PRODUCT SPECIFICATIONS

For Customer:__________ ☐ : APPROVAL FOR SPECIFICATION

Customer Model No.______________ ☐ : APPROVAL FOR SAMPLE

Module No.:___________________________ Date : 2015.05.08

Version :0

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For Customer's Acceptance:

Approved By	Comment

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

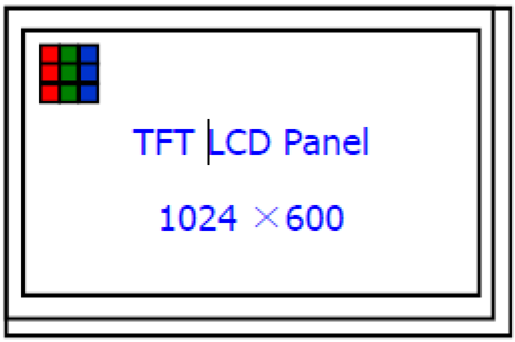
2. Revision Record

Date	Rev.No.	Page	Revision Items	Prepared
2015.05.08	**V0**		**The first release**	

3. General Specifications

3.1 Introduction

070BOE30PMIPI-2.6-97 is a color active matrix TFT LCD product using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 7 inch diagonally measured active area with WSVGA resolutions (1024 horizontal by 600 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors. The TFT-LCD panel used for this product is adapted for higher color type.



3.2 Features

.High Transmittance: 5.0%

.0.5 t Glass

3.3 Application

. Tablet & Application Mini-PC

3.4 General Specification

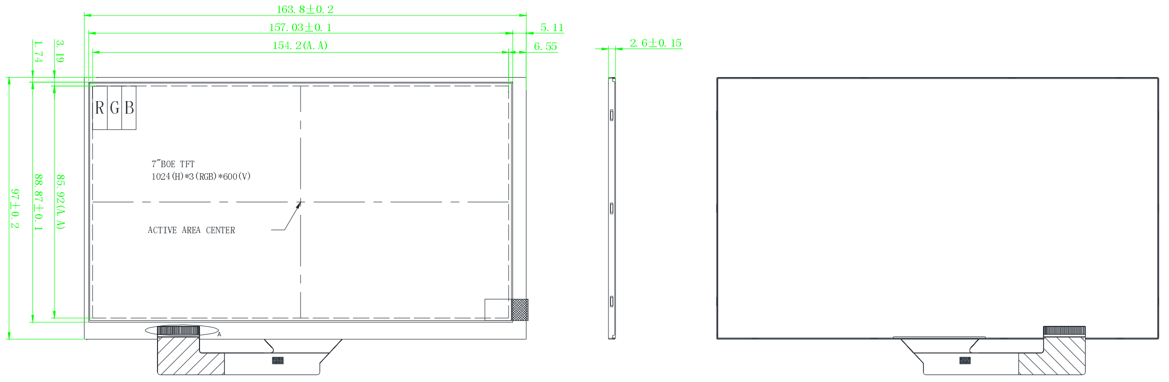
Parameter	Specification	Unit	Remarks
Number of pixels	1024(H)×600(V)	pixels	
Pixel pitch	0.1506(H)×0.1432 (V)	mm	
Active area	154.2144(H)x85.92(V)	mm	
CF size	159(H)×91(V)	mm	
Panel size	162.5(H)×95.7(V)	mm	
Pixel arrangement	Pixels RGB stripe arrangement		
Display colors	16.7M	colors	
Color gamut (C light)	50(Typ.)	%	
Display mode	Normally Black		
View angle	85/85/85/85	°	
Q-Panel size	Q1: 824.5(H)×492.7(V)/ Q2: 824.5(H)×588.4(V)	mm	
Weight (Single)	35.6 (Typ.)	g	
Weight (Q-Panel)	Q1: 965.4 (Typ.)/Q2: 1152.9(Typ.)	g	
Response time	25 (Typ.), 40 (Max)	ms	
推荐Source IC	HX 8282-A(LVDS)/ HX 8282-C或FITI EK79007(MIPI)		两种电路接口兼容

4.Outline.Drawing

? ? For Customer:	? ? ? ? :	? ? ? ? :
	? ? ? ? :	? ? ? ? :

REV??	DESCRIPTION????	REVISER???	DATE????

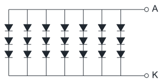
ROHS



163.8±0.2
157.03±0.1
154.2(A.A)
5.11
6.55
2.6±0.15
1.74
3.19
97±0.2
88.87±0.1
85.92(A.A)
R G B
7"BOE TFT
1024(H)*3(RGB)*600(V)
ACTIVE AREA CENTER
A

Notes:

1.LED CIRCUIT DIAGRAM:

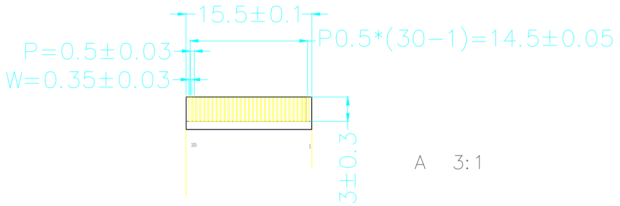


2.RoHS must be complied.

3△ Modification rev.number

4.Draft angle 1.5°:

5.All radii without dimension R0.3 Unspecified Tolerances is: ±0.2



15.5±0.1
P0.5*(30-1)=14.5±0.05
P=0.5±0.03
W=0.35±0.03
3±0.3
A 3:1

Electrical-Optical Characteristics(Ta=25°C):

Item (项目)		Symbol(符号)	min.(最小)	typ.(典型)	max(最大)	Unit (单位)	Condition (测定条件)
Main screen (主屏)	Luminance (亮度)	Lv	210	230		cd/m2	If= 160mA(恒定电流测试)
	Uniformity (均匀度)	Avg	75			%	
	Colour (色度坐标) Coordinate	X	0.26		0.315		
		Y	0.27		0.325		
Sub screen (副屏)	Luminance (亮度)	Lv	---			cd/m^2	Measure tolerance: Luminance:±5% Colour coordinate:±0.008 Voltage:±0.1V
	Uniformity (均匀度)	Avg	---			%	
	Colour (色度坐标) Coordinate	X	---		---		
		Y	---		---		
Forward Voltage (正向电压)		Vf	9	---	10.5	V	
Reverse Current (反向电流)		Ir		20		mA	Vr= 0.8V

- Operating Temperature (工作温度) -30~+70°C
- Storage Temperature (贮存温度) -40~+80°C
- Storage condition Recommended: temperature (25°C±5°C) and humidity (65%RH±20%RH)

MODEL NO.: 模组型号:			
UNIT(单位) mm	THE THIRD ANGLE PROJECTION (第三角法)	EDITION 版本号:	A/0
DESIGN 设计:		DATE日期:	
CHECKED 审核:		DATE日期:	
APPROVED批准:		DATE日期:	

5. Absolute Maximum Ratings(Ta=25℃)

Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30℃	80℃	-20℃	70℃	1,2
Humidity	-	-	-	-	3

1. The response time will become lower when operated at low temperature.
2. Background color changes slightly depending on ambient temperature.
   The phenomenon is reversible.
3. Ta<=40℃:85%RH MAX.
   Ta>=40℃:Absolute humidity must be lower than the humidity of 85%RH at 40℃.

6. Electrical Specifications and Instruction Code

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

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Digital Power Supply Voltage For LCD	DVDD	1.8	2.0		V	
Analog Power Supply Voltage	AVDD	9.4	9.6	9.8	V	
Gate On Power Supply Voltage	VGH	17	18	19	V	
Gate Off Power Supply Voltage	VGL	-6.6	-6	-5.4	V	
Common Power Supply Voltage	VCOM	3.6	3.8	4.0	V	Note 1
Logic Input Voltage	VIH	0.7*DVDD		DVDD	V	
	VIL	GND		0.3*DVDD	V	

Note1：Please adjust VCOM to make the flicker level be minimum.

6.2 LED backlight specification(VSS=0V ,Ta=25℃)

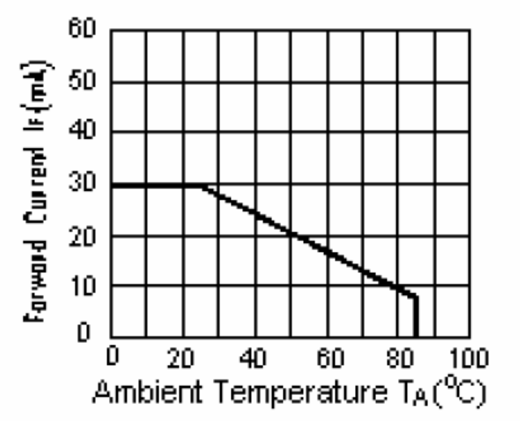
Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage		-	-	-	9.6	-	V	1
Supply current		I_f	-	-	140	-	mA	2
Forward current	Normal	I_{pn}	3-chip series x 7	-	140	-	mA	
	Dimming	I_{pd}		-	-	-		

Note:

1: VLED=VLED(+)-VLED(-).

2:The current of LED is 20mA.
A LED drive in constant current mode is recommended.

3: LED power consumption is around 0.297W.



CIRCUIT DIAGRAM

ILED VS TEMP

6.3 PIN DESCRIPTION

Pin No.	Symbol	Function	Remark
1-2	LED+	LED Anode	
3	VGH	Gate ON Voltage	
4	VGL	Gate OFF Voltage	
5	UPDN	Gate Up or Down scan control	
6	SHLR	Source Right or Left sequence	
7-8	LED-	LED Cathode	
9	AVDD	Power for Analog Circuit	
10	GND	Ground	
11	RXIN3P	MIPI Data lane3 input	
12	RXIN3N		
13	GND	Ground	
14	RXIN2P	MIPI Data lane2 input	
15	RXIN2N		
16	GND	Ground	
17	RXCLKP	MIPI CLK input	
18	RXCLKN		
19	GND	Ground	
20	RXIN1P	MIPI Data lane1 input	
21	RXIN1N		
22	GND	Ground	
23	RXIN0P	MIPI Data lane0 input	
24	RXIN0N		
25	GND	Ground	
26	STBYB	Standby mode	
27	RESET	Global reset pin	
28	VDD	Power Supply (1.8V)	
29	VDD	Power Supply (1.8V)	
30	VCOM	Common Voltage	

6.4 OPTICAL SPECIFICATION

6.5.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance 1lux and temperature = 25 2℃) with the equipment of Luminance meter system(Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0 . We refer to θØ=0 (=θ3) as the 3 o' clock direction (the "right"), θØ=90 (= θ12) as the 12 o' clock direction ("upward"), θØ=180 (= θ9) as the 9 o' clock direction ("left") and θØ=270(= θ6)as the 6 o' clock direction ("bottom"). While scanning θ and /or Ø, the center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement. VDD shall be 3.3±0.3V for LVDS interface or 1.8±0.09V for MIPI interface at 25 C.

6.5.2 Optical Specifications

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	-	85	-	Deg.	Note 1
		Θ_9		-	85	-	Deg.	
	Vertical	Θ_{12}		-	85	-	Deg.	
		Θ_6		-	85	-	Deg.	
Color Gamut (C light)				-	50	-	%	
Luminance Contrast ratio		CR	$\Theta = 0°$	-	800			Note 2
Transmittance		T(%)	$\Theta = 0°$	-	5.0	-	%	Base on C Light Note 3
White Chromaticity		x_w	$\Theta = 0°$	0.273	0.303	0.333		Note 4 C light
		y_w		0.303	0.333	0.363		
Reproduction of color (C light)	Red	x_R	$\Theta = 0°$	0.588	0.618	0.648		
		y_R		0.296	0.326	0.356		
	Green	x_G		0.255	0.285	0.315		
		y_G		0.509	0.539	0.569		
	Blue	x_B		0.116	0.146	0.176		
		y_B		0.118	0.148	0.178		
Response Time (Rising + Falling)		T_{RT}	Ta= 25° C $\Theta = 0°$	-	25	40	ms	Note 5

Notes : 1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles 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 1).

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 1) 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

4. The color chromaticity coordinates specified in Table 5 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 panel.

5. The electro-optical response time measurements shall be made as FIGURE 3 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.

7. APPENDIX

Figure 2. The Definition of Vth & Vsat

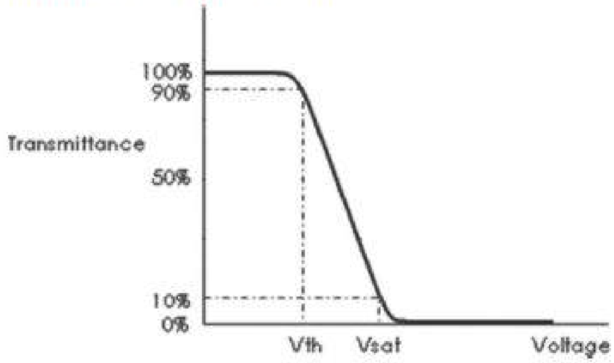


Figure 3. Measurement Set Up

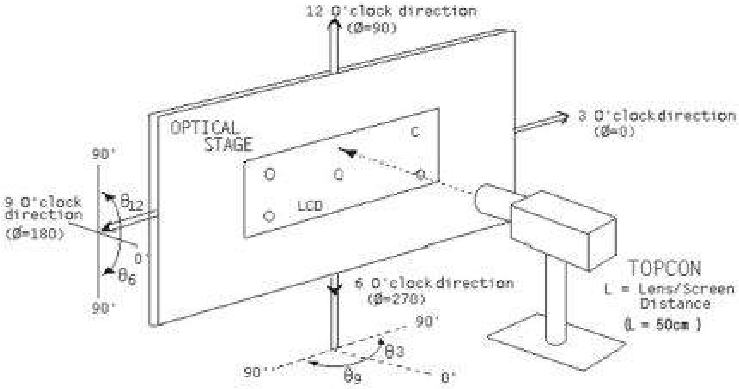
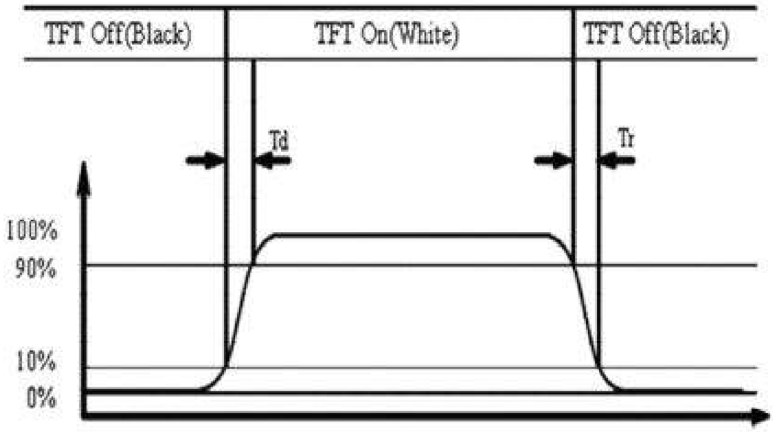

12 O'clock direction
(Ø=90)
3 O'clock direction
(Ø=0)
OPTICAL
STAGE
LCD
9 O'clock
direction
(Ø=180)
90'
θ12
0'
θ6
90'
6 O'clock direction
(Ø=270)
90'
θ3
θ9
90'
0'
TOPCON
L = Lens/Screen
Distance
(L = 50cm)

Figure 4. Response Time Testing



Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		θ=0° Φ=0°	-	180	-	Cd/m^2	1
Uniformity	⊿Bp			75	80	-	%	1,2
Viewing Angle	3:00		Cr≥10	60	70	-	Deg	3
	6:00			60	70	-		
	9:00			60	70	-		
	12:00			50	60	-		
Contrast Ratio	Cr		θ=0° Φ=0°	350	500		-	4
Response Time	T_r+T_f				25		ms	5
Color of CIE Coordinate	W	x	θ=0° Φ=0°	0.269	0.299	0.329	-	1,6
		y		0.308	0.338	0.368	-	
		Y		-	-	-		
	R	x		0.562	0.592	0.622	-	
		y		0.289	0.319	0.349	-	
		Y		-	-	-		
	G	x		0.279	0.309	0.339	-	
		y		0.537	0.567	0.597	-	
		Y		-	-	-		
	B	x		0.117	0.147	0.177	-	
		y		0.120	0.150	0.180	-	
		Y		-	-	-		
NTSC Ratio	S			-	50	-	%	

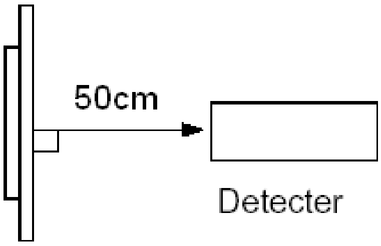
Note：The parameter is slightly changed by temperature, driving voltage and materiel

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

Measuring condition:

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

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

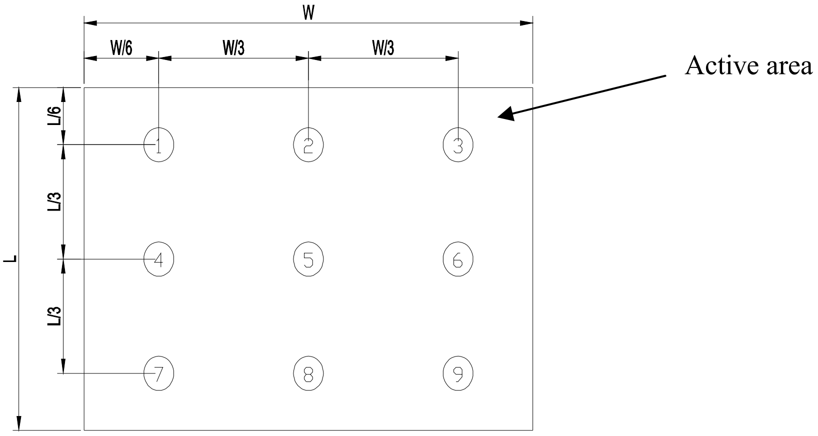


Note 2: The luminance uniformity is calculated by using following formula.

⊿Bp = Bp (Min.) / Bp (Max.)×100 (%)

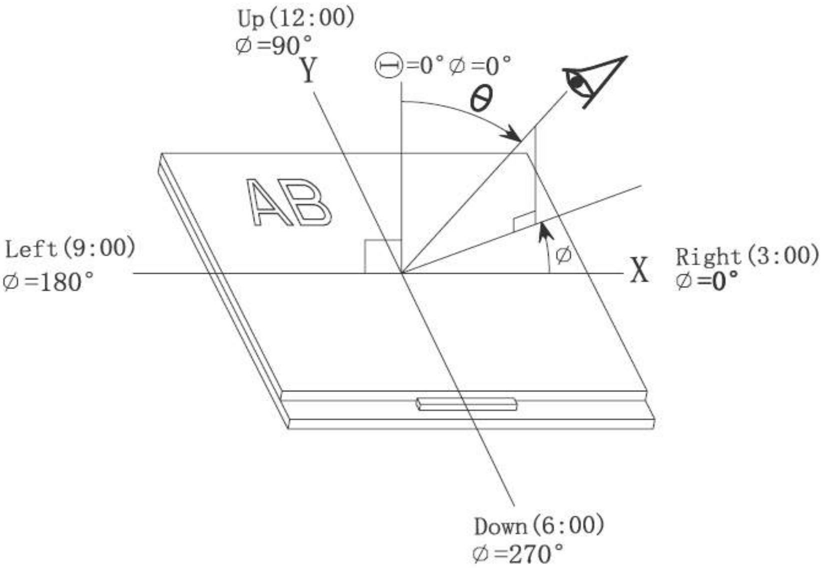
Bp (Max.) = Maximum brightness in 9 measured spots

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

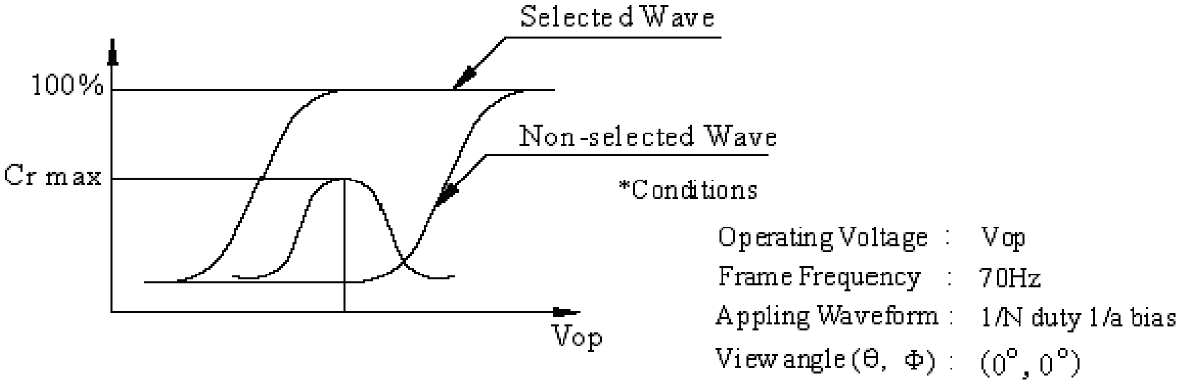


Note 3: The definition of viewing angle:

Refer to the graph below marked by *θ* and *Φ*


Up (12:00)
Ø=90°
Y
Θ=0° Ø=0°
θ
AB
Left (9:00)
Ø=180°
Ø
X
Right (3:00)
Ø=0°
Down (6:00)
Ø=270°

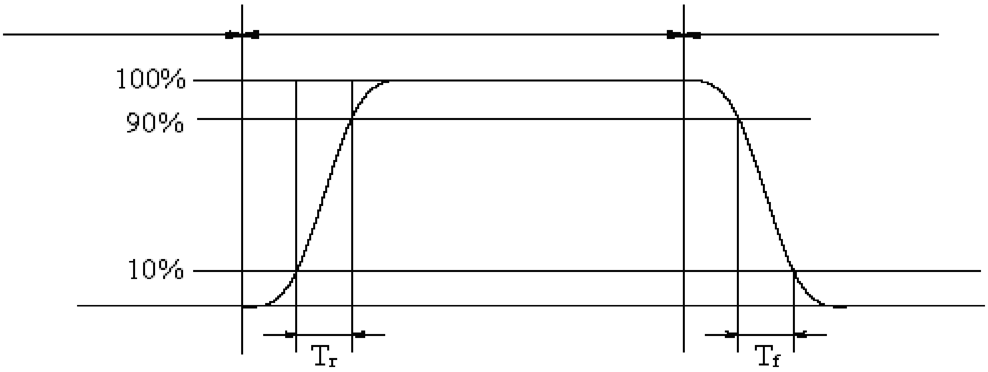
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



$$Contrast\ ratio(Cr) = \frac{Brightness\ of\ \ selected\ dots}{Brightness\ of\ \ non-selected\ dots}$$

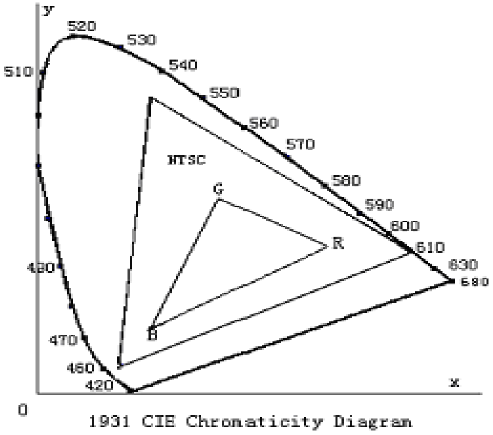
Note 5: Definition of Response time. (Test LCD using DMS501):

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


100%
90%
10%
Tr
Tf

The definition of response time

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

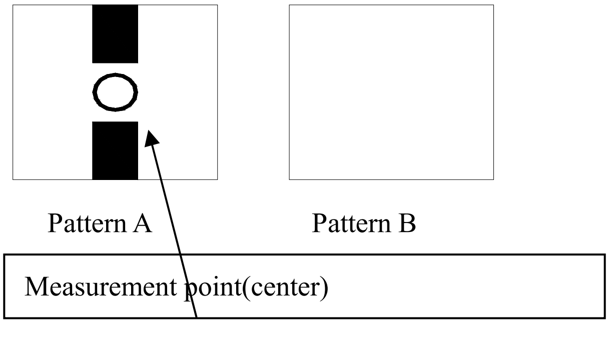

y
520
530
540
550
560
570
580
590
600
610
630
680
510
NTSC
G
R
B
480
470
460
420
0
x
1931 CIE Chromaticity Diagram

Color gamut:

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

Note 7: Definition of cross talk.

Cross talk ratio(%)=|pattern A Brightness-pattern B Brightness|/pattern A Brightness*100


Pattern A
Pattern B
Measurement point(center)

Electric volume value=3F+/-3Hex

8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80℃±2℃ 96H Restore 2H at 25℃ Power off	1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice of initial value.
2	Low Temperature Storage	-30℃±2℃ 96H Restore 2H at 25℃ Power off	
3	High Temperature Operation	70℃±2℃ 96H Restore 2H at 25℃ Power on	
4	Low Temperature Operation	-20℃±2℃ 96H Restore 4H at 25℃ Power on	
5	High Temperature/Humidity Operation	60℃±2℃ 90%RH 96H Power on	
6	Temperature Cycle	-30℃←——→80℃ 30min 5min 30min after 5 cycle, Restore 2H at 25℃ Power off	
7	Vibration Test	10Hz~150Hz, 100m/s^2, 120min	Not allowed cosmetic and electrical defects.
8	Shock Test	Half- sine wave,300m/s^2,11ms	
9	ESD Test	Air discharge:+/-8KV, Contact discharge:4KV	

Note: Operation: Supply 2.8V for logic system.

The inspection terms after reliability test, as below

ITEM	Inspection
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone+/-0,05

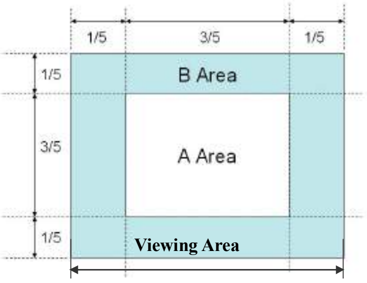
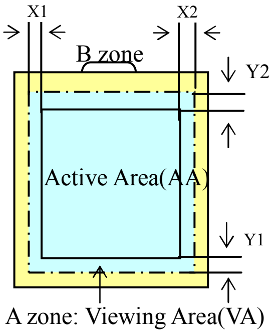
9 Quality level

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): 2mm X2(A.A~V.A): 2mm Y1(A.A~V.A): 2mm Y2(A.A~V.A): 2mm	 1/5 3/5 1/5 1/5 3/5 1/5 B Area A Area Viewing Area Figure 1  X1 X2 B zone Y2 Active Area(AA) Y1 A zone: Viewing Area(VA) Figure 2

9.3 Inspection items and general notes

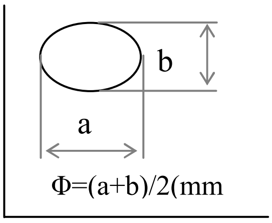
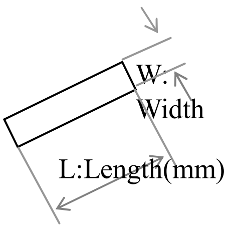
General notes	1.Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and TIANMA. 2.Viewing area should be the area which TIANMA guarantees. 3.Limit sample should be prior to this Inspection standard. 4.Viewing judgment should be under static pattern. 5.Inspection conditions Inspection distance: 250 mm (from the sample) Temperature : 25±5 ºC Inspection angle : 45 degrees in 6 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

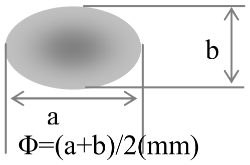
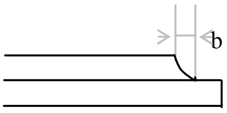
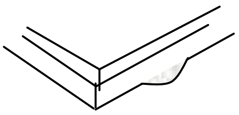
	Polarizer defect	Scratch, Dirt, Particle, Bubble on polarizer or between polarizer and glass
	Dot defect (TFT LCD)	The pixel appears bright or dark abnormally when display
	Functional defect	No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction
	Glass defect	Glass crack, Shaved corner of glass, Surplus glass
	PCB defect	Components assembly defect

9.4 Outgoing Inspection level

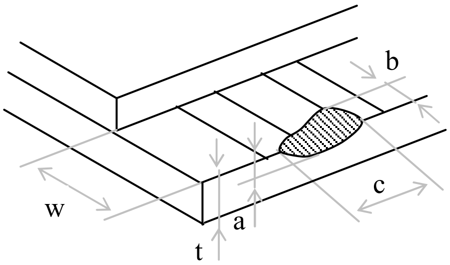
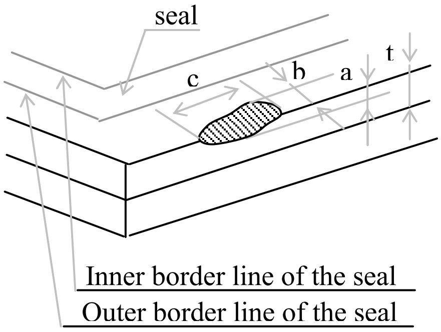
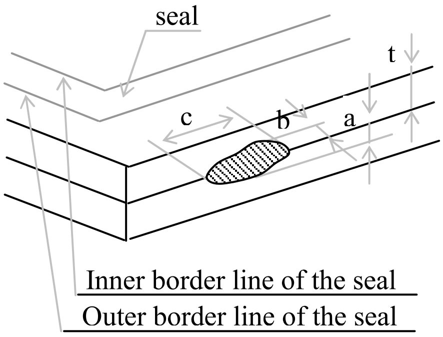
Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 8.3 general notes	See 8.5			II	0.065
Minor Defects	See 8.3 general notes	See 8.5			II	0.065
Note：Sampling standard conforms to GB2828						

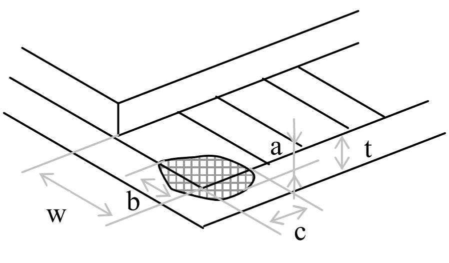
9.5 Inspection Items and Criteria

Inspection items			Judgment standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass	 (a/b<2.5)	A	Φ<=0.20	Neglected	Neglected
			B	0.20<Φ<=0.25	3	Neglected
			C	0.25<Φ<=0.3	2	Neglected
			D	0.3<Φ<=0.4	1	3
			E	0.4<Φ<=0.5	0	2
			Total defective point(B,C)		1	-
2	Black line, White line, and Particle Between Polarizer and glass, Scratch on glass	 L/W>=2.5	A	W<=0.03	Neglected	Neglected
			B	0.03<W<=0.05 L<=3.0	3	Neglected
			C	0.05<W<=0.1 L<=3.0	2	Neglected
			D	0.05<W<=0.1 L<=4.0	1	3

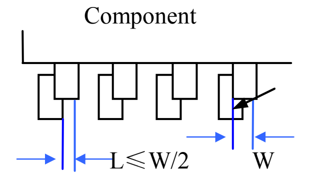
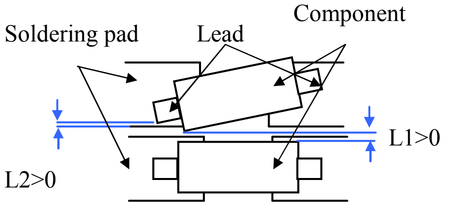
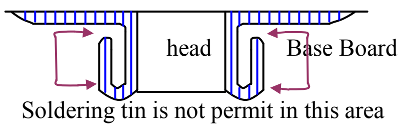
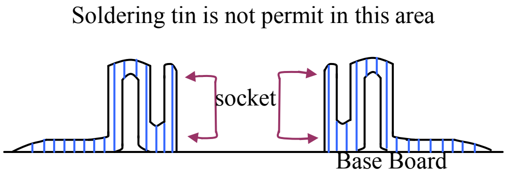
			E	W>0.1 L>4.0	0	2
			Total defective point(B,C)		1	-
3	Bright spot		any size		none	none
4	Contrast variation		A	Φ<0.2	Neglected	Neglected
			B	0.2<Φ<=0.3	2	
			C	0.3<Φ<=0.4	1	
			D	0.4<Φ	0	
			Total defective point(B,C)		3	
5	Bubble inside cell		any size		none	none
6	Polarizer defect (if Polarizer is used)	Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.	Refer to item 1 and item 2.			
		Bubble, dent and convex	A	Φ<=0.1	Neglected	Neglected
			B	0.1 <Φ<=0.2	2	Neglected
			C	0.2 <Φ<=0.3	1	2
7	Surplus glass	Stage surplus glass 	B<=0.3mm			
		Surrounding surplus glass 	Should not influence outline dimension and assembling.			
8	Open segment or open common		Not permitted			
9	Short circuit		Not permitted			
10	False viewing direction		Not permitted			
11	Contrast ratio uneven		According to the limit specimen			
12	Crosstalk		According to the limit specimen			

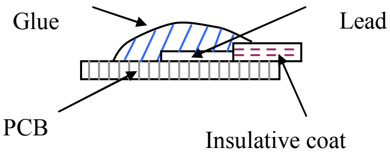
13	Black /White spot(display)	Refer to item 1
14	Black /White line(display)	Refer to item 2

Inspection items			Judgment standard		
			Category(application: B zone)		Acceptable number
15	Glass defect crack	ⅰ）The 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	
		ⅱ）Surrounding crack–non-contact side  seal c b a t Inner border line of the seal Outer border line of the seal	b < Inner borderline of the seal		
		ⅲ）Surrounding crack– contact side  seal t c b a Inner border line of the seal Outer border line of the seal	b < Outer borderline of the seal		
		ⅳ）Corner	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）	 Component L≤W/2 W  Component Soldering pad Lead L1>0 L2>0
		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	 head Base Board Soldering tin is not permit in this area  Soldering tin is not permit in this area socket Base Board

		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

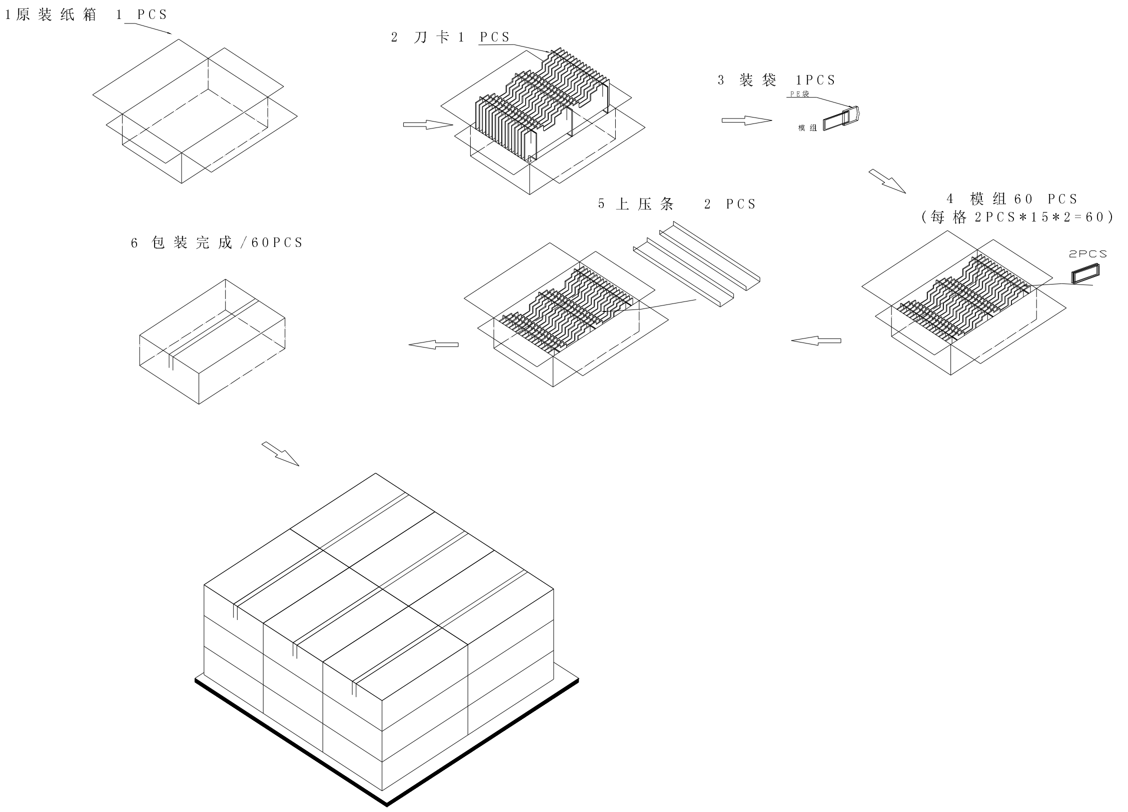
10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

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.


1原装纸箱 1 PCS
2 刀卡1 PCS
3 装袋 1PCS
PE袋
模组
4 模组60 PCS
(每格2PCS*15*2=60)
2PCS
5 上压条 2 PCS
6 包装完成/60PCS