



# 深圳市思迪科科技有限公司

## SHENZHEN CDTECH ELECTRONICS

### Product Specification

|                    |                                                  |
|--------------------|--------------------------------------------------|
| <b>Model Name</b>  | S035HQ55ES-DC37                                  |
| <b>Description</b> | TFT LCD Module<br>3.5" QVGA<br>320(RGB)x240 Dots |
| <b>Date</b>        | 2021/07/15                                       |
| <b>Version</b>     | 2.0                                              |

|                             |                          |                             |
|-----------------------------|--------------------------|-----------------------------|
| <b>Approved<br/>by/Date</b> | <b>Check<br/>by/Date</b> | <b>Prepared<br/>by/Date</b> |
| ZHP 2021/07/15              | HZX 2021/07/15           | ZWF 2021/07/15              |

|                          |  |
|--------------------------|--|
| <b>Customer Approval</b> |  |
|                          |  |
| <b>Date</b>              |  |



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## SHENZHEN CDTECH ELECTRONICS

### 1. Record of Revision

| Rev | Issued Date | Description                         | Editor |
|-----|-------------|-------------------------------------|--------|
| 1.0 | 2020/11/16  | First Release.                      | ZWF    |
| 2.0 | 2021/07/15  | Update the PIN interface definition | ZWF    |
|     |             |                                     |        |
|     |             |                                     |        |
|     |             |                                     |        |
|     |             |                                     |        |
|     |             |                                     |        |
|     |             |                                     |        |
|     |             |                                     |        |
|     |             |                                     |        |
|     |             |                                     |        |
|     |             |                                     |        |

## 2. General Specifications

| Feature         |                      | Spec                          |
|-----------------|----------------------|-------------------------------|
| Characteristics | Size                 | 3.5 inch                      |
|                 | Resolution           | 320(horizontal)*240(Vertical) |
|                 | Interface            | 24bit-RGB                     |
|                 | Connect type         | Connector                     |
|                 | Color Depth          | 16.7M                         |
|                 | Technology type      | a-Si                          |
|                 | Pixel pitch (mm)     | 0.219*0.219                   |
|                 | Pixel Configuration  | R.G.B.Stripe                  |
|                 | Display Mode         | Normally Black                |
|                 | Driver IC            | ST7272A                       |
|                 | Touch Driver IC      | GT911                         |
|                 | Viewing Direction    | Full view                     |
| Mechanical      | LCM (W x H x D) (mm) | 76.90*63.90*4.89              |
|                 | Active Area(mm)      | 70.08*52.56                   |
|                 | Weight (g)           | TBD                           |
|                 | LED Numbers          | 9 LEDs                        |

Note 1: Requirements on Environmental Protection: RoHs

Note 2: LCM weight tolerance: +/- 5%

### 3. Input/Output Terminals

| No.   | Symbol    | Description                            |
|-------|-----------|----------------------------------------|
| 1-2   | VBL-      | Backlight LED Cathode                  |
| 3-4   | VBL+      | Backlight LED Anode.                   |
| 5     | Y1(NC)    | Touch panel up side (NC)               |
| 6     | X1(NC)    | Touch panel right side (NC)            |
| 7     | NC        | -                                      |
| 8     | RESET     | Reset Signal pin ("Low" is enable)     |
| 9     | SPENB(NC) | Chip select(NC)                        |
| 10    | SPCK(NC)  | Serial Clock.(NC)                      |
| 11    | SPDA(NC)  | Serial Data(NC)                        |
| 12-19 | B0~B7     | Data bus                               |
| 20-27 | G0~G7     | Data bus                               |
| 28-35 | R0~R7     | Data bus                               |
| 36    | HSYNC     | Line Synchronous Signal                |
| 37    | VSYNC     | Frame Synchronous Signal               |
| 38    | DOTCLK    | Dot-clock signal and oscillator source |
| 39-40 | NC        | -                                      |
| 41-42 | VDD       | Power supply for logic operation       |
| 43    | Y2(NC)    | Touch panel bottom side (NC)           |
| 44    | X2(NC)    | Touch panel left side (NC)             |
| 45-47 | NC        | -                                      |
| 48    | IF2 (NC)  | Control the input data format (NC)     |
| 49    | IF1 (NC)  | Control the input data format (NC)     |
| 50    | IF0 (NC)  | Control the input data format (NC)     |
| 51    | NC        | -                                      |
| 52    | DEN       | Display enable signal                  |
| 53-54 | GND       | System Ground                          |

### CTP PIN-MAP

| Pin | Signal | Description                   |
|-----|--------|-------------------------------|
| 1   | GND    | Ground                        |
| 2   | VDD    | Power supply                  |
| 3   | INT    | Interrupt request to the host |
| 4   | SDA    | I2C data input and output     |
| 5   | SCL    | I2C clock input               |
| 6   | RST    | Wakeup request from the host  |

## 4. Absolute Maximum Rating

| Item                  | Symbol    | MIN  | Typ | MAX | Unit | Remark |
|-----------------------|-----------|------|-----|-----|------|--------|
| Supply Voltage        | $V_{DD}$  | -0.5 | -   | 5.0 | V    | -      |
| Operating Temperature | $T_{OPR}$ | -20  | -   | 70  | °C   | -      |
| Storage Temperature   | $T_{STG}$ | -30  | -   | 80  | °C   |        |

## 5. Timing characteristics

### 5.1 ELECTRICAL CHARACTERISTICS

| Item                  |            | Symbol   | MIN      | TYP | MAX      | Unit | Remark |
|-----------------------|------------|----------|----------|-----|----------|------|--------|
| Supply Voltage        |            | $V_{cc}$ | 3.0      | 3.3 | 3.6      | V    |        |
|                       |            | IOVCC    | 1.65     | 3.0 | 3.3      |      |        |
| Input Signal Voltage  | Low Leve   | $V_{IL}$ | GND      | -   | 0.1x VDD | V    |        |
|                       | High Level | $V_{IH}$ | 0.8x VDD | -   | VDD      | V    |        |
| Output Signal Voltage | Low Leve   | $V_{OL}$ | 0        | -   | 0.2*VDD  | V    |        |
|                       | High Level | $V_{OH}$ | 0.8*VDD  | -   | VDD      | V    |        |

### 5.2 LED Driving Conditions

| Item                        | Symbol   | MIN | TYP   | MAX | Unit | Remark |
|-----------------------------|----------|-----|-------|-----|------|--------|
| Forward Current             | $I_F$    | -   | 60    | -   | mA   |        |
| Forward Voltage             | $V_F$    | 9.0 | 9.6   | 10  | V    |        |
| Backlight Power consumption | $W_{BL}$ | -   | 0.576 | -   | W    |        |
| LED Lifetime                |          | -   | 30000 | -   | Hrs  |        |

Note 1: Each LED:  $I_F = 20 \text{ mA}$ ,  $V_F = 3.2 \pm 0.2 \text{ V}$ .

Note 2: Optical performance should be evaluated at  $T_a = 25^\circ\text{C}$  only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life Time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

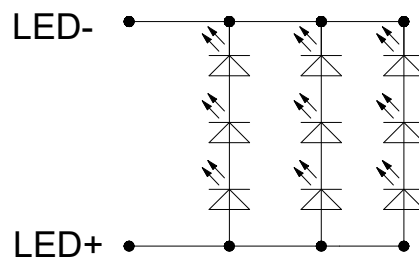
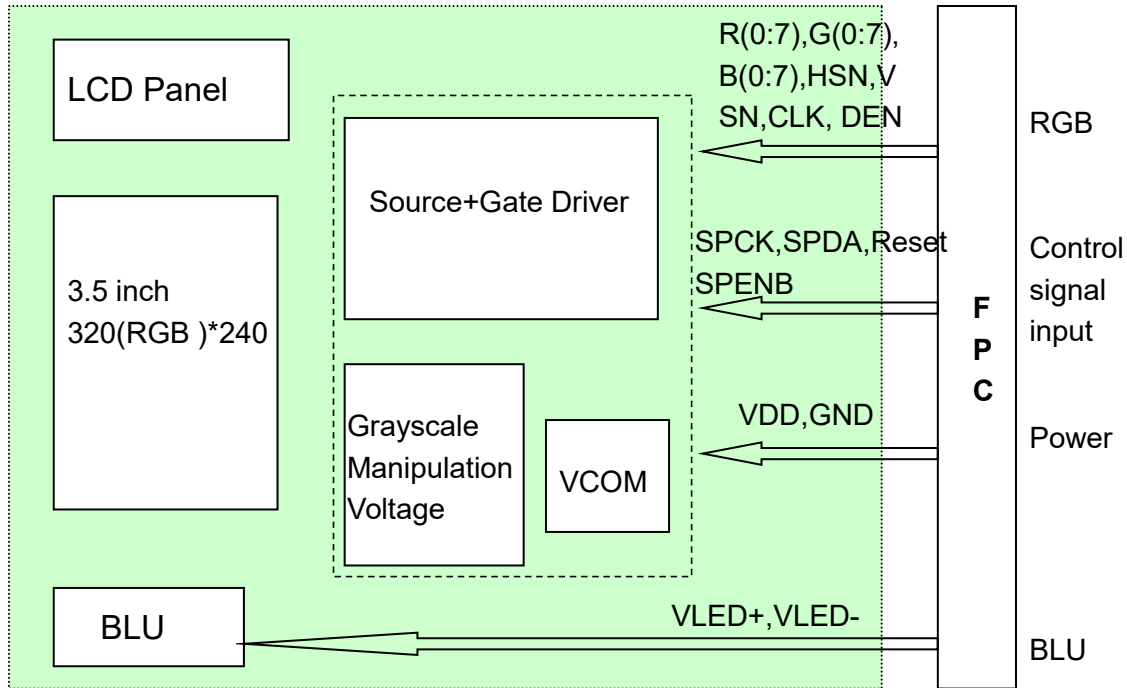


Figure: LED connection of backlight(Constant Current)

### 5.3 Block Diagram



## 6 . Interface Timing

### 6.1 AC Electrical Characteristics

Test Condition: (VDD=VDDP=3.3V, VDDA=5.0V, GND=GND A=GNDP=0V, TA= 25°C)

| Parameter                                           | Symbol                      | Min.     | Typ.  | Max. | Unit  | Conditions                                                                                 |
|-----------------------------------------------------|-----------------------------|----------|-------|------|-------|--------------------------------------------------------------------------------------------|
| <b>System Operation Timing</b>                      |                             |          |       |      |       |                                                                                            |
| VDD power source slew time                          | T <sub>POR</sub>            |          |       | 1000 | us    | From 0V to 90% VDD                                                                         |
| RSTB active pulse width                             | T <sub>RSTB</sub>           | 40       |       |      | us    | VDD = 3.3V                                                                                 |
| <b>Input Output Timing</b>                          |                             |          |       |      |       |                                                                                            |
| CLKIN clock time                                    | T <sub>clk</sub>            | 33.3/125 | -     | -    | ns    | Please refer to timing table(p.32)                                                         |
| HSD to CLKIN                                        | T <sub>hc</sub>             | -        | -     | 1    | CLKIN |                                                                                            |
| HSD width                                           | T <sub>hwh</sub>            | 1        | -     | -    | CLKIN |                                                                                            |
| VSD width                                           | T <sub>vwh</sub>            | 1        | -     | -    | Th    |                                                                                            |
| HSD period time                                     | T <sub>h</sub>              | 60       | 63.56 | 67   | us    |                                                                                            |
| VSD setup time                                      | T <sub>vst</sub>            | 8        | -     | -    | ns    |                                                                                            |
| VSD hold time                                       | T <sub>vhd</sub>            | 10       | -     | -    | ns    |                                                                                            |
| HSD setup time                                      | T <sub>hst</sub>            | 8        | -     | -    | ns    |                                                                                            |
| HSD hold time                                       | T <sub>hhd</sub>            | 10       | -     | -    | ns    |                                                                                            |
| Data set-up time                                    | T <sub>dsu</sub>            | 8        | -     | -    | ns    | DIN[23:0] to CLKIN                                                                         |
| Data hold time                                      | T <sub>dhd</sub>            | 10       | -     | -    | ns    | DIN[23:0] to CLKIN                                                                         |
| DEN setup time                                      | T <sub>esd</sub>            | 12       | -     | -    | ns    | DEN to CLKIN                                                                               |
| Time that VSD to 1 <sup>st</sup> line data input    | T <sub>vs</sub>             | 2        | 13    | 127  | Th    | @CCIR601 / 8bit RGB HV mode<br>Control by HDLY[6:0] setting<br>T <sub>vs</sub> = HDLY[6:0] |
| Time that CCIR_V to 1 <sup>st</sup> line data input | T <sub>vs</sub>             | 12       | 20    | 28   | Th    | @CCIR656 NTSC mode<br>Control by HDLY[6:0] setting<br>T <sub>vs</sub> = HDLY[6:0]          |
| Time that CCIR_V to 1 <sup>st</sup> line data input | T <sub>vs</sub> 17 25 33 Th |          |       |      |       | @CCIR656 PAL mode<br>Control by HDLY[6:0] setting<br>T <sub>vs</sub> = HDLY[6:0]           |
| Time that VSD to 1 <sup>st</sup> line data input    | T <sub>vs</sub>             | 2        | 13    | 127  | Th    | @24bit RGB HV mode<br>Control by HDLY[6:0] setting<br>T <sub>vs</sub> = HDLY[6:0]          |
| Source output stable time 1                         | T <sub>st</sub>             | -        | 25    | 30   | us    | 96% final, CL=30pF, RL=2K                                                                  |
| Gate output stable time                             | T <sub>gst</sub>            | -        | 500   | 1000 | ns    | 96% final, CL=40pF                                                                         |
| VCOMOUT output stable time                          | T <sub>cst</sub>            | -        | 4     | 8    | us    | 96% final, CL=33nF, RL=100ohm                                                              |
| <b>3-wire serial communication AC timing</b>        |                             |          |       |      |       |                                                                                            |
| Serial clock                                        | T <sub>spck</sub>           | 320      | -     | -    | ns    |                                                                                            |
| SPCK pulse duty                                     |                             | 40       | 50    | 60   | %     | T <sub>ckh</sub> / T <sub>spck</sub>                                                       |
| Serial data setup time                              | T <sub>isu</sub>            | 120      | -     | -    | ns    |                                                                                            |
| Serial data hold time                               | T <sub>ihd</sub>            | 120      | -     | -    | ns    |                                                                                            |
| Serial clock high/low                               | T <sub>ckh/l</sub>          | 120      | -     | -    | ns    |                                                                                            |
| Chip select distinguish                             | T <sub>cd</sub>             | 1        | -     | -    | us    |                                                                                            |
| SPENB to VSD                                        | T <sub>cv</sub>             | 1        | -     | -    | us    |                                                                                            |
| SPENB input setup time                              | T <sub>eck</sub>            | 150      | -     | -    | ns    |                                                                                            |
| SPENB input hold time                               | T <sub>cke</sub>            | 150      | -     | -    | ns    |                                                                                            |

## 6.2 DC Electrical Characteristics

### Recommended Operating Range

| Item                       | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|----------------------------|--------|------|------|------|------|------------|
| Supply Voltage             | VDD    | 3.0  | 3.3  | 3.6  | V    |            |
| IO Supply Voltage          | VDDI   | 3.0  | -    | 3.6  | V    |            |
| Charge Pump Supply Voltage | PVDD   | 3.0  | 3.3  | 3.6  | V    |            |

### DC Characteristics for Digital Circuit

| Item                      | Symbol | Min.     | Typ. | Max.     | Unit | Conditions |
|---------------------------|--------|----------|------|----------|------|------------|
| Logic-High Input Voltage  | Vih    | 0.7VDDI  | -    | VDDI     | V    |            |
| Logic-Low Input Voltage   | Vil    | DGND     | -    | 0.3VDDI  | V    |            |
| Logic-High Output Voltage | Voh    | VDDI-0.4 | -    | VDDI     | V    |            |
| Logic-Low Output Voltage  | Vol    | DGND     | -    | DGND+0.4 | V    |            |

### DC Characteristics for Analog Circuit

| Item                        | Symbol | Min. | Typ. | Max. | Unit | Conditions          |
|-----------------------------|--------|------|------|------|------|---------------------|
| Positive High-Voltage Power | VGH    | 13   | 15   | 16.5 | V    | No Load@<br>FR=60Hz |
| Negative High-Voltage Power | VGL    | -7   | -10  | -11  | V    |                     |
| Output Voltage Deviation    | Vod    | -    | ±35  | ±45  | mV   |                     |
| Standby Current             | Isc    | -    |      | 50   | uA   |                     |
| Operation Current           | Ioc    | -    | 20   |      | mA   |                     |

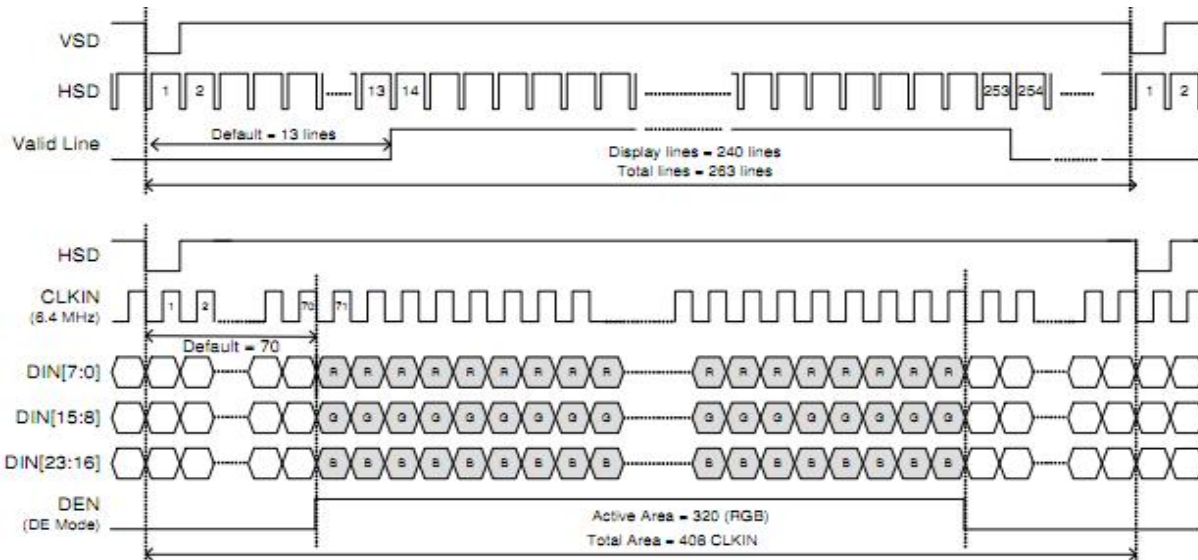
### 6.3 24 Bit RGB Mode

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

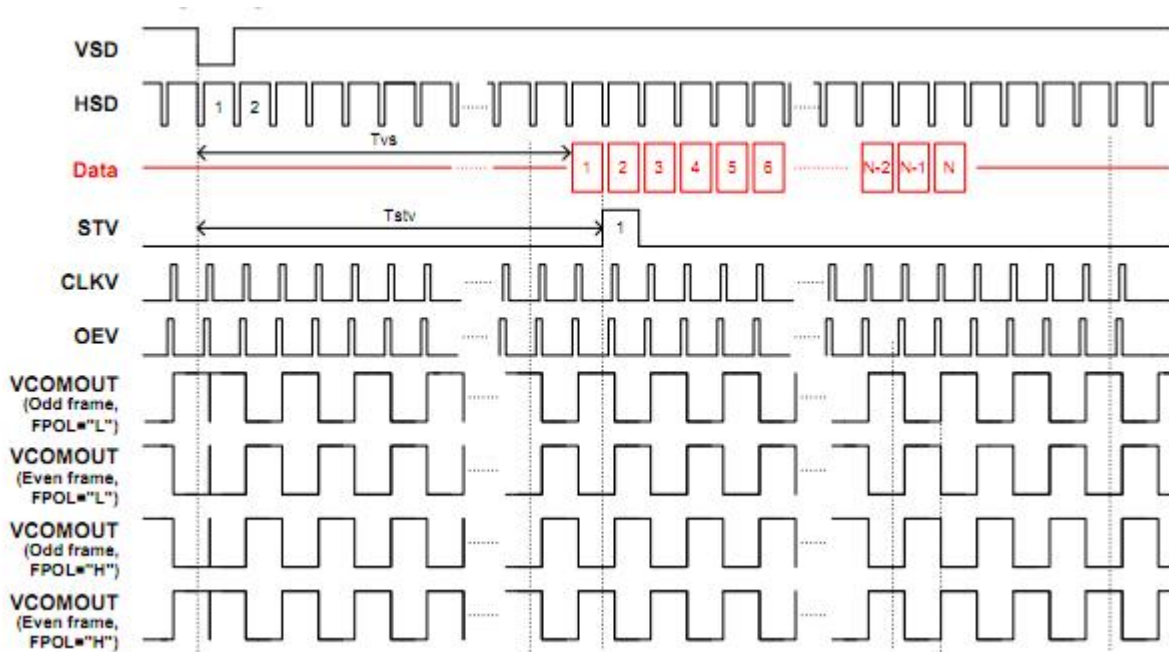
| Parallel 24-bit RGB Input Timing Table |                |        |      |      |      |                                                                                              |
|----------------------------------------|----------------|--------|------|------|------|----------------------------------------------------------------------------------------------|
| Item                                   | Symbol         | Min.   | Typ. | Max. | Unit | Note                                                                                         |
| DCLK Frequency                         | Fclk           | 5      | 6    | 8    | MHz  |                                                                                              |
| DCLK Period                            | Tclk           | 125    | 167  | 200  | ns   |                                                                                              |
| HSYNC                                  | Period Time    | Th     | 325  | 371  | 438  | DCLK                                                                                         |
|                                        | Display Period | Thdisp |      | 320  |      | DCLK                                                                                         |
|                                        | Back Porch     | Thbp   | 3    | 43   | 43   | DCLK<br>SYNC mode back porch control<br>by H_BLANKING[7:0] setting<br>Thbp= H_BLANKING[7:0]  |
|                                        | Front Porch    | Thfp   | 2    | 8    | 75   | DCLK                                                                                         |
|                                        | Pulse Width    | Thw    | 2    | 4    | 43   | DCLK                                                                                         |
| VSYNC                                  | Period Time    | Tv     | 244  | 260  | 289  | HSYNC                                                                                        |
|                                        | Display Period | Tvdisp |      | 240  |      | HSYNC                                                                                        |
|                                        | Back Porch     | Tvbp   | 2    | 12   | 12   | HSYNC<br>SYNC mode back porch control<br>by V_BLANKING[7:0] setting<br>Tvbp= V_BLANKING[7:0] |
|                                        | Front Porch    | Tvfp   | 2    | 8    | 37   | HSYNC                                                                                        |
|                                        | Pulse Width    | Tvw    | 2    | 4    | 12   | HSYNC                                                                                        |

Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

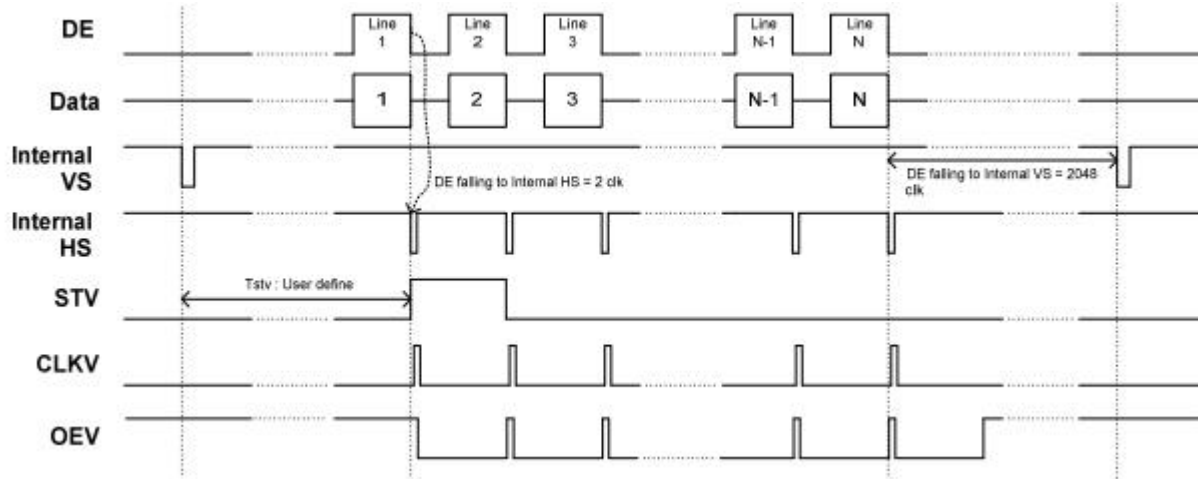
## 6.4 Input Data Timing



## 6.5 Vertical Timing Diagram (HV Mode)



## 6.6 Vertical Timing Diagram (DE Mode)



## 7 . Optical Characteristics

| Items                |       | Symbol            | Condition                                               | Min.  | Typ.  | Max.  | Unit  | Remark           | Note  |
|----------------------|-------|-------------------|---------------------------------------------------------|-------|-------|-------|-------|------------------|-------|
| Response time        |       | Tr+Tf             | -                                                       | -     | 50    | 80    | ms    | FIG.1            | Note4 |
| Contrast Ratio       |       | CR                |                                                         | -     | 600   | -     | -     | FIG.2            | Note1 |
| Surface luminance    |       | LV                | $\theta = 0^\circ$                                      | -     | 850   | -     | cd/m2 | FIG.2            | Note2 |
| Luminance uniformity |       | Yu                | $\theta = 0^\circ$                                      | 75    | 80    | -     | %     | FIG.2            | Note3 |
| NTSC                 |       | -                 | $\theta = 0^\circ$                                      | -     | 50    | -     | %     | FIG.2            | Note5 |
| Viewing angle        |       | $\theta$<br>Cr>10 | $\varnothing = 90^\circ$                                | -     | 80    | -     | deg   | FIG.3            | Note6 |
|                      |       |                   | $\varnothing = 270^\circ$                               | -     | 80    | -     | deg   | FIG.3            |       |
|                      |       |                   | $\varnothing = 0^\circ$                                 | -     | 80    | -     | deg   | FIG.3            |       |
|                      |       |                   | $\varnothing = 180^\circ$                               | -     | 80    | -     | deg   | FIG.3            |       |
| Chromaticity         | Red   | R <sub>x</sub>    | $\theta = 0^\circ$<br>$\varnothing = 0^\circ$<br>Ta=25° | 0.596 | 0.646 | 0.696 | -     | FIG.2<br>CIE1931 | Note5 |
|                      |       | R <sub>y</sub>    |                                                         | 0.282 | 0.332 | 0.382 | -     |                  |       |
|                      | Green | G <sub>x</sub>    |                                                         | 0.273 | 0.323 | 0.373 | -     |                  |       |
|                      |       | G <sub>y</sub>    |                                                         | 0.517 | 0.567 | 0.617 | -     |                  |       |
|                      | Blue  | B <sub>x</sub>    |                                                         | 0.084 | 0.134 | 0.184 | -     |                  |       |
|                      |       | B <sub>y</sub>    |                                                         | 0.071 | 0.121 | 0.171 | -     |                  |       |
|                      | White | W <sub>x</sub>    |                                                         | 0.282 | 0.332 | 0.382 | -     |                  |       |
|                      |       | W <sub>y</sub>    |                                                         | 0.334 | 0.384 | 0.434 | -     |                  |       |

### Note1. Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula. For more information see FIG.2.

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

For contrast ratio, Surface Luminance, Luminance uniformity and CIE, the testing data is based on TOPCON's BM-5 or BM-7 photo detector or compatible.

### Note2. Definition of surface luminance.

Surface luminance is the luminance with all pixels displaying white. For more information see FIG.2.

Lv = Average Surface Luminance with all white pixels(P1,P2,P3, .....,Pn)

### Note3. Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1

through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance. For more information see FIG.2.

$$YU = \frac{\text{Minimum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}{\text{Maximum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}$$

#### Note4. Definition of response time

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

For additional information see FIG1.

#### Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity, The x,y value is determined by screen active area center position P5. For more information see FIG.2.

#### Note6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10. Angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG.3.

For viewing angle and response time testing, the testing data is base on Autronic-Melchers' s ConoScope or DMS series Instruments or compatible.

**FIG.1. The definition of response Time**

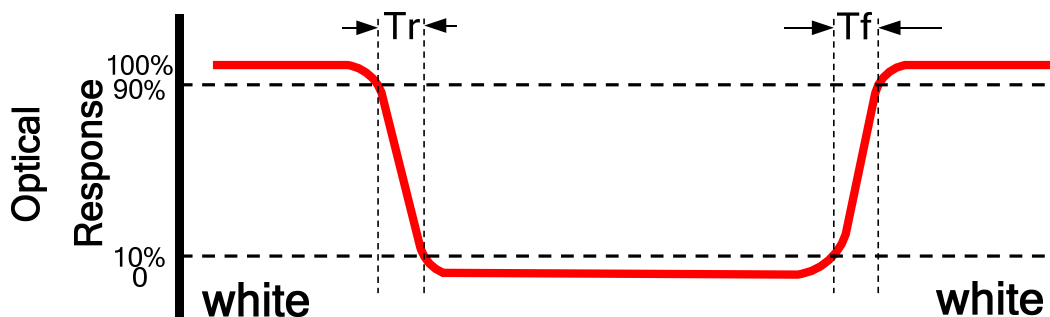


**FIG.2. Measuring method for contrast ratio, surface luminance, luminance uniformity, CIE (x,y) chromaticity**

Size :  $S \leq 5"$  (see Figure a) A : 5 mm B : 5 mm

H,V : Active area

Light spot size  $\varnothing = 5\text{mm}$  (BM-5) or  $\varnothing = 7.7\text{mm}$  (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure a.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

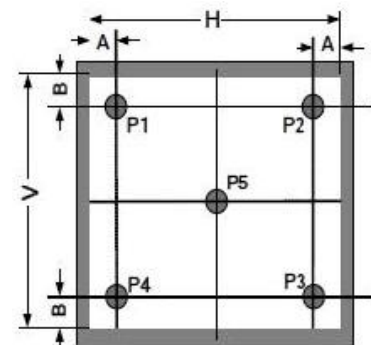


Figure a

Size :  $5" < S \leq 12.3"$  (see Figure b) H,V : Active area

Light spot size  $\varnothing = 5\text{mm}$  (BM-5) or  $\varnothing = 7.7\text{mm}$  (BM-7) 50cm distance or

compatible distance from the LCD surface to detector lens.  
test spot position : see Figure b.  
measurement instrument : TOPCON's luminance meter BM-5 or  
BM-7 or compatible (see Figure c).

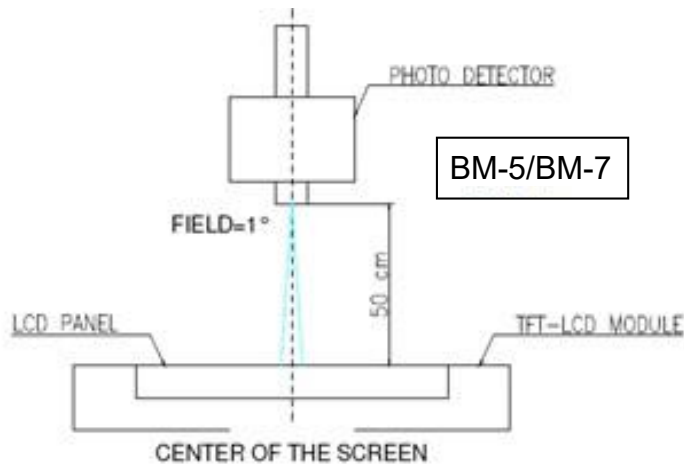


Figure c

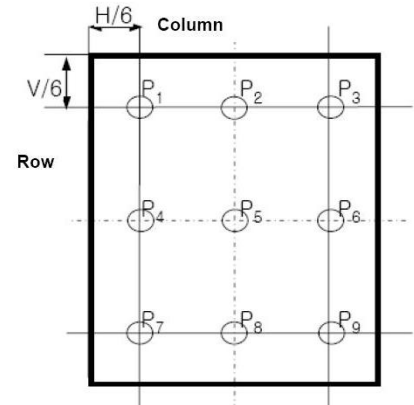
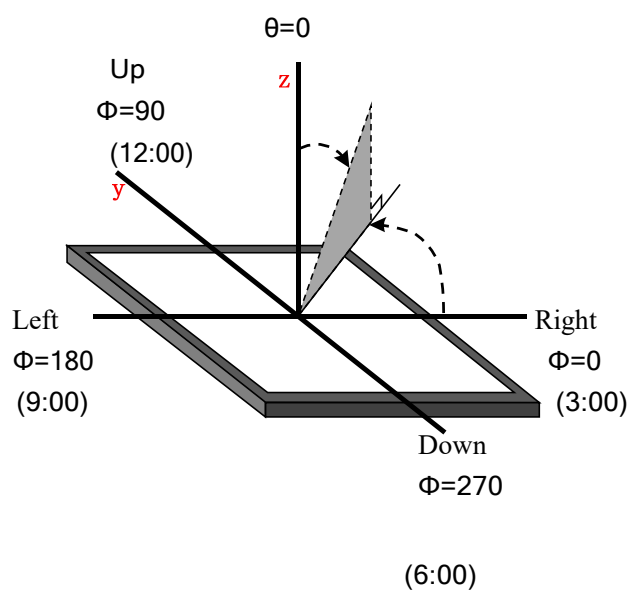


Figure b

FIG.3.The definition of viewing angle



## 8 . Environmental / Reliability Tests

| No | Test Item                             | Condition                                                                                                                                     | Remarks                                                                                            |
|----|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 1  | High Temperature Operation            | Ts= +70°C, 96hrs                                                                                                                              | IEC60068-2-1:2007<br>GB2423. 2-2008                                                                |
| 2  | Low Temperature Operation             | Ta= -20°C, 96hrs                                                                                                                              | IEC60068-2-1:2007<br>GB2423.1-2008                                                                 |
| 3  | High Temperature Storage              | Ta= +80°C, 96hrs                                                                                                                              | IEC60068-2-1:2007<br>GB2423. 2-2008                                                                |
| 4  | Low Temperature Storage               | Ta= -30°C, 96hrs                                                                                                                              | IEC60068-2-1:2007<br>GB2423.1-2008                                                                 |
| 5  | High Temperature & Humidity Operation | Ta= +60°C, 90% RH max, 96 hours                                                                                                               | IEC60068-2-78:2001<br>GB/T2423.3-2006                                                              |
| 6  | Thermal Shock (Non-operation)         | -30°C 30 min ~ +80°C 30 min<br>Change time: 5min, 20 Cycle                                                                                    | Start with cold temperature,<br>end with high temperature<br>IEC60068-2-14:1984,<br>GB2423.22-2002 |
| 7  | ESD                                   | C=150pF, R=330 Ω,<br>5 points/panel ,<br>Air:±8KV, 5 times<br>Contact: ±4KV, 5 times<br>(Environment: 15°C ~ 35°C, 30% ~ 60%, 86Kpa ~ 106Kpa) | IEC61000-4-2:2001<br>GB/T17626.2-2006                                                              |
| 8  | Vibration (Non-operation)             | Frequency range: 10~55Hz,<br>Stroke: 1.5mm ,<br>Sweep: 10Hz~55Hz~10Hz<br>2 hours for each direction of X .Y. Z.<br>(6 hours for total)        | IEC60068-2-6:1982<br>GB/T2423.10-1995                                                              |
| 9  | Mechanical Shock (Non-operation)      | Half Sine Wave<br>60G ,6ms,±X,±Y,±Z<br>3times for each direction                                                                              | IEC60068-2-27:1987<br>GB/T2423.5—1995                                                              |
| 10 | Package Drop Test                     | Height: 60 cm,<br>1 corner, 3 edges, 6 surfaces                                                                                               | IEC60068-2-32:1990<br>GB/T2423.8-1995                                                              |



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### Notes:

1. The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample will not be accepted if appear these defects:
  - 1).Air bubble in the LCD;
  - 2).Seal leak
  - 3).Non-display
  - 4).missing segments
  - 5).Glass crack
  - 6).CR reduction >40%
  - 7).IDD increase >100%
  - 8).Brightness reduction >50%
  - 9).Color coordinate tolerance >0.05
2.  $\leq 7.0$  inch: The size of sample is 5pcs;  
     $> 7.0$  inch: The size of sample is 2pcs;
3. One test sample must complete each test item;
4. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
5. In the test of High Temperature Operation and High Temperature & Humidity Operation ,the operation temperature is the surface temperature of module.



## 10 . Packing

(TBD)

## 11. Precautions for Use of LCD modules

### 11.1 Handling Precautions

11.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketene
- Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

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

11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

### 11.2 Storage Precautions



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11.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2. The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommended condition is:

Temperature : 0°C ~ 40°C      Relatively humidity: ≤80%

11.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

### **11.3 Transportation Precautions**

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.