

LCD MODULE

SPECIFICATION

Model:	UE133FH-RP30-L002
Version:	V1.0
Date:	201606.20

☒ **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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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
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1. GENERAL INFORMATION

1.1 Features

- 1) Pixel Arrangement: RGB Vertical Stripe
- 2) Interface Mode: EDP
- 3) Driver IC:
- 4) Operation Temperature: 0~50℃
- 5) Storage Temperature: -20~60℃
- 6) Backlight Type: White LED
- 7) Display mode: Normally Black
- 8) Pixel Density: 165PPI
- 9) LED life time: 10,000 Hours

1.2 Mechanical Specification

Item 项目	Specification 规格	Unit 单位	Remark 备注
Pixel Driving element	A-Si TFT	-	-
Screen Size	13.3 IPS	Inch	Diagonal
Resolution	1920(W)*3(RGB)*1080(H)	Dots	-
Interface	EDP	-	2lane
Module Power Consumption	TBD	Watt	Typ.
VActive VArea	295.76(W)*167.24(H)	mm	-
Pixel pitch (W*H)	0.153(W)*0.153(H)	mm	-
CTP_Module Size (W*H*D)	305.2(W)*187.9(H)*4(D)	mm	-
Luminance	220	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	VDD	-0.3	-4.0	V	
LED forward current	I _F	-0.001	100	mA	For each led,Note1
LED Reverse Voltage	V _R	-	5	V	For each led,Note1
Operating temperature	T _{op}	0	50	°C	Note1,2
Storage temperature	T _{st}	-20	60	°C	Note1,2
Humidity	H _{st}	10	90	%RH	Note1,3

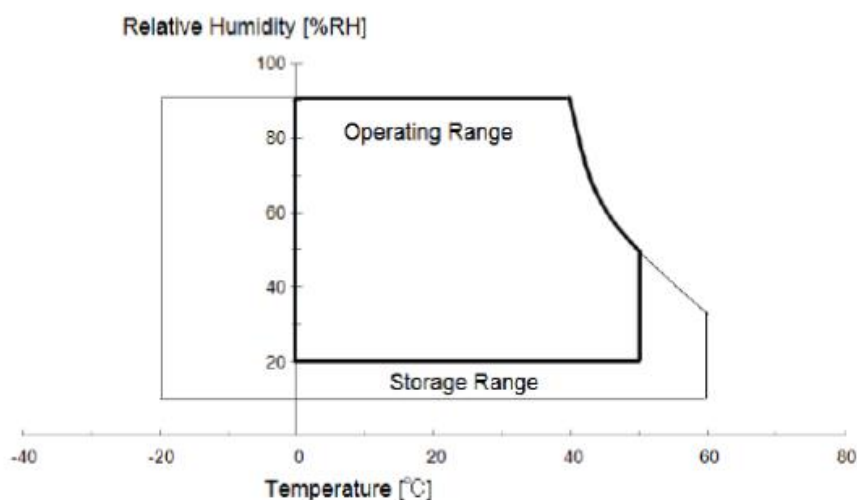
(Ta=+25°C,GND=0V)

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

Note3: Temp. ≤ 40°C , 90% RH MAX.

Temp. >40°C , Maximum wet-bulb temperature at +39 °C or less at Ta>+40 °C, No condensation.





4. I/O CONNECTION & BLOCK DIAGRAM

4.1 CN1 (EDP signals , +3.3V DC power supply and B/L power supply)

LCM	Symbol	I/O	Description	Remark
1	NC	-	Reserved for LCD	[Note4-1-1]
2	H_GND	P	High Speed Ground	[Note4-1-2]
3	Lane1_N	I	Complement Signal Link Lane 1	
4	Lane1_P	I	True Signal Link Lane 1	
5	H_GND	P	High Speed Ground	[Note4-1-2]
6	Lane0_N	I	Complement Signal Link Lane 0	
7	Lane0_P	I	True Signal Link Lane 0	
8	H_GND	P	High Speed Ground	[Note4-1-2]
9	AUX_CH_P	I	True Signal Auxiliary Channel	
10	AUX_CH_N	I	Complement Signal Auxiliary Channel	
11	H_GND	P	High Speed Ground	[Note4-1-2]
12-13	LCD_VCC	P	LCD logic and driver power(3.3V)	
14	NC	-	Reserved for LCD manufacturer' s use	[Note4-1-1]
15-16	LCD_GND	P	LCD logic and driver ground	
17	HPD	O	HPD Signal	[Note4-1-3]
18	BL_GND	P	Backlight ground	
19	BL_GND	P	Backlight ground	
20	BL_GND	P	Backlight ground	
21	BL_GND	P	Backlight ground	
22	BL_ENABLE	I	Backlight on/off	[Note4-1-4]
23	BL_PWM_DIM	I	System PWM	[Note4-1-5]
24	NC	-	Reserved for LCD for manufacturer' s use	[Note4-1-1]
25	NC	-	Reserved for LCD for manufacturer' s use	[Note4-1-1]
26	BL_PWR	P	Backlight power	
27	BL_PWR	P	Backlight power	
28	BL_PWR	P	Backlight power	
29	BL_PWR	P	Backlight power	
30	NC	-	Reserved for LCD for manufacturer' s use	[Note4-1-1]

I: Input; O: Output; P: Power

[Note 4-1-1] Don't input any signals or any powers into a NC pin. Keep the NC pin open.

[Note 4-1-2] The shielding case is connected with signal GND.

- Connector used :20455-030E-12 (I-PEX)
- Corresponding connector : 20453-030T (I-PEX)

(Panda is not responsible to its product quality, if the user applies a connector not corresponding to the above model.)

The equivalent circuit figure of the terminal.

[Note 4-1-3]

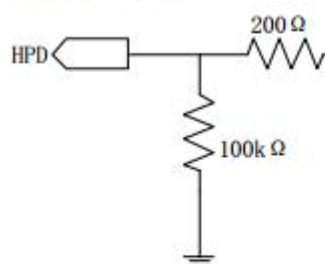


Fig.4-1-1 Equivalent circuit (Pin No.17)

[Note 4-1-4]

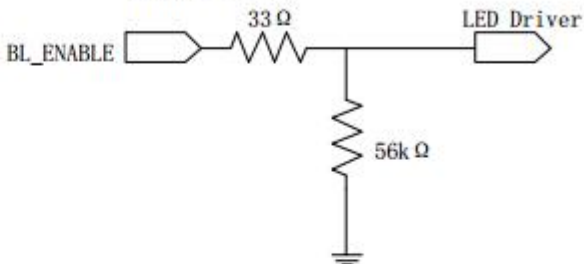


Fig.4-1-2 Equivalent circuit (Pin No.22)

[Note 4-1-5]

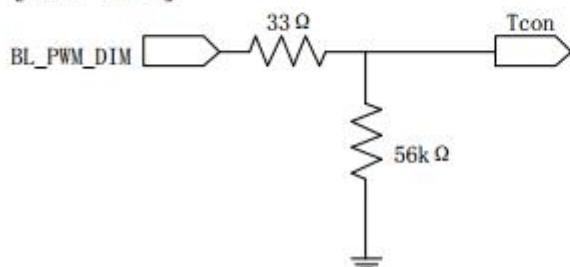


Fig.4-1-3 Equivalent circuit (Pin No.23)

4.2 EDP Block Diagram

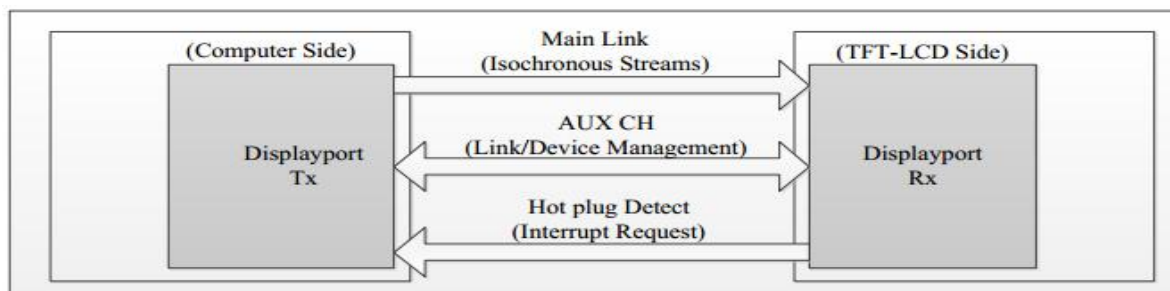


Fig.4-2-1 DP architecture

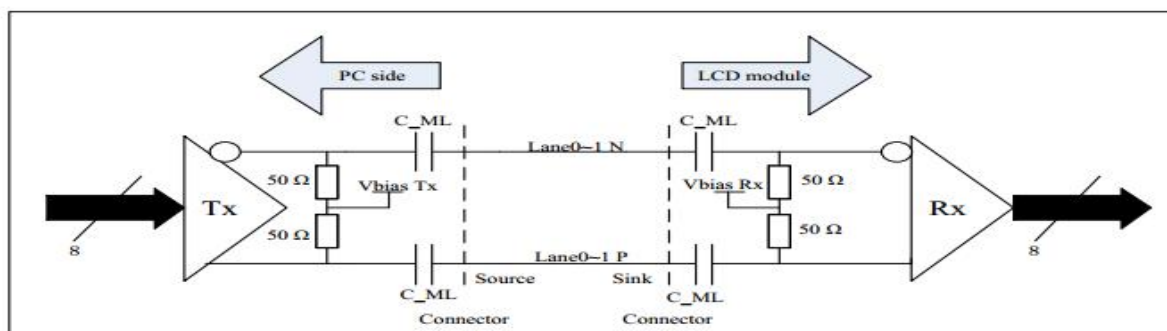


Fig.4-2-2 Main Link differential pair

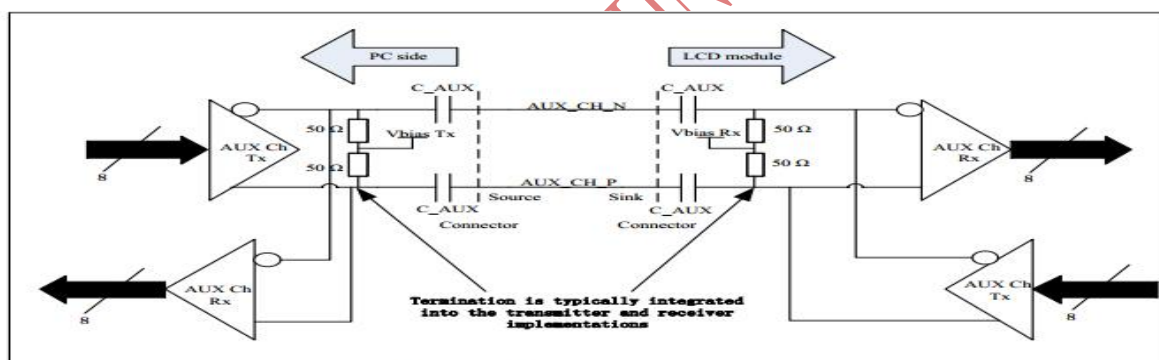


Fig.4-2-3 AUX Link differential pair

Lane0	Lane1
R0-7:0	R1-7:0
G0-7:0	G1-7:0
B0-7:0	B1-7:0
R2-7:0	R3-7:0
G2-7:0	G3-7:0
B2-7:0	B3-7:0
R4-7:0	R5-7:0
G4-7:0	G5-7:0
B4-7:0	B5-7:0

Fig.4-2-4 eDP 2lane 8bit input data mapping

5. ELECTRICAL CHARACTERISTICS

5.1 TFT-LCD Panel Driving Section

Item 项目	Symbol 符号	Min. 最小值	Typ. 典	Max. 最大值	Unit 单位	Remark 备注
Power Supply1 Voltage	VDD	3.0	3.3	3.6	V	
Power Supply Current	I _{VDD}	-	100	-	mA	Note1
Logic Input High Voltage	V _{IH}	0.7VDD	-	VDD	V	-
Logic Input Low Voltage	V _{IL}	0	-	0.3VDD	V	-
Panel Power Consumption	P _{VDD}	-	TBD	-	Watt	Note1
ModulePower Consumption	P _{LCM}	-	TBD	-	Watt	Note1,2

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.

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

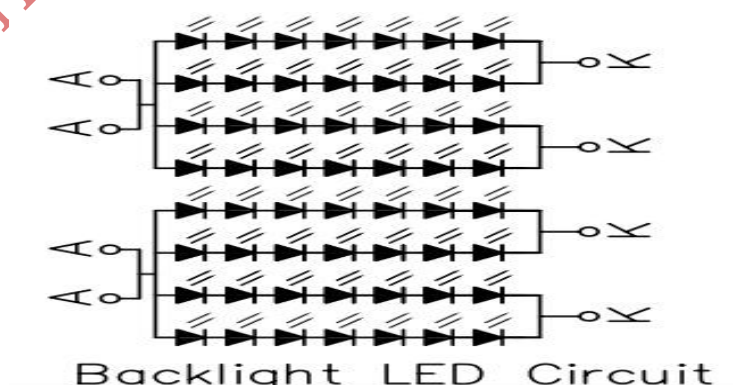
5.2 Back Light Driving Section

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	-	22.4	-	V	Note1
Forward Current	I _F	-	160	-	mA	Note1
Backlight Power consumption	P _{BL}	-	1.8	-	Watt	Note1
LED life time	-	10000	-	-	Hours	Note2
LED Quantity	-	-	56	-	PCS	

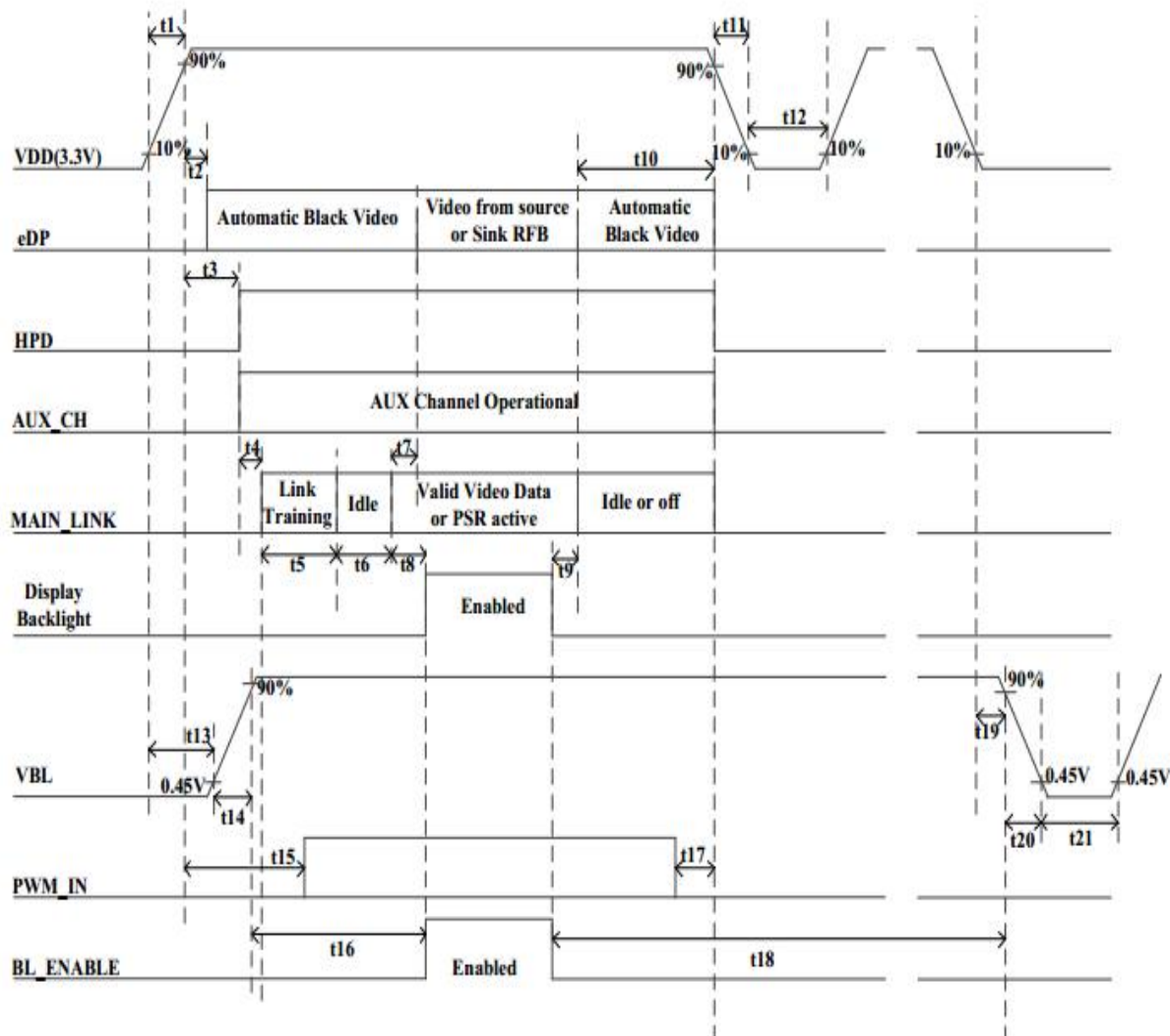
Note1: The LED driving condition is defined for each LED module (7LED Serial, 8 LED Parallel).

For each LED : $I_F = 20\text{mA}$, $V_F = 3.2\text{V}$ (Typ.), $T_a = 25^\circ\text{C}$.

Note2: The “LED life time” is defined as the module brightness decrease to 50% of original brightness at $I_{LED} = 20\text{mA}$ (Per Led). The LED life time could be decreased if operating I_{LED} is larger than 20mA.



5.3 Power On/Off Sequence



Do not keep the interface signal high-impedance or unusual signal when power is on.

Symbol	Min	Max	Unit	Note
t1	0.5	10	ms	
t2	0	200	ms	
t3	0	100	ms	
t4	-	-	ms	

t5	-	-	ms	
t6	-	-	ms	
t7	0	50	ms	
t8	-	-	ms	
t9	-	-	ms	

t10	0	500	ms	
t11	1	50	ms	[Note 5-2-3]
t12	500	-	ms	
t13	-	-	ms	
t14	0.5	10	ms	
t15	100	-	ms	
t16	0	-	ms	
t17	0	-	ms	
t18	-	-	ms	
t19	-	-	ms	
t20	0.1	-	ms	
t21	100	-	ms	

As for the power off sequence for VDD (t11), be sure to keep above mentioned timing.
 If the VDD power off sequence timing is other than shown above, LCD may cause permanent damage.

*1 : As for the power sequence for backlight, it is recommended to apply above mentioned input timing.

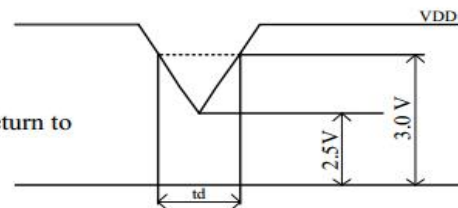
If the backlight is light on and off at a timing other than shown above, displaying image maybe get disturbed.

VDD-dip-conditions

- 1) $2.5\text{ V} \leq \text{VDD} < 3.0\text{ V}$
 $t_d \leq 10\text{ ms}$

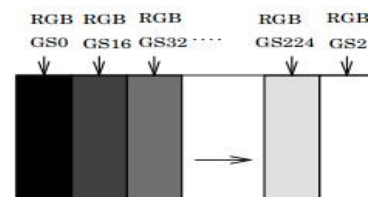
Under above condition, the display image should return to an appropriate figure after VDD voltage recovers.

- 2) $\text{VDD} < 2.5\text{ V}$
 VDD-dip conditions should also follow the ON-OFF conditions for supply voltage.

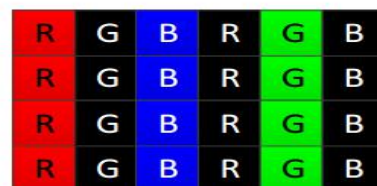


[Note 5-2-2]

Typical current condition: 16-gray-bar pattern.
 $\text{VDD} = +3.3\text{ V}$



Maximum current condition: Vertical stripe pattern.
 $\text{VDD} = +3.3\text{ V}$



5.4 Timing Characteristics

5.4.0 USB DC Characteristics

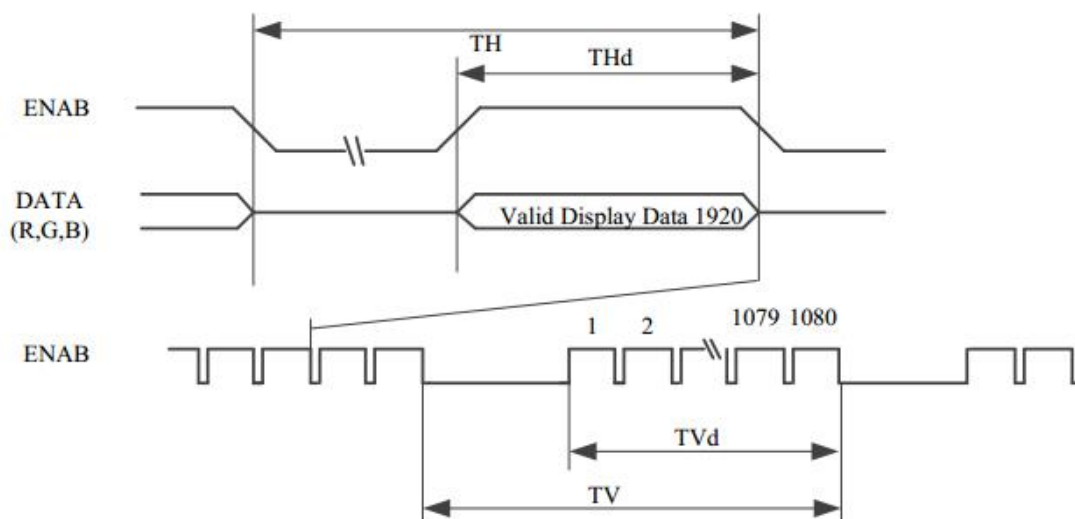
Item	Symbol	Min	Typ.	Max	Unit	Condition
Input Low	V_{IL}			0.8	V	
Input High (driven)	V_{IH}	2.0			V	
Differential input sensitivity	V_{DI}	0.2			V	(D+) – (D-)
Differential common-mode range	V_{CM}	0.8		2.5	V	Includes V_{DI} range
Single-ended receiver threshold	V_{SE}	0.8		2.0	V	
Receiver hysteresis	V_{RH}		200		mV	
Output low (driven)	V_{OL}	0		0.3	V	
Output high (driven)	V_{OH}	2.8		3.6	V	
Output signal cross voltage	V_{CRS}	1.3		2.0	V	
Pull-up resistor	R_{PU}	1.425		1.575	k Ω	
Pull-down resistor	R_{PD}	14.25		15.75	k Ω	
Termination Voltage for upstream port pull up (RPU)	V_{TRM}	3.0		3.6	V	

Item	Symbol	Min	Typ.	Max	Unit	Condition
Input clock frequency	f_{XIN}		12		MHz	External crystal

5.4.1 AC Characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	$1/T_C$	132.0	138.5	140.0	MHz	[Note 6-1-1]
Data enable signal	Horizontal period	TH	2020	2080	2400	clock	
				15.02		μs	
	Horizontal period (High)	THd	-	1920	-	clock	
	Vertical period	TV	1090	1111	1200	line	
			-	16.685	-	ms	
	Vertical period (High)	TVd	-	1080	-	line	

In case of using the long vertical period, the deterioration of display quality, flicker, etc may occur.



5.5 Timing Diagram

5.5.1 Horizontal & Vertical Timings



Display position of input data(V·H)

5.52 Input signal, basic display colors and gray scale of each color

Colors & Gray Scale		Gray Scale	Data signal																												
			R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7					
			LSB								MSB								LSB								MSB				
Basic Color	Black	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Blue	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1			
	Green	—	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0			
	Cyan	—	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
	Red	—	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Magenta	—	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1			
	Yellow	—	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0			
	White	—	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	⇅	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	⇅	↓	↓								↓								↓												
	⇅	↓	↓								↓								↓												
	Brighter	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	⇅	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Red	GS255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Gray Scale of Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	⇅	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	⇅	↓	↓								↓								↓												
	⇅	↓	↓								↓								↓												
	Brighter	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1			
	⇅	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1			
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1			

0: Low level voltage, 1: High level voltage.

Each basic color can be displayed in 256 gray scales from 8 bit data signals.

According to the combination of 24 bit data signals, the 16.7M color display can be achieved on the screen.

5.5.3 Timing Parameters

Parameter	Symbol	Value			Unit
		Min.	Typ.	MAX.	
Bit rate per lane	BRPHY	80	-	1000	Mbps
Active pixel per line	HACT	-	1920	-	Pixels
Horizontal back porch	tHBP	5	-	-	DCLK
Horizontal sync active	tHSA	5	-	-	DCLK
Horizontal front porch	tHFP	5	-	-	DCLK
Active pixel per frame	VACT	-	1080	-	H
Vertical back porch	tVBP	2	-	-	H
Vertical sync active	tVSA	2	-	-	H
Vertical front porch	tVFP	2	-	-	H

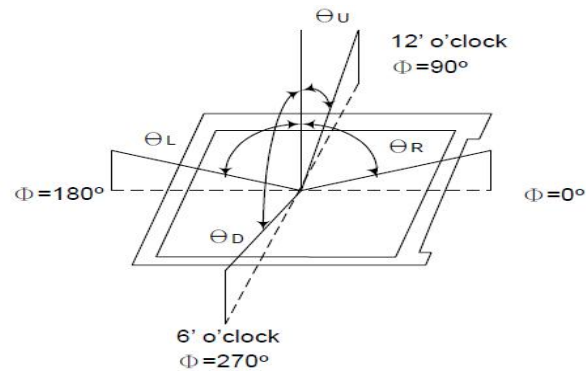
6. OPTICAL CHARACTERISTICS

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	$\theta = 0^\circ$	700	1000	-	-	Note(4)
NTSC Ratio	S	$\theta = 0^\circ$	-	72	-	%	Note(7)
Luminance	L	$\theta = 0^\circ$	-	220	-	cd/m ²	Note(5)
Luminance uniformity	U _W	$\theta = 0^\circ$	75	80	100	%	Note(3)
Response Time	T _R + T _F	25 °C	-	25	-	ms	Note(2)
Color Coordination	W _X	$\theta = 0^\circ$ (Center) Normal viewing angle B/L On	-0.03	0.313	+0.03	NTSC (x,y)	Note(6)
	W _Y			0.329			
	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	-	89	-	Degree	Note(1)
	θ_R		-	89	-		
	θ_U		-	89	-		
	θ_D		-	89	-		

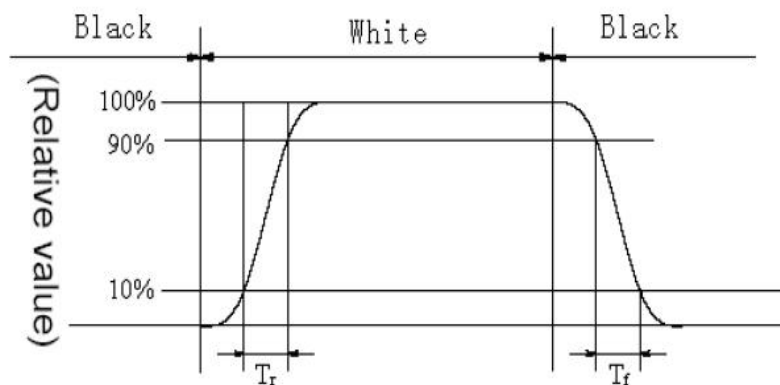
Test Conditions:

- VDD=1.8V, I_F=40mA (Backlight current), the ambient temperature is +25°C.
- The test systems refer to Note 8.

Note1: Definition of Viewing Angle: The viewing angle range that the CR>10

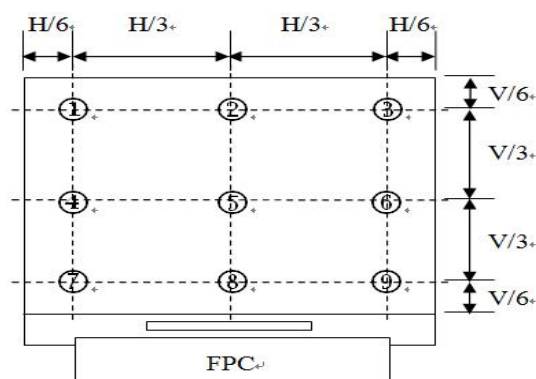


Note2: Definition of Response time: Sum of T_R and T_F



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

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

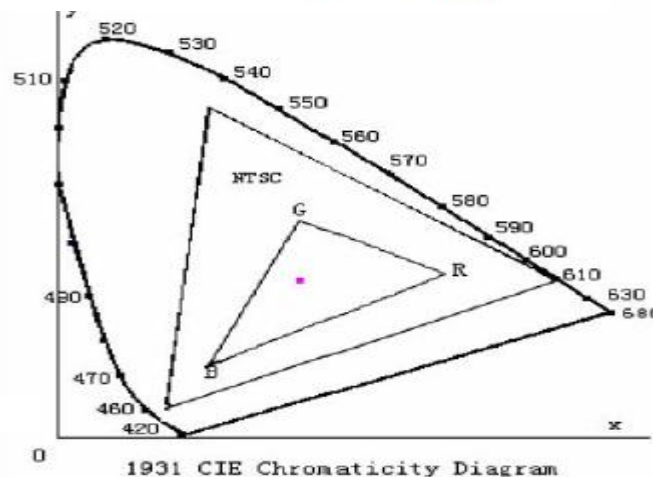
Note 5: Definition of Luminance: Center Luminance of white is defined as luminance values of 1 point average across the LCD surface.

Note 6: Definition of Color Chromaticity (CIE 1931)

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

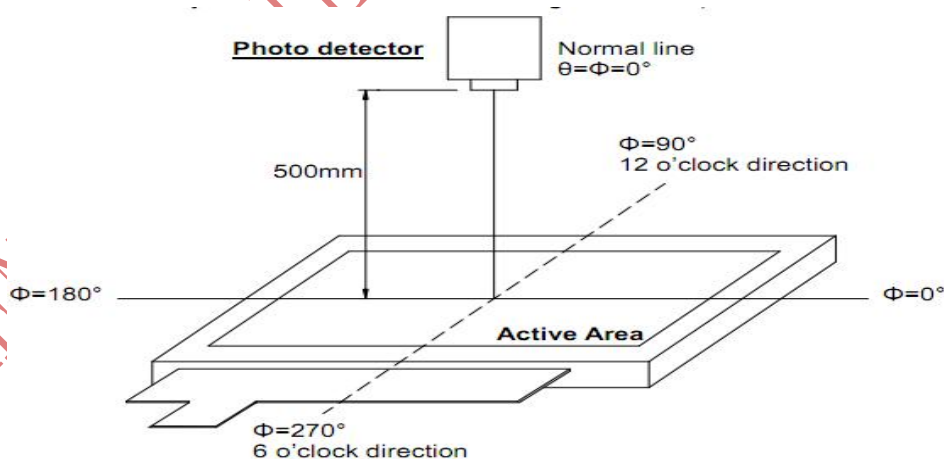
Note 7: Definition of NTSC ratio:

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



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 =+60°C / 96Hours	Note1,2,3
Low Temperature Storage	Ta =-20°C / 96Hours	Note1,2,3
High Temperature Operating	Ta =+50°C / 96Hours	Note1,2,3
Low Temperature Operating	Ta =0°C /96Hours	Note1,2,3
Temperature Cycle storage Test	-20°C/30min ↔+60°C /30min for 30cycles,Transfer time less than 5min	Note2,3
Thermal humidity storage Test	40°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
ESD test	Contact: ±4KV Air: ±8KV 150PF/330Ω,5Points/panel,5times	ESD

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

LCM产品(刀卡类)包装流程图

1. 0包装材料清单:

见受控BOM

2. 0包装方法说明:

