

# SPECIFICATION FOR TFT LCD MODULE

## TFT 模组规格书

|                           |                 |
|---------------------------|-----------------|
| Part NO.<br>产品型号          | SJ-QV28-0548-A0 |
| SIZE<br>尺寸(英寸)            | 2.8             |
| Customer<br>客户名称          |                 |
| Customer Part NO.<br>客户型号 |                 |
| Date<br>日期                | 2019-11-1       |

SCJ Approval

双创嘉确认

|                   |                  |                   |
|-------------------|------------------|-------------------|
| Designed by<br>设计 | Checked by<br>审核 | Approved by<br>确认 |
|                   |                  | 周冬华               |

Customer Approval

客户确认

|                   |                                                           |                   |
|-------------------|-----------------------------------------------------------|-------------------|
| Designed by<br>核准 | Checked by<br>审核                                          | Approved by<br>确认 |
|                   |                                                           |                   |
| 备注<br>Note        | <input type="checkbox"/> Approve Specification Only       |                   |
|                   | <input type="checkbox"/> Approve Specification and Sample |                   |

Table OF Contents

目录

| No.<br>序号 | Item<br>项目                       | Page<br>页 |
|-----------|----------------------------------|-----------|
|           | Cover                            | 1         |
|           | Table OF Contents                | 2         |
|           | Records Of Revision              | 3         |
| 1         | Introduction                     | 4         |
| 2         | General specification            | 5         |
| 3         | Absolute maximum ratings         | 5         |
| 4         | Electrical characteristics       | 5         |
| 5         | Optical characteristics          | 6         |
| 6         | Power ON/OFF Sequence            | 8         |
| 7         | Serial Interface Characteristics | 9         |
| 8         | Pin Assignment                   | 12        |
| 9         | Mechanical drawing               | 13        |
|           |                                  |           |
|           |                                  |           |
|           |                                  |           |
|           |                                  |           |
|           |                                  |           |
|           |                                  |           |
|           |                                  |           |
|           |                                  |           |
|           |                                  |           |
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Records Of Revision

更改记录

| NO.<br>序号 | Version<br>版本 | Description<br>描述 | Date<br>日期 | Note<br>备注 |
|-----------|---------------|-------------------|------------|------------|
| 1         | A             | Original          | 2019-11-1  |            |
| 2         |               |                   |            |            |
| 3         |               |                   |            |            |
| 4         |               |                   |            |            |
| 5         |               |                   |            |            |
| 6         |               |                   |            |            |
| 7         |               |                   |            |            |
| 8         |               |                   |            |            |
| 9         |               |                   |            |            |
| 10        |               |                   |            |            |

## 1. Introduction

### 1.1 Scope of application

This specification applies to the Negative type TFT transmissive dot matrix LCD module that is supplied by SHENZHEN SHENGJI PHOTOELECTRIC. CO., LTD.

This LCD module should be designed for mobile phone use. LCD specification: 6:00, Dots 240xRGBx320. As to basic specification of the driver IC, refer to the IC (GC9306) specification and datasheet.

This specification applies to the Negative type TFT transmissive dot matrix LCD module that is supplied by SHENZHEN SHENGJI PHOTOELECTRIC. CO., LTD.

### 1.2 Structure:

Double display structure:

TFT Module + FPC + BL

FULL 262k Color 2.4 inch TFT LCD size for main LCD;

One bare chip with gold bump (COG) TECH;

### 1.3 TFT features:

Structure: TFT PANNEL+IC+FPC;

Transmissive Type LCD

240 dot-source and 320 dot-gate outputs;

262k Color;

White LED back light;

### 1.4 Applications:

Mobile; phone; Mp4.

### 1.5 This module uses ROHS material

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SHENZHEN SHUANGCHUANGJIA TECHNOLOGY CO., LTD

## 2. General Specification

| No. | ITEM               | Standard value             | UNIT |
|-----|--------------------|----------------------------|------|
| 1   | LCD size           | 2.8                        | Inch |
| 2   | Number of Dots     | 240*(RGB)*320              | Dots |
| 3   | Display Area       | 43.2(W)*57.6(H)            | mm   |
| 4   | Module Size(W*H*T) | 50(W)*69.26(H)*2.2(T)      | mm   |
| 5   | LCD Type           | TFT Negative Transmissive  | /    |
| 6   | Driver element     | a-Si TFT Active matrix     | /    |
| 7   | Pixel Arrangement  | RGB Vertical Stripe        | /    |
| 8   | Pixel Pitch (W*H)  | 0.18(H)*0.18(V)um          | um   |
| 9   | Viewing Direction  | 12 o'clock(Gray inversion) | /    |
| 10  | Driver IC          | GC9306                     | /    |
| 11  | Interface          | 16-bit Parallel Interface  | /    |
| 12  | Back Light         | White LED                  |      |
| 13  | Touch Panel Type   | /                          |      |
| 14  | Approx. Weight     | /                          | g    |

## 3. Absolute Maximum Ratings

| Parameter                | Symbol | Min  | Max | Unit |
|--------------------------|--------|------|-----|------|
| Supply voltage for logic | VDD    | -0.3 | 4.6 | 70   |
| Input voltage for logic  | VIN    | -0.3 | 4.6 | 80   |
| Supply current (One LED) | ILED   | /    | 30  | 3.3  |
| Operating temperature    | TOP    | -20  | 70  | 3.3  |
| Storage temperature      | TST    | -30  | 80  | 0.1  |

## 4. Elecctrical Characteristics

| Item                        | Symbol | Min     | Typ  | Max     | Unit | Applicable terminal |
|-----------------------------|--------|---------|------|---------|------|---------------------|
| Supply voltage for logic    | VDD    | 2.4     | 2.75 | 3.3     | V    | Operating voltage   |
| Interface Operation Voltage | VDDI   | 1.65    | 1.8  | 3.3     | V    | I/O Supply Voltage  |
| Logic-Low Input Voltage     | VIL    | VSS     | -    | 0.3VDDI | V    |                     |
| Logic-High Input Voltage    | VIH    | 0.7VDDI | -    | VDDI    | V    |                     |
| Input leakage current       | IIL    | -0.1    | -    | 0.1     | μA   |                     |
| LED Forward voltage         | Vf     | 2.8     | 3.0  | 3.3     | V    | --                  |

|                         |      |   |    |   |    |    |
|-------------------------|------|---|----|---|----|----|
| Input backlight current | ILED | - | 80 | - | mA | -- |
|-------------------------|------|---|----|---|----|----|

## 5. Optical Characteristics

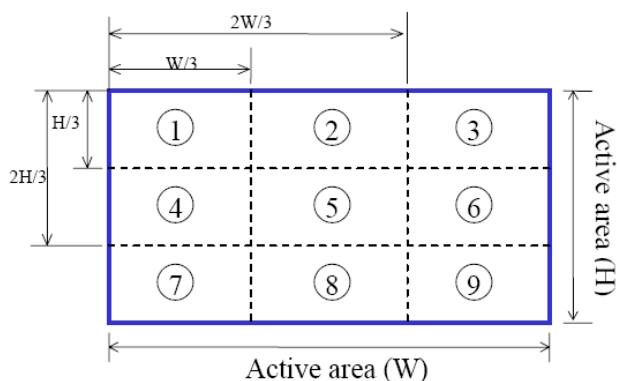
| ITEM                                                                      |            | SYMBOL      | CONDITIONS           | SPECIFICATIONS |       |       | UNIT  | NOTE   |
|---------------------------------------------------------------------------|------------|-------------|----------------------|----------------|-------|-------|-------|--------|
|                                                                           |            |             |                      | MIN.           | TYP.  | MAX   |       |        |
| Brightness                                                                |            | B           |                      | --             | 200   | --    | cd/m2 | Note 1 |
| Uniformity                                                                |            | Un          |                      | 80             | 85    |       | %     | Note 2 |
| Response Time(By Quick)                                                   |            | Tr+Tf       | $\theta = 0^{\circ}$ | -              | 25    | 40    | ms    | Note 5 |
| Contrast Ratio                                                            |            | CR          | $\theta = 0^{\circ}$ | 350            | 500   | --    | --    | Note 4 |
| Viewing Angle                                                             | Horizontal | $\theta 3$  | CR>=10               | 40             | 45    | --    | Deg.  | Note 3 |
|                                                                           |            | $\theta 9$  | CR>=10               | 40             | 45    | --    |       |        |
|                                                                           | Vertical   | $\theta 12$ | CR>=10               | 45             | 50    | --    |       |        |
|                                                                           |            | $\theta 6$  | CR>=10               | 15             | 20    |       |       |        |
| Color chromaticity ( CF only with ITO, light source is C light, CIE 1931) | White      | Wx          | $\theta = 0^{\circ}$ | 0.284          | 0.299 | 0.314 |       | Note 4 |
|                                                                           |            | Wy          |                      | 0.318          | 0.333 | 0.348 |       |        |
|                                                                           | Red        | Rx          |                      | 0.611          | 0.626 | 0.641 |       |        |
|                                                                           |            | Ry          |                      | 0.317          | 0.332 | 0.347 |       |        |
|                                                                           | Green      | Gx          |                      | 0.267          | 0.282 | 0.297 |       |        |
|                                                                           |            | Gy          |                      | 0.574          | 0.589 | 0.604 |       |        |
|                                                                           | Blue       | Bx          |                      | 0.122          | 0.137 | 0.152 |       |        |
|                                                                           |            | By          |                      | 0.134          | 0.149 | 0.164 |       |        |
| NTSC                                                                      |            |             |                      | 55             | 60    |       | %     | Note 5 |

Note 1: Test condition is:

- (1) Center point on active area.
- (2) Best Contrast.

Note 2: Uniform measure condition:

- (1) Measure 9 point. Measure location show below;
- (2) Uniform = (Min. brightness / Max. brightness) \* 100%
- (3) Best Contrast.



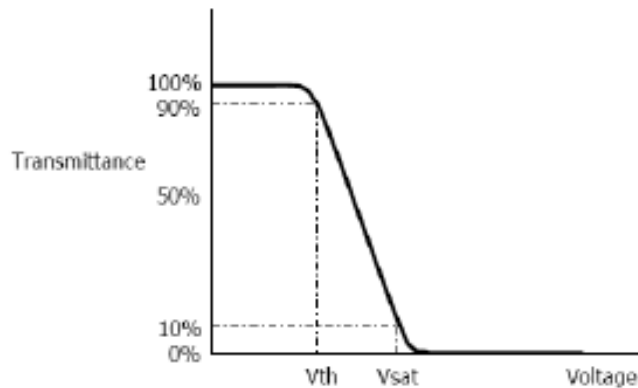
Note:

3. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o' clock direction and the vertical or 6, 12 o' clock direction with respect to the optical axis which is normal to the LCD surface (see FIG. 2).
4. Contrast measurements shall be made at viewing angle of  $\theta = 0$  and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIG. 2) Luminance Contrast Ratio (CR) is defined mathematically.

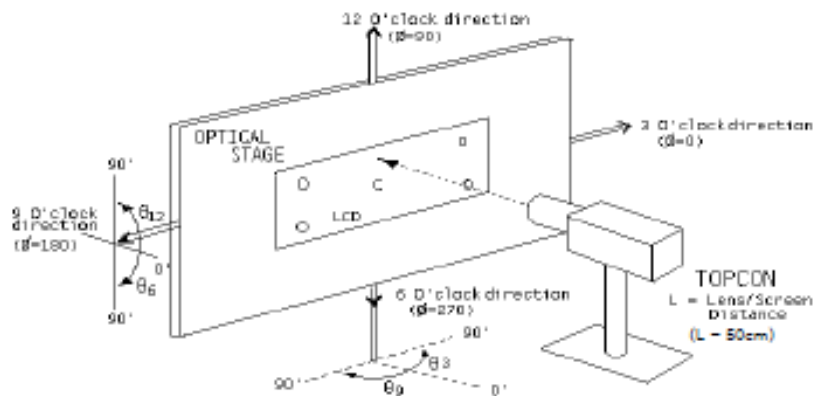
$$\text{Contrast ratio (CR)} = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

5. The electro-optical response time measurements shall be made as FIG.3 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is  $T_f$  and 90% to 10% is  $T_r$ .

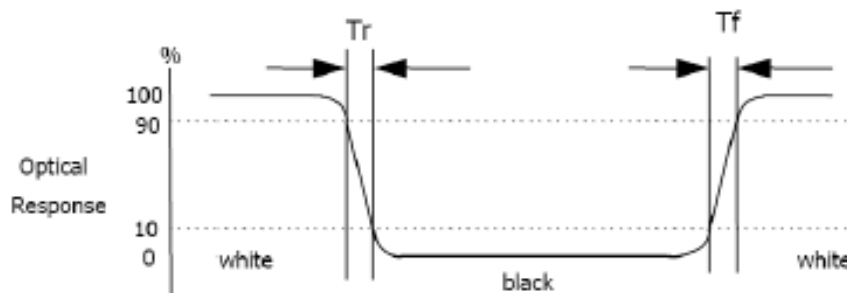
**Figure 1. The definition of  $V_{th}$  &  $V_{sat}$**



**Figure 2. Measurement Set Up**



**Figure 3. Response Time Testing**



## 6. Power ON/OFF Sequence

VDDI and VDD can be applied in any order.

VDD and VDDI can be power down in any order.

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During power off, if LCD is in the Sleep Out mode, VDD and VDDI must be powered down minimum 120msec

after RESX has been released.

During power off, if LCD is in the Sleep In mode, VDDI or VDD can be powered down minimum 0msec after

RESX has been released.

CSX can be applied at any timing or can be permanently grounded. RESX has priority over CSX.

Note 1: There will be no damage to the display module if the power sequences are not met.

Note 2: There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.

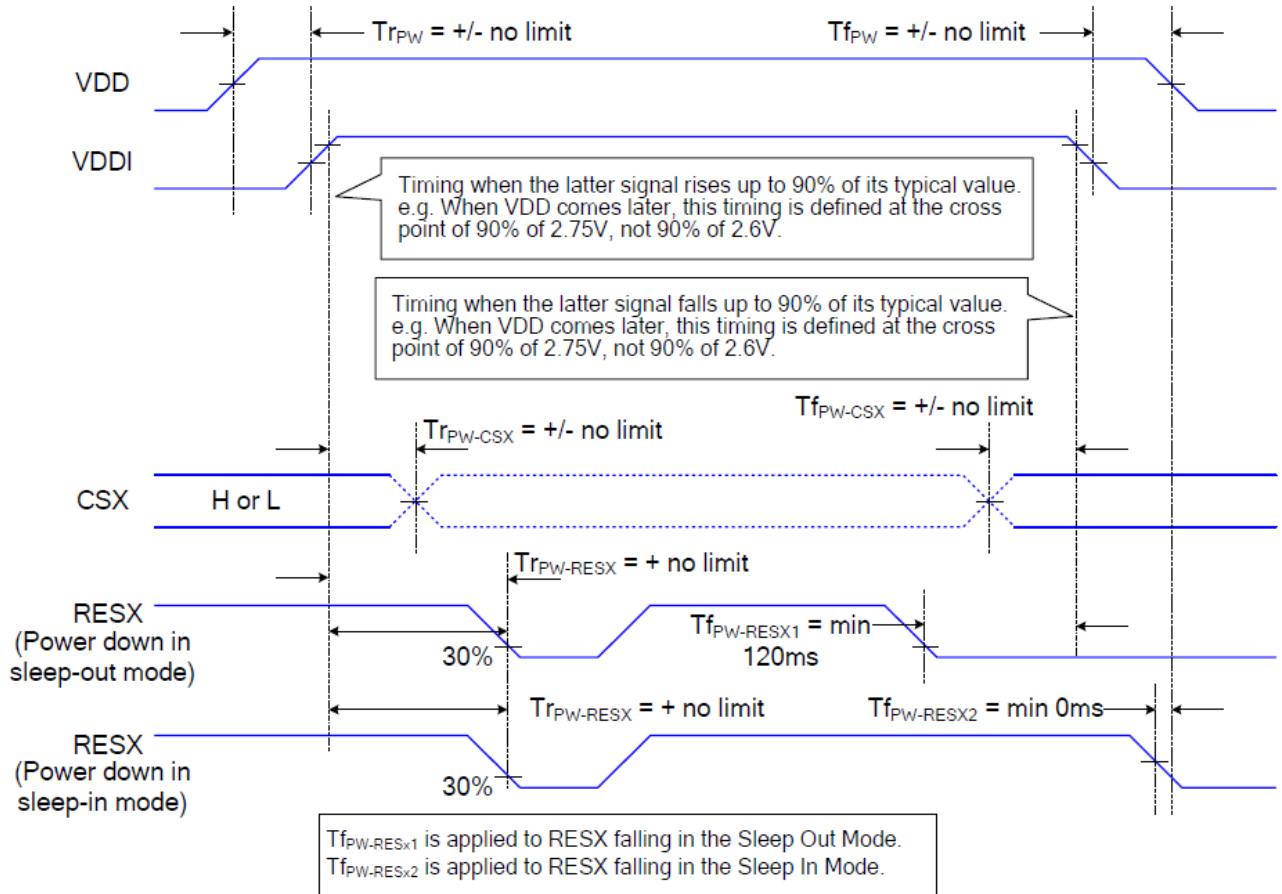
Note 3: There will be no abnormal visible effects on the display between end of Power On Sequence and before receiving Sleep Out

command. Also between receiving Sleep In command and Power Off Sequence.

Note 4: If RESX line is not held stable by host during Power On Sequence as defined in the sequence below, then it will be necessary to

apply a Hardware Reset (RESX) after Host Power On Sequence is complete to ensure correct operation. Otherwise function is not guaranteed.

## 6.1The power on/off sequence is illustrated below



## 6.2 Uncontrolled Power Off

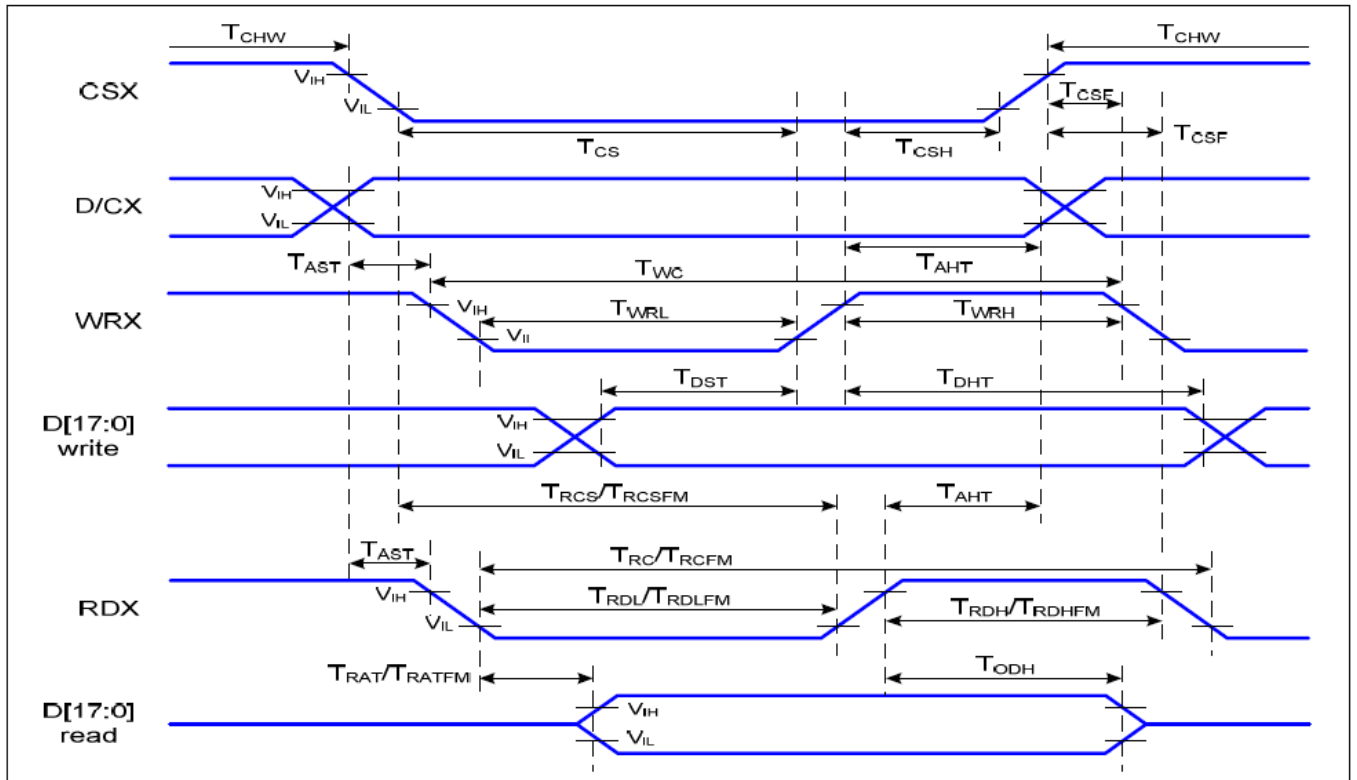
The uncontrolled power-off means a situation which removed a battery without the controlled power off

sequence. It will neither damage the module or the host interface.

If uncontrolled power-off happened, the display will go blank and there will not any visible effect on the

display (blank display) and remains blank until “Power On Sequence” powers it up.

## 7. 8080 Series MCU Parallel Interface Characteristics: 18/16/9/8-bit Bus:



**Figure 1 Parallel Interface Timing Characteristics (8080-Series MCU Interface)**

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 to 70 °C

| Signal | Symbol             | Parameter                          | Min | Max | Unit | Description |
|--------|--------------------|------------------------------------|-----|-----|------|-------------|
| D/CX   | T <sub>AST</sub>   | Address setup time                 | 0   |     | ns   |             |
|        | T <sub>AHT</sub>   | Address hold time (Write/Read)     | 10  |     | ns   |             |
| CSX    | T <sub>CHW</sub>   | Chip select "H" pulse width        | 0   |     | ns   |             |
|        | T <sub>Cs</sub>    | Chip select setup time (Write)     | 15  |     | ns   |             |
|        | T <sub>RCS</sub>   | Chip select setup time (Read ID)   | 45  |     | ns   |             |
|        | T <sub>RCSFM</sub> | Chip select setup time (Read FM)   | 355 |     | ns   |             |
|        | T <sub>CsF</sub>   | Chip select wait time (Write/Read) | 10  |     | ns   |             |
|        | T <sub>CsH</sub>   | Chip select hold time              | 10  |     | ns   |             |
| WRX    | T <sub>WC</sub>    | Write cycle                        | 66  |     | ns   |             |
|        | T <sub>WRH</sub>   | Control pulse "H" duration         | 15  |     | ns   |             |
|        | T <sub>WRL</sub>   | Control pulse "L" duration         | 15  |     | ns   |             |

|          |                    |                                 |     |     |    |                             |
|----------|--------------------|---------------------------------|-----|-----|----|-----------------------------|
| RDX (ID) | TRC                | Read cycle (ID)                 | 160 |     | ns | -read command & data ram    |
|          | TRDH               | Control pulse "H" duration (ID) | 90  |     | ns |                             |
|          | TRDL               | Control pulse "L" duration (ID) | 45  |     | ns |                             |
| RDX (FM) | TRCFM              | Read cycle (FM)                 | 450 |     | ns | When read ID data           |
|          | TRCFM              | Control pulse "H" duration (FM) | 90  |     | ns |                             |
|          | TRDLFM             | Control pulse "L" duration (FM) | 355 |     | ns |                             |
| RDX (FM) | TRCFM              | Read cycle (FM)                 | 450 |     | ns | When read from frame memory |
|          | TRCFM              | Control pulse "H" duration (FM) | 90  |     | ns |                             |
|          | TRDLFM             | Control pulse "H" duration (FM) | 355 |     | ns |                             |
| D[17:0]  | T <sub>DST</sub>   | Data setup time                 | 10  |     | ns | For CL=30pF                 |
|          | T <sub>DHT</sub>   | Data hold time                  | 10  |     | ns |                             |
|          | T <sub>RAT</sub>   | Read access time (ID)           |     | 40  | ns |                             |
|          | T <sub>RATFM</sub> | Read access time (FM)           |     | 340 | ns |                             |
|          | T <sub>ODH</sub>   | Output disable time             | 20  | 80  | ns |                             |

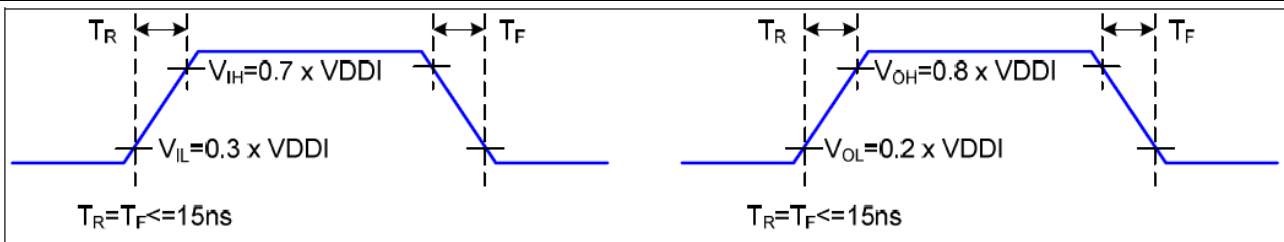


Figure 2 Rising and Falling Timing for I/O Signal

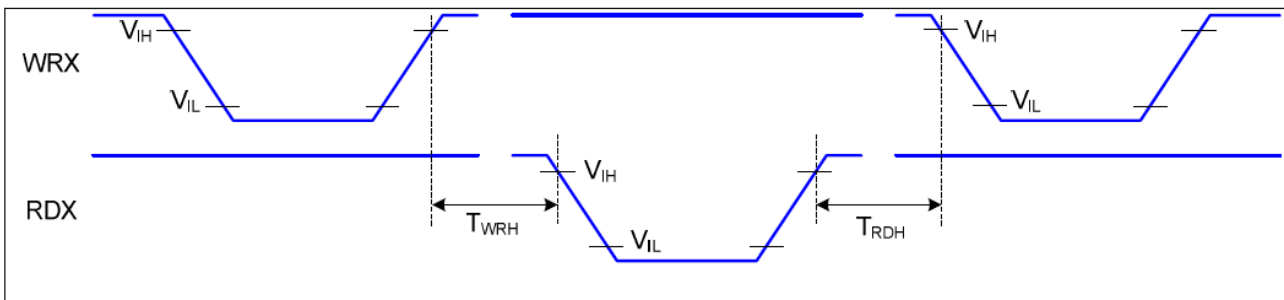


Figure 3 Write-to-Read and Read-to-Write Timing

## 8. MCU Interface Pin Function

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| NO. | SYMBOL | Description                                                                                                    | I/O |
|-----|--------|----------------------------------------------------------------------------------------------------------------|-----|
| 1   | VCC    | Power Supply for Analog, Digital System and Booster Circuit.                                                   | I   |
| 2   | GND    | System Ground                                                                                                  | I   |
| 3   | BL_A   | Anode of Backlight (2.8V-3.2V Typical:3 V)                                                                     | I   |
| 4   | /RESET | This signal will reset the device and it must be applied to properly initialize the chip.Signal is active low. | I   |
| 5   | /CS    | Chip selection pin. (Low enable.; High disable.)                                                               | I   |
| 6   | RS     | Display data/command selection pin in parallel interface.                                                      | I   |
| 7   | WR     | Write enable in MCU parallel interface.                                                                        | I   |
| 8   | RD     | Read enable in 8080 MCU parallel interface.                                                                    | I   |
| 9   | DB0    | Data bus.NO. 0                                                                                                 | I/O |
| 10  | DB1    | Data bus.NO. 1                                                                                                 | I/O |
| 11  | DB2    | Data bus. NO. 2                                                                                                | I/O |
| 12  | DB3    | Data bus.NO. 3                                                                                                 | I/O |
| 13  | DB4    | Data bus.NO. 4                                                                                                 | I/O |
| 14  | DB5    | Data bus.NO. 5                                                                                                 | I/O |
| 15  | DB6    | Data bus. NO. 6                                                                                                | I/O |
| 16  | DB7    | Data bus. NO. 7                                                                                                | I/O |
| 17  | DB8    | Data bus.NO. 8                                                                                                 | I/O |
| 18  | DB9    | Data bus. NO. 9                                                                                                | I/O |
| 19  | DB10   | Data bus. NO. 10                                                                                               | I/O |
| 20  | DB11   | Data bus. NO. 11                                                                                               | I/O |
| 21  | DB12   | Data bus.NO. 12                                                                                                | I/O |
| 22  | DB13   | Data bus. NO. 13                                                                                               | I/O |
| 23  | DB14   | Data bus. NO. 14                                                                                               | I/O |

|    |      |                 |     |
|----|------|-----------------|-----|
| 24 | DB15 | Data bus.N0. 15 | I/O |
|----|------|-----------------|-----|

## 9. Mechanical drawing

Technical drawing of the LCM module showing top, side, and detail views with dimensions and labels.

**Top View Dimensions:**

- Overall width: 49.9 ± 0.15
- Overall height: 57.6 (LCD A.A.)
- Internal width: 44.6 (LCD A.A.)
- Internal height: 56.26 ± 0.15
- Top edge width: 2.4 ± 0.05
- Right edge width: 3.35
- Bottom edge width: 10.29
- Bottom edge width: 27.24
- Bottom edge width: 14.5 ± 0.3
- Bottom edge width: 9.09 ± 0.3
- Bottom edge width: 31.72
- Bottom edge width: 12.5
- Bottom edge width: 2.1
- Bottom edge width: 0.3 ± 0.03mm (加强板)

**Side View Dimensions:**

- Overall height: 24.0 ± 0.35
- Overall height: 23.40 ± 0.3
- Overall height: 0.5 ± 0.23 = 11.50
- Overall height: 3.00 ± 0.3

**Detail View Dimensions:**

- Overall width: 2.4 ± 0.05
- Overall height: 3.35
- Overall width: 49.9 ± 0.15
- Overall height: 57.6 (LCD A.A.)
- Internal width: 44.6 (LCD A.A.)
- Internal height: 56.26 ± 0.15
- Top edge width: 2.4 ± 0.05
- Right edge width: 3.35
- Bottom edge width: 10.29
- Bottom edge width: 27.24
- Bottom edge width: 14.5 ± 0.3
- Bottom edge width: 9.09 ± 0.3
- Bottom edge width: 31.72
- Bottom edge width: 12.5
- Bottom edge width: 2.1
- Bottom edge width: 0.3 ± 0.03mm (加强板)

**Labels:**

- CTC2.8
- 加强板 (0.3 ± 0.03mm)
- A-A
- BL\_A
- GND

投料要求:

1. 投料日期: 2000.1.1
2. 投料数量: 3.3mm
3. 投料温度: 20°C ~ 25°C
4. 投料湿度: 20% ~ 80%
5. 投料时间: 2000.1.1 ~ 2000.1.31
6. 投料地点: 2000.1.1 ~ 2000.1.31
7. 投料人员: 2000.1.1 ~ 2000.1.31
8. 投料设备: 2000.1.1 ~ 2000.1.31
9. 投料材料: 2000.1.1 ~ 2000.1.31
10. 投料工艺: 2000.1.1 ~ 2000.1.31
11. 投料质量: 2000.1.1 ~ 2000.1.31
12. 投料安全: 2000.1.1 ~ 2000.1.31
13. 投料环保: 2000.1.1 ~ 2000.1.31
14. 投料节能: 2000.1.1 ~ 2000.1.31
15. 投料创新: 2000.1.1 ~ 2000.1.31
16. 投料合作: 2000.1.1 ~ 2000.1.31
17. 投料共赢: 2000.1.1 ~ 2000.1.31
18. 投料和谐: 2000.1.1 ~ 2000.1.31
19. 投料文明: 2000.1.1 ~ 2000.1.31
20. 投料进步: 2000.1.1 ~ 2000.1.31
21. 投料发展: 2000.1.1 ~ 2000.1.31
22. 投料繁荣: 2000.1.1 ~ 2000.1.31
23. 投料富强: 2000.1.1 ~ 2000.1.31
24. 投料民主: 2000.1.1 ~ 2000.1.31
25. 投料法治: 2000.1.1 ~ 2000.1.31
26. 投料自由: 2000.1.1 ~ 2000.1.31
27. 投料平等: 2000.1.1 ~ 2000.1.31
28. 投料博爱: 2000.1.1 ~ 2000.1.31
29. 投料敬业: 2000.1.1 ~ 2000.1.31
30. 投料诚信: 2000.1.1 ~ 2000.1.31
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34. 投料进步: 2000.1.1 ~ 2000.1.31
35. 投料发展: 2000.1.1 ~ 2000.1.31
36. 投料繁荣: 2000.1.1 ~ 2000.1.31
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44. 投料诚信: 2000.1.1 ~ 2000.1.31
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46. 投料和谐: 2000.1.1 ~ 2000.1.31
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49. 投料发展: 2000.1.1 ~ 2000.1.31
50. 投料繁荣: 2000.1.1 ~ 2000.1.31
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64. 投料繁荣: 2000.1.1 ~ 2000.1.31
65. 投料富强: 2000.1.1 ~ 2000.1.31
66. 投料民主: 2000.1.1 ~ 2000.1.31
67. 投料法治: 2000.1.1 ~ 2000.1.31
68. 投料自由: 2000.1.1 ~ 2000.1.31
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