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NEXT VISION DISPLAY

SPECIFICATION

CUSTOMER : _____

MODULE NO.: NT050-N001ML

Version	
Engineer	
Date	2020/3/17

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Customer:
Approved by

NEXT VISION DISPLAY CO., LTD.

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1. General Description

- The NT050-C002ML model is a Color TFT LCD supplied by Next Vision Display.
- This main Module has a 5.0 inch diagonally measured active display area with 800(RGB)X480 resolution. Each pixel is divided into Red, Green and Blue sub-pixels and dots, which are arranged in vertical stripes.
- The NT050-C002ML has been designed to apply the HDMI interface method that enables low power, high speed, and high contrast.
- Without touch panel.

2. Mechanical Specification

ITEM	Standard Value	Unit
Display Mode	Normally White, Transmissive LCD	
Module Dimension	120.70(W)*97.05(H)*5.40(T)	mm
Resolution	800(RGB)X 480	Pixels
Active Display Area	108.00(W)×64.80(H)	mm
Module Structure	LCD Display + PCB	
Viewing Direction	All	--
LED Backlight Color	White	--
Interface	LCD：HDMI	--
Color Numbers	16.7M	
Power supply	USB(5.0V)	
Support system	Win/7/Win8/Win10(plug and play)	
	Android,Linux (configured in requests)	
Power Consumption	450(Max)	mA

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3. Absolute Max Ratings & Electrical Specification

- **Absolute Max Rating**

Item	Min.	Typ	Max	Unit	Remark
Operating temperature	-20	--	70	° C	
Storage temperature	-30	--	80	° C	
Humidity	--	--	90%	RH	@60° C

Note:

*1) Liquid Crystal driving voltage.

Due to the characteristics of LC Material, this voltage vary with environmental temperature.

*2) Temp.>60℃, Absolute humidity shall be less than 90%RH at 60℃

*3) Temp.≤60℃, 90%RH MAX.

*4) The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings.

Accordingly, please make sure that the module is used within this range.

And these current values are measured under the condition that all devices are stopped, each component is stable and logic signal is input.

■ TFT Electrical Specification

Item	Min.	Typ	Max	Unit	Remark
PCB operating voltage	-	5.0	-	V	USB input
LCD I/O voltage(VDD)	3.0	3.3	3.6	V	
Input signal ” H”	0.7*VDD	--	VDD	V	
Input signal ” L”	VSS	--	0.3*VDD	V	
Output signal ” H”	VDD-0.4		VDD	V	
Output signal ” L”	VSS		VSS+0.4	V	

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4. Optical Specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp	θ=0°	-	500	-	cd/m^2	
Uniformity	ΔBp	Φ=0°	-	80	-	%	
Viewing Angle	θ1 (Φ=90° or270°)	12 o'clock	-	80	-	Deg	Cr≥10
		6 o'clock	-	80	-		
	θ2 (Φ=0° or 180°)	9 o'clock	-	80	-		
		3 o'clock	-	80	-		
CIE	Wx	θ=0° Φ=0°	0.26	0.30	0.36		
	Wy		0.28	0.33	0.38		
Contrast Ratio	Cr		-	800		-	
Response Time	t_{on}		-	20	-	ms	
	t_{off}		-			ms	

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Note.1 These items are measured by C light.
Note.2 Definition of Viewing Angle(θ,ψ),refer to Fig.1 as below :

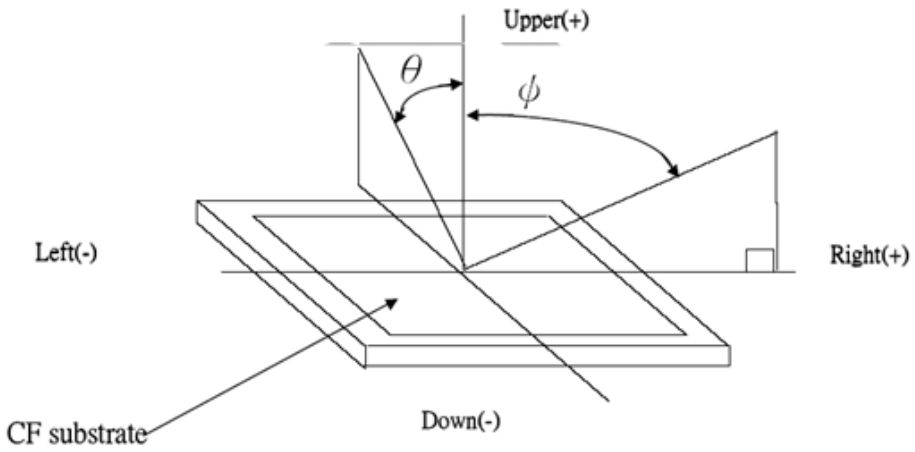
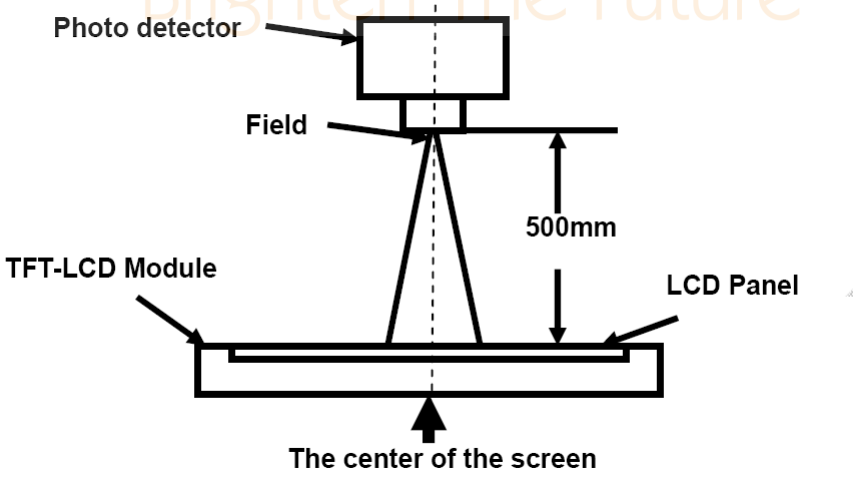


Fig.1 Definition of Viewing Angle

Note.3 Using LC+ EWV Polarizer+Corresponding Backlight, reference only, Measure device：BM-5A (TOPCON)，viewing cone= 1 °，I_L=20mA。

Electro-optical characteristics test method:

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Definition of contrast ratio

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

“White state “:The state is that the LCD should driven by Vwhite.

“Black state”: The state is that the LCD should driven by Vblack.

Vwhite: To be determined

Vblack: To be determined.

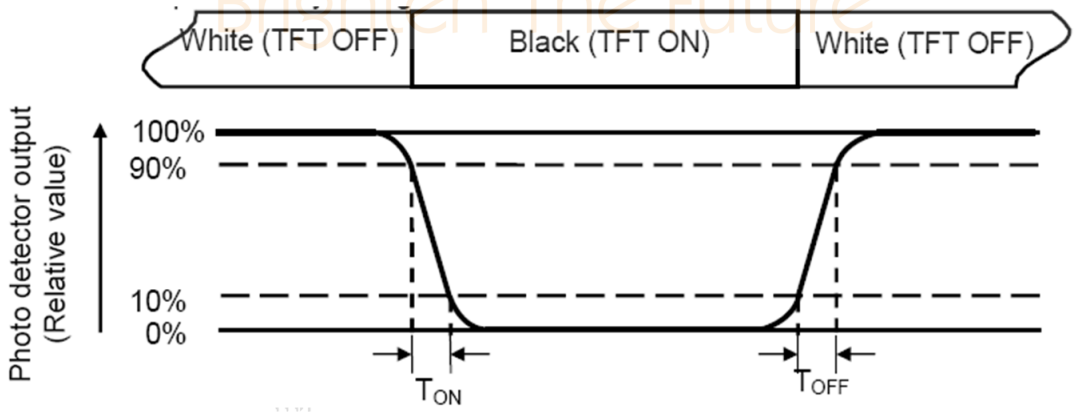
Definition of Response Time:

The response time is defined as the LCD optical switching time interval between “White” state and

“Black” state. Rise time (TON) is the time between photo detector output intensity changed from

90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from10% to 90%.

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Definition of color chromaticity (CIE1931)

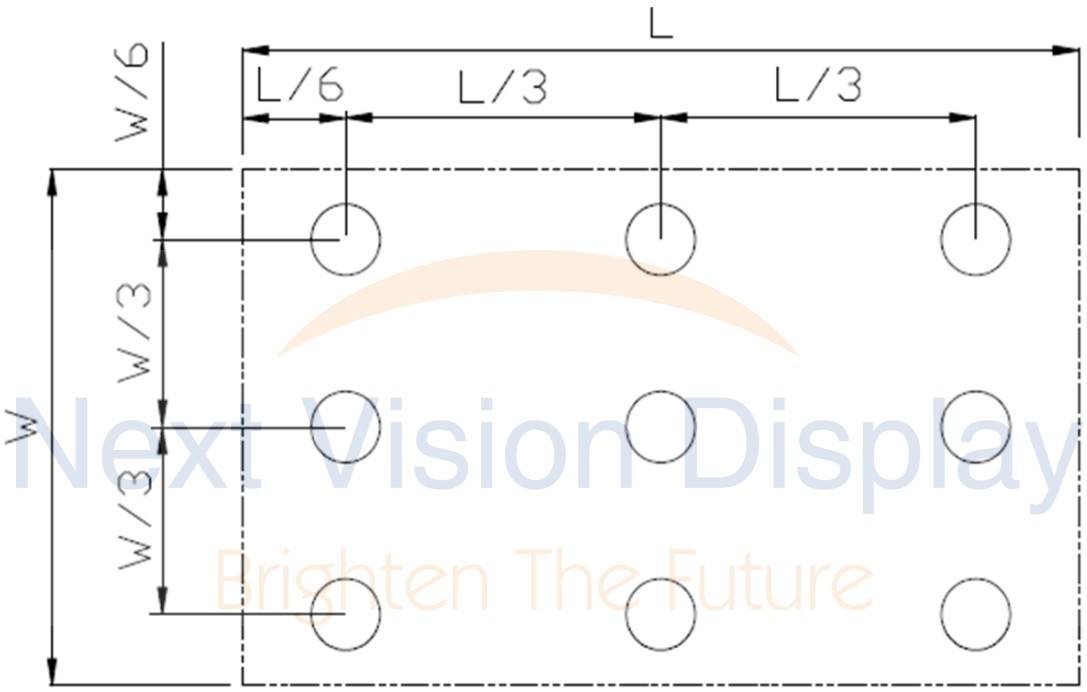
Color coordinates measured at center point of LCD

Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity(U) = Lmin/ Lmax

L-------Active area length W----- Active area width



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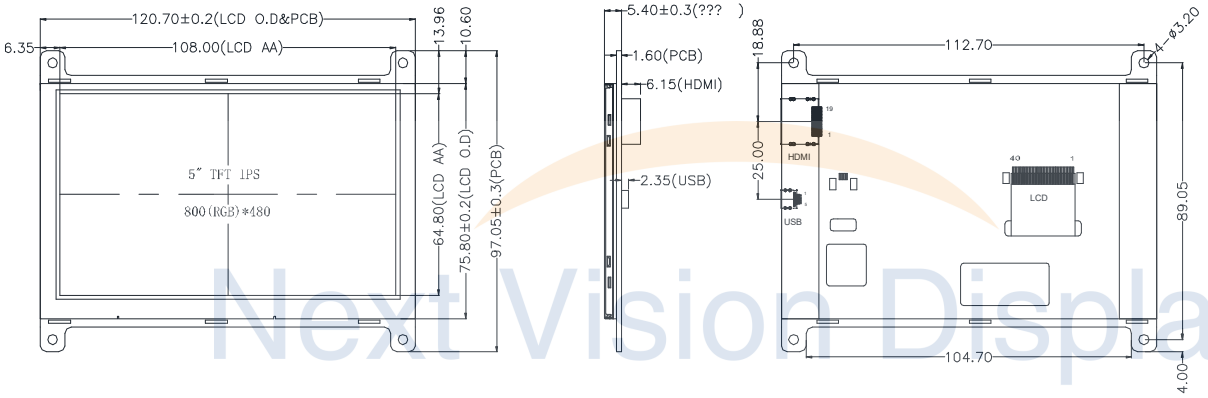
Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

5. Mechanical Diagram

ALL PAGES OF THIS VERSION APPROVED			
SIGNATURE:		DATE:	

REV.	Description	Date
01	New released	



HDMI INTERFACE

PIN	Symbol
1	TMDS Data2+
2	TMDS Data2 Shield
3	TMDS Data2-
4	TMDS Data1+
5	TMDS Data1 Shield
6	TMDS Data1-
7	TMDS Data0+
8	TMDS Data0 Shield
9	TMDS Data0-
10	TMDS Clock+
11	TMDS Clock Shield
12	TMDS Clock-
13	CEC
14	Reserved
15	SCL
16	SDA
17	DDC/CEC Ground
18	+5V Power
19	Hot Plug Detect

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NOTES:

1. DISPLAY TYPE: 5"TFT_LCD/TRANSMISSIVE
2. OPERATING TEMPERATURE: −20°C~70°C
3. STORAGE TEMPERATURE: −30°C~80°C
4. VIEWING ANGLE: ALL
5. BACKLIGHT BRIGHTNESS: 500CD/M2
6. DRIVER: /
7. RESOLUTION: 800(RGB)X480
8. CONNECTOR: FPC
9. UNMARK TOLERANCES: ±0.2MM

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GENERAL TOL 0.30	ALL UNITS: MM	DATE	MODEL NUMBER : NT050-N001ML		SHEET: 1 OF 1
DWN:					
CHK:					DATE:
APP:			DO NOT SCALE THIS DRAWING.	PROJECTION	

6. Interface Pin Connections

HDMI interface：

Pin No.	Symbol	Description
1	TMDS Data2+	Positive side of channel 2 TMDS low-voltage signal differential input pair
2	TMDS Data2 Shield	Ground
3	TMDS Data2-	Negative side of channel 2 TMDS low-voltage signal differential input pair
4	TMDS Data1+	Positive side of channel 1 TMDS low-voltage signal differential input pair
5	TMDS Data1 Shield	Ground
6	TMDS Data1-	Negative side of channel 1 TMDS low-voltage signal differential input pair
7	TMDS Data0+	Positive side of channel 0 TMDS low-voltage signal differential input pair
8	TMDS Data0 Shield	Ground
9	TMDS Data0-	Negative side of channel 0 TMDS low-voltage signal differential input pair
10	TMDS Clock+	Positive side of reference clock. TMDS low-voltage signal differential input pair
11	TMDS Clock Shield	Ground
12	TMDS Clock-	Negative side of reference clock. TMDS low-voltage signal differential input pair
13	CEC	No Connection
14	Reserved(N.C.)	No Connection
15	SCL	DDC SCL
16	SDA	DDC SDA
17	DDC/CEC Ground	Ground
18	+5V Power	+5V Power
19	Hot Plug Detect	Hot Plug Detect

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7. Timing Characteristics

Parallel RGB input Timing table:

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency@ Frame rate=60Hz	DCLK	-	30	50	MHz
Horizontal display area	thd		800		DCLK
1 Horizontal Line	th	-	928	-	DCLK
HSYNC pulse width	thpw	1	48	-	DCLK
HSYNC Back Porch(Blanking)	thb	-	88	-	DCLK
HSYNC Front Porch	thfp	-	40	-	DCLK
Vertical display area	tvd		480		H
VSYNC period time	tv	-	525	-	H
VSYNC pulse width	tvpw	-	3	-	H
VSYNC Back Porch(Blanking)	tvb	-	32	-	H
VSYNC Front Porch	tvfp	-	13	-	H

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8. Inspection Standard

A. Sampling Method

Unless otherwise agreed upon in writing, the sampling inspection shall be applied to theCustomer's incoming inspection.

1) Lot size: Quantity per shipment lot
2) Sampling type: Normal inspection , single sampling
3) Inspection level: Ⅱ
4) Sampling table: MIL-STD-105D
5) Acceptable Quality Level(AQL): Major=0.65Minor=1.5

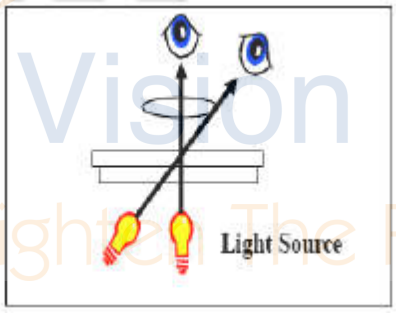
B. Inspection Method

1) Ambient Condition:
   a. Temperature: Room temperature 25±5℃
   b. Illumination: Single fluorescent lamp non-directive(300 to 700 Lux)
2) Viewing distance

The distance between the LCD and the inspector's eyes shall be at least 30-50cm.

3) Viewing Angle

The inspection shall be conducted within normal viewing angle range.



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9. Inspection Criteria

1) Major defect

NO.	Item	Inspection Standard	Classification defect
1	All function defect	No display Display abnormal Short circuit Missing segment Excess power consumption No backligt, flickering	Major

2	missing	Missing compement	Major
3	Outline dimension	Outline Dimension out of drawing tolerance	Major

2) Cosmetic defect

A. 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

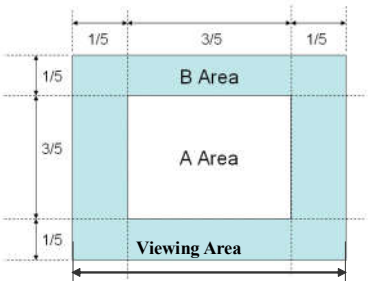


Figure 1

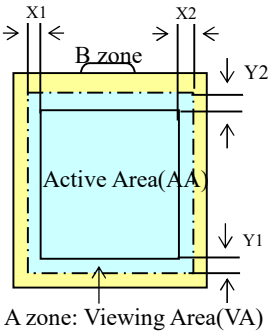
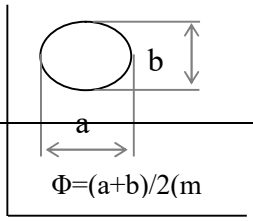


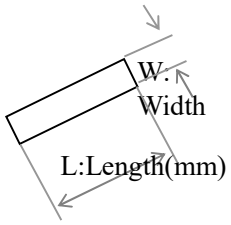
Figure 2

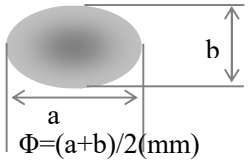
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B. Cosmetic defect criteria

Inspection items			Judgment standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot, Bright Spot, Pinhole, Foreign		A	Φ≦0.10	Neglected	Neglected
			B	0.10<Φ≦0.15	2	
			C	0.15<Φ≦0.20	1	

<table>
<tr><td></td><td>Particle, Particle in or on glass, Scratch on glass</td><td></td><td>D</td><td>0.20<Φ</td><td>0</td><td></td></tr>
<tr><td colspan="3"></td><td colspan="2">Total defective point(B,C)</td><td>3</td><td></td></tr>
<tr><td>2</td><td>Black line, White line, and Particle Between

Polarizer and glass, Scratch on glass</td><td></td><td>A</td><td>W≦0.01</td><td>Neglected</td><td rowspan="5">Neglected</td></tr>
<tr><td></td><td></td><td>B</td><td>0.01<W≦0.03 L≦3.0</td><td>2</td></tr>
<tr><td></td><td></td><td>C</td><td>0.03<W≦0.05 L≦3.0</td><td>1</td></tr>
<tr><td></td><td></td><td>D</td><td>0.05<W</td><td>0</td></tr>
<tr><td></td><td></td><td colspan="2">Total defective point(B,C)</td><td>3</td></tr>
<tr><td>3</td><td>Contrast

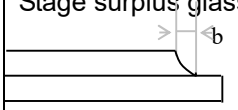
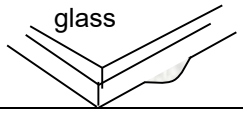
variation</td><td></td><td>A</td><td>Φ≦0.2</td><td>Neglected</td><td rowspan="4">Neglected</td></tr>
<tr><td></td><td></td><td>B</td><td>0.2<Φ≦0.3</td><td>2</td></tr>
<tr><td></td><td></td><td>C</td><td>0.3<Φ≦0.4</td><td>1</td></tr>
<tr><td></td><td></td><td>D</td><td>0.4<Φ</td><td>0</td></tr>
<tr><td></td><td></td><td colspan="2">Total defective point(B,C)</td><td>3</td><td></td></tr>
<tr><td rowspan="11">4</td><td rowspan="11">Dot defect (if TFT LCD is used)</td><td rowspan="4">TFT LCD is smaller than 3 inches</td><td>LCD Class</td><td>Defect</td><td>A area</td><td>B area</td></tr>
<tr><td rowspan="3">A</td><td>Bright dot</td><td>1</td><td rowspan="6">Neglected</td></tr>
<tr><td>Dark dot</td><td>2</td></tr>
<tr><td>Total</td><td>2</td></tr>
<tr><td rowspan="3">B</td><td>Bright dot</td><td>2</td></tr>
<tr><td>Dark dot</td><td>3</td></tr>
<tr><td>Total</td><td>4</td></tr>
<tr><td rowspan="6">TFT LCD between 3~10.4 inches</td><td>LCD Class</td><td>Defect</td><td>A area</td><td>B area</td><td>C area</td></tr>
<tr><td rowspan="3">A</td><td>Bright dot</td><td>1</td><td>1</td><td rowspan="6">Neglected</td></tr>
<tr><td>Dark dot</td><td>1</td><td>2</td></tr>
<tr><td>Total</td><td colspan="2">4</td></tr>
<tr><td rowspan="3">B</td><td>Bright dot</td><td>2</td><td>2</td></tr>
<tr><td>Dark dot</td><td>2</td><td>3</td></tr>
<tr><td>Total</td><td colspan="2">6</td></tr>
<tr><td colspan="6">Notes:

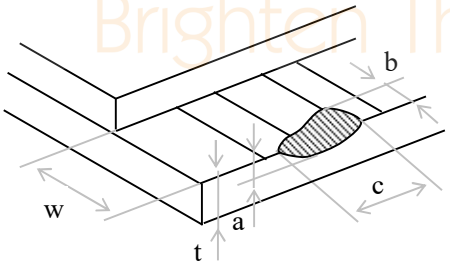
Bright dot: in R、G、B or dark display figure, the pixel appears bright.

Dark dot: in R、G、B or white display figure, the pixel appears dark.

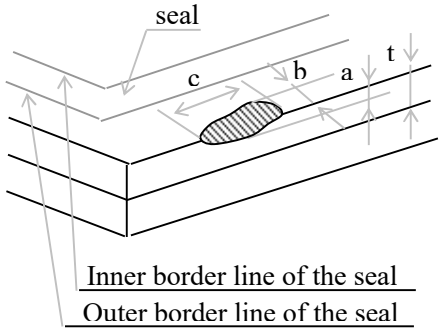
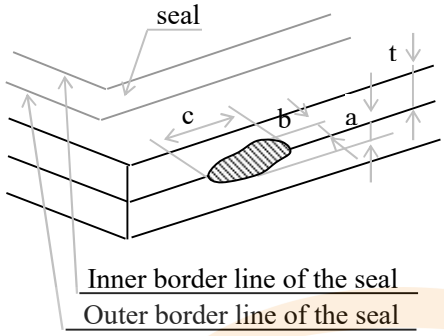
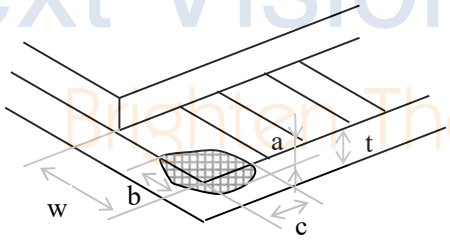
Defect area must be less than an half size of the dot.</td></tr>
<tr><td>5</td><td colspan="2">Bubble inside cell</td><td colspan="2">any size</td><td>none</td><td>none</td></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Polarizer defect (if Polarizer is used)</td><td>Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.</td><td colspan="4">Refer to item 1 and item 2.</td></tr>
<tr><td>Bubble, dent and</td><td>A</td><td>Φ≦0.3</td><td>Neglected</td><td>Neglected</td></tr>
</table>

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		convex	B	0.3<Φ≦0.7	2	
			C	0.7<Φ	0	
7	Surplus glass	Stage surplus glass 	b≦0.3mm			
		Surrounding surplus glass 	Should not influence outline dimension and assembling.			
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			

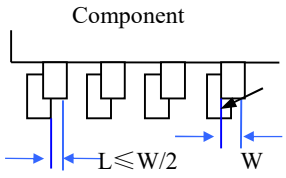
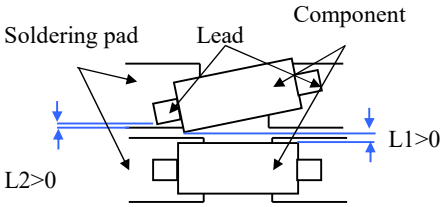
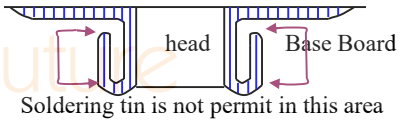
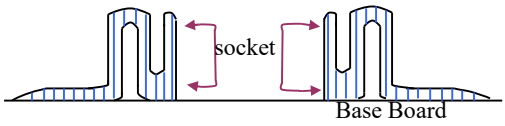
Inspection items			Judgment standard		
			Category(application: B zone)		Acceptable number
15	Glass defect crack	①The front of lead terminals 	A	a≤ t, b≤1/5W, c≤3mm	Max.3 defects allowed
			B	Crack at two sides of lead terminals should not cover patterns and alignment mark	

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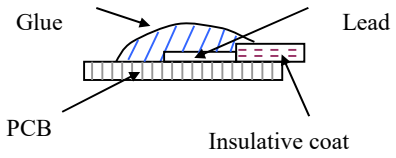
		②Surrounding crack—non-contact side  	b < Inner borderline of the seal		
		③ Surrounding crack— contact side  	b < Outer borderline of the seal		
		④Corner  	A	a ≦ t, b ≦ 3.0, c ≦ 3.0	
			B	Glass crack should not cover patterns u and alignment mark and patterns.	

Inspection items	Judgment standard
	Category(application: B zone)

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16	PCB defect	Component soldering: No cold soldering、short、open circuit、burr、tin ball The flat encapsulation component position deviation must be less than 1/3 width of the pin (Pic.1)； the sheet component deviation: Pin deviates from the pad and contact with the near components is not permitted（Pic.2）	 
		lead defect: The lead lack must be less than 1/3 of its width; The lead burr must be less than 1/3 of the seam; Impurities connect with the near leads is not permitted	
		Connector soldering: Soldering tin is at contact position of the plug and socket is not permitted No foundation is scald Serious cave distortion on plug and socket contact pin is not permitted	 Soldering tin is not permit in this area 

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		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

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— 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.

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

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