LCD MODULE

SPECIFICATION

Model:	UE028VG-RB24-A022A
Version:	V1.2
Date:	20200812

☑ **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	2020.04.27	Preliminary release	
V1.1	2020.06.15	Change MECHANICAL DRAWING and Pin definition	
V1.2	2020.08.12	A020 based cover plate to PMMA Lens material	

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1. GENERAL INFORMATION

1.1 Features

1) Pixel Arrangement：RGB Vertical Stripe
2) Interface Mode： MIPI
3) Driver IC：ST7701S Touch IC：GT1151Q
4) Operation Temperature：-20~70℃
5) Storage Temperature：-30~80℃
6) Backlight Type：White LED
7) Display mode： Normally Black,
8) Pixel Density：283 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	TFT	-	-
Screen Size	2.83	Inch	Diagonal
Resolution	480(W)*3(RGB)*640(H)	Dots	-
Interface	MIPI	-	2 LANES
Module Power Consumption	0.483	Watt	Typ.
VActive VArea	43.8(W)*58.40(H)	mm	-
Pixel pitch (W*H)	0.030(W)*0.090(H)	mm	-
Module Size (W*H*D)	49.94(W)*71.0(H)*3.15(D)	mm	-
Luminance	350	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 supply voltage1	VIO28_PMU	-0.5	3.6	V	Note1
Power supply voltage2	VIO18_PMU	-0.5	3.6	V	
Power supply voltage3	TP_VDD(2V8)	-0.5	3.6	V	
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

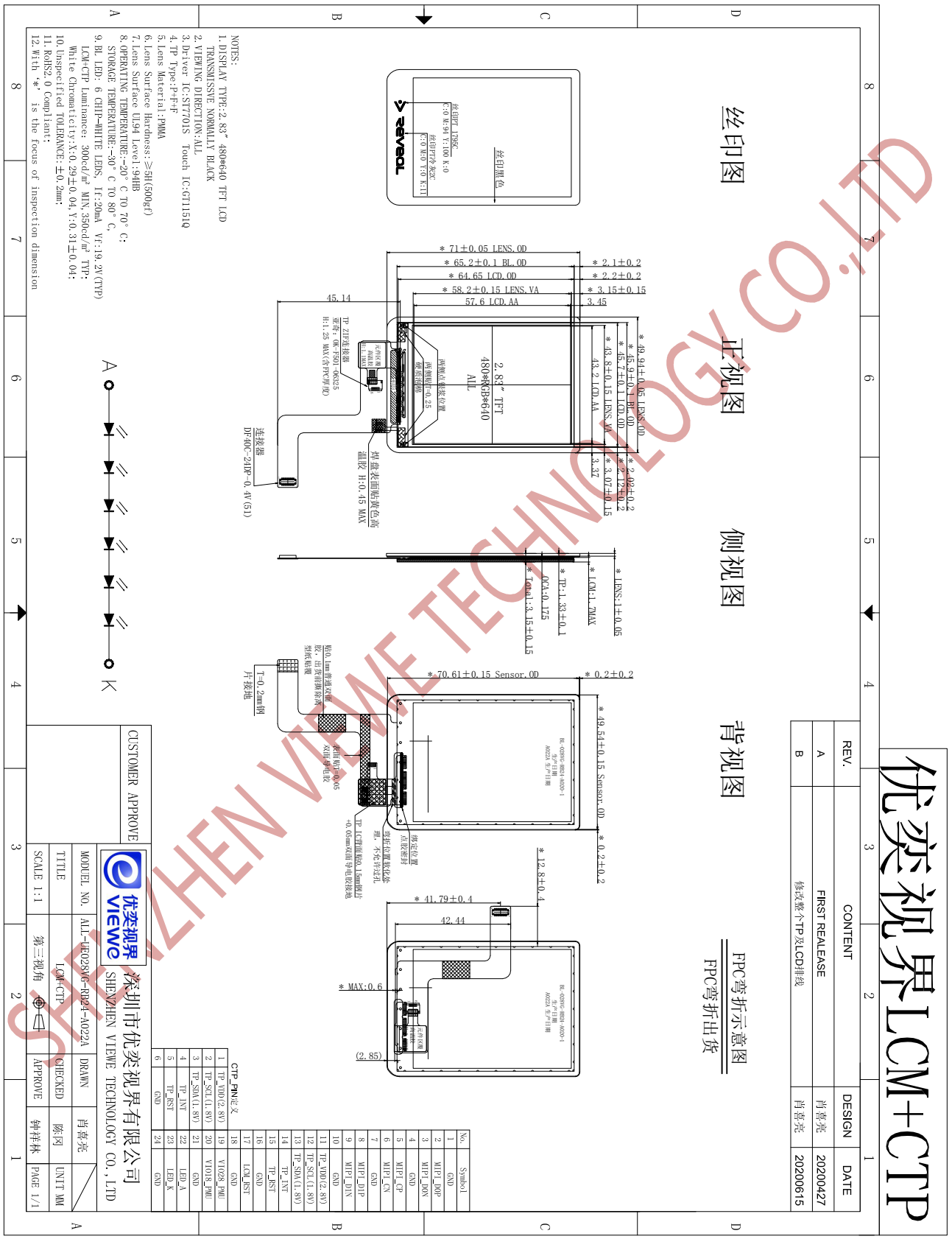
(Ta=+25°C,GND=0V)

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.

3. MECHANICAL DRAWING



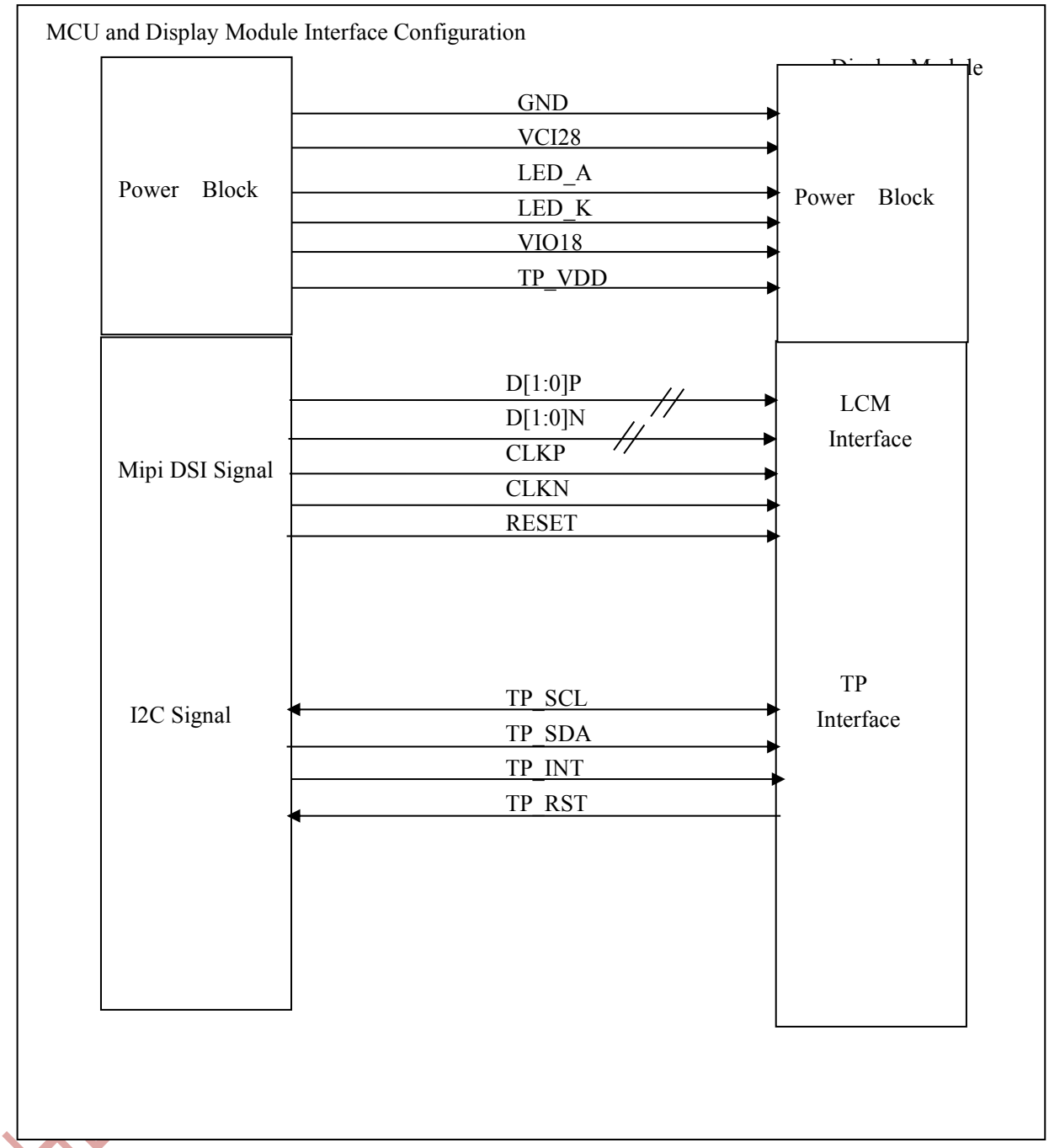
4. I/O CONNECTION & BLOCK DIAGRAM

4.1 I/O Connection

Pin No. 序号	Symbol 符号	I/O	Description 描述
1	**GND**	P	Power Ground
2	**MIPI_D0P**	I/O	MIPI-DSI data lane 0 positive-end input pin
3	**MIPI_D0N**	I/O	MIPI-DSI data lane 0 negative-end input pin
4	**GND**	P	Power Ground
5	**MIPI_CP**	I	MIPI-DSI clock lane positive-end input pin
6	**MIPI_CN**	I	MIPI-DSI clock lane negative-end input pin
7	**GND**	P	Power Ground
8	**MIPI_D1P**	I	MIPI-DSI data lane 1 positive-end input pin
9	**MIPI_D1N**	P	MIPI-DSI data lane 1 negative-end input pin
10	**GND**	P	Power Ground
11	**TP_VDD(2.8 V)**	P	2V8 Power Supply for TP
12	**TP_SCL(1.8 V)**	I	I2C clock signals for TP
13	**TP_SDA(1.8 V)**	I/O	I2C data signals for TP
14	**TP_INT**	O	Interrupt signals for TP
15	**TP_RST**	I	The signal will reset the TP, Signal is active low
16	**GND**	P	Power Ground
17	**LCM_RST**	I	The signal will reset the LCM, Signal is active low.
18	**GND**	P	Power Ground
19	**VIO28_PMU**	P	Power supply to the internal power regulator(2.8V)
20	**VIO18_PMU**	P	Power supply to the internal logic power regulator(1.8V)
21	**GND**	P	Power Ground
22	**LED_A**	P	Power supply for backlight anode
23	**LED_K**	P	Power supply for backlight cathode
24	**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 Supply Voltage1	VCI2.8V	2.6	2.8	3.6	V	-
Power Supply Voltage2	IOVCC1.8V	1.6	1.8	3.6	V	
Power Supply Voltage3	TP_VDD		2.8		V	
Power Supply Current	I_{VDD}	-	30	-	mA	Note1
Logic Input High Voltage	V_{IH}	0.7*VIO18_PMU	-	VIO18_PMU	V	-
Logic Input Low Voltage	V_{IL}	0	-	0.3*VIO18_PMU	V	-
Panel Power Consumption	P_{VDD}	-	0.099	-	Watt	Note1
Module Power Consumption	P_{LCM}	-	0.483	-	Watt	Note1,2

(Ta=+25°C,GND=0V)

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

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

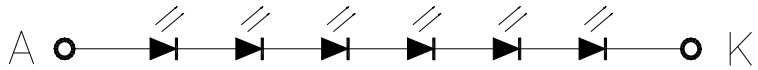
5.2 Back Light Driving Section

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	-	19.2		V	Note1
Forward Current	I_F	-	20	-	mA	Note1
Backlight Power consumption	P_{BL}	-	0.384	-	Watt	Note1
LED life time	-	30000	-	-	Hrs	Note2
LED Quantity			6		PCS	

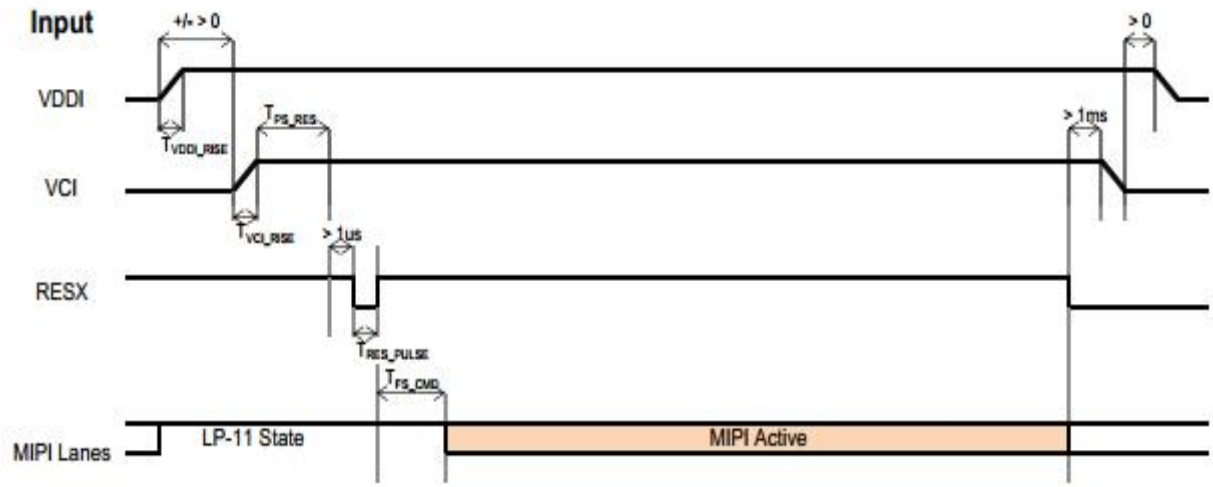
(Ta=+25°C,GND=0V)

Note1: The LED driving condition is defined for each LED module (8 LED Serial)。For each LED ：IF=20mA,VF=3.2V(Typ.)/3.4V(Max.),Ta=25℃。

Note2: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.



5.3.1 Power On/Off Sequence



Symbol	Characteristics	Min.	Typ.	Max.	Units
T_{VDDI_RISE}	VDDI Rise time	100	-	-	us
T_{VCI_RISE}	VCI Rise time	130	-	-	us
T_{PS_RES}	VDDI/VCI on to Reset high	5	-	-	ms
T_{RES_PULSE}	Reset low pulse time	10	-	-	us
T_{FS_CMD}	Reset to first command	10	-	-	ms

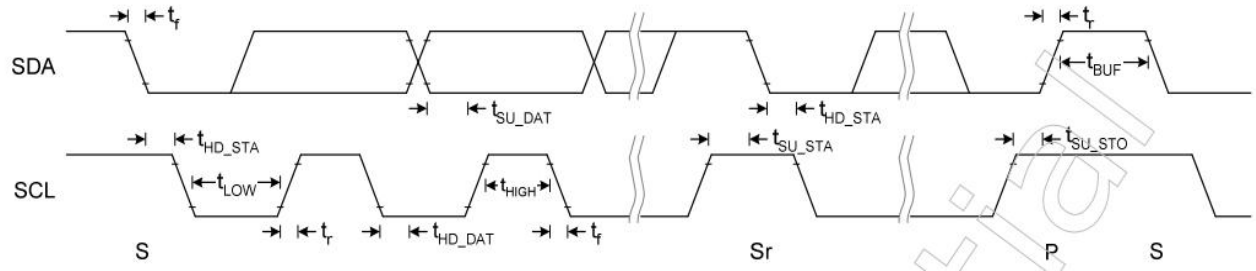
5.3.2 Power Off Sequence

The uncontrolled power-off means a situation which removed a battery without the controlled power off sequence. It will neither damage the module or the host interface.

If uncontrolled power-off happened, the display will go blank and there will not any visible effect on the display (blank display) and remains blank until “Power On Sequence” powers it up.

5.4 Timing Characteristics

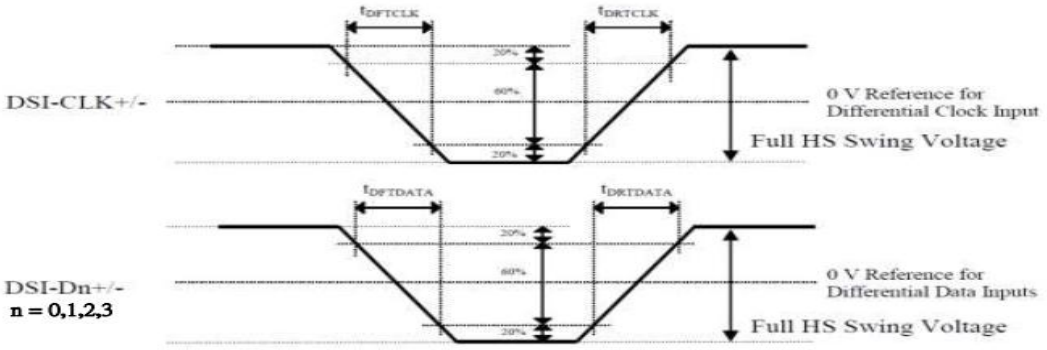
5.4.0 I2C interface timings



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

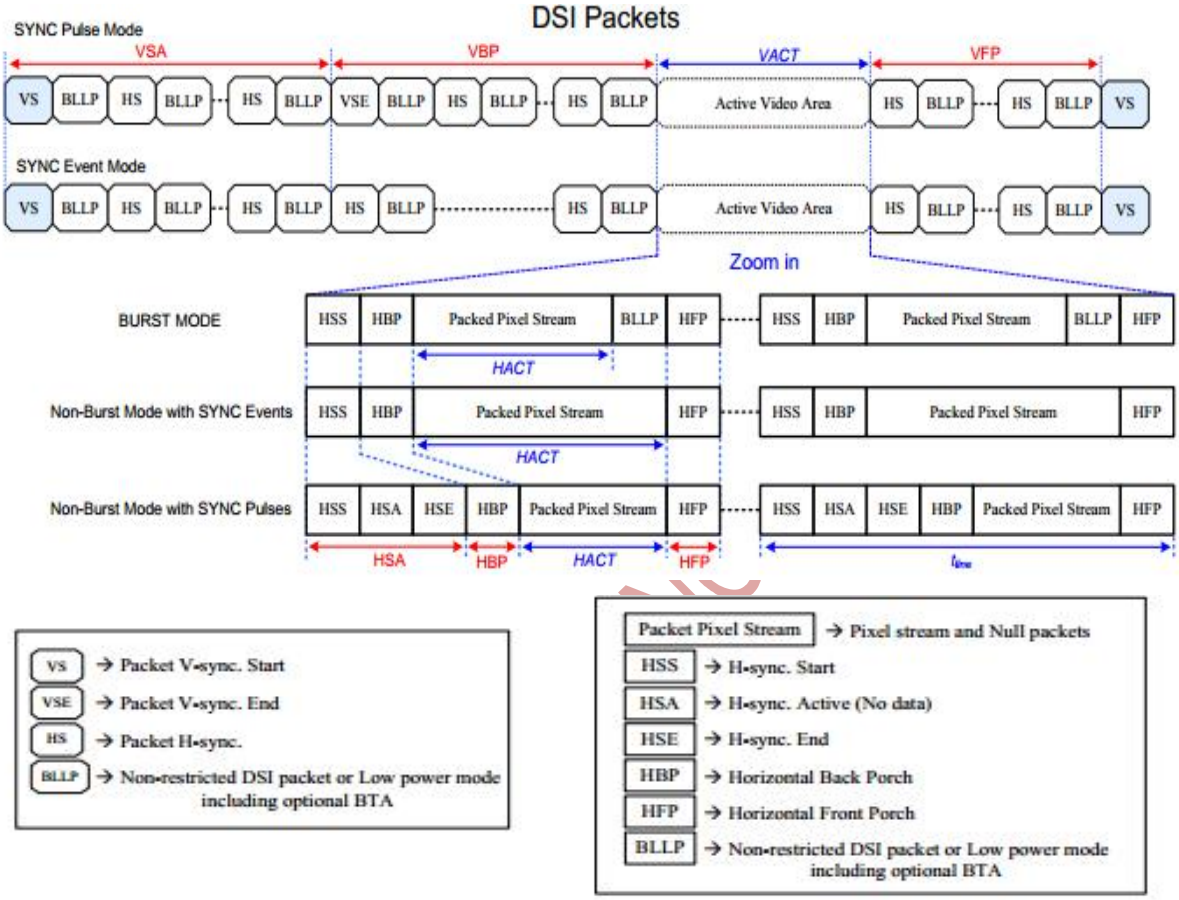
Note：1.8V 通讯接口，400Kbps 通讯速度，上拉电阻 2K

Parameter	Symbol	Condition	Specification		
			Min	Typ	Max
Differential Rise Time for Clock	t_{DRTCLK}	DSI-CLK+/-	150 ps	-	0.3UI (Note)
Differential Rise Time for Data	$t_{DRTDATA}$	DSI-Dn+/- n=0,1,2,3	150 ps	-	0.3UI (Note)
Differential Fall Time for Clock	t_{DFTCLK}	DSI-CLK+/-	150 ps	-	0.3UI (Note)
Differential Fall Time for Data	$t_{DFTDATA}$	DSI-Dn+/- n=0,1,2,3	150 ps	-	0.3UI (Note)



5.5 Timing Diagram

5.5.1 Horizontal and Vertical Timings



5.5.3 Timing Parameters

Parameter	Symbol	Value			Unit
		Min.	Typ.	MAX.	
Bit rate per lane	BR_{PHY}	80	-	1000	Mbps
Active pixel per line	HACT	-	480	-	Pixels
Horizontal back porch	t_{HBP}	-	10	-	DCLK
Horizontal sync active	t_{HSA}	-	10	-	DCLK
Horizontal front porch	t_{HFP}	-	38	-	DCLK
Active pixel per frame	VACT	-	640	-	H
Vertical back porch	t_{VBP}	-	4	-	H
Vertical sync active	t_{VSA}	-	4	-	H
Vertical front porch	t_{VFP}	-	8	-	H

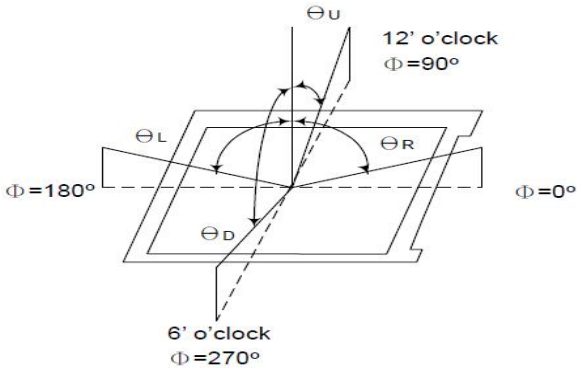
6. OPTICAL CHARACTERISTICS

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°	1000	1500	-	-	Note(4)
NTSC Ratio	S	θ =0°	-	70	-	%	Note(7)
Luminance	L	θ =0°	-	350	-	cd/m2	Note(5)
Luminance uniformity	U_W	θ =0°	-	70	-	%	Note(3)
Response Time	T_R+ T_F	25 °C	-	30	35	ms	Note(2)
Color Coordination	W_X	θ = 0° (Center) Normal viewing angle B/L On	-0.03	0.294	+0.03	NTSC (x,y)	Note(6)
	W_Y			0.313			
	R_X			0.658			
	R_Y			0.318			
	G_X			0.250			
	G_y			0.570			
	B_X			0.139			
	B_Y			0.087			
Viewing Angle	θ_L	C/R>10	-	80	-	Degree	Note(1)
	θ_R		-	80	-		
	θ_U		-	80	-		
	θ_D		-	80	-		

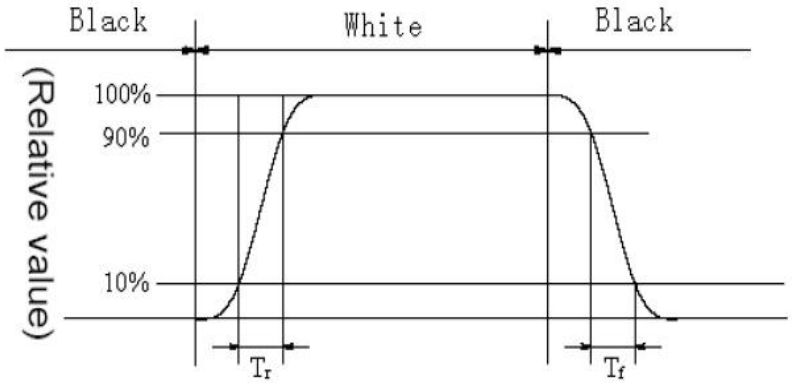
Test Conditions:

1. I_F=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

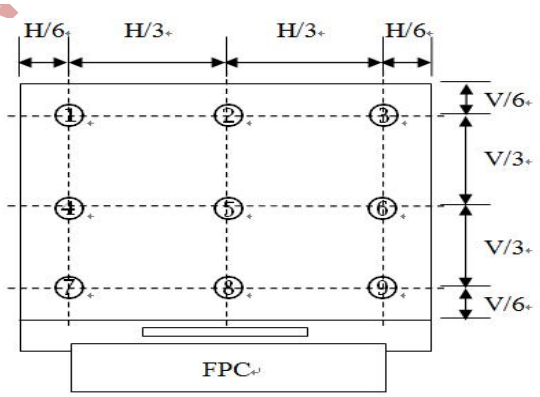


Note2: Definition of Response time: Sum of T_R and T_F



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

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

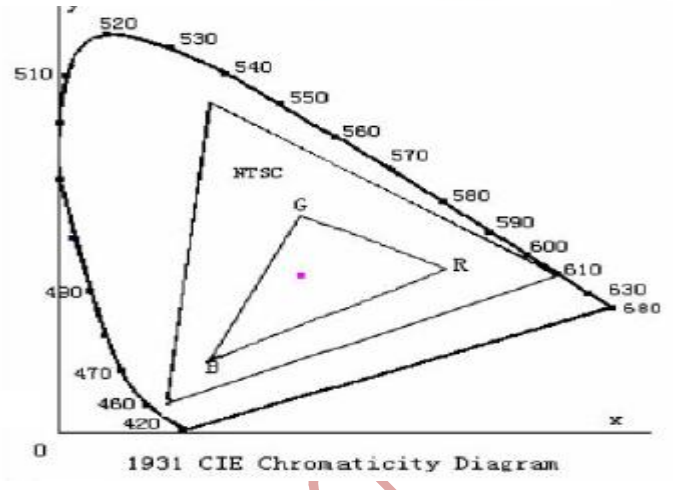
Note 5: Definition of Luminance: Center Luminance of white is defined as luminance values of 1point average across the LCD surface.

Note 6: Definition of Color Chromaticity (CIE 1931)

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

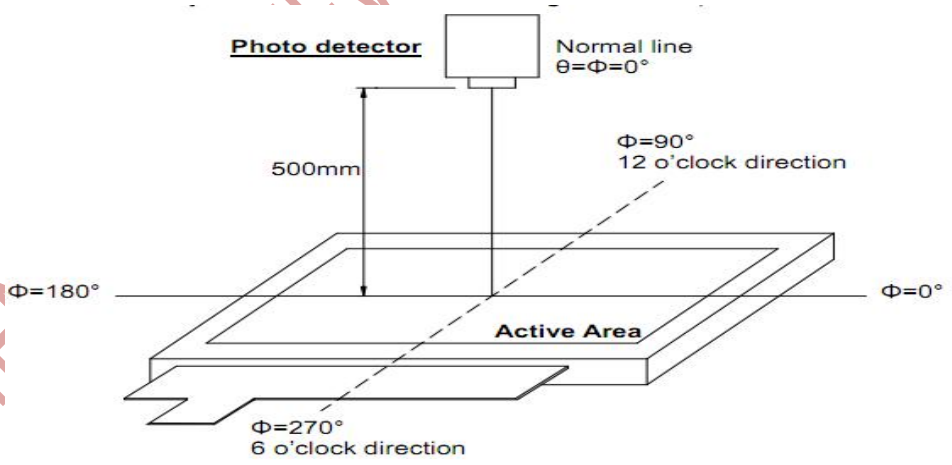
Note 7: Definition of NTSC ratio:

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



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
ESD test	Contact: ±8KV Air: ±15KV 150PF/330Ω,5Points/panel,5times	
Package Vibration Test	Frequency: 10Hz~55Hz,Amplitude:1.5mm, 1 hrs for each direction of X, Y, Z	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