深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, LTD.

TFT-LCD Module Specification

Module NO.：TST397H5102

Version：V1.0

☐ **APPROVAL FOR SPECIFICATION**   ☐ **APPROVAL FOR SAMPLE**

For Customer's Acceptance：

Approved by	Comment

Team Source Display：

Presented by	Reviewed by	Organized by

Version No.	Date	Content	Remark
V1.0	2017-12-8	Initial Release	

CONTENTS

1   General Characteristics

ITEM	Specification	Unit
LCD Type	a-Si TFT,Transmissive,Normally black,IPS	-
LCD Size	3.97	inch
Resolution (W x H)	480 x (RGB) × 800	pixel
LCM size	57.14(W) x 96.85(H) x 2.0(D)	mm
Active Area	51.84 (W) x 86.4 (H)	mm
Dot Pitch	0.108(H)x0.108(V)	mm
Viewing Direction	all o'clock	-
Gray Scale Inversion Direction	-	-
Viewing Angle	Top:85,Bottom:85; Left/ Right:85	deg.
Color Depth	16.7M	-
Pixel Arrangement	RGB-stripe	-
Backlight Type	8 LEDs，20mA	-
Surface Luminance	350	cd/m2
Surface Treatment	Anti-Glare	-
Driver IC	ILI9806E	-
Interface Type	RGB	-
Input Voltage	2.8(TYP)	V
With/Without TP	Without	-
Weight	TBD	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

2 Product drawings

NOTES:
1. DRIVE IC :ILI9806E-2
2. TYPE : TFT   BOE-BP039W2-100
3. DISPLAY MODE : Transmissive
4. Viewing Angle : ALL
5. BACKLIGHT:8 CHIP-WHITE LED
6. OPERATING TEMPERATURE: -20°C TO 70°C
   STORAGE TEMPERATURE: -30°C TO 80°C
7. 产品满足ROHS要求
8. GENERAL TOLERANCE : ±0.2
9. 建议客户开窗尺寸比 POL单边小0.5mm,防止露POL白边
10. 客户做框胶开窗的,LENS上的双面胶不要粘在TP上,要避开TP.
11. 客户机壳上的缝隙需需进入规满单边0.3MM(MIN),防止漏光.

PI补强+FPC T=0.2mm±0.03

Connector : FH26-51S-0.3SHW

Back light Circuit
25.6V,20mA,(8灯)

Interface Mode
RGB + SPI, SCL rising edge trigger

[Scale 1:3]

PIN	NAME
1	LEDK
2	LEDA
3	YUC(Y+)
4	XL(X+)
5	YD(Y-)
6	XRCX-)
7	GND
8	VCL 2.8V
9	VCI 2.8V
10	IOVCC
11	NC
12	TE
13	SDO
14	WR/SCL
15	CSX
16	RESX
17	SDI
18	DB22
19	DB23
20	DB21
21	DB20
22	DB19
23	DB18
24	DB17
25	DB16
26	DB15
27	DB14
28	DB13
29	DB12
30	DB11
31	DB10
32	DB09
33	DB08
34	DB07
35	DB06
36	DB05
37	DB04
38	DB03
39	DB02
40	DB01
41	DB00
42	ENABLE
43	DOTCLK
44	HSYNC
45	VSYNC
46	LEDDN
47	LEDPWM
48	RS(GND)
49	RD(GND)
50	IM0(IOVCC)
51	IM1(IOVCC)
	GND

IM3	IM2	IM1	IM0
0	0	1	1

REV 版本: A00   DESCRIPTION 描述: First issue   DATE 日期: 2015-7-25

MODEL_NUMBER: TST397H5102   PROJECTION PART NO:

东莞市一众显示科技有限公司
DONG GUAN TEAM SOURCE DISPLAY TECH.CO.,LTD.

工程图

SCALE: FIT   SHEET: 1 OF 5   UNIT: mm

GENERAL TOL.: ±0.2

DO NOT SCALE THIS DRAWING.

标记 修 改 内 容   修改者   修改日期
DWN: CHK: APP: APPROVALS   DATE

注: 标注 ☞ 请重点确认

3   Interface description

引脚(PIN)	符号(symbol)	描述(description)
1	LEDK	Backlight K Cathode input pin.
2	LEDA	Backlight A Aothod input pin.
3	YU	The touch panel Y Up pin
4	XL	The touch panel X Left pin
5	YD	The touch panel Y Down pin
6	XR	The touch panel X Right pin
7	GND	System Ground. (0V)
8	VCI	Power supply +2.8V
9	NC	
10	IOVCC	Interface pin Power supply +1.8V~+2.8V
11	TE	Tearing Effect output signal
12	SDO	Serial data output
13	SDI	serial data input
14	WR/SCL	MCU: WRX pin, serves as a write signal SPI: SCL pin as Serial Clock when operates in the serial
15	CSx	Chip select signal.
16	RESET	Reset input signal
17~40	DB23~DB0	Data Pin
41	ENABLE	A data ENABLE input signal
42	DOTCLK	Dot clock signal
43	HSYNC	Line synchronizing signal
44	VSYNC	Frame synchronizing signal
45	LEDPWM	If no use,please open it
46	LEDON	If no use,please open it
47	RS(GND)	Data/Command Selection pin(no use.connect to GND)
48	RD(GND)	read signal(no use.connect to GND)
49	IM0(IOVCC)	SPI +RGB24-bit, DB0~DB23 .
50	IM1(IOVCC)	
51	GND	System Ground. (0V)

4 LCM Interface Timing

4.1 Reset Timing
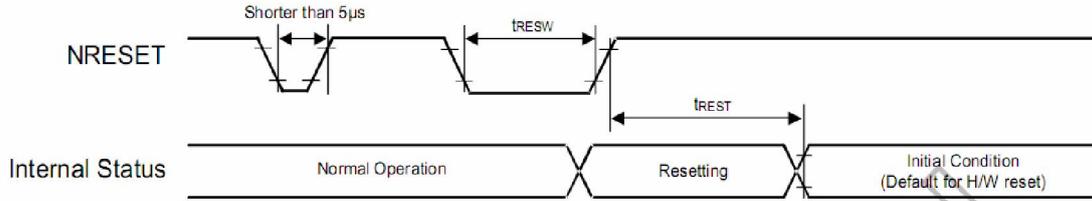
Signal	Symbol	Parameter	Min	Max	Unit
NRESET	tRESW	Reset low pulse width	10	-	us
	tREST	Reset complete time	-	5 (note 1)	ms
			-	120(note 2)	ms

Note: (1) When reset applied during SLPIN mode;

(2) When reset applied during SLPOUT mode.

4.2 RGB Timing Characteristics

DE Mode Timing Diagram
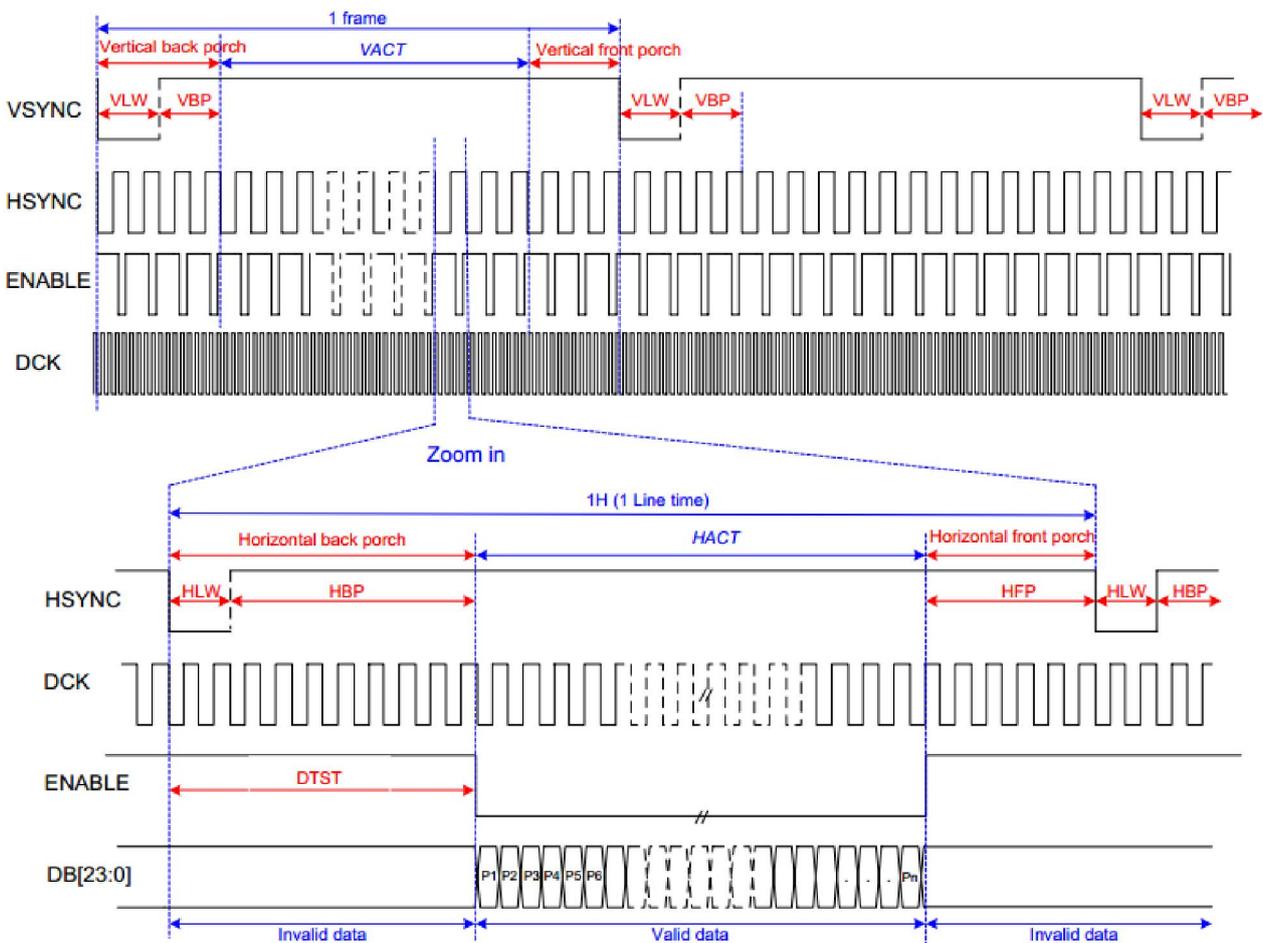
VLW : VSYNC Low pulse Width

HLW : HSYNC Low pulse Width

DTST : Data Transfer Startup Time

Pn : pixel 1, pixel 2···, pixel n.

Parameter	Symbols	Condition	Min.	Typ.	Max.	Units
Frame Rate	FR		54		66	fps
Horizontal Low Pulse width	HLW		1		-	DOTCLK
Horizontal Back Porch	HBP		2		126	DOTCLK
Horizontal Address	HACT			480		DOTCLK
Horizontal Front Porch	HFP		2		-	DOTCLK
Vertical Low Pulse width	VLW		1		126	Line
Vertical Back Porch	VBP		1		126	Line
Vertical Address	VACT				864	Line
Vertical Front Porch	VFP		1		255	Line
Data Clock	DCLK		16.6		41.7	MHz

4.3 SPI Interface Characteristics (3-Pin SPI, 9-bit/16-bit)
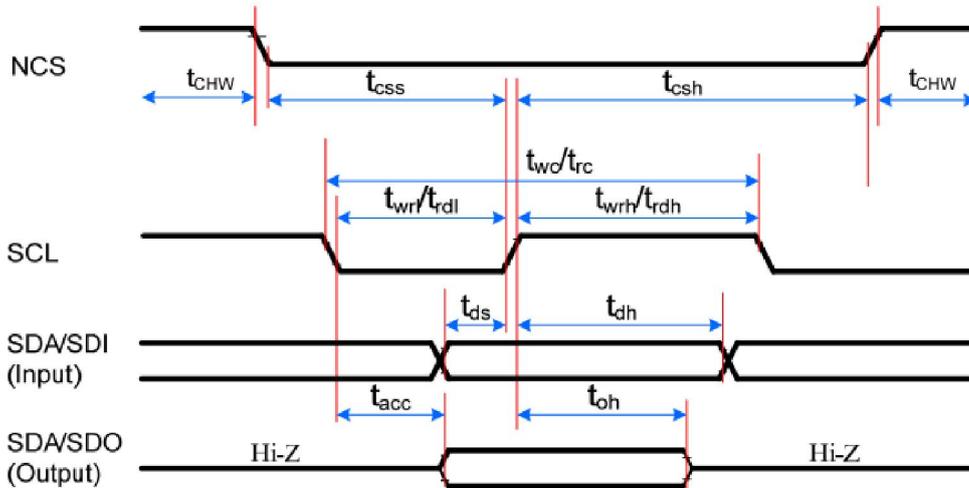
Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tSCYCW	Serial clock cycle (Write)	30	-	ns	-
	tSHW	SCL "H" pulse width (Write)	10	-		
	tSLW	SCL "L" pulse width (Write)	10	-	ns	-
	tSCYCR	Serial clock cycle (Read GRAM)	150	-		
	tSHR	SCL "H" pulse width (Read GRAM)	60	-		
	tSLR	SCL "L" pulse width (Read GRAM)	60	-		
SDI(SDO)	tSDS	Data setup time	10	-	ns	-
	tSDH	Data hold time	10	-		
	tACC	Access time	10	100		
	tOH	Output disable time	15	100		
CSX	tCHW	Chip select "H" pulse width	40	-	ns	
	tCSS	Chip select setup time	15	-		
	tCSH	Chip select hold time	15	-		

5 Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage (Analog)	VDD~GND	-0.3	+4.6	V
Logic signal voltage(I/O)	IOVDD~GND	-0.3	+4.6	V
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Humidity	RH	-	90%(Max 60°C)	RH

6 Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Analog operating voltage	VDD	2.5	2.8	3.6	V
Logic operating voltage	IOVDD	1.65	1.8	VDD	V
Input Current	IDD	-	TBD	-	mA
Input Voltage ' H ' level	VIH	0.7IOVCC	-	IOVCC	V
Input Voltage ' L ' level	VIL	GND	-	0.3IOVCC	
Output Voltage ' H ' level	VOH	0.8IOVCC	-	IOVCC	
Output Voltage ' L ' level	VOL	GND	-	0.2IOVCC	

7 Backlight Characteristics

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V_f	-	24.8	25.6	V
Current for LED backlight	I_f	-	15	20	mA
Power consumption	Wbl	-	372	512	mW
Uniformity	Avg	80	-	-	%
LED Life Time	-	30000	40000	-	Hrs

Note:

1.The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C, 60%RH ±5 %.

2. The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions.

3. Typical operating life time is an estimated data.

4. Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded .Functional operation should be restricted to the conditions described under normal operating conditions.

8 LCD Optical specifications

Item	Symbol	Condition	Specification			Unit	Remark
			Min	Typ	Max		
Response time (By Quick)	Tr+Tf	θ = 0°	-	35	-	ms	Note 5
Contrast ratio	CR	θ = 0°	650	900	-		Note 2,6
Viewing angle	Top	CR≧10	-	85	-	Deg.	Note 2,6,7
	Bottom	CR≧10	-	85	-		
	Left	CR≧10	-	85	-		
	Right	CR≧10	-	85	-		
Color Filter Chromacicity with C light	Wx	θ = 0°	0.638	0.658	0.678		Note 3
	Wy		0.305	0.325	0.345		
	Rx		0.256	0.276	0.296		
	Ry		0.578	0.598	0.618		
	Gx		0.114	0.134	0.154		
	Gy		0.104	0.124	0.144		
	Bx		0.274	0.294	0.314		
	By		0.312	0.332	0.352		
Transmittance	Trans		-	5.3%	-		Note 4

Note 1: Ambient temperature = 25°C.

Note 2: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

Note 3: To be measured with Otsuta chromaticity meter LCF-2100M, CF only measure under C light simulation.

Note 4: CTC shipping status is cell without polarizer. Transmittance of Specification is cell with polarizer. The tolerance of Transmittance is ±10%.

Note 5: Definition of response time:

The output signals of TRD-100 are measured when the input signals are changed to "White" (falling time) and from "White" to "Black" (rising time), respectively. The interval is between the 10% and 90% of amplitudes. Refer to figure as below.
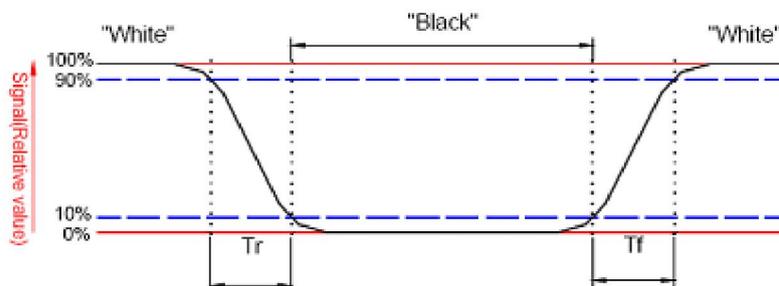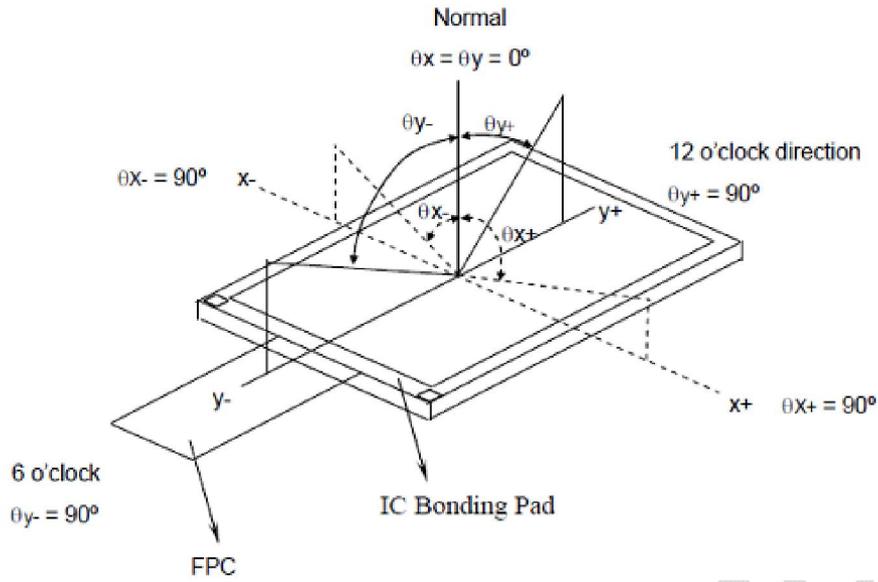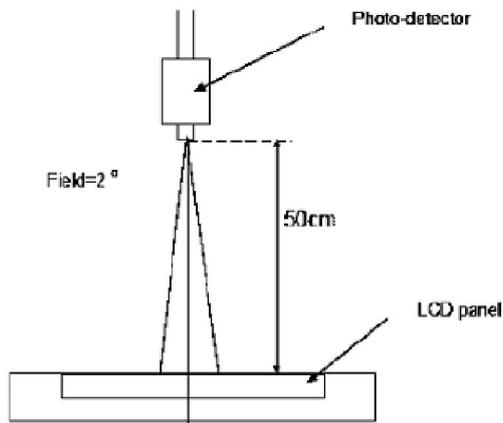

Note 6: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$
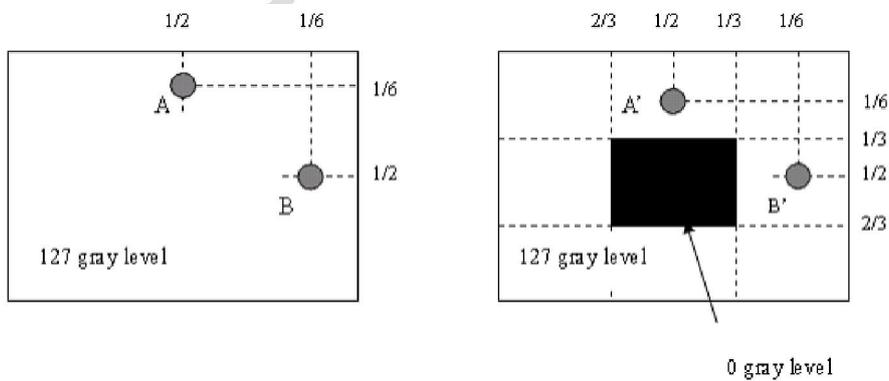
Note 7: Definition of viewing angle

Note 8: Optical characteristic measurement setup.

Note 9:

l LA-LA'l / LA x 100%= 2% max., LA and LA' are brightness at location A and A'.

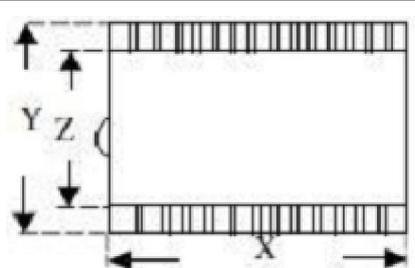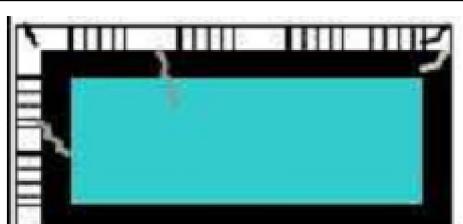l LB-LB'l / LB x 100%= 2% max., LB and LB' are brightness at location B and B'.

9   RELIABILITY TEST

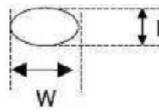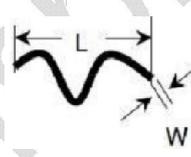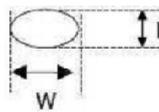| NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	80±2°C/96 hours	
2	Low Temperature Storage	-30±2°C/96 hours	
3	High Temperature Operating	70±2°C/96 hours	
4	Low Temperature Operating	-20±2°C/96 hours	Inspection after 2~4 hours storage at room temperature and humidity. The condensation is not accepted. The sample shall be free from defects:
5	Temperature Cycle	-30±2°C ~ 25~ 80± 2°C × 10 cycles (30 min.) (5min.) (30min.)	
6	Damp Proof Test	60°C ±5°C × 90%RH/96 hours	
7	Vibration Test	Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~150 Hz~10Hz 2 hours For each direction of X, Y, Z	1. Air bubble in the LCD 2. Seal leak 3. Non-display 4. Missing segments 5. Glass crack
8	Shock Test	Half-sine, wave, 300m/s	
9	Packing Drop Test	Height: 80 cm 1 corner, concrete floor	
10	Electrostatic Discharge Test	C=150pF, R=330 Ω Air: ±8KV 150pF/330Ω 30 times Contact: ±4KV,20 times	

10 Inspection standards

10.1 Visual inspection criterion in cosmetic

10.1.1 Glass defect

NO.	Defect	Criteria	Remark
1	Dimension(Minor)	By engineering diagram	
2	Cracks(Major)	Extensive crack [Reject]	

Website: www.tslcd.com/www.lcdlcm.com   Email: tslcd@tslcd.com

10.1.2 LCM appearance defect

NO.	Defect	Criteria		Remark
		Spec	**Permissible Qty**	
1	Round type(Minor)	$\Phi \leqslant 0.1$mm	Disregard	1. $\Phi =(W+L)/2$, L:Length,W=Width 2.Disregard if out of A.A
		0.1mm$< \Phi \leqslant 0.2$mm	2	
		$\Phi >0.2$mm	0	
2	Line type(Minor)	W $\leqslant 0.03$mm	Disregard	1. L:Length,W=Width 2.Disregard if out of A.A
		L$\leqslant$ 3.0mm and 0.03mm$<$W$\leqslant 0.05$mm	2	
		L$\leqslant$ 3.0mm and 0.05mm$<$W$\leqslant 0.1$mm	1	
		W>0.10mm or L>3.0mm	0	
3	Polarizer dent(Minor)	$\Phi \leqslant 0.2$mm	Disregard	1. $\Phi =(W+L)/2$, L:Length,W=Width 2.Disregard if out of A.A
		0.2mm$< \Phi \leqslant 0.3$mm	2	
		0.3mm$< \Phi \leqslant 0.5$mm	1	
		$\Phi >0.5$mm	0	

10.1.3 FPC

NO.	Defect	Criteria	Remark
1	Copper peeling(Minor)	Copper peeling [Reject]	
2	Damaged	Damaged[Reject]	

10.1.4 Black tape

NO.	Defect	Criteria	Remark
1	Shift(Minor)	IC exposed [Reject]	
2	No black tape(Minor)	No black tape [Reject]	

10.1.5 Silicon

NO.	Defect	Criteria	Remark
1	Amount of silicon (Minor)	ITO exposed [Reject]	

10.2 Visual inspection criterion in electrical display

NO.	Defect	Criteria		Remark
		Spec.	Permissible Qty	
1	No display (Major)	Not allowed		
2	Missing line (Major)	Not allowed		
3	Darker or lighter Line (Major)	Not allowed		
4	Weak line(Major)	By limited sample		
5	Bright / Dark point (Minor)	Bright point	1	1:1sub-pixel: 1R or 1G or 1B 2:Point defect area 1/2 sub pixel.
		Dark point	2	
6	Round type (Minor)	Φ≤0.1mm	Disregard	1. Φ=(W+L)/2, L:Length,W=Width 2.Disregard if out of A.A
		0.1＜φ≤0.2	3	
		Φ＞0.2mm	0	
	Line type (Minor)	W ≤0.03mm	Disregard	1. L:Length,W=Width 2.Disregard if out of A.A
		L≤ 3.0mm and 0.03mm<W≤0.05mm	2	
		L≤ 3.0mm and 0.05mm<W≤0.1mm	1	
		W>0.10mm or L>3.0mm	0	
	Mura (Minor)	By 5% ND filter invisible		

10.3 Others

1. Issues that are not defined in this document shall be discussed and agreed with both parties. (Customer and supplier)

2. Unless otherwise agreed upon in writing, the criteria shall be applied to both parties. (Customer and supplier)

11 Suggestions for using LCD modules

11.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.

2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.

3. Don't apply excessive force on the surface of the LCM.

4. If the surface is contaminated, clean it with soft cloth. If the LCM is severely contaminated, use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer. The   following solvents is especially prohibited: water , ketone Aromatic solvents etc.

5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping   and   distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

7. Don't disassemble the LCM.

8. To prevent destruction of the elements by static electricity, be careful   to maintain an optimum work environment.

-    Be sure to ground the body when handling the LCD modules.

-    Tools required for assembling, such as soldering irons, must be properly grounded.

-    To   reduce   the amount of static electricity generated, do not conduct assembling and other work under dry conditions.

-    The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

9. Do not alter, modify or change the the shape of the tab on the metal frame.

10. Do not make extra holes on the printed circuit board, modify its   shape   or   change the positions   of components to be attached.

11. Do not damage or modify the pattern writing on the printed circuit board.

12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector

13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

14. Do not drop, bend or twist LCM.

11.2 Storage

1. Store in an ambient temperature of 5 to 45   C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.

2. Storage in a clean environment, free from dust, active gas, and solvent.

3. Store in antistatic container.