LCD MODULE

SPECIFICATION

Model:	UE040HD-RB40-A049A
Version:	V1.0
Date:	20200313

☑ **Preliminary Specification** 样品规格书

☐ **Final Specification** 量产规格书

Customer Confirmation 客户确认

Approved by	Notes

Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

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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	2020.03.13	Preliminary release	

TABLE of CONTENTS

1. GENERAL INFORMATION

1.1 Features

1) Pixel Arrangement：RGB Vertical Stripe
2) Interface Mode： MIPI
3) Driver IC： ST7701S；Touch IC：FT6336U
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	IPS TFT	-	-
Screen Size	4.0	Inch	Diagonal
Resolution	720(W)*3(RGB)*720(H)	Dots	-
Interface	MIPI	-	2 lanes
Module Power Consumption	0.6	Watt	Typ.
Active Area	71.93(W)*71.93(H)	mm	-
Pixel pitch (W*H)	0.108(W)*0.108(H)	mm	-
CTP_Module Size (W*H*D)	84(W)*84(H)*3.19(D)	mm	Typ
Luminance	300	cd/m^2	Typ.
Viewing Direction	ALL	O'clock	
Display Color	16.7M	Colors	24bits

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	VCCB	1.65	5.5	V	Note1
Power supply2 voltage	IOVCC	-0.3	1.95	V	Note1
LED forward current	I_F	-0.001	20	mA	For each led,Note1
LED Reverse Voltage	V_R	-	5	V	For each led,Note1
Operating temperature	T_{op}	-20	70	℃	Note1,2
Storage temperature	T_{st}	-30	80	℃	Note1,2
Humidity	H_{st}	10	90	%RH	Note1,3

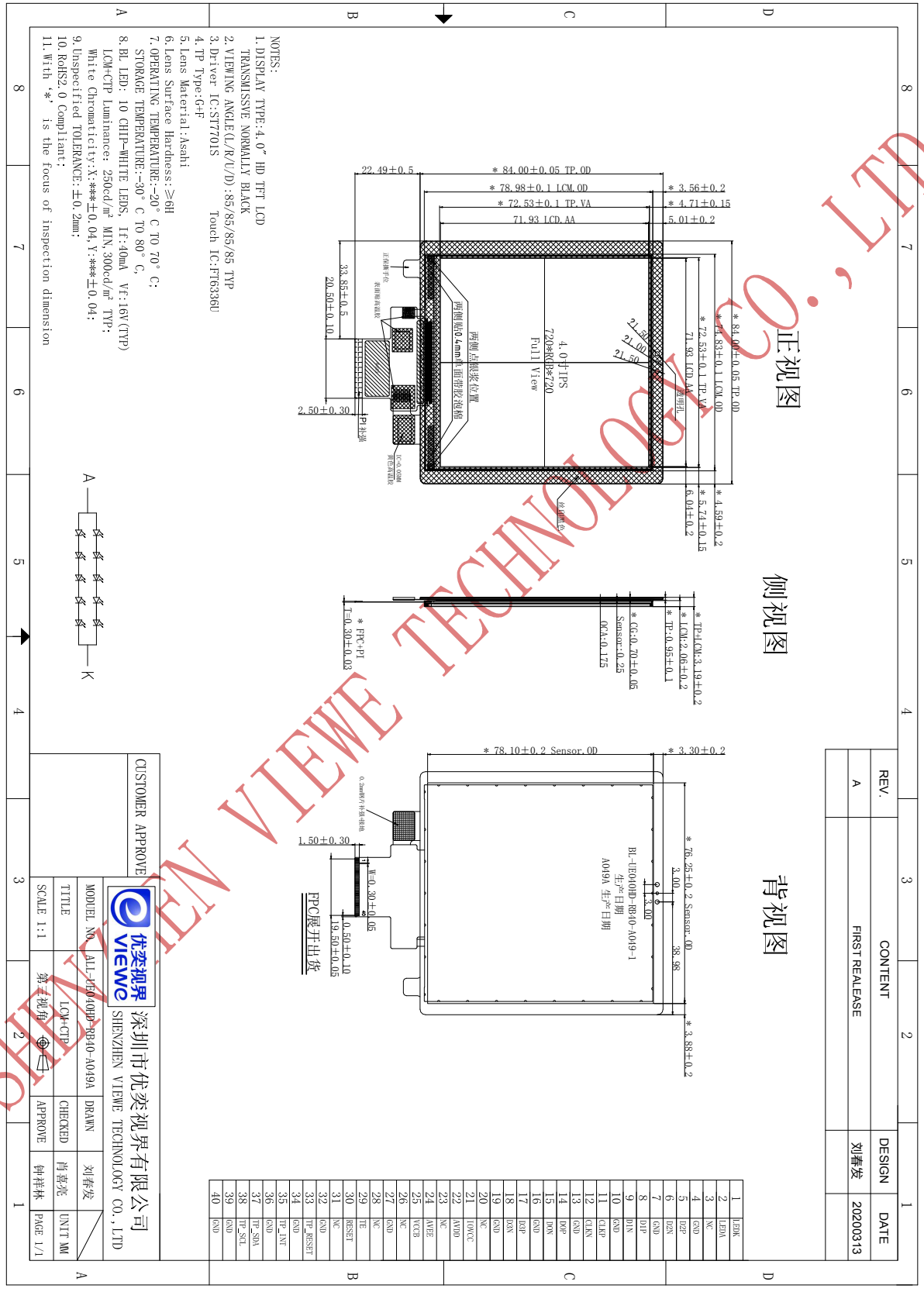
(Ta=+25°C,GND=0V)

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℃,the response time of liquid crystal (LC) becomes slower and the color of panel darker than normal one.

Note3: Temp. ≤ 60℃ , 90% RH MAX.
Temp. ＞60℃ , Absolute humidity shall be less than 90% RH at 60℃.

3. MECHANICAL DRAWING



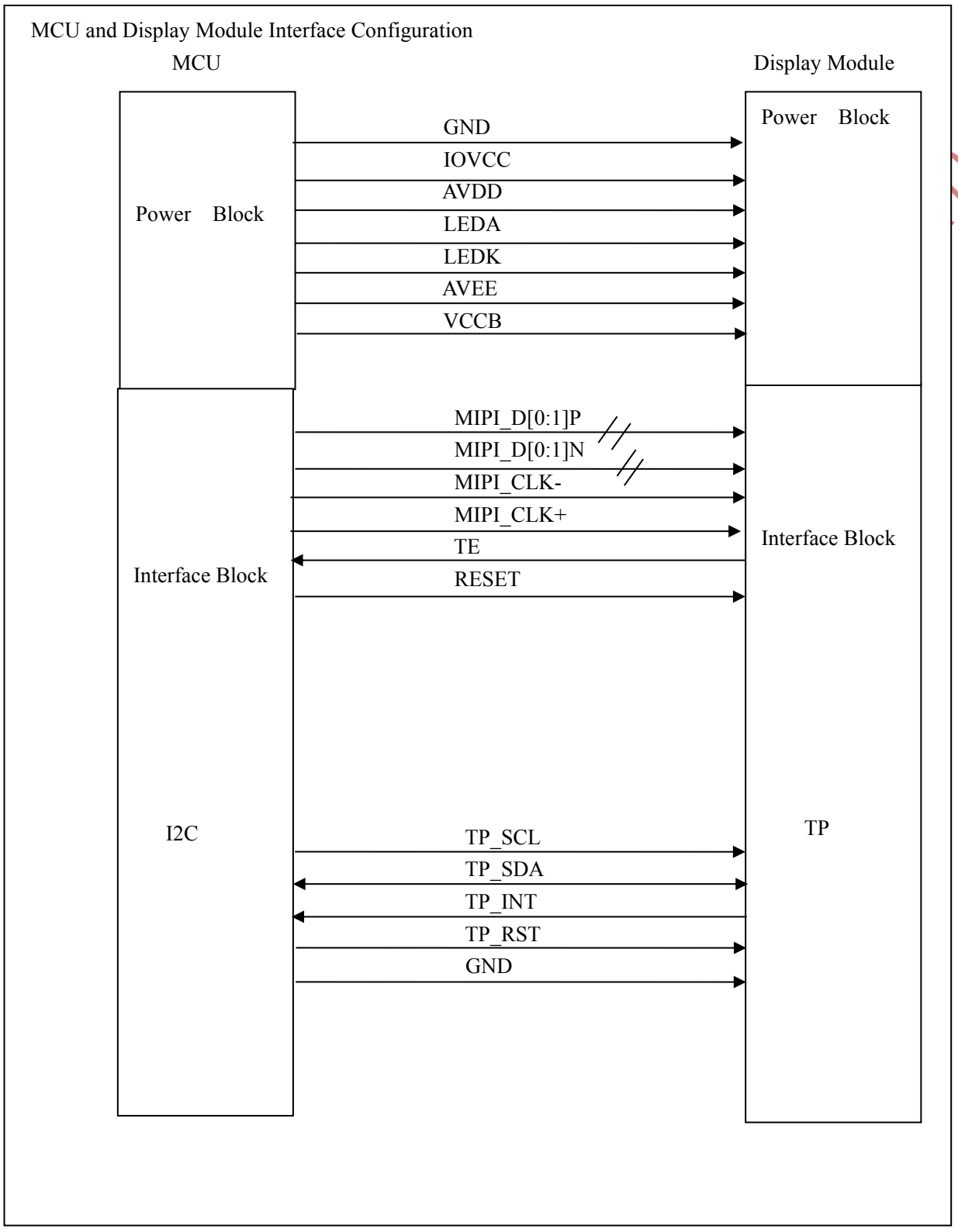
4. I/O CONNECTION & BLOCK DIAGRAM

4.1 I/O Connection

Pin No.	Symbol	I/O	Description
1	LEDK	P	Power supply for backlight cathode
2	LEDA	P	Power supply for backlight anode
3	NC	-	No connected
4	GND	P	Power Ground
5	D2P	I	No connected
6	D2N	I	No connected
7	GND	P	Power Ground
8	D1P	I	MIPI-DSI data lane 1 positive-end input pin
9	D1N	I	MIPI-DSI data lane 1 negative-end input pin
10	GND	P	Power Ground
11	CLKP	I	MIPI-DSI clock lane positive-end input pin
12	CLKN	I	MIPI-DSI clock lane negative-end input pin
13	GND	P	Power Ground
14	D0P	I/O	MIPI-DSI data lane 0 positive-end input pin
15	D0N	I/O	MIPI-DSI data lane 0 negative-end input pin
16	GND	P	Power Ground
17	D3P	I	No connected
18	D3N	I	No connected
19	GND	P	Power Ground
20	NC	-	No connected
21	IOVCC	P	Power supply to interface pins(1.8V)
22	AVDD	P	Positive input analog power for driver IC use(5.7V)
23	NC	-	No connected
24	AVEE	P	Negative input analog power for driver IC use(-5.7V)
25	VCCB	P	Power supply to level shift IC(3.3V).If not used please
26	NC	-	No connected
27	GND	P	Power Ground
28	NC	-	No connected
29	TE		Tearing effect outputsignal. If not used, please let this pin
30	RESET	I	The signal will reset the LCM, Signal is active low.
31	NC	-	No connected
32	GND	P	Power Ground
33	TP_RESET	I	The signal will reset the TP,Signal is active low
34	GND	P	Power Ground
35	TP_INT	0	Interrupt signals for TP
36	GND	P	Power Ground
37	TP_SDA	I/O	I2C data signal for TP
38	TP_SCL	I	I2C clock signals for TP
39-40	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	1.7	1.8	1.9	V	-
Power Supply2 Voltage	VCCB	3.2	3.3	3.4	V	-
Power Supply Current	VCC	-	32	-	mA	Note1
Logic Input High Voltage	V_{IH}	0.7IOVCC	-	IOVCC	V	-
Logic Input Low Voltage	V_{IL}	0	-	0.3IOVCC	V	-
Panel Power Consumption	P_{VDD}	-	0.1	-	Watt	Note1
Module Power Consumption	P_{LCM}	-	0.74	-	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_{BL}， About P_{BL} information, inference to 5.2 Back Light Driving Section.

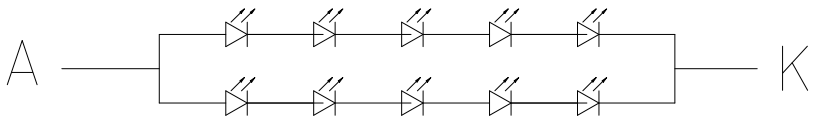
Note3: VCOM values reference only, must be adjusted to optimize display quality

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	-	16	-	V	Note1
Forward Current	I_F	-	40	-	mA	Note1
Backlight Power consumption	P_{BL}	-	0.64	-	Watt	Note1
LED life time	-	30000	-	-	Hours	Note2
LED Quantity			10		PCS	

(Ta=+25°C,GND=0V)

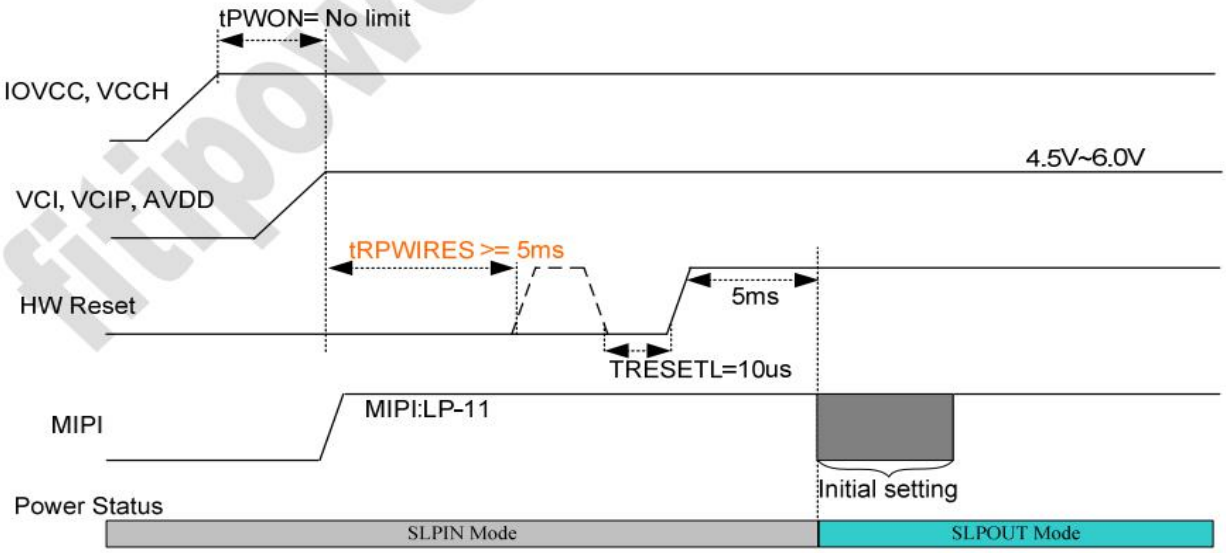
Note1:The “LED life time” is defined as the module brightness decrease to 50% of original brightness at I_{LED}=20mA(Per Led). The LED life time could be decreased if operating I_{LED} is larger than 20mA.



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

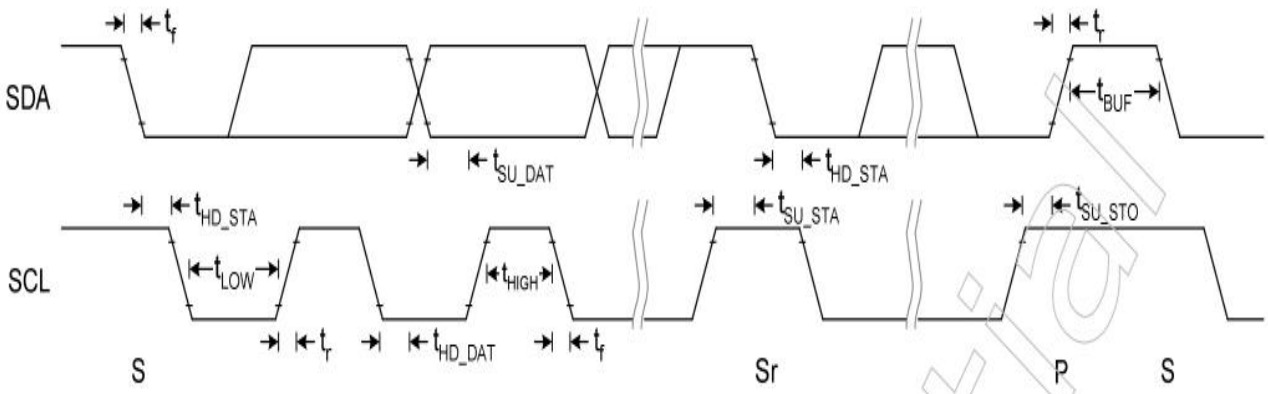


. Uncontrolled power off

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

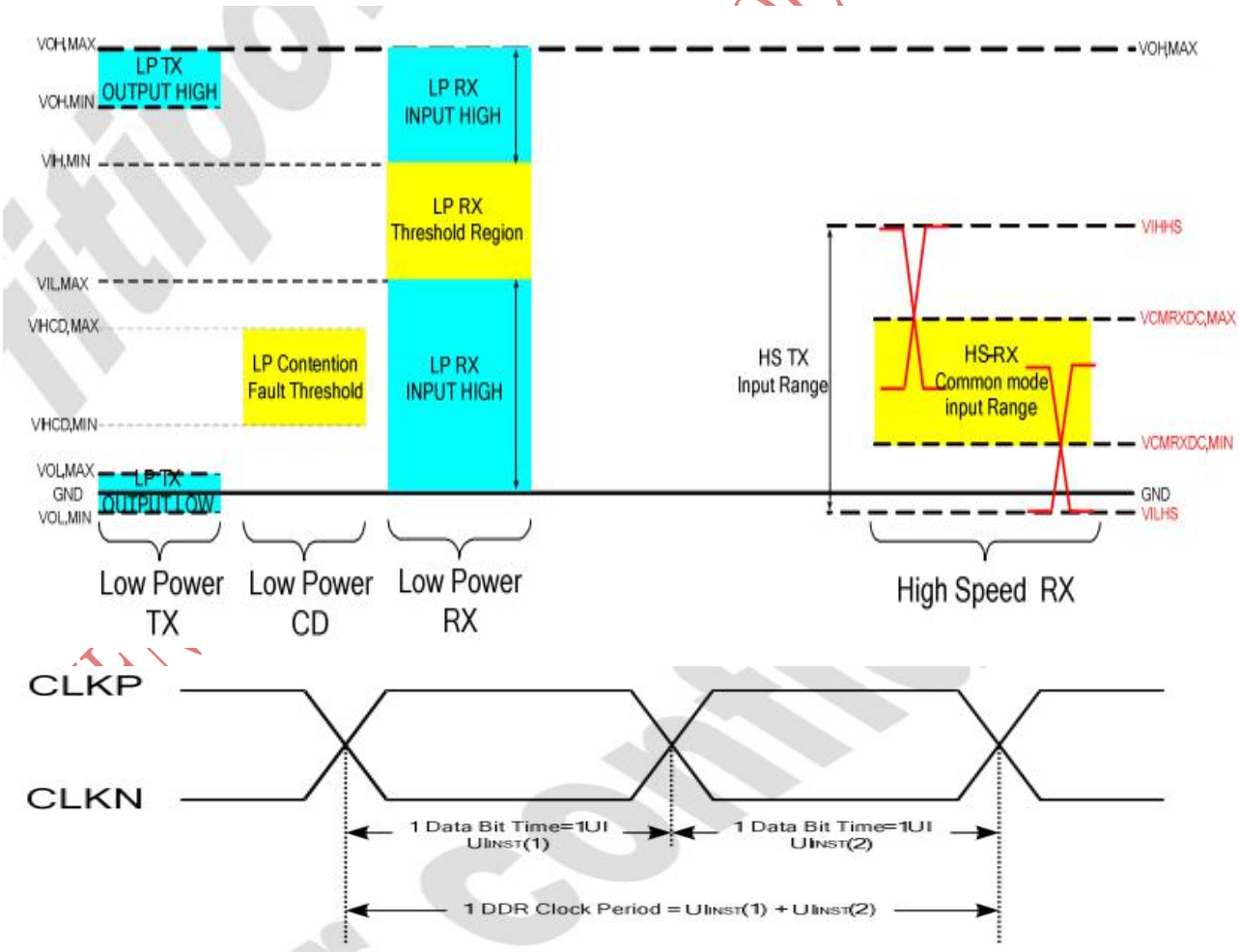
5.4.0 I2C interface timings



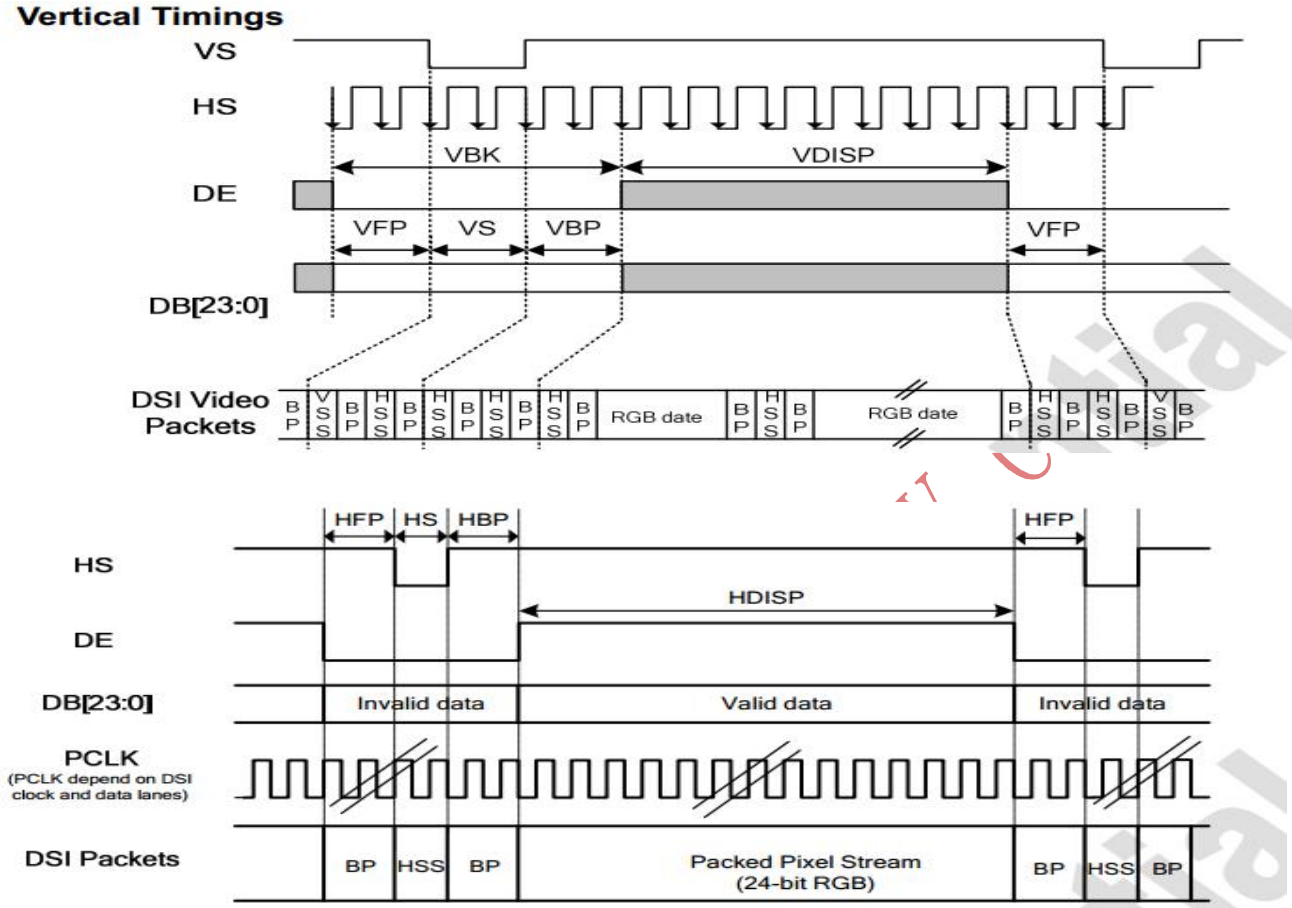
Parameter	Symbol	Min.	Max.	Unit
SCL low period	t_{lo}	1.3	-	us
SCL high period	t_{hi}	0.6	-	us
SCL setup time for START condition	t_{st1}	0.6	-	us
SCL setup time for STOP condition	t_{st3}	0.6	-	us
SCL hold time for START condition	t_{hd1}	0.6	-	us
SDA setup time	t_{st2}	0.1	-	us
SDA hold time	t_{hd2}	0	-	us

Note：3.3V 通讯接口，400Kbps 通讯速度，上拉电阻 2K

5.4.1ACCharacteristics



5.5 Timing Diagram



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.

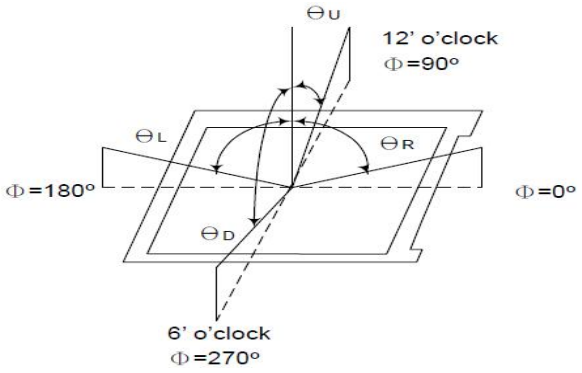
6. OPTICAL CHARACTERISTICS

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	θ = 0°	650	900	-	-	Note(4)
NTSC Ratio	S	θ =0°	-	69.83		%	Note(7)
Luminance	L	θ =0°	-	300	-	cd/m2	Note(5)
Luminance uniformity	U_W	θ =0°	75	80	-	%	Note(3)
Response Time	T_R+ T_F	25 °C	-	35	-	ms	Note(2)
Color Coordination	W_X	θ = 0° (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	-		

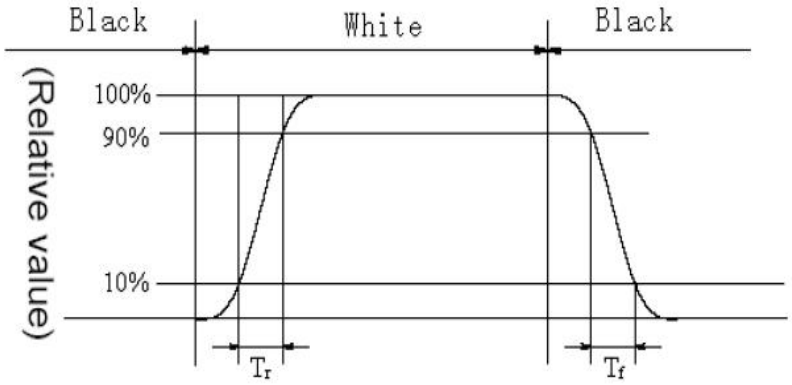
Test Conditions:

1. VDD=1.8V, I_F=20mA (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

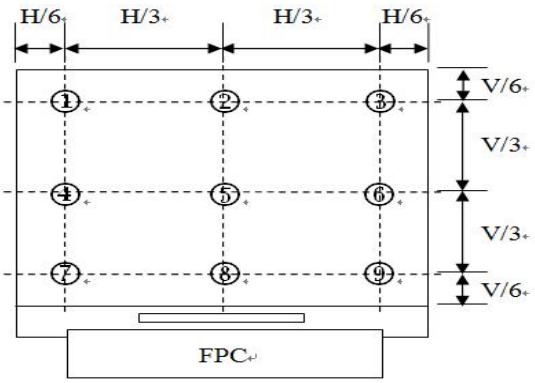


Note2: Definition of Response time: Sum of T_R and T_F



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

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

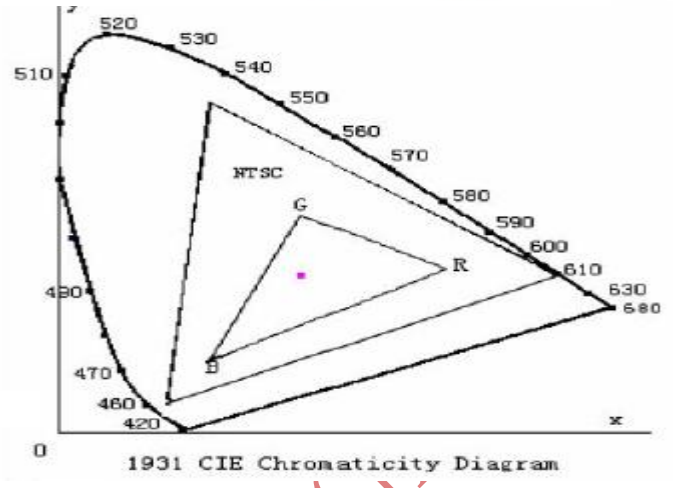
Note 5: Definition of Luminance: Center Luminance of white is defined as luminance values of 1point average across the LCD surface.

Note 6: Definition of Color Chromaticity (CIE 1931)

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

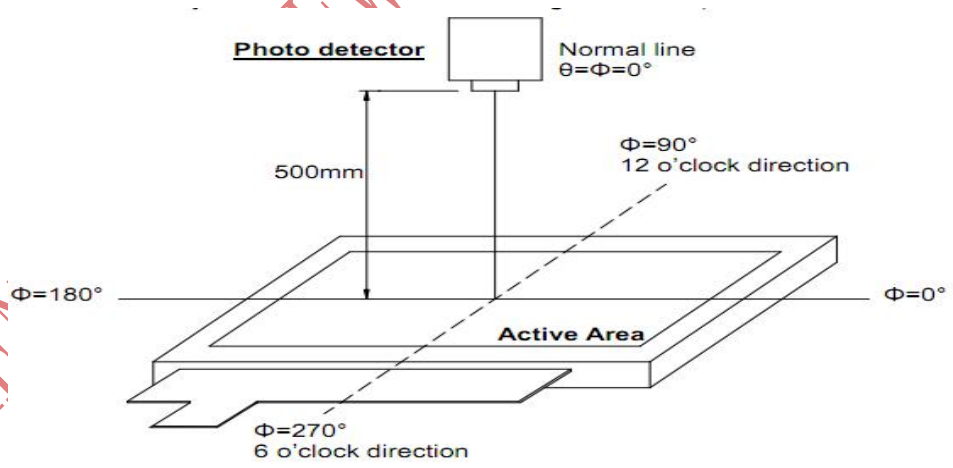
Note 7: Definition of NTSC ratio:

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



Note 8: Definition of optical measurement system.

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