# RG24064

# DISPLAY 240×64 GREEN

## 1. Features:

The features of LCD are as follows:

- Display mode : STN /GREEN, POSITIVE, TRANSMISSIVE
- Colour : Display dot : BLACK
  Background: GREEN
- Display Format : 240x64 Dots
- * IC : RA6963
- Interface Input Data : 8 Bits
- Driving Method : 1/64 Duty, 1/9 Bias
- Viewing Direction: 6 O'clock
- Backlight : LED (WHITE)

## 2. Mechanical Specifications:

| Item | Specification | Unit |
|---|---|---|
| Module Size | 180.00(W) X65.00(H) X13.30(T) | mm |
| Viewing Area | 132.00(W) X 39.00(H) | mm |
| Effective Display Area | 127.16(W) X33.88(H) | mm |
| Number of Dots | 240x64 | - |
| Dot Size | 0.49(W) X 0.49(H) | mm |
| Dot Pitch | 0.54(W) X 0.54(H) | mm |

## Electrical Specifications:

### 1. Absolute Maximum Ratings (Vss = 0V)

| Item | Symbol | Standard Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Supply Voltage For Logic | $V_{DD}$ | -0.3 | - | 7.0 | V |
| Supply Voltage For LCD Drive | $V_0$, $V_{OUT}$ | 12 | 12.2 | 12.4 | V |
| Operating Temp. | $T_{OP}$ | -20 | - | +70 | °C |
| Storage Temp. | $T_{ST}$ | -30 | - | +80 | °C |
| Static Electricity | Be sure that you are ground when handing LCM | | | | |

## 2. Electrical Characteristics:

| Item | | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Supply Voltage For Logic | | $V_{DD} - V_{SS}$ | Ta=25℃ | 4.8 | 5.0 | 5.2 | V |
| Supply Voltage For LCD | | $V_{DD} - V_0$ | Ta=25℃ | 12 | 12.2 | 12.4 | V |
| Input Voltage | "H" Level | $V_{IH}$ | Ta=25℃ | 0.8$V_{DD}$ | - | $V_{DD}$ | V |
| | "L" Level | $V_{IL}$ | | $V_{SS}$ | - | 0.2$V_{DD}$ | V |
| Output Voltage | "H" Level | $V_{OH}$ | $I_{OUT}$= -0.5mA | 0.8$V_{DD}$ | - | $V_{DD}$ | V |
| | "L" Level | $V_{OL}$ | $I_{OUT}$= 0.5mA | $V_{SS}$ | - | 0.2$V_{DD}$ | V |
| Current Consumption | | $I_{DD}$ | $V_{IN} = V_{DD}$ | - | - | 1.0 | mA |

NOTE: 1) Duty ratio=1/65, Bias=1/9
2) Measured in Dots ON-state

## 3. BACKLIGHT:

### 3.1 Absolute Maximum Ratings:

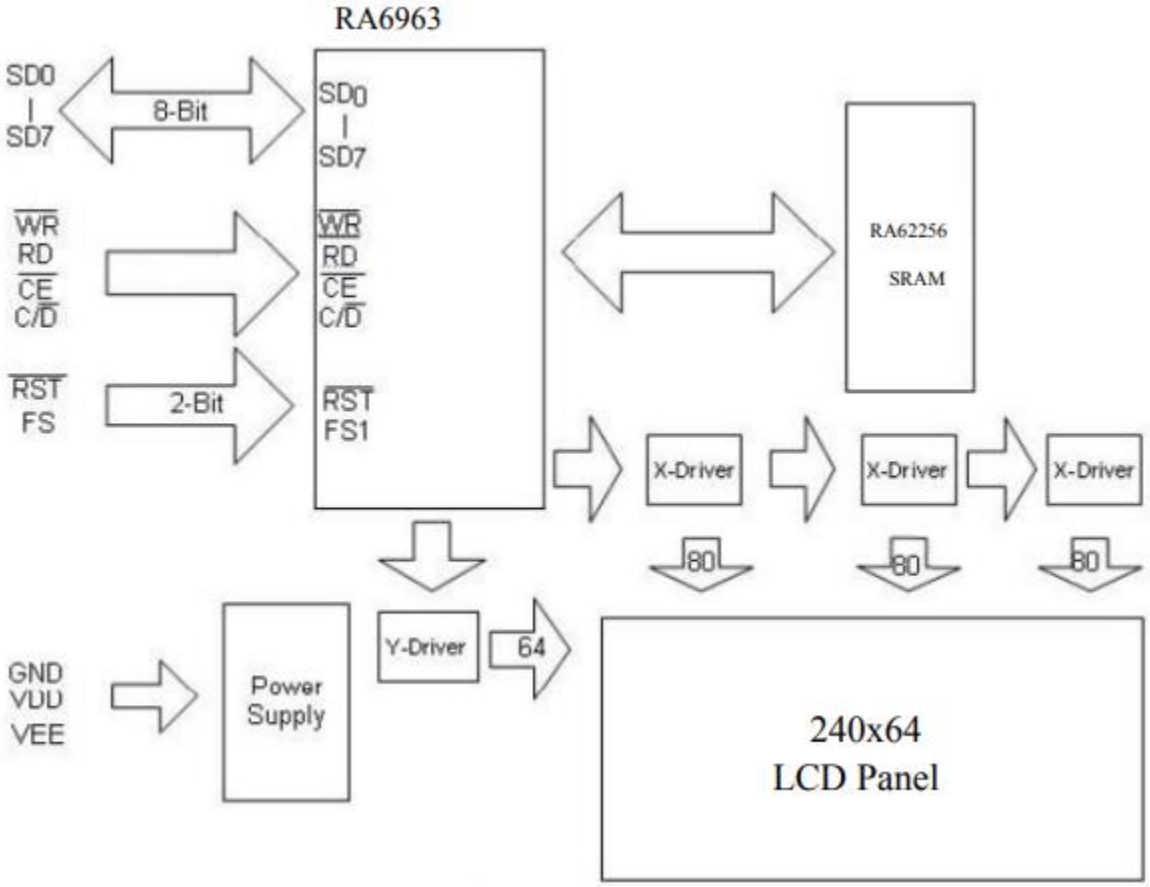
| Item | Symbol | Condition | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Current | IF | Ta= 25℃ | - | - | 20 | mA |
| Reverse Voltage | VR | | - | - | 5 | V |
| Power Dissipation | PD | Ta= 25℃ | - | - | 100 | mW |

### 3.2 Opto-electronic Characteristics:

| Item | Symbol | Condition | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | VF | Ta= 25℃ IF= 130mA | 4.8 | 5.0 | 5.2 | V |
| Luminous | - | | 100 | 150 | - | cd/m² |

** The brightness is measured without LCD panel*

## 3. Schematic Design:



## 4. Interface Pin Function:

| Pin No. | Symbol | Level | Description |
|---|---|---|---|
| 1 | FG | – | Mounting holes grounding |
| 2 | Vss | 0V | Ground |
| 3 | Vdd | 5.0V | Supply voltage for logic (option +3.3V) |
| 4 | Vo | – | Operating voltage for LCD |
| 5 | WR | H/L | White signal, active "L". |
| 6 | RD | H/L | Read signal, active "L". |
| 7 | CE | H/L | Chip enable signal, active "L". |
| 8 | C\D | H/L | H: Instruction code; L: Data. |
| 9 | NC | – | No connection |
| 10 | /RST | L | Reset signal |
| 11 | DB0 | H/L | Data bus line 0 |
| 12 | DB1 | H/L | Data bus line 1 |
| 13 | DB2 | H/L | Data bus line 2 |
| 14 | DB3 | H/L | Data bus line 3 |
| 15 | DB4 | H/L | Data bus line 4 |
| 16 | DB5 | H/L | Data bus line 5 |
| 17 | DB6 | H/L | Data bus line 6 |
| 18 | DB7 | H/L | Data bus line 7 |
| 19 | FS | H/L | Selection of font H:6 X 8, L=8 X 8 |
| 20 | VOUT | – | Negative Voltage output –18.5V |
| 21 | LEDA | – | Power supply for B/L ( + ) |
| 22 | LEDK | – | Power supply for B/L (GND) |

## 5. Command List:

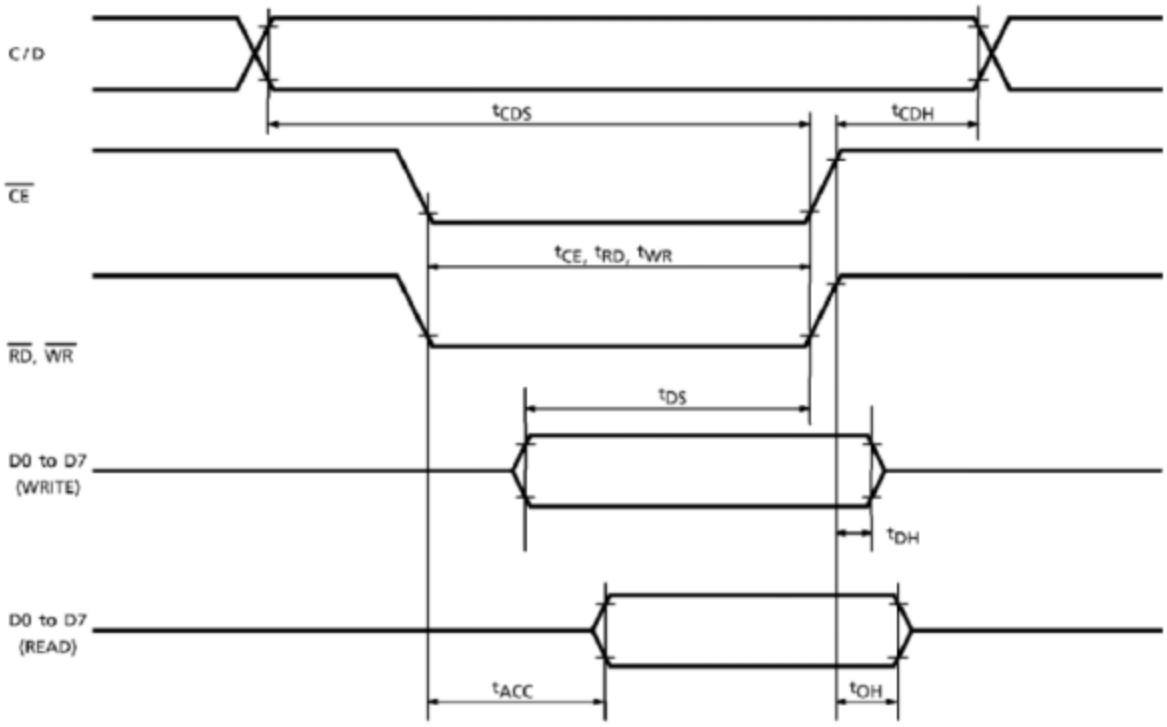
| COMMAND | CODE | D1 | D2 | FUNCTION |
|---|---|---|---|---|
| REGISTERS SETTING | 00100001 | X address | Y address | Set Cursor Pointer |
| | 00100010 | Data | 00H | Set Offset Register |
| | 00100100 | Low address | High address | Set Address Pointer |
| SET CONTROL WORD | 01000000 | Low address | 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 |
| MODE SET | 1000X000 | — | — | OR mode |
| | 1000X001 | — | — | EXOR mode |
| | 1000X011 | — | — | AND mode |
| | 1000X100 | — | — | Text Attribute mode |
| | 10000XXX | — | — | Internal CG ROM mode |
| | 10001XXX | — | — | External CG RAM mode |
| DISPLAY MODE | 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 |
| CURSOR PATTERN SELECT | 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 |
| DATA AUTO READ/ WRITE | 10110000 | — | — | Set Data Auto Write |
| | 10110001 | — | — | Set Data Auto Read |
| | 10110010 | — | — | Auto Reset |
| DATA READ/WRITE | 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 Nonvariable ADP |
| | 11000101 | — | — | Data Read and Nonvariable ADP |
| SCREEN PEEK | 11100000 | — | — | Screen Peek |
| SCREEN COPY | 11101000 | | | Screen Copy |

## Command List (Continued)

| COMMAND | CODE | D1 | D2 | FUNCTION |
|---|---|---|---|---|
| BIT SET / RESET | 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) |

### FONT BALE

## 6. Timing Characteristics (Continued):




| ITEM | SYMBOL | TEST CONDITIONS | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| C/D Set-up Time | $t_{CDS}$ | — | 100 | — | ns |
| C/D Hold Time | $t_{CDH}$ | — | 10 | — | ns |
| CE, RD, WR Pulse Width | $t_{CE}$, $t_{RD}$, $t_{WR}$ | — | 80 | — | ns |
| Data Set-up Time | $t_{DS}$ | — | 80 | — | ns |
| Data Hold Time | $t_{DH}$ | — | 40 | — | ns |
| Access Time | $t_{ACC}$ | — | — | 150 | ns |
| Output Hold Time | $t_{OH}$ | — | 10 | 50 | ns |

## 7. Quality Specification (Continued):

8-3. Sampling Plan and Acceptance

**1. Sampling Plan**

MIL - STD - 105E ( **II** ) ordinary single inspection is used.

**2. Acceptance**

Major defect: AQL = 0.25%

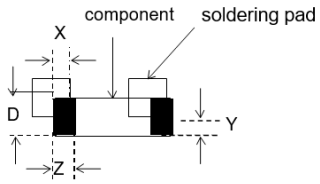
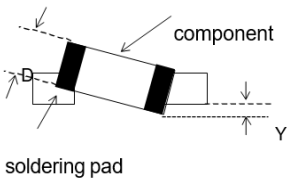
Minor defect: AQL = 0.65%

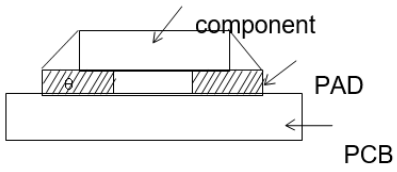
8-4. Criteria

**a) COB**

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Major | PCB copper flakes peeling off | Any copper flake in viewing Area should be greater than 1.0mm$^2$ | Reject |
| Major | Height of coating epoxy | Exceed the dimension of drawing | Reject |
| Major | Void or hole of coating epoxy | Expose bonding wire or IC | Reject |
| Major | PCB cutting defect | Exceed the dimension of drawing | Reject |

**b) SMT**

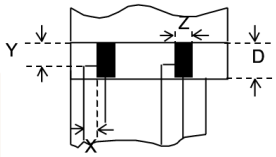
| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Minor | Component marking not readable | | Reject |
| Minor | Component height | Exceed the dimension Of drawing | Reject |
| Major | Component solder defect (missing , extra, wrong component or wrong orientation | | Reject |
| Minor |  Component position shift | X < 3/4Z<br>Y > 1/3D | Reject<br>Reject |
| Minor |  Component tilt | Y > 1/3D | Reject |

| | | | |
|---|---|---|---|
| Minor | Insufficient solder   | $\theta \leq 20^{\circ}$ | Reject |

**c) Metal (Plastic) Frame**

| Defect | Inspection Item | Inspection Standards | | |
|---|---|---|---|---|
| Major | Crack / breakage | Anywhere | | Reject |
| Minor | Frame Scratch | W | L | Acceptable of Scratch |
| | | w<0.03mm | Any | Ignore |
| | | 0.03mm≤w<0.05mm | L≤5.0mm | 2 |
| | | 0.05mm<w<0.1mm | L<3.0mm | 1 |
| | | w>0.1mm | Any | 0 |
| | | Note: 1. Above criteria applicable to scratch lines with distance greater than 5mm.<br>2. Scratch on the back side of frame (not visible) can be ignored. | | |
| Minor | Frame Dent, Prick $\Phi = \frac{L + W}{2}$ | | | Acceptable of Dents / Pricks |
| | | $\Phi \leq 1.0$mm | | 2 |
| | | $1.0 < \Phi \leq 1.5$mm | | 1 |
| | | $1.5\text{mm} > \Phi$ | | 0 |
| | | Note: 1. Above criteria applicable to any two dents / pricks with distance greater than 5mm<br>2. Dent / prick on the back side of frame (not visible) can be ignored | | |
| Minor | Frame Deformation | Exceed the dimension of drawing | | |
| Minor | Metal Frame Oxidation | Any rust | | |

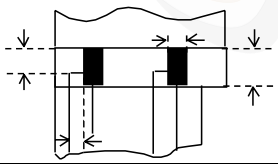
**d) Flexible Film Connector (FFC)**

| Defect | Inspection Item | | Inspection Standards | |
|---|---|---|---|---|
| Minor | Tilted soldering | | Within the angle ±3° | Acceptable |
| Minor | Uneven solder joint /bump | | | Reject |
| Minor | Hole | $\Phi = \frac{L+W}{2}$ | Expose the conductive line | Reject |
| | | | $\Phi$ > 1.0mm | Reject |
| Minor | Position shift   | | Y > 1/3D | Reject |
| | | | X > 1/2Z | Reject |

**e) Screw**

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Major | Screw missing/loosen | | Reject |
| Minor | Screw oxidation | Any rust | Reject |
| Minor | Screw deformation | Difficult to accept screw driver | Reject |

**f) Heat seal 、TCP 、FPC**

| Defect | Inspection Item | | Inspection Standards | |
|---|---|---|---|---|
| Major | Scratch expose conductive layer | | | Reject |
| Minor | HS Hole | $\Phi = \frac{L+W}{2}$ | $\Phi$ > 0.2mm | Reject |
| Major | Adhesion strength | | Less than the specification | Reject |
| Minor | Position shift  | | Y > 1/3D | Reject |
| | | | X > 1/2Z | Reject |
| Major | Conductive line break | | | Reject |

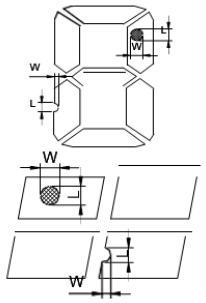
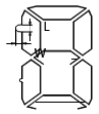
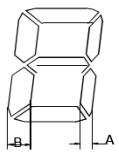
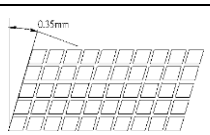
### g) LED Backing Protective Film and Others

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Minor | LED dirty, prick | Acceptable number of units | |
| | | Φ≤0.10mm | Ignore |
| | | 0.10<Φ≤0.15mm | 2 |
| | | 0.15<Φ≤0.2mm | 1 |
| | | Φ>0.2mm | 0 |
| | | The distance between any two spots should be ≥10mm<br>Any spot/dot/void outside of viewing area is acceptable | |
| Minor | Protective film tilt | Not fully cover LCD | Reject |
| Major | COG coating | Not fully cover ITO circuit | Reject |

### h) Electric Inspection

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Major | Short | | Reject |
| Major | Open | | Reject |

## i) Inspection Specification of LCD

| Defect | Inspect Item | | Inspection Standards | | | |
|---|---|---|---|---|---|---|
| Minor | Linear Defect | * Glass Scratch<br>* Polarizer Scratch<br>* Fiber and Linear material | W | W<0.03 | 0.03<W<0.05 | W>0.05 |
| | | | L | L<5 | L<3 | Any |
| | | | ACC. NO. | 1 | 1 | Reject |
| | | | Note | L is the length and W is the width of the defect | | |
| Minor | Black Spot and Polarizer Pricked | * Foreign material between glass and polarizer or glass and glass<br>* Polarizer hole or protuberance by external force | Φ | Φ≤0.1 | 0.1<Φ≤0.15 | 0.15<Φ≤0.2 | Φ>0.2 |
| | | | ACC. NO. | 3EA /1PC | 2 | 1 | 0 |
| | | | Note | Φ is the average diameter of the defect.Distance between two defects > 10mm. | | | |
| Minor | White Spot and Bubble in polarizer | * Unobvious transparent foreign material between glass and glass or glass and polarizer<br>* Air protuberance between polarizer and glass | Φ | Φ≤0.1 | 0.1<Φ≤0.15 | 0.15<Φ≤0.2 | Φ>0.2 |
| | | | ACC. NO. | 3EA / 1PC | 2 | 1 | 0 |
| | | | Note | Φ is the average diameter of the defect.Distance between two defects > 10mm. | | | |
| Minor | Segment Defect |  | Φ | Φ≤0.10 | 0.10<Φ≤0.20 | Φ>0.2 |
| | | | ACC. NO. | 3EA /1PC | 2 | 0 |
| | | | Note | W is more than 1/2 segment width | | Reject |
| | | | | $\Phi = \frac{L + W}{2}$<br>Distance between two defect is 10mm | | |
| Minor | Protuberant Segment |  <br>Φ = ( L + W ) / 2 | Φ | Φ≤0.10 | 0.10<Φ≤0.20 | Φ>0.2 |
| | | | W | Glue | W≤1/2 Seg , W≤0.2 | Ignore |
| | | | ACC. NO. | 3EA /1PC | 2 | 0 |
| Minor | Assembly Mis-alignment |  | 1. Segment | | | |
| | | | B | B≤0.4mm | 0.4<B≤1.0mm | B>1.0mm |
| | | | B-A | B-A<1/2B | B-A<0.2 | B-A<0.25 |
| | | | Judge | Acceptable | Acceptable | Acceptable |
| | |  | 2. Dot Matrix | | | |
| | | | Deformation>0.35mm | | | Reject |

| | | | |
|---|---|---|---|
| Minor | Stain on LCD Panel Surface | | Accept when stains can be wiped lightly with a soft cloth or a similar one. Otherwise, judged according to the aboveitems: “Black spot” and “White Spot” |

## 8. Reliability:

| NO. | Item | Condition | Criterion |
|---|---|---|---|
| 1 | High Temperature Operating | 70℃, 96Hrs | No defect in cosmeticand operational function allowable.<br><br>Total current Consumption shouldbe below double of initial value. |
| 2 | Low Temperature Operating | -20℃, 96Hrs | |
| 3 | High Humidity | 40℃, 90%RH, 96Hrs | |
| 4 | High Temperature Storage | 80℃, 96Hrs | |
| 5 | Low Temperature Storage | -30℃, 96Hrs | |
| 6 | Vibration | Random wave<br>10 ~ 100Hz<br>Acceleration: 2g<br>2 Hrs per direction(X,Y,Z) | |
| 7 | Thermal Shock | -10℃ to 25℃ to 60℃<br>(60Min) (5Min) (60Min)<br>16Cycles | |
| 8 | ESD Testing | Contract Discharge Voltage:<br>+1 ~ 5kV and –1 ~ –5kV | There will be discharged ten times at every discharging voltage cycle. The voltage gap is 1kV. |
| | | Air Discharge Voltage:<br>+1 ~ 8kV and –1 ~ -8kV | |

***Note:*** 1) Above conditions are suitable for xinnuoya standard products.

2) For restrict products, the test conditions listed as above must be revised.

## 9. Handling Precaution:

(1) Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizerswhich easily get damaged since the Module is fixed by utilizing fitting holes in the printed circuit board. Extreme care should be taken when handling
the LCD Modules.

(2) Caution of LCD handling & cleaning

When cleaning the display surface, use soft cloth with solvent (recommendedbelow) and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Trichlorotrifloroethane

Do not wipe the display surface with dry or hard materials that will damage thepolarizer surface.

Do not use the following solvent:

- Water
- Ketone
- Aromatics

(3) Caution against static charge

The LCD Module use C-MOS LSI drivers, so we recommend that you connect any unused input terminal to VDD or VSS, do not input any signals before poweris turned on. And ground your body, Work/assembly table. And assembly equipment to protect against static electricity.

(4) Packaging

- Modules use LCD elements, and must be treated as such. Avoid intense shockand falls from a height.

- To prevent modules from degradation. Do not operate or store them exposeddirectly to sunshine or high temperature/humidity.

(5) Caution for operation

- It is indispensable to drive LCD's within the specified voltage limit since the higher voltage than the limit shorten LCD life. An electrochemical reaction due to direct current causes LCD deterioration, Avoid the use of direct current drive.

## Handling Precaution (Continued):

- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show darkcolor in them. However those phenomena do not mean malfunction or out of order with LCD's.Which will come back in the specified operating temperature range.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the relative condition of 60□C, 90%RH or less is required.

(6) Storage

In the case of storing for a long period of time (for instance, for years) for thepurpose or replacement use, The following ways are recommended.

- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it,And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is.

Keeping temperature in the specified storage temperature range.

- Storing with no touch on polarizer surface by the anything else. (It is recommendedto store them as they have been contained in the inner container at the time of delivery)

(7) Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and washoff liquid crystal by using solvents such as acetone and ethanol.

Which should be burned up later.
When any liquid crystal leaked out of a damaged glass cell comes in contact withyour hands, please wash it off well with soap and water.

## 11. Outline Dimensions: