JICTECH LCD (HONGKONG) CO.,LTD

DONGGUAN JICTECH LCD CO.,LTD

PROFESSIONAL LCM SUPPLIER

# Product Specification For TFT-LCD Module

## Model No.: RT035T8T-R3

## Specification Ver.: 01

☐APPROVAL FOR SPECIFICATIONS ONLY

■APPROVAL FOR SPECIFICATIONS AND SAMPLE

| CUSTOMER: | APPROVED BY: |
|---|---|
| DATA: | DATA: |

| APPROVED BY | CHECKED BY | PREPARED BY |
|---|---|---|
| Karen | Zhanglei | XIN LIU |
| 2019.03.01 | 2019.03.01 | 2019.03.01 |

# REVISION RECORD

| Rev NO. | Date | Revision Contents | Note |
|---|---|---|---|
| 01 | 2019.03.01 | Initialize the version | |
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# CONTENTS

# 1. GENERAL SPECIFICATION

## 1.1 Introduction

3.5'' is a color active matrix TFT LCD Panel using amorphous silicon TFT's (Thin Film Transistors) as active switching device. It is a transmissive type display operating in the normal white. The TFT-LCD has a 3.5 inch diagonally measured active area with WVGA resolutions (320horizontal by 480vertical pixel arrays). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this panel can display 16.7M colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.

## 1.2 Feature

- ADS type main TFT-LCD panel.
- Structure FOG+B/L interface, Power saving mode.

## 1.3 Application

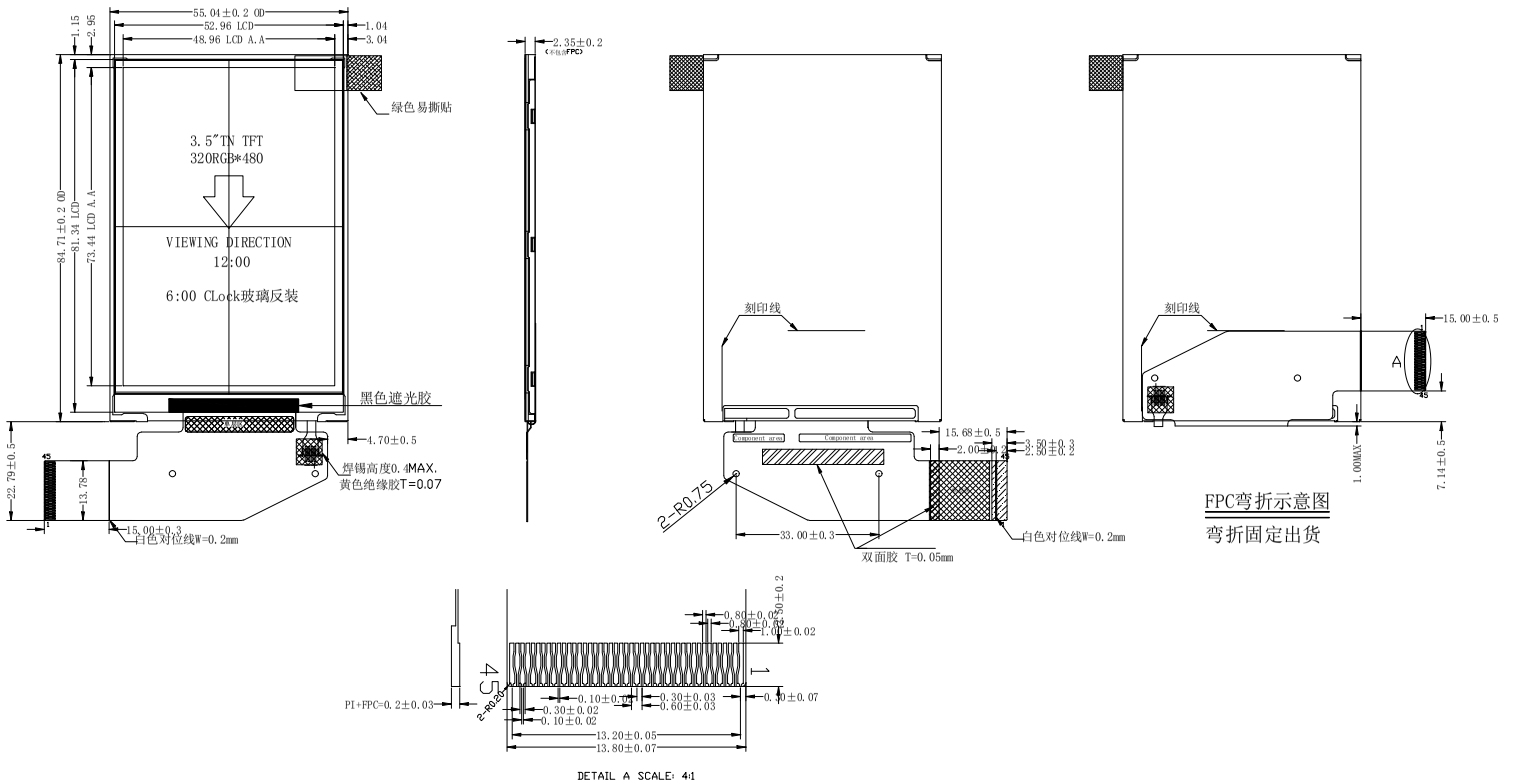
- Display terminals for digital products. Industrial control Etc.

## 1.4 General Specification

| No. | Item | Specification | Unit | Remark |
|---|---|---|---|---|
| 1 | LCD Size | 3.5 | inch | - |
| 2 | Panel Type | a-Si TFT active matrix | - | - |
| 3 | Resolution | 320RGB(H) x 480(V) | pixel | - |
| 4 | Display Mode | Normally White | - | - |
| 5 | Display Number of Colors | 16.7M | - | - |
| 6 | Viewing Direction | 12:00 CLock | - | - |
| 7 | Contrast Ratio | 500 | - | - |
| 8 | Luminance | 300 | cd/m2 | - |
| 9 | Module Size | 55.04(H) x 84.71(V) x 2.35(T) | mm | - |
| 10 | Active Area | 48.96(H) x73.44(V) | mm | - |
| 11 | Pixel Pitch | 0.153(H) x 0.153(V) | mm | - |
| 12 | Driver IC | ILI9488 | - | - |
| 13 | Light Source | 6 LEDs White | - | - |
| 14 | Interface | RGB 18Bit | - | - |
| 15 | Operating Temperature | -20~70 (Max. scope) | ℃ | - |
| 16 | Storage Temperature | -30~80 (Max. scope) | ℃ | - |
| 17 | Weight | TBD | g | - |

## 2. EXTERNAL DIMENSIONS

| REV. | REVISION RECORD | DATE |
|---|---|---|
| 01 | First issue | 2018-11-14 |

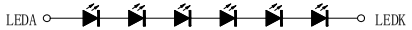



| NO. | PIN NAME |
|---|---|
| 1 | LEDK |
| 2 | LEDA |
| 3 | NC |
| 4 | GND |
| 5 | VCC |
| 6 | IOVCC |
| 7 | IM2 |
| 8 | IM1 |
| 9 | IM0 |
| 10 | TE |
| 11 | SDO |
| 12 | SDI |
| 13 | D/C |
| 14 | WR/SCL |
| 15 | RD |
| 16 | CS |
| 17 | RESET |
| 18 | NC |
| 19 | NC |
| 20 | NC |
| 21 | NC |
| 22 | NC |
| 23 | NC |
| 24 | D17 |
| 25 | D16 |
| 26 | D15 |
| 27 | D14 |
| 28 | D13 |
| 29 | D12 |
| 30 | D11 |
| 31 | D10 |
| 32 | D9 |
| 33 | D8 |
| 34 | D7 |
| 35 | D6 |
| 36 | D5 |
| 37 | D4 |
| 38 | D3 |
| 39 | D2 |
| 40 | D1 |
| 41 | D0 |
| 42 | DE |
| 43 | PCLK |
| 44 | Hsync |
| 45 | Vsync |

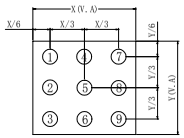
SPECIFICATION:

1.LCD Panel Size : 3.5 Inch(A.A Diagonal)
2.Resolution : 320 RGB(H)*480(V)
3.Display Mode : Normally WHite
4.Viewing Direction : 12:00 CLock( human eye view)
5.Operating/Storage temperature : -20°C~+70°C/-30°C~+80°C
6.Operating Voltage : VDD=2.5~3.3V,IOVCC=1.65~3.3V
7.LED Backlight : 20mA/3.2V*6
8.Control IC Interface : ILI9488
9.FPC MEET WITH CONNECTOR:FH26-45S-0.3SHW
10.Dimensions with mark "()"are reference.
11.RoHS compliant.

1.Backlight Circuit Diagram (1*6=6 SMD)




2.Test Ponit




SHENZHEN JICTECHLCD CO.,LTD

| | | |
|---|---|---|
| DESIGNED BY: LiuX | RT035T8T-R3 | UNIT: mm |
| CHECKED BY: | OUTLINE | GENERAL TOL.: ±0.20 |
| APPROVED BY: | | PAGE: 1/1 |
| | | DATE: 2018-11-14 |

# 3. ABSOLUTE MAXIMUM RATINGS

| Parameter of absolute maximum ratings | Symbol | Min | Max | Unit |
|---|---|---|---|---|
| Operating temperature | Top | -20 | 70 | ℃ |
| Storage temperature | Tst | -30 | 80 | ℃ |
| Humidity | RH | - | 90%(Max60 °C) | RH |

# 4. ELECTRICAL CHARACTERISTICS

## 4.1. DC Characteristics

| Parameter of DC characteristics | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Supply voltage for logic | VCC/VCI | 2.5 | 2.8 | 3.6 | V |
| I/O power supply | IOVCC | 2.5 | 2.8 | 3.6 | V |
| Input Current | Idd | - | 27 | 33 | mA |
| Input voltage 'H' level | VIH | 0.7 IOVCC | - | IOVCC | V |
| Input voltage 'L' level | VIL | VSS | - | 0.3 IOVCC | V |
| Output voltage 'H' level | VOH | 0.8 IOVCC | - | IOVCC | V |
| Output voltage 'L' level | VOL | VSS | - | 0.2 IOVCC | V |

## 4.2. Backlight Characteristics

| Item of backlight characteristics | Symbol | Min. | Typ. | Max. | Unit | Condition |
|---|---|---|---|---|---|---|
| Forward voltage | Vf | 18 | 19.2 | 20.4 | V | If=20mA |
| Number of LED | - | - | 6 | - | Piece | - |
| Connection mode | 6LED Series connection | | | | | |
| Chromaticity White CIE (x, y) | x | 0.25 | - | 0.38 | - | If=20mA |
| | y | 0.25 | - | 0.38 | - | |

Using condition: constant current driving method If=20mA(+/-10%).

# 5. INTERFACE DESCRIPTION

| Pin No. | Symbol | I/O | Description | Note |
|---|---|---|---|---|
| 1 | BLK | P | Power supply Cathode input for backlight | |
| 2 | BLA | P | Power supply Anode input for backlight. | |
| 3 | NC | | NO connect | |
| 4 | GND | P | System ground | |
| 5 | VCC | P | A supply voltage to the analog circuit. Connect to an external power supply of 2.5 ~ 3.3V | |
| 6 | IOVCC | P | A supply voltage to the digital circuit. Connect to an external power supply of 1.65 ~ 3.3V. | |
| 7-9 | IM2-IM0 | IM2 / IM1 / IM0 / INTERFACE / Data pin | | |
| | | 0 / 0 / 0 / MCU18-BIT / DB[17:0] | | |
| | | 0 / 1 / 0 / MCU16-BIT / DB[15:0] | | |
| | | 0 / 1 / 1 / MCU8-BIT / DB[7:0] | | |
| | | 1 / 0 / 1 / 3SPI+RGB / SDA, DB[17:0] | | |
| | | 1 / 1 / 1 / 4SPI+RGB / SDA, DB[17:0] | | |
| 10 | TE | I | Tearing effect | |
| 11 | SDO | I | Serial data output in the serial interface | |
| 12 | SDI | I | Serial data input in the serial interface | |
| 13 | D/C | I | Data/command selection pin in the RGB interface | |
| 14 | WR/SCL | I | Serves as a write signal in the MCU interface<br>Serial clock signal in the serial interface | |
| 15 | RD | I | Read signal in the MCU interface | |
| 16 | CS | I | Chip select | |
| 17 | RESET | I | Reset pin | |
| 18 | NC | | NO connect | |
| 19 | NC | | NO connect | |
| 20 | NC | | NO connect | |

| | | | | |
|---|---|---|---|---|
| 21 | NC | | NO connect | |
| 22 | NC | | NO connect | |
| 23 | NC | | NO connect | |
| 24 | D17 | I/0 | Data bus | |
| 25 | D16 | I/0 | Data bus | |
| 26 | D15 | I/0 | Data bus | |
| 27 | D14 | I/0 | Data bus | |
| 28 | D13 | I/0 | Data bus | |
| 29 | D12 | I/0 | Data bus | |
| 30 | D11 | I/0 | Data bus | |
| 31 | D10 | I/0 | Data bus | |
| 32 | D9 | I/0 | Data bus | |
| 33 | D8 | I/0 | Data bus | |
| 34 | D7 | I/0 | Data bus | |
| 35 | D6 | I/0 | Data bus | |
| 36 | D5 | I/0 | Data bus | |
| 37 | D4 | I/0 | Data bus | |
| 38 | D3 | I/0 | Data bus | |
| 39 | D2 | I/0 | Data bus | |
| 40 | D1 | I/0 | Data bus | |
| 41 | D0 | I/0 | Data bus | |
| 42 | DE | I | Data Enable signal | |
| 43 | PCLK | I | Clock input | |
| 44 | HSYNC | I | Horizontal sync input. Negative polarity | |
| 45 | VSYNC | I | Vertical sync input. Negative polarity | |

Note: The voltage power of the interface logic pin depend on “IOVCC” and “GND”, Such as $DB_n$ and function pins

# 6. ELECTRO-OPTICAL CHARACTERISTICS

| Item of electro-optical characteristics | Symbol | | Condition | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Contrast ratio | CR | | Viewing normal angle $\theta = \phi = 0^\circ$ If=20mA TC=25°C | - | 500 | - | - | Note 1 |
| SurfaceLuminance | Lv | | | -- | 300 | - | cd/m2 | Note 2 |
| Luminance uniformity | $\delta$ WHITE | | | 80 | - | - | % | Note 3 |
| Response time | Tr+Tf | | | - | 35 | - | ms | Note 4 |
| Viewing angle range | $\theta$ | 3:00 | Center (CR≥10) | - | 70 | - | degree | Note 5 |
| | | 9:00 | | - | 70 | - | | |
| | | 6:00 | | - | 60 | - | | |
| | | 12:00 | | - | 40 | - | | |
| Module Chromaticity CIE (x, y) | White | x | Viewing normal angle $\theta = \phi = 0^\circ$ | 0.255 | - | 0.377 | - | Note6 |
| | | y | | 0.253 | - | 0.378 | | |
| | Red | x | | 0.648 | - | 0.678 | | |
| | | y | | 0.310 | - | 0.340 | | |
| | Green | x | | 0.256 | - | 0.386 | | |
| | | y | | 0.579 | - | 0.609 | | |
| | Blue | x | | 0.119 | - | 0.149 | | |
| | | y | | 0.107 | - | 0.137 | | |
| Color Gamut | S | | - | - | 69% | - | - | Note7 |

*Note: All above side data are based on JICTECH following condition –

Note1. Contrast Ratio (CR) is defined mathematically by the following formula. For more information see FIG 1. (Cover RTP test)

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

Note2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see FIG 1.

Lv = Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)

Note3. The uniformity in surface luminance（ $\delta$ 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 1.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5 )}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

Note4. 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 2.

Note5. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast 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.

Note6. CIE (x, y) chromaticity ,The x,y value is determined by screen active area position 5. For more information see FIG 1.

Note7: NTSC ratio：For more information see FIG 4.

$$\text{NTSC ratio} = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}}$$

Note8. 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 and CIE， the testing data is base on BM-7 photo detector.

Note9. For TFT transmissive module, Gray scale reverse occurs in the direction of panel viewing angle

FIG.1. 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 =5mm, 500mm distance from the LCD surface to detector lens
measurement instrument is luminance meter BM-7.
or portable is luminance meter measurement instrument.

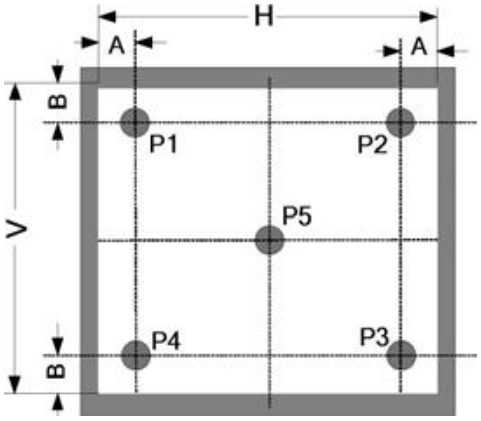



FIG. 2. The definition of Response Time

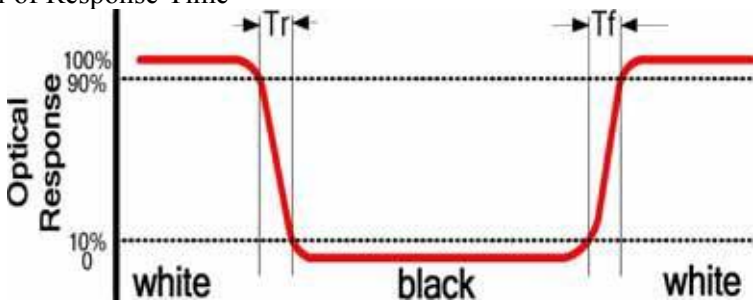
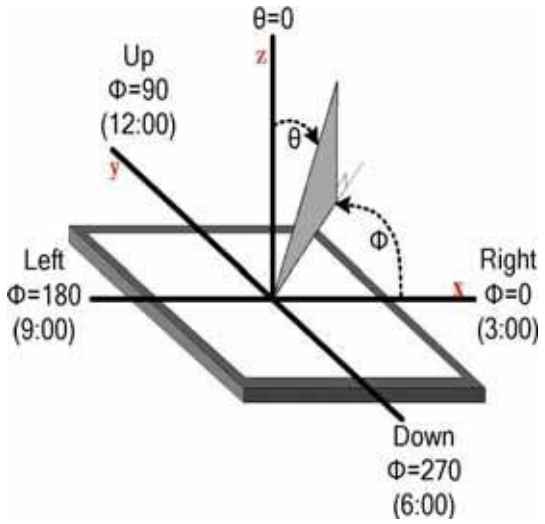



FIG. 3. The definition of viewing angle



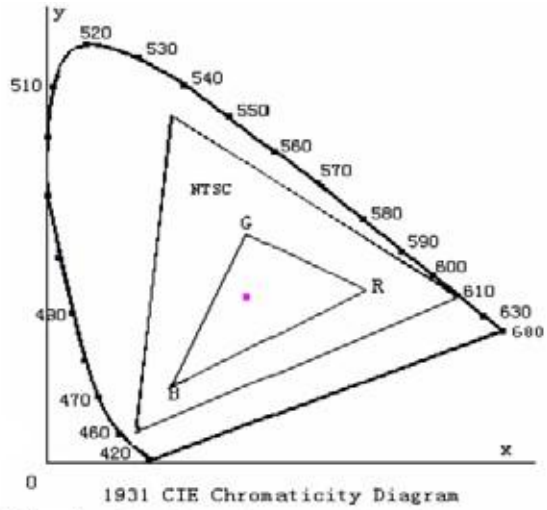




Fig.4. 1931 CIE chromaticity diagram

# 7. RELIABILITY TEST CONDITIONS

| No. | Test Item | Test Condition | Inspection after test |
|---|---|---|---|
| 1 | High Temperature Storage | 80℃/24ours | Inspection after 2~4hours storage at room temperature, the sample shall be free from defects:<br>1.Air bubble in the LCD;<br>2.Sealleak;<br>3.Non-display;<br>4.missing segments;<br>5.Glass crack;<br>6.Current Idd is twice higher than initial value.<br>7.The surface shall be free from damage.<br>8.The electrical characteristics requirements shall be satisfied. |
| 2 | Low Temperature Storage | -30℃/24ours | |
| 3 | High Temperature Operating | 70℃/24ours | |
| 4 | Low Temperature Operating | -20℃/24ours | |
| 5 | Temperature Cycle | -20±2℃(30min.) ~70±2℃(30min.)<br>x 5 cycles | |
| 6 | Damp Proof Test | 60℃±3℃x90%RH/12ours | |
| 7 | Vibration Test | Frequency：10Hz~55Hz~10Hz Amplitude 1.5mm, X，Y，Z direction for total 0.5hours (Packing condition) | |
| 8 | Dropping test | Drop to the ground from 1.0m height, one time, every side of carton. (Packing condition) | |
| 9 | ESD test | Voltage:±8kv/±4kv R: 200Ω C: 150pF<br>Air/Contact discharge, each 10time | |

Remark:
1. The test samples should be applied to only one test item.
2. Sample size for each test item is 5~10pcs.
3. For Damp Proof Test, Pure water(Resistance＞10MΩ) should be used.
4. 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.
5. EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

# 8. INSPECTION CRITERION

## 8.1 Classification of defects

Major defects (MA): A major defect refers to a defect that may substantially degrade usability for product applications, including all functional defects(such as no display, abnormal display, open or missing segment, short circuit, missing component), outline dimension beyond the drawing, progressive defects and those affecting reliability.

Minor defects (MI): A minor defect refers to a defect which is not considered to be able to substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation, such as black spot, white spot, bright spot, pinhole, black line, white line, contrast variation, glass defect, polarizer defect, etc.

## 8.2 Definition of inspection range

For dot defect of TFT LCD which is not smaller than 3 inches, dividing three areas to
make a judgment (according to figure 1).
A area : center of viewing area
B area : periphery of viewing area
C area : Outside viewing area
For other defects, dividing two areas to make a judgment (according figure 2).
A zone : Inside Viewing area
B zone : Outside Viewing area
X1(A.A~V.A): 2mm X2(A.A~V.A): 2mm
Y1(A.A~V.A): 2mm Y2(A.A~V.A): 2mm

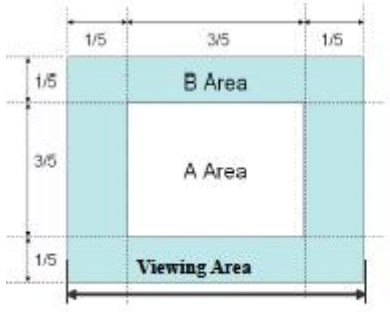


Figure 1

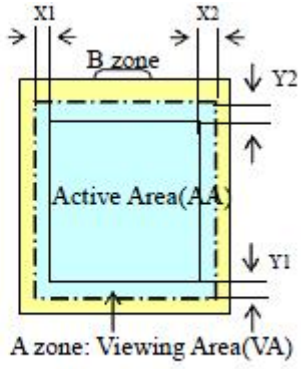


Figure 2

### 8.3 Inspection items and general notes

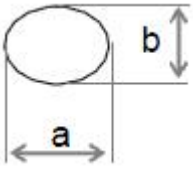
| | | |
|---|---|---|
| Inspection items | Pinhole, Bright spot, Black spot, White spot, Black line, White Line, Foreign particle, Bubble | The color of a small area is different from the remainder. The phenomenon doesn't change with voltage |
| | Contrast variation | The color of a small area is different from the remainder. The phenomenon changes with voltage |
| | Polarizer defect | Scratch, Dirt, Particle, Bubble on polarizer or between polarizer and glass |
| | Dot defect (TFT LCD) | The pixel appears bright or dark abnormally when display |
| | Functional defect | No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction |
| | Glass defect | Glass crack, Shaved corner of glass, Surplus glass |
| | PCB defect | Components assembly defect |
| General notes | 1.Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and JICTECH.<br>2.Viewing area should be the area which JICTECH guarantees.<br>3.Limit sample should be prior to this Inspection standard.<br>4.Viewing judgment should be under static pattern.<br>5.Inspection conditions<br>Inspection distance : 250 mm (from the sample) Temperature : 25±5 ºC<br>Inspection angle : 45 degrees in sample viewing direction (all defects in viewing area should be inspected from this direction) | |

### 8.4 Outgoing Inspection level

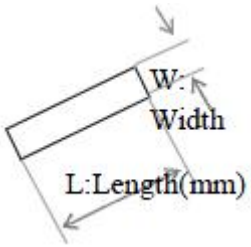
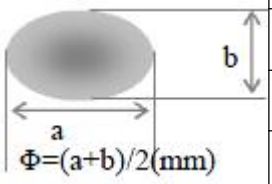
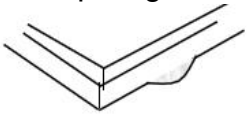
| Outgoing Inspection standard | Inspection conditions | Inspection | | | | |
|---|---|---|---|---|---|---|
| | | Min. | Max. | Unit | IL | AQL |
| Major Defects | See 8.3 general notes | See 8.5 | | | II | 0.065 |
| Minor Defects | See 8.3 general notes | See 8.5 | | | II | 0.065 |
| Note：Sampling standard conforms to GB2828 | | | | | | |

### 8.5 Inspection Items and Criteria

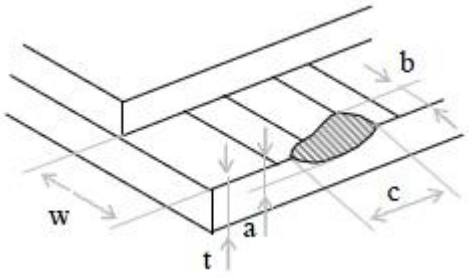
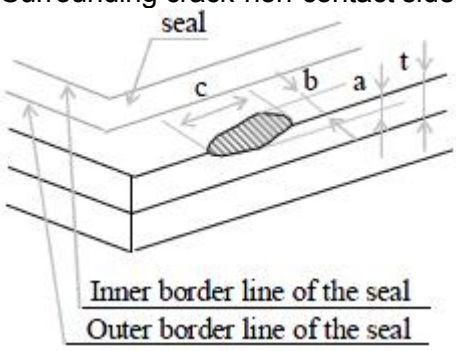
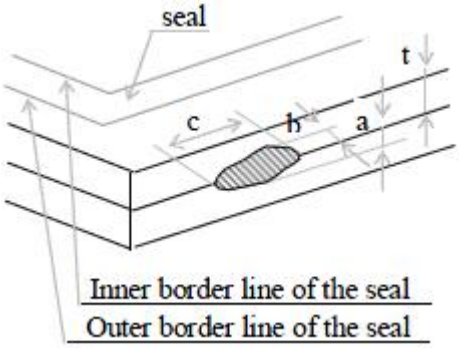
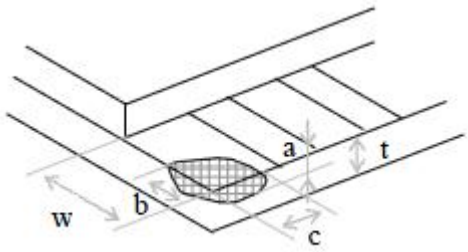
| Inspection items | Judgment standard |
|---|---|

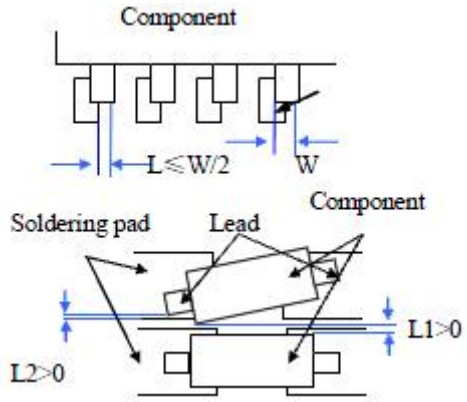
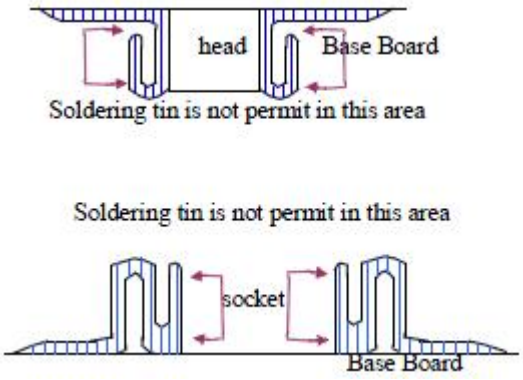
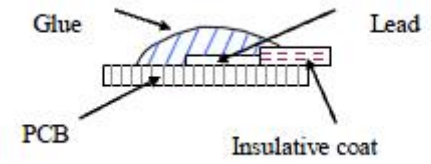
<table>
<tr><td colspan="3" rowspan="2"></td><td colspan="2" rowspan="2">Category</td><td colspan="2">Acceptable number</td></tr>
<tr><td>A zone</td><td>B zone</td></tr>
<tr><td rowspan="5">1</td><td rowspan="5">Black spot, White spot,Pinhole,Foreign Particle,Particle in or on glass, Scratch on glass</td><td rowspan="5"> 

Φ=(a+b)/2(mm)</td><td>A</td><td>Φ<=0.10</td><td>Neglected</td><td rowspan="5">Neglected</td></tr>
<tr><td>B</td><td>0.10<Φ<=0.15</td><td>2</td></tr>
<tr><td>C</td><td>0.15<Φ<=0.2</td><td>1</td></tr>
<tr><td>D</td><td>0.20<Φ</td><td>0</td></tr>
<tr><td colspan="2">Total defective point(B,C)</td><td>1</td></tr>
</table>

<table>
<tr><td rowspan="5">2</td><td rowspan="5">Black line, White line, and Particle Between Polarizer and glass, Scratch on glass</td><td rowspan="5"> 
</td><td>A</td><td>W<=0.02</td><td>Neglected</td><td rowspan="5">Neglected</td></tr>
<tr><td>B</td><td>0.02<W<=0.03<br>L<=1.0</td><td>1</td></tr>
<tr><td>C</td><td>0.03<W<=0.05<br>L>1.0</td><td>0</td></tr>
<tr><td>D</td><td>0.05<W, 1.0<L</td><td>0</td></tr>
<tr><td colspan="2">Total defective point(B,C)</td><td>1</td></tr>
<tr><td>3</td><td colspan="2">Bright spot</td><td colspan="2">any size</td><td>none</td><td>none</td></tr>
<tr><td rowspan="5">4</td><td rowspan="5">Contrast variation</td><td rowspan="5"> 
</td><td>A</td><td>Φ<0.2</td><td>Neglected</td><td rowspan="4">Neglected</td></tr>
<tr><td>B</td><td>0.2<Φ<=0.3</td><td>2</td></tr>
<tr><td>C</td><td>0.3<Φ<=0.4</td><td>1</td></tr>
<tr><td>D</td><td>0.4<Φ</td><td>0</td></tr>
<tr><td colspan="2">Total defective point(B,C)</td><td>3</td><td></td></tr>
<tr><td>5</td><td colspan="2">Bubble inside cell</td><td colspan="2">any size</td><td>none</td><td>none</td></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Polarizer defect (if Polarizer is used)</td><td>Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.</td><td colspan="4">Refer to item 1 and item 2.</td></tr>
<tr><td rowspan="3">Bubble,dent and convex</td><td>A</td><td>Φ<=0.1</td><td>Neglected</td><td rowspan="3">Neglected</td></tr>
<tr><td>B</td><td>0.1 <Φ<=0.2</td><td>1</td></tr>
<tr><td>C</td><td>0.2 <Φ</td><td>0</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">Surplus glass</td><td>Stage surplus glass<br> 
</td><td colspan="4">b<=0.3mm</td></tr>
<tr><td>Surrounding surplus glass<br>  </td><td colspan="4">Should not influence outline dimension and assembling.</td></tr>
<tr><td>8</td><td colspan="2">Open segment or open common</td><td colspan="4">Not permitted</td></tr>
</table>

| | | |
|---|---|---|
| 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 |

<table>
<tr><th colspan="3" rowspan="2">Inspection items</th><th colspan="2">Judgment standard</th></tr>
<tr><th colspan="2">Category(application: B zone)</th><th>Acceptable number</th></tr>
<tr><td rowspan="5">15</td><td rowspan="5">Glass defect crack</td><td>i)The front of lead terminals<br>  <br></td><td>A</td><td>a≤ t, b≤1/5W, c≤3mm</td><td rowspan="5">Max.3 defects allowed</td></tr>
<tr><td>B</td><td>Crack at two sides of lead terminals should not cover patterns and alignment mark</td></tr>
<tr><td>ii)Surrounding crack-non-contact side<br>  <br></td><td colspan="2">b < Inner borderline of the seal</td></tr>
<tr><td>iii)Surrounding crack- contact side<br>  <br></td><td colspan="2">b < Outer borderline of the seal</td></tr>
<tr><td>iv)Corner<br>  <br></td><td>A</td><td>a <= t, b <= 3.0, c <= 3.0</td></tr>
<tr><td>B</td><td>Glass crack should not cover patterns u and alignment mark and patterns.</td></tr>
</table>

| 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 istortion 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. |  |

# 9. PRECAUTIONS FOR USING LCD MODULES

## 9.1. Handing Precautions

9.1.1 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.

9.1.2 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.

9.1.3 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).

9.1.4 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.

9.1.5 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.

9.1.6 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

9.1.7 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.

9.1.8 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.

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

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

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

9.1.12 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.

9.1.13 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.

## 9.2. Handing Precautions for LCM

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

9.2.2 Correct handling;

9.2.2.1 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.

9.2.2.2 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).

9.2.3 Others

9.2.3.1 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.

9.2.3.2 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.

9.2.3.3 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.

- Exposed area of the printed circuit board.

-Terminal electrode sections.

## 9.3. Using LCD modules

9.3.1 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.

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

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

9.3.1.3 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.

9.3.1.4 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.

9.3.2 Precautions for Operation

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

9.3.2.2 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.

9.3.2.3 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.

9.3.2.4 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.

9.3.2.5 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.

9.3.2.6 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.

9.3.2.7 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.

9.3.3 Safety

9.4.5.1 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.

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

9.3.4 Return LCM under warranty

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

-Broken LCD glass.

-PCB eyelet is damaged or modified.

-PCB conductors damaged.

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

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

-Soldering to or modifying the bezel in any manner.

9.3.4.2Module 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.

## 9.4. Storage Precautions

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

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

9.4.1.2 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.

9.4.1.3 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).

9.4.2 Others

9.4.2.1 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.

9.4.2.2 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.

9.4.2.3 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.

- Exposed area of the printed circuit board.

-Terminal electrode sections.

# 10. PRIOR CONSULT MATTER

1. For OEM products, if any changes are needed which may affect the product property, we will consult with our customer in advance.
2. If you have special requirement about reliability condition, please let us know before you start the design on our samples.
3. For JICTECH standard products, we keep the right to change material, process ... for improving the product property without prior notice to our customer.
4. JICTECH company commitment to product quality assurance period for 1 year.