



深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, LTD.

# TFT-LCD Module Specification

**Module NO.:** TST043015CMHX-P

**Version:** V1.0

☐ APPROVAL FOR SPECIFICATION

☐ APPROVAL FOR SAMPLE

| For Customer' s Acceptance: |         |
|-----------------------------|---------|
| Approved by                 | Comment |
|                             |         |

| Team Source Display: |             |              |
|----------------------|-------------|--------------|
| Presented by         | Reviewed by | Organized by |
|                      |             |              |

| Version No. | Date       | Content         | Remark |
|-------------|------------|-----------------|--------|
| V1.0        | 2015-08-05 | Initial Release |        |
|             |            |                 |        |

# CONTENTS

|    |                          |
|----|--------------------------|
| 1  | General Descriptions     |
| 2  | Mechanical Description   |
| 3  | Mechanical Drawing       |
| 4  | Interface Definition     |
| 5  | Interface Timing         |
| 6  | Absolute Maximum Ratings |
| 7  | DC Characteristics       |
| 8  | Backlight                |
| 9  | Optical Specification    |
| 10 | Touch Panel              |
| 11 | Reliability testing      |
| 12 | Inspection Standard      |
| 13 | Precaution               |

## 1. General Description

### 1.1 Introduction

Team Source Display-TST043015CMHX-P is a color active matrix thin film Transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 4.3 (16:9) inch diagonally measured active display area with WQVGA (480 horizontal by 272 vertical pixel) resolution.

### 1.2 Applications

- Personal Navigation Device
- Multimedia applications and Others AV system
- 94% transmittance resistive touch panel

## 2. Features

|                     |                                                 |      |
|---------------------|-------------------------------------------------|------|
| Display Mode        | Transmissive, Normally white                    |      |
|                     | 4.3 (16:9 diagonal) inch configuration a-Si TFT |      |
| Display Format      | Graphic 480RGB*272 Dot-matrix                   |      |
| Input Data          | RGB interface 30 pins                           |      |
| Viewing Direction   | 12 : 00 O'CLOCK                                 |      |
| Driver              | HX8257A                                         |      |
| LCD Power Supply    | 3.3V for TFT Circuit                            |      |
| Compliance          | RoHS and Halogen-Free compliance                |      |
| Surface Treatment   | Anti-Glare                                      |      |
| Item                | Specifications                                  | Unit |
| Dimensional outline | 105.5(W)*67.2(H)*4.05(D)                        | mm   |
| Resolution          | 480RGB*272                                      | dots |
| LCD Active area     | 95.04(W)*53.856(H)                              | mm   |
| Pixel size          | 0.198(W)*0.198(H)                               | mm   |

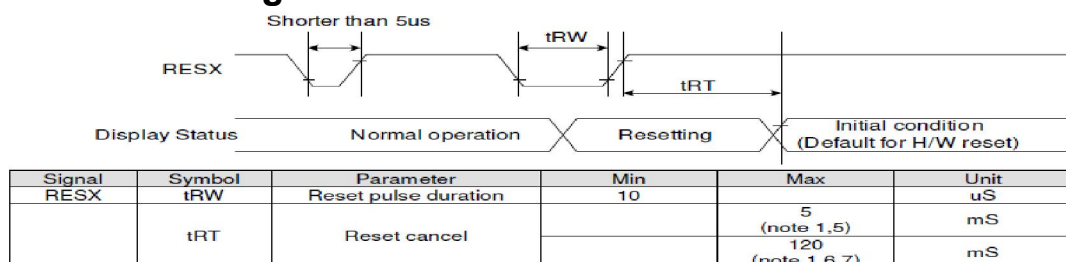


## 4. Interface Definition

| PIN NO. | PIN Name | Funtion Description                                         |
|---------|----------|-------------------------------------------------------------|
| 1       | VLED-    | back light power supply negative                            |
| 2       | VLED+    | back light power supply positive                            |
| 3       | GND      | Ground                                                      |
| 4       | VDD      | Power supply                                                |
| 5-12    | R0-R7    | Red Data                                                    |
| 13-20   | G0-G7    | Green Data                                                  |
| 21-28   | B0-B7    | Blue Data                                                   |
| 29      | GND      | Ground                                                      |
| 30      | CLK      | Colock signal                                               |
| 31      | DISP     | Display on/off                                              |
| 32      | HSYNC    | Horizontal sync input in RGB mode(short to GND if not used) |
| 33      | VSYNC    | Vertical sync input in RGB mode(short to GND if not used)   |
| 34      | DE       | Data enable                                                 |
| 35      | NC       | No Connection                                               |
| 36      | GND      | Ground                                                      |
| 37      | XR       | touch panel X-right                                         |
| 38      | YD       | touch panel Y-bottom                                        |
| 39      | XL       | touch panel X-left                                          |
| 40      | YU       | touch panel Y-up                                            |

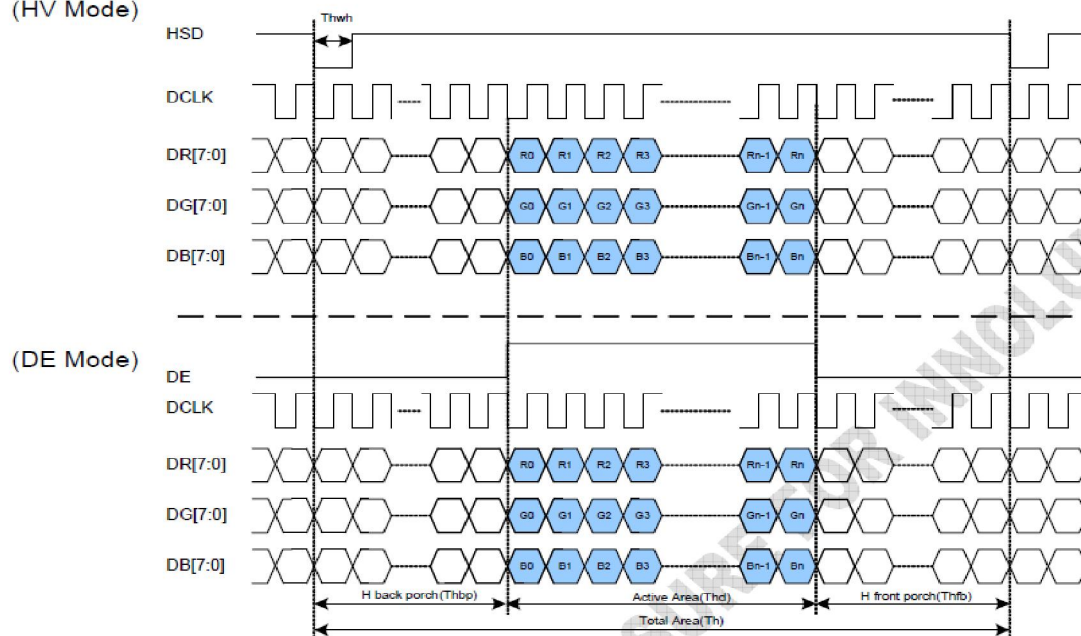
## 5. Interface Timing:

### 5.1 Reset Timing

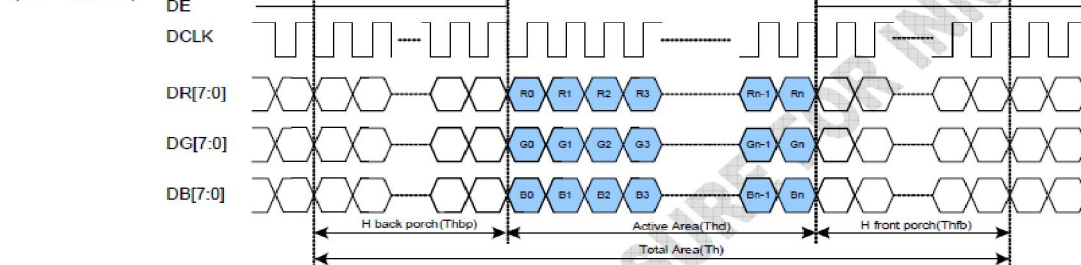


### 5.2 RGB Interface Timing

(HV Mode)



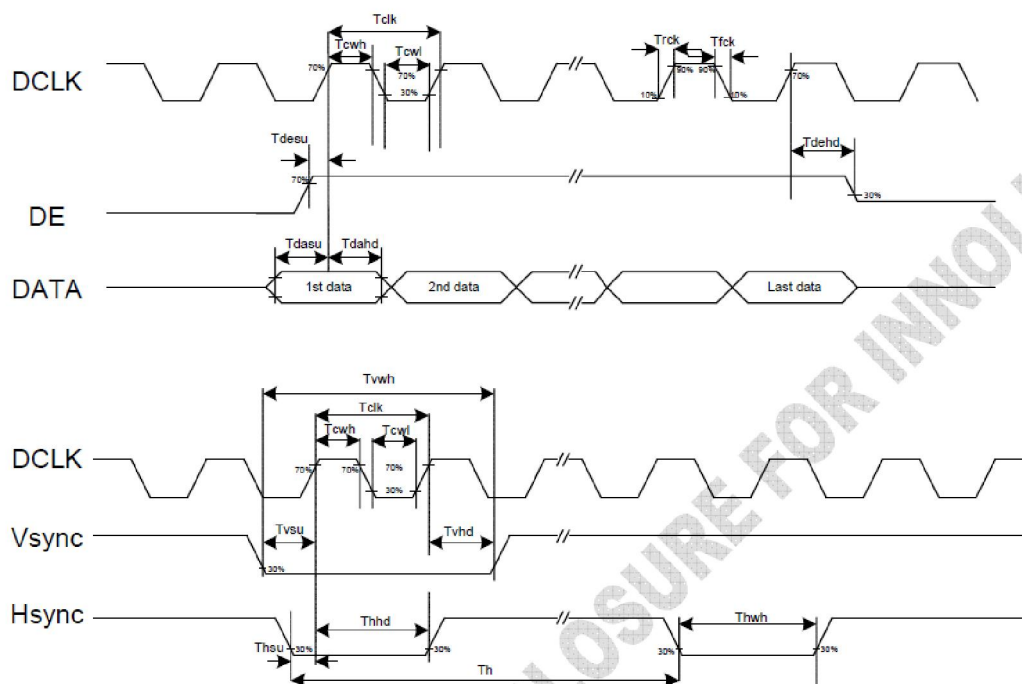
(DE Mode)



Parallel RGB input timign table

| Parameter        | Symbol | Value |      |      | Unit |
|------------------|--------|-------|------|------|------|
|                  |        | Min.  | Typ. | Max. |      |
| DCLK frequency   | fclk   | 5     | 9    | 12   | MHz  |
| VSD period time  | Tv     | 277   | 288  | 400  | H    |
| VSD display area | Tvd    | 272   |      |      | H    |
| VSD back porch   | Tvb    | 3     | 8    | 31   | H    |
| VSD front porch  | Tvfp   | 2     | 8    | 97   | H    |
| HSD period time  | Th     | 520   | 525  | 800  | DCLK |
| HSD display area | Thd    | 480   |      |      | DCLK |
| HSD back porch   | Thbp   | 36    | 40   | 255  | DCLK |
| HSD front porch  | Thfp   | 4     | 5    | 65   | DCLK |

## 5.3 AC Timing Diagram



|                                      |       |      |    |     |      |                                  |
|--------------------------------------|-------|------|----|-----|------|----------------------------------|
| DCLK clock time                      | Tclk  | 33.3 | -  | -   | ns   | DCLK=30MHz                       |
| DCLK clock low period                | Tcwl  | 40   | -  | 60  | %    |                                  |
| DCLK clock high period               | Tcwh  | 40   | -  | 60  | %    |                                  |
| Clock rising time                    | Trck  | 9    | -  | -   | ns   |                                  |
| Clock falling time                   | Tfck  | 9    | -  | -   | ns   |                                  |
| HSD width                            | Thwh  | 1    | -  | -   | DCLK |                                  |
| HSD period time                      | Th    | 55   | 60 | 65  | us   |                                  |
| HSD setup time                       | Thsu  | 12   | -  | -   | ns   |                                  |
| HSD hold time                        | Thhd  | 12   | -  | -   | ns   |                                  |
| VSD width                            | Tvwh  | 1    | -  | -   | Th   |                                  |
| VSD setup time                       | Tvsu  | 12   | -  | -   | ns   |                                  |
| VSD hold time                        | Tvhd  | 12   | -  | -   | ns   |                                  |
| Data setup time                      | Tdasu | 12   | -  | -   | ns   |                                  |
| Data hold time                       | Tdahd | 12   | -  | -   | ns   |                                  |
| DE setup time                        | Tdesu | 12   | -  | -   | ns   |                                  |
| DE hold time                         | Tdehd | 12   | -  | -   | ns   |                                  |
| Source output setting time           | Tsst  | -    | -  | TBD | us   | 10% to 90%<br>CL=60pF, RL=2Kohm  |
| Gate output setting time             | Tgst  | -    | -  | TBD | ns   | 10% to 90%, CL=60pF              |
| VCOM output setting time             | Tcst  | -    | -  | TBD | us   | 10% to 90%,<br>CL=40nF, RL=50ohm |
| Time from VSD to 1st line data input | Tvs   | 3    | 8  | 31  | Th   | HV mode<br>By HDL[4:0] setting   |

## 6. Absolute Maximum Ratings:

| Name                  | symbol          | Min | Type | Max | Unit |
|-----------------------|-----------------|-----|------|-----|------|
| Operation Temperature | T <sub>OP</sub> | -20 | -    | 70  | °C   |
| Storage Temperature   | T <sub>ST</sub> | -30 | -    | 80  | °C   |

## 7. DC Characteristics

| Name                | Symbol          | Min      | Type | Max      | Unit |
|---------------------|-----------------|----------|------|----------|------|
| Logical Voltage     | V <sub>DD</sub> | 3.1      | 3.3  | 3.5      | V    |
| Input High Voltage  | V <sub>IH</sub> | 0.8IOVCC | -    | IOVCC    | V    |
| Input Low Voltage   | V <sub>IL</sub> | -0.3     | -    | 0.2IOVCC | V    |
| Output High Voltage | V <sub>OH</sub> | 0.8IOVCC | -    | -        | V    |
| Output Low Voltage  | V <sub>OL</sub> | -        | -    | 0.2IOVCC | V    |
| Current Consumption | I <sub>DD</sub> | -        | -    | 25       | mA   |

## 8. Blacklight:

| Name                 | Min   | Type  | Max  | Unit                      |
|----------------------|-------|-------|------|---------------------------|
| Current              | -     | 40    | 45   | mA                        |
| Voltage              | -     | 15.6  | 17.1 | V                         |
| Power Consumption    | -     | 624   | -    | mW                        |
| luminance            | -     | 470   | -    | CD/M <sup>2</sup> (Note1) |
| Luminance uniformity | 75%   | 80%   | -    | (Note2)                   |
| X Color Coordinates  | 0.27  | 0.28  | 0.31 | -                         |
| Y Color Coordinates  | 0.27  | 0.28  | 0.31 | -                         |
| Backlight Lifetime   | 20000 | 30000 | ---  | Hours                     |

Note1: This luminance is tested with assembling the LCD.

Note2: Definition of Luminance Uniformity.



Active area is divided into 9 measuring areas (Refer to Fig. 4-4 ).Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{\min}}{B_{\max}}$$

L-----Active area length      W----- Active area width

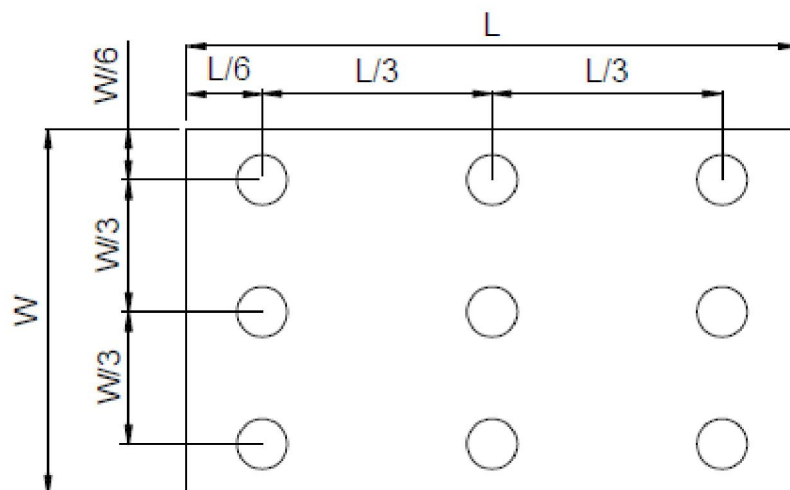


Fig. 4-4 Definition of measuring points

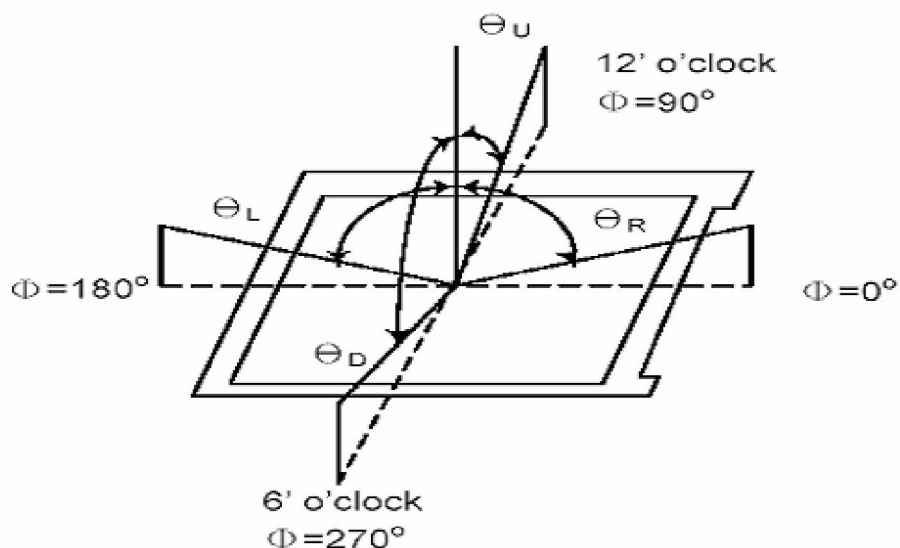
**B<sub>max</sub>**: The measured maximum luminance of all measurement position.

**B<sub>min</sub>**: The measured minimum luminance of all measurement position.

## 9. Optical Specification

| Name               | Symbol | Min | Type | Max | Unit               |
|--------------------|--------|-----|------|-----|--------------------|
| Transmittance rate | T (%)  | –   | 4.6  | –   | %                  |
| Contrast ratio     | C/R    | 400 | 500  | –   | –                  |
| Response time      | Tr+Tf  | –   | 45   | –   | ms                 |
| Viewing Angle      | θ U    | 50  | 60   | –   | degree<br>(C/R>10) |
|                    | θ D    | 65  | 75   | –   |                    |
|                    | θ L    | 65  | 75   | –   |                    |
|                    | θ R    | 65  | 75   | –   |                    |

\*Viewing angle descriptin:

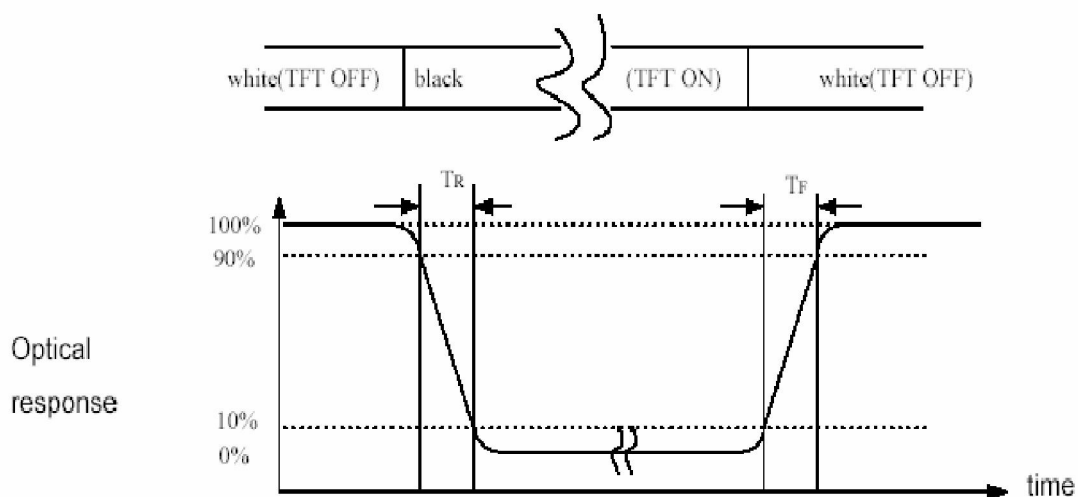


\*Contrast rate description(CR) :

Tested in the center of the LCM panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

\*Response time description : Sum of TR and TF



## 10.Touch Panel:

| Item               | Description | Unit  |
|--------------------|-------------|-------|
| linearity          | <1.5%       | —     |
| transmittance      | >80%        | —     |
| Response time      | <10         | ms    |
| Life time          | 1,000,000   | times |
| Operation pressure | 60~100      | g     |
| Circuit level      | 3~15        | V     |

## 11. Reliability testing:

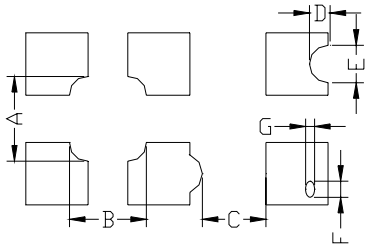
| Item No | Name                                | Condition                                                                                                         | Remark                             |
|---------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------|------------------------------------|
| 1       | High temperature Operating          | 70° C , 168Hours                                                                                                  | Finish product<br>(With polarizer) |
| 2       | Low temperature Operating           | -20° C , 168 Hours                                                                                                | Finish product<br>(With polarizer) |
| 3       | High temperature Storage            | 80° C , 168 Hours                                                                                                 | Finish product<br>(With polarizer) |
| 4       | Low temperature Storage             | -30° C , 168 Hours                                                                                                | Finish product<br>(With polarizer) |
| 5       | High temperature & humidity Storage | 60° C , 90%RH, 168 Hours                                                                                          | Finish product<br>(With polarizer) |
| 6       | Thermal Shock Storage(No operation) | -20° C , 30min.<=> 70° C , 30min.<br>10 Cycles                                                                    | Finish product<br>(With polarizer) |
| 7       | ESD test                            | Voltage:+8KV<br>R:330 ohm, C:150pF<br>Air discharge, 10 times                                                     | Finish product<br>(With polarizer) |
| 8       | Vibration test                      | 10 => 55 =>10 => 55 => 10 Hz,<br>within 1 minute;Amplitude:1.5mm.<br>15 minutes for each Direction<br>( X, Y, Z ) | Finish product<br>(With polarizer) |
| 9       | Drop test                           | Packed, 100CM free fall<br>6 sides, 1 corner, 3edges                                                              | Finish product<br>(With polarizer) |

\*One single product test for only one item.

\* Judgment after test: keep in room temperature for more than 2 hours.

- Current consumption < 2 times of initial value
- Contrast > 1/2 initial value
- Function: work normally

## Inspection Standards

| Item                                                     | Criterion for defects                                                                                                                                                                                                                                                                                                                                                                           | Defect type |
|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1) Display on inspection                                 | (1) Non display (2) Vertical line is deficient<br>(3) Horizontal line is deficient (4) Cross line is deficient                                                                                                                                                                                                                                                                                  | Major       |
| 2) Black / White spot                                    | Size $\Phi$ (mm) Acceptable number<br>$\Phi \leq 0.3$ Ignore (note)<br>$0.3 < \Phi \leq 0.45$ 3<br>$0.45 < \Phi \leq 0.6$ 1<br>$0.6 < \Phi$ 0                                                                                                                                                                                                                                                   | Minor       |
| 3) Black / White line                                    | Length (mm) Width (mm) Acceptable number<br>$L \leq 10$ $W \leq 0.03$ Ignore<br>$5.0 \leq L \leq 10$ $0.03 < W \leq 0.04$ 3<br>$5.0 \leq L \leq 10$ $0.04 < W \leq 0.05$ 2<br>$1.0 \leq L \leq 10$ $0.05 < W \leq 0.06$ 2<br>$1.0 \leq L \leq 10$ $0.06 < W \leq 0.08$ 1<br>$L \leq 10$ $0.08 < W$ follows 2) point defect<br>Defects separate with each other at an interval of more than 20mm | Minor       |
| 4) Display pattern                                       | <br>$\frac{A+B}{2} \leq 0.28$ $0 < C$ $\frac{D+E}{2} \leq 0.25$ $\frac{F+G}{2} \leq 0.25$<br>Note: 1) Up to 3 damages acceptable<br>2) Not allowed if there are two or more pinholes every three-fourth inch.                                                                                                 | Minor       |
| 5) Spot-like contrast irregularity                       | Size $\Phi$ (mm) Acceptable Number<br>$\Phi \leq 0.7$ Ignore (note)<br>$0.7 < \Phi \leq 1.0$ 3<br>$1.0 < \Phi \leq 1.5$ 1<br>$1.5 < \Phi$ 0<br>Note: 1) Conformed to limit samples.<br>2) Intervals of defects are more than 30mm.                                                                                                                                                              | Minor       |
| 6) Bubbles in polarizer                                  | Size $\Phi$ (mm) Acceptable Number<br>$\Phi \leq 0.4$ Ignore (note)<br>$0.4 < \Phi \leq 0.65$ 2<br>$0.65 < \Phi \leq 1.2$ 1<br>$1.2 < \Phi$ 0                                                                                                                                                                                                                                                   | Minor       |
| 7) Scratches and dent on the polarizer                   | Scratches and dent on the polarizer shall be in the accordance with "2) Black/white spot", and "3) Black/White line".                                                                                                                                                                                                                                                                           | Minor       |
| 8) Stains on the surface of LCD panel                    | Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning.                                                                                                                                                                                                                                                                                                   | Minor       |
| 9) Rainbow color                                         | No rainbow color is allowed in the optimum contrast on state within the active area.                                                                                                                                                                                                                                                                                                            | Minor       |
| 10) Viewing area encroachment                            | Polarizer edge or line is visible in the opening viewing area due to polarizer shortness or sealing line.                                                                                                                                                                                                                                                                                       | Minor       |
| 11) Bezel appearance                                     | Rust and deep damages that are visible in the bezel are rejected.                                                                                                                                                                                                                                                                                                                               | Minor       |
| 12) Defect of land surface contact                       | Evident crevices that are visible are rejected.                                                                                                                                                                                                                                                                                                                                                 | Minor       |
| 13) Parts mounting                                       | (1) Failure to mount parts<br>(2) Parts not in the specifications are mounted<br>(3) For example: Polarity is reversed, HSC or TCP falls off.                                                                                                                                                                                                                                                   | Minor       |
| 14) Part alignment                                       | (1) LSI, IC lead width is more than 50% beyond pad outline.<br>(2) More than 50% of LSI, IC leads is off the pad outline.                                                                                                                                                                                                                                                                       | Minor       |
| 15) Conductive foreign matter (solder ball, solder hips) | (1) $0.45 < \Phi$ , $N \geq 1$<br>(2) $0.3 < \Phi \leq 0.45$ , $N \geq 1$ , $\Phi$ : Average diameter of solder ball (unit: mm)<br>(3) $0.5 < L$ , $N \geq 1$ , $L$ : Average length of solder chip (unit: mm)                                                                                                                                                                                  | Minor       |
| 16) Bezel flaw                                           | Bezel claw missing or not bent                                                                                                                                                                                                                                                                                                                                                                  | Minor       |
| 17) Indication on name plate (sampling indication label) | (1) Failure to stamp or label error, or not legible.(all acceptable if legible)<br>(2) The separation is more than 1/3 for indication discoloration, in which the characters can be checked.                                                                                                                                                                                                    | Minor       |

# Handling Precautions

## Mounting method

A panel of LCD module made by TS DISPLAY consists of two thin glass plates with polarizers that easily get damaged. When doing the mounting of the LCD module, extreme care should be used when handling the LCD modules.

## Cautions of LCD handling and cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Trichlorotrifluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Ketene
- Aromatics

## Caution against static charge

The LCD module use C-MOS LSI drivers. So we recommend you:

Connect any unused input terminal to  $V_{dd}$  or  $V_{ss}$ . Do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

## Packaging

- Module employs LCD elements, and must be treated as such. Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity.

## Caution for operation

-It is an indispensable condition to drive LCD module within the limits of the specified voltage since the higher voltage over the limits may cause the shorter life of LCD module.

-An electrochemical reaction due to DC (direct current) causes LCD undesirable deterioration so that the uses of DC (direct current) drive should be avoided.

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

## Storage

In the case of storing for a long period of time, the following ways are recommended:

- Storage in polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with not desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping the storage temperature range.
- Storing with no touch on polarizer surface by any thing else.

## Safety

-It is recommendable to crash damaged or unnecessary LCD into pieces and to wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.

-When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well at once with soap and water.

## Packing

| PARAMETER                      | Specification            | Unit |
|--------------------------------|--------------------------|------|
| Outside box                    | 390(L) x 350(W) x 480(H) | mm   |
| Inside pearl wool box          | 375(L) x 340(W) x 100(H) | mm   |
| Product quantity of Inside box | 36                       | pcs  |
| Total product quantity         | 36*4=144                 | pcs  |
| Total weight                   | 9.5 ± 0.5                | Kg   |

