

SPECIFICATION

PRODUCT NO. : TCXD020ABLGR-12

VERSION : Ver 1.3

ISSUED DATE : 2023-1-31

This module is RoHS compliant

FOR CUSTOMER: _____

☐ : APPROVAL FOR SPECIFICATION

☐ : APPROVAL FOR SAMPLE

DATE	APPROVED BY

Xinli Optoelectronics :

Presented by	Reviewed by	Organized by

Note:

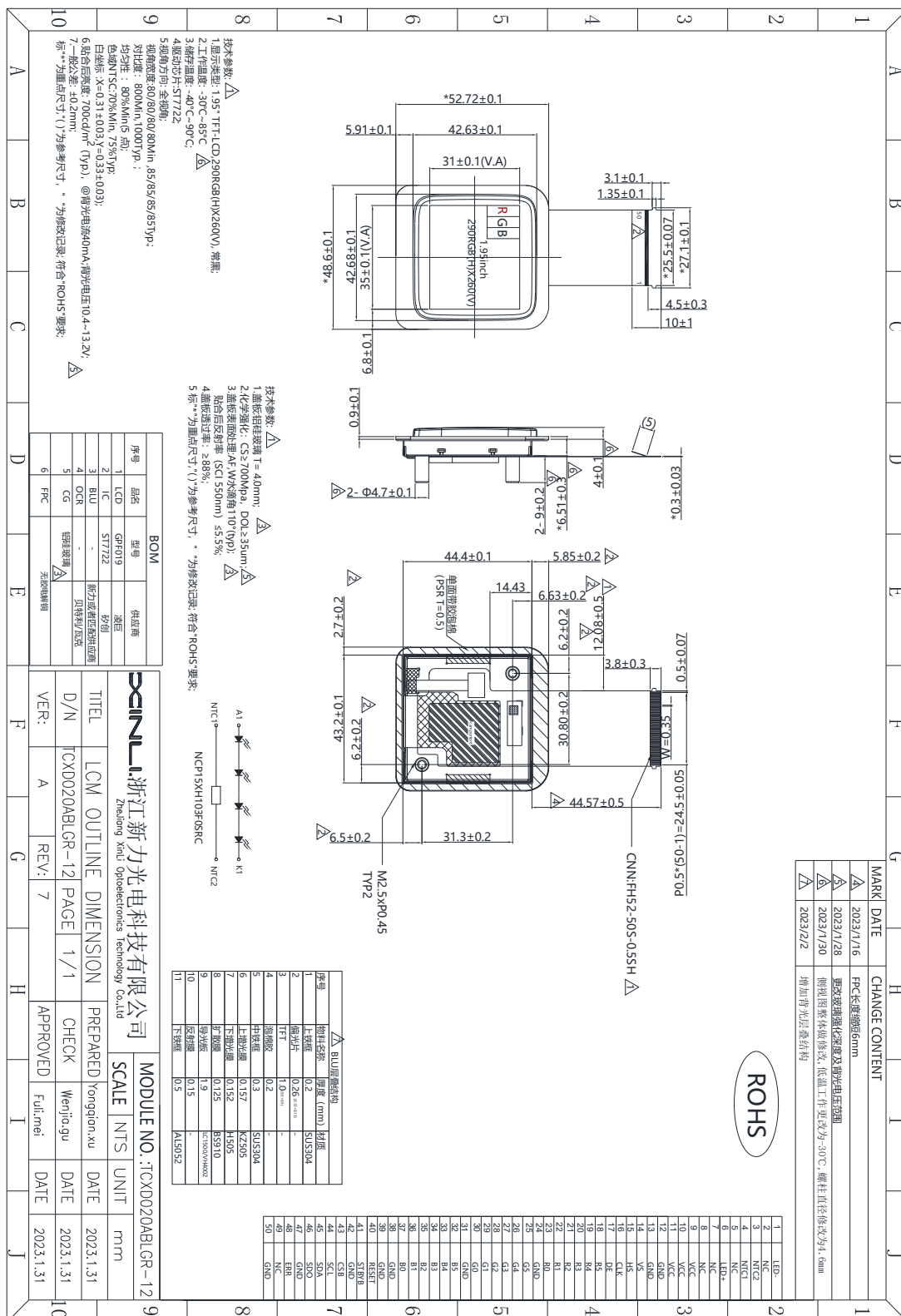
- Xinli Optoelectronics reserves the right to make changes without further notice to any products herein to improve reliability, function or design.
- All rights are reserved. No one is permitted to reproduce or duplicate the whole or part of this document without Xinli Optoelectronics' permission

2. General Description and Features

The 2.0 inch Module named TCXD020ABLGR-12 is a-Si TFT-LCD module, which is the type of transmissive. It is consisted of TFT-LCD Panel, one Driver IC, one FPC , one Back-Light and Glass cover plate unit. Features of this product are listed in the following table.

NO	Item	Contents	Unit
(1)	Module Outline	48.6*52.72	mm
(2)	LCD Active area	36.801*32.994	mm
(3)	Dot Number	290*RGB*260	/
(4)	Dot size	0.1275(H)*0.1275(V)	Mm
(5)	LCD type	TFT Transmissive	/
(6)	Display Color	262k	/
(7)	Viewing direction	ALL	O'clock
(8)	Drive IC	ST7722	/
(9)	Interface type	SPI+RGB	/
(10)	Module weight	TBD	g

3. Mechanical Dimension



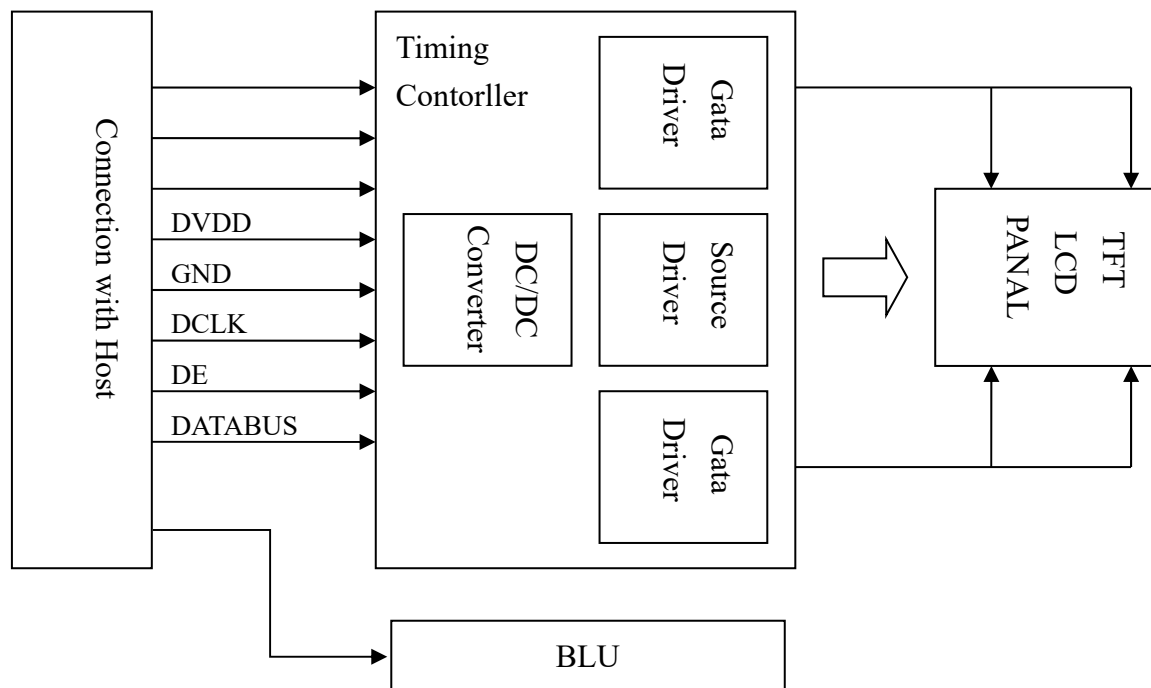
4.Interface Pin Connection

LCM: The Connector recommended model is FH52-50S-0.5SH manufactured by HIROSE

NO	Symbol	Level	Description
1	LED-	P	LED Power -
2	NC	/	No Connection
3	NTC2	O	heat sensor
4	NTC1	O	heat sensor
5	NC	/	No Connection
6	LED+	P	LED Power +
7	NC	/	No Connection
8	NC	/	No Connection
9	VCC	P	Power supply
10	VCC	P	Power supply
11	VCC	P	Power supply
12	GND	P	Power ground
13	GND	P	Power ground
14	VS	I	Vertical sync input in digital parallel RGB. Negative polarity.
15	HS	I	Horizontal sync input in digital parallel RGB. Negative polarity.
16	CLK	I	Clock signal
17	DE	I	Line synchronous signal
18	R5	I	Red data
19	R4	I	
20	R3	I	
21	R2	I	
22	R1	I	
23	R0	I	
24	GND	P	Power ground
25	G5	I	Green data
26	G4	I	
27	G3	I	
28	G2	I	

29	G1	I	
30	G0	I	
31	GND	P	Power ground
32	B5	I	Blue data
33	B4	I	
34	B3	I	
35	B2	I	
36	B1	I	
37	B0	I	
38	GND	P	Power ground
39	GND	P	Power ground
40	RESET	I	Reset input pin H: Normal operation L: Reset state
41	STBYB	I	Standby mode H: Normal operation L: Standby mode
42	GND	P	Power ground
43	CSB	I	Serial communication chip selection
44	SCL	I	Serial communication Clock signal for SPI
45	SDA	I	Serial data input of SPI
46	SDO	I	Serial communication data output pin
47	GND	P	Power ground
48	ERR	I	Output pin for error detection. L: Function error detected. H: No error detected
49	NC	/	No Connection
50	GND	P	Power ground

5. Block Diagram



6. Maximum Rating

Item	Symbol	Rating	Unit
Operating temperature	Top	-30 to 85	°C
Storage temperature	Tst	-40 to 90	°C
Absoulute maximun ratings	VCC	-0.3V ~ 6.0	V

NOTE:

If the module was used these absolute maximum ratings as above, it may be damaged permanently. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability. VDD>GND must be maintained.

7. Electrical Characteristics

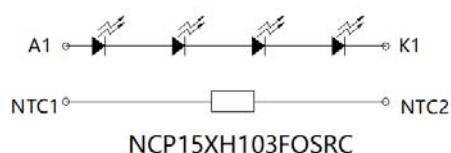
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Analog power supply	VCC	-	2.7	-	3.6	V

Complete the specification after confirmation.

8. Backlight Characteristics

Item	syb	Min	Typ	Max	Unit	Condition
Voltage	Vf	10.4	12.4	13.2	V	IF=40mA
Number of LED	-	4			pcs	-
Current		-	40	80	mA	
Power Consumption	PWF	-	496	-	mW	-
LED life-span	-	(20000)	-	-	Hrs	-

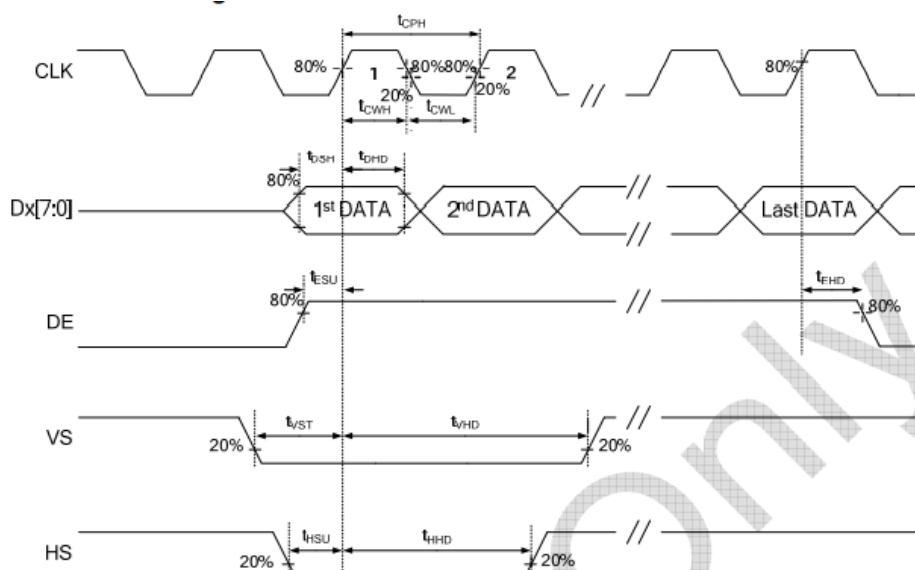
Note1: The recommended current is less than or equal to 40mA.



9. RGB signal Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency	RxFCLK	5.94	5.94	11.34	MHz	
Horizontal Display Area	Thd	290			DCLK	
1 horizontal line	Th	330	330	450		
Vertical Display Area	Tvd	260			H	
1 vertical field	Tv	300	300	420		
Frame rate			60		HZ	

10. TTL AC Characteristics



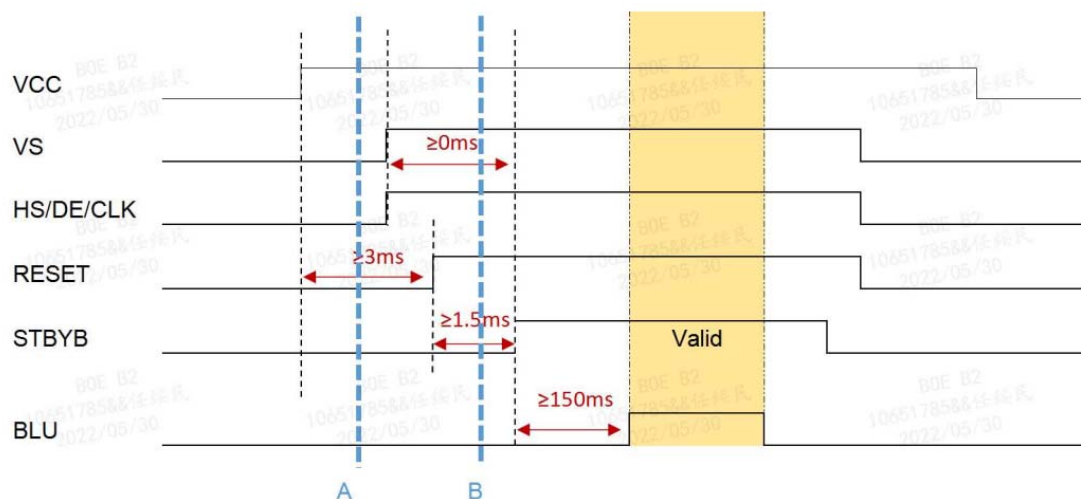
VSSI = VSSRX = VSSP = 0V, VDDI = VDDP = VDDR = 3.0 ~ 3.3V, -40 ~ 105°C

Item	Signal	Symbol	Condition	Rating		Unit
				Min.	Max.	
CLK cycle time	CLK	t_{CPH}		25	250	ns
CLK pulse high duty		t_{CWH}		40	60	
CLK pulse low duty		t_{CWL}		40	60	
VS setup time	VS	t_{VST}		4	-	ns
VS hold time		t_{VHD}		2	-	
HS setup time	HS	t_{HST}		4	-	
HS hold time		t_{HHD}		2	-	
Data setup time	Dx[7:0]	t_{DSH}		4	-	
Date hold time		t_{DHD}		2	-	
DE setup time	DE	t_{ESU}		4	-	
DE hold time		t_{EHD}		2	-	

11. TTL DC Characteristics

Item	Symbol	Condition	Rating			Unit	Applicable Pin
			Min.	Typ.	Max.		
Input High-level Voltage	V_{IH}		0.8 VDDI	—	VDDI	V	SPI & RGB Interface
Input Low-level Voltage	V_{IL}		VSS	—	0.2 VDDI	V	SPI & RGB Interface
Output High-level Voltage	V_{OH}	VDDI=3.0V, IOL=1mA	0.8 VDDI	—	VDDI	V	SPI & I2C Interface
Output Low-level Voltage	V_{OL}	VDDI=3.0V, IOL=1mA	VSS	—	0.2 VDDI	V	SPI & I2C Interface
Input Leakage Current	I_{LI}	$V_{IN}=VDDI$ or DGND	-1.0	—	1.0	μA	SPI & RGB Interface

12. Power on/off sequence



13. Application Circuit

Please consult our technical department for detail information.

14. Initial Code

Please consult our technical department for detail information.

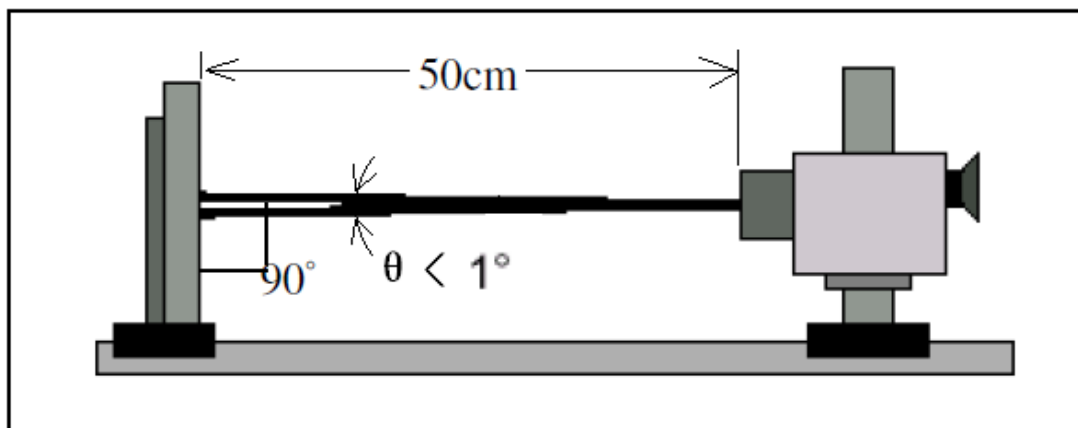
15. Electro-Optical Characteristics

Note 1: Ambient temperature= $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$, IF=40mA.

Note 2: To be measured in the dark room with backlight unit.

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Response time		Tr+Tf	$\theta=0^{\circ}$ $\phi=0^{\circ}$ $Ta=25^{\circ}C$	-	-	30ms	ms	4
Uniformity (Five point)		δ WHITE		80	-	-	%	7
Contrast ratio		Cr		800	1000	-	-	3,5
Surface Luminance		Lv		560	700	-	Cd/m ²	1, 3, 7
Viewing angle range		θ	$\phi=90^{\circ}$	80	85	-	deg	6
			$\phi=270^{\circ}$	80	85	-	deg	
			$\phi=0^{\circ}$	80	85	-	deg	
			$\phi=180^{\circ}$	80	85	-	deg	
Color filter chromaticity (x, y)	White	X	$\theta=\phi=0^{\circ}$	± 0.03	TBD	± 0.03	deg	1,7
		Y			TBD			
	Red	X	$\theta=\phi=0^{\circ}$		TBD			
		Y			TBD			
	Green	X	$\theta=\phi=0^{\circ}$		TBD			
		Y			TBD			
	Blue	X	$\theta=\phi=0^{\circ}$		TBD			
		Y			TBD			
NTSC			Ta=25°C		75		%	

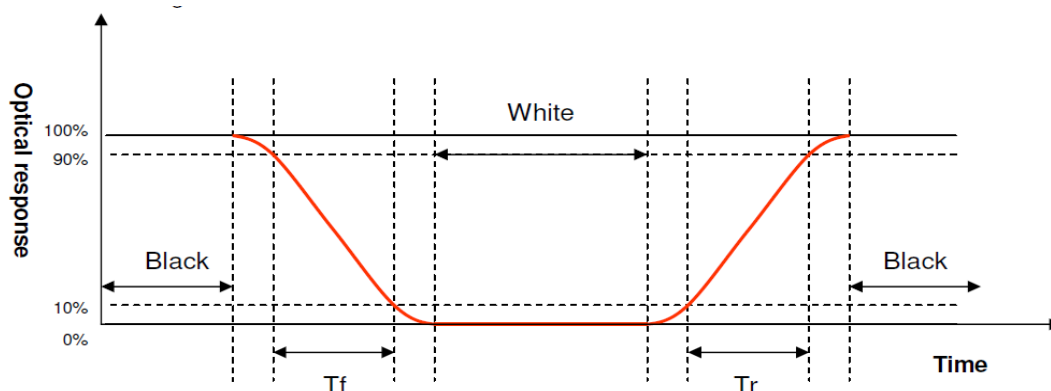
Note 3: To be measured at the center area of panel with a viewing cone of 1 by Topcon luminance meter BM-7A, after 10 minutes operation (module).



Note 4: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white” (rising time) and from “white” to “black” (falling time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes.

Refer to figure as below.



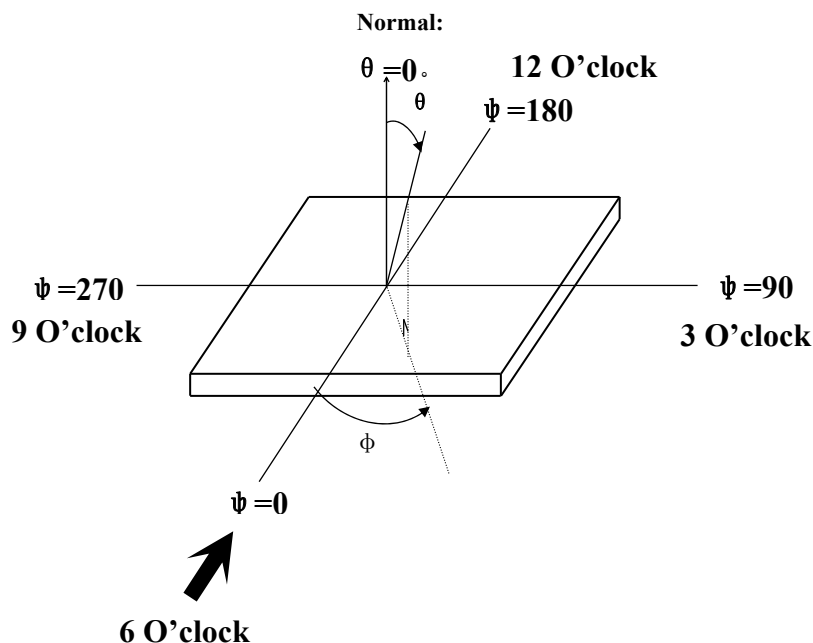
Note 5. Definition of contrast ratio:

Contrast ratio is calculated with the following formula:

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

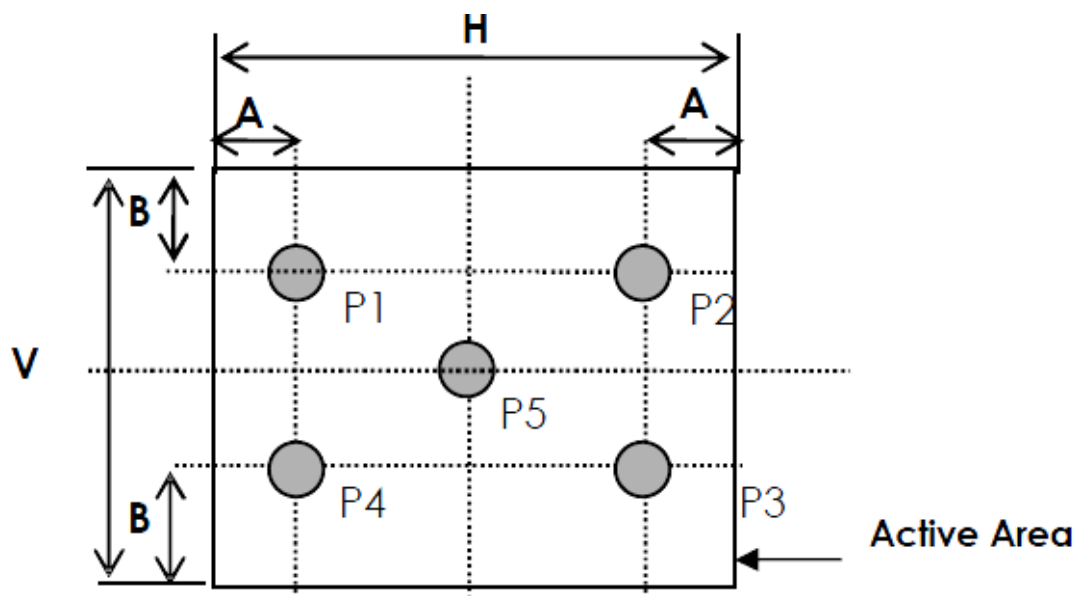
Note 6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 2, for TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.



Note 7. Surface luminance is the LCD surface from the surface with all pixels displaying white. Refer to figure as below.

Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity



A : 5 mm B : 5 mm H, V : Active Area

Light spot size $\varnothing = 7\text{mm}$, 500mm distance from the LCD surface to detector lens

measurement instrument is TOPCON' s luminance meter BM-7A

Uniformity definition= [min of 5point/max of 5points]x100%

L_v = Average Surface Luminance with all white pixels (P5)

16. Quality Assurance

TBD

17. Reliability Test

This standard reliability test is done only for the first lot of MP products. Customer and supplier must hold a discussion if other reliability test is requested by customer.

No	Test Item	Description	Test Condition
1	High temperature storage	Endurance test applying the high storage temperature for a long time	90°C,500 H
2	Low temperature storage	Endurance test applying the low storage temperature for a long time	-40°C,500H
3	High temperature operation	Endurance test applying the electric stress under high temperature for a long time	85°C,500H
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time	-30°C,500H
5	High temperature /humidity storage	Endurance test applying the high temperature and high humidity storage for a long time	60°C,90% RH, 500H
6	Temperature Cycle (Non operation)	Endurance test applying the low and high temperature cycle -30°C ← → 25°C ← → 85°C 30min ← → 5min ← → 30min ←—————→ one cycle	-30°C/85°C, 288 ycles

18. Precautions for Operation and Storage

1. Precautions for Operation

- (1) Since LCD panel made of glass, in order to prevent from glass broken or color tone change, please do not apply any mechanical shock or impact or excessive force to it when installing the LCD module.
- (2) If LCD panel is broken and liquid crystal substance leaks out and contact your skin or clothes, please immediately wash it off by using soap and water.
- (3) The polarizer on the LCD surface is soft and easily scratched. Please be careful when handling.
- (4) If LCD surface becomes contaminated, please wipe it off gently by using moist soft cloth with normal hexane, do not use acetone, ketone, ethanol, alcohol or water. If there is saliva or water on the LCD surface, please wipe it off immediately.
- (5) When handling LCD module, please be sure that the body and the tools are properly grounded. And do not touch I/F pins with bare hands or contaminate I/F pins.
- (6) Do not attempt to disassemble or process the LCD module.
- (7) LCD module should be used under recommended operating conditions shown in chapter 6 and 7.
- (8) Response time will be extremely slower at lower temperature than at specified temperature and LCD will show different color when at higher temperature. The phenomenon will disappear when returning to specified condition.
- (9) Foggy dew, moisture condensation or water droplets deposited on surface and contact terminals will cause polarizer stain or damage, the deteriorated display quality and electrochemical reaction then leads to the shorter life time and permanent damage to the module probably. Please pay attention to the environmental temperature and humidity.

1. Precautions for Storage

- (1) Please store LCD module in a dark place, avoid exposure to sunlight, the light of fluorescent lamp or any ultraviolet ray.
- (2) Keep the environment temperature at between 10°C and 35 °C and at normal humidity. Avoid high temperature, high humidity or temperature below 0°C.
- (3) That keeps the LCD modules stored in the container shipped from supplier before using them is recommended.

(4) Do not leave any article on the LCD module surface for an extended period of time.

2. Warranty period

Warrants for a period of 12 Months from the shipping date when stored or used under normal condition.

19. Packing Specification

TBD