

Product Specification Sheet

Customer: _____

Model Name: SNF601BS1-1

Date: 2023/05/29

Version: V02

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

Record of Revision

Version	Revise Date	Page	Content
V01	2023.03.17	All	Preliminary Specification
V02	2023.05.29	P11	Change LED Power consumption and LED Power Current;
		P13	Change LED LED Light Bar Power Supply Current and LED Luminance;

Contents

1. GENERAL DESCRIPTION	5
1.1 OVERVIEW	5
1.2 SPECIFICATION SUMMARY.....	5
2. MECHANICAL SPECIFICATIONS	6
2.1 INTERFACE CONNECTION.....	6
3. ABSOLUTE MAXIMUM RATINGS	6
3.1 ABSOLUTE RATINGS OF ENVIRONMENT	6
3.2 ELECTRICAL ABSOLUTE RATINGS.....	7
3.2.1 TFT LCD MODULE	7
4. ELECTRICAL SPECIFICATIONS	8
4.1 FUNCTION BLOCK DIAGRAM.....	8
4.2 INTERFACE CONNECTIONS.....	8
4.3 ELECTRICAL CHARACTERISTICS	10
4.4 LCD ELETRONICS SPECIFICATION.....	10
4.4.1 RECOMMENDED BACKLIGHT UNIT.....	12
4.5 INPUT SIGNAL TIMING SPECIFICATIONS.....	12
4.5.1 eDP AUX Channel Characteristics.....	12
4.5.2 eDP Main Link Receiver Characteristics	13
4.5.3 eDP AUX Channel Characteristics.....	13
4.5.4 COLOR DATA INPUT ASSIGNMENT.....	14
4.6 DISPLAY TIMING SPECIFICATIONS	15
4.7 POWER ON/OFF SEQUENCE.....	17
5. OPTICAL CHARACTERISTICS	19
6. RELIABILITY TEST ITEMS.....	22
7. DISPLAY QUALITY.....	22
8. PACKAGING CONDITION.....	22
8.1 CARTON PACKING:	22

9. ROHS DIRECTIVE	23
10. HANDLING PRECAUTIONS	23
APPENDIX. EDID DATA STRUCTURE	25
APPENDIX. OUTLINE DRAWING	30

1. GENERAL DESCRIPTION

1.1 OVERVIEW

SNF601BS1-1 is a 15.6inch FHD TFT Liquid Crystal Display opencell without LED Backlight unit and 30 pins eDP interface. This module supports 1920×1080 FHD mode and can display 16.7M colors.

1.2 SPECIFICATION SUMMARY

i	Item	Specification	Unit	Note
1	LCD size	15.6	inch	
2	Resolution	1920 × RGB ×1080		
3	Pixel Arrangement	RGB		
4	Model Type	FOB		
5	TFT Technology	a-Si		
6	Display mode	FFS, Normally Black	--	
7	Active Area	344.16 (H)×193.59 (V)	mm	
8	pixel pitch	179.25(H)×179.25(V)	um	
9	Display Colors	16.7M(6bit+FRC)		
10	Contrast Ratio	1000:1(Typ) @CSOT BL		
11	Color Gamut	NTSC 45% (Typ)@CSOT BL		
12	Transmission	6.20%@CSOT BL	%	
13	Surface treatment(UP)	Anti-Glare	--	Pol.
14	Interface	eDP 1.2		2 lane@2.7G
15	HDR function	NA		-
16	Method of Inversion	2 dot inversion (dual gate)		
17	Power consumption of Panel	750(Max.)	mW	3.3V@Mosaic
18	Weight	175(Max)	g	

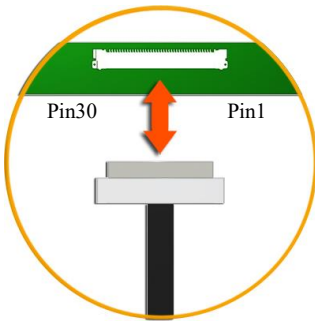
Note (1) The specified power consumption (with converter efficiency) is under the conditions at VCCS =3.3 V, fv = 60 Hz, LED_VCCS = 12V(Typ), fPWM = 200 Hz, Duty=100% and Ta = 25 ±2 ℃, whereas mosaic pattern is displayed.

Note(2)Contrast Ratio is in CSOT BLU and after CSOT AutoVcom.

2. MECHANICAL SPECIFICATIONS

Parameter		Min.	Typ.	Max.	Unit	Note
Unit outline dimensions	Width	348.61	348.76	348.91	mm	
	Height	200.74	200.89	201.04	mm	Without PCBA
	Depth	1.004	1.054	1.104	mm	Without PCBA
Weight		-	-	175	g	With PCBA

2.1 INTERFACE CONNECTION



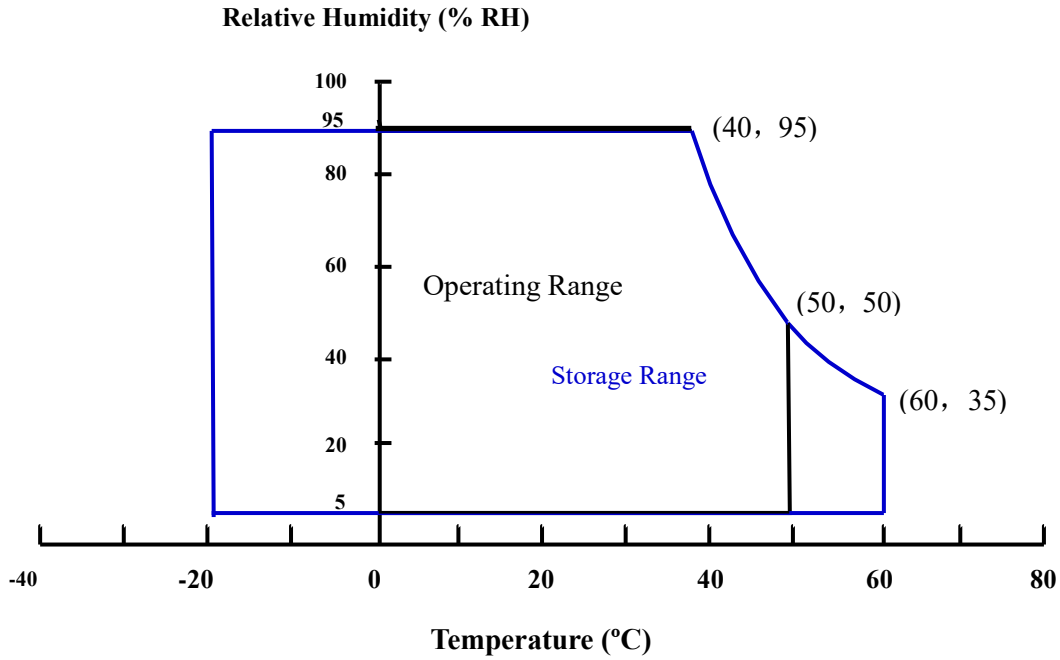
Please refer Appendix Outline Drawing for detail design.

Connector Part No.: 300E30-1010RC-G3(Starconn)

3. ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE RATINGS OF ENVIRONMENT

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



Note (1) (a) 95% RH Max. ($T_a \leq 40^\circ\text{C}$).

(b) Wet-bulb temperature should be 39°C Max. ($T_a > 40^\circ\text{C}$).

(c) No condensation.

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

3.2 ELECTRICAL ABSOLUTE RATINGS

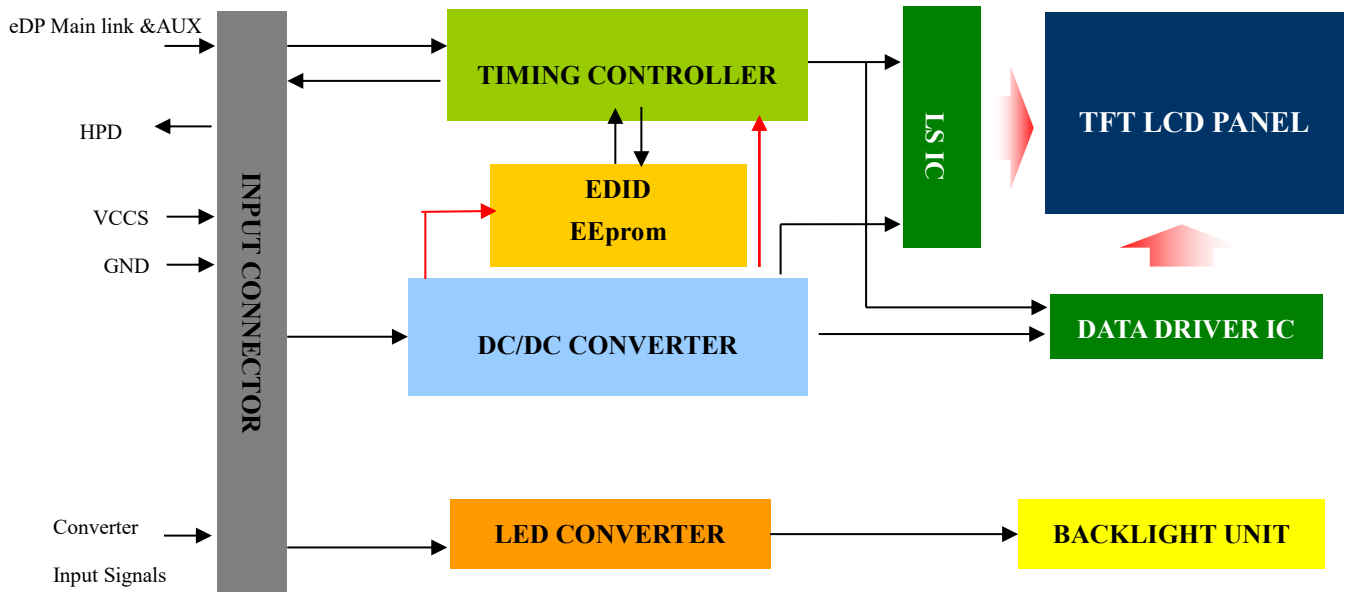
3.2.1 TFT LCD MODULE

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

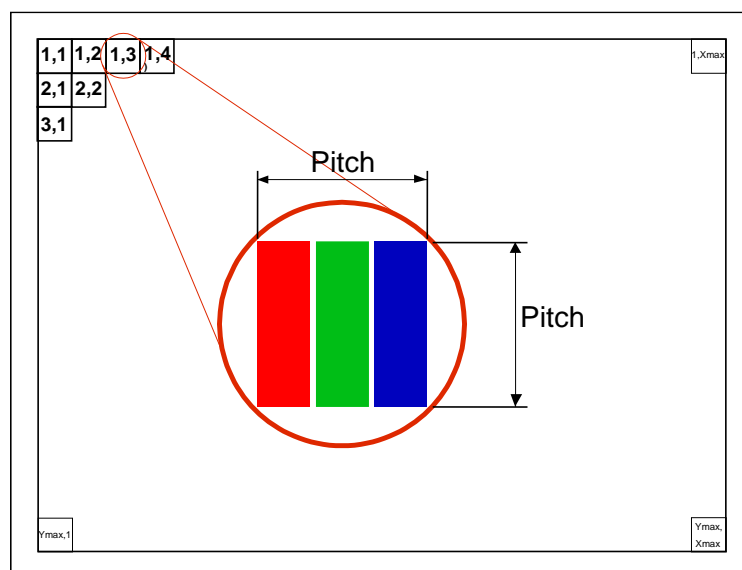
Pin	Symbol	Description	Note
1	NC	No Connection , Please let it open	(2)
2	H_GND	High Speed Ground	
3	ML1-	Complement Signal-Lane 1	
4	ML1+	True Signal-Main Lane 1	
5	H_GND	High Speed Ground	
6	ML0-	Complement Signal-Lane 0	
7	ML0+	True Signal-Main Lane 0	
8	H_GND	High Speed Ground	
9	AUX+	True Signal-Auxiliary Channel	
10	AUX-	Complement Signal-Auxiliary Channel	
11	H_GND	High Speed Ground	
12	VCCS	Power Supply +3.3V (typical)	
13	VCCS	Power Supply +3.3V (typical)	

版权属于广州华星光电技术有限公司所有。禁止任何未经授权的使用
The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.
Any unauthorized use is prohibited.

14	BIST	Built-In Self Test (active high)	
15	GND	Ground	
16	GND	Ground	
17	HPD	Hot Plug Detect	
18	BL_GND	BL Ground	
19	BL_GND	BL Ground	
20	BL_GND	BL Ground	
21	BL_GND	BL Ground	
22	LED_EN	BL_Enable Signal of LED Converter	
23	LED_PWM	PWM Dimming Control Signal of LED Converter	
24	NC	No Connection , Please let it open	(2)
25	NC	No Connection , Please let it open	(2)
26	LED_VCCS	LED Power Supply	
27	LED_VCCS	LED Power Supply	
28	LED_VCCS	LED Power Supply	
29	LED_VCCS	LED Power Supply	
30	NC	No Connection (Reserve)	

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

Note(2) This pin used for CSOT internally, please let it floating on customer side.



版权属于广州华星光电技术有限公司所有。禁止任何未经授权的使用

The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.

Any unauthorized use is prohibited.

4.3 ELECTRICAL CHARACTERISTICS

4.4 LCD ELETRONICS 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	-	-	180	228	mA	(3)

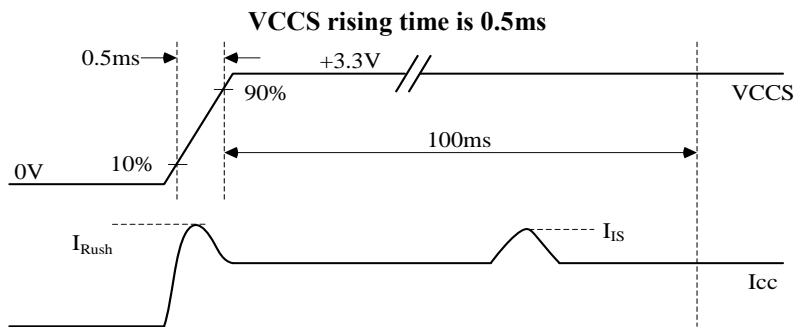
Note (1) The ambient temperature is $T_a = 25 \pm 2^\circ\text{C}$.

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

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

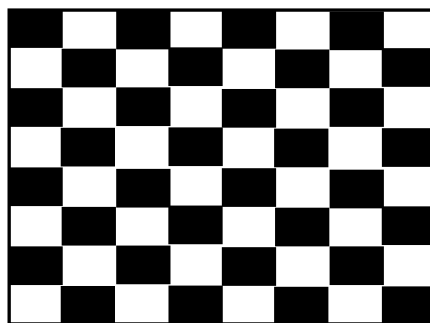
Measurement Conditions: Shown as the following figure.

Test pattern: Mosaic



Note (3) The specified power supply current is under the conditions at VCCS = 3.3 V, $T_a = 25 \pm 2^\circ\text{C}$, DC Current and $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

Mosaic Pattern



Active Area

版权属于广州华星光电技术有限公司所有。禁止任何未经授权的使用

The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.

Any unauthorized use is prohibited.

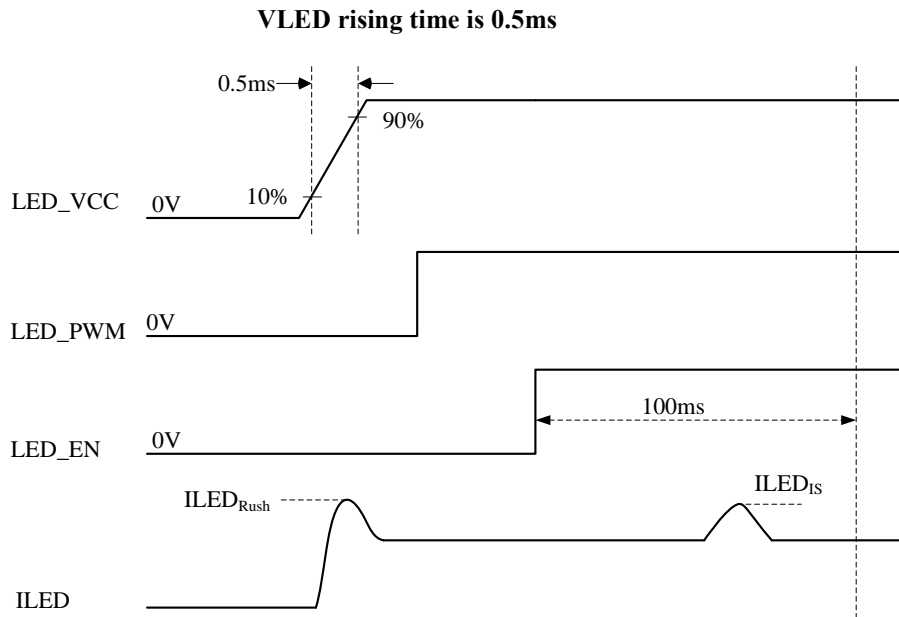
LED CONVERTER SPECIFICATION

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		I _{LED_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		V _{PWM_pp}	-	-	100	mV	
PWM Control Frequency		f _{PWM}	200	-	2000	Hz	
LED Power consumption		P _L	-	-	3.3	W	(2)
LED Power Current	LED_VCCS =Typ.	I _{LED}	-	270	315	mA	(3)

Note (1) I_{LED_RUSH}: the maximum current when LED_VCCS is rising,

I_{LED_IS}: the maximum current of the first 100ms after power-on,

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

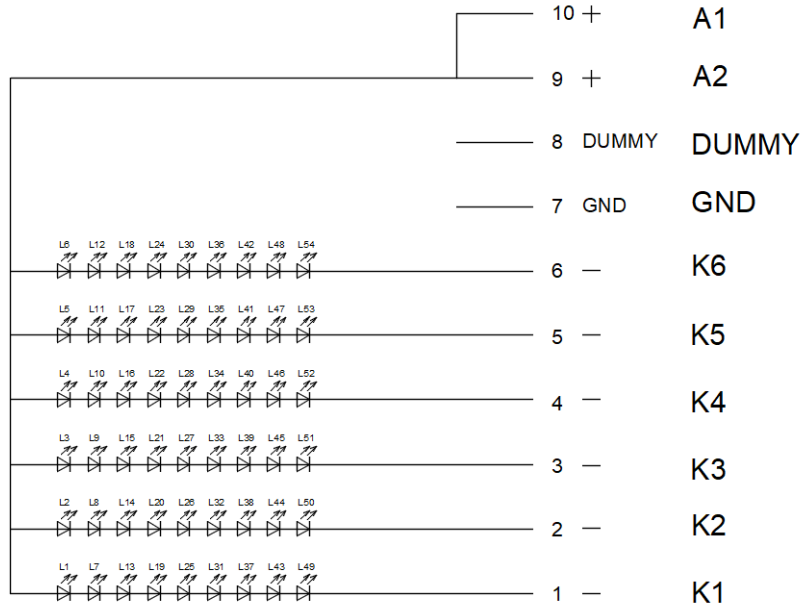


版权属于广州华星光电技术有限公司所有。禁止任何未经授权的使用
The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.
Any unauthorized use is prohibited.

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

Note (3) The specified LED power supply current is under the conditions at “LED_VCCS = Typ.”, $T_a = 25 \pm 2^\circ\text{C}$, fPWM = 200 Hz, Duty=100%,in CSOT BLU;

4.4.1 RECOMMENDED BACKLIGHT UNIT



$T_a = 25 \pm 2^\circ\text{C}$

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Power Supply Voltage	VL	-	-	26.1	V	(1)(2)(3)(4) (Duty100%)
LED Light Bar Power Supply Current	IL	-	109.2	-	mA	
LED Luminance	Y_{LI}	4950	5500		nit	

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) Recommended B/L :6S9P

Note(4)LED Luminance is in CSOT BLU, it's for customer reference only.

4.5 INPUT SIGNAL TIMING SPECIFICATIONS

4.5.1 eDP AUX Channel Characteristics

版权属于广州华星光电技术有限公司所有。禁止任何未经授权的使用
The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.
Any unauthorized use is prohibited.

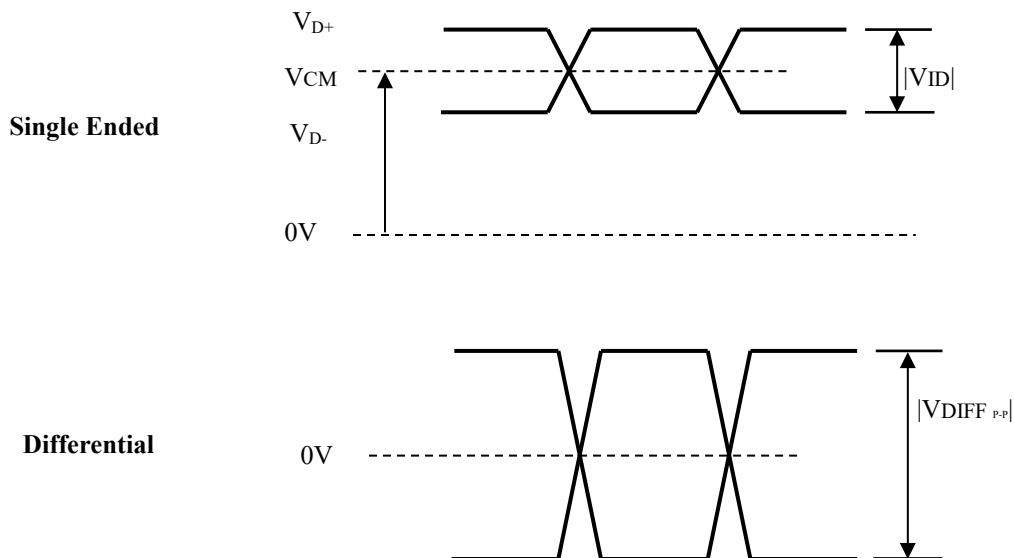
Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Unit Interval for AUX channel	UI_{AUX}	0.4	-	0.6	μS	
Peak-to-peak voltage at TP1	$V_{AUX-DIFF-pp}$	0.39	-	1.38	V	
AUX DC Common mode Voltage	$V_{AUX-DC-CM}$	0	-	2	V	
AUX Short current limit	I_{AUX_SHORT}	-	-	90	mA	
AUX CH termination DC resistor	R_{AUX_TERM}	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		

4.5.2 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	$V_{RX-DIFFp-p}$	120	-	1200	mV	
Differential termination resistance	$R_{RX-TERM}$	90	100	110	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	

4.5.3 eDP AUX Channel Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Hot plug Detect	V_{HPD}	2.25	-	3.6	V	



4.5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is 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							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	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
	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
	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
	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
	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
	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
	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
	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
Gray Scale Of Red	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
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	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(255)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Gray Scale Of Green	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
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0
Gray Scale Of Blue	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
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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

4.6 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	-	147.84	-	MHz	-
DE	Vertical Total Time	TV	-	1120	-	TH	-
	Vertical Active Display Period	TVD	1080	1080	1080	TH	-
	Vertical Active Blanking Period	TVB	-	40	-	TH	-
	Horizontal Total Time	TH	-	2200	-	Tc	-
	Horizontal Active Display Period	THD	1920	1920	1920	Tc	-
	Horizontal Active Blanking Period	THB	-	280	-	Tc	-

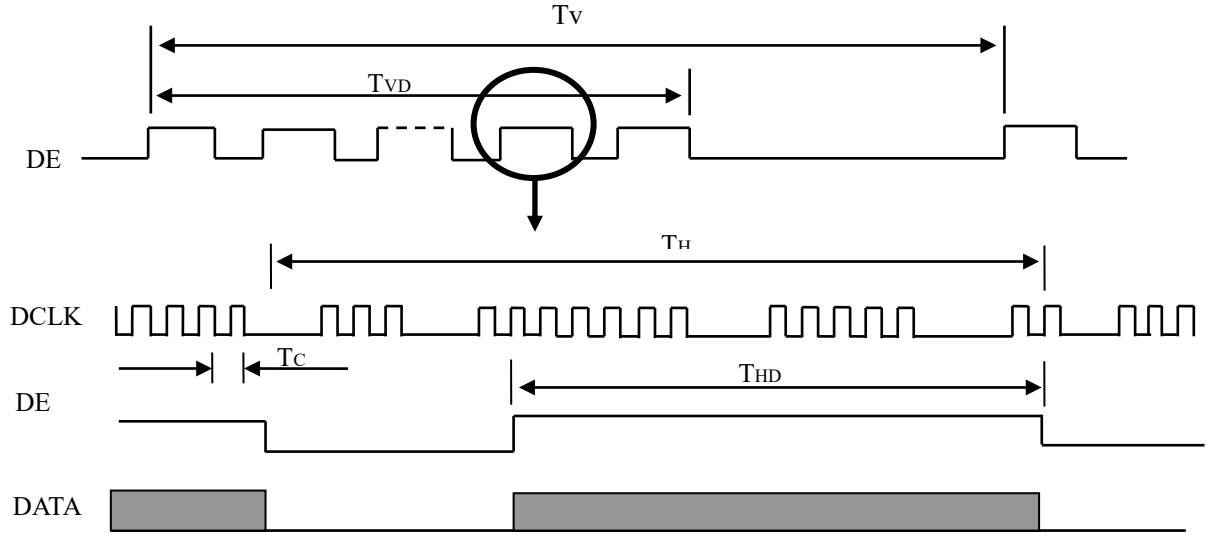
版权属于广州华星光电技术有限公司所有。禁止任何未经授权的使用

The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.

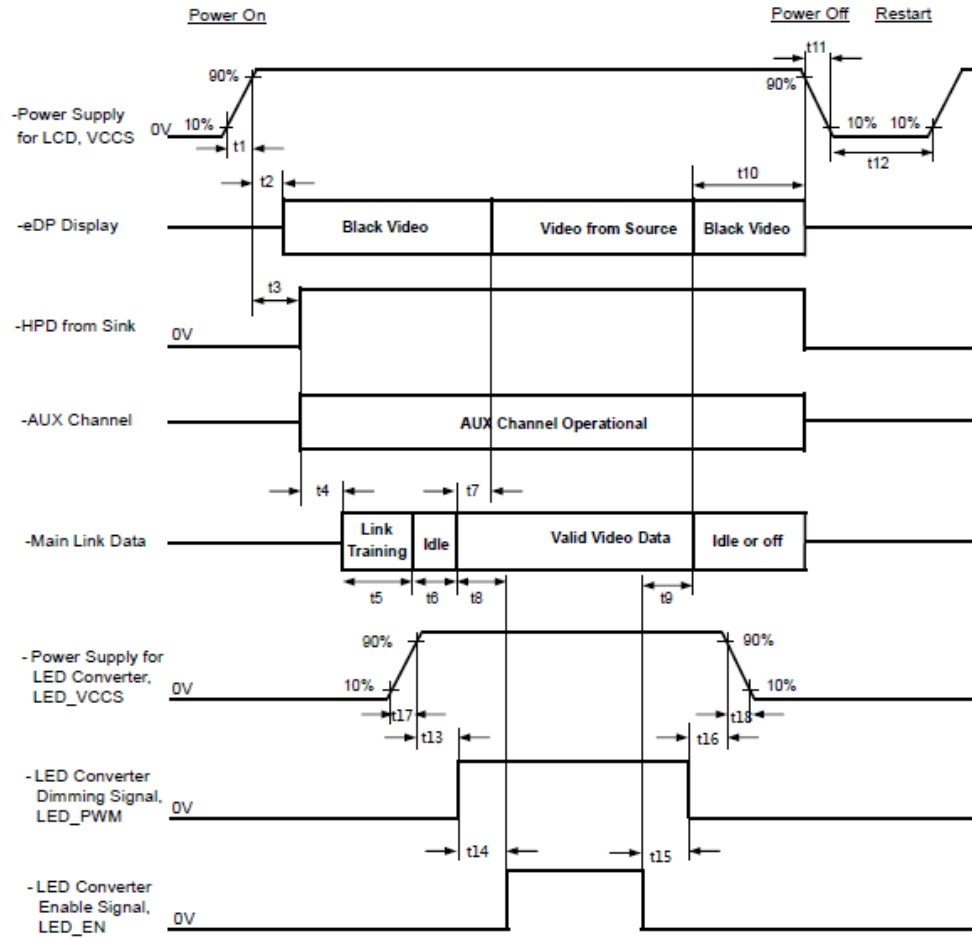
Any unauthorized use is prohibited.

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.

INPUT SIGNAL TIMING DIAGRAM



4.7 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		200	ms	
t3	Delay from LCD,VCCS to HPD high	0		200	ms	
t4	Delay from Sink AUX to link training initialization	-		-	ms	(5)
t5	Link training duration	-		-	ms	(5)
t6	Link idle	-		-	ms	(5)
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	50		-	ms	(5)
t9	Delay from backlight off to end of valid video data	0		-	ms	
t10	Delay from end of valid video data from Source to power off	0		500	ms	

版权属于广州华星光电技术有限公司所有。禁止任何未经授权的使用

The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.

Any unauthorized use is prohibited.

t11	VCCS power rail fall time, 90% to 10%	0.5		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%	0.5		-	ms	
t18	VBL power rail fall time, 90% to 10%	0.5		-	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

Note (5) $T4+T5+T6+T8 > 80\text{ms}$

5. Optical characteristics

Ta=25°C

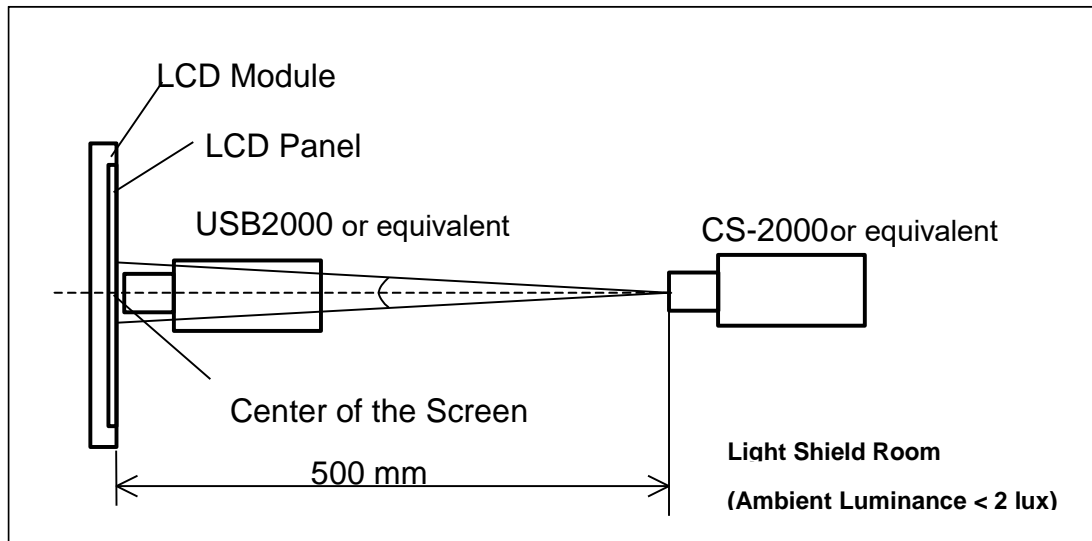
Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Viewing angle range	Horizontal	θ21	CR>10	85	89	-	Deg.	(1), (3), (4), (6)	
		θ22		85	89	-			
	Vertical	θ11		85	89	-	Deg.		
		θ12		85	89	-	Deg.		
Contrast ratio		CR	θ=0 deg.	800	1000		-	(2), (4), (6) @CSOT BL	
Response time		τ _r +τ _d		-	20	25	ms	(5)	
Chromaticity of white		x		Typ. -0.03	0.313	Typ. +0.03	-	(2), (6) Normal operation @CSOT BL	
		y					0.329		-
Chromaticity of red		x					0.584		-
		y					0.364		-
Chromaticity of green		x					0.347		-
		y					0.578		-
Chromaticity of blue		x					0.160		-
		y					0.118		-
Gamut		%		NTSC42%	NTSC45%		%		
Half brighness viewing angle (Left/Right)		--			20/20		[deg]	(3)1	
Half brighness viewing angle (Upper/Lower)					20/20		[deg]	(3)	
gamma		-		1.9	2.2	2.5			
Surface hardness		[H]			3		H		
White uniformity 5pt		δ _w	θ=0 deg.		-	125	%	(2), (8) @CSOT BL	
White uniformity 13pt		δ _w	θ=0 deg.		-	150	%	(2), (8) @CSOT BL	

※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, and CR need to do Auto Vcom.

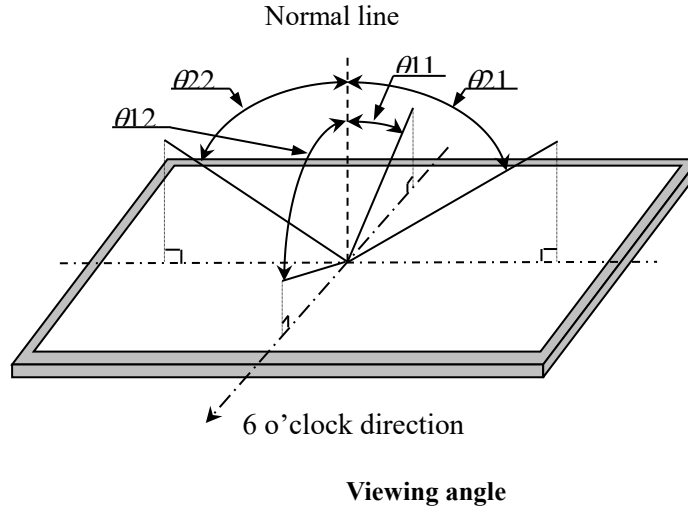
Note (1) Measurement of viewing angle range

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



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

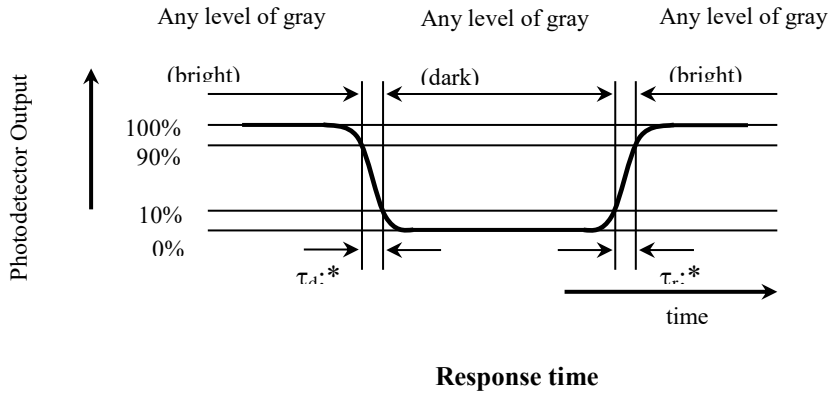
Note (3) Definitions of viewing angle range:



Note (4) Definition of contrast ratio:

The contrast ratio is defined as the following.

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



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" .

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.

Note (8) Definition of white uniformity:

White uniformity of 5 points is defined as the

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

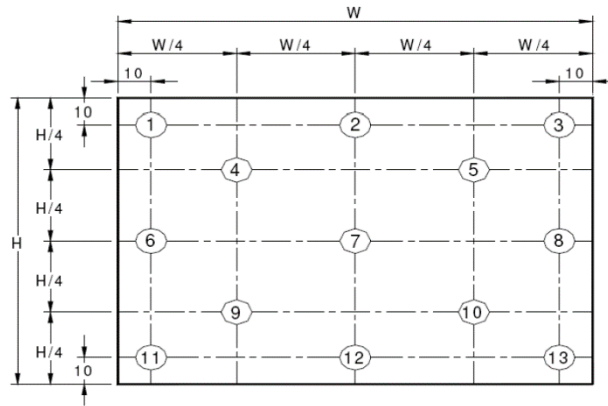


Fig.9-5

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

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	Low temperature storage test	-20±2℃, 240 hours
2	High temperature storage test	60±2℃, 240 hours
3	Low temperature operation test	0±2℃, 240 hours
4	High temperature operation test	50±2℃, 240 hours
5	High temperature & high humidity operation test	50℃±2℃/80±3%%RH, 240 hours
6	Thermal shock test	-20±2℃/30minutes±5%、60±2℃/30minutes±5% 100cycles
7	Packing Vibration	Temp. / Humi.: 25±5℃, 40%~70%RH; Module Operation: Packaged / Non-Operation; Test Type: Random 1.3Grms, 1~200Hz, 30mins / axis (X、Y、Z)
8	Packing Drop	Temp. / Humi.: 25±5℃, 40%~70%RH; Module Operation: Packaged / Non-Operation; Test Type: Drop Height 200 mm;

[Result Evaluation Criteria] Under the display quality test condition with normal operation state.

Do not change these condition as such changes may affect practical display function.

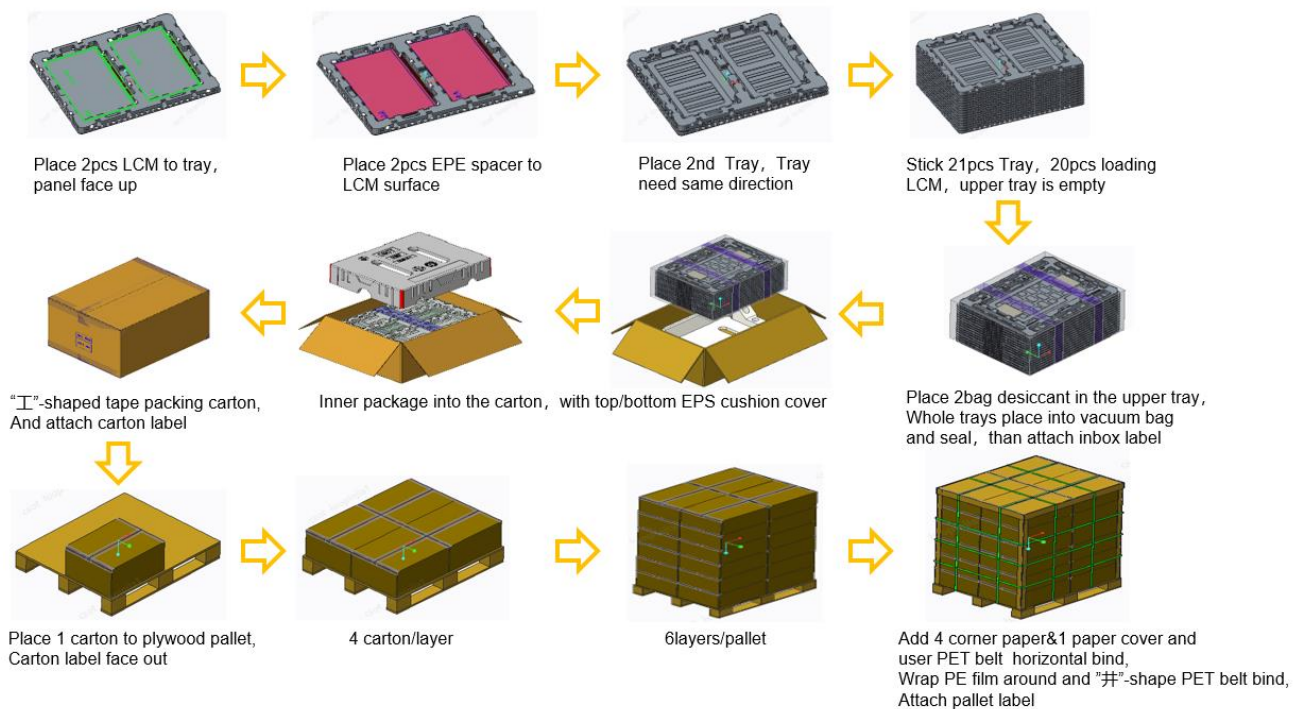
[Normal operation state] temperature : + 15℃~ + 35℃ · Humidity : 45~75% · Atmospheric pressure : 86~106kPa

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 Carton Packing:



9. RoHS Directive

This LCD Module is compliant with RoHS Directive.

10. Handling Precautions

- 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.
- Be sure to design the cabinet so that the Module can be installed without any extra stress such as warp or twist.
- Since the front polarizer is easily damaged, pay attention not to scratch it.
- Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.
- 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.
- This Open-cell has its circuitry PCBs on the side and should be handled carefully in order not to be stressed.
- 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

版权属于广州华星光电技术有限公司所有。禁止任何未经授权的使用

The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.

Any unauthorized use is prohibited.

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

Address	Address	Field Name & Comments	Set Value	Set Value	Set Value
(DEC)	(HEX)		(HEX)	(BIN)	(DEC)
0	0	Header	00	00000000	0
1	1	Header	FF	11111111	255
2	2	Header	FF	11111111	255
3	3	Header	FF	11111111	255
4	4	Header	FF	11111111	255
5	5	Header	FF	11111111	255
6	6	Header	FF	11111111	255
7	7	Header	00	00000000	0
8	8	EISA Manuf. Code LSB	0E	00001110	14
9	9	Compressed ASCII	6F	01101111	111
10	0A	Product Code	0D	00001101	13
11	0B	hex, LSB first	15	00010101	21
12	0C	32-bit ser #	00	00000000	0
13	0D	ID S/N – option	00	00000000	0
14	0E	ID S/N – option	00	00000000	0
15	0F	ID S/N – option	00	00000000	0
16	10	Week of manufacture	0F	00001111	15
17	11	Year of manufacture	21	00100001	33
18	12	EDID Structure Ver	01	00000001	1
19	13	EDID revision #	04	00000100	4
20	14	Video input def.	A5	10100101	165
21	15	Max H image size	22	00100010	34
22	16	Max V image size	13	00010011	19
23	17	Display Gamma	78	01111000	120
24	18	Feature support (no DPMS, Active off, RGB, timing BLK 1)	03	00000011	3

广州华星光电技术有限公司
Guangzhou China Star Optoelectronics Technology Co.,Ltd

25	19	Red/Green Low bits (RxRy/GxGy)	9C	10011100	156
26	1A	Blue/White Low bits (BxBy/WxWy)	15	00010101	21
27	1B	Red X Rx	95	10010101	149
28	1C	Red Y Ry	5D	01011101	93
29	1D	Green X Gx	58	01011000	88
30	1E	Green Y Gy	94	10010100	148
31	1F	Blue X Bx	29	00101001	41
32	20	Blue Y By	1E	00011110	30
33	21	White X Wx	50	01010000	80
34	22	White Y Wy	54	01010100	84
35	23	Established timings 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	Standard timing #1	01	00000001	1
40	28	Standard timing #2	01	00000001	1
41	29	Standard timing #2	01	00000001	1
42	2A	Standard timing #3	01	00000001	1
43	2B	Standard timing #3	01	00000001	1
44	2C	Standard timing #4	01	00000001	1
45	2D	Standard timing #4	01	00000001	1
46	2E	Standard timing #5	01	00000001	1
47	2F	Standard timing #5	01	00000001	1
48	30	Standard timing #6	01	00000001	1
49	31	Standard timing #6	01	00000001	1
50	32	Standard timing #7	01	00000001	1
51	33	Standard timing #7	01	00000001	1
52	34	Standard timing #8	01	00000001	1

版权属于广州华星光电技术有限公司所有。禁止任何未经授权的使用

The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.

Any unauthorized use is prohibited.

广州华星光电技术有限公司
Guangzhou China Star Optoelectronics Technology Co.,Ltd

53	35	Standard timing #8	01	00000001	1
54	36	Pixel Clock LSB	C0	11000000	192
55	37	Pixel Clock HSB	39	00111001	57
56	38	Horizontal Active (lower 8 bits)	80	10000000	128
57	39	Hor blanking (lower 8 bits)	18	00011000	24
58	3A	Horizontal Active/Horizontal blanking (upper4:4 bits)	71	01110001	113
59	3B	Vertcal active(lower 8 bits)	38	00111000	56
60	3C	Vertical blanking(lower 8 bits)	28	00101000	40
61	3D	Vertical Active : Vertical Blanking (upper4:4 bits)	40	01000000	64
62	3E	Horizontal Sync Offset	30	00110000	48
63	3F	Horizontal Sync Pulse Width	20	00100000	32
64	40	Vertical Sync Offset , Sync Width	36	00110110	54
65	41	Horizontal Vertical Sync Offset/Width upper 2 bits	00	00000000	0
66	42	Horizontal Image Size	58	01011000	88
67	43	Vertical image Size	C1	11000001	193
68	44	Horizontal Image Size / Vertical image size	10	00010000	16
69	45	Horizontal Border = (0 for Notebook LCD)	00	00000000	0
70	46	Vertical Border = (0 for Notebook LCD)	00	00000000	0
71	47	Signal (non-intr, norm, no stero, sep sync, neg pol)	1A	00011010	26
72	48	Pixel Clock LSB	00	00000000	0
73	49	Pixel Clock HSB	00	00000000	0
74	4A	Horizontal Active (lower 8 bits)	00	00000000	0
75	4B	Hor blanking (lower 8 bits)	FD	11111101	253
76	4C	Horizontal Active/Horizontal blanking (upper4:4 bits)	00	00000000	0
77	4D	Vertcal active(lower 8 bits)	28	00101000	40
78	4E	Vertical blanking(lower 8 bits)	3C	00111100	60
79	4F	Vertical Active : Vertical Blanking (upper4:4 bits)	43	01000011	67
80	50	Horizontal Sync Offset	43	01000011	67

版权属于广州华星光电技术有限公司所有。 禁止任何未经授权的使用

The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.

Any unauthorized use is prohibited.

广州华星光电技术有限公司
Guangzhou China Star Optoelectronics Technology Co.,Ltd

81	51	Horizontal Sync Pulse Width	0E	00001110	14
82	52	Vertical Sync Offset , Sync Width	01	00000001	1
83	53	Horizontal Vertical Sync Offset/Width upper 2 bits	0A	00001010	10
84	54	Horizontal Image Size	20	00100000	32
85	55	Vertical image Size	20	00100000	32
86	56	Horizontal Image Size / Vertical image size	20	00100000	32
87	57	Horizontal Border = (0 for Notebook LCD)	20	00100000	32
88	58	Vertical Border = (0 for Notebook LCD)	20	00100000	32
89	59	Signal (non-intr, norm, no stero, sep sync, neg pol)	20	00100000	32
90	5A	descriptor#3	00	00000000	0
91	5B	Reserved for definition	00	00000000	0
92	5C	Reserved for definition	00	00000000	0
93	5D	ASCII String	FE	11111110	254
94	5E	Reserved for definition	00	00000000	0
95	5F	Manufacture	43	01000011	67
96	60	Manufacture	53	01010011	83
97	61	Manufacture	4F	01001111	79
98	62	Manufacture	54	01010100	84
99	63	Manufacture	20	00100000	32
100	64	Manufacture	54	01010100	84
101	65	Manufacture	39	00111001	57
102	66	Reserved for definition	0A	00001010	10
103	67	Reserved for definition	20	00100000	32
104	68	Reserved for definition	20	00100000	32
105	69	Reserved for definition	20	00100000	32
106	6A	Reserved for definition	20	00100000	32
107	6B	Reserved for definition	20	00100000	32
108	6C	descriptor #4	00	00000000	0

版权属于广州华星光电技术有限公司所有。 禁止任何未经授权的使用

The copyright belongs to Guangzhou China Star Optoelectronics Technology Co., LTd.

Any unauthorized use is prohibited.

广州华星光电技术有限公司
Guangzhou China Star Optoelectronics Technology Co.,Ltd

109	6D	Reserved for definition	00	00000000	0
110	6E	Reserved for definition	00	00000000	0
111	6F	Reserved for definition	FC	11111100	252
112	70	Reserved for definition	00	00000000	0
113	71	Manufacture P/N	53	01010011	83
114	72	Manufacture P/N	4E	01001110	78
115	73	Manufacture P/N	46	01000110	70
116	74	Manufacture P/N	36	00110110	54
117	75	Manufacture P/N	30	00110000	48
118	76	Manufacture P/N	31	00110001	49
119	77	Manufacture P/N	42	01000010	66
120	78	Manufacture P/N	53	01010011	83
121	79	Manufacture P/N	31	00110001	49
122	7A	Manufacture P/N	2D	00101101	45
123	7B	Manufacture P/N	31	00110001	49
124	7C	Reserved for definition	0A	00001010	10
125	7D	Reserved for definition	20	00100000	32
126	7E	Extension Flag	00	00000000	0
127	7F	Checksum	D2	11010010	242
		Default Value. This will calculated based on color values			

