Specifications

TFT-LCD module

Model No：QD14414B

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

	Signature	Date
Prepared by		
Checked by		
Approved by		

Contents

1. Document revision history :

DOCUMENT REVISION	DATE	DESCRIPTION	PREPARED BY	APPROVED BY
A	2017-01-06	First Release.		

2.General Description

FRD14414B 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 1.44 inch and the resolution is 128×128. High image quality a-Si TFT LCD module. Partial-screen display function is available. Sleep and Stand-by modes are available for power saving.

2.1 Features

No	Item	Specification	Remark
1	Display Mode	Normally White	
2	Screen Size	1.44inch (diagonal)	
3	Resolution	128×RGB×128	
4	Color Number	65K	
5	Color Arrangement	TFT Active matrix	
6	Driver IC	ST7735S	
7	Back Light	White LED*1	
8	Viewing Direction	6’ clock	
9	Interface	4SPI	
10	Surface Treatment		
11	touch panel		

2.2 Application

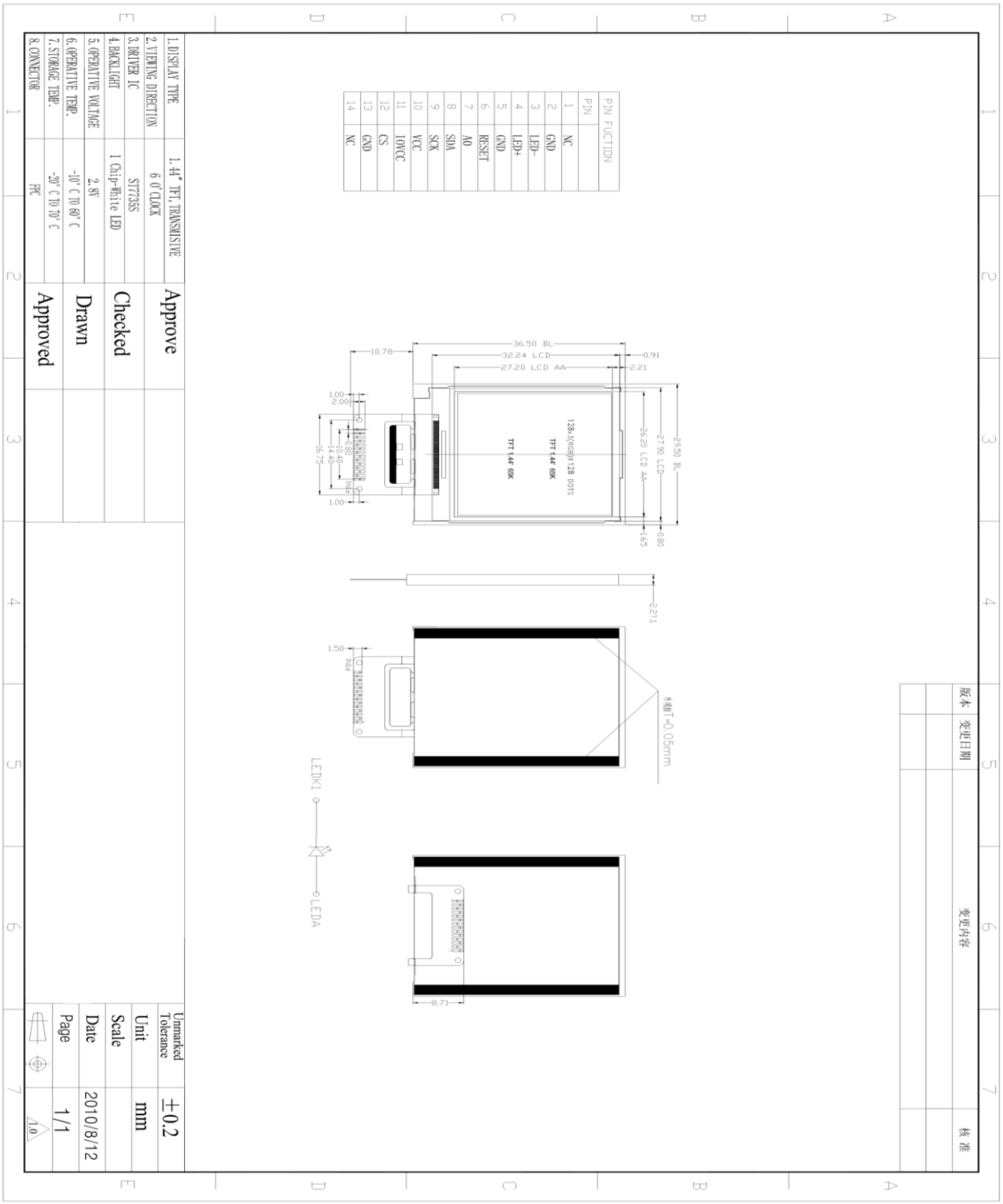
- Mobile phone.
- Portable multimedia device.

3.Outline Dimension

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

Parameter	Specifications	Unit
Outline dimensions	29.5(W) ×36.5(H) × 2.2(D) (LCM, not include FPC)	mm
Active area	26.2(W) ×27.2(H)	mm
Resolution	128(H)RGB× 128(V) dots	-
Dot size	0.1992(H) x 0.207(V)	mm

Figure 1: Module specification of the module



4.TFT-LCM Interface Specification

Pin No	Symbol	Description	Note
1	NC	NC	
2	GND	System Ground	
3	LEDK	Power supply Cathode input for backlight	
4	LEDA	Power supply Anode input for backlight	
5	GND	System Ground	
6	/RESET	Reset signal input Pin	
7	A0	data/ command selection	
8	SDA	Serial input Data BUS	
9	SCL	Serial clock input	
10	VCC	Power supply input for LCM: 2.8V	
11	IOVCC	Power Supply for I/O system:1.8V	
12	CS	Chip select input pin.	
13	GND	System Ground	
14	NC	NC	
15			
16			
17			
18			

5. Absolute Maximum Ratings

5.1 Electrical Maximum Ratings – for IC Only

Table 3: Electrical Maximum Ratings – for IC

Parameter	Symbol	Min.	Max.	Unit	Note
Power supply voltage (VCI)	VCI	-0.3	+4.0	V	1
Power supply voltage (IOVCC)	IOVCC	-0.3	+3.6	V	1

Note:

1.IOVCC,VCI, GND must be maintained.

2.The modules may be destroyed if they are used beyond the absolute maximum ratings.

5.2 Environmental Condition

Table 4

Item	Operating temperature (Topr)		Storage temperature (Tstg) (Note 1)		Remark
	Min.	Max.	Min.	Max.	
Ambient temperature	-10℃	+60℃	-20℃	+70℃	Dry
Humidity (Note 1)	80% max. RH for Ta 40℃< 50% RH for 40℃ < Ta Maximum operating temperature				No condensation

Note 1: Product cannot sustain at extreme storage conditions for long time.

6. Electrical Specifications

Typical Electrical Characteristics

At Ta = 25 ℃, VCI = 2.6V to 3.3V, IOVCC= 1.65V to 3.3V GND=0V.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (analog)	VCI-GND		2.6	2.8	3.3	V
Supply voltage (logic)	IOVDD-GND		1.65	1.8	3.3	V
Supply current (Logic & LCD)	ICC	VCI=2.8V	-	-	10	mA
Supply voltage of white LED backlight	VLED =$V_{(BL+)}$-$V_{(BL-)}$	Forward current =20 mA Number of LED dies = 1	2.8	3.2	3.6	V
Luminance (on the module surface)			80	100	110	cd/m^2

7.Timing Characteristics

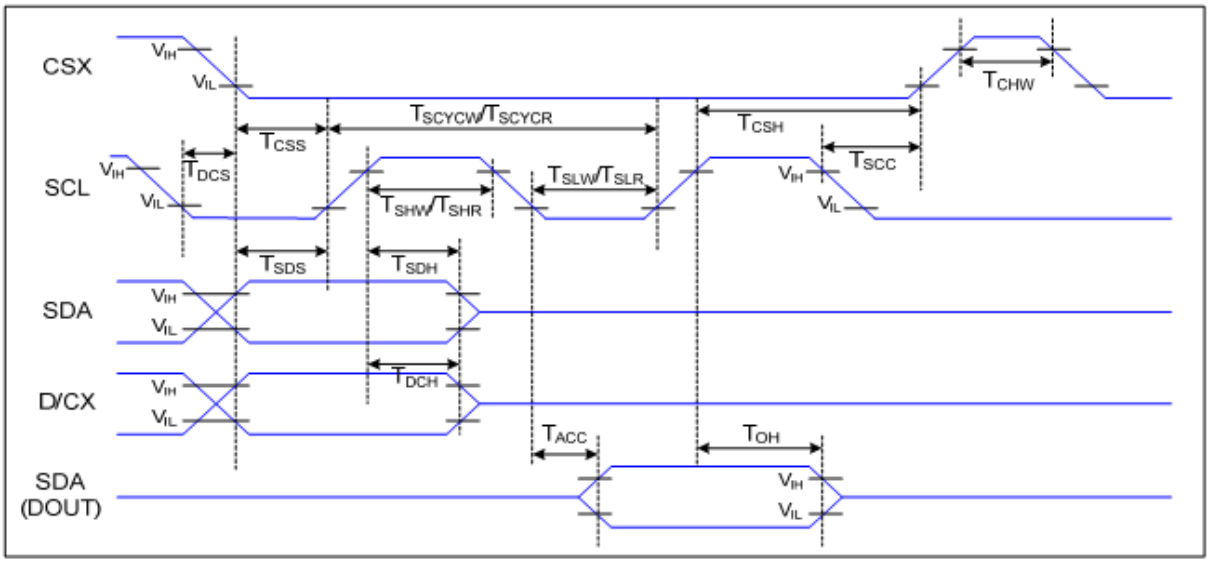


Figure 7 4-line Serial Interface Timing

Ta=25 ℃, VDDI=1.65~3.7V, VDD=2.5~4.8V

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	TCSS	Chip Select Setup Time (Write)	45		ns	
	TCSH	Chip Select Hold Time (Write)	45		ns	
	TCSS	Chip Select Setup Time (Read)	60		ns	
	TSCC	Chip Select Hold Time (Read)	65		ns	
	TCHW	Chip Select “H” Pulse Width	40		ns	
SCL	TSCYCW	Serial Clock Cycle (Write)	66		ns	-Write Command & Data Ram
	TSHW	SCL “H” Pulse Width (Write)	15		ns	
	TSLW	SCL “L” Pulse Width (Write)	15		ns	
	TSCYCR	Serial Clock Cycle (Read)	150		ns	-Read Command & Data Ram
	TSHR	SCL “H” Pulse Width (Read)	60		ns	
	TSLR	SCL “L” Pulse Width (Read)	60		ns	
D/CX	TDCS	D/CX Setup Time	10		ns	
	TDCH	D/CX Hold Time	10		ns	
SDA (DIN) (DOUT)	TSDS	Data Setup Time	10		ns	For Maximum CL=30pF For Minimum CL=8pF
	TSDH	Data Hold Time	10		ns	
	TACC	Access Time	10	50	ns	
	TOH	Output Disable Time	15	50	ns	

8.Power Supply Configuration

11.1 Driver IC Operating Voltage Specification

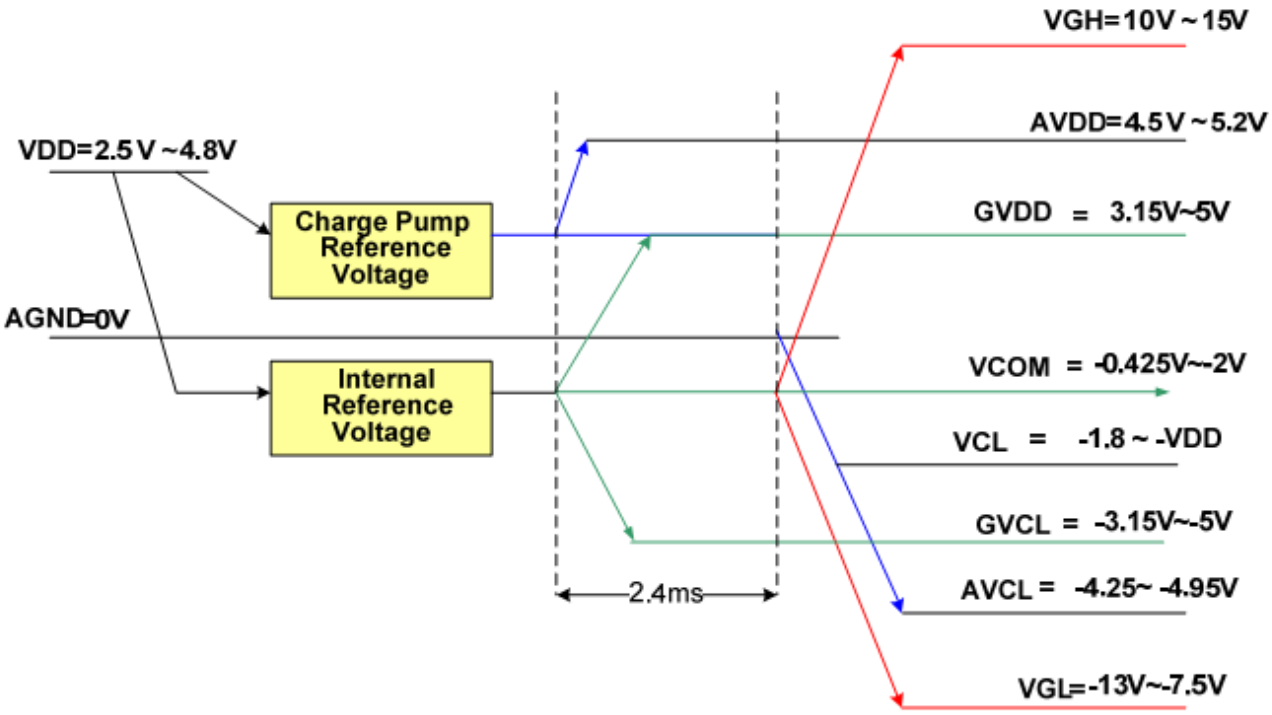


Fig 15 Power Booster Level

Note:

Sleep out flow: AVDD, GVDD, GVCL, VCOM switch on -> 2.4ms -> AVCL, VGH, VGL, VCL switch on -> 78.6ms

scan 2 blank frames

Sleep in flow: Scan 2 blank frames -> All analog power

9.Optical Specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (without Polarizer)		T(%)	–	–	17.5	–	–	
Contrast Ratio		CR	Θ=0 Normal viewing angle	400	500	–	–	(1)(2) Measuring with EWV Polarizer，Reference Only
Response time	Rising	T_R	–	–	4	8	msec	(1)(3)
	Falling	T_F		–	12	24		
Color gamut		S(%)			53		%	
Color chromaticity (CIE1931)	White	W_x		0.273	0.293	0.313		(1)(4) CF glass
		Wy		0.305	0.325	0.345		
	Red	Rx		0.616	0.636	0.656		
		Ry		0.308	0.328	0.348		
	Green	Gx		0.263	0.283	0.303		
		Gy		0.511	0.531	0.551		
	Blue	Bx		0.115	0.135	0.155		
		By		0.114	0.134	0.154		
Viewing angle	Hor.	Θ_L	CR>10	60	70	–		Measuring with EWV Polarizer，Reference Only
		Θ_R		60	70	–		
	Ver.	Θ_U		60	70	–		
		Θ_D		50	60	–		

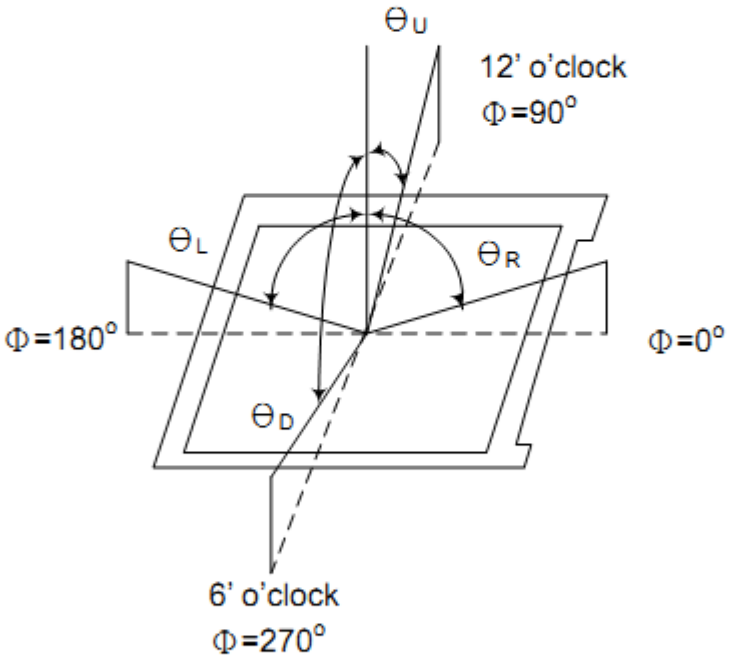
4.2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : 25±2°C
- 15min. warm-up time.

4.3 Measuring Equipment

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

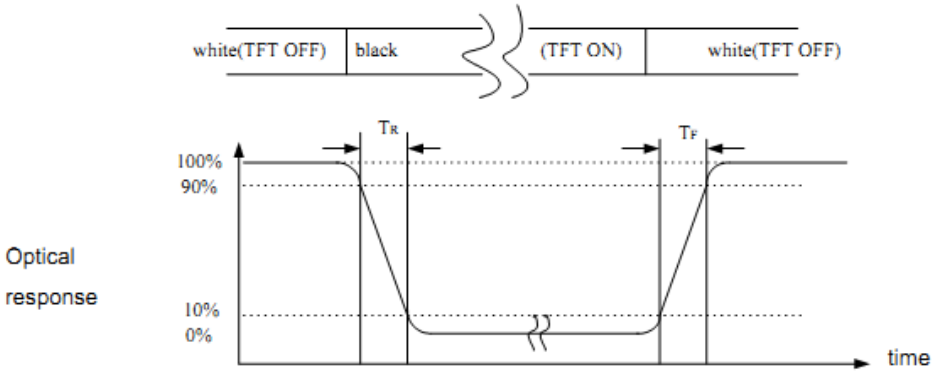
Note (1) Definition of Viewing Angle :



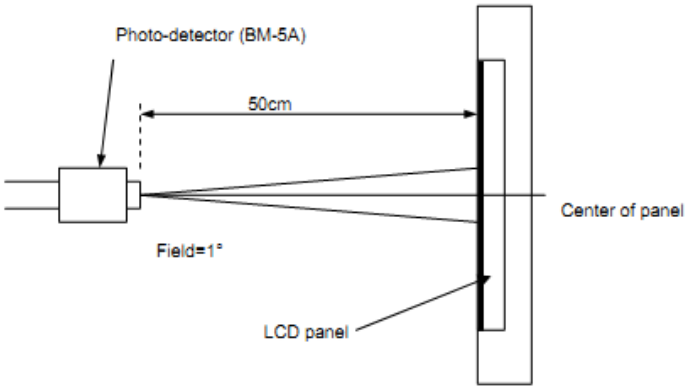
Note (2) Definition of Contrast Ratio(CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

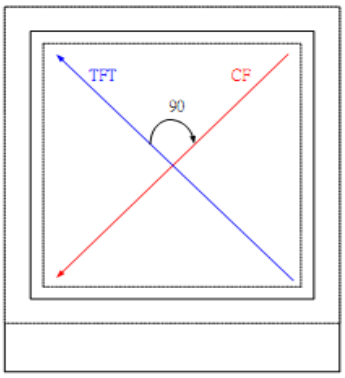
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Rubbing Direction (The different Rubbing Direction will cause the different view direction.

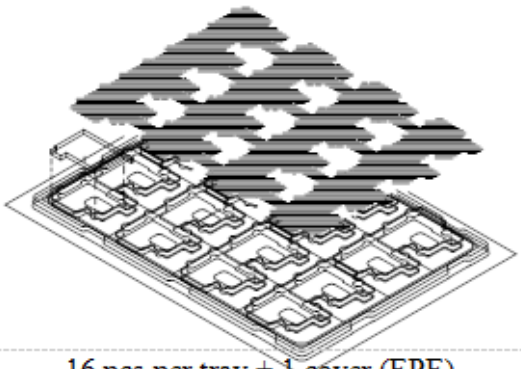
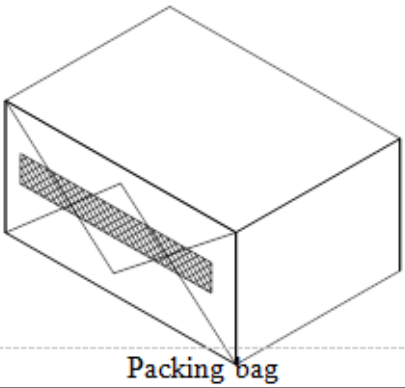
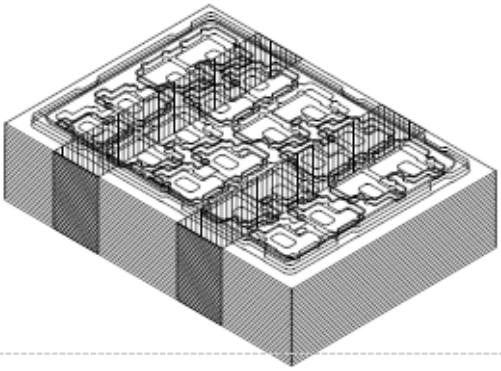
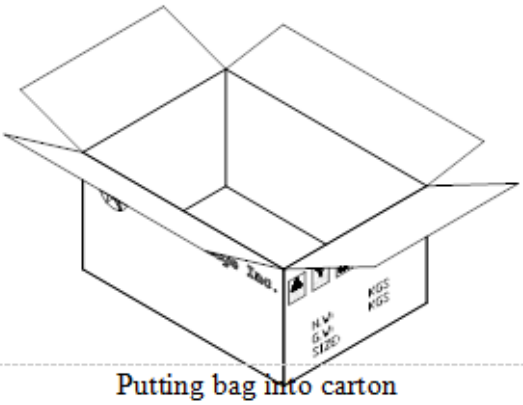
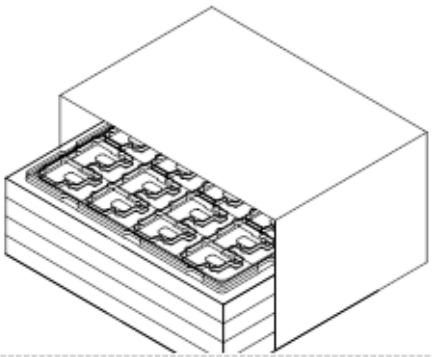
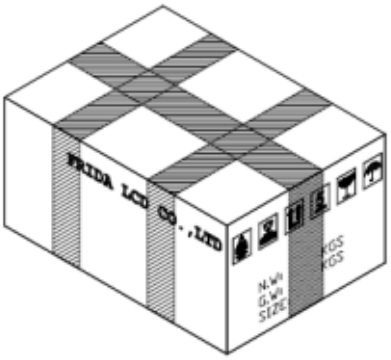


TFT Face up

10.Reliability Test Items

Item	Test Condition		Criterion
High Temperature Storage	20 ℃, 120 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	-70 ℃, 120 hrs		
High Temp. & High Humidity Storage	60 ℃, 90% RH, 120 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	60 ℃, 120 hrs		
Low temperature Operation	-10 ℃, 120 hrs		
High Temperature & High Humidity (Operating)	50 ℃, 90% RH, 120 hrs		
FPC Peeling Strength Test	Pull speed: 50 mm/min, +90 °,		> 400gf/cm

11. Package

1  16 pcs per tray + 1 cover (EPE)	4  Packing bag
2  25 trays + 1 dummy tray = 400 ps	5  Putting bag into carton Protected by 6 pieces of cushion EPE sheet
3  Putting trays into anti-electrostatic bag	6 

12.Precautions

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

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.

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.

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.

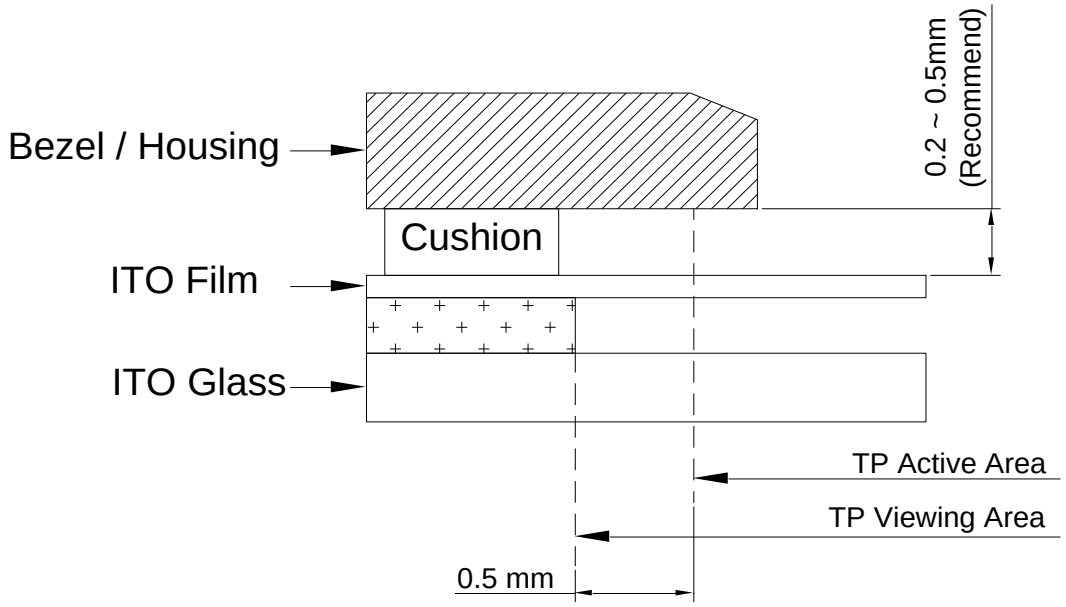
Touch Panel Mounting Notes

(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.

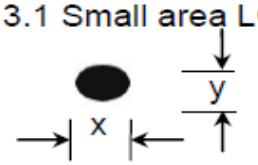
Others

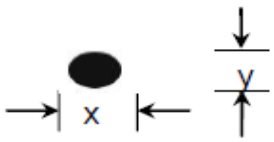
a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.

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

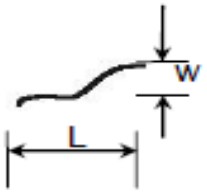
c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.

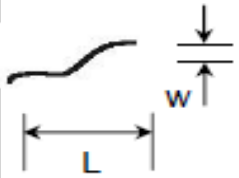
13. Inspection standard

<table>
<tr><th>No</th><th>Item</th><th>Criterion</th><th></th></tr>
<tr><td>01</td><td>Outline Dimension</td><td>In accord with drawing</td><td></td></tr>
<tr><td>02</td><td>Position-finding Dimension Assemble Dimension</td><td>In accord with drawing</td><td></td></tr>
<tr><td rowspan="2">03</td><td rowspan="2">LCD black spots, white spots (Round type)</td><td>Round type: non display
3.1 Small area LCD
Unit : mm
 

<table><tr><th>Dimension</th><th>Qualified Quantity</th></tr><tr><td>D≤0.1</td><td>Ignore</td></tr><tr><td>0.1＜D≤0.15</td><td>2</td></tr><tr><td>D＞0.15</td><td>0</td></tr></table></td><td></td></tr>
<tr><td>3.2Large area LCD
 

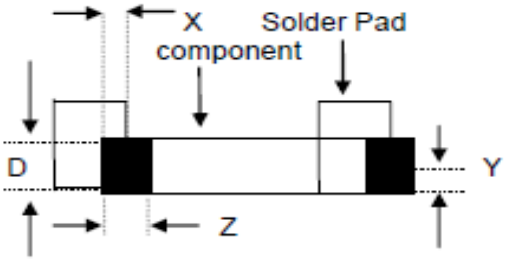
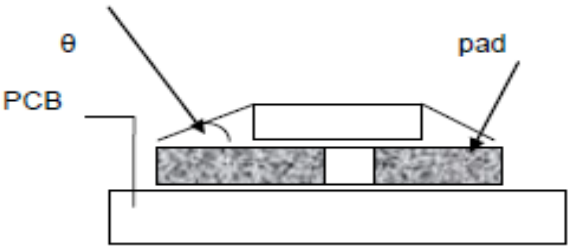
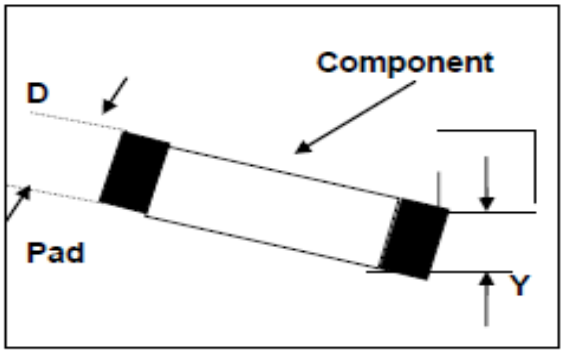
<table><tr><th>Dimension</th><th>Qualified Quantity</th></tr><tr><td>D≤0.1</td><td>Ignore</td></tr><tr><td>0.1＜D≤0.15</td><td>2</td></tr><tr><td>0.15＜D≤0.20</td><td>1</td></tr><tr><td>D＞0.20</td><td>0</td></tr></table>C-STN : if D＞0.1 , unqualified</td><td></td></tr>
</table>

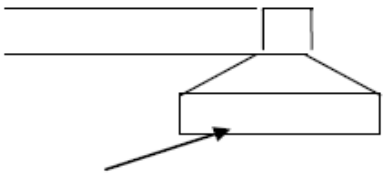
<table>
<tr>
<td>04</td>
<td>LCD black spots, white spots (Line Style)</td>
<td colspan="2">
4.1 Small area LCD
Unit : mm


<table>
<tr><th>Length</th><th>Width</th><th>Qualified Quantity</th></tr>
<tr><td>-</td><td>≤0.015</td><td>Ignore</td></tr>
<tr><td>≤1.0</td><td rowspan="2">0.015<W≤ 0.025</td><td>2</td></tr>
<tr><td>≤2.0</td><td>1</td></tr>
<tr><td>≤1.0</td><td>0.025<W≤ 0.05</td><td>1</td></tr>
<tr><td>-</td><td>D>0.05</td><td>According to circle</td></tr>
</table>
4.2Large area LCD


<table>
<tr><th>Length</th><th>Width</th><th>Qualified Quantity</th></tr>
<tr><td>-</td><td>≤0.015</td><td>Ignore</td></tr>
<tr><td>≤2.0</td><td>0.015<W≤ 0.025</td><td>2</td></tr>
<tr><td>≤1.0</td><td>0.025<W≤ 0.05</td><td>1</td></tr>
<tr><td>-</td><td>D>0.05</td><td>According to circle</td></tr>
</table>
CSTN : If W ⩾ 0.015 , unqualified
Ignore beyond viewing area
</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>LCD Scratch 、Threadlike Fiber</td>
<td colspan="2">Same to NO.3 circle
sightline and surface of LCD is vertical
(2)Same to NO.3 line style</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>POL</td>
<td colspan="2">It is not admissible that POL is beyond the edge of glass, else, unqualified.
It is essential that POL is over the 50 percent of width of frame , else ,unqualified.
According to the drawing in case of special definition.</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>IC/FPC Bonding</td>
<td>Scratch</td>
<td>Reject</td>
<td></td>
</tr>
</table>

		Intensity Of Adhesion	If lower than specification, reject	
		Gold Fold Twist	Reject	
07	IC/FPC Bonding	Silicon	According to outline, no gold outside, seal can not be higher than LCD	
		FPC Gold Sever	Reject	
08	SMT	Lack of Component、Polarity Inverse	If exist, reject	
		Leak Solder、Virtual Solder	If exist, reject	
		Short Circuit In Solder Point	If exist, reject	
		Tin Ball	If exist, reject	
		Tin Acumination	If visual, reject	
		Height Solder Point	If higher 0.5mm than component. reject	
		Height of component	Either side higher 0.5mm than component, reject	

		Component Shift	 X<3/4Z reject y＞1/3D reject	
08	SMT	Few Tin	 If θ≤20° reject	
		Component Deflection	 If Y＞1/3D reject	
		Component Carcass Sideways	Reject	

		Component Carcass Sideways	If exist with visual inspection , reject	
		Lot Tin	A: Tin accrete the solder side completely , hollowly ,Ok B: Tin accrete the solder side completely , full circle arc , ok C: Jointing include whole solder side, height of tin>50 percent of height of component, reject	
		Few Tin	A: Tin accrete the solder side completely , hollowly ,Ok B: height of tin > 1/3 of solder side of component , ok C: height of tin ≤ 1/3 of solder side of component, reject	
08	SMT	Normal  Jointing side		
09	Light	Short circuit 、 Open circuit	Forbid	
		Quality of CSTN Display	1、Rolling strake with visual inspection, forbid 2、Differentness of color in viewing area with visual inspection (full white、red、green、blue), forbid 3 、 Display change with visual inspection , forbid	