

## LCD MODULE SPECIFICATION

|                 |                     |
|-----------------|---------------------|
| <b>Model:</b>   | UE043WV-AH40-A013-A |
| <b>Version:</b> | V1.2                |
|                 |                     |
| <b>Date:</b>    | 20180428            |

☒ **Preliminary Specification** 样品规格书

☐ **Final Specification** 量产规格书

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|             |             |             |

## REVISION HISTORY

| Revision<br>版本号 | Date<br>日期 | Contents of Revision Change<br>修改内容 | Remark<br>备注 |
|-----------------|------------|-------------------------------------|--------------|
| V1.0            | 2018.3.26  | Preliminary release                 |              |
|                 |            |                                     |              |
|                 |            |                                     |              |
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## 1. GENERAL INFORMATION

### 1.1 Features

- 1) Pixel Arrangement: RGB Vertical Stripe
- 2) Interface Mode: 40PIN RGB 24bits
- 3) Driver IC: HX8264D(Source)/ HX8664B(Gate)
- 4) Operation Temperature: -30~85℃
- 5) Storage Temperature: -40~85℃
- 6) Backlight Type: White LED
- 7) Display mode: Normally black,
- 8) Pixel Density: 217 PPI
- 9) LED life time: 30,000 Hours

### 1.2 Mechanical Specification

| Item<br>项目               | Specification<br>规格      | Unit<br>单位        | Remark<br>备注    |
|--------------------------|--------------------------|-------------------|-----------------|
| Pixel Driving element    | A-Si TFT                 | -                 |                 |
| Screen Size              | 4.3                      | Inch              | Diagonal        |
| Resolution               | 800(W)*3(RGB)*480(H)     | Dots              |                 |
| Interface                | RGB 24bits               | -                 | 40PIN           |
| Module Power Consumption | 1.04                     | Watt              | Typ.            |
| Active Area              | 95.04(W)*53.86(H)        | mm                |                 |
| VActiveV Area            | 95.94(W)*54.76(H)        | mm                |                 |
| Pixel pitch (W*H)        | 0.1188(W)*0.1122(H)      | mm                |                 |
| CTP_ Module Size (W*H*D) | 105.5(W)*67.2(H)*4.95(D) | mm                | Tolerance: ±0.2 |
| Luminance                | 650                      | cd/m <sup>2</sup> | Typ.            |
| Viewing Direction        | All                      | O'clock           |                 |
| Display Color            | 16.7M                    | Colors            | 24bits          |

## 2. ABSOLUTE MAXIMUM RATINGS

| Item<br>项目            | Symbol<br>符号    | Min.<br>最小值 | Max.<br>最大值 | Unit<br>单位 | Remark<br>备注        |
|-----------------------|-----------------|-------------|-------------|------------|---------------------|
| Power supply voltage  | VDD             | -0.5        | 3.96        | V          | Note1               |
| Power supply voltage  | TP_VDD          | -0.5        | 3.96        | V          |                     |
| LED forward current   | I <sub>F</sub>  | -0.001      | 30          | mA         | For each led, Note1 |
| LED Reverse Voltage   | V <sub>R</sub>  | -           | 5           | V          | For each led, Note1 |
| Operating temperature | T <sub>op</sub> | -30         | 85          | °C         | Note1,2             |
| Storage temperature   | T <sub>st</sub> | -40         | 85          | °C         | Note1,2             |
| Humidity              | H <sub>st</sub> | 10          | 90          | %RH        | Note1,3             |

(Ta=+25°C, GND=0V)

Note1: If the module exceeds the absolute maximum ratings, it may be damaged permanently. Also if the module operates with the absolute maximum ratings for a long time, the reliability may drop.

Note2: In case of temperature below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel darker than normal one.

Note3: Temp. ≤ 60°C , 90% RH MAX.

Temp. > 60°C , Absolute humidity shall be less than 90% RH at 60°C.

### 3. MECHANICAL DRAWING

[illegible]

## 4. I/O CONNECTION & BLOCK DIAGRAM

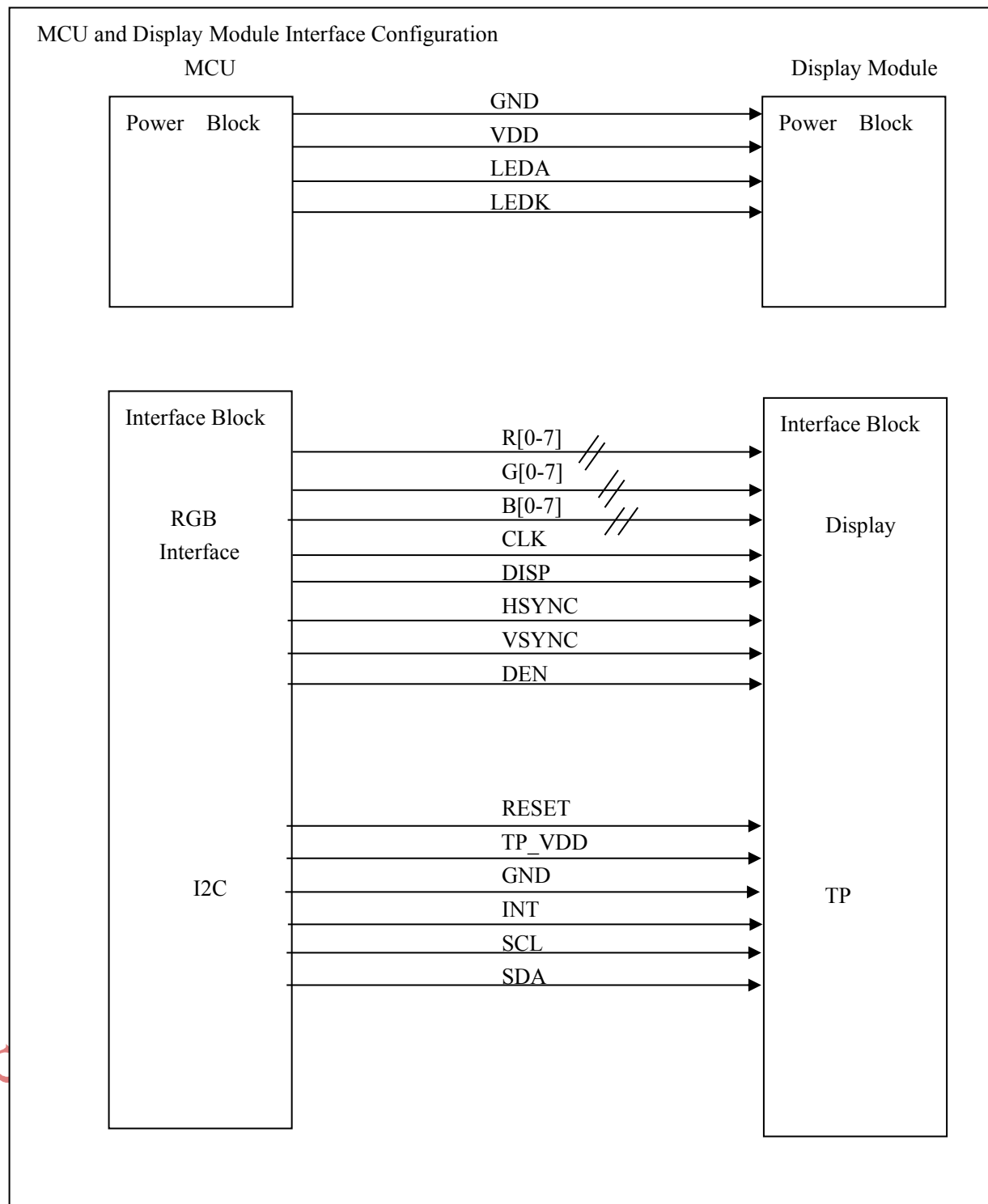
### 4.1 I/O Connection

| Pin No.<br>序号 | Symbol<br>I | I/O | Description<br>描述                                           |
|---------------|-------------|-----|-------------------------------------------------------------|
| 1             | LEDK        | P   | Power supply for backlight cathode                          |
| 2             | LEDA        | P   | Power supply for backlight anode                            |
| 3             | GND         | P   | Power Ground                                                |
| 4             | VDD         | P   | Power supply to the internal logic power regulator( 3.3V)   |
| 5-12          | R0-R7       | I   | Red data input.                                             |
| 13-20         | G0-G7       | I   | Green data input.                                           |
| 21-28         | B0-B7       | I   | Blue data input.                                            |
| 29            | GND         | P   | Power Ground                                                |
| 30            | CLK         | I   | Pixel clock input pin, Negative polarity                    |
| 31            | DISP        | I   | Standby mode. Normally pulled high.                         |
| 32            | HSYNC       | I   | Horizontal sync signal, Negative polarity                   |
| 33            | VSNC        | I   | Vertical sync signal, Negative polarity                     |
| 34            | DEN         | I   | Data input enable. Display access is enabled when DE is “H” |
| 35            | NC          | I   | Dummy                                                       |
| 36            | GND         | P   | Power Ground                                                |
| 37            | XR          | -   | Dummy                                                       |
| 38            | YD          | -   | Dummy                                                       |
| 39            | XL          | -   | Dummy                                                       |
| 40            | YU          | -   | Dummy                                                       |

| TP PIN | Symbol     | I/O | Description                                        |
|--------|------------|-----|----------------------------------------------------|
| 1      | RESET      | I   | The signal will reset the TP, Signal is active low |
| 2      | TP_VDD2.8V | P   | TP_VDD(2.8V) Power Supply for TP                   |
| 3      | GND        | P   | Ground.                                            |
| 4      | INT        | O   | Interrupt signals for TP                           |
| 5      | SCL        | I   | I2C clock signals for TP                           |
| 6      | SDA        | I/O | I2C data signals for TP                            |

I: Input; O: Output; P: Power

## 4.2 Block Diagram





## 5. ELECTRICAL CHARACTERISTICS

### 5.1 TFT-LCD Panel Driving Section

| Item<br>项目               | Symbol<br>符号     | Min.<br>最小值 | Typ.<br>典型值 | Max.<br>最大值 | Unit<br>单位 | Remark<br>备注 |
|--------------------------|------------------|-------------|-------------|-------------|------------|--------------|
| Power Supply Voltage     | VDD              | 3.0         | 3.3         | 3.6         | V          | -            |
| Power Supply Voltage     | TP_VDD           | 3.0         | 3.3         | 3.6         | V          | -            |
| Power Supply Current     | I <sub>VDD</sub> | -           | 122         | -           | mA         | Note1        |
| Logic Input High Voltage | V <sub>IH</sub>  | 0.7VDD      | -           | VDD         | V          | -            |
| Logic Input Low Voltage  | V <sub>IL</sub>  | 0           | -           | 0.3VDD      | V          | -            |
| Panel Power Consumption  | P <sub>VDD</sub> | -           | 0.4         | -           | Watt       | Note1        |
| Module Power Consumption | P <sub>LCM</sub> | -           | 1.04        | -           | Watt       | Note1,2      |

(Ta=+25°C, GND=0V)

Note1: Measurement Conditions (Video Mode): Full Screen Red Pattern, VDD=3.3V, 60Hz Refresh.

Note2: P<sub>LCM</sub> = P<sub>VDD</sub> + P<sub>B/L</sub>, About P<sub>B/L</sub> information, inference to 5.2 Back Light Driving Section.

### 5.2 Back Light Driving Section

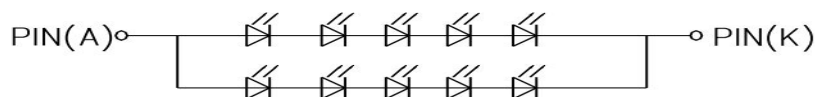
| Item<br>项目                  | Symbol<br>符号     | Min.<br>最小值 | Typ.<br>典型值 | Max.<br>最大值 | Unit<br>单位 | Remark<br>备注 |
|-----------------------------|------------------|-------------|-------------|-------------|------------|--------------|
| Forward Voltage             | V <sub>F</sub>   | -           | 16          | 17          | V          | Note1        |
| Forward Current             | I <sub>F</sub>   | -           | 40          | -           | mA         | Note1        |
| Backlight Power consumption | P <sub>B/L</sub> | -           | 0.64        | -           | Watt       | Note1        |
| LED life time               | -                | 30000       | -           | -           | Hrs        | Note2        |
| LED Quantity                | -                | 10          |             |             | PCS        |              |

(Ta=+25°C, GND=0V)

Note1: The LED driving condition is defined for each LED module (5 LED Serial, 2 LED Parallel)。

For each LED : I<sub>F</sub>=20mA, V<sub>F</sub>=3.2V(Typ.)/3.4V(Max.), Ta=25°C。

Note2: The “LED life time” is defined as the module brightness decrease to 50% of original brightness at I<sub>LED</sub>=20mA(Per Led). The LED life time could be decreased if operating I<sub>LED</sub> is larger than 20mA.

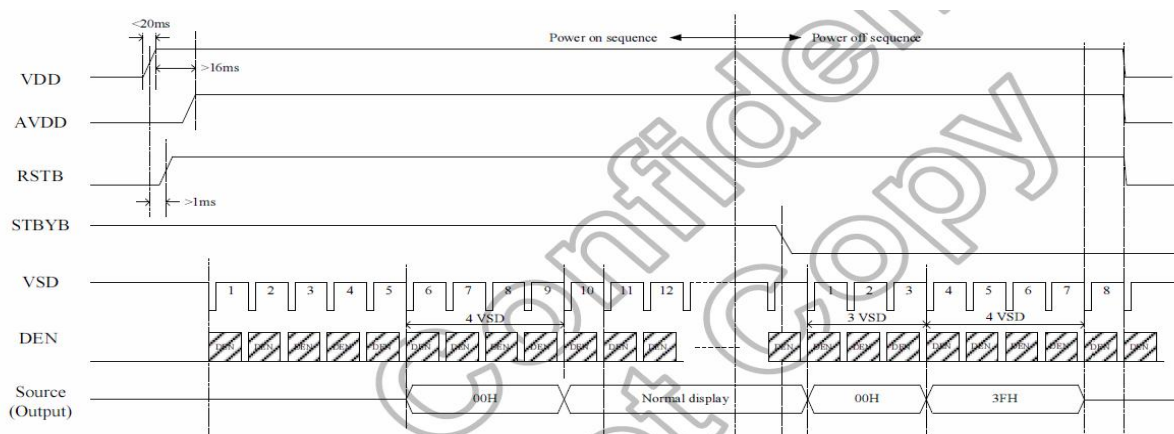


BACKLIGHT CIRCUIT DIAGRAM 20mA/LED (10LED)

LED V<sub>f</sub>: 16V (TYP)

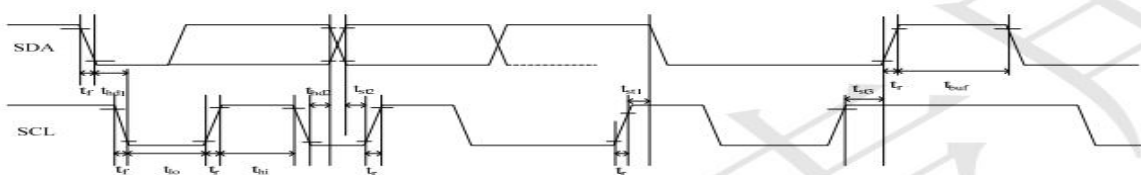
背光电路图  
(CIRCUIT DIAGRAM)

## 5.3 Power On/Off Sequence



## 5.4 Timing Characteristics

### 5.4.0 I2C interface timings



测试条件 2: 3.3V 通讯接口, 400Kbps 通讯速度, 上拉电阻 2K

| Parameter                          | Symbol    | Min. | Max. | Unit |
|------------------------------------|-----------|------|------|------|
| SCL low period                     | $t_{Lo}$  | 1.3  | -    | us   |
| SCL high period                    | $t_{Hi}$  | 0.6  | -    | us   |
| SCL setup time for START condition | $t_{St1}$ | 0.6  | -    | us   |
| SCL setup time for STOP condition  | $t_{St3}$ | 0.6  | -    | us   |
| SCL hold time for START condition  | $t_{Hd1}$ | 0.6  | -    | us   |
| SDA setup time                     | $t_{St2}$ | 0.1  | -    | us   |
| SDA hold time                      | $t_{Hd2}$ | 0    | -    | us   |

### 5.4.1 Timing Parameters

| Parameter              | Symbol    | Spec. |      |      | Unit |
|------------------------|-----------|-------|------|------|------|
|                        |           | Min.  | Typ. | Max. |      |
| HS setup time          | $T_{hst}$ | 8     | -    | -    | ns   |
| HS hold time           | $T_{hhd}$ | 8     | -    | -    | ns   |
| VS setup time          | $T_{vst}$ | 8     | -    | -    | ns   |
| VS hold time           | $T_{vhd}$ | 8     | -    | -    | ns   |
| Data setup time        | $T_{dsu}$ | 8     | -    | -    | ns   |
| Data hold time         | $T_{dhd}$ | 8     | -    | -    | ns   |
| DE setup time          | $T_{esu}$ | 8     | -    | -    | ns   |
| DE hold time           | $T_{ehd}$ | 8     | -    | -    | ns   |
| VDD Power On Slew rate | $T_{POR}$ | -     | -    | 20   | ms   |
| RSTB pulse width       | $T_{Rst}$ | 10    | -    | -    | us   |
| CLKIN cycle time       | $T_{cph}$ | 20    | -    | -    | ns   |
| CLKIN pulse duty       | $T_{cwh}$ | 40    | 50   | 60   | %    |
| Output stable time     | $T_{sst}$ | -     | -    | 6    | us   |

( $T_a = +25^\circ\text{C}$ , GND=0V)

## 5.4.2 Horizontal Timing

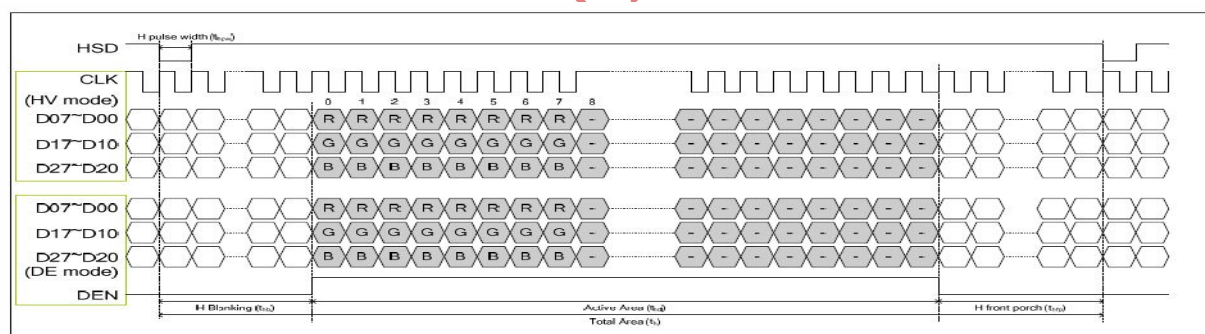
| Parameter                | Symbol | Spec. |      |      | Unit |
|--------------------------|--------|-------|------|------|------|
|                          |        | Min.  | Typ. | Max. |      |
| Horizontal Display Area  | thd    |       | 800  |      | DCLK |
| DCLK frequency           | fclk   | -     | 30   | 50   | MHz  |
| One Horizontal Line      | th     | 889   | 928  | 1143 | DCLK |
| HS pulse width           | thpw   | 1     | 48   | 255  | DCLK |
| HS Back Porch (Blanking) | thb    |       | 88   |      | DCLK |
| HS Front Porch           | thfp   | 1     | 40   | 255  | DCLK |
| DE mode Blanking         | th-thd | 85    | 128  | 512  | DCLK |

## 5.4.3 Vertical Timing

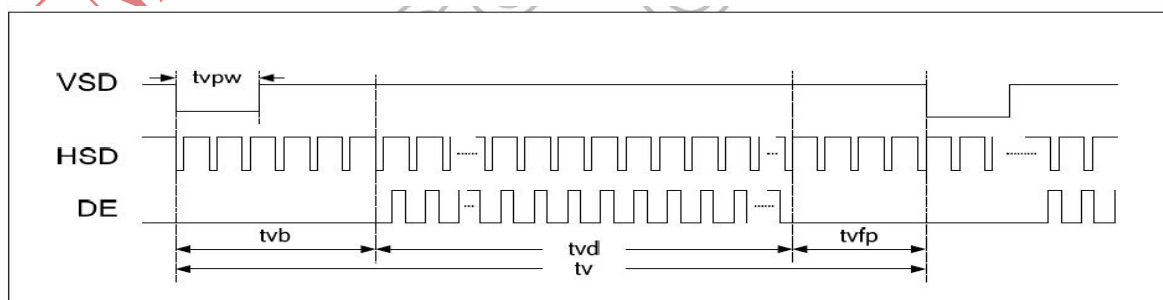
| Parameter                | Symbol | Spec. |      |      | Unit           |
|--------------------------|--------|-------|------|------|----------------|
|                          |        | Min.  | Typ. | Max. |                |
| Vertical Display Area    | tvd    |       | 480  |      | T <sub>H</sub> |
| VS period time           | tv     | 513   | 525  | 767  | T <sub>H</sub> |
| VS pulse width           | tvpw   | 3     | 3    | 255  | T <sub>H</sub> |
| VS Back Porch (Blanking) | tvb    |       | 32   |      | T <sub>H</sub> |
| VS Front Porch           | tvfp   | 1     | 13   | 255  | T <sub>H</sub> |
| DE mode Blanking         | tv-tvd | 4     | 45   | 255  | T <sub>H</sub> |

## 5.5 Timing Diagram

### 5.5.1 Horizontal Timing



### 5.5.2 Vertical Timing



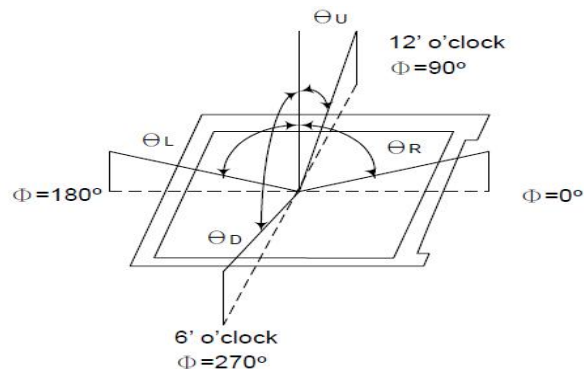
## 6. OPTICAL CHARACTERISTICS

| Parameter<br>参数         | Symbol<br>符号                    | Condition<br>条件                                                        | Min.<br>最小值 | Typ.<br>典型值 | Max.<br>最大值 | Unit<br>单位        | Remark<br>备注 |
|-------------------------|---------------------------------|------------------------------------------------------------------------|-------------|-------------|-------------|-------------------|--------------|
| Contrast Ratio          | C/R                             | $\theta = 0^\circ$                                                     | 640         | 800         | -           | -                 | Note(4)      |
| NTSC Ratio              | S                               | $\theta = 0^\circ$                                                     | 45          | 50          | -           | %                 | Note(7)      |
| Luminance               | L                               | $\theta = 0^\circ$                                                     | -           | 650         | -           | cd/m <sup>2</sup> | Note(5)      |
| Luminance<br>uniformity | U <sub>W</sub>                  | $\theta = 0^\circ$                                                     | 70          | 80          | -           | %                 | Note(3)      |
| Response Time           | T <sub>R</sub> + T <sub>F</sub> | 25 °C                                                                  | -           | 30          | 40          | ms                | Note(2)      |
| Color<br>Coordination   | W <sub>X</sub>                  | $\theta = 0^\circ$<br>(Center)<br>Normal<br>viewing<br>angle<br>B/L On | -0.03       | 0.313       | +0.03       | NTSC<br>(x,y)     | Note(6)      |
|                         | W <sub>Y</sub>                  |                                                                        |             | 0.339       |             |                   |              |
|                         | R <sub>X</sub>                  |                                                                        |             | 0.631       |             |                   |              |
|                         | R <sub>Y</sub>                  |                                                                        |             | 0.329       |             |                   |              |
|                         | G <sub>X</sub>                  |                                                                        |             | 0.328       |             |                   |              |
|                         | G <sub>Y</sub>                  |                                                                        |             | 0.548       |             |                   |              |
|                         | B <sub>X</sub>                  |                                                                        |             | 0.136       |             |                   |              |
|                         | B <sub>Y</sub>                  |                                                                        |             | 0.141       |             |                   |              |
| Viewing Angle           | $\theta_L$                      | C/R>10                                                                 | 70          | 80          | -           | Degree            | Note(1)      |
|                         | $\theta_R$                      |                                                                        | 70          | 80          | -           |                   |              |
|                         | $\theta_U$                      |                                                                        | 70          | 80          | -           |                   |              |
|                         | $\theta_D$                      |                                                                        | 70          | 80          | -           |                   |              |

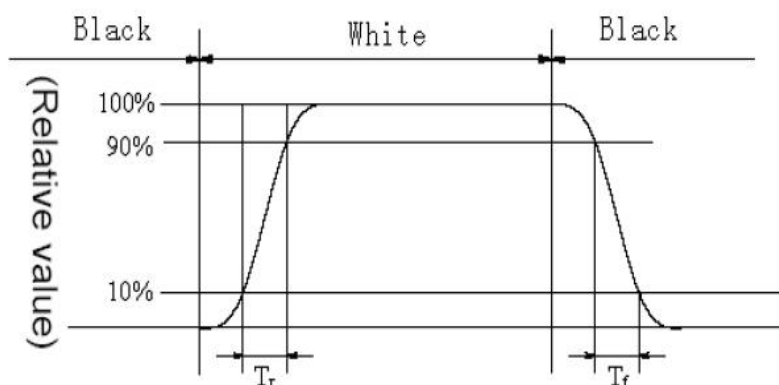
Test Conditions:

1. VDD=3.3V, I<sub>F</sub>=40mA (Backlight current), the ambient temperature is +25℃.
2. The test systems refer to Note 8.

**Note1:** Definition of Viewing Angle: The viewing angle range that the CR>10

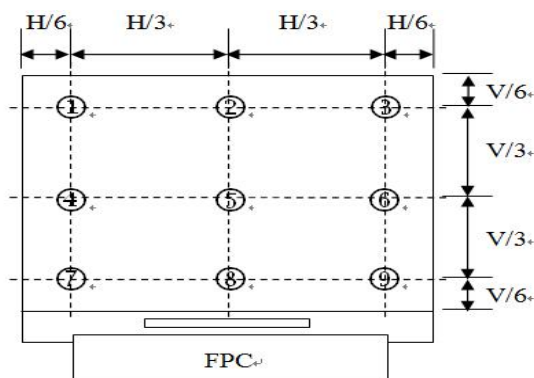


**Note2:** Definition of Response time: Sum of T<sub>R</sub> and T<sub>F</sub>



**Note 3:** Definition of Luminance Uniformity: Active area is divided into 9 measuring areas, every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity} = \frac{\text{Min Luminance of white among 9-points}}{\text{Max Luminance of white among 9-points}} \times 100\%$$





**Note4:** Definition of Contrast Ratio (CR): measured at the center point of panel

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

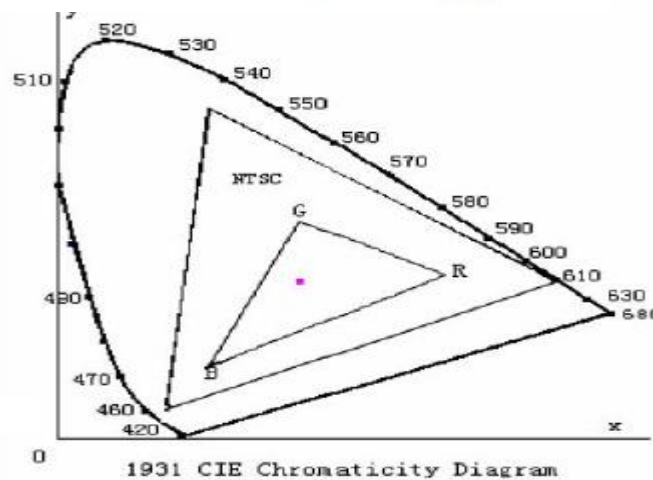
**Note 5:** Definition of Luminance: Center Luminance of white is defined as luminance values of 1point average across the LCD surface.

**Note 6:** Definition of Color Chromaticity (CIE 1931)

Color coordinates of white & red, green, blue measured at center point of LCD.

**Note 7:** Definition of NTSC ratio:

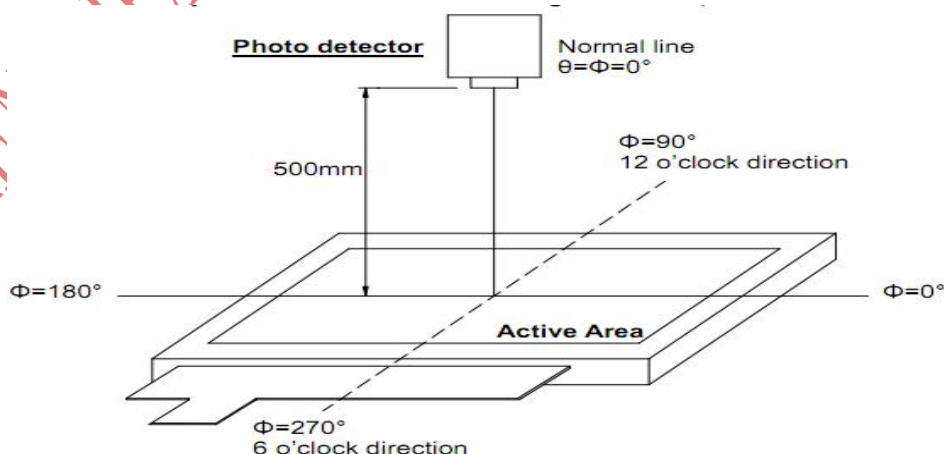
$$\text{NTSC ratio} = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}}$$



**Note 8:** Definition of measurement system.

optical

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7, Field of view: 1°/Height: 500mm.)



## 7. RELIABILITY

| Item<br>项目                     | Test Condition<br>测试条件                                                      | Remark<br>备注 |
|--------------------------------|-----------------------------------------------------------------------------|--------------|
| High Temperature Storage       | Ta =+85°C / 240Hours                                                        | Note1,2,3    |
| Low Temperature Storage        | Ta =-40°C / 240Hours                                                        | Note1,2,3    |
| High Temperature Operating     | Ta =+85°C / 240Hours                                                        | Note1,2,3    |
| Low Temperature Operating      | Ta =-30°C / 240Hours                                                        | Note1,2,3    |
| Temperature Cycle storage Test | -30°C/30min ↔ +80°C /30min for 30cycles, Transfer time less than 5min       | Note2,3      |
| Thermal humidity storage Test  | 60°C x 90%RH / 240Hours                                                     | Note2,3      |
| Package Vibration Test         | Frequency: 10Hz~55Hz, Amplitude: 1.5mm, 1 hrs for each direction of X, Y, Z | Note2        |
| Packing shock test             | Drop to the ground from 60cm height, 1 corner, 3 edges, 6 surfaces.         | Note2        |

### Inspection after Test:

Note1: Ta is the ambient temperature of samples.

Note 2: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.

Note 3: Before cosmetic and function tests, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

## 8. PACKAGE DRAWING

