



# 曜凌光電股份有限公司

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## RFJ240L-AYW-DNN

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### SPECIFICATION

CUSTOMER:

|             |  |
|-------------|--|
| APPROVED BY |  |
| PCB VERSION |  |
| DATE        |  |

FOR CUSTOMER USE ONLY

| SALES BY | APPROVED BY | CHECKED BY | PREPARED BY |
|----------|-------------|------------|-------------|
|          |             |            |             |

Release DATE:

TFT Display Inspection Specification: <https://www.raystar-optronics.com/download/products.htm>

Precaution in use of TFT module: <https://www.raystar-optronics.com/download/declaration.htm>

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## Revision History

| VERSION | DATE       | REVISED PAGE NO. | Note                                                                 |
|---------|------------|------------------|----------------------------------------------------------------------|
| 0       | 2018/09/30 |                  | First issue                                                          |
| A       | 2018/11/15 |                  | Correct summary &<br>LCD Type.                                       |
| B       | 2020/02/13 |                  | Modify Interface                                                     |
| C       | 2020/06/02 |                  | Modify<br>Pin39=SDA;Pin40=NC<br>Add Power sequence<br>& Initial Code |

# Contents

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13.Reliability

14.Initial Code For Reference

15.Other

# 1.Module Classification Information

|          |          |          |           |           |          |          |          |          |          |          |          |          |
|----------|----------|----------|-----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>R</b> | <b>F</b> | <b>J</b> | <b>24</b> | <b>0L</b> | <b>-</b> | <b>A</b> | <b>Y</b> | <b>W</b> | <b>-</b> | <b>D</b> | <b>N</b> | <b>N</b> |
| 1        | 2        | 3        | 4         | 5         | -        | 6        | 7        | 8        | -        | 9        | 10       | 11       |

| Item | Description                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                        |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1    | R : Raystar Optonics Inc.                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                        |
| 2    | Display Type : F→TFT Type, J→ Custom TFT                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                        |
| 3    | Solution: A: 128x160    B:320x234    C:320x240    D:480x234    E:480x272<br>F:800x480    G:640x480    H:1024x600    I:320x480    J:240x320<br>K:1280x800    L:240x400    M:1024x768    N:128x128    O:480x800<br>P:640x320    Q:800x600    S:480x128    T:800x320 |                                                                                                                                                                                                                                                                                                                                                                        |
| 4    | Display Size : 2.4" TFT                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                        |
| 5    | Version Code.                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                        |
| 6    | Model Type:<br>A : TFT LCD<br>E : TFT+FR+CONTROL BOARD<br>J : TFT+FR+A/D BOARD<br>N : TFT+FR+A/D BOARD+CONTROL BOARD<br>S : TFT+FR+POWER BOARD (DC TO DC)<br>1 : TFT+CONTROL BOARD                                                                                | 6 : TFT+FR<br>H : TFT+D/V BOARD<br>I : TFT+FR+D/V BOARD<br>B : TFT+POWER BD                                                                                                                                                                                                                                                                                            |
| 7    | Polarizer<br>Type,<br>Temperature<br>range,<br>View direction                                                                                                                                                                                                     | I→Transmissive, W. T, 6:00 ;    C→Transmissive, N. T, 6:00<br>L→Transmissive, W.T,12:00 ;    F→Transmissive, N.T,12:00<br>Y→Transmissive,W.T, IPS TFT ;<br>A→Transmissive, N.T, IPS TFT<br>Z→Transmissive, W.T, O-TFT<br>R→Transmissive, Super W.T, O-TFT<br>N→Transmissive, Super W.T, 6:00;<br>Q→Transmissive, Super W.T, 12:00<br>V→Transmissive, Super W.T, VA TFT |
| 8    | Backlight                                                                                                                                                                                                                                                         | W : LED, White                      H : LED, High Light White<br>F : CCFL, White                                                                                                                                                                                                                                                                                       |
| 9    | Driver Method                                                                                                                                                                                                                                                     | D: Digital    A: Analog    L : LVDS    M:MIPI                                                                                                                                                                                                                                                                                                                          |
| 10   | Interface                                                                                                                                                                                                                                                         | N : without control board    A : 8Bit    B : 16Bit<br>S:SPI Interface    R: RS232    U:USB    I: I2C                                                                                                                                                                                                                                                                   |
| 11   | TS                                                                                                                                                                                                                                                                | N : Without TS    S : resistive touch panel<br>C : capacitive touch panel capacitive touch panel (G-F-F)<br>G : capacitive touch panel(G-G)                                                                                                                                                                                                                            |

## 2.Summary

TFT 2.4" is a IPS TFT transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is composed of a TFT\_LCD module, It is usually designed for industrial application and this module follows RoHs.

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### 3.General Specifications

- Size: 2.4"
- Dot Matrix: 240 x RGB x 320(TFT) dots
- Module dimension: 42.72(W) x 60.26(H) x 2.8(D) mm
- Active area: 36.72 x 48.96 mm
- Dot pitch: 0.153 x 0.153 mm
- LCD type: TFT, Normally Black, Transmissive
- Controller IC: ILI9341V or equivalent
- Viewing angle: 80/80/80/80
- Aspect Ratio: Portrait
- Backlight Type: LED, Normally White
- With /Without TP: Without TP
- Surface: Glare

\*Color tone slight changed by temperature and driving voltage.

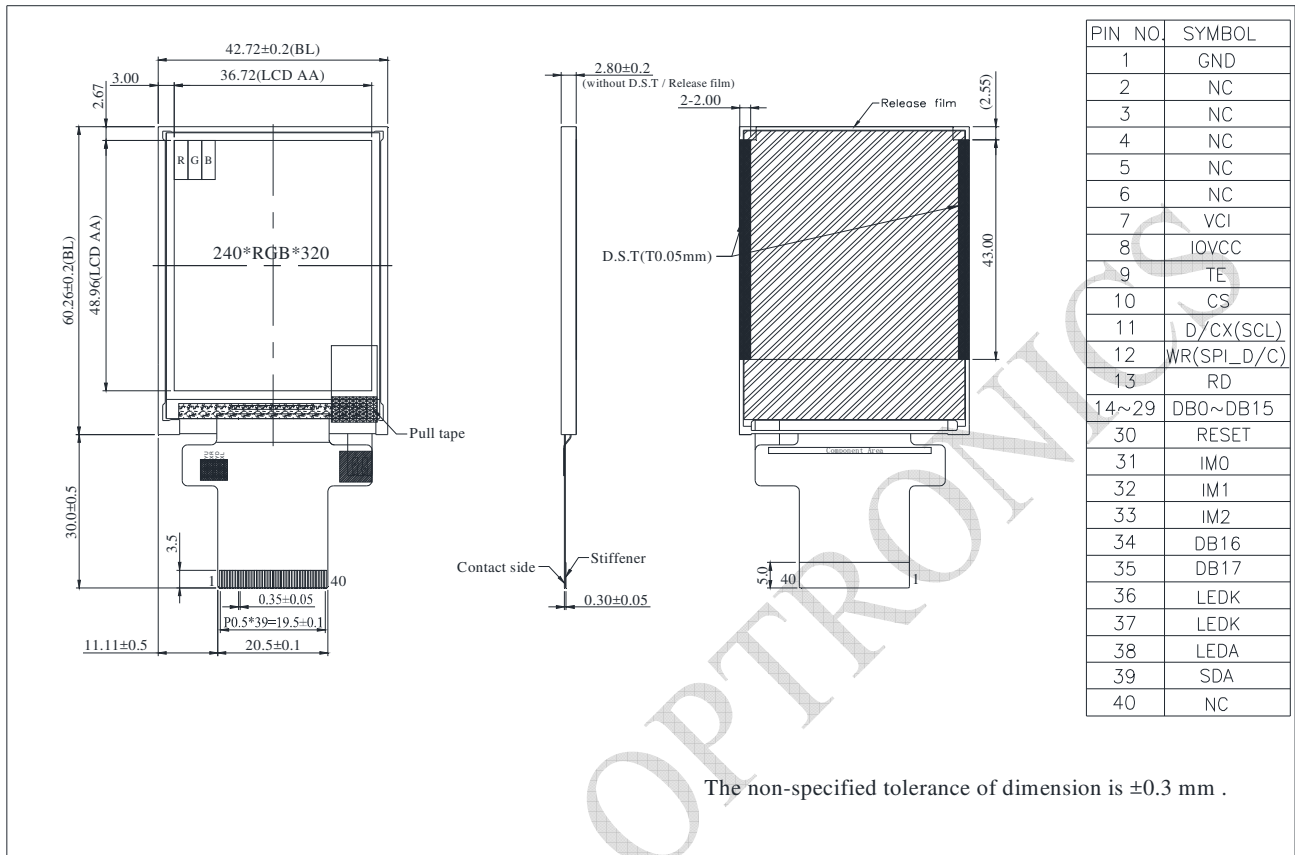
## 4.Interface

### 4.1. LCM PIN Definition

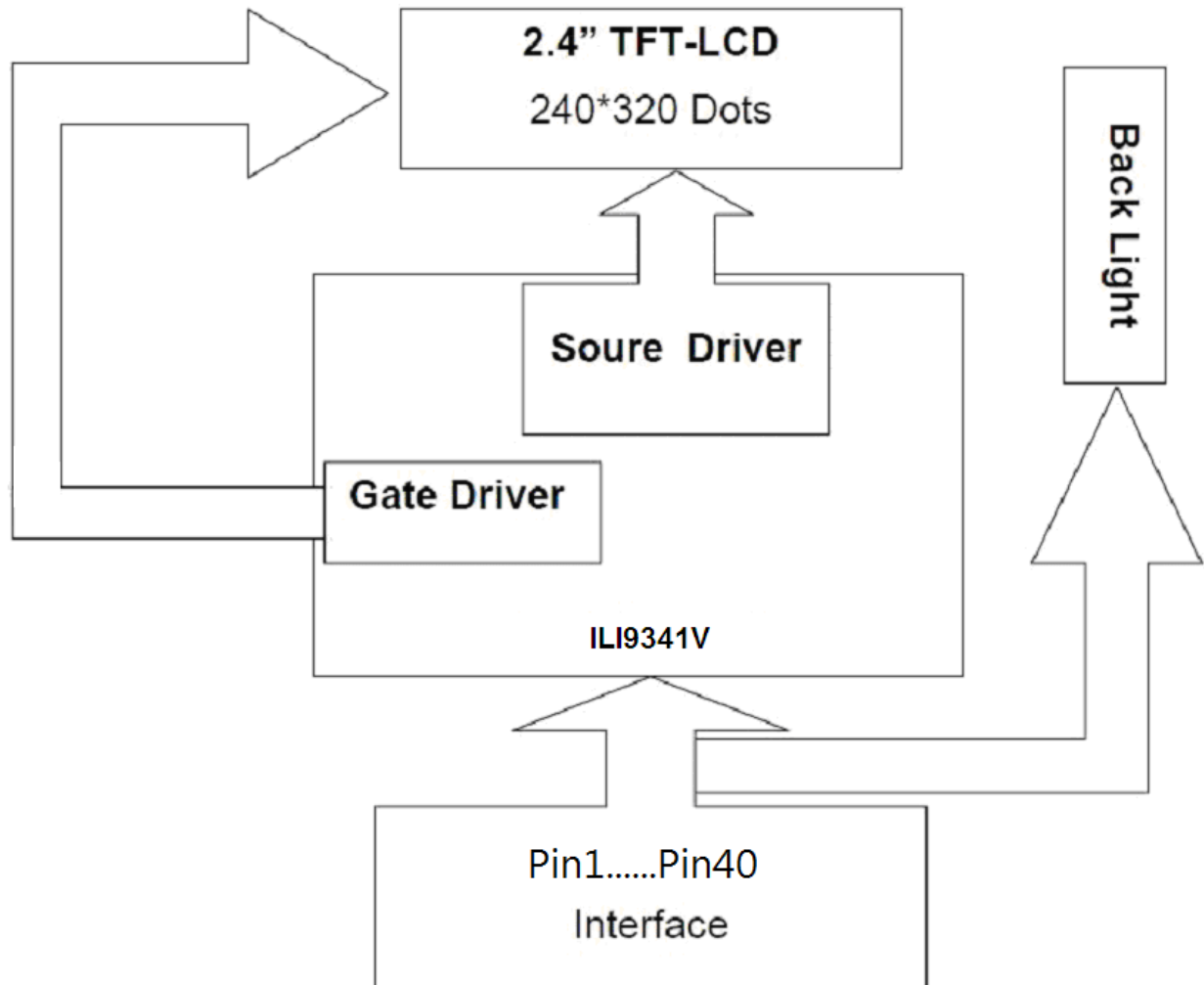
| NO    | Symbol      | Function                                                                                                                                                                                                                                                                                                                                  | I/O |
|-------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1     | GND         | Ground                                                                                                                                                                                                                                                                                                                                    | P   |
| 2-6   | NC          | No connection                                                                                                                                                                                                                                                                                                                             | -   |
| 7     | VCI         | High voltage power supply for analog circuit blocks<br>(2.5 ~ 3.3 V)                                                                                                                                                                                                                                                                      | P   |
| 8     | IOVCC       | Low voltage power supply for interface logic circuits<br>(2.5 ~ 3.3 V)                                                                                                                                                                                                                                                                    | P   |
| 9     | TE          | Tearing effect output pin to synchronize MPU to frame writing,<br>activated by S/W command. When this pin is not activated, this<br>pin is low.<br>If not used, open this pin.                                                                                                                                                            | O   |
| 10    | CS          | Chip select signal.                                                                                                                                                                                                                                                                                                                       | I   |
| 11    | D/CX(SCL)   | (D/CX): This pin is used to select "Data or Command" in the<br>parallel interface.<br>When DCX = 1, data is selected.<br>When DCX = 0, command is selected.<br>(SCL): This pin is used as the serial interface clock in 3-wire<br>9-bit/4-wire 8-bit serial data interface.<br>If not used, this pin should be connected to IOVCC or GND. | I   |
| 12    | WR(SPI_D/C) | (WRX) - 8080- I /8080- II system: Serves as a write signal and<br>writes data at the rising edge.<br>(D/CX) - 4-line system: Serves as the selector of command or<br>parameter.<br>Fix to IOVCC level when not in use.                                                                                                                    | I   |
| 13    | RD          | 8080- I /8080- II system (RDX): Serves as a read signal and<br>MCU read data at the rising edge.<br>Fix to IOVCC level when not in use.                                                                                                                                                                                                   | I   |
| 14-29 | DB0~DB15    | 18-bit parallel bi-directional data bus for MCU system.<br>Fix to GND level when not in use.                                                                                                                                                                                                                                              | I/O |
| 30    | RESET       | This signal will reset the device and must be applied to properly<br>initialize the chip.<br>Signal is active low.                                                                                                                                                                                                                        | I   |
| 31    | IM0         | Select the MCU interface mode                                                                                                                                                                                                                                                                                                             | I   |
| 32    | IM1         |                                                                                                                                                                                                                                                                                                                                           |     |
| 33    | IM2         |                                                                                                                                                                                                                                                                                                                                           |     |

|                                                                                                                                                   |      | IM2                                                                                                                                    | IM1 | IM0 | MCU-Interface Mode                   | DB Pin in use    |         |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------|-----|-----|--------------------------------------|------------------|---------|-----|
|                                                                                                                                                   |      |                                                                                                                                        |     |     |                                      | Register/Content | GRAM    |     |
|                                                                                                                                                   |      |                                                                                                                                        |     |     |                                      |                  |         |     |
|                                                                                                                                                   |      | 0                                                                                                                                      | 0   | 0   | 80 MCU 8-bit bus interface I         | D[7:0]           | D[7:0]  |     |
|                                                                                                                                                   |      | 0                                                                                                                                      | 0   | 1   | 80 MCU 16-bit bus interface I        | D[7:0]           | D[15:0] |     |
|                                                                                                                                                   |      | 0                                                                                                                                      | 1   | 0   | 80 MCU 9-bit bus interface I         | D[7:0]           | D[8:0]  |     |
|                                                                                                                                                   |      | 0                                                                                                                                      | 1   | 1   | 80 MCU 18-bit bus interface I        | D[7:0]           | D[17:0] |     |
|                                                                                                                                                   |      | 1                                                                                                                                      | 0   | 1   | 3-wire 9-bit data serial interface I | SDA: In/OUT      |         |     |
|                                                                                                                                                   |      | 1                                                                                                                                      | 1   | 0   | 4-wire 8-bit data serial interface I | SDA: In/OUT      |         |     |
| MPU Parallel interface bus and serial interface select<br>If use RGB Interface must select serial interface.<br>* : Fix this pin at IOVCC or GND. |      |                                                                                                                                        |     |     |                                      |                  |         |     |
| 34                                                                                                                                                | DB16 | 18-bit parallel bi-directional data bus for MCU system and RGB interface mode<br>Fix to GND level when not in use.                     |     |     |                                      |                  |         | I/O |
| 35                                                                                                                                                | DB17 |                                                                                                                                        |     |     |                                      |                  |         |     |
| 36                                                                                                                                                | LEDK | Cathode of LED backlight.                                                                                                              |     |     |                                      |                  |         | P   |
| 37                                                                                                                                                | LEDK | Cathode of LED backlight.                                                                                                              |     |     |                                      |                  |         | P   |
| 38                                                                                                                                                | LEDA | Anode of LED backlight.                                                                                                                |     |     |                                      |                  |         | P   |
| 39                                                                                                                                                | SDA  | SDA : Serial in/out signal.<br>The data is applied on the rising edge of the SCL signal.<br>If not used, fix this pin at IOVCC or GND. |     |     |                                      |                  |         | I/O |
| 40                                                                                                                                                | NC   | Not used, open this pin                                                                                                                |     |     |                                      |                  |         | N   |

## 5. Contour Drawing



## 6. Block Diagram



## 7. Absolute Maximum Ratings

| Item                  | Symbol | Min | Typ | Max | Unit |
|-----------------------|--------|-----|-----|-----|------|
| Operating Temperature | TOP    | -20 | —   | +70 | °C   |
| Storage Temperature   | TST    | -30 | —   | +80 | °C   |

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

- Temp.  $\leq 60^{\circ}\text{C}$ , 90% RH MAX. Temp.  $> 60^{\circ}\text{C}$ , Absolute humidity shall be less than 90% RH at  $60^{\circ}\text{C}$

## 8. Electrical Characteristics

### 8.1. Operating conditions:

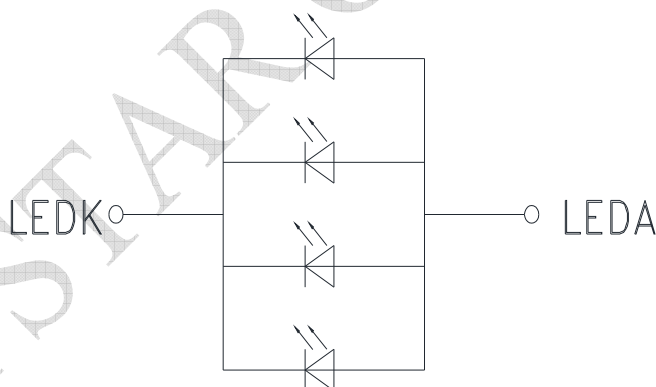
| Item                      | Symbol | Min                    | Typ | Max | Unit |
|---------------------------|--------|------------------------|-----|-----|------|
| Supply Voltage For Analog | VCI    | 2.5                    | —   | 3.3 | V    |
| Supply Voltage For Logic  | IOVCC  | 2.5                    | —   | 3.3 | V    |
| Supply Current For LCM    | ICC    | IOVCC=VCI<br>=VCC=3.0V | 6   | 9   | mA   |

Note: to avoid power supply noise, please avoid using driving conditions close to min. or max. value.

### 8.2. LED driving conditions

| Parameter         | Symbol | Min.   | Typ. | Max. | Unit | Remark     |
|-------------------|--------|--------|------|------|------|------------|
| LED current       | —      | —      | 80   | —    | mA   | —          |
| Power Consumption | —      | —      | 280  | —    | mW   | —          |
| LED voltage       | VBL+   | 2.8    | 3.5  | 3.7  | V    | Note 1     |
| LED Life Time     | —      | 50,000 | —    | —    | Hr   | Note 2,3,4 |

Note 1 : There are 1 Groups LED



Note 2 : Ta = 25 °C

Note 3 : Brightness to be decreased to 50% of the initial value

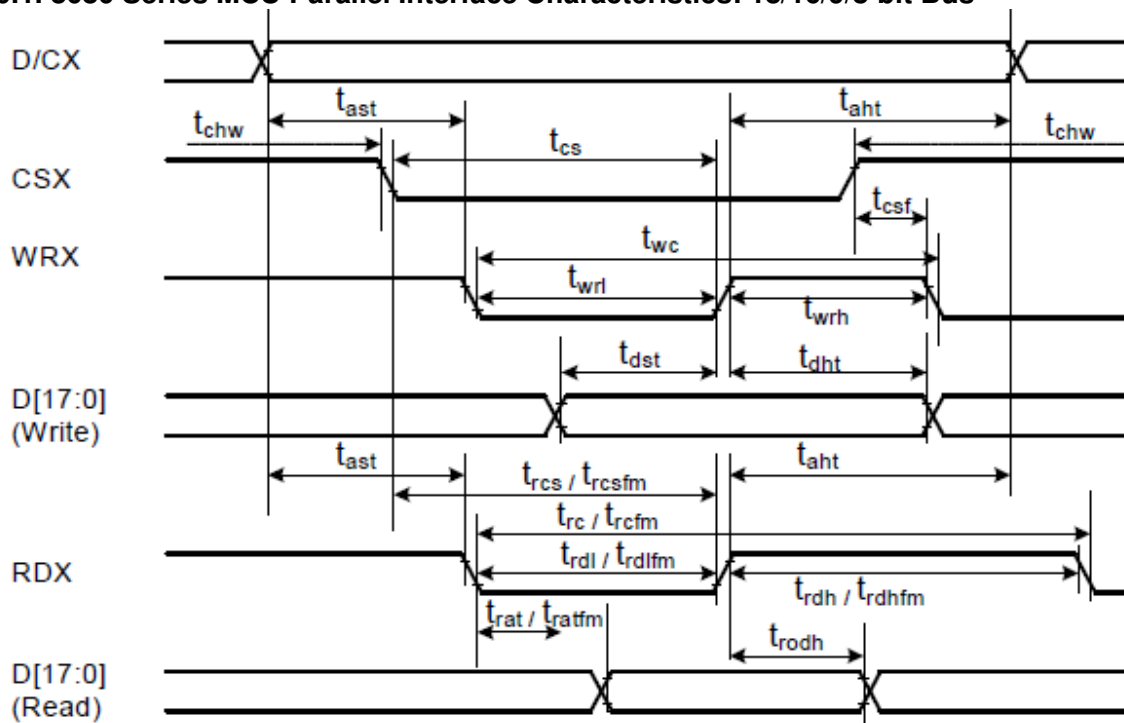
Note 4 : The single LED lamp case

## 9.DC CHARATERISTICS

| Parameter                | Symbol   | Rating |     |        | Unit | Condition |
|--------------------------|----------|--------|-----|--------|------|-----------|
|                          |          | Min    | Typ | Max    |      |           |
| Low level input voltage  | $V_{IL}$ | 0      | -   | 0.3VCC | V    |           |
| High level input voltage | $V_{IH}$ | 0.7VCC | -   | VCC    | V    |           |

## 10.AC Characteristics

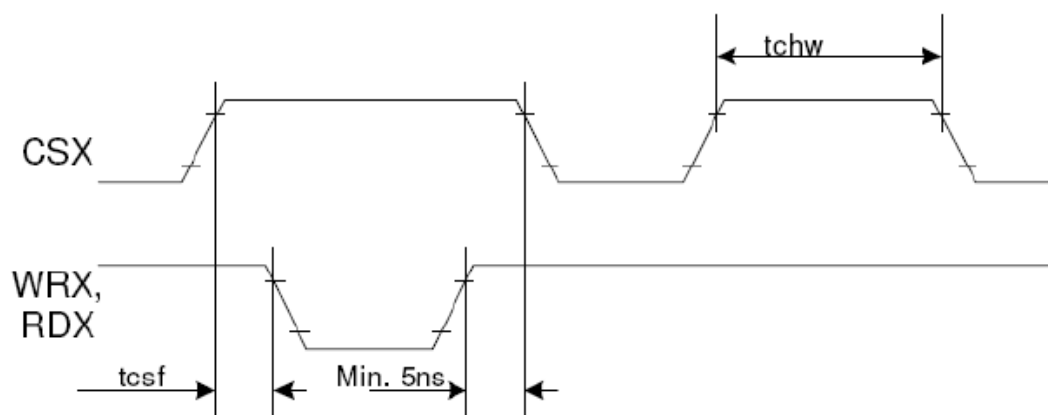
### 10.1. 8080 Series MCU Parallel Interface Characteristics: 18/16/9/8-bit Bus



| Signal                                    | Symbol | Parameter                          | min | max | Unit | Description                               |
|-------------------------------------------|--------|------------------------------------|-----|-----|------|-------------------------------------------|
| DCX                                       | tast   | Address setup time                 | 0   | -   | ns   |                                           |
|                                           | taht   | Address hold time (Write/Read)     | 0   | -   | ns   |                                           |
| CSX                                       | tchw   | CSX "H" pulse width                | 0   | -   | ns   |                                           |
|                                           | tcs    | Chip Select setup time (Write)     | 15  | -   | ns   |                                           |
|                                           | trcs   | Chip Select setup time (Read ID)   | 45  | -   | ns   |                                           |
|                                           | trcsfm | Chip Select setup time (Read FM)   | 355 | -   | ns   |                                           |
| WRX                                       | tcsf   | Chip Select Wait time (Write/Read) | 10  | -   | ns   |                                           |
|                                           | twc    | Write cycle                        | 66  | -   | ns   |                                           |
|                                           | twrh   | Write Control pulse H duration     | 15  | -   | ns   |                                           |
| RDX (FM)                                  | twrl   | Write Control pulse L duration     | 15  | -   | ns   |                                           |
|                                           | trcfm  | Read Cycle (FM)                    | 450 | -   | ns   |                                           |
|                                           | trdhfm | Read Control H duration (FM)       | 90  | -   | ns   |                                           |
| RDX (ID)                                  | trdlfm | Read Control L duration (FM)       | 355 | -   | ns   |                                           |
|                                           | trc    | Read cycle (ID)                    | 160 | -   | ns   |                                           |
|                                           | trdh   | Read Control pulse H duration      | 90  | -   | ns   |                                           |
| D[17:0],<br>D[15:0],<br>D[8:0],<br>D[7:0] | trdl   | Read Control pulse L duration      | 45  | -   | ns   |                                           |
|                                           | tdst   | Write data setup time              | 10  | -   | ns   | For maximum CL=30pF<br>For minimum CL=8pF |
|                                           | tdht   | Write data hold time               | 10  | -   | ns   |                                           |
|                                           | trat   | Read access time                   | -   | 40  | ns   |                                           |
|                                           | tratfm | Read access time                   | -   | 340 | ns   |                                           |
|                                           | trodh  | Read output disable time           | 20  | 80  | ns   |                                           |

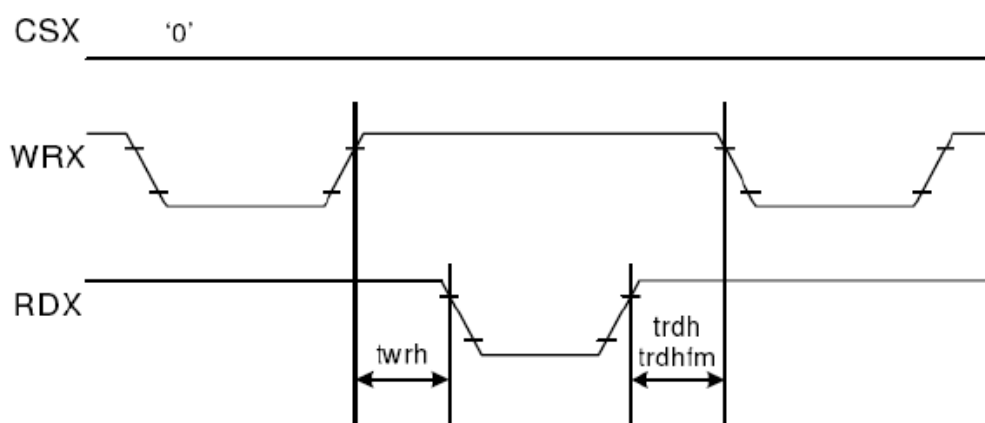
Note:  $T_a = -30$  to  $70\text{ }^{\circ}\text{C}$ ,  $V_{DDI}=1.65\text{V}$  to  $3.3\text{V}$ ,  $V_{CI}=2.5\text{V}$  to  $3.3\text{V}$ ,  $V_{SS}=0\text{V}$

CSX timings :



*Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.*

Write to read or read to write timings:



*Note: Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.*

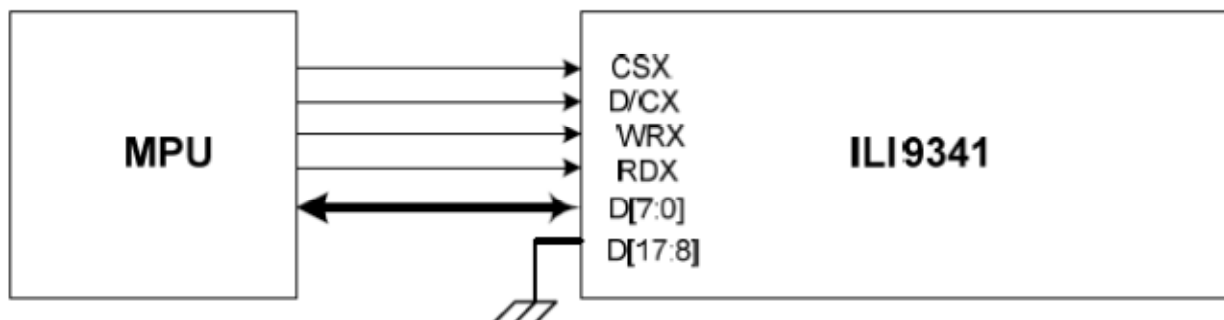
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## 10.2. Interface Pixel Format

| 3Ah                                                     | PIXSET (Pixel Format Set)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                      |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----------------------|----------------------|-----------|-----------|----|----------------------|----|-----------|----|----------|-----|---|---|----------|---|---|---|----------|---|---|---|----------|---|---|---|----------|---|---|---|-----------------|---|---|---|-----------------|---|---|---|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|-----------|--|--|----------------------|---|---|---|----------|---|---|---|----------|---|---|---|----------|---|---|---|----------|---|---|---|----------|---|---|---|-----------------|---|---|---|-----------------|---|---|---|----------|
|                                                         | D/CX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | RDX | WRX                  | D17-8                | D7        | D6        | D5 | D4                   | D3 | D2        | D1 | D0       | HEX |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| Command                                                 | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | ↑                    | XX                   | 0         | 0         | 1  | 1                    | 1  | 0         | 1  | 0        | 3Ah |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| Parameter                                               | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | ↑                    | XX                   | 0         | DPI [2:0] |    |                      | 0  | DBI [2:0] |    |          | 66  |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| Description                                             | <p>This command sets the pixel format for the RGB image data used by the interface. DPI [2:0] is the pixel format select of RGB interface and DBI [2:0] is the pixel format of MCU interface. If a particular interface, either RGB interface or MCU interface, is not used then the corresponding bits in the parameter are ignored. The pixel format is shown in the table below.</p>                                                                                                                                                                           |     |                      |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
|                                                         | <table><tr><th colspan="3">DPI [2:0]</th><th>RGB Interface Format</th></tr><tr><td>0</td><td>0</td><td>0</td><td>Reserved</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Reserved</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Reserved</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Reserved</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Reserved</td></tr><tr><td>1</td><td>0</td><td>1</td><td>16 bits / pixel</td></tr><tr><td>1</td><td>1</td><td>0</td><td>18 bits / pixel</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Reserved</td></tr></table> |     |                      |                      | DPI [2:0] |           |    | RGB Interface Format | 0  | 0         | 0  | Reserved | 0   | 0 | 1 | Reserved | 0 | 1 | 0 | Reserved | 0 | 1 | 1 | Reserved | 1 | 0 | 0 | Reserved | 1 | 0 | 1 | 16 bits / pixel | 1 | 1 | 0 | 18 bits / pixel | 1 | 1 | 1 | Reserved | <table><tr><th colspan="3">DBI [2:0]</th><th>MCU Interface Format</th></tr><tr><td>0</td><td>0</td><td>0</td><td>Reserved</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Reserved</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Reserved</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Reserved</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Reserved</td></tr><tr><td>1</td><td>0</td><td>1</td><td>16 bits / pixel</td></tr><tr><td>1</td><td>1</td><td>0</td><td>18 bits / pixel</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Reserved</td></tr></table> |  |  |  | DBI [2:0] |  |  | MCU Interface Format | 0 | 0 | 0 | Reserved | 0 | 0 | 1 | Reserved | 0 | 1 | 0 | Reserved | 0 | 1 | 1 | Reserved | 1 | 0 | 0 | Reserved | 1 | 0 | 1 | 16 bits / pixel | 1 | 1 | 0 | 18 bits / pixel | 1 | 1 | 1 | Reserved |
|                                                         | DPI [2:0]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |     |                      | RGB Interface Format |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
|                                                         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0   | 0                    | Reserved             |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
|                                                         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0   | 1                    | Reserved             |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
|                                                         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | 0                    | Reserved             |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
|                                                         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | 1                    | Reserved             |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
|                                                         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0   | 0                    | Reserved             |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
|                                                         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0   | 1                    | 16 bits / pixel      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
|                                                         | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | 0                    | 18 bits / pixel      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| 1                                                       | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | Reserved             |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| DBI [2:0]                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     | MCU Interface Format |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| 0                                                       | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0   | Reserved             |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| 0                                                       | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | Reserved             |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| 0                                                       | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0   | Reserved             |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| 0                                                       | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | Reserved             |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| 1                                                       | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0   | Reserved             |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| 1                                                       | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | 16 bits / pixel      |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| 1                                                       | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0   | 18 bits / pixel      |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| 1                                                       | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1   | Reserved             |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| If using RGB Interface must selection serial interface. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                      |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |
| X = Don't care                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |     |                      |                      |           |           |    |                      |    |           |    |          |     |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |           |  |  |                      |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |          |   |   |   |                 |   |   |   |                 |   |   |   |          |

## 10.3. 8-bit Parallel MCU Interface

The 8080- I system 8-bit parallel bus interface of ILI9341V can be used by setting external pin as IM [2:0] to "000". The following shown figure is the example of interface with 8080- I MCU system interface.



Different display data formats are available for two color depths supported by listed below.

- 65K-Colors, RGB 5, 6, 5 -bits input data.
- 262K-Colors, RGB 6, 6, 6 -bits input data.

### 65K color: 16-bit/pixel (RGB 5-6-5 bits input)

One pixel (3 sub-pixels) display data is sent by 2 byte transfers when DBI [2:0] bits of 3Ah register are set to "101".

| Count | 0  | 1   | 2   | 3   | 4   | ... | 477   | 478   | 479   | 480   |
|-------|----|-----|-----|-----|-----|-----|-------|-------|-------|-------|
| D/CX  | 0  | 1   | 1   | 1   | 1   | ... | 1     | 1     | 1     | 1     |
| D7    | C7 | 0R4 | 0G2 | 1R4 | 1G2 | ... | 238R4 | 238G2 | 239R4 | 239G2 |
| D6    | C6 | 0R3 | 0G1 | 1R3 | 1G1 | ... | 238R3 | 238G1 | 239R3 | 239G1 |
| D5    | C5 | 0R2 | 0G0 | 1R2 | 1G0 | ... | 238R2 | 238G0 | 239R2 | 239G0 |
| D4    | C4 | 0R1 | 0B4 | 1R1 | 1B4 | ... | 238R1 | 238B4 | 239R1 | 239B4 |
| D3    | C3 | 0R0 | 0B3 | 1R0 | 1B3 | ... | 238R0 | 238B3 | 239R0 | 239B3 |
| D2    | C2 | 0G5 | 0B2 | 1G5 | 1B2 | ... | 238G5 | 238B2 | 239G5 | 239B2 |
| D1    | C1 | 0G4 | 0B1 | 1G4 | 1B1 | ... | 238G4 | 238B1 | 239G4 | 239B1 |
| D0    | C0 | 0G3 | 0B0 | 1G3 | 1B0 | ... | 238G3 | 238B0 | 239G3 | 239B0 |

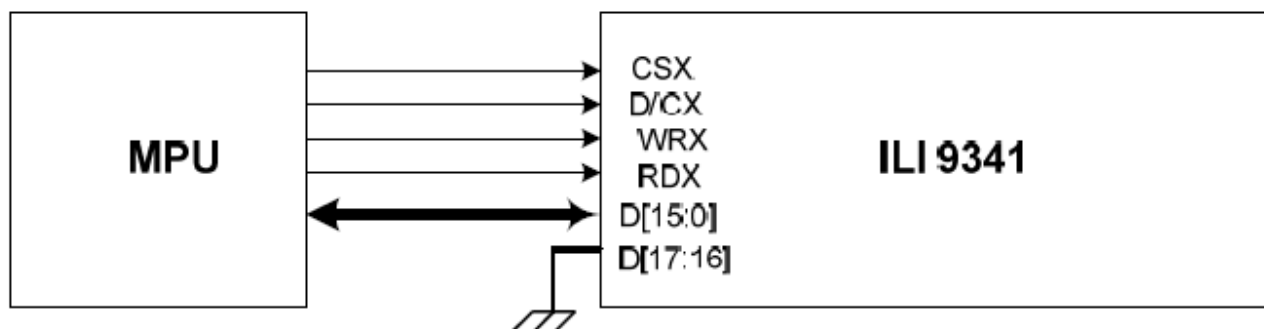
### 262K color: 18-bit/pixel (RGB 6-6-6 bits input)

One pixel (3 sub-pixels) display data is sent by 3 bytes transfer when DBI [2:0] bits of 3Ah register are set to "110".

| Count | 0  | 1   | 2   | 3   | ... | 718   | 719   | 720   |
|-------|----|-----|-----|-----|-----|-------|-------|-------|
| D/CX  | 0  | 1   | 1   | 1   | ... | 1     | 1     | 1     |
| D7    | C7 | 0R5 | 0G5 | 0B5 | ... | 239R5 | 239G5 | 239B5 |
| D6    | C6 | 0R4 | 0G4 | 0B4 | ... | 239R4 | 239G4 | 239B4 |
| D5    | C5 | 0R3 | 0G3 | 0B3 | ... | 239R3 | 239G3 | 239B3 |
| D4    | C4 | 0R2 | 0G2 | 0B2 | ... | 239R2 | 239G2 | 239B2 |
| D3    | C3 | 0R1 | 0G1 | 0B1 | ... | 239R1 | 239G1 | 239B1 |
| D2    | C2 | 0R0 | 0G0 | 0B0 | ... | 239R0 | 239G0 | 239B0 |
| D1    | C1 |     |     |     | ... |       |       |       |
| D0    | C0 |     |     |     | ... |       |       |       |

## 16-bit Parallel MCU Interface

The 8080- I system 16-bit parallel bus interface of ILI9341V can be selected by setting hardware pin IM[2:0] to “001”.The following shown figure is the example of interface with 8080- I MCU system interface.



Different display data format is available for two colors depth supported by listed below.

- 65K-Colors, RGB 5, 6, 5 -bits input data.
- 262K-Colors, RGB 6, 6, 6 -bits input data.

### 65K color: 16-bit/pixel (RGB 5-6-5 bits input)

One pixel (3 sub-pixels) display data is sent by 1 transfer when DBI [2:0] bits of 3Ah register are set to “101”.

| Count | 0  | 1   | 2   | 3   | ... | 238   | 239   | 240   |
|-------|----|-----|-----|-----|-----|-------|-------|-------|
| D/CX  | 0  | 1   | 1   | 1   | ... | 1     | 1     | 1     |
| D15   |    | 0R4 | 1R4 | 2R4 | ... | 237R4 | 238R4 | 239R4 |
| D14   |    | 0R3 | 1R3 | 2R3 | ... | 237R3 | 238R3 | 239R3 |
| D13   |    | 0R2 | 1R2 | 2R2 | ... | 237R2 | 238R2 | 239R2 |
| D12   |    | 0R1 | 1R1 | 2R1 | ... | 237R1 | 238R1 | 239R1 |
| D11   |    | 0R0 | 1R0 | 2R0 | ... | 237R0 | 238R0 | 239R0 |
| D10   |    | 0G5 | 1G5 | 2G5 | ... | 237G5 | 238G5 | 239G5 |
| D9    |    | 0G4 | 1G4 | 2G4 | ... | 237G4 | 238G4 | 239G4 |
| D8    |    | 0G3 | 1G3 | 2G3 | ... | 237G3 | 238G3 | 239G3 |
| D7    | C7 | 0G2 | 1G2 | 2G2 | ... | 237G2 | 238G2 | 239G2 |
| D6    | C6 | 0G1 | 1G1 | 2G1 | ... | 237G1 | 238G1 | 239G1 |
| D5    | C5 | 0G0 | 1G0 | 2G0 | ... | 237G0 | 238G0 | 239G0 |
| D4    | C4 | 0B4 | 1B4 | 2B4 | ... | 237B4 | 238B4 | 239B4 |
| D3    | C3 | 0B3 | 1B3 | 2B3 | ... | 237B3 | 238B3 | 239B3 |
| D2    | C2 | 0B2 | 1B2 | 2B2 | ... | 237B2 | 238B2 | 239B2 |
| D1    | C1 | 0B1 | 1B1 | 2B1 | ... | 237B1 | 238B1 | 239B1 |
| D0    | C0 | 0B0 | 1B0 | 2B0 | ... | 237B0 | 238B0 | 239B0 |

### 262K color: 18-bit/pixel (RGB 6-6-6 bits input)

One pixel (3 sub-pixels) display data is sent by 2 transfers when DBI [2:0] bits of 3Ah register are set to “110”.

**MDT[1:0]="00"**

|       |    |     |     |     |     |       |       |       |
|-------|----|-----|-----|-----|-----|-------|-------|-------|
| Count | 0  | 1   | 2   | 3   | ... | 358   | 359   | 360   |
| D/CX  | 0  | 1   | 1   | 1   | ... | 1     | 1     | 1     |
| D15   |    | 0R5 | 0B5 | 1G5 | ... | 238R5 | 238B5 | 239G5 |
| D14   |    | 0R4 | 0B4 | 1G4 | ... | 238R4 | 238B4 | 239G4 |
| D13   |    | 0R3 | 0B3 | 1G3 | ... | 238R3 | 238B3 | 239G3 |
| D12   |    | 0R2 | 0B2 | 1G2 | ... | 238R2 | 238B2 | 239G2 |
| D11   |    | 0R1 | 0B1 | 1G1 | ... | 238R1 | 238B1 | 239G1 |
| D10   |    | 0R0 | 0B0 | 1G0 | ... | 238R0 | 238B0 | 239G0 |
| D9    |    |     |     |     | ... |       |       |       |
| D8    |    |     |     |     | ... |       |       |       |
| D7    | C7 | 0G5 | 1R5 | 1B5 | ... | 238G5 | 239R5 | 239B5 |
| D6    | C6 | 0G4 | 1R4 | 1B4 | ... | 238G4 | 239R4 | 239B4 |
| D5    | C5 | 0G3 | 1R3 | 1B3 | ... | 238G3 | 239R3 | 239B3 |
| D4    | C4 | 0G2 | 1R2 | 1B2 | ... | 238G2 | 239R2 | 239B2 |
| D3    | C3 | 0G1 | 1R1 | 1B1 | ... | 238G1 | 239R1 | 239B1 |
| D2    | C2 | 0G0 | 1R0 | 1B0 | ... | 238G0 | 239R0 | 239B0 |
| D1    | C1 |     |     |     | ... |       |       |       |
| D0    | C0 |     |     |     | ... |       |       |       |

## MDT[1:0]="01"

|       |    |     |     |     |     |       |       |       |       |       |
|-------|----|-----|-----|-----|-----|-------|-------|-------|-------|-------|
| Count | 0  | 1   | 2   | 3   | ... | 357   | 358   | 479   | 480   |       |
| D/CX  | 0  | 1   | 1   | 1   | ... |       | 1     | 1     | 1     |       |
| D15   |    | 0R5 | 0B5 | 1R5 | 1B5 | ...   | 238R5 | 238B5 | 239R5 | 239B5 |
| D14   |    | 0R4 | 0B4 | 1R4 | 1B4 | ...   | 238R4 | 238B4 | 239R4 | 239B4 |
| D13   |    | 0R3 | 0B3 | 1R3 | 1B3 | ...   | 238R3 | 238B3 | 239R3 | 239B3 |
| D12   |    | 0R2 | 0B2 | 1R2 | 1B2 | ...   | 238R2 | 238B2 | 239R2 | 239B2 |
| D11   |    | 0R1 | 0B1 | 1R1 | 1B1 | ...   | 238R1 | 238B1 | 239R1 | 239B1 |
| D10   |    | 0R0 | 0B0 | 1R0 | 1B0 | ...   | 238R0 | 238B0 | 239R0 | 239B0 |
| D9    |    |     |     |     | ... |       |       |       |       |       |
| D8    |    |     |     |     | ... |       |       |       |       |       |
| D7    | C7 | 0G5 |     | 1G5 | ... | 238G5 |       | 239G5 |       |       |
| D6    | C6 | 0G4 |     | 1G4 | ... | 238G4 |       | 239G4 |       |       |
| D5    | C5 | 0G3 |     | 1G3 | ... | 238G3 |       | 239G3 |       |       |
| D4    | C4 | 0G2 |     | 1G2 | ... | 238G2 |       | 239G2 |       |       |
| D3    | C3 | 0G1 |     | 1G1 | ... | 238G1 |       | 239G1 |       |       |
| D2    | C2 | 0G0 |     | 1G0 | ... | 238G0 |       | 239G0 |       |       |
| D1    | C1 |     |     |     | ... |       |       |       |       |       |
| D0    | C0 |     |     |     | ... |       |       |       |       |       |

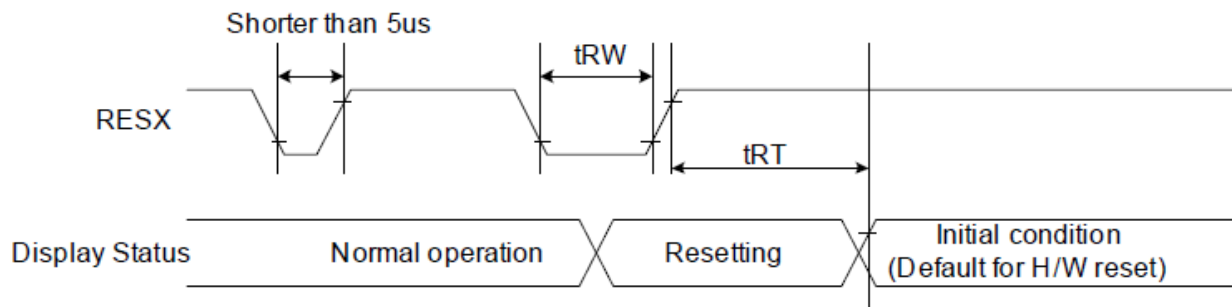
## MDT[1:0]="10"

|       |    |     |     |     |     |     |       |       |       |       |
|-------|----|-----|-----|-----|-----|-----|-------|-------|-------|-------|
| Count | 0  | 1   | 2   | 3   | ... | 357 | 358   | 479   | 480   |       |
| D/CX  | 0  | 1   | 1   | 1   | ... |     | 1     | 1     | 1     |       |
| D15   |    | 0R5 | 0B1 | 1R5 | 1B1 | ... | 238R5 | 238B1 | 239R5 | 239B1 |
| D14   |    | 0R4 | 0B0 | 1R4 | 1B0 | ... | 238R4 | 238B0 | 239R4 | 239B0 |
| D13   |    | 0R3 |     | 1R3 |     | ... | 238R3 |       | 239R3 |       |
| D12   |    | 0R2 |     | 1R2 |     | ... | 238R2 |       | 239R2 |       |
| D11   |    | 0R1 |     | 1R1 |     | ... | 238R1 |       | 239R1 |       |
| D10   |    | 0R0 |     | 1R0 |     | ... | 238R0 |       | 239R0 |       |
| D9    |    | 0G5 |     | 1G5 |     | ... | 238G5 |       | 239G5 |       |
| D8    |    | 0G4 |     | 1G4 |     | ... | 238G4 |       | 239G4 |       |
| D7    | C7 | 0G3 |     | 1G3 |     | ... | 238G3 |       | 239G3 |       |
| D6    | C6 | 0G2 |     | 1G2 |     | ... | 238G2 |       | 239G2 |       |
| D5    | C5 | 0G1 |     | 1G1 |     | ... | 238G1 |       | 239G1 |       |
| D4    | C4 | 0G0 |     | 1G0 |     | ... | 238G0 |       | 239G0 |       |
| D3    | C3 | 0B5 |     | 1B5 |     | ... | 238B5 |       | 239B5 |       |
| D2    | C2 | 0B4 |     | 1B4 |     | ... | 238B4 |       | 239B4 |       |
| D1    | C1 | 0B3 |     | 1B3 |     | ... | 238B3 |       | 239B3 |       |
| D0    | C0 | 0B2 |     | 1B2 |     |     | 238B2 |       | 239B2 |       |

**MDT[1:0]="11"**

| Count | 0  | 1   | 2   | 3   |     | ... | 357   | 358   | 479   | 480   |
|-------|----|-----|-----|-----|-----|-----|-------|-------|-------|-------|
| D/CX  | 0  | 1   | 1   | 1   |     | ... |       | 1     | 1     | 1     |
| D15   |    |     | 0R3 |     | 1R3 | ... |       | 238R3 |       | 239R3 |
| D14   |    |     | 0R2 |     | 1R2 | ... |       | 238R2 |       | 239R2 |
| D13   |    |     | 0R1 |     | 1R1 | ... |       | 238R1 |       | 239R1 |
| D12   |    |     | 0R0 |     | 1R0 | ... |       | 238R0 |       | 239R0 |
| D11   |    |     | 0G5 |     | 1G5 | ... |       | 238G5 |       | 239G5 |
| D10   |    |     | 0G4 |     | 1G4 | ... |       | 238G4 |       | 239G4 |
| D9    |    |     | 0G3 |     | 1G3 | ... |       | 238G3 |       | 239G3 |
| D8    |    |     | 0G2 |     | 1G2 | ... |       | 238G2 |       | 239G2 |
| D7    | C7 |     | 0G1 |     | 1G1 | ... |       | 238G1 |       | 239G1 |
| D6    | C6 |     | 0G0 |     | 1G0 | ... |       | 238G0 |       | 239G0 |
| D5    | C5 |     | 0B5 |     | 1B5 | ... |       | 238B5 |       | 239B5 |
| D4    | C4 |     | 0B4 |     | 1B4 | ... |       | 238B4 |       | 239B4 |
| D3    | C3 |     | 0B3 |     | 1B3 | ... |       | 238B3 |       | 239B3 |
| D2    | C2 |     | 0B2 |     | 1B2 | ... |       | 238B2 |       | 239B2 |
| D1    | C1 | 0R5 | 0B1 | 1R5 | 1B1 | ... | 238R5 | 238B1 | 239R5 | 239B1 |
| D0    | C0 | 0R4 | 0B0 | 1R4 | 1B0 | ... | 238R4 | 238B0 | 239R4 | 239B0 |

## 10.4. Reset Timing



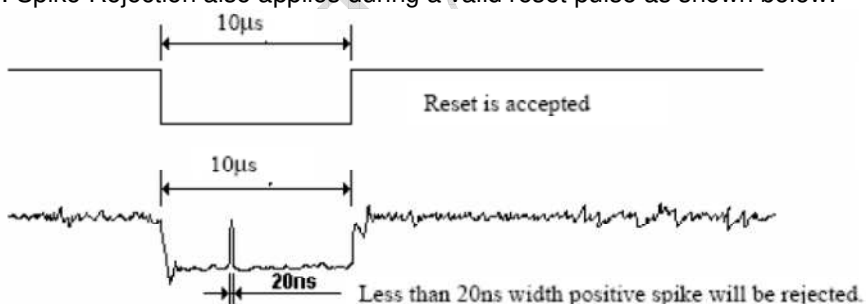
| Signal | Symbol   | Parameter            | Min | Max                                 | Unit |
|--------|----------|----------------------|-----|-------------------------------------|------|
| RESX   | $t_{RW}$ | Reset pulse duration | 10  |                                     | us   |
|        | $t_{RT}$ | Reset cancel         |     | 5 (Note 1, 5)<br>120 (Note 1, 6, 7) | ms   |

Notes:

1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time ( $t_{RT}$ ) within 5 ms after a rising edge of RESX.
2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

| RESX Pulse           | Action         |
|----------------------|----------------|
| Shorter than 5us     | Reset Rejected |
| Longer than 10us     | Reset          |
| Between 5us and 10us | Reset starts   |

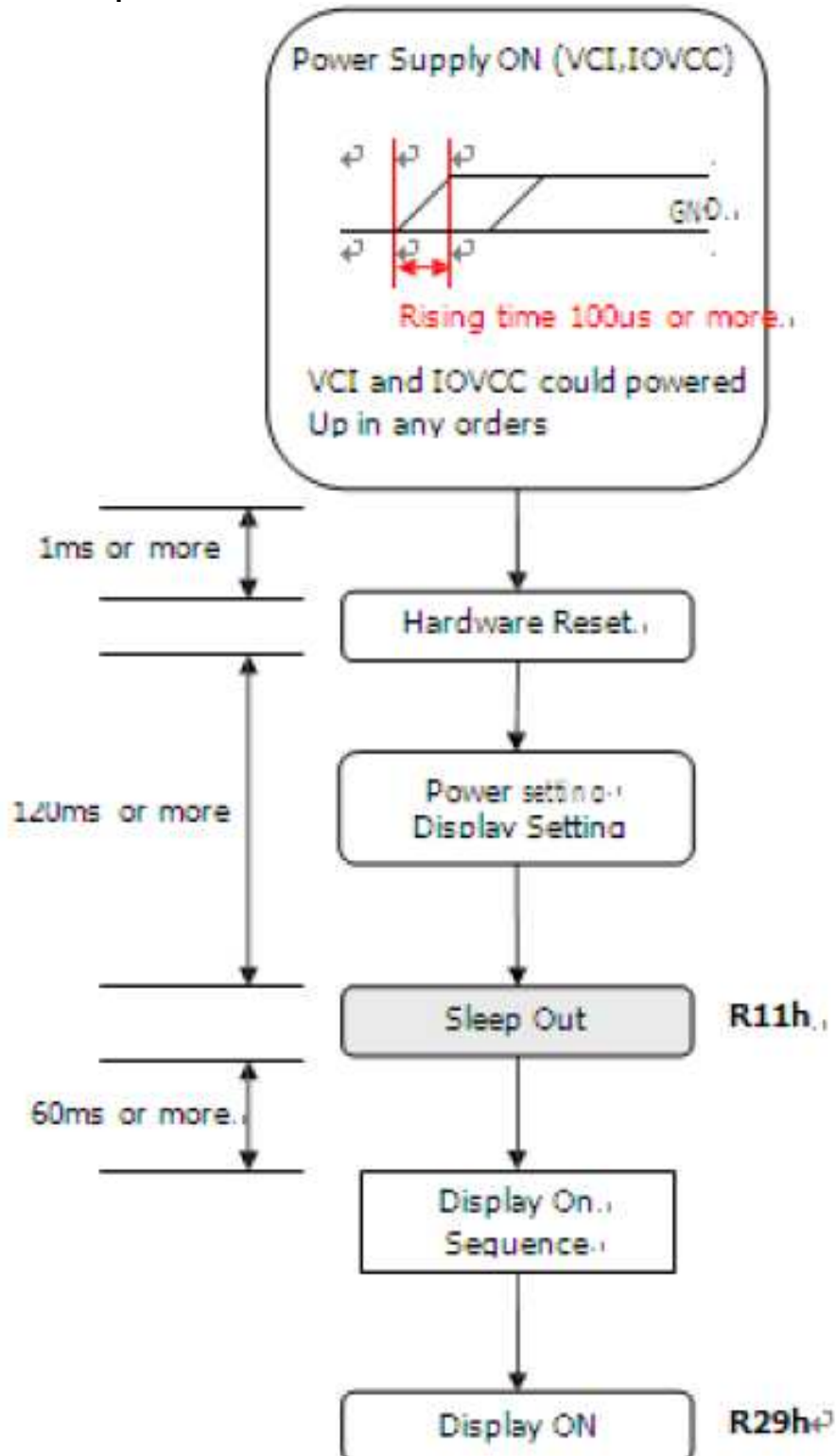
3. During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode.) and then return to Default condition for Hardware Reset.
4. Spike Rejection also applies during a valid reset pulse as shown below:



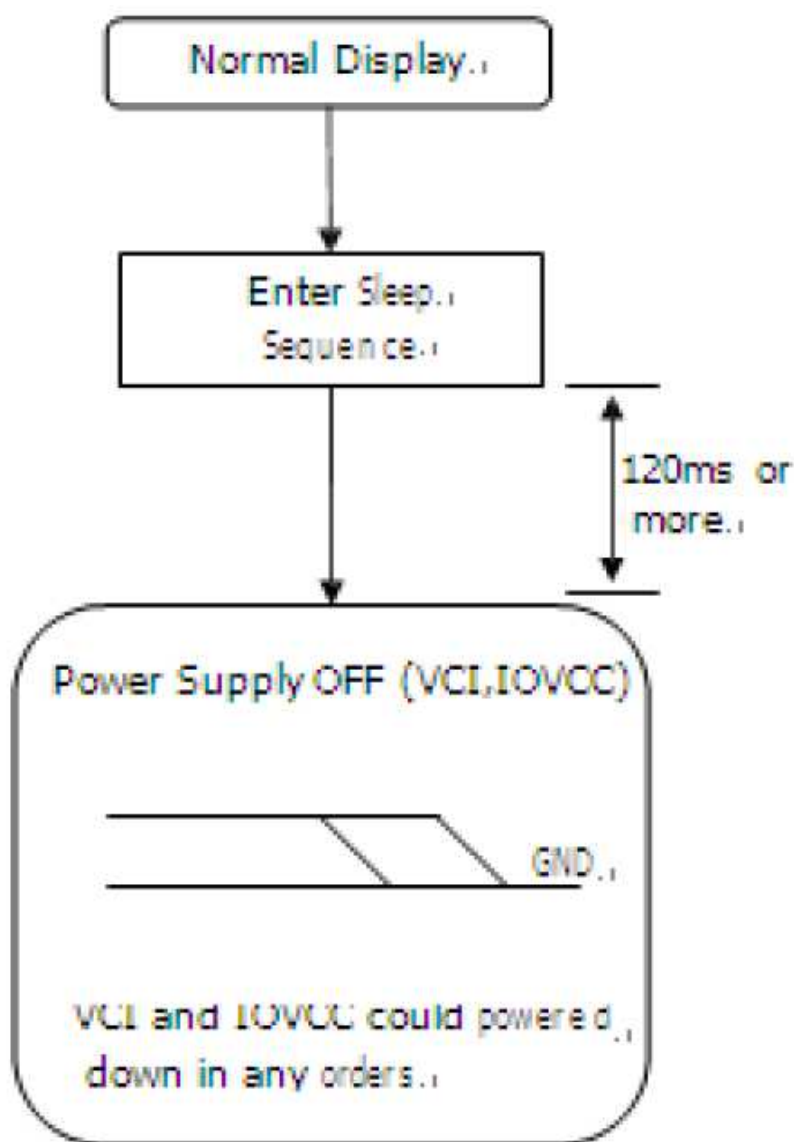
5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

## 11. Power sequence

### 11.1. Power ON Sequence



## 11.2. Power OFF Sequence



## 12. Optical Characteristics

| Item               |       | Symbol     | Condition.                            | Min  | Typ. | Max. | Unit              | Remark            |
|--------------------|-------|------------|---------------------------------------|------|------|------|-------------------|-------------------|
| Response time      |       | Tr         | $\theta=0^{\circ}$ 、 $\Phi=0^{\circ}$ | -    | 16   | 21   | ms                | Note 3            |
|                    |       | Tf         |                                       | -    | 19   | 24   | ms                |                   |
| Contrast ratio     |       | CR         | At optimized viewing angle            | 640  | 800  | -    | -                 | Note 4            |
| Color Chromaticity | White | Wx         | $\theta=0^{\circ}$ 、 $\Phi=0$         | 0.26 | 0.31 | 0.36 |                   | Note 2,6,7        |
|                    |       | Wy         |                                       | 0.28 | 0.33 | 0.38 |                   |                   |
| Viewing angle      | Hor.  | $\Theta R$ | $CR \geq 10$                          | -    | 80   | -    | Deg.              | Note 1            |
|                    |       | $\Theta L$ |                                       | -    | 80   | -    |                   |                   |
|                    | Ver.  | $\Phi T$   |                                       | -    | 80   | -    |                   |                   |
|                    |       | $\Phi B$   |                                       | -    | 80   | -    |                   |                   |
| Brightness         |       | -          | -                                     | 400  | 500  | -    | cd/m <sup>2</sup> | Center of display |
| Uniformity         |       | (U)        | -                                     | 75   | -    | -    | %                 | Note 5            |

Ta=25±2℃, ILED=80mA

Note 1: Definition of viewing angle range

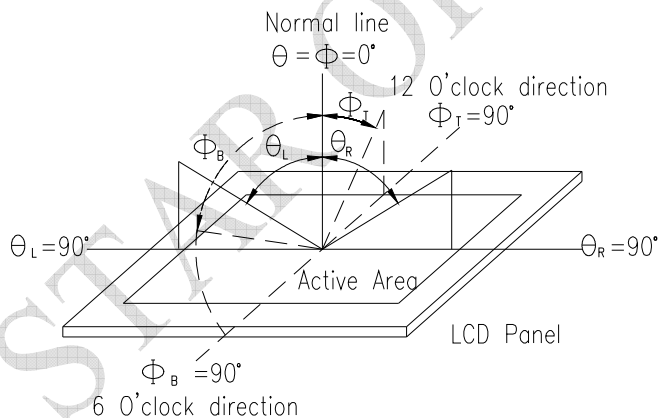


Fig. 12.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

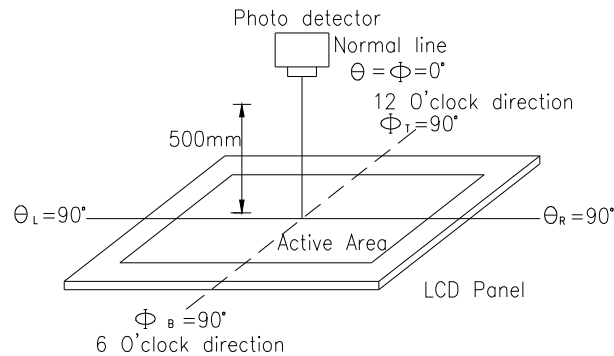
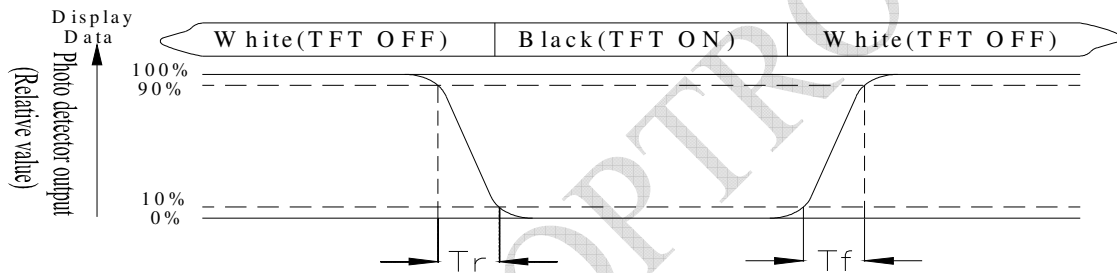


Fig. 12.2. Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time,  $T_r$ , is the time between photo detector output intensity changed from 90% to 10%. And fall time,  $T_f$ , is the time between photo detector output intensity changed from 10% to 90%.



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

**Note 5: Definition of Luminance Uniformity**

Active area is divided into 5 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) =  $L_{min}/L_{max} \times 100\%$

L = Active area length

W = Active area width

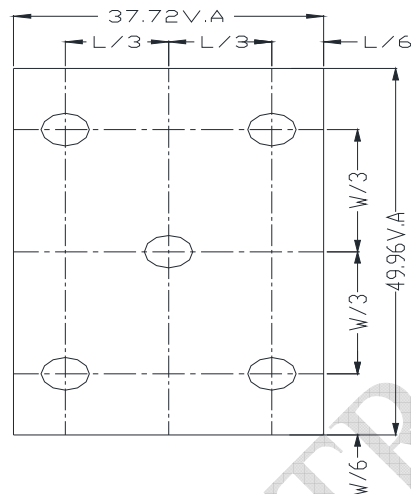


Fig 12.3. Definition of uniformity

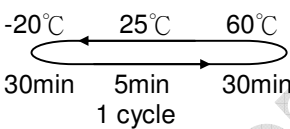
**Note 6: Definition of color chromaticity (CIE 1931)**

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

## 13. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

| Environmental Test                   |                                                                                                                                                                   |                                                                                                                                                                    |      |
|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| Test Item                            | Content of Test                                                                                                                                                   | Test Condition                                                                                                                                                     | Note |
| High Temperature storage             | Endurance test applying the high storage temperature for a long time.                                                                                             | 80°C<br>96hrs                                                                                                                                                      | 2    |
| Low Temperature storage              | Endurance test applying the low storage temperature for a long time.                                                                                              | -30°C<br>96hrs                                                                                                                                                     | 1,2  |
| High Temperature Operation           | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.                                            | 70°C<br>96hrs                                                                                                                                                      | —    |
| Low Temperature Operation            | Endurance test applying the electric stress under low temperature for a long time.                                                                                | -20°C<br>96hrs                                                                                                                                                     | 1    |
| High Temperature/ Humidity Operation | The module should be allowed to stand at 60°C,85%RH max                                                                                                           | 60°C,85%RH<br>96hrs                                                                                                                                                | 1,2  |
| Thermal shock resistance             | <p>The sample should be allowed stand the following 10 cycles of operation</p>  | -20°C/60°C<br>10 cycles                                                                                                                                            | —    |
| Vibration test                       | Endurance test applying the vibration during transportation and using.                                                                                            | <p>Total fixed amplitude : 3<br/>1.5mm<br/>Vibration Frequency :<br/>10~55Hz<br/>One cycle 60<br/>seconds to 3<br/>directions of X,Y,Z for<br/>Each 15 minutes</p> | 3    |
| Static electricity test              | Endurance test applying the electric stress to the terminal.                                                                                                      | <p>VS=±600V(contact),<br/>±800v(air),<br/>RS=330Ω<br/>CS=150pF<br/>10 times</p>                                                                                    | —    |

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

## 14.Initial Code For Reference

```

void ILI9341_RF28J(void)
{
    GATE = 320;
    SOURCE = 240;

    IC_RST = 1;
    asm("nop");
    asm("nop");
    asm("nop");
    delay(3000);
    IC_RST = 0;
    delay(5000);
    asm("nop");
    asm("nop");
    asm("nop");
    IC_RST = 1;
    asm("nop");
    asm("nop");
    asm("nop");
    delay(600000);

    ///=====ILI9341V=====
    Write_Command(0x11);    //Sleep out
    delay(150);             //Delay 120ms

    Write_Command(0x3A);    //
    Write_Data(0x55);

    Write_Command(0x26);    //
    Write_Data(0x01);

    ///=====ILI9341V=====
    Write_Command(0xb0);    //Porch Setting
    Write_Data(0X80|(1<<0)|(1<<1));
    Write_Command(0xb1);    //Frame Rate Control (In Normal Mode/Full Colors)
    Write_Data(0);
    Write_Data(0x1B);

    Write_Command(0xb6);    //
    Write_Data(0x0a);
    Write_Data(0x02);        //black
    Write_Data(0x27);
    Write_Data(0x04);

    Write_Command(0xb7);    //Entry Mode Set,
    Write_Data(0x06);

```

```
Write_Command(0xc0);    //power1 GVDD
Write_Data(0x35);
Write_Command(0xc1);    //power2 /AVDDVGH/VGL
Write_Data(0x10);        //10
```

```
Write_Command(0xC5);    //VCOMH/VCOML
Write_Data(0x20);        //20
Write_Data(0x21);        //21
Write_Command(0xC7);    //
Write_Data(0x80|0x40);
```

```
Write_Command(0x55); //Write Content Adaptive Brightness Control and Color
Enhancement
```

```
Write_Data(0x90);
```

```
Write_Command(0x34);
Write_Command(0x35);
Write_Data(0x01);
```

```
Write_Command(0x36);    //Memory Data Access Control
Write_Data(0x48);        //D3='1' =BGR color filter panel)   rgb/ bgr
```

```
Write_Command(0x3a);    //Interface Pixel Format   65k
Write_Data(0x55);        //16-bit   0x06 is 18-bit
```

```
Write_Command(0x26);    //Set Gamma
Write_Data(0x01);
```

```
Write_Command(0xE0);    //Set Gamma
Write_Data(0x0F);
Write_Data(0x35);
Write_Data(0x31);
Write_Data(0x0B);
Write_Data(0x0E);
Write_Data(0x06);
Write_Data(0x49);
Write_Data(0xA7);
Write_Data(0x33);
Write_Data(0x07);
Write_Data(0x0F);
Write_Data(0x03);
Write_Data(0x0C);
Write_Data(0x0A);
Write_Data(0x00);
```

```
Write_Command(0XE1);    //Set Gamma
Write_Data(0x00);
Write_Data(0x0A);
```

```
Write_Data(0x0F);  
Write_Data(0x04);  
Write_Data(0x11);  
Write_Data(0x08);  
Write_Data(0x36);  
Write_Data(0x58);  
Write_Data(0x4D);  
Write_Data(0x07);  
Write_Data(0x10);  
Write_Data(0x0C);  
Write_Data(0x32);  
Write_Data(0x34);  
Write_Data(0x0F);
```

```
Write_Command(0x2A);  
Write_Data(0x00);  
Write_Data(0x00);  
Write_Data(0x00);  
Write_Data(0xEF);
```

```
Write_Command(0x2B);  
Write_Data(0x00);  
Write_Data(0x0);  
Write_Data(0x01);  
Write_Data(0x3F);
```

```
Write_Command(0x29);    //Display on  
}
```

| <b>LCM Sample Estimate Feedback Sheet</b>                                                                           |                               |                                     |
|---------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------|
| <b>Module Number :</b> _____                                                                                        |                               |                                     |
| <b>1 、 <u>Panel Specification</u> :</b>                                                                             |                               |                                     |
| 1. Panel Type :                                                                                                     | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. View Direction :                                                                                                 | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Numbers of Dots :                                                                                                | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. View Area :                                                                                                      | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. Active Area :                                                                                                    | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. Operating Temperature :                                                                                          | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Storage Temperature :                                                                                            | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8. Others : _____                                                                                                   |                               |                                     |
| <b>2 、 <u>Mechanical Specification</u> :</b>                                                                        |                               |                                     |
| 1. PCB Size :                                                                                                       | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. Frame Size :                                                                                                     | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Material of Frame :                                                                                              | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. Connector Position :                                                                                             | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. Fix Hole Position :                                                                                              | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. Backlight Position :                                                                                             | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Thickness of PCB :                                                                                               | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8. Height of Frame to PCB :                                                                                         | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 9. Height of Module :                                                                                               | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 10. Others :                                                                                                        | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| <b>3 、 <u>Relative Hole Size</u> :</b>                                                                              |                               |                                     |
| 1. Pitch of Connector :                                                                                             | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. Hole size of Connector :                                                                                         | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Mounting Hole size :                                                                                             | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. Mounting Hole Type :                                                                                             | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. Others :                                                                                                         | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| <b>4 、 <u>Backlight Specification</u> :</b>                                                                         |                               |                                     |
| 1. B/L Type :                                                                                                       | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. B/L Color :                                                                                                      | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. B/L Driving Voltage (Reference for LED Type) : <input type="checkbox"/> Pass <input type="checkbox"/> NG , _____ |                               |                                     |
| 4. B/L Driving Current :                                                                                            | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. Brightness of B/L :                                                                                              | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. B/L Solder Method :                                                                                              | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Others :                                                                                                         | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

&gt;&gt; Go to page 2 &lt;&lt;

**Module Number :** \_\_\_\_\_

**5 、 Electronic Characteristics of Module :**

|                             |                               |                                     |
|-----------------------------|-------------------------------|-------------------------------------|
| 1.Input Voltage :           | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2.Supply Current :          | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3.Driving Voltage for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4.Contrast for LCD :        | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5.B/L Driving Method :      | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6.Negative Voltage Output : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7.Interface Function :      | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8.LCD Uniformity :          | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 9.ESD test :                | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 10.Others :                 | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

**6 、 Summary :**
**Sales signature :** \_\_\_\_\_

**Customer Signature :** \_\_\_\_\_

**Date :**    /    /