

**LCD MODULE**

MODULE NO. :

**KSEGB24064XXX-11-V SERIES****Customer:**

Approved by:

Approved by	Checked by	Prepared by

**RECORDS OF REVISION**

<b>Part Number</b>	<b>Revision</b>	<b>Revision Content</b>	<b>Revised on</b>
KSEGB24064XXX-11-V	1.0	First issue	Dec. 15th, 2013



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**1. MODULE CLASSIFICATION INFORMATION****KSE G B 24064 - X X X - 11 - V**

① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

① KSE: KEEN SIDE electronics

② C: Character Type, G: Graphic Type

③ B: COB, G: COG

④ Display Font: 240 \* 64

⑤ LCD Mode:        B→ STN-Blue Negative        F→ FSTN Positive  
                         G→ STN Gray Positive        Y→ STN Yellow Green Positive⑥ Backlight Type: N→ Without backlight        A→ Amber LED backlight  
                         B→ Blue LED backlight        G→ Green LED backlight  
                         R→ Red LED backlight        W→ Withe LED backlight  
                         Y→ Yellow-Green LED backlight⑦ LCD Polarizer Type/Temperature range/View direction :  
                         D→ Transflective, W.T, 12:00        E→ Transmissive, W.T, 6:00  
                         P→ Reflective, W. T, 6:00        Q→ Transmissive, W.T, 12:00  
                         Z→ Transflective, W.T, 6:00

⑧ Model serials no. :

⑨ Special Code: V : Built in negative voltage&amp; Temperature Compensation

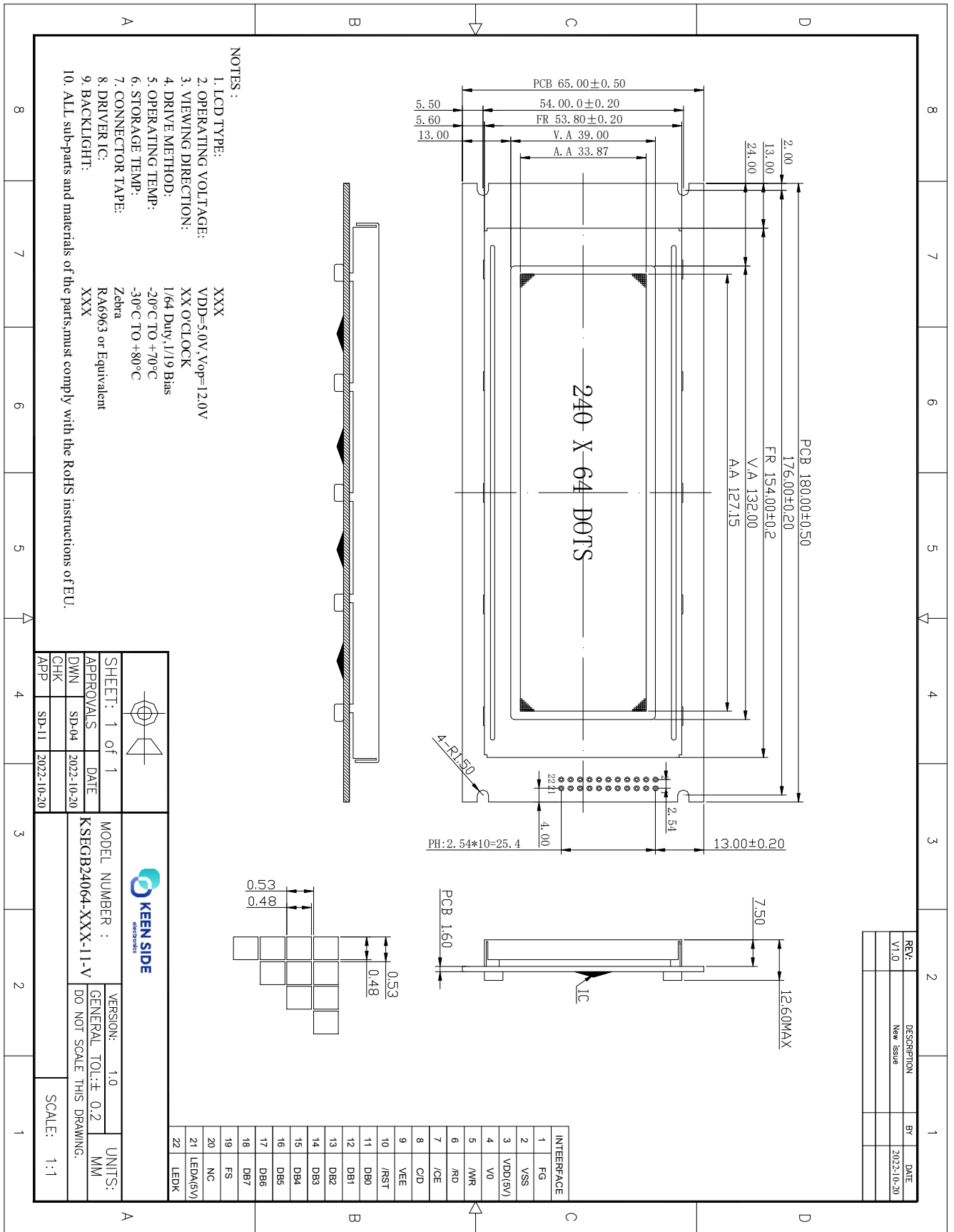
**2. FUNCTIONS & FEATURES**

- Driving Scheme : 1/64Duty, 1/9 Bias
- Power Supply for logic : 5.0V
- Display Content : 240\*64 Dots
- V<sub>LCD</sub> : 12.0V
- Operation temperature : -20°C to +70°C
- Storage temperature : -30°C to +80°C

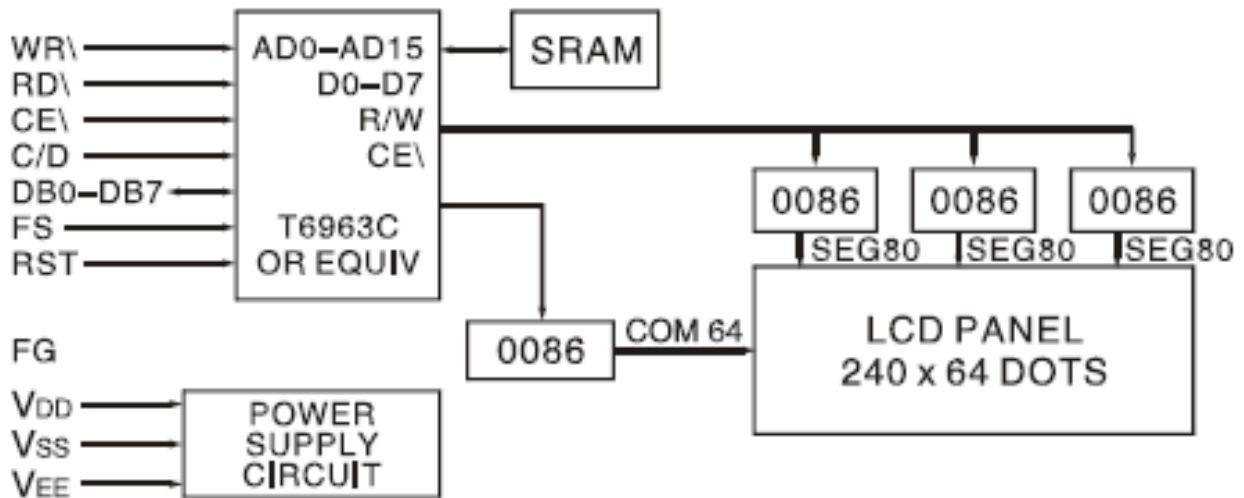
**3. MODULE ARTWORK**

- Module Size : 180.00(L)\*65.00 (W)\*12.60(H)mm
- Viewing Area : 132.00(L)mm\*39.00 (W)mm
- Active Area : 127.15(L)mm\*33.87(W)mm
- Dot Pitch : 0.53 (W)mm\*0.53 (H)mm
- Dot Size : 0.48(W)mm\*0.48 (H)mm
- Dot Gap : 0.05 mm

4. EXTERNAL DIMENSIONS



**5. BLOCK DIAGRAM**



**6. PIN ASSIGNMENT**

Pin No.	Symbol	Function
1	FG	Frame ground
2	VSS	Ground (0V)
3	VDD	Power Supply(+5V)
4	V0	Power Supply for LCD Drive
5	/WR	Data write. Write data to controller T6963C when "L"
6	/RD	Data read. Read data from controller T6963C when "L"
7	CE	Chip enable of controller when "L"
8	C/ D	Command/Data read/write. "H" for command read/write and "L" for data read/write
9	V E E	Negative voltage - 10V output
10	/RST	Controller reset when "L"
11	DB0	Data input/output(LSB)
12	DB1	Data input/output
13	DB2	Data input/output
14	DB3	Data input/output
15	DB4	Data input/output
16	DB5	Data input/output
17	DB6	Data input/output
18	DB7	Data input/output(MSB)
19	FS	Font select. "H" for 6x8 font & "L" for 8x8 font
20	NC	No connection
21	LED+(A)	Anode of LED backlight
22	LED-(K)	Cathode of LED backlight

## 7. BACKLIGHT ELECTRICAL/OPTICAL SPECIFICATIONS

Item	Symbol	MIN.	TYP.	MAX.	Unit	Conditions
Forward Voltage	V <sub>f</sub>	4.8	5.0	5.2	V	If=15*8mA
Forward Current	If		60		mA	
Power Dissipation	Pd		0.30		W	If=15*8mA
Reverse Voltage	VR			5.0	V	
Reverse Current	IR			0.4	mA	
Luminous Intensity	Lv	150			cd/m <sup>2</sup>	If=15*8mA
Luminous Uniformity	ΔLv	70			%	If=15*8mA
Emission Wavelength	x	0.28		0.30		If=15*8mA, Ta=25°C
	y	0.28		0.30		
Backlight Color	White					

8. ABSOLUTE MAXIMUM RATINGS( V<sub>SS</sub>=0V, Ta=25°C)

Item	Symbol	Standard value	Unit
Supply voltage for logic	V <sub>DD</sub>	-0.3~+7.0	V
Supply voltage	V <sub>0</sub>	V <sub>DD</sub> -19.0~V <sub>DD</sub> +0.3	V
Driver supply voltage	V <sub>DD</sub> -V <sub>0</sub>	V <sub>0</sub> -0.3~V <sub>DD</sub> +0.3	V
Operating temperature	T <sub>opr</sub>	-20~+70	°C
Storage temperature	T <sub>stg</sub>	-30~+80	°C

## 9. ELECTRICAL CHARACTERISTICS

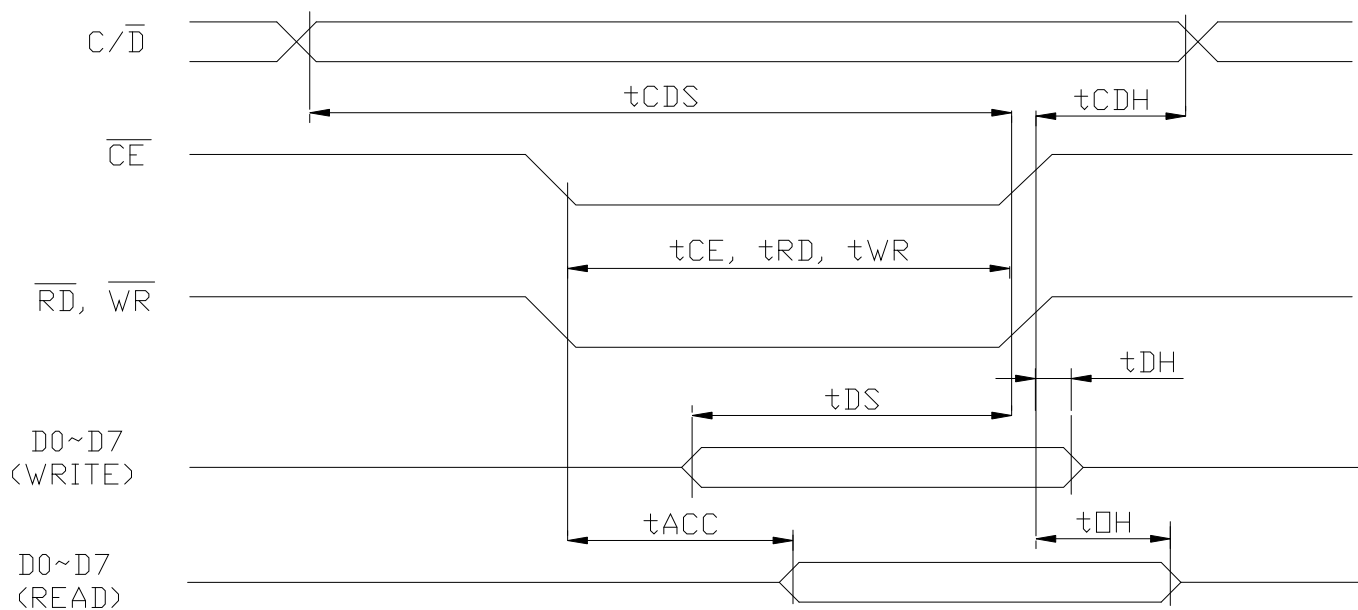
## 1). DC Characteristics

Item	Symbol	Standard Value			Test Condition	Unit
		MIN	TYP	MAX		
Supply current for logic	V <sub>DD</sub>	4.8	5.0	5.2	-----	V
Supply current for logic	I <sub>DD</sub>	----	2.7	5	-----	mA
operating Voltage for LCD	V <sub>DD</sub> -V <sub>0</sub>	11.8	12.0	12.2	25°C	V
Input voltage “H” level	V <sub>IH</sub>	0.7V <sub>DD</sub>	---	V <sub>DD</sub>	---	V
Input voltage “L” level	V <sub>IL</sub>	0	---	0.3V <sub>DD</sub>	---	V

## 2). AC Characteristics

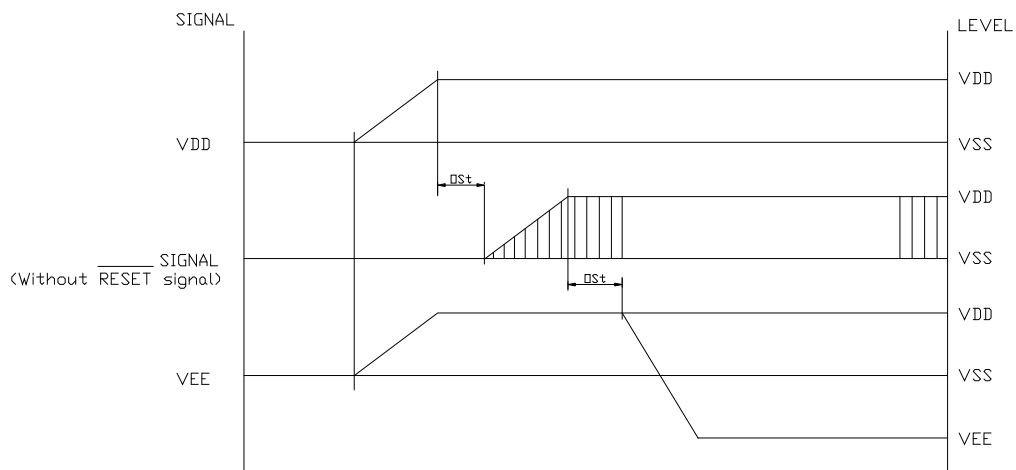
Parameter	Symbol	Min.	Max.	Units
C/D Setup Time	t <sub>CDS</sub>	100	-	ns
C/D Hold Time	t <sub>CDH</sub>	10	-	ns
CE, RD, WR Pulse Width	t <sub>CE</sub> , t <sub>RD</sub> , t <sub>WR</sub>	80	-	ns
Data Setup Time	t <sub>DS</sub>	80	-	ns
Data Hold Time	t <sub>DH</sub>	40	-	ns
Access Time	t <sub>ACC</sub>	-	150	ns
Output Hold Time	t <sub>OH</sub>	10	50	ns



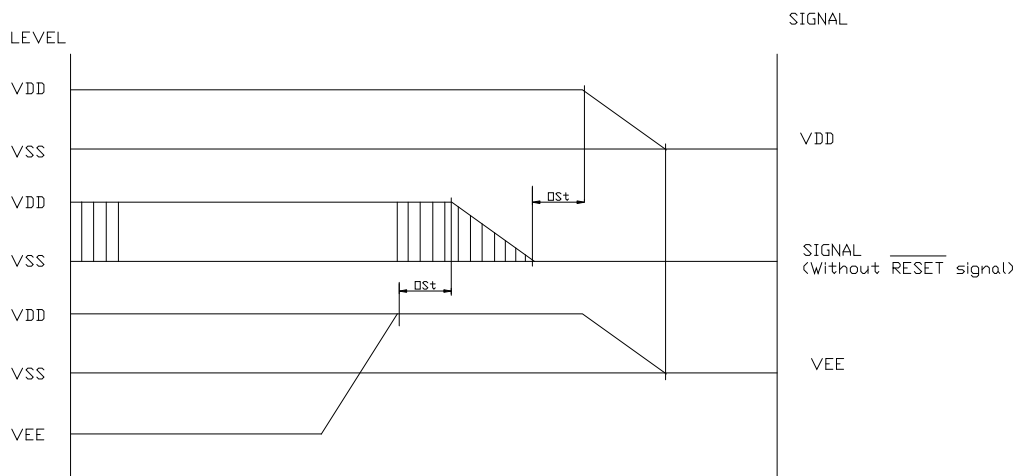


**3). Power Supply ON/OFF Sequence**

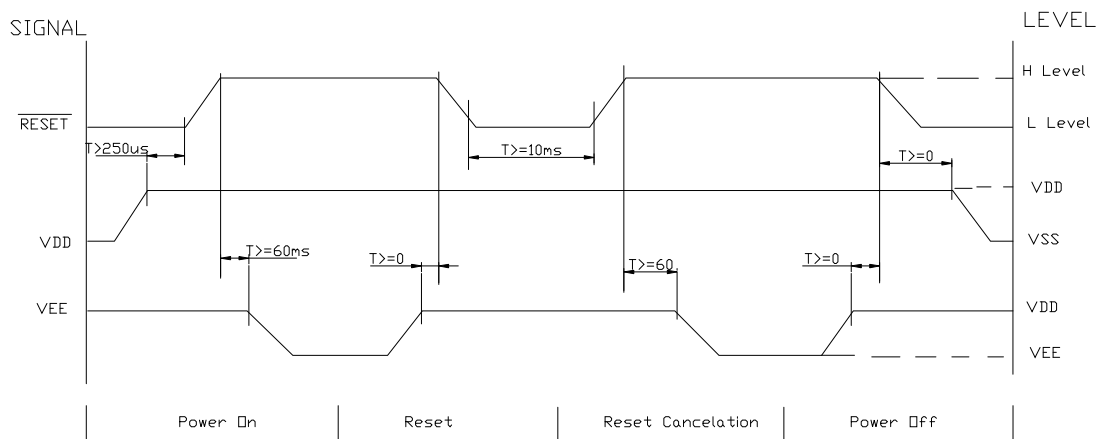
- ON Sequence



● **OFF Sequence**



● **Reset Sequence**



Please maintain the above sequence when turning on and off the power supply of the module.

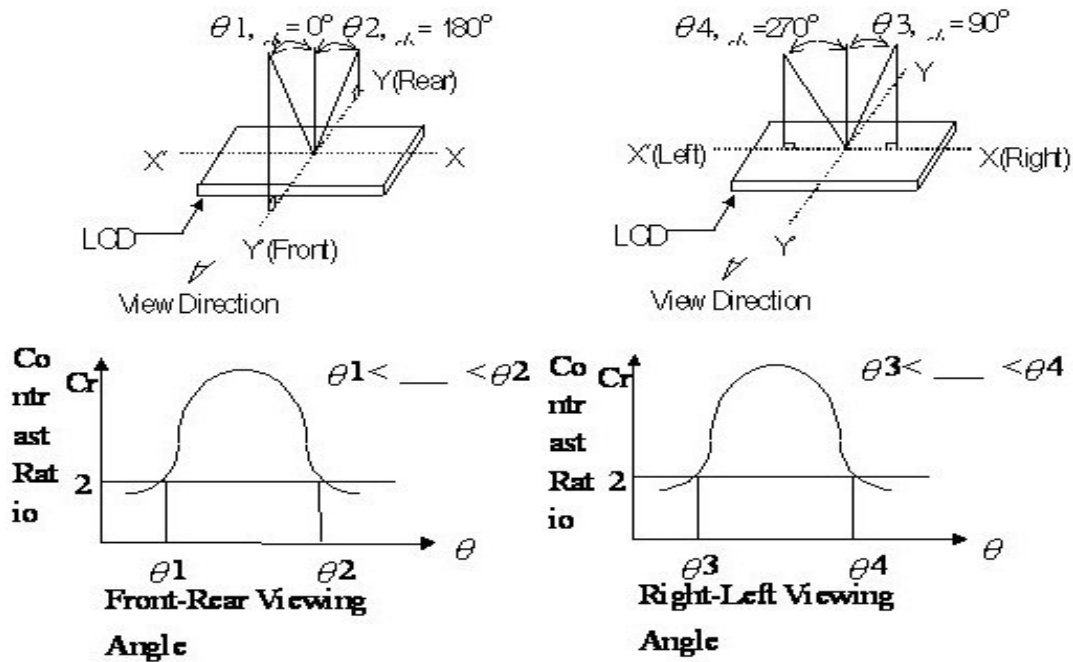
If VEE is supplied to the module while internal alternate signal for LCD driving (M) is unstable or RESET is active, DC component will be supplied to the LCD panel. This may cause damage to the LCD module.

## 10. COMMAND DEFINITIONS

Command	Code	D1	D2	Function
<b>Registers Setting</b>	00100001	X address	Y address	Set cursor pointer
	00100010	Data	00h	Set Offset Register
	00100100	Low address	High address	Set Address pointer
<b>Set Control Word</b>	01000000	Low address	High address	Set Text Home Address
	01000001	Columns	00h	Set Text Area
	01000010	Low address	High address	Set Graphic Home Address
	01000011	Columns	00h	Set Graphic Area
<b>Mode Set</b>	1000X000	--	--	OR mode
	1000X001	--	--	EXOR mode
	1000X011	--	--	AND mode
	1000X100	--	--	Text Attribute mode
	10000XXX	--	--	Internal CG ROM mode
	10001XXX	--	--	External CG RAM mode
<b>Display Mode</b>	10010000	--	--	Display off
	1001XX10	--	--	Cursor on, blink off
	1001XX11	--	--	Cursor on, blink on
	100101XX	--	--	Text on, graphic off
	100110XX	--	--	Text off, graphic on
	100111XX	--	--	Text on, graphic on
<b>Cursor Pattern Select</b>	10100000	--	--	1-line cursor
	10100001	--	--	2-line cursor
	10100010	--	--	3-line cursor
	10100011	--	--	4-line cursor
	10100100	--	--	5-line cursor
	10100101	--	--	6-line cursor
	10100110	--	--	7-line cursor
	10100111	--	--	8-line cursor
<b>Data Read/Write</b>	11000000	Data	--	Data Write and Increment ADP
	11000001	--	--	Data Read and Increment ADP
	11000010	Data	--	Data Write and Decrement ADP
	11000011	--	--	Data Read and Decrement ADP
	11000100	Data	--	Data Write and Non-variable ADP
	11000101	--	--	Data Read and Non-variable ADP
<b>Data auto Read/Write</b>	10110000	--	--	Set Data Auto Write
	10110001	--	--	Set Data Auto Read
	10110010	--	--	Auto Reset
<b>Screen Peek</b>	11100000	--	--	Screen Peek
<b>Screen Copy</b>	11101000	--	--	Screen Copy
<b>Bit Set/Reset</b>	11110XXX	--	--	Bit Reset
	11111XXX	--	--	Bit Set
	1111X000	--	--	Bit 0 (LSB)
	1111X001	--	--	Bit 1
	1111X010	--	--	Bit 2
	1111X011	--	--	Bit 3
	1111X100	--	--	Bit 4
	1111X101	--	--	Bit 5
	1111X110	--	--	Bit 6
	1111X111	--	--	Bit 7 (MSB)
<b>Screen Reverse</b>	11010000	Data	--	Whole screen reverse

**11. OPTICAL CHARACTERISTICS**

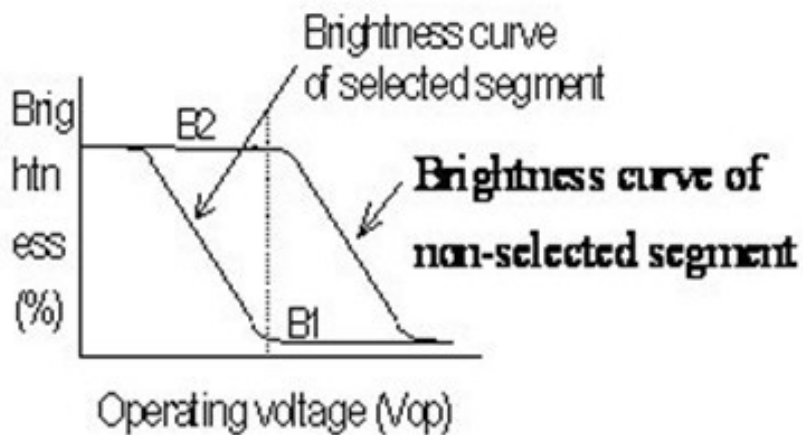
**11.1 Definition of Viewing Angle**



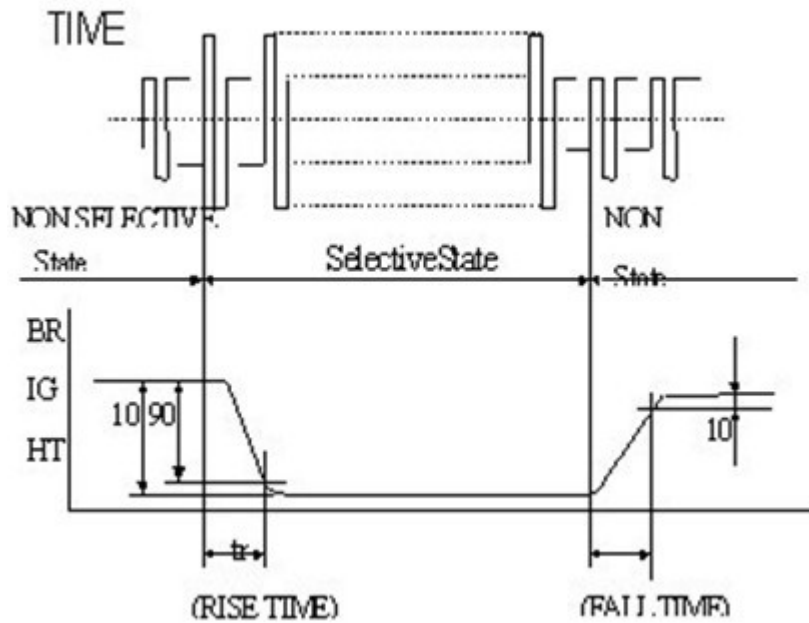
**10.2 Definition of Contrast**

RATIO

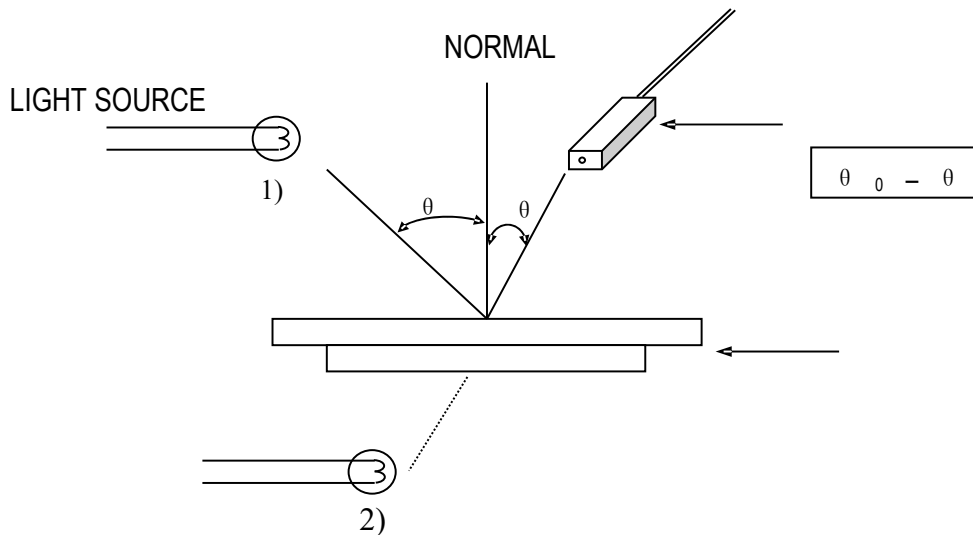
$$C.R = \frac{\text{Brightness of nonselected segment (E2)}}{\text{Brightness of selected segment}}$$



**10.3 Definition of Response**



**10.4 Measuring Instruments for Elector-optical Characteristics**



**\* Note:**

- 1) Light source position for measuring the reflective type of LCD panel;
- 2) Light source position for measuring the transfective / transmissive types of LCD panel.

**12. MODULE ACCEPT QUALITY LEVEL (AQL)**

12.1 AQL Standard Value: Critical Defect =0.1, Major Defect=0.65; Minor Defect =2.5.

12.2 Inspection Standard: MIL-STD-105E Table Normal Inspection Single Sampling Level II

**13. RELIABILITY TEST**

Operating life time: Longer than 75,000 hours

(at room temperature without direct irradiation of sunlight)

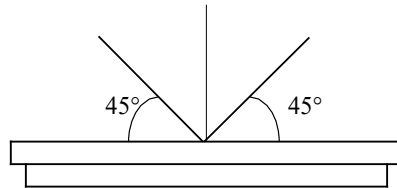
Reliability characteristics shall meet following requirements.

No.	Test Item	Content of Test	Test Condition
1	High Temperature Storage	Endurance test applying the high temperature for a long time storage	+80°C 96H
2	Low Temperature Storage	Endurance test applying the low temperature for a long time storage	-30°C 96H
3	High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the thermal stress to the element for a long time	+70°C 96H
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time	-20°C 96H
5	High Temperature/ Humidity Storage	Endurance test applying the high temperature and humidity storage for a long time	40°C 90%RH 96H
6	Temperature Cycle	Endurance test applying the low and high temperature cycle $  \begin{array}{ccccccc}  -20^{\circ}\text{C} & \longleftrightarrow & 25^{\circ}\text{C} & \longleftrightarrow & 70^{\circ}\text{C} & \longleftrightarrow & 25^{\circ}\text{C} \\  30\text{min} & & 5\text{min} & & 30\text{min} & & 5\text{min} \\  \longleftarrow & & & & & & \longrightarrow \\  & & & & & & \text{1 cycle}  \end{array}  $	-20°C/70°C 5 cycles
7	Vibration Test (Package State)	Endurance test applying the vibration during transportation	10Hz - 55Hz, 50m/s, 15min
8	Shock Test (Package State)	Endurance test applying the shock during transportation	Half-sinewave, 100m/s, 11ms
9	Atmospheric Pressure Test	Endurance test applying the atmospheric pressure during transportation by air	40 kPa 16 H


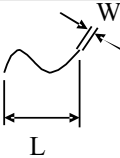
**14. Inspection specification**

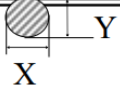
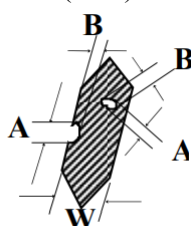
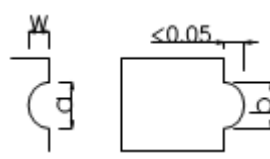
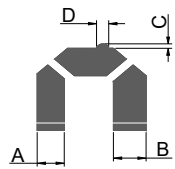
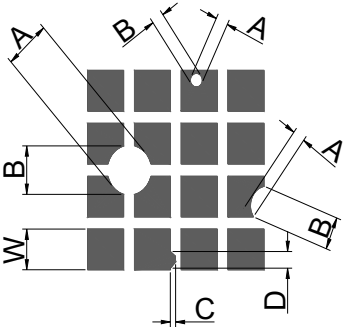
**14.1 Visual Inspection**

- 1) Inspect under 2x20W or 40W fluorescent lamp (approximately 3000 lux) leaving 25 to 30 cm between the module and the lamp and 30 cm between the module and the eye (measuring position).
- 2) Appearance is inspected at the best contrast voltage (best contrast is adjusted considering clearness and crosstalk on screen).
- 3) Inspect the module at 45° right and left, top and bottom.
- 4) Use the optimum viewing angle during the contrast inspection.



**13.2 Standard of Appearance Inspection**

No.	Item	Criteria																			
1	Black spot White spot Dust	Round type: as per following drawing $\Phi = (X+Y)/2$  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="3">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td><math>\Phi &lt; 0.1</math></td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td><math>0.1 &lt; \Phi &lt; 0.2</math></td> <td>2</td> </tr> <tr> <td><math>0.2 &lt; \Phi &lt; 0.25</math></td> <td>1</td> </tr> <tr> <td><math>0.25 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table>	Acceptable quantity			Size	Zone A	Zone B	$\Phi < 0.1$	Any number	Any number	$0.1 < \Phi < 0.2$	2	$0.2 < \Phi < 0.25$	1	$0.25 < \Phi$	0				
		Acceptable quantity																			
Size	Zone A	Zone B																			
$\Phi < 0.1$	Any number	Any number																			
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$0.2 < \Phi < 0.25$	1																				
$0.25 < \Phi$	0																				
Line type: as per following drawing <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="4">Acceptable quantity</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td>—</td> <td><math>W \leq 0.02</math></td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td><math>L \leq 3.0</math></td> <td><math>0.02 &lt; W \leq 0.03</math></td> <td>2</td> </tr> <tr> <td><math>L \leq 2.5</math></td> <td><math>0.03 &lt; W \leq 0.05</math></td> <td>2</td> </tr> <tr> <td>—</td> <td><math>0.05 &lt; W</math></td> <td>As round type</td> </tr> </tbody> </table> 	Acceptable quantity				Length	Width	Zone A	Zone B	—	$W \leq 0.02$	Any number	Any number	$L \leq 3.0$	$0.02 < W \leq 0.03$	2	$L \leq 2.5$	$0.03 < W \leq 0.05$	2	—	$0.05 < W$	As round type
Acceptable quantity																					
Length	Width	Zone A	Zone B																		
—	$W \leq 0.02$	Any number	Any number																		
$L \leq 3.0$	$0.02 < W \leq 0.03$	2																			
$L \leq 2.5$	$0.03 < W \leq 0.05$	2																			
—	$0.05 < W$	As round type																			
		Total acceptable quantity: 3																			
2	Polariser scratch	Scratch on protective film is permitted Scratch on polariser: same as No. 1																			
3	Polariser bubble	$\Phi = (X+Y)/2$																			

		 <table border="1" data-bbox="766 185 1428 459"> <thead> <tr> <th colspan="3">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th>Zone A</th> <th>Zone B</th> </tr> </thead> <tbody> <tr> <td><math>\Phi &lt; 0.2</math></td> <td>Any number</td> <td rowspan="4">Any number</td> </tr> <tr> <td><math>0.2 &lt; \Phi &lt; 0.5</math></td> <td>2</td> </tr> <tr> <td><math>0.5 &lt; \Phi &lt; 1.0</math></td> <td>1</td> </tr> <tr> <td><math>1.0 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table> <p>Total acceptable quantity: 3</p>	Acceptable quantity			Size	Zone A	Zone B	$\Phi < 0.2$	Any number	Any number	$0.2 < \Phi < 0.5$	2	$0.5 < \Phi < 1.0$	1	$1.0 < \Phi$	0																					
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$1.0 < \Phi$	0																																					
4	Segment deformation	<p>4.1 Pin hole on segmented display  W: segment width  <math>\Phi = (A+B)/2</math></p>  <table border="1" data-bbox="837 627 1428 952"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Width</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td><math>W \leq 0.4</math></td> <td><math>\Phi \leq 0.2</math> and <math>\Phi \leq 1/2W</math></td> </tr> <tr> <td><math>W &gt; 0.4</math></td> <td><math>\Phi \leq 0.25</math> and <math>\Phi \leq 1/3W</math></td> </tr> </tbody> </table> <p>Total acceptable quantity: 1 defect per segment  Pin holes with <math>\Phi</math> under 0.10 mm are acceptable</p> <p>4.2 Pin hole on dot matrix display</p>  <table border="1" data-bbox="981 1019 1428 1232"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td><math>a, b &lt; 0.1</math></td> <td>Any number</td> </tr> <tr> <td><math>(a+b)/2 \leq 0.1</math></td> <td>Any number</td> </tr> <tr> <td><math>0.5 &lt; \Phi &lt; 1.0</math></td> <td>3</td> </tr> </tbody> </table> <p>Total acceptable quantity: 7</p> <p>4.3 Segments / dots with different width</p>  <table border="1" data-bbox="981 1377 1340 1489"> <thead> <tr> <th colspan="2">Acceptable</th> </tr> </thead> <tbody> <tr> <td><math>a \geq b</math></td> <td><math>a/b \leq 4/3</math></td> </tr> <tr> <td><math>a &lt; b</math></td> <td><math>a/b &gt; 4/3</math></td> </tr> </tbody> </table> <p>4.4 Alignment layer defect  <math>\Phi = (A+B)/2</math></p>  <table border="1" data-bbox="989 1680 1428 1993"> <thead> <tr> <th colspan="2">Acceptable quantity</th> </tr> <tr> <th>Size</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.4</math></td> <td>Any number</td> </tr> <tr> <td><math>0.4 &lt; \Phi \leq 1.0</math></td> <td>5</td> </tr> <tr> <td><math>1.0 &lt; \Phi \leq 1.5</math></td> <td>3</td> </tr> <tr> <td><math>1.5 &lt; \Phi \leq 2.0</math></td> <td>2</td> </tr> </tbody> </table> <p>Total acceptable quantity: 7</p>	Acceptable quantity		Width	Quantity	$W \leq 0.4$	$\Phi \leq 0.2$ and $\Phi \leq 1/2W$	$W > 0.4$	$\Phi \leq 0.25$ and $\Phi \leq 1/3W$	Acceptable quantity		Size	Quantity	$a, b < 0.1$	Any number	$(a+b)/2 \leq 0.1$	Any number	$0.5 < \Phi < 1.0$	3	Acceptable		$a \geq b$	$a/b \leq 4/3$	$a < b$	$a/b > 4/3$	Acceptable quantity		Size	Quantity	$\Phi \leq 0.4$	Any number	$0.4 < \Phi \leq 1.0$	5	$1.0 < \Phi \leq 1.5$	3	$1.5 < \Phi \leq 2.0$	2
Acceptable quantity																																						
Width	Quantity																																					
$W \leq 0.4$	$\Phi \leq 0.2$ and $\Phi \leq 1/2W$																																					
$W > 0.4$	$\Phi \leq 0.25$ and $\Phi \leq 1/3W$																																					
Acceptable quantity																																						
Size	Quantity																																					
$a, b < 0.1$	Any number																																					
$(a+b)/2 \leq 0.1$	Any number																																					
$0.5 < \Phi < 1.0$	3																																					
Acceptable																																						
$a \geq b$	$a/b \leq 4/3$																																					
$a < b$	$a/b > 4/3$																																					
Acceptable quantity																																						
Size	Quantity																																					
$\Phi \leq 0.4$	Any number																																					
$0.4 < \Phi \leq 1.0$	5																																					
$1.0 < \Phi \leq 1.5$	3																																					
$1.5 < \Phi \leq 2.0$	2																																					
5	Colour	Level of sample for approval set as limit sample																																				



	uniformity																	
6	Backlight	The backlight colour should correspond to the product specification Flashing and or unlit backlight is not allowed Dust larger than 0.25 mm is not allowed																
7	COB	Exposed wire bond pad is not allowed Insufficient covering with resin is not allowed (wire bond line exposed) Dust or bubble on the resin are not allowed																
8	PCB	No unmelted solder paste should be present on PCB Cold solder joints, missing solder connections, or oxidation are not allowed No residue or solder balls on PCB are allowed Short circuits on components are not allowed																
9	Tray particles	<table border="1"> <thead> <tr> <th colspan="3">Acceptable quantity</th> </tr> <tr> <th></th> <th>Size</th> <th>Quantity</th> </tr> </thead> <tbody> <tr> <td rowspan="2">On tray</td> <td><math>\Phi &lt; 0.2</math></td> <td>Any number</td> </tr> <tr> <td><math>\Phi &gt; 0.25</math></td> <td>4</td> </tr> <tr> <td rowspan="2">On display</td> <td><math>\Phi \geq 0.25</math></td> <td>2</td> </tr> <tr> <td>L = 3</td> <td>1</td> </tr> </tbody> </table>	Acceptable quantity				Size	Quantity	On tray	$\Phi < 0.2$	Any number	$\Phi > 0.25$	4	On display	$\Phi \geq 0.25$	2	L = 3	1
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## **15. LCD MODULES HANDLING PRECAUTIONS**

- Please remove the protection foil of polarizer before using.
- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If the substance come into contact with your skin or clothes promptly wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.
- 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.
- Storage precautions  
When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

## **16. OTHERS**

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.
- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.
- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
  - Exposed area of the printed circuit board
  - Terminal electrode sections