



## LCD MODULE SPECIFICATION

**MODEL NO.**

**BG320240A series**

FOR MESSRS:

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ON DATE OF:

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APPROVED BY:

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## **C O N T E N T S**

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## 1. Numbering System

<u>B</u>	<u>C</u>	<u>2004</u>	<u>A</u>	<u>G</u>	<u>P</u>	<u>L</u>	<u>E</u>	<u>B</u>	<u>xxx</u>
0	1	2	3	4	5	6	7	8	9

<b>0</b>	Brand				Bolymin				
<b>1</b>	Module Type				C= character type G= graphic type P= TAB/TCP type		O= COG type F= COF type		
<b>2</b>	Format				2002=20 characters, 4 lines 12232= 122 x 32 dots				
<b>3</b>	Version No.				A type				
<b>4</b>	LCD Color				G=STN/gray Y=STN/yellow-green C=color STN		B=STN/blue F=FSTN T=TN		
<b>5</b>	LCD Type				R=positive/reflective P=positive/transflective		M=positive/transmissive N=negative/transmissive		
<b>6</b>	Backlight type/color				L=LED array/ yellow-green H=LED edge/white R=LED array/red G=LED edge/yellow-green		D=LED edge/blue E=EL/white B=EL/blue C=CCFL/white		
<b>7</b>	CGRAM Font (applied only on character type)				J=English/Japanese Font E=English/European Font		C=English/Cyrillic Font H=English/Hebrew Font		
<b>8</b>	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		
<b>9</b>	Special Code				3=3 volt logic power supply n=negative voltage for LCD c=cable/connector xxx=to be assigned on data sheet		t=temperature compensation for LCD p=touch panel		



## 2. General Specification

### (1) Mechanical Dimension

Item	Standard Value	Unit
Number of dots	320x240	dots
Outline dimension	166.8(W)x 109.0(H)x 11.0max(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

(2) Controller IC: No built-in Controller (Recommended controller: SED1335)

### (3) Temperature Range

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

### (4) Polarizer

FSTN / black / Negative, STN / blue / Negative : Anti-glare Polarizer

## 3. 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>	0	—	V <sub>DD</sub>	V
Supply Voltage For Logic	V <sub>DD</sub>	0	—	6.5	V
Supply Voltage For LCD	V <sub>DD</sub> -V <sub>EE</sub>	0	—	32	V



#### 4. Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Voltage	$V_{DD}-V_{SS}$	—	3.0	5.0	5.5	V
Supply Voltage For LCD	$V_{DD}-V_O$	Ta=-20°C	—	24.5	—	V
		Ta=25°C	—	23.5	—	V
		Ta=+70°C	—	21.5	—	V
Input High Volt.	$V_{IH}$	—	$0.8V_{DD}$	—	$V_{DD}$	V
Input Low Volt.	$V_{IL}$	—	0	—	$0.2V_{DD}$	V
Output High Volt.	$V_{OH}$	—	$V_{DD}-0.4$	—	—	V
Output Low Volt.	$V_{OL}$	—	—	—	0.4	V
Supply Current	$I_{DD}$	—	—	—	60.0	mA
	$I_{EE}$	—	—	—	2.0	mA

#### 5. Optical Characteristics

##### a. STN

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) $\theta$	$CR \geq 2$	10		45	deg
	(H) $\varphi$	$CR \geq 2$	-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) $\theta$	$CR \geq 3$	10		60	deg
	(H) $\varphi$	$CR \geq 3$	-45		45	deg
Contrast Ratio	CR	—		5		—
Response Time 25°C	T rise	—		100	150	ms
	T fall	—		150	200	ms

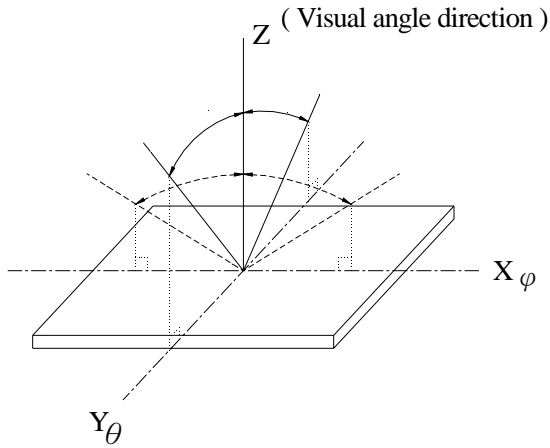
#### \*Polarizer

FSTN / black / Negative, STN / blue / Negative : Anti-glare Polarizer

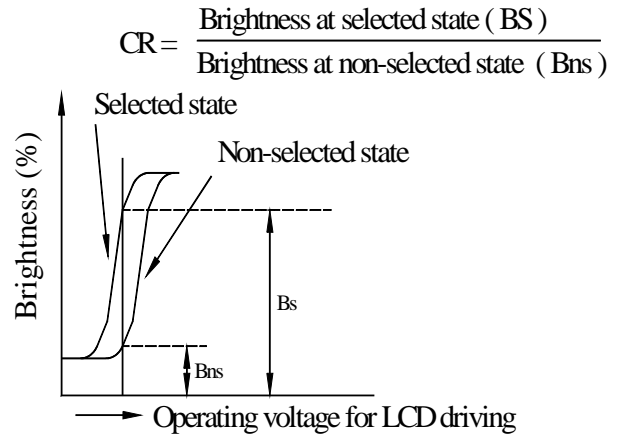


5.1 Definitions

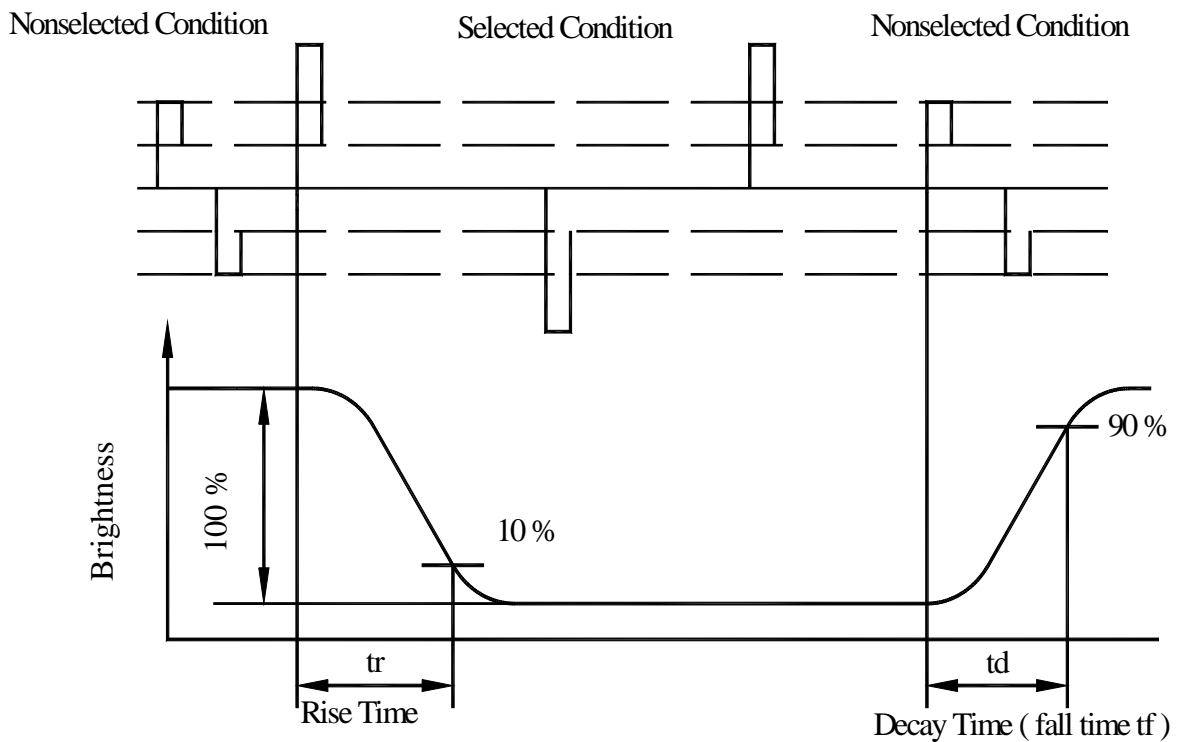
■ View Angles



■ Contrast Ratio



■ Response time



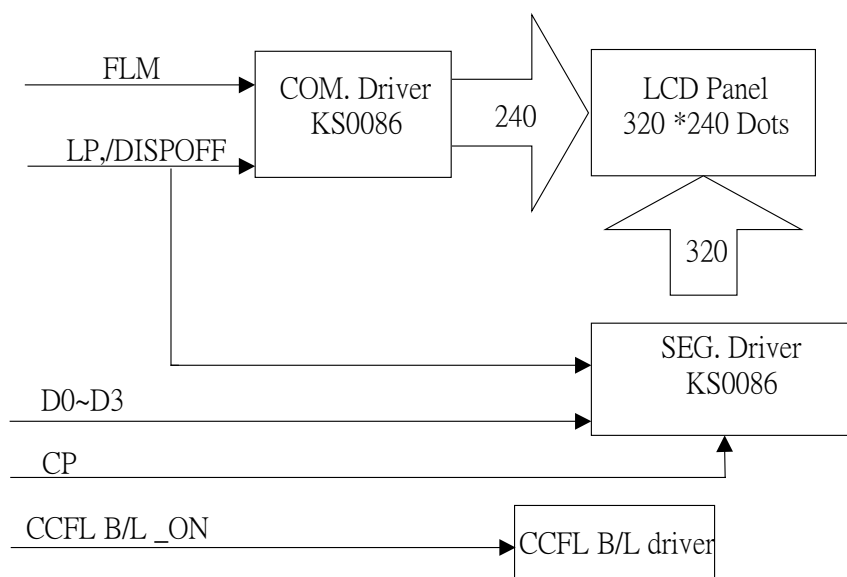


## 6. Interface Description

Pin No.	Symbol	Level	Description
1	D0	H/L	Display data, bit0
2	D1	H/L	Display data, bit1
3	D2	H/L	Display data, bit2
4	D3	H/L	Display data, bit3
5	DISPOFF	H/L	H: Display ON, L: Display OFF
6	FLM	H/L	Scan start-up signal
7	N.C		No Connection
8	LP	H to L	Data latch pulse
9	CP	H to L	Data shift pulse
10	VDD	5.0V	Power supply for Logic (option +3V)
11	VSS	0V	Ground
12	VEE		Negative voltage output -21.0V (option)
13	V <sub>O</sub>	(Variable)	Driving voltage for LCD
14	FGND		Frame Ground



## 7. Block Diagram



## 8. Timing Characteristics

Item	symbol	Test Condition	Min.	Typ.	Max.	Units
Clock Cycle	tC	Fig.1	100	—	—	ns
CP Pulse Width	tWC	Fig.1	50	—	—	ns
LP Pulse Width	tWL	Fig.1	50	—	—	ns
Data Set Up Time	tDSU	Fig.1	30	—	—	ns
Data Hold Time	tDHD	Fig.1	30	—	—	ns
CP Rise/Fall Time	tr,tf	Fig.1	—	—	50	ns
CP to LOAD	tCL	Fig.1	80	—	—	ns
LOAD to CP	tLC	Fig.1	110	—	—	ns
LP Pulse Width	tLW	Fig.1	50	—	—	ns
CL1 Pulse Width	tCW	Fig.2	63	—	—	ns
Data Set Up Time	tDSU2	Fig.2	100	—	—	ns
Data Hold Time	tDHD2	Fig.2	100	—	—	ns
CL1 Rise/Fall Time	tr2,tf2	Fig.2	—	—	50	ns



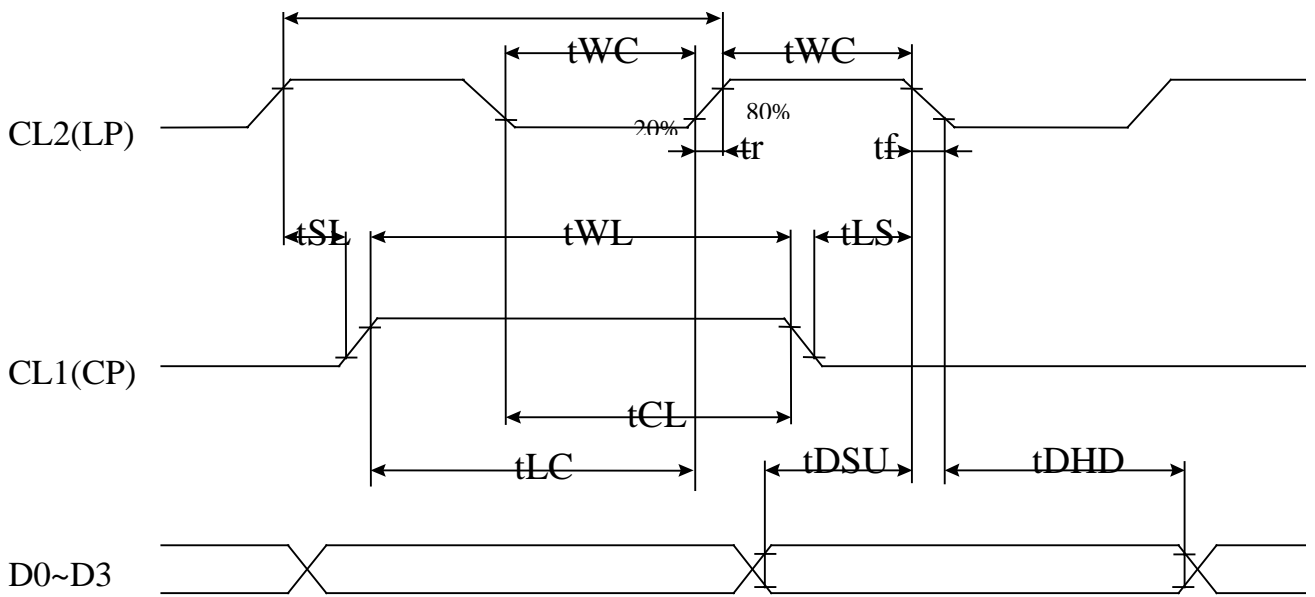


Fig 1. SEGMENT TIMING

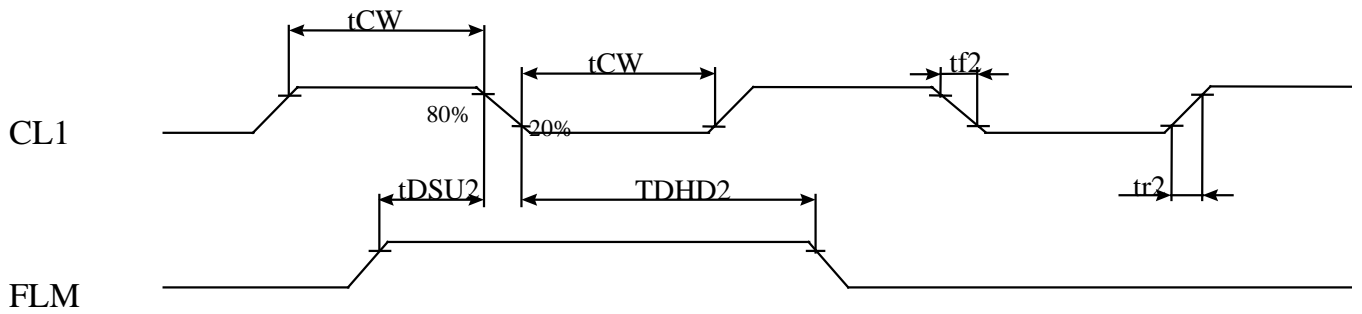


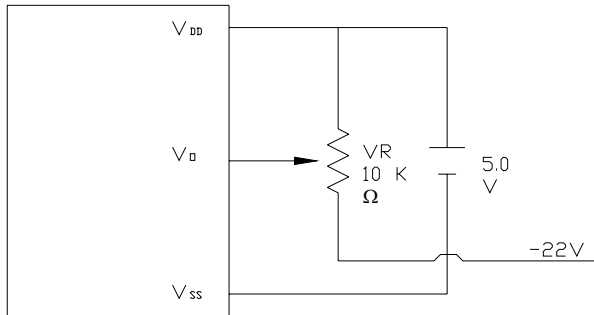
Fig 2 COMMON TIMING



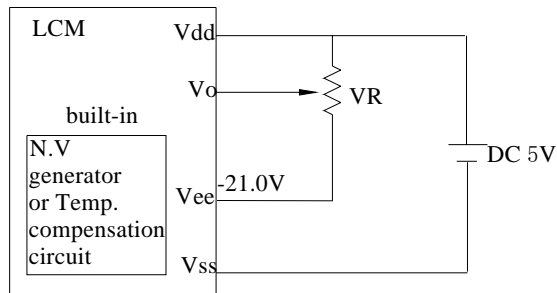
### 9. Power Supply for LCD Module and LCD Operating Voltage a Adjustment

\*(Optional) LCM operating on DC3V or DC5V with external negative voltage.(dual power)

LCD Module block diagram



\*(Optional) LCM operating on DC3V or DC5V input with built-in negative voltage (singal power)





## 10. Backlight Information

### 10.1 Specification

#### (1) LED edge/white

Parameter	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Current	I <sub>LED</sub>	—	160	200	mA	V=3.5V
Supply Voltage	V	—	3.5	3.7	V	—
Reverse Voltage	V <sub>R</sub>	—	—	8	V	—
Luminous Intensity	I <sub>V</sub>	—	150	—	cd/m <sup>2</sup>	I <sub>LED</sub> =160mA
Life Time	—	—	15000	—	Hr.	V ≤ 3.7V
Color	White					

#### (2) CCFL / white

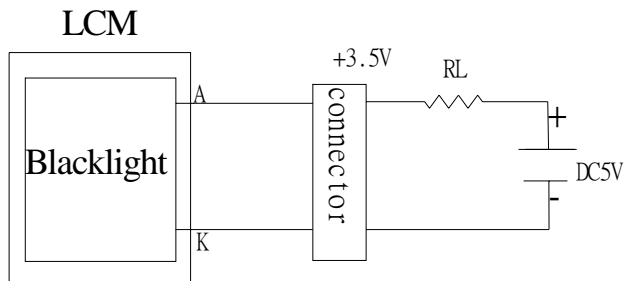
(Ta=25°C)

Item	Symbol	Specification			Unit	Condition
		Min	Typ	Max		
Driving Voltage	V <sub>FL</sub>	—	278	—	V <sub>rms</sub>	—
Input current	I <sub>FL</sub>	3.0	5.0	6.0	mArms	—
Power consumption	W	—	1.35	—	W	—
Starting Voltage	V <sub>FLS</sub>	—	530	—	V <sub>rms</sub>	—
Luminance	L	—	550	—	Cd/m <sup>2</sup>	$\varphi, \theta = 0 \text{ deg}, I_{FL} = 5.0 \text{ mArms}$
Chromaticity	x	—	0.340	—	—	—
	y	—	0.370	—	—	—
Luminance Uniformity (Testing 9 point)	—	75%	—	—	%	$\varphi, \theta = 0 \text{ deg}, I_{FL} = 5.0 \text{ mArms}$
Life time	—	15000	—	—	hrs	—
Color	White					

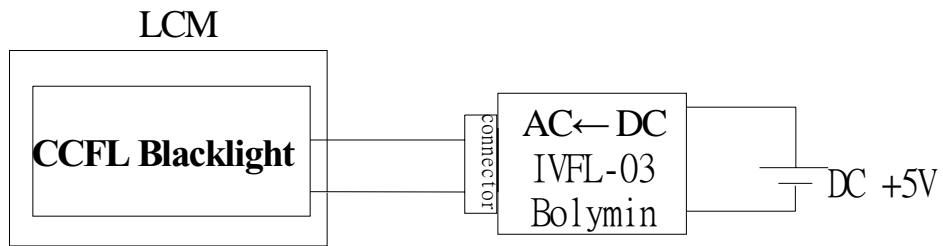


## 10.2 Backlight driving methods

### a. LED white B/L driven from A.K cable directly



### b. CCFL B/L driven from A.K cable directly



Bolymin, Inc.



**11.Touch panel Information (5.7")**

As shown on TP320240A SPEC.



## 12. Quality Assurance

### ◆ Screen Cosmetic Criteria

No.	Defect	Judgement Criterion	Partition																				
1	Spots	<p>A)Clear</p> <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td><math>d \leq 0.1</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.1 &lt; d \leq 0.2</math></td> <td>6</td> </tr> <tr> <td><math>0.2 &lt; d \leq 0.3</math></td> <td>2</td> </tr> <tr> <td><math>0.3 &lt; d</math></td> <td>0</td> </tr> </tbody> </table> <p>Note: Including pin holes and defective dots which must be within one pixel size.</p> <p>B)Unclear</p> <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td><math>d \leq 0.2</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.2 &lt; d \leq 0.5</math></td> <td>6</td> </tr> <tr> <td><math>0.5 &lt; d \leq 0.7</math></td> <td>2</td> </tr> <tr> <td><math>0.7 &lt; d</math></td> <td>0</td> </tr> </tbody> </table>	Size: d mm	Acceptable Qty in active area	$d \leq 0.1$	Disregard	$0.1 < d \leq 0.2$	6	$0.2 < d \leq 0.3$	2	$0.3 < d$	0	Size: d mm	Acceptable Qty in active area	$d \leq 0.2$	Disregard	$0.2 < d \leq 0.5$	6	$0.5 < d \leq 0.7$	2	$0.7 < d$	0	Minor
Size: d mm	Acceptable Qty in active area																						
$d \leq 0.1$	Disregard																						
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$0.2 < d \leq 0.5$	6																						
$0.5 < d \leq 0.7$	2																						
$0.7 < d$	0																						
2	Bubbles Polarize in	<table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td><math>d \leq 0.3</math></td> <td>Disregard</td> </tr> <tr> <td><math>0.3 &lt; d \leq 1.0</math></td> <td>3</td> </tr> <tr> <td><math>1.0 &lt; d \leq 1.5</math></td> <td>1</td> </tr> <tr> <td><math>1.5 &lt; d</math></td> <td>0</td> </tr> </tbody> </table>	Size: d mm	Acceptable Qty in active area	$d \leq 0.3$	Disregard	$0.3 < d \leq 1.0$	3	$1.0 < d \leq 1.5$	1	$1.5 < d$	0	Minor										
Size: d mm	Acceptable Qty in active area																						
$d \leq 0.3$	Disregard																						
$0.3 < d \leq 1.0$	3																						
$1.0 < d \leq 1.5$	1																						
$1.5 < d$	0																						
3	Scratch	In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor																				
4	Allowable Density	Above defects should be separated more than 30mm each other.	Minor																				
5	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-light type should be judged with back-light on state only.	Minor																				



### 13. 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.	-10°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.	50°C, 90%RH 96hrs	—
7	Temperature Cycle	<p>Endurance test applying the low and high temperature cycle.</p> <p>1 cycle</p>	-10°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 msedc 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



13.Outline drawing

