Specifications

TFT-LCDmodule

Model No：MZ2D0N096-B

For Customer's Acceptance	
Approved by	**Comment**

	Signature	Date
Prepared by		
Checked by		
Approved by		

SHENZHEN MINGZE PHOTOELECTRIC DISPLAY CO., LTD

3/F block D,Yue Sheng Industrial Park,Le Zhu jiao Village,Zhou Shi

road,Xi Xiang Street,Bao and district,Shen Zhen city.

Tel:0755-29975710   **Fax:0755-81469960**

Contents

1 General Description

MZ2D0N0096-B 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 2.0 inch and thresolution is 176x220. 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 White	
2	Screen Size	2.0inch (diagonal)	
3	Resolution	176XRGBX220	
4	Color Number	262K	
5	Color Arrangement	RGB-stripe	
6	Driver IC	GC9201	
7	Back Light	White LED*3	
8	Viewing Direction	12 o'clock	
9	Interface	8-bit interface.	
10	Surface Treatment	UV Cut	
11	touch panel	N/A	

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	37.68(W) x51.3(H) x 2.25(D) (LCM,no include FPC)	mm
Active area	31.68(W) x39.6(H)	mm
Resolution	176(H)RGBx 220(V) dots	-
Dot size	0.18(H) x 0.18(V)	mm
Overall Weight		grams

SPEC TITLE
DOCUMENT CONTROL SPECIFICATION

NO.	NAME
1	DB15
2	DB14
3	DB13
4	DB12
5	DB11
6	DB10
7	DB9
8	DB8
9	GND
10	DB7
11	DB6
12	DB5
13	DB4
14	DB3
15	DB2
16	DB1
17	DB0
18	IOVCC
19	VCC
20	RD
21	WR
22	RS
23	CS
24	RESET
25	IM0
26	GND
27	LED_A
28	LED_K1
29	LED_K2
30	LED_K3
31	YU(Y+)
32	YD(Y-)
33	XL(X-)
34	XR(X+)
35	NC
36	NC

BACKLIGHT CIRCUIT

Specification:
1). Viewing angle: 12:0' Clock
2). Display mode: 262K TFT/Transmissive/Normally Black
3). Operating temp: -10°C~+60°C
4). Storage temp: -20°C~+70°C
5). LCD Driver IC:GC9201
6). Backlight: 3 chip White LED
7). General Tolerance: ±0.2
8). ROHS Request

注：展开出货

TITLE.	LCM OUTLINE	REV.	UNIT	SIZE
MODEL.	M22D0N096	B	mm	A4

Figure 1: Module specification of the module

3 Electrical Characteristics

3.1 TFT-LCD Module

Ta=25℃

Item	Symbo	Value			Unit	Notes
		Min	Typ	Max		
Supply Voltage for logic	Vcc	2.5	2.8	3.3	V	
	Vci	2.5	2.8	3.3		
TFT Gate ON Voltage	VGH *	10	15	20	V	
TFT Gate OFF Voltage	VGL	-15	-8	-5	V	
Operating temperature	Top	-20		+70	℃	
Storage temperature	Tst	-30		+80	℃	

3.2 Back-Light Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Current	IF	--	15X3	20X3	mA	
Forward voltage	VF	3.0	3.2	3.4	V	IF=45mA VF=3.2V
Chroma	X	0.250		0.30		
	Y	0.250		0.30		
Brightness	L	2700			Cd/m2	
Uniformity	UBL	80			%	

- 3 LEDs used

- The luminous intensity of LED is strongly dependent on the driving current.

- It is recommended the input of backlight to be constant current rather than constant voltage.

4   Block Diagram

5　TFT-LCM Interface Specification

Pin No	Symbol	Description	Note
1~8	DB15-DB8	Data bus	
9	GND	Ground	
10~17	DB7-DB0	Data bus	
18	IOVCC	Power supply input for LCM: 1.8V	
19	VCC	Power supply input for LCM: 2.8V	
20	RD	A read strobe signal can be input via this pin and initiallizes a read operation when the signal is low.	
21	WR	A write strobe signal can be input via this pin and initiallizes a write operation when the signal is low.	
22	RS	Data/Instruction select input pin ---RS='H ': Display data. ---RS='L ': Instruction data.	
23	/CS	Chip select input pin.	
24	/RESET	Reset signal input Pin	
25	IM0	Select a mode for interface to an MCU When IM0=0,IM3=0,setting 16bit when IM0=1,IM3=0,setting 8080 8bit	
26	GND	Ground	
27	LED-A	Power supply Anode input for backlight	
28	LED-K1	Power supply Cathode input for backlight1	
29	LED-K2	Power supply Cathode input for backlight2	
30	LED-K3	Power supply Cathode input for backlight3	
31	Y+（NC）	NC	
32	Y-（NC）	NC	
33	X+（NC）	NC	
34	X-（NC）	NC	
35~36	NC	NC	

6 Description of Interface'Signal

6.1 Register Selection

/WR	/RD	RS	Operations
0	1	0	Write command to register
1	0	0	Read command data to RAM
0	1	1	Write display data to RAM
1	0	1	Read display data from RAM

6.2 Values of /CS during GRAM Write

/CS	Operations
0	Data is written to the GRAM. RAM address is updated.
1	Data is not written to the GRAM. RAM address is not updated.

6.3 80-system Interface signals

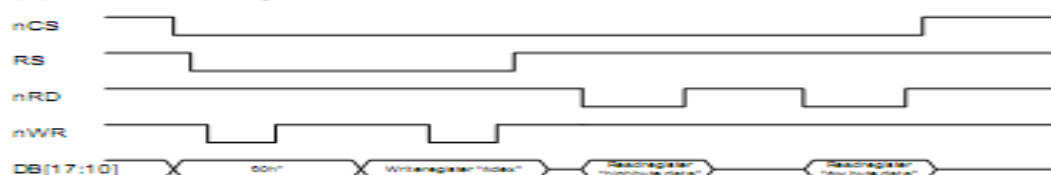### i80 18-/16-bit System Bus Interface Timing
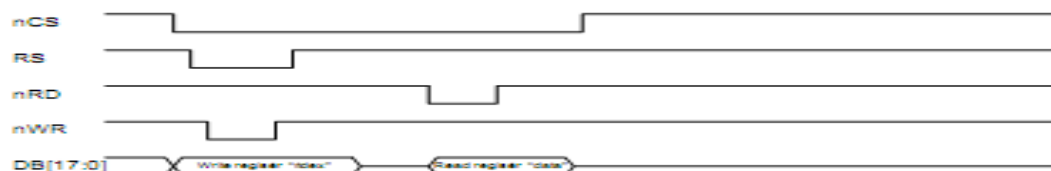
(a) Write to register

nCS
RS
nRD
nWR
DB[17:0]   Write register "index"   Write register "data"

(b) Read from register

nCS
RS
nRD
nWR
DB[17:0]   Write register "index"   Read register "data"

i80 9-/8-bit System Bus Interface Timing

(a) Write to register

nCS
RS
nRD
nWR
DB[17:10]   60h"   Write register "index"   Write register "high byte data"   Write register "low byte data"

(b) Read from register

nCS
RS
nRD
nWR
DB[17:10]   60h"   Write register "index"   Read register "high byte data"   Read register "low byte data"

6.4 DC Characteristics (Vcc=2.4~ 3.3V, IOVcc=1.65-3.3V,Ta=-40 ~ 85℃)

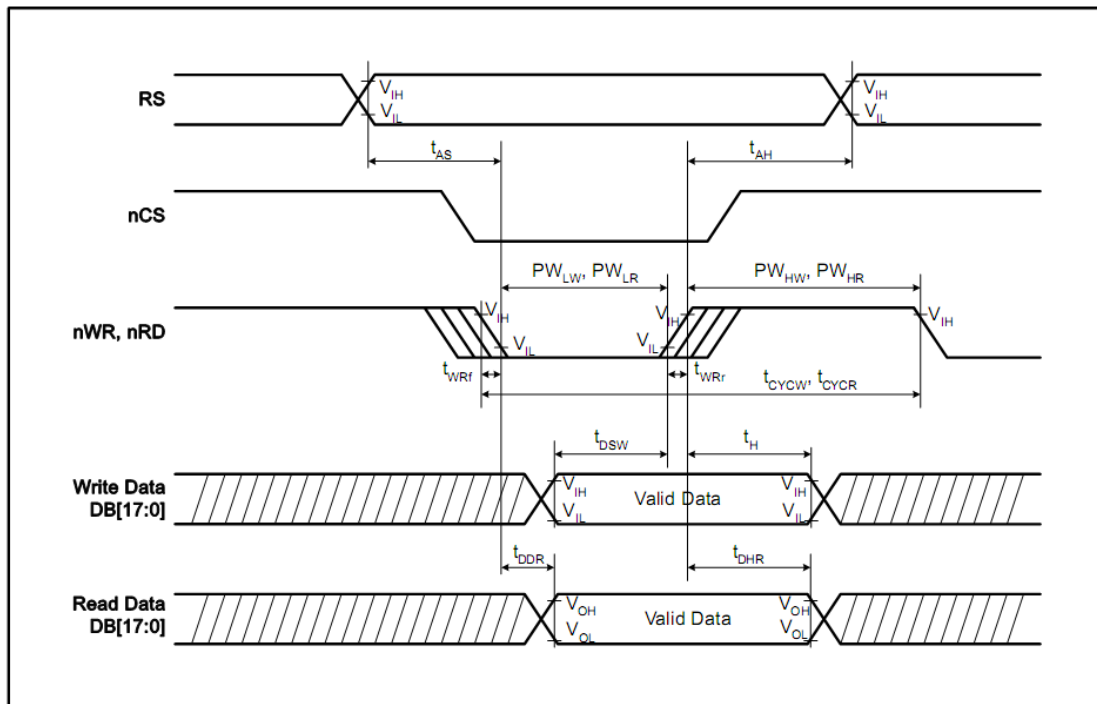**(VCC = VCI=2.40 ~ 3.0V, IOVCC = 1.65 ~ 3.30V, Ta= -40 ~ 85 °C)**

Item	Symbol	Unit	Test Condition	Min.	Typ.	Max.	Note
Input high voltage	V_{IH}	V	IOVCC= 1.8 ~ 3.3V	0.8*IOVCC	-	IOVCC	-
Input low voltage	V_{IL}	V	IOVCC= 1.8 ~ 3.3V	-0.3	-	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	-	-	0.2*IOVCC	-
I/O leakage current	I_{LI}	µA	Vin = 0 ~ VCC	-0.1	-	0.1	-
Current consumption during normal operation (V_{CC} – GND)	I_{OP}	µA	VCC=2.8V , Ta=25°C , fOSC = 512KHz (Line) GRAM data = 0000h	-	100 (VCC)	-	-
Current consumption during standby mode (V_{CC} – GND)	I_{ST}	µA	VCI=2.8V , Ta=25 °C	-	30	50	-
LCD Drive Power Supply Current (DDVDH-GND)	ILCD	mA	VCI=2.8V , VREG1OUT =4.8V DDVDH=5.2V , Frame Rate: 70Hz, line-inversion, Ta=25 °C, GRAM data = 0000h,	-	5.0	-	-
LCD Driving Voltage (DDVDH-GND)	DDVDH	V	-	4.5	-	6	-
Dispersion of the Average Output Voltage	V	mV	-	-10	-	10	-

6.5 AC Characteristics

Normal Write Mode (IOVCC = 1.65~3.3V)

Item		Symbol	Unit	Min.	Typ.	Max.	Test Condition
Bus cycle time	Write	t_{CYCW}	ns	100	-	-	-
	Read	t_{CYCR}	ns	300	-	-	-
Write low-level pulse width		PW_{LW}	ns	50	-	500	-
Write high-level pulse width		PW_{HW}	ns	50	-	-	-
Read low-level pulse width		PW_{LR}	ns	150	-	-	-
Read high-level pulse width		PW_{HR}	ns	150	-	-	

Item		Symbol	Unit	Min.	Typ.	Max.	
Write / Read rise / fall time		t_{WRr}/t_{WRf}	ns	-	-	25	
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	-	-	

6.6 Reset Timing Characteristics

Reset Timing Characteristics (IOVCC = 1.65 ~ 3.3 V)

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low-level width	t_{RES}	ms	1	-	-
Reset rise time	t_{rRES}	µs	-	-	10
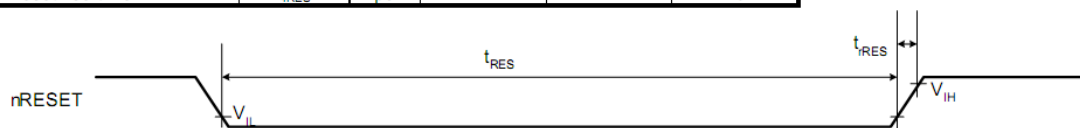
7 Optical Specification

Ta=25℃, Vcc=Vci=2.8V, I_B=80mA

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Brightness		B	θ=0° Normal viewing angle At the center of panel Backlight On Equipment: BM7 Field=2 °	120	170	--	cd/m^2	Note 1 With out TP
Contrast Ratio		CR		150	200	--	--	Note 2
Response Time	Rising : T_r		--	25	40	ms	Note 3
	Falling : T_f							
Color Chromaticity (CIE 1931)	White	X		0.273	0.320	0.330	--	
		Y		0.304	0.343	0.363		
	Red	X		0.584	0.604	0.624		
		Y		0.305	0.325	0.345		
	Green	X		0.279	0.299	0.329		
		Y		0.587	0.600	0.612		
	Blue	X		0.115	0.135	0.155		
		Y		0.060	0.063	0.075		
Viewing Angle	Top	$θ_U$	CR≧10 Backlight On Equipment: BM7 Field=2 °	45	--	--	Degrees	Note 4
	Bottom	$θ_D$		15	--	--		
	Left	$θ_L$		40		--		
	Right	$θ_R$		40	--	--		
Uniformity		Un	θ=0° Normal viewing angle Backlight On Equipment: BM7 Field=2 °	70	80	--	%	Note 5

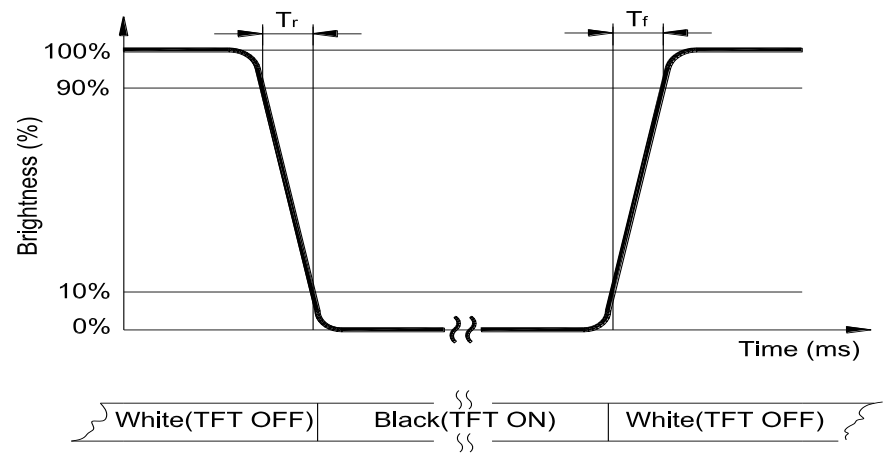Note 1: The brightness test equipment setup

I_B=60mA, Field=2° (As measuring "black" image, field=2° is the best testing condition.)

50 cm

BM-7

Field = 2°

The center of the screen

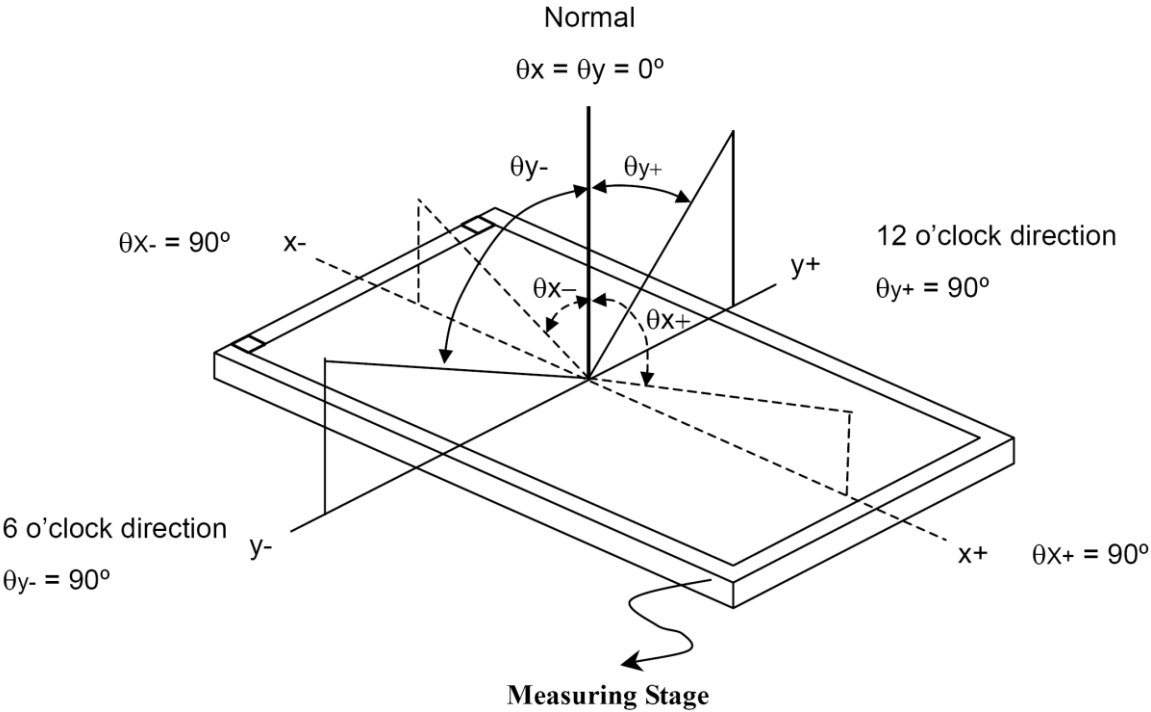TFT-LCD Panel
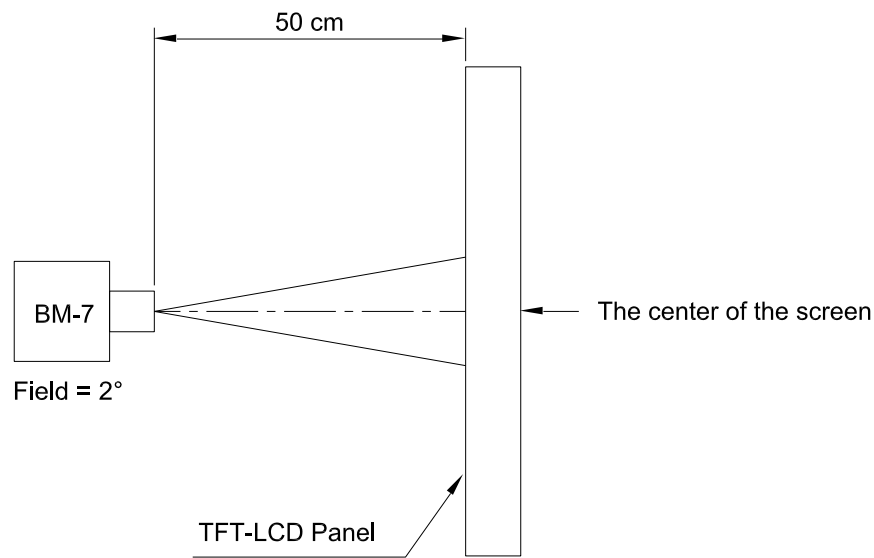
Note 2: Definition of contrast ratio (**C.R**)

$$C.R = \frac{\text{Brightness When LCD is at "White" State}}{\text{Brightness When LCD is at "Black" State}}$$
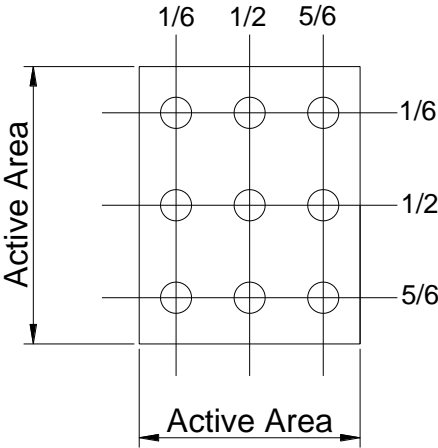
Note 3: Definition of response time

T_r T_f

100%
90%

Brightness (%)

10%
0%

Time (ms)

White(TFT OFF) Black(TFT ON) White(TFT OFF)

Note 4: Definition of viewing angle

Normal

$\theta x = \theta y = 0°$

$\theta y-$　$\theta y+$

$\theta X- = 90°$　x-

12 o'clock direction

y+

$\theta x-$　$\theta x+$

$\theta y+ = 90°$

6 o'clock direction　y-

x+　$\theta X+ = 90°$

$\theta y- = 90°$

Measuring Stage

Note 5: Definition of uniformity (**Un**)

1/6　1/2　5/6

Active Area

1/6

1/2

5/6

Active Area

$$Un = \frac{Bmin}{Bmax} \times 100\%$$

8   Environment Absolute Maximum Ratings

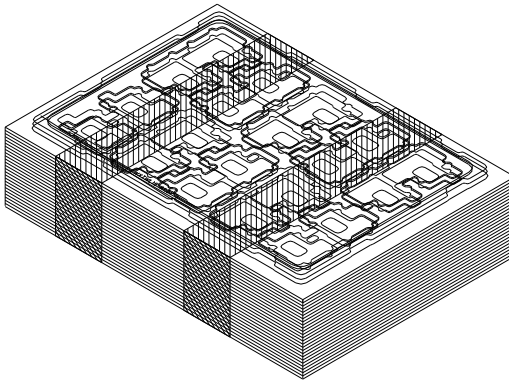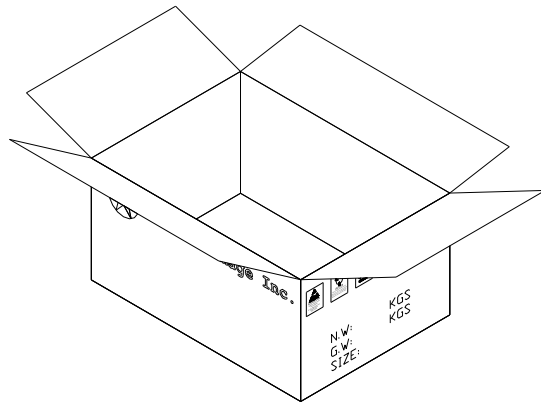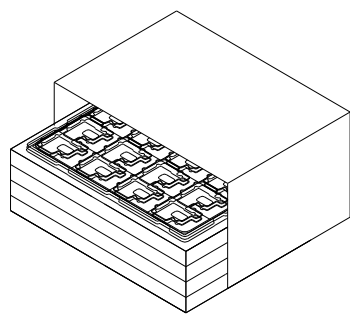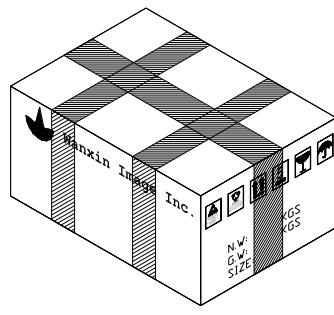| Item	Symbol	Min	Max	Unit	Remark
Operation temperature range	Top	-20	70	℃	Ambient
Storage temperature range	Tst	-30	80	℃	Ambient
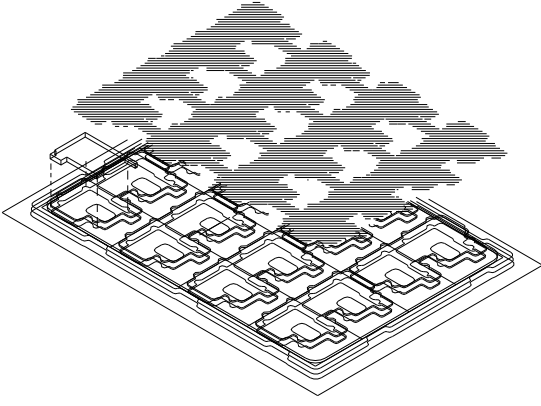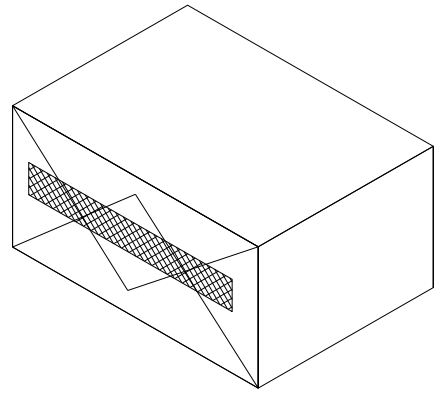
- Corrosive gas environment is not acceptable.

- TFT-LCD color will change slightly depending on environment temperature. This phenomenon is reversible. Current reduction rate of LED backlight is according to the graph indicated below:

9   Reliability Test Items

Item	Test Condition		Criterion
High Temperature Storage	80 ℃, 240 hrs		There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.
Low Temperature Storage	-30 ℃, 240 hrs		
High Temp. & High Humidity Storage	60 ℃, 90％ RH, 240 hrs		
Vibration Test (Non-operating)	Freq.:10~55~10 Hz, Amp.:1.5mm 1 hr for each direction of X, Y, Z		
Electrostatic Discharge Test (Non-operating)	Terminals	150 pF, 0 Ω, ±300 V, Contact	
	Panel	150 pF, 330 Ω, ±8 KV, Air	
Thermal Shock (Static)	-30℃, 30 min /80℃, 30 min, 20 cycles		
High Temperature Operation	70 ℃, 240 hrs		
Low temperature Operation	-20 ℃, 240 hrs		
High Temperature & High Humidity (Operating)	50 ℃, 90％ RH, 240 hrs		
FPC Peeling Strength Test	Pull speed: 50 mm/min, +90 °;		> 400gf/cm

10 Package

1	4
16 pcs per tray + 1 cover (EPE)	Packing bag
2	5
25 trays + 1 dummy tray = 400 ps	Putting bag into carton Protected by 6 pieces of cushion EPE sheet
3	6
Putting trays into anti-electrostatic bag	Packing carton with sealing tape Carton outline size: 417×310×262 (mm)

11 Precautions

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

11.1 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.

11.2 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 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.

11.3 Operation

(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.

11.4 Touch 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.

(d) Mounting example:
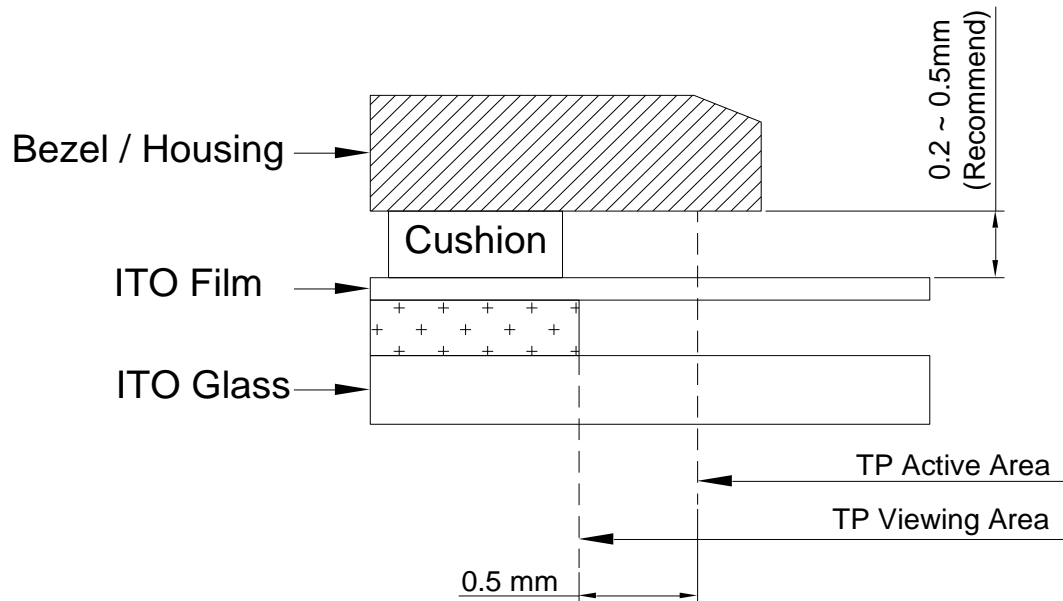
The corner part has conductivity. Do not touch any metal part after mounting.

11.5 Others

a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.

b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.

c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.

12 Records of Version

Version	Revise Date	Page	Content
A	2014-04-18	All	New released