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Mechanical design



MODEL NO : ET101WX04-T

MODEL VERSION: 01

SPEC VERSION : 1.0

ISSUED DATE: 2022-06-30

- ☐ Preliminary Specification
☒ Final Product Specification

Customer : _____

Approved by	Notes

Youri Confirmation

Prepared by	Reviewed by	Approved by
John	Johnny	Wang

Record of Revision

Version	Revise Date	Page	Content
Pre-Spec.01	2017/11/19	All	Initial Release
Pre-Spec.02	2019/05/23	20	Add alignment mark at left and right side PCB Connector,196479-40041-3 Add dummy pin ,adjust test pad ,remove some pad and traces,update silk seal
Pre-Spec.03	2019/06/21	20	PCB shorten some dummy pinchange components area design, update silkscreen
Pre-Spec.04	2019/12/25	All	Update module thickness
Pre-Spec.05	2021/05/20	20	Update the Drawings
Pre-Spec.06	2021/07/16	20	Update the Drawings
Pre-Spec.07	2021/07/26	20	Update the Drawings
Pre-Spec.08	2022/06/30	2	1. General Specification
		5	3.1 Absolute Maximum Ratings
		6	3.3 Current Consumption
		7	3.4 Power Sequence
		16	7. Mechanical Drawing

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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	1280 × 3(RGB) × 800	
4	Display mode	Normally Black, Transmissive	
5	Dot pitch	0.0565(W) × 0.1695(H) mm	
6	Active area	216.96(W) × 135.60(H) mm	
7	Module size	229.46(W) × 149. 1(H) × 2.50(D) mm	Note 1
8	Surface treatment	Hard Coating (3H)	
9	Color arrangement	RGB-stripe	
10	Interface	LVDS	
11	Backlight power consumption	(1.86 W)(Typ.)	
12	Panel power consumption	(0.307W)(Typ.)	Note 2
13	Weight	190g(Typ.)	

Note 1: Refer to Mechanical Drawing.

Note 2: Power consumption is white pattern

2. Pin Assignment

A 40pin connector is used for the module electronics interface. This model used 196479-40041-3 manufactured by P2 connector

Pin No.	Symbol	I/O	Function	Remark
1	NC	---	No connection	
2	VDD	P	Power Supply	
3	VDD	P	Power Supply	
4	NC	---	Only for INX test	
5	NC	---	Only for INX test	
6	NC	---	Only for INX test	
7	GND	P	Ground	
8	Rxin0-	I	-LVDS Differential Data Input	R0-R5, G0
9	Rxin0+	I	+LVDS Differential Data Input	
10	GND	P	Ground	
11	Rxin1-	I	-LVDS Differential Data Input	G1~G5, B0,B1
12	Rxin1+	I	+LVDS Differential Data Input	
13	GND	P	Ground	
14	Rxin2-	I	-LVDS Differential Data Input	B2-B5,HS,VS, DE
15	Rxin2+	I	+LVDS Differential Data Input	
16	GND	P	Ground	
17	RxCLK-	I	-LVDS Differential Clock Input	LVDS CLK
18	RxCLK+	I	+LVDS Differential Clock Input	
19	GND	P	Ground	
20	Rxin3-	I	-LVDS Differential Data Input	R6, R7, G6, G7, B6, B7
21	Rxin3+	I	+LVDS Differential Data Input	
22	GND	P	Ground	
23	NC	---	No connection	
24	NC	---	No connection	
25	GND	P	Ground	
26	NC	---	No connection	

27	NC	...	No connection	
28	NC	...	No connection	
29	AVDD	P	Power for Analog Circuit	
30	GND	P	Ground	
31	LED-	P	LED Cathode	
32	LED-	P	LED Cathode	
33	NC	...	No connection	
34	NC	...	No connection	
35	VGL	P	Gate OFF Voltage	
36	NC	...	No connection	
37	NC	...	No connection	
38	VGH	P	Gate ON Voltage	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

I: input, O: output, P: Power

3. Operation Specifications

3.1. Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power voltage	VDD	-0.5	4	V	
	AVDD	-0.3	18	V	
	V _{GH}	-0.5	V _{GL} +32	V	
	V _{GL}	-17	-0.3	V	
	V _{GH} -V _{GL}	12	32	V	
Operation Temperature	T _{OP}	-20	70	C	
Storage Temperature	T _{ST}	-30	80	C	
LED Reverse Voltage	V _F	2.7	3.1	V	I _F =20mA
LED Forward Current	I _R	...	2.5	mA	V _R =5V

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

3.1.1. Current Consumption

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current for Driver	I _{GH}	1.0	1.4	1.8	mA	V _{GH} =15V
	I _{GL}	1.0	1.4	1.8	mA	V _{GL} = - 13V
	I _{VDD}	26	31	36	mA	V _{DD} =2.5V
	I _{AVDD}	17	22	27	mA	A _{VDD} =8.2V

3.1.2. Backlight Driving Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED backlight	V _L	9.0	(9.9)	10.5	V	Note 1
Current for LED backlight	I _L		260		mA	
LED life time		20000	25000		Hr	Note 2

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25C and I_L =260mA.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25C and I_L =260mA. The LED lifetime could be decreased if operating I_L is larger than 260mA.

3.2. Typical Operation Conditions

(Note 1)

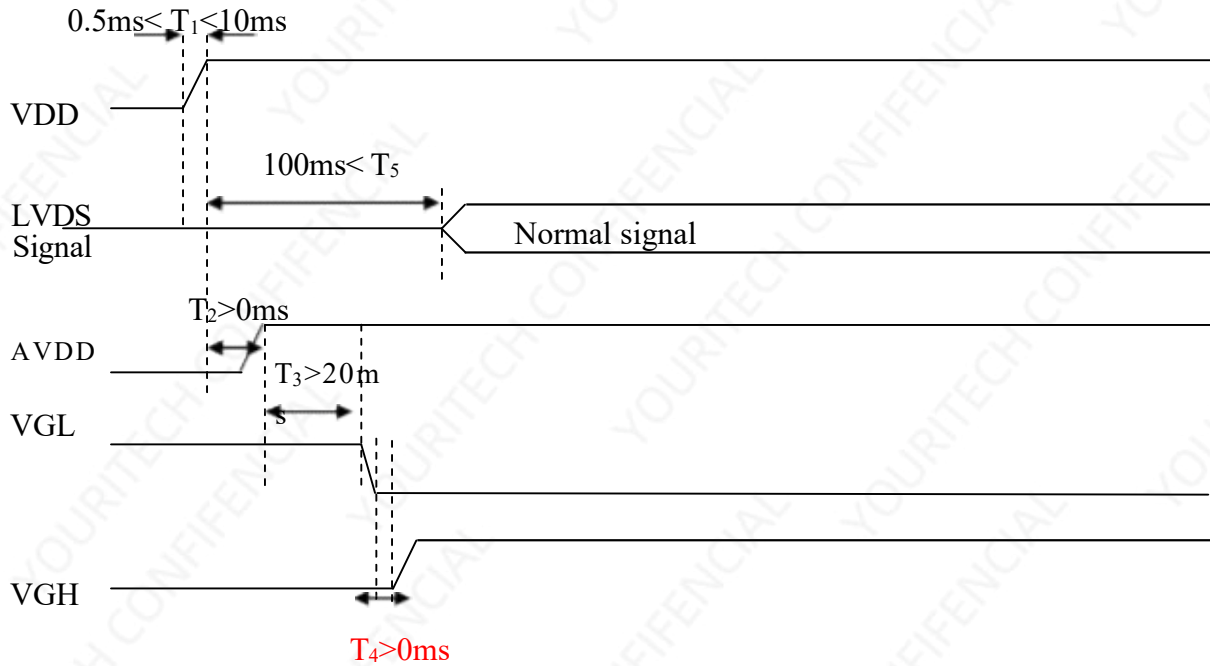
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	2.3	2.5	3.6	V	Note 2
	AVDD	8.0	8.2	8.4	V	
	V _{GH}	14.5	15	15.5	V	
	V _{GL}	- 13.5	- 13	- 12.5	V	
Input logic high voltage	V _{IH}	0.8 VDD	.	VDD	V	
Input logic low voltage	V _{IL}	0	.	0.2 DV _{DD}	V	

Note 1: Be sure to apply VDD and V_{GL} to the LCD first, and then apply V_{GH}

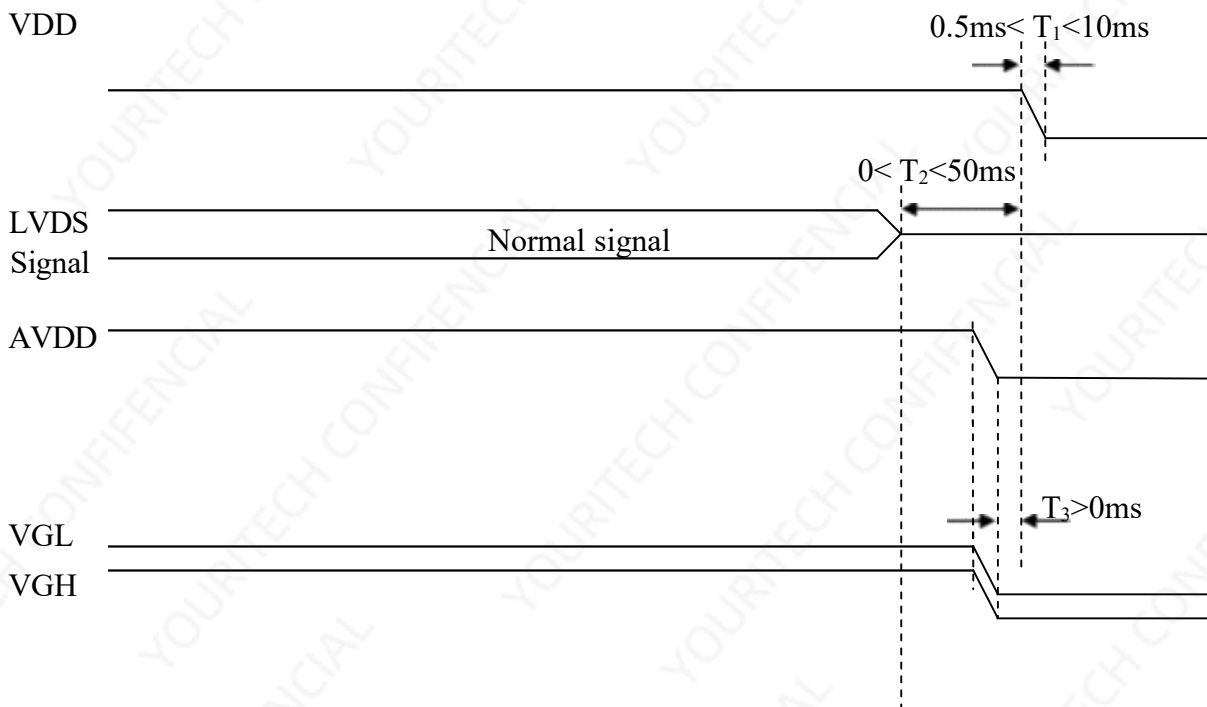
Note 2: VDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

3.3. Power Sequence

a. Power on:



b. Power off:

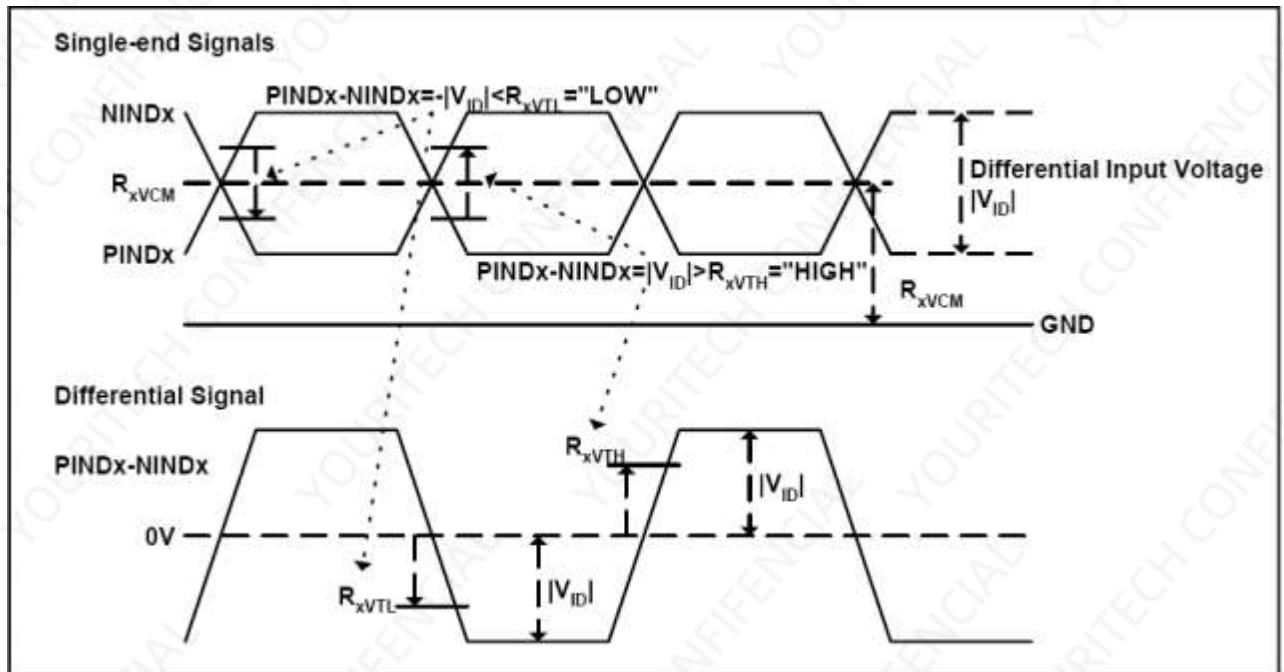


Note: VGH 電壓先于 VGL 下電或同時下電。

3.4. LVDS Signal Timing Characteristics

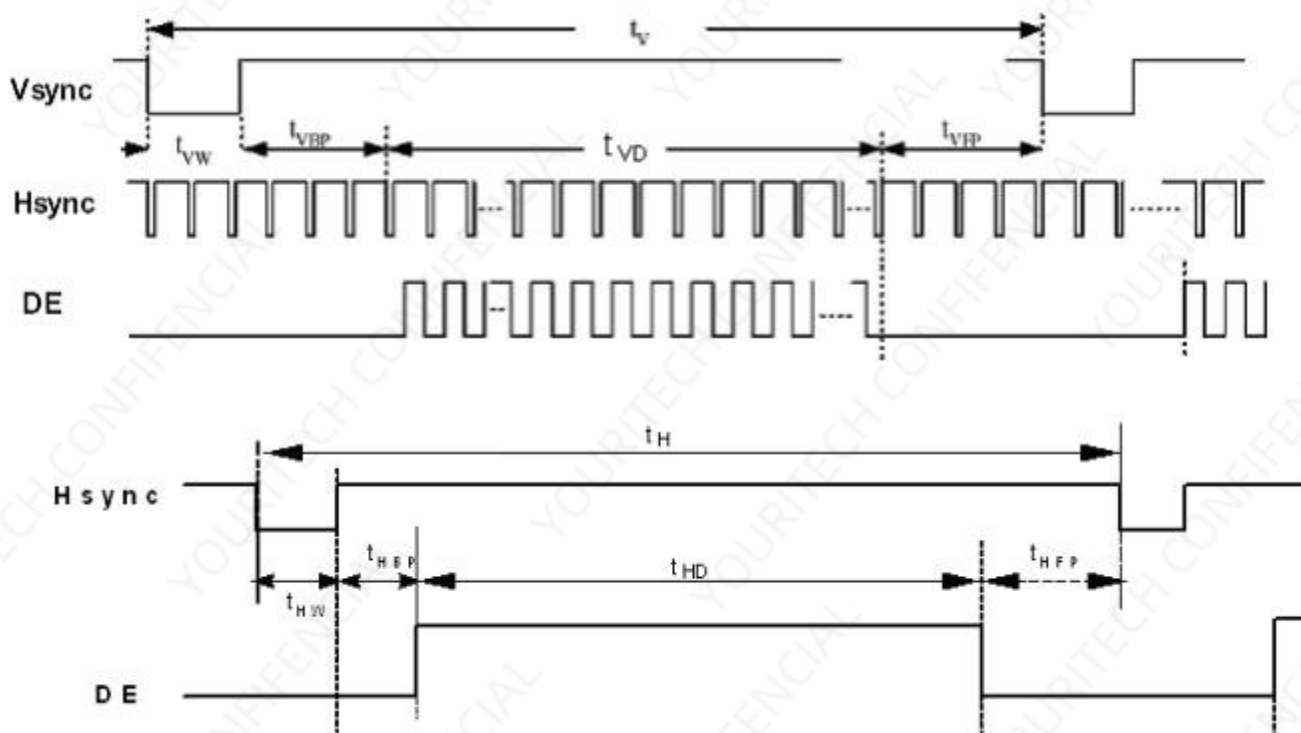
3.4.1. AC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	R_{xVTH}			+100	mV	$R_{xVCM}=1.2V$
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	

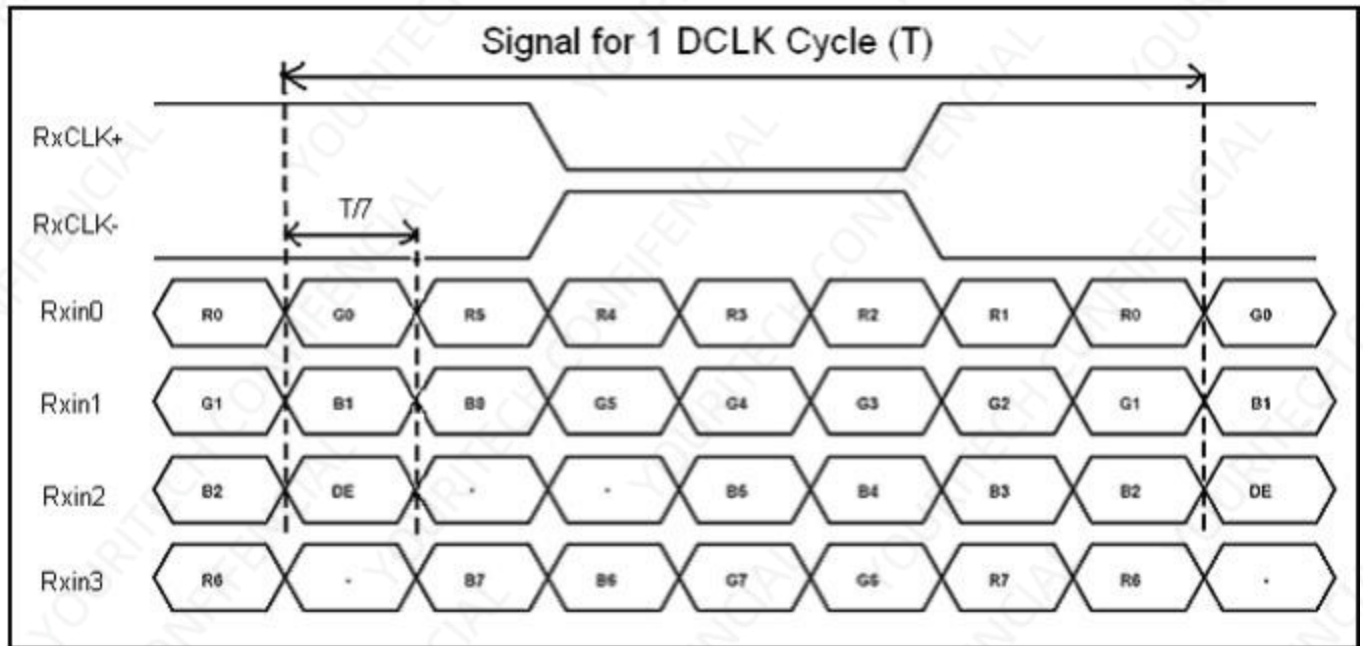


3.4.2. Timing Table

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	1/Tc	66.3	72.4	78.9	MHz	Frame rate =60Hz
Horizontal display area	t _{HD}	1280			Tc	
HSYNC pulse width	t _{HPW}	2	.	40	Tc	
HSYNC back porch(with pulse width)	t _{HBP}	88	88	88	Tc	
HSYNC front porch	t _{HFP}	12	72	132	Tc	
Vertical display area	t _{VD}	800			t _H	
VSYNC pulse width	t _{VPW}	2	.	20	t _H	
VSYNC back porch(with pulse width)	t _{VBP}	23	23	23	t _H	
VSYNC front porch	t _{VFP}	1	15	49	t _H	



3.4.3. LVDS Data Input Format



4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	75	85	.	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	75	85	.		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	75	85	.		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	75	85	.		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	.	10	20	msec	Note 3
	T_{OFF}		.	15	30	msec	Note 3
Contrast ratio	CR		600	800	.	.	Note 4
Color chromaticity	W_X		0.26	0.31	0.36	.	Note 2
	W_Y		0.28	0.33	0.38	.	Note 5 Note 6
Luminance	L		300	350	.	cd/m2	Note 6
Luminance uniformity	Y_U		75	80	.	%	Note 7

Test Conditions:

1. $DV_{DD}=3.3V$, $I_L=260mA$ (Backlight current), the ambient temperature is 25C..
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

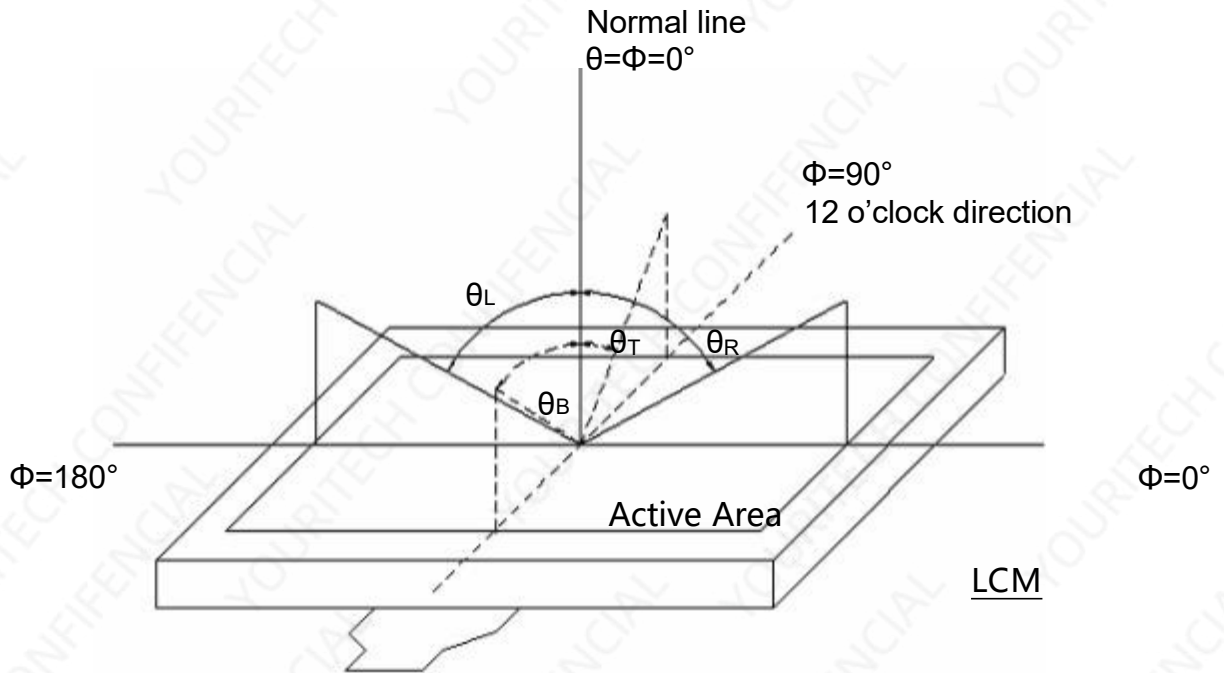


Fig. 4-1 Definition of viewing angle

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. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.)

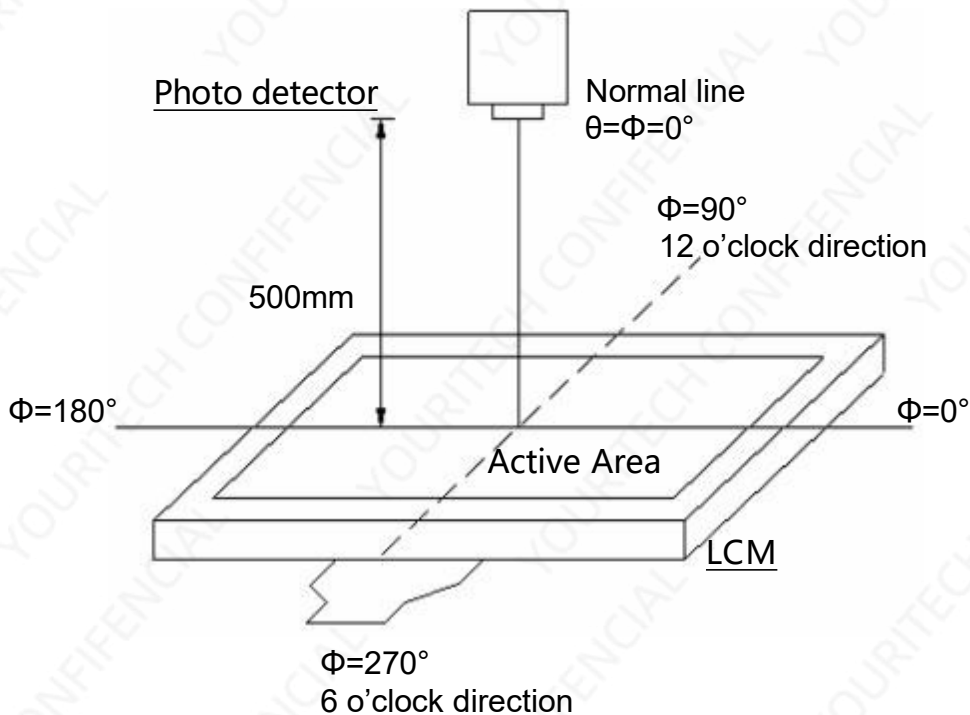


Fig. 4-2 Optical measurement system setup

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 detector 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%.

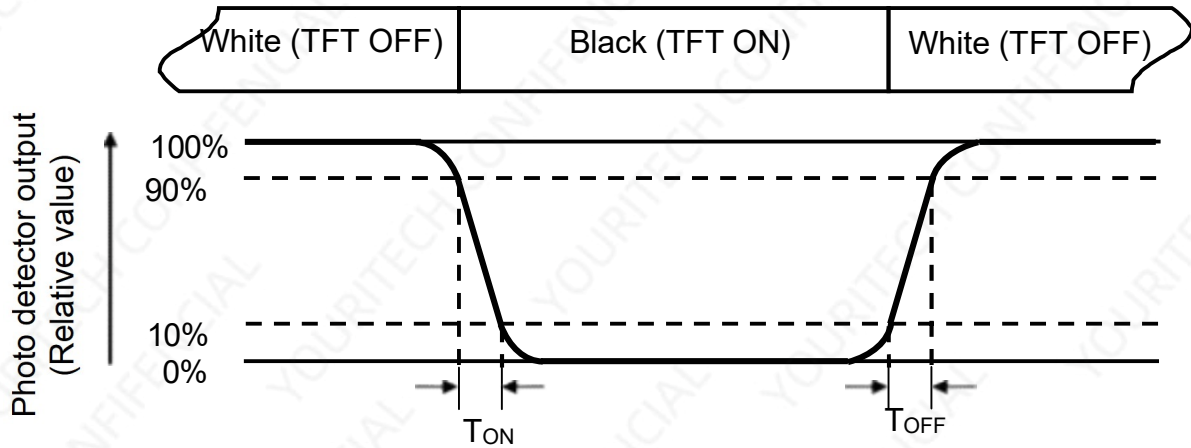


Fig. 4-3 Definition of response time

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)

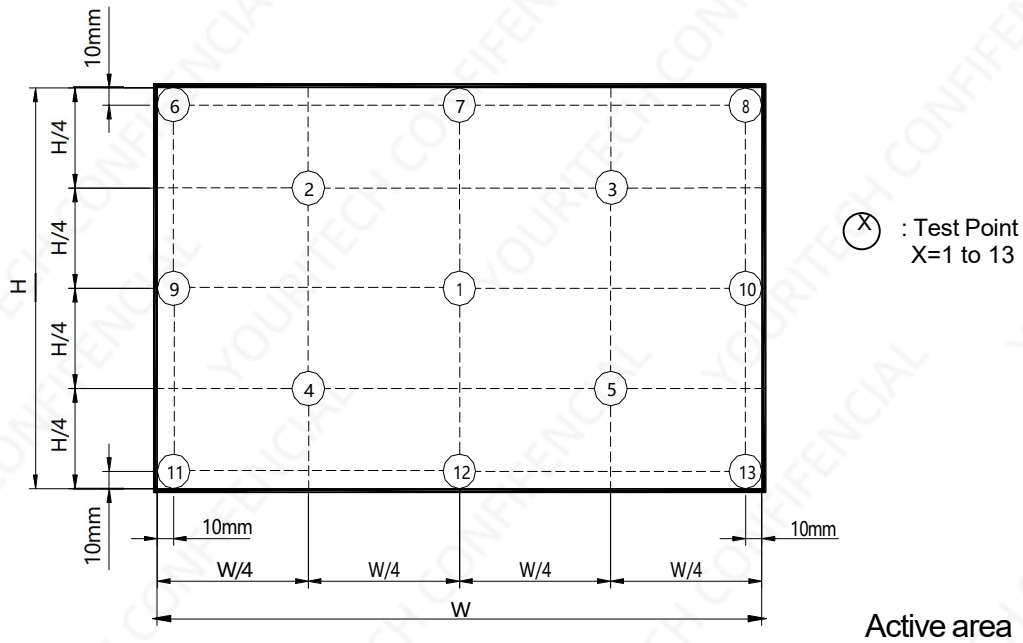
Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_L=260\text{mA}$.

Note 7: Definition of Luminance Uniformity

Measure the luminance of gray level 63 at 9 points

$$\delta W_{9p} = \frac{\text{Minimum [L (1)+ L (6)+ L (7)+ L (8)+ L (9)+ L (10)+ L (11)+ L (12) +L (13)]}}{\text{Maximum [L (1)+ L (6)+ L (7)+ L (8)+ L (9)+ L (10)+ L (11) +L (12) +L (13)]}} \times 100\%$$



5. Reliability Test Items

(Note3)

Item	Test Conditions	Remark
High Temperature Storage	Ta = 80C 120hrs	Note 1 , Note 4
Low Temperature Storage	Ta = -30C 120hrs	Note 1 , Note 4
High Temperature Operation	Ts = 70C 120hrs	Note 2 , Note 4
Low Temperature Operation	Ta = -20C 120hrs	Note 1 , Note 4
Operate at High Temperature and Humidity	+40C, 90%RH 120hrs	Note 4
Thermal Shock	-10C/30 min ~ +50C/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note 4
Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	Random Vibration : ISTA-3A 1Hz~200Hz,Grms=0.53 Half hours for direction of Z.	
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: 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.

Note 4: 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

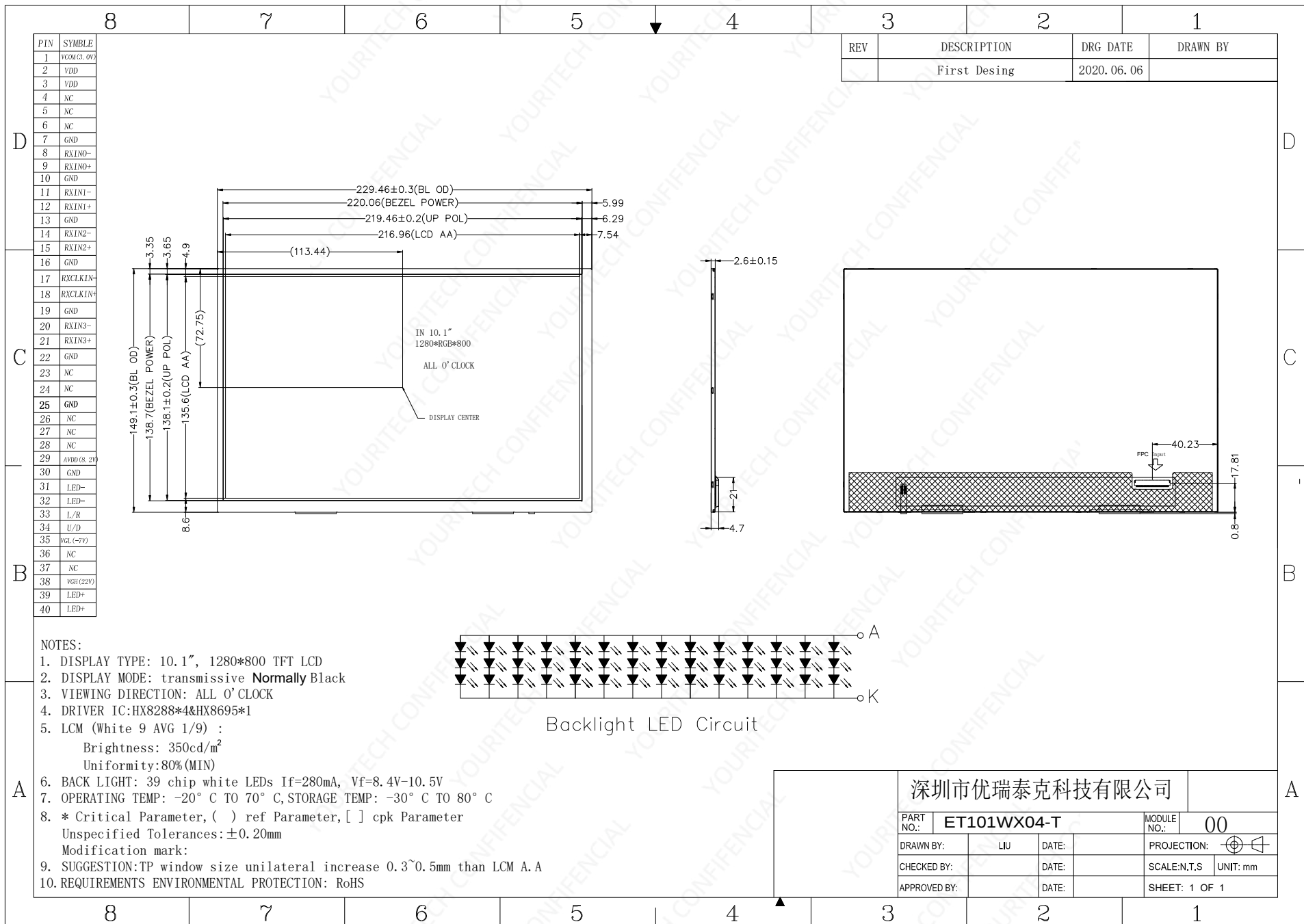
1. Be sure to ground module before turning on power or operating module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

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.



8. Package Drawing

8.1. Packaging Material Table

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	ET101WX04-T	229.46 × 149.1 × 2.6	0.150	40pcs	
8	Total weight	TBD ± 5%				

8.2. Packaging Quantity

Total LCM quantity in Carton: 20Rows × quantity per Row 2 = 40 Pcs

9. Inspection Standards for LCD Modules

9.1 Description

These inspection standards shall be applied to LCD Module supplied. This model is only used in CE product, if it is used in other product applications; it still adopts this copy of specification. If there are any other product applications such as handwriting recognition, Industrial use, Medical use, Aerospace usage and so on, the specifications should be negotiated separately.

9.2 Acceptable Criteria

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD- 105E.

- (1) Lot size: Quantity per shipment as one lot (different model as different lot).
- (2) Sampling type: Normal inspection, single sampling.
- (3) Sampling level: Level II.
- (4) AQL: Acceptable Quality Level
Major defect: AQL=0.65 Minor
defect: AQL= 1.0

9.3 Classification of defects

Defects are classified two types, major defect and minor defect according to the defect. And, the definition of defects is classified as below.

(5) Major defect

Any defect may result in functional failure, or reduce the usability of product for its purpose. For example, electrical failure, deformation and etc..

(6) Minor defect

A defect that is not to reduce the usability of product for its intended purpose and un-uniformity, dot defect and etc..

The criteria on major or minor judgment will be according with the classification of defects.

9.4 The environmental condition of inspection

The environmental condition and visual inspection shall be conducted as below.

- (7) Ambient temperature : 25 ± 5 C
- (8) Humidity : 25~75 % RH
- (9) Panel visual inspection on the operation condition for cosmetic shall be conducted at the distance 30~40cm or more between the LCD module and eyes of inspector.
Ambient Illumination : 800~ 1200Lux for external appearance inspection

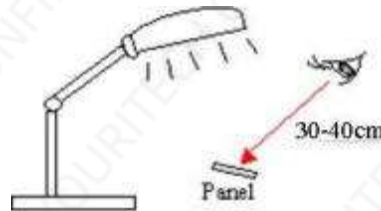
Ambient Illumination : 200~500 Lux for light on inspection

(10) The viewing angle :

- a) ± 15 degree to the front surface of display panel in vertical direction.
- b) ± 15 degree to the front surface of display panel in horizontal direction.

(11) Display panel shall be conducted at the distance 30~40cm between the LCD module and eyes of inspector (Fig. 1)

Fig. 1



9.5 Inspection Criteria

(12) Definition of dot defect induced from the panel inside

- a) Bright dot : Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
- b) Dark dot : Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.
- c) 2 dot adjacent = 1 pair = 2 dots

Picture:



2 dot adjacent



2 dot adjacent



2 dot adjacent (vertical)



2 dot adjacent (slant)

(13) Display Inspection

Items		Acceptable count
Bright dot	Random	$N \leq 3$
	2 dots adjacent	$N \leq 0$
	3 dots adjacent	$N \leq 0$
Distance	Minimum Distance Between Bright dots	5mm
Dark dot	Random	$N \leq 4$
	2 dots adjacent	$N \leq 0$
	3 dots adjacent	$N \leq 0$
Total bright and dark dot		$N \leq 6$
Distance	Minimum Distance Between dark dots Minimum Distance Between dark and bright dot.	5mm
Tiny bright dot		visible through 5% ND filter $D \leq 0.3\text{mm}$, Ignore 0.3mm $< D \leq 0.5\text{mm}$, $N \leq 4$ Distance $\geq 5\text{mm}$
Display failure (V-line/H-line/Cross line etc.)		Not allowable
Mura/ Waving/ Hot spot	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary	

***Note: Defect which is on the Black Matrix(outside of Active Area) are not considered as a defect.**

(14) Appearance & Display inspection

Item	Standards
Foreign Black/ White/ Bright Spot (Display & Appearance)	$D \leq 0.3\text{mm}$, Ignore $0.3\text{mm} < D \leq 0.5\text{mm}$, $N \leq 4$ Distance $\geq 5\text{mm}$ It is shown in Fig. 2.
Foreign Black/ White/ Bright Line (Display & Appearance)	$W \leq 0.07\text{mm}$, Ignore $0.07 < W \leq 0.1\text{mm}$ $L \leq 5.0\text{mm}$, $N \leq 4$ It is shown in Fig. 3.
Polarizer Dent/ Air Bubble	$D \leq 0.3\text{mm}$, Ignore $0.3\text{mm} < D \leq 0.5\text{mm}$, $N \leq 4$ Distance $\geq 5\text{mm}$
Polarizer Scratches	$W \leq 0.07\text{mm}$, Ignore $0.07 < W \leq 0.1\text{mm}$ $L \leq 5.0\text{mm}$, $N \leq 4$

Notes: If any specific defect is not included in the above defect table, this defect should be judged by INX/ODM/Brand customer discussion.

1. W : Width
2. L : Length
3. D : Average Diameter
4. N : Count

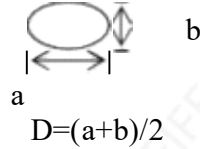


Fig. 2



W: width, L : length

Fig. 3

9.6 External Appearance Inspection Criteria

Item	Contents	
FPC cable	Cable not continuous 、 Break-off 、 Connector Burn-off /Break-off	
Metal frame (Bezel)	Scratch	* Noticeable scratch and exfoliation coating are not permitted. * The oxidized metal is not permitted
	Incomplete assembly is not permitted.	
Backlight	Scratch	The scratch which may causes a problem in practical use is not permitted.
	Break- off	Breaking off is not permitted.
	Crack	The crack is not permitted.
Stain on Polarizer	The stain, which can't be wiped off, is not permitted.	
Tape/ Label	Incorrect position, missed label is not permitted.	
Connector	Assembly NG or Function fail caused by deformation is not permitted	
Outline size	Spec. out is not permitted.	