深圳市勋瑞光电科技有限公司
Xunrui photoelectric technology （shenzhen）CO,.LTD.

Specifications

TFT-LCD module

Model No：H020SQC45T2520

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
A0	2023-05-05	First Release.		

2.General Description

H020SQC45T2520 is a color active matrix TFT(Thin Film Transistor) LCD(liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, back-light unit. The resolution of a 2.0”TFT-LCD contains 176x220 pixels, and can display up to 65/262K colors.

2.1 Features

No	Item	Specification	Remark
1	Display Mode	Transmissive/Normally White	
2	Screen Size	2.0inch	
3	Resolution	176 × RGB × 220	
4	Color Number	65K/262K	
5	Color Arrangement	Tft Active Matrix	
6	Driver IC	ILI9225G	
7	Back Light	White Led*3	
8	Viewing Direction	12:00	
9	Interface	8/9/16/18Bit MCU;3/4SPI	
10	Surface Treatment	Uv Cut	
11	touch panel	Without TP	

2.2 Application

- Mobile phone.
- Portable multimedia device.

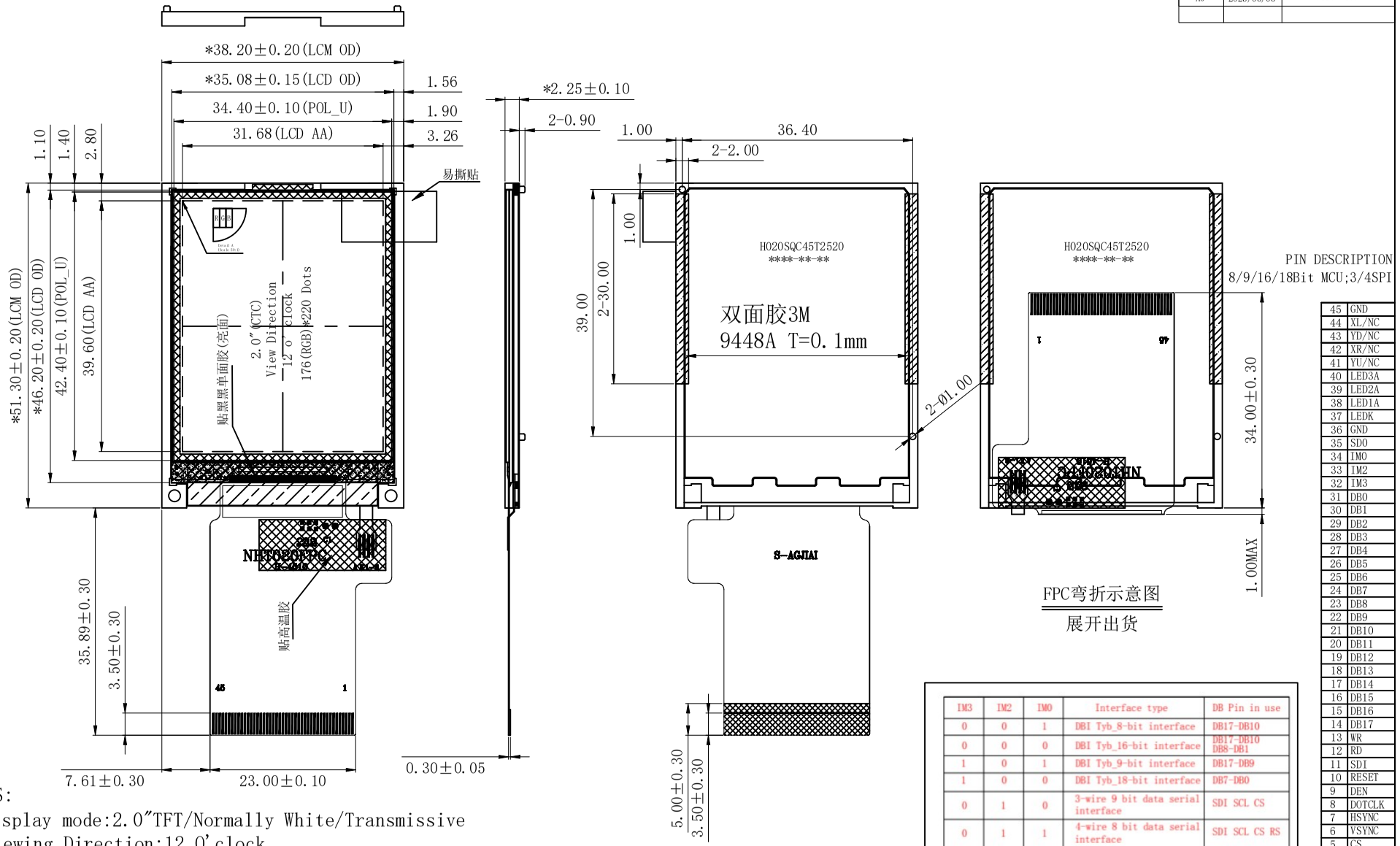
3.Outline Dimension

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

Parameter	Specifications	Unit
Outline dimensions	38.20(W) ×51.30(H) × 2.25(D) (LCM, not include FPC)	mm
Active area	31.68(W) ×39.60(H)	mm
Resolution	176(H)×RGB× 220(V) dots	
Dot size	0.180(H) × 0.180(V)	mm

Figure 1: Module specification of the module

REV.	DATE	MODIFICATION
A0	2023/05/05	First issue

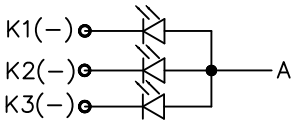


FPC弯折示意图

展开出货

NOTES:

1. Display mode:2.0"TFT/Normally White/Transmissive
2. Viewing Direction:12 O'clock
3. OPERATING TEMP: -20° C~+70° C
4. STORAGE TEMP: -30° c~+80° c
5. Backlight color:3 CHIP WHITE LED
6. RESOLUTION: 176xRGBx220
7. LCD IC:ILI9225G
8. "( )"reference dimension. "*"critical dimension
9 .RoHS Compliant
10. luminance:350cd/m2(MIN),400cd/m2(TYP)
11. Chromaticity(centre point): 0.30+/-0.03;0.30+/-0.03.



VF=3.1V(TYP),IF=60mA

IM3	IM2	IM0	Interface type	DB Pin in use
0	0	1	DBI Tyb_8-bit interface	DB17-DB10
0	0	0	DBI Tyb_16-bit interface	DB17-DB10 DB8-DB1
1	0	1	DBI Tyb_9-bit interface	DB17-DB9
1	0	0	DBI Tyb_18-bit interface	DB7-DB0
0	1	0	3-wire 9 bit data serial interface	SDI SCL CS
0	1	1	4-wire 8 bit data serial interface	SDI SCL CS RS

NOTE:
1. IF not use PIN, fix to the GND, IOVCC or NC
2. IF use RGB interface must select serial interface

PIN DESCRIPTION
8/9/16/18Bit MCU;3/4SPI

45	GND
44	XL/NC
43	YD/NC
42	XR/NC
41	YU/NC
40	LED3A
39	LED2A
38	LED1A
37	LEDK
36	GND
35	SDO
34	IM0
33	IM2
32	IM3
31	DB0
30	DB1
29	DB2
28	DB3
27	DB4
26	DB5
25	DB6
24	DB7
23	DB8
22	DB9
21	DB10
20	DB11
19	DB12
18	DB13
17	DB14
16	DB15
15	DB16
14	DB17
13	WR
12	RD
11	SDI
10	RESET
9	DEN
8	DOTCLK
7	HSYNC
6	VSYNC
5	CS
4	RS
3	VCCIO
2	VCC
1	GND

INTERFACE	MCU Interface	深圳市新通光电科技有限公司	
	FPC Connector	MODEL NAME: TFT Display Module	PART NO.: H020SQC45T2520
VIEWING DIRECTION	12 O'clock	DWN	REV.: A0 / SHEET OF: 1/1
		CHKD	TOLERANCE UNLESS SPECIFIED: ±0.2
Gray Scale DIRECTION	6 O'clock	PROJECTION: 3RD ANGLE	UNIT: mm / SCALE: 1:1

4.TFT-LCM Interface Specification

Pin No	Symbol	Description	Note
1	GND	System Ground	
2	VCC	Power supply for LCD	
3	VCCIO	Power supply for LCD	
4	RS	Date/Commond select signal	
5	CS	Chip Select PIN	
6	VSYNC	Frame Synchronizing Signal For RGB Interface Operation	
7	HSYNC	Line Synchronizing Signal For RGB Interface Operation	
8	DOTCLK	Dot clock signal for RGB interface operation	
9	DEN	Data input enable	
10	RESET	Reset Signal	
11	SDI	Serial communication data input	
12	RD	Read Signal And Read Data	
13	WR	Write signal	
14-31	DB17-DB0	Data Bus	
32	IM3	Interface Mode Select	
33	IM2	Interface Mode Select	
34	IM0	Interface Mode Select	
35	SD0	Register Select Signal	
36	GND	Chip Select PIN	
37	LEDK	Power Supply For LED Backlight Cathode Input	
38	LED1A	Power Supply For LED Backlight Anode Input	
39	LED2A	Power Supply For LED Backlight Anode Input	
40	LED3A	Power Supply For LED Backlight Anode Input	
41	YU/NC	Not Connect	
42	XR/NC	Not Connect	
43	YD/NC	Not Connect	
44	XL/NC	Not Connect	
45	GND	System Ground	

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 (VCC)	VCC	-0.3	+4.0	V	1
Power supply voltage (VCCIO)	VCCIO	-0.3	+3.6	V	1

Note:

1. VCCIO,VCC, 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	-20℃	+70℃	-30℃	+80℃	Dry
Humidity (Note 1)	≤80% RH				No condensation
	Maximum operating temperature				

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

6. Electrical Specifications

Typical Electrical Characteristics

At Ta = 25 ℃, VCC = 2.6V to 3.3V, VCCIO= 1.65V to 3.3V GND=0V.

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply voltage (analog)	VCC-GND		2.6	2.8	3.3	V
Supply voltage (logic)	VCCIO-GND		1.65	1.8	3.3	V
Supply current (Logic & LCD)	ICC	VCC=2.8V	-	-	10	mA
Supply voltage of white LED backlight	Vf	Forward current =20mA	2.9	3.2	3.6	V
	If	3White LED In Parallel	45	54	60	mA
Reverse Voltage	Vr	10uA	-	-	5	V
Luminance (on the module surface)		Number of LED dies = 3	220	-	-	cd/m^2
Life Time		If=60mA	50000	-	-	Hr

7.Timing 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	-	

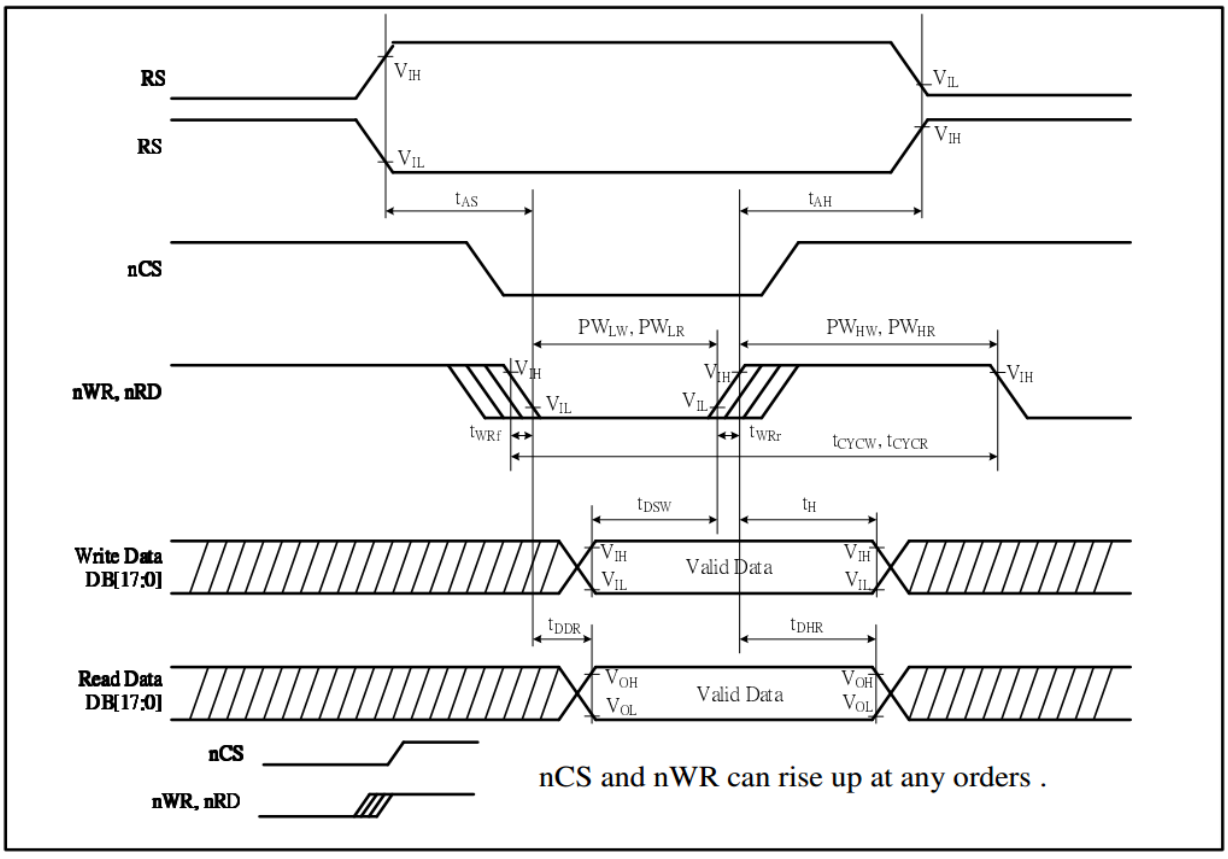
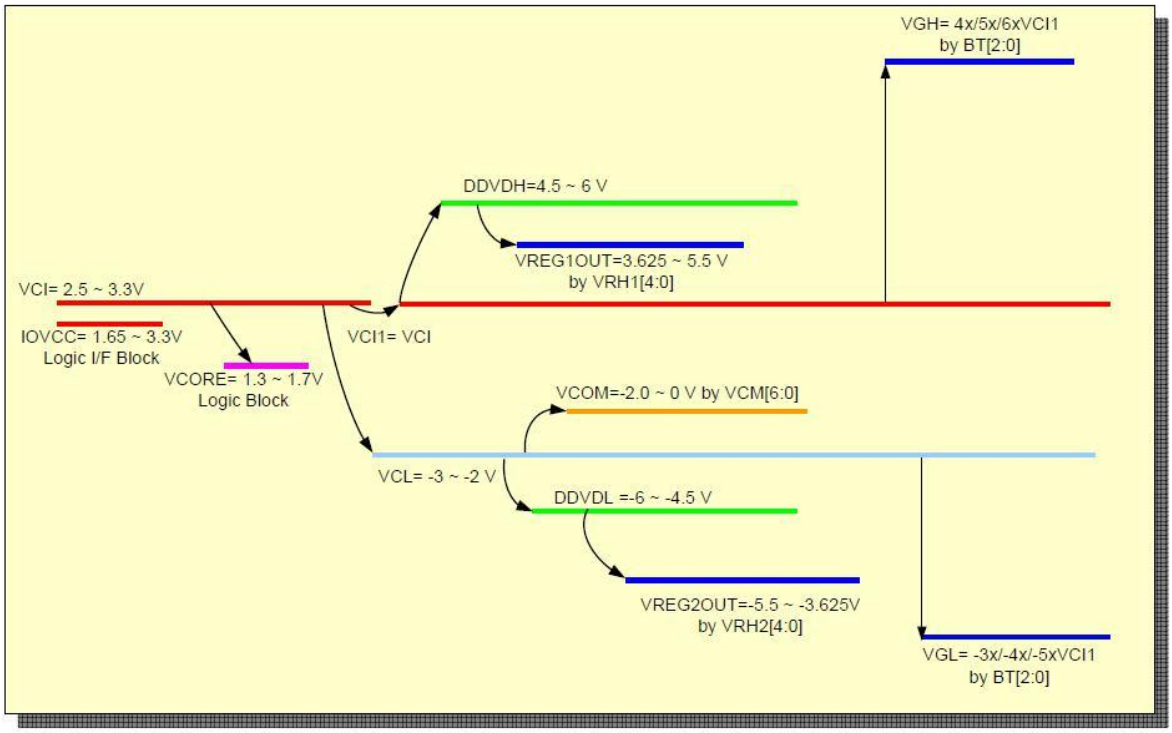


Figure45 i80-System Bus Timing

8.Power Supply Configuration



Note: The DDVDH, DDVDL, VREG1OUT, VREG2OUT, VCOM, VGH, VGL and VCL output voltage levels are lower than their theoretical levels (ideal voltage levels) due to the current consumption at respective outputs.

9.Optical Specification

Item		Symbol	Conditions	Specifications (typ)	Unit	Note
Transmittance		T%	Viewing normal angle $q_X = q_Y = 0°$	4.3	%	All left side data are based on INX's following condition – 1.CG : NTSC 69% 2.AR : 67.5% 3.Light Source : INX LED BLU 4.Machine : DMS 803 5. Vwhite > 5.0 V, Vdark < 0.3V 6. Polarizer : NPF-TEGQ1465DUHC
Contrast Ratio		CR		700	--	
Response Time		Ton+ Toff		30	ms	
Viewing Angle	Hor.	q_{X+}	Center CR>10	80	deg.	
		q_{X-}		80		
	Ver.	q_{Y+}		80		
		q_{Y-}		80		
CF only Chromaticity	Red	X_R	Viewing normal angle $q_X = q_Y = 0°$	0.660	--	Under C light Simulation
		Y_R		0.325	--	
	Green	X_G		0.277	--	
		Y_G		0.568	--	
	Blue	X_B		0.145	--	
		Y_B		0.072	--	
	White	X_W		0.309	--	
		Y_W		0.332	--	

*Note (1)Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

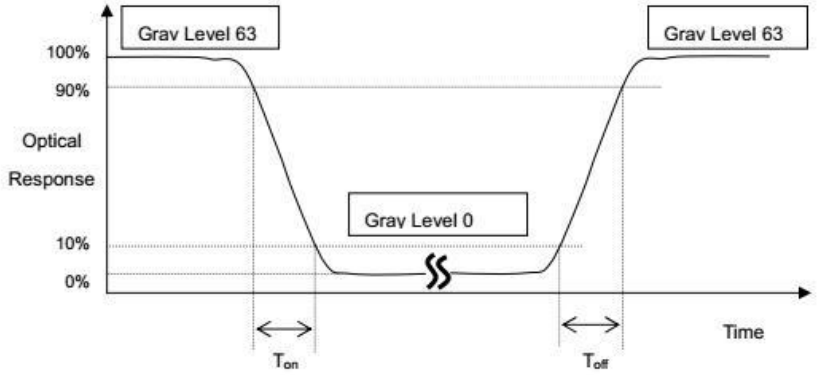
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

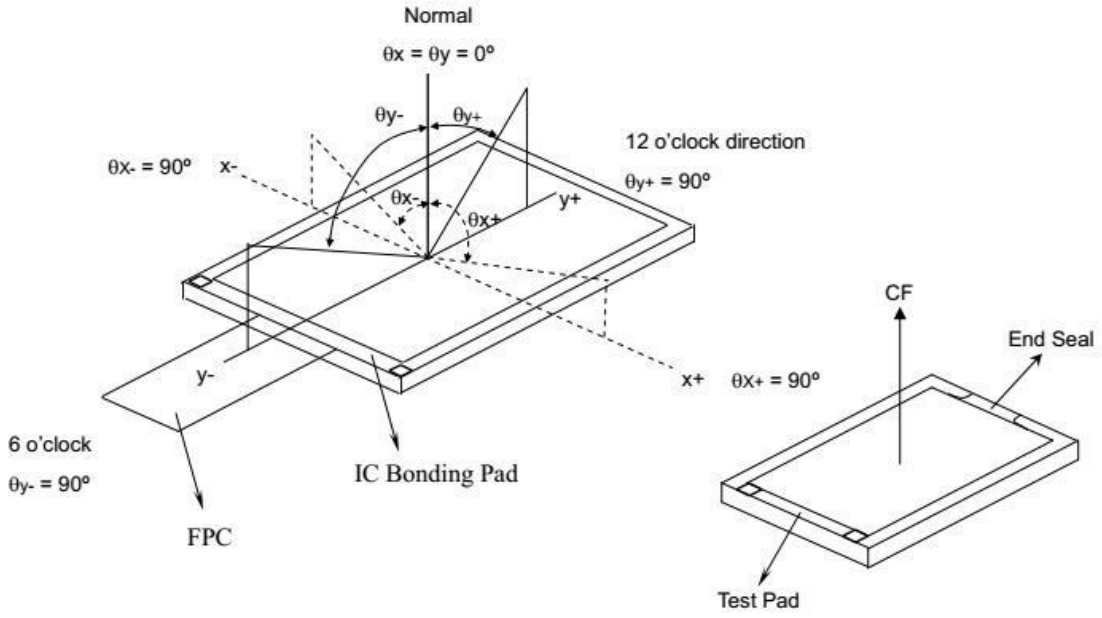
CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

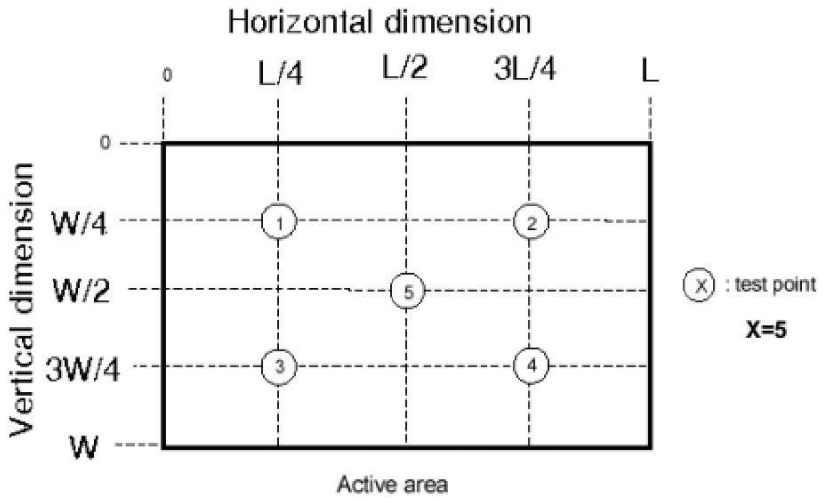
*Note (2) Definition of Response Time (T_{on}, T_{off}):



*Note(3) Definition of Viewing Angle

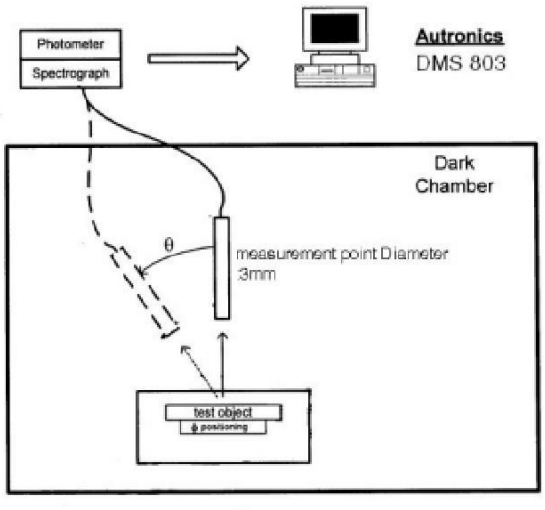


*Note (5)



*Note (4) Measurement Set-Up:

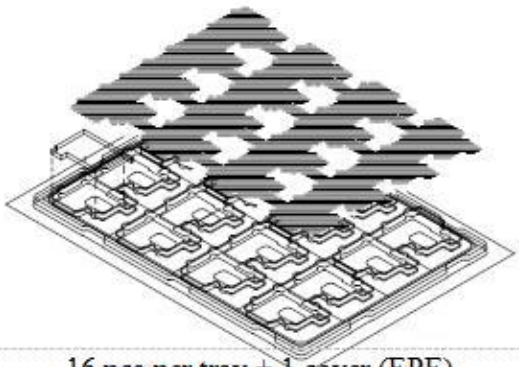
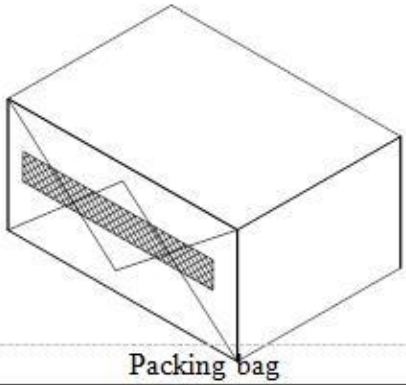
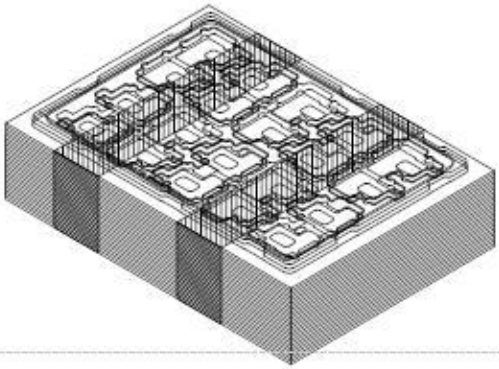
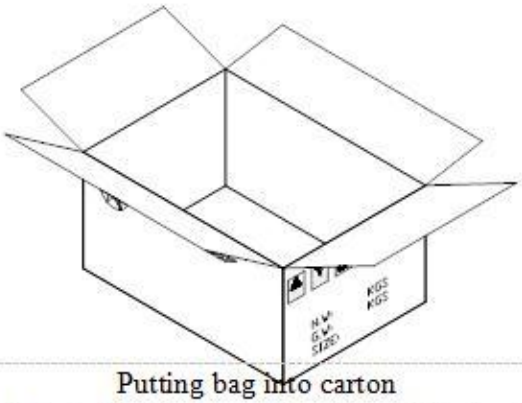
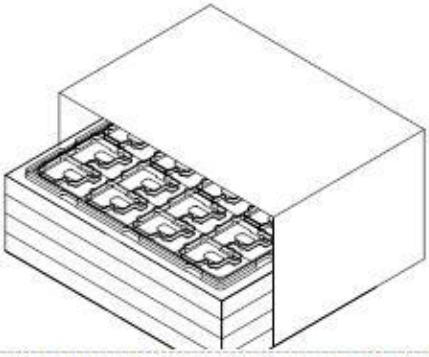
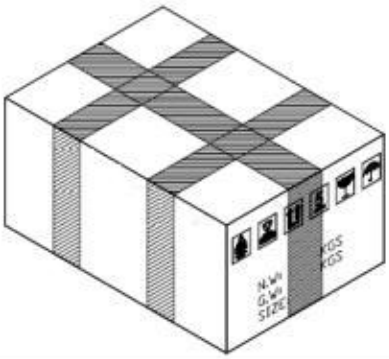
The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



10.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	50 ℃, 80％ 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 ℃, 80％ RH, 240 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.

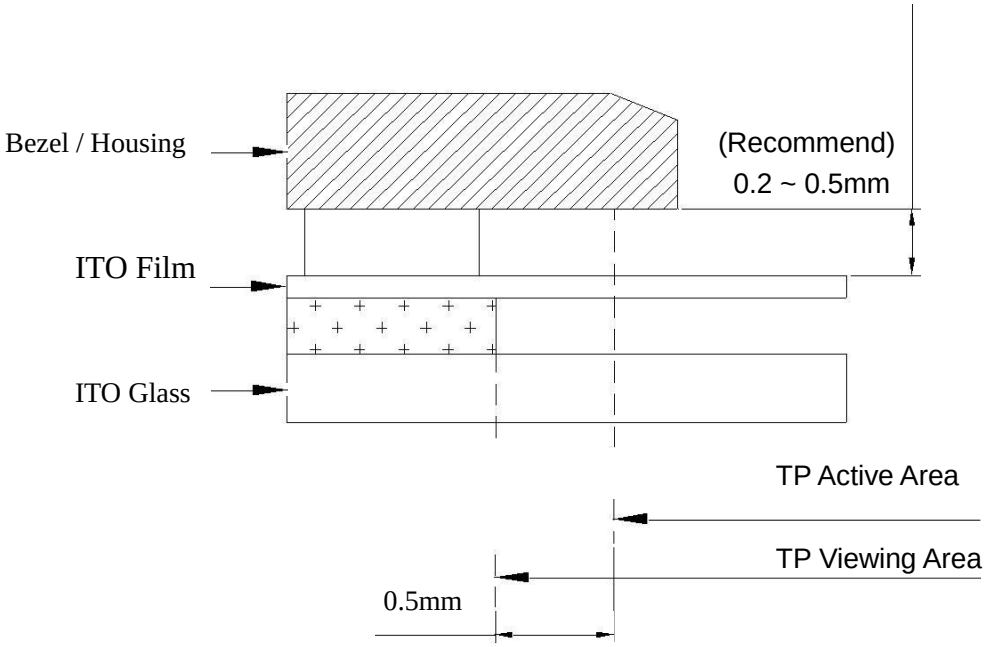
Touch Panel Mounting Notes

(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.

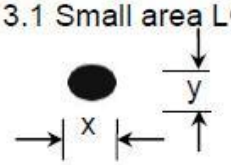
Others

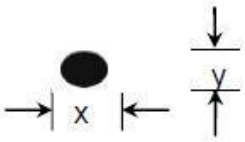
a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.

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

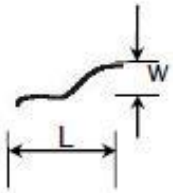
c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.

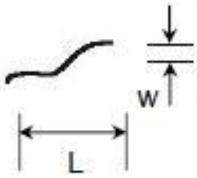
13. Inspection standard

<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
 

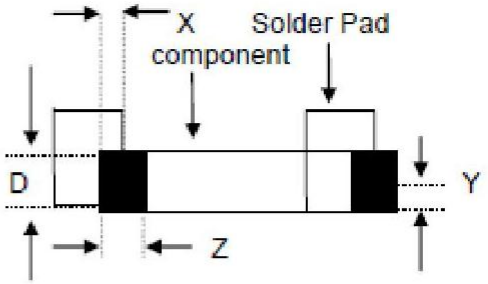
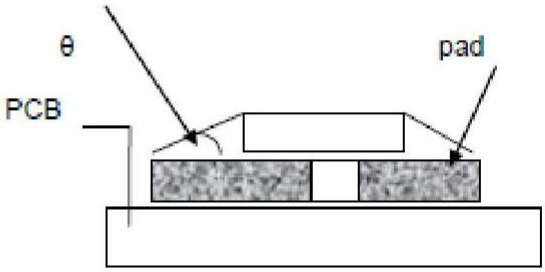
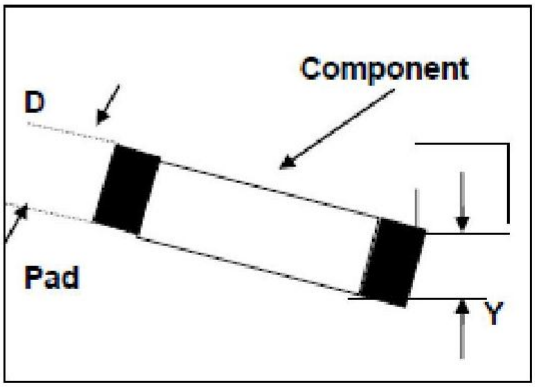
<table><tr><th>Dimension</th><th>Qualified Quantity</th></tr><tr><td>D≤0.1</td><td>Ignore</td></tr><tr><td>0.1＜D≤0.15</td><td>2</td></tr><tr><td>0.15＜D≤0.20</td><td>1</td></tr><tr><td>D＞0.20</td><td>0</td></tr></table>C-STN : if D＞0.1 , unqualified</td><td></td></tr>
</table>

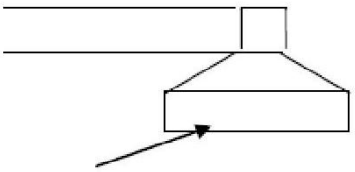
<table>
<tr>
<td rowspan="2">04</td>
<td rowspan="2">LCD black spots, white spots (Line Style)</td>
<td>
4.1 Small area LCD
Unit : mm


<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>
</td>
<td></td>
</tr>
<tr>
<td>
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	