

PRODUCT SPECIFICATION **FOR LCD MODULE**

Revision: 1.0

Model No: LS088I01-MP-V1

Module Type: COG+FPC+B/L

APPROVED SIGNATURE

- ☒ Approved Product Specification only
- ☐ Approved Product Specification and Samples

<u>Prepared By</u>	<u>Checked By</u>	<u>Approved By</u>

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1. General Description

LS088I01-MP-V1 is a transmissive type a-Si TFT-LCD (amorphous silicon thin film transistor liquid crystal display) module, which is composed of a TFT-LCD panel, a driver circuit and a backlight unit. The panel size is 8.8 inch and the resolution is 480(RGB)*1920, the panel can display up to 16.7 M colors.

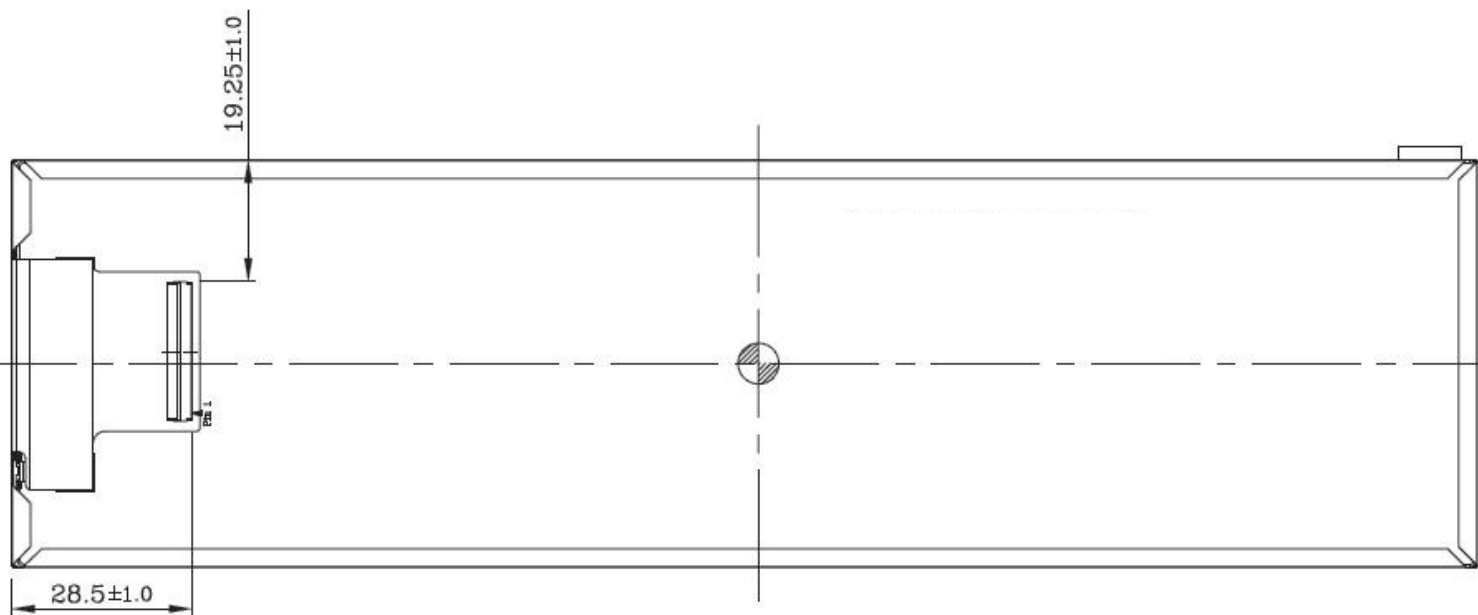
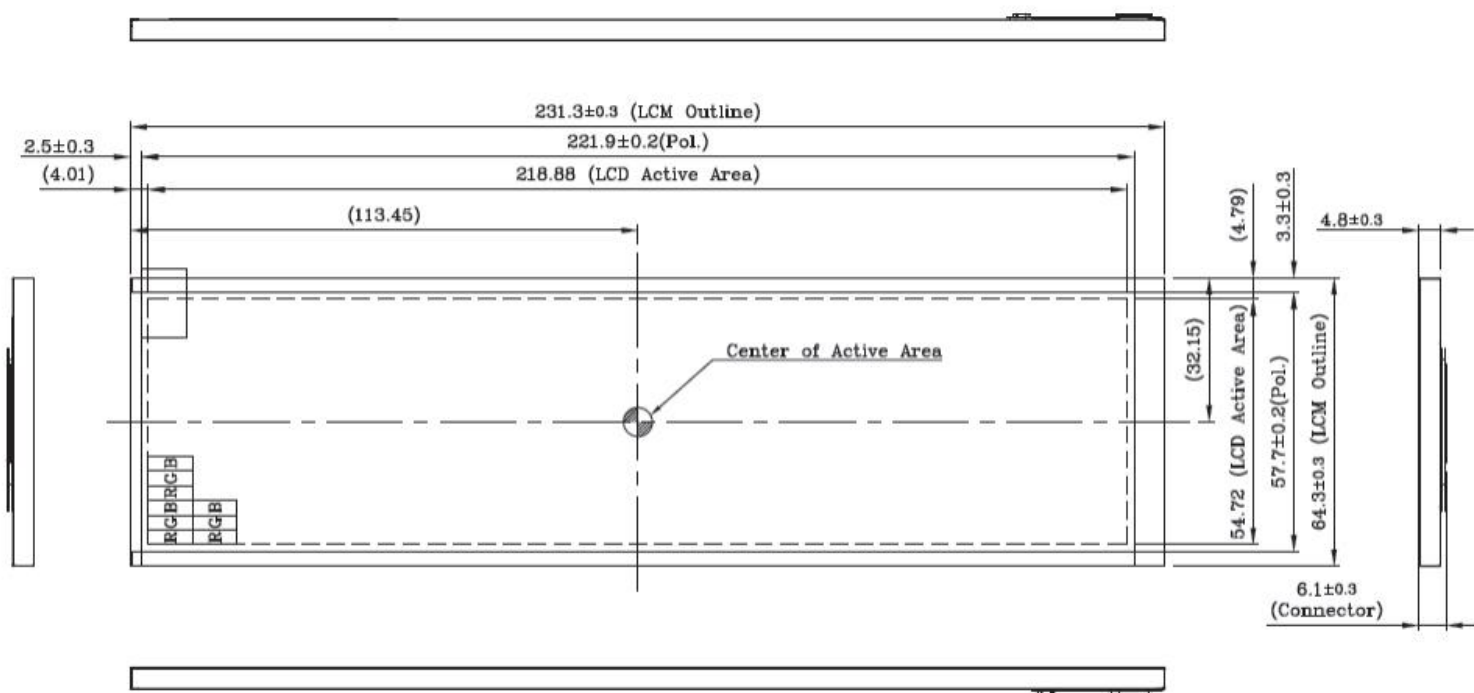
2. Physical Features

Display Mode	TFT-LCD Module
	Active matrix TFT, Transmissive type
Display Format	Graphic 480(RGB)×1920 Dot-matrix
Input Data	MIPI
Viewing Direction (Grayscale Inversion)	Free (IPS)

3. Mechanical Specification

Item	Specification	Unit
Module size (H×V×D)	64.3 ×231.3 ×4.8	mm
Number of dots	480(RGB) ×1920	pixel
Active area (H×V)	54.72×218.88	mm

4. Outline Dimension



5. Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Remark
Supply voltage	VDD	-0.5	4.0	V	Note1 Note2
Supply voltage	VGH	15	26	V	
Supply voltage	VGL	-11.5	-4	V	
Supply voltage	AVDD	7	12.5	V	
Operating temperature	TOPR	-20	70	°C	
Storage temperature	TSTR	-30	80	°C	

Backlight unit

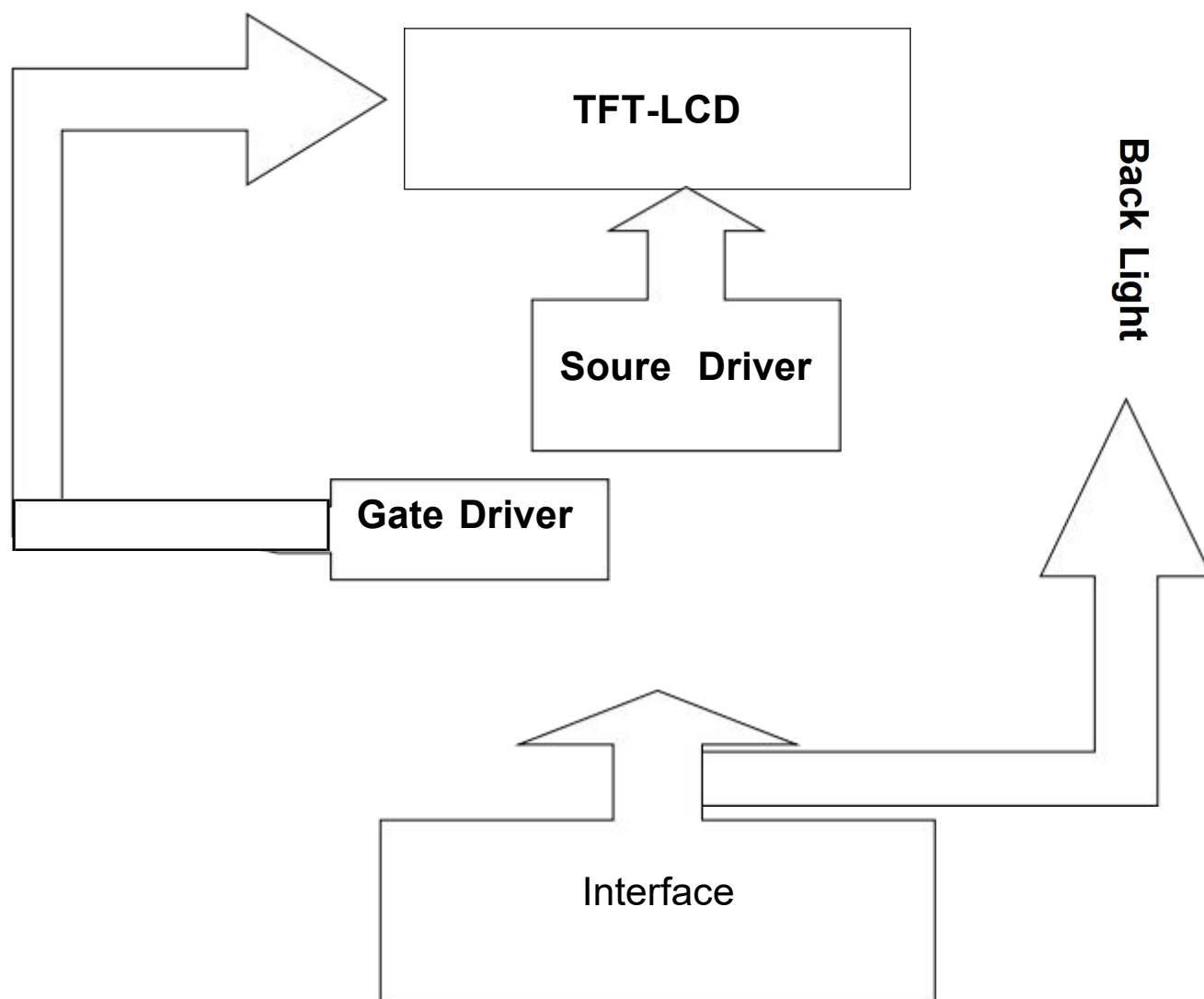
Item	Symbol	Typ.	Max.	Unit	Note
LED current	I _L	160	-	mA	(1) (2)(3)
LED voltage	V _L	16	17.5	V	(1) (2)(3)
LED reverse voltage	V _R	--	5	V	
LED forward current	I _F		80	mA	

6. Electrical Characteristics

Item		Symbol	Rating			Unit	Remark
			Min	Typ	Max		
Supply voltage		VDD	3.0	3.3	3.6	V	Note1
Supply voltage		VGH	19	20	21	V	
Supply voltage		VGL	-11	-10	-9	V	
Supply voltage		AVDD	11.8	12	12.2	V	
Supply voltage		VCOM	4.5	4.88	5.2	V	
Input Voltage	L level	VIL	0	---	0.3*IOVCC	V	
	H level	VIH	0.7*VCC	---	IOVCC	V	
Current of power supply		IDD	---	---	35	mA	VDD =3.3V
		IADD	---	---	30	mA	AVDD=12V
		IGH	---	---	5	mA	VGH=18V
		IGL	---	---	-5	mA	VGL= -10V
		IVCOM	---	---	0.1	mA	Vcom4.88V

7. Module Function Description

7-1. Block Diagram Of LCM



7-2. Pin Description

FPC connector is used for electronics interface. The recommended model is Hirose FH34SRJ-40S-0.5SH(50)

Pin No.	Symbol	I/O	Function
1	GND	P	Ground
2	NC	---	No connection
3	LED+	P	LED Anode
4	LED+	P	LED Anode
5	NC	---	No connection
6	LED-	P	LED Cathode
7	LED-	P	LED Cathode
8	NC	---	No connection
9	GND	P	Ground
10	NC	---	No connection
11	AVDD	P	Power supply for analog circuit
12	NC	---	No connection
13	VGH	P	Power supply for analog circuit
14	NC	---	No connection
15	VGL	P	Power supply for analog circuit
16	NC	---	No connection
17	GND	P	Ground
18	VCOM	P	Power supply for common voltage
19	GND	P	Ground
20	GND	P	Ground
21	RESET	I	Global reset
22	VDD	P	Power supply for digital circuits
23	STBYB	I	Standby mode
24	TP_Sync	O	Sync signal for touch panel
25	GND	P	Ground
26	D0P	I	MIPI Data Input Lane0 positive-end
27	D0N	I	MIPI Data Input Lane0 negtive-end
28	GND	P	Ground
29	D1P	I	MIPI Data Input Lane1 positive-end
30	D1N	I	MIPI Data Input Lane1 negtive-end
31	GND	P	Ground
32	CLKP	I	MIPI Clock Input positive-end
33	CLKN	I	MIPI Clock Input negtive-end
34	GND	P	Ground
35	D2P	I	MIPI Data Input Lane2 positive-end
36	D2N	I	MIPI Data Input Lane2 negtive-end
37	GND	P	Ground
38	D3P	I	MIPI Data Input Lane3 positive-end
39	D3N	I	MIPI Data Input Lane3 negtive-end
40	GND	P	Ground

7-3 Timing Characteristics

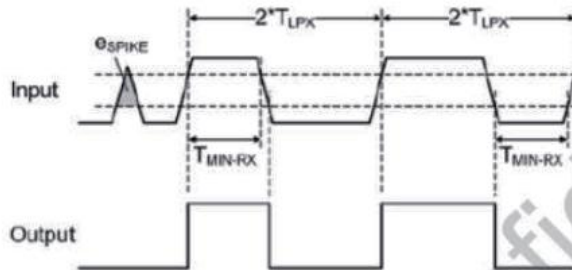
Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Operation Voltage	VDD	1.5-10%	1.5	1.5+10%	mV	
Differential Input Voltage	VID	70	200	260	mV	
Common Mode Voltage	V _{CMRX(DC)}	70	-	330	mV	
Differential Input High Threshold Voltage	V _{TH}	-	-	70	mV	
Differential Input Low Threshold Voltage	V _{TL}	-70	-	-	mV	
Singled-ended input high voltage	V _{IHHS}	-	-	460	mV	
Singled-ended input low voltage	V _{ILHS}	-40	-	-	mV	
Singled-ended threshold for HS termination enable	V _{TERM-EN}	-	-	450	mV	
Differential input impedance	Z _{ID}	80	100	125	ohm	
Pin leakage current	I _{LEAK}	-10	-	10	uA	
Common-mode interference beyond 450MHz	ΔV _{CMRX(HF)}	-	-	100	mV	
Common-mode interference 50MHz - 450MHz	ΔV _{CMRX(LF)}	-50	-	50	mV	
Common-mode termination	C _{CM}	-	-	60	pF	
Embedded Termination	R _T	90	100	110	ohm	2bits RT_SEL[1: 0] for termination resistor selection 00 → 200ohm 10 , 01 → 150ohm 11 → 100ohm (default) 1bit ERMR_EN for termination resistor enable TERM_R_EN=0, termr disable R=(OPEN) TERM_R_EN=1, termr enable

Note:

- (1) Excluding possible additional RF interference of 100mV peak sine wave beyond 450MHz.
- (2) This table value includes a ground difference of 50mV between the transmitter and the receiver, the static common-mode level tolerance and variations below 450MHz.

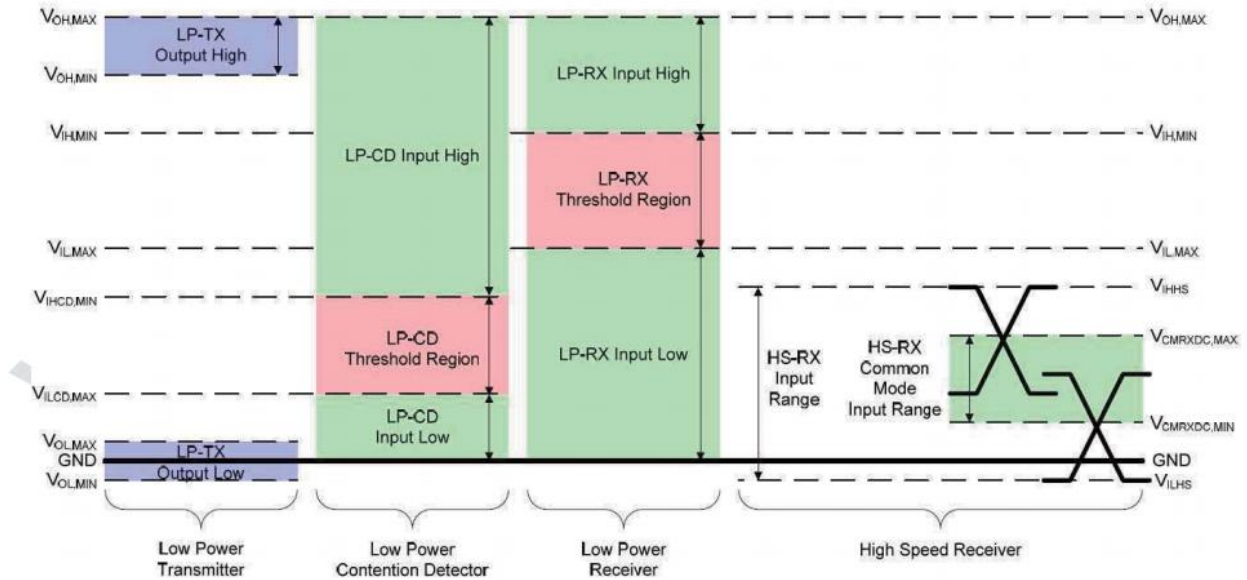
6.2.2 LP Receiver DC Specification

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Logic 1 input voltage	V_{IH}	880	-	-	mV	
Logic 0 input voltage, not in ULP State	V_{IL}	-	-	550	mV	
Input hysteresis	V_{HYST}	25	-	-	mV	



6.2.3 Line Contention Detection

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Logic 1 contention threshold	V_{IHCD}	450	-	-	mV	
Logic 0 contention threshold	V_{ILCD}	-	-	200	mV	

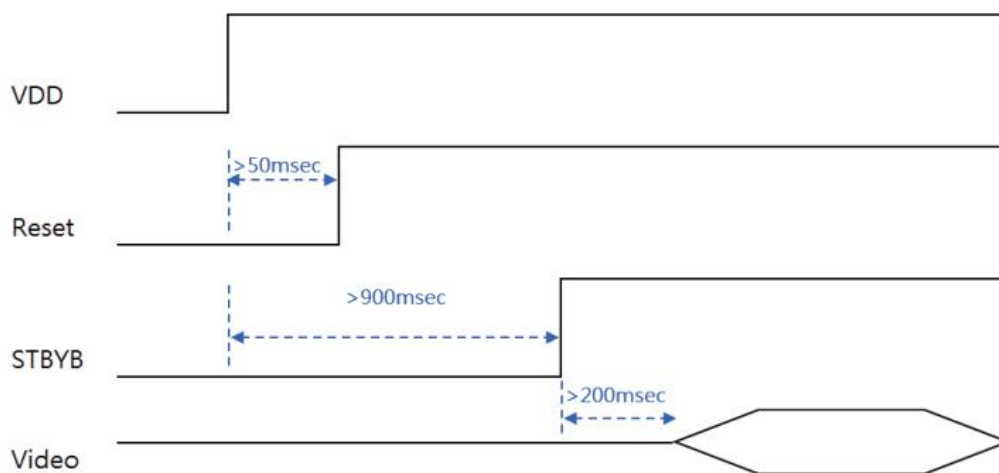
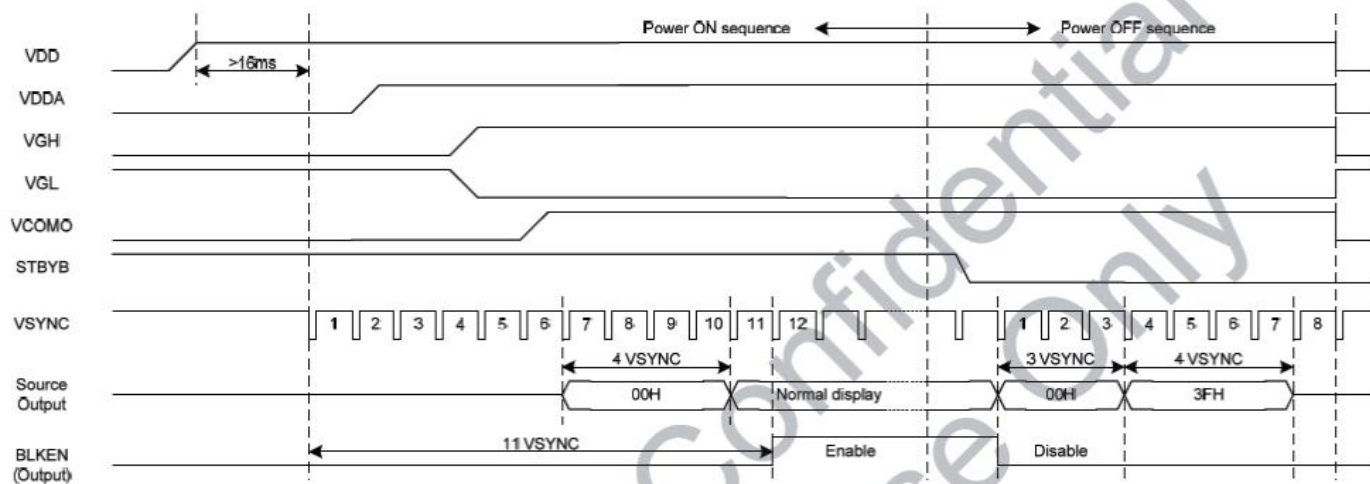


6.3 Interface Timing

Item	Symbol	Min.	Typ.	Max.	Unit
MIPI Video data rate(4 lane)	-	-	397.7	-	Mbps
PCLK Frequency	FPCLK	-	66.3	-	MHz
Horizontal Synchronization	Hsync	-	30	-	PCLK
Horizontal Back Porch	HBP	-	30	-	PCLK
Horizontal Front Porch	HFP	-	30	-	PCLK
Hsync+HBP+HFP	-	75	90	-	PCLK
Horizontal Address(Display Area)	Hadr	-	480	-	PCLK
Horizontal cycle	-	555	570	-	PCLK
Vertical Synchronization	Vsync	-	6	-	Line
Vertical Back Porch	VBP	-	6	-	Line
Vertical Front Porch	VFP	-	6	-	Line
Vsync+VBP+VFP	-	15	18	-	Line
Vertical Address(Display Area)	Vadr	-	1920	-	Line
Vertical cycle	-	1935	1938	-	Line
Frame Rate	-	-	60	-	Hz

6.4 Power On / Off Sequence

Power-On/Off Timing Sequence:



6.5 Backlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_F	--	160	--	mA	$T_a=25^{\circ}\text{C}$
LED Voltage	V_F	--	--	17.5	Volt	$T_a=25^{\circ}\text{C}$
LED Life-Time	N/A	--	30,000	--	Hour	$T_a=25^{\circ}\text{C}$ $I_F=160\text{mA}$ Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm3^{\circ}\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_L=160\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 160mA. The constant current driving method is suggested.

Note (3) LED Light Bar Circuit

8. Electro-Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	
Response time		Tr +Tf	$\theta_x = \theta_y = 0$	---	30	40	ms	Note 1	
Contrast Ratio		CR		600	800	---	---	Note 2	
Transmittance		T%		---	4.2	---	%		
Color Chromaticity (CIE1931)	White	W x	$\theta_x = \theta_y = 0$	---	0.300	---	---		
		W y		---	0.322	---	---		
Viewing angle	θ_T		CR > 10	---	85	---	Deg.	Note 3	
	θ_B			---	85	---			
	θ_L			---	85	---			
	θ_R			---	85	---			
White luminance (Center)		L		480	600	---	cd/m2	Note4	

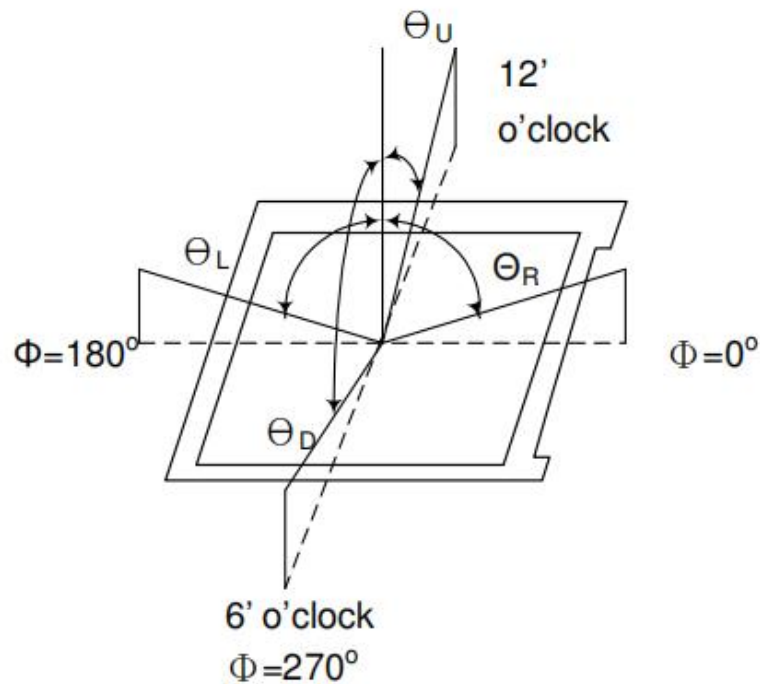
3.2 Measuring Condition

- Measuring surrounding : dark room
- LED current I_L : 160mA
- Ambient temperature : $25 \pm 2^\circ\text{C}$
- 15min. warm-up time.

4.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

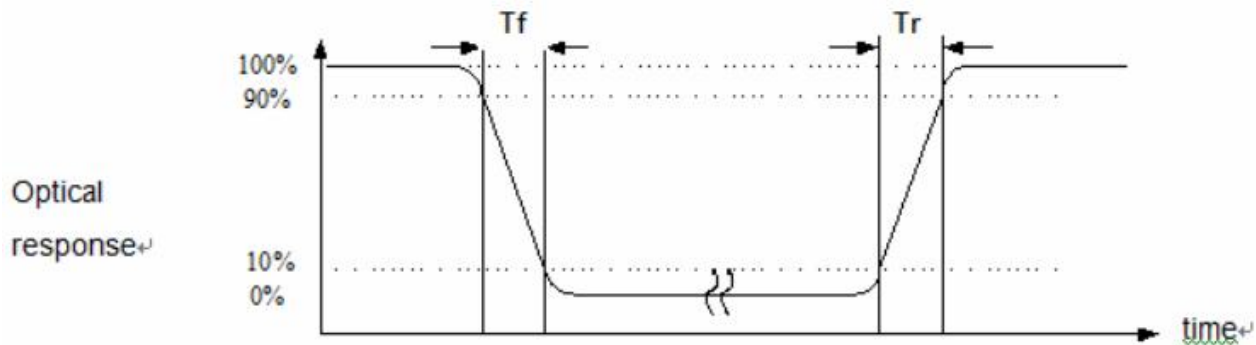
Note (1) Definition of Viewing Angle:



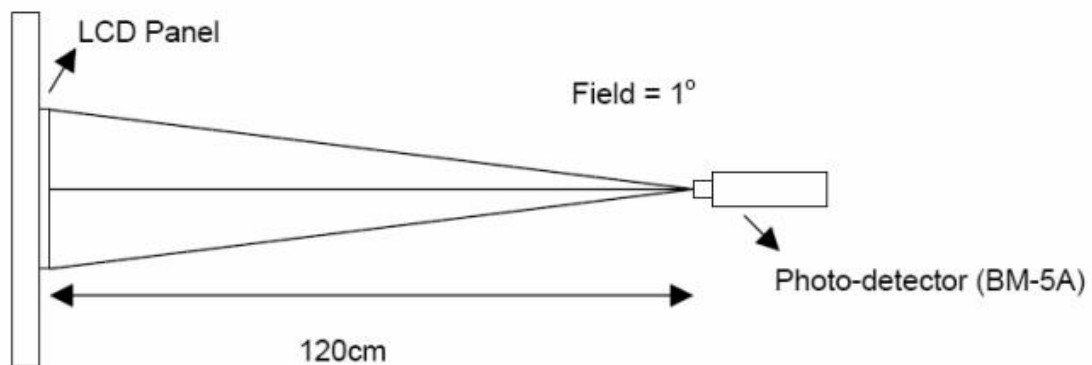
Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)

9.Records Of Version

Version	Revise Date	Page	Content
00		ALL	New released