TOPWIN DISPLAY Co.,Ltd.
10B B Tower Xuesong Building,Tairan Industrial Park,Futian District,Shenzhen
Tel:13922848035 Email:vk@topwin-cn.com

Product Specification

Customer P/N: _____

TOPWIN P/N: TW050LH9CTLCM

For Customer Approved

TOPWIN DISPLAY		
Approve	**Check**	**Prepare**

REVISION RECORD

Date	Version	Revision Items	Page	Design by
2015-05-29	2.0	Preliminary	ALL	Zhou Qi

CONTENTS

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1.General Specifications

The TW050LH9CTLCM model is a Color TFT(Main) LCD + CTP supplied by TOPWIN-Display. This main Module has a 5.0 inch diagonally measured active display area with 720*3(RGB)*1280 resolution. Each pixel is divided into Red, Green and Blue sub-pixels and dots which are arranged in vertical stripes. Main LCD color is determined with 16,777,216 colors signal for each pixel. TW050LH9CTLCM has been designed to apply the interface method that enables low power, high speed, and high contrast. TW050LH9CTLCM is intended to support applications where thin thickness, wide viewing angle and low power are critical factors and graphic displays are important.

Item	Contents	Unit	Note
LCD Type	a-si TFT	-	
Display color	16.7M		1
Viewing Direction	Free	0'Clock	
Viewing Area(W*H)	70*129.1	mm	
Number of Dots	720 * 3(RGB) * 1280	mm	
Dot Size(W*H)	198x198	um	
LCD Controller	HX8394	-	
LCD V_{CC}	2.8	V	
Operating Temperature	-20～+70℃	-	
Storage Temperature	-30～+80℃	-	
Weight	TBD	g	2
LCD Data Transfer	MIPI4	-	
LCD Polarizer Mode	Transmissive Mode	-	
CTP Type	G-F-F		
CTP Controller	GT3516		
CTP Vcc	2.8	V	
CTP Interface	I2C		

Note 1: Color tune is slightly changed by temperature and driving voltage.
Note 2: TBD- To Be Determined.

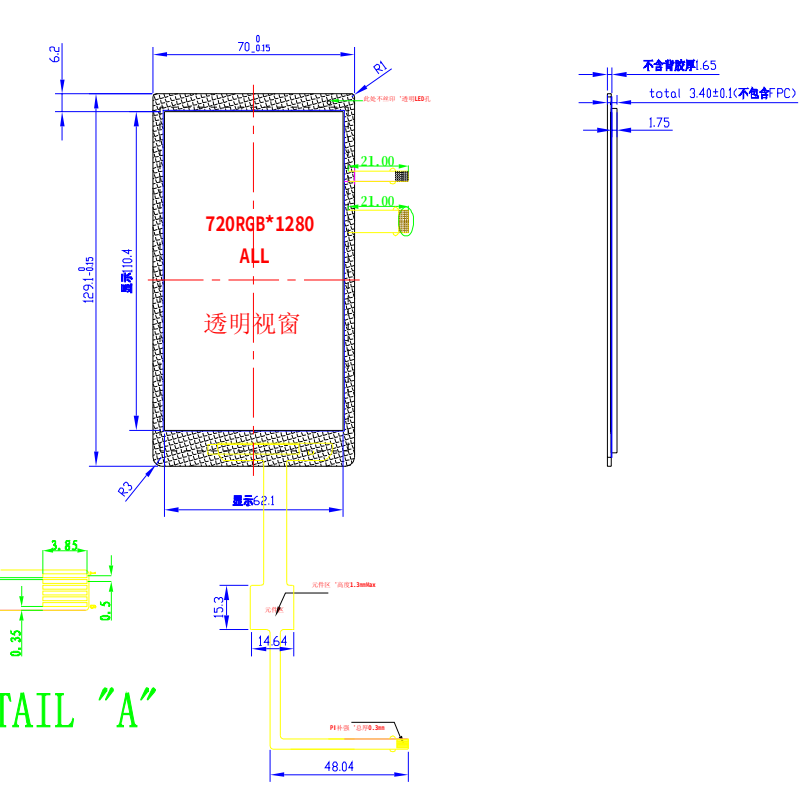
Note: Requirements on Environmental Protection: ROHS

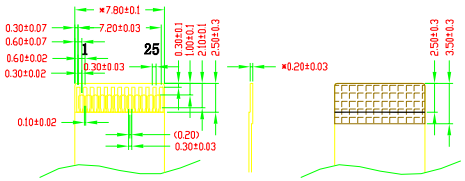
REV	DATE	Content	Approved

正视图

侧视图

背视图





B-B 插接手指局部图 (S=4:1)

DETAIL "A"

LCM Pin Assignment

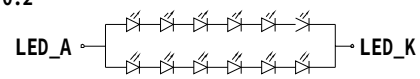
Pad No.	Pad Name
1	LED_A
2	NC
3	LED K
4	VPP
5	TE
6	RESET
7	VIO(1.8V)
8	VCC(2.8V)
9	NC
10	GND
11	D1P
12	D1N
13	GND
14	D2P
15	D2N
16	GND
17	CLKP
18	CLKN
19	GND
20	D3P
21	D3N
22	GND
23	DOP
24	DON
25	GND

CTP Pin Assignment

PIN	ASSIGNMENTS
1	SCL 3.3V
2	SDA 3.3V
3	RESET 3.3V
4	INT 3.3V
5	VDD 3.3V
6	GND

Notes:
1. Display :5",HD TFT
2. Resolution: 720xRGBx1280
3. Viewing Direction:ALL
4. Polarizer Mode: Transmissive/Positive;
5. LCD Driver:HX8394, CTP Driver:GT3516
6. Backlight: 12 Chip-White LED
7. Operating temperature:-20° C~60° C, Storage temperature:-30° C~70° C
8. 表面硬度≥6H;
9.( ):Referance dimension * :Critical dimension, general tolerance ±0.2
10.Connector type : XXXXXXX
11.Requirements on Environmental Protection: ROHS
12.RECOMMENDED CELL PHONE WINDOW SIZE: 0.30mm FROM LCD A/A AREA.

CIRCUIT DIAGRAM:
12 CHIP-WHITE LED If=40mA Vf=19.2



3RD ANGLE			TOPWIN DISPLAY Co,Ltd		
NOT IN SCALE	NAME	DATE	CUST NO.:	UNIT:	mm
DRAFTED BY:	D	20151222		Tolerance:	±0.1
CHECKED BY:			Product NO.:	SCALE:	1:1
APPROVED BY:				SH NO:	1/1

3. Absolute Maximum Ratings (Ta=25℃)

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LCD Power for Circuit	VCC	2.6	2.8	3.3	V	
CTP Power for Circuit	CTP_VCC	2.8	---	3.3	V	
Operating Temperature	Top	-20	-	+70	℃	1), 2)
Operating Ambient Humidity	HOP	10	-	90	%RH	1), 2)
Storage Humidity	Hstg	10	-	90	%RH	1), 2)
Storage Temperature	Tst	-30	-	+80	℃	1), 2)

Notes:

The following are maximum values which, if exceeded, may cause operation or damage to the unit.

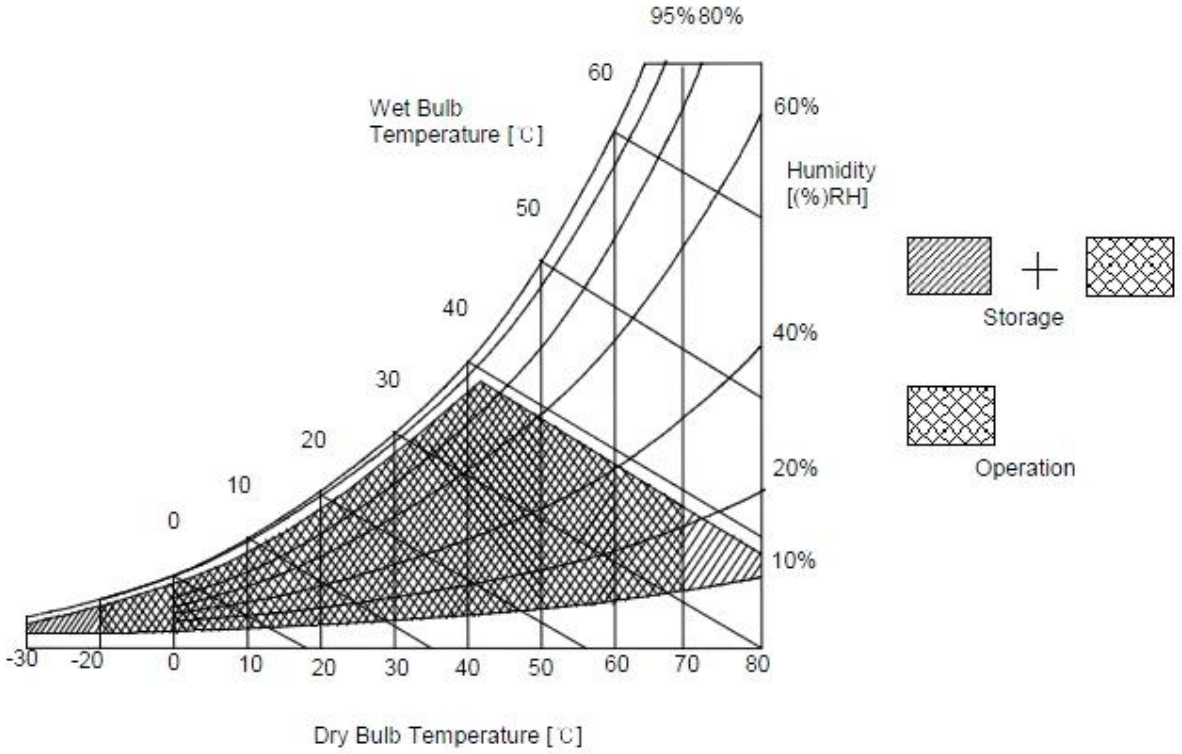
1) Temp. <= 60℃, 90%RH MAX.

Temp. >60℃, Absolute humidity shall be less than 90% RH at 60℃.

2) The diagram below indicates the peripheral environment of the module.

The wet bulb temperature should be kept under 39 °C and there should be no compensation.

If the LSI is used above these absolute maximum ratings, it may become permanently damaged.



4. Electrical Specifications

4.1 LCD Electrical characteristics (Ta=25℃)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Power for Analogue Circuit	V_{CC}	Ta=25℃	2.6	2.8	3.3	V	
Logic Input Voltage	V_{IH}	-	0.8*VCC	-	VCC	V	
	V_{IL}	-	0	-	0.2*VCC	V	
Current Consumption	I_{Ci}	Normal mode	-	-	-	mA	
	I_{stb}	Stand-by mode	-	0.05	0.1	mA	
	I_{bat}	Dimming mode	-	-	-	mA	

Notes:
The recommended operating conditions refers to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings. Accordingly, please make sure that the module is used within this range. And these current values are measured under the condition that all device are stopped, each component is stable and logic signal is input.

4.2 LED backlight specification

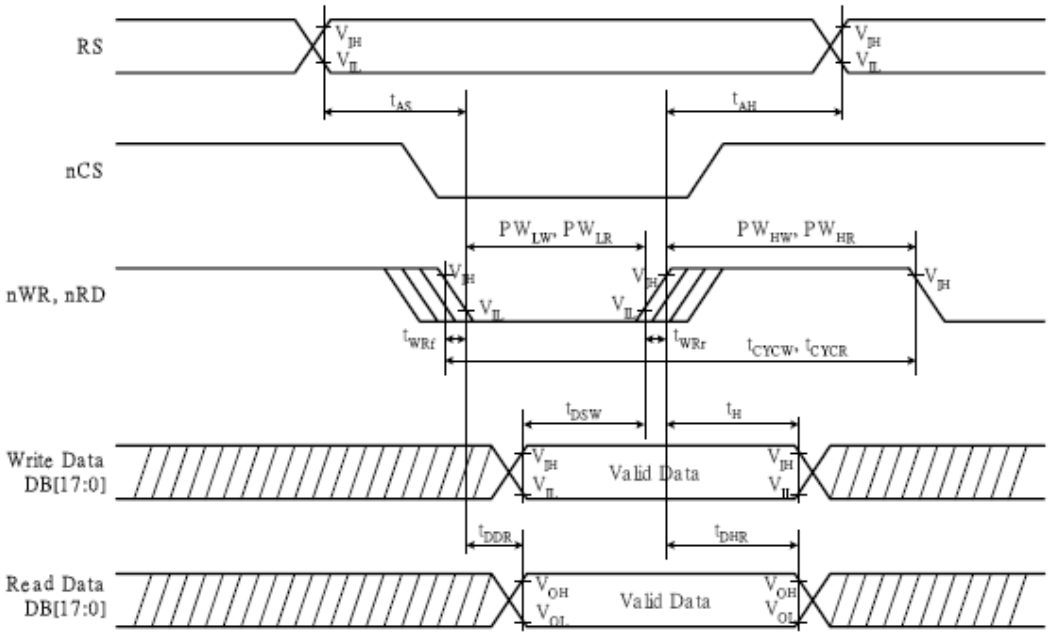
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Forward voltage	V_f	I_f=40mA	18	19.2	19.8	V	Without Pol., LCD and Touch Panel
Luminance	Lv		7000	9000	-	Cd/㎡	
Colour Coordinate	X		0.260		0.310		
	Y		0.260		0.310		
Reverse Current	I_r	V_r= 3.2V			15	μA	
Uniformity		I_f= 20 mA	80			%	

4.3 Interface Signals

Pin	Symbol	Function
1	LEDA	LED Anode Connection
2	NC	No Connection
3	LEDK	LED Cathode Connection
4	NC	No Connection
5	TE	TE
6	RESET	LCD Reset Signal
7	VIO	LCD IOVCC / 2V8 / 1V8
8	VCC	LCD VCC / 2V8
9	NC	No Connection
10	GND	Ground (0V)
11	D1P	Date 1 Lane
12	D1N	Date 1 Lane
13	GND	Ground (0V)
14	D2P	Date 2 Lane
15	D2N	Date 2 Lane
16	GND	Ground (0V)
17	CP	CLK Signal
18	CN	CLK Signal
19	GND	Ground (0V)
20	D3P	Date 3 Lane
21	D3N	Date 3 Lane
22	GND	Ground (0V)
23	D0P	Date 0 Lane
24	D0N	Date 0 Lane
25	GND	Ground (0V)
TP PIN Assignment		
1	CTP_SCL	CTP I2C Serial Clock Signal
2	CTP_SDA	CTP I2C Serial Data Signal
3	CTP_WAKE	CTP Reset Signal
4	CTP_INT	CTP I2C Interrupt Signal
5	CTP_VCC/2 V8	CTP VCC / 2V8
6	GND	Ground (0V)

4.4 LCD Interface Timing Chart (Please reference IC datasheet about RGB timing)

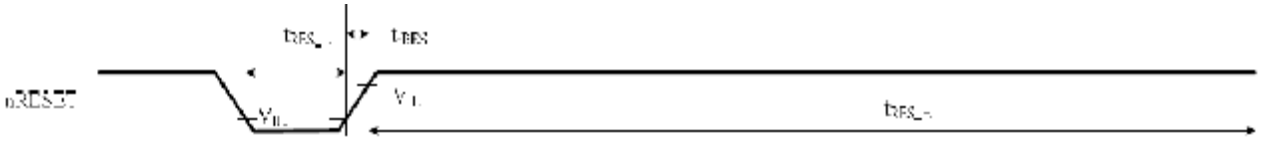
Parallel interface characteristics: 18, 16, 9 or 8-bits bus (8080-series MCU interface)



i80-system Bus Timing

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

4.5 LCD Reset Timing (Please reference IC datasheet about RGB timing)



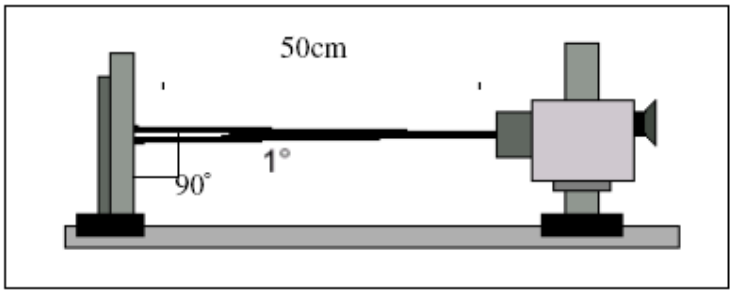
Reset Timing Characteristics (IOVCC = 1.65 ~ 3.3 V)

Item	Symbol	Unit	Min.	Typ.	Max.
Reset low-level width	t_{RES_L}	ms	1	-	-
Reset rise time	t_{rRES}	µs	-	-	10
Reset high-level width	t_{RES_H}	ms	50	-	-

5. LCD Optical Characteristics

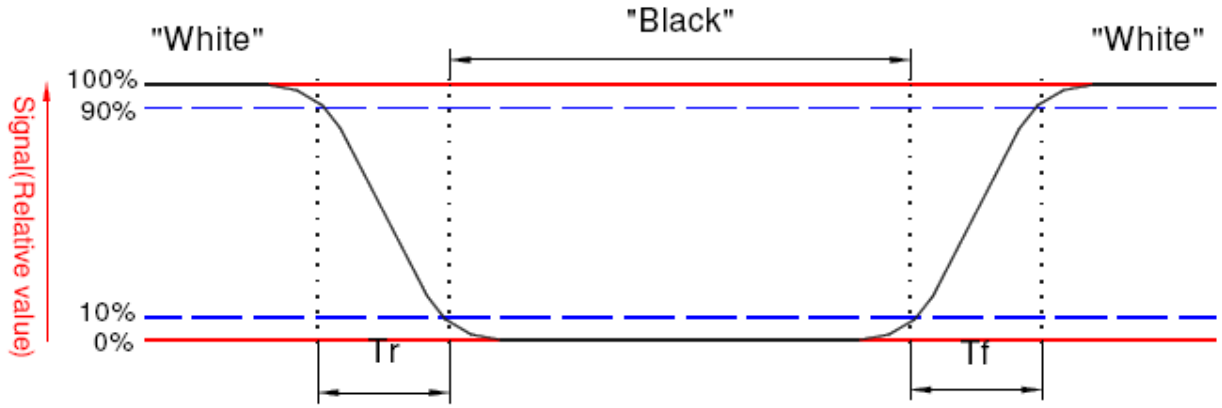
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time (with polarizer)	Rise	Tr	θ=0°	-	10		ms	Note 4, 5
	Fall	Tf		-	20		ms	
Contrast ratio (with polarizer)		CR	At optimized Viewing angle	150	200	-		Note 5, 6
Viewing angle (with polarizer)	Top		CR≧10		60	-	degree	Note 5, 7
	Bottom				15	-		
	Left				40	-		
	Right				40	-		
Transmittance				6.5%				
Color filter coordination		Rx	θ=0°	-	0.58	-		Simulated by LED light source, which is provided by customer
		Ry		-	0.34	-		
		Gx		-	0.32	-		
		Gy		-	0.58	-		
		Bx		-	0.15	-		
		By		-	0.11	-		
		Wx		-	0.30	-		
		Wy		-	0.32	-		

Note 1: Ambient temperature =25℃±2℃.
Note 2: To be measured in the dark room with backlight unit.
Note 3: To be measured at the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 10 minutes operation (module).



Note 4: Definition of response time:

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:



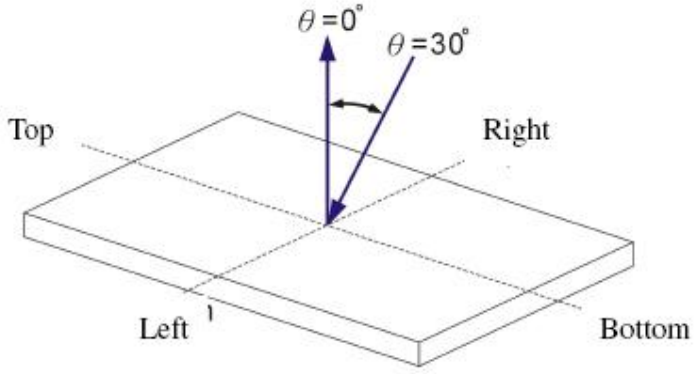
Note 5. White Vi=0.9V
Black Vi=4.5V

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6. Definition of contrast ratio:
Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 7. Definition of viewing angle:
Refer to the figure as below.

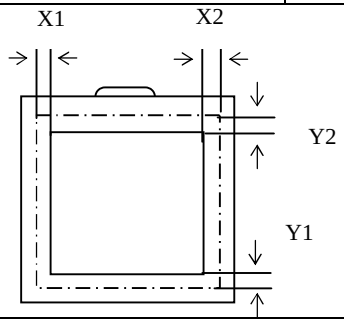


6. LCD Reliability

No.	Test Item	Test condition	Criterion
1	High Temperature Storage	80℃±2℃96H Restore 4H at 25℃	1. After testing, cosmetic defects should not happen. 2.Total current consumption should not be over 10% of initial value.
2	Low Temperature Storage	-30℃±2℃ 96H Restore 4H at 25℃	
3	High Temperature Operation	70℃±2℃ 48H Restore 4H at 25℃	
4	Low Temperature Operation	-20℃±2℃ 48H Restore 4H at 25℃	
5	High Temperature /Humidity Storage	40℃±2℃ 90%RH 48H	
6	Temperature Cycle	-30℃←→25℃←→80℃ 5min 30min ←→25℃ , 5min after 10cycle, Restore 4H at 25℃	
7	Vibration Test (package state)	10Hz~150Hz, 100m/s2, 120min	Not allowed cosmetic and electrical defects.
8	Shock Test (package state)	Half- sine wave,300m/s2, 18ms	
9	Atmospheric Pressure Test	25kPa 16H Restore 2H	

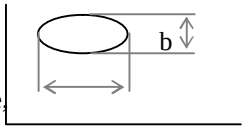
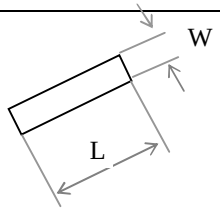
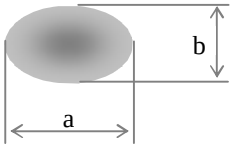
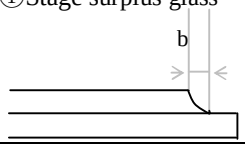
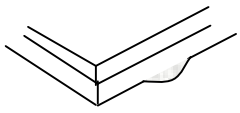
7.LCD Quality level

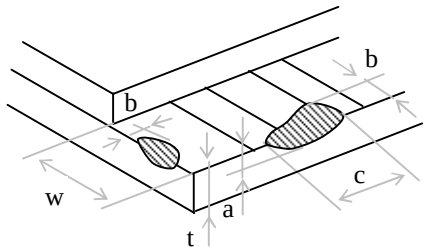
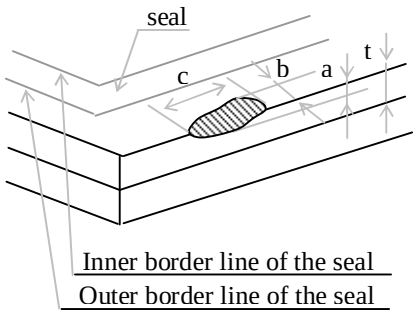
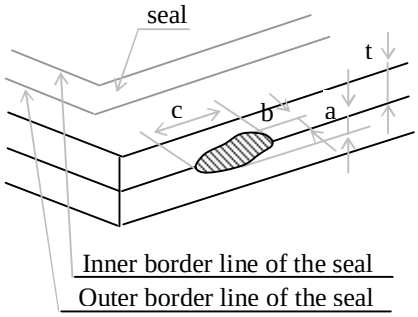
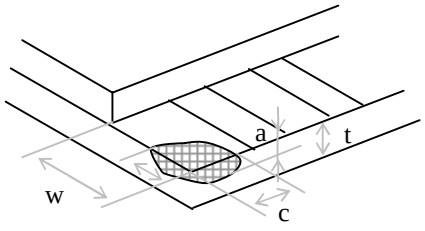
7.1 Notes for quality standard

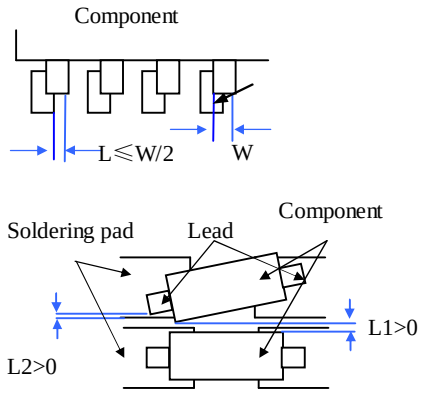
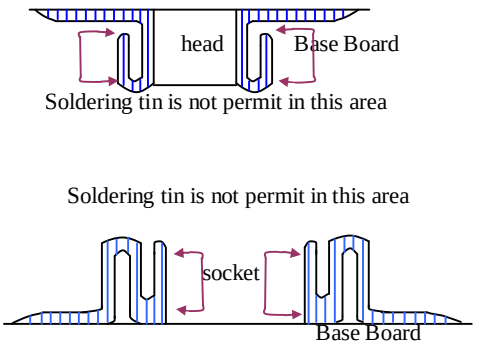
<table>
<tr><td></td><td colspan="2">Note</td></tr>
<tr><td>General</td><td colspan="2">1. Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and Tianma.
2. Viewing Area should be the area which Tianma guarantees.
3. Limited sample should be prior to this Inspection standard.
4. Viewing Judgement should be under static pattern.
5. Inspection conditions
Inspection distance : 250 mm (from the sample)
Temperature : 25±5℃
Inspection angle : 45degrees in LCD view direction</td></tr>
<tr><td rowspan="4">Definitions of Inspection items</td><td>Pinhole, Bright spot, Black spot, White spot, Black line, White Line, Foreign particle, Bubble</td><td>The color of a small area is different from the remainder.
The phenomenon dose not change with voltage.</td></tr>
<tr><td>Contrast variation</td><td>The color of a small area is different from the remainder.
The phenomenon changes with voltage.</td></tr>
<tr><td>Polarizer defect</td><td>Scratch, Dirt, Particle, Bubble on polarizer or between polarizer and glass.</td></tr>
<tr><td>Glass defect</td><td>Glass crack, Shaved corner of glass, Surplus glass</td></tr>
<tr><td>Definitions of Inspection ranges</td><td colspan="2"> 

Dividing A zone and B zone proceed to make a judgment.
A zone : Inside Viewing area
B zone : Outside Viewing area
X1(A.A~V.A): mm
X2(A.A~V.A): mm
Y1(A.A~V.A): mm
Y2(A.A~V.A): mm</td></tr>
<tr><td>Outgoing Inspection standard</td><td colspan="2">Inspection level Ⅱ Normal Inspection Sampling standard conforms to GB2828
<table>
<tr><td>Rank</td><td>Inspection Item</td><td>AQL(Number of defective LCMs counted)</td></tr>
<tr><td>Major defect</td><td>All Functional defects(Such as No display, Display abnormally, Open or missing segment, Short circuit，Missing component, No sound, Blight abnormally),Outline dimension beyond the drawing</td><td>0.65</td></tr>
<tr><td>Minor defect</td><td>Appearance defects, such as Black/White spot, Bright spot, Pinhole, Black/White line, Contrast variation, Bubble Glass defect, Polarizer defect, and so on. Details of the standard as follows.</td><td>1.50</td></tr>
</table></td></tr>
</table>

7.2Standards of inspection items

Inspection item			Judgement standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot Bright Spot, Pinhole Foreign Particle, Bubble and Particle Between polarizer and glass, Scratch on polarizer	 Φ=(a+b)/2(mm)	A	Φ≦0.15	Neglecte	Neglected
			B	0.15<Φ≦0.20	2	
			C	0.20<Φ≦0.30	1	
			D	0.30<Φ	0	
			Total defective point(B,C)		3	
2	Black line, White line, Bubble and Particle Between Polarizer and glass, Scratch on polarizer	 W:Width, L:Length(mm)	A	W≦0.10	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)		2	
3	Contrast variation	 Φ=(a+b)/2(mm)	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	Bubble inside cell		any size		none	none
5	Polarizer defect (if Polarizer is used)	Scratch and damage on polarizer, Particle on polarizer or between polarizer and glass.	Refer to item 1 and item 2.			
		Bubble, dent and convex	A	Φ≦0.3	Neglected	Neglected
			B	0.3<Φ≦0.7	2	
			C	0.7<Φ	0	
			Total defective point(B,C)		2	
6	Surplus glass	①Stage surplus glass 	b≦0.3mm			
		②Surrounding surplus glass 	Should not influence outline dimension and assembling.			

<table>
<tr><td colspan="3" rowspan="2">Inspection item</td><td colspan="2">Judgment standard</td></tr>
<tr><td colspan="2">Category(application: B zone)</td></tr>
<tr><td rowspan="4">7</td><td rowspan="4">Glass defect crack</td><td rowspan="4">①The front of lead terminals
 
</td><td>A</td><td>If a ≦ t and b ≦1.0, c is not limited</td></tr>
<tr><td>B</td><td>a ≦ t, 1≦b≦2mm, c≦3mm</td></tr>
<tr><td>C</td><td>If glass crack cover alignment mark, b≦0.5mm.</td></tr>
<tr><td>D</td><td>Crack at two sids of lead terminals should not cover patterns and alignment mark</td></tr>
<tr><td></td><td></td><td>②Surrounding crack—non-contact side
 
</td><td colspan="2">b < Inner borderline of the seal</td></tr>
<tr><td></td><td></td><td>③ Surrounding crack— contact side
 
</td><td colspan="2">b < Outer borderline of the seal</td></tr>
<tr><td></td><td></td><td>④Corner
 
</td><td>A</td><td>a ≦ t, b ≦ 3.0, c ≦ 3.0
*Glass crack should not cover patterns used for</td></tr>
</table>

Inspection item			Judgement standard
8	PCB defect	Component soldering: No cold soldering、short、open circuit、burr、tin ball The flat encapsulation component position deviation must be less than 1/2 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 1/2of its width; The lead burr must be less than 1/2 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	

8. Precautions for Use of LCD Modules

8.1 Handling Precautions

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

8.1.2 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.

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

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

8.1.5 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

8.1.6 Do not attempt to disassemble the LCD Module.

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

8.1.8 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.

8.2 Storage precautions

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

8.2.2 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%

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

8.**3** The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.