JICTECH LCD (HONGKONG) CO.,LTD
DONGGUAN JICTECH LCD CO.,LTD
PROFESSIONAL LCM SUPPLIER

PRODUCT SPECIFICATION FOR LCD MODULE

Model NO.:JV028T1CSR-03B

Specification Ver.: 01

□APPROVAL FOR SPECIFICATIONS ONLY

■APPROVAL FOR SPECIFICATIONS AND SAMPLE

CUSTOMER：	APPROVED BY：

JICTECH LCM R&D CENTER		
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REVISION RECORD

Rev NO.	Date	Revision Contents	Note
01	2022.03.22	First release	Initial sample

CONTENTS

1. GENERAL SPECIFICATION

1.1 Introduction

The JV028T1CSR-03B is a color active matrix Thin Film Transistor (TFT) Liquid Crystal Display (LCD) that uses amorphous silicon (a-Si) TFT as a switching device. This model is composed of a single 2.8 inches transmissive type main TFT-LCD panel. The resolution of the panel is 240[RGB]x320 pixels and can display up to 262K color.

1.2 Feature

- Using TN panel and EWV polarizer.
- FOG and backlight assembly module with RTP.

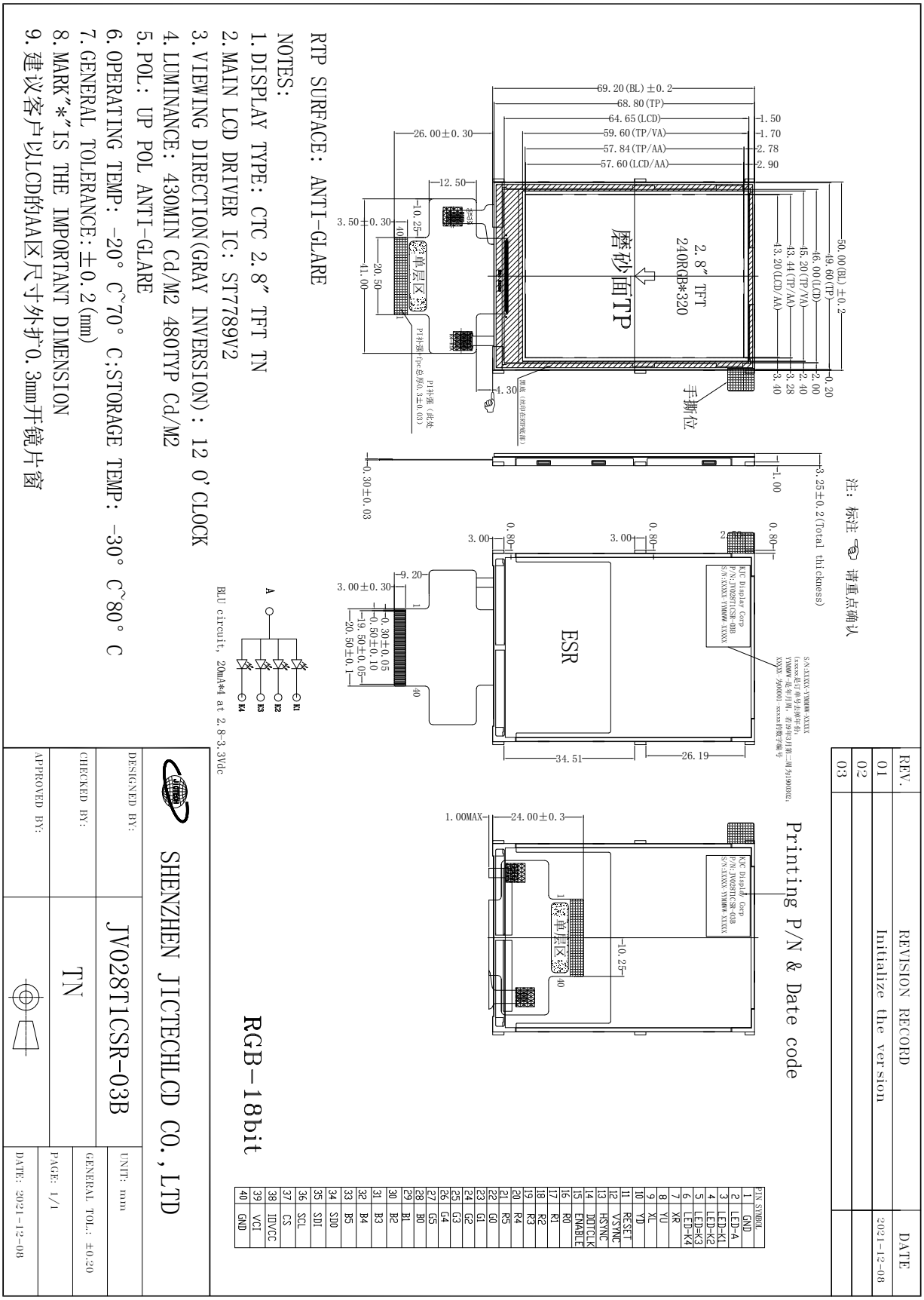
1.3 Application

- Display terminals for digital products. Industrial control Etc.

1.4 General Specification

No.	Item	Specification	Note
1	LCD Size	2.8 inch	-
2	Panel Type	a-Si TFT active matrix	-
3	Resolution	240RGB(H) x 320(V) pixel	-
4	Display Mode	TN / Normally White	-
5	Display Number of Colors	262K colors	-
6	Viewing Direction (Gray inversion):	12 O'CLOCK	-
7	Contrast Ratio	500	-
8	Luminance	480 cd/m^2	-
9	Module Size	50.00(H) x 69.20(V) x 3.25 (T)mm	-
10	Active Area	43.20 mm(H) x57.60 mm(V)	-
11	pixel size	0.18(H) x 0.18(V)mm	-
12	Driver IC	ST7789V2	-
13	Light Source	4 LEDs (White)	-
14	Interface	RGB	-
15	RTP surface treatment	Anti-glare	-
16	Operating Temperature	-20~70 (Max. scope)	-
17	Storage Temperature	-30~80 (Max. scope)	-
18	Weight	TBD	

2. OUTLINE DIMENSIONS



PIN	SYMBOL
1	GND
2	LED-A
3	LED-K1
4	LED-K2
5	LED-K3
6	LED-K4
7	XR
8	YU
9	XL
10	YD
11	RESET
12	VSYNC
13	HSYNC
14	DOTCLK
15	ENABLE
16	R0
17	R1
18	R2
19	R3
20	R4
21	R5
22	G0
23	G1
24	G2
25	G3
26	G4
27	G5
28	B0
29	B1
30	B2
31	B3
32	B4
33	B5
34	SDO
35	SDI
36	SCL
37	CS
38	IOVCC
39	VCI
40	GND

3. ABSOLUTE MAXIMUM RATINGS

Parameter of absolute maximum ratings	Symbol	Min	Max	Unit
Supply voltage	VCI	-0.3	+4.6	V
Supply voltage (Logic)	VDDI	-0.3	+4.6	V
Logic Input Voltage Range	VIN	-0.3	VDDI+0.3	V
Logic Output Voltage Range	VO	-0.3	VDDI+0.3	V
Operating temperature	Top	-20	70	°C
Storage temperature	Tst	-30	80	°C

4. ELECTRICAL CHARACTERISTICS

4.1. DC Characteristics for Panel Driving

Item	Symbol	Min	Typ	Max	Unit
Analog Operating Voltage	VDD	2.5	2.8	3.3	V
Logic Operating Voltage	VDDI	1.65	2.8	3.3	V
Input voltage 'H' level	VIH	0.7VDDI	-	VDDI	V
Input voltage 'L' level	VIL	VSS	-	0.3VDDI	V
Output voltage 'H' level	VOH	0.8VDDI	-	VDDI	V
Output voltage 'L' level	VOL	VSS	-	0.2VDDI	V

4.2. Backlight Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward voltage	V	2.8	3.0	3.3	V	If=80mA
LED circuit	4 LEDs parallel connection					
Chromaticity	x	0.26	0.28	0.32	-	If=80mA
White CIE (x, y)	y	0.26	0.28	0.32	-	

Using condition: constant current driving method I_f= Single led 20mA(+/-10%).

5. INTERFACE DESCRIPTION

5.1. LCM PORT:

Pin No.	Symbol	I/O	Description	When not in use
1	GND		System ground	
2	LEDA		LED Positive.	
3	LEDK1		LED Negative	
4	LEDK2		LED Negative	
5	LEDK3		LED Negative	
6	LEDK4		LED Negative	
7	XR		RTP PIN	
8	YU		RTP PIN	
9	XL		RTP PIN	
10	YD		RTP PIN	
11	RESET		Reset signal	
12	VSYNC		Vertical(Frame)synchronizing input signal	
13	HSYNC		Horizontal(Line)synchronizing input signal	
14	DOTCLK		Dot clock signal for RGB interface operation	
15	ENABLE		Data enable signal for RGB interface operation	
16-21	R0-R5		Data bus pin	
22-27	G0-G5			
28-33	B0-B5			
34	SD0		Serial data output	
35	SDI		Serial data input	
36	SCL		Serial interface clock	

37	CS		Chip selection pin	
38	IOVCC		I/O Voltage	
39	VCI		Analog Voltage	
40	GND		System ground	

Note: The voltage power of the interface logic pin depend on “IOVCC” and “GND”.

6. OPTICAL CHARACTERISTICS

Item	Symbol		Condition	Min	Typ	Max	Unit	Remark
Contrast ratio	CR		Viewing normal angle θ=ψ= 0° If=80mA TC=25°C	-	500	-	-	Note 1
White Luminance (center)	Lv			430	480	--	cd/m^2	Note 2
Brightness uniformity	δWHITE			80		-	%	Note 3
Response time	Tr+Tf			-	16		ms	Note 4
Color Chromaticity (CIE1931) (center)	White	Wx		+0.05	0.30	-0.05	-	-
	White	Wy			0.29		-	-
Viewing angle range	θ	3:00	Center (CR≥10)	-	45	-	degree	Note 5
		9:00		-	45	-		
		6:00		-	50	-		
		12:00		-	20	-		
NTSC Ratio	S		-	-	55%	-	-	Note6

*Note: All above side data are based on JICTECH following condition.

Note1. Contrast Ratio (CR) is defined mathematically by the following formula. For more information see FIG 1.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels}}{\text{Average Surface Luminance with all black pixels}}$$

Note2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see FIG 1.

Lv = Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)

Note3. The uniformity in surface luminance（δWHITE）is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see FIG 1.

s

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels}}{\text{Maximum Surface Luminance with all white pixels}}$$

Note4. Response time is the time required for the display to transition from White to black (Rise Time, Tr) and from black to white (Decay Time, Tf). For additional information see FIG 2.

Note5. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

Note6: NTSC ratio：For more information see FIG 4.

$$\text{NTSC ratio} = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}}$$

FIG.1. Measuring method for Contrast ratio,surface luminance, Luminance

s

A : 5 mm

B : 5 mm

H,V : Active Area

Light spot size =5mm, 500mm distance from the LCD surface to detector lens

measurement instrument is luminance meter BM-7. or DMS 803.

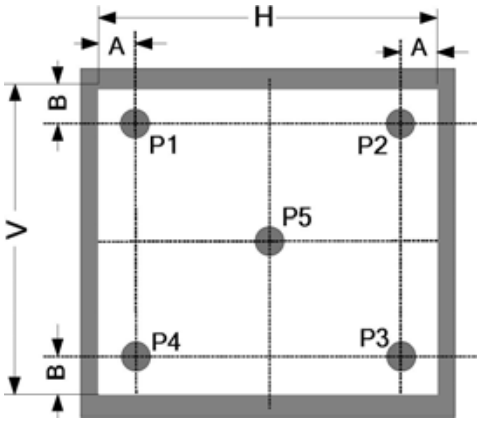


FIG.2.The definition of Response Time

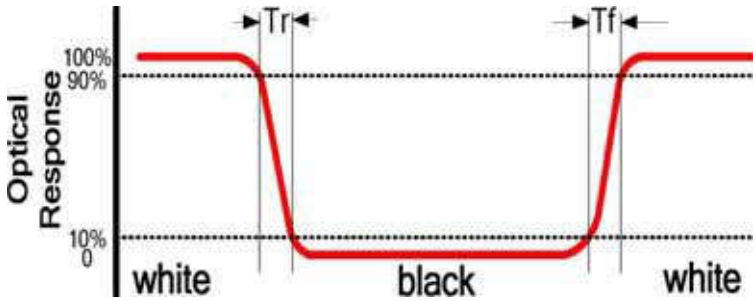
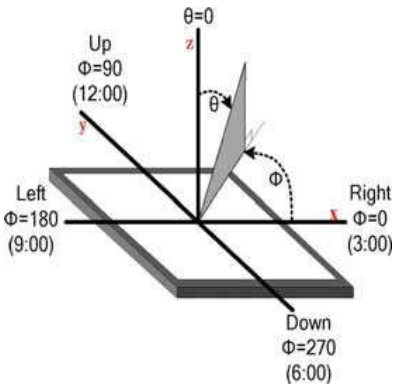


FIG.3. The definition of viewing angle



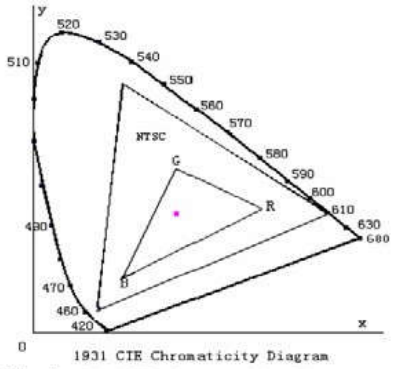


Fig.4. 1931 CIE chromaticity diagram

7.RELIABILITY TEST CONDITONS

No.	Test Item	Content of Test	Test Conditions
1	High Temperature Storage	Endurance test of high temperature for a long time.	80±2℃48H
2	Low Temperature Storage	Endurance test of low temperature for a long time.	-30±2℃48H
3	High Temperature Operation	Endurance test of electrical stress (Voltage & Current) and the thermal stress to the element.	70±2℃48H
4	Low Temperature Operation	Endurance test of electrical stress (Voltage & Current) and the thermal stress to the element.	-20±2℃48H
5	Thermal shock	Endurance test of low and high temperature cycles.(air to air)	-20±2℃(30min)→+25±2℃(30min)→+70(30min)±2℃,10 cycl
6	ESD test	ESD test	Voltage:±6kv/±4kv R: 200Ω C: 150pF Air/Contact discharge, 5 points each 1 times

Note:

1) When making the low temperature test, not to dewy.

2) Driving condition for operation test. Power Supply Voltage for Logic System Failure Judgment Criterion After the above mentioned test.(For Environmental Test, after 2 hours in room temperature.) There should not be conspicuous failure of display quality and appearance.

3) Contrast ratio should be 50% of the initial contrast ratio.

4) There should not have any abnormality of function.

LIFE TIME

Item	Description
1.	Functions, Performance, appearance, etc. shall be free from remarkable deterioration within 20,000 hours under ordinary operating and storage conditions room temperature (25±10ºC) , normal humidity(40±20%RH),and in area not exposed to direct sun light.

8. INSPECTION CRITERION

8.1 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.

8.2 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

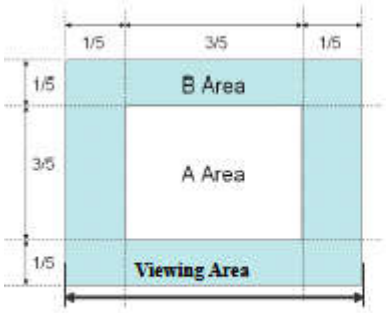


Figure 1

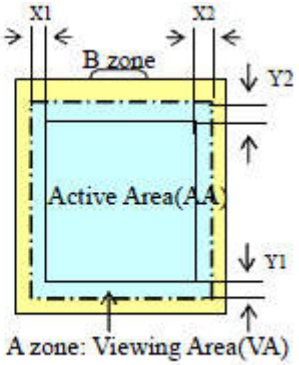


Figure 2

8.3 Inspection items and general notes

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
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 JICTECH. 2.Viewing area should be the area which JICTECH 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 sample viewing direction (all defects in viewing area should be inspected from this direction)	

8.4 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	0.25
Minor Defects	See 8.3 general notes	See 8.5			II	0.65
Note：Sampling standard conforms to GB2828						

8.5 Inspection Items and Criteria

	检验项目 **Inspection items**	检验内容 Inspect **content**	缺陷级别 **Defect levels**	
			主缺 **main deficiency**	轻缺 less **deficiency**
1		点状不良超规格不可：Spotty defects over specification can not: 黑点、白点、红点、绿点、蓝点等。凹凸点\异物 (点状) Black spots, white spots, red spots, green spots, blue spots, etc. Bump points \ foreign bodies (dots)		√

大小(D)MM (D) MM size	允许的个数 **allowed qty**
D< 0.1	不计（密集不可）Not count (dense not allowed)
0.1 ≤D≤0.15	2
0.15≤D≤0.2	1
0.2<D	0

线状不良超规格不可：

长 L(mm)	宽 W (mm)	允许数量 **allowed qty**
不计	W≤0.02	不计(密集不可) Not count (dense not allowed)
L≤3.0	0.02＜W≤0.03	2
L≤2.0	0.03＜W≤0.05	1
———	W＞0.05	0

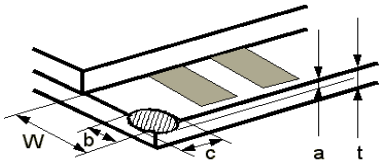
√

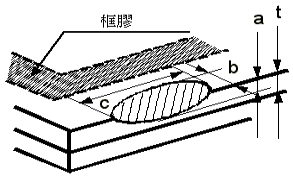
Bad pixel

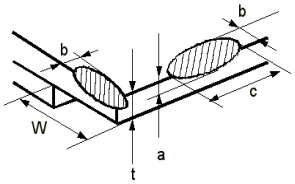
Item	Criteria	Total
Bright dot	N≤2	≤3
Dark dot	N≤1	
Bright adjacent dots	N≤2	2
Dark adjacent dots	N≤2	2
Adjacent bright and dark dots	N≤2	2

√

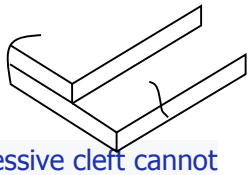
外观部分：Appearance:

<table>
<tr><th rowspan="2">NO</th><th rowspan="2">检验项目
Inspection items</th><th rowspan="2">检验内容 Inspection content</th><th colspan="2">缺陷级别
Defect levels</th><th rowspan="2">检验方法及工具
Inspection methods and tools</th></tr>
<tr><th>主缺
main defici ency</th><th>轻缺
less defici ency</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">LCD 外观
LCD appearance</td><td>角边破损超规格不可：Corner damage is not acceptable
 

<table><tr><td>c（长度）</td><td>b（宽度）</td><td>t（厚度）</td></tr><tr><td>≤2.0MM</td><td>≤W</td><td>不计</td></tr></table></td><td></td><td>√</td><td rowspan="2">目视、
比对卡、
放大镜、
塞规
Visual,
The comparison,
A magnifying glass, Plug gauge</td></tr>
<tr><td>非端子部破损：Non-terminal damage:
 

<table><tr><td>c（长度）</td></tr><tr><td>≤3.0MM</td></tr><tr><td>b（宽度）</td></tr><tr><td>不可触到框胶</td></tr><tr><td>t（厚度）</td></tr><tr><td>不计</td></tr></table>
 

<table><tr><td>c（长度）</td></tr><tr><td>≤3.0MM</td></tr><tr><td>b（宽度）</td></tr><tr><td>≤W/3</td></tr><tr><td>t（厚度）</td></tr><tr><td>不计</td></tr></table></td><td></td><td>√</td></tr>
</table>

NO	检验项目 **Inspection items**	检验内容 **Inspection content**	缺陷级别 Defect levels		检验方法及工具 **Inspection methods and tools**
			主缺 **main deficiency**	轻缺 less **deficiency**	
2	LCD 外观 **LCD appearance**	裂 crack  有进行性裂不可 progressive cleft cannot		√	目视、比对卡、放大镜、塞规 Visual, The comparison, A magnifying glass, Plug gauge
		偏光片裂痕：VA 区域内不论大小不可存在 Polaroid crack: no matter the size of the VA area does not exist	√		
		偏光片偏移（凹、凸）不可超出图纸要求 Polarizer offset (concave, convex) should not exceed the requirements of the drawing		√	
		封口胶不良(脱落、尺寸不符) Poor sealing glue (falling off, size inconsistent)		√	
		气泡：气泡不能横跨 2 条线路, 且不可超过 2 个 Bubbles: No more than two bubbles can span two lines		√	

9 PRECAUTION FOR USE OF LCD MODULE

9.1. Handling Precautions

1) The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
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.
3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. 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 异丙醇

--Ethyl alcohol 酒精

Solvents other than those mentioned above may damage the polarizer.
Especially, do not use the following:

--Water 水

--Ketone 芳香剂

6) Do not attempt to disassemble or process the LCD module.

9.2. Assembling Precautions

1) When mounting the LCD module make sure that it is free of twisting, warping, and distortion. Distortion has great influence upon display quality. Also keep the stiffness enough regarding the outer case.
2) Please handle the LCD module by its side.
3) NC terminal should be open. Do not connect anything.
4) If the logic circuit power is OFF, do not apply the input signals.
5) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
   ·Be sure to ground the body when handling the LCD module.
   ·Tools required for assembly, such as soldering irons, must be properly grounded.
   ·To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
   ·The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.
   LCD
6) Be careful when treating the glass panel because it has very sharpened edge.

9.3. Storage Precautions

1) When storing the LCD module, avoid exposure to direct sunlight of to the light of fluorescent lamps and high temperature/high humidity. Whenever possible, the LCD module should be stored in the same conditions in which they were shipped from our company.
2) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets or a current flow in a high-humidity environment.

9.4. Design Precautions

The absolute maximum ratings represent the rated value beyond which LCD module can not

1) exceed. When the LCD modules are used in excess of this rated value, their operation characteristics may be adversely affected.
2) To prevent the occurrence of erroneous operation caused by noise, attention must be paid to satisfy VIL, VIH specification values including taking the precaution of using signal cables that are short.
3) The LCD exhibits temperature dependency characteristics. Since recognition of the display becomes difficult when the LCD is used outside its designated operating temperature range, be sure to use the LCD within this range. Also keep in mind that the LCD driving voltage levels necessary for clear displays will vary according to temperature.
4) We recommended that power supply lines (VDD) have over-current protection line. (Fuse etc. Recommend Value:0.5A)
5) Sufficiently notice the mutual noise interference occurred by peripheral devices.
6) To cope with EMI, take measures basically on outputting side.
7) When installing an LCD module, fasten it at the LCD panel.
8) The display panel is made of general float glass which is not guaranteed for strength. So please consider about following.
   ·Do not subject panel to a mechanical shock by dropping directly.
   ·Do not let case to touch to panel directly.

Others

1) Liquid crystal solidifies under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the LCD module is subjected to a strong shock at a low temperature.
2) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
3) To minimize the performance degradation of the LCD module's resulting from destruction caused by static electricity, etc., exercise care to avoid touching the following section when handling this module: LCD's Terminal electrode sections.
4) Optimum voltage to obtain best contrast value depending on products. Therefore voltage adjustment with electric volume is required in each display.
5) Precaution for disposal of LCD module. When disposal of LCD module, ask specialization company of industrial waste which is permitted by the government. When burn up LCD module, obey the law of environmental hygienics.