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Specifications

TFT-LCDmodule

Model No: QY50015FOG-00

Customer name:

The project name:

For Customer's Acceptance	
Approved by	Comment

	Signature	Date
Prepared by		
Checked by		
Approved by		

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1 General Description

QY50015FOG-00 is a transmissive type a-Si TFT-LCD (amorphous silicon thin film transistor liquid crystal display) module, which is composed of a TFT-LCD panel, a driver circuit a backlight unit, The panel size is 5.0inch and thresolution is 1920x1080. High image quality a-Si TFT LCD module. Partial-screen display function is available. Sleep and Stand-by modes are available for power saving.

1.1 Features

No	Item	Specification	Remark
1	Display Mode	Normally Black	
2	Screen Size	5.0inch (diagonal)	
3	Resolution	1920XRGBX1080	
4	Color Number	16.7M	
5	Color Arrangement	RGB-stripe	
6	Driver IC		
7	Viewing Direction	ALL O'clock	
8	Interface	LVDS	
9	Surface Treatment	HC	

1.2 Application

- ◆ Mobile phone.
- ◆ Portable multimedia device.

2 Outline Dimension

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Parameter	Specifications	Unit
Outline dimensions	112.592(W) x69.908(H) x 1.3+_0.1(D) (FOG,no include FPC)	mm
Active area	110.592(W) x62.208(H)	mm
Resolution	1920(H)RGBx 1080(V) dots	-
Dot size	0.0192 (H) ×0.0576(V)	mm
Module brightness		cd/m ²



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3 Electrical Characteristics

< Table 2. Absolute Maximum Ratings>

Parameter	Symbol	Min.	Max.	Unit	Remarks
LC operating Voltage ^[1]	V _{OP}	4.7	5.3	V	Typ=5.0 Ta=25+/-2°C
Operating Temperature (Humidity)	T _{OP}	-30	+80	°C	
	RH		90	%	At 60°C
Storage Temperature (Humidity)	T _{ST}	-30	+80	°C	
	RH		90	%	At 60°C

Parameter	Symbol	Value	Unit	Remarks
TFT Gate ON Voltage	VGH	8	V	7.5~8.5
TFT Gate OFF Voltage	VGL	-8	V	-7.5~-8.5
TFT Common Electrode Voltage	VCOM	-0.2	V	
I/O Supply Voltage	IOVCC	3.3	V	
Liquid crystal driver supply voltage	VSP	5.5	V	
Liquid crystal driver supply voltage	VSN	-5.5	V	
Frame Frequency	f_Frame	60	Hz	

5 TFT-LCM Interface Specification

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Pin No.	Symbol	Functional	Notes
1,2	GND	Power Ground	
3	NC	NC	
4,5	VCC	Power supply	
6	NC	NC	
7	STBYB	Standby mode setting pin,	
8	RESET	The external reset input	
9	VSP	Power input for source driver and power circuits(5.5V)	
10	VSN	Power input for source driver and power circuits(-5.5v)	
11	UD	Gate up or down scan control	
12	RL	Horizontal shift direction (Source output) selection.	
13	GND	Power Ground	
14	CS/NC	chip select signal	
15	I2C SCL/NC	Serial interface clock input for I2C interface.	
16	I2C_SDA/NC	Serial interface address and data input/output for I2C interface.	
17	NC	NC	
18	NC(VGH)	NC	
19	NC(VGL)	NC	
20	NC	NC	
21	VDD OTP	Power input for OTP programming (8.6V). Leave this	
22	NC	NC	
23	SPI SCL/NC	Serial interface clock input for I2C interface.pin open	
24	SPI SDAI/N	Serial interface address and data input for SPI	
25	SPI SDAO/N	Serial interface data output for SPI interface.pin	
26,27	NC	NC	
28	GND	Power Ground	
29	OLV0N	LVDS Mode pin	
30	OLV0P	LVDS Mode pin	
31	GND	Power Ground	
32	OLV1N	LVDS Mode pin	
33	OLV1P	LVDS Mode pin	
34	GND	Power Ground	
35	OLVCLKN	LVDS Mode pin	
36	OLVCLKP	LVDS Mode pin	
37	GND	Power Ground	
38	OLV2N	LVDS Mode pin	
39	OLV2P	LVDS Mode pin	
40	GND	Power Ground	
41	OLV3N	LVDS Mode pin	
42	OLV3P	LVDS Mode pin	
43	GND	Power Ground	
44	ELV0N	LVDS Mode pin	

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45	ELV0P	LVDS Mode pin	
46	GND	Power Ground	
47	ELV1N	LVDS Mode pin	
48	ELV1P	LVDS Mode pin	
49	GND	Power Ground	
50	ELVCLKN	LVDS Mode pin	
51	ELVCLKP	LVDS Mode pin	
52	GND	Power Ground	
53	ELV2N	LVDS Mode pin	
54	ELV2P	LVDS Mode pin	
55	GND	Power Ground	
56	ELV3N	LVDS Mode pin	
57	ELV3P	LVDS Mode pin	
58,59,60	GND	Power Ground	

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6.2 DC Characteristics

(VCC1=VCC1P=VCC2=VCCIF=3.0V to 3.6V, VSS1=VSS2=VSSA=0V, T_A=-40~105°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Operating frequency, TTL mode	F _{TTL}	-	5.25	-	60	MHz
Operating frequency, LVDS mode	F _{LVDS}	1 Port-	15	-	110	MHz
		2 Port	15	-	105	MHz
Supply voltage	VCC1 VCC1P VCC2 VCCIF	-	3.0	3.3	3.6	V
Internal digital operating voltage	VDDD VDDIF	-	1.4	1.5	1.6	V
OTP programming voltage	VDD_OTP	Current loading @10mA	8.5	8.6	8.7	V
Low level input voltage	V _{IL}	-	VSS1-0.3	-	0.3 X VCC1	V
High level input voltage	V _{IH}	-	0.7 X VCC1	-	VCC1+0.3	V
High level output voltage	V _{OH}	Current loading @5mA	VCC1-0.4	-	-	V
Low level output voltage	V _{OL}	Current loading @6mA	GND	-	GND+0.4	V
Pull low/high resistor	R _I	For I/O circuit	150	350	550	KΩ

11.2.2 Digital circuit: LVDS mode

(VCC1=VCC1P=VCC2=VCCIF=3.0V to 3.6V, VSS1=VSS2=VSSA=0V, T_A=-40~105°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Differential input high Threshold voltage	V _{TH}	V _{cm} =1.2V	+0.10	-	-	V
Differential input low threshold voltage	V _{TL}	V _{cm} =1.2V	-	-	-0.10	V
Differential input common Mode voltage	V _{CM}	-	1	1.2	1.7- V _{ID} /2	V
LVDS input voltage	V _{INLV}	-	0.7	-	1.7	V
Differential input voltage	V _{ID}	-	0.1	-	0.6	V
Differential input leakage Current	I _{LVLEAK}	-	-10	-	+10	μA

Table 11.1: LVDS mode DC electrical characteristics

Single-ended:
LVCLKP,
LVCLKN,
LVD[3:0]P,
LVD[3:0]N

Differential:
LVCLKP-LVCLKN,
LVD[3:0]P-LVD[3:0]N

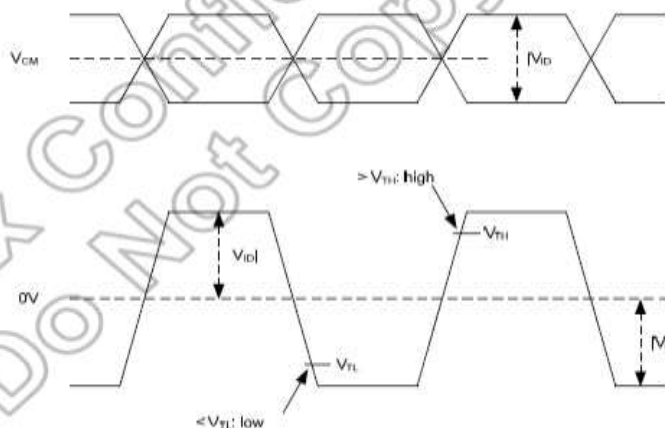


Figure 11.1: LVDS mode DC electrical characteristics

6.3 AC Characteristics

11.2.4 LVDS mode AC electrical characteristics

(VCC1=VCC1P=VCC2=VCCIF=3.0V to 3.6V, VSS1=VSS2=VSSA=0V, T_A=-40~105℃)

Parameter	Symbol	Min.	Spec. Typ.	Max.	Unit
Clock frequency (1-port/2-port)	F _{LVCYC}	15	-	105/110	MHz
Clock period (1-port/2-port)	T _{LVCYC}	9.52/9.09	-	-	ns
1 data bit time	UI	-	1/7	-	T _{LVCYC}
Clock high time	T _{LVCH}	-	4	-	UI
Clock low time	T _{LVCL}	-	3	-	UI
Position 1	T _{POS1}	-0.2	0	0.2	UI
Position 0	T _{POS0}	0.8	1	1.2	UI
Position 6	T _{POS6}	1.8	2	2.2	UI
Position 5	T _{POS5}	2.8	3	3.2	UI
Position 4	T _{POS4}	3.8	4	4.2	UI
Position 3	T _{POS3}	4.8	5	5.2	UI
Position 2	T _{POS2}	5.8	6	6.2	UI
Input eye width	T _{EYEW}	0.6	-	-	UI
Input eye border	T _{EX}	-0.2	0	0.2	UI
LVDS wake up time	T _{ENLVDS}	-	-	150	ms
LVDS clock to clock skew	T _{skw} ED	-1/7	-	1/7	UI

Table 11.2: LVDS mode AC electrical characteristics

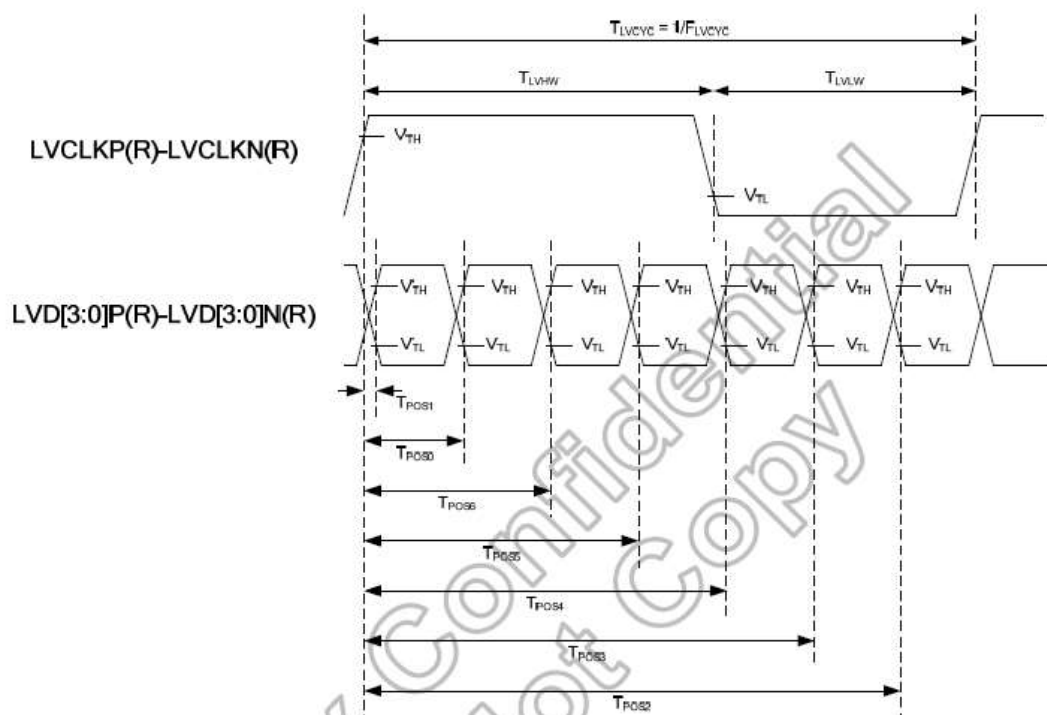


Figure 11.2: LVDS input timing

6.4 Timing

11.2.6 Reset timing

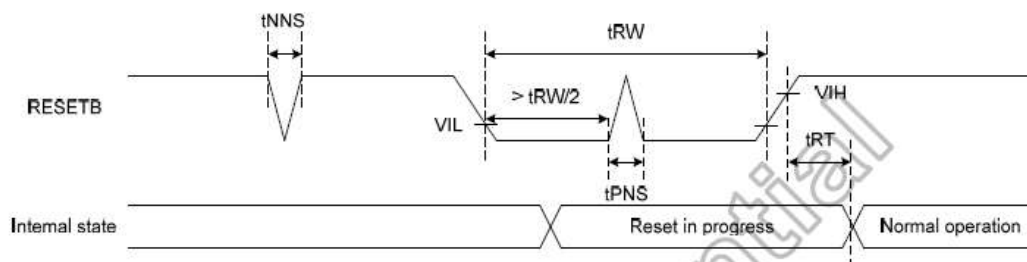


Figure 11.7: Reset input timing

(VDD1=VDD2=3.0 to 3.6V, GND=0V, TA=-40 to +105 °C)

Signal	Parameter	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
RESETB	Reset pulse width	tRW	15	-	-	μs
	Reset complete time	tRT	-	-	5	μs
	Positive spike noise width	tPNS	-	-	100	ns
	Negative spike noise width	tNNS	-	-	100	ns

Table 11.5: Reset timing parameter

11.2.7 SPI timing

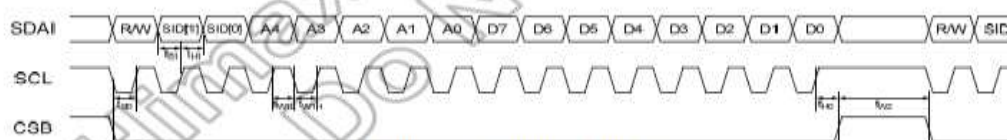


Figure 11.8: SPI signal timing

(VCC1=VCC1P=VCC2=VCCIF=3.0V to 3.6V, VSS1=VSS2=VSSA=0V, TA=-40~105°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
SDAI Setup Time	tSU	CSB to SCL	60	-	-	ns
	tS1	SDAI to SCL	60	-	-	ns
SDAI Hold Time	tHD	CSB to SCL	60	-	-	ns
	tH1	SDAI to SCL	60	-	-	ns
Pulse Width	tW1	SCL pulse width	100	-	-	ns
	tW1H	SCL pulse width	100	-	-	ns
	tW2	CSB pulse width	1	-	-	μs
Clock duty	-	-	40	50	60	%

Table 11.6: SPI timing parameter

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11.2.8 I2C timing

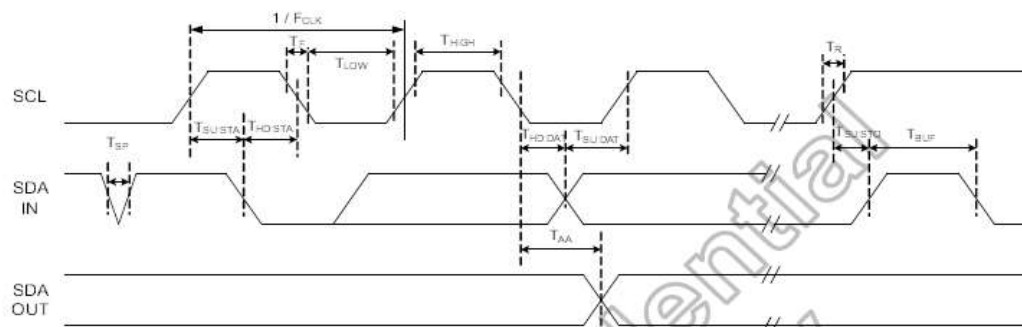


Figure 11.9: I2C signal timing

(VCC1=VCC1P=VCC2=VCCIF=3.0V to 3.6V, VSS1=VSS2=VSSA=0V, $T_A=-40\sim105^{\circ}\text{C}$)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Clock frequency	FCLK	-	-	-	400	KHz
Clock high time	T _{HIGH}	-	600	-	-	ns
Clock low time	T _{LOW}	-	1300	-	-	ns
SDA and SCL rise time	T _R	-	-	-	300	ns
SDA and SCL fall time	T _F	-	-	-	300	ns
Start condition hold time	T _{HD:STA}	-	600	-	-	ns
Start condition setup time	T _{SU:STA}	-	600	-	-	ns
Data input hold time	T _{HD:DAT}	-	0	-	-	ns
Data input setup time	T _{SU:DAT}	-	100	-	-	ns
Stop condition setup time	T _{SU:STO}	-	600	-	-	ns
Output valid from clock	T _{AA}	-	-	-	900	ns
Bus free-time	T _{BUF}	Time the bus must be free before a new transmission can start	1300	-	-	ns
Input filter spike suppression	T _{SP}	SDA and SCL pins	-	-	10	ns

Table 11.7: I2C timing parameter

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7. Optical Specification

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	70	85	-	Deg.	@CR > 10
		Θ_9		70	85	-	Deg.	
	Vertical	Θ_{12}		70	85	-	Deg.	
		Θ_6		70	85	-	Deg.	
Luminance Contrast ratio		CR	$\Theta = 0^\circ$	1000	1500	-		
Cell Transmittance		Tr		-	5.0	-	%	W/O APF & W/O Haze & W/O CG
White Chromaticity		x	CIE 1931	0.285	0.295	0.305		CF @ C Light
		y		0.309	0.319	0.329		
Red Chromaticity		x	CIE 1931	0.622	0.632	0.642		
		y		0.301	0.311	0.321		
Green Chromaticity		x	CIE 1931	0.260	0.270	0.280		
		y		0.529	0.539	0.549		
Blue Chromaticity		x	CIE 1931	0.127	0.137	0.147		
		y		0.087	0.097	0.107		
Color Gamut (C light)				-	60	-	%	CF @ C Light
Response Time (Rising + Falling)		T _{RT}	Ta= 25° C $\Theta = 0^\circ$	-	40	45	ms	GTG@25°C

Figure 1. Optical Test Equipment Setup

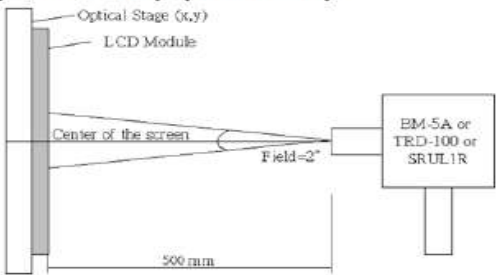


Figure 2. Response Time Testing

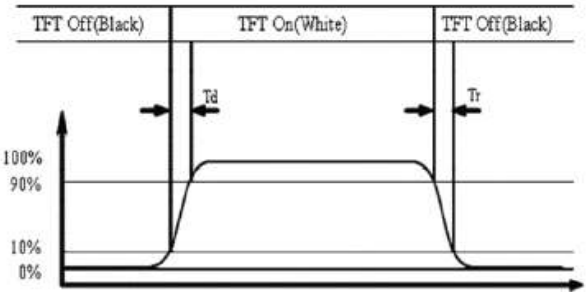


Figure 3. The Definition of Vth & Vsat

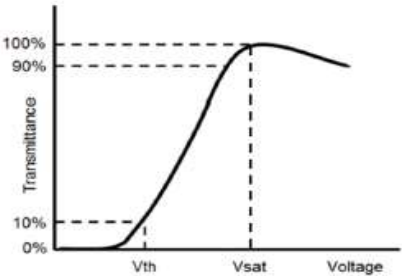
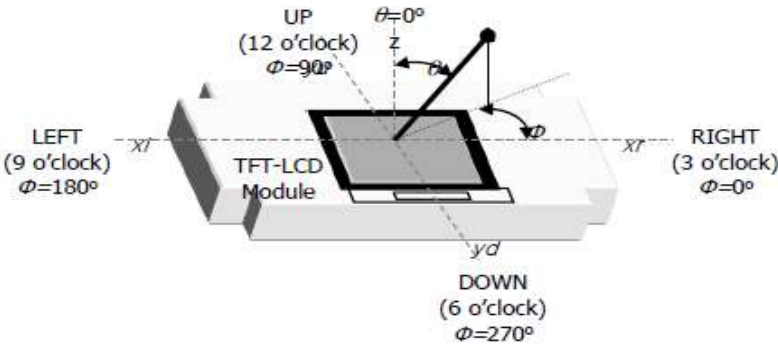


Figure 4. Viewing Angle Range is defined as follows;



Allowable Forward Current (mA)

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9 Reliability Test Items

<Table 8. Reliability test>

No	Test Items	Conditions
1	High temperature storage test	Ta = 80 °C, 240 hrs
2	Low temperature storage test	Ta = -30°C, 240hrs
3	High temperature & high humidity operation test	Ta = 60 °C, 90%RH, 240hrs
4	High temperature operation test	Ta = 70 °C, 240 hrs
5	Low temperature operation test	Ta = -20 °C, 240hrs
6	Thermal shock test	Ta = -30 °C ↔ 80 °C (30min), 100cycle

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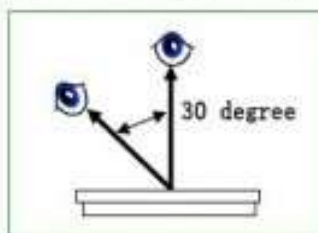
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10 Inspection Standard

This standard apply to TFT module specification.

1. Inspection condition:

Under daylight lamp 20~40W, product distance inspector'eye 30cm.incline degree 30° .



2. Inspection standard

NO.	Item	Inspection standard	Rate															
2.1	Dot	Case of Dot defect is below ① Bright Dot (whit spot) : "0" ② Dark Dot (black spot) : "0" (In case of Dark Dot on Main TFT LCD) - NG if there's full Dot defect. - Damaged less than the size of sub-pixel is not counted as defect - Dots darker than the size of sub-pixel are not defined as bright dot defect <table><tr><th>area size (mm)</th><th>Acceptable number</th></tr><tr><td>$\Phi \leq 0.10$</td><td>ignore</td></tr><tr><td>$0.10 < \Phi \leq 0.15$</td><td>3</td></tr><tr><td>$0.15 < \Phi \leq 0.20$</td><td>2</td></tr><tr><td>$0.25 < \Phi \leq 0.25$</td><td>1</td></tr><tr><td>$0.25 < \Phi$</td><td>0</td></tr></table>	area size (mm)	Acceptable number	$\Phi \leq 0.10$	ignore	$0.10 < \Phi \leq 0.15$	3	$0.15 < \Phi \leq 0.20$	2	$0.25 < \Phi \leq 0.25$	1	$0.25 < \Phi$	0	minor			
area size (mm)	Acceptable number																	
$\Phi \leq 0.10$	ignore																	
$0.10 < \Phi \leq 0.15$	3																	
$0.15 < \Phi \leq 0.20$	2																	
$0.25 < \Phi \leq 0.25$	1																	
$0.25 < \Phi$	0																	
2.2	line	<table><tr><th colspan="2">Size (mm)</th><th>Acceptable number</th></tr><tr><td>ignore</td><td>$W \leq 0.03$</td><td>ignore</td></tr><tr><td>$L \leq 4.0$</td><td>$0.03 < W \leq 0.04$</td><td>2</td></tr><tr><td>$L \leq 4.0$</td><td>$0.04 < W \leq 0.05$</td><td>1</td></tr><tr><td></td><td>$0.05 < W$</td><td>Treat with dot non-conformance</td></tr></table>	Size (mm)		Acceptable number	ignore	$W \leq 0.03$	ignore	$L \leq 4.0$	$0.03 < W \leq 0.04$	2	$L \leq 4.0$	$0.04 < W \leq 0.05$	1		$0.05 < W$	Treat with dot non-conformance	
Size (mm)		Acceptable number																
ignore	$W \leq 0.03$	ignore																
$L \leq 4.0$	$0.03 < W \leq 0.04$	2																
$L \leq 4.0$	$0.04 < W \leq 0.05$	1																
	$0.05 < W$	Treat with dot non-conformance																

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	Carton outline size: 400×295×145 (mm)
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12 Precautions

Please pay attentions to the followings as using the LCD module.

12.1 Handling

- (a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.
- (b) Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.
- (c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.
- (d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.
- (e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the touch panel surface permanently. The recommended solvents are water and Isopropyl alcohol.
- (f) Wipe off water droplets or oil immediately.
- (g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.
- (h) Do not touch the output pins directly with bare hands.
- (i) Do not disassemble the LCD module.
- (j) Do not lift the FPC of Touch Panel.

12.2 Storage

- (a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.
- (b) Do not expose the LCD modules to sunlight directly.
- (c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong

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ultraviolet ray for a long time.

- (d) Avoid condensation of water. It may cause improper operation.
- (e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

12.3Operation

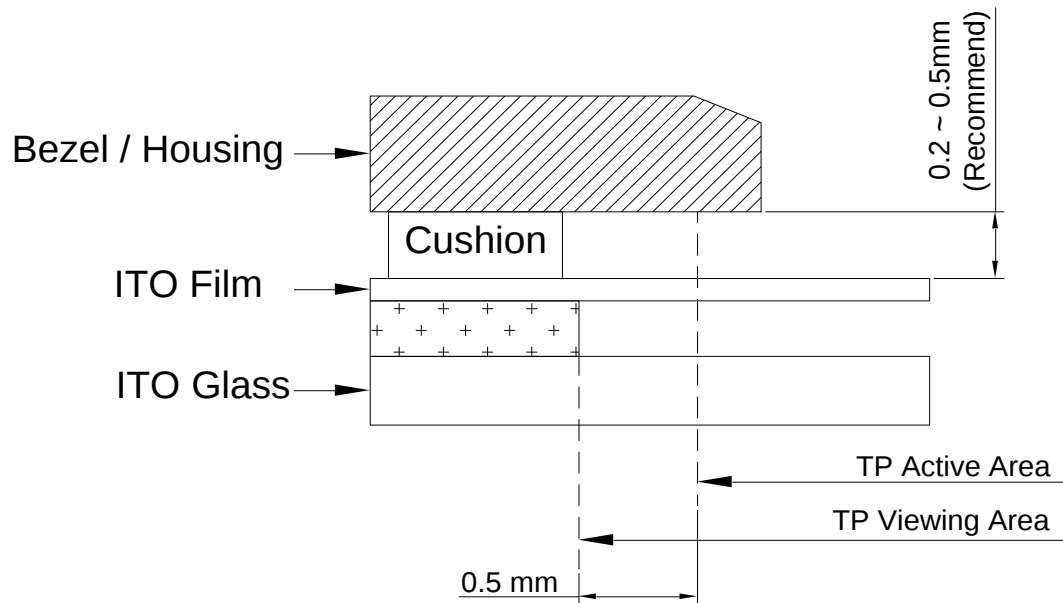
- (a) When mounting or dismounting the LCD modules, turn the power off.
- (b) Protect the LCD modules from electric shock.
- (c) The Driver IC control algorithms stated above should always obeyed to avoid damaging the LSI and electronic circuit.
- (d) Be careful to avoid mixing up the polarity of power supply for backlight.
- (e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.
- (f) When a static image is displayed for a long time, remnant image is likely to occur.
- (g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.
- (h) Most of the touch screens have air vent to equalize the inside air pressure to the outside one. The air vent must be open and liquid contact must be avoided as the liquid may be absorbed if the liquid is accumulated near the air vent.
- (i) For the fragility of ITO film, it should avoid to use too tapering pen as the input material.

12.4Touch Panel Mounting Notes

- (a) If a cushion is used between bezel/housing and film must be choose as free as enough to absorb the expansion and contraction to avoid the distortion of film.
- (b) The cushion must be placed out of the Viewing Area.
- (c) Bezel/Housing edge must be posited between Key Area and Viewing Area. The edge enters the Key Area may cause unexpected input if the gap is too narrow or foreign particles like dusts exist between Bezel/Housing and ITO film.

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(d) Mounting example:



The corner part has conductivity. Do not touch any metal part after mounting.

12.5Others

- If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.
- For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.
- It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.

