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Release date	2021/04/21	Revision	1.0

SPECIFICATION

PRODUCT NO. : TCXD015IBLON-18

VERSION : Ver 1.0

ISSUED DATE : 2021-04-21

This module uses ROHS material

FOR CUSTOMER: _____

☐ : APPROVAL FOR SPECIFICATION

☐ : APPROVAL FOR SAMPLE

DATE	APPROVED BY

Xinli Optoelectronics :

Presented by	Reviewed by	Organized by

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1. Revision Recode

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2. General Description and Features

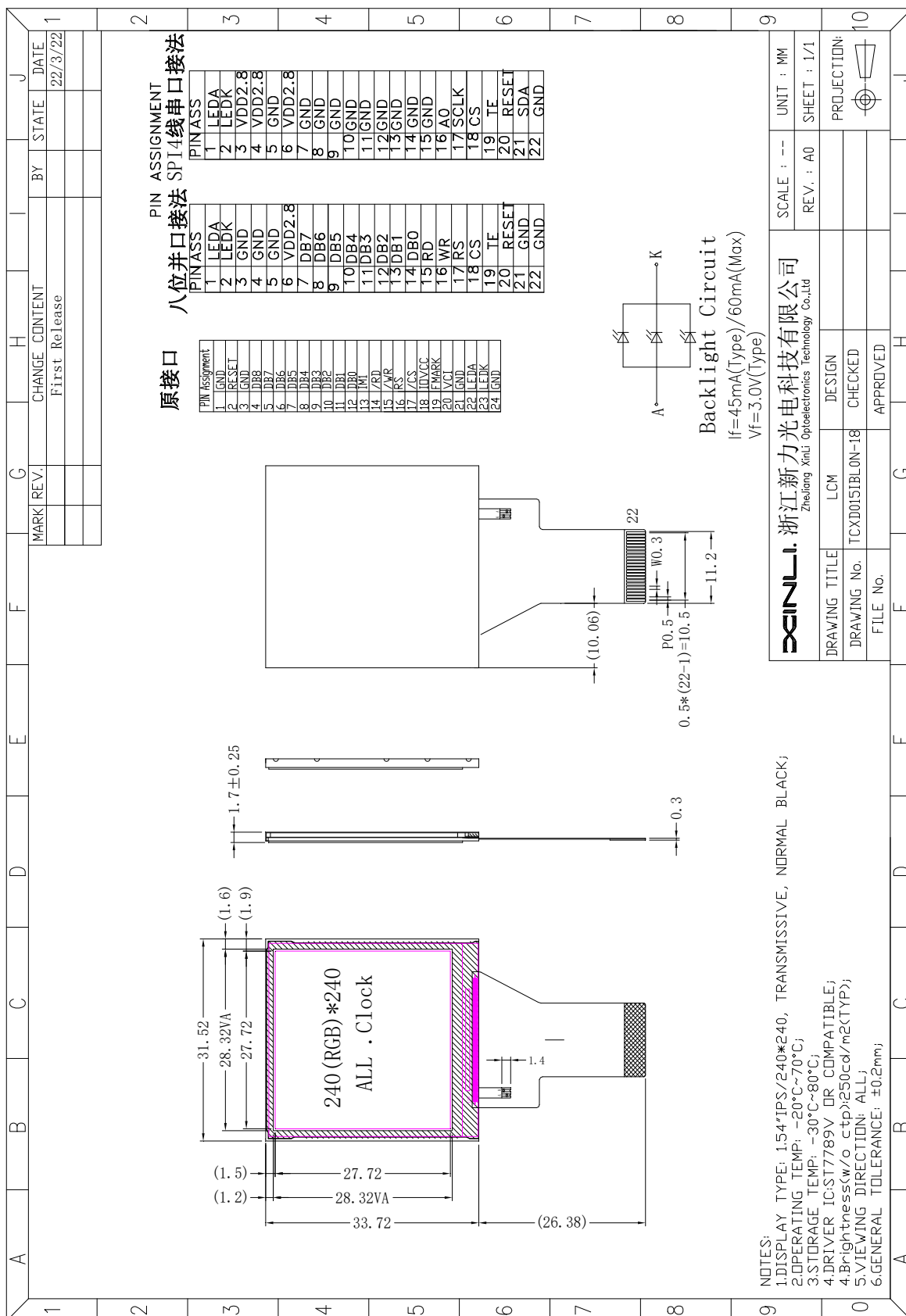
2.1 Overview

The 1.5 inch Module named TCXD015IBL0N-18 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 unit and one CTP. Features of this product are listed in the following table.

2.2 General Specification

NO	Item	Contents	Unit
(1)	Module Outline	31.52*33.72*1.7	mm
(2)	LCD Active area	27.72*27.72	mm
(3)	Dot Number	240*3(RGB)*240	/
(4)	Dot size	0.1155*0.1155	mm
(5)	LCD type	TFT Transmissive, Normally black	/
(6)	Display Color	65K	/
(7)	Viewing direction	Free	O'clock
(8)	Backlight Type	3-chips LEDs	/
(9)	Power Supply	2.8(TYP)	V
(10)	Drive IC	ST7789V	/
(11)	Interface type	MCU interface	
(12)	Module weight	TBD	/

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Interface Pin Connection

4.1 LCM

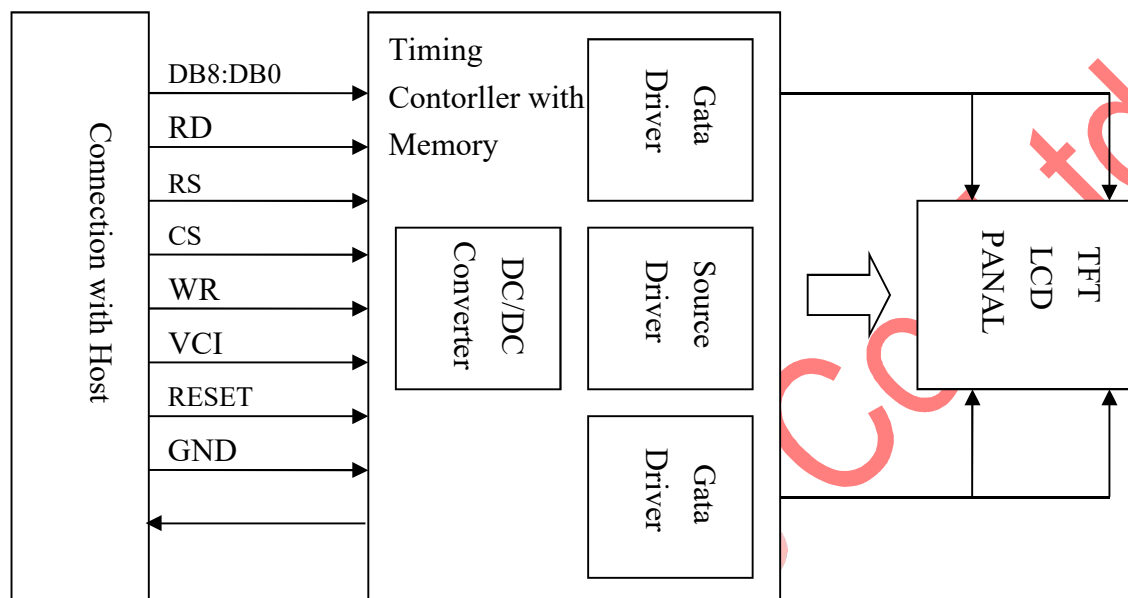
NO	Symbol	Level	Description
1	GND	P	Ground
2	RESET	I	This signal will reset the device and must be applied to properly initialize the chip. Signal is active low.
3	GND	P	Ground
4	DB8	I/O	data bus
5	DB7	I/O	data bus
6	DB6	I/O	data bus
7	DB5	I/O	data bus
8	DB4	I/O	data bus
9	DB3	I/O	data bus
10	DB2	I/O	data bus
11	DB1	I/O	data bus
12	DB0	I/O	data bus
13	IM1	I	Select the system interface mode
14	/RD	I	A read strobe signal and enables an operation to read out data when the signal is low.
15	/WR	I	Chip select signal
16	RS	I	This pin is used to select “Data or Command” in the parallel interface.
17	/CS	I	A chip select signal.
18	IOVCC	P	I/O voltage
19	FAMARK	I/O	A power output of grayscale voltage generator.

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20	VCI	P	Analog Power
21	GND	P	Ground
22	LEDA	P	A
23	LEDK	P	K
24	GND	P	Ground

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5. Block Diagram



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6. Maximum Rating

Item	Symbol	Rating	Unit
Operating temperature	Top	-20 to 70	°C
Storage temperature	Tst	-30 to 80	°C
Supply voltage for internal logic	VCC	-0.3V ~ 4.0	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. VCC>GND must be maintained.

7. Electrical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
Analog power supply		VCI	—	2.5	2.8	3.3	V
Module current		Ivcc	—	-	-	-	mA
Logic input signal Voltage	H level	V _{IH}		0.7*VCI	-	VCI	V
	L level	V _{IL}		-0.3V	-	0.3* VCI	V
Logic output signal Voltage	H level	V _{OH}		0.8*VCI	-	VCI	V
	L level	V _{OL}		-	-	0.2* VCI	V

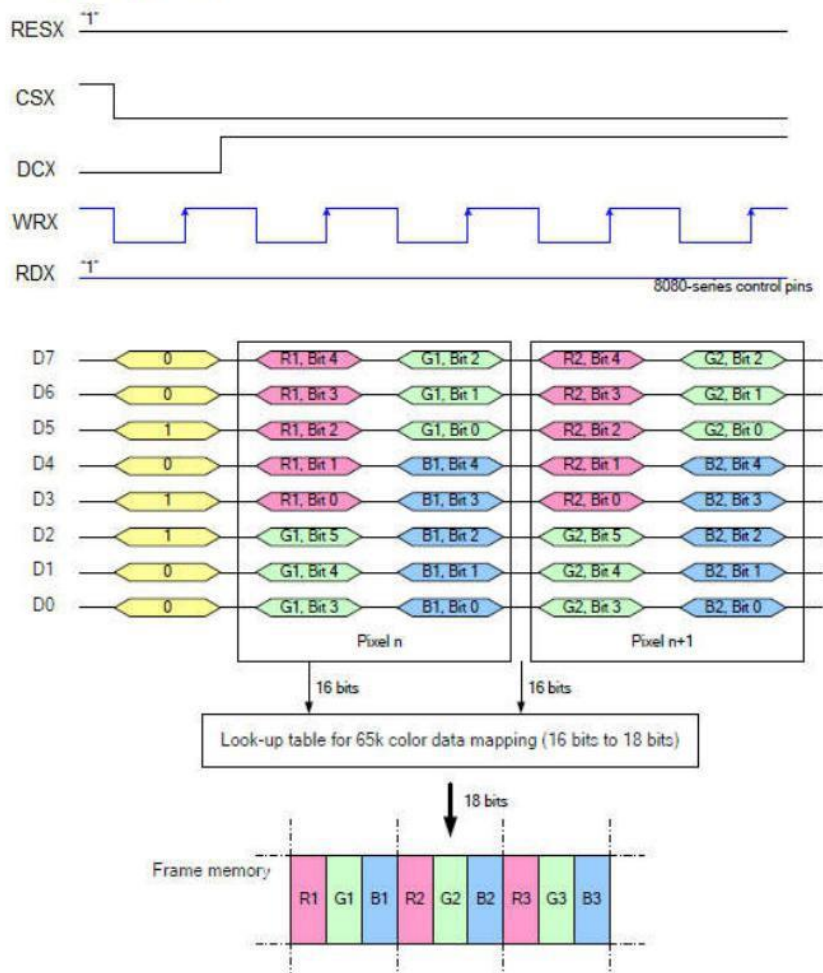
8. Backlight Characteristics

Item	syb	Min	Typ	Max	Unit	Condition
Voltage	Vf	-	-	-	V	-
Number of LED	-	3			pcs	-
Power Consumption	PWF	-	-	-	mW	-
LED life-span	-	-	(20000)	-	Hrs	-

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9. Timing Characteristics

There is 1pixel (3 sub-pixels) per 2-byte



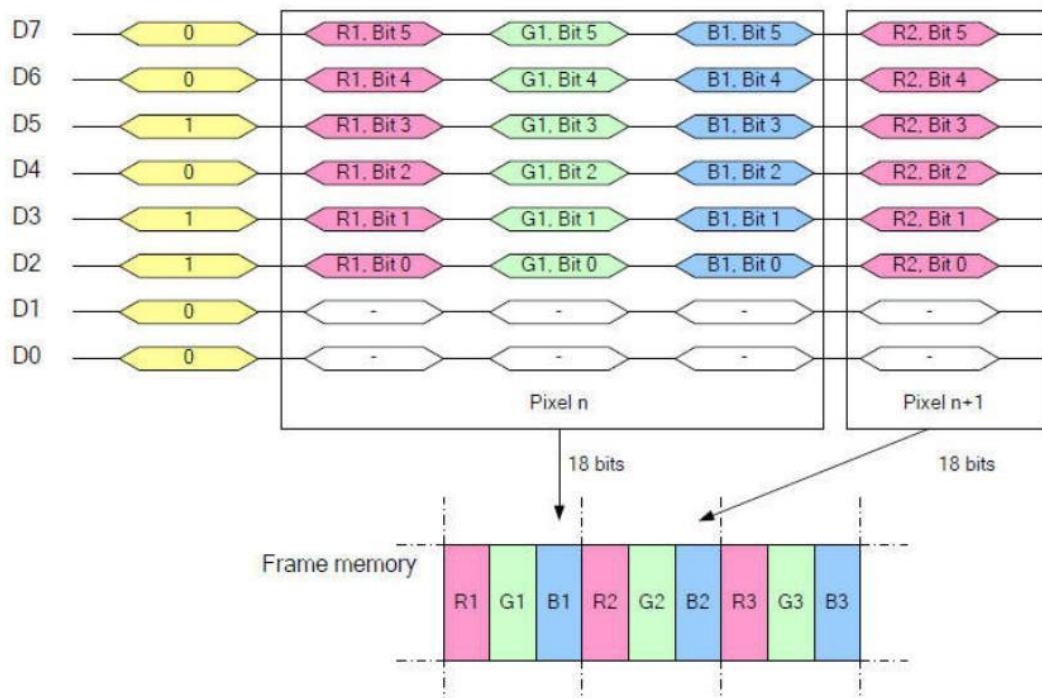
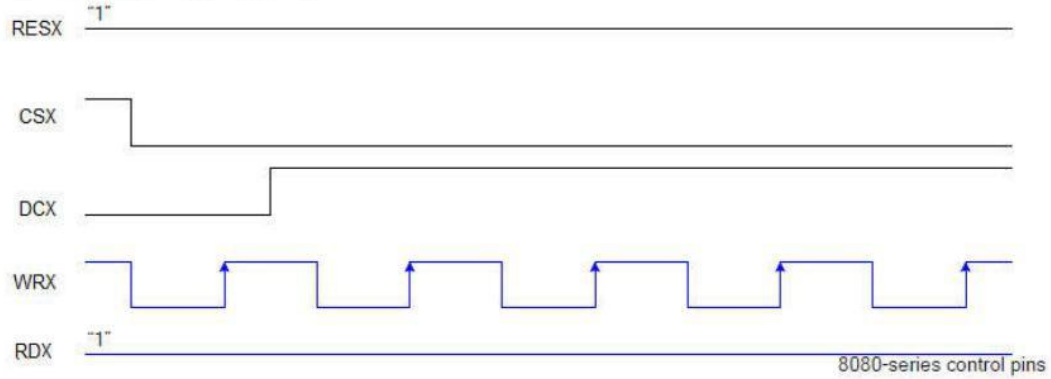
Note 1: The data order is as follows, MSB=D15, LSB=D0 and picture data is MSB=Bit 5, LSB=Bit 0 for Green, and MSB=Bit 4, LSB=Bit 0 for Red and Blue data.

Note 2: 2-times transfer is used to transmit 1 pixel data with the 16-bit color depth information.

Note 3: '-' = Don't care – Can be set to '0' or '1'.

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There is 1 pixel (3 sub-pixels) per 3-bytes.



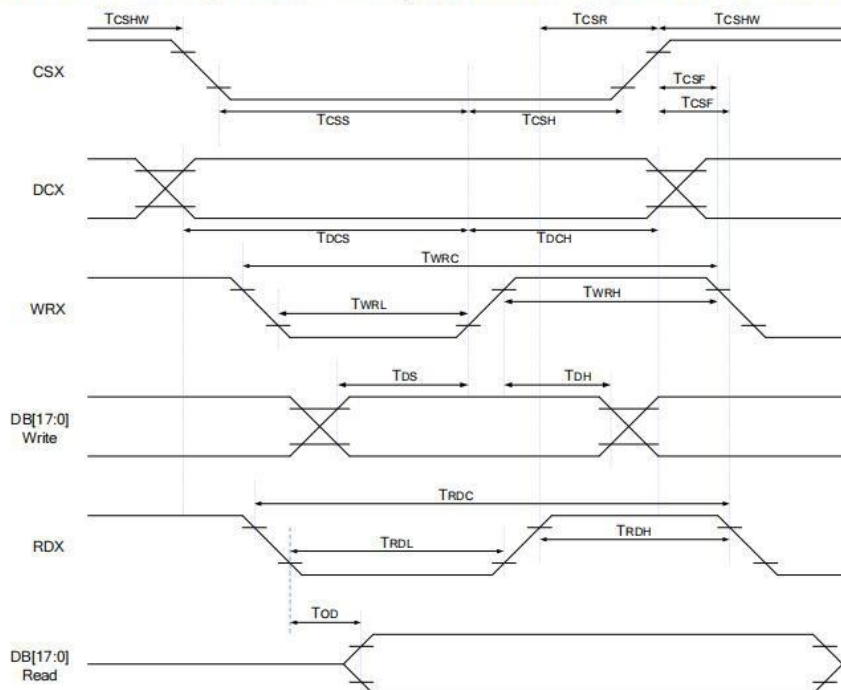
Note 1: The data order is as follows, MSB=D7, LSB=D0 and picture data is MSB=Bit 5, LSB=Bit 0 for Red, Green and Blue data.

Note 2: 3-times transfer is used to transmit 1 pixel data with the 18-bit color depth information.

Note 3: '-' = Don't care – Can be set to '0' or '1'.

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10.3.2 Parallel Interface Timing Characteristics(8080 series 8/9/16/18-Bit Parallel Interface)



Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T _{CS}	CSX setup time	15	-	ns	
	T _{CSH}	CSX hold time	15	-	ns	
	T _{CSF}	CSX falling edge before WRX/RDX falling edge	10	-	ns	
	T _{CSHW}	CSX high level width	0	-	ns	
	T _{CSR}	CSX rising edge after RDX rising edge	0	-	ns	
DCX	T _{DCS}	DCX setup time	10	-	ns	
	T _{DCH}	DCX hold time	10	-	ns	
WRX	T _{WRC}	WRX cycle	30	-	ns	
	T _{WRL}	WRX low pulse duration	10	-	ns	
	T _{WRH}	WRX high pulse duration	10	-	ns	
DB[17:0] Write	T _{DS}	Write data setup time	10	-	ns	Write
	T _{DH}	Write data hold time	10	-	ns	
RDX	T _{RDC}	RDX cycle	160	-	ns	
	T _{RDL}	RDX low pulse duration	48	-	ns	
	T _{RDH}	RDX high pulse duration	48	-	ns	
DB[17:0] Read	T _{OD}	Read data output delay	-	30	ns	Read

Note: Ta=-30℃~70℃, VDDI=1.65V to 3.6V, VCI=2.5V to 3.3V, VSSA=VSSD=0V.

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10. Application Circuit

Please consult our technical department for detail information.

11. Initial Code

Please consult our technical department for detail information.

12. Electro-Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Response time		Tr	$\theta = 0^{\circ}$	-	20	25	ms	4
		Tf	$\phi = 0^{\circ}$	-	10	15	ms	
Uniformity (Five point)		δ WHITE	$T_a = 25^{\circ}\text{C}$	-	85	-	%	7
Contrast ratio		Cr		700	900	-	-	3,5
Surface Luminance		Lv		-	250	-	-	3,7
Viewing angle range		θ	$\phi = 90^{\circ}$	-	80	-	deg	6
			$\phi = 270^{\circ}$	-	80	-	deg	
			$\phi = 0^{\circ}$	-	80	-	deg	
			$\phi = 180^{\circ}$	-	80	-	deg	
Color filter chromaticity (x, y)	White	X	$\theta = \phi = 0^{\circ}$	TBD	TBD	TBD	deg	7
		Y		TBD	TBD	TBD		
	Red	X		TBD	TBD	TBD	deg	
		Y		TBD	TBD	TBD		
	Green	X		TBD	TBD	TBD	deg	
		Y		TBD	TBD	TBD		
	Blue	X		TBD	TBD	TBD	deg	
		Y		TBD	TBD	TBD		

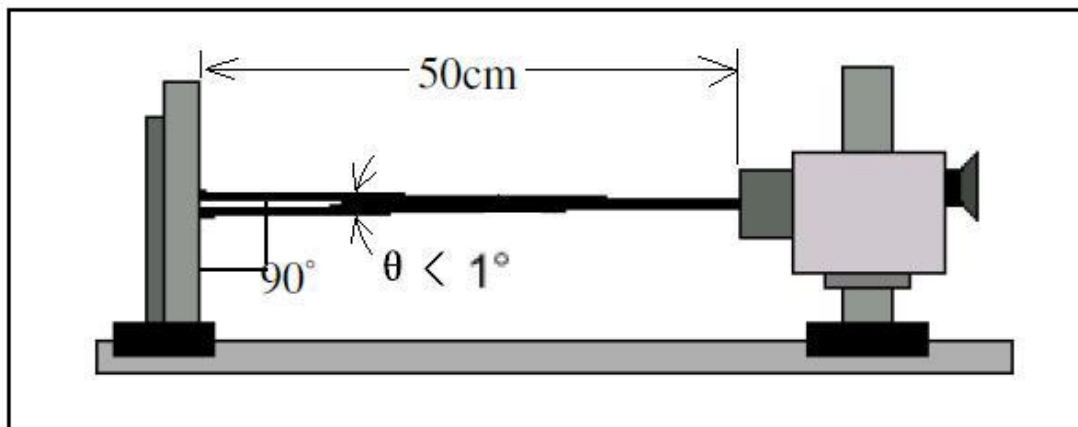
Note 1: Ambient temperature= $25^\circ\text{C} \pm 2^\circ\text{C}$

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).

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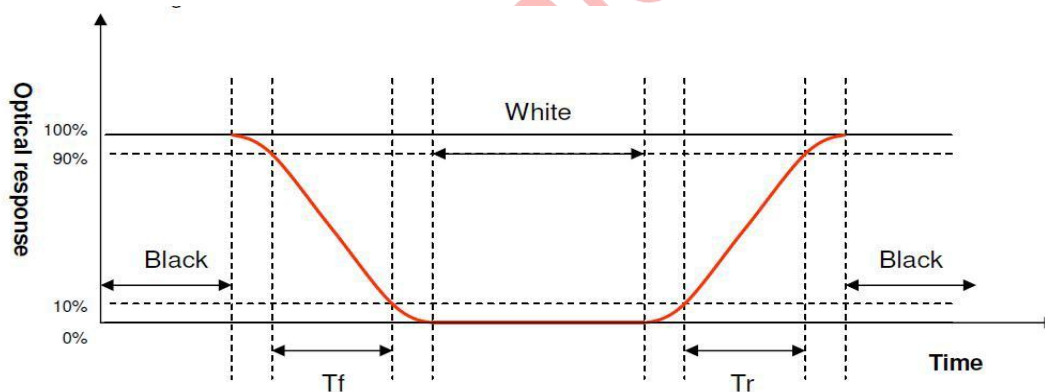
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Note 4: Definition of response time:

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:

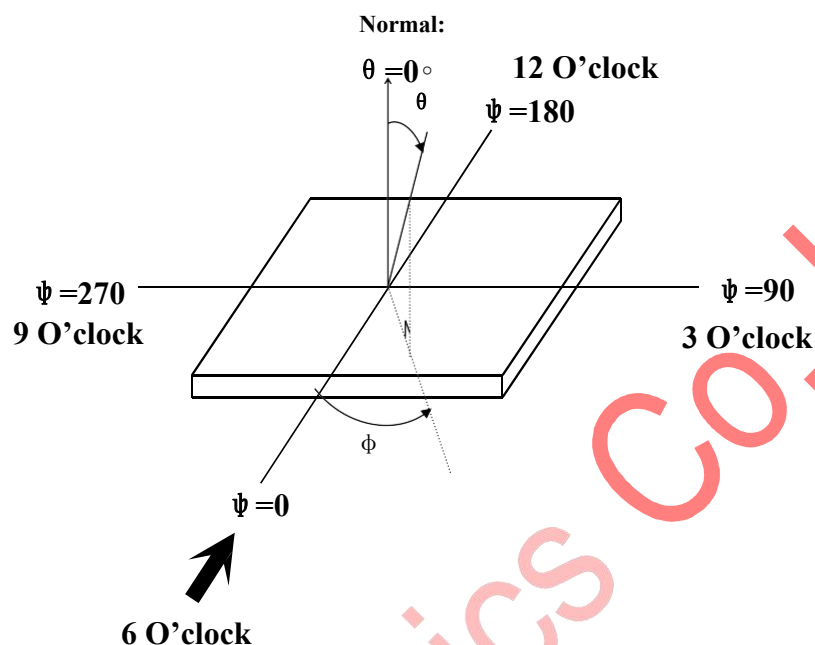
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

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

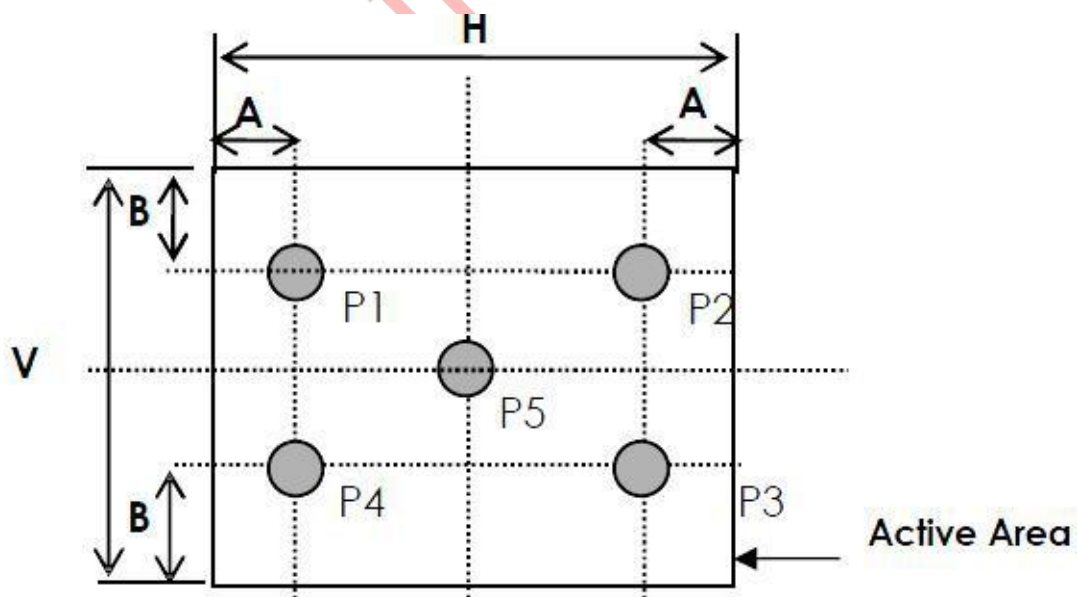
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to the LCD surface.



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

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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 (P₁, P₂, P₃, P₄, P₅)

13. Reliability Test

This standard reliability test is done only for the first lot of MP products. Customer and supply 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	80℃, 240H
2	Low temperature storage	Endurance test applying the low storage temperature for a long time	-30℃, 240H

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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 storage	Endurance test applying the high temperature and high humidity storage for a long time	60℃, 90%RH
6	Temperature Cycle/humidity storage	<p>Endurance test applying the low and high temperature cycle</p> <p>-40℃ ← → 25℃ ← → 90℃</p> <p>30min ← → 5min ← → 30min</p> <p>←—————→</p> <p>one cycle</p>	-40℃/80℃, 168cycles
7	ESD Test/Non-operating	150pF, 330ohm	Voltage: ±8KV (contact discharge); ±15KV (air discharge)
8	FPC(pull-plugging test and flexural test)	To check the product after FPC pull-plugging test and flexural test	Pull-plug: 10 times under normal use; Flexural: Radian ≥ 0.38mm 10 times

14. 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.

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(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.

2. 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.

3. Warranty period

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

15. Package Specification

TBD