Product Specification Sheet

Customer: /

Model Name: **MNG007ZA1-2**

Date: **2023/04/10**

Version： **V06**

Customer's Approval		**CSOT**	
Signature	Date	Approved By	Date
		Reviewed By	Date
		Prepared By:	Date

Record of Revision

Version	Revise Date	Page	Content
V01	2022/07/05	All	Preliminary Specification
V02	2022/08/08	26~32	Update EDID data
V03	2022/10/12		Update the optical SPEC, SPEC of electrical part, add FID in EDID
V04	2022/10/21		Luminance elevate to 430nits,update the optical SPEC and Power Consumption
V05	2023/01/17		Update Luminance of White Max
V06	2023/04/10	2	Update Power consumption of Backlight
		12	Update Backlight Unit
		17	Update power sequence chart
		18	Update power sequence description
		19	Update Surface hardness
		30、34	Update EDID data

Contents

1. General Description

1.1 Overview

MNG007ZA1-2 is a 16” TFT Liquid Crystal Display Low blue light module with LED Backlight unit and 40 pins eDP 1.4 interface. This module supports 3200 x 2000 mode and can display 1073.7M colors.

1.2 Specifications Summary

No.	Item	Specification	Unit	Note
1	LCD size	16.0	inch	
2	Resolution	3200x RGB x 2000		
3	Pixel Arrangement	RGB		
4	Model Type	LCM		
5	TFT Technology	LTPS		
6	Display mode	FFS, Normally Black		
7	Active Area	344.6784 (H) × 215.424(V)	mm	
8	pixel pitch	107.71(H) ×107.71(V)	um	
9	Display Colors	1073.7M		@ 10bit
10	Contrast Ratio	1200:1(Typ)		
11	Color Gamut	DCI-P3 100% (typ) / 95% (min)		
12	LCM Outline Dimension	349.60×224.42×2.45	mm	Typical
13	Luminance	430(Typ)	nits	5 Points Average
14	Low blue light ratio	50	%	Max
15	Surface treatment(UP)	Anti-Glare	--	Pol.
16	Interface	eDP 1.4		
17	Refresh rate	60/165	Hz	
18	FEC function	support		
19	DSC function	support		
20	VRR function	support		
21	VESA adaptive Sync/ AMD FreeSync function	support		
22	DDS function	support		
23	Gsync function	support		
24	OD function	support		

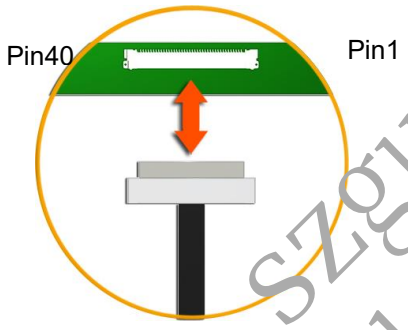
25	Method of Inversion	Column Inversion		
26	Power consumption of Panel	2.2(Max)	W	3.3V@Mosaic 165Hz
	Power consumption of Backlight	5.45	W	Max
27	Weight	320	g	Max

Note (1) The specified power consumption (with converter efficiency) is under the conditions at VCCS =3.3 V, LED_VCCS = Typ, fPWM = 200 Hz, Duty=100% and Ta = 25 ± 2 ºC, whereas mosaic pattern is displayed.

2. Mechanical Specifications

Parameter		Min.	Typ.	Max.	Unit	Note
Unit outline dimensions	Width	349.38	349.68	349.98	mm	
	Height	223.92	224.42	224.92	mm	
	Depth	2.3	2.45	2.6	mm	
Weight		-	-	320	g	

2.1 Interface Connection



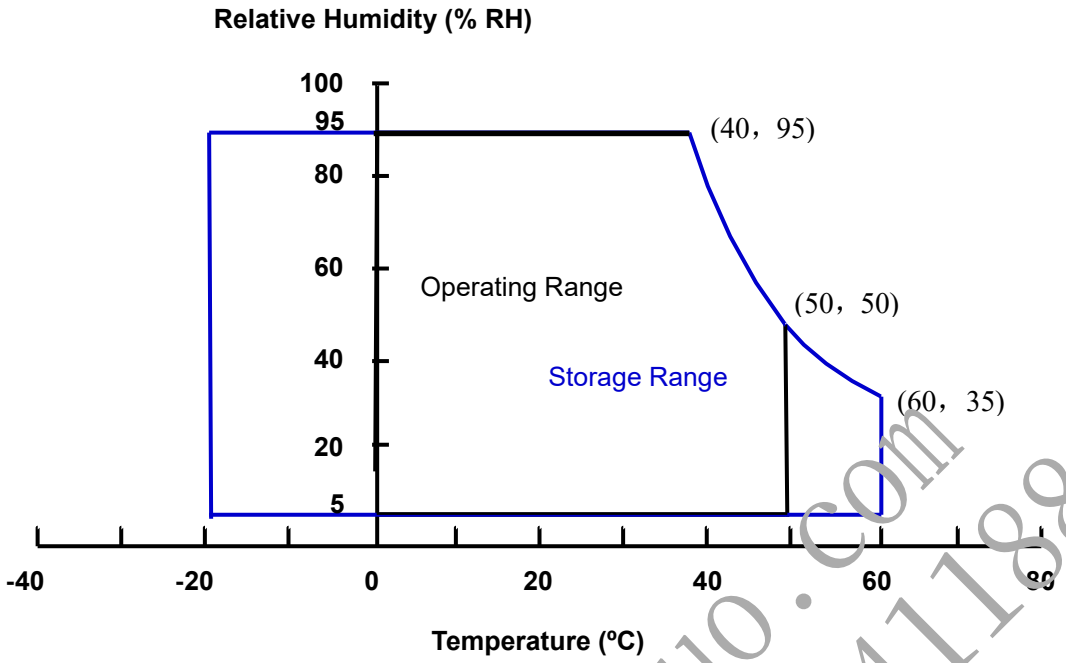
Please refer Appendix Outline Drawing for detail design.

Connector Part No.: IPEX-20455-040E or compatible

3. Absolute Maximum Ratings

3.1 Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)



Note (1)

(a) 95% RH Max. (Ta <= 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) The temperature of panel surface should be 0 ºC min. and 60 ºC max.

3.2 Electrical Absolute Ratings

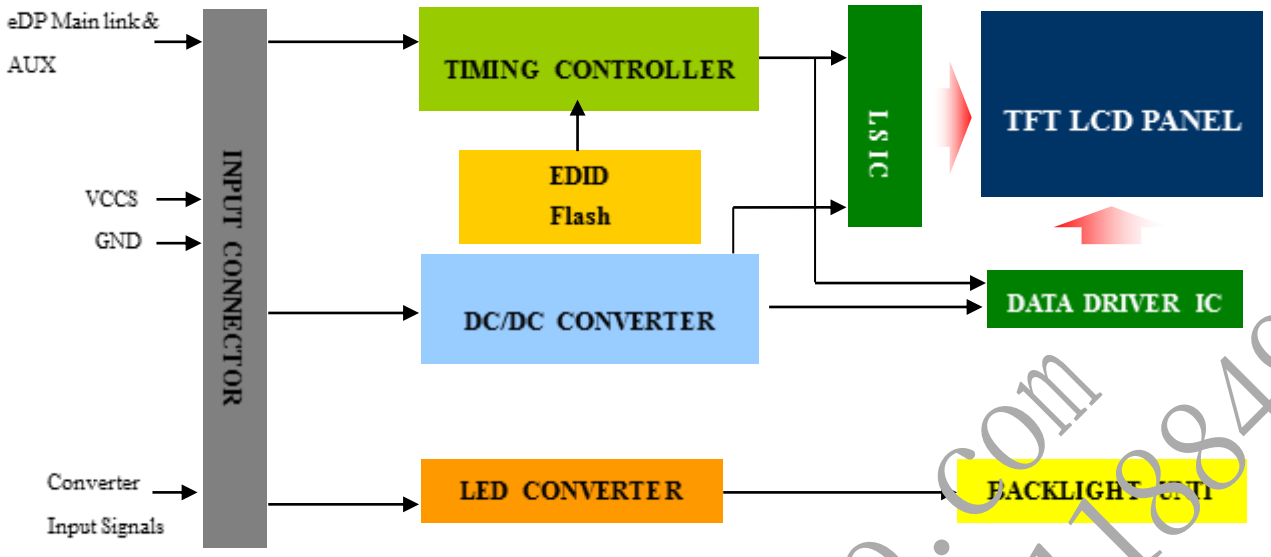
3.2.1 TFT LCD Module

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	+4	V	(1)
Logic Input Voltage	V_{IN}	-0.3	+3.6	V	
Converter Input Voltage	LED_VCCS	-0.3	26	V	(1)
Converter Control Signal Voltage	LED_PWM,	-0.3	+3.6	V	(1)
Converter Control Signal Voltage	LED_EN	-0.3	+3.6	V	(1)

Note (1) Stresses beyond those listed in above “ELECTRICAL ABSOLUTE RATINGS” may cause permanent damage to the device. Normal operation should be restricted to the conditions described in “ELECTRICAL CHARACTERISTICS”.

4. Electrical Specifications

4.1 Function Block Diagram



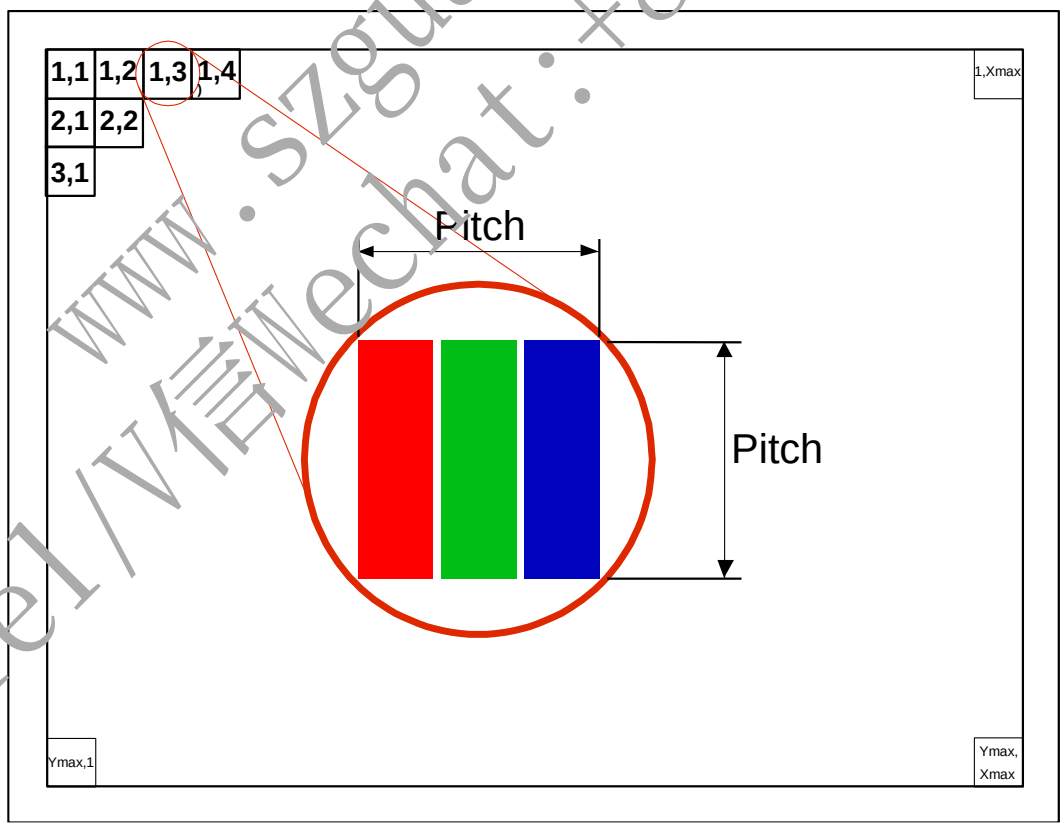
4.2 Interface Connections

PIN Assignment

Pin	Symbol	Description	Note
1	#01	I2C SCL	For DDS function
2	#02	H_GND	
3	#03	Lane3_N	
4	#04	Lane3_P	
5	#05	H_GND	
6	#06	Lane2_N	
7	#07	Lane2_P	
8	#08	H_GND	
9	#09	Lane1_N	
10	#10	Lane1_P	
11	#11	H_GND	
12	#12	Lane0_N	
13	#13	Lane0_P	
14	#14	H_GND	
15	#15	AUX_CH_P	
16	#16	AUX_CH_N	
17	#17	H_GND	
18	#18	LCD_VCC	
19	#19	LCD_VCC	
20	#20	LCD_VCC	

21	#21	LCD_VCC	
22	#22	LCD Self-Test	
23	#23	LCD_GND	
24	#24	LCD_GND	
25	#25	LCD_GND	
26	#26	LCD_GND	
27	#27	HPD	
28	#28	BL_GND	
29	#29	BL_GND	
30	#30	BL_GND	
31	#31	BL_GND	
32	#32	BL_Enable	
33	#33	BL_PWM_DIM	
34	#34	I2C_SDA	For DDS function
35	#35	NC	For CSOT use
36	#36	BL_PWR	
37	#37	BL_PWR	
38	#38	BL_PWR	
39	#39	BL_PWR	
40	#40	Over Drive enable Pull high(1): OD on; Pull low(0): OD off	Suggest to pull low at the system

Note (1) The pixel is shown in the following figure



4.3 Electrical Characteristics

4.3.1 LCD Electronics Specification

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		VCCS	3.0	3.3	3.6	V	(1)
BIST Control Level		BIST on	2.2	3.3	3.6	V	(1)
		BIST off	0	-	0.5	V	(1)
Ripple Voltage		V_{RP}	-	-	100	mV	(1)
Inrush Current		I_{RUSH}	-	-	1.5	A	(1),(2)
Power Supply Current	Mosaic	I_{LCD}	-	576	667	mA	(3)
Power consumption	Mosaic	P_{LCD}	-	1.9	2.2	W	(3)

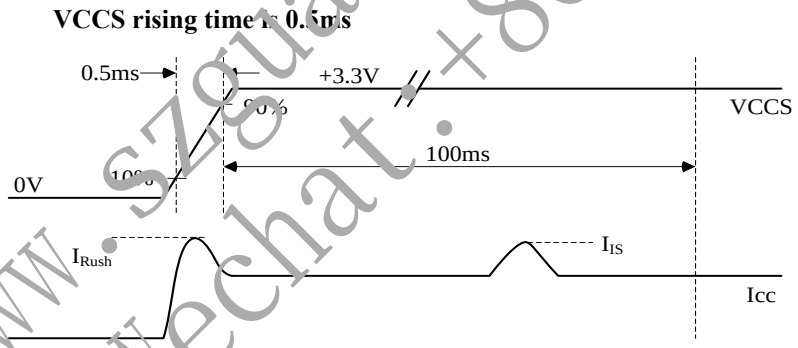
Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

Note (2) I_{RUSH}: the maximum current when VCCS is rising

I_{IS}: the maximum current of the first 100ms after power-on.

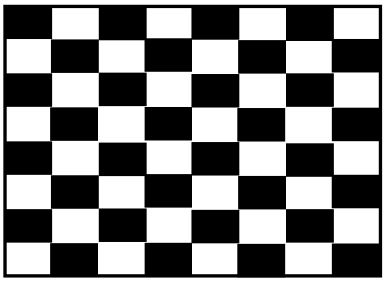
Measurement Conditions: Shown as the following figure.

Test pattern: Mosaic



Note (3) The specified power supply current is under the conditions at VCCS = 3.3 V, Ta = 25 ± 2 ºC, DC Current and f_v = 165 Hz, whereas a power dissipation check pattern below is displayed.

Mosaic Pattern



Active Area

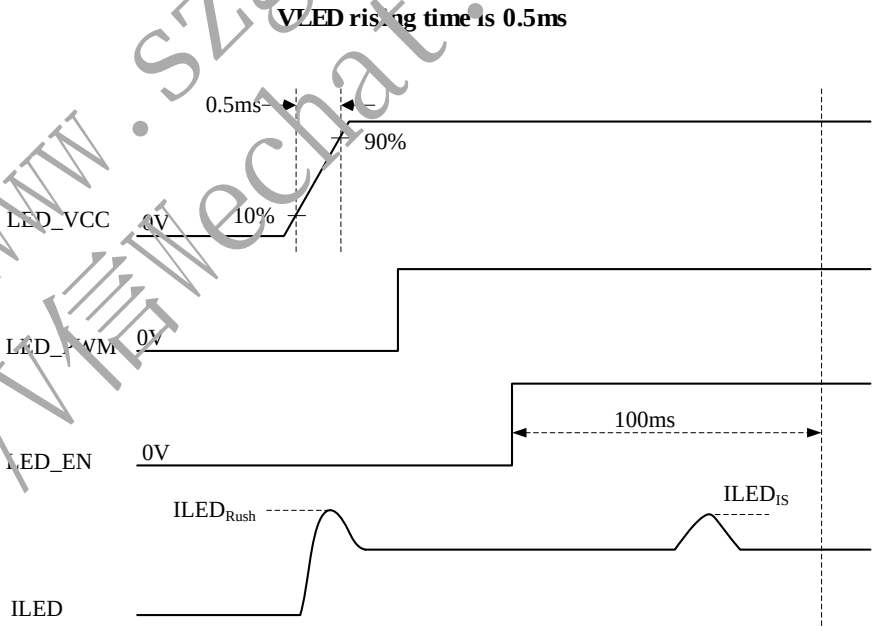
LED CONVERTER SPECIFICATION

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Input power supply voltage		LED_Vccs	5.0	12.0	21.0	V	
Converter Inrush Current		$ILED_{RUSH}$	-	-	1.5	A	(1)
EN Control Level	Backlight On		1.5	-	3.6	V	
	Backlight Off		0	-	0.5	V	
PWM Control Level	PWM High Level		1.5	-	3.6	V	
	PWM Low Level		0	-	0.5	V	
PWM Control Duty Ratio			1	-	100	%	
PWM Control Permissive Ripple Voltage		VPWM_pp	-	-	100	mV	
PWM Control Frequency		f_{PWM}	200	-	2000	Hz	
LED Power consumption		P_L	-	-	5.45	W	(2)
LED Power Current	LED_VCCS =Typ.		-	-	446	mA	(3)

Note (1) $ILED_{RUSH}$: the maximum current when LED_VCCS is rising

$ILED_{IS}$: the maximum current of the first 100ms after power on

Measurement Conditions: Shown as the following figure. LED_VCCS = Typ, Ta = 25 ± 2 ºC, f_{PWM} = 200 Hz, Duty=100%.

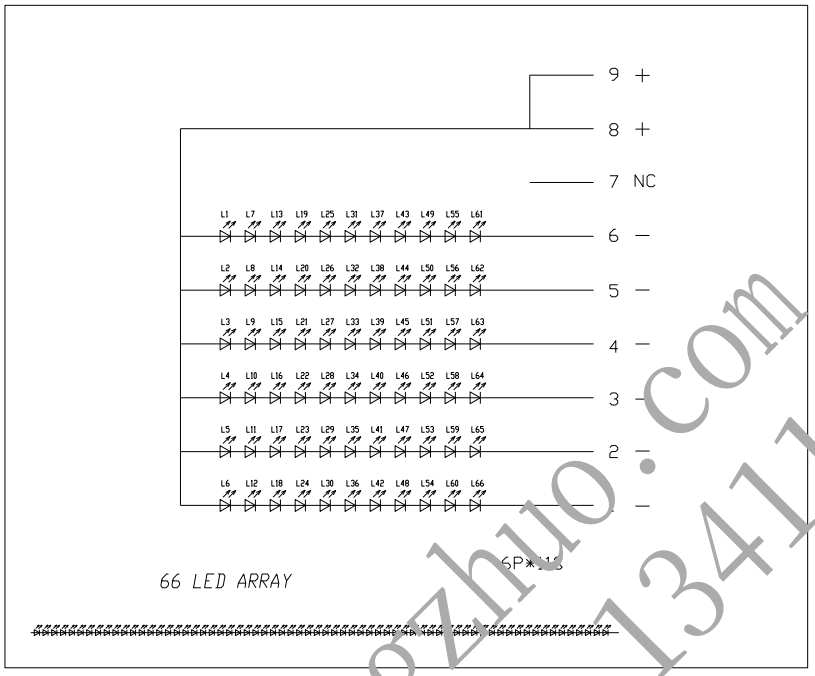


Note(2) $P_L = I_L \times V_L$ (With LED converter transfer efficiency);

Note (3) The specified LED power supply current is under the conditions at “LED_VCCS = Typ.”, Ta = 25 ± 2 ºC, fPWM

= 200 Hz, Duty=100%.

4.3.2 Backlight Unit



Ta = 25 ± 2 ºC

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Power Supply Voltage	VL	-	-	32.23	V	(1)(2) (Duty100%)
LED Light Bar Power Supply Current	IL	-	146.4	-	mA	
Power Consumption	PL	-	-	4.72	W	(3)
LED Life Time	L_{BL}	15000	-	-	Hrs	(4)

Note (1) LED current is measured by utilizing a high frequency current meter :

Note (2) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light-bar.

Note (3) $P_L = I_L \times V_L$ (Without LED converter transfer efficiency)

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 °C and I_L = 24.4 mA(Per EA) until the brightness becomes ≦ 50% of its original value.

4.4 Input Signal Timing Specification

4.4.1 eDP AUX Channel Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Unit Interval for AUX channel	UI_{AUX}	0.4	-	0.6	μS	
Peak-to-peak voltage at TP1	$V_{AUX-DIFF-pp}$	0.18	0.2	1.38	V	
AUX DC Common mode Voltage	$V_{AUX-DC-CM}$	0	-	1.2	V	
AUX Short current limit	I_{AUX_SHORT}	-	-	90	mA	
AUX CH termination DC resistor	R_{AUX_TERM}	80	100	120	Ω	Differential input
AUX AC coupling capacitor	C_{AUX}	75	-	200	nF	
Number of pre-charge pulses	Pre-charge pulses	10	-	16		

4.4.2 eDP Main Link Receiver Characteristics

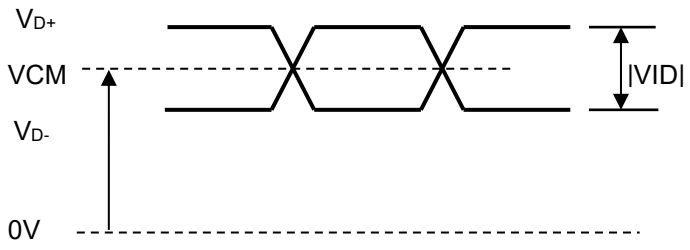
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Link clock down spreading	Down_Spread_Amplitude	0		0.5	%	
Differential Peak-to-peak Input Voltage at Rx package pins	$V_{RX-DIFFp-p}$	100	-	1320	mV	
Differential termination resistance	$R_{RX-TERM}$	80	100	120	Ω	
RX short circuit Current Limit	$I_{RX-SHORT}$	-	-	50	mA	
Lane Intra-pair Skew at RX package pins	$T_{RX-SKEW-INTRA-PAIR-High-Bit-Rate}$	-	-	50	ps	

4.4.3 eDP AUX Channel Characteristics

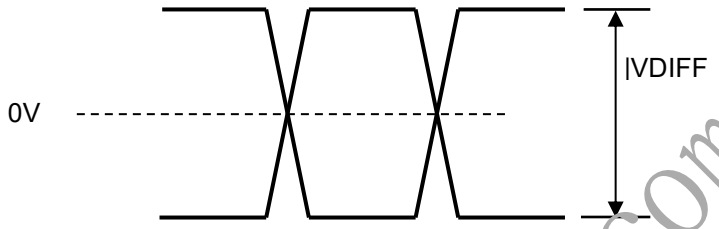
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Hot plug Detect	VHPD	2.5	-	2.8	V	

Note (1) Display port interface related AC coupled signals are following VESA Display Port Standard V1.4b.

Single Ended



Differential



4.4.4 Color Data Input Assignment

The brightness of each primary color (red, green and blue) based on the 8-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																													
		Red										Green										Blue									
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	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	0	0	0	0
	Red	1	1	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	0	0
	Green	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	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	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Cyan	0	0	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	1	1
	Magenta	1	1	1	1	1	1	1	1	1	1	0	0	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	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	1	1	1	1

	Red(0)/Dark	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	0	0	0	0
	Red(1)	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	0	0	0	0
Gray	Red(2)	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	0	0	0	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Of	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
Red	Red(1021)	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1022)	1	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	0	0	0
	Red(1023)	1	1	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	0	0
	Green(0)/Dark	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	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Gray	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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Green	Green(1021)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
	Green(1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	Green(1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Blue(0)/Dark	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	0	0	0	0
	Blue(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	0	0	0	0	1
Gray	Blue(2)	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	0	0	1	0
Scale	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
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Blue	Blue(1021)	0	0	0	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	0	1
	Blue(1022)	0	0	0	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	0
	Blue(1023)	0	0	0	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	1

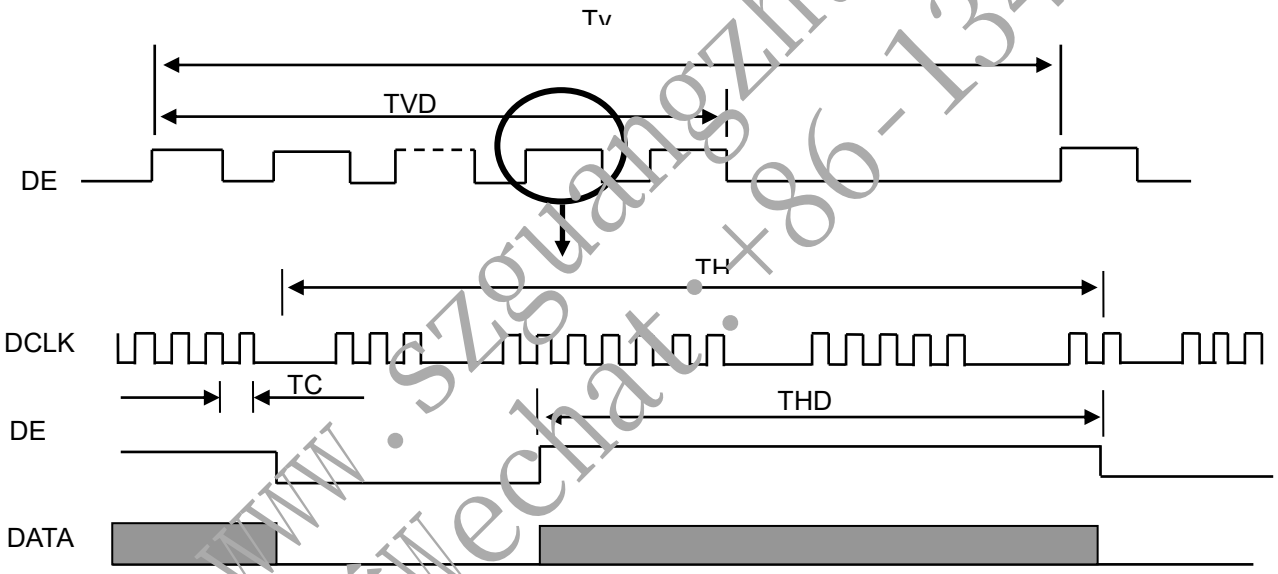
Note (1) 0: Low Level Voltage, 1: High Level Voltage

4.5 Display Timing Specifications

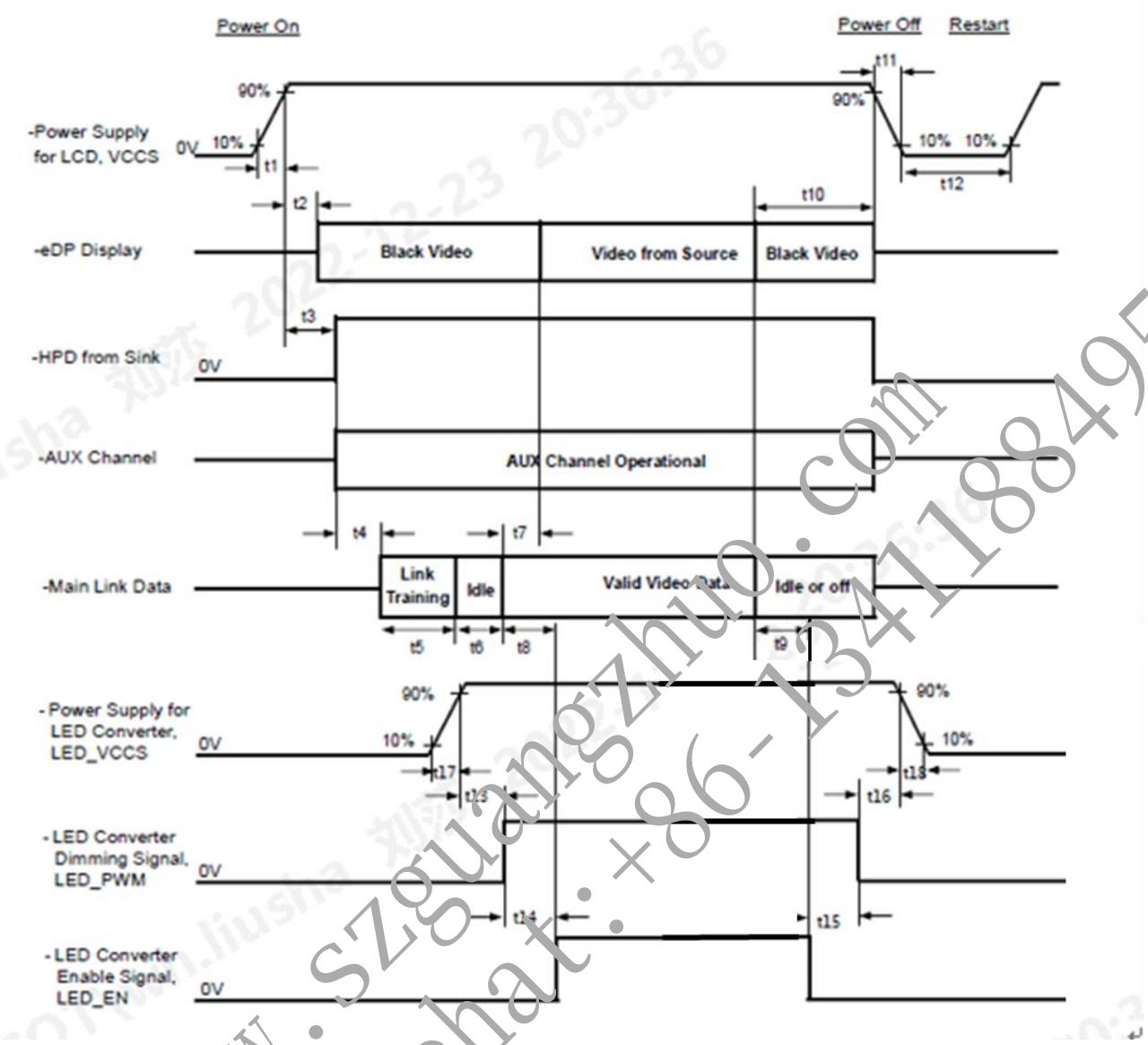
The input signal timing specification is showed as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	1/Tc		1201.94		MHz	-
DE	Vertical Total Time	TV	--	2168	--	TH	-
	Vertical Active Display Period	TVD		2000		TH	-
	Vertical Active Blanking Period	TVB	--	168	--	TH	-
	Horizontal Total Time	TH	--	3360	--	Tc	-
	Horizontal Active Display Period	THD		3200		Tc	-
	Horizontal Active Blanking Period	THB	--	160	--	Tc	-

Note (1) Display timing signal should be contained and transferred by Display Port Main Link stream data packing described in VESA Display Port Standard V1.4b.



4.6 Power ON/OFF Sequence



Symbol	Description	Min	Typ.	Max	Unit	Note
t1	Power rail rise time, 10% to 90%	0.5		10	ms	
t2	Delay from LCD,VCCS to eDP Display	0		80	ms	
t3	Delay from LCD,VCCS to HPD high	0		80	ms	
t4	Delay from Sink AUX to link training initialization	-		-	ms	
t5	Link training duration	-		-	ms	
t6	Link idle	-		-	ms	
t7	Delay from valid video data from Source to video on display	0		50	ms	

t8	Delay from valid video data from Source to backlight on	-		-	ms	
t9	Delay from backlight off to end of valid video data	0		T10-50	ms	
t10	Delay from end of valid video data from Source to power off	50		500	ms	
t11	VCCS power rail fall time, 90% to 10%	1		10	ms	(1)
t12	VCCS Power off time	500		-	ms	
t13	Delay from VCC to PWM	0		-	ms	
t14	Delay from PWM to LED ENABLE	0		-	ms	
t15	Delay from LED ENABLE to PWM Disable	0			ms	
t16	Delay from PWM Disable to VBL 90%	0		-	ms	
t17	Delay from VBL 10% to VBL 90%	0		-	ms	
t18	VBL power rail fall time, 90% to 10%	0		-	ms	

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might abnormal display or be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. When the interface signal is invalid, be sure to pull down the power supply of LCD VCCS to 0 V.

Note (3) The backlight must be turned on after the power supply for the logic and the interface signal is valid. The backlight must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Please follow the LED backlight power sequence as above. If the customer could not follow, it might cause backlight flash issue during display ON/OFF or damage the LED backlight controller

5. Optical characteristics

Ta=25°C

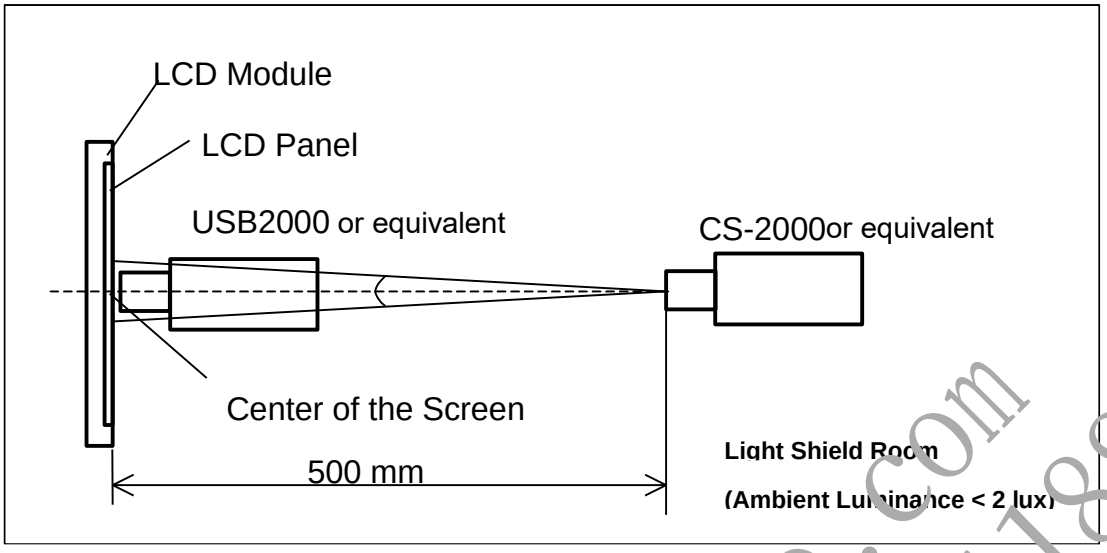
	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing angle range	Left/Rig	CR＞10	-	89	-	Deg.	(1), (3), (4), (6)
	Upper/L		-	89	-		
	Left/Rig	CR＞100	-	80	-	Deg.	
	Upper/L		-	80	-	Deg.	
Contrast ratio	CR		1000	1200	-	-	(2), (4), (6)
Response time	GTG wi		-	3	4	ms	(5)
	GTG wo		-	5	6	ms	
	Tr+Tf		-	9	-	ms	
Chromaticity of white	x			0.313		-	(2), (6) Normal operation
	y			0.329		-	
Chromaticity of red	x			0.680		-	
	y			0.320		-	
Chromaticity of green	x			0.265		-	
	y			0.690		-	
Chromaticity of blue	x			0.150		-	
	y			0.060		-	
		θ=0 deg.	Typ. -0.025		Typ. +0.025		
CCT	K		5500	-	7000	--	
Gamut	%		95%	100%		DCI-P3	
Luminance of White	Y_{LI}		366	430	495	cd/m^2	(7)
Half brigthness viewing	--	-	-	20/20	-	[deg]	(3)
Half brigthness viewing	-	-	-	20/20	-	[deg]	(3)
gamma	-	-	2.0	2.2	2.4	-	-
Surface hardness	[H]	-	3	-	-	H	-
White uniformity 5pt	δW	θ =0 deg.	80	-	-	%	(8)
White uniformity 13pt	δW	θ =0 deg.	60	-	-	%	(2), (8)
Low blue light ratio	%	(415nm~455nm)/ (400nm~500nm)	-	-	50	%	-
Reflection ratio	%	-	-	-	6.5	%	-

※The measurement shall be taken 5 minutes after lighting the LCM at the following rating.

※The optical characteristics shall be measured in a dark room or equivalent.

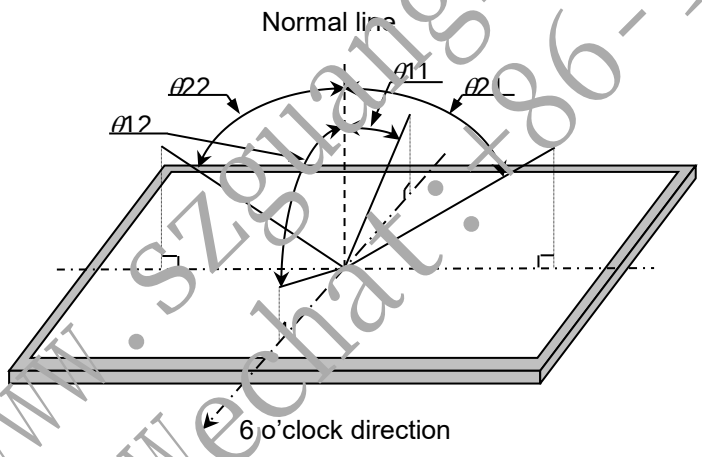
Note (1) Measurement of viewing angle range

Note (2) Measurement of luminance and Chromaticity and Contrast.



Measurement of Contrast, Luminance, Chromaticity, White variation, Crosstalk and Color temperature variation

Note (3) Definitions of viewing angle range:

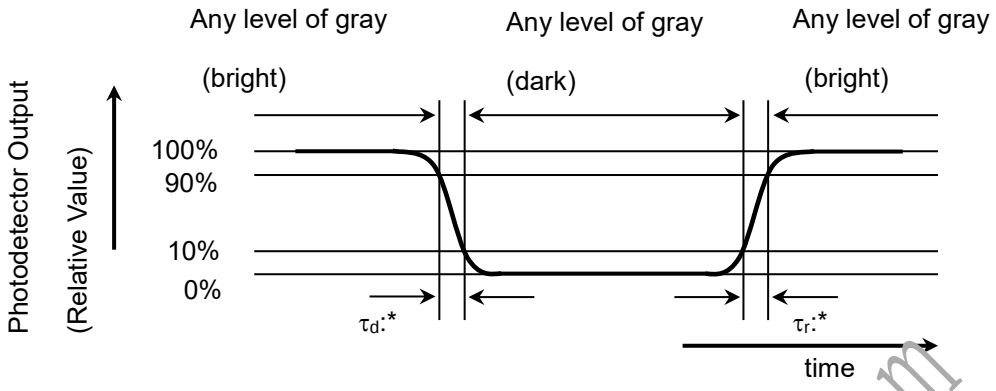


Viewing angle

Note (4) Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio} = \frac{\text{Luminance(Brightness) with all pixels white}}{\text{Luminance(Brightness) with all pixels Black}}$$



		Start Gray								
		0	31	63	95	127	159	191	223	255
End Gray	0	■								
	31		■							
	63			■						
	95				■					
	127					■				
	159						■			
	191							■		
	223								■	
	255									■

Response time

Note (5) Definition of response time:

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white" ,

$$GTG\ ave = \frac{t_{0-31} + t_{31-0} + t_{0-63} + t_{63-0} + \cdots + t_{223-255} + t_{255-223}}{8 * 9}$$

Note (6) This shall be measured at center of the screen.

Note (7) The Luminance of White is the average of 5 points measurements (4,5,7,9,10) showing in the Fig.9-5.

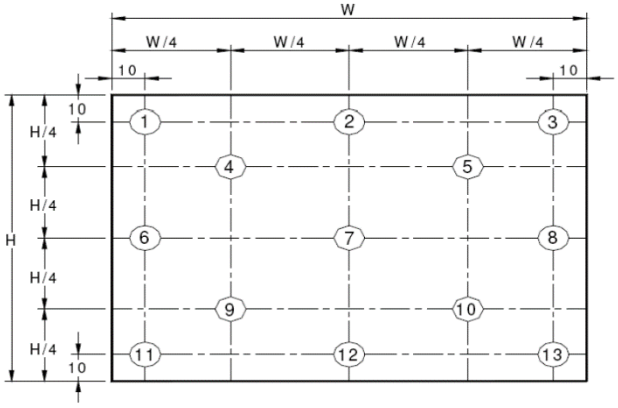


Fig.9-5

Note (8) Definition of white uniformity:

White uniformity of 5 points is defined as the

following with 5 measurements(4,5,7,9,10).

$$\delta_{W1} = \frac{\text{Maximum Luminance of 5 Points(Brightness)}}{\text{Minimum Luminance of 5 Points(Brightness)}}$$

White uniformity of 13 points is defined as the following with 13 measurements(1~13).

$$\delta_{W2} = \frac{\text{Maximum Luminance of 13 Points(Brightness)}}{\text{Minimum Luminance of 13 Points(Brightness)}}$$

6. Reliability Test Items

No.	Test Item	Conditions
1	High temperature storage test	60℃，240h Power off
2	Low temperature storage test	-20℃，240h Power off
3	Low temperature operation test	0℃，500h
4	High temperature & high humidity operation test	50℃，80% RH，1000hrs±48hrs
5	Thermal shock test	-20℃/30min、60℃/30min 100cycles Power off
6	TC	-10±2℃/18minutes±5%、30±2℃/18minutes±5%　100cycles Power off
7	Altitude test （Alt）	53.3±5% kPa (altitude 5000m)，24±2 hours
8	ON/OFF Test （On/Off）	Room temperature　(25±3℃), 500 hours (30sec. On / 30sec. Off, 30,000 cycles)；
9	Life Test （Life）	Room temperature （25±3℃），2000hrs±72hrs；
10	ESD	150pF[330Ω],Contact:±8KV, Air:±15KV
11	Vibration	1.5G，10->200Hz，For x,，y，z axis，30min for each axis　Power off
12	shock	50G 18msec. trapezoidal (2) 210G 3msec. half-sine 1 for each ± x, y, z direction, total 6 times for (1),(2)　Power off
13	IS	Temp. Room temp.(25±3℃) Test pattern. Black window pattern (background L32 white) and Full-screen L32 white Brightness　AC Mode, max. brightness

		Room ambient 0 - 500 lux Viewing distance 30 - 50cm Viewing angle 0 degree 1-0. Display attached the pattern 2-1. Check image sticking every 5 minutes up to 30 minutes by using 64 gray scale patterns from Gray0-Gray63 under 30 seconds. 2-2. Check image sticking at 30min, 2hr, 4hr by using 64 gray scale patterns from Gray0-Gray63 under 30 seconds. 2-3. Check image sticking at 10hr by using gray scale patterns with Gray0, and Gray40-Gray63 under 30seconds.

7. Display Quality

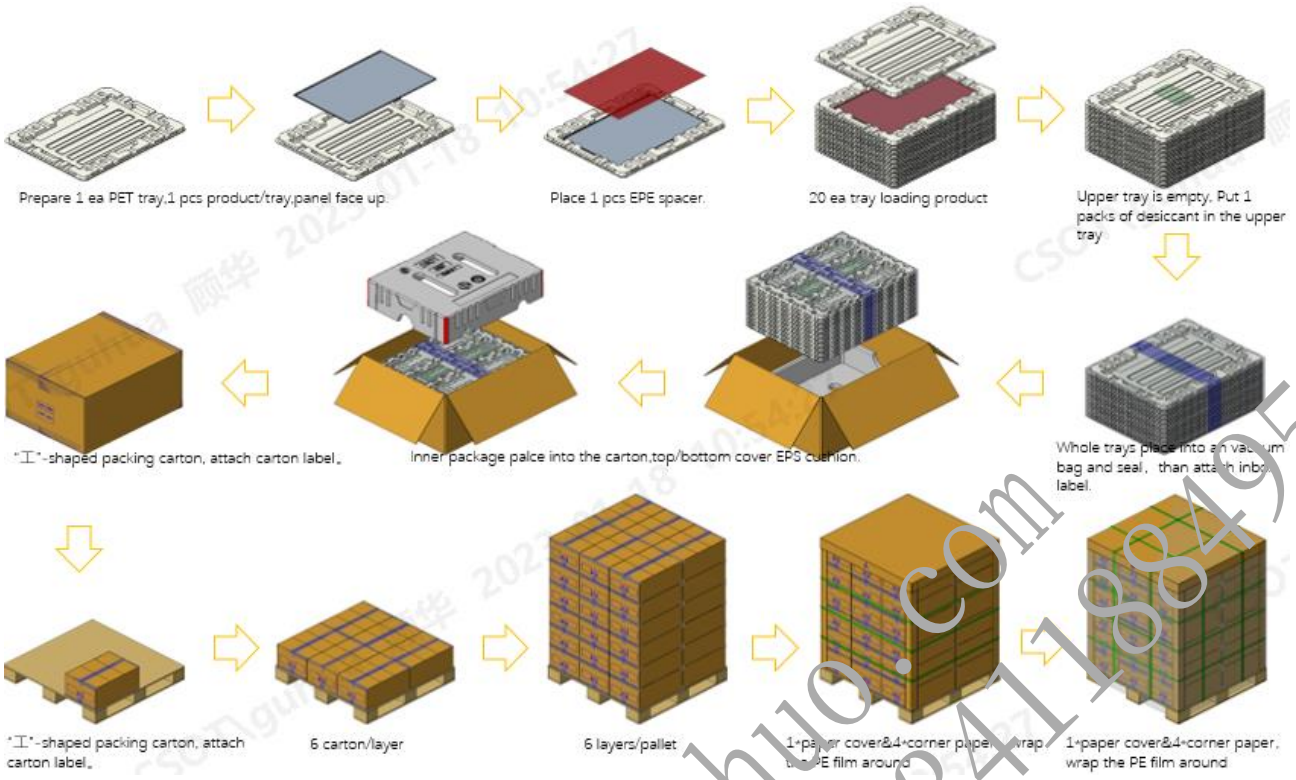
The display quality of the color TFT-LCD Module shall be in compliance with the Incoming Inspection Standard.

8. Packaging Condition

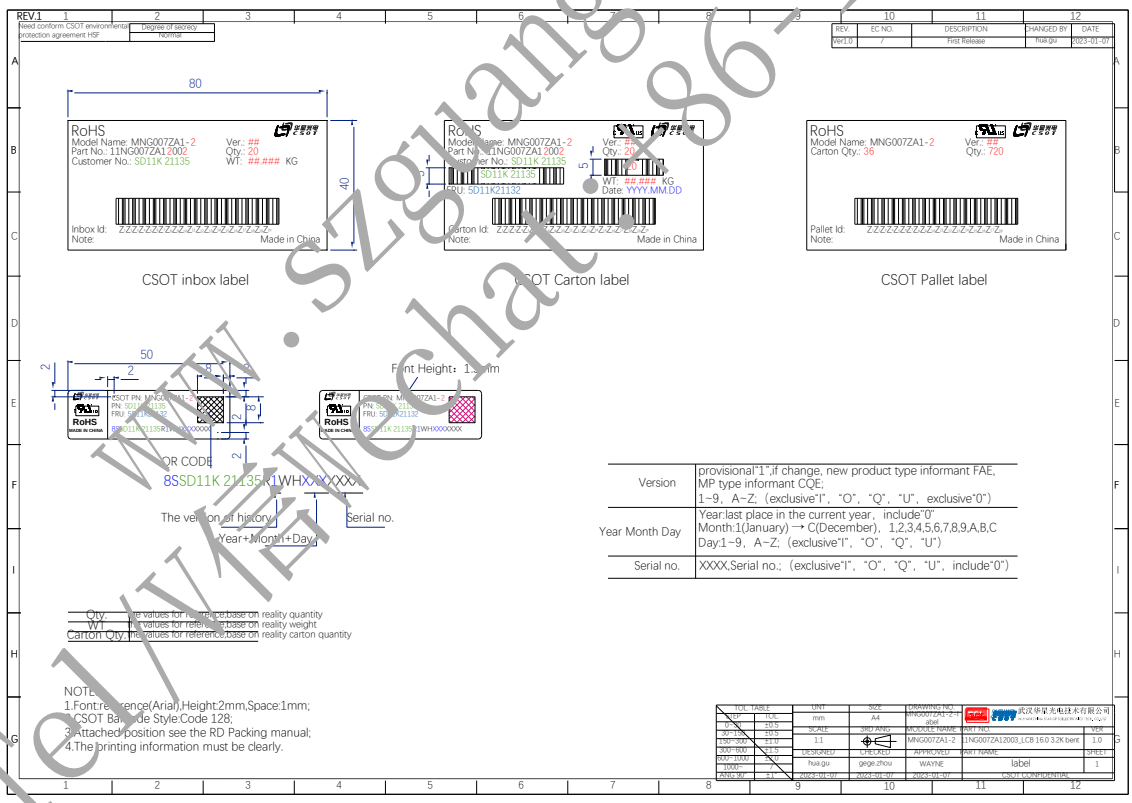
8.1 Packing Specification

Item	Specification	Remark
Carton(Box) Packing	20 PCS/Carton (Box)	
Carton(Box) Packing Size	465mm(L)x375mm(W)x220mm(H)	Length x With x Height
Pallet Packing	36 Carton(Box)/Pallet	
Pallet Packing Size	1140mm(L) x 945mm(W) x 1450mm(H)	Length x With x Height

8.2 Packing Method



8.3 Label



9. RoHS Directive

This LCD Module is compliant with RoHS Directive.

10. Handling Precautions

a) Be sure to turn off the power supply when inserting or disconnecting the cable .Please insert for too much stress not to join a connector in the case of insertion of a connector.

b) Be sure to design the cabinet so that the Module can be installed without any extra stress such as warp or twist.

c) Since the front polarizer is easily damaged, pay attention not to scratch it.

d) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.

g) Since CMOS LSI is used in this Module, take care of static electricity and injure the human earth when handling. Observe all other precautionary requirements in handling components.

h) This Open-cell has its circuitry PCBs on the side and should be handled carefully in order not to be stressed.

i) Laminate film is attached to the Module surface to prevent it from being scratched. Peel the laminate film off slowly just before the use with strict attention to electrostatic charges. Ionized air shall be blown over during the action. Blow off the 'dust' on the polarizer by using an ionized nitrogen gun, etc. Working under the following environments is desirable.

   - All workers wear conductive shoes, conductive clothes, conductive fingerstalls and grounding belts without fail.
   - Use Ionized blower for electrostatic removal, and peel of the laminate film with a constant speed. (Peeling of it at over 2 seconds)

j) The polarizer surface on the panel is treated with Anti Glare . In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.

k) Do not expose the LCD Module to a direct sunlight, for a long period of time to protect the Module from the ultra violet ray.

l) When handling LCD Modules and assembling them into cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the Modules.

m) Liquid crystal contained in the panel may leak if the LCD is broken. Rinse it as soon as possible if it gets inside your eye or mouth by mistake.

n) Disassembling the Module can cause permanent damage and should be strictly avoided.(Except for protection film of the panel.)

o) Be careful when using it for long time with fixed pattern display as it may cause afterimage.(Please use a screen saver etc., in order to avoid an afterimage.)

p) If a minute particle enters in the Module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.

q) Epoxy resin (amine series curing agent), silicone adhesive material (dealcoholization series and oxime series), tray forming agent (azo compound) etc, in the cabinet or the packing materials may induce abnormal display with polarizer film deterioration regardless of contact or noncontact to polarizer film.Be sure to confirm the component of them.

r) Do not use polychloroprene. If you use it, there is some possibility of generating Cl2 gas that influences the reliability of the connection between LCD panel and driver IC.

s) Do not put a laminate film on LCD Module, after peeling of the original one. If you put on it, it may cause discoloration or spots because of the occurrence of air gaps between the polarizer and the film.

t) Ground module bezel to stabilize against EMI and external noise.

Appendix. EDID Data Structure

EDID Table Format					
Address (DEC)	Address (HEX)	Field Name & Comments	Set Value (HEX)	Set Value (BIN)	Set Value (DEC)
0	00	Header	00	00000000	0
1	01		FF	11111111	255
2	02		FF	11111111	255
3	03		FF	11111111	255
4	04		FF	11111111	255
5	05		FF	11111111	255
6	06		FF	11111111	255
7	07		00	00000000	0
8	08	ID Manufacturer Name	0E	00001110	14
9	09		6F	01101111	111
10	0A	ID Product Code	26	00100110	38
11	0B		16	00010110	22
12	0C	32-bit serial No.	02	00000010	2
13	0D		60	01100000	96

14	0E		00	00000000	0
15	0F		00	00000000	0
16	10	Week of manufacture	00	00000000	0
17	11	Year of Manufacture	20	00100000	32
18	12	EDID Structure Ver.	01	00000001	1
19	13	EDID revision #	04	00000100	4
20	14	Video input definition	B5	10110101	181
21	15	Max H image size	22	00100010	34
22	16	Max V image size	16	00010110	22
23	17	Display Gamma	78	01111000	120
24	18	Feature support	03	00000011	3
25	19	Red/Green low bits	81	10000001	129
26	1A	Blue/White low bits	D8	11011000	216
27	1B	Red x high bits	AD	10101101	173
28	1C	Red y high bits	51	01010001	81
29	1D	Green x high bits	44	01000100	68
30	1E	Green y high bits	AF	10101111	175
31	1F	Blue x high bits	23	00100011	35
32	20	Blue y high bits	0E	00001110	14
33	21	White x high bits	51	01010001	81
34	22	White y high bits	55	01010101	85
35	23	Established timing 1	00	00000000	0
36	24	Established timing 2	00	00000000	0
37	25	Established timing 3	00	00000000	0
38	26	Standard timing #1	01	00000001	1
39	27		01	00000001	1
40	28	Standard timing #2	01	00000001	1
41	29		01	00000001	1
42	2A	Standard timing #3	01	00000001	1
43	2B		01	00000001	1
44	2C	Standard timing #4	01	00000001	1

45	2D		01	00000001	1
46	2E	Standard timing #5	01	00000001	1
47	2F		01	00000001	1
48	30	Standard timing #6	01	00000001	1
49	31		01	00000001	1
50	32	Standard timing #7	01	00000001	1
51	33		01	00000001	1
52	34	Standard timing #8	01	00000001	1
53	35		01	00000001	1
54	36	Detailed timing/monitor descriptor #1	BB	10111011	187
55	37		AA	10101010	170
56	38		80	10000000	128
57	39		A0	10100000	160
58	3A		C0	11000000	192
59	3B		D0	11010000	208
60	3C		A8	10101000	168
61	3D		70	01110000	112
62	3E		30	00110000	48
63	3F		20	00100000	32
64	40		36	00110110	54
65	41		00	00000000	0
66	42		58	01011000	88
67	43		D7	11010111	215
68	44		10	00010000	16
69	45		00	00000000	0
70	46		00	00000000	0
71	47		18	00011000	24
72	48	Detailed timing/monitor descriptor #2	00	00000000	0
73	49		00	00000000	0
74	4A		00	00000000	0
75	4B		FD	11111101	253

76	4C		0C	00001100	12
77	4D		30	00110000	48
78	4E		A5	10100101	165
79	4F		67	01100111	103
80	50		67	01100111	103
81	51		78	01111000	120
82	52		01	00000001	1
83	53		0A	00001010	10
84	54		20	00100000	32
85	55		20	00100000	32
86	56		20	00100000	32
87	57		20	00100000	32
88	58		20	00100000	32
89	59		20	00100000	32
90	5A	Detailed timing/monitor descriptor #3	00	00000000	0
91	5B		00	00000000	0
92	5C		00	00000000	0
93	5D		FE	11111110	254
94	5E		00	00000000	0
95	5F		43	01000011	67
96	60		53	01010011	83
97	61		4F	01001111	79
98	62		54	01010100	84
99	63		20	00100000	32
100	64		54	01010100	84
101	65		33	00110011	51
102	66		0A	00001010	10
103	67		20	00100000	32
104	68		20	00100000	32
105	69		20	00100000	32
106	6A		20	00100000	32

107	6B		20	00100000	32
108	6C	Detailed timing/monitor descriptor #4	00	00000000	0
109	6D		00	00000000	0
110	6E		00	00000000	0
111	6F		FE	11111110	254
112	70		00	00000000	0
113	71		4D	01001101	77
114	72		4E	01001110	78
115	73		47	01000111	71
116	74		30	00110000	48
117	75		30	00110000	48
118	76		37	00110111	55
119	77		5A	01011010	90
120	78		41	01000001	65
121	79		31	00110001	49
122	7A		2D	00101101	45
123	7B		32	00110010	50
124	7C		0A	00001010	10
125	7D		20	00100000	32
126	7E	Extension flag	01	00000001	1
127	7F	Checksum	DF	11011111	223
128	80	EDID Extension Block Tag	70	01110000	112
129	81	Display ID version	12	00010010	18
130	82	section size	79	01111001	121
131	83	product Type identifier	00	00000000	0
132	84	extension count	00	00000000	0
133	85	block tag	03	00000011	3
134	86	block rev	01	00000001	1
135	87	Payload	14	00010100	20
136	88	pixel clock	82	10000010	130
137	89		D5	11010101	213

138	8A		01	00000001	1
139	8B	timing options	05	00000101	05
140	8C	H-Active	7F	01111111	127
141	8D		0C	00001100	12
142	8E	H-Blanking	9F	10011111	159
143	8F		00	00000000	0
144	90	H-offset	2F	00101111	47
145	91		00	00000000	0
146	92	H-sync pulse width	1F	00011111	31
147	93		00	00000000	0
148	94	V-Active	CF	11001111	207
149	95		07	00000111	7
150	96	V-Blanking	A7	10100111	167
151	97		00	00000000	0
152	98	V-offset	02	00000010	2
153	99		00	00000000	0
154	9A	V-sync pulse width	05	00000101	5
155	9B		00	00000000	0
156	9C		00	00000000	0
157	9D		00	00000000	0
158	9E		00	00000000	0
159	9F		00	00000000	0
160	A0		00	00000000	0
161	A1		00	00000000	0
162	A2		00	00000000	0
163	A3		00	00000000	0
164	A4		00	00000000	0
165	A5		00	00000000	0
166	A6		00	00000000	0
167	A7		00	00000000	0
168	A8		00	00000000	0

169	A9		00	00000000	0
170	AA		00	00000000	0
171	AB		00	00000000	0
172	AC		00	00000000	0
173	AD		00	00000000	0
174	AE		00	00000000	0
175	AF		00	00000000	0
176	B0		00	00000000	0
177	B1		00	00000000	0
178	B2		00	00000000	0
179	B3		00	00000000	0
180	B4		00	00000000	0
181	B5		00	00000000	0
182	B6		00	00000000	0
183	B7		00	00000000	0
184	B8		00	00000000	0
185	B9		00	00000000	0
186	BA		00	00000000	0
187	BB		00	00000000	0
188	BC		00	00000000	0
189	BD		00	00000000	0
190	BE		00	00000000	0
191	BF		00	00000000	0
192	C0		00	00000000	0
193	C1		00	00000000	0
194	C2		00	00000000	0
195	C3		00	00000000	0
196	C4		00	00000000	0
197	C5		00	00000000	0
198	C6		00	00000000	0
199	C7		00	00000000	0

200	C8		00	00000000	0
201	C9		00	00000000	0
202	CA		00	00000000	0
203	CB		00	00000000	0
204	CC		00	00000000	0
205	CD		00	00000000	0
206	CE		00	00000000	0
207	CF		00	00000000	0
208	D0		00	00000000	0
209	D1		00	00000000	0
210	D2		00	00000000	0
211	D3		00	00000000	0
212	D4		00	00000000	0
213	D5		00	00000000	0
214	D6		00	00000000	0
215	D7		00	00000000	0
216	D8		00	00000000	0
217	D9		00	00000000	0
218	DA		00	00000000	0
219	DB		00	00000000	0
220	DC		00	00000000	0
221	DD		00	00000000	0
222	DE		00	00000000	0
223	DF		00	00000000	0
224	E0		00	00000000	0
225	E1		00	00000000	0
226	E2		00	00000000	0
227	E3		00	00000000	0
228	E4		00	00000000	0
229	E5		00	00000000	0
230	E6		00	00000000	0

231	E7		00	00000000	0
232	E8		00	00000000	0
233	E9		00	00000000	0
234	EA		00	00000000	0
235	EB		00	00000000	0
236	EC		00	00000000	0
237	ED		00	00000000	0
238	EE		00	00000000	0
239	EF		00	00000000	0
240	F0		00	00000000	0
241	F1		00	00000000	0
242	F2		00	00000000	0
243	F3		00	00000000	0
244	F4		00	00000000	0
245	F5		00	00000000	0
246	F6		00	00000000	0
247	F7		00	00000000	0
248	F8		00	00000000	0
249	F9		00	00000000	0
250	FA		00	00000000	0
251	FB		00	00000000	0
252	FC		00	00000000	0
253	FD		00	00000000	0
254	FE	Checksum(81~FD)	04	00000100	04
255	FF	Checksum(80~FE)	90	10010000	144

Appendix. Outline Drawing