

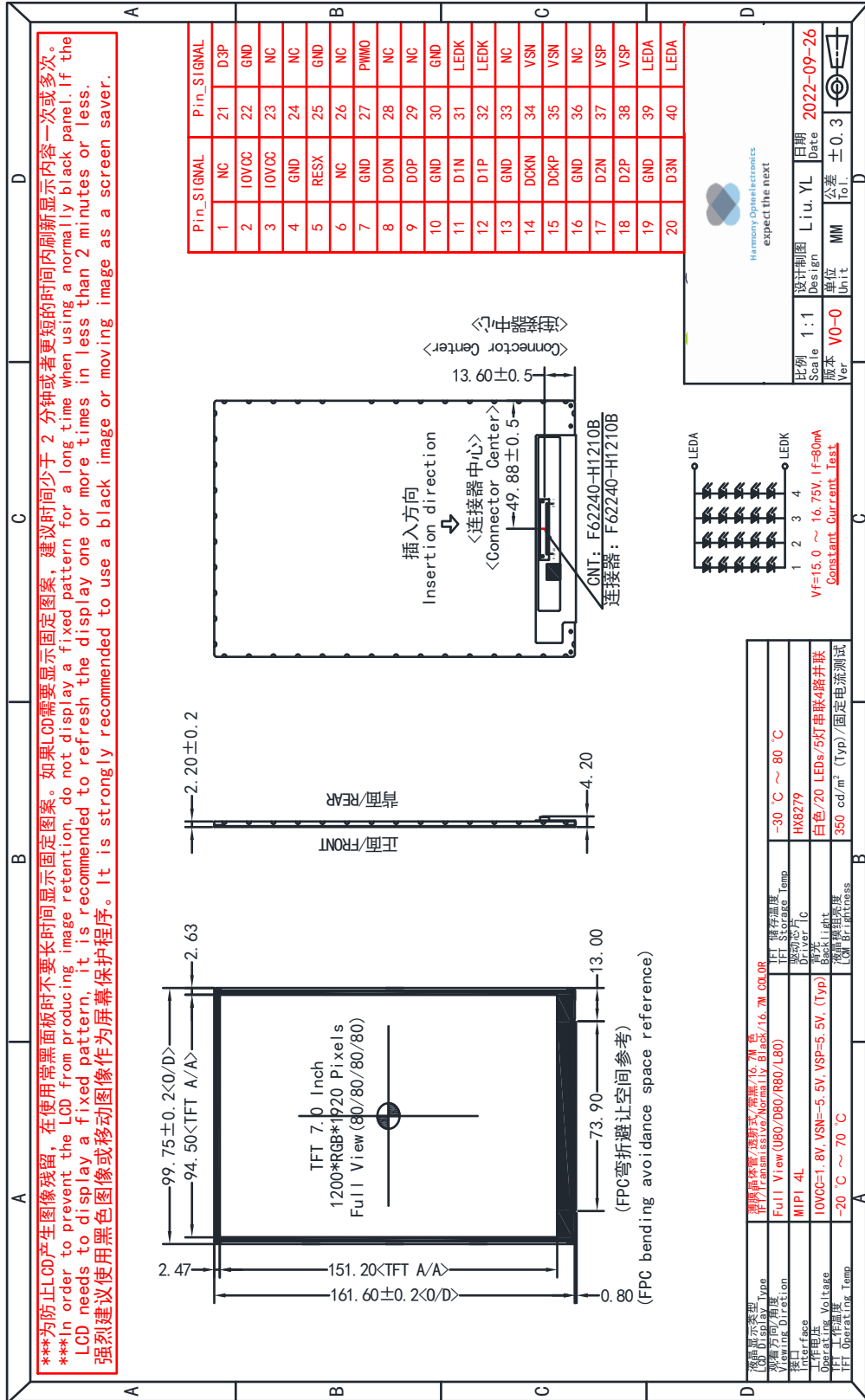
LCM Specification

<p>产品描述 Product Description</p>	<p>TFT LCD Module 1200 x 3RGB x 1920 Dots 7.0 Inch TFT LCD</p>
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一、基本特征 General Feature:

项目 Item	标准值 Standard Value			单位 Unit
显示尺寸 Display Size	7.0			英寸 Inch
分辨率 Number of Pixels	1200 (H) * 3(RGB) * 1920 (V)			点 dots
显示区域 Active Area	94.50 (H) * 151.20 (V)			毫米 mm
外形尺寸 Outline Dimension	99.75(H) * 161.60(V) * 2.20(D)			毫米 mm
观看方向 Viewing Direction	全 视角 FULL 0'clock			-
端口 Interface	MIPI 4L			-
驱动芯片 Driver IC	HX8279			-
驱动电压 Driver Condition	IOVCC=1.8V, VSN=-5.5V, VSP=5.5V(Typ)			伏 V
背光-1 Backlight-1	白色 LED/20 颗/5 颗串联 4 路并联 White LED/20 PCS/5 PCS serial 4 ways parallel			-
触摸屏 Touch Panel	<input checked="" type="checkbox"/> 不带触摸屏 Whitout TP	<input type="checkbox"/> 带电阻触摸屏 Whit RTP	<input type="checkbox"/> 带电容触摸屏 Whit CTP	-
电容触摸屏驱动芯片 CTP Driver IC	- - -			-
电容触摸屏驱动电压 CTP Driver Condition	- - -			伏 V
TFT 液晶工作温度 Operation Temperature	-20 ~ 70			摄氏度 ℃
TFT 液晶储存温度 Storage Temperature	-30 ~ 80			摄氏度 ℃

二、外形尺寸 Outline Dimensions



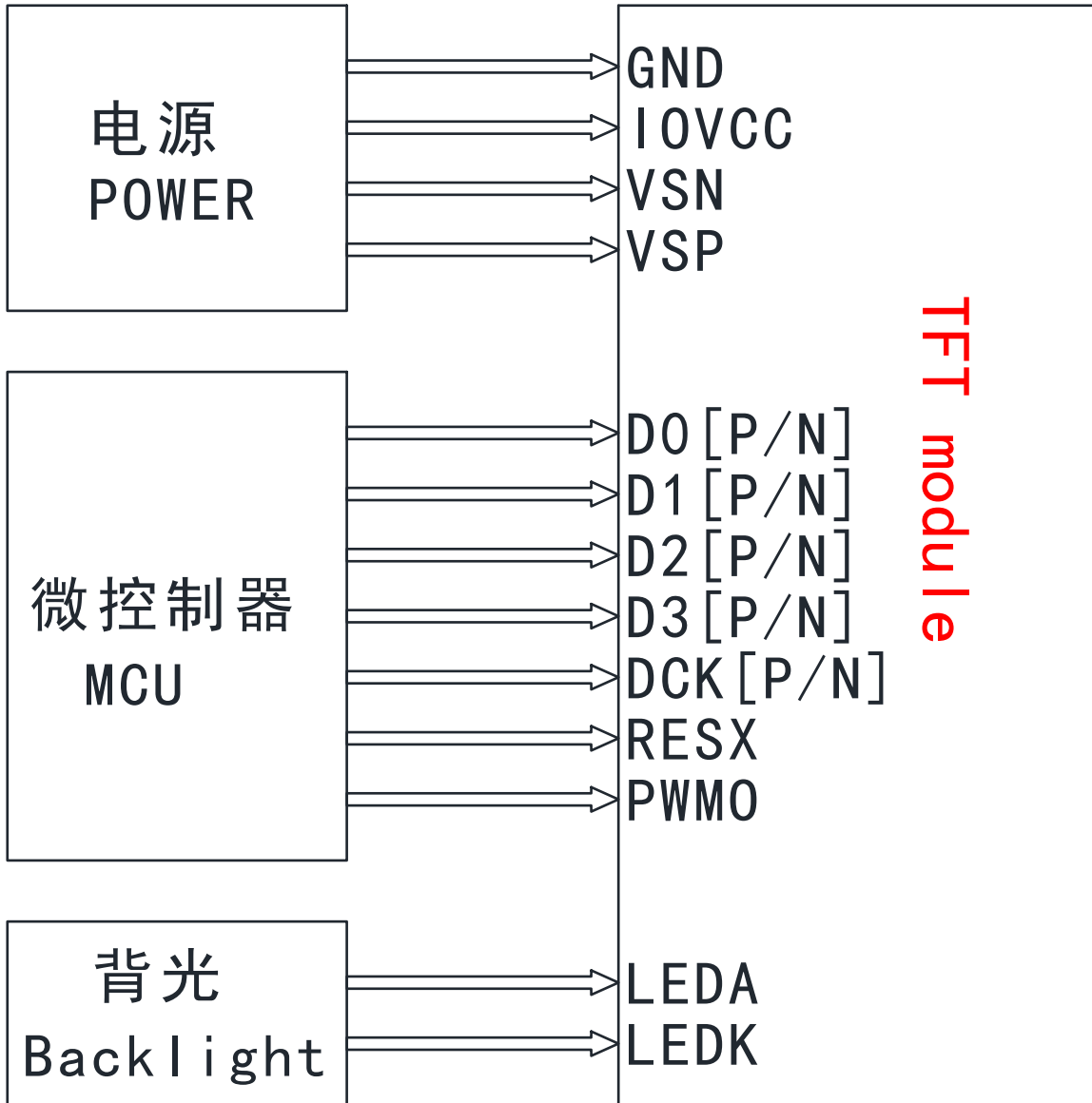
三、引脚说明 Pin Description

3.1 模组引脚说明 TFT Pin Description

引脚编号 Pin NO.	标号 Symbol	详细描述 Description
1	NC	不连接 Not connected
2 ~ 3	IOVCC	1.8V 电源 1.8V power supply
4	GND	地 Ground
5	RESX	重置引脚。 Reset pin.
6	NC	不连接 Not connected
7	GND	地 Ground
8	DON	MIPI负数据信号 (-) MIPI Negative data signal (-)
9	DOP	MIPI正数据信号 (+) MIPI Positive data signal (+)
10	GND	地 Ground
11	D1N	MIPI负数据信号 (-) MIPI Negative data signal (-)
12	D1P	MIPI正数据信号 (+) MIPI Positive data signal (+)
13	GND	地 Ground
14	DCKN	MIPI负时钟信号 (-) MIPI Negative clock signal (-)
15	DCKP	MIPI正时钟信号 (+) MIPI Positive clock signal (+)
16	GND	地 Ground
- 接下页 - - Continued on next page -		

引脚编号 Pin NO.	标号 Symbol	详细描述 Description
17	D2N	MIPI负数据信号 (-) MIPI Negative data signal (-)
18	D2P	MIPI正数据信号 (+) MIPI Positive data signal (+)
19	GND	地 Ground
20	D3N	MIPI负数据信号 (-) MIPI Negative data signal (-)
21	D3P	MIPI正数据信号 (+) MIPI Positive data signal (+)
22	GND	地 Ground
23 ~ 24	NC	不连接 Not connected
25	GND	地 Ground
26	NC	不连接 Not connected
27	PWMO	LED驱动器的PWM控制信号 PWM control signal for LED driver
28 ~ 29	NC	不连接 Not connected
30	GND	地 Ground
31 ~ 32	LEDK	LED阴极 LED cathode
33	NC	不连接 Not connected
34 ~ 35	VSN	模拟电源负电压 Analog supply negative voltage
36	NC	不连接 Not connected
37 ~ 38	VSP	模拟电源正电压 Analog supply positive voltage
39 ~ 40	LEDA	LED阳极 LED anode
- 结束 - - END -		

3.2 接线说明 Wiring instructions



四、电气特性 Electrical Characteristics

4-1 TFT 模组工作条件 TFT LCD Module Operating Conditions

项目 Item	标号 Symbol	条件 Condition	最小值 Min	典型值 Type	最大值 Max	单位 Unit
数字电源 Digital Power	VCC	-	-0.3	-	2.1	伏 V
接口工作电压 IO Supply Voltage	IOVCC	-	-0.3	-	2.1	伏 V
输入电压范围 Input Voltage Range	VIN	-	-0.3	-	IOVCC +0.3	伏 V

注释 Note:

1. 超过上面列出的极限值可能会导致驱动 IC 永久损坏。这些值仅用于测试。IC 应在芯片特性条件下正常运行。如果不满足这些条件，IC 操作可能会出错，可靠性可能会下降。

That the exceeds the Limiting Value listed above it may cause the driver IC permanent damage. These values are for test only. IC should be operated under the Chip Characteristic conditions for normal operation. If these conditions are not met, IC operation may be error and the reliability may be deteriorated.

2. 参数在工作温度范围内有效，除非另有说明。除非另有说明，所有电压均相对于 GND。

Parameters are valid over operating temperature range unless otherwise specified. All voltages are with respect to GND unless otherwise noted.

3. 确保 IOVCC、VCI 的电压电平始终符合正确的关系： $1.7V \cong IOVCC \cong VCC \cong 2.0V$ 。

Insure the voltage levels of IOVCC, VCI, always matches the correct relation:
 $1.7V \cong IOVCC \cong VCC \cong 2.0$.

4. VIN 应小于或等于 2.0。 ($VIN \leq 2.0V$)。

VIN should be less than or equal to 2.0V. ($VIN \leq 2.0V$).

5. 面板显示质量取决于面板负载，在低温/高温下可能有不同的性能。

Panel display quality depends on panel loading, and it may have the different performance at low/high temperature.

4-2 TFT 面板工作条件 TFT Panel Operating Conditions

项目 Item	标号 Symbol	条件 Condition	最小值 Min	典型值 Type	最大值 Max	单位 Unit
接口工作电压 IO Supply Voltage	IOVCC	-	1.7	1.8	2.0	伏 V
模拟电源负电压 VSN voltage	VSN	-	-5.0	-5.5	-6.0	伏 V
模拟电源正电压 VSP voltage	VSP	-	5.0	5.5	6.0	伏 V
待机电流 Standby Current	Isc	No Load@ FR=60Hz	-	-	-	微安 uA
工作电流 Operation Current	Ioc		-	-	-	毫安 mA

4-3 背光工作条件 LED back light specification

项目 Item	标号 Symbol	条件 Condition	最小值 Min	典型值 Type	最大值 Max	单位 Unit
工作电压 Forward voltage	VF	If=3.2V/20mA /1-chip	15.0	16.0	16.75	伏 V
工作电流 Forward current	IF		-	80	-	毫安 mA
亮度 (带 LCD) Luminance (With LCD)	Lv	Without TP	-	350	-	坎德拉/平 方米 cd/m ²
		With TP	-	-	-	
LED 寿命 LED life time	Hr	Ta=25±3 °C	20,000	30,000	-	小时 Hour

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%.

五、液晶光学规格 TFT OPTICAL SPECIFICATION

5.1 概述 Overview

光学规格的测试应在暗室（环境亮度 1lux，温度=25 ±2℃）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 θ 和 Φ 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 ±2℃) 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 θ and Φ 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 Parameter		标号 Symbol	条件 Condition	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit	备注 Remark
视角范围 Viewing Angle Range	水平 Horizontal	⊕左/L	CR>10	-	80	-	Deg.	Note 1
		⊕右/R		-	80	-	Deg.	
	垂直 Vertical	⊕上/U		-	80	-	Deg.	
		⊕下/D		-	80	-	Deg.	
对比度 Contrast ratio		CR	⊕ = 0°	-	1200	-	-	Note2
色域 Color Gamut		CG	CIE1931	75	80	-	%	
白色色度 White Chromaticity		Wx	⊕ = 0°	-0.03	0.285	+0.03	-	Note4 (Based on C Light)
		Wy			0.317		-	
色彩还原 Reproduction of color	红 Red	Rx			0.673		-	
		Ry			0.319		-	
	绿 Green	Gx			0.228		-	
		Gy			0.614		-	
	蓝 Blue	Bx			0.140		-	
		By			0.106		-	
响应时间（上升 + 下降） Response Time (Rising + Falling)		Tr+Tf	⊕ = 0° 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

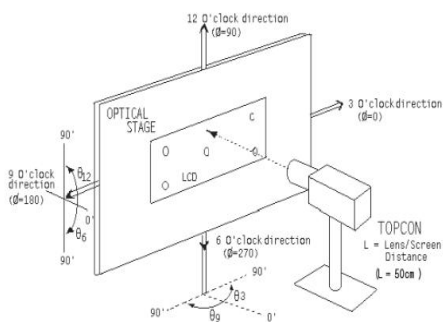


图 1

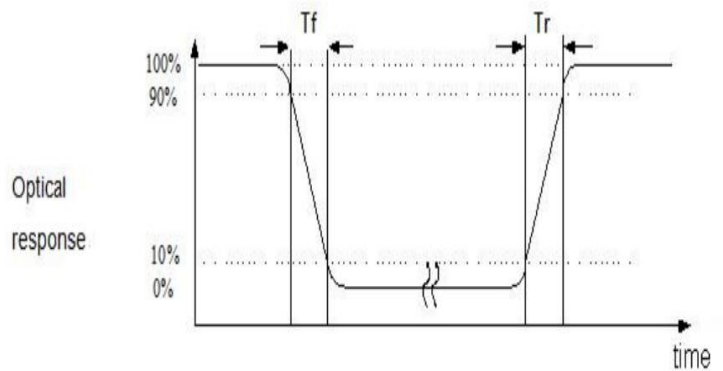


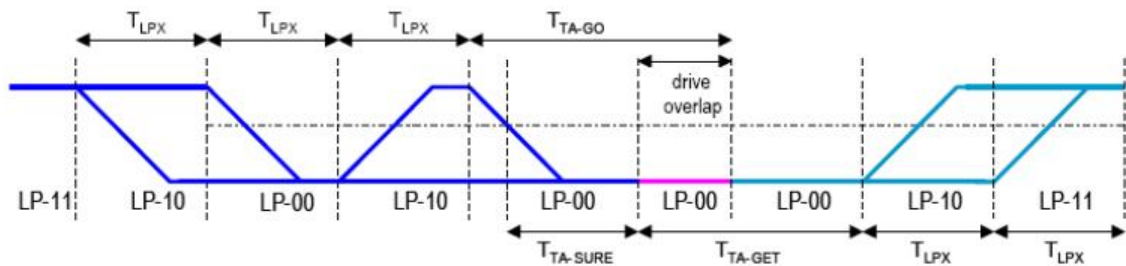
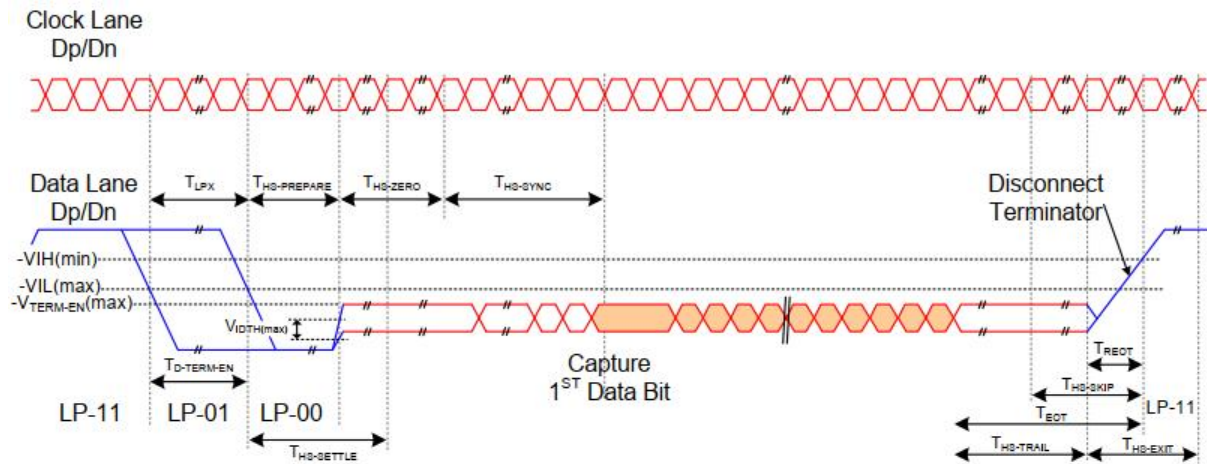
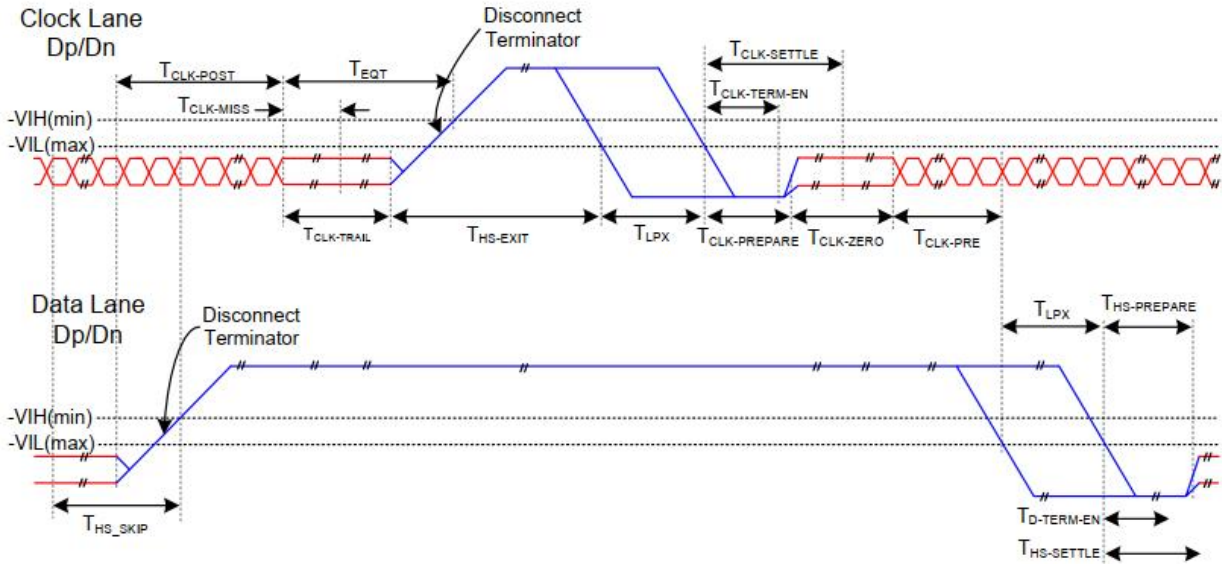
图 2

六、交流特性 AC characteristic

6.1. 时序 Timing



MIPI 交流特性 MIPI AC characteristic



Parameter	Description	Spec.			Unit
		Min.	Typ.	Max.	
T _{REOT}	30%-85% rise time and fall time	-	-	35	ns
T _{CLK-MISS}	Timeout for receiver to detect absence of Clock transitions and disable the Clock Lane HS-RX.	-	-	60	ns
T _{CLK-POST} *1	Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of THS-TRAIL to the beginning of T _{CLK-TRAIL} .	60 ns + 52*UI (For DCS)	-	-	ns
T _{CLK-PRE}	Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.	8	-	-	ns
T _{CLK-SETTLE}	Time interval during which the HS receiver shall ignore any Clock Lane HS transitions, starting from the beginning of T _{CLK-PRE} .	95	-	300	ns
T _{CLK-TERM-EN}	Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses V _{IL,MAX} .	Time for Dn to reach V _{TERM-EN}	-	38	ns
T _{HS-SETTLE}	Time interval during which the HS receiver shall ignore any Data Lane HS transitions, starting from the beginning of T _{HSPREPARE} .	85 ns + 6*UI	-	145 ns + 10*UI	ns
T _{EOT}	Time from start of T _{HS-TRAIL} or T _{CLK-TRAIL} period to start of LP-11 state	-	-	105ns+48*UI	-
T _{HS-EXIT} ⁽¹⁾	time to drive LP-11 after HS burst	100	-	-	ns
T _{HS-PREPARE}	Time to drive LP-00 to prepare for HS transmission	40ns + 4*UI	-	85ns+6*UI	ns
T _{HS-PREPARE} + T _{HS-ZERO}	T _{HS-PREPARE} + Time to drive HS-0 before the Sync sequence	145ns + 10*UI	-	-	ns
T _{HS-SKIP}	Time-out at RX to ignore transition period of EoT	40	-	55ns+4*UI	ns
T _{HS-TRAIL}	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60 + 4*UI	-	-	ns
T _{LPX}	Length of any Low-Power state period	50	-	-	ns
Ratio T _{LPX}	Ratio of T _{LPX(MASTER)} /T _{LPS(SLAVE)} between Master and Slave side	2/3	-	3/2	-
T _{TA-GET}	Time to drive LP-00 by new TX	5*T _{LPX}			ns
T _{TA-GO}	Time to drive LP-00 after Turnaround Request	4*T _{LPX}			ns
T _{TA-SURE}	Time-out before new TX side starts driving T	LPX	-	2*T _{LPX}	ns

Note: (1) For image transmission:

T_{CLK-POST} min value =164 when MIPI max frequency per lane = 0.53Gbps.

T_{CLK-POST} min value =112 when MIPI max frequency per lane = 1Gbps

LCD显示器初始化代码 LCD display initialization code

H_active	1200	H_total	1330	clk
H_plus_W	10	V_total	1969	H
H_Back_porch	70	Frame rate	60	Hz
H_Front_porch	50	PCLK	157.1262	MHz
V_active	1920	mipi mbps (888)	942.7572	mbps
V_plus_W	4			
V_Back_porch	20	H_frequency	118.14	KHz
V_Front_porch	25	Line_time	8.464534	us
		frame_time	16.66667	ms

```

Void Panel_initial_code(void)
{
    //-----Reset sequence-----//
    LCD_RESET=1;
    Delays(1); //Delay 1ms
    LCD_RESET=0;
    Delays(10); //Delay 10ms
    LCD_RESET=1;
    Delays(120); //Delay 120ms
    //-----//

    Generic_Short_Write_1P(0xB0, 0x05);
    Generic_Short_Write_1P(0xB3, 0x52);
    Generic_Short_Write_1P(0xB8, 0x7F);
    Generic_Short_Write_1P(0xBC, 0x20);
    Generic_Short_Write_1P(0xD6, 0x7F);

    Generic_Short_Write_1P(0xB0, 0x01);
    Generic_Short_Write_1P(0xC0, 0x0D);
    Generic_Short_Write_1P(0xC1, 0x0D);
    Generic_Short_Write_1P(0xC2, 0x06);
    Generic_Short_Write_1P(0xC3, 0x06);
    Generic_Short_Write_1P(0xC4, 0x08);
    Generic_Short_Write_1P(0xC5, 0x08);
    Generic_Short_Write_1P(0xC6, 0x0A);
    Generic_Short_Write_1P(0xC7, 0x0A);
    Generic_Short_Write_1P(0xC8, 0x0C);

```

Generic_Short_Write_1P(0xC9, 0x0C) ;
Generic_Short_Write_1P(0xCA, 0x00) ;
Generic_Short_Write_1P(0xCB, 0x00) ;
Generic_Short_Write_1P(0xCC, 0x0E) ;
Generic_Short_Write_1P(0xCD, 0x0E) ;
Generic_Short_Write_1P(0xCE, 0x01) ;
Generic_Short_Write_1P(0xCF, 0x01) ;
Generic_Short_Write_1P(0xD0, 0x04) ;
Generic_Short_Write_1P(0xD1, 0x04) ;
Generic_Short_Write_1P(0xD2, 0x00) ;
Generic_Short_Write_1P(0xD3, 0x00) ;
Generic_Short_Write_1P(0xD4, 0x0D) ;
Generic_Short_Write_1P(0xD5, 0x0D) ;
Generic_Short_Write_1P(0xD6, 0x05) ;
Generic_Short_Write_1P(0xD7, 0x05) ;
Generic_Short_Write_1P(0xD8, 0x07) ;
Generic_Short_Write_1P(0xD9, 0x07) ;
Generic_Short_Write_1P(0xDA, 0x09) ;
Generic_Short_Write_1P(0xDB, 0x09) ;
Generic_Short_Write_1P(0xDC, 0x0B) ;
Generic_Short_Write_1P(0xDD, 0x0B) ;
Generic_Short_Write_1P(0xDE, 0x00) ;
Generic_Short_Write_1P(0xDF, 0x00) ;
Generic_Short_Write_1P(0xE0, 0x0E) ;
Generic_Short_Write_1P(0xE1, 0x0E) ;
Generic_Short_Write_1P(0xE2, 0x01) ;
Generic_Short_Write_1P(0xE3, 0x01) ;
Generic_Short_Write_1P(0xE4, 0x03) ;
Generic_Short_Write_1P(0xE5, 0x03) ;
Generic_Short_Write_1P(0xE6, 0x00) ;
Generic_Short_Write_1P(0xE7, 0x00) ;

Generic_Short_Write_1P(0xB0, 0x03) ;
Generic_Short_Write_1P(0xBA, 0xF0) ;
Generic_Short_Write_1P(0xC8, 0x07) ;
Generic_Short_Write_1P(0xC9, 0x03) ;
Generic_Short_Write_1P(0xCA, 0x41) ;
Generic_Short_Write_1P(0xD2, 0x01) ;
Generic_Short_Write_1P(0xD3, 0x05) ;
Generic_Short_Write_1P(0xD4, 0x05) ;

```
Generic_Short_Write_1P(0xD5, 0x8A);  
Generic_Short_Write_1P(0xE4, 0xC0);  
Generic_Short_Write_1P(0xE5, 0x00);
```

```
Generic_Short_Write_1P(0xB0, 0x00);  
Generic_Short_Write_1P(0xBF, 0x1F);  
Generic_Short_Write_1P(0xC0, 0x12);  
Generic_Short_Write_1P(0xC2, 0x1E);  
Generic_Short_Write_1P(0xC4, 0x1E);
```

```
Generic_Short_Write_1P(0xB0, 0x06);  
Generic_Short_Write_1P(0xB8, 0xA5);  
Generic_Short_Write_1P(0xC0, 0xA5);  
Generic_Short_Write_1P(0xBC, 0x11);  
Generic_Short_Write_1P(0xD5, 0x48);  
Generic_Short_Write_1P(0xB8, 0x00);  
Generic_Short_Write_1P(0xC0, 0x00);
```

```
}
```

```
Void ST7789sPanelSleepInMode (void)  
{  
Generic_Short_Write_NP(0x10);  
Delaysms (120);  
}
```

```
Void ST7789sPanelSleepOutMode (void)  
{  
Generic_Short_Write_NP(0x11);  
Delaysms (120);  
}
```

— -END- —