SPECIFICATION FOR

TFT LCD MODULE

MODEL NO: _____

CUSTOMER: _____

This module uses ROHS material

Customer Approval:

☐ **Approve Specification Only**

☐ **Approve Specification and Sample**

APPROVED BY
DATE:

ISSUED DATE: 2013-02-21

PREPARED BY	CHECKED BY	APPROVED BY

Records of Revision

DATE	REF.PAGE PARAGRAPH DRAWING No.	REVISED No.	SUMMARY	REMARK
2012-12-28	ALL	00	FIRST ISSUE	
2013-01-29	ALL	01	MODIFY FPC	
2013-02-21	ALL	02	MODIFY TP	

Contents

1. Introduction

1.1 Scope of application

This specification applies to the Negative type TFT transmissive dot matrix LCD module that is supplied by This LCD module should be designed for mobile phone use.
LCD specification: Dots480xRGBx800
As to basic specification of the driver IC, refer to the IC (OTM8009A) specification and datasheet.

1.2 Structure:

Double display structure:
TFT Module + FPC + Touch Panel +BL
FULL 16.7M Color 3.97 inch TFT LCD size for main LCD;
One bare chip with gold bump (COG) TECH;
24/16/8 BITS 80 parallel and RGB 24BITS interface;

1.3 TFT features:

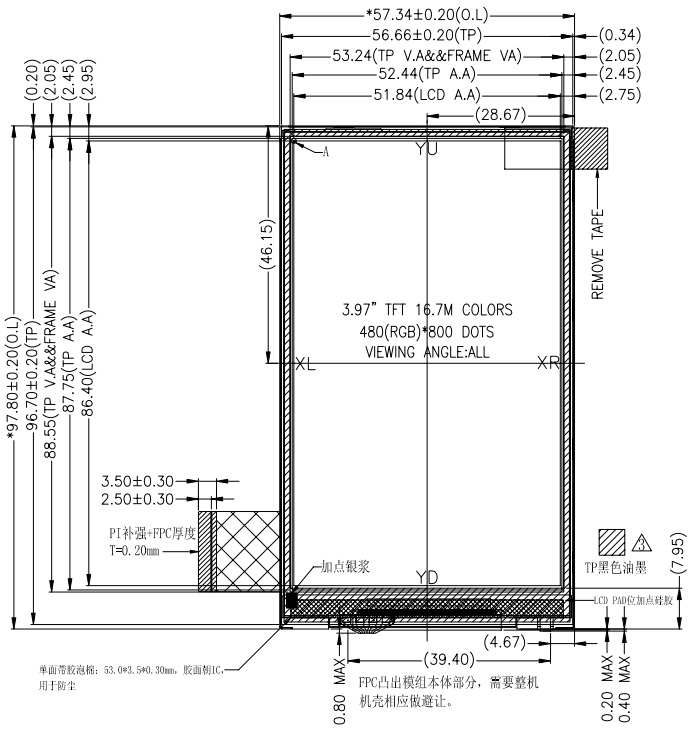
Structure: TFT PANNEL+IC+FPC+BL+TP;
Transmissive Type LCD
480 dot-source and 800 dot-gate outputs;
16.7M Color can be selected by software;
White LED back light;
24/16/8 BITS 80 parallel and RGB 24BITS interface;

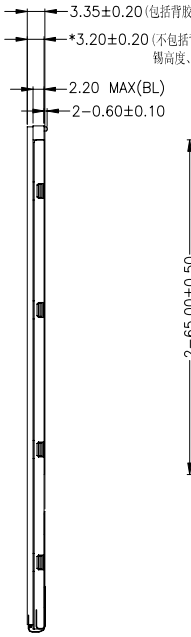
1.4 Applications:

Mobile phone
PSP
PDA
GPS
Etc…

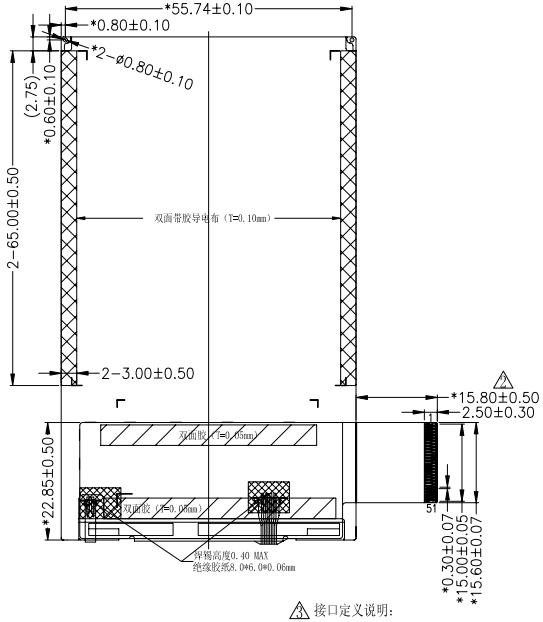
2. General specification

ITEM	Standard value	UNIT
Size	3.97 inch	---
LCD Type	TFT Transmissive	---
Driver element	a-Si TFT Active matrix	
Number of Dots	480*(RGB)*800	Dots
Pixel Arrangement Pixel Pitch(mm)	RGB Vertical Stripe 0.108x0.108	
Active Area	51.84 *86.4	mm
Viewing Area (W*H)	/	mm
Display Colors	16.7M	
Display Mode	TN With Normally White	
Viewing Direction	ALL	
Driver IC	OTM8009A	
Module Size(W*H*T)	57.34x97.8x3.35(WITH TOUCH PANEL)	mm
Approx. Weight	TBD	g
Back Light	8 White LEDs Series	
Touch Panel Type	4-wire Analog Resistive	
Touch Panel Active Area	56.66x96.7	mm
System interface	24/16/8 BITS 80 parallel and RGB 24BITS interface	





FPC弯折图
FPC弯折出货



接口定义：

NO:	PIN NAME	NO:	PIN NAME
1	LEDK(-)	27	DB16
2	LEDA(+)	28	DB15
3	YU	29	DB14
4	XR	30	DB13
5	YD	31	DB12
6	XL	32	DB11
7	VDD	33	DB10
8	VDDI	34	DB9
9	IM3 ⚠	35	DB8
10	IM2 ⚠	36	DB7
11	IM1 ⚠	37	DB6
12	IM0 ⚠	38	DB5
13	SDO	39	DB4
14	SDI	40	DB3
15	DCX	41	DB2
16	WRX	42	DB1
17	RDX	43	DB0
18	CSX	44	DE
19	RESX	45	GND
20	DB23	46	PCLK
21	DB22	47	GND
22	DB21	48	HS
23	DB20	49	VS
24	DB19	50	TE
25	DB18	51	LED_PWM
26	DB17		

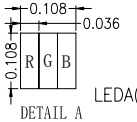
⚠ 接口定义说明：
IM3：ONLY FOR SPI, IF NOT USED PLEASE CONNECT TO VSS.

IM2	IM1	IM0	SYS MODE
0	0	0	8-BIT MPU
0	0	1	16-BIT MPU
0	1	0	24-BIT MPU
0	1	1	RGB SPI

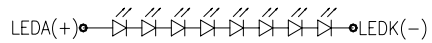
NOTES:
1. GENERAL TOLERANCE: ±0.2.
2. (...) IS REFERENCE DIMENSION.
3. * CRITICAL DIMENSION.
4. RoHS COMPLIANT.
5. CONNECTOR: FH26-51S-0.3SHW.
5. 图中FRAME VA为推荐机壳视窗位置、大小，建议机壳视窗位置、大小不要超过FRAME VA。
6. 建议机壳上泡棉的开窗比（TP VA）单边大0.5mm以上。

TP接口定义：

1	YU
2	XL
3	YD
4	XR



DETAIL A
SCALE 100:1



LED CIRCUIT DIAGRAM

⚠

Operating Voltage	8V
Operation Temperature	−10°C TO 60°C
Storage Temperature	−20°C TO 70°C
Interface	MPU/RGB
Backlight	WHITE(20mA,25.6V,8LED)
Brightness	250CD/M2 TYP
White X/Y	
Homogeneity	80% MIN

VER.	SYMBOL	AMENDMENT	SIGN	DATE
04	⚠	更改TP黑油和更正接口定义	钟武炎	13.02.21
03	⚠	更换FPC	钟武炎	13.01.11
02	⚠	更换IC和更改接口定义	钟武炎	12.12.20
01		FIRST RELEASE	钟武炎	12.12.17

DRAWN	钟武炎
ME.CHECKED	
EE.CHECKED	
APPROVED	
CUSTOMER'S APPROVAL	

TITLE: MODULE SPEC.

DRAWING NO.

UNIT	mm	SCALE	FIT
3rd Angle		SHEET 1 OF 1	

4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	V_{cc}	-0.3	3.3	V
Input voltage for logic	V_{IN}	-0.5	V_{cc} +0.3	V
Supply current (One LED)	I_{LED}		20	mA
Operating temperature	T_{OP}	-10	+60	°C
Storage temperature	T_{ST}	-20	+70	°C

5. ELECTRICAL CHARACTERISTICS

Item	Symbol	Min	Typ	Max	Unit	Applicable terminal
Supply voltage for logic	V_{cc}	2.3	2.8	3.3	V	V_{DD}
Supply voltage for digital	VDDIO	1.65	1.8	3.3	V	IOVCC
Input voltage	V_{IL}	-0.3	-	0.2 V_{CC}	V	
	V_{IH}	0.8 V_{cc}	-	V_{cc}	V	
I/O leakage current	I_{LKG}	-1		1	μA	
LED Forward voltage	V_f	3.0	3.2	3.4	V	--
Input backlight current	I_{LED}	-	18	20	mA	With One LED

6. TOUCH PANEL SPECIFICATIONS

6.1 Electrical Characteristics

ITEM	SPECIFICATIONS			UNIT	REMARK
	MIN.	TYP.	MAX		
Terminal Resistance	200	-	900	ohm	X(Film side)
	200	-	900	ohm	Y(Glass side)
Insulation Resistance	20	-	-	Mohm	DC 25V 1min
Operating Voltage	-	5	-	V	DC

6.2 Optical Characteristics

ITEM	SPECIFICATIONS			UNIT	REMARK
	MIN.	TYP.	MAX		
Response Time	-	-	10	ms	100kohm pull-up
Light Transparency	80	-	-	%	

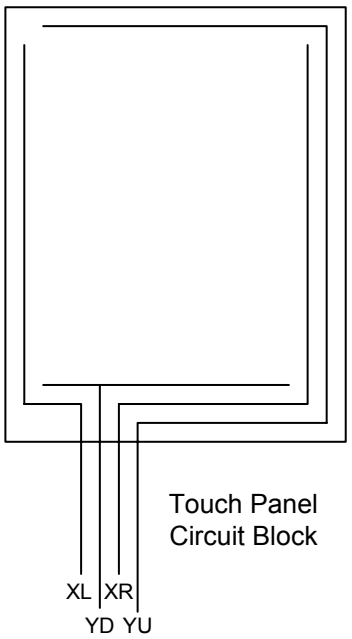
6.3 Mechanical Characteristics

ITEM	SPECIFICATIONS			UNIT	REMARK
	MIN.	TYP.	MAX		
Operation Force	-	20	100	gf	Note1
Surface Hardness	3	-	-	H	
Pen Sliding Durability	30,000			times	Note2
Hitting Durability	300,000			times	Note3

Note 1: Do not operate it with a thing except a polyacetal pen (tip R0.8mm or less) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil.
Depending on the pitch & the dimension of the spacer dots in between.

Note 2: Measurement for surface area.
-Scratch 30,000 times straight line on the film with a stylus change every 10,000 times.
-Force: 100gf.
-Speed: 60mm/sec.
-Stylus: R0.8 polyacetal tip.

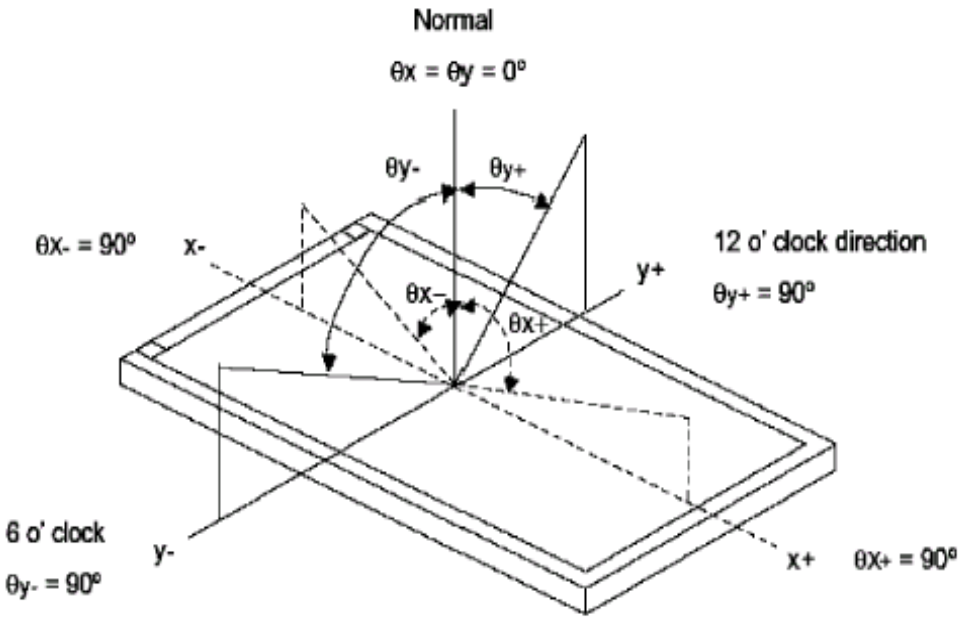
Note 3: Hit 300,000 times on the film with an R12.5mm tip.
-Force: 100gf.
-Speed: 2 times/sec.



7. OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
				MIN.	TYP.	MAX		
Brightness		B	Viewing normal angle		250	--	Cd/m^2	All left side data are based on BOOYI's product reference only
Contrast Ratio		CR		--	800	--	--	
Response Time		Tr+Tf		--	40	--	ms	
CIE Color coordinate	Red	X_R		0.640	0.660	0.680		
		Y_R		0.305	0.325	0.345		
	Green	X_G		0.251	0.271	0.291		
		Y_G		0.576	0.596	0.616		
	Blue	X_B		0.112	0.132	0.152		
		Y_B		0.105	0.125	0.145		
	White	X_W		0.276	0.296	0.316		
		Y_W		0.313	0.333	0.353		
Viewing Angle	Hor.	θ_{X+}	Center CR>=10	80	85	--	Deg.	
		θ_{X-}		80	85	--		
	Ver.	θ_{Y+}		80	85	--		
		θ_{Y-}		80	85	--		
Uniformity	Un			--	80		%	

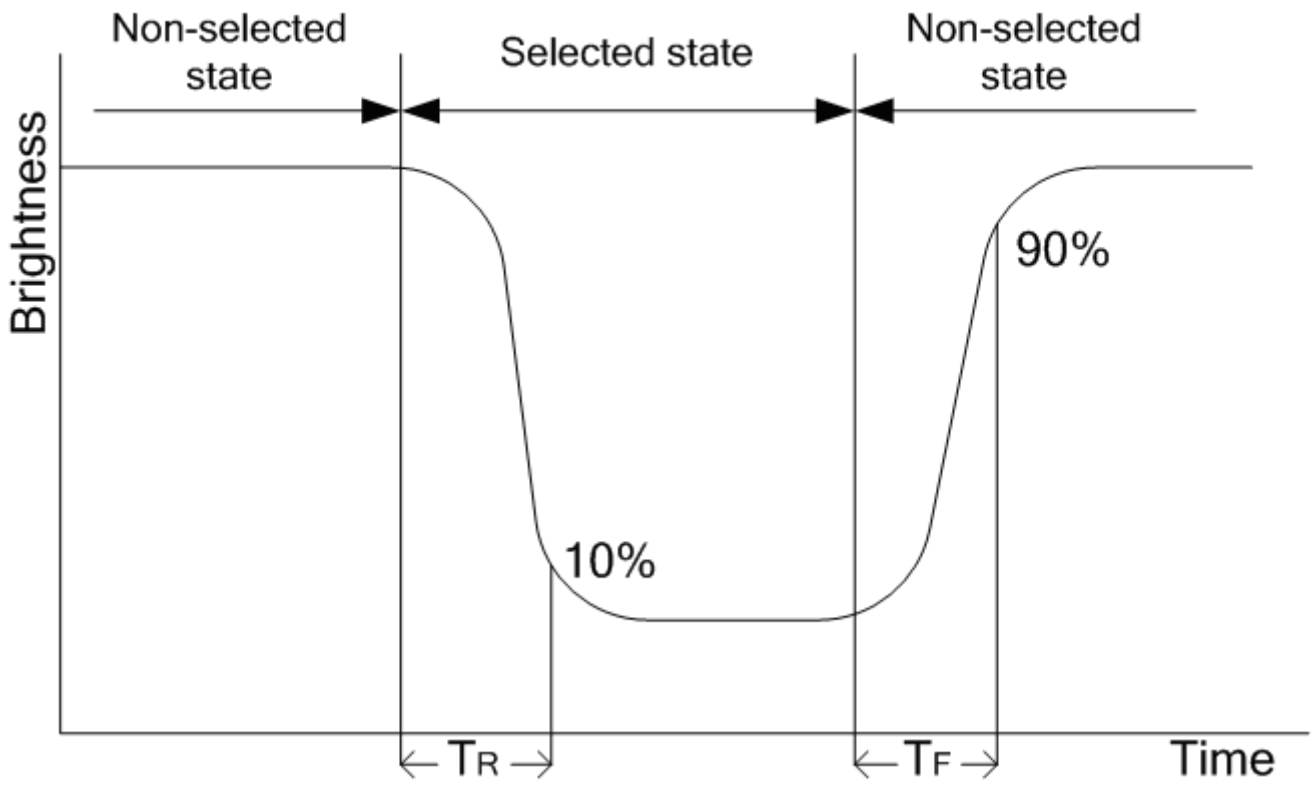
Note 1 : Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

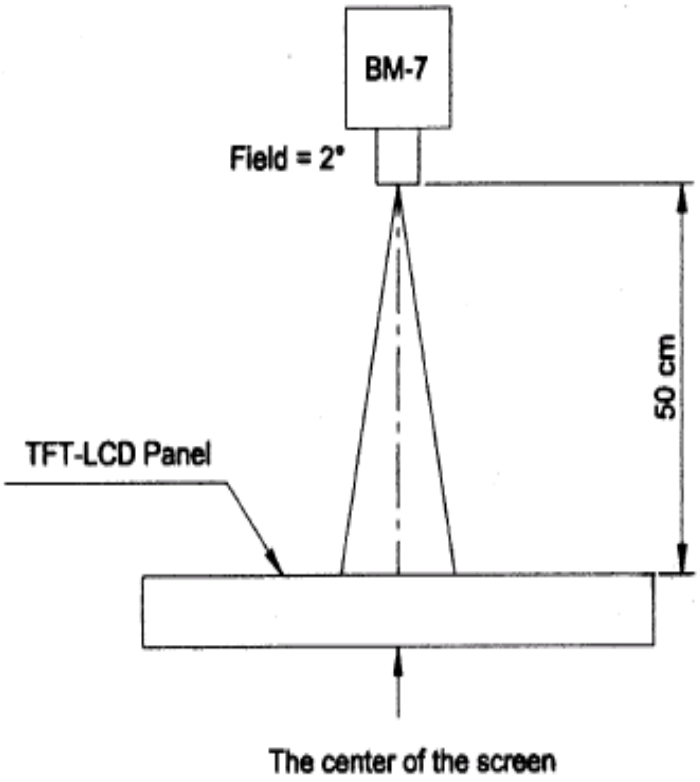
$$CR = \frac{\text{Brightness of non-selected dots (white)}}{\text{Brightness of selected dots (black)}}$$

Note 3: Definition of response time (T_R, T_F)

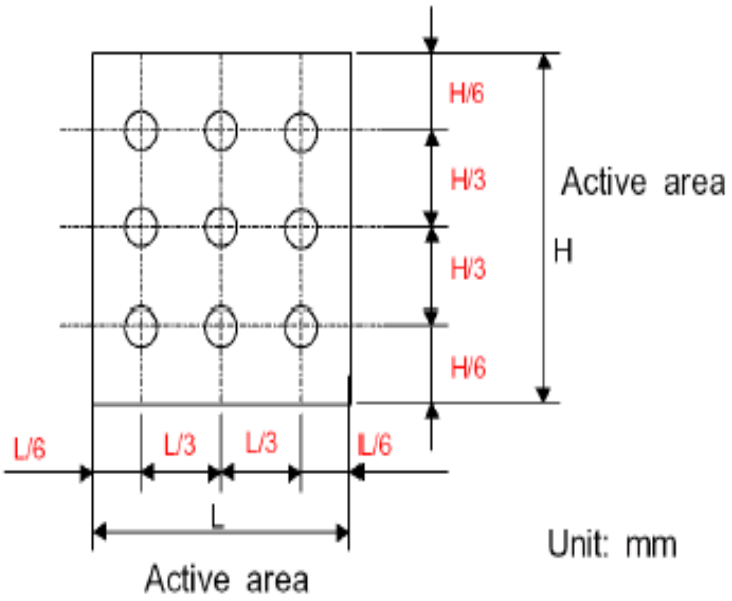


: The brightness test equipment setup

20mA Field=2° (As measuring "black" image, field=2° is the best testing condition)



Note 4 :



8. MCU Interface Pin Function

NO.	SYMBOL	Description	I/O
1	LEDK	LED Cathode	Power supply
2	LEDA	LED Anode	Power supply
3	YU	Touch Panel Control Pin	I
4	XR		I
5	YD		I
6	XL		I
7	VDD	Power supply (2.5~3.3V)	Power supply
8	VDDI	Power supply (1.65~3.3V)	Power supply
9	IM3	only for SPI,if not used please connect to VSS	I
10	IM2	IM2 IM1 IM0 SYS MODE 0 0 0 8 bits MPU	I
11	IM1	0 0 1 16bits MPU 0 1 0 24 bits MPU	I
12	IM0	0 1 1 RGB+SPI (blank)	I
13	SDO	Serial data output pin and used for the DBI type C mode	O
14	SDI	Serial data input pin and used for the DBI type C mode.	I/O
15	DCX	Command/Data Select	I
16	WRX	Write signal	I
17	RDX	Read signal	I
18	CSX	Chip Select	I
19	RESX	LCD RESET TERMINAL ACITVE"L"	I
20~43	DB23~DB0	RGB DATA BUS	I/O
44	DEN	RGB I/F Data Enable signal	I
45	GND	Ground	Power supply
46	PCLK	RGB I/F Dot Clock Signa	I
47	GND	Ground	Power supply
48	HS	RGB I/F Line synchronous signal	I
49	VS	RGB I/F Frame synchronous signal	I
50	TE	Output a frame head pulse signal	O
51	LED-PWM	Backlight On/Off control pin	O

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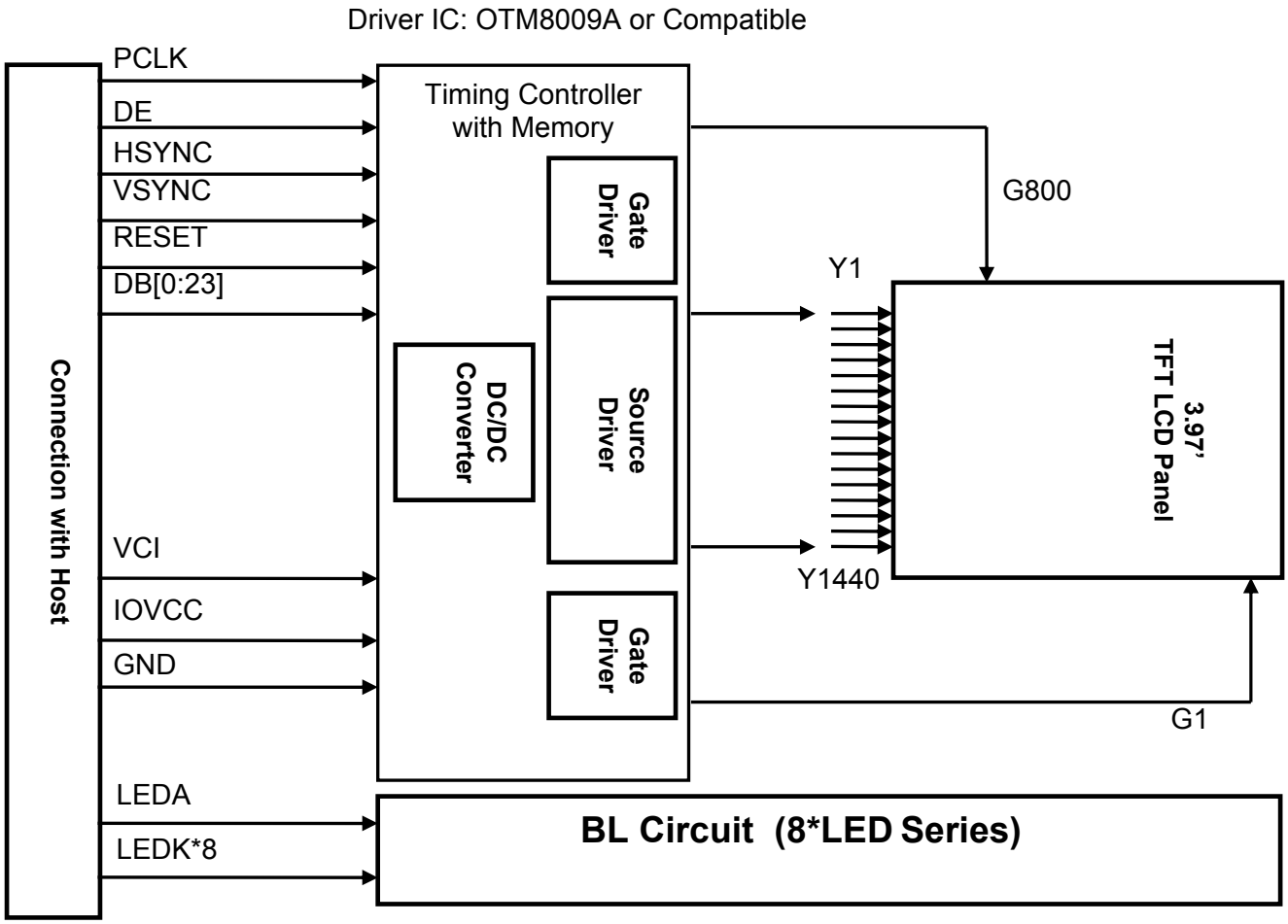
9. BLOCK DIAGRAM



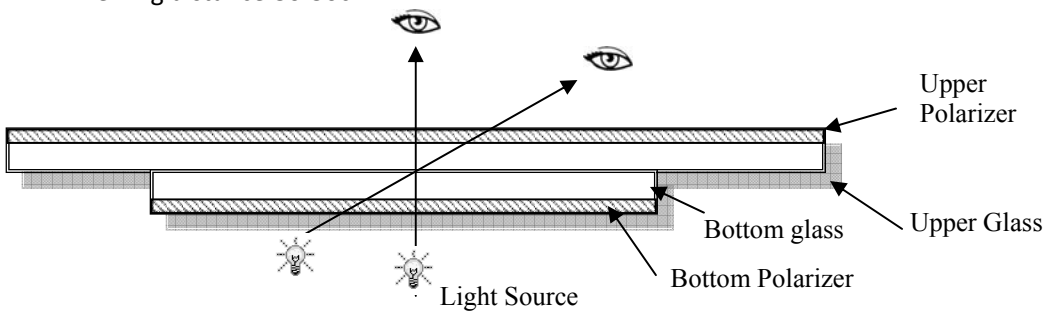
10.LCM Quality Criteria

10.1 VISUAL & FUNCTION INSPECTION STANDARD

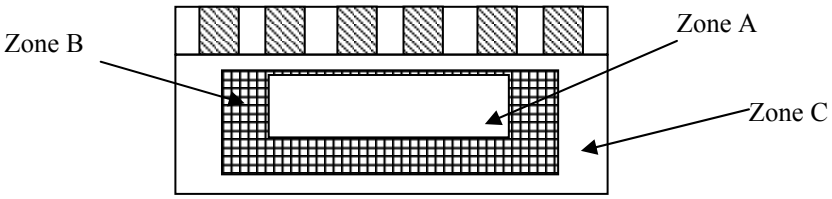
10.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

Temperature : 25±5℃
Humidity : 65%±10%RH
Viewing Angle : Normal viewing Angle.
Illumination: Single fluorescent lamp (300 to 700Lux)
Viewing distance:30-50cm



10.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)
Zone B : Viewing Area except Zone A
Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)
Note:
As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer.

10.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class Ⅱ
AQL:

Major defect	Minor defect
0.40	0.65

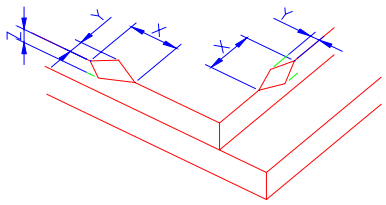
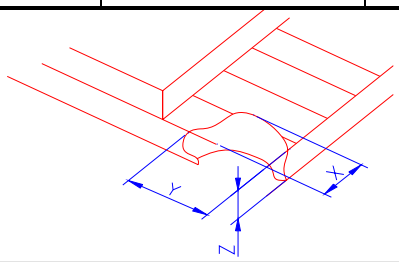
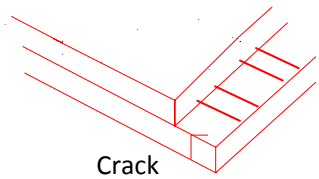
LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

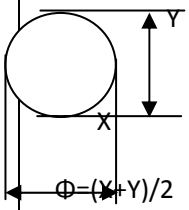
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display 2) Display abnormally 3) Missing vertical， horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting 6)Cross-Talk 7)Noise 8)Color contrast	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	

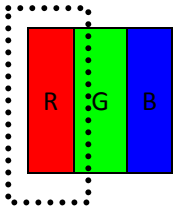
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Soldering appearance	Good soldering , Peeling off is not allowed.	
6	LCD/Polarizer	Black/White spot/line, scratch, crack, etc.	

10.1.4 Criteria (Visual)

<table>
<tr><th>Number</th><th>Items</th><th>Criteria(mm)</th></tr>
<tr><td rowspan="3">1.0 LCD Crack/Broken

NOTE:
X: Length
Y: Width
Z: Height
L: Length of ITO,
T: Height of LCD</td><td>(1) The edge of LCD broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤2.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr></table></td></tr>
<tr><td>(2)LCD corner broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤2.0 mm</td><td>≤2.0mm</td><td>≤T</td></tr></table></td></tr>
<tr><td>(3) LCD crack</td><td> 
Crack
Not allowed</td></tr>
</table>

<table>
<tr><th>Number</th><th>Items</th><th>Criteria (mm)</th></tr>
<tr><td>2.0</td><td>Spot defect
 
</td><td>① light dot（LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain）
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.1<Φ≤0.2</td><td colspan="2">2</td></tr>
<tr><td>0.2<Φ≤0.3</td><td colspan="2">1</td></tr>
<tr><td>Φ＞0.3</td><td colspan="2">0</td></tr>
</table>
②Dim spot（LCD/TP/Polarizer dim dot, light leakage、dark spot）
<table>
<tr><th rowspan="2">Zone
Size (mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.1<Φ≤0.2</td><td colspan="2">2</td></tr>
<tr><td>0.2<Φ≤0.3</td><td colspan="2">1</td></tr>
<tr><td>Φ＞0.3</td><td colspan="2">0</td></tr>
</table></td></tr>
<tr><td></td><td>Line defect (LCD /Polarizer black/white line, scratch, stain)</td><td>
<table>
<tr><th>Width(mm)</th><th>Length(mm)</th><th>Acceptable Qty</th></tr>
<tr><td>Φ≤0.03</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td>0.03<W≤0.05</td><td>L≤2.0</td><td>1</td></tr>
<tr><td>0.05<W</td><td colspan="2">0</td></tr>
</table></td></tr>
<tr><td>3.0</td><td>Polarizer scratch</td><td>
<table>
<tr><th>Width(mm)</th><th>Length(mm)</th><th>Acceptable Qty</th></tr>
<tr><td>W≤0.03</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td>0.03<W≤0.05</td><td>L≤2</td><td>2</td></tr>
<tr><td>0.05< W≤0.10</td><td>L≤1</td><td>1</td></tr>
<tr><td colspan="2">W>0.10mm or L>2mm</td><td>0</td></tr>
</table></td></tr>
</table>

<table>
<tr>
<td></td>
<td>Polarizer Bubble</td>
<td colspan="2">
<table>
<tr><th>Zone / Size (mm)</th><th>Acceptable Qty</th></tr>
<tr><td>Φ≤0.1</td><td>Ignore</td></tr>
<tr><td>0.1<Φ≤0.2</td><td>2</td></tr>
<tr><td>0.2<Φ≤0.3</td><td>1</td></tr>
<tr><td></td><td></td></tr>
</table>
</td>
</tr>
<tr>
<td>4.0</td>
<td>SMT</td>
<td colspan="2">According to the <Acceptability of electronic assemblies>
IPC-A-610C class 2 standard. Component missing or function defect are Major defect, the others are Minor defect.</td>
</tr>
<tr>
<td>5.0</td>
<td>TFT</td>
<td>
<table>
<tr><th>distinguish</th><th>type</th><th>Acceptable Qty</th></tr>
<tr><td rowspan="2">Bright dot</td><td>Any color window</td><td>0</td></tr>
<tr><td>Adjacent Bright dot</td><td>0</td></tr>
<tr><td rowspan="2">Dark dot</td><td>Dark dot</td><td>1</td></tr>
<tr><td>Adjacent Dark dot</td><td>0</td></tr>
</table>
Note: the red (R), green(G), blue (B) 3 points constitute a pixel
</td>
<td> 

Dot</td>
</tr>
</table>

Criteria (functional items)

Items	**Criteria**
No display	Not allowed
Display abnormally	Not allowed
Missing vertical，horizontal	Not allowed
Segment	Not allowed
Short circuit	Not allowed
Back-light no lighting,	Not allowed
Flickering and abnormal lighting	Not allowed
Cross-Talk	Not allowed
Noise	Not allowed
Color contrast	Not allowed
The LCD surface dirt	If you cannot use smudgy surface air clean and clear, soco is not acceptable
Components off	Not allowed
FPC&PCB undesirable	Not allowed
Iron frame deformation	Not allowed

10.2 RELIABILITY TEST

ITEM	Condition	Sample size	Criterion
High Temp. Storage	70℃, 240 hrs	5pcs	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Sealleak; 3.Non-display; 4.Missing segments; 5. The surface shall be free from damage. 6. Contrast must be no more than 10% by the linearity tester. 7. Power must be no more than 10% by the linearity tester.
Low Temp. Storage	-20℃, 240 hrs	5pcs	
High Temp. Operation	60℃,240 hrs	5pcs	
Low Temp. Operation	-10℃, 240 hrs	5pcs	
Humidity operation	40℃,90%RH ,96 hrs	5pcs	
Humidity storage	60℃,90%RH ,96 hrs	5pcs	
Temp humidity cycles	25℃ Calefaction/3hrs→60℃/9hrs →Descendtemp/3hrs→25℃/9hrs 90%RH Total:18cycles	5pcs	
Thermal shock	-10℃/30min→60℃/30mins Total:32cycles	5pcs	
Vibration	Amplitude between 5 and 500Hz:3G(30m/s^2)/2hrs for each direction(X,Y,Z)	1Carton-box	After testing, there are no any defective appearances or electrical properties.
Drop test	0.8m,10times	1Carton-box	
ESD	1.Contact discharge method± 4KV,150pF/330Ω 10times	5pcs	1. After testing, there are no any defective appearances or electrical properties. 2. It can be acceptable when all defective ESD disappears in the RESET.
	2.Air discharge method±8KV,150pF/330Ω 10times	5pcs	

10.3 Safetv instructions

10.3.1 If the LCD panel breaks, be careful not to get any liquid crystal substance in your mouth.

10.3.2 If the liquid crystal substance touches your skin or clothes, please wash it off immediately by using soap and water.

10.4 Handling Precautions

10.4.1 Avoid static electricity damaging the LSI.

10.4.2 Do not remove the panel or frame from the module .

10.4.3 The polarizing plate of the display is very fragile . So, please handle it very carefully.

10.4.4 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of the plate.

10.4.5 The color tone of display and background of LCM has the possibility to be changed in the storage temperature range.

10.4.6 Pay attention to the working environment, as the element may be destroyed by static electricity.

--Be sure to ground human body and electric appliance during work.

--Avoid working in a dry environment to minimize the generations of static electricity.

--Static electricity may be generated when the protective film is fast peeled off.

10.4.7 When soldering the terminal of LCM, make certain the AC power source of soldering iron does not leak.

10.4.8 If the display surface becomes contaminated ,breathe on the surface and gently wipe it with a soft-dry- clean cloth .If it is heavily contaminated ,moisten cloth with the following solvent(ex:Ethyl alcohol).Solvents other than those above-mentioned may damage the polarizer(Especially ,do not use them .ex: Warter / Ketone)

10.5 Operation instructions

10.5.1 It is recommended to drive the LCD within the specified voltage limits, try to adjust the operating voltage for the optimal contrast, the color and contrast of LCD panel will varies at different temperature.

10.5.2 Response time is greatly delayed at low operating temperature range. However, this does not mean the LCD will be out of the order, It will recover when it returns to the specified temperature range.

10.5.3 If the display area is pushed hard during operation, the display will become abnormal.

10.5.4 Do not operate the LCD at the environments over the specified conditions, this may cause damage on the LCD and shorten the lifetime.

10.6 Storage instructions:

10.6.1 Store LCDs in a sealed polyethylene bag.

10.6.2 Store LCDs in a dark place, Do not expose to sunlight or fluorescent light. Keep the temperature between 0℃ and 35℃.

10.6.3 Avoid the polarizer touch any other object, (It is recommended to store them in the container in which they were shipped.)

10.7 Limited Warranty

10.7.1 will replace or repair any of its LCD modules, which are found to be defective, when inspected in accordance with LCM acceptance standards (copies available upon request) for a period of 12 months from ink- print date on product

10.7.2 Any defects must be returned to within 60 days since ship-out. Confirmation of such date shall be based on freight documents. The warranty liability of wasam limited to repair and/or replacement on defects above (7.1,7.2)

10.7.3 No warranty can be granted if the precautions stated above have been disregarded. The typical samples are as below:

-- LCD glass crack/break
--PCB outlet is damaged or modified.
--PCB conductors damaged.
--Circuit modified with by grinding, engraving or painting varnish.
--FPC crack

10.7.4 Modules must be returned with sufficient description of the failures of defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB outlet, conductors and terminals. Modules must be packed with the container in which they were shipped.

11. Packing method

Please consult our technical department for detail information.