LCD MODULE SPECIFICATION

■Preliminary Specification

□Final Product Specification

MODEL NO. : IE-A-2221CV03MP-CB-1

CUSTOMER P/N:

ISSUED DATE : 2023.12.04

VERSION :

ATOPS:

Prepare by	Check by	Approve by
Bruce 2023-12-04		

Customer :

Approve by	Notes

Record of Version

Rev	Issued Date	Description	Editor
1.0	2023-12-04	First Issue	Bruce

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1. General Specification

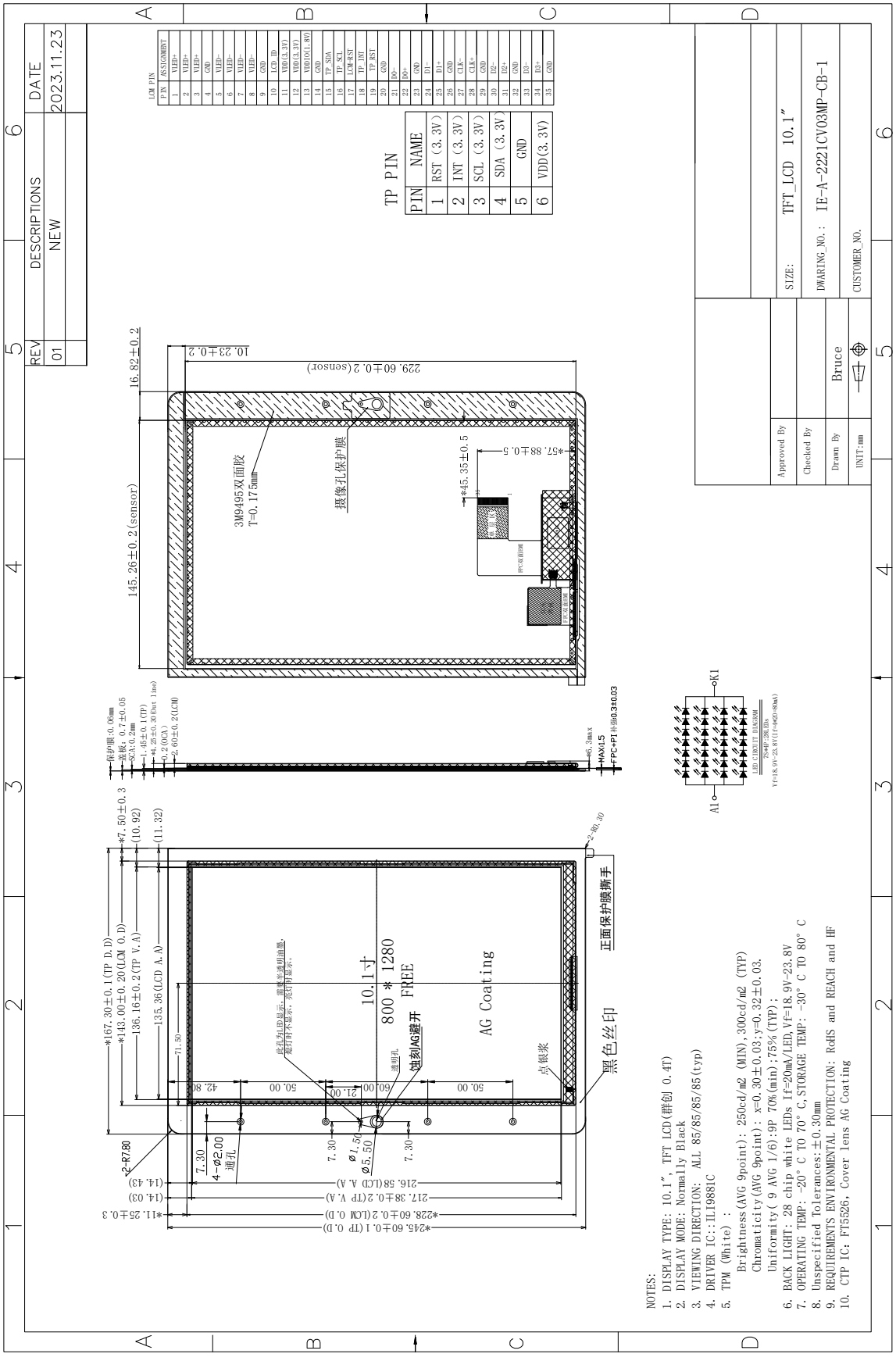
1.1. General Specification for LCM

Feature		Spec
Characteristics	Size	10.1 inch
	Resolution	800(RGB) x 1280
	Interface	MIPI
	Color Depth	16.7M
	Technology Type	a-Si
	Pixel Pitch (mm)	0.1692(W) X 0.1692(H)
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	Normally Black
	Surface Treatment(Polarizer)	Glare
	Viewing Direction	ALL
Mechanical Characteristics	Overall dimensions (W x H x D) (mm)	167.3x245.6x4.25
	Active Area(mm)	135.36(W)X216.58(H)
	With /Without TP	With CTP
	Weight (g)	TBD
	LED Numbers	28 LEDs
Electronic	LCD Driver IC	ILI9881C

1.2. General Specification for CTP

Feature		Spec
Mechanical Characteristics	CTP Size	10.1 inch
	Resolution	800 x 1280
	Interface	IIC
	CTP report rate	>100Hz
	Support Points	10
	Surface hardness	>6H
	Transparency	>85%
	CTP (W x H x D) (mm)	167.3x245.6x1.45
	COVER V.A (mm)	136.16(W)x217.38(H)
Electronic	CTP Driver IC	FT5526
	Power supply	3.3V

2.Mechanical Drawing



3.PIN Description

3.1. LCM PIN

Item	Terminal	Functions
1	VLED+	B/L Power input PIN anode
2	VLED+	B/L Power input PIN anode
3	VLED+	B/L Power input PIN anode
4	GND	Ground
5	VLED-	B/L Power input PIN negative
6	VLED-	B/L Power input PIN negative
7	VLED-	B/L Power input PIN negative
8	VLED-	B/L Power input PIN negative
9	GND	Ground
10	LCD_ID	NC
11	VDD(3.3V)	Interface power supply3.3V
12	VDD(3.3V)	Interface power supply3.3V
13	VDDIO(1.8V)	Interface power supply1.8V
14	GND	Ground
15	TP_SDA	TP I2C Serial Data Input
16	TP_SCL	TP I2C Serial Clock Input
17	LCM_RST	LCM Reset pin
18	TP_INT	TP I2C Interrupt signal
19	TP_RST	TP Reset pin
20	GND	Ground
21	D0-	Differential data pairs for MIPI interface.
22	D0+	Differential data pairs for MIPI interface.
23	GND	Ground
24	D1-	Differential data pairs for MIPI interface.

25	D1+	Differential data pairs for MIPI interface.
26	GND	Ground
27	CLK-	Differential clock or strobe pair for MIPI interfaces.
28	CLK+	Differential clock or strobe pair for MIPI interfaces.
29	GND	Ground
30	D2-	Differential data pairs for MIPI interface.
31	D2+	Differential data pairs for MIPI interface.
32	GND	Ground
33	D3-	Differential data pairs for MIPI interface.
34	D3+	Differential data pairs for MIPI interface.
35	GND	Ground

3.2. CTP PIN

Pin No.	Symbol	I/O	**Function**
1	RES	I	Reset(3.3V)
2	INT	I/O	INT(3.3V)
3	SCL	I	Serial interface clock
4	SDA	I/O	Serial in/out signal
5	GND	P	Ground.
6	VDD	P	Power supply 3.3V.

4. Absolute Maximum Rating

Ta = 25℃

Item	Symbol	Min	Max	Unit	Remark
Power Voltage for LCM	VDD-LCM	0	3.6	V	-
	VDDIO-LCM	0	3.6	V	
Backlight Forward Current	IF	-	25.0	mA	For each serial LED
Power Voltage for CTP	VDD-CTP	0	3.6	V	
Operating Temperature	Top	-20	70	℃	-
Storage Temperature	Tst	-30	80	℃	-

5. Electrical Characteristics

5.1. Operating Condition for LCD

Ta = 25℃

Parameter		Symbol	MIN	TYP	MAX	Unit	Remark
Digital supply Voltage		VDD-LCM	3.20	3.30	3.40	V	-
		VDDIO-LCM	1.70	1.80	1.90	V	-
Input Signal Voltage	Low Level	VIL	-0.3	-	0.3*VDDIO	V	D0-,D0+,D1-,D1+,D2-,D2+,CLK-,CLK+, RESET
	High Level	VIH	0.7*VDDIO	-	VDDIO	V	
Current of digital supply voltage		$I_{VDD-LCM}$	26	33	40	mA	VDD-LCM=3.3V color bar pattern

5.2. Driving Condition for Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	IF	-	80	-	mA	Constant current driving
Forward Voltage	VF	18.9	-	23.6	V	
Backlight Power Consumption	WBBLB	-	-	-	W	
Operating Life Time	-	-	30000	-	hrs	Note 3

Note 1: The LED driving condition is defined for total backlight consumption, and which depend on Forward Current setting.

Note 2: Forward Voltage is just for reference for one serial.

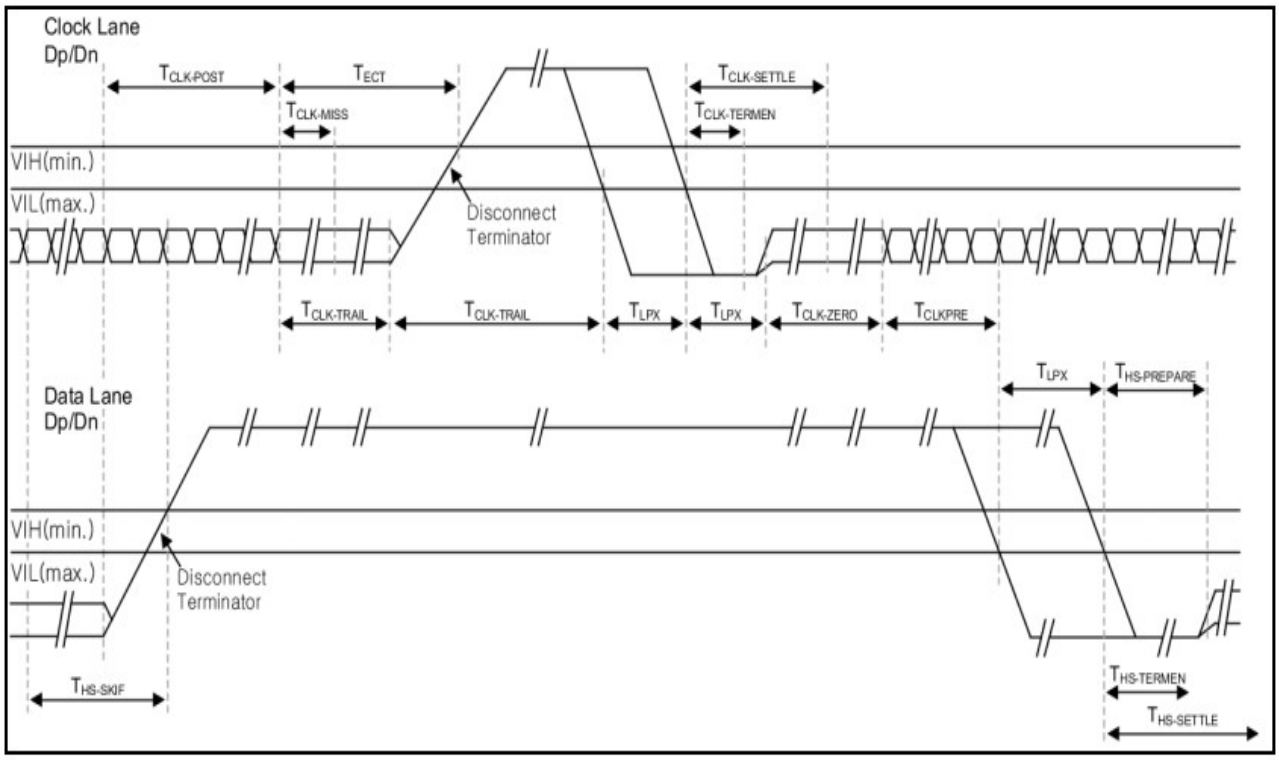
Note 3: The "Operating life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IF =80mA. The LED lifetime could be decreased if operating IF is lager than 80mA.

5.3. Driving Condition for CTP

Parameter		Symbol	MIN	TYP	MAX	Unit	Remark
Digital supply Voltage		VDD-CTP	2.8	3.0	3.3	V	-
Input Signal Voltage	Low Level	VIL	-0.30	-	0.3VDD	V	-
	High Level	VIH	0.7VDD	-	VDD	V	
Operating current(Normal mode)		$I_{VDD-CTP}$	-	13	-	mA	VDD=3.3V
Operating current(Green mode)		$I_{VDD-CTP}$	-	-	-	mA	
Operating current(Sleep mode)		$I_{VDD-CTP}$	-	42	-	uA	

6.Timing Chart for LCM

6.1.LP Power Mode Transmission



Parameters	Symbols	Min.	Typ.	Max.	Units
Vertical sync. active	VSA	2 (Note 6)	-	-	Line
Vertical Back Porch	VBP	14(Note 6)	-	-	Line
Vertical Front Porch	VFP	8 (Note 6)	-	-	Line
Active lines per frame	VACT	-	1280	-	Line
Horizontal sync. active	HSA	2	-	-	Pixel
Horizontal Porch period	HSA + HBP + HFP	1.6	-	-	us
Active pixels per line	HACT	-	800	-	Pixel
Bit rate	BR_{bps}	385		Note 5	Mbps/lane

6.2. Reset Operation

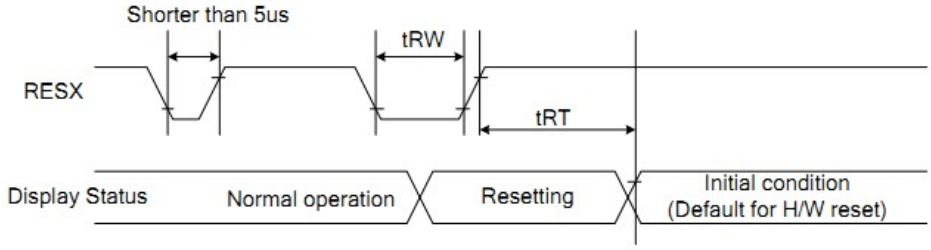


Figure 124: Reset Timing

Table 47: Reset Timing

Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

Notes:

1. *The reset cancel also includes required time for loading ID bytes, VCOM setting and other settings from EEPROM to registers. This loading is done every time when there is H/W reset cancel time (tRT) within 5 ms after a rising edge of RESX.*
2. *Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the Table 48.*

Table 48: Reset Descript

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts

3. During the Resetting period, the display will be blanked (The display enters the blanking sequence, which maximum time is 120 ms, when Reset Starts in the Sleep Out mode. The display remains the blank state in the Sleep In mode.) and then return to Default condition for Hardware Reset.
4. Spike Rejection can also be applied during a valid reset pulse, as shown below:

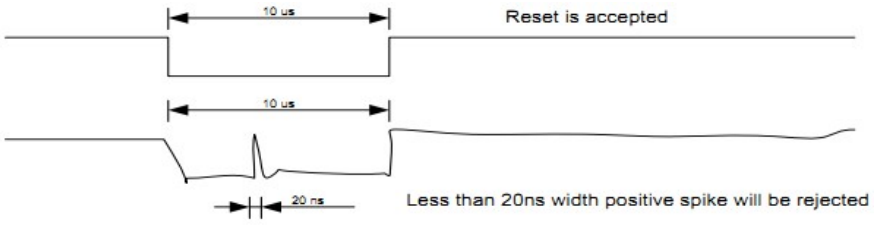


Figure 125: Positive Noise Pulse during Reset Low

5. When Reset applied during Sleep In Mode.
6. When Reset applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

7. Optical Characteristics

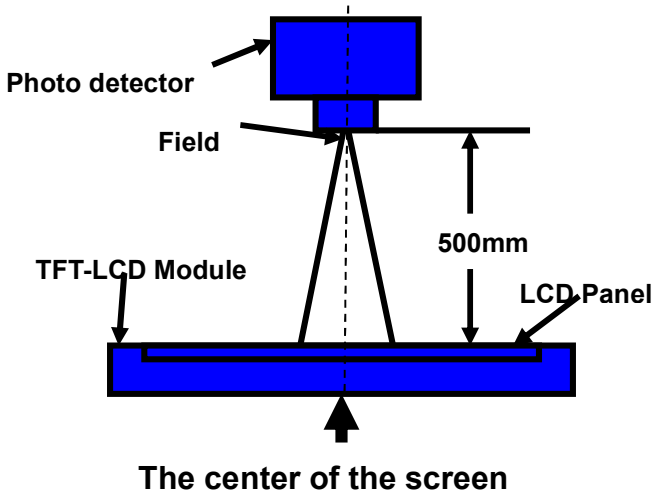
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angle		θ_T	CR≧10	75	80	--	Degree	Note 2
		θ_B		75	80	--		
		θ_L		75	80	--		
		θ_R		75	80	--		
Contrast Ratio		CR	θ=0°	800	1000	--		Note1 Note3
Response Time		Tr	25℃	--	30	--	ms	Note1 Note4
		Tf						
Chromaticity (CIE1931)	White	x		0.275	0.305	0.335	-	Note1 Note5
		y		0.301	0.331	0.361		
	Red	x		0.585	0.615	0.645		
		y		0.324	0.354	0.384		
	Green	x		0.312	0.342	0.372		
		y		0.534	0.564	0.594		
	Blue	x		0.108	0.138	0.168		
		y		0.054	0.084	0.114		
Uniformity		U	-	70	75	--	%	Note1 Note6
NTSC ratio		-	-	50	60	--	%	Note 5
Luminance		L	-	250	300	--	cd/m2	Note1 Note7

Test Conditions:

1. IF= 80 mA, and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

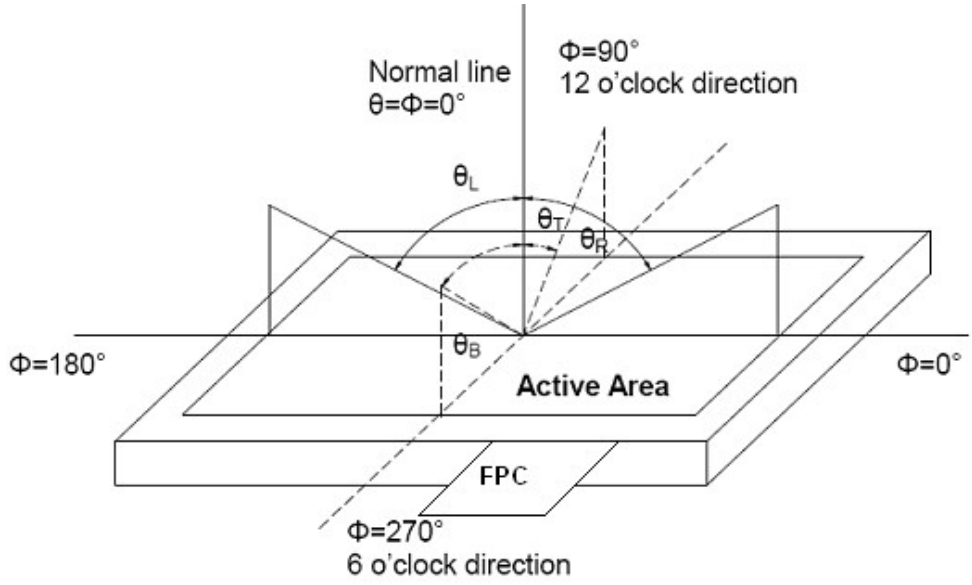
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen.



Item	Photo detector	Field
Contrast Ratio	BM-7A	1°
Luminance		
Chromaticity		
Lum Uniformity		

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。



Note 3: Definition of contrast ratio

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

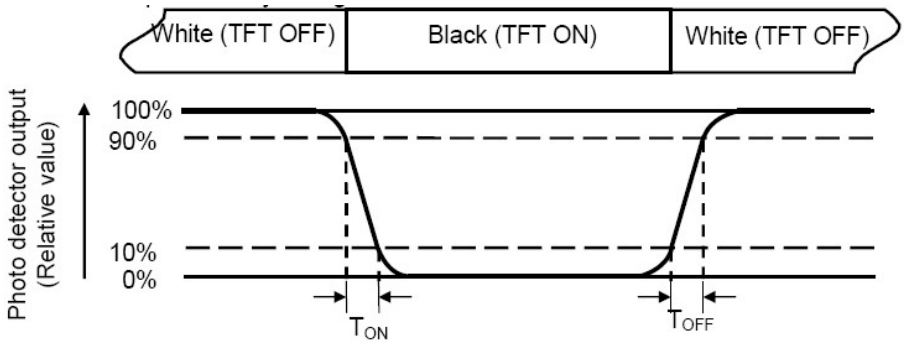
"White" state: The state is that the LCD should drive by Vwhite.

"Black" state: The state is that the LCD should drive by Vblack.

Vwhite: To be determined Vblack: To be determined.

Note 4: Definition of Response time

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



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = Lmin/ Lmax x100%

L-------Active area length W----- Active area width

Note 7: Definition of Luminance:

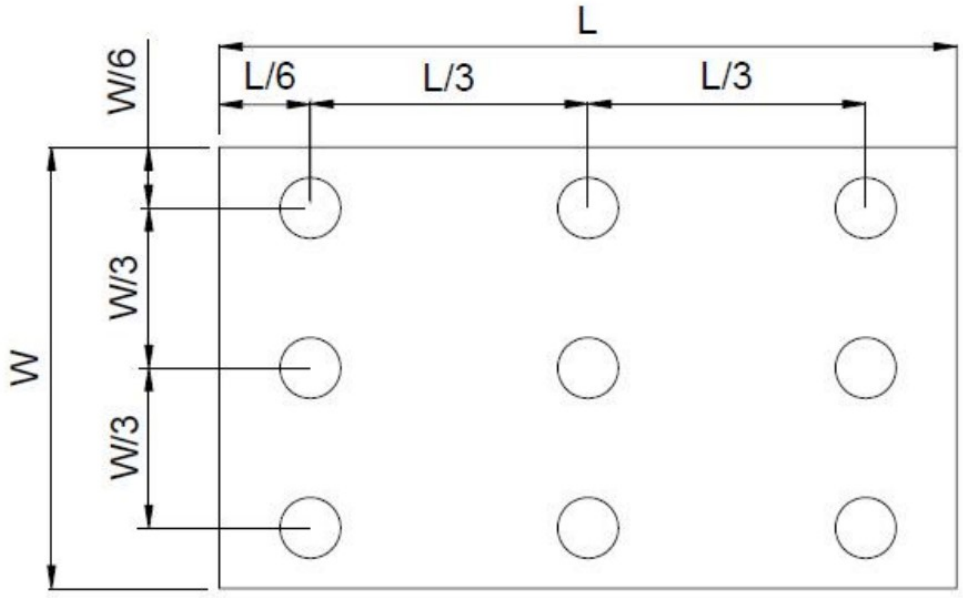
Measure the luminance of white state at center point.

Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

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

L-------Active area length W----- Active area width



8. Reliability Test

Item	Test Conditions	Criterion
High Temperature Storage	Ta = 80℃ 96hrs	A,B,C,D,E
Low Temperature Storage	Ta = -30℃ 96hrs	A,B,C,D,E
High Temperature Operation	Ts = 70℃ 96hrs	A,B,C,D,E
Low Temperature Operation	Ta =-20℃ 96hrs	A,B,C,D,E
Operate at High Temperature and Humidity	+60℃, 90%RH 96hrs	A,B,C,D,E
Thermal Shock(non operation)	-20℃/30 min ~ +70℃/30 min for a total 5 cycles, Start with cold temperature and end with high temperature.	A,B,C,D,E
Vibration Test	Sweep:10Hz~55Hz~10Hz 2G 1 hours for each direction of X. Y. Z. (3 hours for total)	A,B,C,D,E
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 1 hours for each direction of X. Y. Z. (3 hours for total)	A,B,C,D,E
Package Drop Test	Height:40 cm 1 corner, 3 edges, 6 surfaces	A,B,C,D,E
Electro Static Discharge	Contact=+/-4KV, Air=+/-8KV,(R=330R,C=150pF), 1 sec,9point,10times/point;	A,B,C,D,E

※Criterion:

A.LCM each function is OK.

B.LCM appearance inspection without abnormalities (Including scratch, damage, corrosion and serious deformation)

C.LCM brightness above the Min. value of Spec.

D. Luminance uniformity above the Min. value of Spec.

E. Color chromaticity within tolerance range

9. Packing Specification

TBD

10. Precautions

10.1. Handling Precautions

10.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.2. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.3. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

10.1.4. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.5. Do not attempt to disassemble the LCD Module.

10.1.6. If the logic circuit power is off, do not apply the input signals.

10.1.7. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8. Be sure to ground the body when handling the LCD Modules.

10.1.9. Tools required for assembly, such as soldering irons, must be properly ground.

10.1.10. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.11. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2. Storage Precautions

When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃ Relatively humidity: ≤80%

The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3. Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.