

# 液晶模组说明书

## LCD Module Instructions

☒初定规格 Preliminary specification

☐正式规格 Official specifications

|                                                                                                                                                                                               |                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| 项目编号<br>Project No.                                                                                                                                                                           | TFT-H050A21 Series                                           |
| 产品描述<br>Product Description                                                                                                                                                                   | TFT LCD Module<br>800 (RGB) x 480 Pixels<br>5.0 Inch TFT LCD |
| 客 户 确 认 签 章:<br>Signature by customer:                                                                                                                                                        |                                                              |
| <div></div>                                                                                                 |                                                              |
| <input type="checkbox"/> 小批量试产 Trial Production <input type="checkbox"/> 大批量生产 Mass Production<br>请返回一份带有您的签名和评论的确认副本<br>Please return one copy confirmation with signature and your comments |                                                              |

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内容  
substance

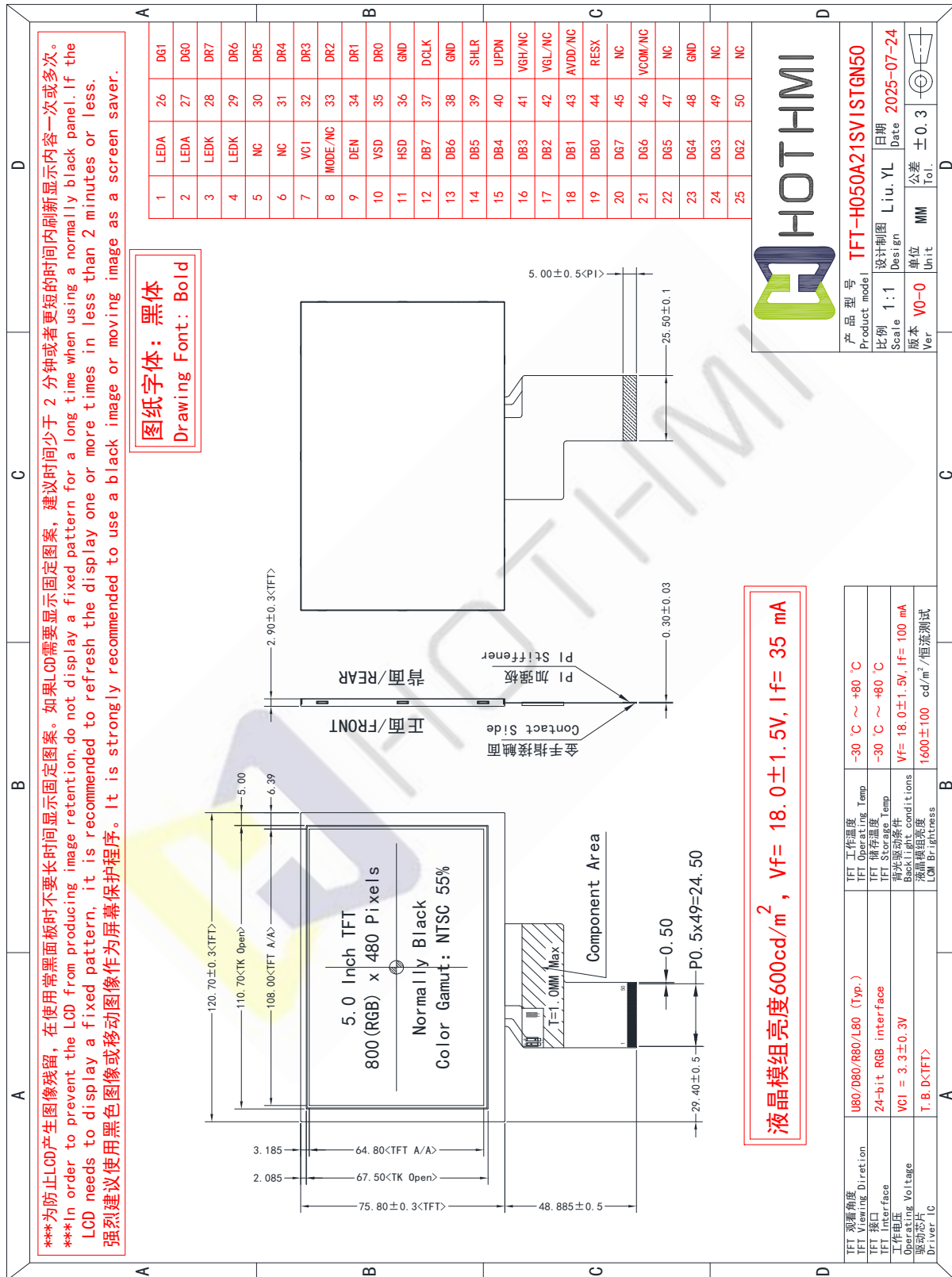
|                                    |    |
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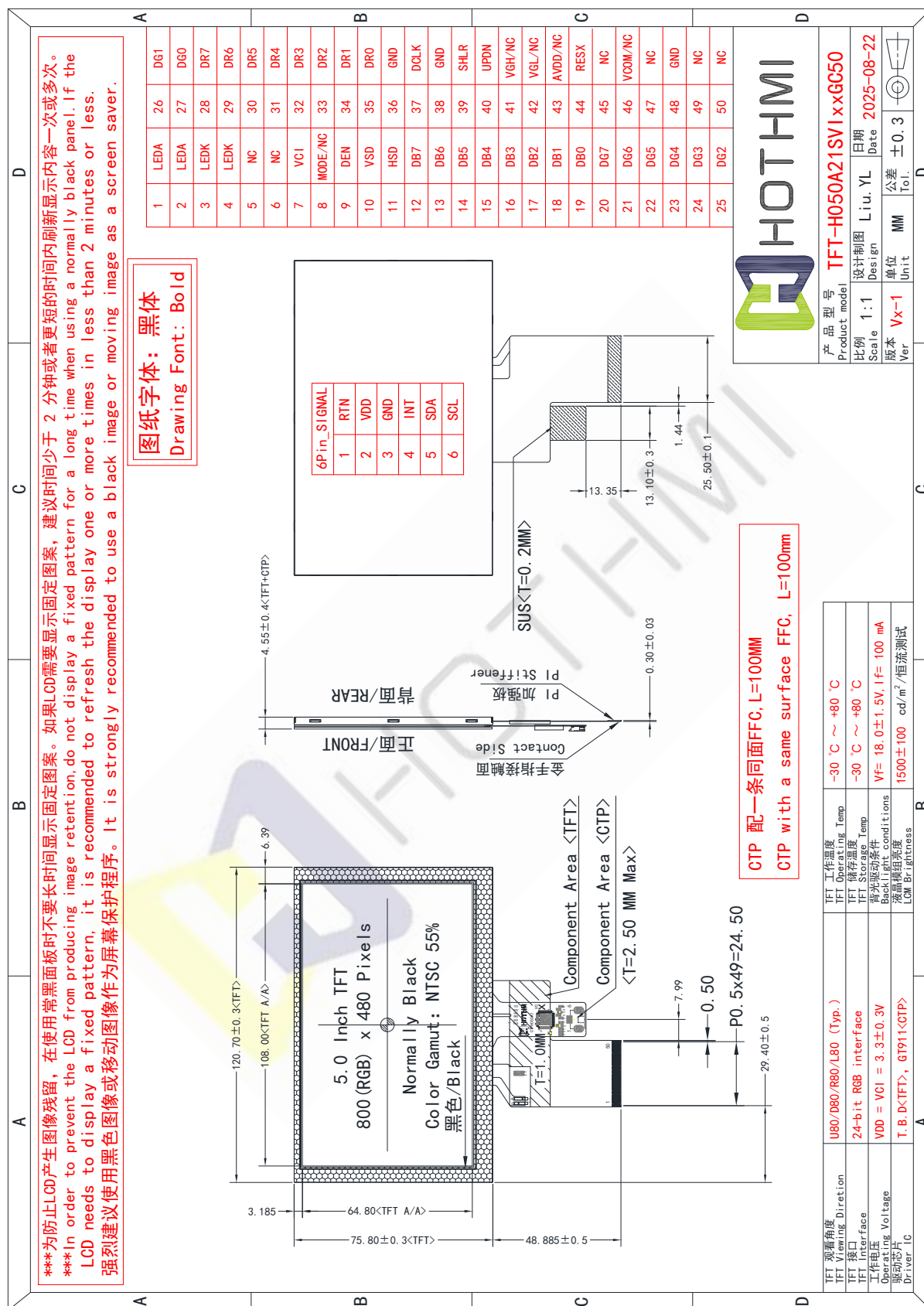
# 一、基本特征 General Feature:

| 项目<br>Item                            | 标准值<br>Standard Value                              |                                             |                                             | 单位<br>Unit  |
|---------------------------------------|----------------------------------------------------|---------------------------------------------|---------------------------------------------|-------------|
| TFT 显示尺寸<br>TFT Display Size          | 5.0                                                |                                             |                                             | 英寸<br>Inch  |
| TFT 分辨率<br>TFT Number of Pixels       | 800 (RGB) (H) x 480 (V)                            |                                             |                                             | 像素<br>Pixel |
| TFT 显示有效区域<br>TFT Display Active Area | 108.00 (H) x 64.80 (V)                             |                                             |                                             | 毫米<br>mm    |
| TFT 模组外形尺寸<br>TFT Module Dimensions   | 120.70 (H) x 75.80 (V) x2.90 (D) <TFT>             |                                             |                                             | 毫米<br>mm    |
| TFT 观看方向<br>TFT Viewing Direction     | U80/D80/R80/L80 (Typ.)                             |                                             |                                             | 度<br>Deg.   |
| TFT 模组接口<br>TFT Module Interfaces     | RGB 24 Bit (SYNC + DE mode)                        |                                             |                                             | -           |
| TFT 驱动芯片<br>TFT Driver IC             | China Taiwan <V1 Version FPC>                      |                                             |                                             | -           |
| 电容触摸屏驱动芯片<br>CTP Driver IC            | -                                                  |                                             |                                             | -           |
| 触摸屏选项<br>Touch Screen Options         | <input checked="" type="checkbox"/> 不带触摸屏<br>No TP | <input type="checkbox"/> 带电阻触摸屏<br>Have RTP | <input type="checkbox"/> 带电容触摸屏<br>Have CTP | -           |
| TFT 模组重量<br>TFT Module Weight         | 不带触摸屏<br>Without TP                                | T. B. D ±3%                                 |                                             | 克<br>g      |
|                                       | 带电容触摸屏<br>With CTP                                 | T. B. D ±3%                                 |                                             |             |
|                                       | 带电阻触摸屏<br>With RTP                                 | T. B. D ±3%                                 |                                             |             |

说明 Description:

## 二、外形尺寸 Outline Dimensions

TFT-H050A21SV1xxGN50\_Vx-0 (NO TP\_1600 cd/m<sup>2</sup>)



TFT-H050A21SVI<sub>xx</sub>GC50 V<sub>x</sub>-1 (Have CTP 1500 cd/m<sup>2</sup>)

### 三、引脚说明 Pin Description

#### 3.1 模组引脚说明 TFT Pin Description

| 引脚编号<br>Pin NO.          | 标号<br>Symbol | 详细描述<br>Description                                |
|--------------------------|--------------|----------------------------------------------------|
| 1~2                      | LEDA         | LED阳极<br>LED anode                                 |
| 3~4                      | LEDK         | LED阴极<br>LED cathode                               |
| 5~6                      | NC           | 不连接<br>Not connected                               |
| 7                        | VCI          | 数字电源电压<br>Digital supply voltage                   |
| 8                        | NC           | 不连接<br>Not connected                               |
| 9                        | DEN          | 数据输入启用<br>Data Input Enable                        |
| 10                       | VSD          | 垂直同步信号<br>Vertical sync signal                     |
| 11                       | HSD          | 水平同步信号<br>Horizontal sync signal                   |
| 12~19                    | DB[7~0]      | 8位数据总线显示蓝色数据<br>8 bit data bus display blue data.  |
| 20~27                    | DG[7~0]      | 8位数据总线显示绿色数据<br>8 bit data bus display green data. |
| 28~35                    | DR[7~0]      | 8位数据总线显示红色数据<br>8 bit data bus display red data.   |
| 36                       | GND          | 电源地<br>Power supply ground                         |
| 37                       | PCLK         | 像素时钟输入<br>Pixel clock input                        |
| 38                       | GND          | 电源地<br>Power supply ground                         |
| - 下一页 -<br>- Next Page - |              |                                                    |

| 引脚编号<br>Pin NO.   | 标号<br>Symbol | 详细描述<br>Description                                                                                                                                                                                                                                                                                                                         |
|-------------------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 39                | SHLR         | <p>水平扫描方向控制引脚<br/>Horizontal scan direction control pin</p> <p><b>V0 Version FPC:</b><br/>SHLR ="VCI", 左边 → 右边; SHLR ="GND", 右边 → 左边;<br/>SHLR ="VCI", left → right; SHLR ="GND", right → left;</p> <p><b>V1 Version FPC:</b><br/>SHLR ="VCI", 左边 → 右边; SHLR ="GND", 右边 → 左边;<br/>SHLR ="VCI", left → right; SHLR ="GND", right → left;</p> |
| 40                | UPDN         | <p>垂直扫描方向控制引脚<br/>Vertical scan direction control Pin.</p> <p><b>V0 Version FPC:</b><br/>UPDN ="VCI", 底部 → 顶部; UPDN ="GND", 顶部 → 底部;<br/>UPDN ="VCI", Bottom → Top; UPDN ="GND", Top → Bottom;</p> <p><b>V1 Version FPC:</b><br/>UPDN ="VCI", 顶部 → 底部; UPDN ="GND", 底部 → 顶部;<br/>UPDN ="VCI", Top → Bottom; UPDN ="GND", Bottom → Top;</p>  |
| 41                | VGH          | 不连接<br>Not connected                                                                                                                                                                                                                                                                                                                        |
| 42                | VGL          | 不连接<br>Not connected                                                                                                                                                                                                                                                                                                                        |
| 43                | AVDD         | 不连接<br>Not connected                                                                                                                                                                                                                                                                                                                        |
| 44                | RESX         | 全局复位引脚。低电平进入复位状态<br>Global reset pin. Active Low to enter Reset State.                                                                                                                                                                                                                                                                      |
| 45                | NC           | 不连接<br>Not connected                                                                                                                                                                                                                                                                                                                        |
| 46                | VCOM         | 不连接<br>Not connected                                                                                                                                                                                                                                                                                                                        |
| 47                | NC           | 不连接<br>Not connected                                                                                                                                                                                                                                                                                                                        |
| 48                | GND          | 电源地<br>Power supply ground                                                                                                                                                                                                                                                                                                                  |
| 49~50             | NC           | 不连接<br>Not connected                                                                                                                                                                                                                                                                                                                        |
| - 结束 -<br>- END - |              |                                                                                                                                                                                                                                                                                                                                             |

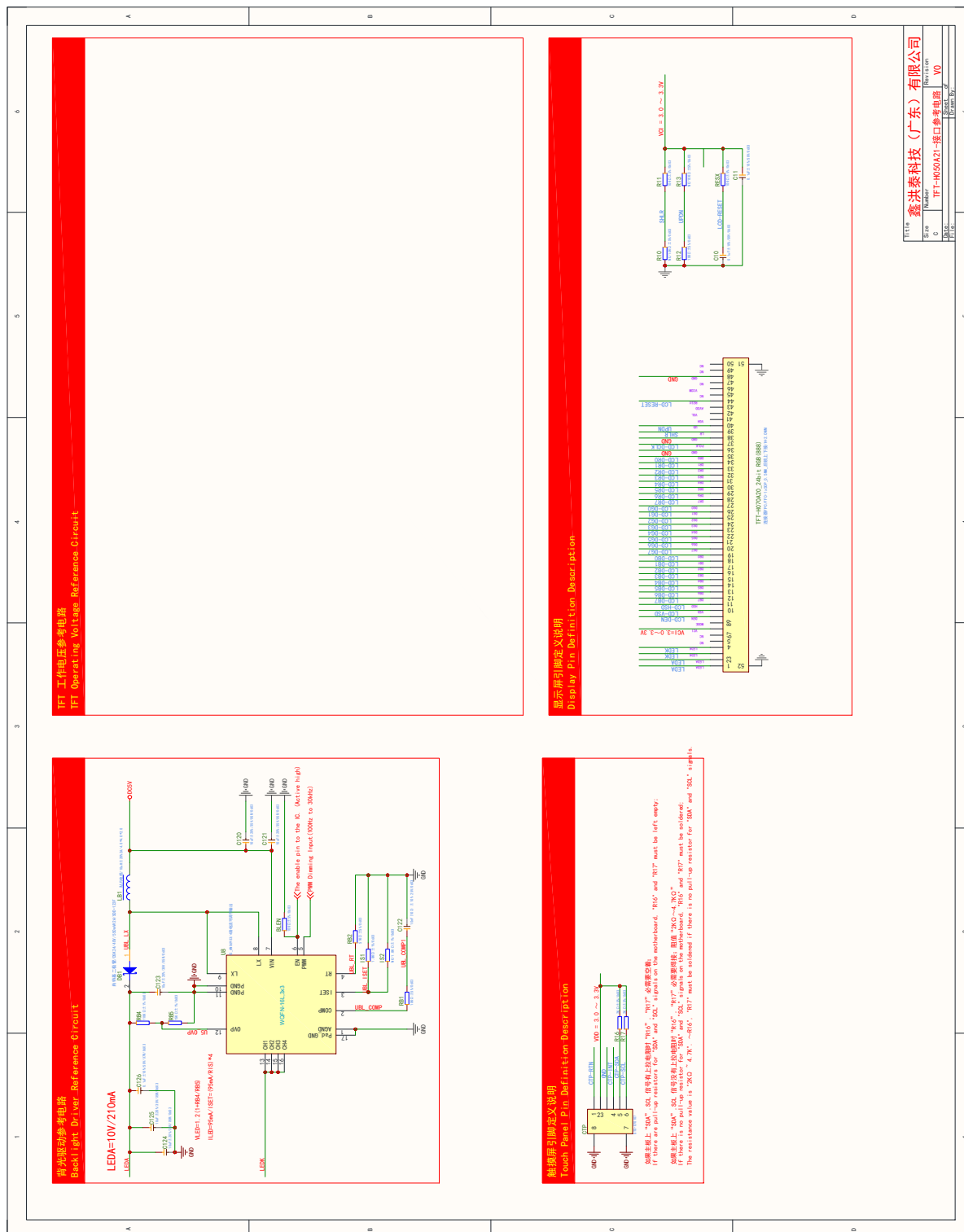
### 3.2 CTP 引脚说明 CTP Pin Description

| 引脚编号<br>Pin NO.   | 标号<br>Symbol | 详细描述<br>Description                    |
|-------------------|--------------|----------------------------------------|
| 1                 | RSTN         | 复位信号，低电平有效<br>Reset signal, active low |
| 2                 | VDD          | 模拟电源<br>Analog power supply            |
| 3                 | GND          | 电源地<br>Power supply ground             |
| 4                 | INT          | 中断信号<br>Interrupt signal               |
| 5                 | SDA          | IIC 数据信号<br>IIC data signal            |
| 6                 | SCL          | IIC 时钟信号<br>IIC clock signal           |
| - 结束 -<br>- END - |              |                                        |

### 3.3 RTP 引脚说明 RTP Pin Description

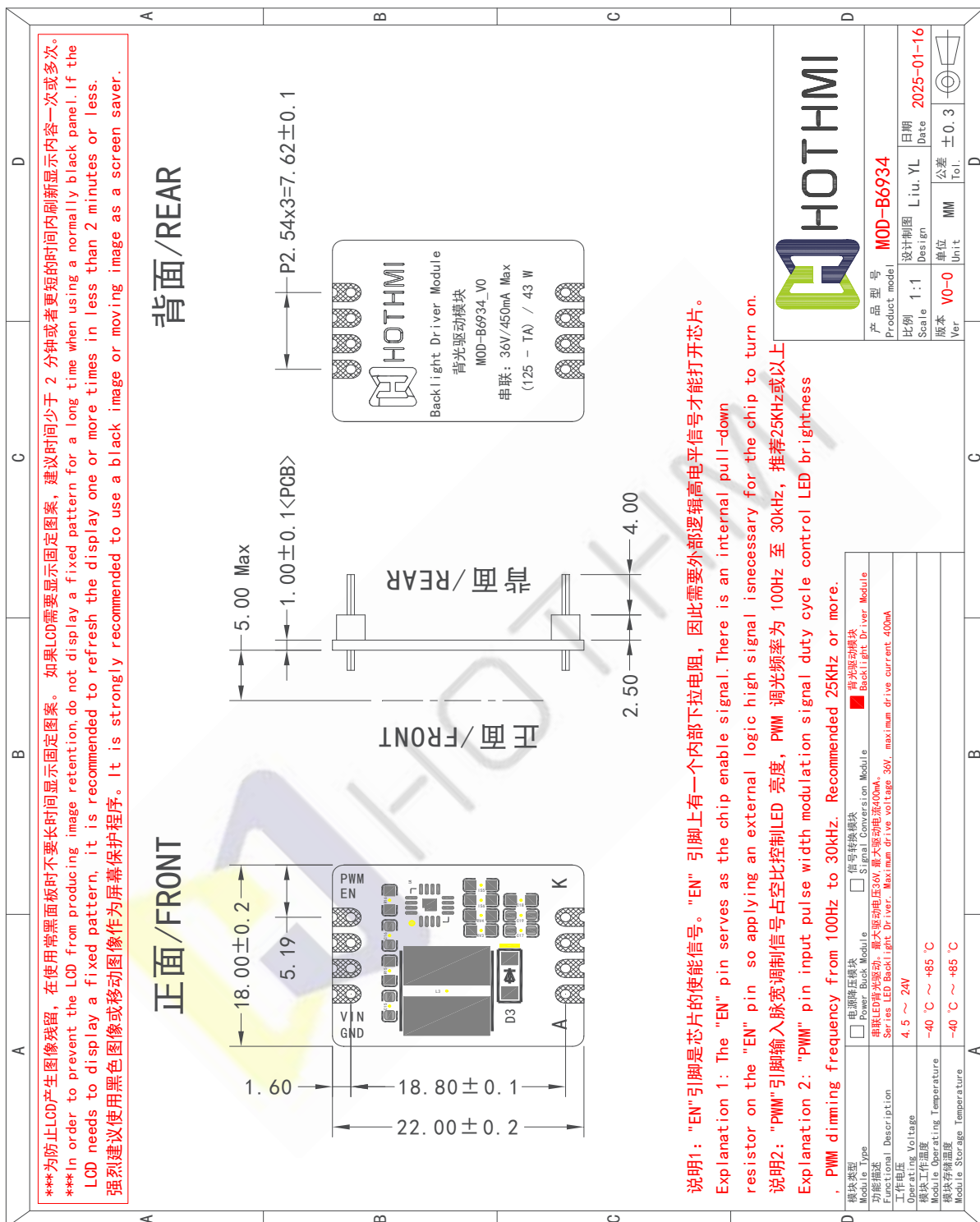
| 引脚编号<br>Pin NO.   | 标号<br>Symbol | 详细描述<br>Description |
|-------------------|--------------|---------------------|
| 1                 | -            | -                   |
| 2                 | -            | -                   |
| 3                 | -            | -                   |
| 4                 | -            | -                   |
| - 结束 -<br>- END - |              |                     |

### 3.5 参考电路图 Reference Circuit Diagram



说明 1: 为了方便调试, 我司可以提供配套的背光驱动模块和升压模块

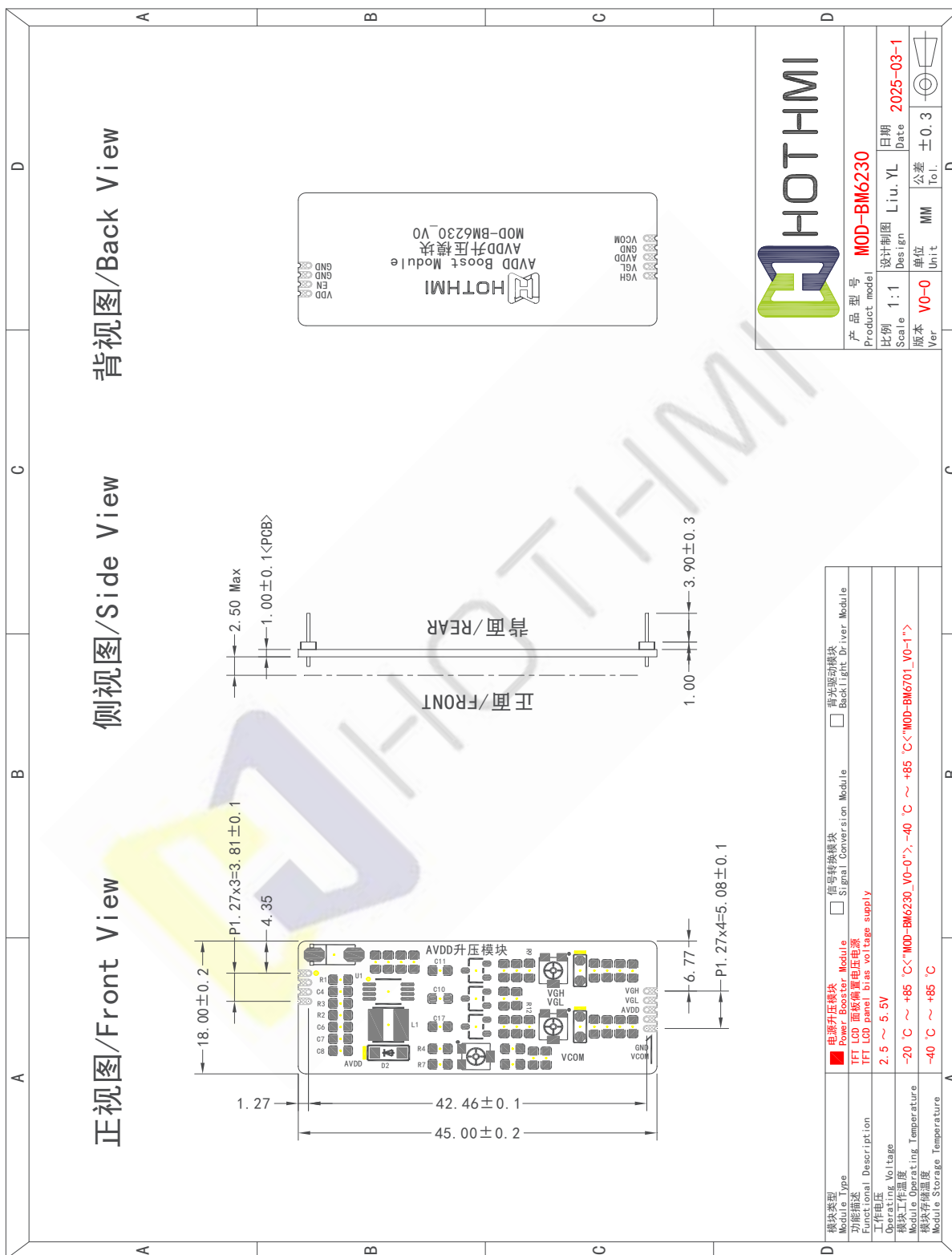
Note 1: In order to facilitate debugging, our company can provide matching backlight driver module and boost module .



## 背光模块尺寸 Backlight Module Dimensions

说明 1: 我司所有背光模块长, 宽尺寸相同, 引脚定义相同。使用的模块以实物为准。

Note 1: All of our backlight modules have the same length and width dimensions and the same pin definition. Modules used are subject to physical.



## AVDD 升压模块尺寸

## AVDD Boost Module Dimensions

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## 四、电气特性 Electrical Characteristics

### 4-1 TFT 面板工作条件 TFT Panel Operating Conditions

| 项目<br>Item                         | 标号<br>Symbol    | 条件<br>Condition | 最小值<br>Min | 典型值<br>Type | 最大值<br>Max | 单位<br>Unit |
|------------------------------------|-----------------|-----------------|------------|-------------|------------|------------|
| 数字电源<br>Digital Power              | VCI             | -               | 3.0        | 3.3         | 3.6        | 伏<br>V     |
| 接口工作电压<br>IO Supply Voltage        | IOVCC           | -               | -          | -           | -          | 伏<br>V     |
| 模拟电路电源<br>Power For Analog         | AVDD            | -               | -          | -           | -          | 伏<br>V     |
| TFT 栅极导通电压<br>TFT Gate ON Voltage  | VGH             | -               | -          | -           | -          | 伏<br>V     |
| TFT 栅极关断电压<br>TFT Gate OFF Voltage | VGL             | -               | -          | -           | -          | 伏<br>V     |
| TFT 公共电极电压<br>TFT Common Electrode | VCOM            | -               | -          | -           | -          | 伏<br>V     |
| 工作电流<br>Operation Current          | I <sub>oc</sub> | -               | -          | -           | -          | 毫安<br>mA   |
| 待机电流<br>Standby Current            | I <sub>sc</sub> | -               | -          | -           | -          | 微安<br>uA   |
| TFT 工作温度<br>TFT Operating Temp     | TOPR            | -               | -30        | +25         | +80        | 摄氏度<br>℃   |
| TFT 储存温度<br>TFT Storage Temp       | TSTG            | -               | -30        | +25         | +80        | 摄氏度<br>℃   |

#### 备注 Notes :

1. VGH 为 TFT 栅极工作电压。VGH is TFT Gate operating voltage.

2. VGL 为 TFT 栅极工作电压。VGL 信号的低电平必须与 Vcom 同相波动。

VGL is TFT Gate operating voltage. The low voltage level of VGL signal must be fluctuates with same phase as Vcom.

3. 必须调节 Vcom 以优化显示质量，如串扰和对比度等。

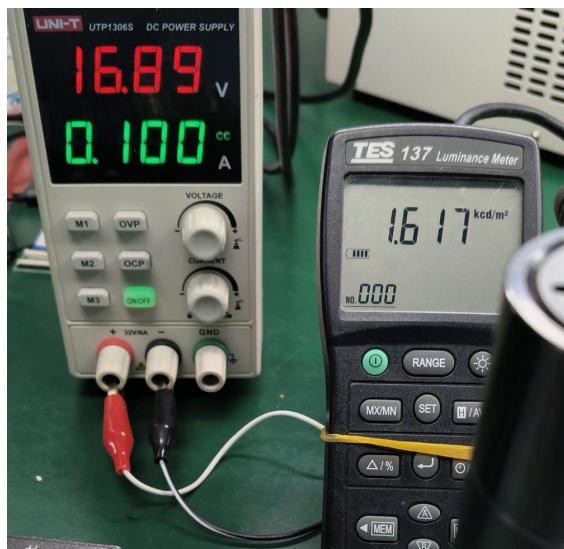
Vcom must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc.

4. 该值只是参考值。客户可通过不同的 D-IC 优化设置值。

The value is just the reference value. The customer can optimize the setting value by the different D-IC.

#### 4-2 背光工作条件 LED back light specification

| 项目<br>Item                         | 标号<br>Symbol | 条件<br>Condition              | 最小值<br>Min   | 典型值<br>Type | 最大值<br>Max   | 单位<br>Unit                   |
|------------------------------------|--------------|------------------------------|--------------|-------------|--------------|------------------------------|
| 工作电压<br>Forward voltage            | VF           | 恒流<br>constant<br>current    | Type<br>-1.5 | 18.0        | Type<br>+1.5 | 伏特<br>V                      |
| 工作电流<br>Forward current            | IF           |                              | -            | 100         | -            | 毫安<br>mA                     |
| 亮度 (带 LCD)<br>Luminance (With LCD) | Lv           | 不带触摸<br>No TP                | Type<br>-100 | 1600        | Type<br>+100 | 坎德拉/平方米<br>cd/m <sup>2</sup> |
|                                    |              | 带玻璃盖板<br>With Glass<br>cover |              | -           |              |                              |
| LED 寿命<br>LED life time            | Hr           | Ta=25±3 °C                   | 20,000       | 30,000      | -            | 小时<br>Hour                   |



不带触摸 Without TP

#### 注释 Note:

1. LED 寿命 (Hr) 定义为在 Ta=25±3 °C, 上表所示的典型电压电流值条件下持续工作直至亮度低于 50% 的时间。

LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

2. 以上结果是按 MTBF 计算方式预估判定的 LED 失效时间, 实际测试 LED 在 Ta=25±3 °C 点亮 5000H, 亮度衰减 8%.

The above results are estimated and judged by the MTBF calculation method of the LED failure time. The actual test LED is lit for 5000H at Ta=25±3 °C, and the brightness decays by 8%.

#### 4-3 电容触摸屏工作条件 CTP Operating Conditions

| 项目<br>Item                    | 标号<br>Symbol | 条件<br>Condition | 最小值<br>Min   | 典型值<br>Type | 最大值<br>Max   | 单位<br>Unit |
|-------------------------------|--------------|-----------------|--------------|-------------|--------------|------------|
| 表面硬度<br>Surface hardness      | -            | 铅笔<br>Pencil    | -            | 6H          | -            | 硬度<br>Hard |
| 有效数据数<br>No. of valid data    | -            | -               | -            | -           | 5            | 点<br>Point |
| 透光率<br>Transmittance          | -            | -               | 80           | -           | -            | 百分比<br>%   |
| 数字电源<br>Digital Power         | VDD          | -               | Type<br>-0.3 | 3.0         | Type<br>+0.3 | 伏特<br>V    |
| I/O 电源<br>I/O Power           | IOVDD        | -               | Type<br>-0.3 | 3.0         | Type<br>+0.3 | 伏特<br>V    |
| 工作温度<br>Operation Temperature | -            | 20%-90%RH;      | -20          | +25         | +70          | 摄氏度<br>℃   |
| 储存温度<br>Storage Temperature   | -            |                 | -30          | +25         | +80          | 摄氏度<br>℃   |

## 五、液晶光学规格 TFT OPTICAL SPECIFICATION

光学规格的测试应在暗室（环境亮度 1lux，温度=25 ℃）中使用亮度计系统（测角仪系统和TOPCON BM-5）设备进行测量，测试单元应位于大约在  $\theta$  和  $\Phi$  等于 0 的视角下，距 LCD 表面 50cm 的距离。显示面上测量点的中心应保持固定。测量前背光应工作 30 分钟。

The test of Optical specifications shall be measured in a dark room (ambient luminance 1lux and temperature = 25 ℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of  $\theta$  and  $\Phi$  equal to 0 . The center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement.

### 5.2 光学规格 Optical Specifications

| 参数<br>Parameter                                      |                  | 标号<br>Symbol | 条件<br>Condition   | 最小值<br>Min. | 典型值<br>Typ. | 最大值<br>Max. | 单位<br>Unit | 备注<br>Remark                |
|------------------------------------------------------|------------------|--------------|-------------------|-------------|-------------|-------------|------------|-----------------------------|
| 视角范围<br>Viewing<br>Angle<br>Range                    | 水平<br>Horizontal | ⊙ 左/L        | CR>10             | 70          | 80          | -           | Deg.       | Note 1                      |
|                                                      |                  | ⊙ 右/R        |                   | 70          | 80          | -           | Deg.       |                             |
|                                                      | 垂直<br>Vertical   | ⊙ 上/U        |                   | 70          | 80          | -           | Deg.       |                             |
|                                                      |                  | ⊙ 下/D        |                   | 70          | 80          | -           | Deg.       |                             |
| 对比度 Contrast ratio                                   |                  | CR           | ⊙ = 0°            | 1000        | 1200        | -           | -          | Note2                       |
| 色域 Color Gamut                                       |                  | CG           | CIE1931           | -           | 50          | -           | %          |                             |
| 白色色度<br>White Chromaticity                           |                  | Wx           | ⊙ = 0°            | -0.03       | 0.308       | +0.03       | -          | Note4<br>(Based on C Light) |
|                                                      |                  | Wy           |                   |             | 0.339       |             | -          |                             |
| 色彩还原<br>Reproduct<br>ion of<br>color                 | 红<br>Red         | Rx           |                   |             | 0.617       |             | -          |                             |
|                                                      |                  | Ry           |                   |             | 0.313       |             | -          |                             |
|                                                      | 绿<br>Green       | Gx           |                   |             | 0.312       |             | -          |                             |
|                                                      |                  | Gy           |                   |             | 0.562       |             | -          |                             |
|                                                      | 蓝<br>Blue        | Gy           |                   |             | 0.141       |             | -          |                             |
|                                                      |                  | By           |                   |             | 0.138       |             | -          |                             |
| 响应时间（上升 + 下降）<br>Response Time<br>(Rising + Falling) |                  | Tr+Tf        | ⊙ = 0°<br>Ta= 25℃ | -           | 30          | 40          | ms         | Note5                       |

注释 Note:

1. 视角是对比度大于10的角度。视角确定为相对于光轴的水平或3、9点钟方向和垂直或6、12点钟方向 垂直于 LCD 表面（见图 1）。

Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o' clock direction and the vertical or 6, 12 o' clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2. 对比度测量应在  $\theta = 0$  的视角和 LCD 表面的中心进行。亮度测量时, 视场中的所有像素首先设置为白色, 然后设置为暗 (黑色) 状态。(参见图 1) 亮度对比度 (CR) 是通过数学定义的。

Contrast measurements shall be made at viewing angle of  $\Theta = 0$  and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (see FIGUR 1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. 透射率是没有 APF 和没有 CG 的值。

Transmittance is the Value without APF and without CG.

4. 上表中规定的色度坐标应由所有像素首先测量的光谱数据计算为红色、绿色、蓝色和白色。测量应在面板的中心进行。

The color chromaticity coordinates specified in the above table shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

5. 电光响应时间测量应如图 2 所示, 通过打开和关闭“数据”输入信号来进行。亮度从 10%变化到90%所需的时间是 $T_r$ , 90%到10%是 $T_f$ 。

The electro-optical response time measurements shall be made as FIGURE 2 by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is  $T_r$ , and 90% to 10% is  $T_f$ .

Figure1 Measurement Set Up

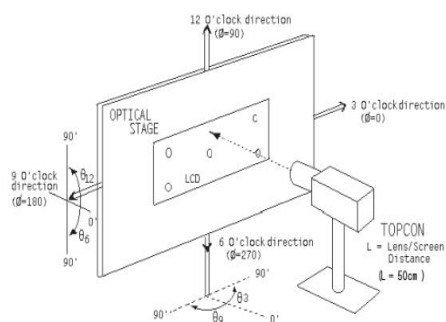


图 1

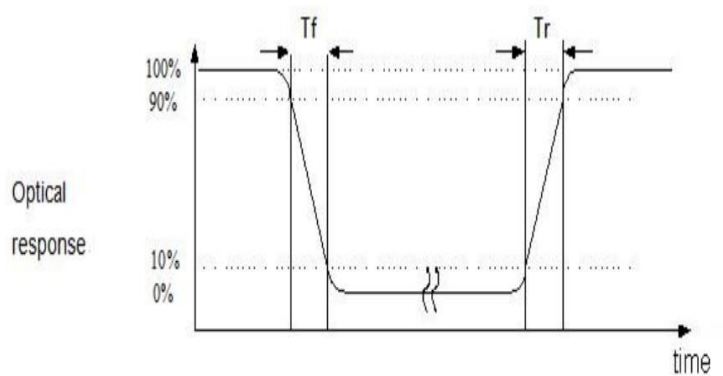
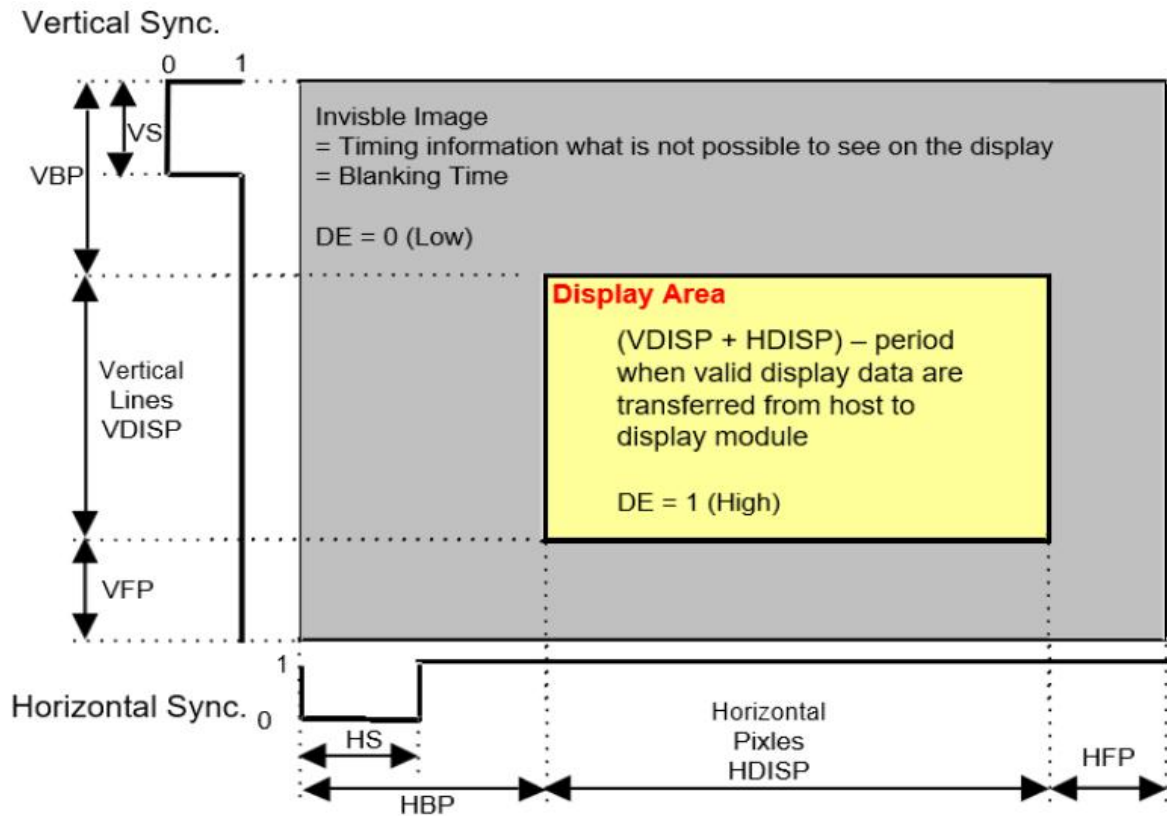


图 2

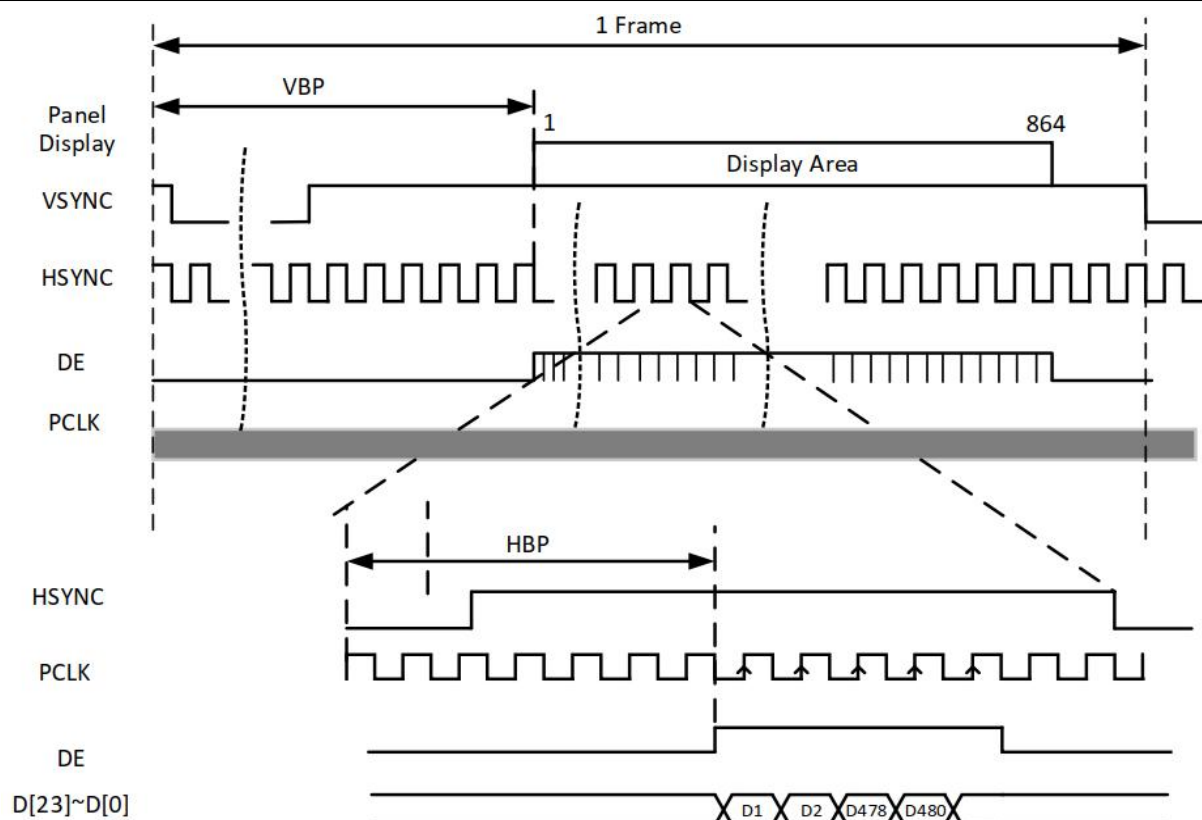
## 六、交流特性 AC characteristic

### 6. 1. RGB 接口的系统总线时序 System bus timing for RGB interface

#### A. V0 Version FPC (Chinese Mainland)



General timing diagram



RGB (800RGB x 480) timing diagram

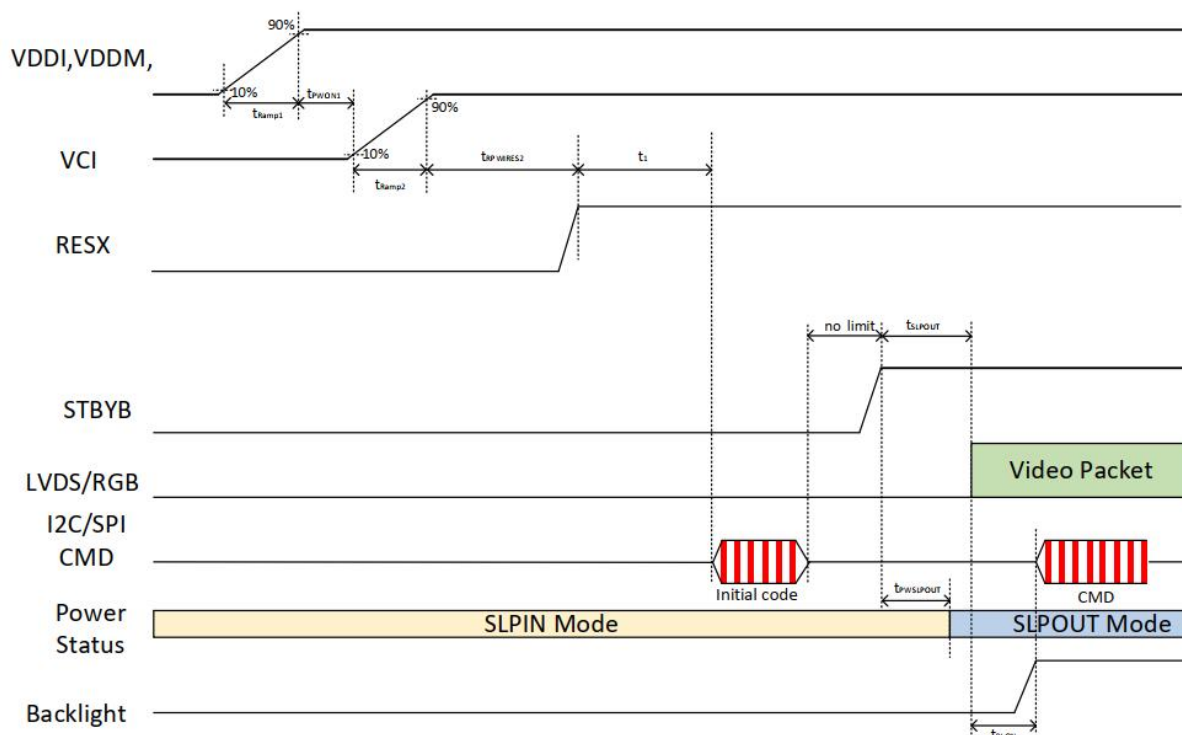
| Data format      | DB 23 | DB 22 | DB 21 | DB 20 | DB 19 | DB 18 | DB 17 | DB 16 | DB 15 | DB 14 | DB 13 | DB 12 | DB 11 | DB 10 | DB 09 | DB 08 | DB 07 | DB 06 | DB 05 | DB 04 | DB 03 | DB 02 | DB 01 | DB 00 |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 24bit (3Ah=0x70) | R7    | R6    | R5    | R4    | R3    | R2    | R1    | R0    | G7    | G6    | G5    | G4    | G3    | G2    | G1    | G0    | B7    | B6    | B5    | B4    | B3    | B2    | B1    | B0    |
| 18bit (3Ah=0x60) | R5    | R4    | R3    | R2    | R1    | R0    |       |       | G5    | G4    | G3    | G2    | G1    | G0    |       |       | B5    | B4    | B3    | B2    | B1    | B0    |       |       |
| 16bit (3Ah=0x50) | R4    | R3    | R2    | R1    | R0    |       |       |       | G5    | G4    | G3    | G2    | G1    | G0    |       |       | B4    | B3    | B2    | B1    | B0    |       |       |       |

RGB Interface data format

## 1) 开机上电顺序 Power On Sequence

The power on sequence timing for different power input modes and interfaces are shown as below table.

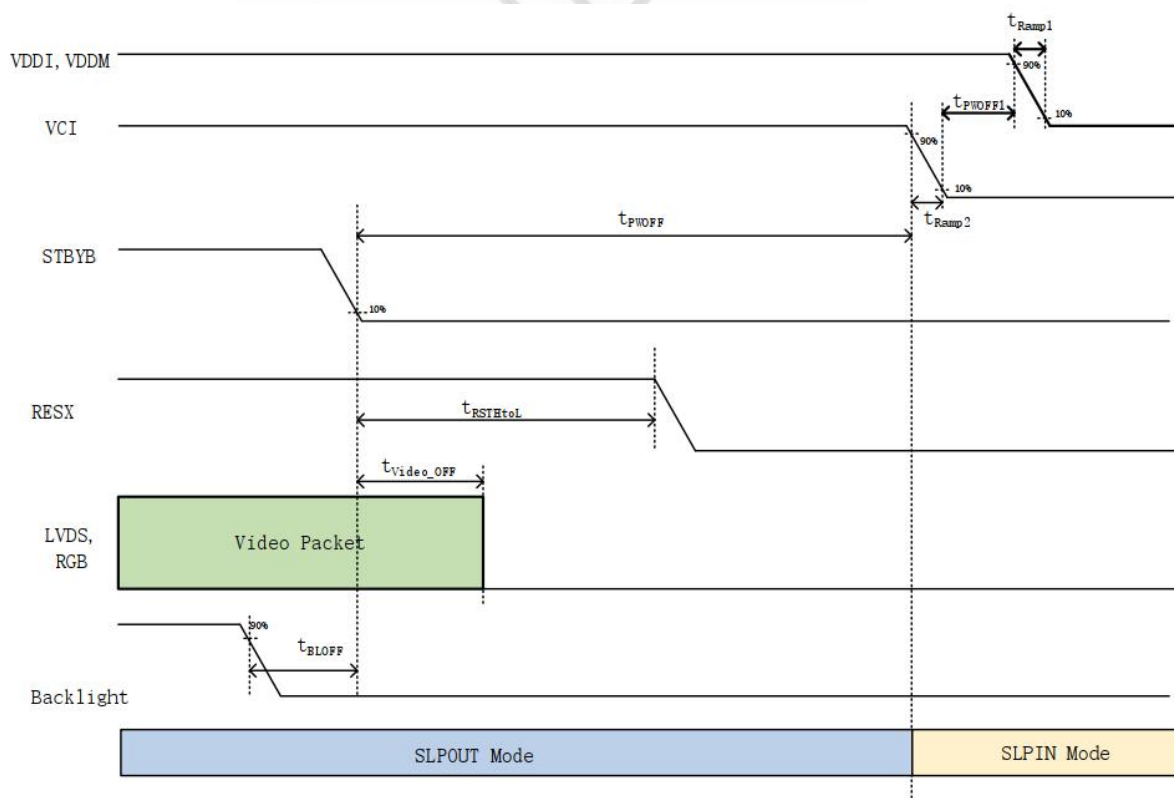
| Symbol                 | Value |     |                       | Unit | Remark     |
|------------------------|-------|-----|-----------------------|------|------------|
|                        | Min   | Typ | Max                   |      |            |
| t <sub>PWON1</sub>     | 0     | 5   | -                     | ms   |            |
| t <sub>PWON2</sub>     | 0     | 5   | -                     | ms   |            |
| t <sub>PWON3</sub>     | 0     | 5   |                       | ms   |            |
| t <sub>PWON4</sub>     | 0     | 5   |                       | ms   |            |
| t <sub>ramp1</sub>     | 0.2   | -   | 20                    | ms   | VDDI, VDDM |
| t <sub>ramp2</sub>     | 0.2   | -   | 20                    | ms   | VCI, VSP   |
| t <sub>ramp3</sub>     | 0.2   | -   | 20                    | ms   | VSN        |
| t <sub>ramp4</sub>     | 0.2   | -   | -                     | ms   | VGL        |
| t <sub>ramp5</sub>     | 0.2   | -   | -                     | ms   | VGH        |
| t <sub>RPWIRES1</sub>  | 10    | -   | -                     | ms   |            |
| t <sub>RPWIRES2</sub>  | 1     | -   | -                     | ms   |            |
| t <sub>MIPI_LP11</sub> | -     | -   | t <sub>RPWIRES1</sub> | ms   |            |
| t <sub>RESETL</sub>    | 20    | -   | -                     | μs   |            |
| t <sub>1</sub>         | 5     | -   | -                     | ms   |            |
| t <sub>SLPOUT</sub>    | 120   | -   | -                     | ms   |            |
| t <sub>PWSLPOUT</sub>  | -     | 45  | -                     | ms   |            |
| t <sub>BLON</sub>      | 2     | -   | -                     | VS   |            |



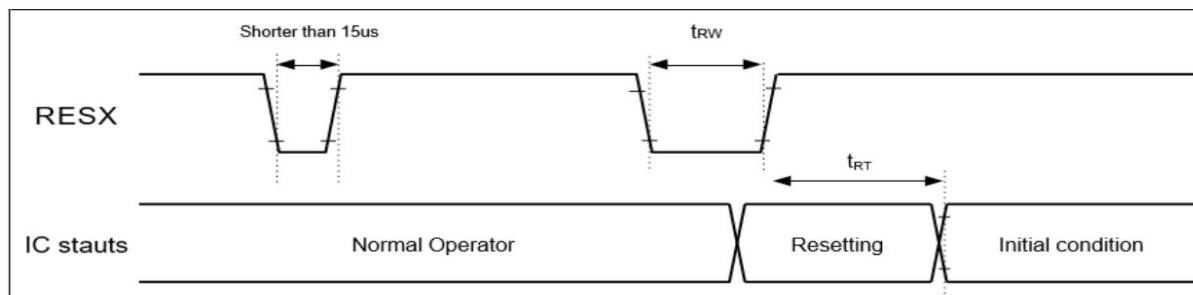
## 2) 开机掉电顺序 Power Off Sequence

The power off sequence timing for different power input modes and interfaces are shown as below table.

| Symbol                  | Value |     |                    | Unit | Remark           |
|-------------------------|-------|-----|--------------------|------|------------------|
|                         | Min   | Typ | Max                |      |                  |
| $t_{PW\text{OFF}1}$     | 0     | 5   | -                  | ms   |                  |
| $t_{PW\text{OFF}2}$     | 0     | 5   | -                  | ms   |                  |
| $t_{PW\text{OFF}3}$     | 0     | 5   | -                  | ms   |                  |
| $t_{PW\text{OFF}4}$     | 0     | 5   | -                  | ms   |                  |
| $t_{\text{ramp}1}$      | 0.2   | -   | 20                 | ms   | VDDI, VDDM, VDDC |
| $t_{\text{ramp}2}$      | 0.2   | -   | 20                 | ms   | VCI, VSP         |
| $t_{\text{ramp}3}$      | 0.2   | -   | 20                 | ms   | VSN              |
| $t_{\text{ramp}4}$      | 0.2   | -   | -                  | ms   | 5Power: VGL      |
| $t_{\text{ramp}5}$      | 0.2   | -   | -                  | ms   | 5Power: VGH      |
| $t_{PW\text{OFF}}$      | 120   | -   | -                  | ms   |                  |
| $t_{\text{MIPI\_LP}11}$ | 0     | -   | $t_{PW\text{OFF}}$ | ms   |                  |
| $t_{\text{DISPOFF}}$    | 50    | -   | $t_{PW\text{OFF}}$ | ms   |                  |
| $t_{\text{RSTHtoL}}$    | 50    | -   | $t_{PW\text{OFF}}$ | ms   |                  |
| $t_{\text{Video\_OFF}}$ | 0     | -   | $t_{PW\text{OFF}}$ | ms   |                  |
| $t_{\text{BLOFF}}$      | 0     | -   | -                  | ms   |                  |



### 3) 重置输入时序 Reset input timings



Reset input timings

| Symbol   | Parameter                            | Related pins | Min. | Max.                       | Unit    |
|----------|--------------------------------------|--------------|------|----------------------------|---------|
| $t_{RW}$ | Reset "L" pulse width <sup>(2)</sup> | RESX         | 20   | -                          | $\mu s$ |
| $t_{RT}$ | Reset complete time <sup>(3)</sup>   | -            | -    | 5 <sup>(5)</sup>           | ms      |
|          |                                      | -            | -    | 120 <sup>(6) (7) (8)</sup> | ms      |

**Note:**

1. The reset complete time also required time for loading ID bytes from OTP to registers. This loading is done every time when there is HW reset complete time ( $t_{RT}$ ) within 5 ms after a rising edge of RESX.
2. Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

| RESX Pulse                        | Action         |
|-----------------------------------|----------------|
| Shorter than 15 $\mu s$           | Reset Rejected |
| Longer than 20 $\mu s$            | Reset          |
| Between 15 $\mu s$ and 20 $\mu s$ | Reset Start    |

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 returns to Default condition for H/W reset.
4. Spike Rejection also applies during a valid reset pulse as shown below:

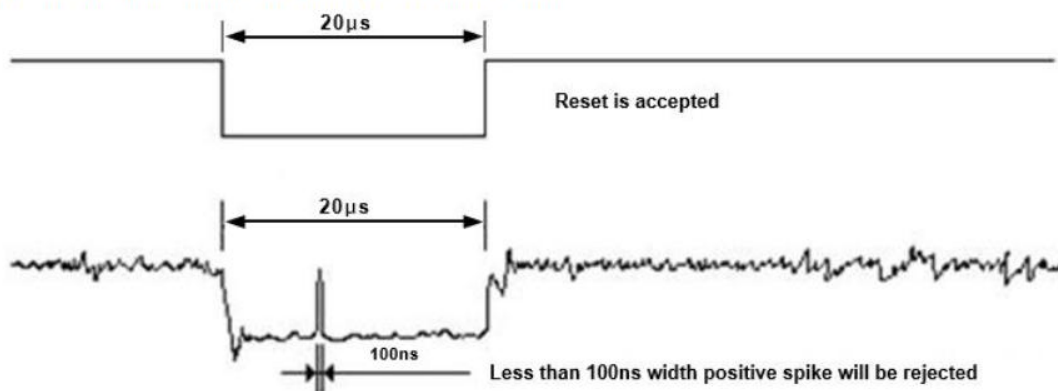
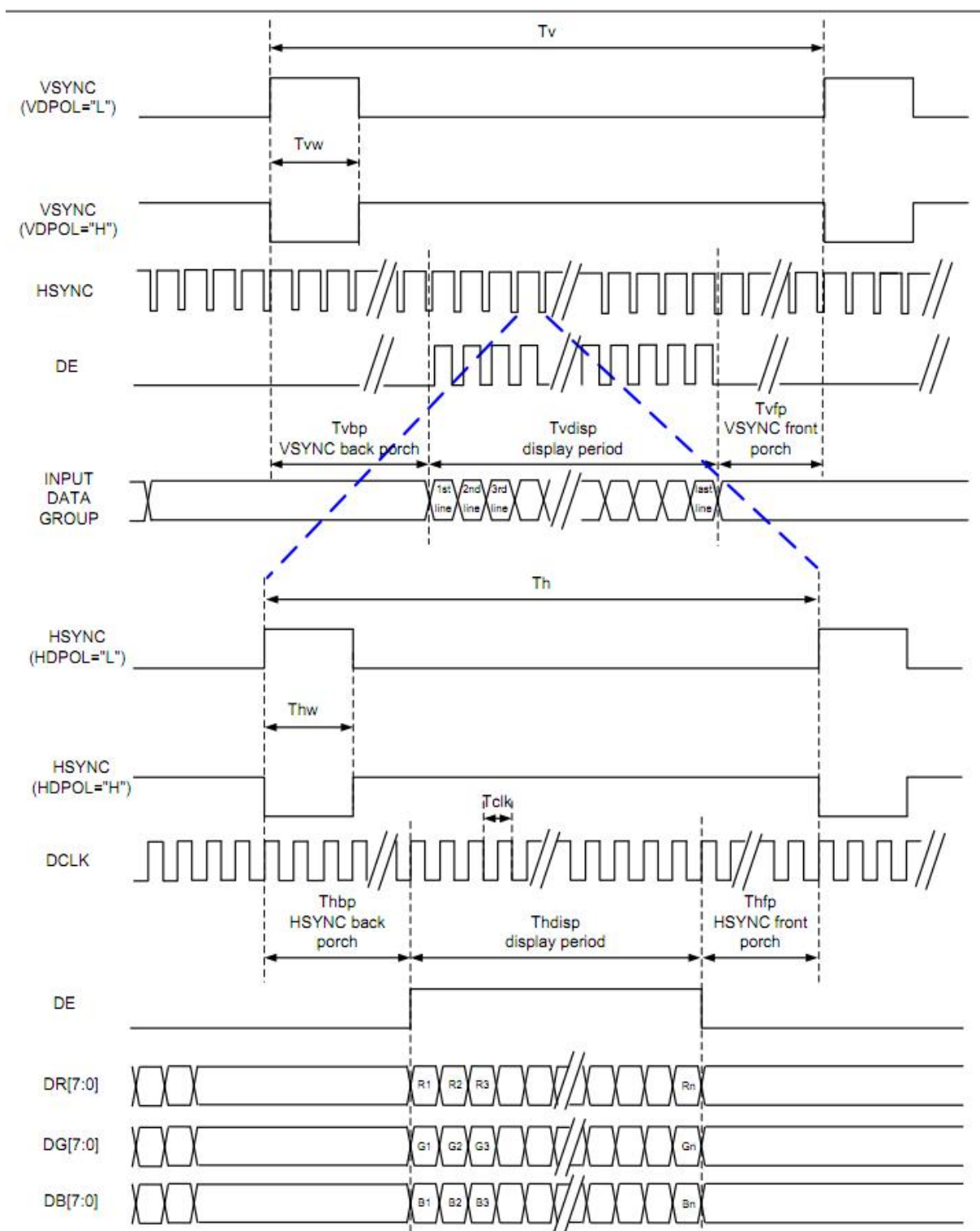


Table 10.4: Reset timings

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

## B. V1 Version FPC (Chinese Taiwan)

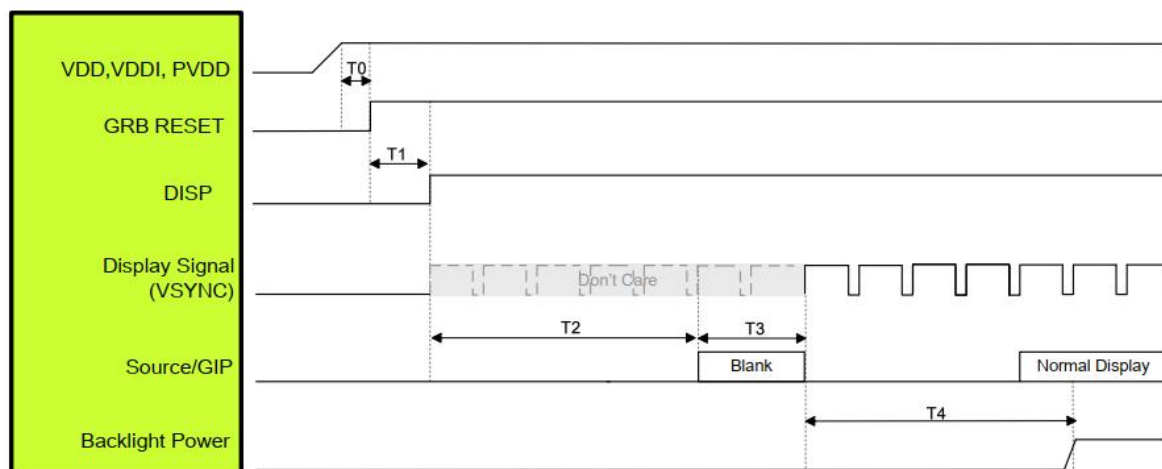


| Parallel 24-bit RGB Interface Timing Table |                |        |      |      |       |        |
|--------------------------------------------|----------------|--------|------|------|-------|--------|
| Item                                       | Symbol         | Min.   | Typ. | Max. | Unit  | Remark |
| DCLK Frequency                             | Fclk           | 23     | 25   | 27   | MHz   |        |
| HSYNC                                      | Period Time    | Th     | 808  | 816  | 848   | DCLK   |
|                                            | Display Period | Thdisp | 800  |      | DCLK  |        |
|                                            | Back Porch     | Thbp   | 4    | 8    | 24    | DCLK   |
|                                            | Front Porch    | Thfp   | 4    | 8    | 24    | DCLK   |
|                                            | Pulse Width    | Thw    | 2    | 4    | 8     | DCLK   |
| VSYNC                                      | Period Time    | Tv     | 496  | 512  | 528   | HSYNC  |
|                                            | Display Period | Tvdisp | 480  |      | HSYNC |        |
|                                            | Back Porch     | Tvbp   | 8    | 16   | 24    | HSYNC  |
|                                            | Front Porch    | Tvfp   | 8    | 16   | 24    | HSYNC  |
|                                            | Pulse Width    | Tvw    | 2    | 4    | 8     | HSYNC  |

| Data format      | DB 23 | DB 22 | DB 21 | DB 20 | DB 19 | DB 18 | DB 17 | DB 16 | DB 15 | DB 14 | DB 13 | DB 12 | DB 11 | DB 10 | DB 09 | DB 08 | DB 07 | DB 06 | DB 05 | DB 04 | DB 03 | DB 02 | DB 01 | DB 00 |
|------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 24bit (3Ah=0x70) | R7    | R6    | R5    | R4    | R3    | R2    | R1    | R0    | G7    | G6    | G5    | G4    | G3    | G2    | G1    | G0    | B7    | B6    | B5    | B4    | B3    | B2    | B1    | B0    |
| 18bit (3Ah=0x60) | R5    | R4    | R3    | R2    | R1    | R0    |       |       | G5    | G4    | G3    | G2    | G1    | G0    |       |       | B5    | B4    | B3    | B2    | B1    | B0    |       |       |
| 16bit (3Ah=0x50) | R4    | R3    | R2    | R1    | R0    |       |       |       | G5    | G4    | G3    | G2    | G1    | G0    |       |       | B4    | B3    | B2    | B1    | B0    |       |       |       |

RGB Interface data format

## 1) 开机上电顺序 Power On Sequence



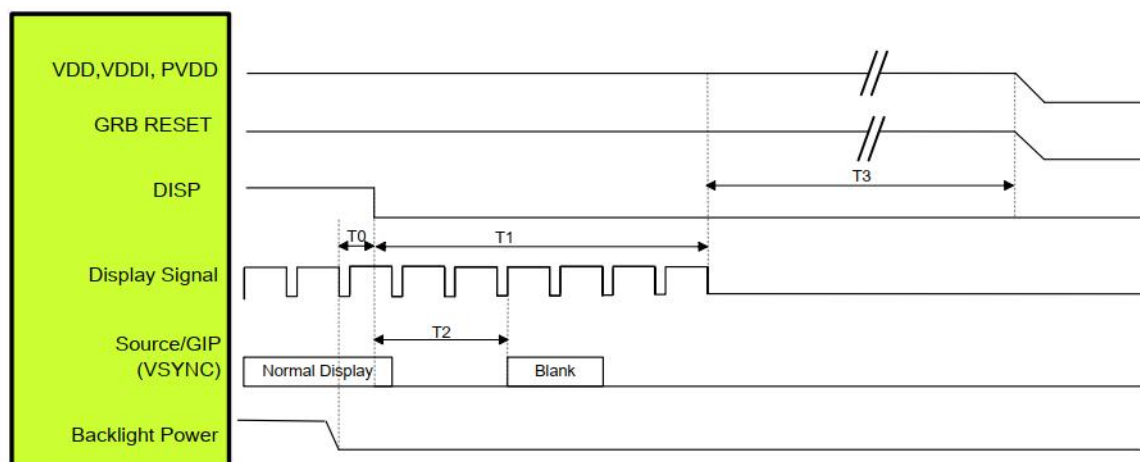
| Symbol | Description                                                                            | Time       | Unit |
|--------|----------------------------------------------------------------------------------------|------------|------|
| T0     | System power stability to GRB RESET signal                                             | $\geq 1$   | ms   |
| T1     | GRB RESET= "High" to DISP="High"                                                       | $\geq 10$  | ms   |
| T2     | DISP="High" to Source/GIP scan blank                                                   | 85         | ms   |
| T3     | IC scan blanking signal                                                                | $\geq 33$  | ms   |
| T4     | Display signal input to Backlight power on<br>(base on Display Signal Frame Rate 60Hz) | $\geq 100$ | ms   |

Note: 1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures. Please be careful about the timing of DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.

2. RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0].

3. LVDS interface Display signal: DCLK P/N; RX[3:0] P/N.

## 2) 开机掉电顺序 Power Off Sequence



| Symbol | Description                                                                     | Time | Unit |
|--------|---------------------------------------------------------------------------------|------|------|
| T0     | Backlight Power off to DISP="Low"                                               | ≥1   | ms   |
| T1     | DISP="Low" to IC internal voltage discharge complete                            | ≥100 | ms   |
| T2     | DISP="Low" to Source/GIP scan blank<br>(base on Display Signal Frame Rate 60Hz) | ≤50  | ms   |
| T3     | IC internal voltage discharge is completed to VDD/VDDI/PVDD off                 | ≥0   | ms   |

Note: 1. When DISP pull "H" or "L", IC will execute the internal power on or power off procedures. Please be careful about the timing of

DISP and do not interrupt it during power on or power off procedure, otherwise unexpected errors will occur.

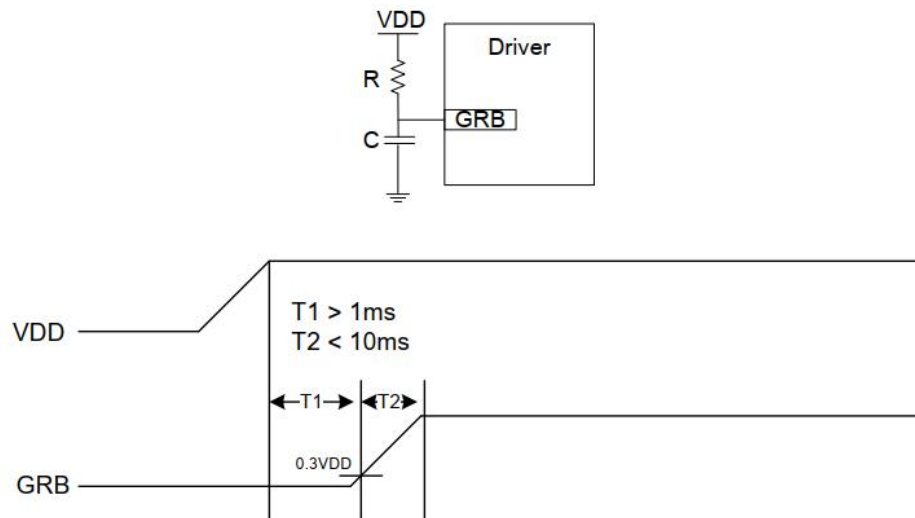
2. RGB interface Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0].

3. LVDS interface Display signal: DCLK P/N; RX[3:0] P/N.

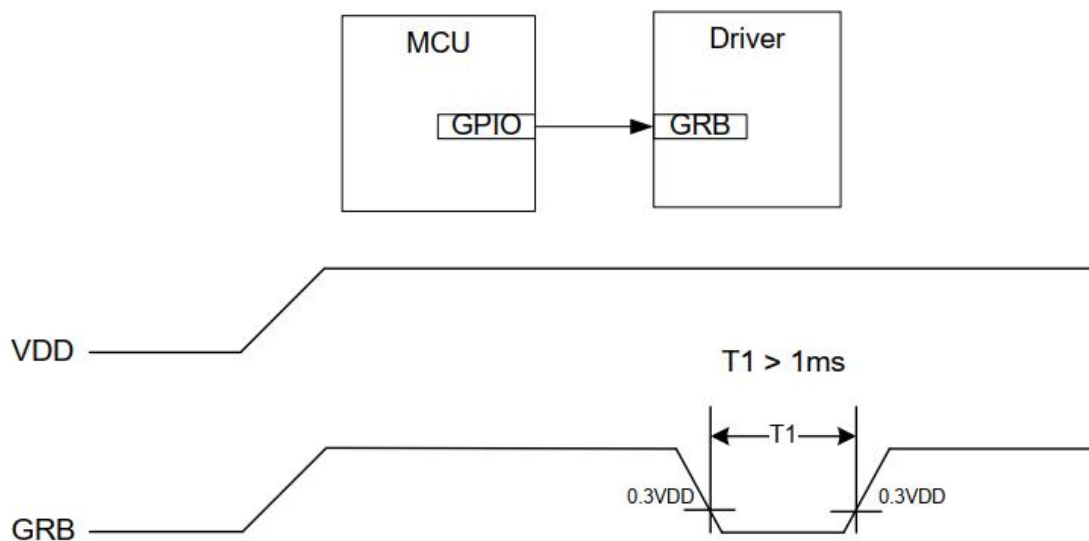
### 3) 重置输入时序 Reset input timings

Setting GRB pin to "L" (hardware reset) can initialize internal function. Initialized by GRB pin is essential before operating. There are two suggestions for hardware reset connection.

(1) The GRB pin with external RC circuit.



(2) The GRB pin controlled by MCU.



## 七、可靠性测试 RELIABILITY TEST

### 7-1 温度和湿度 Temperature and Humidity

| 测试项目<br>TEST ITEMS                                           | 条件<br>CONDITIONS         | 注释<br>NOTE |
|--------------------------------------------------------------|--------------------------|------------|
| 高温储存<br>High Temperature Storage                             | Ta=+80 °C, 120hrs        |            |
| 低温储存<br>Low Temperature Storage                              | Ta=-30 °C, 120hrs        |            |
| 高温运行试验<br>High Temperature Operation                         | Ta=+80 °C, 120hrs        |            |
| 低温运行试验<br>Low Temperature Operation                          | Ta=-30 °C, 120hrs        |            |
| 高温高湿（运行测试）<br>High Temperature and High Humidity (Operating) | Ta=+60 °C, 90%RH, 120hrs |            |

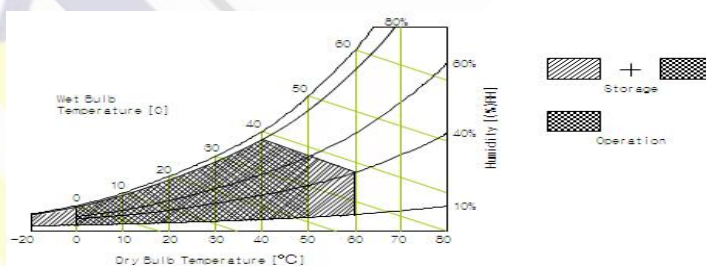
注释 Note:

1. 液晶驱动电压。由于液晶材料的特性，该电压随环境温度而变化。

Liquid Crystal driving voltage. Due to the characteristics of LC Material, this voltage varies with environmental temperature.

2. 温度和相对湿度范围如下图所示。湿球温度最高应为39°C。并且没有冷凝水。

Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be 39 °C max. and no condensation of water.



3. 产品经可靠性测试后，仅保证功能正常，无任何致命缺陷（不显示、线路缺陷、显示异常等）。

After the reliability test, the product only guarantee function normally without any fatal defect(non-display, line defect, abnormal display etc ).

4. 所有显示判断均在面板温度恢复到室温2小时后进行

All display judgments are made after the panel temperature returns to room temperature for 2 hours

5. Ta: 环境温度

Ta: Ambient temperature

## 7-2 冲击和振动 Shock and Vibration

| 测试项目<br>TEST ITEMS                                | 条件<br>CONDITIONS                                                                                                                                                              |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 包装冲击(非操作)<br>Packing Shock<br>(Non-Operation)     | <ul style="list-style-type: none"> <li>● Shock level:980m/s<sup>2</sup></li> <li>● Waveform:1/2 Sine wave,6msec</li> <li>● ±X, ±Y ±Z, each axis 1 times</li> </ul>            |
| 包装振动(非操作)<br>Packing Vibration<br>(Non-Operation) | <ul style="list-style-type: none"> <li>● Frequency range:8-33.3HZ</li> <li>● Stoke:1.0mm</li> <li>● Sweep: 10Hz-50Hz</li> <li>● x, y, z 2 hours for each direction</li> </ul> |

## 7-3 静电放电测试 Electrostatic Discharge

| 测试项目<br>TEST ITEMS     | 条件<br>CONDITIONS                                                                         |
|------------------------|------------------------------------------------------------------------------------------|
| ESD<br>(Non-operation) | 150pF, 330 Ω, Contact ±4KV, Air : ±8KV. Note 1<br>200pF, 0 Ω, ±200V Contact test. Note 2 |

测量点 Measure Point:

1. LCD玻璃和金属边框  
LCD glass and metal bezel
2. 连接器引脚  
IF connector pins

## 八、处理和注意事项 HANDDLING & CAUTIONS

### 8-1 操作注意事项 Caution For Operation

◆由于液晶模组是玻璃材质，请勿对其施加强烈的机械冲击或静载荷。请小心搬运，因为冲击、振动和粗心的搬运可能会严重影响产品。如果从高处坠落或受到强烈冲击，玻璃可能碎了。

Since the LCM is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass maybe broken.

◆在规定的电压限制内驱动 LCM 是必不可少的，因为高于限制的电压会导致 LCM 的寿命缩短。由直流引起的电化学反应会导致 LCM 出现不良劣化，因此应避免使用直流驱动。

It is indispensable to drive the LCM within the specified voltage limit since the higher voltage than the limit causes LCM's life shorter. An electro-chemical reaction due to DC causes undesirable deterioration of the LCM so that the use of DC drive should avoid.

◆请勿在电源开启时将 LCM 连接到系统或从系统断开连接。

Do not connect or disconnect the LCM to or from the system when power is on.

◆切勿在高温高湿的异常条件下使用 LCM。

Never use the LCM under abnormal conditions of high temperature and high humidity.

◆当暴露于剧烈的温度波动（热到冷或冷到热）时，LCM 可能会受到影响；具体来说，从冷到热的剧烈温度波动会在 LCM 表面产生露水，这可能会影响 LCM 上偏振片的运行。

When expose to drastic fluctuation of temperature(hot to cold or cold to hot), the LCM may be affected; specifically, drastic temperature fluctuation from cold to hot, produces dew on the LCM's surface which may affect the operation of the polarizer on the LCM.

◆在低于工作温度范围的温度下，响应时间将极度延迟，另一方面，在高于其工作范围的温度下，LCM 可能会变黑。然而，这些现象并不意味着 LCM 出现故障或故障。一旦温度恢复到正常运行的推荐温度范围，LCM 将恢复正常运行。

Response time will be extremely delay at lower temperature than the operating temperature range and on the other hand LCM may turn black at temperature above its operational range. However those phenomenon do not mean malfunction or out of order with the LCM. The LCM will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.

◆为防止LCD产生图像残留，在使用常黑面板时不要长时间显示固定图案。如果LCD需要显示固定图案，建议时间少于 2 分钟或者更短的时间内刷新显示内容一次或多次。强烈建议使用黑色图像或移动图像作为屏幕保护程序。

In order to prevent the LCD from producing image retention, do not display a fixed pattern for a long time when using a normally black panel. If the LCD needs to display a fixed pattern, it is recommended to refresh the display one or more times in less

than 2 minutes or less. It is strongly recommended to use a black image or moving image as a screen saver.

◆强烈的光照会导致 LCD 偏光片和彩色滤光片退化。 不准在强光或高温高湿下长期存放或直接运行。

Strong sunlight can cause LCD polarizers and color filters to degrade. Long-term storage or direct operation under strong light or high temperature and humidity is not allowed.

## 8-2 防静电措施 Caution Against Static Charge

◆LCM 使用 C-MOS LSI 驱动器，因此建议客户将任何未使用的输入端连接到 Vdd 或 Vss，上电前不要输入任何信号，并将您的身体、工作/装配区、装配设备接地 防止静电。

The LCM use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.

◆缓慢去除保护膜，保持去除方向与面板表面不垂直约 30 度，如有可能，在离子风机等 ESD 控制装置下，工作室湿度应保持在 50%RH 以上，以减少静电风险

Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, if possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.

◆避免使用合成纤维制成的工作服。 我们推荐棉质衣服或其他经过导电处理的纤维。

Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.

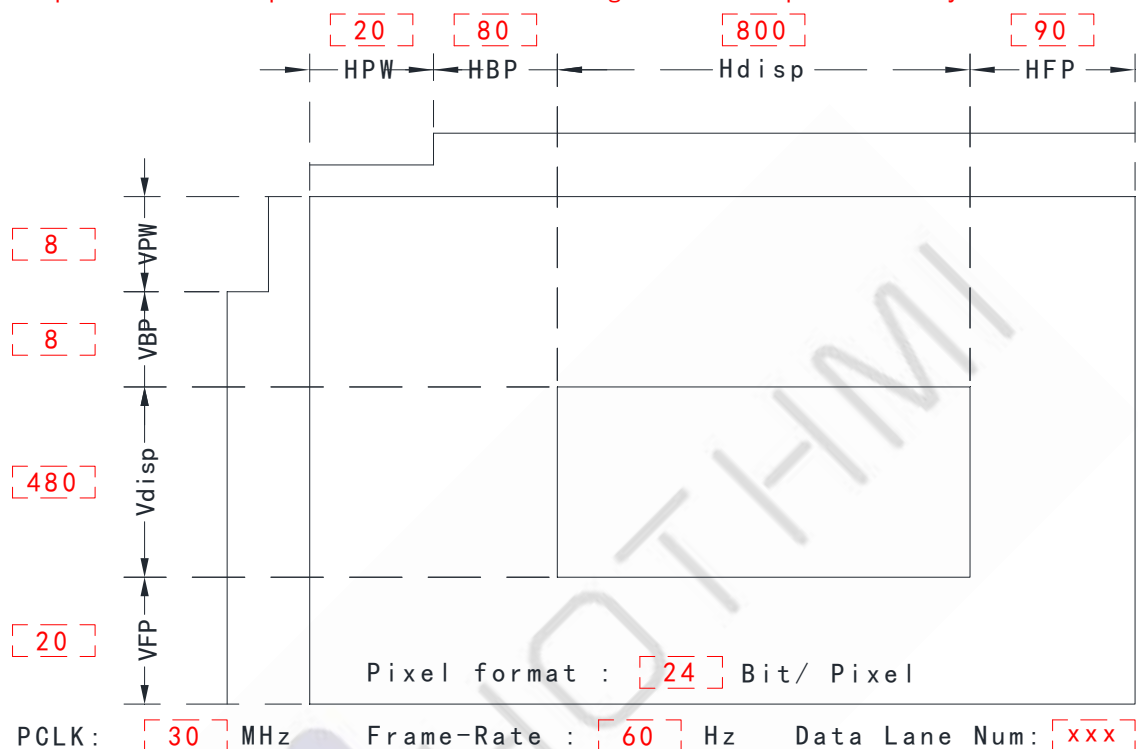
◆在处理 LCM 时，请戴上不带电材料的手套。 对地导电手腕和对地导电鞋是必需的

In handling the LCM, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary

## 九、初始化代码 Initialization code

说明：这些参数值仅供参考，可能并不完全适用于所有软件平台，  
请根据您使用的平台优化参数。

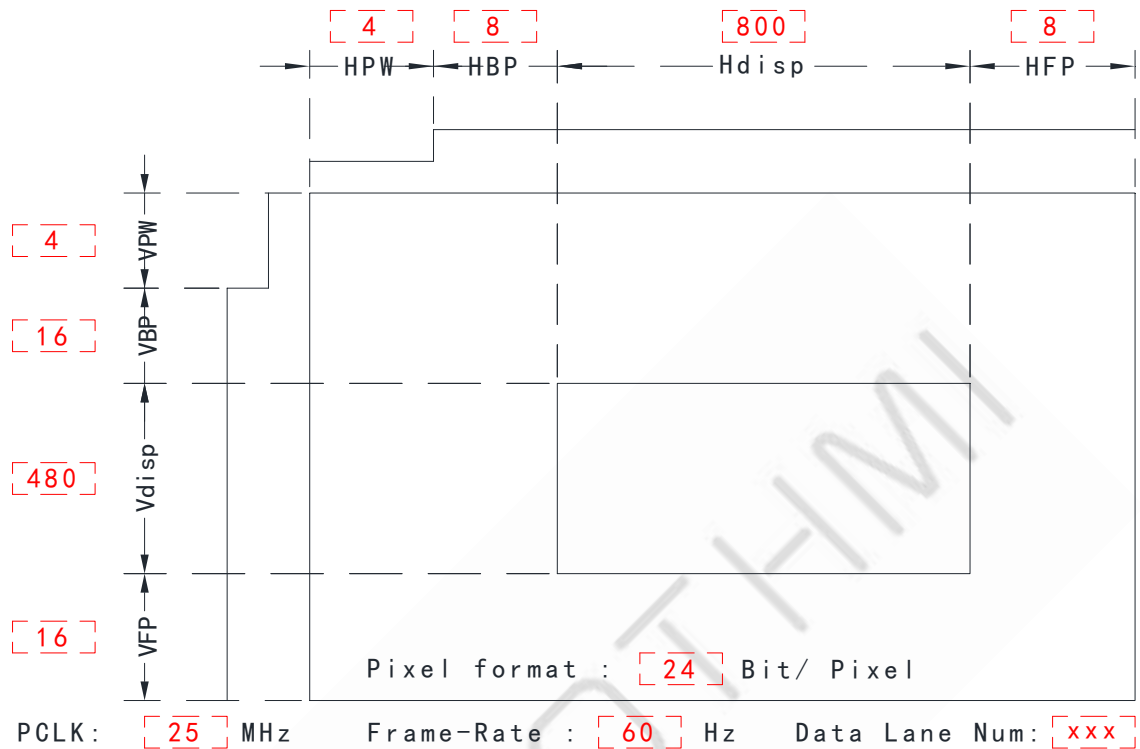
Description : These parameter values are for reference only and  
may not be fully applicable to all software platforms, please  
optimise the parameters according to the platform you are using.



Chinese Mainland <V0 Version>

说明：这些参数值仅供参考，可能并不完全适用于所有软件平台，  
请根据您使用的平台优化参数。

Description : These parameter values are for reference only and  
may not be fully applicable to all software platforms, please  
optimise the parameters according to the platform you are using.



Chinese Taiwan <V1 Version>

```
Void Panel_Initial_code(void)
{
//=====上电复位操作=====//
LCD_RESET=1;
Delays(1);          //Delay 1ms
LCD_RESET=0;
Delays(10);         //Delay 10ms
LCD_RESET=1;
Delays(120);        //Delay 120ms
//=====//
//本产品不需要初始化代码
//No initialisation code is required for this product

}
```

文档修订记录 Document revision history :

| 版本<br>Version | 日期<br>DATE | 修改说明<br>Modify description | 编著<br>Editorial |
|---------------|------------|----------------------------|-----------------|
| 0-0           | 2025-08-22 | 初次编制<br>First compilation. | YL              |
|               |            |                            |                 |
|               |            |                            |                 |
|               |            |                            |                 |

— — 结束 — —  
— — END — —