOTCLK. | |
| 3 | Hsync | I | Horizontal sync signal in SYNC mode.<br>Pull low or floating in DE mode. | |
| 4 | Vsync | I | Vertical sync signal in SYNC mode.<br>Pull low or floating in DE mode. | |
| 5 | GND | P | Ground | |
| 6 | R0 | I | Red data (LSB) | |
| 7 | R1 | I | Red data | |
| 8 | R2 | I | Red data | |
| 9 | R3 | I | Red data | |
| 10 | R4 | I | Red data | |
| 11 | R5 | I | Red data (MSB) | |
| 12 | GND | P | Ground | |
| 13 | G0 | I | Green data(LSB) | |
| 14 | G1 | I | Green data | |
| 15 | G2 | I | Green data | |
| 16 | G3 | I | Green data | |
| 17 | G4 | I | Green data | |
| 18 | G5 | I | Green data(MSB) | |
| 19 | GND | P | Ground | |
| 20 | B0 | I | Blue data(LSB) | |
| 21 | B1 | I | Blue data | |
| 22 | B2 | I | Blue data | |
| 23 | B3 | I | Blue data | |
| 24 | B4 | I | Blue data | |
| 25 | B5 | I | Blue data(MSB) | |
| 26 | GND | P | Ground | |
| 27 | ENABLE | I | Data enable signal in DE mode.<br>This pin must pull high in SYNC mode. | |
| 28 | VCC | P | Power supply | |
| 29 | VCC | P | Power supply | |
| 30 | R/L | I | Set horizontal scan direction:<br>Low/NC: left to right; High: right to left | |
| 31 | U/D | I | Set vertical scan direction:<br>High/NC: up to down; Low: down to up | |
| 32 | NC | - | No connection | |
| 33 | GND | P | Ground | |

Note1: I/O definition:
I----Input O----Output P----Power/Ground
Note2: CN1 Matching FPC type: 33 pin, pitch: 0.5mm, height: 0.3mm.

2. BACKLIGHT PIN ASSIGNMENT

Connector type: SHLP-06V-S-B (JST)

| No | Symbol | I/O | Description | Comment |
|---|---|---|---|---|
| 1 | AN1 | P | LED Anode Terminal | Red |
| 2 | AN2 | P | LED Anode Terminal | Red |
| 3 | AN3 | P | LED Anode Terminal | Red |
| 4 | CA1 | P | LED Cathode Terminal | White |
| 5 | CA2 | P | LED Cathode Terminal | Blue |
| 6 | CA3 | P | LED Cathode Terminal | Black |

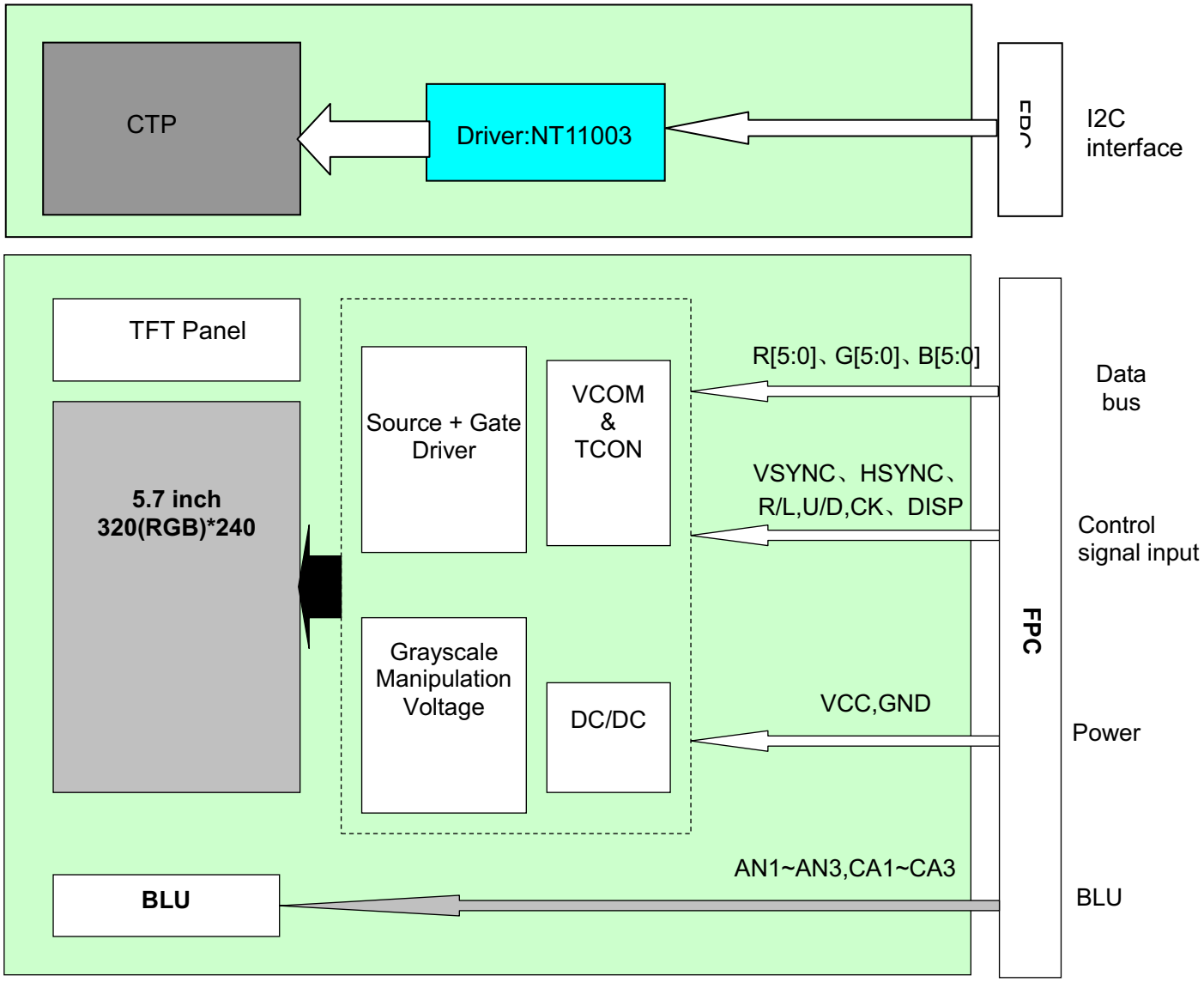
Note1: CN2 Matching Connector type: SM06B-SHLS-TF (JST)
Note2:P: Power/GND; I: input pin; I/O: input or output pin;

3. CTP PIN ASSIGNMENT

| Pin No. | Symbol | I/O | Description | Remark |
|---|---|---|---|---|
| 1 | GND | P | Groud | |
| 2 | RESET | I/O | External interrupt from the host | |
| 3 | VDD | P | CTP power supply | |
| 4 | INT | I/O | External interrupt to the host | |
| 5 | SCL | I/O | I2C clock input | |
| 6 | SDA | I/O | I2C data input and output | |
| 7 | H_SYNC | I/O | External singal from LCD | |
| 8~10 | NC | NC | NC | |

Note: I/O definition.
I---Input, O---Output, P--- Power/Ground, N--- No connection

## ■BLOCK DIAGRAM



# ■ APPLICATION NOTES

## 1 TFT LCD TIMING CHART

### 1.1 SYNC Mode

| Parameter | Symbol | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| DOTCLK | DOTCLK frequency | Fclk | 6.2 | 6.4 | 12.1 | MHz |
| | DOTCLK cycle | Tclk | 82.64 | 156.25 | 161.29 | ns |
| Hsync | Horizontal display area | Thd | 320 | 320 | 320 | Tclk |
| | 1 horizontal line | Th | 406 | 408 | 560 | Tclk |
| | Hsync pulse width | Thpw | 1 | - | - | Tclk |
| | Horizontal blanking | Thb | 70 | 70 | 70 | Tclk |
| | Horizontal front porch | Thfp | 16 | 18 | 170 | Tclk |
| Vsync | Frame rate | - | - | 60 | 65 | Hz |
| | Vertical display area | Tvd | 240 | 240 | 240 | Th |
| | Vsync period time | Tv | 254 | 263 | 360 | Th |
| | Vsync pulse width | Tvpw | 1 | - | - | Th |
| | Vsync blanking | Tvb | 13 | 13 | 13 | Th |
| | Vsync front porch | Tvfp | 1 | 10 | 107 | Th |

**Table 1.1 SYNC mode**

### 1.2 DE Mode

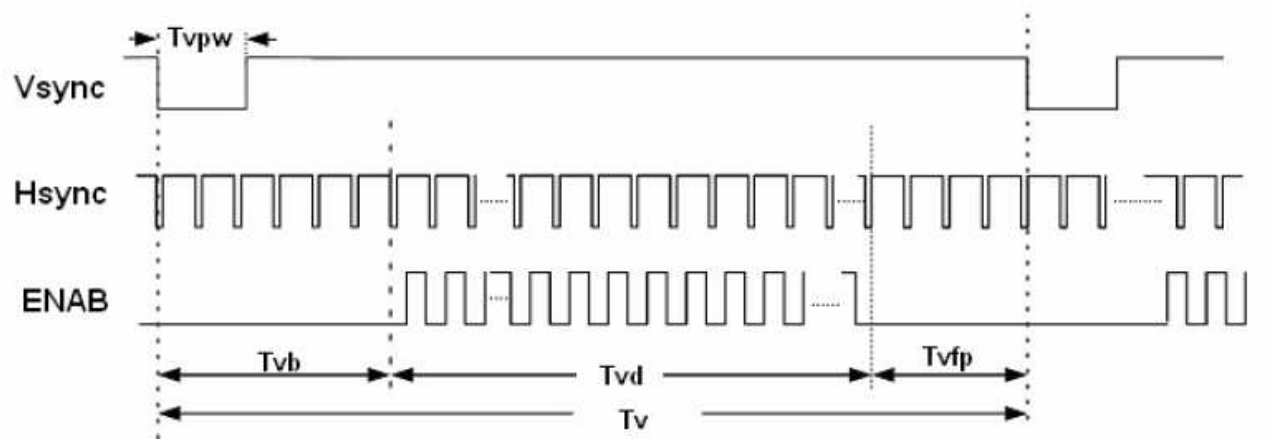
| Description | | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| DOTCLK frequency | | Fclk | 6.2 | 6.4 | 12.1 | MHz |
| Horizontal section | Horizontal total | Th | 406 | 408 | 560 | Tclk |
| | H Total blank | Thb+Thfp | 86 | 88 | 240 | Tclk |
| | Valid Data Width | Thd | 320 | 320 | 320 | Tclk |
| Vertical section | Frame rate | - | - | 60 | 65 | Hz |
| | Vertical total | Tv | 254 | 263 | 360 | Th |
| | V total blank | Tvb+Tvfp | 14 | 23 | 120 | Th |
| | Valid Data Width | Tvd | 240 | 240 | 240 | Th |

Note: The LCM could auto-detect which mode is working.

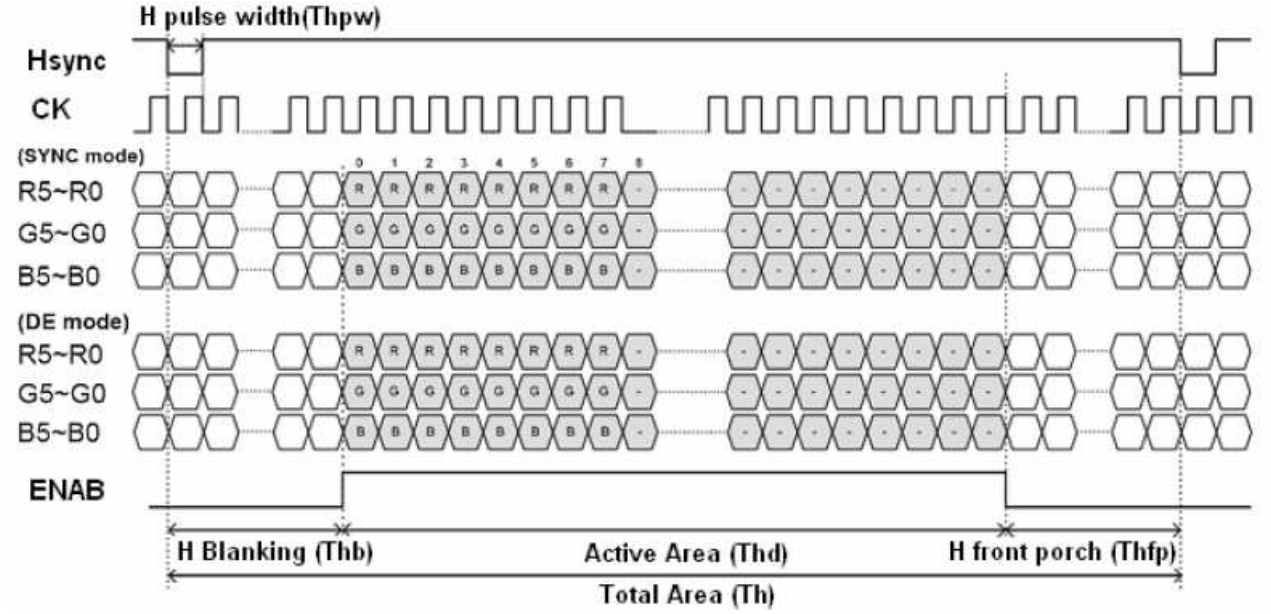
**Table 1.2 DE mode**

1.3 Timing Diagram

1.3.1 Vertical Input Timing



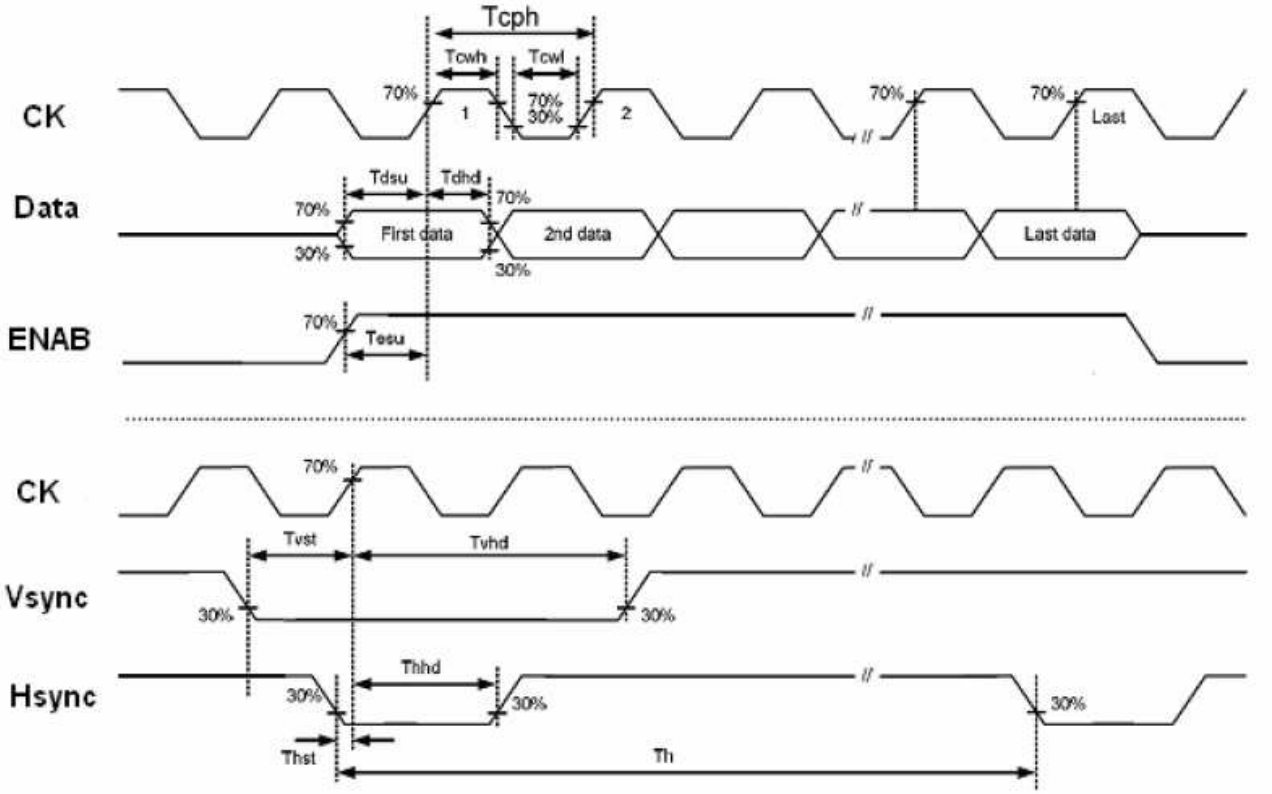

1.3.2 Horizontal Input Timing




1.4 AC Input Characteritics

(VCC=3.3V, GND=0V, Ta=25℃)

| Parameter | Symbol | Min | Typ | Max | Unit | Conditions |
|---|---|---|---|---|---|---|
| DOTCLK pulse duty | Tcwh | 40% | 50% | 60% | Tclk | Tcph is DCLK cycle |
| VSYNC setup time | Tvst | 10 | - | - | ns | |
| VSYNC hold time | Tvhd | 10 | - | - | ns | |
| HSYNC setup time | Thst | 10 | - | - | ns | |
| HSYNC hold time | Thhd | 10 | - | - | ns | |
| Data setup time | Tdsu | 10 | - | - | ns | Rn, Gn, Bn to DCLK |
| Data hold time | Tdhd | 10 | - | - | ns | Rn, Gn, Bn to DCLK |
| Enable setup time | Tesu | 10 | | | ns | |




1.5 Power ON/OFF Sequence

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|
| VCC 3.0V to signal starting | Tp1 | 5 | - | 50 | ms | |
| Signal starting to backlight on | Tp2 | 50 | - | - | ms | |
| Signal off to VCC 3.0V | Tp3 | 5 | - | 50 | ms | |
| Backlight off to signal off | Tp4 | 50 | - | - | ms | |

**Table 4. Power on/off sequence**

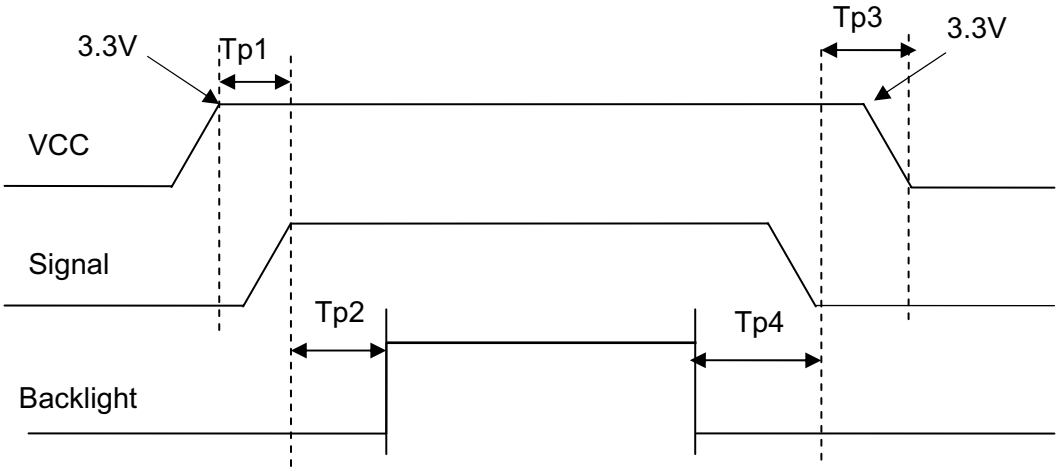
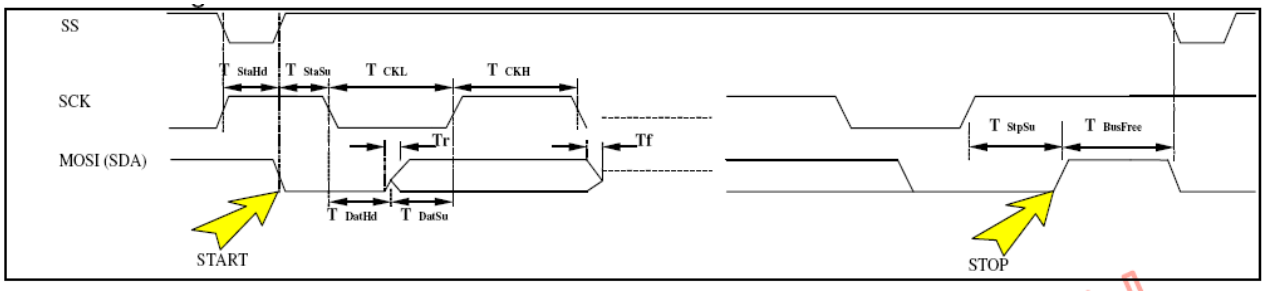



**Figure 4. Power on/off sequence**

# 2 CTP TIMING

## 2.1 I2C Interface



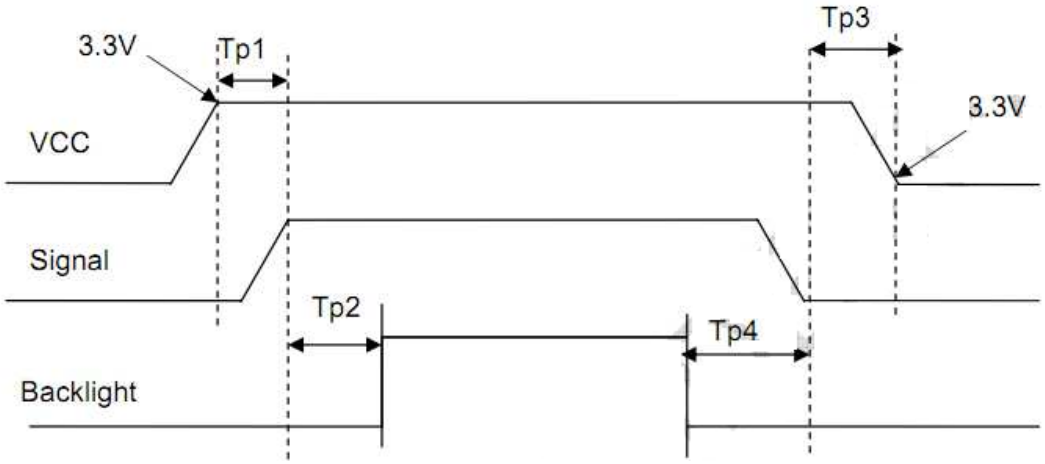

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| I²C Clock | $F_{CLK}$ | | | 400 | KHz | $V_{DD}$=$V_{DDIO}$ =3.3V, $T_A$=25℃ |
| I²C Clock Low | $T_{CKL}$ | 1300 | | | nS | $V_{DD}$=$V_{DDIO}$ =3.3V, $T_A$=25℃ |
| I²C Clock High | $T_{CKH}$ | 600 | | | nS | $V_{DD}$=$V_{DDIO}$ =3.3V, $T_A$=25℃ |
| I²C Data Rising Time | $T_r$ | | | 300 | nS | $V_{DD}$=$V_{DDIO}$ =3.3V, $T_A$=25℃ |
| I²C Data Falling Time | $T_f$ | | | 300 | nS | $V_{DD}$=$V_{DDIO}$ =3.3V, $T_A$=25℃ |
| I²C Data Hold Time | $T_{DatHd}$ | 0 | | | nS | $V_{DD}$=$V_{DDIO}$ = 3.3V, $T_A$=25℃ |
| I²C Data Setup Time | $T_{DatSu}$ | 100 | | | nS | $V_{DD}$=$V_{DDIO}$ = 3.3V, $T_A$=25℃ |
| I²C Start Condition Hold Time | $T_{StaHd}$ | 600 | | | nS | $V_{DD}$=$V_{DDIO}$ = 3.3V, $T_A$=25℃ |
| I²C Start Condition Setup Time | $T_{StaSu}$ | 600 | | | nS | $V_{DD}$=$V_{DDIO}$ = 3.3V, $T_A$=25℃ |
| I²C Stop Condition Setup Time | $T_{StpSu}$ | 600 | | | nS | $V_{DD}$=$V_{DDIO}$ = 3.3V, $T_A$=25℃ |
| I²C Bus Free Time | $T_{BusFree}$ | 1300 | | | nS | $V_{DD}$=$V_{DDIO}$ = 3.3V, $T_A$=25℃ |



## 2.2 Power ON Sequence

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|
| VCC 3.0V to signal starting | Tp1 | 5 | - | 50 | ms | |
| Signal starting to backlight on | Tp2 | 50 | - | - | ms | |
| Signal off to VCC 3.0V | Tp3 | 5 | - | 50 | ms | |
| Backlight off to signal off | Tp4 | 50 | - | - | ms | |

**Table 5.5 Power on/off sequence**



## ■ RELIABILITY TEST

| No. | Test Item | Test Condition | Remark |
|---|---|---|---|
| 1 | High Temperature Storage | 80±2℃/120 hours | IEC60068-2-1<br>GB2423.2 |
| 2 | Low Temperature Storage | -30±2℃/96 hours | IEC60068-2-1<br>GB2423.1 |
| 3 | High Temperature Operating | 70±2℃/120 hours | Note 1,IEC60068-2-1<br>GB2423.2 |
| 4 | Low Temperature Operating | -20±2℃/120 hours | IEC60068-2-1<br>GB2423.1 |
| 5 | Temperature Cycle storage | -30±2℃~25~80±2℃×100cycles<br>(30min.) (5min.) (30min.) | Start with cold temperature,<br>with high temperature,<br>IEC60068-2-14<br>GB2423.22 |
| 6 | Damp proof Test operating | 65℃±5℃×90%RH/120 hours | Note 2,IEC60068-2-78<br>GB/T2423.3 |
| 7 | Vibration Test<br>(non-operation) | Frequency range:10Hz~55Hz,<br>Stroke:1.5mm<br>Sweep:10Hz~55Hz~10Hz 2hours for each direction of X,Y,Z(6 hours for total) | IEC60068-2-6<br>GB/T2423.10 |
| 8 | Package drop test | Height:60cm,1 corner,3 edges,6 surfaces | IEC60068-2-32,GB2423.8 |
| 9 | ESD test<br>(operation) | C=150pF,R=330Ω,5points/panel<br>Air: ±8KV,5times<br>Contact: ±4KV,5times(Environment: 15℃~35℃,30%~60%,86Kpa~106Kpa) | IEC61000-4-2<br>GB/T17626.2 |
| 10 | Shock(non-operation) | 60G 6ms,±X,±Y,±Z 3times each direction | IEC60068-2-27<br>GB/T2423.5 |
| 11 | Package vibration test | Random Vibration:<br>0.015G*G/Hzfor5-200Hz,-6dB/Octave from 200-500Hz 2hours for each direction of X,Y,Z(6hours for total) | IEC60068-2-34<br>GB/T2423.11 |

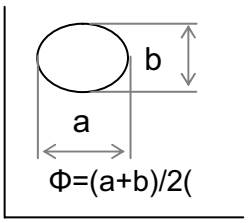
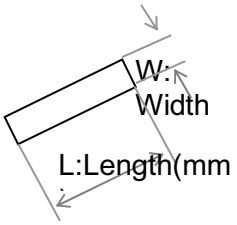
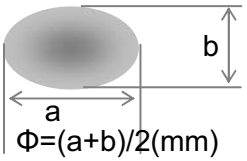
Note 1:Ts is the temperature of panel's surface.
Note 2:Ta is the ambient temperature of sample.

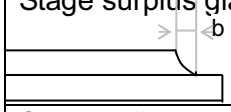
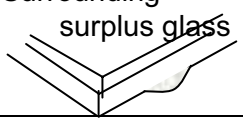
# ■ INSPECTION CRITERION

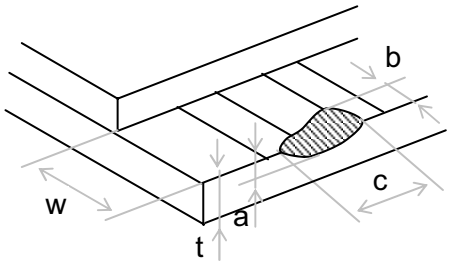
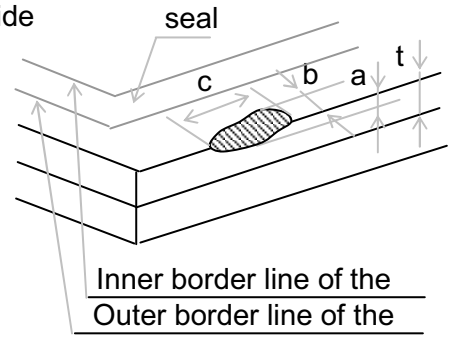
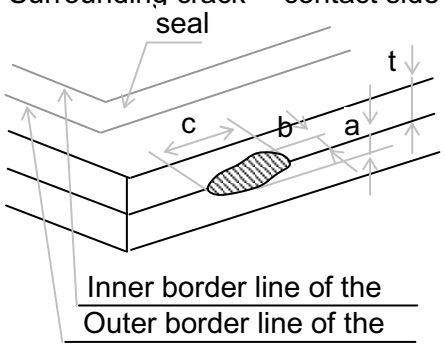
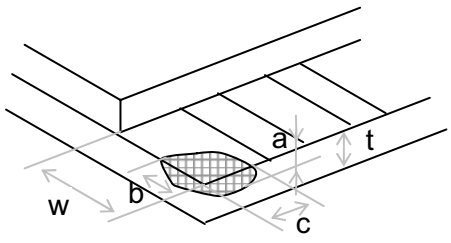
### 1. Outgoing Inspection Level

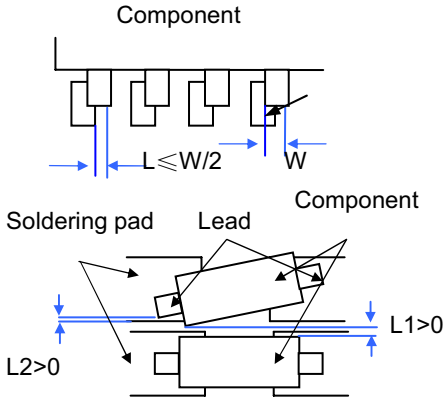
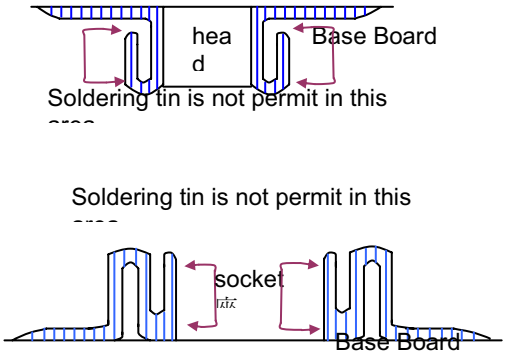
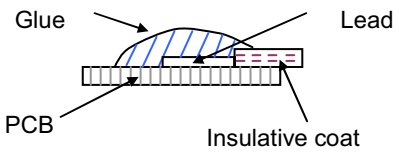
| Outgoing Inspection standard | Inspection conditions | Inspection | | | | |
|---|---|---|---|---|---|---|
| | | Min. | Max. | Unit | IL | AQL |
| Major Defects | See 9.3 general notes | See 11.5 | | | II | 0.65 |
| Minor Defects | See 9.3 general notes | See 11.5 | | | II | 1.5 |
| Note：Sampling standard conforms to GB2828 | | | | | | |

### 2. Inspection Items And Criteria

| Inspection items | | | Judgment standard | | | |
|---|---|---|---|---|---|---|
| | | | Category | | Acceptable number | |
| | | | | | A zone | B zone |
| 1 | Black spot, White spot, Bright Spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass |  | A | Φ≦0.10 | Neglected | Neglected |
| | | | B | 0.10<Φ≦0.15 | 2 | |
| | | | C | 0.15<Φ≦0.20 | 1 | |
| | | | D | 0.20<Φ | 0 | |
| | | | Total defective point(B,C) | | 3 | |
| 2 | Black line, White line, and Particle Between Polarizer and glass, Scratch on glass |  | A | W≦0.01 | Neglected | Neglected |
| | | | B | 0.01<W≦0.03<br>L≦3.0 | 2 | |
| | | | C | 0.03<W≦0.05<br>L≦3.0 | 1 | |
| | | | D | 0.05<W | 0 | |
| | | | Total defective point(B,C) | | 3 | |
| 3 | Contrast variation |  | A | Φ≦0.2 | Neglected | Neglected |
| | | | B | 0.2<Φ≦0.3 | 2 | |
| | | | C | 0.3<Φ≦0.4 | 1 | |
| | | | D | 0.4<Φ | 0 | |
| | | | Total defective point(B,C) | | 3 | |
| 4 | Dot defect (if TFT LCD is | TFT LCD is smaller than 3 inches | LCD Class | Defect | A area | B area |
| | | | A | Bright dot | 1 | Neglecte |

| | | | | | | |
|---|---|---|---|---|---|---|
| | used) | | | Dark dot | 2 | d |
| | | | | Total | 2 | |
| | | | B | Bright dot | 2 | |
| | | | | Dark dot | 3 | |
| | | | | Total | 4 | |
| | | TFT LCD between 3~10.4 inches | LCD Class | Defect | A area / B area | C area |
| | | | A | Bright dot | 1 / 1 | Neglected |
| | | | | Dark dot | 1 / 2 | |
| | | | | Total | 4 | |
| | | | B | Bright dot | 2 / 2 | |
| | | | | Dark dot | 2 / 3 | |
| | | | | Total | 6 | |
| | | Notes:<br>Bright dot: in R、G、B or dark display figure, the pixel appears bright.<br>Dark dot: in R、G、B or white display figure, the pixel appears dark.<br>Defect area must be less than an half size of the dot. | | | | |
| 5 | Bubble inside cell | | any size | | none | none |
| 6 | Polarizer defect (if Polarizer is used) | Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass. | Refer to item 1 and item 2. | | | |
| | | Bubble, dent and convex | A | Φ≦0.3 | Neglected | Neglected |
| | | | B | 0.3<Φ≦0.7 | 2 | |
| | | | C | 0.7<Φ | 0 | |
| 7 | Surplus glass | Stage surplus glass   | b≦0.3mm | | | |
| | | Surrounding surplus glass  | Should not influence outline dimension and assembling. | | | |
| 8 | Open segment or open common | | Not permitted | | | |
| 9 | Short circuit | | Not permitted | | | |
| 10 | False viewing direction | | Not permitted | | | |
| 11 | Contrast ratio uneven | | According to the limit specimen | | | |
| 12 | Crosstalk | | According to the limit specimen | | | |
| 13 | Black /White spot(display) | | Refer to item 1 | | | |
| 14 | Black /White line(display) | | Refer to item 2 | | | |

| Inspection items | | | Judgment standard | | |
|---|---|---|---|---|---|
| | | | Category(application: B zone) | | Acceptable number |
| 15 | Glass defect crack | ①The front of lead terminals   | A | a≤ t, b≤1/5W, c≤3mm | Max.3 defects allowed |
| | | | B | Crack at two sides of lead terminals should not cover patterns and alignment mark | |
| | | ②Surrounding crack—non-contact side   | b < Inner borderline of the seal | | |
| | | ③ Surrounding crack— contact side   | b < Outer borderline of the seal | | |
| | | ④Corner   | A | a ≦ t, b ≦ 3.0, c ≦ 3.0 | |
| | | | B | Glass crack should not cover patterns u and alignment mark and patterns. | |

| Inspection items | | | Judgment standard<br>Category(application: B zone) |
|---|---|---|---|
| 16 | PCB defect | Component soldering:<br>No cold soldering、short、open circuit、burr、tin ball<br>The flat encapsulation component position deviation must be less than 1/3 width of the pin (Pic.1)；<br>the sheet component deviation:<br>Pin deviates from the pad and contact with the near components is not permitted（Pic.2） |  |
| | | lead defect:<br>The lead lack must be less than 1/3 of its width;<br>The lead burr must be less than 1/3 of the seam;<br>Impurities connect with the near leads is not permitted | |
| | | Connector soldering:<br>Soldering tin is at contact position of the plug and socket is not permitted<br>No foundation is scald<br>Serious cave distortion on plug and socket contact pin is not permitted |  |
| | | Glue on root of the speaker receiver and motor lead:<br>The insulative coat of the lead must join into the PCB; the protected glue must envelop to the insulative coat. |  |

# ■ PRECAUTIONS FOR USING LCD MODULES

## 1 Handing Precautions

1.1 The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

1.2 If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air.

1.5 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents

- Isopropyl alcohol
- Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

1.6 Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.

- Water
- Ketone
- Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats.

1.7 Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets moisture condensation or a current flow in a high-humidity environment

1.8 Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

1.9 Do not attempt to disassemble or process the LCD module.

1.10 NC terminal should be open. Do not connect anything.

1.11 If the logic circuit power is off, do not apply the input signals.

1.12 Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Before removing LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.

- Tools required for assembling, such as soldering irons, must be properly grounded. Make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dry. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

1.13 Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- Do not alter modify or change the shape of the tab on the metal frame.

- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

- Do not damage or modify the pattern writing on the printed circuit board.

- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

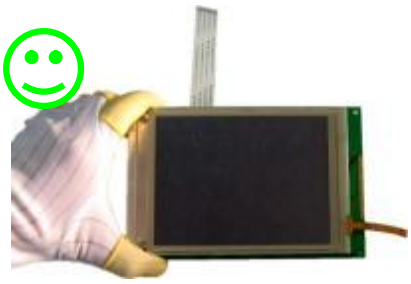
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

- Do not drop, bend or twist the LCM.

## 2 Handling precaution for LCM

### 2.1 LCM is easy to be damaged. Please note below and be careful for handling.

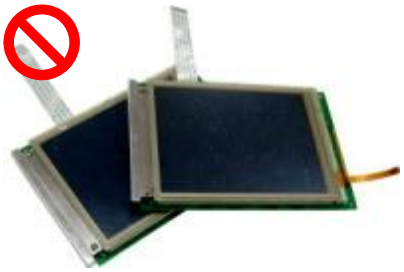
### 2.2 Correct handling:



As above picture, please handle with anti-static gloves around LCM edges.

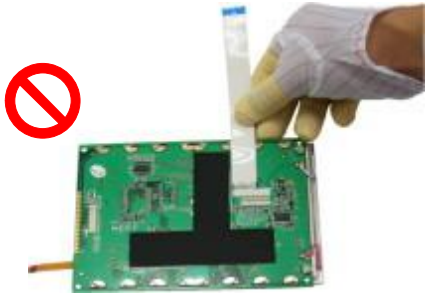
### 2.3 Incorrect handling:

Please don't touch IC directly.

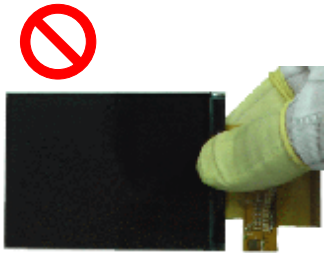


Please don't stack LCM.

Please don't hold the surface of panel.



Please don't stretch interface of output, such as FPC cable.



Please don't hold the surface of IC.

Please don't operate with sharp stick such as pens.

## 3 Storage Precautions

3.1 When storing the LCD modules, the following precaution are necessary.

3.1.1 Store them in a sealed polyethylene bag. If properly sealed, there is no need for the desiccant.

3.1.2 Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.

3.1.3 The polarizer surface should not come in contact with any other objects (We advise you to store them in the anti-static electricity container in which they were shipped).

3.2 Transportation Precautions

3.2.1 During shipment, please handle with care. The packaging bag can not be broken, step on trap. Packaging Carton layer height can not be over two meters.

3.2.2 The transportation process should pay attention to the waterproof and moisture-proof measures. Product can not be watering. Ethylene sealed bags can not be unsealed.

3.3 Others

3.3.1 Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

3.3.2 If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

3.3.3 To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

3.3.3.1 - Exposed area of the printed circuit board.

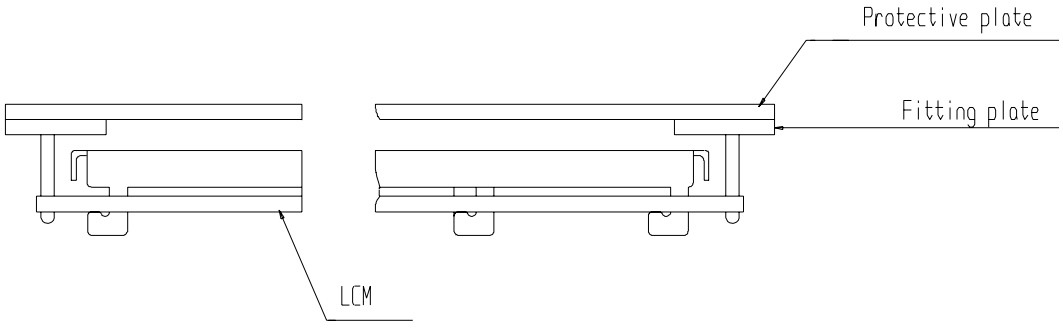
3.3.3.2 -Terminal electrode sections.

## 4 USING LCD MODULES

4.1 Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

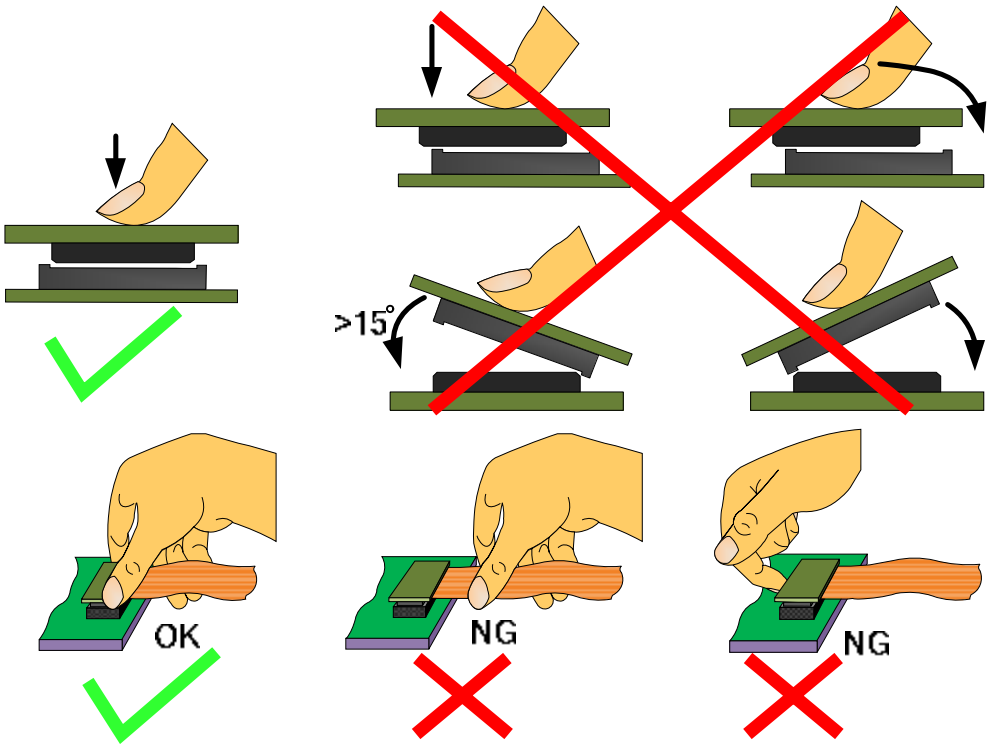
4.1.1 Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



4.1.2 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 ±0 1mm

4.2 Precaution for assemble the module with BTB connector:

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows



**4.3** Precaution for soldering the LCM

| | Manual soldering | Machine drag soldering | Machine press soldering |
|---|---|---|---|
| No RoHS Product | 290°C ~350°C.<br>Time : 3-5S. | 330°C ~350°C.<br>Speed : 4-8 mm/s. | 300°C ~330°C.<br>Time : 3-6S.<br>Press: 0.8~1.2Mpa |
| RoHS Product | 340°C ~370°C.<br>Time : 3-5S. | 350°C ~370°C.<br>Time : 4-8 mm/s. | 330°C ~360°C.<br>Time : 3-6S.<br>Press: 0.8~1.2Mpa |

4.3.1 If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation (This does not apply in the case of a non-halogen type of flux). It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters

4.3.2 When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

4.3.3 When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

4.4 Precautions for Operation

4.4.1 Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.

4.4.2 It is an indispensable condition to drive LCD s within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided

4.4.3 Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operating temperature.

4.4.4 If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

4.4.5 A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required

4.4.6 Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable.

4.4.7 Please keep the temperature within the specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity

**4.5** Safety

4.5.1 It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol which should later be burned

4.5.2 If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water

4. 6 Limited Warranty

Unless agreed between Multi-Inno and the customer Multi-Inno will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with Multi-Inno LCD acceptance standards (copies available upon request) for a period of one year from date of production. Cosmetic/visual defects must be returned to Multi-Inno within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of Multi-Inno limited to repair and/or replace on the terms set forth above. Multi-Inno will not be responsible for any subsequent or consequential events.

4.7 Return LCM under warranty

4.7.1 No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

4.7.1.1 - Broken LCD glass.

4.7.1.2 - PCB eyelet is damaged or modified.

4.7.1.3 -PCB conductors damaged.

4.7.1.4 - Circuit modified in any way, including addition of components.

4.7.1.5 - PCB tampered with by grinding, engraving or painting varnish.

4.7.1.6 - Soldering to or modifying the bezel in any manner.

4.7.2 Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

## PACKING SPECIFICATION

Please consult our technical department for detail information.

## PRIOR CONSULT MATTER

1 For Multi-Inno standard products, we keep the right to change material, process ... for improving the product property without prior notice to our customer.

2 For OEM products, if any changes are needed which may affect the product property, we will consult with our customer in advance.

3 If you have special requirement about reliability condition, please let us know before you start the test on our samples.