



**SPECIFICATION**

**CUSTOMER :** \_\_\_\_\_

**MODULE NO.:** **FM3202402-WNI-T\*A+**

*3V drive*

<b>APPROVED BY:</b>		
	<b>PCB VERSION:</b>	<b>DATA:</b>

<b>SALES BY</b>	<b>APPROVED BY</b>	<b>CHECKED BY</b>	<b>PREPARED BY</b>

**ISSUED DATE:**

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MODLE NO :

**RECORDS OF REVISION****DOC. FIRST ISSUE**

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2007/9/18		First issue

**\*\*\*Content**

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2	Precautions in use of LCD Modules
3	General Specification
4	Absolute Maximum Ratings
5	Electrical Characteristics
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9	Function Description
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**F M 320240 2 – W N I – T \* A ±****1 2 3 4 5 6 7 8 9 10**

1	Forenex Technology Ltd.	
2	Product type:: COB constructure	
3	Graphic Type : 320*240 Dots	
4	Serials no.:2 (Epson SID13700 Controller on board)	
5	Backlight	W→ LED white
6	LCD Mode :	N→ FSTN negative
7	Polarizer / View direction	I→ transmissive, 6:00 angle, wide temperature
8	Language font	T: Negative voltage & Temperature compensation on board
9	*A	FFC cable length 80mm, bottom contact 3.V Drive Bezel color: black
10	+	RoHS Compliance



Background: Dark Blue      Text: White



## 2. Precautions in Use of LCD Module

- (1) Avoid applying excessive shocks to the module or making any alterations or modifications to it.
- (2) Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD Module.
- (3) Don't disassemble the LCM.
- (4) Don't operate it above the absolute maximum rating.
- (5) Don't drop, bend or twist LCM.
- (6) Soldering: only to the I/O terminals.
- (7) Storage: please storage in anti-static electricity container and clean environment.
- (8) Don't touch the elastomer connector, especially insert a backlight panel (EL or CCFL)

## 3. General Specification

ITEM	STANDARD VALUE	UNIT
Number of dots	320x240	dots
Outline dimension	166.8(W)x 109.0(H)x 13.0max(T)	mm
View area	122.0(W)x 92.0(H)	mm
Active area	115.18(W)x 86.38(H)	mm
Dot size	0.34(W)x 0.34(H)	mm
Dot pitch	0.36(W)x 0.36(H)	mm
LCD type	FSTN, Negative, Transmissive	
View direction	6 o'clock	
Backlight	LED, White edge	



#### 4. Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Temperature	T <sub>OP</sub>	-20	—	+70	°C
Storage Temperature	T <sub>ST</sub>	-30	—	+80	°C
Input Voltage	V <sub>I</sub>	V <sub>SS</sub>	—	V <sub>DD</sub>	V
Supply Voltage For Logic	V <sub>DD</sub> -V <sub>SS</sub>	-0.3	—	7	V
Supply Voltage For LCD	V <sub>DD</sub> -V <sub>O</sub>	-0.3	—	28	V

#### 5. Electrical Characteristics

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Voltage	V <sub>DD</sub> -V <sub>SS</sub>	—	3	—	3.6	V
Supply Voltage For LCD	V <sub>DD</sub> -V <sub>O</sub>	T <sub>a</sub> =-20°C	—	24.4	—	V
		T <sub>a</sub> =25°C	—	22.2	—	V
		T <sub>a</sub> =70°C	—	20.4	—	V
Input High Volt.	V <sub>IH</sub>	—	2.2	—	V <sub>DD</sub>	V
Input Low Volt.	V <sub>IL</sub>	—	0	—	0.8	V
Output High Volt.	V <sub>OH</sub>	—	V <sub>DD</sub> -0.4	—	V <sub>DD</sub>	V
Output Low Volt.	V <sub>OL</sub>	—	0	—	0.4	V
Supply Current	I <sub>DD</sub>	V <sub>DD</sub> =5V	—	110.0	—	mA



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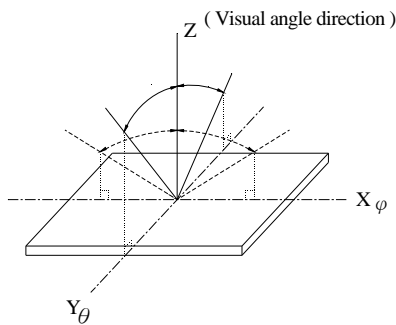


## 6. Optical Characteristics

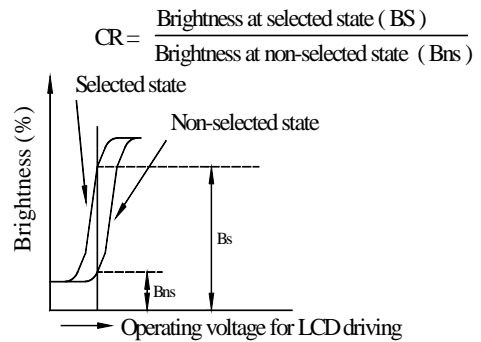
ITEM	SYMBAL	CONDITION	MIN	TYP	MAX	UNIT
View Angle	(V) $\theta$	$CR \geq 3$	10	—	60	deg.
	(H) $\varphi$	$CR \geq 3$	-45	—	45	deg.
Contrast Ratio	CR	—	—	15	—	—
Response Time	T rise	—	—	300	450	ms
	T fall	—	—	120	180	ms

### 6.1 Definitions

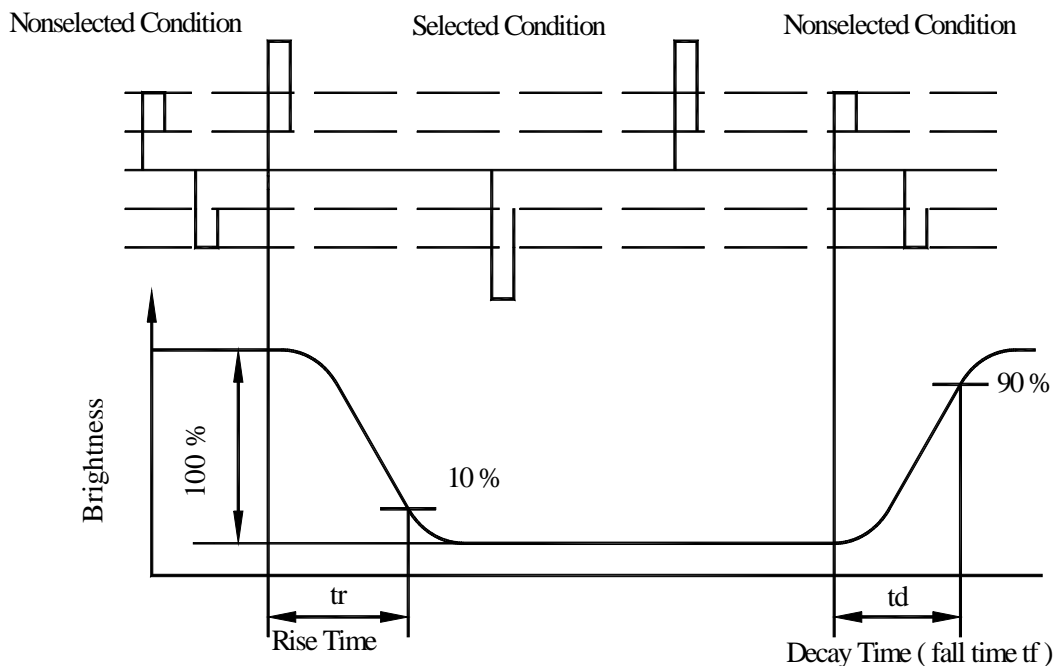
#### View Angles



#### Contrast Ratio



#### Response time

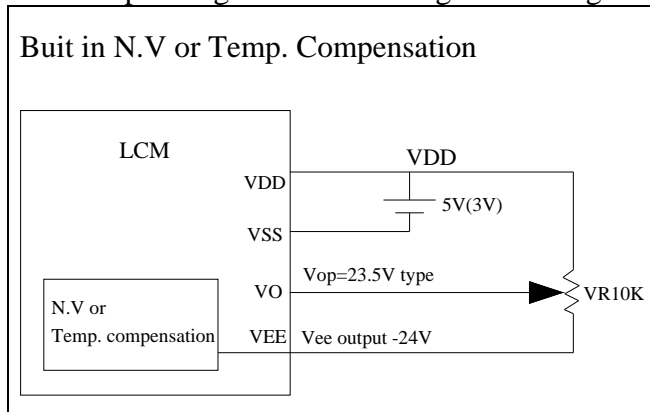




## 7. Interface Description

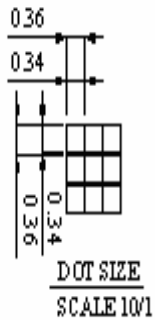
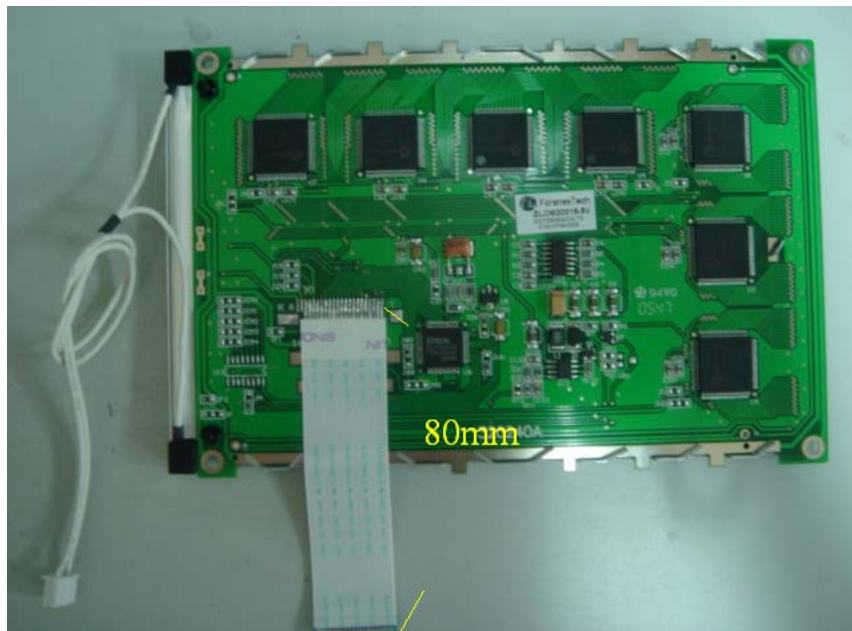
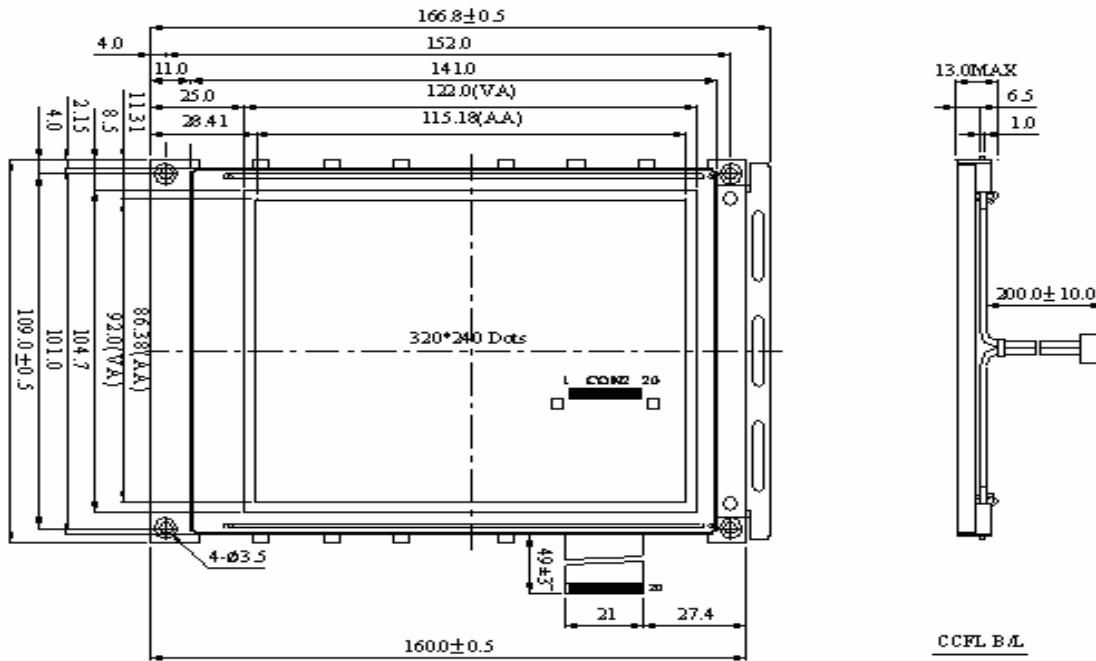
Pin No.	Symbol	Level	Description
1	V <sub>SS</sub>	0V	Ground
2	V <sub>DD</sub>	3.3.0V	Power supply for Logic
3	V <sub>O</sub>		Driving voltage for LCD
4	A0	H/L	RD=L WR=H ,A0=L :Data Read AO=H :Status read RD=H WR=L ,A0=L :Data Write AO=H :Command write
5	$\overline{\text{WR}}(\text{R/W})$	H/L	8080 family: Write signal, 6800 family: R/W signal
6	$\overline{\text{RD}}(\text{E})$	H/L	8080 family: Read signal, 6800 family: Enable clock
7~14	DB0~DB7	H/L	Data bus
15	$\overline{\text{CS}}$	H/L	Chip select ,Active L
16	$\overline{\text{RES}}$	H/L	Controller reset signal, Active L
17	VEE	-	Negative voltage output (Optional)
18	SEL	-	H=6800 series L=8080 series Interface
19	NC	-	No connection
20	NC	-	No connection

\* LCM operating with built-in negative voltage





### 8. Contour Drawing





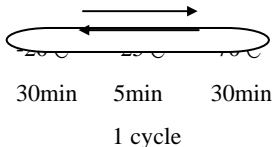
## **9. Function Description**

*Please check the data sheet of SID13700 controller*



## 10. Reliability

### Content of Reliability Test (wide temperature, -20°C~70°C)

Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C, 90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	60°C, 90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation  30min 5min 30min 1 cycle	-20°C/70°C 10 cycles	—
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 15mm Vibration Frequency : 0~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V, RS=1.5kΩ CS=100pF 1 time	—

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber

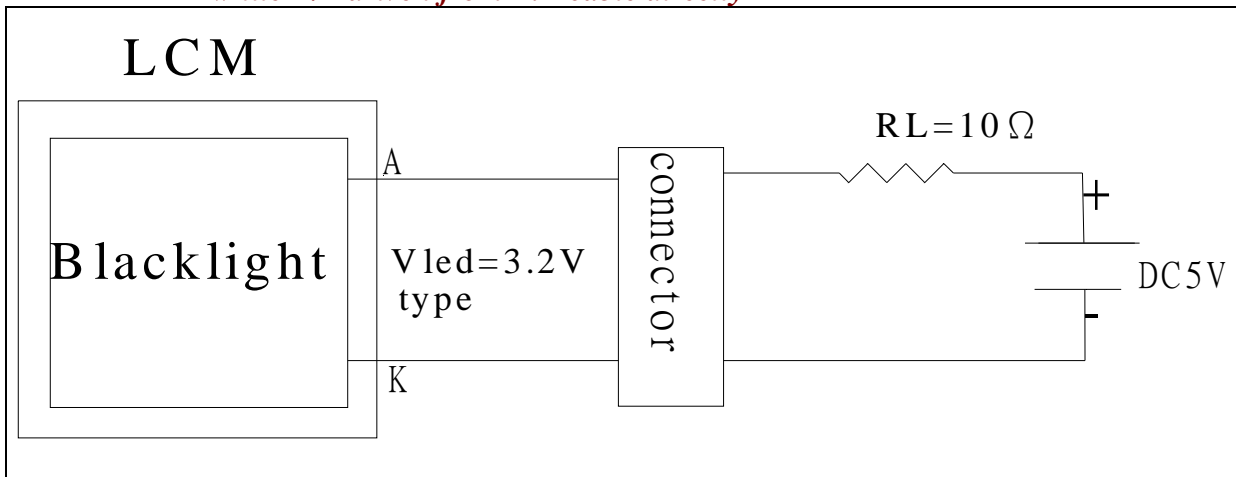
Note3: Vibration test will be conducted to the product itself without putting it in a container.



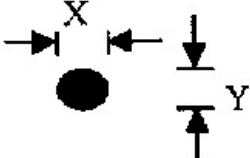

## 11. Backlight Information

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	I <sub>LED</sub>	—	160	200	mA	V=3.2V
Supply Voltage	V	—	3.2	3.4	V	—
Reverse Voltage	V <sub>R</sub>	—	—	5	V	—
Luminous Intensity	I <sub>V</sub>	120	-	—	cd/m <sup>2</sup>	I <sub>LED</sub> =160mA
Chromaticity	X		0.320			
	Y		0.320			
Life Time	—	—	50000	—	Hr.	V ≤ 3.2V
Color	LED White					

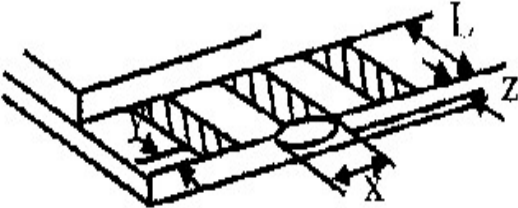
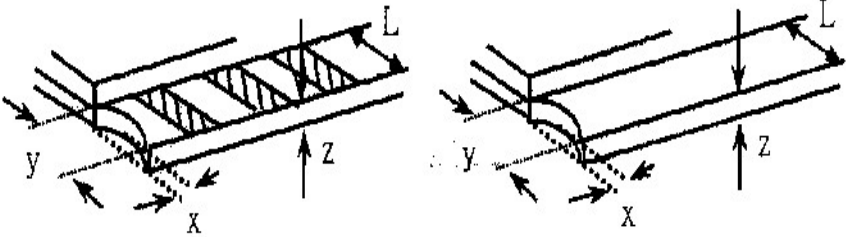
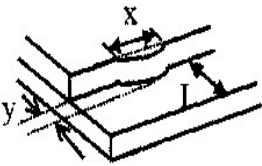
**\*\* LED white B/L driven from A.K cable directly**



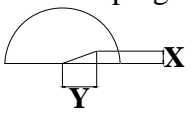
## 12. Inspection specification

NO	Item	Criterion	AQL											
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. Contrast defect.	0.65											
02	Black or white spots on LCD (display only)	2.1 White and black spots on display $\leq 0.25\text{mm}$ , no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm	2.5											
03	LCD black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing $\Phi = (x + y) / 2$  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>SIZE</th> <th>Acceptable Q TY</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.10</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>0.10 &lt; \Phi \leq 0.20</math></td> <td>2</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.25</math></td> <td>1</td> </tr> <tr> <td><math>0.25 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table>	SIZE	Acceptable Q TY	$\Phi \leq 0.10$	Accept no dense	$0.10 < \Phi \leq 0.20$	2	$0.20 < \Phi \leq 0.25$	1	$0.25 < \Phi$	0	2.5	
		SIZE	Acceptable Q TY											
$\Phi \leq 0.10$	Accept no dense													
$0.10 < \Phi \leq 0.20$	2													
$0.20 < \Phi \leq 0.25$	1													
$0.25 < \Phi$	0													
3.2 Line type : (As following drawing)  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable Q TY</th> </tr> </thead> <tbody> <tr> <td>---</td> <td><math>W \leq 0.02</math></td> <td>Accept no dense</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.02 &lt; W \leq 0.03</math></td> <td rowspan="2">2</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> </tr> <tr> <td>---</td> <td><math>0.05 &lt; W</math></td> <td>As round type</td> </tr> </tbody> </table>	Length	Width	Acceptable Q TY	---	$W \leq 0.02$	Accept no dense	$L \leq 3.0$	$0.02 < W \leq 0.03$	2	$L \leq 2.5$	$0.03 < W \leq 0.05$	---	$0.05 < W$	As round type
Length	Width	Acceptable Q TY												
---	$W \leq 0.02$	Accept no dense												
$L \leq 3.0$	$0.02 < W \leq 0.03$	2												
$L \leq 2.5$	$0.03 < W \leq 0.05$													
---	$0.05 < W$	As round type												
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.	2.5											



NO	Item	Criterion	AQL																
05	Scratches	Follow NO.3 LCD black spots, white spots, contamination																	
06	Glass crack	<p>Symbols :</p> <p>x: Chip length      y: Chip width      z: Chip thickness            k: Seal width      t: Glass thickness      a: LCD side length            L: Electrode pad length</p> <p>6.2 Protrusion over terminal :</p> <p>6.2.1 Chip on electrode pad :</p>  <table border="1" data-bbox="416 981 1329 1070"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td><math>y \leq 0.5\text{mm}</math></td> <td><math>x \leq 1/8a</math></td> <td><math>0 &lt; z \leq t</math></td> </tr> </table> <p>6.2.2 Non-conductive portion:</p>  <table border="1" data-bbox="488 1368 1329 1458"> <tr> <td>y: Chip width</td> <td>x: Chip length</td> <td>z: Chip thickness</td> </tr> <tr> <td><math>y \leq L</math></td> <td><math>x \leq 1/8a</math></td> <td><math>0 &lt; z \leq t</math></td> </tr> </table> <p>⊙If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.</p> <p>⊙If the product will be heat sealed by the customer, the alignment mark not be damaged.</p> <p>6.2.3 Substrate protuberance and internal crack.</p>  <table border="1" data-bbox="826 1720 1334 1809"> <tr> <td>y: width</td> <td>x: length</td> </tr> <tr> <td><math>y \leq 1/3L</math></td> <td><math>x \leq a</math></td> </tr> </table>	y: Chip width	x: Chip length	z: Chip thickness	$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$	y: Chip width	x: Chip length	z: Chip thickness	$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$	y: width	x: length	$y \leq 1/3L$	$x \leq a$	2.5
y: Chip width	x: Chip length	z: Chip thickness																	
$y \leq 0.5\text{mm}$	$x \leq 1/8a$	$0 < z \leq t$																	
y: Chip width	x: Chip length	z: Chip thickness																	
$y \leq L$	$x \leq 1/8a$	$0 < z \leq t$																	
y: width	x: length																		
$y \leq 1/3L$	$x \leq a$																		



07	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using LCD spot, lines and contamination standards. 8.3 Backlight doesn't light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
10	PCB、COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 10.5 No oxidation or contamination PCB terminals. 10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts. 10.7 The jumper on the PCB should conform to the product characteristic chart. 10.8 If solder gets on bezel tab pads, LED pad, zebra pad or screw hold pad, make sure it is smoothed down. 10.9 The Scraping testing standard for Copper Coating of PCB  $X * Y \leq 2\text{mm}^2$	2.5 2.5 0.65 2.5 2.5 0.65 0.65 2.5 2.5
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65



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NO	Item	Criterion	AQL
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP.	2.5
		12.2 No cracks on interface pin (OLB) of TCP.	0.65
		12.3 No contamination, solder residue or solder balls on product.	2.5
		12.4 The IC on the TCP may not be damaged, circuits.	2.5
		12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever.	2.5
		12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.	2.5
		12.7 Sealant on top of the ITO circuit has not hardened.	2.5
		12.8 Pin type must match type in specification sheet.	0.65
		12.9 LCD pin loose or missing pins.	0.65
		12.10 Product packaging must the same as specified on packaging specification sheet.	0.65
		12.11 Product dimension and structure must conform to product specification sheet.	0.65