

# SPECIFICATION

**PRODUCT NO. : TCXD035IBLGA-41**

**VERSION : Ver 1.0**

**ISSUED DATE : 2022-4-11**

This module uses ROHS material

**FOR CUSTOMER:** \_\_\_\_\_

☐: APPROVAL FOR SPECIFICATION

☒: APPROVAL FOR SAMPLE

DATE	APPROVED BY

**Xinli Optoelectronics :**

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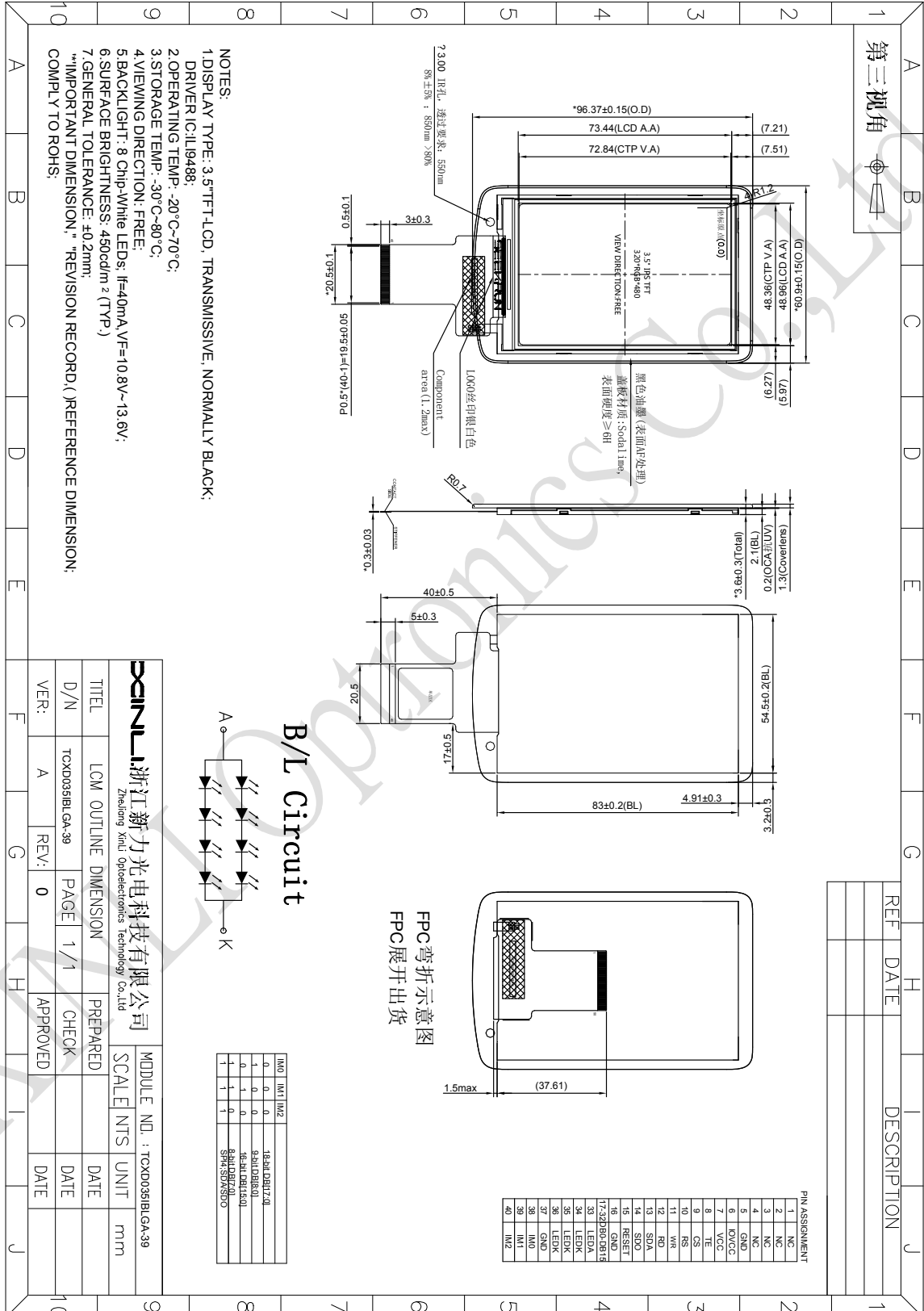
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## 2. General Description and Features

The 10.1 inch Module named TCXD035IBLGA-41 is a-Si TFT-LCD module, which is the type of transmissive. It is consisted of TFT-LCD Panel, Driver IC, FPC,CG and Back-Light unit. Features of this product are listed in the following table.

NO	Item	Contents	Unit
(1)	Module Outline	60.9(H)*96.37(V)*3.6(T)	mm
(2)	LCD Active area	48.96(H)*73.44(V)	mm
(3)	Dot Number	320RGB*480	/
(4)	Sub pixel size	0.153(H)*0.153(V)	mm
(5)	LCD type	TFT Transmissive, Normally Black	/
(6)	Display Color	262K	/
(7)	Viewing direction	ALL	O'clock
(8)	Drive IC	ST7796	
(9)	Power Supply	2.8 (TYP)	V
(10)	Backlight Type	8-chip LED	/
(11)	Interface type	8080 MCU Interface	/
(12)	Module weight	TDB	g

### 3. Mechanical Dimension

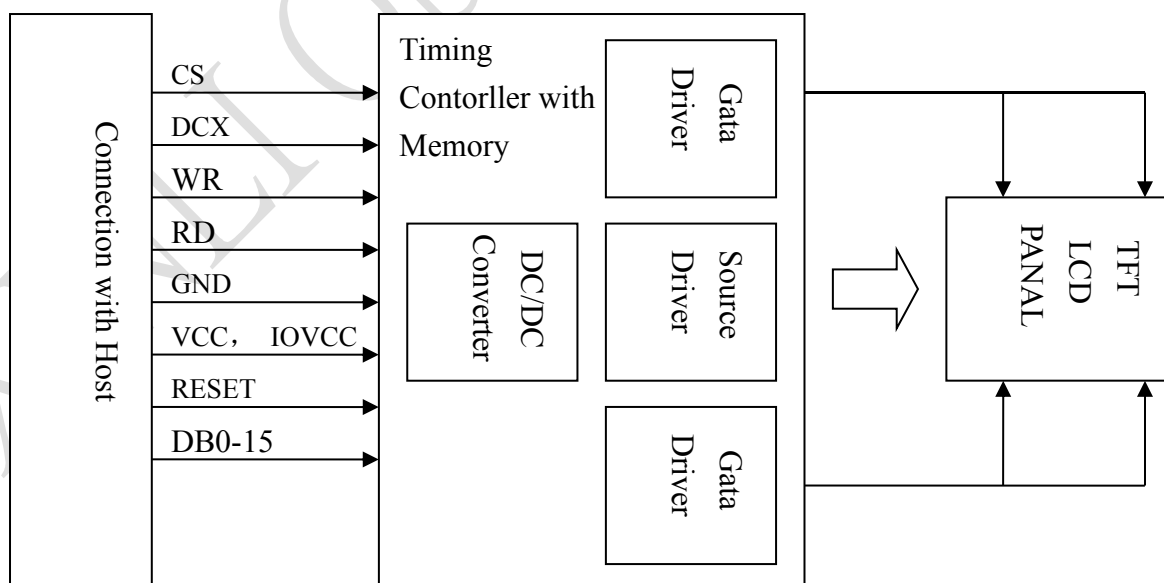


#### 4. Interface Pin Connection

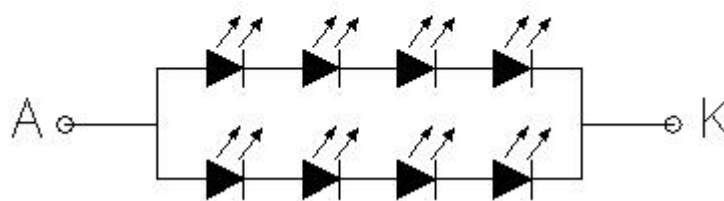
NO	Symbol	Level	Description
1	NC	-	No Connection
2	NC	-	No Connection
3	NC	-	No Connection
4	NC	-	No Connection
5	GND	P	Power ground
6	IOVCC	P	Power supply for I/O system
7	VCC	P	Power supply
8	TE	O	Tearing effect output.
9	CS	I	Chip selection pin. Low-active.
10	RS	I	Data/Command Selection pin
11	WR	I	Write enable
12	RD	O	Read enable
13	SDA	I	SPI interface input/output pin.
14	SDO	O	SPI interface output pin.
15	RESET		Reset pin
16	GND	P	Power ground
17	DB0	I/O	Data Pin
18	DB1	I/O	Data Pin
19	DB2	I/O	Data Pin
20	DB3	I/O	Data Pin
21	DB4	I/O	Data Pin
22	DB5	I/O	Data Pin
23	DB6	I/O	Data Pin
24	DB7	I	Data Pin
25	DB8	I	Data Pin
26	DB9	I	Data Pin
27	DB10	I	Data Pin
28	DB11	I	Data Pin

29	DB12	I	Data Pin																											
30	DB13	I	Data Pin																											
31	DB14	I	Data Pin																											
32	DB15	I	Data Pin																											
33	LEDA	P	LED power																											
34	LEDK	P	LED string Ground																											
35	LEDK	P	LED string Ground																											
36	LEDK	P	LED string Ground																											
37	GND	P	Power ground																											
38	IM0	I	<table><tr><td>IM0</td><td>IM1</td><td>IM2</td><td></td></tr><tr><td>0</td><td>0</td><td>0</td><td>18-bit DB[17:0]</td></tr><tr><td>1</td><td>0</td><td>0</td><td>9-bit DB[8:0]</td></tr><tr><td>0</td><td>1</td><td>0</td><td>16-bit DB[15:0]</td></tr><tr><td>1</td><td>1</td><td>0</td><td>8-bit DB[7:0]</td></tr><tr><td>1</td><td>1</td><td>1</td><td>SPI4;SDA/SDO</td></tr></table>				IM0	IM1	IM2		0	0	0	18-bit DB[17:0]	1	0	0	9-bit DB[8:0]	0	1	0	16-bit DB[15:0]	1	1	0	8-bit DB[7:0]	1	1	1	SPI4;SDA/SDO
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39	IM1	I																												
40	IM2	I																												

## 5. Block Diagram



## B/L Circuit



### 6. Maximum Rating

Item	Symbol	Rating	Unit
Operating temperature	Top	-20 to 70	°C
Storage temperature	Tst	-30 to 80	°C
Power supply for LCD	VCC	-0.3 ~ 4.6	V
	IOVCC	-0.3 ~ 4.6	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. VCC>GND must be maintained.

### 7. Electrical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Power supply for LCD		VCC	-	2.5	2.8	3.3	V
		IOVCC		1.65	1.8	3.3	V
Logic input signal Voltage	H level	V <sub>IH</sub>		0.7*IOVCC	-	IOVCC	V
	L level	V <sub>IL</sub>		GND	-	0.3*IOVCC	V
Logic output signal Voltage	H level	V <sub>OH</sub>		0.8*IOVCC	-	IOVCC	V
	L level	V <sub>OL</sub>		GND	-	0.2*IOVCC	V

## 8. Backlight Characteristics

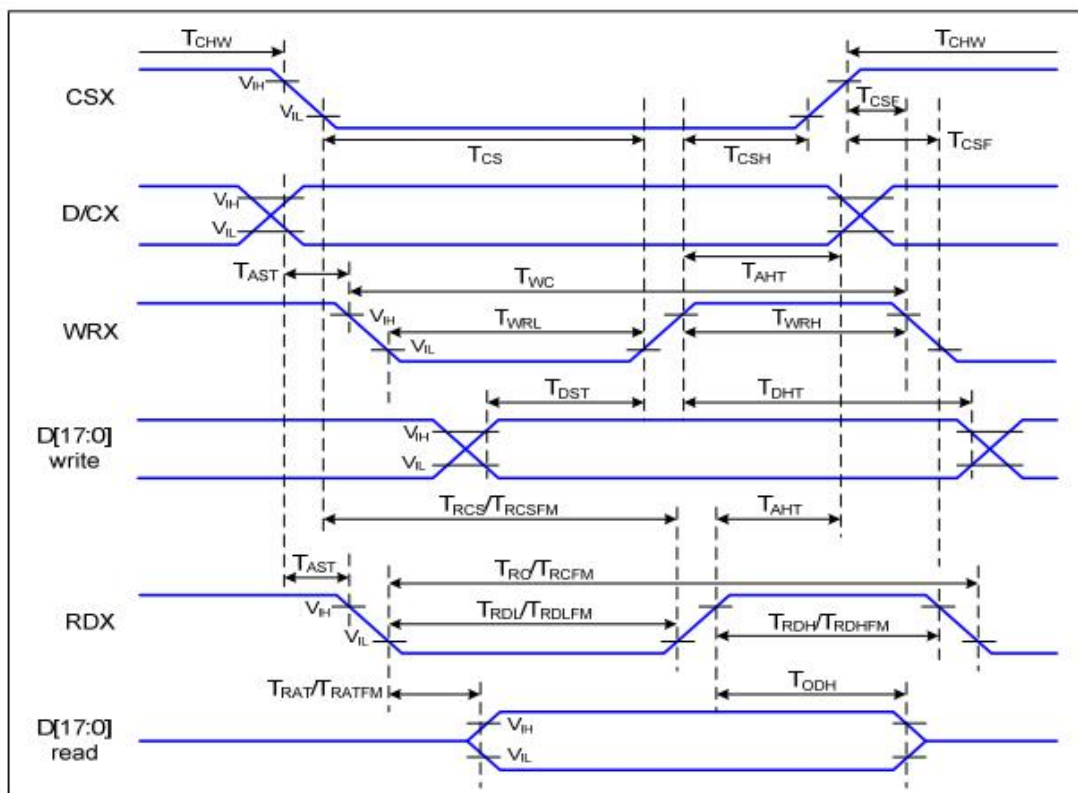
Item	syb	Min	Typ	Max	Unit	Condition
Voltage	Vf	10.8	12.8	13.6	V	IF=40mA
Number of LED	-	8			pcs	-
Power Consumption	PWF	-	320	-	mW	-
Connection mode	-	4P2S			-	-
LED life-span	-	-	(20000)	-	Hrs	-

## 9. Timing Characteristics

### 9.1. AC Characteristics

**8080 Series MCU Parallel Interface Characteristics: 18/16/9/8-bit Bus**

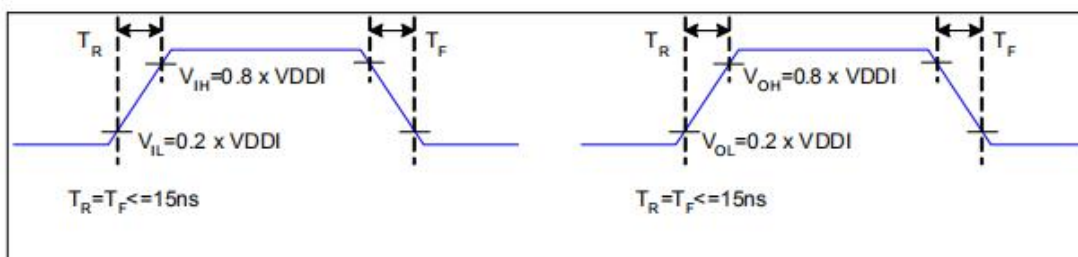




VDDI=1.8V, VDDA=2.8V, AGND=DGND=0V,  $T_a=25\text{ }^{\circ}\text{C}$

Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	$T_{AST}$	Address setup time	0		ns	-
	$T_{AHT}$	Address hold time (Write/Read)	10		ns	
CSX	$T_{CHW}$	Chip select "H" pulse width	0		ns	-
	$T_{CS}$	Chip select setup time (Write)	15		ns	
	$T_{RCS}$	Chip select setup time (Read ID)	45		ns	
	$T_{RCSFM}$	Chip select setup time (Read FM)	355		ns	
	$T_{CSF}$	Chip select wait time (Write/Read)	10		ns	
	$T_{CSH}$	Chip select hold time	10		ns	
WRX	$T_{WC}$	Write cycle	66		ns	-
	$T_{WRH}$	Control pulse "H" duration	15		ns	

	$T_{WRL}$	Control pulse "L" duration	15		ns	
RDX (ID)	$T_{RC}$	Read cycle (ID)	160		ns	When read ID data
	$T_{RDH}$	Control pulse "H" duration (ID)	90		ns	
	$T_{RDL}$	Control pulse "L" duration (ID)	45		ns	
RDX (FM)	$T_{RCFM}$	Read cycle (FM)	450		ns	When read from frame memory
	$T_{RDHFM}$	Control pulse "H" duration (FM)	90		ns	
	$T_{RDLFM}$	Control pulse "L" duration (FM)	355		ns	
D[17:0]	$T_{DST}$	Data setup time	10		ns	For CL=30pF
	$T_{DHT}$	Data hold time	10		ns	
	$T_{RAT}$	Read access time (ID)	-	40	ns	
	$T_{RATFM}$	Read access time (FM)	-	340	ns	
	$T_{ODH}$	Output disable time	20	80	ns	



Rising and Falling Timing for I/O Signal

## 10. Application Circuit

Please consult our technical department for detail information.

## 11. QUALITY LEVEL

Please consult our technical department for detail information.

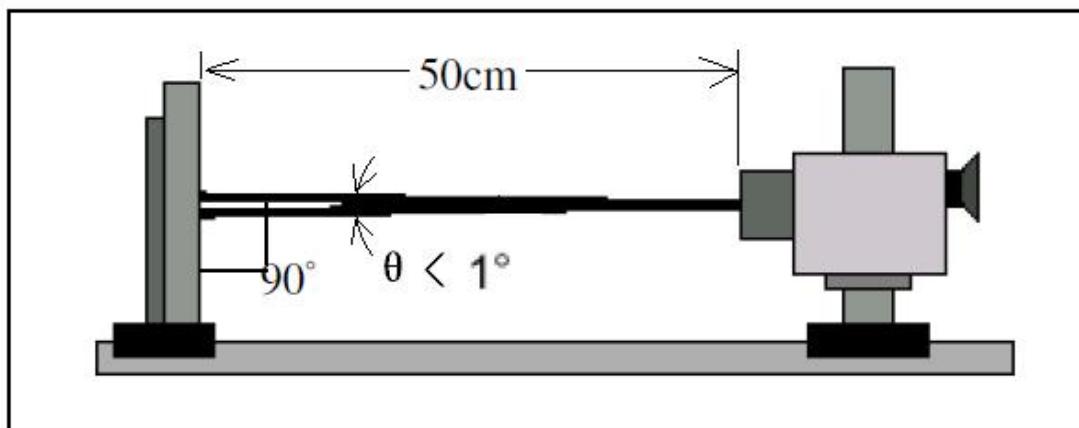
## 12. Electro-Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Response time		Tr+Tf	$\theta = 0$	-	30	40	ms	5
Uniformity (Five point)		$\delta$ WHITE	$=0$ $T_a=25^\circ\text{C}$	70	75	-	%	1, 2, 3 4, 5
Contrast ratio		Cr		-	1000	-	-	3, 5
LCM LUMINANCE		Lv		-	450	-	-	5
Viewing angle range		$\theta$	$\varnothing = 90^\circ$	75	80	-	deg	5
			$\varnothing = 270^\circ$	75	80	-	deg	
			$\varnothing = 0^\circ$	75	80	-	deg	
			$\varnothing = 180^\circ$	75	80	-	deg	
Color filter chromaticity (x, y)	White	X	$\theta = \phi = 0^\circ$	-0.04	TBD	+0.04		5
		Y			TBD			
	Red	X			TBD			
		Y			TBD			
	Green	X			TBD			
		Y			TBD			
	Blue	X			TBD			
		Y			TBD			

Note 1: Ambient temperature= $25^\circ\text{C} \pm 2^\circ\text{C}$

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

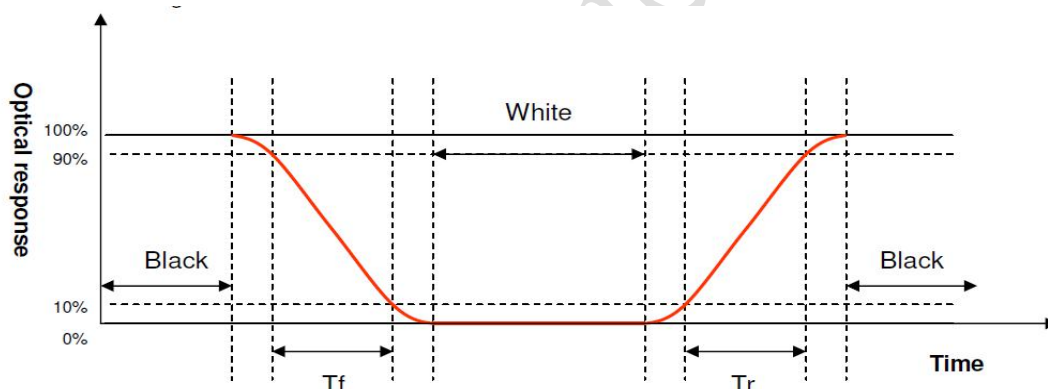
Note 3: To be measured at the center area of panel with a viewing cone of 1 by Topcon luminance meter BM-7A, after 10 minutes operation (module).



**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.



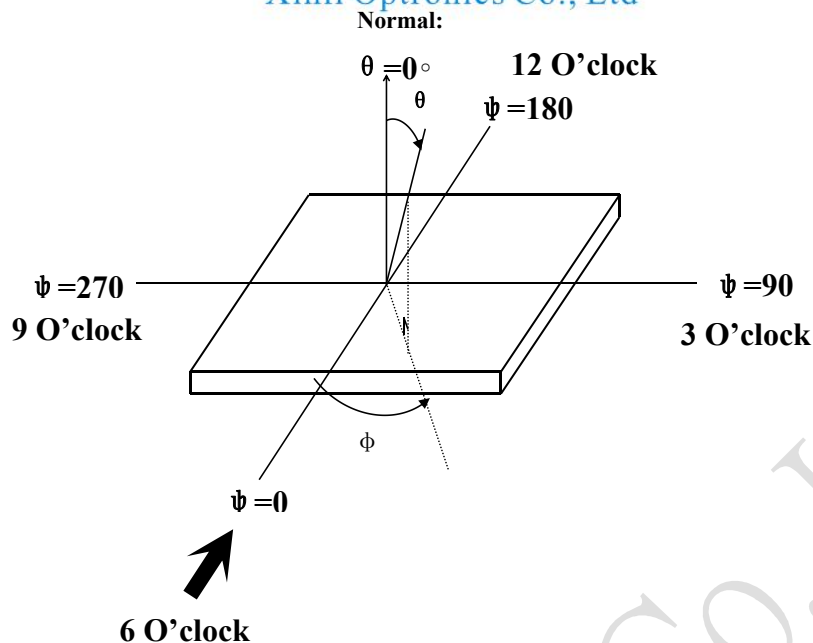
**Note 5. Definition of contrast ratio:**

Contrast ratio is calculated with the following formula:

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

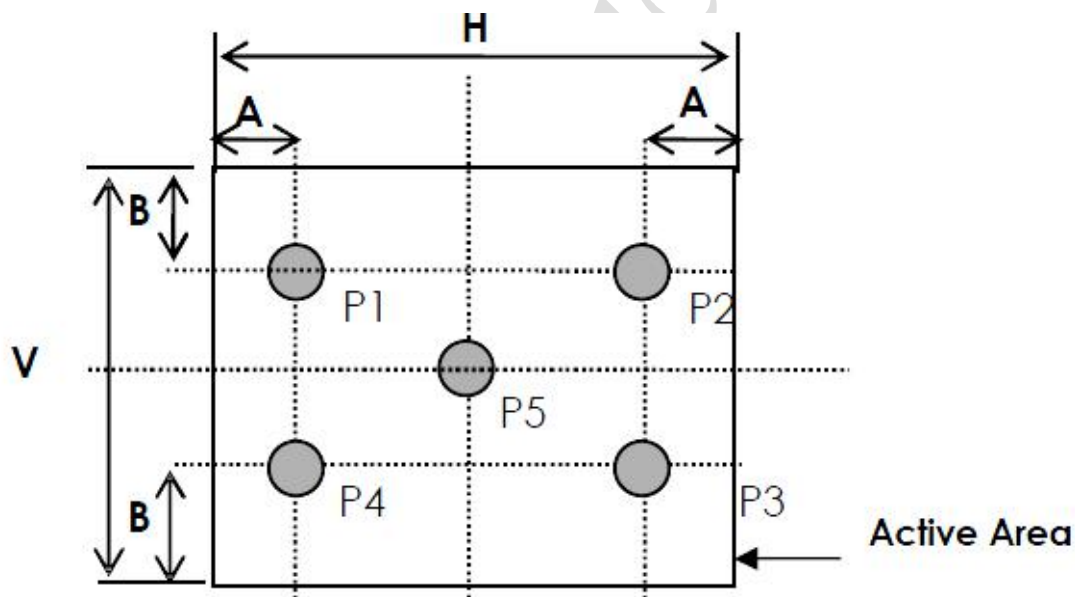
**Note 6. Definition of viewing angle**

Viewing angle is the angle at which the contrast ratio is greater than 10 for TFT module. 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**



$A : 5 \text{ mm}$   $B : 5 \text{ mm}$   $H, V : \text{Active Area}$

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] $\times 100\%$**

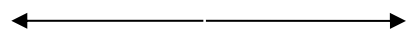
**$L_v$  = Average Surface Luminance with all white pixels ( $P_1, P_2, P_3, P_4, P_5$ )**

### 13. 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.

If there is any abnormality, the normal temperature and humidity recovery 2 hours after the display is OK, the result is judged as OK.

NO.	Test Item	Description	Test Condition
1	High temperature storage	Endurance test applying the high storage temperature for a long time	80℃,240 H
2	Low temperature storage	Endurance test applying the low storage temperature for a long time	-30℃,240H
3	High temperature operation	Endurance test applying the electric stress under high temperature for a long time	70℃,240H
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time	-20℃,240H
5	High temperature /humidity operation	Endurance test applying the high temperature and high humidity storage for a long time	60℃,90% RH, 240H
6	Temperature Cycle (Non operation)	Endurance test applying the low and high temperature cycle $-30^{\circ}\text{C} \leftarrow \rightarrow 25^{\circ}\text{C} \leftarrow \rightarrow 80^{\circ}\text{C}$ $30\text{min} \leftarrow \rightarrow 5\text{min} \leftarrow \rightarrow 30\text{min}$  one cycle	-30℃/80℃, 100 cycles

## 14. Quality Assurance

TBD

## 15. 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 moisten 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.

## **16. Package Specification**

TBD