-

SPECIFICATION OF TFT MODULE

T24-ILI9325-V12

Remark:

Contents

Contents

Specification of -T24-ILI9325-V11

1. General Description

- 240 x RGB x320 Dots TFT Transmissive Dot Matrix LCD Module.
- Driving duty: 1/240Duty.
- 2.4" (COG type).
- Viewing Angle: 12 O'clock.
- ILI9325 LCD Driver or equivalent.
- Logic voltage: 2.8V.
- Data interface: 80 system 8/16bit bus interface.
- Touch panel.
- White backlight.

2. Mechanical Specifications

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

ID	Parameter(Unit)	Specifications
1	Outline dimensions(mm)	42.72(W) x 60.26(H) x 3.6(D)
2	Active area(mm)	36.72(W) x 48.96(H)
3	Display format(dots)	240 x RGB x 320
4	Dot pitch(mm)	0.18(W) x 0.18(H)
5	Weight(grams)	TBD

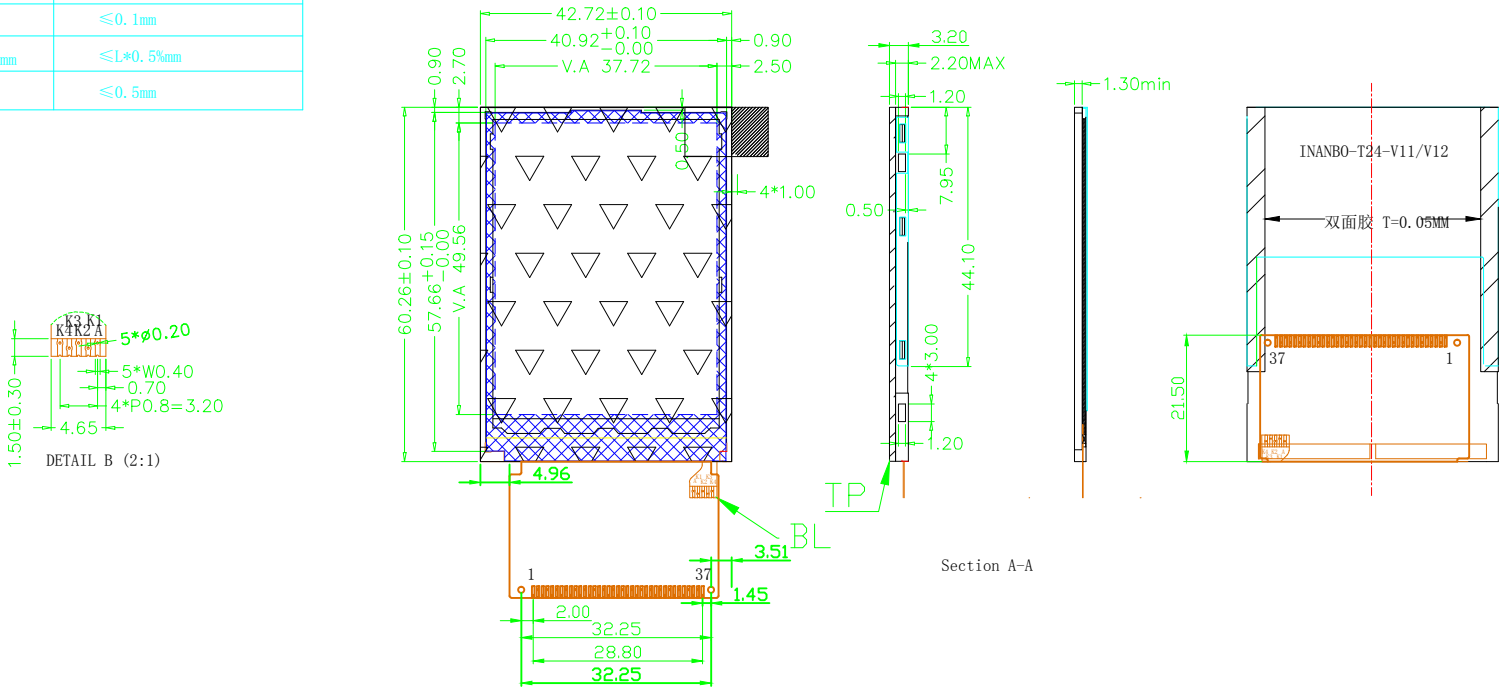
For Customer:		Approval Date:	

			B
			02

平面翘曲度公差

边长度L	对应公差范围
L≤20mm	≤0.1mm
20<L≤100mm	≤L*0.5%mm
L>100mm	≤0.5mm

符合ROHS要求

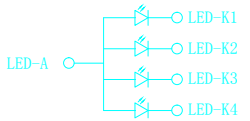


DETAIL B (2:1)

Section A-A

Notes:
1. Unit:mm
2. Modification rev. number
3. Unmarked radii:R0.3;unmarked toleracce:±0.1
4. draft angle 1.5°
5. Mark mold cavity indentification in recess approximately where indicated
6. ( ) reference dimension; area critical dimension; area CPK ≥1.33
7. ELECTRICAL-OPTICAL CHARACTERISTICS (Ambient temperature Ta=25° C)

Item		Symbol	Min.	Typ.	Max.	Unit	Condition
Main screen	Luminance(AVG)	Lv	3200	3500		cd/m²	BM-7, 500mm ,1Á
	Uniformity	Avg	80	85		%	(min/max)*100%
	Colour Coordinate (Center point)	X	0.25		0.3		If= 60 mA
		Y	0.25		0.3		
Forward Voltage		Vf	2.9	3.3	3.4	V	
Operating Temperature		T_{OPR}	-30	--	70	°C	
Storage Temperature		T_{STG}	-40	--	80	°C	

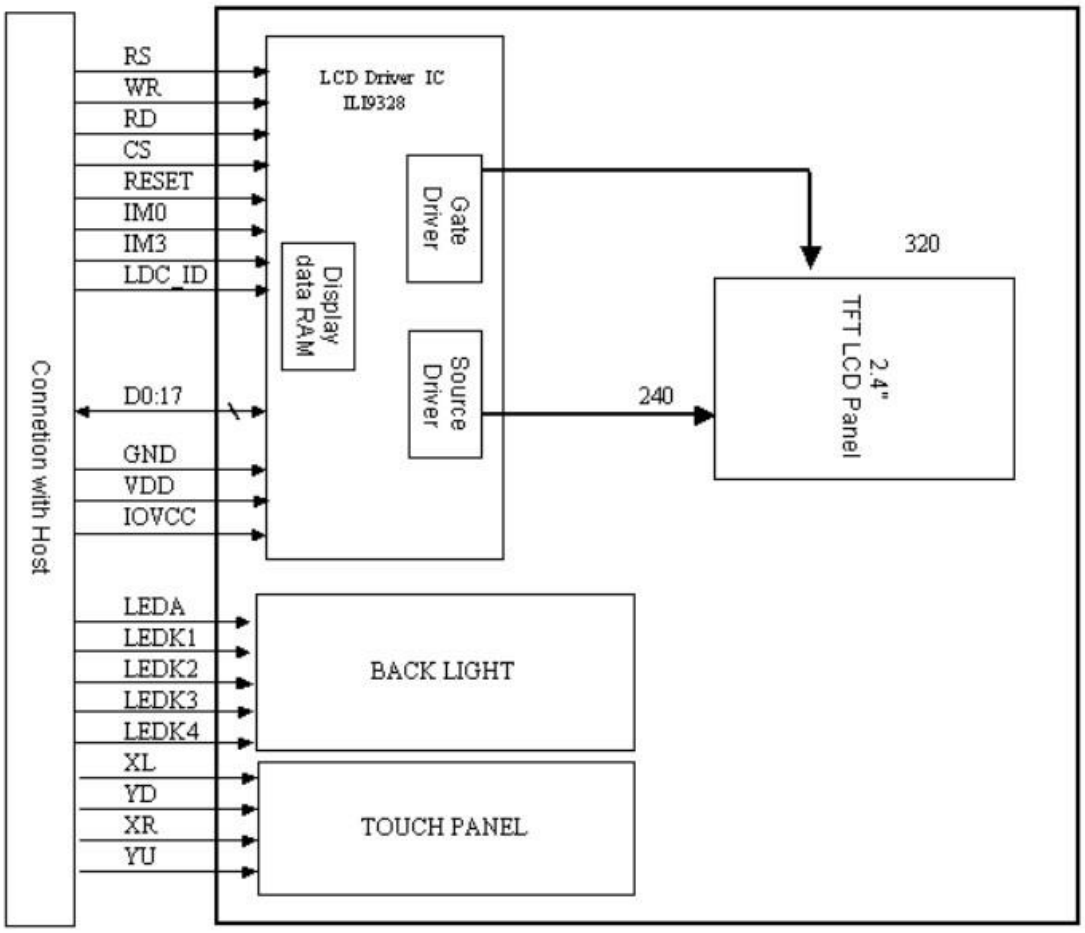


LED CIRCUIT DIAGRAM:

Pin	
01	DB0
02	DB1
03	DB2
04	DB3
05	GND
06	VCC
07	/CS
08	RS
09	/WR
10	/RD
11	IM0
12	XL
13	YU
14	XR
15	YD
16	LED-A
17	LED-1
18	LED-2
19	LED-3
20	LED-4
21	IM3
22	DB4
23	DB8
24	DB9
25	DB10
26	DB11
27	DB12
28	DB13
29	DB14
30	DB15
31	REST
32	VCC
33	VCC
34	GND
35	DB5
36	DB6
37	DB7

REV	DATE	DESCRIPTION

DESIGN:		CHECKED:		APPROVED:		Date:	第三视角	Page: 1/1



[Block Diagram]

3. Interface signals

PIN	SYMBOL	FUNCTION
1	DB0	Data bus
2	DB1	
3	DB2	
4	DB3	
5	GND	Ground
6	VCC	Power supply
7	/CS	Chip select input pin (“Low” enable).
8	RS	Display data / Command selection pin
9	/WR	Write pin
10	/RD	Read pin
11	IM0	16bit interface /8bit interface mode select PIN 【 8BIT:DB10~DB17, Connected VCC】 【16BIT:DB0~DB7 DB10~DB17, Connected GND】
12	XL	Left electrode
13	YB	Bottom electrode
14	XR	Right electrode
15	YT	Top electrode
16	LED-A	Backlight power supply
17	LED-K1	Backlight ground
18	LED-K2	
19	LED-K3	
20	LED-K4	
21	IM3	16 bit interface /8bit interface mode select PIN
22	DB4	Data bus
23	DB8	
24	DB9	
25	DB10	
26	DB11	
27	DB12	
28	DB13	
29	DB14	
30	DB15	
31	/RESET	Reset pin
32	VCC	Power supply
33	VCC	
34	GND	Ground
35	DB5	Data bus
36	DB6	
37	DB7	

Note(1):

4. Absolute Maximum Ratings

Electrical Maximum Ratings:

(1)TFT-LCD Module (Ta=25+/5℃)

Parameter	Unit	Symbol	Min	Max	note
Supply voltage	V	VCC	-0.3	3.3	-

(2)Back-Light Unit

Parameter	Unit	Symbol	Min	Max	note
Current	mA	1B	-	20	(1)

Note(2): Each LED

(3)Touch Panel

Parameter	Unit	Symbol	Min	Max	note
Vtp	VDC	Vtp	-	7	-

Environmental Condition

Item	Operating Temperature(Topr)		Storage Temperature(Tstg)		Remark
	Min	Max	Min	Max	
Ambient	-20℃	+70℃	-30℃	+80℃	
Humidity	90%max RH For Ta=25℃				

5. Electrical Specifications

Electrical Characteristics

(1)TFT-LCD Module (Ta=25 ± 2℃)

Parameter	Unit	Symbol	Min	Max	Typ.	note
Supply voltage	V	VCC	2.75	2.85	2.8	-

(2)Back-Light Unit (Ta=25 ± 5℃)

Parameter	Unit	Symbol	Min	Max	Typ.	note
Current	mA	1B	-	-	15	(1)

Note(3):For Each LED

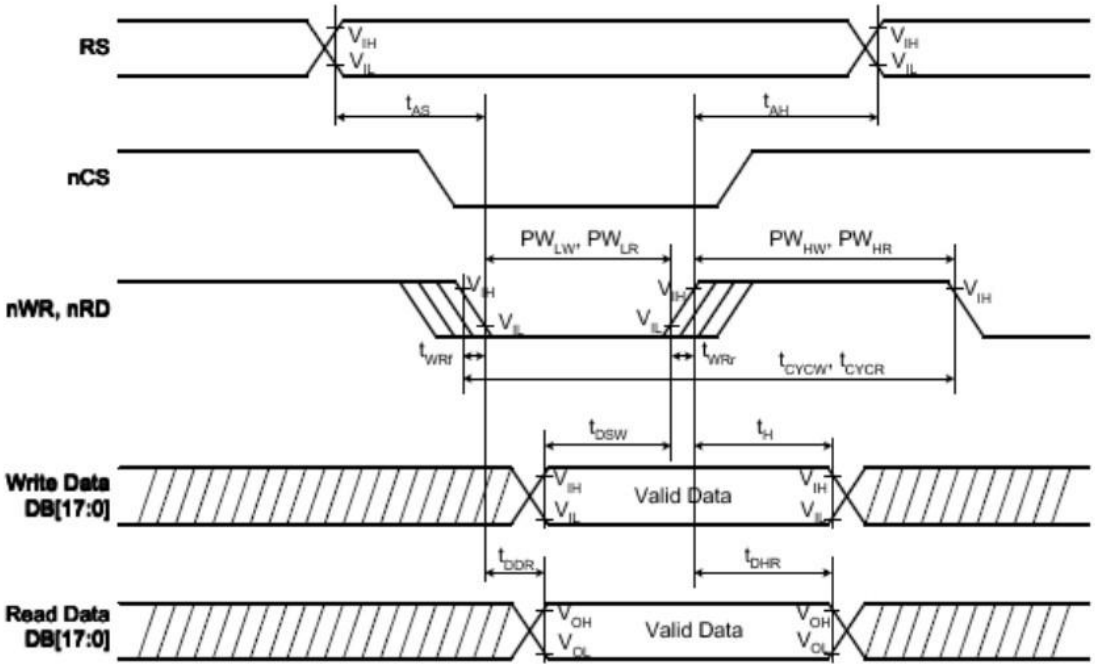
(3)Touch Panel

Parameter	Unit	Symbol	Min	Max	Typ.	note
Vtp	VDC	Vtp	-	7	5	

Interface Characteristics

For 80-Serial MPUs

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	-	-	-
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	-	-	
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. Electro-Optical characteristics .

The test of Optical specifications shall be measured in a dark room

(ambient luminance≤ 1 lux and temperature = 25±2℃)

with the equipment of Luminance meter system(Goniometer system and TOPCONE BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of è and ? equal to 0°.,The center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement. Optimum viewing angle direction is 12 o'clock.

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Threshold voltage		Vsat		2.2	2.3	2.4	V	Fig. 1
		Vth		1.3	1.4	1.5	V	
Viewing Angle range	Horizontal	Θ_3	CR > 10	40	45		Deg.	Note 1
		Θ_9		40	45		Deg.	
	Vertical	Θ_{12}		45	50		Deg.	
		Θ_6		15	20		Deg.	
Contrast ratio		CR	$\Theta = 0°$		300			Note 2
Transmittance		T(%)	$\Theta = 0°$		5.8			Note 3
White Chromaticity		x_w	$\Theta = 0°$	0.220	0.300	0.380		Note 4 *Color Filter Glass
		y_w		0.254	0.334	0.414		
Reproduction Of color	Red	x_R	$\Theta = 0°$	0.550	0.630	0.710		
		y_R		0.251	0.331	0.411		
	Green	x_G		0.205	0.285	0.365		
		y_G		0.481	0.561	0.641		
	Blue	x_B		0.055	0.135	0.215		
		y_B		0.046	0.126	0.206		
Response Time		Tr+Tf	$\Theta = 0°$		25		msec	Note 5

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 2 shown in Appendix).
2. Contrast measurements shall be made at viewing angle of Θ= 0° and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIGURE 2 shown in Appendix) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the value with Polarizer The color chromaticity coordinates specified in Table 2 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the C/F. Measurement condition is C - light source & Halogen Lamp.
4. The electro-optical response time measurements shall be made as FIGURE 3 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

Figure 1. The definition of Vth & Vsat

Figure 1. The definition of Vth & Vsat

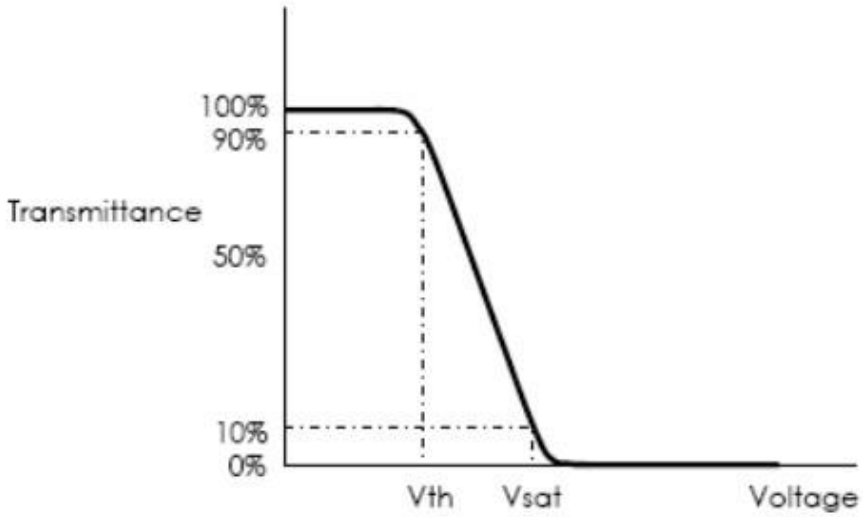


Figure 2. Measurement Set Up

Figure 2. Measurement Set Up

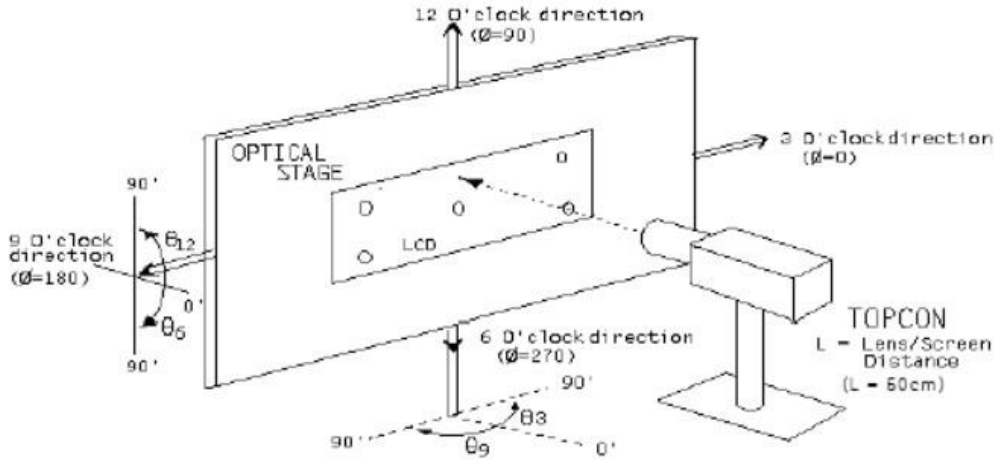
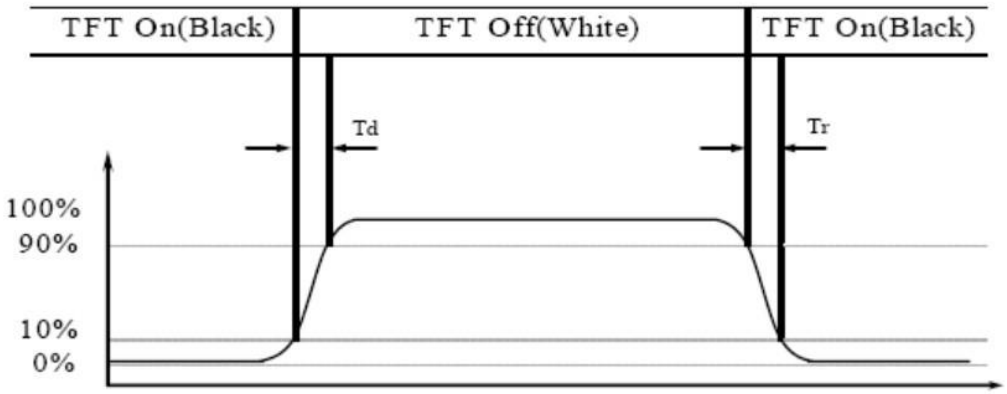


Figure 3. Response Time Testing

Figure 3. Response Time Testing



7. Quality Guaranty

7.1 Manufacture Assurance

Item		100% test	Sampling	Reliability test
	Raw material		O	O
LCM finished goods	Electrical function	O	O	O
	Appearance	O	O	O
	Physical characteristics		O	O
	Environmental condition		O	O

7.2 Inspection environment condition

7.2.1Temperature and humidity:Room temperature(23±5°C)/ less than 70%RH. 7.2.2 Vision inspection distance:30cm at the upright direction

7.2.3 Inspection method:

7.2.3.1 The appearance inspection should be performed under a daylight lamp (Power of 40W/ Distance of 1.5m will be a standard at any disputation)

7.3.2.2 During the electrical functional test and the screen defect inspection'the LCD should light electrically and the environment light should be avoided with a lens hood or the test is performed under a dark condition

7.3 Sample plan:MIL-STD-105E AQL (II) 0.65%, as below:

Lot or batch size	Sample size	0.65%	
		AC	RE
Less than 20pcs	100%	0	1
20~280	20	0	1
281~1200	80	1	2
1201~3200	125	2	3
3201~10,000	200	3	4
10,001~35,000	315	5	6

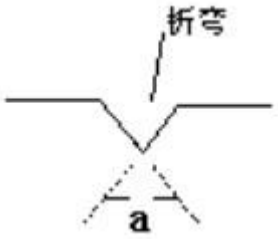
7.4 Dimension measurement

7.4.1 Sample size:5pcs per shipment lot

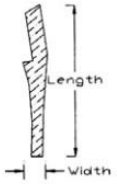
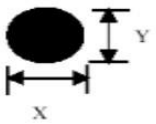
7.4.2 Criterion: Verify the all dimensions according to the appropriate drawing if needed and should reject the dimensions that are out of the tolerance.

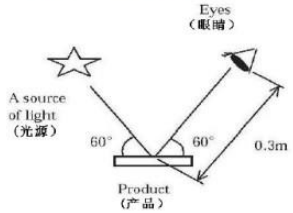
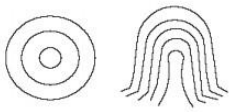
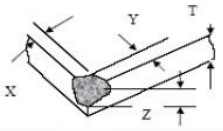
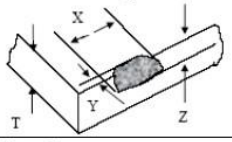
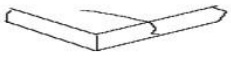
7.5 Appearance inspection

7.5.1 General Parts:

Item	Criterion	Remark
1.FPCA	The criterion for chip component solder point: IPC-A-610C CLASS 2 on general occasion。	Vision Inspection / Microscope
2.Back light	2.1 Defect of no light is unaccepted。 2.2 The brightness (test with BM-7 equipment) and power consume must	
3.Bezel	Any damage, distortion and other solder spark on the bezel surface is unaccepted。	
4.FPC	4.1 Criterion for bending and crease As picture:  Picture 22 “a” is the angle composed of the extended lines of the crease .This angle must be morte than 90 degree. 4.2 The area of crack, damage, foreign material and air bubble is not allowed to be more than 1/5 of that of the enhancing film,	
5.LCD screen	5.1 A protect plaster should be stuck to the screen based on the SPEC. 5.2 Any dust, finger mark, stain or other foreign material on the screen surface which can not be got rid of with soft cloth or air gun is unaccepted. 5.3 Defect of no display is unaccepted. 5.4 Defect of lack of line or cross-talk is unaccepted. 5.5 Abnormal chroma, brightness and contrast (compared with golden Sample and SPEC parameter) are unaccepted 5.6 Uneven back light (compared with golden Sample) or dark area is unaccepted. 5.7 Response time of menu change must meet SPEC. 5.8The LCD screen shift amount should not be more than 0.2mm based	Vision inspection / Microscope

7.5.2 Cosmetic defects of LCM(Include Touch Panel and TFT)out of acceptable criteria are listed in below table:

<table>
<tr><th>Inspection item</th><th>Criterion</th><th>Remark</th></tr>
<tr><td>Liner matter</td><td>
<table>
<tr><th>Width (mm)</th><th>Length (mm)</th><th>Q'ty</th></tr>
<tr><td>W≤0.1</td><td>/</td><td>Ignore</td></tr>
<tr><td>0.1<W≤0.2</td><td>L≤5</td><td>3</td></tr>
<tr><td>W>0.2</td><td>/</td><td>0</td></tr>
</table>
</td><td> 
</td></tr>
<tr><td>Scratch</td><td>
<table>
<tr><th>Width (mm)</th><th>Length (mm)</th><th>Q'ty</th></tr>
<tr><td>W≤0.03</td><td>/</td><td>Ignore</td></tr>
<tr><td>0.03m<W≤0.05</td><td>L≤5</td><td>2</td></tr>
<tr><td>0.05mm<W≤0.1</td><td>L≤2</td><td>2</td></tr>
<tr><td colspan="2">W>0.1mm or L>2mm</td><td>0</td></tr>
</table>
</td><td>As liner</td></tr>
<tr><td>Fish eye on film/
Dent on film and
Air bubble</td><td>
<table>
<tr><th>Size（mm）</th><th>Q'ty</th></tr>
<tr><td>D≤0.2</td><td>Ignore</td></tr>
<tr><td>0.2<D≤0.4</td><td>5</td></tr>
<tr><td>0.4<D≤0.5</td><td>2</td></tr>
<tr><td>D>0.5</td><td>0</td></tr>
</table>
</td><td>Size：D=(X+Y)/2
 
</td></tr>
<tr><td>Dot</td><td>
<table>
<tr><th>Size (mm)</th><th>Q'ty</th></tr>
<tr><td>D≤0.15</td><td>Ignore</td></tr>
<tr><td>0.15<D≤0.2</td><td>3</td></tr>
<tr><td>0.2<D≤0.3</td><td>1</td></tr>
<tr><td>D>0.3</td><td>0</td></tr>
</table>
</td><td>As fish eye</td></tr>
</table>

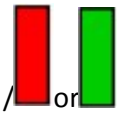
Newton's ring	A. When Newton ring dimension is more than 1/3of sample dimension, it is regarded as adefect. B. When Newton ring dimension that is less than 1/4 of sample dimension and is not affect font effect and line distortion under a ceiling fluorescent light, it is acceptable. 	
Chip and crack	Corner chip 	X≤3mm Y≤3mm Z≤T
	General chip 	X≤3mm Y≤3mm Z≤T Or X≤5mm Y≤1mm Z≤T
	Crack 	0

7.5.3 TFT Pixel Inspection

1>Pixel

b-pixels (R+G+B) 

2>DOT

1 sub-pixel (R or G or B /  or or )

3>Bright/Dark Dot

A sub-pixel (R,G, B dot) stuck off/on (electrical)

Bright dots shall be counted on a black pattern and black dots on a pure R,G, B and white pattern.

4>Adjacent Dot

2 or 3 dots connected with neighboring dot. (R,G or G,B or B,R or R,G,B)

7.5.4 TFT Pixel Dot Defect Criteria

Defect Mode	Acceptable Judgment Criteria	
	Dot Type	Quantity (ea)
Bright Dot	Random (Red, Blue, Green)	1
	2 or more adjacent dot defects	0
Dark Dot	Dark dot	3
	2 adjacent dots	1
	3 or more adjacent dots	0

7.6 Function test

7.6.1 To set the voltage and current based on the specification requirement of the product make the LCD electrically light, then test LCD, the product will be accepted if its LCD can display normally.

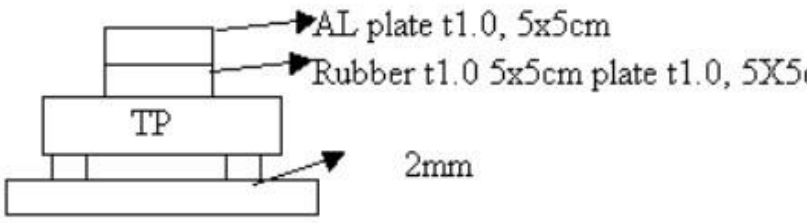
7.6.2 The product should be judged as fail if there is any test item fails in passing the test.
7.6.3 If the product fails in test, it should be tested serially two times again, if it pass the testing in the last two times, then it should be accepted.

7.7 Accepted criterion:For a out going lot, We inspect it based on above sampling plan and the corresponding acceptable criterion, if all inspection items meet the SPEC,this lot should

be accepted and rejected otherwise.

7.8 Reliability test

No.	Items	Specification
1	High Temp storage	70°C, 160hr
2	Low Temp storage	-20°C, 160hr
3	High Temp operation	60°C, 160hr
4	Low Temp operation	-20°C, 160hr
5	Humidity storage	60°C, 90%, 160hr
6	Humidity operation	60°C, 90%, 160hr
7	Thermal Shock	-10°C (30min) ~60°C (30min) 20 cycle
8	TP static load resistance	No glass 25 kg load from the break for top film or glass crack after press the product with resistance 1s at the center area(25cm2) side.



9	TP Surface hardness	3 H -pressure. (500gf, 45°)
10	TP Tapping durability	One million times minimum. The requirements in 5.1.3 shall be satisfied. Tapping pen: Tip 8mm&R0.8 mm Polyacetal pen Load: 100gf Hitting speed: 3times/sec. Electric load: None
11	TP Pen sliding durability	100,000 times minimum. The requirements in 5.1.3) shall be satisfied. Sliding pen: Tip R0.8 mm Polyacetal pen. Load: 100gf Sliding speed:150 mm/sec. Sliding length: 20mm Electric load: None

Note:

1) If there is other special test item required, it should be discussed by the customer and VP.

2) The product should be tested and inspected at least 24 hours after the reliability experiment under the condition of room temperature.

3) Before MP, whether the reliability report is provided is based on our customer's requirement.

4) Only those products without unaccepted appearance and function defect pass inspection.

7.9 Package and storage

7.9.1 Placement

To handle lightly; to store in clear environment; to avoid direct daylight.

7.9.2 Cleaning method

Only soft cloth or equal material can be used to clean the screen gently. It is prohibited

to use any stiff or other unproposed liquid to clean the screen. Especially below material is absolutely prohibited:

- Water

- Ketone
- Aromaticity compound

7.9.3 Package and storage method

1) Please place the product according to the method showed on the packing box.

2) All products should be handled and placed lightly avoiding any bump and knock, especially throw onto the earth.

3) Once the pack is opened, extreme temperature & humidity and dust should be avoided.

4) There must be Anti-ESD measure to protect the product during usage (the product include CMOS component)

5) All returned defective products should be rightly packaged with their original packing material and method.

6) To prevent modules from degradation, Do not operate or store them exposed direct to sunshine or high temperature/humidity

7.9.4 In case of storing for long period of time, the following ways are recommended:

1) Storage in polyethylene bag with opening sealed so fresh air outside can

not enter in, and with no desiccant.

2) Placing in a dark place where neither exposure to direct sunlight nor light is keeping the storage temperature range.

3) Storing with no load on package surface by anything else.

8. General Precautions for touch panel

In order to prevent accidental use and performance deterioration, please keep the following precautions and inhibited points.

8.1. Transparency is an important factor for the product. So, please wear clean finger sacks, handling gloves and mask to protect the products from fingerprint or stain attach, and also hold the portion outside the view area when handling the panel.

8.2. Do not put a heavy, hard or sharp object on the product.

8.3. Wipe off the stain on the product by using soft cloth moistened with ethanol. Take care not to allow ethanol to soak into the joint of upper Film and bottom glass. Do not use any organic solvent or detergent other than ethanol.

8.4. Do not clean with a thing other than the finger such as hard or sharp edges like a finger nail etc. on the cloth, because it cause transparent conductive film cracks. Please advise this inhibition to your last customers

8.5. Operate it with a polyacetal pen (tip R0.8 or over) or a belly of a finger without applying operation excessive load. Do not operate by other than polyacetal pen (tip R0.8 or over) and/or a belly of a finger like a hard or a sharp edges such as a ball point pen, sharp pencil, sharp tiptoe, etc. Operation at the out of Active Area is out of our guarantee. Because, it causes a serious damage of a transparent electrode. Do not operate at the out of Active Area.

8.6. Design guide----important massage, please read it carefully.

(1) Electrical aspect

1. Keep the voltage under DC 7V operating the T/P.

2. The Touch Panel cannot work correctly while touch two separate points at the same time.

3. The contact resistance need to be stabilized before read the position figure.

4. Please design the capacitor value of the touch panel in your sensing circuit and low-pass filters as it acts in an equivalent circuit.

(2) Software

It should be have the location calibration function in customer's software.

Please include "User calibration" in your software programming for long term using.

(3) Mechanical Design

Active Area

The linearity, durability, and the operating force is guaranteed inside this area.

1. Please design your function area inside the" Active Area", which is 1mm~1.5mm inside of the transparent insulation area.

2. Usually, the" Active Area" is equal or more than customer's display "Active Area".

3. Due to the construction and the material character, the durability of the input area at the edge is less than the center area; suggest not placing the key function at the edge area.

Unbearable Area

1. It still can be activated at this area, only the resistance is not stately, the linearity could not be guaranteed.

2. While in design, to prevent the potential problem is to avoid the housing of the unit to have any contact from the touch panel, or possible pressing on it while holding it. The contact causes the malfunction.

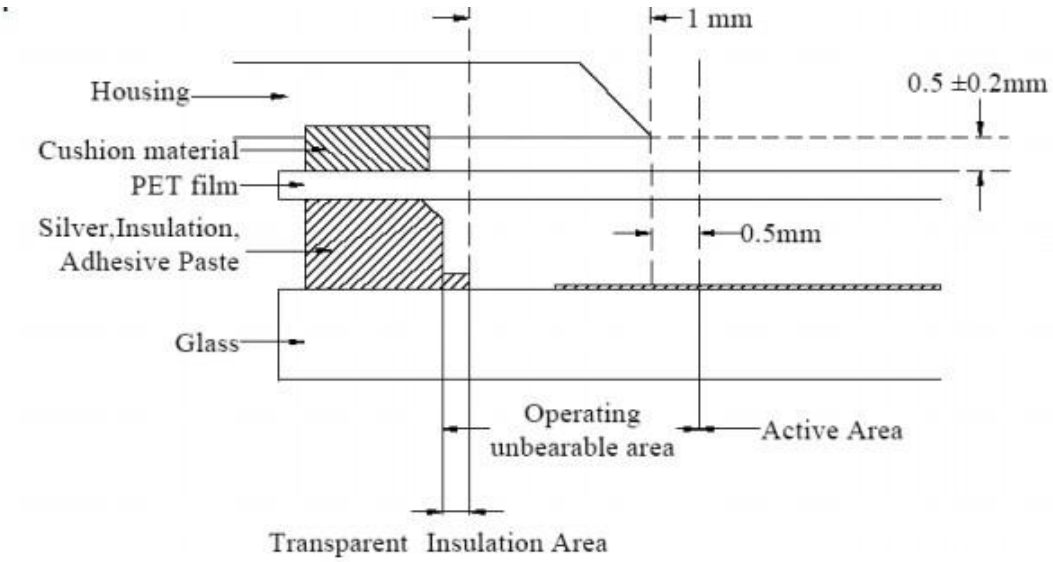
3. Normally, the durability is not guaranteed. The sliding in this area may cause the damage of the touch panel.

4. Usually the width of unbearable area is 1~1.5mm from “Active Area”, please check our specific drawing for each size, or discuss with our engineer.

Transparent Insulation-area

1. The Insulation area is located outside the “Active Area” with a distance of 1~1.5mm. Please see the attached drawing of cross-section construction. It is to prevent the malfunction of the housing edge contacting the touch panel.

2. We suggest your housing design at least keep. 1.0mm outside the inner edge of Transparent Area. Please see the attached drawing of cross-section construction.



9. Other agreement

9.1 Criterion application

9.1.1 Criterion confirmation

Before lot delivery, the inspection criterion and method proposed by VP must be confirmed by customer and VP respectively. The confirmed criterion and method will be taken as quality criterion for VP outgoing inspection and customer incoming inspection.

9.1.2 If there is unclear item in this criterion,the agreement can be achieved by making a reference sample after being discussed by two parties.

9.1.3 Any defect which is not defined or mentioned in this criterion must be confirmed and discussed by the two parties to determine whether it is acceptable.

9.2 Production guaranty period

The Lot production guaranty period is 12 months from the date when customer receives the product (the product should be used under the condition recommended by VP). VP should respond for the expense caused by repairing or changing the defective product,and VP should assist the customer to resolve the problem fed back by customer. The inspection method that will be performed by customer and VP. The confirmed criterion and method will

be the quality criterion in VP out going inspection and customer incoming inspection.

9.3 Disposal of defective product

Within the guaranty period, VP product defect found in the incoming inspection process, Test and finished goods inspection should be dealt with based on below principles.

9.3.1 Analysis and improvement for defective product.

1) On occasion when serious defect occurs or there is special requirement from customer, VP should analyze the defect root cause and take corresponding corrective actions.

2) Customer should provide VP with the defective sample or its picture and the production lot number and other necessary information for analysis.

3) The analysis report and the corrective action report should be provided by VP in 10 days after the analysis result is worked out.

9.3.2 Disposal on site

If it is necessary for VP analyst to do on-site defect analyze,VP analyst or related people should arrive at the appointed factory in time according to the customer requirement (limited in china main land). The customer should open the production line and provide necessary area and equipment or other condition for VP to analyze.

9.3.3 Disposal of returned defective product

Under the condition of that customer line can keep producing, customer return the defective products back to VP exactly the amount then VP should repair the defective product rapidly and delivery them back to customer. Customer should supply statistic information of defect happening in process and field periodically or by quantity and to VP. After receiving the report, VP should come to the spot to confirm the defect with customer and exchange the defective products, which caused by themselves with equal quantity good products. For those defective products caused by customer incorrect usage, VP

has the duty to help customer repair them, and the repairing expense should be determined based on the discussion between customer and VP.

9.4 The criterion should be advisably loosen (waive) if the defect do not influence the mobile function and appearance, if necessarily, the problem should be resolved through by discussing between customer and VP.

9.5 Recommended usage condition

Operation temperature:15℃~30℃.

Operation humidity:45~85%RH

The product should be stored under the recommended condition to keep its normal Characteristics.

9.6 In order to protect the LCD, glove should be used to avoid the stain and finger mark

during the assembling or any operation in which the operator may directly touch the LCD.

9.7 A good communication should be established between customer and VP, in order to resolve the problem, special personnel should be appointed for convenient communication.

END