SPECIFICATION
FOR TFT+TP MODULE

MODEL NO:	TM057QVHG01
CUSTOMER:	
CUSTOMER P/N.	
VERSION	V1.0
CUSTOMER APPROVED	

■Preliminary specification
□Final specification

PREPARED BY	CHECKED BY	VERIFIED BY QA DEPT.	APPROVED BY

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TFT+TP REVISION RECORD

Version	Page	Revision Items	Name	Date
1.0		First release	Yunhua Xu	2013.03.15

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1. General Specifications

TM057QVHG01 is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver IC , FPC, a back light unit and CTP (Capacitive Touch Panel) with Multi-Touch function. The mounting method is with double-sided tape bonding . This product accords with RoHS environmental criterion.

Item	Feature	Spec	Unit	Note
TFT	Size	5.7	inch	--
	Resolution	640(RGB) x 480	--	--
	Interface	RGB 18 bits	--	--
	Color Depth	262k	--	--
	Technology Type	a-Si	--	--
	Pixel Pitch	0.180x0.180	mm	--
	Pixel Configuration	R.G.B. Vertical Stripe	--	--
	Display Mode	TM with Normally White	--	--
	Surface Treatment(Up Polarizer)	Anti-Glare(3H)	--	--
	Viewing Direction	6 o'clock	--	1
	Gray Scale Inversion Direction	12 o'clock	--	--
	LCM (W x H x D)	144.00x104.60x12.30	mm	--
TP	Operation Technology	Projected capacitive	--	--
	Control IC	NT11003_QFN68	--	--
	Input Method	Bare finger	--	--
	Number of simultaneous touches	2 points	--	--
	Surface hardness	--	--	--
	Minimum Touch Area	Φ6	mm	--
	Finger Pitch	15	mm	--
	Product structure	Glass Lens－Glass Sensor	--	2
	Interface	I2C		
Mechanical Characteristics	TFT Active Area	115.20x86.40	mm	--
	TP Active Area	119.20x90.40	mm	--
	LED Numbers	21 LEDs	--	--
	Weight	TBD	g	3

Reliability Characteristics	Operation temperature	-20~70	℃	--
	Storage temperature	-30~80	℃	--

Note 1: Viewing direction for best image quality is different from Gray Scale Inversion Direction, there is a 180 degree shift.
Note 2: Requirements on Environmental Protection: RoHS.
Note 3: The weight is for reference only.

2. Input/Output Terminals

2.1 TFT CN1 pin assignment

Connector type: 089H33-000100-G2-R (STARCONN)

No	Symbol	I/O	Description	Comment
1	GND	P	Ground	
2	CK	I	Dot clock. Latch data at falling edge of CK.	
3	Hsync	I	Horizontal sync signal in SYNC mode. Pull low or floating when DE mode.	
4	Vsync	I	Vertical sync signal in SYNC mode. Pull low or floating when DE mode.	
5	GND	P	Ground	
6	R0	I	Red data (LSB)	
7	R1	I	Red data	
8	R2	I	Red data	
9	R3	I	Red data	
10	R4	I	Red data	
11	R5	I	Red data (MSB)	
12	GND	P	Ground	
13	G0	I	Green data(LSB)	
14	G1	I	Green data	
15	G2	I	Green data	
16	G3	I	Green data	
17	G4	I	Green data	
18	G5	I	Green data(MSB)	
19	GND	P	Ground	
20	B0	I	Blue data(LSB)	
21	B1	I	Blue data	
22	B2	I	Blue data	
23	B3	I	Blue data	
24	B4	I	Blue data	
25	B5	I	Blue data(MSB)	
26	GND	P	Ground	
27	ENAB	I	Data enable signal in DE mode. This pin must pull high when SYNC mode.	
28	VCC	P	Power supply	
29	VCC	P	Power supply	
30	R/L	I	Set horizontal scan direction: Low/NC: left to right; High: right to left	
31	U/D	I	Set vertical scan direction: High/NC: up to down; Low: down to up	
32	NC	-	No connection	
33	GND	P	Ground	

Note1: I/O definition:
I----Input O----Output P----Power/Ground
Note2: CN1 Matching FPC type: 33 pin, pitch: 0.5mm, height: 0.3mm.

Table 2.1 CN1 pin assignment

2.2CN2 pin assignment (backlight interface)

Connector type: SHLP-06V-S-B (JST)

No	Symbol	I/O	Description	Comment
1	AN1	P	LED Anode Terminal	Red
2	AN2	P	LED Anode Terminal	Red
3	AN3	P	LED Anode Terminal	Red
4	CA1	P	LED Cathode Terminal	White
5	CA2	P	LED Cathode Terminal	Blue
6	CA3	P	LED Cathode Terminal	Black

Note1: CN2 Matching Connector type: SM06B-SHLS-TF (JST)
Note2:P: Power/GND; I: input pin; I/O: input or output pin;

Table 2.2 CN2 pin assignment

2.3 TP pin assignment

Pin No.	Symbol	I/O	Description	Remark
1	GND	P	Groud	
2	RESET	I/O	External interrupt from the host	
3	VDD	P	CTP power supply	
4	INT	I/O	External interrupt to the host	
5	SCL	I/O	I2C clock input	
6	SDA	I/O	I2C data input and output	
7	H_SYNC	I/O	External singal from LCD	
8~10	NC	NC	NC	

3. Absolute Maximum Ratings

Ta = 25℃

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD	-0.50	5.00	V	
	VIN	-0.50	5.00	V	Note1
Operating Temperature	TOP	-20	70	℃	Note2
Storage Temperature	TST	-30	80	℃	

Table 3.1 absolute maximum rating

Note1: The parameter is for driver IC (gate driver, source driver) only
Note2: 70℃ is the surface temperature of module

4. Electrical Characteristics

4.1 .1Driving TFT LCD Panel

Ta = 25℃

Item		Symbol	Min	Typ	Max	Unit	Remark
Voltage for logic circuit		VCC	3.00	3.30	3.60	V	
Permissive input ripple Voltage		VRF	--	--	100	mVp-p	VCC=3.3
Current of VCC Power supply		IVCC	--	TBD	TBD	mA	Note2
Common Electrode Driving Signal		VCOM	--	TBD	--	V	Note1
Input Signal Voltage	Low Level	VIL	0	-	0.3xVCC	V	
	High Level	VIH	0.7xVCC	-	VCC	V	

Table 4.1 LCD module electrical characteristics

Note1: For different LCM, the value may have a bit of difference.
Note2: To test the current dissipation, use “all Black Pattern”.

4.1.2 TFT Driving Backlight

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Voltage	VLED	--	22.4	25.9	V	
Backlight Power Consumption	WBL	--	1732	--	mW	
Life Time	--	25,000	50,000	--	Hrs	Note3
Series1 Forward Current	I1	--	25	--	mA	Note1
Series2 Forward Current	I2	--	25	--	mA	
Series3 Forward Current	I3	--	25	--	mA	

Table 4.2 LED backlight characteristics

Note 1: I_F is defined for one channel LED. There are total three LED channels in back light unit.Under LCM operating, the stable forward current should be inputted.

Note 2: Optical performance should be evaluated at Ta=25℃ only.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

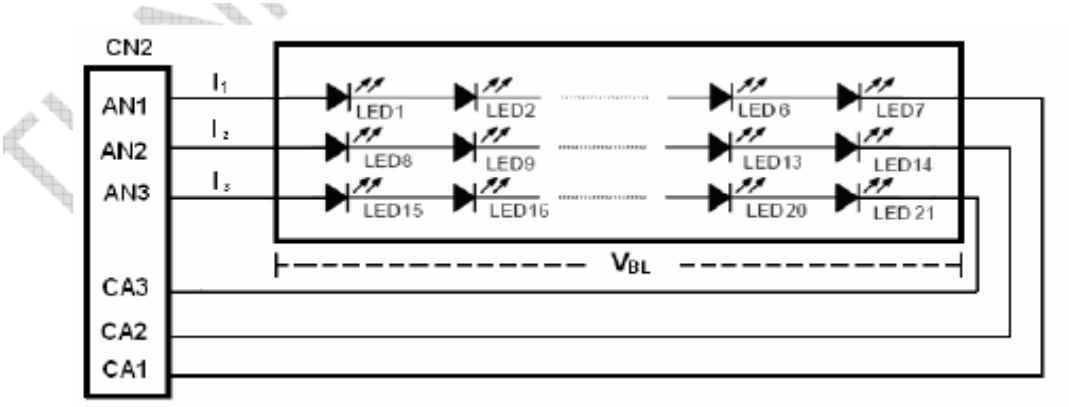


Figure 4.2 LED connection of backlight

4.2 TP DC Characteristics

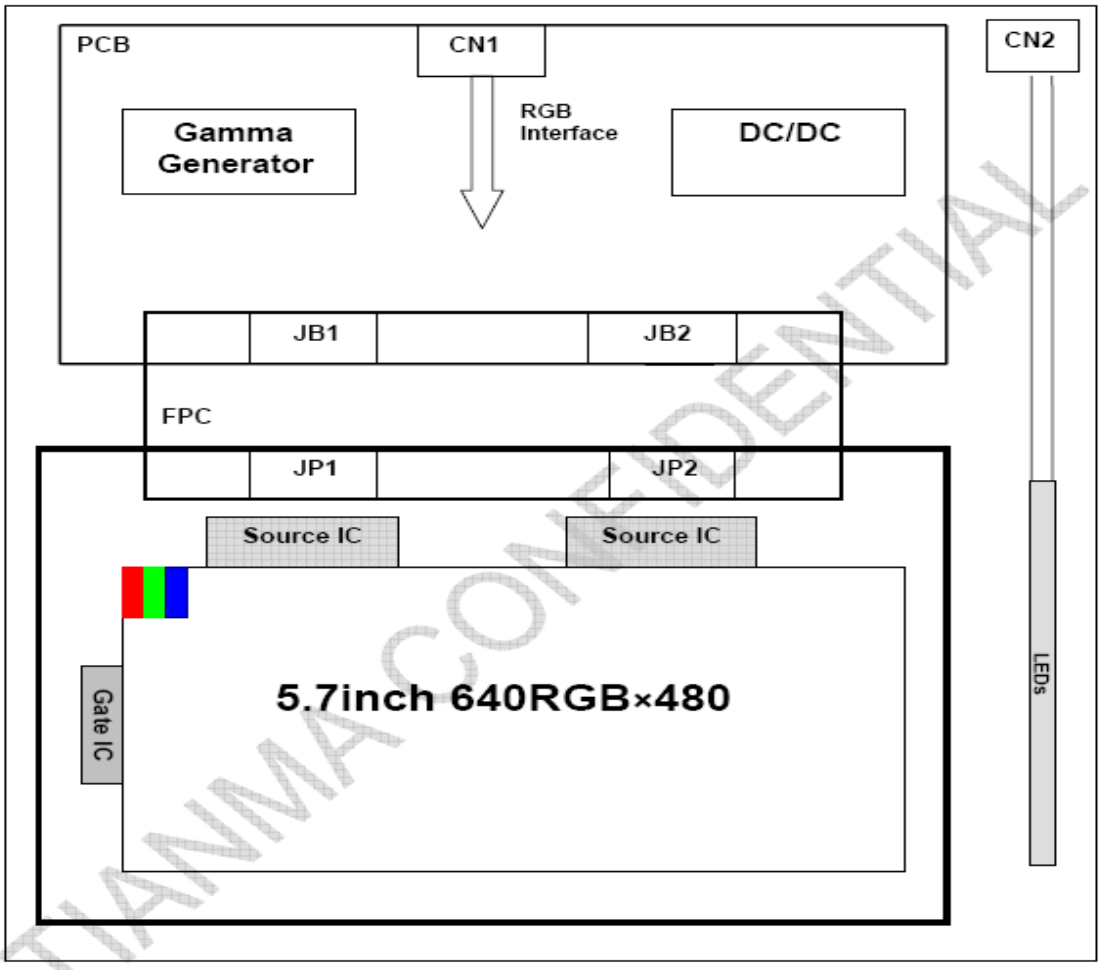
(T_A= 25℃,VDD=3.3V)

Item	Min	Typ	Max	Unit	Note
power supply voltage	--	3.3	--	V	DC(noise should be under 100mV)
Power supply current	--	6	10	mA	One finger on sensor
Sleep mode	--	--	60	uA	
Respond time	--	--	200	ms	

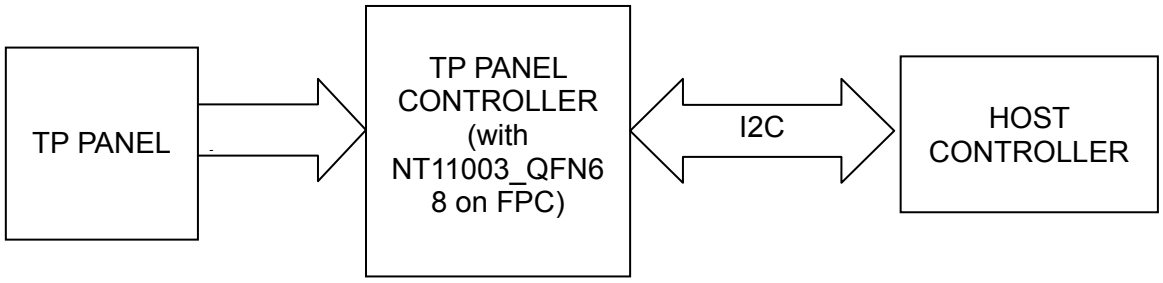
Note1: All current measurement is average current.

4.3 Block Diagram

4.3.1 TFT Block Diagram



4.3.2 TP Circuit Block Diagram



5. Data input timing

5.1 SYNC mode

Parameter	Symbol	Symbol	Min	Typ	Max	Unit
CK	Dotclk frequency	Fclk	24.8	25.2	34.2	MHz
	Dotclk cycle	Tclk	29.24	39.68	40.32	ns
Hsync	Horizontal display area	Thd	640	640	640	Tclk
	1 horizontal line	Th	800	800	1000	Tclk
	Hsync pulse width	Thpw	1	-	-	Tclk
	Horizontal blank	Thb	144	144	144	Tclk
	Horizontal front porch	Thfp	16	16	216	Tclk
Vsync	Frame rate	-	-	60	-	Hz
	Vertical display area	Tvd	480	480	480	Th
	Vsync period time	Tv	516	525	570	Th
	Vsync pulse width	Tvpw	1	-	-	Th
	Vsync blank	Tvb	35	35	35	Th
	Vsync front porch	Tvfp	1	10	55	Th

Table 5.1 SYNC mode input timing

5.2 DE mode

Description		Symbol	Min	Typ	Max	Unit
CK	Dot clock frequency	Fclk	24.8	25.2	34.2	MHz
Horizontal section	Horizontal total	Th	800	800	1000	Tclk
	H Total blank	Thb+Thfp	160	160	360	Tclk
	Valid Data Width	Thd	640	640	640	Tclk
Vertical section	Frame rate	-	-	60	-	Hz
	Vertical total	Tv	516	525	570	Th
	V total blank	Tvb+Tvfp	36	45	90	Th
	Valid Data Width	Tvd	480	480	480	Th

Note: The LCM could auto-detect which mode is working.

Table 5.2 DE mode input timing

5.3. Timing Diagram

5.3.1 Vertical Input Timing

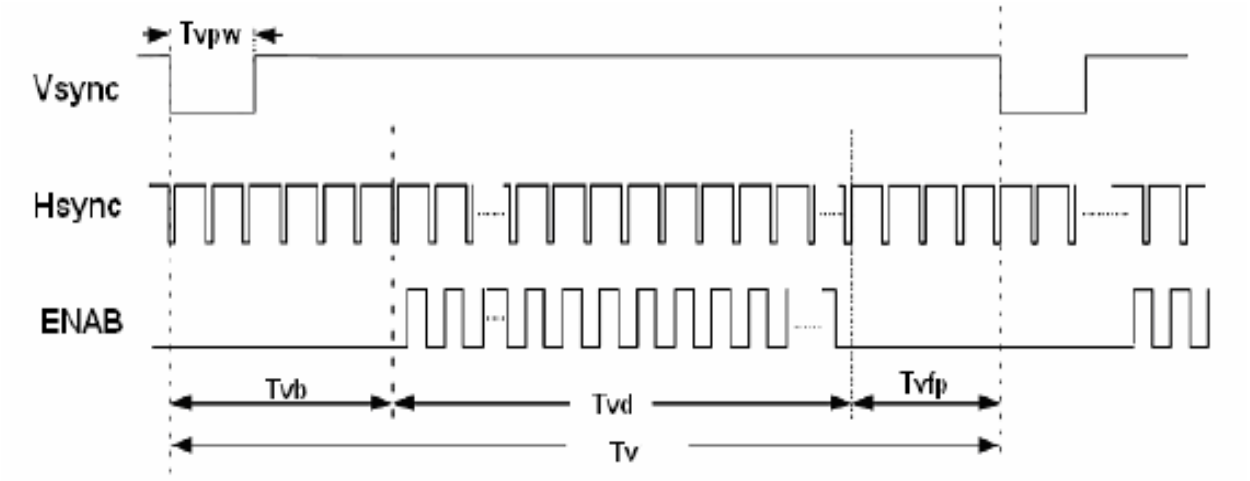


Figure 5.3.1 Vertical input timing

5.3.2 Horizontal Input Timing

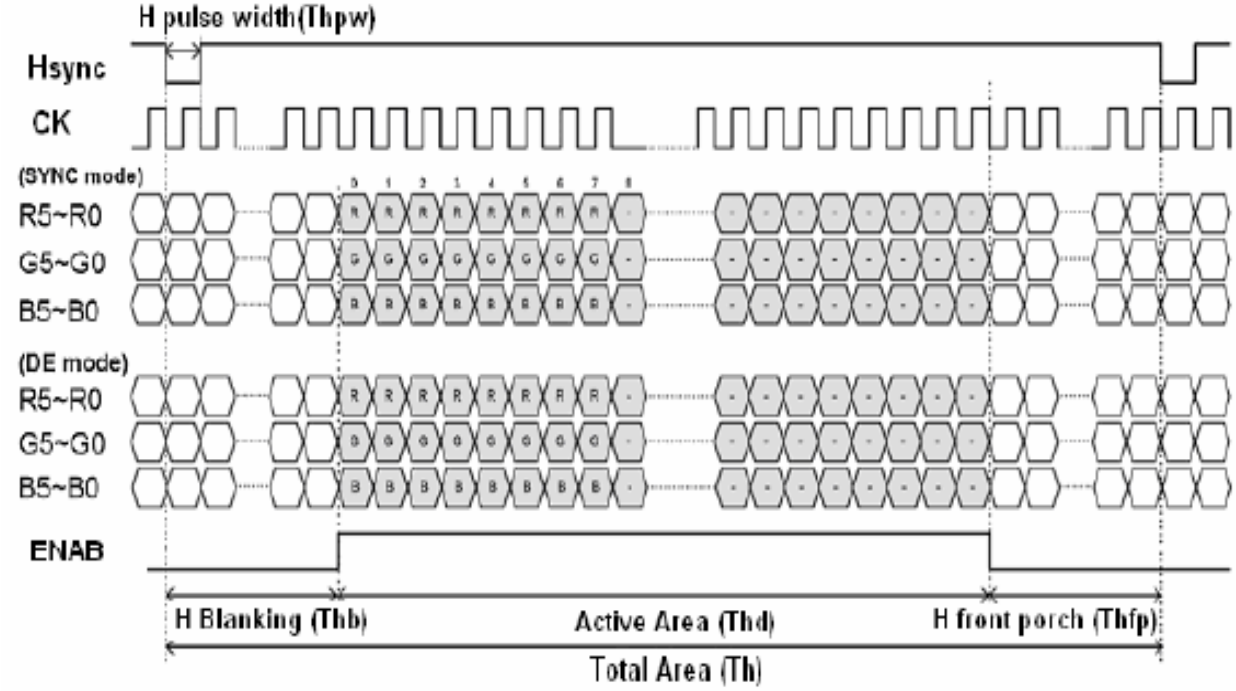


Figure 5.3.2 Horizontal input timing

5.4 AC input characteristics

(VCC=3.3V, GND=0V, Ta=25℃)

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
CK pulse duty	Tcwh	40%	50%	60%	Tclk	
Vsync setup time	Tvst	8	-	-	ns	
Vsync hold time	Tvhd	8	-	-	ns	
Hsync setup time	Thst	8	-	-	ns	
Hsync hold time	Thhd	8	-	-	ns	
Data setup time	Tdsu	8	-	-	ns	Rn, Gn, Bn to Dotclk
Data hold time	Tdhd	8	-	-	ns	Rn, Gn, Bn to Dotclk
ENAB setup time	Tesu	8			ns	

Table 5.4 AC input characteristics

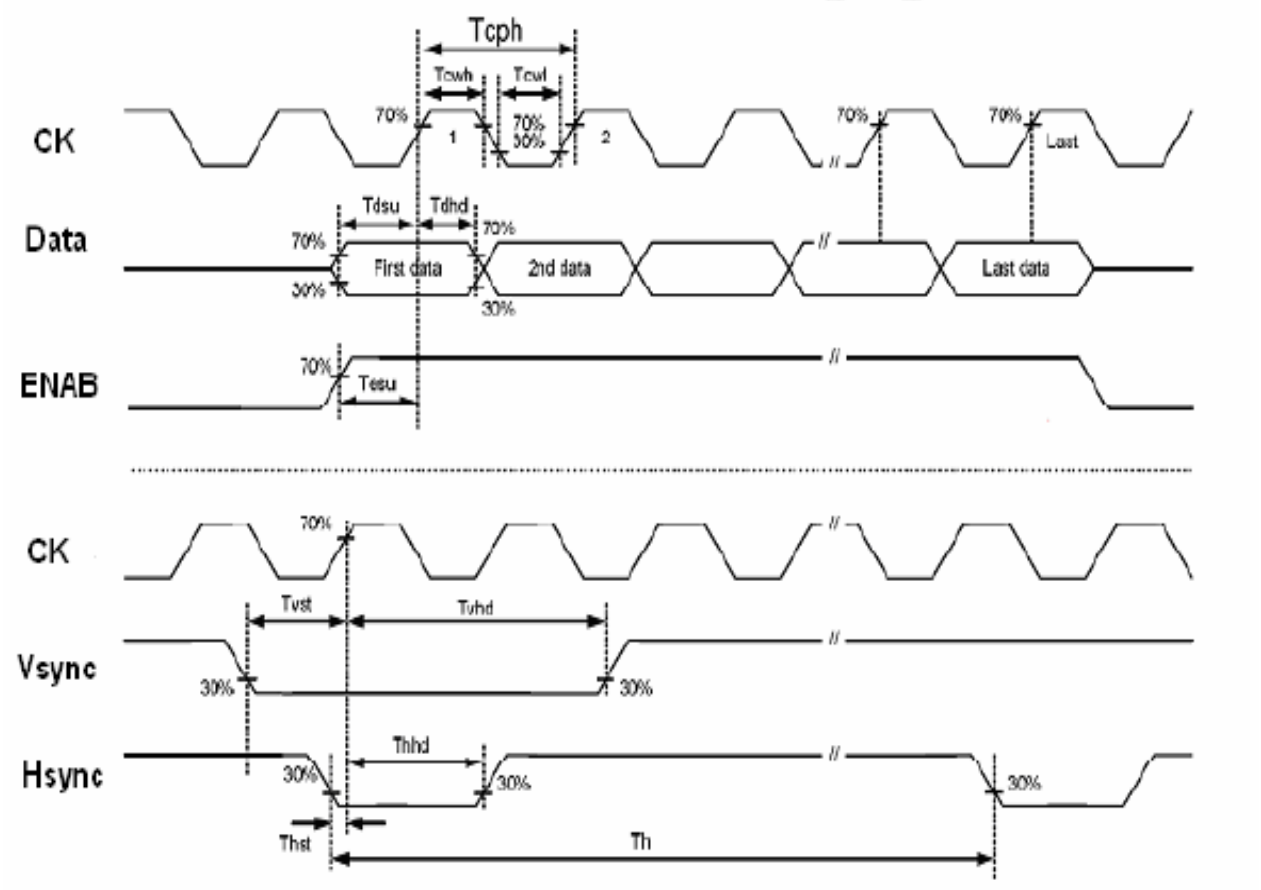


Figure 5.4 AC input characteristics

5.5 Power ON/OFF Sequence

Item	Symbol	Min	Typ	Max	Unit	Remark
VCC 3.0V to signal starting	Tp1	5	-	50	ms	
Signal starting to backlight on	Tp2	50	-	-	ms	
Signal off to VCC 3.0V	Tp3	0	-	50	ms	
Backlight off to signal off	Tp4	50	-	-	ms	

Table 5.5 Power on/off sequence

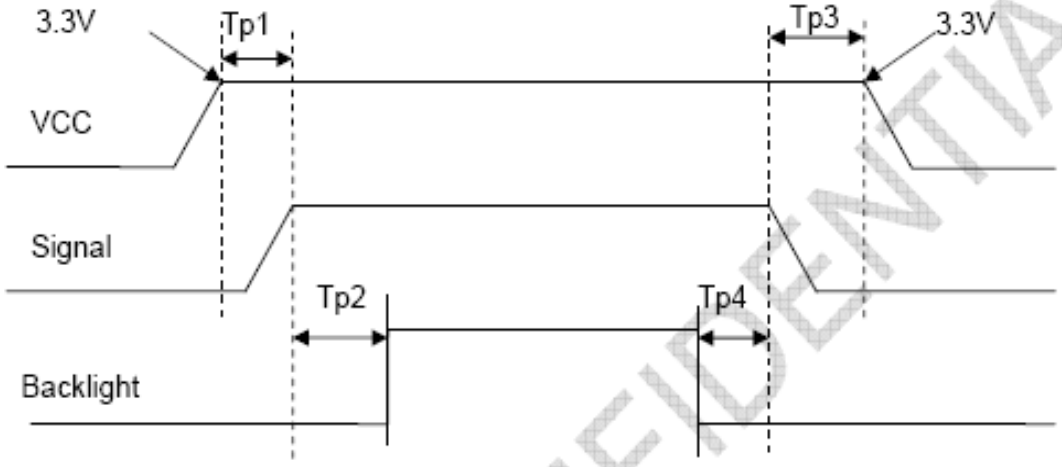


Figure 5.5 Power on/off sequence

6. Optical Characteristics

6.1 TFT Optical Characteristics

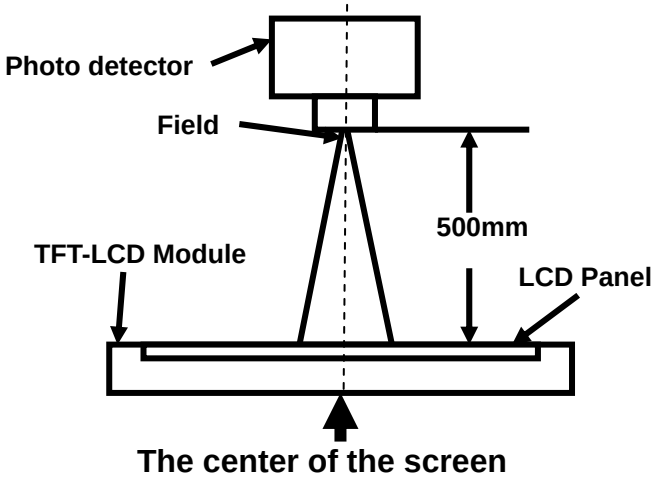
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	60	70	--	Degree	Note 2
		θB		50	60	--		
		θL		60	70	--		
		θR		60	70	--		
Contrast Ratio		CR	θ=0°	400	500	--		Note1 Note3
Response Time		T_{ON}	25℃	--	20	30	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	--	TBD	--		Note5 Note1
		y		--	TBD	--		
	Red	x		--	TBD	--		
		y		--	TBD	--		
	Green	x		--	TBD	--		
		y		--	TBD	--		
	Blue	x		--	TBD	--		
		y		--	TBD	--		
Uniformity		U		--	75	--	%	Note1,Note6
NTSC				--	50	--	%	Note5
Luminance		L		320	400	--	cd/m^2	Note1,Note7

Test Conditions:

1. I_F= 20mA(one channel), the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

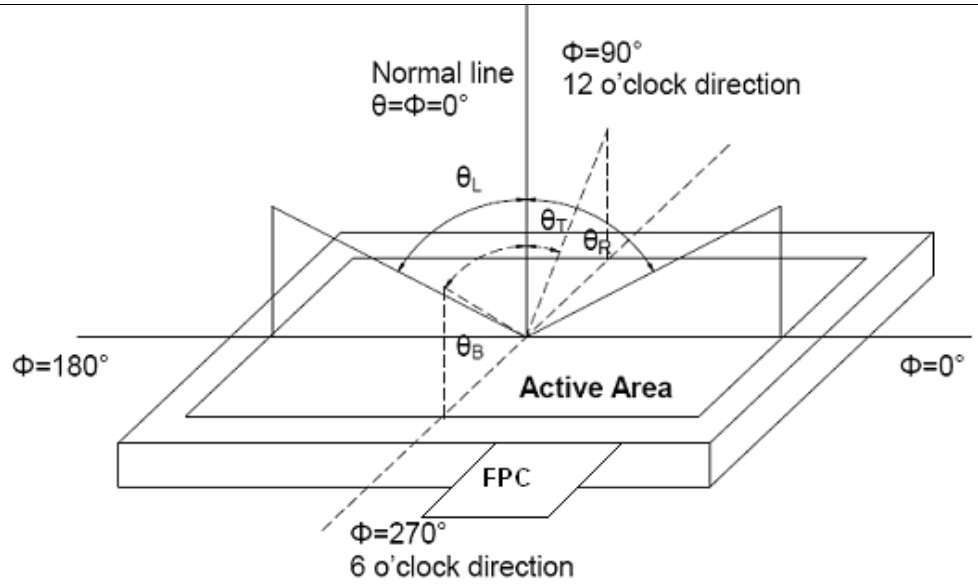
The optical characteristics should be measured in dark room. After 10 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

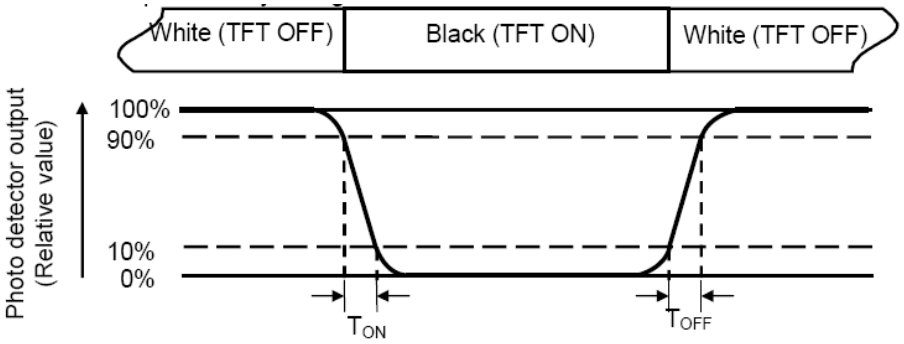
viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80)。



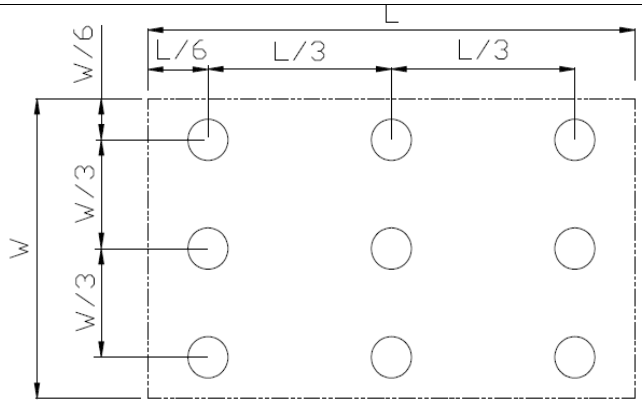
Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

"White state ": The state is that the LCD should drive by Vwhite.
"Black state": The state is that the LCD should drive by Vblack.
Vwhite: To be determined Vblack: To be determined.
Note 4: Definition of Response time
The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.
Note 6: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.
Luminance Uniformity (U) = Lmin/ Lmax
L-------Active area length W----- Active area width



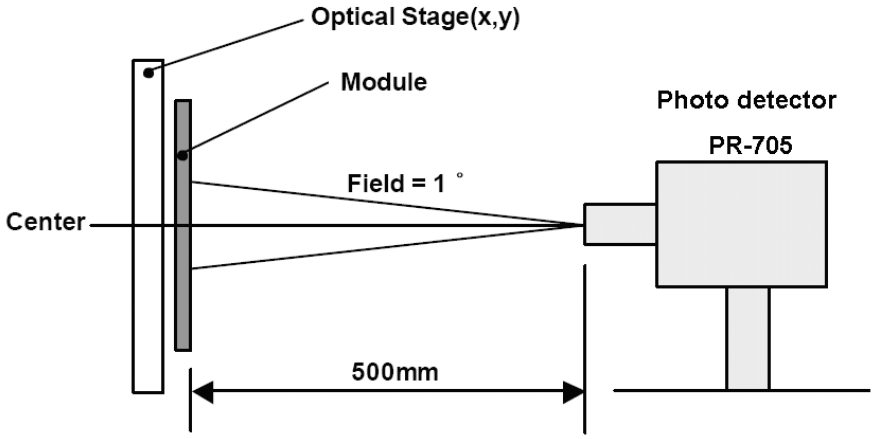
Lmax: The measured Maximum luminance of all measurement position.
Lmin: The measured Minimum luminance of all measurement position.
Note 7: Definition of Luminance:
Measure the luminance of white state at center point.

6.2 TP Optical Characteristics

(Ta = 25 C)

No.	Item	Min.	Typ.	Max.	Unit	Remark
1	Transmission	86	88		%	Note 1
2	Reflectivity			4	%	Note 1,Note 2
3	HAZE			2	%	

Note1: Measuring equipments: DMS-501, PR-705. @550nm
Measuring condition:
- After stabilizing and leaving the panel alone at a given temperature for 30 min, the measurement should be executed,
- Measuring surroundings: a stable, windless and dark room,
- Measuring temperature: Ta=25°C,
- 30 min after lighting the back-light.



Note2: conform to National standard GB2410—80 /ASTM D1003—61(1997)

7. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ta = +70℃, 240 hours	Note1,Note6,Note7 IEC60068-2-1,GB2423.2
2	Low Temperature Operation	Ta = -20℃, 240 hours	Note1, Note7,IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +80℃, 240 hours	Note1, Note7,Note8 IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta = -30℃, 240 hours	Note1, Note7,EC60068-2-1 GB2423.1
5	High Temperature & Humidity Storage	Ta=+60℃、RH=90%, 240 hours	Note1,Note3, Note4,Note7 IEC60068-2-78 GB/T2423.3
6	Thermal Shock/ Solder Joint Life Test	-20℃（30min）⇔60℃（30min） Change Time:5min,100cycle	Note1,Note9 Start with cold temperature End with high temperature, IEC60068-2-14,GB2423.22
12	ESD	C=150pF、R=330Ω, 5point/panel Air: ±15KV Contact:±8KV 5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	Note2,Note5, IEC61000-4-2 GB/T17626.2
13	Shock Test	Half Sine Wave 50G ,6ms,±X,±Y,±Z 3times for each direction	Note2
14	Drop Test(package state)	Height:60cm, 1corner,3edges,6surfaces	Note2,IEC60068-2-32 GB/T2423.8

Notes:

1. The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample will not be accepted if appear these defects:
   1).Air bubble in the LCD;
   2).Seal leak
   3).Non-display
   4).missing segments
   5).Glass crack
   6).CR reduction >40%
   7).IDD increase >100%
   8).Brightness reduction >50%
   9).Color coordinate tolerance >0.05
2. The samples of these tests will not be accepted if appear these defects:
   1).Air bubble in the LCD;
   2).Seal leak

3).Non-display

4).missing segments

5).Glass crack

3. Each test item applies for a test sample only once, The test sample can not be used again in any other test item.

4.For Damp Proof Test, Pure water(Resistance＞10MΩ) should be used.

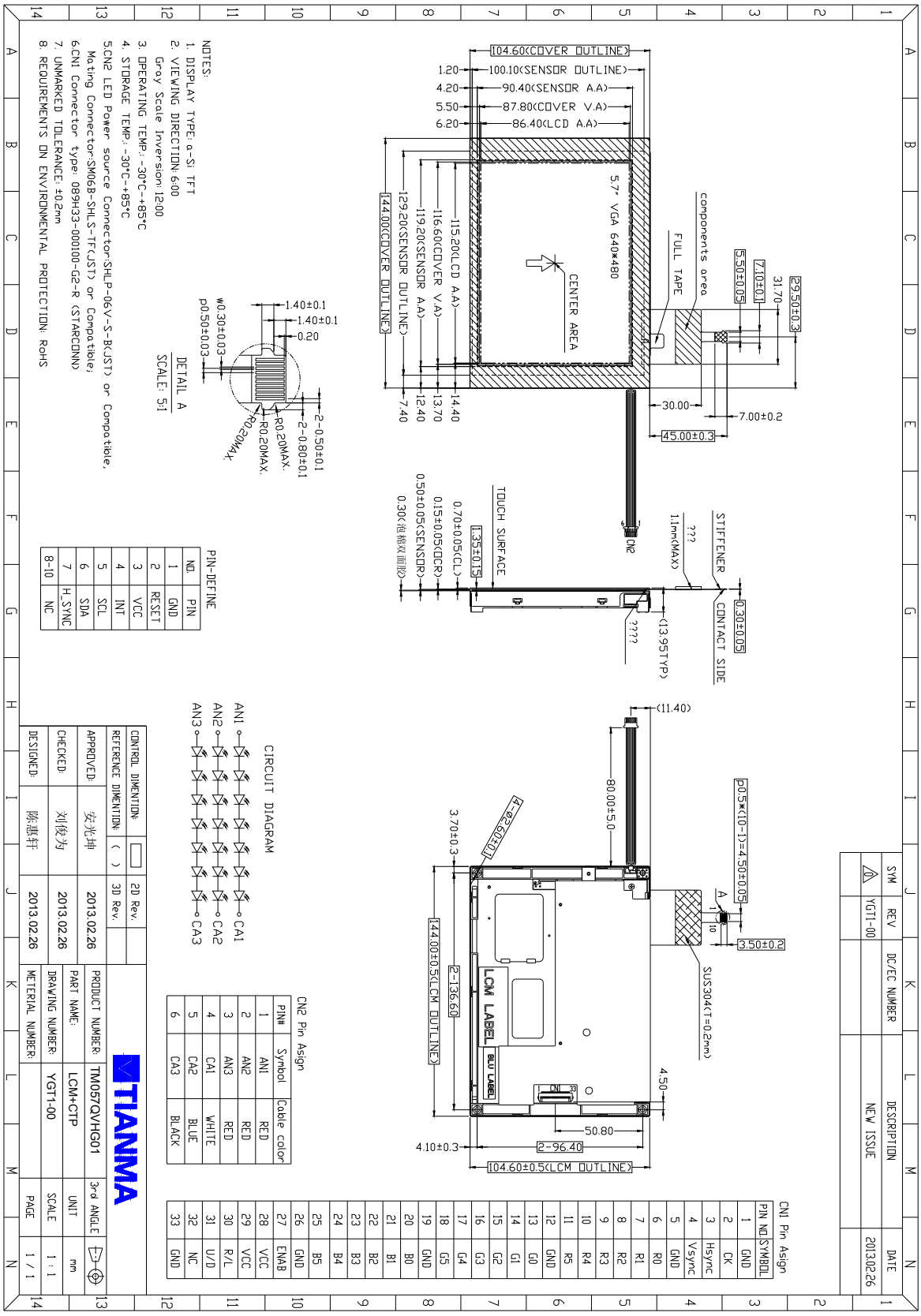
5.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.

6 In the test of High Temperature Operation and High Temperature & Humidity Operation ,the operation temperature is the surface temperature of module

7 High Temperature Operation、Low Temperature Operation、High Temperature Storage、Low Temperature Storage、High Temperature & Humidity Operation、High Temperature & Humidity Storage will be increased the test time to 1000hours in the same conditions to test out the ability of module, and we can not guarantee that the module will not fail during 1000hours.These items test only once

8.Thermal Shock will be changed the cycle to 1000cycles to test out the ability of module, and we can not guarantee that the module will not fail after the test. This item test only once

8 Mechanical Drawing



PIN-DEFINE

NO.	PIN
1	GND
2	RESET
3	VCC
4	INT
5	SCL
6	SDA
7	H_SYNC
8-10	NC

CN2 Pin Asign

PIN#	Symbol	Cable color
1	AN1	RED
2	AN2	RED
3	AN3	RED
4	CA1	WHITE
5	CA2	BLUE
6	CA3	BLACK

CN1 Pin Asign

PIN NO.	SYMBOL
1	GND
2	CK
3	Hsync
4	Vsync
5	GND
6	R0
7	R1
8	R2
9	R3
10	R4
11	R5
12	GND
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	GND
20	B0
21	B1
22	B2
23	B3
24	B4
25	B5
26	GND
27	ENAB
28	VCC
29	VCC
30	R/L
31	U/D
32	NC
33	GND

SYM	REV	DC/EC NUMBER	DESCRIPTION	DATE
1	YGT1-00		NEW ISSUE	2013.02.26

CONTROL DIMENTION: 2D Rev.
REFERENCE DIMENTION: ( ) 3D Rev.

DESIGNED:	陈惠轩	2013.02.26
CHECKED:	刘俊为	2013.02.26
APPROVED:	安光坤	2013.02.26

TIANMA

PRODUCT NUMBER:	TM057QVHG01
PART NAME:	LCM+CTP
DRAWING NUMBER:	YGT1-00
METERIAL NUMBER:	
3rd ANGLE	
UNIT	mm
SCALE	1 : 1
PAGE	1 / 1

9. Product Inspection Criteria

9.1 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.

9.2 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

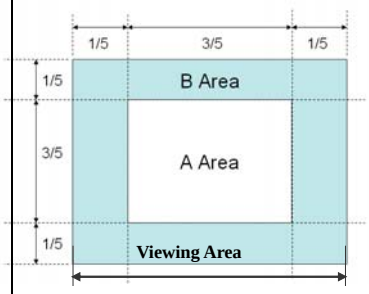


Figure 1

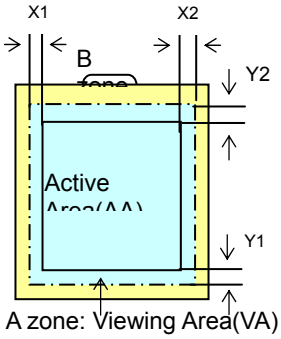


Figure 2

9.3 Inspection items and general notes

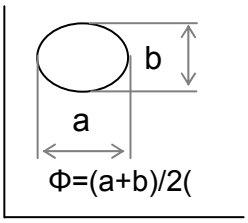
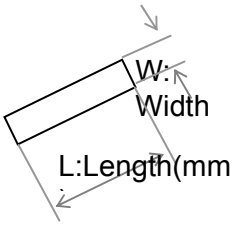
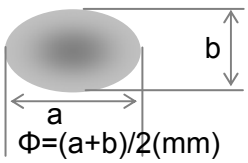
General notes	①Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and TIANMA. ②Viewing area should be the area which TIANMA guarantees. ③Limit sample should be prior to this Inspection standard. ④Viewing judgment 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

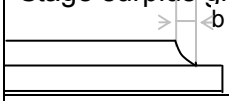
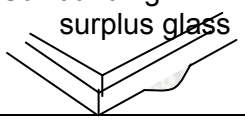
	PCB defect	Components assembly defect

9.4 Outgoing Inspection level

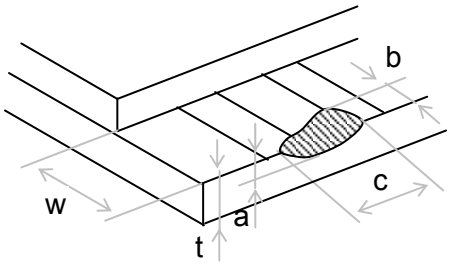
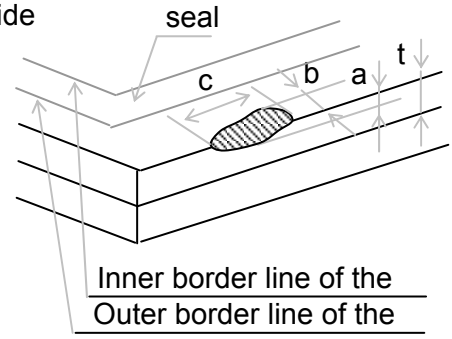
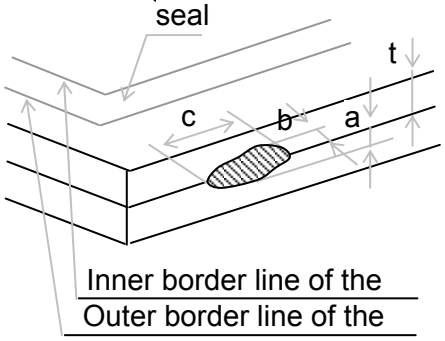
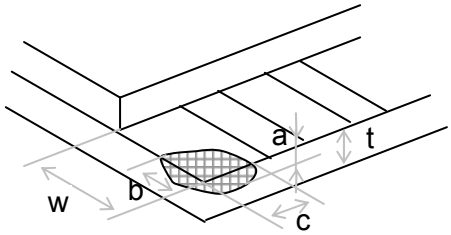
Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 9.3 general notes	See 9.5			II	0.65
Minor Defects	See 9.3 general notes	See 9.5			II	1.5
Note：Sampling standard conforms to GB2828						

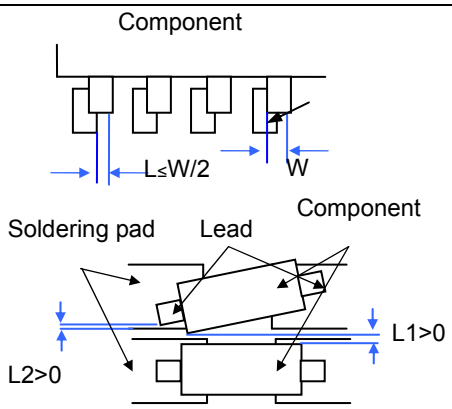
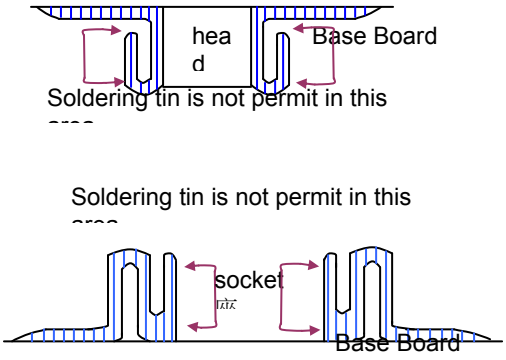
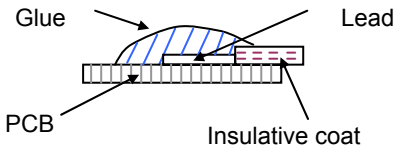
9.5 Inspection Items and Criteria

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="6"></td><td rowspan="6"></td><td></td><td rowspan="3">B</td><td>Bright dot</td><td colspan="2">2</td><td rowspan="3"></td></tr>
<tr><td></td><td>Dark dot</td><td colspan="2">3</td></tr>
<tr><td></td><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="5">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="5">b≦0.3mm</td></tr>
<tr><td>Surrounding surplus glass
  </td><td colspan="5">Should not influence outline dimension and assembling.</td></tr>
<tr><td>8</td><td colspan="2">Open segment or open common</td><td colspan="5">Not permitted</td></tr>
<tr><td>9</td><td colspan="2">Short circuit</td><td colspan="5">Not permitted</td></tr>
<tr><td>10</td><td colspan="2">False viewing direction</td><td colspan="5">Not permitted</td></tr>
<tr><td>11</td><td colspan="2">Contrast ratio uneven</td><td colspan="5">According to the limit specimen</td></tr>
<tr><td>12</td><td colspan="2">Crosstalk</td><td colspan="5">According to the limit specimen</td></tr>
<tr><td>13</td><td colspan="2">Black /White spot(display)</td><td colspan="5">Refer to item 1</td></tr>
<tr><td>14</td><td colspan="2">Black /White line(display)</td><td colspan="5">Refer to item 2</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 seal 	b < Inner borderline of the seal		
		③ Surrounding crack— contact side seal 	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.	

10. Precautions for Use of LCD Modules

10.1 Handling Precautions

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

10.1.2 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.

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

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

10.1.5 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

10.1.6 Do not attempt to disassemble the LCD Module.

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

10.1.8 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.

10.2 Storage precautions

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

10.2.2 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%

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

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