IIDWay Technology Co. Ltd

PRODUCT SPECIFICATIONS

For Customer: _____ ☐ : APPROVAL FOR SPECIFICATION

Customer Model No. _____ ☐ : APPROVAL FOR SAMPLE

Module No.: *GZ70111-DIT021TH* *Date : 2020-01-14*

Table of Contents

For Customer's Acceptance:

Approved By	Comment

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

2. Revision Record

Date	Rev.No.	Page	Revision Items	Prepared
2020.01.14	**V0**		**The first release**	**YGM**

3. General Specifications

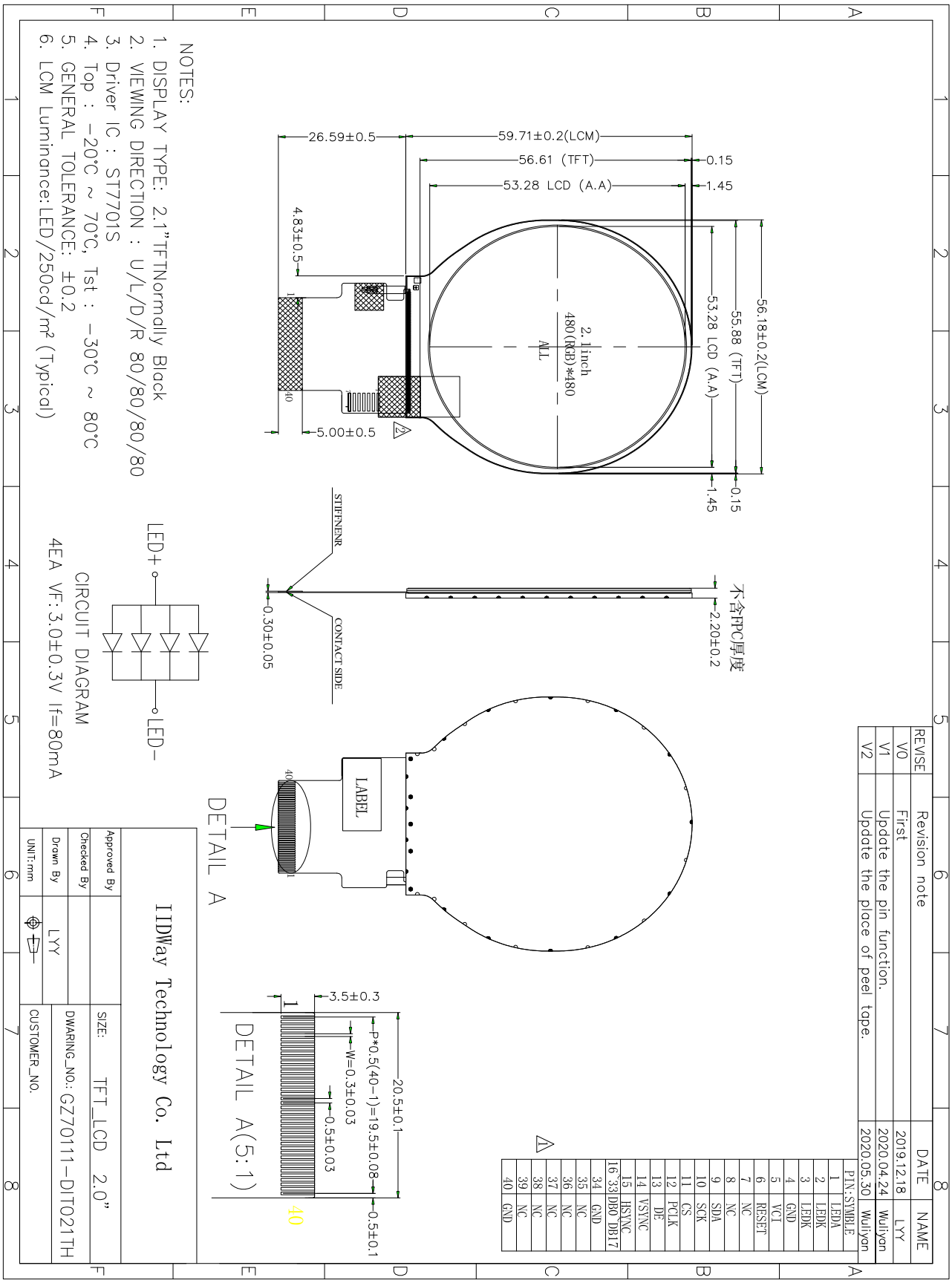
GZ70111-DIT021TH is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC,a back light unit. The 2.1″ display area contains 480X(RGB)*x480 pixels and can display up to 262K colors. This product accords with ROHS environmental criterion.*

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	262K	Color	1
Viewing Direction	ALL	O'Clock	
Operating temperature	-20~+70	℃	
Storage temperature	-30~+80	℃	
Module size	56.18X59.71X2.20	mm	2
Active Area(W×H)	53.28X53.28	mm	
Number of Dots	480×480	dots	
Controller	ST7701S	-	
Power Supply Voltage	2.8	V	
Backlight	4P-LEDs (white)	pcs	
Weight	---	g	
Interface	RGB18bit+SPI	-	

Note 1: Color tune is slightly changed by temperature and driving voltage.

Note 2: Without FPC and Solder.

4.Outline.Drawing



5. Absolute Maximum Ratings(Ta=25℃)

5.1 Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25℃)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VCI	-0.3	3.6	V	1,2

Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.

2. $V_{CI} > V_{SS}$ must be maintained.

3. Please be sure users are grounded when handing LCD Module.

5.2 Environmental Absolute Maximum Ratings.

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

Notes:

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℃.

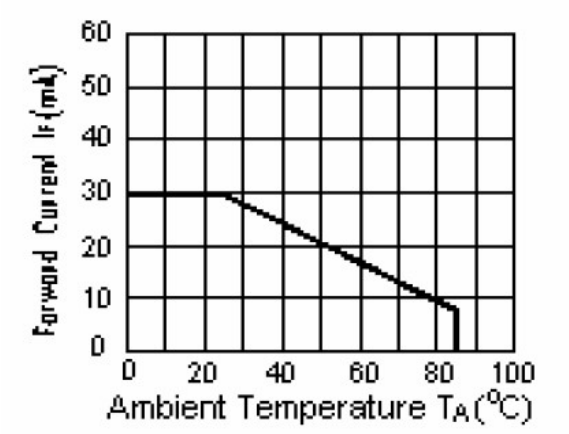
6. Electrical Specifications

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

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power voltage		VCI	Ta=25℃	2.5	2.8	3.6	V	
Input voltage	'H'	V_{IH}	Ta=25℃	0.7*VCI	-	VCI	V	
	'L'	V_{IL}	Ta=25℃	0	-	0.3*VCI	V	

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

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V_f	If=80mA	2.7	3.0	3.3	V	
Uniformity	ΔBp	If=80mA	75	80	-	%	
Life Time	time	If=80mA	-	20K	-	hours	1



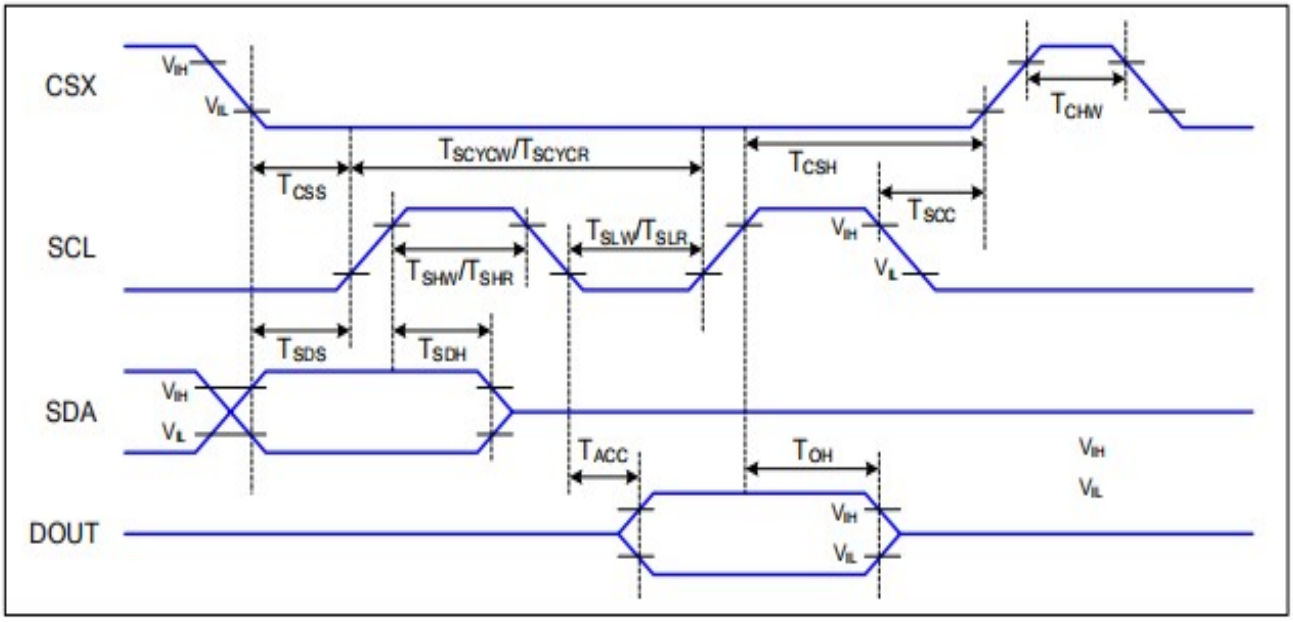
Note 1: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25℃

6.3 Interface signals

Pin No.	Symbol	I/O	Function
1	LEDA	P	LED back light(Anode)
2-3	LEDK	P	LED back light(Cathode)
4	GND	P	Ground.
5	VCI	P	Power supply
6	RESET	I	Reset pin,active “L”
7-8	NC	-	No connection.
9	SDA	I	Serial Input data bus
10	SCK	I	Serial clock as serial interface.
11	CS	I	Chip select signal
12	PCLK	I	Data clock
13	DE	I	Data enable pin
14	VSYNC	I	Vertical sync input in RGB mode
15	HSYNC	I	Horizontal sync input in RGB mode
16-33	DB0-DB17	I	RGB data bus
34	GND	P	Ground.
35	TP-INT	I	CTP control pin,no use please NC
36	TP-SDA	I	
37	TP-SCL	I	
38	TP-RESET	I	
39	TP-VCI	I	
40	GND	P	Ground.

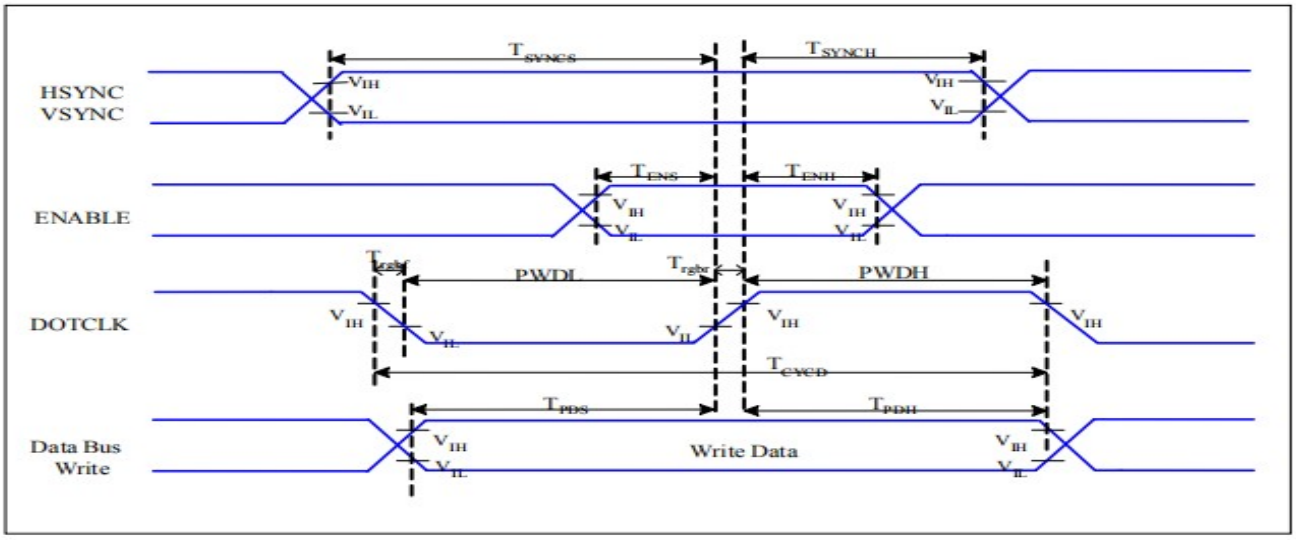
6.4 AC Characteristics

Serial Interface Characteristics (3-line serial):



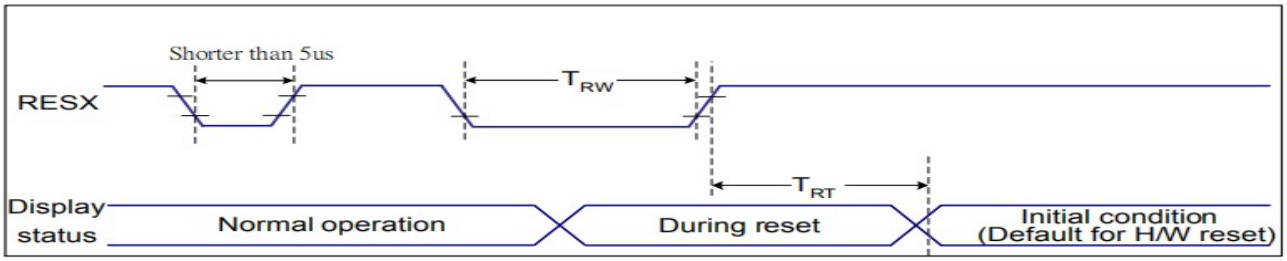
Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	60		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	

RGB Interface Characteristics :



Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYNC, HSYNC Setup Time	5	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	5	-	ns	
	T_{ENH}	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	T_{CYCD}	DOTCLK Cycle Time	33	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	5	-	ns	
	T_{PDH}	PD Data Hold Time	5	-	ns	

6.5 Reset timing



Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120(Note 1, 6, 7)	ms

7. *Optical Characteristics*

Item	Symbol		**Condition**	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		θ=0° Φ=0°	200	250	-	Cd/m^2	1
Uniformity	⊿Bp			75	80	-	%	1,2
Viewing Angle	3:00		Cr≥10	-	80	-	Deg	3
	6:00			-	80	-		
	9:00			-	80	-		
	12:00			-	80	-		
Contrast Ratio	Cr		θ=0° Φ=0°	800	1000	-	-	4
Response Time	$T_{r+}T_f$			-	30	35	ms	5
Color of CIE Coordinate	W	x	θ=0° Φ=0°	Typ. -0.05	0.301	Typ. +0.05	-	1,6
		y			0.333		-	
	R	x			0.655		-	
		y			0.327		-	
	G	x			0.284		-	
		y			0.594		-	
	B	x			0.138		-	
		y			0.111		-	
NTSC Ratio	S			60	69	-	%	

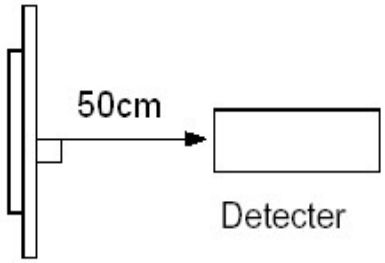
Note：The parameter is slightly changed by temperature, driving voltage and materiel

*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 equipm*ent BM-7 (Φ5mm)

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.

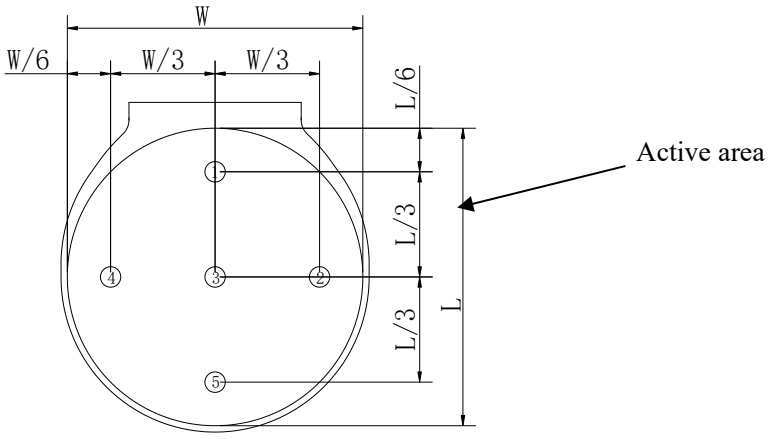


Note 2: The luminance uniformity is calculated by using following formula.

⊿Bp = Bp (Min.) / Bp (Max.)×100 (%)

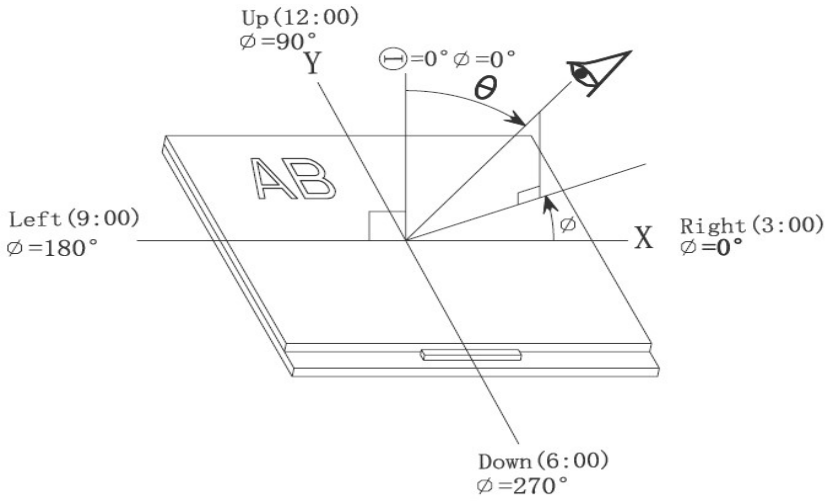
Bp (Max.) = Maximum brightness in 9 measured spots

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

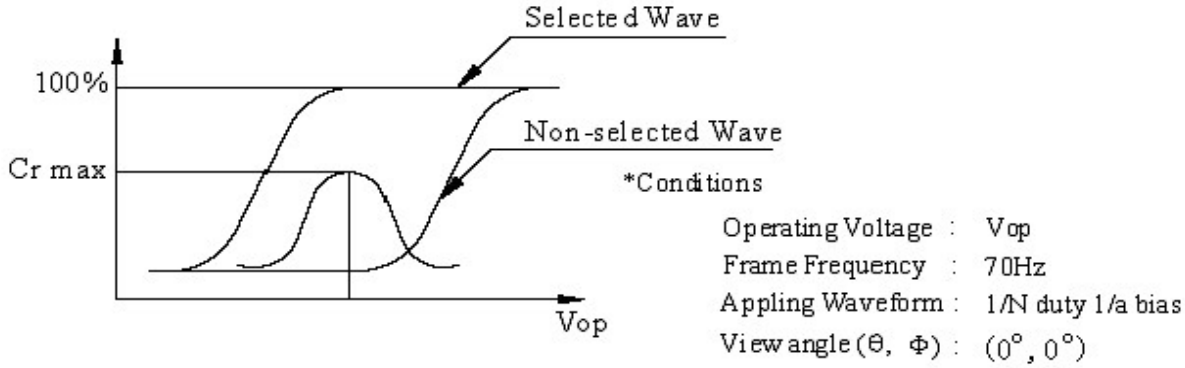


Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and Φ



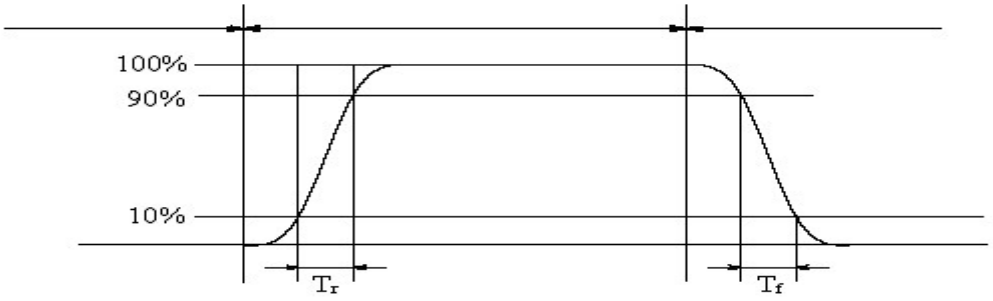
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



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

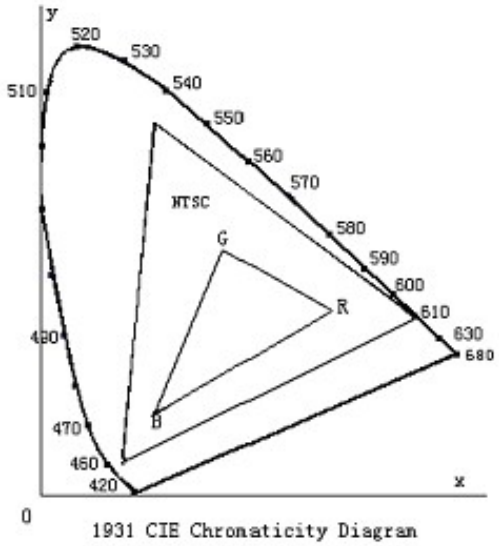
Note 5: Definition of Response time. (Test LCD using DMS501):

TThe 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.



The definition of response time

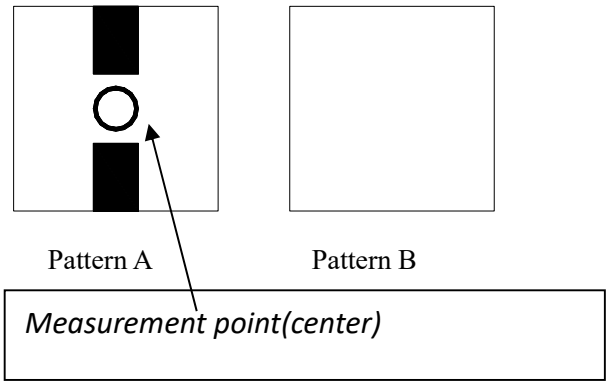
Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.



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*



Electric volume value=3F+/-3Hex

8. Reliability Test Items and Criteria

Test Item	Test condition	Remark
High Temperature Storage	Ta = 80℃ 96hrs	Note1,Note3，4
Low Temperature Storage	Ta = -30℃ 96hrs	Note1,Note3，4
High Temperature Operation	Ts = 70℃ 96hrs	Note2,Note3，4
Low Temperature Operation	Ta = -20℃ 96hrs	Note1,Note3，4
Operation at High Temperature/Humidity	+60℃, 90%RH 96hrs	Note3，4
Thermal Shock	-30℃/30 min ~ +80℃/30 min for a total 10 cycles, Start with cold temperature and end with high temperature.	Note3，4
Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Package Drop Test	Height:60cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	±2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel’s surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don’t guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time,at least 2 hours at room temperature

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

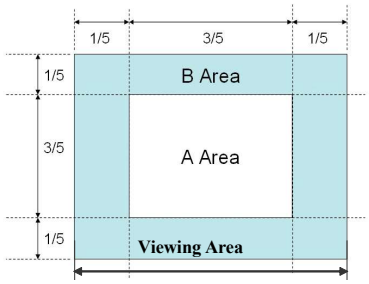


Figure 1

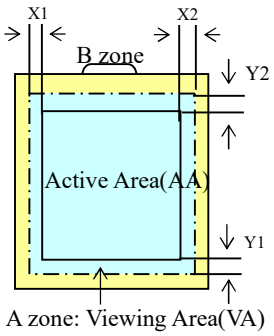


Figure 2

9.3 Inspection items and general notes

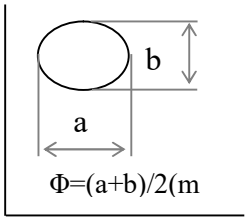
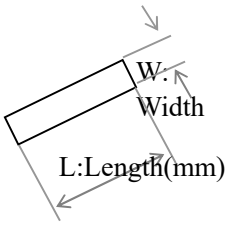
General notes	Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and us. Viewing area should be the area which us guarantees. Limit sample should be prior to this Inspection standard. Viewing judgment should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

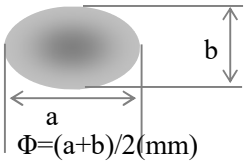
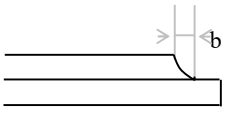
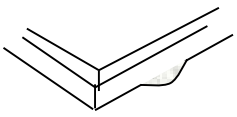
	Dot defect (TFT LCD)	The pixel appears bright or dark abnormally when display
	Functional defect	No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction
	Glass defect	Glass crack, Shaved corner of glass, Surplus glass
	PCB defect	Components assembly defect

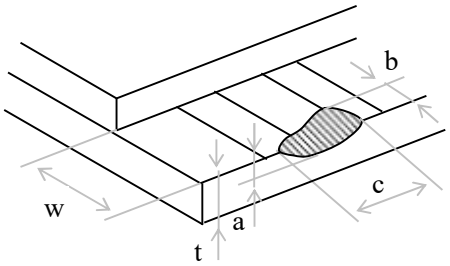
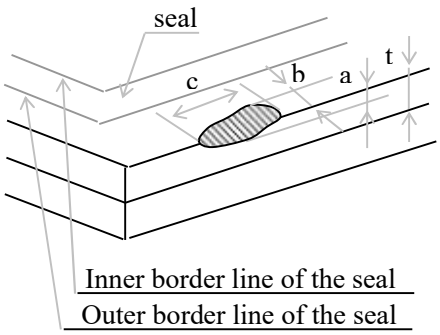
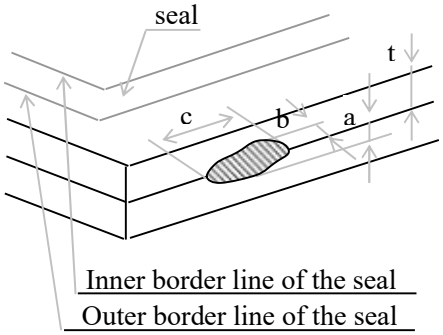
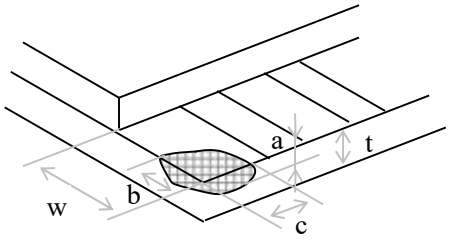
9.4 Outgoing Inspection level

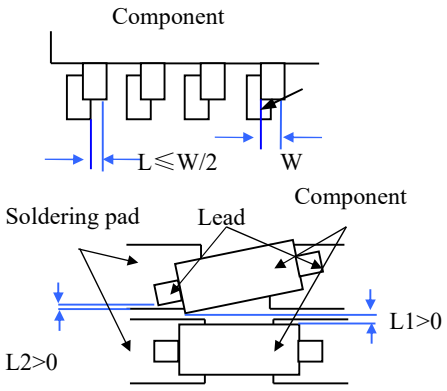
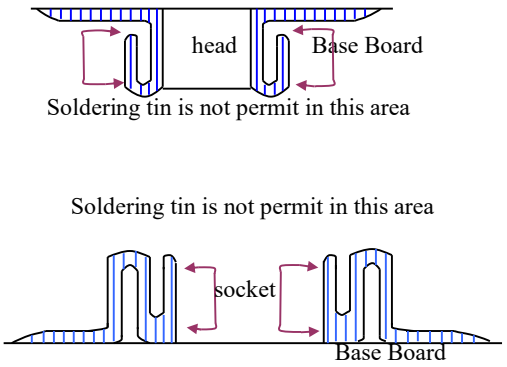
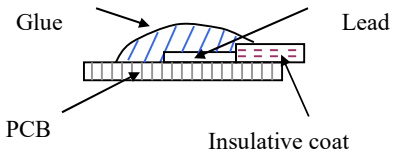
Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 9.3 general notes	See 9.5			II	0.65
Minor Defects	See 9.3 general notes	See 9.5			II	1.0
Note：Sampling standard conforms to GB2828						

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<=0.25	2	
			C	0.25<Φ	0	
			D	-	-	
			Total defective point(B,C)		1	
2	Black line, White line, and Particle Between Polarizer and glass, Scratch on glass		A	W<=0.03	Neglected	Neglected
			B	0.03<W<=0.05 L<=3.0	1	
			C	0.05<W<=0.1 L>3.0	0	
			Total defective point(B,C)		1	

<table>
<tr><td rowspan="5">3</td><td rowspan="5">Contrast variation</td><td rowspan="5"> 
</td><td>A</td><td>Φ<0.25</td><td>Neglected</td><td rowspan="4">Neglected</td></tr>
<tr><td>B</td><td>0.25<Φ<=0.3</td><td>2</td></tr>
<tr><td>C</td><td>0.3<Φ<=0.4</td><td>1</td></tr>
<tr><td>D</td><td>0.4<Φ</td><td>0</td></tr>
<tr><td colspan="2">Total defective point(B,C)</td><td>3</td><td></td></tr>
<tr><td>4</td><td colspan="2">Bubble inside cell</td><td colspan="2">any size</td><td>none</td><td>none</td></tr>
<tr><td rowspan="4">5</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="4">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<=0.4</td><td>1</td></tr>
<tr><td>C</td><td>0.4 <Φ</td><td>0</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Surplus glass</td><td>Stage surplus glass
 
</td><td colspan="4">B<=0.3mm</td></tr>
<tr><td>Surrounding surplus glass
  </td><td colspan="4">Should not influence outline dimension and assembling.</td></tr>
<tr><td>7</td><td colspan="2">Open segment or open common</td><td colspan="4">Not permitted</td></tr>
<tr><td>8</td><td colspan="2">Short circuit</td><td colspan="4">Not permitted</td></tr>
<tr><td>9</td><td colspan="2">False viewing direction</td><td colspan="4">Not permitted</td></tr>
<tr><td>10</td><td colspan="2">Contrast ratio uneven</td><td colspan="4">According to the limit specimen</td></tr>
<tr><td>11</td><td colspan="2">Crosstalk</td><td colspan="4">According to the limit specimen</td></tr>
<tr><td>12</td><td colspan="2">Black /White spot(display)</td><td colspan="4">Refer to item 1</td></tr>
<tr><td>13</td><td colspan="2">Black /White line(display)</td><td colspan="4">Refer to item 2</td></tr>
</table>

Inspection items			Judgment standard		
			Category(application: B zone)		Acceptable number
14	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 	b < Inner borderline of the seal		
		iii) Surrounding crack- contact side 	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)
15	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.*

END