

LCD MODULE
SPECIFICATION

| | |
|-----------------|--------------------|
| Model: | UE040WV-RB30-L032C |
| Version: | V1.2 |
| Date: | 20190808 |

☐ Preliminary Specification 样品规格书☒ Final Specification 量产规格书

Customer Confirmation 客户确认

| Approved by | Notes |
|-------------|-------|
| | |

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VIEWE Confirmation 优奕确认

| Prepared by | Reviewed by | Approved by |
|-------------|-------------|-------------|
| | | |

REVISION HISTORY

| Revision 版本号 | Date 日期 | Contents of Revision Change 修改内容 | Remark 备注 |
|-----------------|------------|-------------------------------------|--------------|
| V1.0 | 2019.01.03 | Preliminary release | |
| V1.1 | 2019.05.07 | 切换 LCD 玻璃, 修改型号 | |
| V1.1 | 2019.08.08 | 修改 LCD IC 型号 | |
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1. GENERAL INFORMATION

1.1 Features

- 1) Pixel Arrangement: RGB Vertical Stripe
- 2) Interface Mode: MIPI 2lane
- 3) Driver IC: ST7701S
- 4) Operation Temperature: -20~70℃
- 5) Storage Temperature: -30~80℃
- 6) Backlight Type: White LED
- 7) Display mode: Normally Black
- 8) Pixel Density: 233 PPI
- 9) LED life time: 30,000 Hours

1.2 Mechanical Specification

| Item 项目 | Specification 规格 | Unit 单位 | Remark 备注 |
|--------------------------|--------------------------|-------------------|-----------------|
| Pixel Driving element | A-Si TFT | - | - |
| Screen Size | 4.0 | Inch | Diagonal |
| Resolution | 480(W)*3(RGB)*800(H) | Dots | - |
| Interface | MIPI | - | 2lane |
| Module Power Consumption | 0.6 | Watt | Typ. |
| Active Area | 51.84(W)*86.30(H) | mm | - |
| Pixel pitch (W*H) | 0.108(W)*0.108(H) | mm | - |
| CTP_Module Size (W*H*D) | 57.14(W)*96.85(H)*2.1(D) | mm | Tolerance: ±0.2 |
| Luminance | 700 | cd/m ² | Typ. |
| Viewing Direction | ALL | O'clock | Gray inversion |
| Display Color | 16.7M | Colors | 8bits |

2. ABSOLUTE MAXIMUM RATINGS

| Item 项目 | Symbol 符号 | Min. 最小值 | Max. 最大值 | Unit 单位 | Remark 备注 |
|-----------------------|-----------------|-------------|-------------|------------|--------------------|
| Power supply1 voltage | VCC | -0.5 | 3.9 | V | Note1 |
| Power supply2 voltage | IOVCC | -0.5 | 3.6 | V | Note1 |
| LED forward current | I _F | -0.001 | 30 | mA | For each led,Note1 |
| LED Reverse Voltage | V _R | - | 5 | V | For each led,Note1 |
| Operating temperature | T _{op} | -20 | 70 | °C | Note1,2 |
| Storage temperature | T _{st} | -30 | 80 | °C | Note1,2 |
| Humidity | H _{st} | 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]

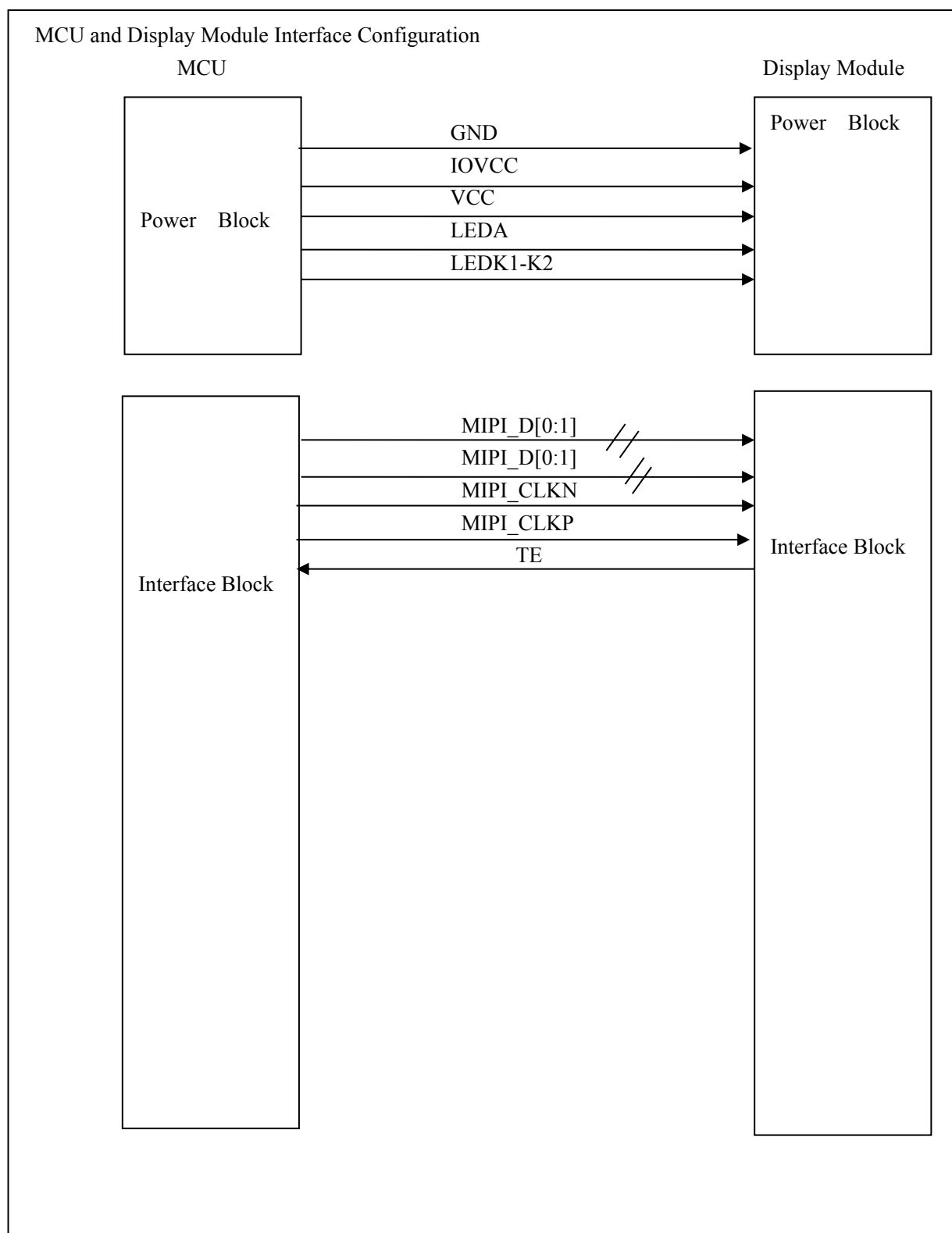
4. I/O CONNECTION & BLOCK DIAGRAM

4.1 I/O Connection

| Pin No. 管脚号 | Symbol 符号 | I/O | Description 描述 |
|----------------|--------------|-----|---|
| 1 | GND | P | Power Ground |
| 2 | MIPI_D0N | I | MIPI differential data |
| 3 | MIPI_D0P | I | MIPI differential data |
| 4 | GND | P | Power Ground |
| 5 | MIPI_D1N | I | MIPI differential data |
| 6 | MIPI_D1P | I | MIPI differential data |
| 7 | GND | P | Power Ground |
| 8 | MIPI_CLKN | I | MIPI differential clock |
| 9 | MIPI_CLKP | I | MIPI differential clock |
| 10 | GND | P | Power Ground |
| 11-12 | VCC | P | A power supply for digital circuits and IO pads(3.3V) |
| 13 | IOVCC | P | Power supply for digital circuits (1.8V) |
| 14 | GND | P | Power Ground |
| 15 | LCD_ID(GND) | | Power Ground |
| 16 | GND | P | Power Ground |
| 17 | RESET | I | Global reset pin |
| 18 | TE | O | Tearing effect output pin to synchronize MCU to |
| 19 | TP_ID_IOVCC | P | Power supply for digital circuits (1.8V) |
| 20 | GND | P | Power Ground |
| 21 | LEDA | P | Power supply for LED+ |
| 22 | LEDK1 | P | Power supply for LED- |
| 23 | LEDK2 | P | Power supply for LED- |
| 24 | GND | P | Power Ground |
| 25 | TP_SDA | - | NC |
| 26 | TP_SCL | - | NC |
| 27 | TP_INT | - | NC |
| 28 | TP_RST | - | NC |
| 29 | TP-VCC2.8V | - | NC |
| 30 | GND | P | Power Ground |

I: Input; O: Output; P: Power

4.2 Block Diagram



5. ELECTRICAL CHARACTERISTICS

5.1 TFT-LCD Panel Driving Section

| Item 项目 | Symbol 符号 | Min. 最小值 | Typ. 典型值 | Max. 最大值 | Unit 单位 | Remark 备注 |
|--------------------------|------------------|-------------|-------------|-------------|------------|--------------|
| Power Supply1 Voltage | IOVCC | - | 1.8 | - | V | - |
| Power Supply2 Voltage | VCC | - | 3.3 | - | V | - |
| Power Supply Current | VCC | - | 32 | - | mA | Note1 |
| Logic Input High Voltage | V _{IH} | 0.7VDD | - | VDD | V | - |
| Logic Input Low Voltage | V _{IL} | 0 | - | 0.3VDD | V | - |
| Panel Power Consumption | P _{VDD} | - | 0.099 | - | Watt | Note1 |
| Module Power Consumption | P _{LCM} | - | 0.611 | - | Watt | Note1,2 |

(Ta=+25°C,GND=0V)

Note1:Measurement Conditions (Video Mode): Full Screen Red Pattern,VDD=1.8V,60Hz Refresh.

Note2: P_{LCM}= P_{VDD}+ P_{B/L}, About P_{B/L} information, inference to 5.2 Back Light Driving Section.

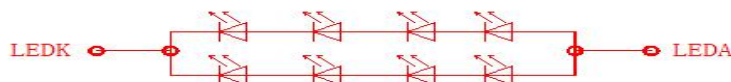
Note3: VCOM values reference only, must be adjusted to optimize display quality

5.2 Back Light Driving Section

| Item 项目 | Symbol 符号 | Min. 最小值 | Typ. 典型值 | Max. 最大值 | Unit 单位 | Remark 备注 |
|-----------------------------|------------------|-------------|-------------|-------------|------------|--------------|
| Forward Voltage | V _F | - | 12.8 | - | V | Note1 |
| Forward Current | I _F | - | 40 | - | mA | Note1 |
| Backlight Power consumption | P _{B/L} | - | 0.512 | - | Watt | Note1 |
| LED life time | - | 30000 | - | - | Hours | Note2 |
| LED Quantity | | 8 | | | PCS | |

(Ta=+25°C,GND=0V)

Note1:The “LED life time” is defined as the module brightness decrease to 50% of original brightness at I_{LED}=20mA(Per Led). The LED life time could be decreased if operating I_{LED} is larger than 20mA.



BACKLIGHT CIRCUIT DIAGRAM

LED I_F:40 mA

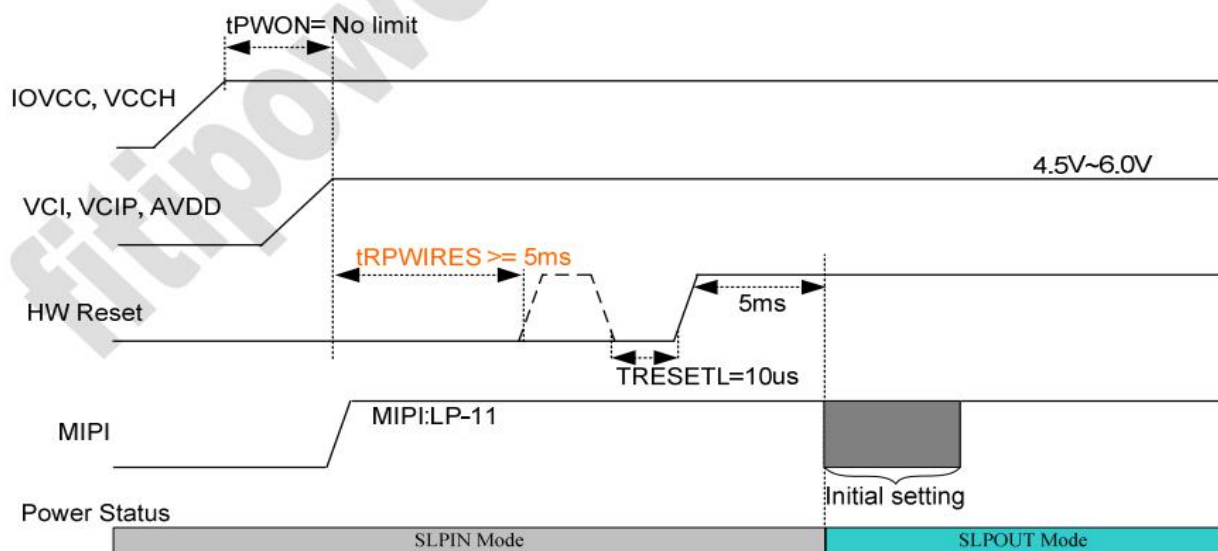
LED V_f:12.8V (TYP)

背光电路图
(CIRCUIT DIAGRAM)

5.3 Power On/Off Sequence

BOOSTM [1:0]=01 (External AVDD power, Internal AVEE power)

IOVCC=VCCH=1.65V ~ 3.6V, AVDD=VCI=VCIP=4.5V ~ 6.0V

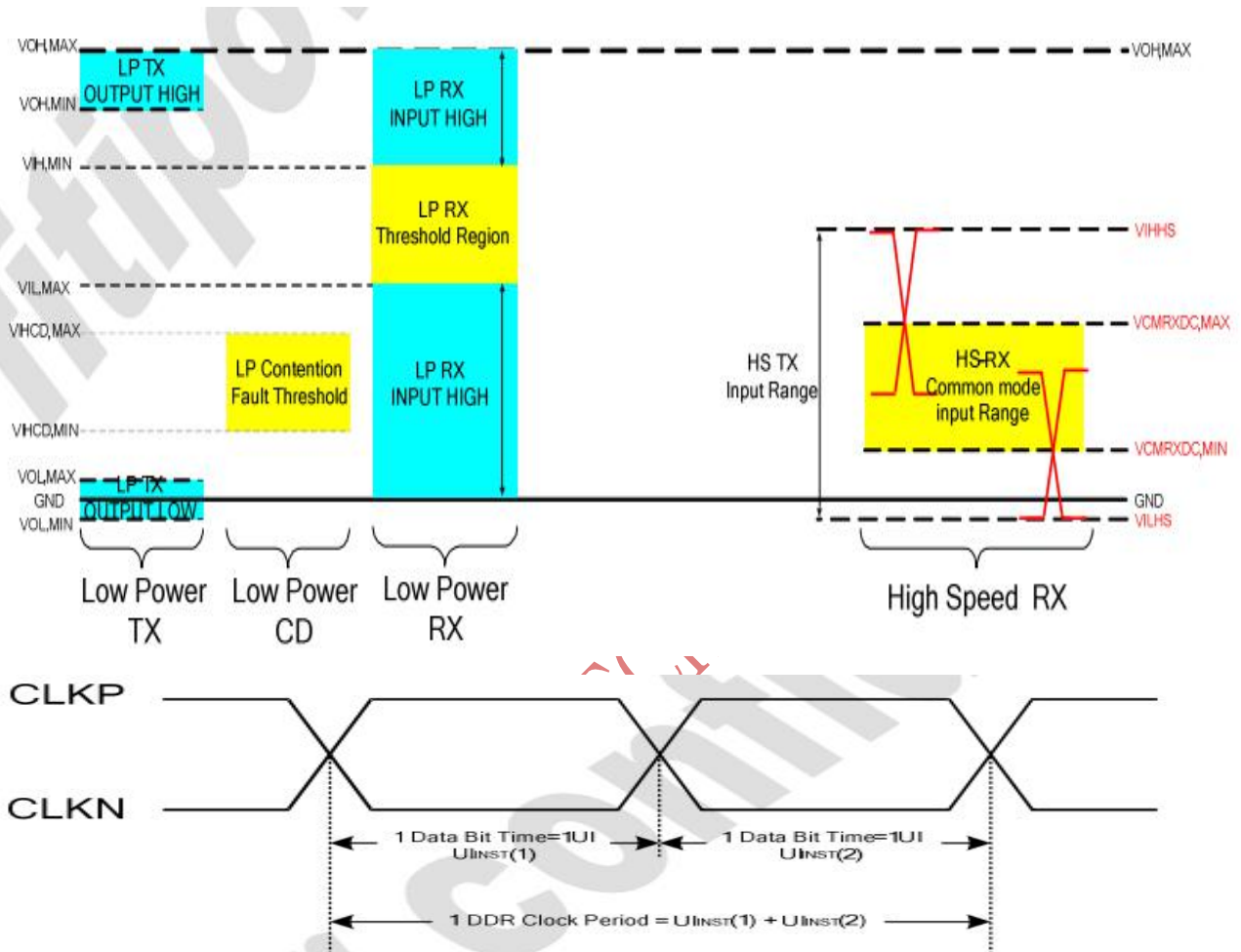


Uncontrolled power off

The uncontrolled power off means a situation when e.g. there is removed a battery without the controlled power off sequence. The display module must meet following requirements:

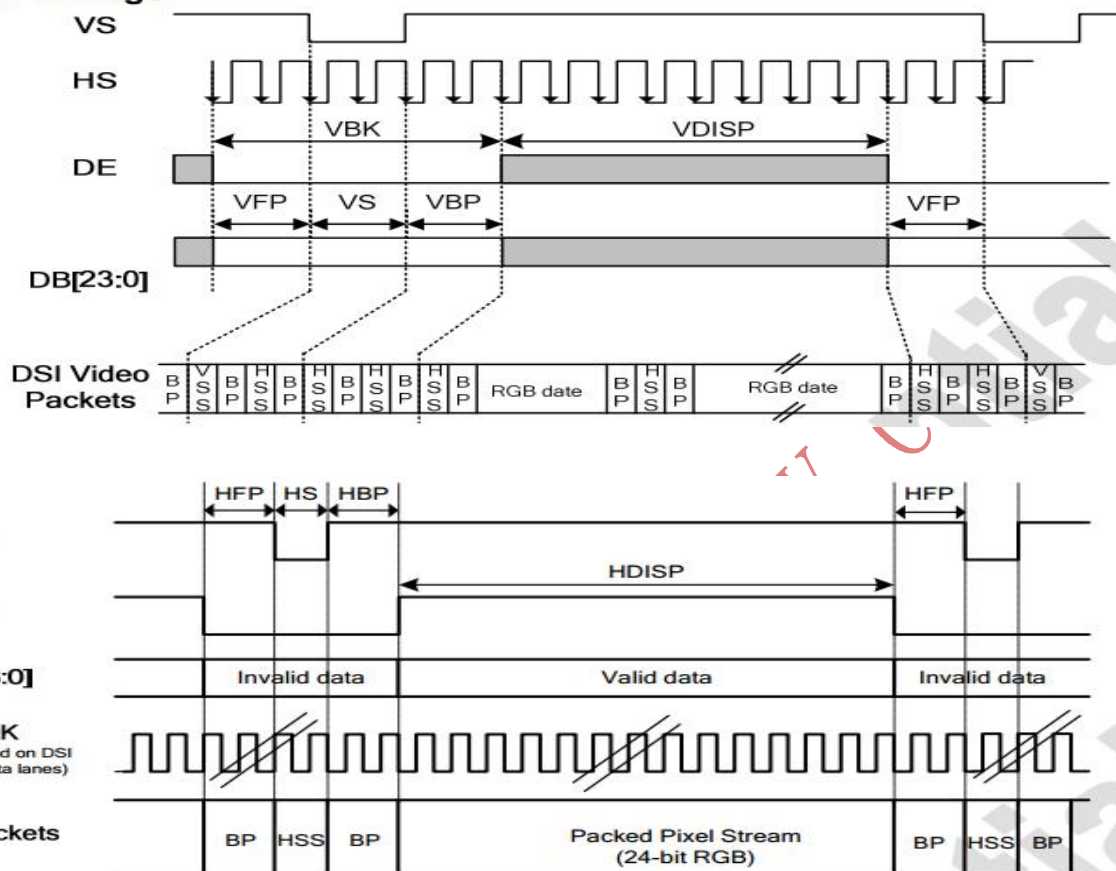
- There cannot be any damages for the display module or the display module cannot cause any damages for the host or lines of the interface.
- There cannot be any abnormal visible effects (= display must be blank) with in 1 second on the display and remains blank until "Power On Sequence" powers it up

5.4.1ACCharacteristics



5.5 Timing Diagram

Vertical Timings



5.5.1 Timing Parameters

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|--------------------------|--------|------------|------|------|---------|------|
| Vertical low pulse width | VS | - | 2 | - | Note(1) | Line |
| Vertical front porch | VFP | - | 2 | - | - | Line |
| Vertical back porch | VBP | - | 2 | - | Note(1) | Line |
| Vertical blanking period | VBK | VS+VBP+VFP | 6 | - | - | Line |
| Vertical active area | - | VDISP | - | 800 | - | Line |
| Vertical Refresh rate | VRR | - | - | 60 | - | Hz |

Note: (1) The VS and VBP pulse width are related to GIP start pulse and GIP clock pulse timing. The GIP start pulse and GIP clock pulse must be set at corresponding position for LCD normal display.

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|----------------------------|--------|------------|------|------|------|------|
| HS low pulse width | HS | - | 6 | - | 78 | DCK |
| Horizontal back porch | HBP | - | 5 | - | 78 | DCK |
| Horizontal front porch | HFP | - | 5 | - | 78 | DCK |
| Horizontal blanking period | HBLK | HS+HBP+HFP | 16 | - | 88 | DCK |
| Horizontal active area | HDISP | - | - | 480 | - | DCK |

Note: (1) HS+HBP>0.5uS.

(2) HFP>0.5uS.

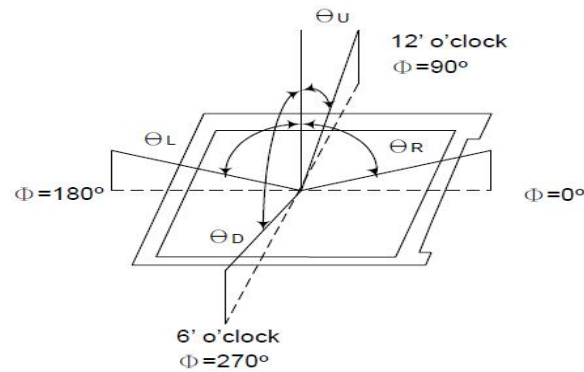
6. OPTICAL CHARACTERISTICS

| Parameter 参数 | Symbol 符号 | Condition 条件 | Min. 最小值 | Typ. 典型值 | Max. 最大值 | Unit 单位 | Remark 备注 |
|-------------------------|---------------------------------|--|-------------|-------------|-------------|-------------------|--------------|
| Contrast Ratio | C/R | $\theta = 0^\circ$ | 650 | 900 | - | - | Note(4) |
| NTSC Ratio | S | $\theta = 0^\circ$ | - | 69.83 | | % | Note(7) |
| Luminance | L | $\theta = 0^\circ$ | - | 700 | - | cd/m ² | Note(5) |
| Luminance uniformity | U _W | $\theta = 0^\circ$ | 75 | 80 | - | % | Note(3) |
| Response Time | T _R + T _F | 25 °C | - | 35 | - | ms | Note(2) |
| Color Coordination | W _X | $\theta = 0^\circ$ (Center) Normal viewing angle B/L On | -+0.03 | 0.288 | +0.03 | NTSC (x,y) | Note(6) |
| | W _Y | | | 0.319 | | | |
| | R _X | | | 0.640 | | | |
| | R _Y | | | 0.335 | | | |
| | G _X | | | 0.325 | | | |
| | G _Y | | | 0.606 | | | |
| | B _X | | | 0.148 | | | |
| | B _Y | | | 0.045 | | | |
| Viewing Angle | θ_L | C/R>10 | - | 80 | - | Degree | Note(1) |
| | θ_R | | - | 80 | - | | |
| | θ_U | | - | 80 | - | | |
| | θ_D | | - | 80 | - | | |

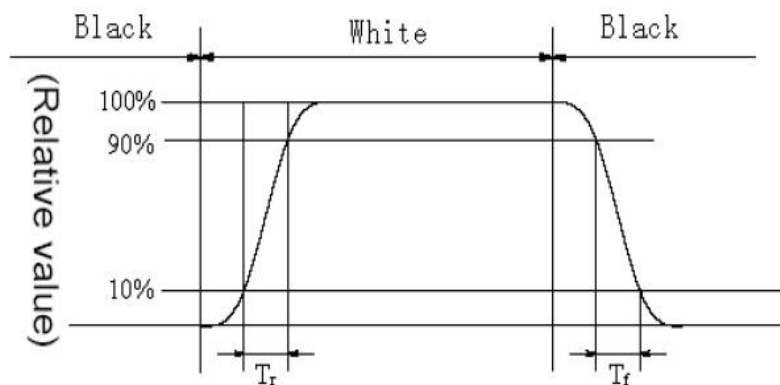
Test Conditions:

1. VDD=1.8V, I_F=40mA (Backlight current), the ambient temperature is +25°C.
2. The test systems refer to Note 8.

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

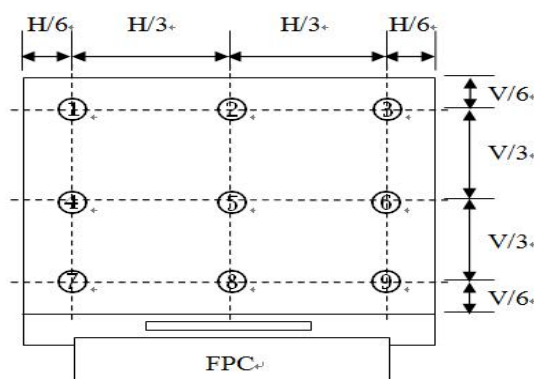


Note2: Definition of Response time: Sum of T_R and T_F



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

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

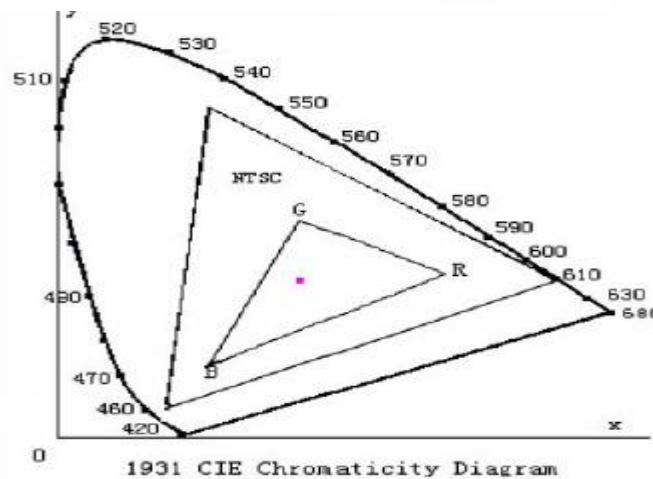
Note 5: Definition of Luminance: Center Luminance of white is defined as luminance values of 1 point average across the LCD surface.

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:

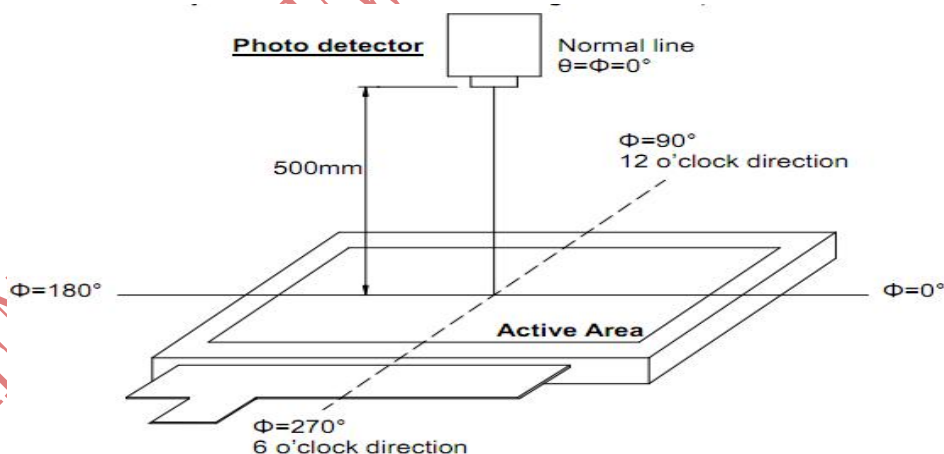
$$\text{NTSC ratio} = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}}$$



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 项目 | Test Condition 测试条件 | Remark 备注 |
|--------------------------------|---|--------------|
| High Temperature Storage | Ta =+80°C / 96Hours | Note1,2,3 |
| Low Temperature Storage | Ta =-30°C / 96Hours | Note1,2,3 |
| High Temperature Operating | Ta =+70°C / 96Hours | Note1,2,3 |
| Low Temperature Operating | Ta =-20°C / 96Hours | 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 / 96Hours | 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 1m 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.

8. PACKAGE DRAWING

