TIANMA
Microelectronics Co.,LTD

SPECIFICATION FOR TFT LCD MODULE

MODEL NO:	**TM070RRNZ04**
CUSTOMER:	
CUSTOMER P/N.	
VERSION	**V1.0**
CUSTOMER APPROVED	

■**Preliminary Specification**

□**Final Specification**

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT

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REVISION RECORD

Date	Rev.No.	Page	Revision Items	Prepared
2009.10.08	**V1.0**		**The first release**	

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1.General Specifications

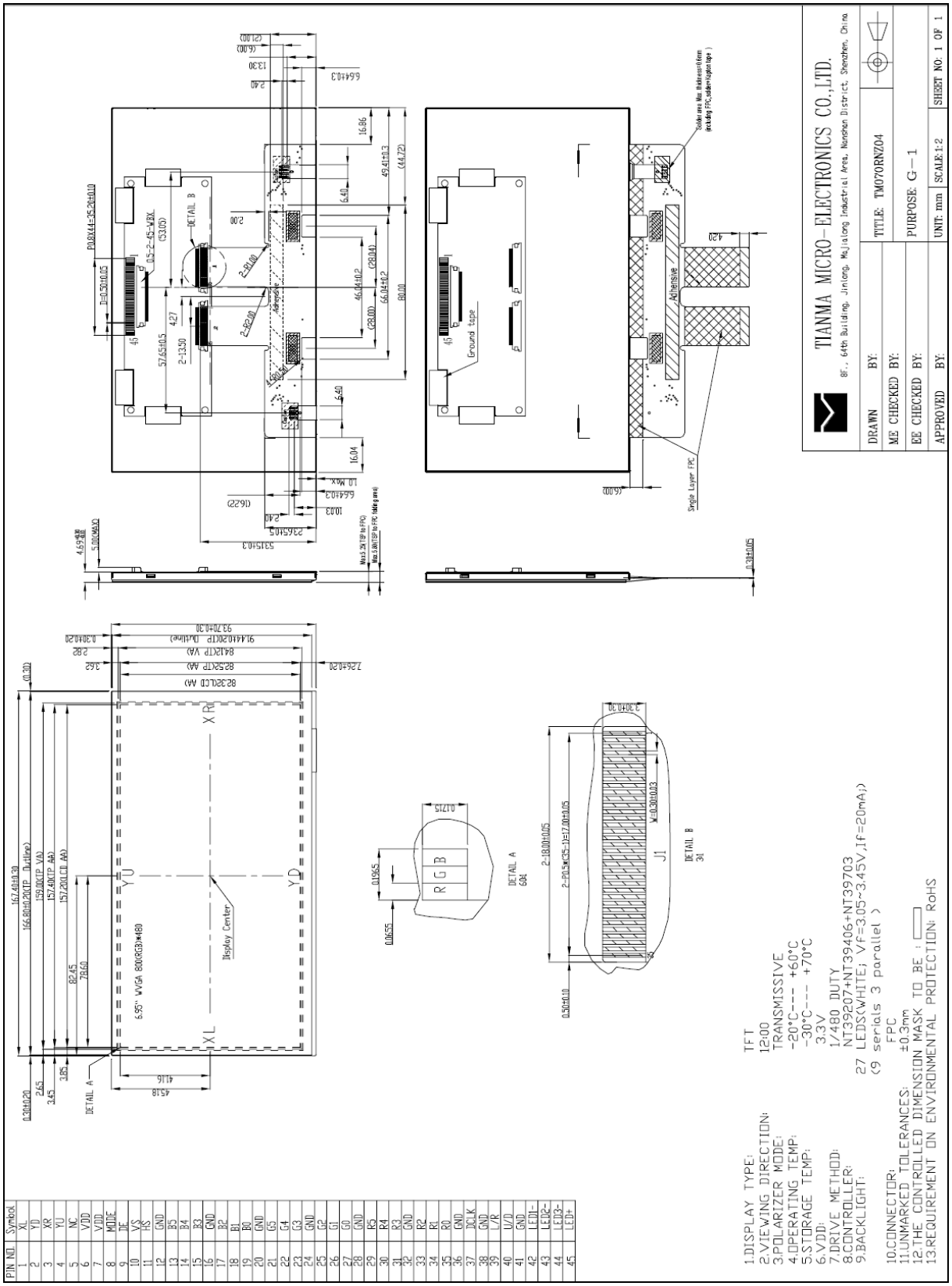
TM070RRNZ04 is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). This product is composed of a color TFT-LCD panel,driver ICs, T-CON board, backlight unit and TP (Touch Panel). The 7.0″ display area contains 800RGB x 480 pixels and can display up to 262K colors.

- ◆ Requirements on environmental protection: RoHS.

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display Color	262K		1
Viewing Direction	12:00	O'Clock	
Active Area(W×H)	157.20x82.32	mm	
Number of Dots	800(RGB)×480	mm	
Dot Pitch(W×H)	0.1965x0.1715	mm	
Controller	NT39207+NT39406 +NT39703	-	
VDD	3.3	V	
Outline Dimensions	Refer to outline drawing on next page		
Backlight	27-LEDs (white)	-	
Weight	TBD	g	
Interface	Digital 18-bits RGB	-	
Polarizer Mode	Transmissive/Positive	-	

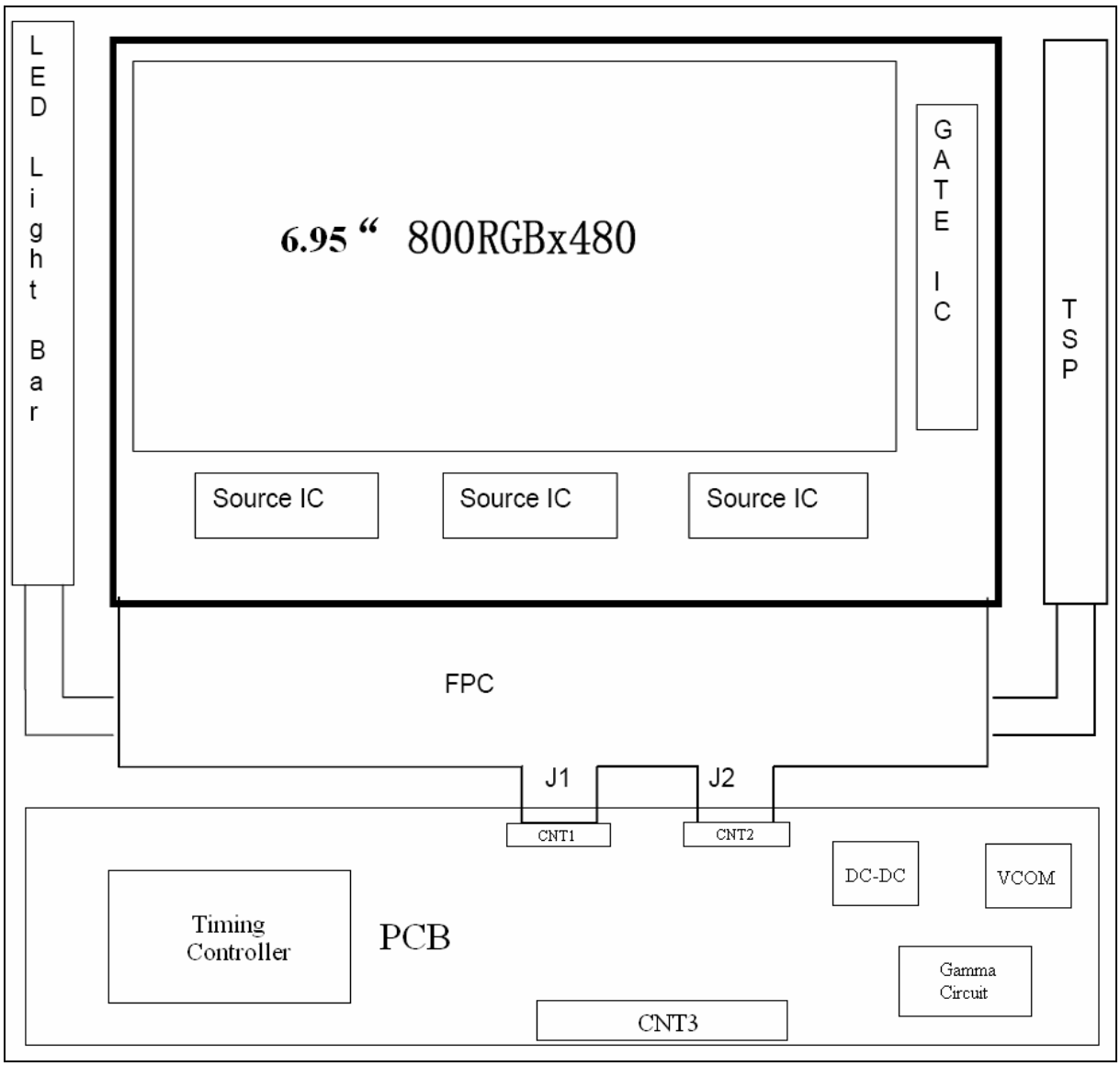
Note 1: Color tune is slightly changed by temperature and driving voltage.
Note 2: Requirements on Environmental Protection:RoHS

2. Outline Drawing



PIN NO	Symbol
1	XL
2	YD
3	XR
4	YU
5	NC
6	VDD
7	VDD
8	MODE
9	DE
10	VS
11	HS
12	GND
13	B5
14	B4
15	B3
16	GND
17	B2
18	B1
19	B0
20	GND
21	G5
22	G4
23	G3
24	GND
25	G2
26	G1
27	G0
28	GND
29	R5
30	R4
31	R3
32	GND
33	R2
34	R1
35	R0
36	GND
37	DCLK
38	GND
39	L/R
40	U/D
41	GND
42	LED-
43	LED2-
44	LED3-
45	LED+

3. Circuit Block Diagram



4. Absolute Maximum Ratings(Ta=25℃)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	-0.5	5.0	V	1，2
Logic Signal Input /Output Voltage	V_{IOVCC}	-0.3	V_{DD}+0.3	V	
Operating Temperature	Top	-20	+60	℃	
Storage Temperature	Tst	-30	+70	℃	

Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.

2. V_{DD} >V_{SS} must be maintained.

5. Electrical Specifications and Instruction Code

5.1 Electrical characteristics(Vss=0V ,Ta=25℃)

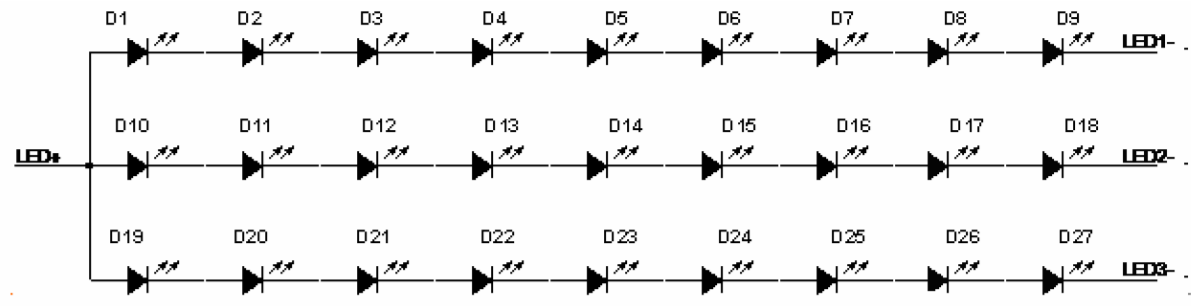
Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Input voltage	'H'	V_{IH}	V_{DD}=3.3V	0.8V_{DD}	-	V_{DD}	V	
	'L'	V_{IL}	V_{DD}=3.3V	Vss	-	0.2V_{DD}	V	
Output Voltage	'H'	V_{OH}	-	V_{DD}-0.4	-	V_{DD}	V	
	'L'	V_{OL}	-	Vss	-	Vss+0.4	V	
Current Consumption		I_{CC1}	Normal mode	-	TBD	-	mA	1
		I_{CC2}	Standby mode	-	TBD	-	mA	2

Note:

1: Display full white. Backlight on state.

2: IC on standby mode.

5.2 LED backlight specification(Vss=0V ,Ta=25℃)



Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage		--	--	--	--	--	--	
Supply current		I_f	I_f=20mA x3	27.45	28.8	31.05	V	
Reverse voltage		V_r	-	-	-	-	V	
Forward current	Normal	I_{pn}	27-chip	--	20x3	--	mA	
	Dimming	I_{pd}		--	--	--		
Reverse Current		I_r	-	-	--	--	μA	
Uniformity		△Bp	I_f=32mA	70%	80%	--		
Color coordinate*		X		0.279	0.304	0.329	-	
		Y		0.280	0.305	0.310	-	

Note:

● If the backlight is above these maximum ratings for long time, the service life of the LED backlight will reduce or it will cause poor reliability.

5.3 Interface Signals

Pin No.	Symbol	I/O	Function
1	XL	I/O	Left side of Touch panel
2	YD	I/O	Bottom side of Touch panel
3	XR	I/O	Right side of Touch panel
4	YU	I/O	Up side of Touch panel
5	NC	N	No Connection
6	VDD	P	Power Supply(+3.3V)
7	VDD	P	Power Supply(+3.3V)
8	MODE	I	DE or HV mode select
9	DE	I	Data Enable Control Pin
10	VS	I	Vertical synchronizing signal.
11	HS	I	Horizontal synchronizing signal.
12	GND	P	Power Ground (0V)
13	B5	I	Blue Data Bit 5
14	B4	I	Blue Data Bit 4
15	B3	I	Blue Data Bit 3
16	GND	P	Power Ground (0V)
17	B2	I	Blue Data Bit 2
18	B1	I	Blue Data Bit 1
19	B0	I	Blue Data Bit 0(LSB)
20	GND	P	Power Ground (0V)
21	G5	I	Green Data Bit 5
22	G4	I	Green Data Bit 4
23	G3	I	Green Data Bit 3
24	GND	P	Power Ground (0V)
25	G2	I	Green Data Bit 2
26	G1	I	Green Data Bit 1
27	G0	I	Green Data Bit 0(LSB)

5.3 Interface Signals(continued)

Pin No.	Symbol	I/O	Function
28	GND	P	Power Ground (0V)
29	R5	I	Red Data Bit 5
30	R4	I	Red Data Bit 4
31	R3	I	Red Data Bit 3
32	GND	P	Power Ground (0V)
33	R2	I	Red Data Bit 2
34	R1	I	Red Data Bit 1
35	R0	I	Red Data Bit 0(LSB)
36	GND	P	Power Ground (0V)
37	DCLK	I	Pixel clock
38	GND	P	Power Ground (0V)
39	L/R	I	Left/ Right selection
40	U/D	I	Up/down selection
41	GND	P	Power Ground (0V)
42	LED1-	P	LED Cathode
43	LED2-	P	LED Cathode
44	LED3-	P	LED Cathode
45	LED+	P	LED Anode

Note1: I/O definition.

I---Input pin, O---Output pin, P--- Power/Ground, N--- No connection

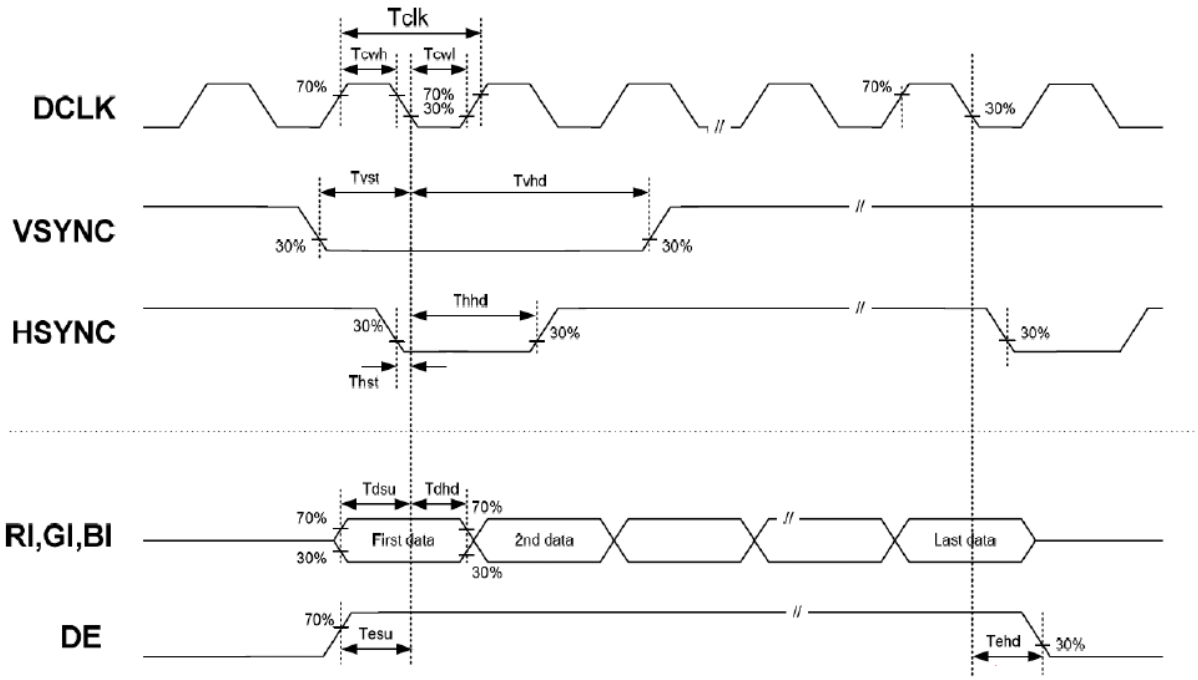
5.4 Interface Timing Chart

(VDD=3.3V, GND=0V, Ta=25℃)

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK	fclk	24.4	33.3	40.0	MHZ	
	Tclk	41.0	30.0	25.0	ns	
	Tcwh	40	50	60	%	
Hsync	Thst	4	-	-	ns	
	Thhd	4	-	-	ns	
Vsync	Tvst	4	-	-	ns	
	Tvhd	4	-	-	ns	
DE	Tesu	4	-	-	ns	
	Tesd	4	-	-	ns	
DATA (RI,GI,BI)	Tdsu	4	-	-	ns	
	Tdhd	4	-	-	ns	

Note: Base on TCON NT39703-5

Timing Diagram



6. Optical Characteristics

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		θ=0° Φ=0°	220	280	--	Cd/m^2	1
Uniformity	△Bp			70	80	--	%	1,2
Viewing Angle	θ1 (Φ=90° or270°)		Cr≥10	-50～+65			Deg	3
	θ2 (Φ=0° or 180°)			-65～+65				
Contrast Ratio	Cr		θ=0° Φ=0°	300	400	-	-	4
Response Time	T_r ＋T_f			-	25	40	ms	5
Color of CIE Coordinate	W	x	θ=0° Φ=0°	0.271	0.321	0.371	-	1,6
		y		0.298	0.348	0.398	-	
	R	x		0.528	0.578	0.628	-	
		y		0.302	0.352	0.402	-	
	G	x		0.293	0.343	0.393	-	
		y		0.532	0.582	0.632	-	
	B	x		0.096	0.146	0.196	-	
		y		0.056	0.106	0.156	-	
NTSC Ratio	S			-	50.0	-	%	

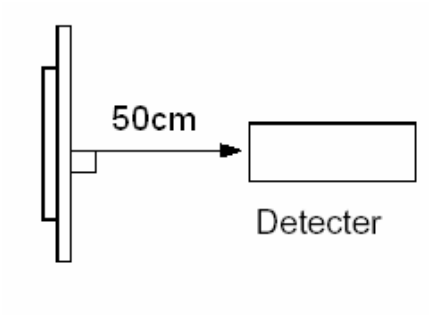
Note：The parameter is slightly changed by temperature, driving voltage and materiel.

Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25℃.
- One LED current is 20mA
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.

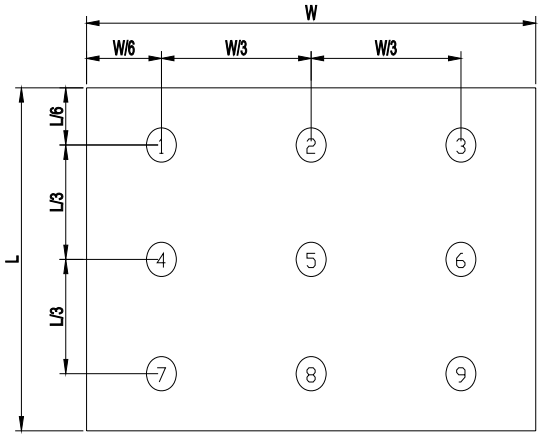


Note 2: The luminance uniformity is calculated by using following formula.

△Bp = Bp (Min.) / Bp (Max.)×100 (%)

Bp (Max.) = Maximum brightness in 9 measured spots

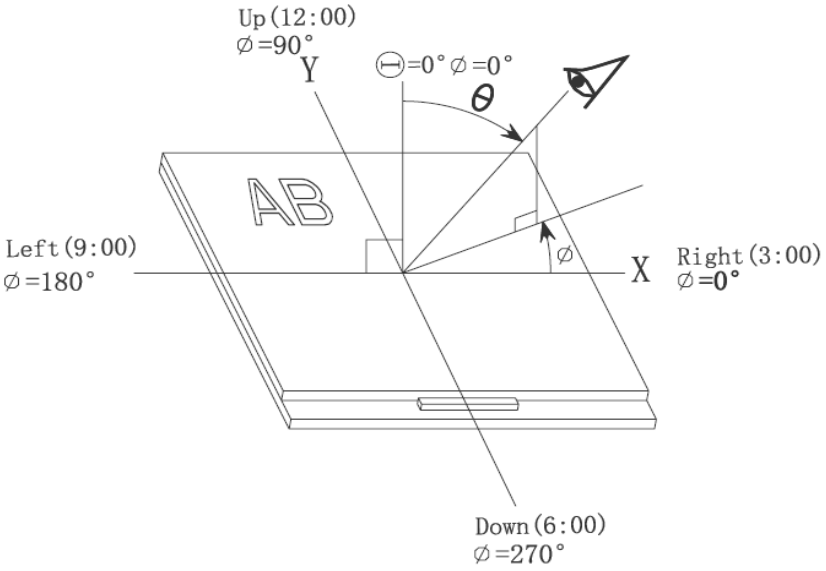
Bp (Min.) = Minimum brightness in 9 measured spots.



Measurement equipment PR-705 (Φ8mm)

Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and Φ



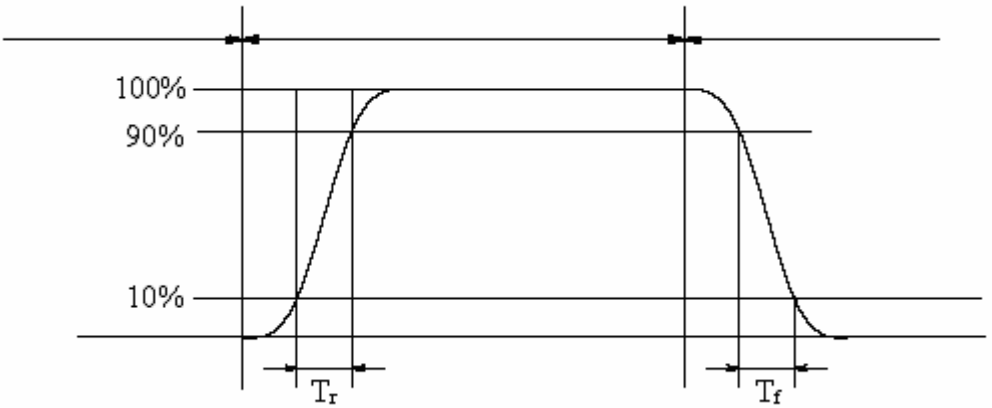
Note 4: The definition of contrast ratio (Test LCM using PR-705):

$$\text{Contrast Ratio(CR)} = \frac{\text{Luminance When LCD is at “White” state}}{\text{Luminance When LCD is at “Black” state}}$$

(Contrast Ratio is measured in optimum common electrode voltage)

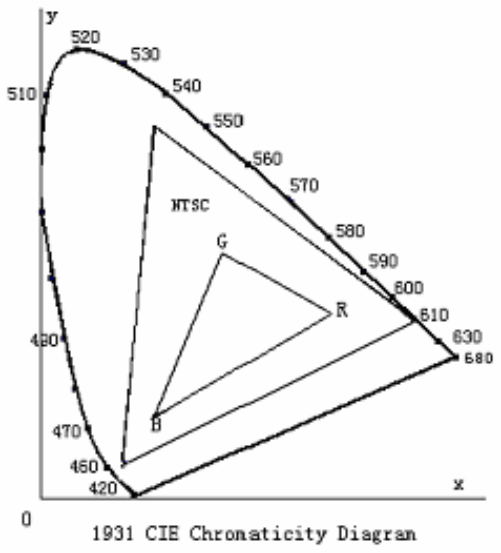
Note 5: Definition of Response time. (Test LCD using DMS501):

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes.Refer to figure as below.



The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.



Color gamut:

$$S = \frac{\textbf{area of RGB triangle}}{\textbf{area of NTSC triangle}} \times 100\%$$

7. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	70℃±2℃ 240H Restore 2H at 25℃ Power off	After testing, cosmetic and electrical defects should not happen.
2	Low Temperature Storage	-30℃±2℃ 240H Restore 2H at 25℃ Power off	
3	High Temperature Operation	60℃±2℃ 240H Restore 2H at 25℃ Power on	
4	Low Temperature Operation	-20℃±2℃ 240H Restore 4H at 25℃ Power on	
5	High Temperature & Humidity Operation	40℃±2℃ 90%RH 240H Power on	
6	Temperature Cycle	−20℃←→25℃←→60℃ 30min 5min 30min after 10cycle, Restore 2H at 25℃ Power off	
7	Vibration Test	Sine Wave Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)	
8	Shock Test	Half Sine Wave 60G 6ms, ±X,±Y,±Z 3times for each direction	

9	Drop Test(package state)	Height:60cm, 1corner,3edges,6surfaces	1.After testing, cosmetic and electrical defects should not happen. 2.the product should remain at initial place 3.Product uncovered or package broken is not permitted.
10	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times	ISO10605

Note:Additional test Item proposed by customer shall be determined by mutual agreement between customer and Tianma

8 Quality level

8.1 Classification of defects

Major defects (MA): A major defect refers to a defect that may substantially degrade usability for product applications, including all functional defects(such as no display, abnormal display, open or missing segment, short circuit, missing component), outline dimension beyond the drawing, progressive defects and those affecting reliability.

Minor defects (MI): A minor defect refers to a defect which is not considered to be able to substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation, such as black spot, white spot, bright spot, pinhole, black line, white line, contrast variation, glass defect, polarizer defect, etc.

8.2 Definition of inspection range

For dot defect of TFT LCD which is not smaller than 3 inches, dividing three areas to make a judgment (according to figure 1).

A area : center of viewing area

B area : periphery of viewing area

C area : Outside viewing area

For other defects, dividing two areas to make a judgment (according figure 2).

A zone : Inside Viewing area

B zone : Outside Viewing area

X1(A.A~V.A): 0mm X2(A.A~V.A): 0mm

Y1(A.A~V.A): 0mm Y2(A.A~V.A): 0mm

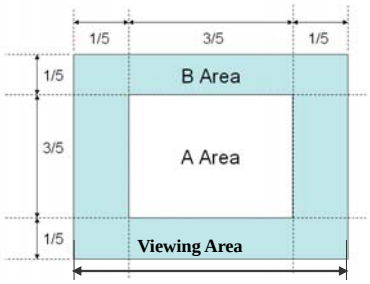


Figure 1

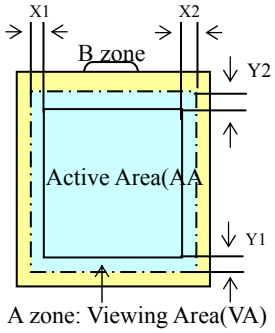


Figure 2

8.3 Inspection items and general notes

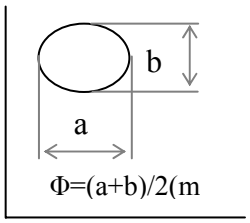
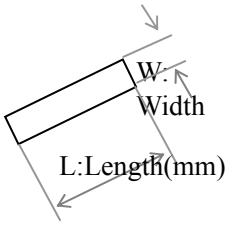
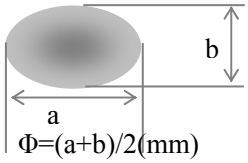
General notes	①Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and TIANMA. ②Viewing area should be the area which TIANMA guarantees. ③Limit sample should be prior to this Inspection standard. ④Viewing judgment should be under static pattern. ⑤Inspection conditions Inspection distance: 250 mm (from the sample) Temperature : 25±5 ºC Inspection angle : 45 degrees in 12 o′clock direction (all defects in viewing area should be inspected from this direction)	
Inspection items	Pinhole, Bright spot, Black spot, White spot, Black line, White Line, Foreign particle, Bubble	The color of a small area is different from the remainder. The phenomenon doesn't change with voltage
	Contrast variation	The color of a small area is different from the remainder. The phenomenon changes with voltage
	Polarizer defect	Scratch, Dirt, Particle, Bubble on polarizer or between polarizer and glass
	Dot defect (TFT LCD)	The pixel appears bright or dark abnormally when display
	Functional defect	No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction
	Glass defect	Glass crack, Shaved corner of glass, Surplus glass

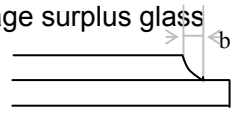
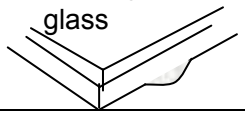
	PCB defect	Components assembly defect

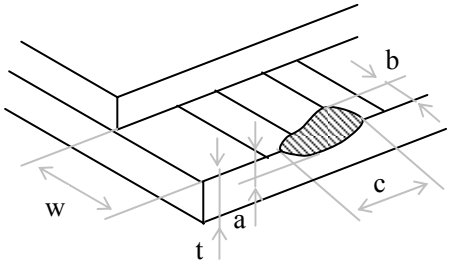
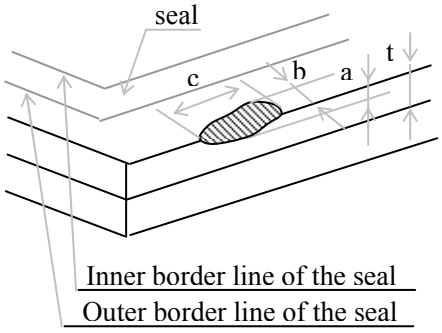
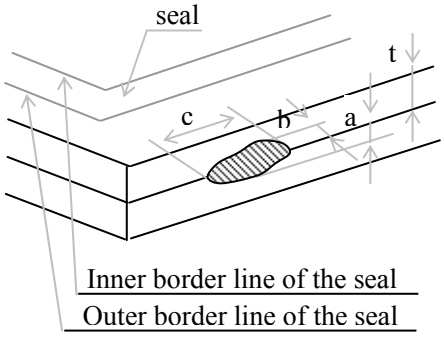
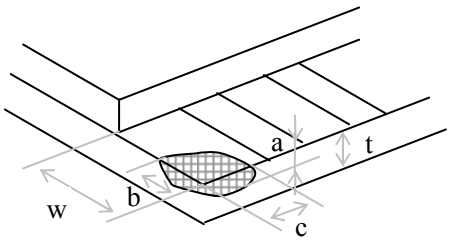
8.4 Outgoing Inspection level

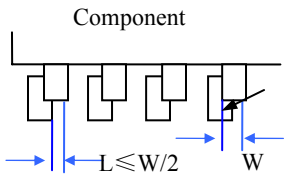
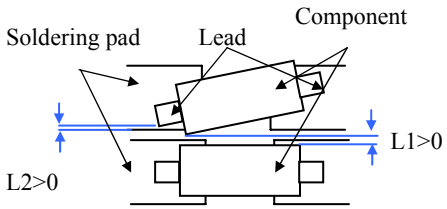
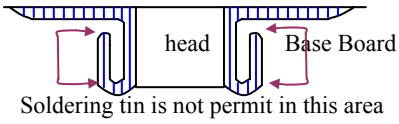
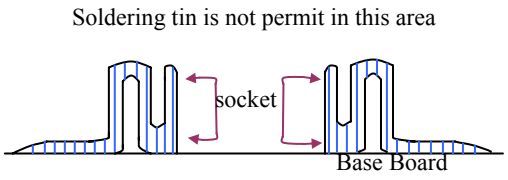
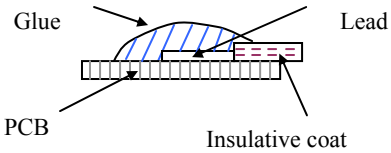
Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 8.3 general notes	See 8.5			II	0.65
Minor Defects	See 8.3 general notes	See 8.5			II	1.5
Note：Sampling standard conforms to GB2828						

8.5 Inspection Items and Criteria

Inspection items			Judgment standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot, Bright Spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass		A	Φ≦0.10	Neglected	Neglected
			B	0.10<Φ≦0.15	2	
			C	0.15<Φ≦0.20	1	
			D	0.20<Φ	0	
			Total defective point(B,C)		3	
2	Black line, White line, and Particle Between Polarizer and glass, Scratch on glass		A	W≦0.01	Neglected	Neglected
			B	0.01<W≦0.03 L≦3.0	2	
			C	0.03<W≦0.05 L≦3.0	1	
			D	0.05<W	0	
			Total defective point(B,C)		3	
3	Contrast variation		A	Φ≦0.2	Neglected	Neglected
			B	0.2<Φ≦0.3	2	
			C	0.3<Φ≦0.4	1	
			D	0.4<Φ	0	
			Total defective point(B,C)		3	
4	Dot defect (if TFT LCD is used)	TFT LCD is smaller than 3 inches	LCD Class	Defect	A area	B area
			A	Bright dot	1	Neglected
				Dark dot	2	
				Total	2	

<table>
<tr><td rowspan="11"></td><td rowspan="11"></td><td rowspan="3"></td><td rowspan="3">B</td><td>Bright dot</td><td colspan="2">2</td><td rowspan="3"></td></tr>
<tr><td>Dark dot</td><td colspan="2">3</td></tr>
<tr><td>Total</td><td colspan="2">4</td></tr>
<tr><td rowspan="5">TFT LCD between 3~10.4 inches</td><td>LCD Class</td><td>Defect</td><td>A area</td><td>B area</td><td>C area</td></tr>
<tr><td rowspan="3">A</td><td>Bright dot</td><td>1</td><td>1</td><td rowspan="6">Neglected</td></tr>
<tr><td>Dark dot</td><td>1</td><td>2</td></tr>
<tr><td>Total</td><td colspan="2">4</td></tr>
<tr><td rowspan="3">B</td><td>Bright dot</td><td>2</td><td>2</td></tr>
<tr><td>Dark dot</td><td>2</td><td>3</td></tr>
<tr><td>Total</td><td colspan="2">6</td></tr>
<tr><td colspan="6">Notes:
Bright dot: in R、G、B or dark display figure, the pixel appears bright.
Dark dot: in R、G、B or white display figure, the pixel appears dark.
Defect area must be less than an half size of the dot.</td></tr>
<tr><td>5</td><td colspan="2">Bubble inside cell</td><td colspan="3">any size</td><td>none</td><td>none</td></tr>
<tr><td rowspan="4">6</td><td rowspan="4">Polarizer defect (if Polarizer is used)</td><td>Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.</td><td colspan="4">Refer to item 1 and item 2.</td></tr>
<tr><td rowspan="3">Bubble, dent and convex</td><td>A</td><td>Φ≦0.3</td><td>Neglected</td><td rowspan="3">Neglected</td></tr>
<tr><td>B</td><td>0.3<Φ≦0.7</td><td>2</td></tr>
<tr><td>C</td><td>0.7<Φ</td><td>0</td></tr>
<tr><td rowspan="2">7</td><td rowspan="2">Surplus glass</td><td>Stage surplus glass  </td><td colspan="4">b≦0.3mm</td></tr>
<tr><td>Surrounding surplus glass  </td><td colspan="4">Should not influence outline dimension and assembling.</td></tr>
<tr><td>8</td><td colspan="2">Open segment or open common</td><td colspan="4">Not permitted</td></tr>
<tr><td>9</td><td colspan="2">Short circuit</td><td colspan="4">Not permitted</td></tr>
<tr><td>10</td><td colspan="2">False viewing direction</td><td colspan="4">Not permitted</td></tr>
<tr><td>11</td><td colspan="2">Contrast ratio uneven</td><td colspan="4">According to the limit specimen</td></tr>
<tr><td>12</td><td colspan="2">Crosstalk</td><td colspan="4">According to the limit specimen</td></tr>
<tr><td>13</td><td colspan="2">Black /White spot(display)</td><td colspan="4">Refer to item 1</td></tr>
<tr><td>14</td><td colspan="2">Black /White line(display)</td><td colspan="4">Refer to item 2</td></tr>
<tr><td></td><td colspan="2"></td><td colspan="4"></td></tr>
</table>

Inspection items			Judgment standard		
			Category(application: B zone)		Acceptable number
15	Glass defect crack	①The front of lead terminals 	A	a≤ t, b≤1/5W, c≤3mm	Max.3 defects allowed
			B	Crack at two sides of lead terminals should not cover patterns and alignment mark	
		②Surrounding crack—non-contact side 	b < Inner borderline of the seal		
		③ Surrounding crack— contact side 	b < Outer borderline of the seal		
		④Corner 	A	a ≦ t, b ≦ 3.0, c ≦ 3.0	
			B	Glass crack should not cover patterns u and alignment mark and patterns.	

Inspection items			Judgment standard Category(application: B zone)
16	PCB defect	Component soldering: No cold soldering、short、open circuit、burr、tin ball The flat encapsulation component position deviation must be less than 1/3 width of the pin (Pic.1)； the sheet component deviation: Pin deviates from the pad and contact with the near components is not permitted（Pic.2）	
		lead defect: The lead lack must be less than 1/3 of its width; The lead burr must be less than 1/3 of the seam; Impurities connect with the near leads is not permitted	
		Connector soldering: Soldering tin is at contact position of the plug and socket is not permitted No foundation is scald Serious cave distortion on plug and socket contact pin is not permitted	 
		Glue on root of the speaker receiver and motor lead: The insulative coat of the lead must join into the PCB; the protected glue must envelop to the insulative coat.	

9. Precautions for Use of LCD Modules

9.1 Handling Precautions

9.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

9.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

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

9.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

9.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

— Isopropyl alcohol
— Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

— Water
— Ketone
— Aromatic solvents

9.1.6 Do not attempt to disassemble the LCD Module.

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

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

a. Be sure to ground the body when handling the LCD Modules.
b. Tools required for assembly, such as soldering irons, must be properly ground.
c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

9.2 Storage precautions

9.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

9.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃
Relatively humidity: ≤80%

9.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

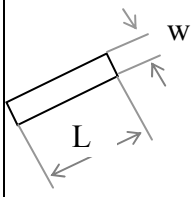
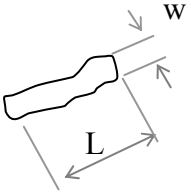
9.3 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.

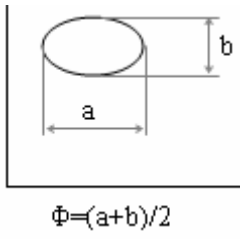
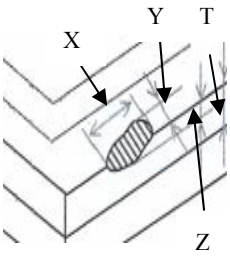
10. TP Module Inspection Standard

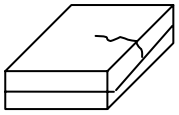
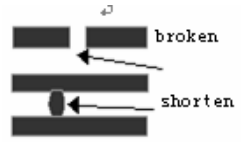
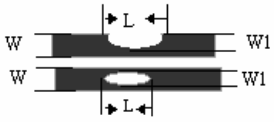
10.1 Scope:

The standard is applied to all customers owning license tag. When there is special requirement by the customer (the customer signed the standard agreement with our company) ,please reference to the customer agreement first.

10.2 Appearance defects inspection item and limit criteria (unit:mm):

Inspection item	Detail content	criteria			remark
Outline dimension	Length, Width, Thickness	Outline should meet the drawing			Vernier caliper ruler
LOGO inclined, color, icon, grounding		LOGO inclined :not allowed			Eyeballing
Surface scratch		(1) W≤0.03 mm，allowed (2)0.03 mm＜W≤0.05，L≤3 mm， defects space 20mm at least, 2 defects are allowed; L＞3mm，not allowed (3)W＞0.05 mm，not allowed			Eyeballing
Linear foreign matter		TP product under 3.5”	A	W≤0.02mm，L≤3mm	Neglected
			B	0.02mm ＜ W≤0.05mm ，L≤3mm，	2
			C	L＞3mm or W＞0.05mm	0
			Total defects（B）		2
			Distance: D≥10mm,out of V,A is neglected		
		TP product between 3.5” and 4.3”	A	W≤0.02mm，L≤3mm	Neglected
			B	0.02mm＜W≤0.03mm，L≤3mm，	3
			C	0.03mm＜W≤0.05mm，L≤3mm，	2
			D	L＞3mm or W＞0.05mm	0
			Total defects(B,C)		2
			Distance: D≥15mm,out of V,A is neglected		
		TP product over 4.3”	A	W≤0.02mm，L≤3mm	Neglected
			B	0.02mm＜W≤0.03mm，L≤3mm，	3
			C	0.03mm＜W≤0.05mm，L≤3mm，	2
			D	L＞3mm or W＞0.05mm	0
			Total defects(B,C)		3
			Distance: D≥20mm,out of V,A is neglected		

Inspection item	Detail content	criteria				remark
Bright spot, Black spot, White spot, Pinhole, Black line, White Line, Foreign matter, air bubble		TP product under 3.5”	A	Φ≤0.15	Neglected	Eyeballing
			B	0.15＜Φ≤0.20	2	
			C	0.20＜Φ≤0.25	1	
			D	Φ＞0.25	0	
			Total defects(B,C)		2	
			distance	D≥10mm	Out of V,A is neglected	
		TP product between 3.5” and 4.3”	A	Φ≤0.15	Neglected	
			B	0.15＜Φ≤0.35	2	
			C	0.35＜Φ≤0.40	1	
			D	Φ＞0.40	0	
			Total defects(B,C)		2	
			distance	D≥15mm	Out of V,A is neglected	
		TP product over 4.3”	A	Φ≤0.15	Neglected	
			B	0.15＜Φ≤0.35	3	
			C	0.35＜Φ≤0.50	1	
			D	Φ＞0.50	0	
			Total defects(B,C)		3	
			distance	D≥20mm	Out of V,A is neglected	
Glass chip and crack		Side: x(length)≥2mm z(deepness) =T: not allowed y(width)≥2 mm z(deepness) =T: not allowed Corner: x、y≥2 mm or z=T: not allowed （T: glass thickness）				Eyeballing
Newton ring		Film+ glass: Newton ring area(S)≤1/2（T/P area Film+ Film：Newton ring area (S)≤1/3 (T/P area)				Eyeballing with the lamplight
rainbow		Check in the range of viewing angle or press the TP LOGO by the finger, the rainbow is not allowed.				Eyeballing

Inspection item	Detail content	criteria	remark
TP white border		The insulation tape meet the LOGO is not allowed	Eyeballing
Glass crack		Not allowed	Eyeballing
TP surface dirty matter		Cleaned before shipment	Eyeballing
TP pressing mark	The mark btween the TP and LCD	n the V,A(see limited sample):not allowed	Eyeballing
FPC brim teared, shorten, broken, trace mended		Not allowed	Eyeballing with the lamplight
FPC damage		(1)W1＜1/3 trace width W，2 lines are allowed (2)W1≥1/3 routing line width W， the damage length L≥ W，not allowed	Eyeballing with the lamplight
FPC pressing mark /folding mark		(1)hot pressing side and connecting side: not allowed(make the limited sample if necessary) (2)around the hole: not allowed (3)routing line: mark width≤1/3trace width, The mark length ≤1mm is allowed (4)big ground area: neglected (5)no see base material because of the mark.	Eyeballing with the lamplight
FPC trace reveal copper, Electrode oxidated, scratch		Revealing copper is not allowed; Palm oxidation is allowed; black oxidation is allowed; protect cover is forbad scratched and damaged	Eyeballing with the lamplight
TP inclined		Obvious incline is not allowed. No affect the machine assembly first.	eyeballing
Bezel defect		Scratch: length ≤10mm，width≤0.4mm and 3 defects at most; rust and distortion is not allowed	eyeballing
Spray Code defect		According to the content specified by the customer font illegible and wrong position is not allowed	eyeballing
Note: other appearance inspection standards which not mentioned in it ,please refer to《LCM raw material inspection standard》（Q/DDG212-2005）			

10.3 TP function inspection

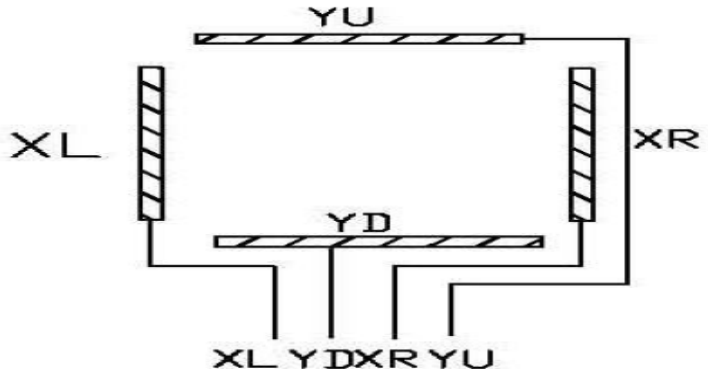
Inspection item	Detail content	Limit criteria
Linearity defect (including distortion and drawing back)	x,y axial linearity＞1.5% : not allowed	Special test jig +computer
Line broken	Exceed 4mm : not allowed	
Terminal resistance	The resistance between X1 and X2 or Y1 and Y2 exceed the design value: not allowed	Test it when it is required during Designing the drawing
insulation resistance	Resistance between X1 and Y1:not allowed	

10.4 Electrical Characteristics

Item	Min	Typ	Max	Unit	Remark
Linearity	-1.5	-	1.5	%	Analog X and Y directions
Terminal Resistance	100	-	1300	ohm	X
	100	-	900	ohm	Y
Insulation Resistance	10	-	-	ohm	DC 25V
Voltage	-	5	7	V	DC
Chattering	-	-	10	Ms	100k pull-up
Transparency	78	-	-	%	JIS-K7105,ASTM D1003,@550nm

Note1: Do not operate it with a thing except a placental pen (tip R0.8mm or more) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.

Note2: The figure below shows the connection of touch panel.



10.4 Display defects inspection item and limit criteria

About display defects inspection item and limit criteria ,please refer to the content of 《LCM-TFT liquid display module》（Q/DDG199-2007）and 《liquid display module display defects inspection standard》（Q/DDG439-1999）。