
SPECIFICATION

Customer: _____

Model Name: _____

Date: 2023/05/26

Version: V0

Preliminary Specification

Final Specification

For customer's Acceptance

APPROVED BY	Comment

APPROVED BY	Reviewed BY	Prepared BY

Record of Revision

Version	Revise Date	Page	Content
Pre-spec 0	2023/05/26		Initial Release

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1. General Specifications

NO	Item	Specification	Remark
1	LCD Size	10.1 inch (Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1920(H) x 3(RGB) x 1200(V)	
4	Display mode	Normally Black, Transmissive	
5	Dot pitch	0.03764(H)×RGB×0.11292(V)	
6	Active area	217.60(H)*135.95(V)	
7	Module size	229.46(W) x150.50(H) x4.4 (D)mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Interface	LVDS	
11	Backlight power consumption	7800	mW
12	Panel power consumption	660(Typ.)	mW
13	Weight	TBD	

Note 1: Refer to Mechanical Drawing

2. Pin Assignment

TFT LCD Panel Driving Section

FPC Connector is used for the module electronics interface. The recommended model is FH41-60S-0.5SHED (HRS) or equivalent.

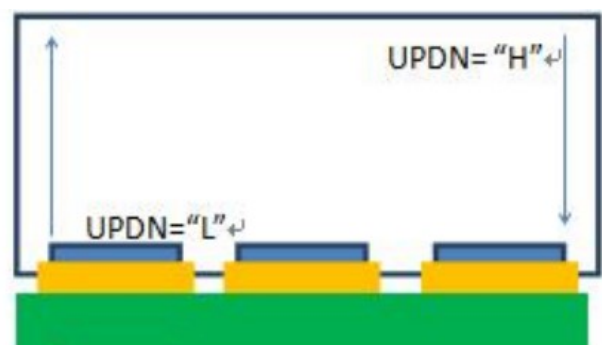
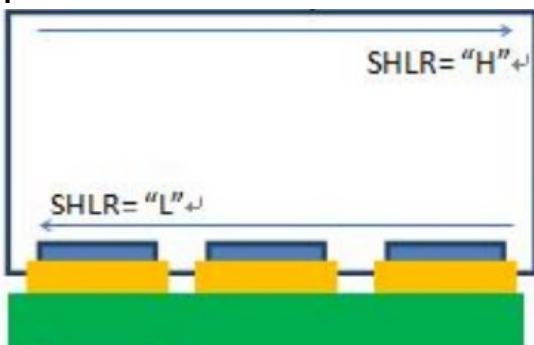
Pin No. Symbol I/O Function Remark

Pin NO	Symbol	I/O	Function	Remark
1~2	LED+	-	LED+ power supply voltage	
3	NC	-	No connect	
4~7	LED-	-	LED- power supply voltage	
8	ABIND	O	Abnormal detection output. ABIND=H, normal ABIND=L, abnormal	
9	THB+	-	- Thermistor B+	
10	THB-	-	Thermistor B-	
11	VDD	P	Power Supply, VDD=3.3V (Typ.)	
12	SDI	I	Interface of OTP (System side: NC)	
13	SDO	O	Interface of OTP (System side: NC)	
14	SCL	I	Interface of OTP (System side: NC)	
15	CSB	I	Interface of OTP (System side: NC)	
16	STBYB	I	Standby signal	
17	GRB	I	Reset signal	
18~19	VDD	P	Power Supply, VDD=3.3V (Typ.)	
20	NC	-	No connect	
21	GND	P	Power Ground	
22	ELV13P	I	Even LVDS Positive differential data signal input	
23	ELV13N	I	Even LVDS Negative differential data signal input	
24	GND	P	Ground	
25	ELVCLKP	I	Even LVDS Positive differential clock Signal input	
26	ELVCLKN	I	Even LVDS Negative differential clock signal input	
27	GND	P	Ground	
28	ELV12P	I	Even LVDS Positive differential data signal input	
29	ELV12N	I	Even LVDS Negative differential data signal input	
30	GND	P	Power Ground	
31	ELV11P	I	Even LVDS Positive differential clock Signal input	
32	ELV11N	I	Even LVDS Negative differential clock signal input	

33	GND	P	Power Ground	
34	ELV10P	I	Even LVDS Positive differential clock Signal input	
35	ELV10N	I	Even LVDS Negative differential clock signal input	
36	GND	P	Power Ground	
37	OLV03P	I	Odd LVDS Positive differential clock Signal input	
38	OLV03N	I	Odd LVDS Positive differential clock Signal input	
39	GND	P	Power Ground	
40	OLVCLKP	I	Odd LVDS Positive differential clock Signal input	
41	OLVCLKN	I	Odd LVDS Positive differential clock Signal input	
42	GND	P	Power Ground	
43	OLV02P	I	Odd LVDS Positive differential clock Signal input	
44	OLV02N	I	Odd LVDS Positive differential clock Signal input	
45	GND	P	Power Ground	
46	OLV01P	I	Odd LVDS Positive differential clock Signal input	
47	OLV01N	I	Odd LVDS Positive differential clock Signal input	
48	GND	P	Power Ground	
49	OLV00P	I	Odd LVDS Positive differential clock Signal input	
50	OLV00N	I	Odd LVDS Positive differential clock Signal input	
51	GND	P	Power Ground	
52	NC	-	No connect	
53	SHLR	I	Horizontal scan direction control	Note1
54	UPDN	I	Vertical scan direction control	Note1
55	NC	-	No connect	
56~57	VPP	P	OTP voltage (NC, AUO internal use)	
58	NC	-	No connect	
59	LVFMT	I	"L" = JEIDA; "H" = VESA	
60	GND		Power Ground	

注： I: Digital signal input, O: Digital signal output, G: GND, PI: Power input; T: touch panel signal

Note1:



3. Operation Specifications

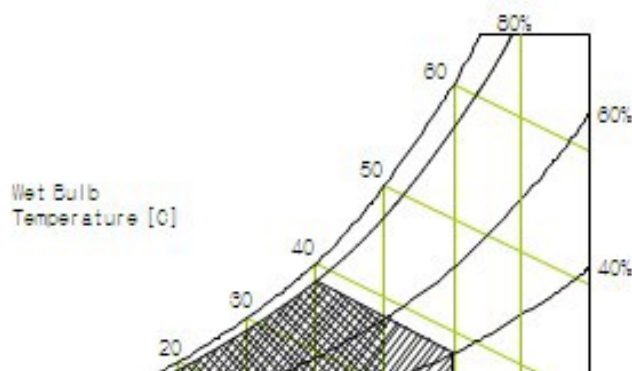
3.1. Absolute Maximum Ratings

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

Parameter		Symbol	Min.	Max.	Unit	Remarks
Power Supply	LCD Module	VDD	VSS-0.3	3.6	V	Ta = 25 °C Note 1&2
Operation Temperature		Topa	30	80	°C	Note 3
Storage Temperature		TST	-30	+80	°C	
Operating Ambient Humidity		Hop	10	90	%RH	
Storage Humidity		Hst	10	90	%RH	

Note:

1. These range above is maximum value not the actual operating temperature . Actual Operating temperature is no more than **40°C** and temperature refers to the LCM surface temperature ; Length of operation: No more than **8** hours per day, and no more than **4** hours of continuous use one time.
2. BOE is not responsible for product problems beyond the use conditions.
3. Temperature and relative humidity range are shown in the figure below. Wet bulb temperature should be **39 °C** max. and no condensation of water.



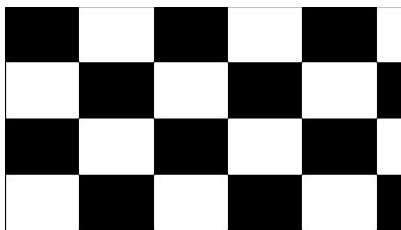
3.2. Typical Operation conditions

Parameter		Symbol	Values			Unit	Notes
			Min.	Typ.	Max.		
Power Supply Voltage		VDD	3.0	3.3	3.6	V	
		VRP			300	mV	Ripple
Power Supply Current		IDD	-	700	900	mA	Note 1
Power Consumption		PLCD	-	0.7	2.3	W	
Rush current		IRUSH	-	-	1.5	A	Note 2
Interface	Input Voltage	VIH	2.7		3.3	V	
		VIL	0		0.5	V	
	Output Voltage	VOH	2.7		3.3	V	
		VOL	0		0.5	V	

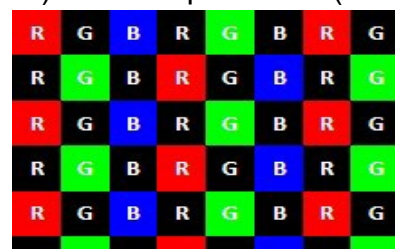
Note :

1 The supply voltage is measured and specified at the interface connector of LCM.
 The current draw and power consumption specified is for VDD=3.3V, Frame rate $f_v=60\text{Hz}$ and Clock frequency = 72.4MHz. Test Pattern of power supply current

a) Typ : Mosaic 8 x 6 Pattern(L0/L255)



b) Max : skip subPixel(L255)



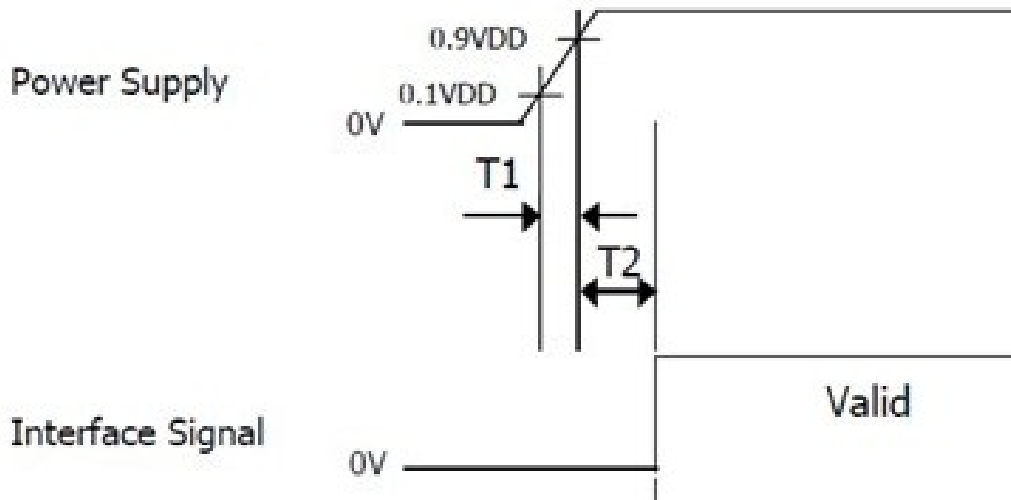
3.3. Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max		
Voltage for LED backlight	VL	21.6	24.0	27.2	V	Note1
Current for LED backlight	IL	-	(325)	-	mA	
LED life time	-	-	20,000	-	Hr	Note2

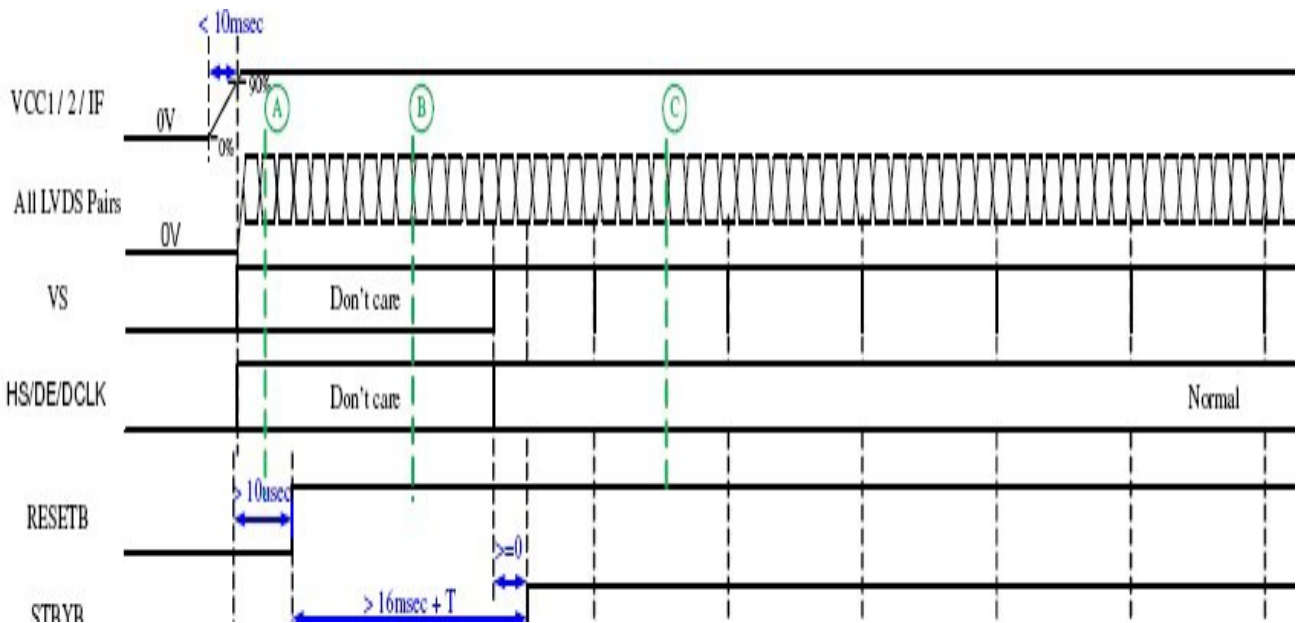
Note1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and IL =325mA.

Note1: The LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C、60±20%RH and IL =325mA.The LED lifetime could be decreased if operating IL is lager than 325mA

3.4. Power Sequence



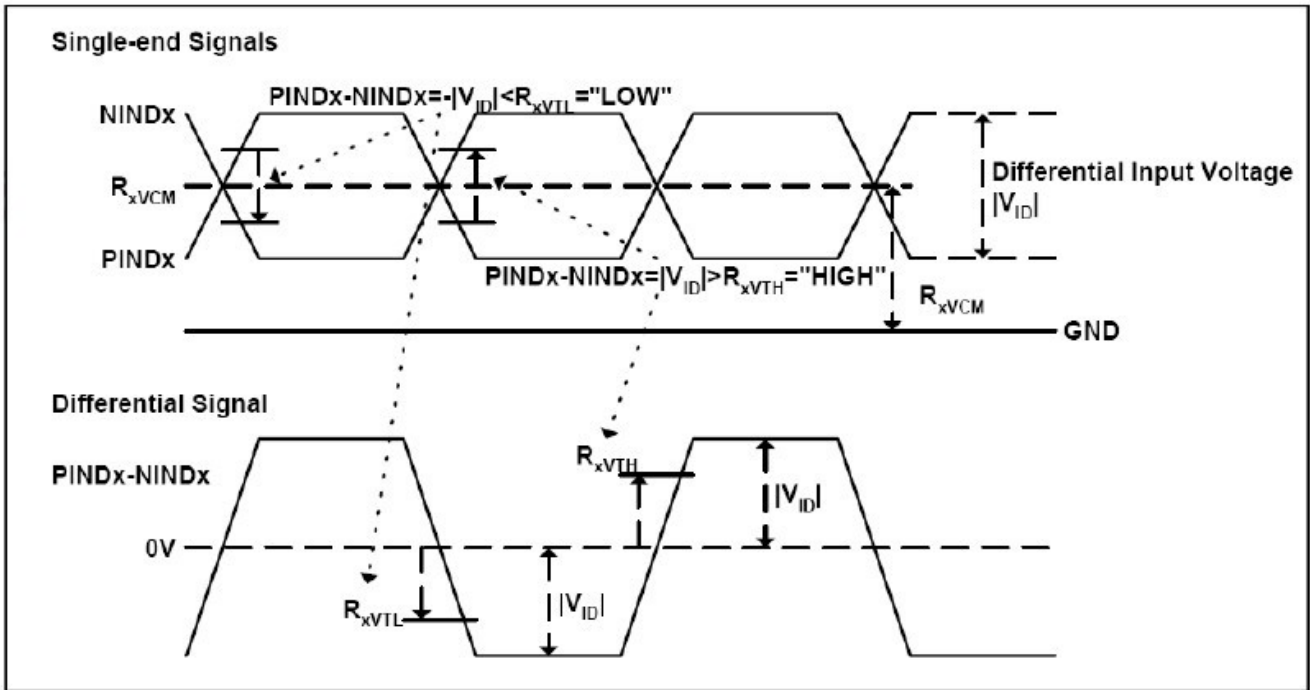
Parameter	Values			Units
	Min	Typ	Max	
T1	0	-	10	ms
T2	0	-	50	ms
T3	200	-	-	ms
T4	500	-	-	ms
T5	0	-	50	ms
T6	0	-	10	ms
T7	500	-	-	ms



3.5. LVDS Signal Timing Characteristics

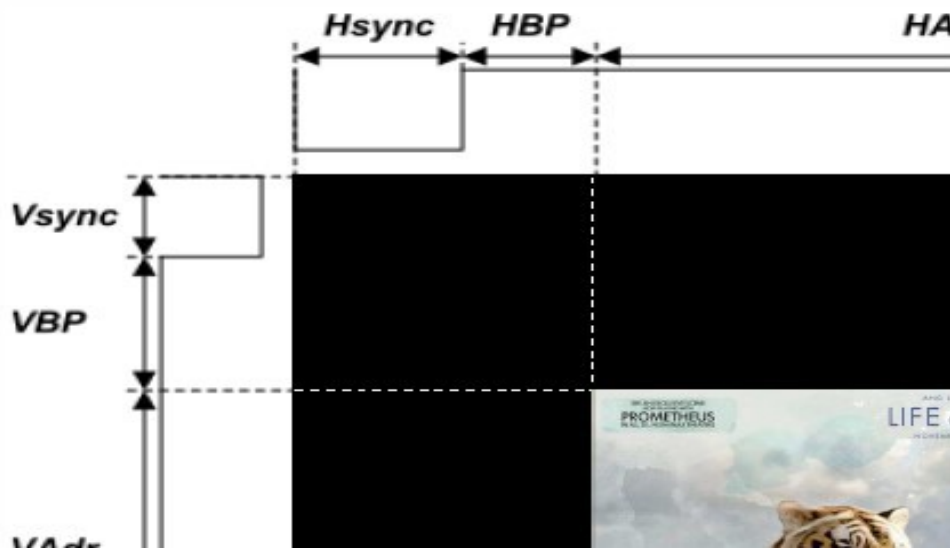
3.5.1. Ac Electrical characteristics

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max		
LVDS Differential input high Threshold voltage	R_{xVTH}	-	-	+100	mV	
LVDS Differential input low Threshold voltage	R_{xVTL}	-100	-	-	mV	
LVDS Differential input common mode voltage	R_{xVCM}	0.7	-	1.6	V	
LVDS Differential voltage	$ V_{ID} $	200	-	600	mV	



3.5.2. Data Input Format

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK Frequency	Fdclk	73.9	74.2	85	MHz
Horizontal display area	Thd	960			DCLK
HSYNC period time	Th	1020	1024	1150	DCLK
HSYNC pulse width	Thp	1	8	15	DCLK
HSYNC porch	Thbp+Thfp	60	64	190	DCLK
Vertical display area	Tvd	1200			H
VSYNC period time	Tv	1206	1208	1231	H
VSYNC Pluse width	Tvp	1	3	20	H
VSYNC porch	Tvbp+ Tvfp	6	8	31	H
Frequency	fV	-	60	-	Hz



4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max		
Viewing angle (CU 43,	θ_L	$=180^\circ$	80	85	-	degree	Note1
	θ_R	$=0^\circ$	80	85	-		
	θ_T	$=90^\circ$	80	85	-		
	θ_B	$=270^\circ$	80	85	-		
Response time	Ton	Normal $\theta = 0^\circ$	-	10	20	msec	Note3
	Toff		-	15	30	msec	Note3
Contrast ratio	CR		700	900	-	-	Note4
Color chromaticity	Wx		0.26	0.31	0.36	-	Note2
	Wy		0.31	0.36	0.41	-	Note5 Note6
Luminance	L		900	1000	-	Cd/m2	Note6
Luminance uniformity	Yu		70	75	-	%	Note7
NTSC Ratio	NTSC	CIE1931		72		%	Note8
Colour Temperature	CT		6000	6500	7000	K	

Test Conditions:

1. $V_{DD}=3.3V, I_{BL}=325mA$ (Backlight current), the ambient temperature is $25^\circ C$
2. The test systems refer to Note2.

Note 1: Definition of viewing angle range

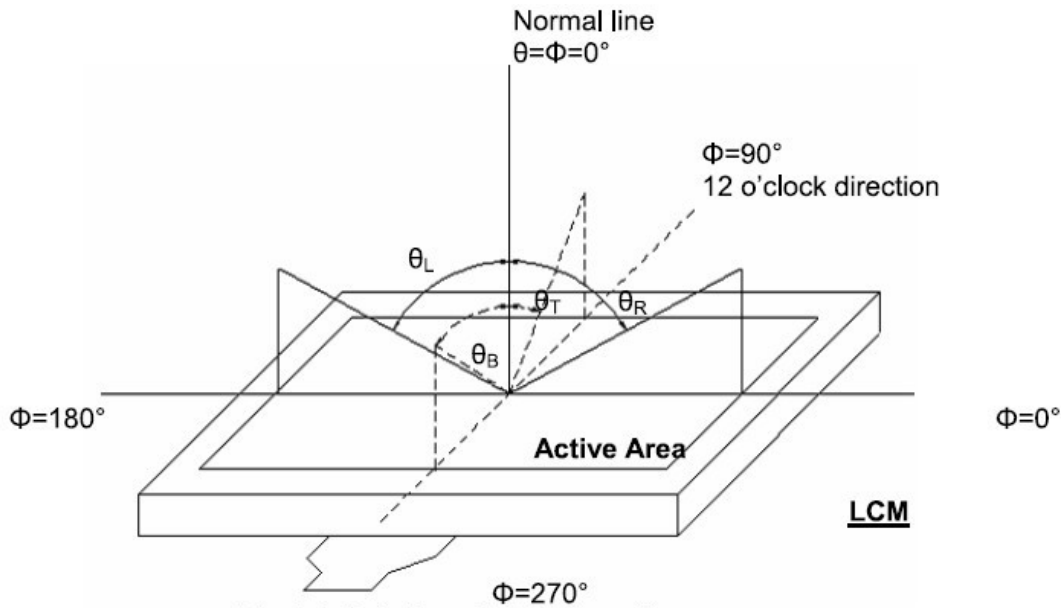


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 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, other items are measured by BM-5A/Field of view: 1° /Height: 500mm.)

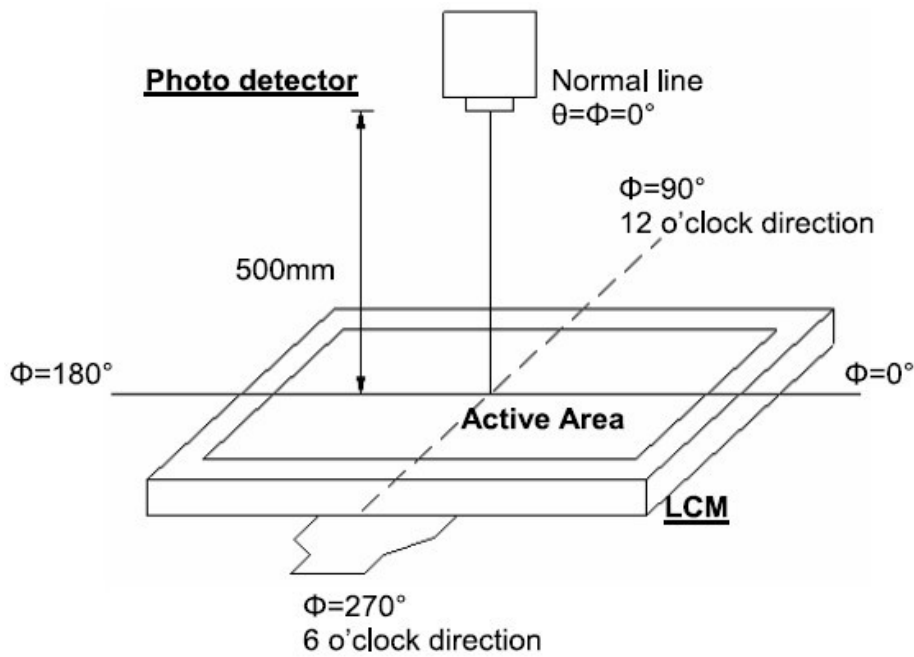


Fig. 4-2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detect output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

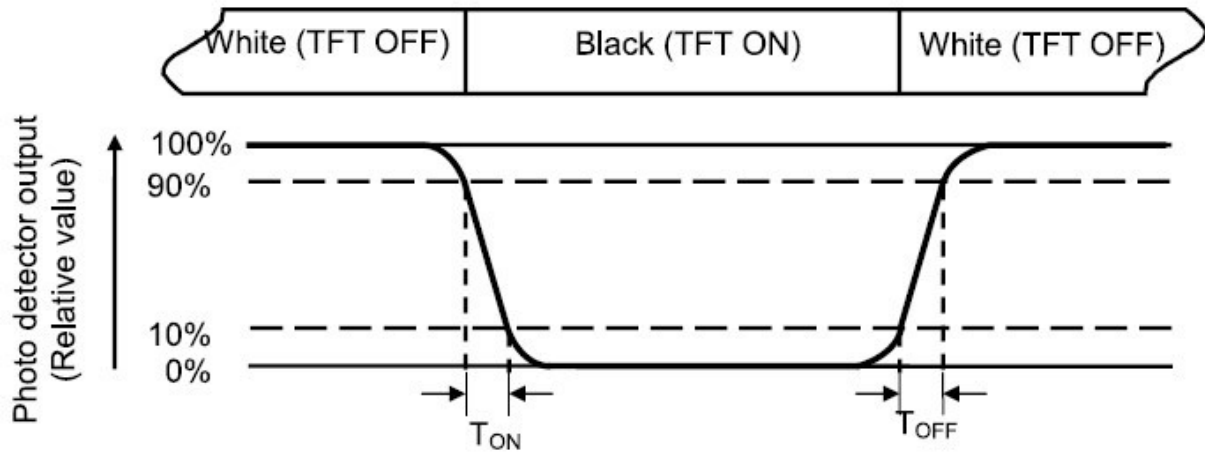


Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

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

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_L=280\text{mA}$.

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity } (Yu) = \frac{B_{min}}{B_{max}}$$

L——Active area length W—— Active area width

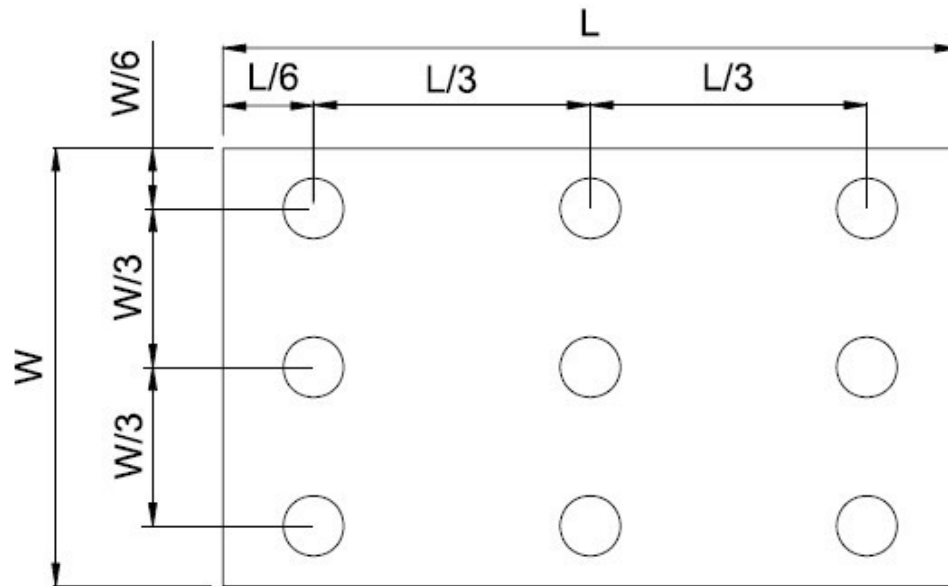


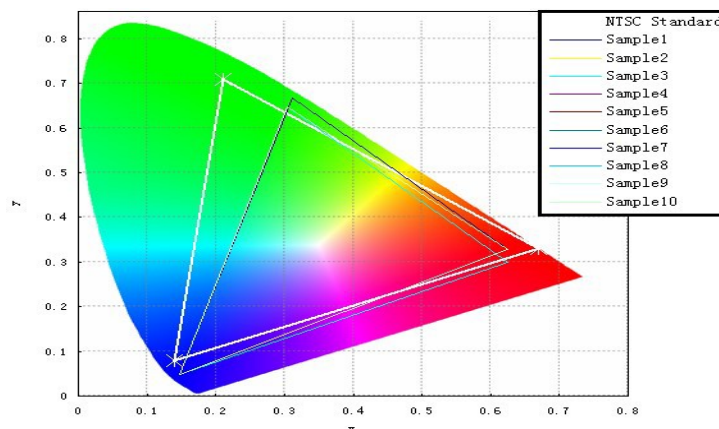
Fig. 4-4 Definition of measuring points

B_{max}: The measured maximum luminance of all measurement position.

B_{min}: The measured minimum luminance of all measurement position.

Note 8: Definition of Color of CIE Coordinate and NTSC Ratio.

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$



5. Reliability Test Items

No	Test Items	Conditions
1	High temperature storage test	80°C 240hr
2	Low temperature storage test	-30°C 240hr
3	Low temperature operation test	-30°C 240hr
4	High temperature operation test	80°C 240hr
5	High temperature & high humidity (operation test)	40°C 90%RH 240hr
6		
7		
8		
9		
10		
...		

Note1: T_a is the ambient temperature of samples.

Note2: T_s is the temperature of panel's surface.

Note3: 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 don't guarantee all of the cosmetic specification.

Note4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

6. General Precautions

6.1. Safety

Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

6.2. Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

6.3. Static Electricity

1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

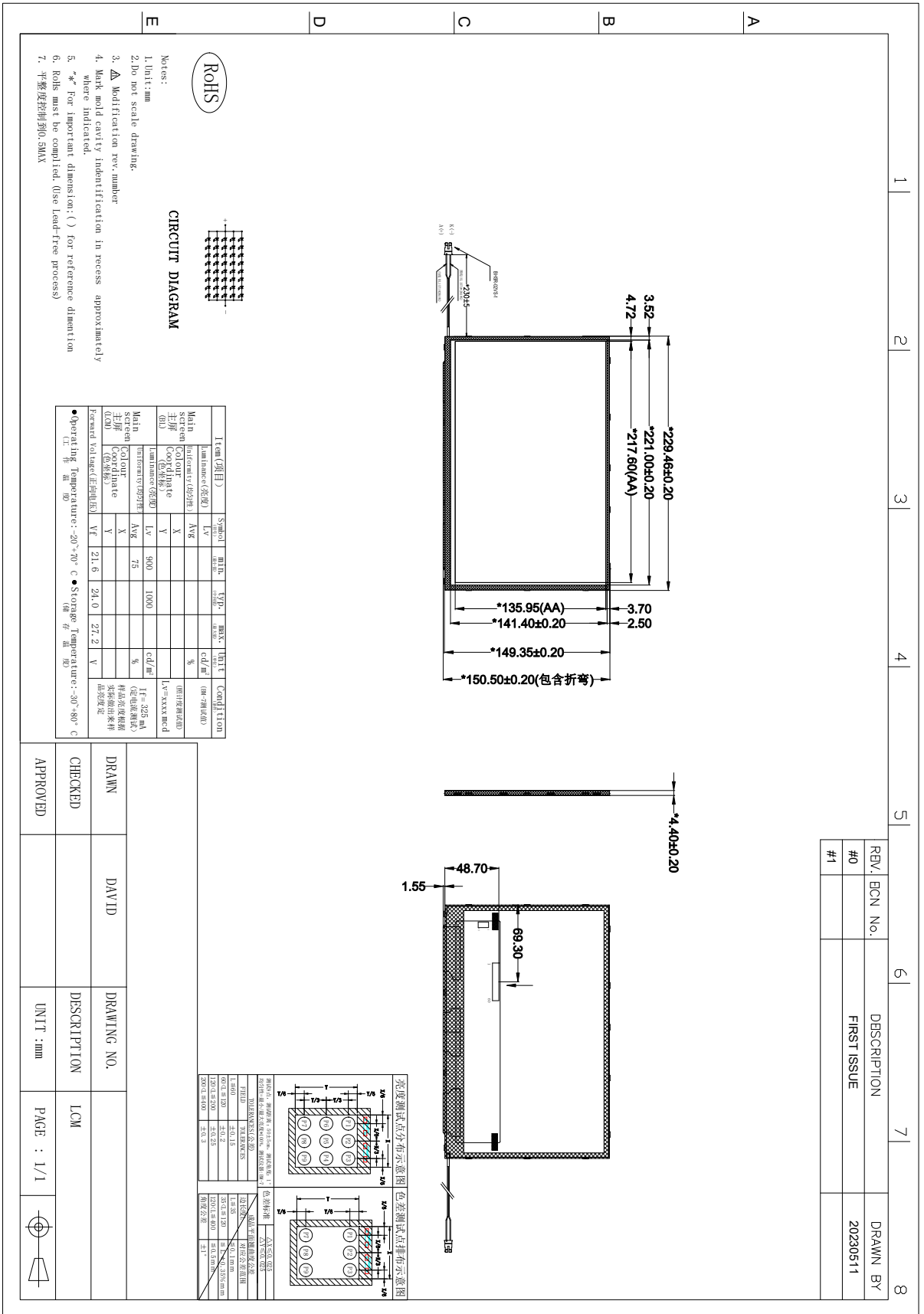
6.4. Storage

1. Store the module in a dark room where must keep at $25\pm 10^{\circ}\text{C}$ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

6.5. Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

7. Mechanical Drawing



8.1. Packaging Material Table

No.	Item	Model (Material)	Dimensions(m m)	Unit weight (kg)	Quantity	Remark
1	LCM Module		TBD	TBD	40pcs	
2	Partition	BC Corrugated paper	TBD	TBD	1est	
3	Corrugated Paper	BC Corrugated paper	TBD	TBD	4pcs	
4	Corrugated Bar	BC Corrugated paper	TBD	TBD	4pcs	
5	Dust-Proof Bag	PE	TBD	TBD	1pcs	
6	A/S Bag	PE	235*155*0.2	0.002	40pcs	
7	Carton	Corrugated paper	590*360*210	TBD	1pcs	
8	Total weight	TBD				

8.2 . Packaging Drawing

