

SPECIFICATIONS FOR LCD MODULE

MODEL NO.

BC1602A-20c3 series

VER.02

FOR MESSRS:

ON DATE OF:

APPROVED BY:

BOLYMIN, INC.

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1. Numbering System

<u>B</u>	<u>C</u>	<u>1602</u>	<u>A</u>	:	:	:	:	:	<u>xxx</u>
0	1	2	3	4	5	6	7	8	9

0	Brand	Bolymin	
1	Module Type	C= character type G= graphic type P= TAB/TCP type	O= COG type F= COF type L=PLED/OLED
2	Format	2002=20 characters, 2 lines 12232= 122 x 32 dots	
3	Version No.	A type	
4	LCD Color	G=STN/gray Y=STN/yellow-green C=color STN	B=STN/blue F=FSTN T=TN
5	LCD Type	R=positive/reflective P=positive/transflective	M=positive/transmissive N=negative/transmissive
6	Backlight type/color	L=LED array/ yellow-green H=LED edge/white R=LED array/red G=LED edge/yellow-green F=RGB Q=LED edge/red A=LED edge/amber N=No backlight	D=LED edge/blue E=EL/white B=EL/blue C=CCFL/white Y=LED Bottom/yellow O=LED array/orange K=LED edge/green A=LED edge/amber
7	CGRAM Font (applied only on character type)	J=English/Japanese Font E=English/European Font G=Chinese(simple) F=Chinese(traditional)	C=English/Cyrillic Font H=English/Hebrew Font A=English/Arabic Font
8	View Angle/ Operating Temperature	B=Bottom/Normal Temperature H=Bottom/Wide Temperature U=Bottom/Ultra wide Temperature	T=Top/Normal Temperature W=Top/Wide Temperature C=9H/Normal Temperature E=Top/ultra wide temperature
9	Special Code	3=3 volt logic power supply n=negative voltage for LCD c=cable/connector xxx=to be assigned on datasheet	t=temperature compensation for LCD p=touch panel

2. Precaution 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 elastmer connector, especially insert a backlight panel (EL or CCFL)

3. General Specification

(1) Mechanical Dimension

Item	Dimension	Unit
Number of Characters	16characters x 2 Lines	-
Module dimension (L x W x H)	80.0 x 36.0 x12.1(Max)-LED edge B/L (white)	mm
View area	66.0 x 16.0	mm
Active area	59.62 x 11.5	mm
Dot size	0.55 x 0.66	mm
Dot pitch	0.63 x 0.70	mm
Character size (L x W)	3.07 x 5.94	mm
Character pitch (L x W)	3.77 x 6.56	mm

(2) Controller IC: **PCF2116 (or Equivalent) controller**

(3) Temperature Range

	Normal	Wide
Operating	0 ~+50°C	-20 ~+70°C
Storage	-10 ~+60°C	-30 ~+80°C

4. Absolute Maximum Ratings

4.1 Electrical Absolute Maximum Ratings

(V_{ss}=0V, Ta=25°C)

Item	Symbol	Min	Max	Unit
Supply Voltage (Logic)	V _{dd} -V _{ss}	2.5	6	V
Input Voltage	V _I	V _{ss}	V _{dd}	V
Wide Temperature Type	Top	-20	+70	°C
	T _{stg}	-30	+80	°C

4.2 Environmental Absolute Maximum Ratings

Item	Operating		Storage		Comment
	(Min.)	(Max.)	(Min.)	(Max.)	
Humidity	Note (2)		Note (2)		Without condensation
Vibration	--	4.9M/S ²	--	19.6M/S ²	XYZ Direction
Shock	--	29.4M/S ²	--	490M/S ²	XYZ Direction

Note (1) Ta = 0°C : 50Hr Max.

Note (2) Ta ≤ 40°C : 90% RH MAX

Ta > 40°C : Absolute humidity must be lower than the humidity of 90% at 40°C.

5. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	Vdd-Vss	-	-	3.3	-	V
Input High Volt.	V _{IH}	-	2.2	-	Vdd	V
Input Low Volt.	V _{IL}	-	-	-	0.6	V
Output High Volt.	V _{OH}	-	2.4	-	-	V
Output Low Volt.	V _{OL}	-	-	-	0.4	V
Supply Current	I _{dd}	Vdd=3.3V	-	1.2	-	mA

6. Optical Characteristics

a. STN

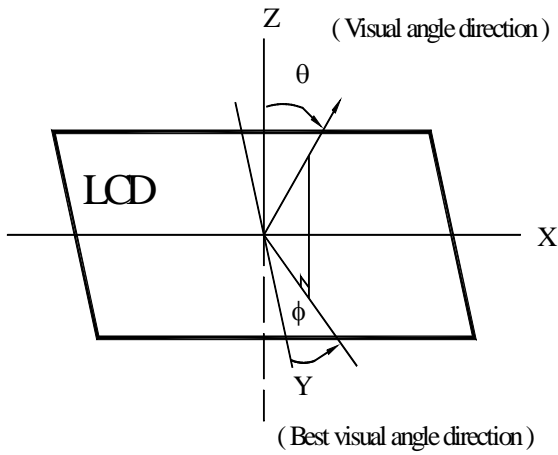
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) θ	$CR \geq 2$	10		45	deg
	(H) φ	$CR \geq 2$	-30		30	deg
Contrast Ratio	CR	—		3		—
Response Time 25°C	T rise	—		100	150	ms
	T fall	—		150	200	ms

b. FSTN

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) θ	$CR \geq 3$	10		60	deg
	(H) φ	$CR \geq 3$	-45		45	deg
Contrast Ratio	CR	—		5		—
Response Time 25°C	T rise	—		100	150	ms
	T fall	—		150	200	ms

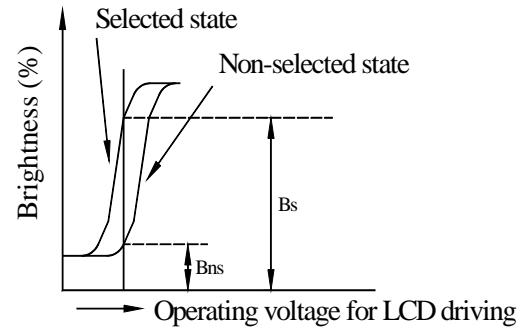
6.1 Definitions

■ View Angles

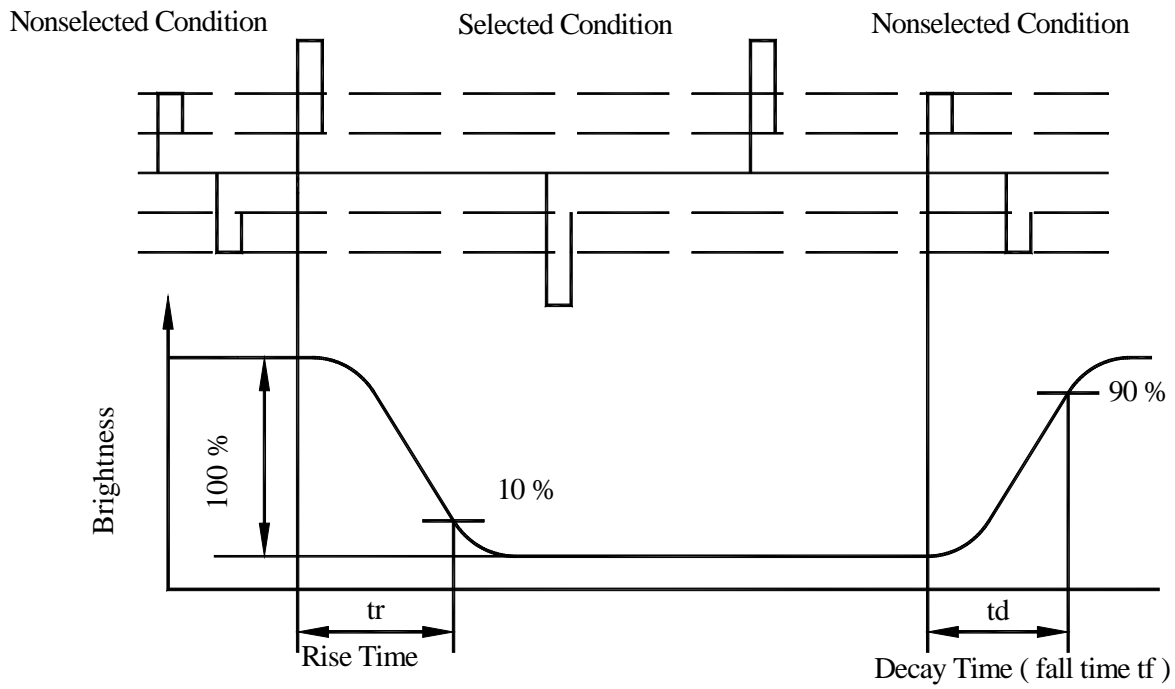


■ Contrast Ratio

$$CR = \frac{\text{Brightness at selected state (BS)}}{\text{Brightness at non-selected state (Bns)}}$$



■ Response Time



7. Interface Pin Function

Pin No.	Symbol	Level	Description
1	Vdd	3.3V	Supply voltage
2	SCL	H/L	Input for the I ² C-bus clock signal.
3	SDA	H/L	Input/output for the I ² C-bus data line.
4	Vss	Gnd	Ground

8.Backlight Information

8.1 Specification

(1) LED edge / (white / blue)

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	I _{LED}	—	20	25	mA	V=3.0V
Supply Voltage	V	—	3.0	3.2	V	
Reverse Voltage	V _R	—	—	8	V	
Luminous Intensity	I _V	50	—	—	cd/m ²	I _{LED} =20mA
Life Time		—	35000-white	—	Hr.	V ≤ 3.2 V
			50000-blue			
Color	White / Blue					

(2) LED array / yellow-green

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	I _{LED}	—	100		mA	V=4.2V
Supply Voltage	V	—	4.2	4.3	V	
Reverse Voltage	V _R	—	—	8	V	
Luminous Intensity	I _V	60	—	—	cd/m ²	I _{LED} =100mA
Wave Length	λ _p		574		nm	I _{LED} =100mA
Life Time		—	100000	—	Hr.	V ≤ 4.2V
Color	Yellow Green					

(3) LED edge/ yellow-green

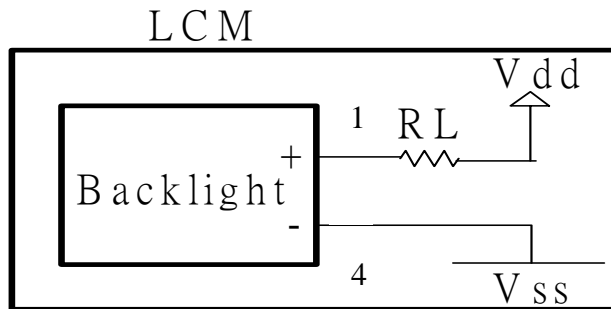
Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	I _{LED}	—	20		mA	V=3.9V
Supply Voltage	V	—	3.9	4.1	V	
Reverse Voltage	V _R	—	—	6	V	
Luminous Intensity	I _V	—	—	—	cd/ m ²	I _{LED} =20mA
Wave Length	λ _p		573		nm	I _{LED} =20mA
Life Time		—	100000	—	Hr.	V ≤ 3.9V
Color	Yellow Green					

(4) EL / Blue

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Voltage	V _{rms}	--	110 (AC)		--	
Frequency	HZ	--	400		--	
Brightness*	cd/m ²	48	60		--	110V _{rms} 400Hz
CIE Chromaticity Diagram	X	--	0.330		--	
	Y	--	0.365		--	
Current Dissipation	mA/cm ²	--	1.33		--	
Power Dissipation	mW/cm ²	--	26.29		--	
Color	Blue					

8.2 Backlight driving methods

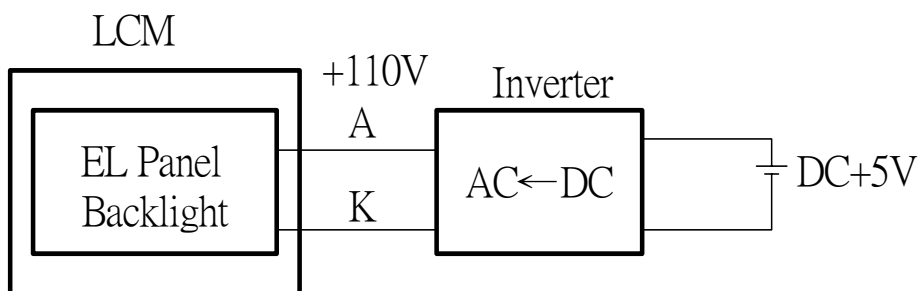
a. *(Option) LED B/L drive from pin1 (Vdd) pin4 (Vss)



(1) Current Resistor required on RL

(2) To be sure of enough current supply for both Vdd + LED B/L

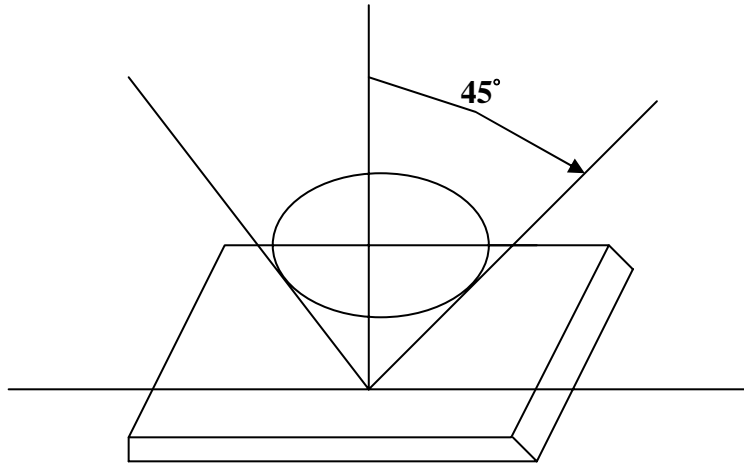
b. EL B/L drive from A.K directly



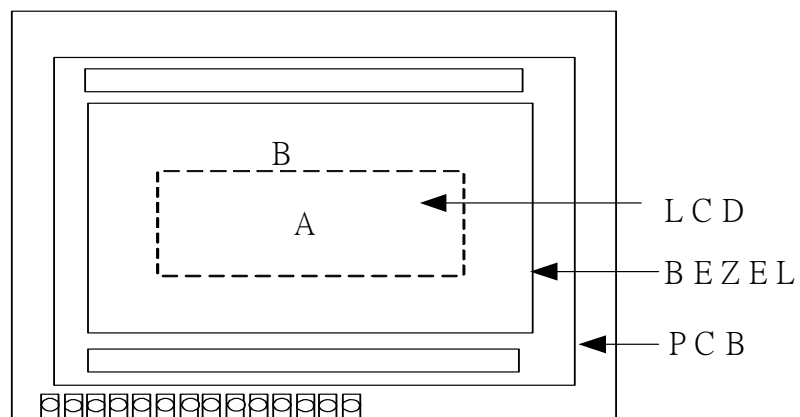
9. Quality Assurance

9.1 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.



Definition of applicable Zones

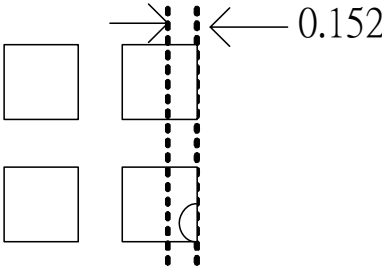
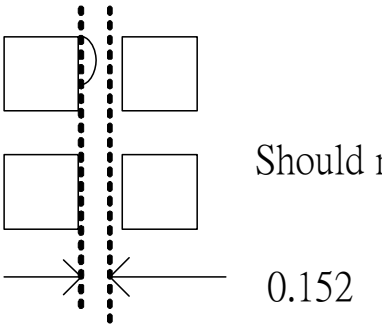
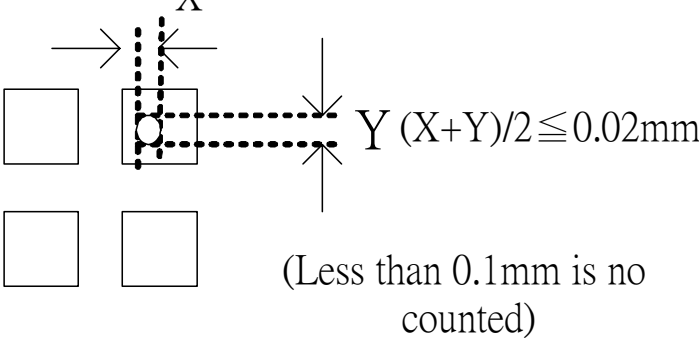
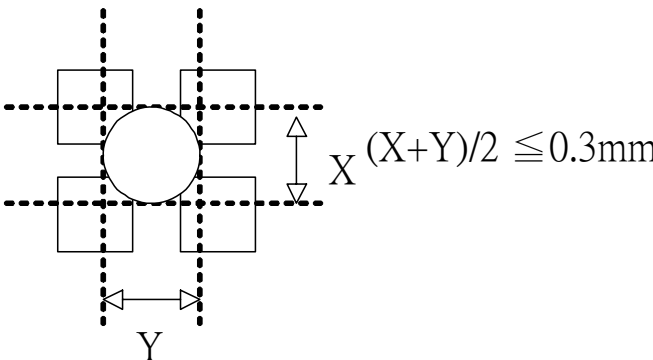


A : Display Area

B : Non-Display Area

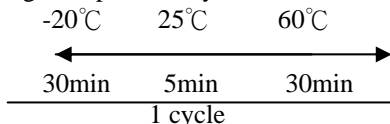
9.2 Inspection Parameters

NO.	Parameter	Criteria																					
1	Black or White spots	<table border="1"> <thead> <tr> <th rowspan="2">Zone Dimension</th> <th colspan="2">Acceptable Number</th> <th rowspan="2">Class Of Defects</th> <th rowspan="2">Acceptable Level</th> </tr> <tr> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>$D < 0.15$</td> <td>*</td> <td>*</td> <td rowspan="4">Minor</td> <td rowspan="4">2.5</td> </tr> <tr> <td>$0.15 \leq D \leq 0.2$</td> <td>4</td> <td>4</td> </tr> <tr> <td>$0.2 \leq D \leq 0.25$</td> <td>2</td> <td>2</td> </tr> <tr> <td>$D \leq 0.3$</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>$D = (\text{Long} + \text{Short})/2$ *: Disregard</p>	Zone Dimension	Acceptable Number		Class Of Defects	Acceptable Level	A	B	$D < 0.15$	*	*	Minor	2.5	$0.15 \leq D \leq 0.2$	4	4	$0.2 \leq D \leq 0.25$	2	2	$D \leq 0.3$	0	1
Zone Dimension	Acceptable Number			Class Of Defects	Acceptable Level																		
	A	B																					
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$0.15 \leq D \leq 0.2$	4	4																					
$0.2 \leq D \leq 0.25$	2	2																					
$D \leq 0.3$	0	1																					
2	Scratch, Substances	<table border="1"> <thead> <tr> <th rowspan="2">Zone X(mm) Y(mm)</th> <th colspan="2">Acceptable Number</th> <th rowspan="2">Class Of Defects</th> <th rowspan="2">Acceptable Level</th> </tr> <tr> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>* $0.04 \geq W$</td> <td>*</td> <td>*</td> <td rowspan="4">Minor</td> <td rowspan="4">2.5</td> </tr> <tr> <td>$3.0 \geq L$ $0.06 \geq W$</td> <td>4</td> <td>4</td> </tr> <tr> <td>$2.0 \geq L$ $0.08 \geq W$</td> <td>2</td> <td>3</td> </tr> <tr> <td>— $0.1 < W$</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>X: Length Y : Width *: Disregard Total defects should not exceed 4/module</p>	Zone X(mm) Y(mm)	Acceptable Number		Class Of Defects	Acceptable Level	A	B	* $0.04 \geq W$	*	*	Minor	2.5	$3.0 \geq L$ $0.06 \geq W$	4	4	$2.0 \geq L$ $0.08 \geq W$	2	3	— $0.1 < W$	0	1
Zone X(mm) Y(mm)	Acceptable Number			Class Of Defects	Acceptable Level																		
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* $0.04 \geq W$	*	*	Minor	2.5																			
$3.0 \geq L$ $0.06 \geq W$	4	4																					
$2.0 \geq L$ $0.08 \geq W$	2	3																					
— $0.1 < W$	0	1																					
3	Air Bubbles (between glass & polarizer)	<table border="1"> <thead> <tr> <th rowspan="2">Zone Dimension</th> <th colspan="2">Acceptable Number</th> <th rowspan="2">Class Of Defects</th> <th rowspan="2">Acceptable Level</th> </tr> <tr> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>$D \leq 0.15$</td> <td>*</td> <td>*</td> <td rowspan="3">Minor</td> <td rowspan="3">2.5</td> </tr> <tr> <td>$0.15 < D \leq 0.25$</td> <td>2</td> <td>*</td> </tr> <tr> <td>$0.25 < D$</td> <td>0</td> <td>1</td> </tr> </tbody> </table> <p>*: Disregard Total defects shall not excess 3/module.</p>	Zone Dimension	Acceptable Number		Class Of Defects	Acceptable Level	A	B	$D \leq 0.15$	*	*	Minor	2.5	$0.15 < D \leq 0.25$	2	*	$0.25 < D$	0	1			
Zone Dimension	Acceptable Number			Class Of Defects	Acceptable Level																		
	A	B																					
$D \leq 0.15$	*	*	Minor	2.5																			
$0.15 < D \leq 0.25$	2	*																					
$0.25 < D$	0	1																					

4	Uniformity	<p>(1) Pixel shape (with Dent)</p>  <p>(2) Pixel shape (With Projection)</p>  <p>Should not be connected to next pixel</p> <p>(3) Pin hole</p>  <p>$(X+Y)/2 \leq 0.02\text{mm}$</p> <p>(Less than 0.1mm is no counted)</p> <p>(4) Deformation</p>  <p>$(X+Y)/2 \leq 0.3\text{mm}$</p> <p>Total acceptable number : 1/pixel,5/cell</p>
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10. Reliability

Content of Reliability Test

Environmental Test				
No.	Test Item	Content of Test	Test Condition	Applicable Standard
1	High Temperature storage	Endurance test applying the high storage temperature for a long time.	60°C 200hrs	-
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-20°C 200hrs	-
3	High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	50°C 200hrs	-
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	0°C 200hrs	-
5	High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	60°C, 90%RH 96hrs	-
6	High Temperature/ Humidity Operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	40°C, 90%RH 96hrs	-
7	Temperature Cycle	Endurance test applying the low and high temperature cycle. <div style="text-align: center;">  </div>	-20°C/60°C 10 cycles	-
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	-
9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msdc 3 times of each direction	-
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115mbar 40hrs	-
Others				
11	Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	-

***Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25°C

11. Appendix.

11.1 Drawing

