LCD Module
Product Specification

OrderingNo:LCD-TFT2.0-122-30pin

(RoHS Compliant Product)

Customer Approval:

Customer P/N:

☐ **Approved for sample making.**

☐ **Approved for pilot production. Please specify minimum quantity (if any) _____ pcs**

☐ **Approved for mass production.**

Customer Signature and Date:

Written By (Electrical)	Written By (Mechanical)	Checked By (R&D)	Approved By	
			R&D	QA

REVISION HISTORY:				
Revision	Date	Description	Written By	Approved By
1.0	10-Jan-2013			

CONTENTS

1.0 GENERAL SPECIFICATION

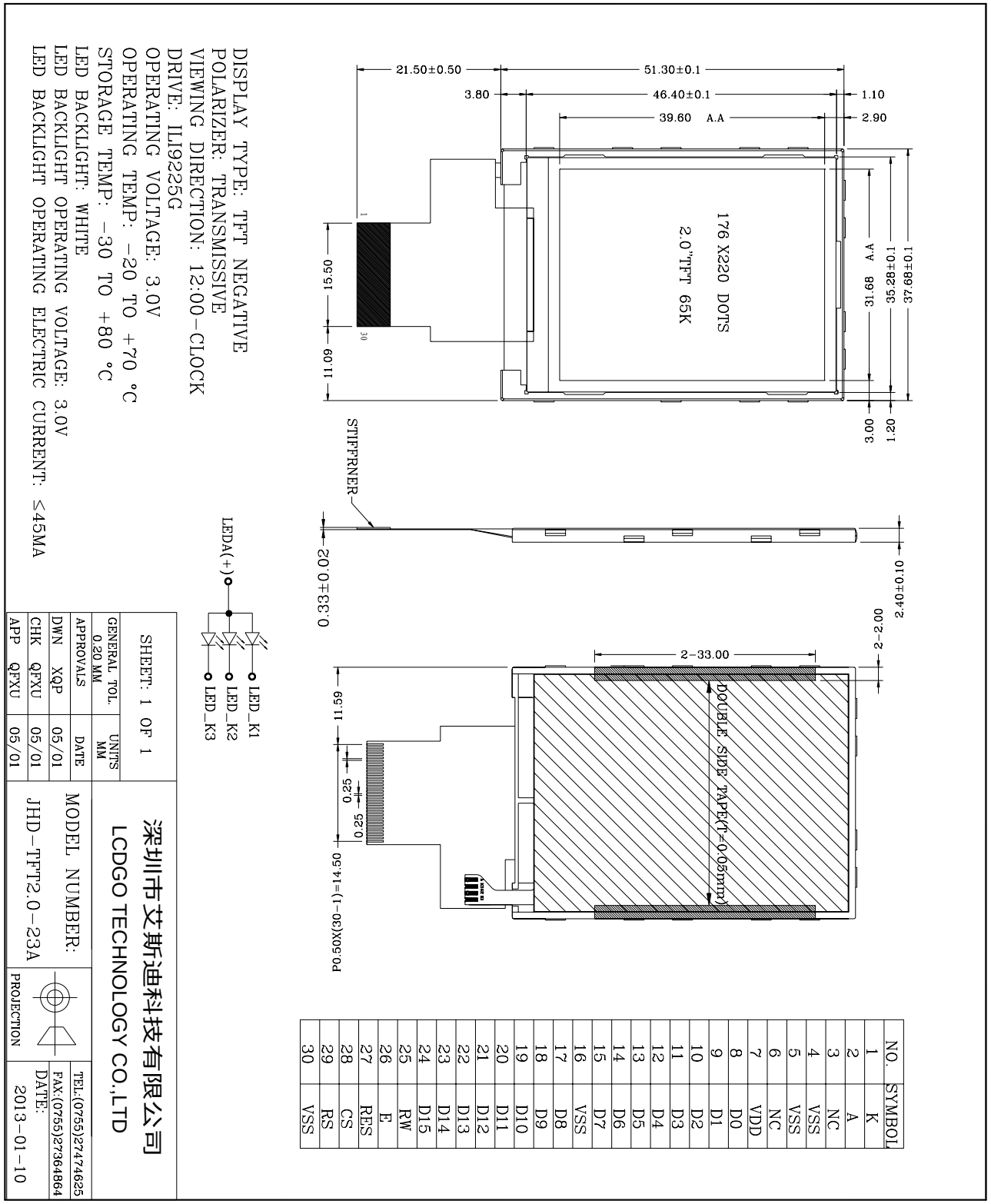
Item	Contents	Unit
LCD type	TFT Transmissive/positive	-
Viewing direction	12:00	O'Clock
Module size (W×H×T)	51.30*37.68*2.40max	mm
Active area (WxH)	39.6*31.68	mm
Driver IC	ILI9225G	-
Number of dots	176(RGB)*220	-
Colors	262k	-
Backlight type	white LED	-
Interface type	System parallel interface	-
VDD	3V	V
Backlight	LED	-
Operating temperature	-20 ~+ 70	^{o}C
Storage temperature	-30 ~ +80	^{o}C
Weight	TBD	g
Input Voltage	2.8V	V

2.0 LCM NUMBERING SYSTEM

JHD - TFT 2.0- 23A
(1) (2) (3) (4)

(1) ShenZhen JHDLCM Electronic Co., Ltd
(2) Display type (S: STN/FSTN, H: HTN, C: CSTN,T:TFT)
(3) Module size
(4) Serial number

3.0 OUTLINE DRAWING



NO.	SYMBOL
1	K
2	A
3	NC
4	VSS
5	VSS
6	NC
7	VDD
8	D0
9	D1
10	D2
11	D3
12	D4
13	D5
14	D6
15	D7
16	VSS
17	D8
18	D9
19	D10
20	D11
21	D12
22	D13
23	D14
24	D15
25	RW
26	E
27	RES
28	CS
29	RS
30	VSS

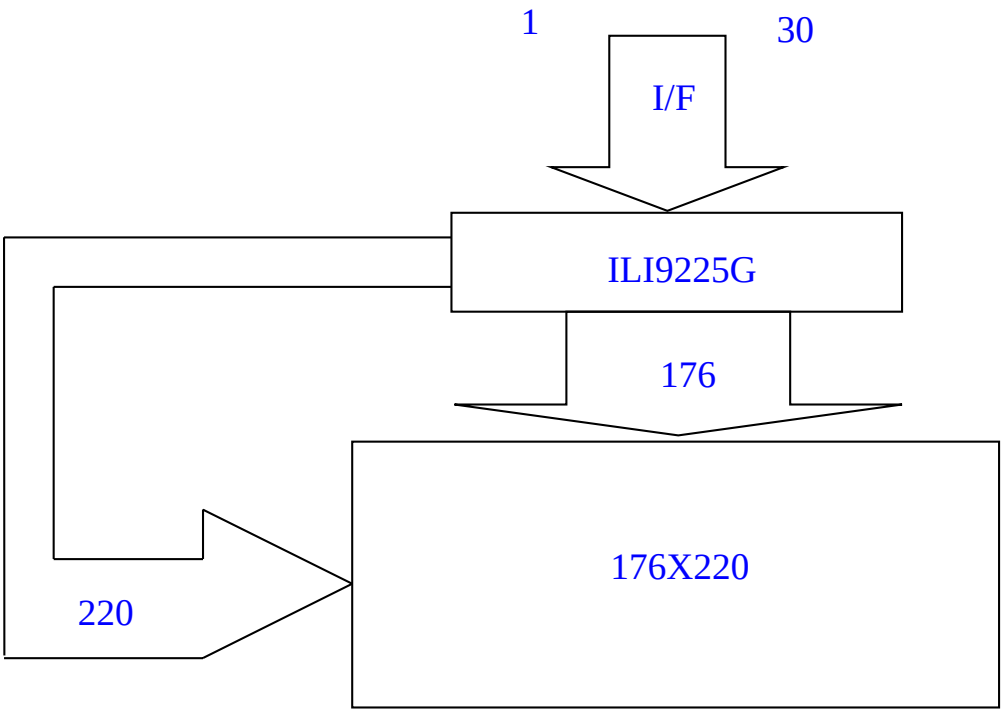
DISPLAY TYPE: TFT NEGATIVE
POLARIZER: TRANSMISSIVE
VIEWING DIRECTION: 12:00-CLOCK
DRIVE: ILI9225G
OPERATING VOLTAGE: 3.0V
OPERATING TEMP: -20 TO +70 °C
STORAGE TEMP: -30 TO +80 °C
LED BACKLIGHT: WHITE
LED BACKLIGHT OPERATING VOLTAGE: 3.0V
LED BACKLIGHT OPERATING ELECTRIC CURRENT: ≤45MA

SHEET: 1 OF 1		深圳市艾斯迪科技有限公司	
GENERAL TOL. 0.20 MM	UNITS MM	LCDGO TECHNOLOGY CO.,LTD	
APPROVALS	DATE	MODEL NUMBER:	TEL:(0755)27474625
DWN XQP	05/01	JHD-TFT2.0-23A	FAX:(0755)27364864
CHK QFXU	05/01	PROJECTION	DATE: 2013-01-10
APP QFXU	05/01		

4.0 INTERFACE PIN DESCRIPTION

Pin No.	Symbol	Pin Description
1	K	back light power supply negative
2	A	back light power supply positive
3	NC	NC
4	VSS	Ground
5	VSS	Ground
6	NC	NC
7	VDD	power supply
8-15	D0-D7	Data bits
16	VSS	Ground
17-24	D8-D15	Data bits
25	RW	write select signal input
26	E	read select signal
27	RES	A reset pin.
28	CS	chip select signal input(low active)
29	RS	data or command select signal input
30	VSS	Ground

5.0 BLOCK DIAGRAM



6.0 OPERATING PRINCIPLE & DRIVING METHOD

No.	Registers Name	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
IR	Index	W	0	0	0	0	0	0	0	0	0	ID7	ID6	ID5	ID4	ID3	ID2	ID1	ID0
00h	Driver Code Read	R	1	1	0	0	1	0	0	1	0	0	0	1	0	0	1	1	0
01h	Driver Output Control	W	1	VSPL (0)	HSPL (0)	DPL (0)	EPL (0)	0	SM (0)	GS (0)	SS (0)	0	0	0	NL4 (1)	NL3 (1)	NL2 (1)	NL1 (0)	NL0 (0)
02h	LCD AC Driving Control	W	1	0	0	0	0	0	0	INV1 (0)	INV0 (1)	0	0	0	0	0	0	0	FLD (0)
03h	Entry Mode	W	1	0	0	0	BGR (0)	0	0	MDT1 (0)	MDT0 (0)	0	0	ID1 (1)	ID0 (1)	AM (0)	0	0	0
07h	Display Control 1	W	1	0	0	0	TEMON (0)	0	0	0	0	0	0	0	GON (0)	CL (0)	REV (0)	D1 (0)	D0 (0)
08h	Blank Period Control 1	W	1	0	0	0	0	FP3 (1)	FP2 (0)	FP1 (0)	FP0 (0)	0	0	0	0	BP3 (1)	BP2 (0)	BP1 (0)	BP0 (0)
0Bh	Frame Cycle Control	W	1	NO3 (0)	NO2 (0)	NO1 (1)	NO0 (1)	SDT3 (0)	SDT2 (0)	SDT1 (0)	SDT0 (1)	0	0	0	0	RTN3 (0)	RTN2 (0)	RTN1 (0)	RTN0 (0)
0Ch	Interface Control	W	1	0	0	0	0	0	0	0	RIM (0)	0	0	0	DM (0)	0	0	RIM1 (0)	RIM0 (0)
0Fh	Oscillation Control	W	1	0	0	0	0	FOSC3 (0)	FOSC2 (1)	FOSC1 (1)	FOSC0 (1)	0	0	0	0	0	0	0	OSC CN(1)
10h	Power Control 1	W	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	STB (0)
11h	Power Control 2	W	1	0	0	0	APON (0)	0	0	0	0	0	1	0	0	0	0	0	1
12h	Power Control 3	W	1	0	BT2 (0)	BT1 (1)	BT0 (0)	0	0	0	0	0	0	0	1	0	0	1	0
13h	Power Control 4	W	1	0	0	0	0	0	0	0	0	0	GVD5 (1)	GVD5 (1)	GVD4 (0)	GVD3 (0)	GVD2 (1)	GVD1 (1)	GVD0 (0)
14h	Power Control 5	W	1	VCOMG (0)	VCM6 (1)	VCM5 (0)	VCM4 (1)	VCM3 (0)	VCM2 (0)	VCM1 (0)	VCM0 (1)	0	VML6 (1)	VML5 (1)	VML4 (0)	VML3 (1)	VML2 (0)	VML1 (0)	VML0 (1)
20h	RAM Address Set 1	W	1	0	0	0	0	0	0	0	0	AD7 (0)	AD6 (0)	AD5 (0)	AD4 (0)	AD3 (0)	AD2 (0)	AD1 (0)	AD0 (0)
21h	RAM Address Set 2	W	1	0	0	0	0	0	0	0	0	AD15 (0)	AD14 (0)	AD13 (0)	AD12 (0)	AD11 (0)	AD10 (0)	AD9 (0)	AD8 (0)
22h	Write Data to GRAM	W	1	WD[17:0]: Pin assignment varies according to the interface method.															
22h	Read Data to GRAM	R	1	RD[17:0]: Pin assignment varies according to the interface method.															

No.	Registers Name	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
30h	Gate Scan Control	W	1	0	0	0	0	0	0	0	0	0	0	0	SCN4 (0)	SCN3 (0)	SCN2 (0)	SCN1 (0)	SCN0 (0)
31h	Vertical Scroll Control 1	W	1	0	0	0	0	0	0	0	0	SEA7 (1)	SEA6 (1)	SEA5 (0)	SEA4 (1)	SEA3 (1)	SEA2 (0)	SEA1 (1)	SEA0 (1)
32h	Vertical Scroll Control 2	W	1	0	0	0	0	0	0	0	0	SSA7 (0)	SSA6 (0)	SSA5 (0)	SSA4 (0)	SSA3 (0)	SSA2 (0)	SSA1 (0)	SSA0 (0)
33h	Vertical Scroll Control 3	W	1	0	0	0	0	0	0	0	0	SST7 (0)	SST6 (0)	SST5 (0)	SST4 (0)	SST3 (0)	SST2 (0)	SST1 (0)	SST0 (0)
34h	Partial Driving Position -1	W	1	0	0	0	0	0	0	0	0	SE17 (1)	SE16 (1)	SE15 (0)	SE14 (1)	SE13 (1)	SE12 (0)	SE11 (1)	SE10 (1)
35h	Partial Driving Position-2	W	1	0	0	0	0	0	0	0	0	SS17 (0)	SS16 (0)	SS15 (0)	SS14 (0)	SS13 (0)	SS12 (0)	SS11 (0)	SS10 (0)
36h	Horizontal Window Address -1	W	1	0	0	0	0	0	0	0	0	HEA7 (1)	HEA6 (0)	HEA5 (1)	HEA4 (0)	HEA3 (1)	HEA2 (1)	HEA1 (1)	HEA0 (1)
37h	Horizontal Window Address -2	W	1	0	0	0	0	0	0	0	0	HSA7 (0)	HSA6 (0)	HSA5 (0)	HSA4 (0)	HSA3 (0)	HSA2 (0)	HSA1 (0)	HSA0 (0)
38h	Vertical Window Address - 1	W	1	0	0	0	0	0	0	0	0	VEA7 (1)	VEA6 (1)	VEA5 (0)	VEA4 (1)	VEA3 (1)	VEA2 (0)	VEA1 (1)	VEA0 (1)
39h	Vertical Window Address - 2	W	1	0	0	0	0	0	0	0	0	VSA7 (0)	VSA6 (0)	VSA5 (0)	VSA4 (0)	VSA3 (0)	VSA2 (0)	VSA1 (0)	VSA0 (0)
50h	Gamma Control 1	W	1	0	0	0	0	KP13 (0)	KP12 (0)	KP11 (0)	KP10 (0)	0	0	0	0	KP03 (0)	KP02 (0)	KP01 (0)	KP00 (0)
51h	Gamma Control 2	W	1	0	0	0	0	KP33 (1)	KP32 (0)	KP31 (0)	KP30 (0)	0	0	0	0	KP23 (1)	KP22 (0)]	KP21 (0)	KP20 (0)
52h	Gamma Control 3	W	1	0	0	0	0	KP53 (1)	KP52 (0)	KP51 (0)	KP50 (0)	0	0	0	0	KP43 (1)	KP42 (0)	KP41 (1)	KP40 (0)
53h	Gamma Control 4	W	1	0	0	0	0	RP13 (0)	RP12 (0)	RP11 (0)	RP10 (0)	0	0	0	0	RP03 (1)	RP02 (0)	RP01 (1)	RP00 (0)
54h	Gamma Control 5	W	1	0	0	0	0	KN13 (1)	KN12 (0)	KN11 (1)	KN10 (0)	0	0	0	0	KN03 (1)	KN02 (0)	KN01 (0)	KN00 (0)
55h	Gamma Control 6	W	1	0	0	0	0	KN33 (1)	KN32 (0)	KN31 (0)	KN30 (0)	0	0	0	0	KN23 (1)	KN22 (0)	KN21 (0)	KN20 (0)
56h	Gamma Control 7	W	1	0	0	0	0	KN53 (0)	KN52 (0)	KN51 (0)	KN50 (0)	0	0	0	0	KN43 (0)	KN42 (0)	KN41 (0)	KN40 (0)
57h	Gamma Control 8	W	1	0	0	0	0	RN13 (1)	RN12 (0)	RN11 (1)	RN10 (0)	0	0	0	0	RN03 (0)	RN02 (0)	RN01 (0)	RN00 (0)

No.	Registers Name	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
58h	Gamma Control 9	W	1	0	0	0	VRP14 (0)	VRP13 (0)	VRP12 (1)	VRP11 (1)	VRP10 (1)	0	0	0	VRP04 (1)	VRP03 (0)	VRP02 (0)	VRP01 (0)	VRP00 (0)
59h	Gamma Control 10	W	1	0	0	0	VRN14 (0)	VRP13 (0)	VRP12 (1)	VRP11 (1)	VRP10 (1)	0	0	0	VRN04 (1)	VRN03 (0)	VRN02 (0)	VRN01 (0)	VRN00 (0)
60h	NV Memory Data Programming	W	1	0	0	0	0	0	0	0	0	NVM_ D7	NVM_ D6	NVM_ D5	NVM_ D4	NVM_ D3	NVM_ D2	NVM_ D1	NVM_ D0
61h	NV Memory Control	W	1	0	0	0	0	0	0	0	VCM_ SEL	0	0	0	0	0	0	ID_PGM_ EN	VCM_ PGM_EN
62h	NV Memory Status	W	1	0	0	PGM_ CNT2	PGM_ CNT1	0	0	0	0	0	VCM_ D6	VCM_ D5	VCM_ D4	VCM_ D3	VCM_ D2	VCM_ D1	VCM_ D0
63h	NV Memory Protection Key	R		KEY 15	KEY 14	KEY 13	KEY 12	KEY 11	KEY 10	KEY 9	KEY 8	KEY 7	KEY 6	KEY 5	KEY 4	KEY 3	KEY 2	KEY 1	KEY 0
65h	ID Code	R		0	0	0	0	0	0	0	0	0	0	0	0	ID3	ID2	ID1	ID0
66h	SPI Read/Write Control	R		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R/WX (0)

7.0 ABSOLUTE MAXIMUM RATINGS (Ta = 25°C, V_{SS} = 0 V)

The absolute maximum rating is listed on following table. When ILI9225G is used out of the absolute maximum ratings, the ILI9225G may be permanently damaged. To use the ILI9225G within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the ILI9225G will malfunction and cause poor reliability.

Item	Symbol	Unit	Value	Note
Power supply voltage (1)	IOVCC	V	-0.3 ~ + 4.6	1, 2
Power supply voltage (1)	VCI – GND	V	-0.3 ~ + 4.6	1, 4
Power supply voltage (1)	AVDD – GND	V	-0.3 ~ + 6.0	1, 4
Power supply voltage (1)	GND –VCL	V	-0.3 ~ + 4.6	1
Power supply voltage (1)	AVDD – VCL	V	-0.3 ~ + 9.0	1, 5
Power supply voltage (1)	VGH – GND	V	-0.3 ~ + 18.5	1, 5
Power supply voltage (1)	GND – VGL	V	-0.3 ~ + 18.5	1, 6
Input voltage	Vt	V	-0.3 ~ VCI+ 0.3	1
Operating temperature	Topr	℃	-40 ~ + 85	8, 9
Storage temperature	Tstg	℃	-55 ~ + 110	8, 9

Notes:
1. VCI,GND must be maintained
2. (High) VCI ≥ GND (Low), (High) IOVCC ≥ GND (Low).
3. Make sure (High) VCI ≥ GND (Low).
4. Make sure (High) AVDD ≥ ASSD (Low).
5. Make sure (High) AVDD ≥ VCL (Low).
6. Make sure (High) VGH ≥ ASSD (Low).
7. Make sure (High) ASSD ≥ VGL (Low).
8. For die and wafer products, specified up to 85℃.
9. This temperature specifications apply to the TCP package

8.0 ELECTRICAL CHARACTERISTICS

(VCI = 2.50 ~ 3.30V, IOVCC = 1.65 ~ 3.30V, Ta= -40 ~ 85 °C)

Item	Symbol	Unit	Test Condition	Min.	Typ.	Max.	Note
Input high voltage	V_{IH}	V	IOVCC= 1.65 ~ 3.3V	0.8*IOVCC	-	IOVCC	-
Input low voltage	V_{IL}	V	IOVCC= 1.65 ~ 3.3V	0	-	0.2*IOVCC	-
Output high voltage(1) (DB0-17 Pins)	V_{OH1}	V	IOH = -0.1 mA	0.8*IOVCC	-	-	-
Output low voltage (DB0-17 Pins)	V_{OL1}	V	IOVCC=1.65~3.3V VCI= 2.5 ~ 3.3V IOL = 0.1mA	-	-	0.2*IOVCC	-
I/O leakage current	I_{LI}	µA	Vin = 0 ~ IOVCC	-0.1	-	0.1	-
Current consumption during standby mode (VCI – GND)	I_{ST}	µA	VCI=2.8V , Ta=25 °C	-	-	100	-
LCD Driving Voltage (AVDD-GND)	AVDD	V	-	4.5	-	6	-
Output voltage deviation		mV	-	-	20	-	-
Dispersion of the Average Output Voltage	V	mV	-	-20	-	20	-

9.0 ELECTRO-OPTICAL CHARACTERISTICS

Normal Write Mode (IOVCC = 1.65~3.3V, VCI=2.5~3.3V)

Item		Symbol	Unit	Min.	Max.	Test Condition
Bus cycle time	Write	t_{CYCW}	ns	66	-	-
	Read	t_{CYCR}	ns	300	-	-
Write low-level pulse width		PW_{LW}	ns	35	500	-
Write high-level pulse width		PW_{HW}	ns	35	-	-
Read low-level pulse width		PW_{LR}	ns	150	-	-
Read high-level pulse width		PW_{HR}	ns	150	-	
Write / Read rise / fall time		t_{WRr}/t_{WRf}	ns	-	15	
Setup time	Write (RS to nCS, E/nWR)	t_{AS}	ns	10	-	
	Read (RS to nCS, RW/nRD)			5	-	
Address hold time		t_{AH}	ns	5	-	
Write data set up time		t_{DSW}	ns	10	-	
Write data hold time		t_H	ns	15	-	
Read data delay time		t_{DDR}	ns	-	100	
Read data hold time		t_{DHR}	ns	5	-	

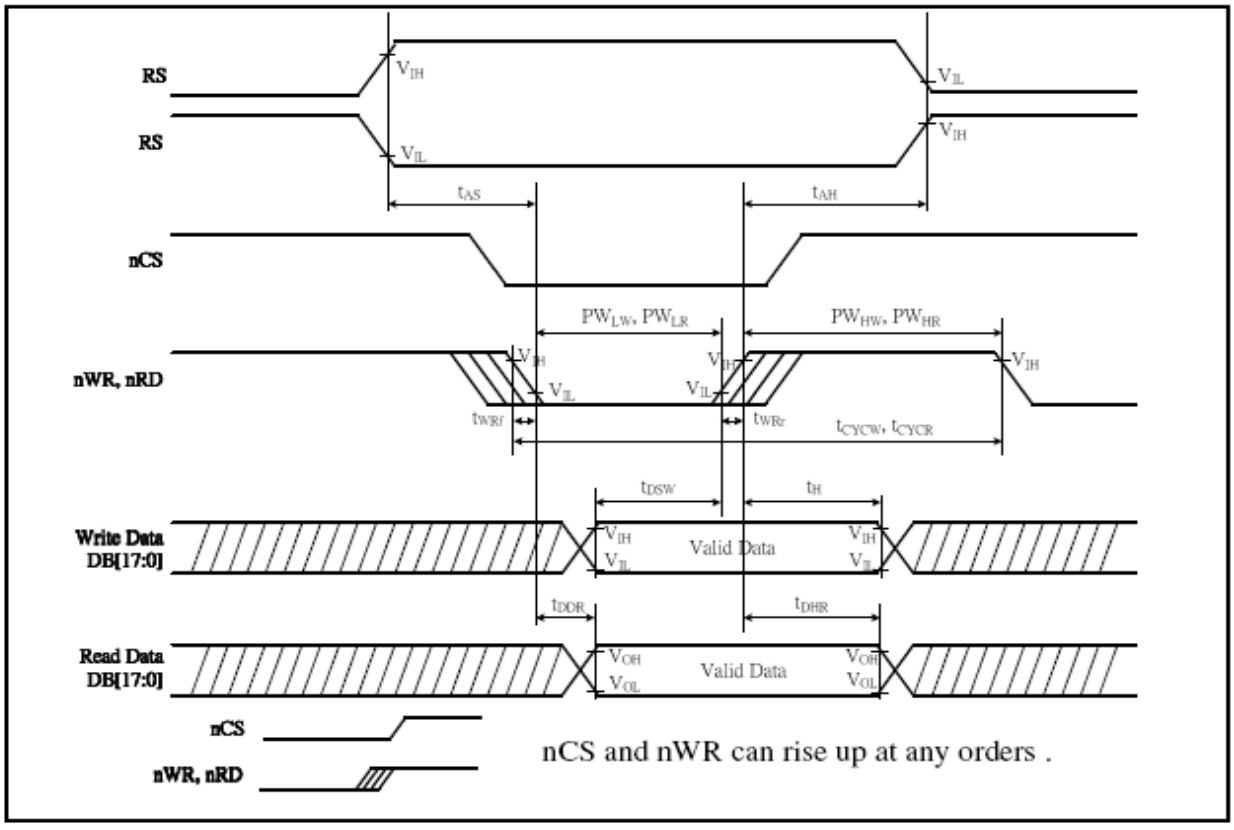
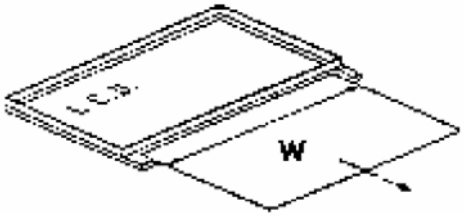
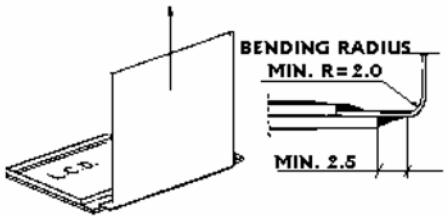


Figure45 i80-System Bus Timing

10.0 STANDARD SPECIFICATION FOR RELIABILITY

10.1 Standard specification of Reliability Test

No.	Test Item	Content of Test	Test Condition
1	High temperature operation	Endurance test applying the high storage temperature for a long time.	70ºC+/-2°C 96H Restore 2H at 25°C Power on
2	Low temperature operation	Endurance test applying the low storage temperature for a long time.	-20ºC+/-2°C 96H Restore 2H at 25°C Power on
3	Low temperature storage	Endurance test applying the low storage temperature for a long time.	-30 °C+/-2°C 96H Restore 2H at 25°C Power off
4	High temperature storage	Endurance test applying the low storage temperature for a long time.	80 °C +/-2°C 96H Restore 2H at 25°C Power off
5	High Temperature& Humidity Operation		60°C+/-2°C 90% RH 96H Power on
6	Temperature Cycle		30°C◄►25°C◄►80°C 30min 5min 30min
7	Vibration Test		10Hz~150Hz, 100m/s2, 120min
8	Shock Test		Half -sinewave, 300m/s,11ms
9	Drop Test(package state)		800mm, concrete floor, 1 corner, 3 edges, 6 sides each time
10	Damp heat Operation	Endurance test applying the electric stress and temperature / humidity stress to the element for a long time.	+60 ºC, 95%RH for 500Hrs
11	Thermal cycles operation	Endurance test applying the thermal shock operation for a long time.	Display on , 2h at -30°C ; shift from - 30°C to + 80°C with gradient of 3°C/min; 2 h at 80°C; shift from +80°C to - 30°C with gradient of 2°C/min , repeated 100 times.
12	Thermal shocks	Endurance test applying the thermal shock operation for a long time.	Display off, 1h at -30°C ; shift from - 30°C to + 80°C in 10 s max. 1 h at 80°C; shift from + 80°C to - 30°C in 10 s max. , repeated 100 times
13	Random vibrations	Endurance test applying the vibrations. for a long time when transportation	Test 3 axes during 8 hour/axe - from 5 to 200 Hz: Acc = 10G - from 200 to 500 Hz : Amplitude =5mm – from 5 to 12HZ. Scanning speed= 1 octave / min

14	ESD test	To check the immunity of display to ESD incurred during storage, handling, maintenance and assembly operation.	Discharge resistance = 2kΩ Discharge capacitance = 150pF Number of discharges = 3times Discharge interval = 3 sec Discharge voltage = ± 2 kV on COG connection interface.
15	FPC pull test	To verify the FPC/ glass connection resistance to pull forces applied to the FPC.	 Keeping the LCD fixed, pull the FPC/FFC with a force F= 40 N for cm width of FPC at glass connection.
16	FPC peel test	To verify the FPC/ glass connection resistance to peel forces applied to the FPC.	 Keeping the LCD fixed, pull the FPC/FFC according to the figure above with a force F= 10 N for cm width of FPC at glass connection. The minimum bending radius has to be 2 mm

Remarks:

1) For operation test, above specification is applicable when test pattern is changing during entire operation test.
2) Inspections after reliability tests are performed when the display temperature resumes back to room temperature.
3) It is a normal characteristic that some display abnormality can be seen during reliability test. If the display abnormality can resume back to normal condition at room temperature within 24hours, there is no permanent destruction over the display. The display still possesses its functionality after reliability tests.

10.2 Failure Judgment Criteria

After the reliability tests above, test sample shall be let return to room temperature and humidity for at least 4 hours before final tests are carried out.

Criterion Item	Failure Judgment Criteria
Electrical characteristic	Electrical short and open.
Mechanical characteristic	Out of mechanical specification
Optical characteristic	Out of the Appearance Standard

11.0 QUALITY ASSURANCE

11.1 Inspection Standard

Item	Contents
Objective	This product inspection standard is intended to provide an inspection guideline for the LCD or LCM products manufactured by the Company for automotive customer MM.
Scope	Applicable to the inspection criteria of dimension, appearance, functionality etc.for the LCD or LCM products supplied to the customer MM. Criteria not included in this Inspection Standard will be justified in accordance with any documents agreed upon

	otherwise.
Inspection Unit	An inspection unit is a unit of display under inspection. The unit for the dimension addressed in this inspection standard is referring to mm, unless otherwise specified.
Inspection System	1： Inspection system includes inspection during production inspection and outgoing product inspection. 2： Process inspection is the inspection for appearance and functionality of the products during the production process. 3： Outgoing inspection is the inspection for the finished products prior to the delivery, based on defined sampling plan.
Inspection Condition	1： Inspection equipments: Equipment and tools used for inspection, measuring and testing during the inspection process. 2：Inspection conditions are described as the following. Distance：40cm between the observer's eyes and the LCD. Viewing angle：according to main viewing direction（MVD）.

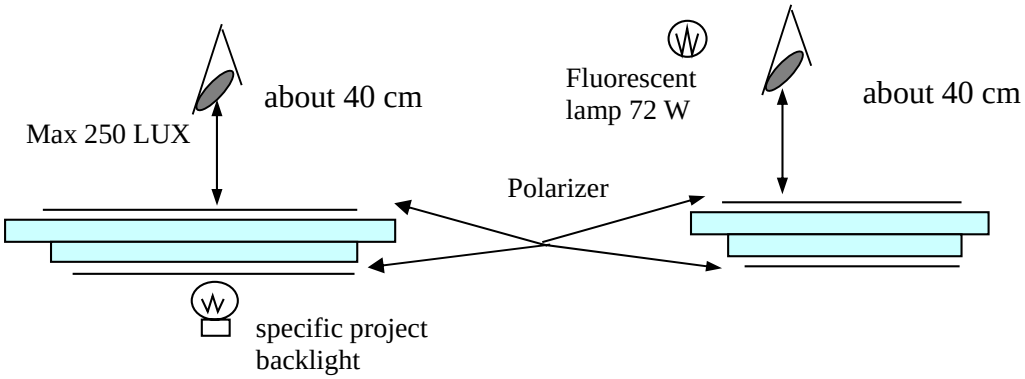


Fig 1
Trasflective or Transmissive LCD/LCM

Fig 2
Reflective LCD/LCM

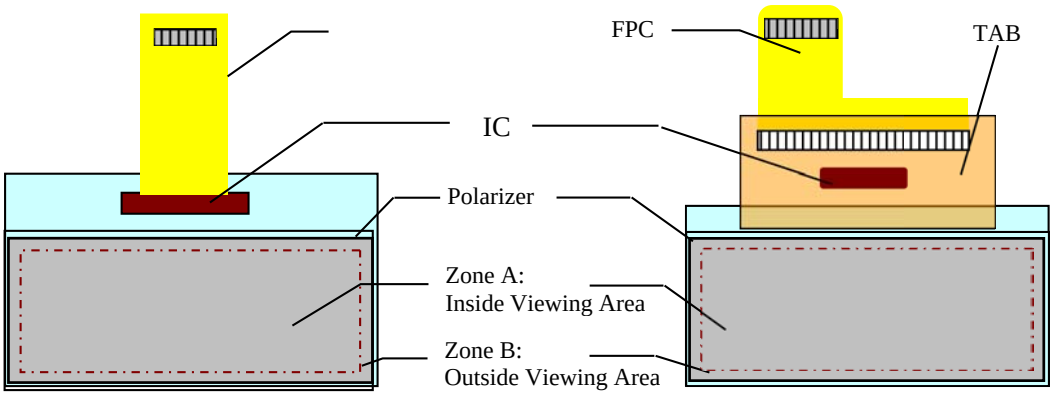
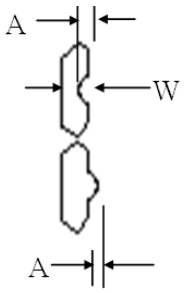
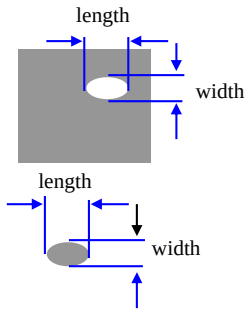


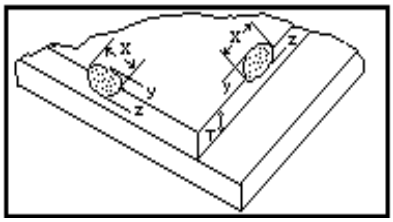
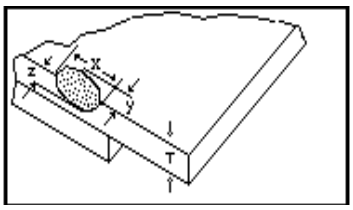
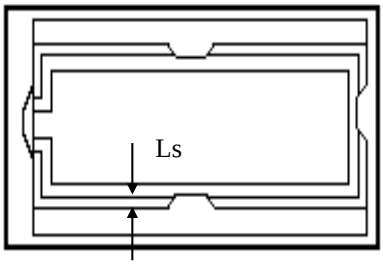
Fig 3
Product Configuration

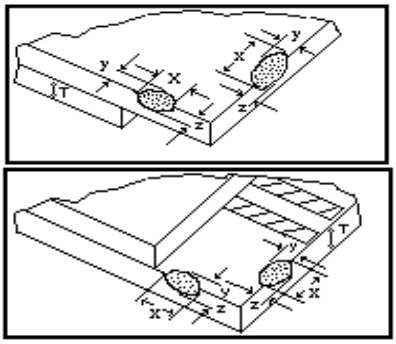
11.2 Acceptance Criteria (Zastron internal standard: JU-MM)

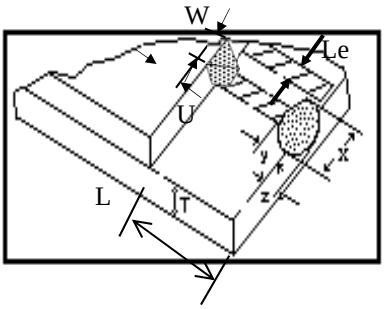
<table>
<tr><th>Inspection Item</th><th>Acceptance/Rejection Criteria</th><th>Defect Classification</th><th>Method</th><th>Applicable Zone</th></tr>
<tr><td>Functional</td><td>1. No display defect is not acceptable.
2. Abnormal display defect is not acceptable.
3. Missing segment and extra segment is not acceptable.
4. Dim contrast or dark contrast is not acceptable.
5. Current consumption (Idd MAX) shall not exceed the limit specified on the MI.
6. Wrong/reversed viewing angle is not acceptable.
7. Uneven contrast or stripe defect shall be in accordance with master sample. (Refer to specified limit sample if applicable)
8. Display character/ pattern shall be referred to the Test Instruction of the related models.</td><td>Major</td><td>Visual</td><td>A</td></tr>
<tr><td>Pattern Deformation</td><td> 

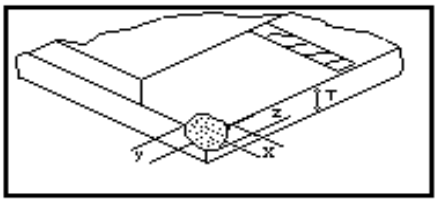
<table>
<tr><th>Size</th><th>Acceptable Number</th></tr>
<tr><td>A≤0.10 or A≤1/4W, whichever is less</td><td>1 per segment
3 per display</td></tr>
<tr><td>A>0.10 or A>1/4W, whichever is less</td><td>Unlimted</td></tr>
</table>
Note: Protrusion shall not cause bridging between adjacent segments</td><td>Major</td><td>Visual
Magnifier</td><td>A</td></tr>
</table>

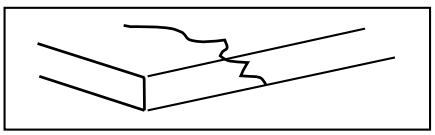
<table>
<tr>
<td>Black or white spots (on pattern), pin hole</td>
<td>


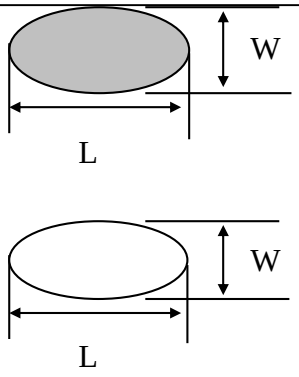
<table>
<tr><th>Size, d (mm)</th><th>Acceptable quantity</th></tr>
<tr><td>d ≤ 0.10</td><td>Unlimited</td></tr>
<tr><td>0.10 < d ≤ 0.20</td><td>1</td></tr>
<tr><td>d > 0.20</td><td>0</td></tr>
</table>
d = (length + width) / 2
Note:
Number of spot shall not be more than 1 per each segment.
If 2 spots exist, the distance must be > 20mm between each other
</td>
<td>Minor</td>
<td>Visual Magnifier</td>
<td>A</td>
</tr>
<tr>
<td rowspan="2">Chip-out</td>
<td>A. General chip-out (for glass edges and glass corner along perimeter seal)




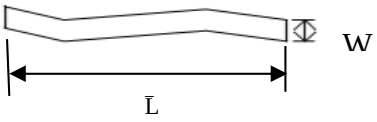
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>⩽2.0</td><td>⩽1.5 or ⩽Ls, whichever is less</td><td>⩽1/2t</td></tr>
<tr><td>⩽2.0</td><td>⩽1.0 or ⩽Ls, whichever is less</td><td>⩽t</td></tr>
</table>
X = length parallel with glass edge.
Y = width perpendicular with glass edge
Z = height of glass
t = single glass thickness
Note:
Chip out shall not reach the perimeter seal.</td>
<td>Minor</td>
<td>Visual Magnifier</td>
<td>B</td>
</tr>
<tr>
<td>B： Chip-out at terminal ledge or back of terminal ledge, but no exactly on terminal

<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>⩽2.0</td><td>⩽1.5</td><td>⩽1/2t</td></tr>
<tr><td>⩽2.0</td><td>⩽1.0</td><td>⩽t</td></tr>
</table>
Note:
In the event that the distance between the chip-out location and the terminal is less than the width of ITO pad Le, the acceptance criteria of chip-out on terminal shall apply.</td>
<td>Minor</td>
<td>Visual Magnifier</td>
<td>B</td>
</tr>
</table>

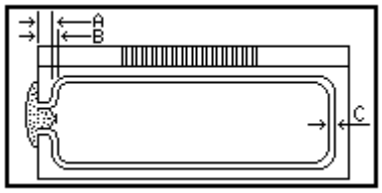
<table>
<tr><td rowspan="2"></td><td>C：Chip-out and protuberance at terminals
 

<table>
<tr><th>W</th><th>U</th></tr>
<tr><td colspan="2">Meet the dimension tolerance of the drawing</td></tr>
</table>
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>⩽0.5 Le
& not bridge two adjacent ITO pads.</td><td>⩽0.2L or ⩽2.0mm whichever is less</td><td>⩽1/2t</td></tr>
</table>
Note:
Chip out and protuberance shall not co-exist on the same ITO pad.
Protuberance is not allowed if affect assembly.</td><td>Minor</td><td>Visual
Magnifier</td><td>B</td></tr>
<tr><td>D：Chip-out at corner (ITO ledge)
 

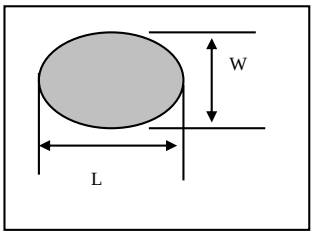
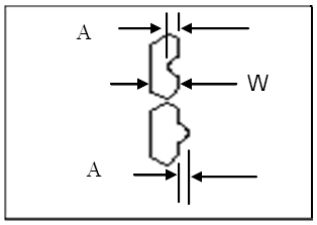
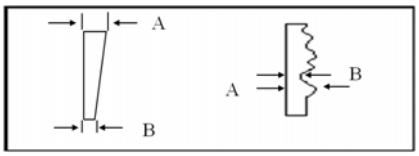
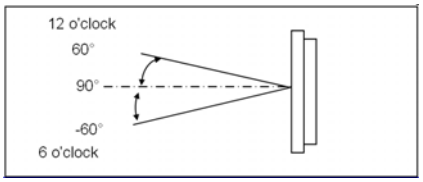
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>⩽2.0</td><td>⩽2.0</td><td>⩽t</td></tr>
</table></td><td>Minor</td><td>Visual
Magnifier</td><td>B</td></tr>
<tr><td>Crack line</td><td> 
Crack line is not acceptable.</td><td>Minor</td><td>Visual
Magnifier</td><td>A & B</td></tr>
<tr><td>Number of Chip-out</td><td>Maximum acceptable number of chip-out: 2 defects per LCD; 1 defect on ITO ledge.
Distance between chip-out: > 5mm.</td><td>Minor</td><td>Visual</td><td>B</td></tr>
</table>

<table>
<tr><td>Black spot
White spot
Bubble
Foreign material
Dent</td><td> 

<table>
<tr><th>D</th><th>Acceptable Number</th></tr>
<tr><td>D≤0.10</td><td>Unlimited</td></tr>
<tr><td>0.10＜D≤0.2</td><td>1</td></tr>
<tr><td>D＞0.2</td><td>0</td></tr>
</table>
Note: If 2 spots exist, the distance must be > 20mm between each other
D=（L+W）/2</td><td>Minor</td><td>Visual
Magni
fier</td><td>A</td></tr>
<tr><td>Scratch line
Dark line
Lint</td><td> 

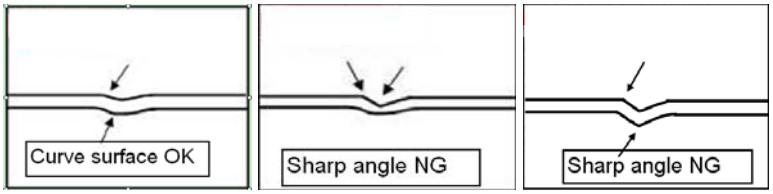
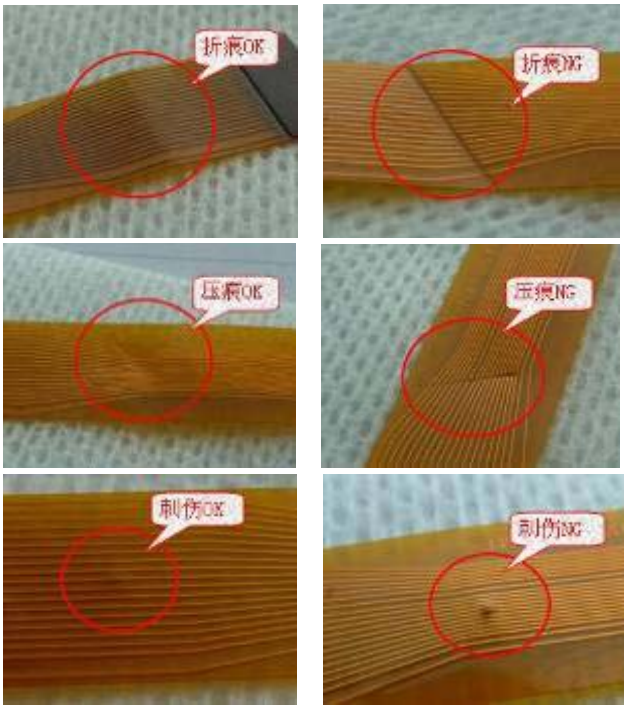
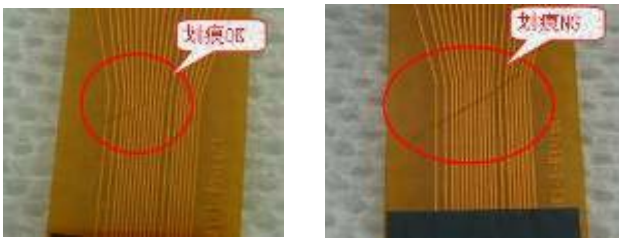
<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Number</th></tr>
<tr><td>L≤3.0</td><td>W≤0.015</td><td>2</td></tr>
<tr><td>L≤1.5</td><td>W≤0.03</td><td>1</td></tr>
<tr><td></td><td>W＞0.03</td><td>0</td></tr>
</table>
Note: If 2 line defects co-exist, the distance must be > 20mm between each other</td><td>Minor</td><td>Visual
Magni
fier</td><td>A</td></tr>
<tr><td>Endseal</td><td> 

A：Length of end-sealant
B：Length of seal mouth
C：Perimeter seal width
1.Minimum amount of end-sealant filled, A> 1/3 B
2.Maximum amount of end-sealant shall not spread over to Zone A, Viewing Area (VA).
3.Dimension of end seal shall meet the dimension specified on the drawing.
4.Deformation of perimeter seal which result in perimeter seal becoming less than 1/3 C is not acceptable.</td><td>Minor</td><td>Visual
Magni
fier</td><td>A,B</td></tr>
<tr><td>Polarizer</td><td>Polarizer position shall meet the dimension tolerance indicated on the drawing</td><td>Minor</td><td>Visual</td><td>A,B</td></tr>
<tr><td>Background color</td><td>Background color shall not exceed the range of the limit sample.
Obvious uneven coloration (rainbow) shall not be seen.</td><td>Minor</td><td>Visual</td><td>A</td></tr>
<tr><td rowspan="6">Ink printing</td><td>1. Pattern position on the display shall match the MI/drawing.</td><td>Major</td><td>Visual</td><td rowspan="6">A</td></tr>
<tr><td>2. Pattern appearance shall match the MI/drawing.</td><td>Major</td><td>Visual</td></tr>
<tr><td>3. Reverse printing is not acceptable.</td><td>Major</td><td>Visual</td></tr>
<tr><td>4. Printing color shall match the master sample.</td><td>Major</td><td>Visual</td></tr>
<tr><td>5. Insufficient ink, blur, missing pattern, broken pattern are not acceptable.</td><td>Major</td><td>Visual</td></tr>
<tr><td>6. Angle of the printed pattern, the dimension between the pattern and the glass edge shall meet the dimension on the drawing.</td><td>Major</td><td>Visual</td></tr>
</table>

	7. The printed patterns shall be free of stain, fingeprint and scratch.	Major	Visual Magnifier	
	8. Spot/pinhole on the pattern.  D=（L+W）/2	Major	Visual	
	9. Ink pattern deformation  Protrusion ≤0.10 or ≤1/4W, whichever is less, Indentation ≤0.10 or ≤1/4W, whichever is less	Minor	Visual Magnifier	A
	10. Ink line deformation  A-B≤0.15	Minor	Visual Magnifier	A
	11. Pattern misalignment  Dimension must meet the requirement on the drawing For 12 o'clock viewing angle product, light leakage between 90°to 60° shall not be seen. For 6 o'clock viewing angle product, light leakage between 90°to -60° shall not be seen.	Minor	Visual	A
HSC FPC FFC	1. The outer dimension shall meet the MI/drawing.	Minor	Visual	B

D	Acceptable Number
D≤0.10	Unlimited
0.10＜D≤0.20	1
D＞0.20	0

Note:
If 2 spots exist, the distance must be > 20mm between each other

	2. FPC、HSC、FFC、shall not have folding/stress/dented mark with sharp angle on the surface.  			
	4.Scratch on FPC、HSC、FFC、TAB shall not damage the PI layer and the conductive traces. 			
	5.Goldfinger of FPC、TAB、FFC shall be free of solder。			
	6.Goldfinger of FPC、TAB、FFC shall be max 5% of area of oxidization and corrosion. 	Major	Visual	B
Stiffening tape Identity Label Identity marking	1. The tape sticking position shall meet the requirement on the MI/drawing. 2. Missing label/tape/marking is not acceptable. 3. The format of identification (including date code and product code) shall meet the requirement (eg. label,color marking, inkjet printing) on the MI/drawing.	Minor	Visual	B

Metal bezel	1. Dimension and specification shall meet the requirment on the MI/drawing.	Major	Visual	B
	2.The lock tab of bezel shall not have wrong bending orientation, missing tab, or crack.	Minor		B
	3.Bezel shall be free of rust, twist, deformation,finger print,oil stain and unknown contamination.	Minor		B

12.0 PRECAUTIONS FOR USING LCD MODULE

12.1 Handing Precautions

12.1.1 The display panel is made of glass and polarizer. Do not subject it to mechanical shock by dropping or impact which may cause chipping especially on the edges.

12.1.2 Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

12.1.3 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with Isopropyl alcohol or ethyl alcohol. Avoid using solvents like acetone (ketene), water, toluene, ethanol to clean the polarizer surface.

12.1.4 Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

12.1.5 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

12.1.6 Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion.

12.1.7 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.

12.1.8 NC terminal should be open. Do not connect anything.

12.1.9 If the logic circuit power is off, do not apply the input signals.

12.1.10 Avoid contacting oil and fats.

12.1.11 Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

12.1.12 Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

12.2 Electro-Static Discharge Control

12.2.1 Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

12.2.2 Be sure to ground the body when handling the LCD modules. Tools required for assembling, such as soldering irons, must be properly grounded.

12.2.3 To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity, be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

12.2.4 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.

12.2.5 When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.

12.3 Precaution for soldering to the LCM

12.3.1 Observe the following when soldering lead wire, connector cable and etc. to the LCD module.

- Soldering iron temperature: 300 ~ 350°C.
- Soldering time: ≤ 3 sec.
- Solder: eutectic solder.

Above is a recommended approach based on a 5mm distance between soldering point and pin contact point. Due to different solder composition, actual distance between soldering and contact point, and processing method, it is recommended that customer to study and fine tuning their soldering process parameters accordingly so that the temperature at pin-LCD contact point does not exceed 85ºC during soldering..

12.3.2 If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

12.4 Precautions for Operation

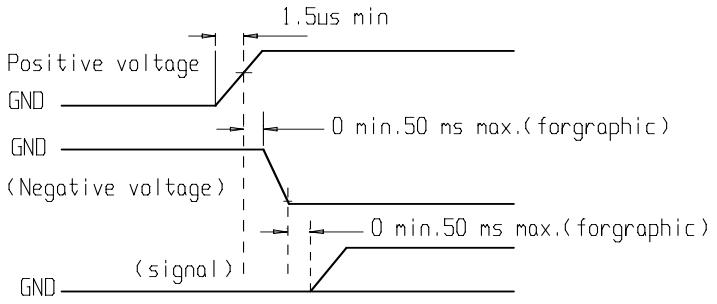
12.4.1 Viewing angle varies with the change of liquid crystal driving voltage (V_O). Adjust V_O to show the best contrast.

12.4.2 Driving the LCD in the voltage above the limit shortens its lifetime.

12.4.3 Response time is greatly delayed at temperature below the operating temperature range. However, it will recover when it returns to the specified temperature range.

12.4.4 If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

12.4.5 When turning the power on, input each signal after the positive/negative voltage becomes stable (below figure is a general illustration where typical value depends on individual product design).



12.5 Storage

12.5.1 When storing LCDs as spares for some years, the following precautions are necessary.

- Store them in a sealed polyethylene bag. If properly sealed, there is no need for desiccant.

- Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.

12.5.2 Environmental conditions:

- Do not leave them for more than 168hrs. at 60°C.
- Should not be left for more than 48hrs. at -20°C.

12.6 Safety

12.6.1 It is recommended to crush damaged or unnecessary LCD into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

12.6.2 If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.