

LCD MODULE

SPECIFICATION

Model:	UE020WV-UB40-L011B
Version:	V1.1
Date:	20191223

☐ 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	2019.11.27	Preliminary release	
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TABLE of CONTENTS

1. GENERAL INFORMATION.....	4
1.1 Features.....	4
1.2 Mechanical Specification.....	4
2. ABSOLUTE MAXIMUM RATINGS.....	5
3. MECHANICAL DRAWING.....	6
4. I/O CONNECTION & BLOCK DIAGRAM.....	7
4.1 I/O Connection.....	7
4.2 Block Diagram.....	8
5. ELECTRICAL CHARACTERISTICS.....	9
5.1 TFT-LCD Panel Driving Section.....	9
5.2 Back Light Driving Section.....	9
5.3 Power On/Off Sequence.....	10
5.4 Timing Characteristics.....	13
5.5 Timing Diagram.....	12
6. OPTICAL CHARACTERISTICS.....	13-16
7. RELIABILITY.....	17
8. PACKAGE DRAWING.....	18

1. GENERAL INFORMATION

1.1 Features

- 1) Pixel Arrangement: RGB Vertical Stripe
- 2) Interface Mode: 40PIN 3SPI-RGB_16bits
- 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: 300PPI

1.2 Mechanical Specification

Item 项目	Specification 规格	Unit 单位	Remark 备注
Pixel Driving element	IPS TFT	-	-
Screen Size	2.0	Inch	Diagonal
Resolution	480(W)*3(RGB)*360(H)	Dots	-
Interface	3SPI-RGB 16bits	-	40PIN
Module Power Consumption	0.4	Watt	Typ.
Active Area	40.82(W)*30.62(H)	mm	-
Pixel pitch (W*H)	28.35W)*85.05(H)	μ m	-
Module Size (W*H*D)	46.16(W)*41.02(H)*2.6(D)	mm	-
Luminance	1100	cd/m ²	Typ.
Viewing Direction	ALL	O'clock	-
Display Color	16.7M	Colors	16bits

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 voltage	VCI	-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

(T_a=+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.

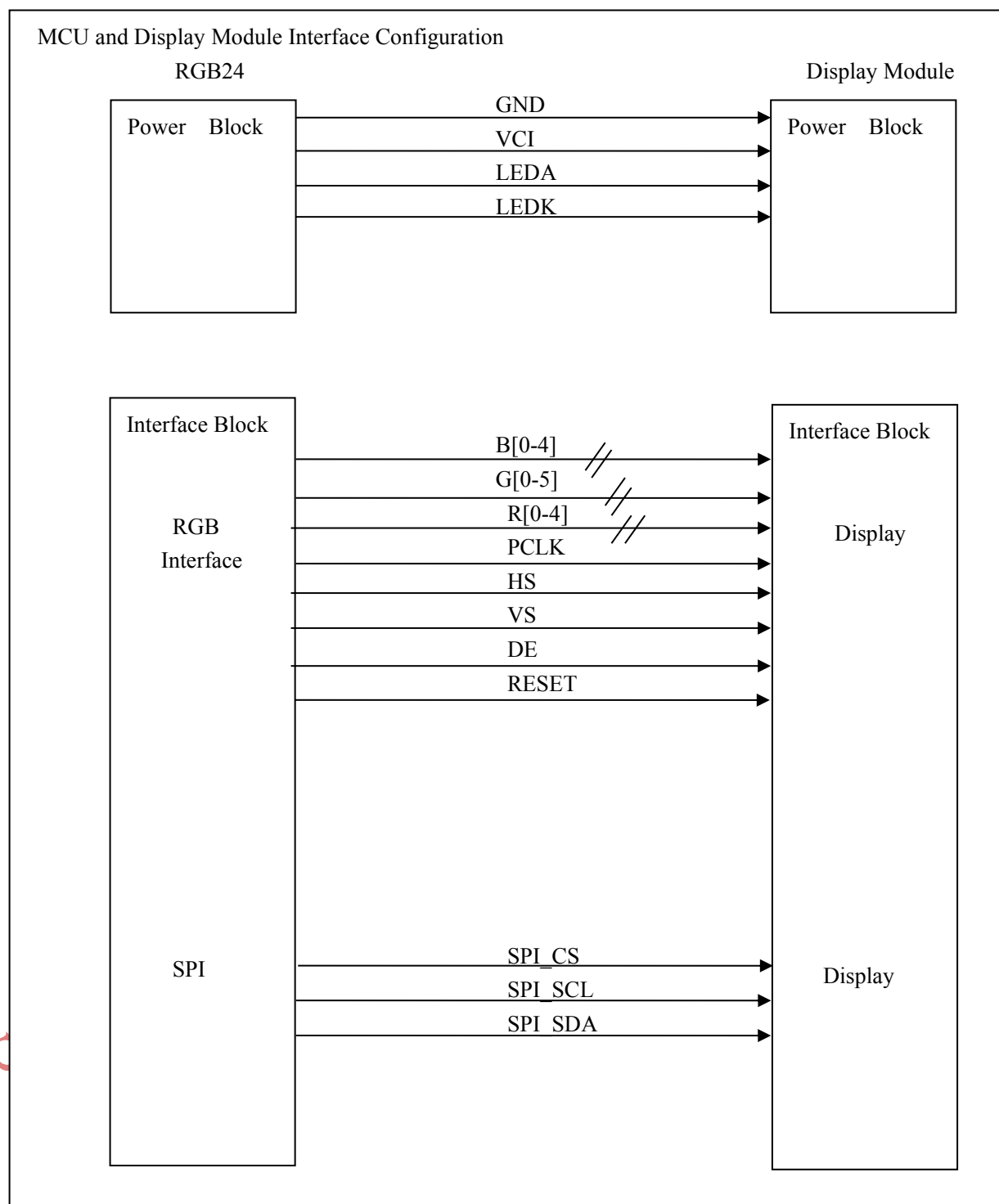
4. I/O CONNECTION & BLOCK DIAGRAM

4.1 I/O Connection

Pin No. 序号	Symbol 符号	I/O	Description 描述
1	LEDK	P	Power supply for backlight cathode
2	LEDA	P	Power supply for backlight anode
3	GND	P	Power Ground
4	VCC	P	Power supply to the internal logic power regulator(3.3V)
5-13	GND	P	Power Ground
14	VS	I	Vertical sync signal, Negative polarity
15	HS	I	Horizontal sync signal, Negative polarity
16	PCLK	I	Pixel clock input pin, Negative polarity
17	DE	I	Data input enable. Display access is enabled when DE is “H”
18-22	B0-B4	I	Blue data input.
23-28	G0-G5	I	Green data input.
29-33	R0-R4	I	Red data input.
34	RESET	I	Global reset pin.
35	SPI_CS	I	Chip select pin for SPI interface.
36	SPI_SCL	I	Serial clock input in SPI interface
37	SPI_SDI	I/O	Serial data input pin in serial interface operation.
38	VCC	P	Power supply to the internal logic power regulator(3.3V)
39	GND	P	Power Ground
40	VCC	P	Power supply to the internal logic power regulator(3.3V)

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 Voltage	VCC	2.6	3.3	3.6	V	-
Power Supply Current	I _{VDD}	-	30	-	mA	Note1
Logic Input High Voltage	V _{IH}	0.7VCC	-	VCC	V	-
Logic Input Low Voltage	V _{IL}	0	-	0.3VCC	V	-
Panel Power Consumption	P _{VDD}	-	0.099	-	Watt	Note1
Module Power Consumption	P _{LCM}	-	0.4	-	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	15	17	18	V	Note1
Forward Current	I _F	-	20	-	mA	Note1
Backlight Power consumption	P _{BL}	-	0.34	-	Watt	Note1
LED Quantity			3		PCS	

(Ta=+25°C,GND=0V)

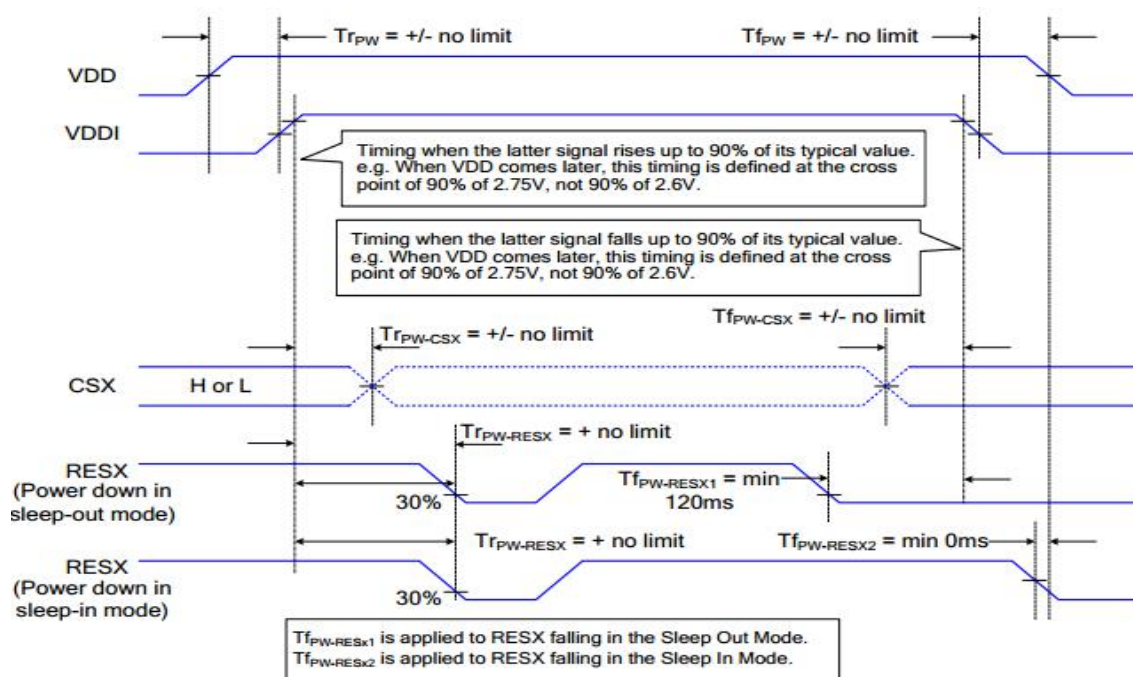
Note1: The LED driving condition is defined for each LED module (3 LED Serial, 1LED Parallel)。

For each LED : I_F=20mA, V_F=3.2V(Typ.)/3.4V(Max.), Ta=25°C。

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 Power On/Off Sequence



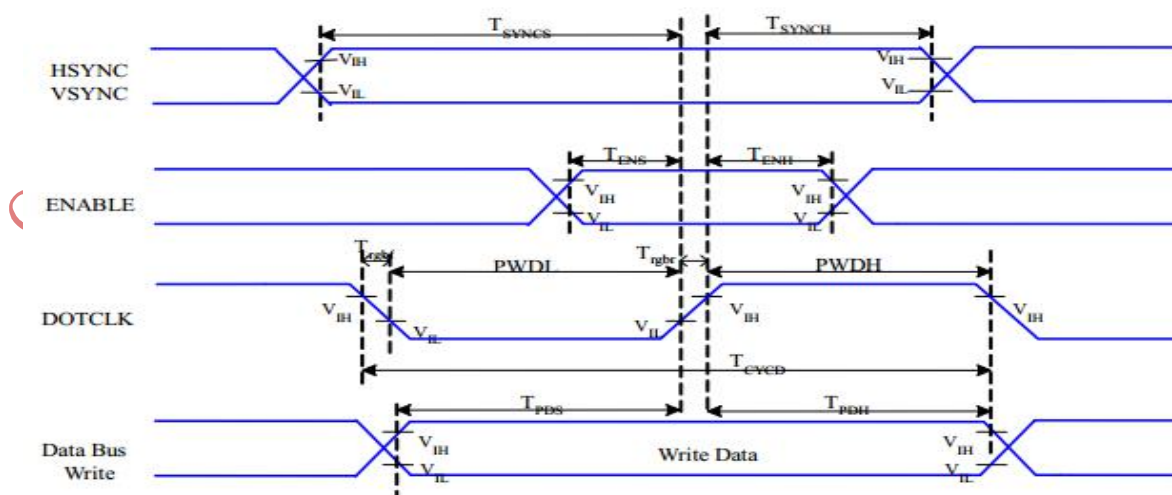
9.1 Uncontrolled Power Off

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.

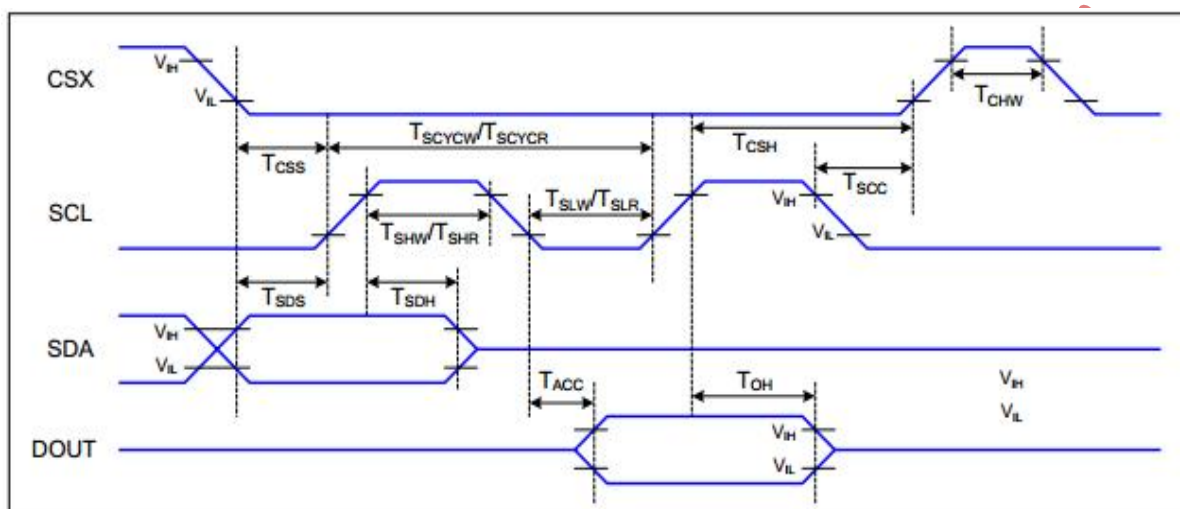
If uncontrolled power-off happened, the display will go blank and there will not any visible effect on the display (blank display) and remains blank until "Power On Sequence" powers it up.

5.4 Timing Characteristics

5.4.1 Timing Parameters

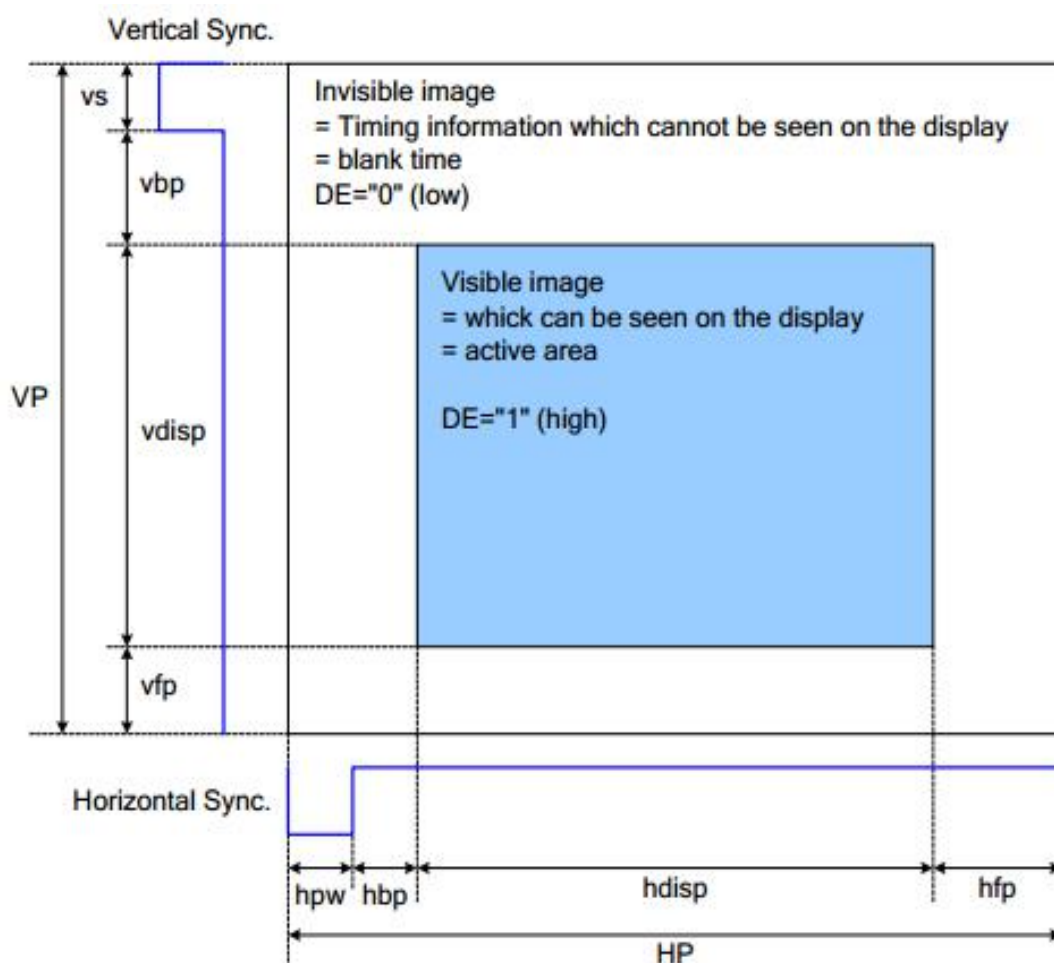


Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYNC, HSYNC Setup Time	5	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	5	-	ns	
	T_{ENH}	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	T_{CYCD}	DOTCLK Cycle Time	33	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	5	-	ns	
	T_{PDH}	PD Data Hold Time	5	-	ns	



Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	60		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	

5.4.2 Horizontal& Vertical Timing

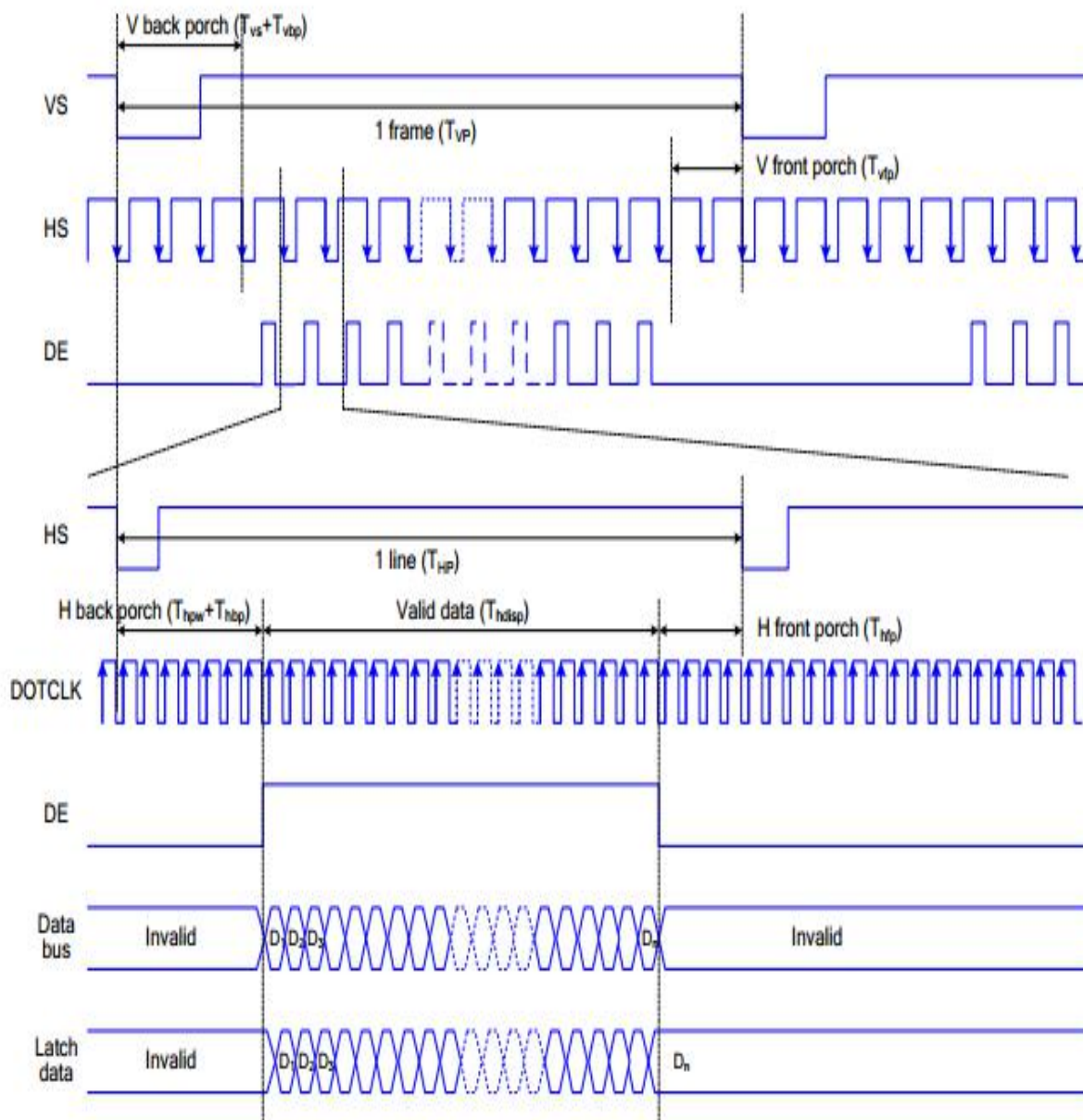


Parameter	Symbol	Min.	Typ.	Max.	Unit
Horizontal Sync. Width	hpw	1	-	255	Clock
Horizontal Sync. Back Porch	hbp	1	--	255	Clock
Horizontal Sync. Front Porch	hfp	1	--	-	Clock
Vertical Sync. Width	vs	1	--	254	Line
Vertical Sync. Back Porch	vbp	1	--	254	Line
Vertical Sync. Front Porch	vfp	2	--	--	Line

5.5 Timing Diagram

5.5.1 Horizontal&Vertical Timing

The timing chart of RGB interface DE mode is shown as follows.



Note: The setting of front porch and back porch in host must match that in IC as this mode.

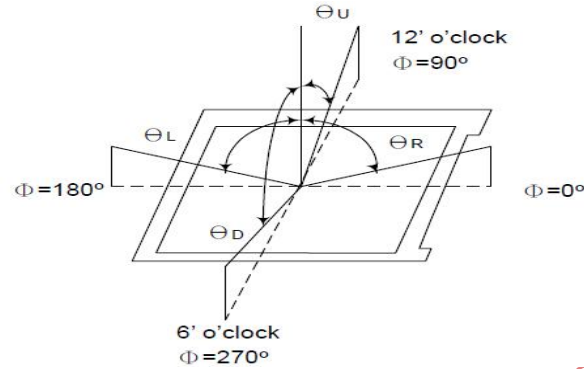
6. OPTICAL CHARACTERISTICS

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	$\theta = 0^\circ$	800	1000	-	-	Note(4)
NTSC Ratio	S	$\theta = 0^\circ$	50	55	-	%	Note(7)
Luminance	L	$\theta = 0^\circ$	-	1100	-	cd/m ²	Note(5)
Luminance uniformity	U _W	$\theta = 0^\circ$	70	80	-	%	Note(3)
Response Time	T _R + T _F	25 °C	-	35	45	ms	Note(2)
Color Coordination	W _X	$\theta = 0^\circ$ (Center) Normal viewing angle B/L On	-0.03	0.310	+0.03	NTSC (x,y)	Note(6)
	W _Y			0.360			
	R _X			TBD			
	R _Y			TBD			
	G _X			TBD			
	G _Y			TBD			
	B _X			TBD			
	B _Y			TBD			
Viewing Angle	θ_L	C/R>10	70	80	-	Degree	Note(1)
	θ_R		70	80	-		
	θ_U		70	80	-		
	θ_D		70	80	-		

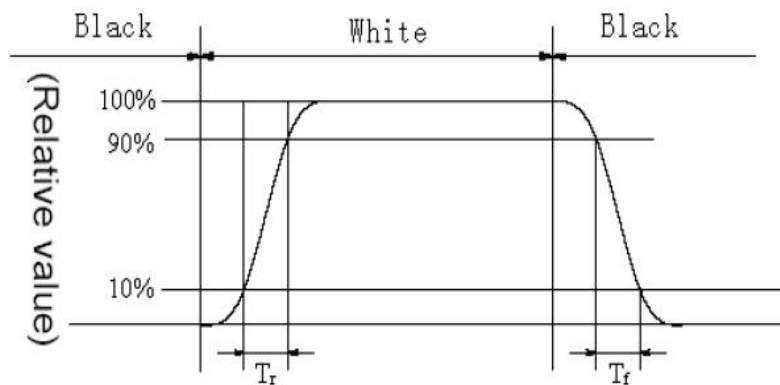
Test Conditions:

1. VDD=3.3V, 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

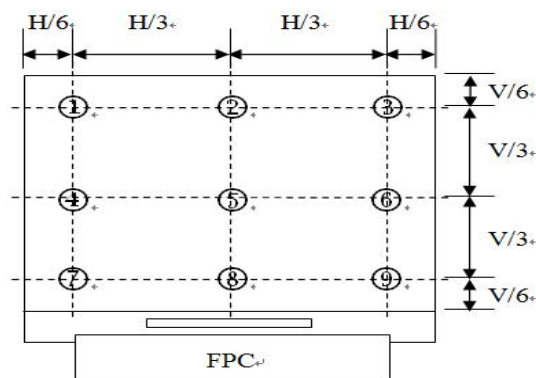


Note2: Definition of Response time: Sum of T_R and T_F



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

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

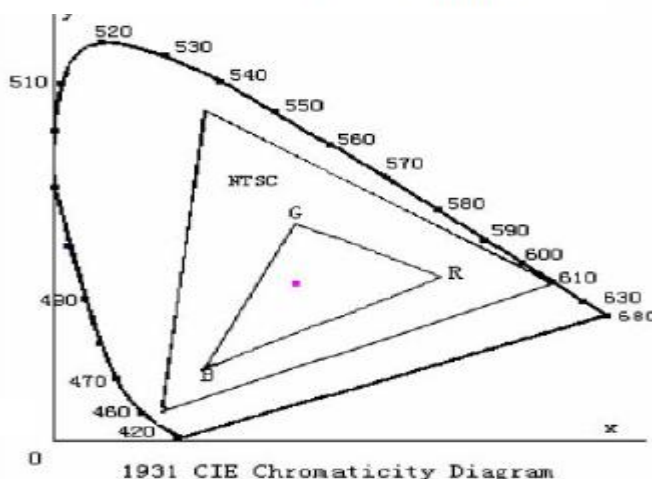
Note 5: Definition of Luminance: Center Luminance of white is defined as luminance values of 1point average across the LCD surface.

Note 6: Definition of Color Chromaticity (CIE 1931)

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

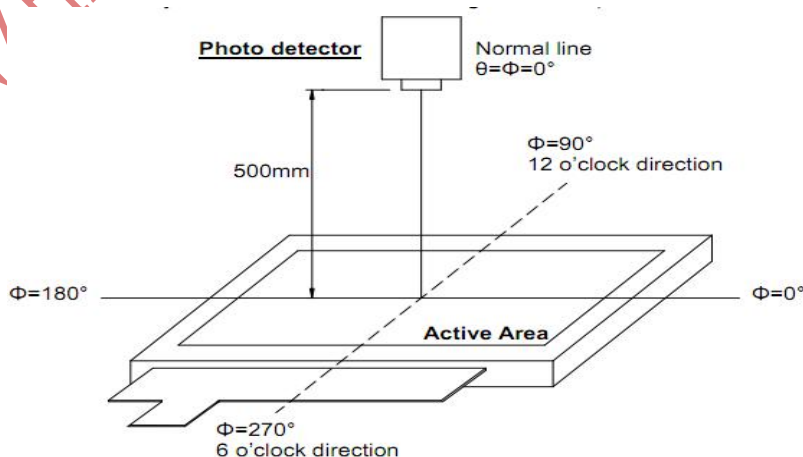
Note 7: Definition of NTSC ratio:

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



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 Δ +80°C /30min for 30cycles, Transfer time less than 5min	Note2,3
Thermal humidity storage Test	80°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

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.

Note 4: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

8. PACKAGE DRAWING

