



Shenzhen Hongcai Technology Co. Ltd.

## APPROVAL SHEET

|                 |   |
|-----------------|---|
| <b>Customer</b> |   |
| <b>Part NO.</b> | <b>K280I40300</b>   |
| <b>Remarks</b>  | <input type="checkbox"/> Approval For Specification Only<br><input checked="" type="checkbox"/> Approval For Specification And Simple |

| <b>CUSTOMER</b> |                |                 | <b>HONGCAI</b>  |                |                 |
|-----------------|----------------|-----------------|-----------------|----------------|-----------------|
| <b>APPROVED</b> | <b>CHECKED</b> | <b>PREPARED</b> | <b>APPROVED</b> | <b>CHECKED</b> | <b>PREPARED</b> |
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## Revision Record

| Rev No | Date      | Description                        |
|--------|-----------|------------------------------------|
| V01    | 2018.4.21 | Preliminary Specification Release. |
|        |           |                                    |
|        |           |                                    |
|        |           |                                    |

## Contents

- 1 General specification
- 2 Mechanical Drawing
- 3 Pin Assignments
- 4 Electrical Specification
- 5 Measurement system
- 6 Reliability Test Items
- 7 Suggestions for using LCD modules
- 8 Packing and Storage Specification(Reference Only)

## 1. General Specifications

| Item                  | Contents                       | Unit  |
|-----------------------|--------------------------------|-------|
| Size                  | 2.8TFT                         | inch  |
| LCM Dimension         | 50.00 (W) * 69.20 (H) *2.30(T) | mm    |
| LCD Active Area       | 43.20* 57.60                   | mm    |
| Number OfDots         | 240 * RGB * 320                | pixel |
| LCD Type              | a-Si TFT                       |       |
| Viewing Direction     | ALL                            |       |
| Driver IC             | ST7789V2-G4-A-1                |       |
| Interface Type        | RGB                            |       |
| Operating Temperature | -20°C ~ 70°C                   |       |
| Storage Temperature   | -30°C ~ 80°C                   |       |
| Backlight Type        | 4 LEDs                         |       |
| Weight                | TBD                            |       |
|                       |                                |       |

## 2. Mechanical Drawing

**注：标注** **请重点确认**

**RGB16位**

双面板 T=0.05

2.8" TFT  
240RGB\*320  
IPS

银浆点

不含玻璃厚度  
2.30±0.1

0.30±0.03  
以背强(此值)  
IP封装+pc总高0.3±0.03

50.00 (BL) ± 0.2  
46.20 (LCD)  
43.20 (LCD/AA)  
1.90  
3.40  
1.45  
2.95  
64.75 (LCD)  
57.60 (LCD/AA)  
26.00  
14.75  
20.50

3.50  
5.00

3.50  
19.50  
20.50±0.07

**RGB16位**

| Pin | DESCRIPTION |
|-----|-------------|
| 1   | GND         |
| 2   | LEDK        |
| 3   | LEDA        |
| 4   | VCC         |
| 5   | R7          |
| 6   | R6          |
| 7   | R5          |
| 8   | R4          |
| 9   | R3          |
| 10  | GND         |
| 11  | G7          |
| 12  | G6          |
| 13  | G5          |
| 14  | G4          |
| 15  | G3          |
| 16  | G2          |
| 17  | GND         |
| 18  | B7          |
| 19  | B6          |
| 20  | B5          |
| 21  | B4          |
| 22  | B3          |
| 23  | DCLK        |
| 24  | GND         |
| 25  | DISPINC     |
| 26  | HS          |
| 27  | VS          |
| 28  | DE          |
| 29  | CS          |
| 30  | SCL         |
| 31  | SDA         |
| 32  | NC          |
| 33  | NC          |
| 34  | NC          |
| 35  | RESET       |
| 36  | GND         |
| 37  | GND         |
| 38  | GND         |
| 39  | GND         |
| 40  | GND         |

BLU circuit, 15mA\*4 at 3.2Vdc

**NOTES:**

1. POL: ±0.17/下0.17
2. DISPLAY TYPE: HSD 2.8" TFT
3. MAIN LCD DRIVER IC: ST7789V
4. OPTIMUM VIEWING ANGLE: ALL
5. LUMINANCE: 230MIN Cd/M2 250TYP Cd/M2
6. OPERATING TEMP: -20° C~70° C; STORAGE TEMP: -30° C~80° C
7. GENERAL TOLERANCE: ±0.2MM
8. MARK "\*" IS THE IMPORTANT DIMENSION
9. 建议客户以LCD的AA区尺寸外扩0.3mm开镜片窗

**深圳市泓彩科技有限公司**

|                 |       |    |           |
|-----------------|-------|----|-----------|
| 比例 1:1          | 单位 MM | 审核 | 设计        |
| 产品型号 K280I40300 | 公差    |    |           |
| 客户项目            |       |    | 2018.4.21 |

### 3. Pin Assignments

| NO.   | Symbol | Description                |
|-------|--------|----------------------------|
| 1     | GND    | Ground                     |
| 2     | LEDK   | BACKLIGHT CATHODE          |
| 3     | LEDA   | BACKLIGHT ANODE            |
| 4     | VCC    | POWER SUPPLY               |
| 5-9   | R7-R3  | Data Bus                   |
| 10    | GND    | Ground                     |
| 11-16 | G7-G2  | Data Bus                   |
| 17    | GND    | Ground                     |
| 18-22 | B7-B3  | Data Bus                   |
| 23    | DCLK   | Dot Clock Signa            |
| 24    | GND    | Ground                     |
| 25    | NC     | NC                         |
| 26    | HS     | Line Synchronizing Signal  |
| 27    | VS     | Frame Synchronizing Signal |
| 28    | DE     | Data Enable Signal         |
| 29    | CS     | Chip Select                |
| 30    | SCL    | Serial Clock               |
| 31    | SDA    | Serial Data Input          |
| 32-34 | NC     | NC                         |
| 35    | RESET  | Reset pin                  |
| 36-40 | GND    | Ground                     |
|       |        |                            |
|       |        |                            |
|       |        |                            |
|       |        |                            |
|       |        |                            |

## 4. Electrical Specification

### 4.1 DC Characteristics

| Item                         | Symbol | Min | Typ  | Max | Unit |
|------------------------------|--------|-----|------|-----|------|
| TFT gate on voltage          | VGH    | --  | 15   | --  | V    |
| TFT gate off voltage         | VGL    | --  | -7.5 | --  | V    |
| TFT common electrode Voltage | Vcom   | --  | -1   | --  | V    |

### 4.2 AC Characteristics

Refer to the SPEC of ST7789V

### 4.3 Typical Operation Conditions

| Item                   | Symbol | Min.      | Typ.    | Max.      | Unit |
|------------------------|--------|-----------|---------|-----------|------|
| Analog Supply Voltage  | VCI    | 2.5       | 2.8     | 3.3       | V    |
| Digital Supply Voltage | VDD    | 2.5       | 2.8     | 3.3       | V    |
| I/O Supply Voltage     | IOVCC  | 1.65      | 1.8/2.8 | 3.3       | V    |
| Input High Voltage     | VIH    | 0.8*IOVCC | -       | IOVCC     | V    |
| Input Low Voltage      | VIL    | 0         | -       | 0.2*IOVCC | V    |
| Output High Voltage    | VOH    | 0.8*IOVCC | -       | -         | V    |
| Output Low Voltage     | VOL    | -         | -       | 0.2*IOVCC | V    |

### 4.4 Backlight Circuit Characteristics

| Item              | Symbol | Min. | Typ. | Max. | Unit              |
|-------------------|--------|------|------|------|-------------------|
| LED Current       | IB     | --   | 60   | 80   | mA                |
| LED Voltage       | Vf     | 2.8  | 3.0  | 3.2  | V                 |
| CIE               | X      | 0.25 | 0.30 | 0.35 |                   |
|                   | Y      | 0.26 | 0.31 | 0.36 |                   |
| Brightness of LCM | L      | --   | 250  | --   | cd/m <sup>2</sup> |

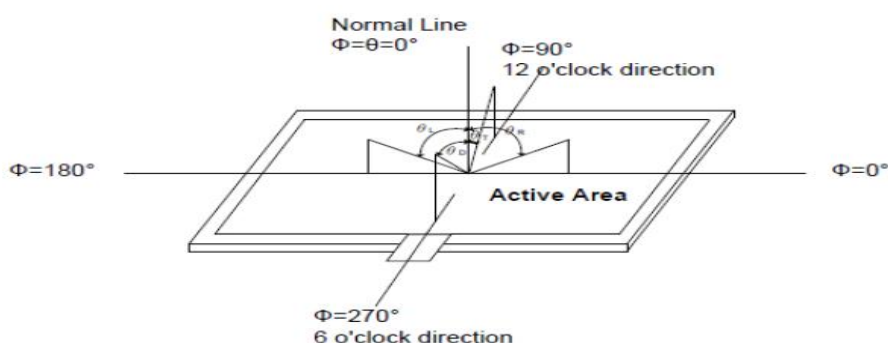
## 4.5 Electro-Optical Characteristics

| Item                                 | Symbol      | Condition                                | Min.    | Typ.    | Max.    | Unit    | Note  |
|--------------------------------------|-------------|--|---------|---------|---------|---------|---|
| Transmittance<br>(with Polarizer)    | T (%)       | $\Theta=0$<br>Normal<br>viewing<br>angle | —       | (4.63)  | —       | %       | Measuring with<br>Polarizer ,<br>Reference Only           |
| Transmittance<br>(without Polarizer) | T (%)       |  | —       | (17.5)  | —       | %       |   |
| Contrast Ratio                       | CR          |  | 600     | 800     | —       | —       | (1)(2)  |
| Response Time                        | $T_R + T_F$ |  | —       | 30      | 40      | msec    | (1)(3)  |
| Color gamut                          | (%)         |  | —       | 60      | —       | %       | C-light   |
| Color<br>chromaticity<br>(CIE1931)   | White       |  | $W_x$   | (0.288) | (0.308) | (0.328) | —   |
|                                      |             | $W_y$                                    | (0.310) | (0.330) | (0.350) | —       |   |
|                                      | Red         | $R_x$                                    | (0.621) | (0.641) | (0.661) | —       |   |
|                                      |             | $R_y$                                    | (0.317) | (0.337) | (0.357) | —       |   |
|                                      | Green       | $G_x$                                    | (0.254) | (0.274) | (0.294) | —       |   |
|                                      |             | $G_y$                                    | (0.540) | (0.560) | (0.580) | —       |   |
| Blue                                 | $B_x$       | (0.121)                                  | (0.141) | (0.161) | —       |         |   |
|                                      | $B_y$       | (0.093)                                  | (0.113) | (0.133) | —       |         |   |
| Viewing angle                        | Hor.        | $\Theta_L$                               | —       | 80      | —       | —       | (1)(4)<br>Measuring with<br>Polarizer ,<br>Reference Only |
|                                      |             | $\Theta_R$                               | —       | 80      | —       |         |   |
|                                      | Ver.        | $\Theta_U$                               | —       | 80      | —       |         |   |
|                                      |             | $\Theta_D$                               | —       | 80      | —       |         |   |
| Optima View Direction                | Free        |  |         |         |         |         | (5)   |

Note : Color chromaticity is for LCD only.

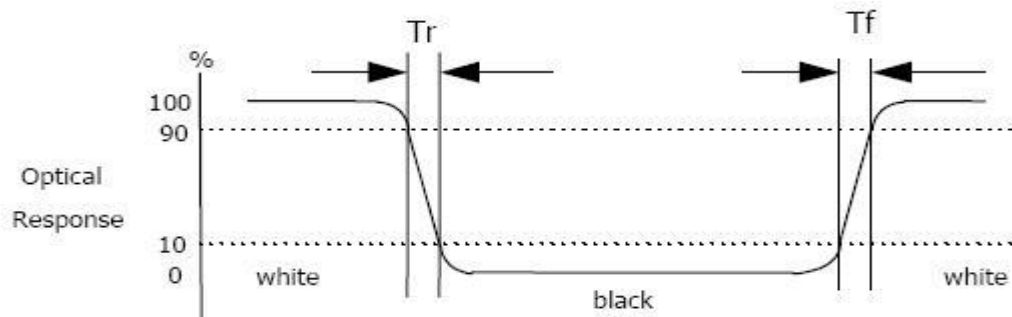
## 5. Measurement system

### 5.1 LCM Viewing Angle



Viewing angle is the angle at which 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

## 5.2 Response time



Response time is the time required for the display to transition from white to black (Rising time, Tr) and from black to white (Falling time, Tf) for additional information.

## 5.3 Contrast Ratio (CR)

Contrast Ratio (CR) is defined mathematically as:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white.



## 6. Reliability Test Items

| Test Item                  | Test Condition   | Test result determinant gist  |
|----------------------------|--|---|
| High temperature storage   | $80\pm 3^{\circ}\text{C}$ , 48H;   | Inspection after 2~4hours storage at room temperature,<br>the sample shall be free from defects:<br><br>1. Air bubble in the LCD;<br><br>2. Non-display;<br><br>3. Glass crack;<br><br>4. The electrical characteristics requirements shall be satisfied. |
| Low temperature storage    | $-30\pm 3^{\circ}\text{C}$ , 48H;  |   |
| High temperature operation | $70\pm 3^{\circ}\text{C}$ , 48H;   |   |
| Low temperature operation  | $-20\pm 3^{\circ}\text{C}$ , 48H;  |   |
| High temperature /humidity | $60^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , $90\% \pm 3\% \text{RH}$ , 48H;                                     |   |
| Thermal Shock              | $-20^{\circ}\text{C}/0.5\text{h} \sim +70^{\circ}\text{C}/0.5\text{h}$<br>for a total 24 cycles;                 |   |
| Vibration Test             | Frequency 10Hz~55Hz~10Hz<br>Amplitude: 1.5mm, X, Y, Z<br>direction for total 1H;<br>(Packing condition)          |   |
| ESD test                   | $\pm 4\text{KV}$ , Human Body Mode,<br>150pF/330 $\Omega$ ;<br>$\pm 8\text{KV}$ , Air Mode, 150pF/330 $\Omega$ ; |   |

**Remark:**

1. The test samples should be applied to only one test item.
2. Sample size for each test item is 2pcs.
3. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

**7. Suggestions for using LCD modules**

- 7.1 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.
- 7.2 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.
- 7.3 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).
- 7.4 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.
- 7.5 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 alcoholDo not scrub hard to avoid damaging the display surface.
- 7.6 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. 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.

7.8 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.

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

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

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

7.12 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.

7.13 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.

## 8.Storage Method

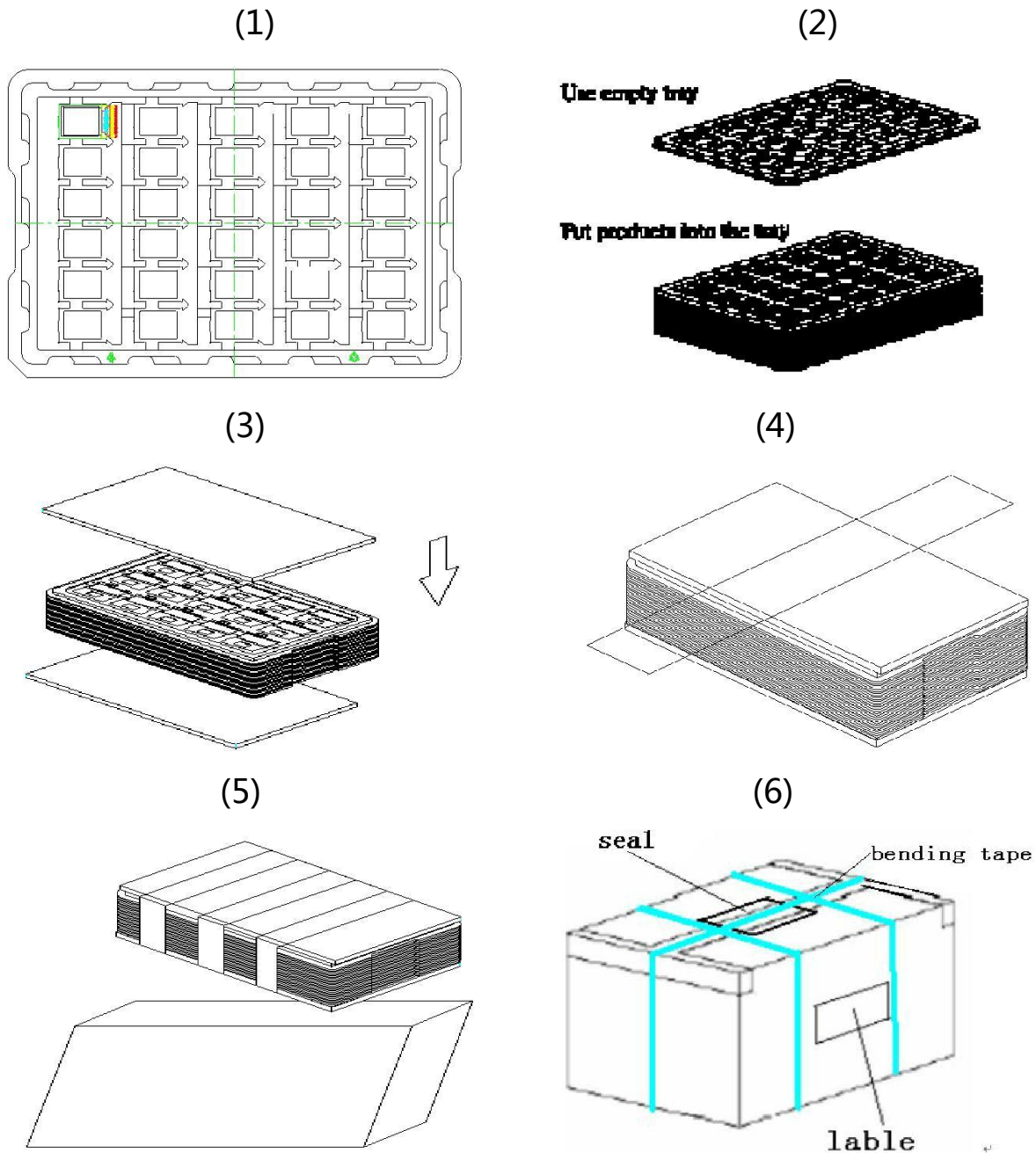
8.2.1.Store in an ambient temperature of  $23\text{ }^{\circ}\text{C}\pm 5\text{ }^{\circ}\text{C}$ , and in a relative humidity of  $55\%\pm 15\%$ . Don't exceed 12 months and expose to sunlight or fluorescent light.

8.2.2.Store in a clean environment, free from dust, active gas, and solvent.

8.2.3 LCM module is stored in warehouse, Store in antistatic container, There may be air bubbles between the protective film on the surface of polarizer and polarizer。 It can only be found under LED light, Before production, IQC should be inspected directly by LED light, If residual traces are found, alcohol should be used to wipe them。

## 9.Packing and Storage Specification(Reference Only)

### 9.1 Packing Method



1. Put module into tray cavity.
2. Tray stacking.
3. Put 1 foam under the tray stack and 1 foam above.
4. Fix the cardboard to the tray stack with adhesive tape.
5. Put the tray stack into carton.
6. Carton sealing with adhesive tape.