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SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, LTD.

# TFT-LCD Module Specification

**Module NO.:** TST043WQHS-99C

**Version:** V1.0

APPROVAL FOR SPECIFICATION

APPROVAL FOR SAMPLE

|                                    |                |
|------------------------------------|----------------|
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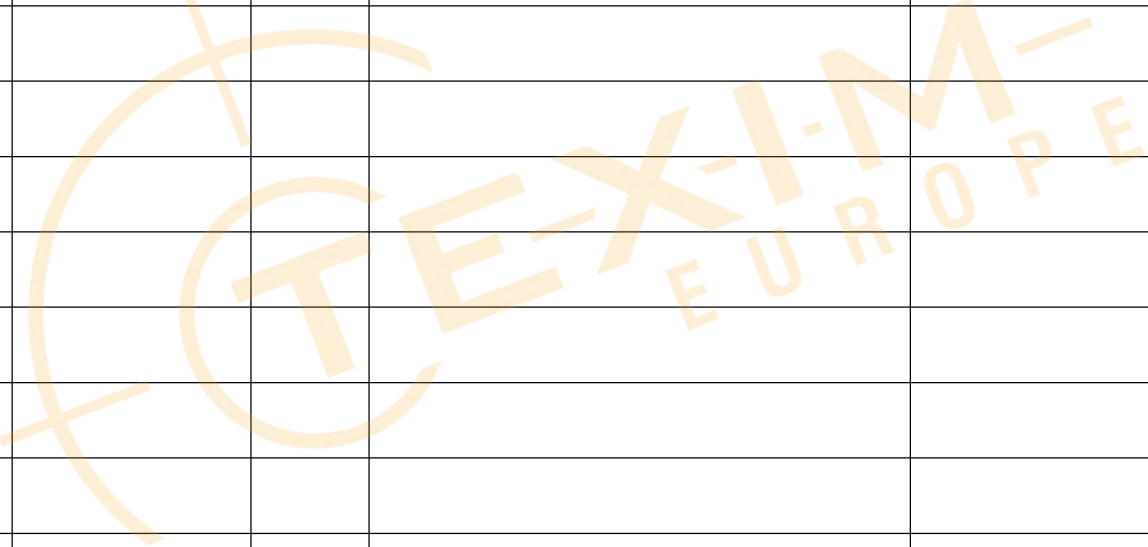
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### Document Revision History

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# 1. LCM Specification

## 1.1 Description

TST043WQHS-99C( 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, a drive IC, a FPC, and a LED-backlight unit,and a **capacitive touch panel**. The active display area is 4.3inches diagonally measured and the native resolution is 480\*RGB\*272.Features of this product are listed in the following table.

## 1.2 Functions & Features

**Table 1.1 Module Functions & Features**

| Parameter             | Value                                  | Unit              |
|-----------------------|--|-------------------|
| LCD Mode              | TFT/Transmissive                       | -                 |
| Color Depth           | 16.7M                                  | -                 |
| Display Resolution    | 480*RGB*272                            | pixels            |
| LCD Module Size       | 105.5 (H)*67.2(V)*4.25(T)(Exclude FPC) | mm                |
| CTP+LCM Size          | 123.04(H)*84.46(V)*4.77(T)             | mm                |
| Active Area (A.A.)    | 95.04 (L)* 53.86 (W)                   | mm                |
| Pixel Arrangement     | RGB-stripe                             | -                 |
| Viewing Direction     | ALL                                    | -                 |
| Display Mode          | Normally Black                         | -                 |
| LCD Controller/Driver | SC7283                                 | -                 |
| IC Package Type       | COG                                    | -                 |
| Interface             | RGB24-bit                              | -                 |
| Power Supply Voltage  | 3.3                                    | V                 |
| Backlight             | White LED*12                           | pcs               |
| Brightness            | 600(Typ)                               | cd/m <sup>2</sup> |
| TP/Lens               | <b>With CTP (FT5446)</b>               | -                 |



### 3. Pin Descriptions (参见 P5 页模组图)

| Pin No. | Symbol | Description              |
|---------|--------|--------------------------|
| 1       | LED-   | Cathode of LED backlight |
| 2       | LED+   | Anode of LED backlight   |
| 3       | GND    | Power ground             |
| 4       | VDD    | Power voltage            |
| 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      | DCLK   | Pixel clock              |
| 31      | DISP   | Display on/off           |
| 32      | HSYN   | Horizontal sync signal   |
| 33      | VSYNC  | Vertical sync signal     |
| 34      | DE     | Data enable              |
| 35      | NC     | NO connect               |
| 36      | GND    | Power ground             |
| 37      | XR     | NC                       |
| 38      | YD     | NC                       |
| 39      | XL     | NC                       |
| 40      | YU     | NC                       |

## 4. Electrical Units

### 4.1 Absolute Maximum Ratings

The absolute maximum ratings are list on Table 4.1. When used out of the absolute maximum ratings, the LCM may be permanently damaged. Using the LCM within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the LCM will malfunction and cause poor reliability.

**Table 4.1 Module Absolute Maximum Ratings**

| Item                     | Symbol    | Unit  | Value         | Note |
|--------------------------|-----------|-------|---------------|------|
| Power Supply Voltage (1) | VCC       | V     | -0.3 to + 3.6 |      |
| Power Supply Voltage (2) | VGH ~ VSS | V     | 10.0 to +20.0 |      |
| Power Supply Voltage (3) | VSS ~ VGL | V     | 5.0 to +15.0  |      |
| Operating Temperature    | Top       | °C    | -20 to +70    |      |
| Storage Temperature      | Tst       | °C    | -30 to +80    |      |
| Operating Humidity       | Hop       | %(RH) | 10~90         |      |

(VSS=0V)

### 4.2 Electrical characteristics (Ta=25°C)

**Table 4.2:DC Characteristic**

| Item                |         | Symbol          | Condition  | Min.               | Typ. | Max.               | Unit |
|---------------------|---------|-----------------|--|--------------------|------|--------------------|------|
| Supply Voltage      | Logic   | VCC             | ---  | 2.8                | -    | 3.3                | V    |
| Input Voltage       | H level | V <sub>IH</sub> | ---  | 0.8V <sub>dd</sub> | ---  | V <sub>dd</sub>    | V    |
|                     | L level | V <sub>IL</sub> |  | 0                  | ---  | 0.2V <sub>CC</sub> |      |
| Current Consumption |         | I <sub>DD</sub> | With internal voltage generation; VDD=3.3V; Tamb=25°C; | ---                | ---  | TBD                | mA   |
| LCD Driving Voltage |         | VOP             | ---  | ---                | TBD  | ---                | V    |

### 4.3 Backlight Specification

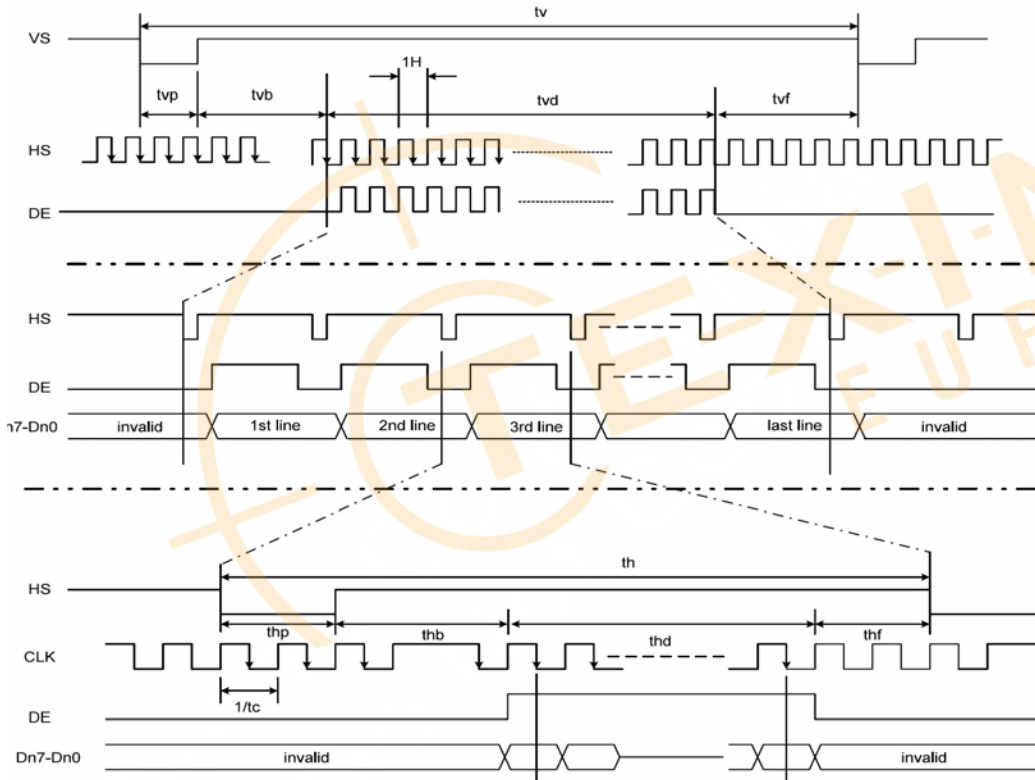
**Table 4.3 Back-light Characteristics**

| Item           | Symbol | Conditions                   | Min.  | Typ.  | Max. | Unit  |
|----------------|--------|------------------------------|-------|-------|------|-------|
| Supply Voltage | VF     | Backlight Current<br>IF=40mA | -     | 18.6  | -    | V     |
| Supply Current | IF     |                              | 40    |       |      | mA    |
| Life times     | Lt     |                              | 20000 | 30000 | -    | hours |
| Uniformity     | B      |                              | 80    | -     | -    | %     |
| Color          | White  |                              |       |       |      |       |

**Note:** With 12 pcs white LED parallel connection.

## 5. AC Characteristics

### 5.1 Parallel RGB Mode Timing Diagram



| Parameter                 | Symbol             | Spec. |       |      | Unit             |
|---------------------------|--------------------|-------|-------|------|------------------|
|                           |                    | Min.  | Typ.  | Max. |                  |
| Clock cycle               | $f_{CLK}^{(1)}$    | -     | 9     | 15   | MHz              |
| Hsync cycle               | $1/th$             | -     | 17.14 | -    | KHz              |
| Vsync cycle               | $1/tv$             | -     | 59.94 | -    | Hz               |
| <b>Horizontal Signal</b>  |                    |       |       |      |                  |
| Horizontal cycle          | th                 | 525   | 525   | 605  | CLK              |
| Horizontal display period | thd                | 480   | 480   | 480  | CLK              |
| Horizontal front porch    | thf                | 2     | 2     | 82   | CLK              |
| Horizontal pulse width    | thp <sup>(2)</sup> | 2     | 41    | 41   | CLK              |
| Horizontal back porch     | thb <sup>(2)</sup> | 2     | 2     | 41   | CLK              |
| <b>Vertical Signal</b>    |                    |       |       |      |                  |
| Vertical cycle            | tv                 | 285   | 286   | 399  | H <sup>(1)</sup> |
| Vertical display period   | tvd                | 272   | 272   | 272  | H <sup>(1)</sup> |
| Vertical front porch      | tvf                | 1     | 2     | 227  | H <sup>(1)</sup> |
| Vertical pulse width      | tvp <sup>(2)</sup> | 1     | 10    | 11   | H <sup>(1)</sup> |
| Vertical back porch       | tvb <sup>(2)</sup> | 1     | 2     | 11   | H <sup>(1)</sup> |

**Note:** (1) Unit: CLK=1/ f<sub>CLK</sub>, H= th,

(2) It is necessary to keep tvp+tvb=12 and thp+thb=43 in sync mode. DE mode is unnecessary to keep it.



## 6. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the TFT-LCD surface at a viewing angle of  $\Phi$  and  $\theta$  equal to 0° .

Measurement condition: Refer to next pages ( C-light source, Halogen Lamp )

\*1): with Polarizer \*2): without Polarizer \*3): Only Color Filter glass

| Items                |       | Symbol        | Condition              | Specifications |       |      | Unit              |
|----------------------|-------|---------------|------------------------|----------------|-------|------|-------------------|
|                      |       |               |                        | Min.           | Typ.  | Max. |                   |
| Contrast Ratio       |       | CR            |                        | 640            | 800   | -    | -                 |
| Response Time        |       | $T_R$         |                        | -              | 30    | -    | ms                |
|                      |       | $T_F$         |                        |                |       |      | ms                |
| Chromaticity         | Red   | $X_R$         | $\Theta=0$             | -0.03          | +0.03 | 0.61 | -                 |
|                      |       | $Y_R$         |                        |                |       | 0.33 | -                 |
|                      | Green | $X_G$         |                        |                |       | 0.36 | -                 |
|                      |       | $Y_G$         |                        |                |       | 0.59 | -                 |
|                      | Blue  | $X_B$         |                        |                |       | 0.15 | -                 |
|                      |       | $Y_B$         |                        |                |       | 0.11 | -                 |
|                      | White | $X_W$         |                        |                |       | 0.33 | -                 |
|                      |       | $Y_W$         |                        |                |       | 0.36 | -                 |
| Viewing angle        | Hor.  | L(3 o'clock)  | Center<br>CR $\geq$ 10 | -              | 80    | -    | deg.              |
|                      |       | R(9 o'clock)  |                        | -              | 80    | -    |                   |
|                      | Ver.  | U(12 o'clock) |                        | -              | 80    | -    |                   |
|                      |       | D(6 o'clock)  |                        | -              | 80    | -    |                   |
| Color Gamut(NTSC)    |       | -             | $\Theta=0$             | 45             | 50    | -    | %                 |
| Brightness(With LCD) |       | IV            | White                  | 550            | 600   | 650  | cd/m <sup>2</sup> |

## 7.Touch Panel specifications

### 7.1 Mechanical characteristics

| DESCRIPTION            | INL SPECIFICATION       | REMARK                   |
|------------------------|-------------------------|--------------------------|
| Touch Panel Size       | 4.3                     |                          |
| Outline Dimension (OD) | 123.04(H) x 84.46(V) mm | Cover Lens Outline       |
| Product Thickness      | 1.43mm(max)             | With FPC and frame D.S.T |
| Glass Thickness        | 0.7mm                   |                          |
| Ink View Area          | 96.46x55.46mm           |                          |
| Input Method           | 5 Fingers               |                          |
| Activation Force       | Touch                   |                          |
| Surface Hardness       | $\geq$ 6H               |                          |

## 7.2 Electrical characteristics

| DESCRIPTION             |             | SPECIFICATION    |
|-------------------------|-------------|------------------|
| Operating Voltage       |             | DC 2.8~3.3V      |
| Power Consumption (IDD) | Active Mode | 12~4.5mA         |
|                         | Sleep Mode  | TBD              |
| Interface               |             | I <sup>2</sup> C |
| Controller IC           |             | FT5446           |
| Resolution              |             | 480*272          |

## 7.3 Interface timing characteristics

| PARAMETER  | MIN | MAX  | UNIT |
|--|-----|------|------|
| SCL Frequency                                    | -   | 400K | Hz   |
| Bus Free Time Between a STOP and START Condition | 4.7 | -    | uS   |
| Hold Time (repeated) START Condition             | 4.0 | -    | uS   |
| Data Setup Time                                  | 250 | -    | nS   |
| Setup Time for Repeated START Condition          | 4.7 | -    | uS   |
| Setup Time for STOP Condition                    | 4.0 | -    | uS   |

## 8. Reliability Test Items

| No. | Test Items                             | Test Condition   | Remarks                              |
|-----|--|--|--------------------------------------|
| 1   | High Temperature Storage               | T = 80°C for 240hr   | Module<br>(Without<br>Contamination) |
| 2   | Low Temperature Storage                | T = -30°C for 240hr  |                                      |
| 3   | High Temperature Operating             | T = 70°C for 240hr   |                                      |
| 4   | Low Temperature Operating              | T = -20°C for 240hr<br>(But no condensation of dew)  |                                      |
| 5   | High Temp. and High Humidity Operating | T = 50°C /90% for 240hr<br>(But no condensation dew)   |                                      |
| 6   | Thermal Shock                          | -20±2°C~25~70±2°C×10cycles<br>(30min.) (5min.) (30min.)                                      |                                      |
| 7   | ESD test                               | Voltage: ±8KV R: 330 Ω, C:150pF,Air discharge, 10time  |                                      |
| 8   | Packing Shock                          | 1corner, 3edge, 6face / 1.0mDrop   | Packing                              |
| 9   | Packing Vibration                      | Frequency: 10Hz~55Hz~10Hz<br><br>Amplitude: 1.5mm,<br><br>X, Y, Z direction for total 3hours |                                      |

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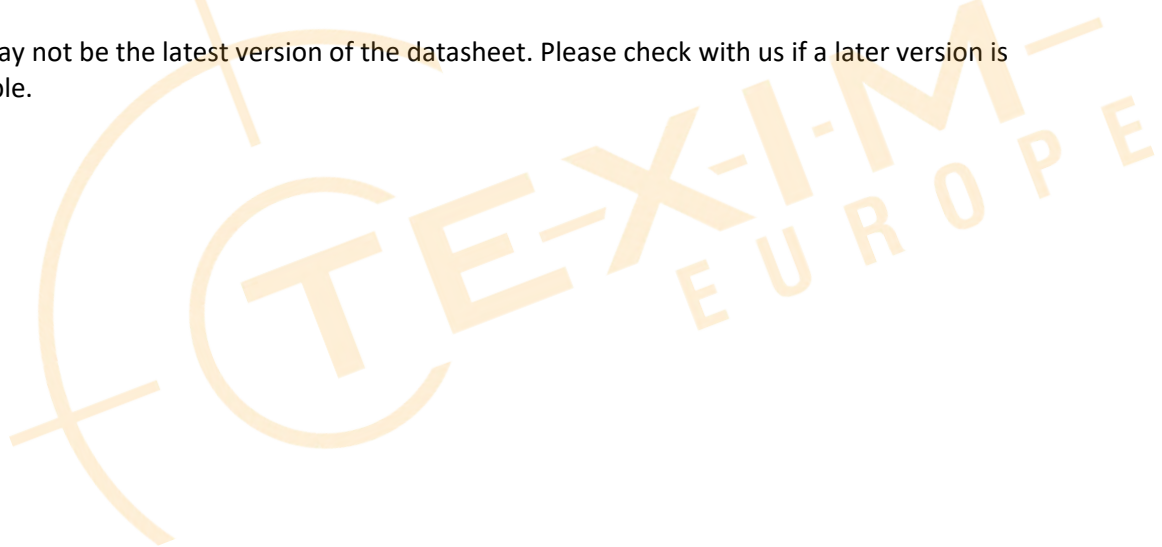
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