

|                          |            |                  |            |
|--------------------------|------------|------------------|------------|
| MDT0240A2ISR-MULTI       | 240 x 320  | Multi Interface  | TFT Module |
| (MCT024N0TW240320PMLIPS) |            |                  |            |
| Specification            |            |                  |            |
| Version: 1               |            | Date: 22/07/2014 |            |
| Revision                 |            |                  |            |
| 1                        | 22/07/2014 | First issue      |            |

| Display Features      |                        |  |                  |
|-----------------------|------------------------|-------------------------------------------------------------------------------------|------------------|
| Display Size          | 2.4"                   |                                                                                     |                  |
| Resolution            | 240 x 320              |                                                                                     |                  |
| Orientation           | Portrait               |                                                                                     |                  |
| Appearance            | RGB                    |                                                                                     |                  |
| Logic Voltage         | 3.3V                   |                                                                                     |                  |
| Interface             | Multi                  |                                                                                     |                  |
| Brightness            | 450 cd/m <sup>2</sup>  |                                                                                     |                  |
| Touchscreen           | RTP                    |                                                                                     |                  |
| Module Size           | 42.72 x 60.26 x 3.30mm |                                                                                     |                  |
| Operating Temperature | -20°C ~ +70°C          |                                                                                     |                  |
| Pinout                | 45 way FFC             |                                                                                     |                  |
| Pitch                 | 0.5mm                  | Box Quantity                                                                        | Weight / Display |
|                       |                        | ---                                                                                 | ---              |

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\* - For full design functionality, please use this specification in conjunction with the ST7789V specification.(Provided Separately)

| Display Accessories |             |
|---------------------|-------------|
| Part Number         | Description |
|                     |             |
|                     |             |
|                     |             |

| Optional Variants |         |
|-------------------|---------|
| Appearances       | Voltage |
|                   |         |
|                   |         |
|                   |         |



# General Description

## \* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 2.4”TFT-LCD contains 240x320 pixels, and can display up to 65K/262K colors.

## \* Features

- Input Voltage: 3.3V(TYP).
- Display Colors of TFT LCD: 65K/262Kcolors
- Interface: 8/9/16/18-bits MCU interface.

1618-bits RGB interface ,3-line / 4-line serial interface.

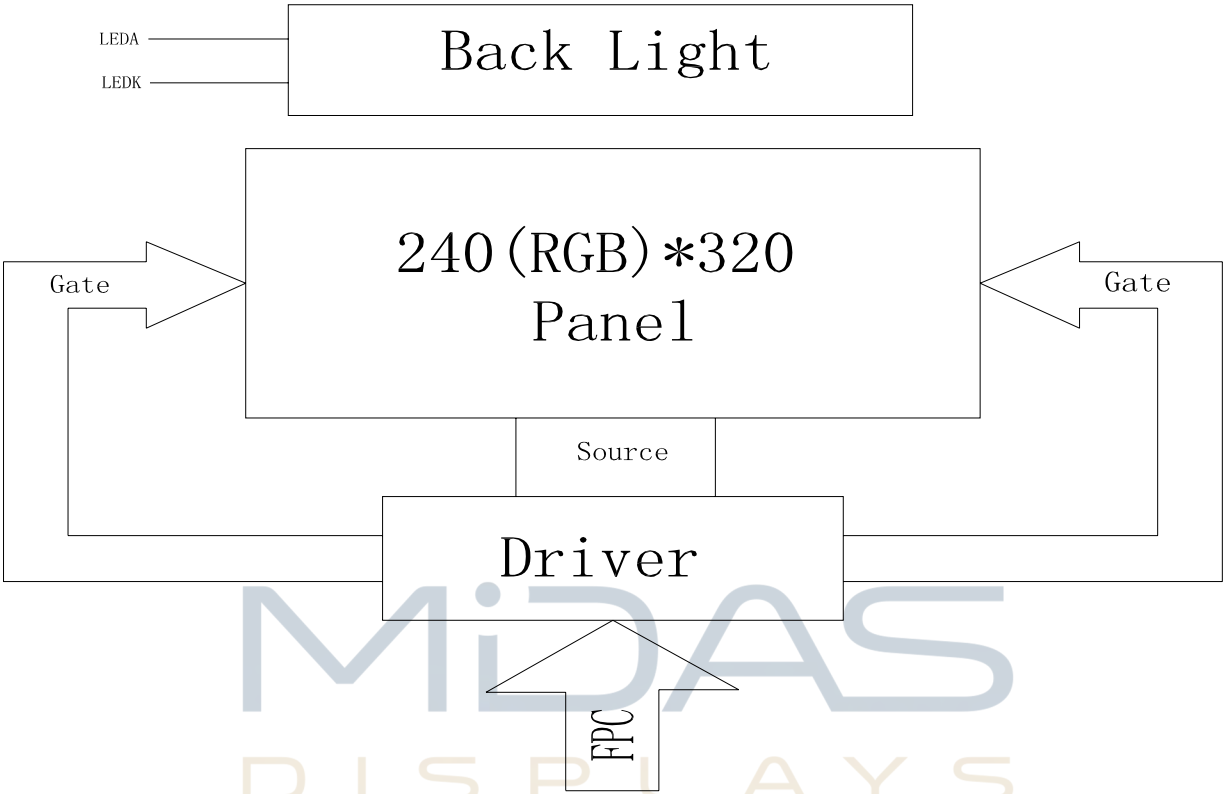
| General Information Items | Specification                   | Unit    | Note |
|---------------------------|---------------------------------|---------|------|
|                           | Main Panel                      |         |      |
| Display area(AA)          | 36. 72(H) *48.96(V) (2. 4inch ) | mm      | -    |
| Driver element            | TFT active matrix               | -       | -    |
| Display colors            | 65K/262K                        | colors  | -    |
| Number of pixels          | 240(RGB)*320                    | dots    | -    |
| Pixel arrangement         | RGB vertical stripe             | -       | -    |
| Pixel pitch               | 0.051 (H) x 0.051 (V)           | mm      | -    |
| Viewing angle             | ALL                             | o'clock | -    |
| Controller IC             | ST7789V                         | -       | -    |
| Display mode              | Transmissive/ Normally Black    | -       | -    |
| Operating temperature     | -20~+70                         | ℃       | -    |
| Storage temperature       | -30~+80                         | ℃       | -    |

## \* Mechanical Information

| Item        |               | Min. | Typ.  | Max. | Unit | Note |
|-------------|---------------|------|-------|------|------|------|
| Module size | Horizontal(H) |      | 42.72 |      | mm   | -    |
|             | Vertical(V)   |      | 60.26 |      | mm   | -    |
|             | Depth(D)      |      | 3.3   |      | mm   | -    |
| Weight      |               |      | TBD   |      | g    | -    |



Block Diagram



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| D2 | D0 | D00 | Interface type                     | DB Pin in use |
|----|----|-----|------------------------------------|---------------|
| 0  | 0  | 0   | DB1 Typ_0-bit interface            | DB7-DB0       |
| 0  | 0  | 1   | DB1 Typ_0-bit interface            | DB15-DB0      |
| 0  | 1  | 0   | DB1 Typ_0-bit interface            | DB8-DB0       |
| 0  | 1  | 1   | DB1 Typ_0-bit interface            | DB17-DB0      |
| 1  | 0  | 1   | 3-Tire 9 BIT data serial interface | SDA SCL CS    |
| 1  | 1  | 0   | 4-Tire 8 BIT data serial interface | SDA SCL CS RS |

**NOTE:**

1. If not use PIN, fix to the GND , IOVCC or NC.
2. If use RGB mode must select serial interface

| Re V | Revision content description | Date       | TOLERANCE(公差)                            | DRAWING NAME | Midas Displays |
|------|------------------------------|------------|------------------------------------------|--------------|----------------|
| A    | FIRST                        | 2013/03/29 | TOLERANCE<br>UNLESS<br>X.X $\pm$ 0.3     | Drawn        | Unit           |
|      |                              |            | OTHERWISE<br>SPECIFIED<br>X.XX $\pm$ 0.2 | Checked      | mm             |
|      |                              |            | Scale 1:1                                | Approve      | Page 1/1       |

NOTES:

1. DISPLAY TYPE: 2.4", TFT-LCD, 65K/262K COLORS
2. DISPLAY MODE: IPS NORMALLY BLACK
3. VIEWING DIRECTION: ALL
4. DRIVER IC: ST7789V (COG)
5. VCI: 3.3V
6. OPERATING TEMP: -20°C TO 70°C  
STORAGE TEMP: -30°C TO 80°C
7. BACK LIGHT: LED WHITE, 4 LED, 80mA, 3.2±0.3V
8. RoHS COMPLIANT.

## Input terminal Pin Assignment

| NO. | SYMBOL          | DISCRIPTION                                                                                                                                                                                                                                                                                      | I/O |
|-----|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| 1   | GND             | Ground.                                                                                                                                                                                                                                                                                          | P   |
| 2   | VCI             | Supply voltage(3.3V).                                                                                                                                                                                                                                                                            | P   |
| 3   | VCI             | Supply voltage(3.3V).                                                                                                                                                                                                                                                                            | P   |
| 4   | IM2             | MPU Parallel interface bus and serial interface select<br>If use RGB Interface must select serial interface.<br>Fix this pin at VCI and GND.                                                                                                                                                     | I   |
| 5   | IM1             |                                                                                                                                                                                                                                                                                                  | I   |
| 6   | IM0             |                                                                                                                                                                                                                                                                                                  | I   |
| 7   | RESET           | This signal will reset the device and must be applied to properly initialize the chip.                                                                                                                                                                                                           | I   |
| 8   | CS              | Chip select input pin ("Low" enable).<br>fix this pin at VCI or GND when not in use.                                                                                                                                                                                                             | I   |
| 9   | DC(SPII_SCL)    | This pin is used to select "Data or Command" in the parallel interface. When D/CX = '1', data is selected. When D/CX = '0', command is selected.<br>This pin is used serial interface clock in 3-wire 9-bit / 4-wire 8-bit serial data interface.<br>fix this pin at VCI or GND when not in use. | I   |
| 10  | WR(SPI_RS,SDA2) | The data is applied on the rising edge of the SCL signal. If not used.<br>Second Data lane in 2 data lane serial interface.<br>fix this pin at VCI or GND when not in use.                                                                                                                       | I   |
| 11  | RD              | Serves as a read signal and MCU read data at the rising edge.<br>fix this pin at VCI or GND when not in use.                                                                                                                                                                                     | I   |
| 12  | VSYN            | Frame synchronizing signal for RGB interface operation.<br>fix this pin at VCI or GND when not in use.                                                                                                                                                                                           | I   |
| 13  | HSYN            | Line synchronizing signal for RGB interface operation.<br>fix this pin at VCI or GND when not in use.                                                                                                                                                                                            | I   |
| 14  | ENABLE          | Data enable signal for RGB interface operation.<br>fix this pin at VCI or GND when not in use.                                                                                                                                                                                                   | I   |
| 15  | DOTCLK          | Dot clock signal for RGB interface operation.                                                                                                                                                                                                                                                    | I   |



|       |          |                                                                                                                             |     |
|-------|----------|-----------------------------------------------------------------------------------------------------------------------------|-----|
|       |          | Fix this pin at VCI or GND when not in use.                                                                                 |     |
| 16    | SDA1     | Data lane in 1 data lane serial interface.<br>The data is latched on the rising edge of the SCL signal.                     | I   |
| 17-34 | DB0-DB17 | 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    | SDO      | SPI interface output pin.<br>-The data is output on the falling edge of the SCL signal.<br>-If not used, let this pin open. | O   |
| 36    | LEDA     | Anode pin of backlight                                                                                                      | P   |
| 37    | LEDK1    | Cathode pin OF backlight                                                                                                    | P   |
| 38    | LEDK2    | Cathode pin OF backlight                                                                                                    | P   |
| 39    | LEDK3    | Cathode pin OF backlight                                                                                                    | P   |
| 40    | LEDK4    | Cathode pin OF backlight                                                                                                    | P   |
| 41    | XR       | Touch panel Right Glass Terminal                                                                                            | A/D |
| 42    | YD       | Touch panel Bottom Film Terminal                                                                                            | A/D |
| 43    | XL       | Touch panel LIFT Glass Terminal                                                                                             | A/D |
| 44    | YU       | Touch panel Top Film Terminal                                                                                               | A/D |
| 45    | GND      | Ground.                                                                                                                     | P   |



## LCD Optical Characteristics

### 1 Optical specification

| Item                                 |         | Symbol         | Condition                         | Min.  | Typ.  | Max.  | Unit | Note                                                      |
|--------------------------------------|---------|----------------|-----------------------------------|-------|-------|-------|------|-----------------------------------------------------------|
| Transmittance<br>(with Polarizer)    |         | T (%)          | Θ=0<br>Normal<br>viewing<br>angle | —     | 4.65  | —     | %    | Measuring with<br>Polarizer ,<br>Reference Only           |
| Transmittance<br>(without Polarizer) |         | T (%)          |                                   | —     | 14.6  | —     | %    |                                                           |
| Contrast                             |         | CR             |                                   | 640   | 800   | —     | —    | (1)(2)                                                    |
| Response<br>time                     | Rising  | T <sub>R</sub> |                                   | —     | 16    | 21    | msec | (1)(3)                                                    |
|                                      | Falling | T <sub>F</sub> |                                   | —     | 19    | 24    |      |                                                           |
| Color gamut                          | (%)     |                |                                   | —     | 70    | —     | %    | C-light                                                   |
| Color<br>chromaticity<br>(CIE1931)   | White   | W <sub>x</sub> |                                   | 0.290 | 0.310 | 0.330 | —    | (1)(4)<br>CF glass                                        |
|                                      |         | W <sub>y</sub> |                                   | 0.316 | 0.336 | 0.356 |      |                                                           |
|                                      | Red     | R <sub>x</sub> |                                   | 0.627 | 0.647 | 0.667 | —    |                                                           |
|                                      |         | R <sub>y</sub> |                                   | 0.297 | 0.317 | 0.337 | —    |                                                           |
|                                      | Green   | G <sub>x</sub> |                                   | 0.255 | 0.275 | 0.295 | —    |                                                           |
|                                      |         | G <sub>y</sub> |                                   | 0.562 | 0.582 | 0.602 |      |                                                           |
|                                      | Blue    | B <sub>x</sub> |                                   | 0.120 | 0.140 | 0.160 | —    |                                                           |
|                                      |         | B <sub>y</sub> |                                   | 0.068 | 0.088 | 0.108 |      |                                                           |
| Viewing angle                        | Hor.    | Θ <sub>L</sub> | CR>10                             | —     | 80    | —     | —    | (1)(4)<br>Measuring with<br>Polarizer ,<br>Reference Only |
|                                      |         | Θ <sub>R</sub> |                                   | —     | 80    | —     |      |                                                           |
|                                      | Ver.    | Θ <sub>U</sub> |                                   | —     | 80    | —     |      |                                                           |
|                                      |         | Θ <sub>D</sub> |                                   | —     | 80    | —     |      |                                                           |
| Optima View Direction                |         | Free           |                                   |       |       |       |      | (5)                                                       |

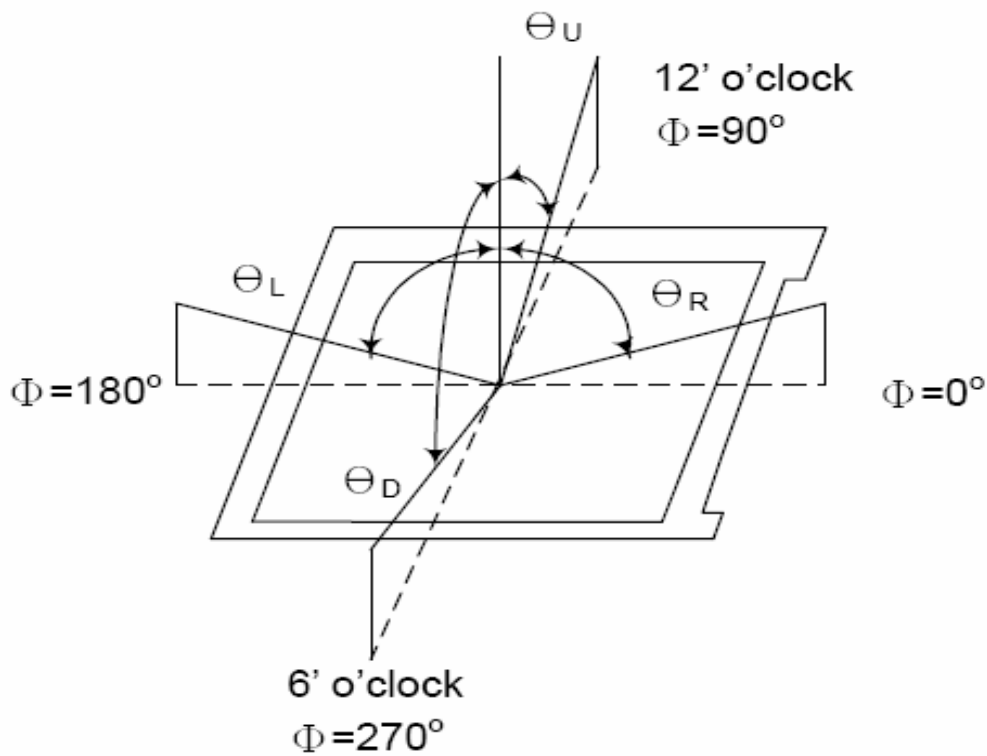


## 2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature :  $25 \pm 2^\circ\text{C}$
- 15min. warm-up time

## 3 Measuring Equipment

**Note (1) Definition of Viewing Angle :**



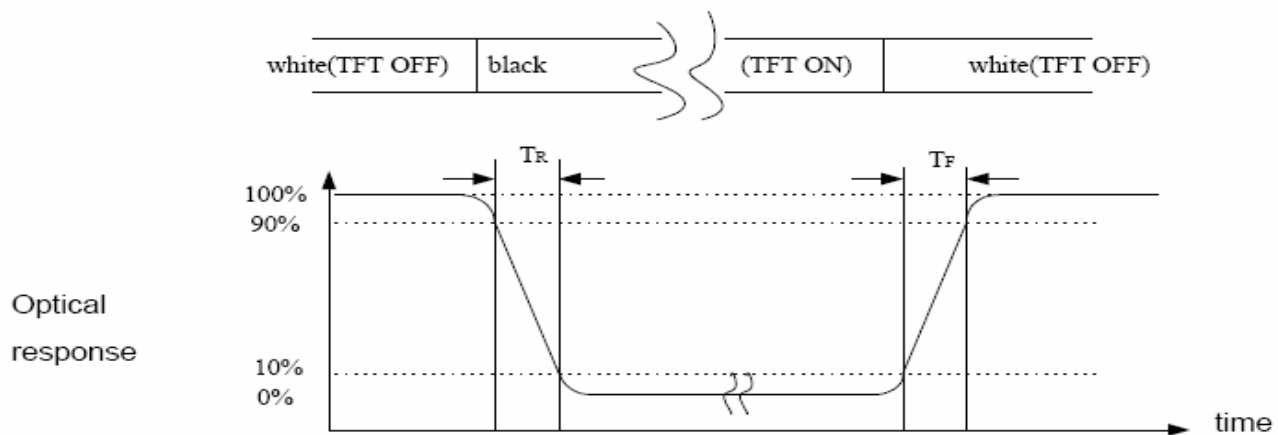
**Note (2) Definition of Contrast Ratio(CR) :**  
measured at the center point of panel

$$\text{CR} = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

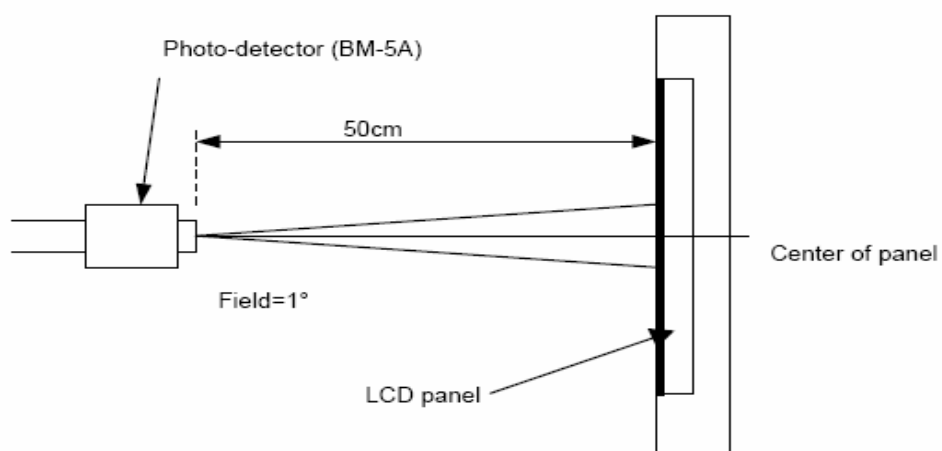
**Note (2) Definition of Contrast Ratio(CR) :**  
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

**Note (3) Definition of Response Time :** Sum of  $T_R$  and  $T_F$



**Note (4) Definition of optical measurement setup**



Electrical Characteristics

1 Absolute Maximum Rating (Ta=25 VSS=0V)

| Characteristics                   | Symbol          | Min. | Max. | Unit |
|-----------------------------------|-----------------|------|------|------|
| Digital Supply Voltage            | VDD             | -0.3 | 4.6  | V    |
| Digital interface supplle Voltage | VDDIO           | -0.3 | 4.6  | V    |
| Operating temperature             | T <sub>OP</sub> | -20  | +70  | °C   |
| Storage temperature               | T <sub>ST</sub> | -30  | +80  | °C   |

2 DC Electrical Characteristics

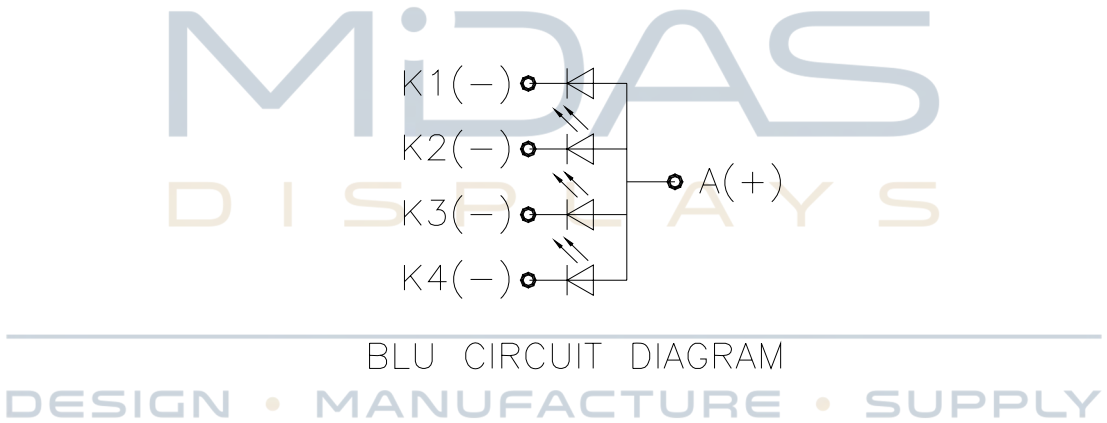
| Characteristics                   | Symbol          | Min.                 | Typ. | Max.                 | Unit | Note |
|-----------------------------------|-----------------|----------------------|------|----------------------|------|------|
| Digital Supply Voltage            | VDD             | 2.6                  | 3.3  | 4.2                  | V    |      |
| Digital interface supplle Voltage | VDDIO           | 1.65                 | 1.8  | 4.2                  | V    |      |
| Normal mode Current consumption   | IDD             | --                   | 8    | --                   | mA   |      |
| Level input voltage               | V <sub>IH</sub> | 0.7V <sub>DDIO</sub> |      | VDDIO                | V    |      |
|                                   | V <sub>IL</sub> | GND                  |      | 0.3V <sub>DDIO</sub> | V    |      |
| Level output voltage              | V <sub>OH</sub> | 0.8VDDIO             |      | VDDIO                | V    |      |
|                                   | V <sub>OL</sub> | GND                  |      | 0.2VDDIO             | V    |      |



3 LED Backlight Characteristics

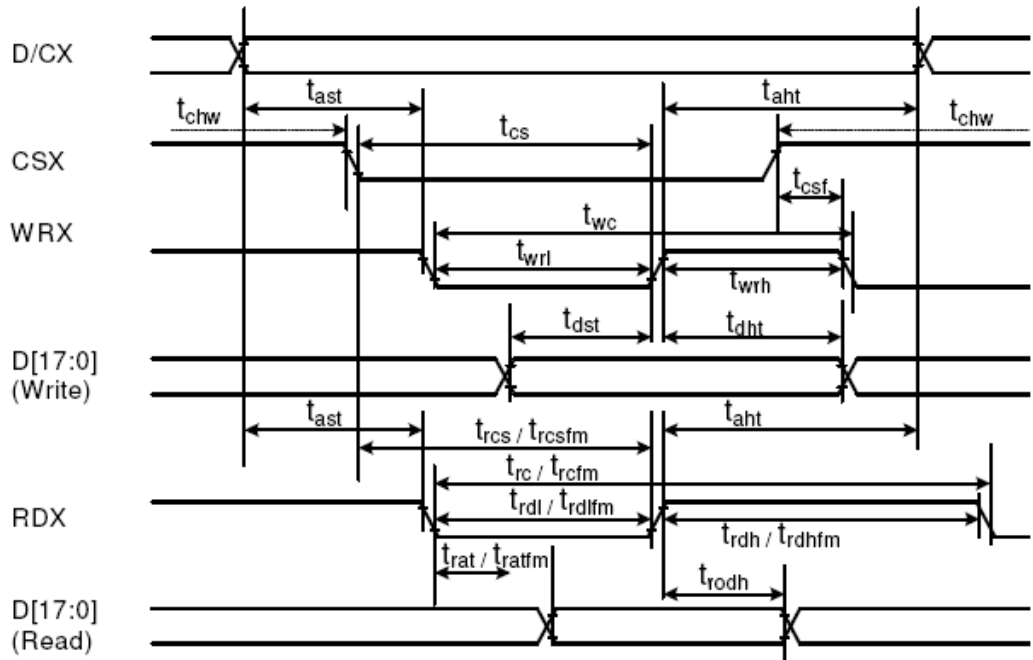
The back-light system is edge-lighting type with 4 chips White LED

| Item            | Symbol | Min. | Typ. | Max. | Unit  | Note    |
|-----------------|--------|------|------|------|-------|---------|
| Forward Current | $I_F$  | 60   | 80   | --   | mA    |         |
| Forward Voltage | $V_F$  | --   | 3.2  | --   | V     |         |
| LCM Luminance   | $L_v$  | 450  | --   | --   | cd/m2 | IF=80mA |
| Uniformity      | AVg    | 80   | --   | --   | %     |         |



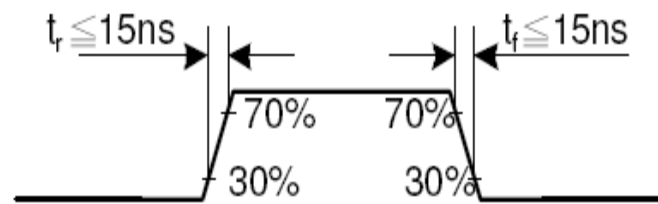
# AC Characteristic

## 1. Display Parallel 18/16/9/8-bit Interface Timing Characteristics (8080- I system)

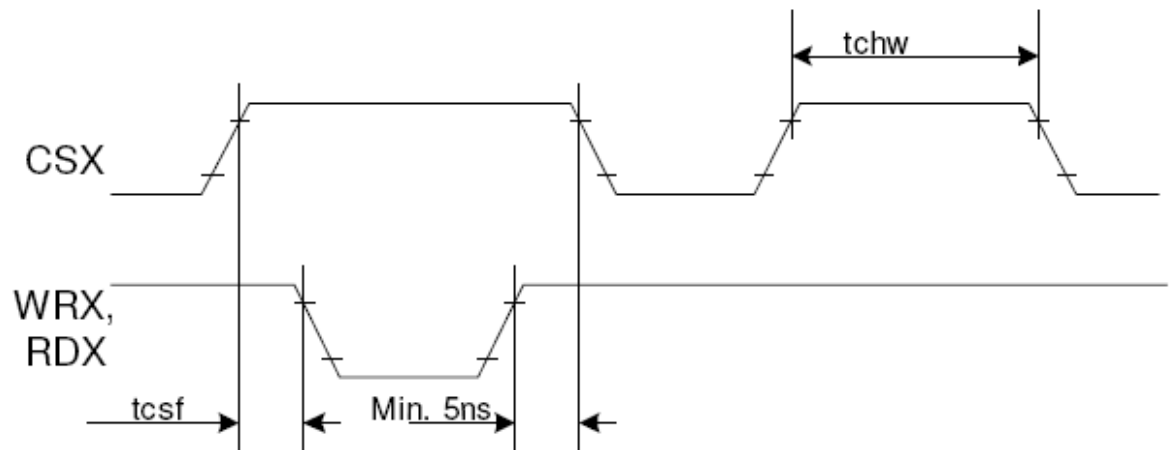


| Signal                                    | Symbol | Parameter                          | min | max | Unit | Description                               |
|-------------------------------------------|--------|------------------------------------|-----|-----|------|-------------------------------------------|
| 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   |                                           |
|                                           | tcsf   | Chip Select Wait time (Write/Read) | 10  | -   | ns   |                                           |
| WRX                                       | twc    | Write cycle                        | 66  | -   | ns   |                                           |
|                                           | twrh   | Write Control pulse H duration     | 15  | -   | ns   |                                           |
|                                           | twrl   | Write Control pulse L duration     | 15  | -   | ns   |                                           |
| RDX (FM)                                  | trcfm  | Read Cycle (FM)                    | 450 | -   | ns   |                                           |
|                                           | trdhfm | Read Control H duration (FM)       | 90  | -   | ns   |                                           |
|                                           | trdlfm | Read Control L duration (FM)       | 355 | -   | ns   |                                           |
| RDX (ID)                                  | trc    | Read cycle (ID)                    | 160 | -   | ns   |                                           |
|                                           | trdh   | Read Control pulse H duration      | 90  | -   | ns   |                                           |
|                                           | trdl   | Read Control pulse L duration      | 45  | -   | ns   |                                           |
| D[17:0],<br>D[15:0],<br>D[8:0],<br>D[7:0] | 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   |                                           |
|                                           | trod   | Read output disable time           | 20  | 80  | ns   |                                           |

Note: Ta = -30 to 70 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, VSS=0V

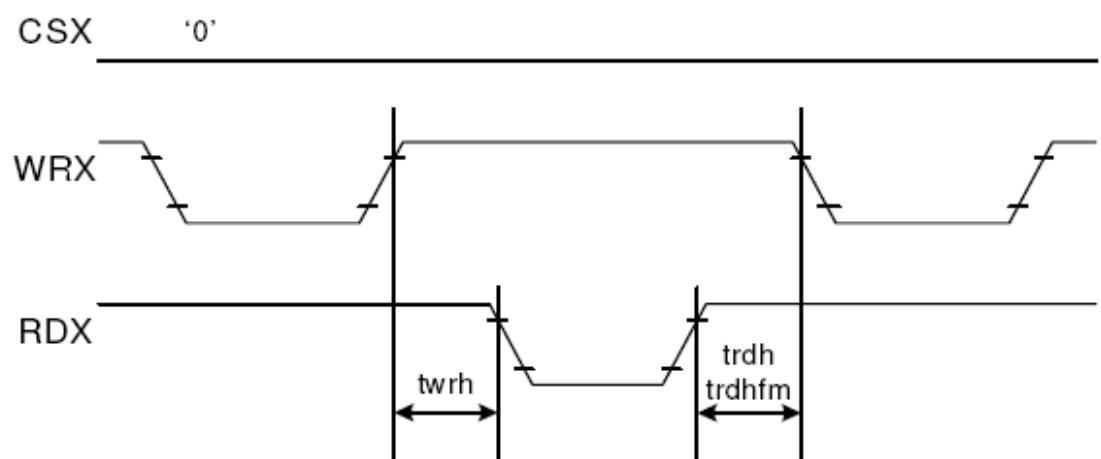


CSX timings :



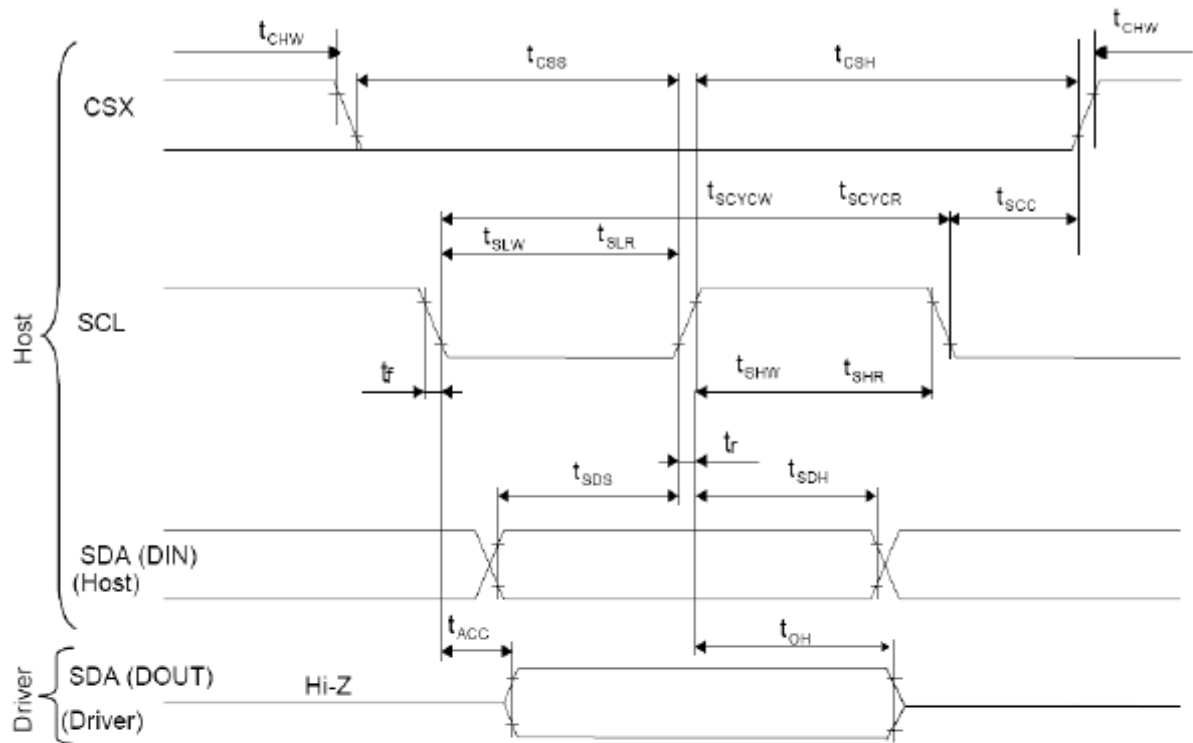
*Note: Logic high and low levels are specified as 30% and 70% of  $V_{DDI}$  for Input signals.*

Write to read or read to write timings:



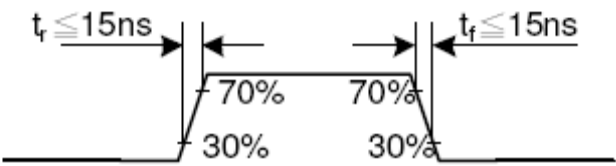
*Note: Logic high and low levels are specified as 30% and 70% of  $V_{DDI}$  for Input signals.*

2 Display Serial Interface Timing Characteristics (3-line SPI system)

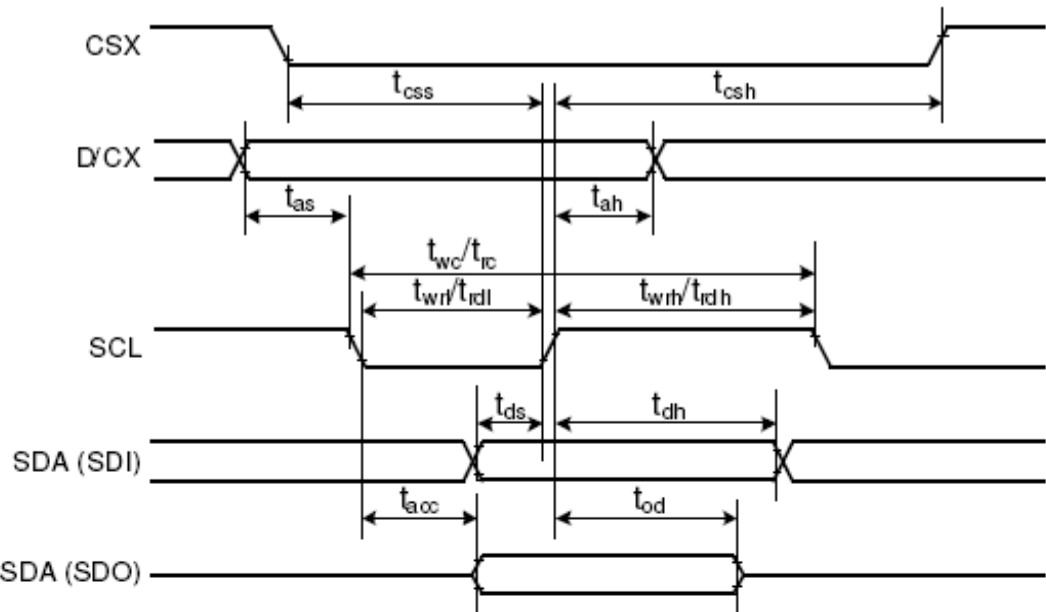


| Signal             | Symbol | Parameter                   | min | max | Unit | Description |
|--------------------|--------|-----------------------------|-----|-----|------|-------------|
| SCL                | tscycw | Serial Clock Cycle (Write)  | 100 | -   | ns   |             |
|                    | tshw   | SCL "H" Pulse Width (Write) | 40  | -   | ns   |             |
|                    | tslw   | SCL "L" Pulse Width (Write) | 40  | -   | ns   |             |
|                    | tscycr | Serial Clock Cycle (Read)   | 150 | -   | ns   |             |
|                    | tshr   | SCL "H" Pulse Width (Read)  | 60  | -   | ns   |             |
|                    | tslr   | SCL "L" Pulse Width (Read)  | 60  | -   | ns   |             |
| SDA / SDI (Input)  | tsds   | Data setup time (Write)     | 30  | -   | ns   |             |
|                    | tsdh   | Data hold time (Write)      | 30  | -   | ns   |             |
| SDA / SDO (Output) | tacc   | Access time (Read)          | 10  | -   | ns   |             |
|                    | toh    | Output disable time (Read)  | 10  | 50  | ns   |             |
| CSX                | tsc    | SCL-CSX                     | 20  | -   | ns   |             |
|                    | tch    | CSX "H" Pulse Width         | 40  | -   | ns   |             |
|                    | tc     | CSX-SCL Time                | 60  | -   | ns   |             |
|                    | tc     |                             | 65  | -   | ns   |             |

Note: Ta = 25 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V

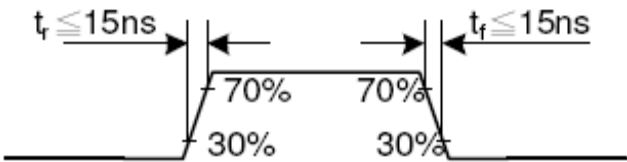


3 Display Serial Interface Timing Characteristics (4-line SPI system)

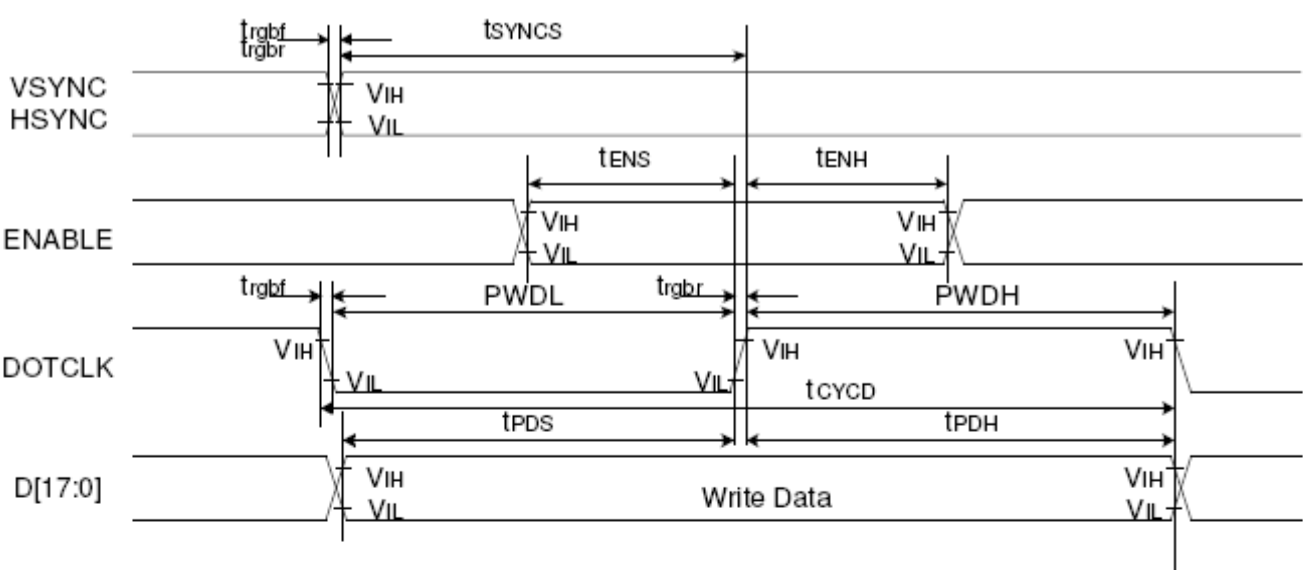


| Signal             | Symbol    | Parameter                     | min | max | Unit | Description         |
|--------------------|-----------|-------------------------------|-----|-----|------|---------------------|
| CSX                | $t_{css}$ | Chip select time (Write)      | 40  | -   | ns   |                     |
|                    | $t_{csh}$ | Chip select hold time (Read)  | 40  | -   | ns   |                     |
| SCL                | $t_{wc}$  | Serial clock cycle (Write)    | 100 | -   | ns   |                     |
|                    | $t_{wrh}$ | SCL "H" pulse width (Write)   | 40  | -   | ns   |                     |
|                    | $t_{wrl}$ | SCL "L" pulse width (Write)   | 40  | -   | ns   |                     |
|                    | $t_{rc}$  | Serial clock cycle (Read)     | 150 | -   | ns   |                     |
|                    | $t_{rdh}$ | SCL "H" pulse width (Read)    | 60  | -   | ns   |                     |
|                    | $t_{rdl}$ | SCL "L" pulse width (Read)    | 60  | -   | ns   |                     |
|                    |           |                               |     |     |      |                     |
| D/CX               | $t_{as}$  | D/CX setup time               | 10  | -   |      |                     |
|                    | $t_{ah}$  | D/CX hold time (Write / Read) | 10  | -   |      |                     |
| SDA / SDI (Input)  | $t_{ds}$  | Data setup time (Write)       | 30  | -   | ns   |                     |
|                    | $t_{dh}$  | Data hold time (Write)        | 30  | -   | ns   |                     |
| SDA / SDO (Output) | $t_{acc}$ | Access time (Read)            | 10  | -   | ns   | For maximum CL=30pF |
|                    | $t_{od}$  | Output disable time (Read)    | 10  | 50  | ns   | For minimum CL=8pF  |

Note:  $T_a = 25\text{ }^{\circ}\text{C}$ ,  $V_{DDI}=1.65\text{V to }3.3\text{V}$ ,  $V_{CI}=2.5\text{V to }3.3\text{V}$ ,  $AGND=VSS=0\text{V}$

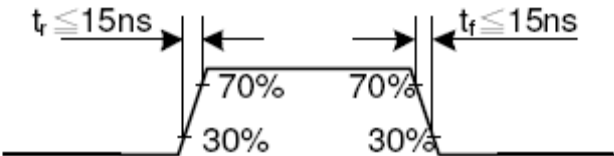


4 Parallel RGB Interface Timing Characteristics

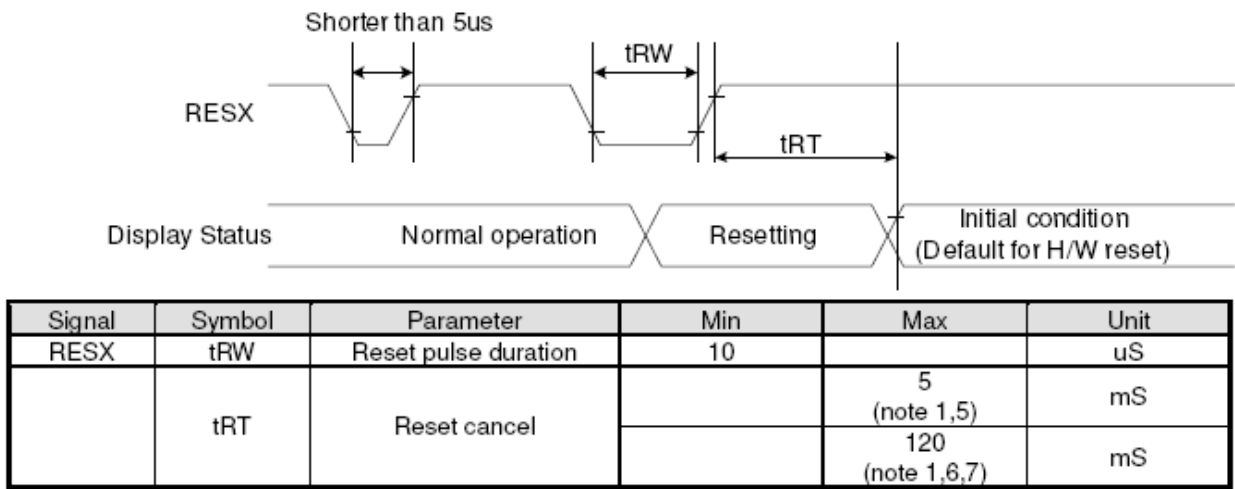


| Signal        | Symbol               | Parameter                         | min | max | Unit | Description                      |
|---------------|----------------------|-----------------------------------|-----|-----|------|----------------------------------|
| VSYNC / HSYNC | $t_{SYNCS}$          | VSYNC/HSYNC setup time            | 15  | -   | ns   | 18/16-bit bus RGB interface mode |
|               | $t_{SYNCH}$          | VSYNC/HSYNC hold time             | 15  | -   | ns   |                                  |
| DE            | $t_{ENS}$            | DE setup time                     | 15  | -   | ns   |                                  |
|               | $t_{ENH}$            | DE hold time                      | 15  | -   | ns   |                                  |
| D[17:0]       | $t_{POS}$            | Data setup time                   | 15  | -   | ns   |                                  |
|               | $t_{PDH}$            | Data hold time                    | 15  | -   | ns   |                                  |
| DOTCLK        | $PWDH$               | DOTCLK high-level period          | 15  | -   | ns   |                                  |
|               | $PWDL$               | DOTCLK low-level period           | 15  | -   | ns   |                                  |
|               | $t_{CYCD}$           | DOTCLK cycle time                 | 100 | -   | ns   |                                  |
|               | $t_{rgbr}, t_{rgbf}$ | DOTCLK,HSYNC,VSYNC rise/fall time | -   | 15  | ns   |                                  |
| VSYNC / HSYNC | $t_{SYNCS}$          | VSYNC/HSYNC setup time            | 15  | -   | ns   | 6-bit bus RGB interface mode     |
|               | $t_{SYNCH}$          | VSYNC/HSYNC hold time             | 15  | -   | ns   |                                  |
| DE            | $t_{ENS}$            | DE setup time                     | 15  | -   | ns   |                                  |
|               | $t_{ENH}$            | DE hold time                      | 15  | -   | ns   |                                  |
| D[17:0]       | $t_{POS}$            | Data setup time                   | 15  | -   | ns   |                                  |
|               | $t_{PDH}$            | Data hold time                    | 15  | -   | ns   |                                  |
| DOTCLK        | $PWDH$               | DOTCLK high-level pulse period    | 15  | -   | ns   |                                  |
|               | $PWDL$               | DOTCLK low-level pulse period     | 15  | -   | ns   |                                  |
|               | $t_{CYCD}$           | DOTCLK cycle time                 | 100 | -   | ns   |                                  |
|               | $t_{rgbr}, t_{rgbf}$ | DOTCLK,HSYNC,VSYNC rise/fall time | -   | 15  | 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  $3.3\text{V}$ ,  $AGND=VSS=0\text{V}$



5 Reset Timing Characteristics



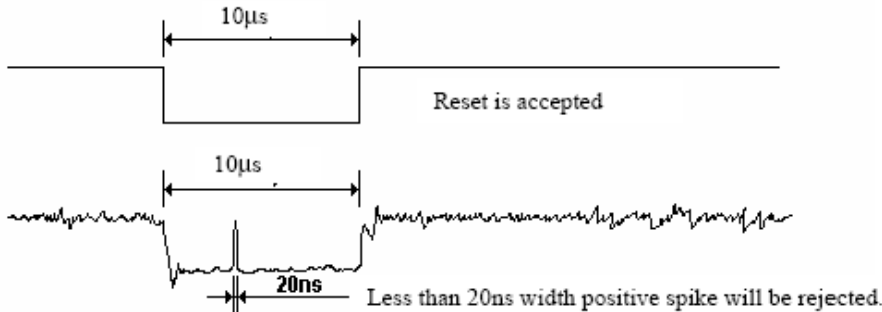
*Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.*

*Note 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   |

*Note 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.*

*Note 4: Spike Rejection also applies during a valid reset pulse as shown below:*



*Note 5: When Reset applied during Sleep In Mode.*

*Note 6: When Reset applied during Sleep Out Mode.*

*Note 7: It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out*

# LCD Module Out-Going Quality Level

## 1 VISUAL & FUNCTION INSPECTION STANDARD

### 1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

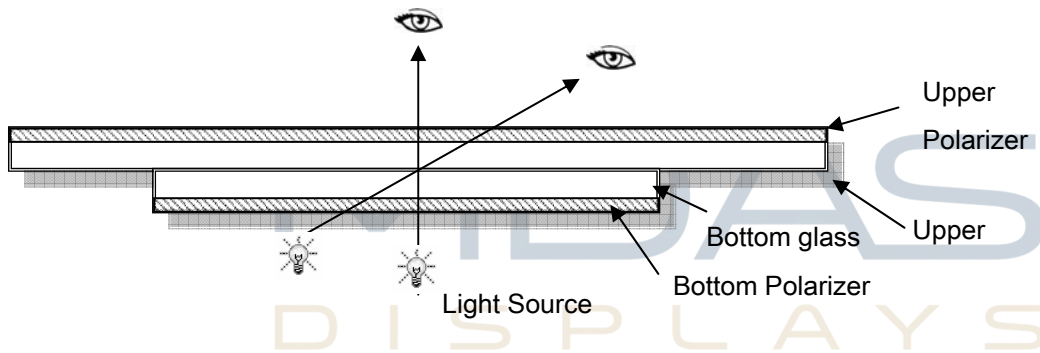
Temperature :  $25 \pm 5^{\circ}\text{C}$

Humidity :  $65\% \pm 10\% \text{RH}$

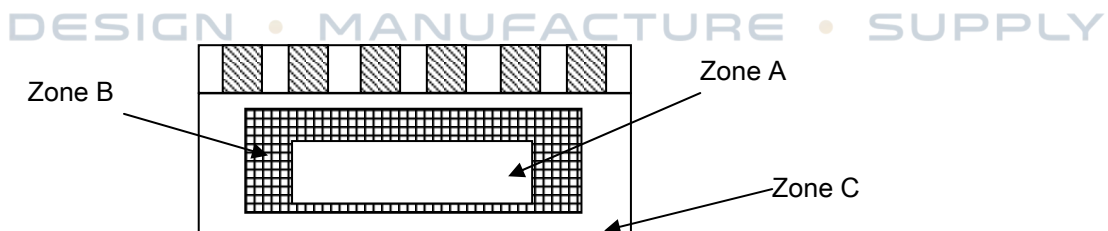
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance: 30–50cm



### 1.2 Definition



Zone A : Effective Viewing Area (Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer.



### 1.3 Sampling Plan

According to GB/T 2828–2003 ; , normal inspection, Class II

AQL:

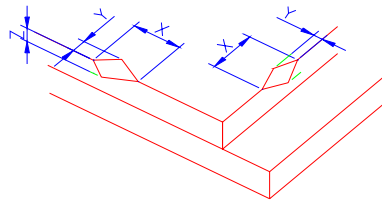
| Major defect | Minor defect |
|--------------|--------------|
| 0.65         | 1.5          |

LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

| No | Items to be inspected | Criteria                                                                                                                              | Classification of defects |
|----|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| 1  | Functional defects    | 1) No display, Open or miss line<br>2) Display abnormally, Short<br>3) Backlight no lighting, abnormal lighting.<br>4) TP no function | Major                     |
| 2  | Missing               | Missing component                                                                                                                     |                           |
| 3  | Outline dimension     | Overall outline dimension beyond the drawing is not allowed                                                                           |                           |
| 4  | Color tone            | Color unevenness, refer to limited sample                                                                                             | Minor                     |
| 5  | Soldering appearance  | Good soldering , Peeling off is not allowed.                                                                                          |                           |
| 6  | LCD/Polarizer/TP      | Black/White spot/line, scratch, crack, etc.                                                                                           |                           |

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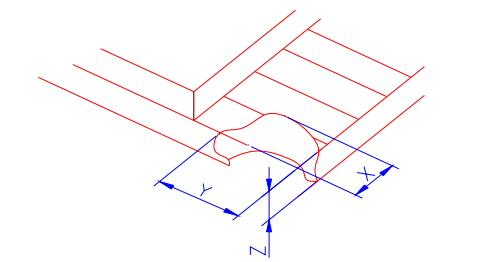
### 1.4 Criteria (Visual)

| Number                         | Items                             | Criteria(mm)                                                                                                                                                                                                                      |   |   |   |        |                                   |    |
|--------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---|--------|-----------------------------------|----|
| 1.0 LCD<br>Crack/Broken        | (1) The edge of LCD broken        |  <table> <tr> <th>X</th><th>Y</th><th>Z</th></tr> <tr> <td>≤3.0mm</td><td>&lt;Inner border<br/>line of the seal</td><td>≤T</td></tr> </table> | X | Y | Z | ≤3.0mm | <Inner border<br>line of the seal | ≤T |
| X                              | Y                                 | Z                                                                                                                                                                                                                                 |   |   |   |        |                                   |    |
| ≤3.0mm                         | <Inner border<br>line of the seal | ≤T                                                                                                                                                                                                                                |   |   |   |        |                                   |    |
| NOTE:<br>X: Length<br>Y: Width |                                   |                                                                                                                                                                                                                                   |   |   |   |        |                                   |    |



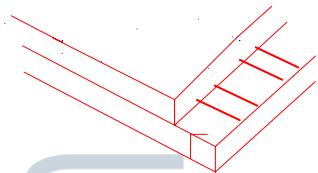
Z: Height  
L: Length of  
ITO,  
T: Height of  
LCD

(2)LCD corner broken



| X                   | Y        | Z        |
|---------------------|----------|----------|
| $\leq 3.0\text{mm}$ | $\leq L$ | $\leq T$ |

(3) LCD crack

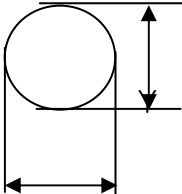


Crack  
Not allowed

MIDAS  
DISPLAYS

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| Number                                                                                                                                                                                                                                                                                                          | Items                                                                                                                                                                                                                                                                                                                                                                                                                                              | Criteria (mm)                                                                                                                                                                                                                                                                                                                                                           |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------|---|---|---|-------|--------|--------|--------|-----------|-------------------|-------------|-------------------|-------|-----|------------|---|-------------|-------|---------|---|--|--------|-----------------------|--|--|--|
| 2.0                                                                                                                                                                                                                                                                                                             | <div>Spot defect</div> <div></div> <div>X</div> <div>Φ=(X+Y)/2</div>                                                                                                                                                                                                                                                                                              | ① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)                                                                                                                                                                                                                                                                                       |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <table><tr><th rowspan="2">Zone<br/>Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>Φ≤0.10</td><td colspan="3">Ignore</td></tr><tr><td>0.10&lt;Φ≤0.15</td><td colspan="3">3( distance≥10mm)</td></tr><tr><td>0.15&lt;Φ≤0.2</td><td colspan="3">1</td></tr><tr><td>0.2&lt;Φ</td><td colspan="3">0</td></tr></table> | Zone<br>Size (mm) | Acceptable Qty |   |   | A | B     | C      | Φ≤0.10 | Ignore |           |                   | 0.10<Φ≤0.15 | 3( distance≥10mm) |       |     | 0.15<Φ≤0.2 | 1 |             |       | 0.2<Φ   | 0 |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Zone<br>Size (mm)                                                                                                                                                                                                                                                                                                                                                       |                   | Acceptable Qty |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                         | A                 | B              | C |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Φ≤0.10                                                                                                                                                                                                                                                                                                                                                                  | Ignore            |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.10<Φ≤0.15                                                                                                                                                                                                                                                                                                                                                             | 3( distance≥10mm) |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.15<Φ≤0.2                                                                                                                                                                                                                                                                                                                                                              | 1                 |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 0.2<Φ                                                                                                                                                                                                                                                                                                                                                                   | 0                 |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ②Dim spot (LCD/TP/Polarizer dim dot, light leakage、 dark spot)                                                                                                                                                                                                                                                                                                          |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <table><tr><th rowspan="2">Zone<br/>Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>Φ≤0.1</td><td colspan="3">Ignore</td></tr><tr><td>0.1&lt;Φ≤0.2</td><td colspan="3">2( distance≥10mm)</td></tr><tr><td>0.2&lt;Φ≤0.3</td><td colspan="3">1</td></tr><tr><td>Φ &gt; 0.3</td><td colspan="3">0</td></tr></table>   | Zone<br>Size (mm) | Acceptable Qty |   |   | A | B     | C      | Φ≤0.1  | Ignore |           |                   | 0.1<Φ≤0.2   | 2( distance≥10mm) |       |     | 0.2<Φ≤0.3  | 1 |             |       | Φ > 0.3 | 0 |  |        |                       |  |  |  |
| Zone<br>Size (mm)                                                                                                                                                                                                                                                                                               | Acceptable Qty                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 | A                                                                                                                                                                                                                                                                                                                                                                                                                                                  | B                                                                                                                                                                                                                                                                                                                                                                       | C                 |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| Φ≤0.1                                                                                                                                                                                                                                                                                                           | Ignore                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| 0.1<Φ≤0.2                                                                                                                                                                                                                                                                                                       | 2( distance≥10mm)                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| 0.2<Φ≤0.3                                                                                                                                                                                                                                                                                                       | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| Φ > 0.3                                                                                                                                                                                                                                                                                                         | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| ③ Polarizer accidented spot                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| <table><tr><th rowspan="2">Zone<br/>Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>Φ≤0.2</td><td colspan="3">Ignore</td></tr><tr><td>0.2&lt;Φ≤0.5</td><td colspan="3">2( distance≥10mm)</td></tr><tr><td>Φ&gt;0.5</td><td colspan="3">0</td></tr></table> | Zone<br>Size (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                  | Acceptable Qty                                                                                                                                                                                                                                                                                                                                                          |                   |                | A | B | C | Φ≤0.2 | Ignore |        |        | 0.2<Φ≤0.5 | 2( distance≥10mm) |             |                   | Φ>0.5 | 0   |            |   |             |       |         |   |  |        |                       |  |  |  |
| Zone<br>Size (mm)                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Acceptable Qty                                                                                                                                                                                                                                                                                                                                                          |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 | A                                                                                                                                                                                                                                                                                                                                                                                                                                                  | B                                                                                                                                                                                                                                                                                                                                                                       | C                 |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| Φ≤0.2                                                                                                                                                                                                                                                                                                           | Ignore                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| 0.2<Φ≤0.5                                                                                                                                                                                                                                                                                                       | 2( distance≥10mm)                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| Φ>0.5                                                                                                                                                                                                                                                                                                           | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| Line defect<br>(LCD/TP<br>/Polarizer<br>black/white<br>line,<br>scratch,<br>stain)                                                                                                                                                                                                                              | <table><tr><th rowspan="2">Width(mm)</th><th rowspan="2">Length(mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td>Φ≤0.03</td><td>Ignore</td><td colspan="3">Ignore</td></tr><tr><td>0.03&lt;W≤0.05</td><td>L≤3.0</td><td colspan="3">N≤2</td></tr><tr><td>0.05&lt;W≤0.08</td><td>L≤2.0</td><td colspan="3">N≤2</td></tr><tr><td>0.08&lt;W</td><td colspan="4">Define as spot defect</td></tr></table> | Width(mm)                                                                                                                                                                                                                                                                                                                                                               | Length(mm)        | Acceptable Qty |   |   | A | B     | C      | Φ≤0.03 | Ignore | Ignore    |                   |             | 0.03<W≤0.05       | L≤3.0 | N≤2 |            |   | 0.05<W≤0.08 | L≤2.0 | N≤2     |   |  | 0.08<W | Define as spot defect |  |  |  |
| Width(mm)                                                                                                                                                                                                                                                                                                       | Length(mm)                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                         |                   | Acceptable Qty |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    | A                                                                                                                                                                                                                                                                                                                                                                       | B                 | C              |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| Φ≤0.03                                                                                                                                                                                                                                                                                                          | Ignore                                                                                                                                                                                                                                                                                                                                                                                                                                             | Ignore                                                                                                                                                                                                                                                                                                                                                                  |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| 0.03<W≤0.05                                                                                                                                                                                                                                                                                                     | L≤3.0                                                                                                                                                                                                                                                                                                                                                                                                                                              | N≤2                                                                                                                                                                                                                                                                                                                                                                     |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| 0.05<W≤0.08                                                                                                                                                                                                                                                                                                     | L≤2.0                                                                                                                                                                                                                                                                                                                                                                                                                                              | N≤2                                                                                                                                                                                                                                                                                                                                                                     |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
| 0.08<W                                                                                                                                                                                                                                                                                                          | Define as spot defect                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |
|                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                         |                   |                |   |   |   |       |        |        |        |           |                   |             |                   |       |     |            |   |             |       |         |   |  |        |                       |  |  |  |



| Items       | Criteria (mm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| Spot defect | <div><div><div><div><div></div><div></div></div><div><div></div><div></div></div></div><div><div></div><div></div></div><div><div></div><div></div></div></div><div><div></div><div></div></div><div><div></div><div></div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> <div><div></div><div></div></div> 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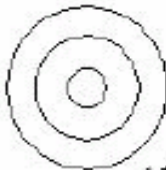
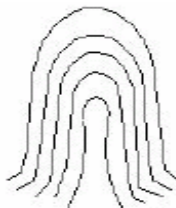
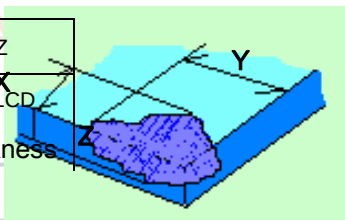
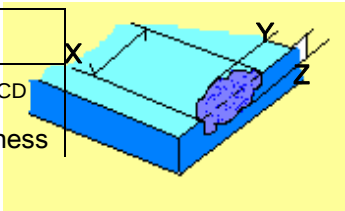


| Line defect<br>(LCD/TP<br>/Polarizer<br>black/white<br>line,<br>scratch,<br>stain) | <table><tr><th rowspan="2">Width(mm)</th><th rowspan="2">Length(mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td><math>\Phi \leq 0.03</math></td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr><tr><td><math>0.03 &lt; W \leq 0.05</math></td><td><math>L \leq 3.0</math></td><td colspan="2"><math>N \leq 2</math></td></tr><tr><td><math>0.05 &lt; W \leq 0.08</math></td><td><math>L \leq 2.0</math></td><td colspan="2"><math>N \leq 2</math></td></tr><tr><td><math>0.08 &lt; W</math></td><td colspan="4">Define as spot defect</td></tr></table> | Width(mm)             | Length(mm)                      | Acceptable Qty |            |                | A | B | C               | $\Phi \leq 0.03$ | Ignore | Ignore |                       | Ignore                          | $0.03 < W \leq 0.05$ | $L \leq 3.0$          | $N \leq 2$ |  | $0.05 < W \leq 0.08$ | $L \leq 2.0$ | $N \leq 2$ |  | $0.08 < W$ | Define as spot defect |  |  |  |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------------------|----------------|------------|----------------|---|---|-----------------|------------------|--------|--------|-----------------------|---------------------------------|----------------------|-----------------------|------------|--|----------------------|--------------|------------|--|------------|-----------------------|--|--|--|
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       |                                 | Width(mm)      | Length(mm) | Acceptable Qty |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | A                     | B                               |                |            | C              |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $\Phi \leq 0.03$      | Ignore                          | Ignore         |            | Ignore         |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $0.03 < W \leq 0.05$  | $L \leq 3.0$                    | $N \leq 2$     |            |                |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $0.05 < W \leq 0.08$  | $L \leq 2.0$                    | $N \leq 2$     |            |                |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
| $0.08 < W$                                                                         | Define as spot defect                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                       |                                 |                |            |                |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
| Polarizer<br>Bubble                                                                | <table><tr><th rowspan="2">Zone<br/>Size (mm)</th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td><math>\Phi \leq 0.2</math></td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td><math>0.2 &lt; \Phi \leq 0.4</math></td><td colspan="2">2(distance <math>\geq 10\text{mm}</math>)</td></tr><tr><td><math>0.4 &lt; \Phi \leq 0.6</math></td><td colspan="2">1</td></tr><tr><td><math>0.6 &lt; \Phi</math></td><td colspan="2">0</td></tr></table>                                                                                                                       | Zone<br>Size (mm)     | Acceptable Qty                  |                |            | A              | B | C | $\Phi \leq 0.2$ | Ignore           |        | Ignore | $0.2 < \Phi \leq 0.4$ | 2(distance $\geq 10\text{mm}$ ) |                      | $0.4 < \Phi \leq 0.6$ | 1          |  | $0.6 < \Phi$         | 0            |            |  |            |                       |  |  |  |
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                       | Zone<br>Size (mm)               | Acceptable Qty |            |                |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | A                     |                                 | B              | C          |                |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $\Phi \leq 0.2$       | Ignore                          |                | Ignore     |                |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $0.2 < \Phi \leq 0.4$ | 2(distance $\geq 10\text{mm}$ ) |                |            |                |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
|                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | $0.4 < \Phi \leq 0.6$ | 1                               |                |            |                |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
| $0.6 < \Phi$                                                                       | 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                       |                                 |                |            |                |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |
| SMT                                                                                | According to IPC-A-610C class II standard . Function defect and missing part are major defect ,the others are minor defect.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                       |                                 |                |            |                |   |   |                 |                  |        |        |                       |                                 |                      |                       |            |  |                      |              |            |  |            |                       |  |  |  |

DESIGN • MANUFACTURE • SUPPLY

|                        |                | TP bubble/<br>accidented<br>spot | <table><tr><th rowspan="2">Size <math>\Phi(\text{mm})</math></th><th colspan="3">Acceptable Qty</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td><math>\Phi \leq 0.1</math></td><td colspan="3">Ignore</td></tr><tr><td><math>0.1 &lt; \Phi \leq 0.2</math></td><td colspan="3">2</td></tr><tr><td><math>0.2 &lt; \Phi \leq 0.3</math></td><td colspan="3">1</td></tr><tr><td><math>0.3 &lt; \Phi</math></td><td colspan="3">0</td></tr></table> | Size $\Phi(\text{mm})$ | Acceptable Qty |  |  | A | B | C | $\Phi \leq 0.1$ | Ignore |  |  | $0.1 < \Phi \leq 0.2$ | 2 |  |  | $0.2 < \Phi \leq 0.3$ | 1 |  |  | $0.3 < \Phi$ | 0 |  |  |
|------------------------|----------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|----------------|--|--|---|---|---|-----------------|--------|--|--|-----------------------|---|--|--|-----------------------|---|--|--|--------------|---|--|--|
| Size $\Phi(\text{mm})$ | Acceptable Qty |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
|                        | A              | B                                | C                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
| $\Phi \leq 0.1$        | Ignore         |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
| $0.1 < \Phi \leq 0.2$  | 2              |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
| $0.2 < \Phi \leq 0.3$  | 1              |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
| $0.3 < \Phi$           | 0              |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                        |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |
|                        |                | Assembly<br>deflection           | beyond the edge of backlight $\leq 0.15\text{mm}$                                                                                                                                                                                                                                                                                                                                                                                                       |                        |                |  |  |   |   |   |                 |        |  |  |                       |   |  |  |                       |   |  |  |              |   |  |  |



|                       |                       |                                                                                                  |                                                                                                                                         |                                                   |                                                                                                                                                                                                                                                                                                                         |                       |                       |                                                                                                                                                                           |                                                       |
|-----------------------|-----------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| 5.0                   | TP<br>Related         | <div>Newton<br/>Ring</div>                                                                       | <div>Newton<br/>area&gt;1/3<br/>TP<br/>NG</div> <div>Newton<br/>area≤1/3<br/>TP<br/>OK</div>                                            | <div>Ring<br/>area</div> <div>Ring<br/>area</div> | <div><br/>1 规律性</div> <div><br/>2 非规律性</div> <div><br/>似牛顿环</div> |                       |                       |                                                                                                                                                                           |                                                       |
|                       |                       | <div>TP corner<br/>broken</div> <div>X : length</div> <div>Y : width</div> <div>Z : height</div> | <table><tr><td>x</td><td>y</td></tr><tr><td><math>x \leq 3.0\text{mm}</math></td><td><math>y \leq 3.0\text{mm}</math></td></tr></table> | x                                                 | y                                                                                                                                                                                                                                                                                                                       | $x \leq 3.0\text{mm}$ | $y \leq 3.0\text{mm}$ | <div><div><div>z</div><div><math>z &lt; \text{LCD thickness}</math></div></div></div> | <div>*<br/>Circuitry broken is<br/>not allowed.</div> |
| x                     | y                     |                                                                                                  |                                                                                                                                         |                                                   |                                                                                                                                                                                                                                                                                                                         |                       |                       |                                                                                                                                                                           |                                                       |
| $x \leq 3.0\text{mm}$ | $y \leq 3.0\text{mm}$ |                                                                                                  |                                                                                                                                         |                                                   |                                                                                                                                                                                                                                                                                                                         |                       |                       |                                                                                                                                                                           |                                                       |
|                       |                       | <div>TP edge<br/>broken</div> <div>X : length</div> <div>Y : width</div> <div>Z : height</div>   | <table><tr><td>x</td><td>y</td></tr><tr><td><math>x \leq 6.0\text{mm}</math></td><td><math>y \leq 2.0\text{mm}</math></td></tr></table> | x                                                 | y                                                                                                                                                                                                                                                                                                                       | $x \leq 6.0\text{mm}$ | $y \leq 2.0\text{mm}$ | <div><div><div>z</div><div><math>z &lt; \text{LCD thickness}</math></div></div></div> | <div>* Circuitry broken is<br/>not allowed.</div>     |
| x                     | y                     |                                                                                                  |                                                                                                                                         |                                                   |                                                                                                                                                                                                                                                                                                                         |                       |                       |                                                                                                                                                                           |                                                       |
| $x \leq 6.0\text{mm}$ | $y \leq 2.0\text{mm}$ |                                                                                                  |                                                                                                                                         |                                                   |                                                                                                                                                                                                                                                                                                                         |                       |                       |                                                                                                                                                                           |                                                       |



Criteria ( functional items)

| Number | Items                 | Criteria (mm) |
|--------|-----------------------|---------------|
| 1      | No display            | Not allowed   |
| 2      | Missing segment       | Not allowed   |
| 3      | Short                 | Not allowed   |
| 4      | Backlight no lighting | Not allowed   |
| 5      | TP no function        | Not allowed   |



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DESIGN • MANUFACTURE • SUPPLY



# Reliability Test Result

## 1 Condition

| Item                                 | Condition                                                                                                                                                                                                                                                                                               | Sample Size | Test Result | Note |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------|
| Low Temperature Operating Life test  | -20℃, 96HR                                                                                                                                                                                                                                                                                              | 3ea         | pass        | -    |
| Thermal Humidity Operating Life test | 70℃, 90%RH, 96HR                                                                                                                                                                                                                                                                                        | 3ea         | pass        | -    |
| Temperature Cycle ON/OFF test        | -20℃ ↔ 70℃, ON/OFF, 20CYC                                                                                                                                                                                                                                                                               | 3ea         | pass        | (1)  |
| High Temperature Storage test        | 80℃, 96HR                                                                                                                                                                                                                                                                                               | 3ea         | pass        | -    |
| Low Temperature Storage test         | - 30℃, 96HR                                                                                                                                                                                                                                                                                             | 3ea         | pass        | -    |
| Thermal Shock Resistance             | The sample should be allowed to stand the following 5 cycles of operation: TSTL for 30 minutes -> normal temperature for 5 minutes -> TSTH for 30 minutes -> normal temperature for 5 minutes, as one cycle, then taking it out and drying it at normal temperature, and allowing it stand for 24 hours | 3ea         | pass        |      |
| Box Drop Test                        | 1 Corner 3 Edges 6 faces, 66cm(MEDIUM BOX)                                                                                                                                                                                                                                                              | 1box        | pass        | -    |

Note (1) ON Time over 10 seconds, OFF Time under 10 seconds



# Cautions and Handling Precautions

## 1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.

Do not warp or twist the module during assembly work.

(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.

(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.

(4) Do not allow drops of water or chemicals to remain on the display surface.

If you have the droplets for a long time, staining and discoloration may occur.

(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.

(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.

Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.

(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.

(8) Protect the module from static; it may cause damage to the CMOS ICs.

(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.

(10) Do not disassemble the module.

(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.

(12) Pins of I/F connector shall not be touched directly with bare hands.

(13) Do not connect, disconnect the module in the "Power ON" condition.

(14) Power supply should always be turned on/off by the item 6.1 Power On Sequence & 6.2 Power Off Sequence

## 2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.

It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%

(2) Do not store the TFT-LCD module in direct sunlight.

(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.

In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

