

Final Revision

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2/11/1919

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## 1.General Specifications

|                    |   |                                                                            |
|--------------------|---|----------------------------------------------------------------------------|
| Operating Temp.    | : | min. -20°C ~ max. 70°C                                                     |
| Storage Temp.      | : | min. -20°C ~ max. 70°C                                                     |
| Display Format     | : | 20 characters × 2 lines                                                    |
| Display Fonts      | : | 5 × 8 dots ( 1 character )                                                 |
| Viewing Area       | : | 83.0 (W) × 18.6 (H) mm                                                     |
| Outline Dimensions | : | 116.0 (W) × 37.0 (H) × (15.6) (D) mm                                       |
| Weight             | : | 42.9g max.                                                                 |
| LCD Type           | : | NTD-21333<br>( STN / Color-mode / Transmissive)                            |
| Viewing Angle      | : | 6:00                                                                       |
| Data Transfer      | : | 8-bit parallel data transfer                                               |
| Backlight          | : | LED Backlight / Blue                                                       |
| Additional Spec    | : | Vivid Color Display Specification<br>(High Performance Color Film is Used) |
| Drawings           | : | Dimensional Outline UE-311044                                              |

## 2. Electrical Specifications

### 2.1. Absolute Maximum Ratings

V<sub>SS</sub>=0V

| Parameter                     | Symbol                           | Conditions | Min. | Max.                 | Units |
|-------------------------------|----------------------------------|------------|------|----------------------|-------|
| Supply Voltage<br>(Logic)     | V <sub>CC</sub> -V <sub>SS</sub> | -          | -0.3 | 7.0                  | V     |
| Supply Voltage<br>(LCD Drive) | V <sub>CC</sub> -V <sub>EE</sub> | -          | -0.3 | 13.5                 | V     |
| Input Voltage                 | V <sub>I</sub>                   | -          | -0.3 | V <sub>CC</sub> +0.3 | V     |

### 2.2. DC Characteristics

T<sub>a</sub>=25°C, V<sub>CC</sub>=5V, V<sub>SS</sub>=V<sub>EE</sub>=0V

| Parameter                     | Symbol                           | Conditions                             | Min. | Typ. | Max.            | Units |
|-------------------------------|----------------------------------|----------------------------------------|------|------|-----------------|-------|
| Supply Voltage<br>(Logic)     | V <sub>CC</sub> -V <sub>SS</sub> | -                                      | 4.5  | -    | 5.5             | V     |
| Supply Voltage<br>(LCD Drive) | V <sub>CC</sub> -V <sub>EE</sub> | Shown in 3.1                           |      |      |                 | V     |
| High Level<br>Input Voltage   | V <sub>IH</sub>                  | -                                      | 2.2  | -    | V <sub>CC</sub> | V     |
| Low Level<br>Input Voltage    | V <sub>IL</sub>                  | -                                      | -0.3 | -    | 0.8             | V     |
| High Level<br>Output Voltage  | V <sub>OH</sub>                  | I <sub>OH</sub> =-0.25mA               | 2.4  | -    | -               | V     |
| Low Level<br>Output Voltage   | V <sub>OL</sub>                  | I <sub>OL</sub> =1.2mA                 | -    | -    | 0.4             | V     |
| Supply Current                | I <sub>CC</sub>                  | V <sub>CC</sub> -V <sub>SS</sub> =5.3V | -    | 2.0  | 3.0             | mA    |

All voltage values are referenced to V<sub>SS</sub> =0V

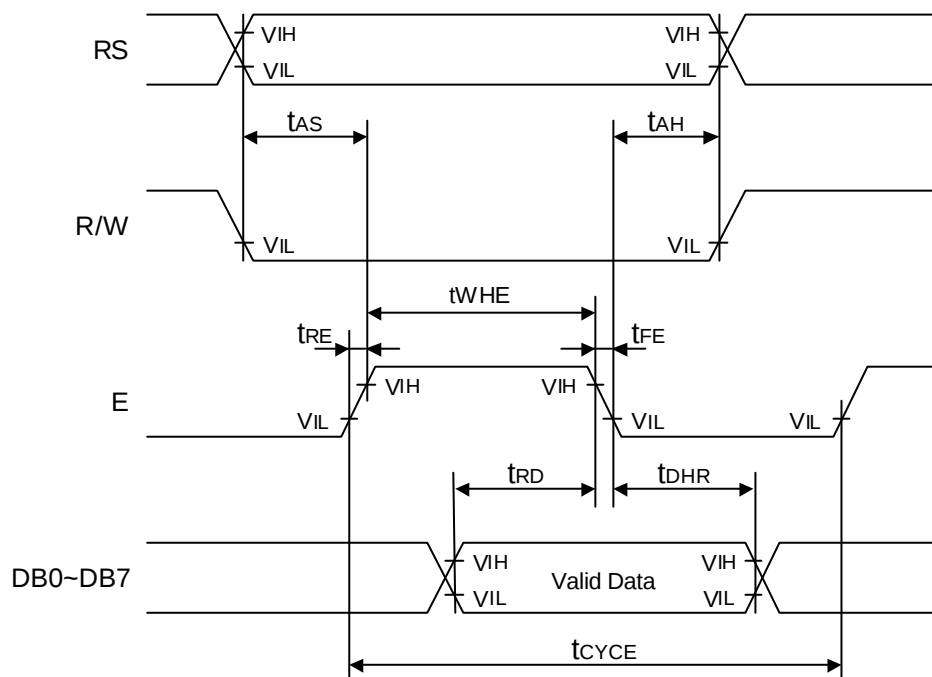
V<sub>1</sub> to V<sub>5</sub> must maintain V<sub>DD</sub> ≥ V<sub>1</sub> ≥ V<sub>2</sub> ≥ V<sub>3</sub> ≥ V<sub>4</sub> ≥ V<sub>5</sub>.

## 2.3.AC Characteristic

### Read Operation

$V_{CC}=5.0V\pm10\%$

| Parameter                                                          | Symbol           | Min.      | Max. | Units |
|--------------------------------------------------------------------|------------------|-----------|------|-------|
| Enable Cycle Time                                                  | $t_{CYCE}$       | 500       | -    | ns    |
| Enable "H" Level Pulse Width                                       | $t_{WHE}$        | 300       | -    | ns    |
| Enable Rise/Fall Time                                              | $t_{RE}, t_{FE}$ | -         | 25   | ns    |
| RS,R/W Setup Time (8-bit operation mode)<br>(4-bit operation mode) | $t_{AS}$         | 60<br>100 | -    | ns    |
| RS,R/W Address Hold Time                                           | $t_{AH}$         | 10        | -    | ns    |
| Read Data Output Delay                                             | $t_{RD}$         | -         | 190  | ns    |
| Read Data Hold Time                                                | $t_{DHR}$        | 20        | -    | ns    |

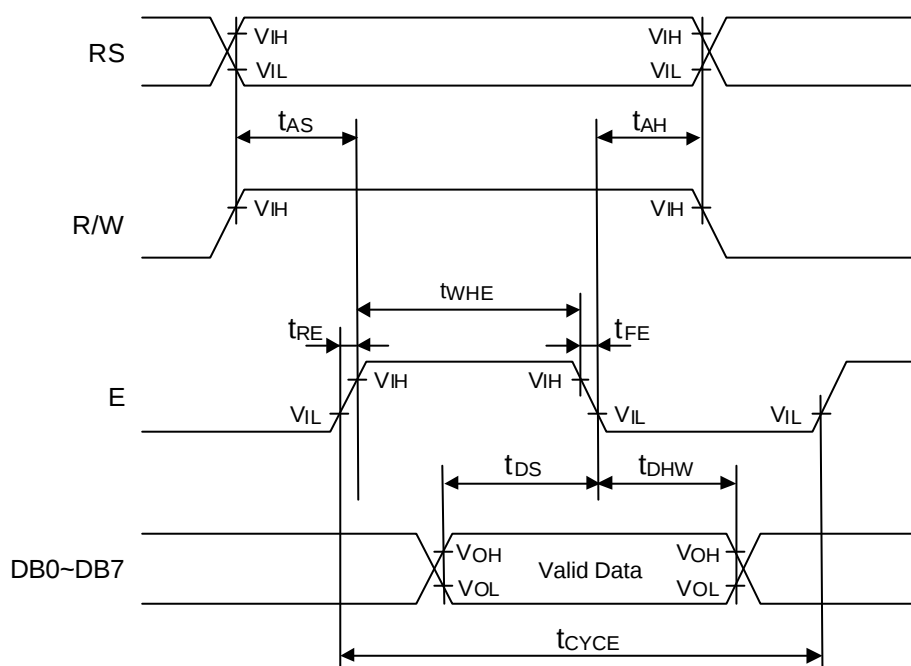


Read Operation Timing

## Write Operation

$V_{CC}=5.0V\pm10\%$

| Parameter                                                          | Symbol           | Min.      | Max. | Units |
|--------------------------------------------------------------------|------------------|-----------|------|-------|
| Enable Cycle Time                                                  | $t_{CYCE}$       | 500       | -    | ns    |
| Enable "H" Level Pulse Width                                       | $t_{WHE}$        | 300       | -    | ns    |
| Enable Rise/Fall Time                                              | $t_{RE}, t_{FE}$ | -         | 25   | ns    |
| RS,R/W Setup Time (8-bit operation mode)<br>(4-bit operation mode) | $t_{AS}$         | 60<br>100 | -    | ns    |
| RS,R/W Address Hold Time                                           | $t_{AH}$         | 10        | -    | ns    |
| Data Output Delay                                                  | $t_{DS}$         | -         | -    | ns    |
| Data Hold Time                                                     | $t_{DHR}$        | 10        | -    | ns    |



Write Operation Timing

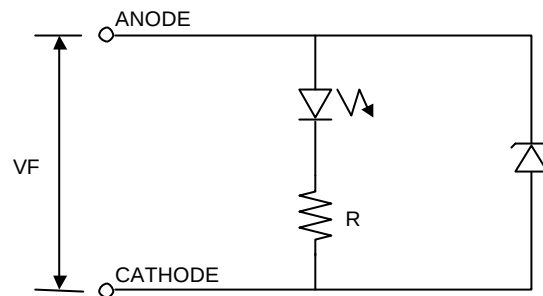
## 2.4. Lighting Specifications

### 2.4.1. Absolute Maximum Ratings

Ta=25°C

| Parameter             | Symbol | Conditions | Min. | Typ. | Max.  | Units |
|-----------------------|--------|------------|------|------|-------|-------|
| Forward Voltage       | $V_F$  | Note 1     | -    | -    | 6.0   | V     |
| LED Power Dissipation | $P_D$  | -          | -    | -    | 0.125 | mW    |
| Reverse Voltage       | $V_R$  | -          | -    | -    | 5.0   | V     |

Note 1 :  $V_F$  is defined as the voltage between ANODE and CATHODE as shown below.



### 2.4.2. Operating Characteristics

Ta=25°C

| Parameter                      | Symbol | Conditions | Min. | Typ. | Max. | Units             |
|--------------------------------|--------|------------|------|------|------|-------------------|
| Forward Current                | $I_F$  | $V_F=5.0V$ | -    | 15   | 18   | mA                |
| Luminance of Backlight Surface | L      | $V_F=5.0V$ | 38   | -    | -    | cd/m <sup>2</sup> |

### 3. Optical Specifications

#### 3.1. LCD Driving Voltage

| Parameter                                    | Symbol          | Conditions | Min. | Typ. | Max. | Units |
|----------------------------------------------|-----------------|------------|------|------|------|-------|
| Recommended<br>LCD Driving Voltage<br>Note 1 | $V_{CC}-V_{EE}$ | Ta= -20°C  | -    | -    | 5.5  | V     |
|                                              |                 | Ta=25°C    | 4.9  | 5.3  | 5.5  | V     |
|                                              |                 | Ta=70°C    | 4.7  | -    | -    | V     |

Note 1 : Voltage (Applied actual waveform to LCD Module) for the best contrast. The range of minimum and maximum shows tolerance of the operating voltage. The specified contrast ratio and response time are not guaranteed over the entire range.

#### 3.2. Optical Characteristics

Ta=25°C, 1/16 Duty, 1/5 Bias, V<sub>OD</sub>=5.5V (Note 4),  $\theta=0^\circ$ ,  $\phi=-^\circ$

| Parameter             | Symbol       | Conditions                        | Min. | Typ. | Max. | Units |
|-----------------------|--------------|-----------------------------------|------|------|------|-------|
| Contrast Ratio Note 1 | CR           | $\theta=0^\circ$ , $\phi=-^\circ$ | -    | 80   | -    |       |
| Viewing Angle         |              | Shown in 3.3                      |      |      |      |       |
| Response Time         | Rise Note 2  | T <sub>ON</sub>                   | -    | 45   | 90   | ms    |
|                       | Decay Note 3 | T <sub>OFF</sub>                  | -    | 200  | 300  | ms    |

Note 1 : Contrast ratio is defined as follows. (CR = L<sub>ON</sub> / L<sub>OFF</sub>)

L<sub>ON</sub> : Luminance of the ON segments

L<sub>OFF</sub>: Luminance of the OFF segments

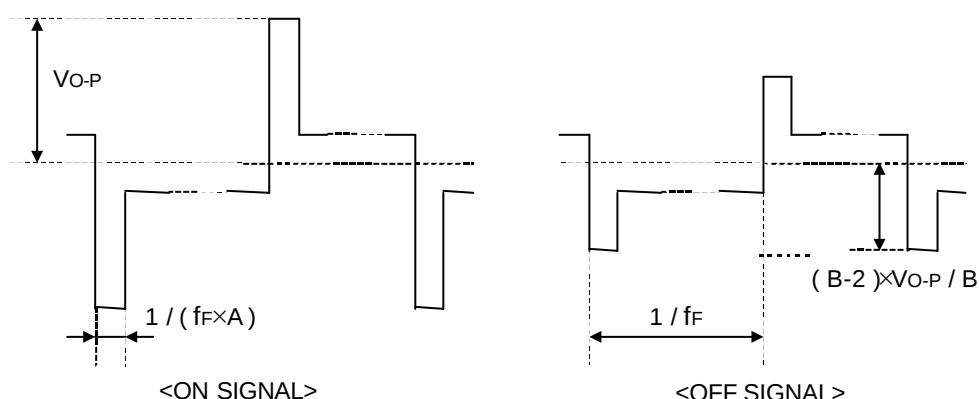
Measuring Spot:0.9mm $\phi$

Note 2 : The time that the luminance level reaches 90% of the saturation level from 0% when ON signal is applied.

Note 3 : The time that the luminance level reaches 10% of the saturation level from 100% when OFF signal is applied.

Note 4 : Definition of Driving Voltage V<sub>OD</sub>

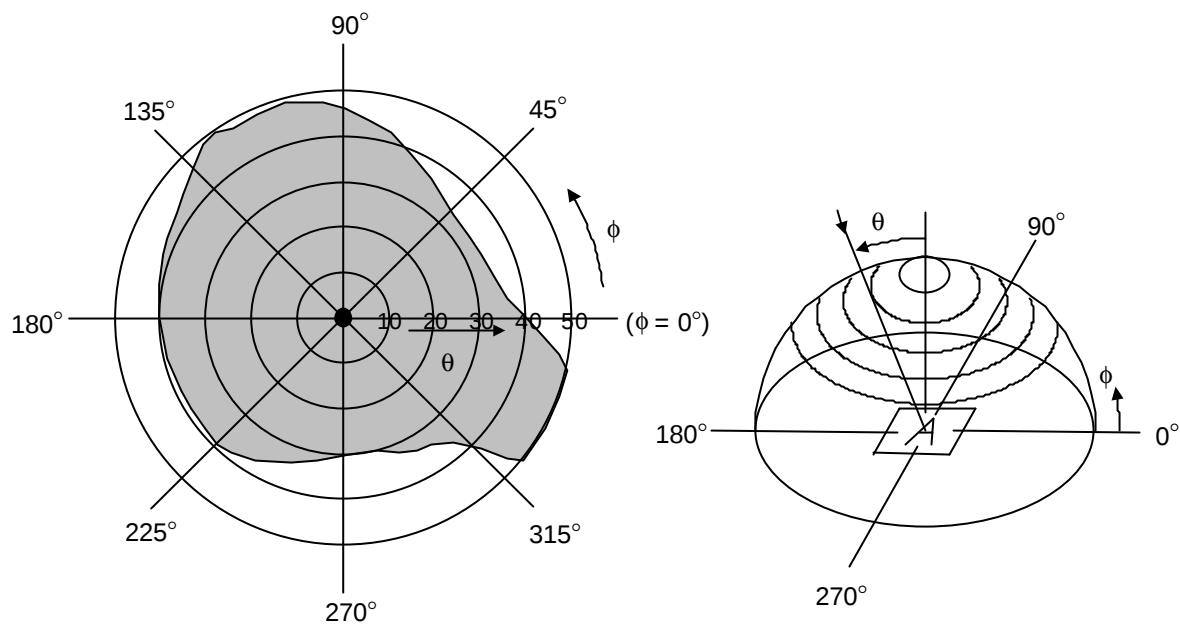
Assuming that the typical driving waveforms shown below are applied to the LCD Panel at 1/A Duty - 1/B Bias (A: Duty Number, B: Bias Number). Driving voltage V<sub>OD</sub> is defined as the voltage V<sub>O-P</sub> when the contrast ratio (CR=L<sub>ON</sub> / L<sub>OFF</sub>) is at its maximum.



### 3.3. Definition of Viewing Angle and Optimum Viewing Area

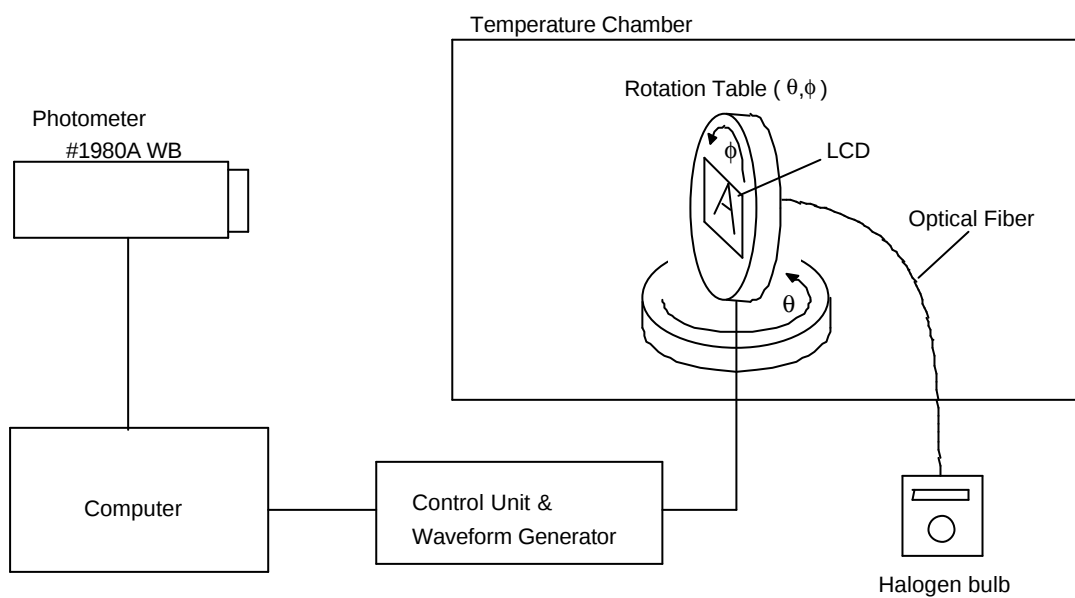
\*Point ● shows the point where contrast ratio is measured. :  $\theta = 0^\circ$ ,  $\phi = 0^\circ$

\*Driving condition : 1/16 Duty, 1/5 Bias,  $V_{OD}=5.5V$ ,  $f_F=84.3Hz$



\*Area  shows typ. CR $\geq 2$  (Measuring Spot: 0.9mm $\phi$ )

### 3.4. System Block Diagram



## 4.I/O Terminal

### 4.1.Pin Assignment

#### CN1

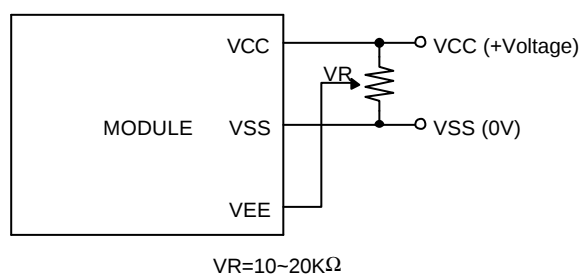
| No. | Symbol          | Function                                          |
|-----|-----------------|---------------------------------------------------|
| 1   | LED (A)         | LED Anode Terminal                                |
| 2   | LED (K)         | LED Cathode Terminal                              |
| 3   | V <sub>SS</sub> | Power Supply (0V, GND)                            |
| 4   | V <sub>CC</sub> | Power Supply for Logic                            |
| 5   | V <sub>EE</sub> | Power Supply for LCD Drive                        |
| 6   | RS              | Register Select Signal                            |
| 7   | R/W             | Read/Write Select Signal H : Read L : Write       |
| 8   | E               | Enable Signal (No pull-up Resister)               |
| 9   | DB0             | Data Bus Line / Non-connection at 4-bit operation |
| 10  | DB1             | Data Bus Line / Non-connection at 4-bit operation |
| 11  | DB2             | Data Bus Line / Non-connection at 4-bit operation |
| 12  | DB3             | Data Bus Line / Non-connection at 4-bit operation |
| 13  | DB4             | Data Bus Line                                     |
| 14  | DB5             | Data Bus Line                                     |
| 15  | DB6             | Data Bus Line                                     |
| 16  | DB7             | Data Bus Line                                     |

#### CN2

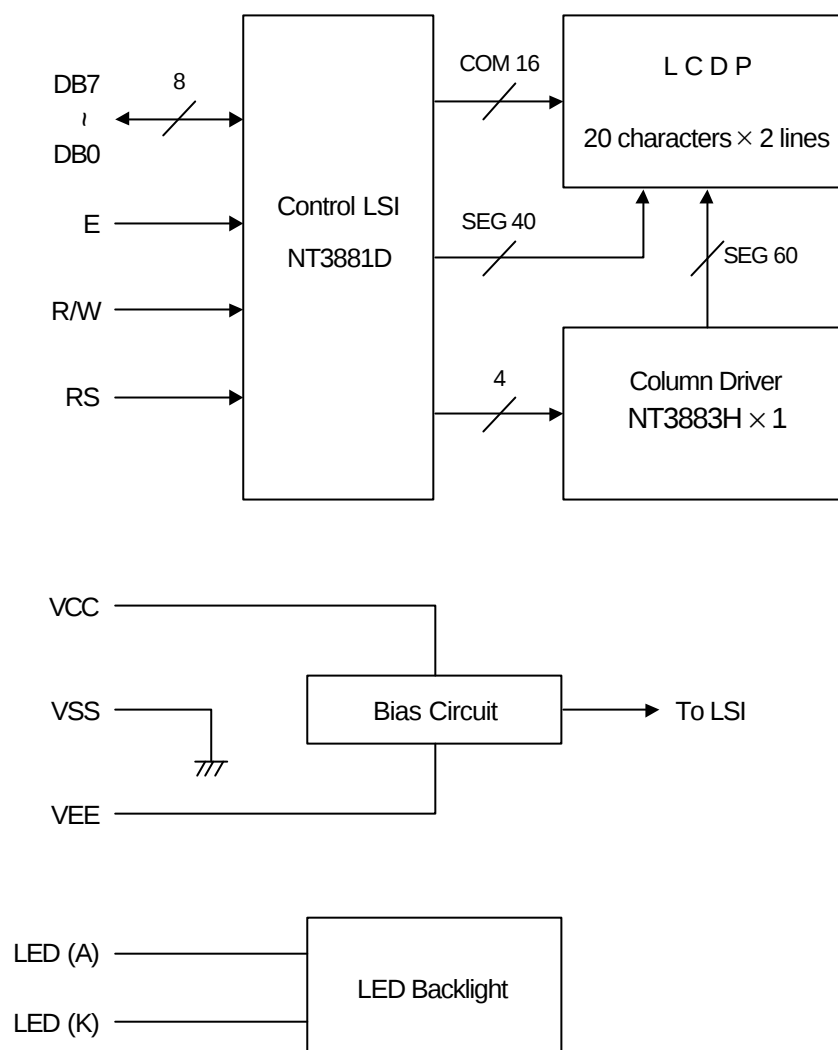
| No. | Symbol  | Function             |
|-----|---------|----------------------|
| 1   | LED (A) | LED Anode Terminal   |
| 2   | LED (K) | LED Cathode Terminal |

### 4.2.Example of Power Supply

It is recommended to apply a potentiometer for the contrast adjust due to the tolerance of the driving voltage and its temperature dependence.



### 4.3. Block Diagram



## 5.Test

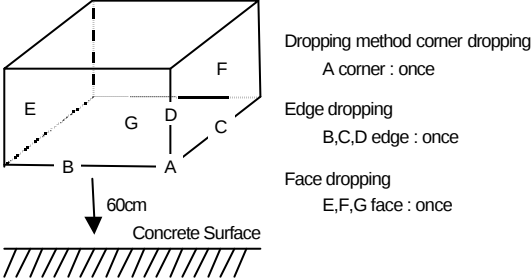
No change on display and in operation under the following test condition.

Conditions: Unless otherwise specified, tests will be conducted under the following condition.

Temperature:  $20 \pm 5^{\circ}\text{C}$

Humidity :  $65 \pm 5\% \text{RH}$

tests will be not conducted under functioning state.

| No. | Parameter                  | Conditions                                                                                                                                                                     | Notes |
|-----|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1   | High Temperature Operating | $70^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 96hrs (operation state)                                                                                                           |       |
| 2   | Low Temperature Operating  | $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 96hrs (operation state)                                                                                                          | 1     |
| 3   | High Temperature Storage   | $70^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 96hrs                                                                                                                             | 2     |
| 4   | Low Temperature Storage    | $-20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 96hrs                                                                                                                            | 1,2   |
| 5   | Damp Proof Test            | $40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , 90~95%RH, 96hrs                                                                                                                   | 1,2   |
| 6   | Vibration Test             | Total fixed amplitude : 1.5mm<br>Vibration Frequency : 10~55Hz<br>One cycle 60 seconds to 3 directions of X, Y, Z for each 15 minutes                                          | 3     |
| 7   | Shock Test                 | To be measured after dropping from 60cm high on the concrete surface in packing state.<br> |       |

Note 1 :No dew condensation to be observed.

Note 2 :The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after removed from the test chamber.

Note 3 :Vibration test will be conducted to the product itself without putting it in a container.

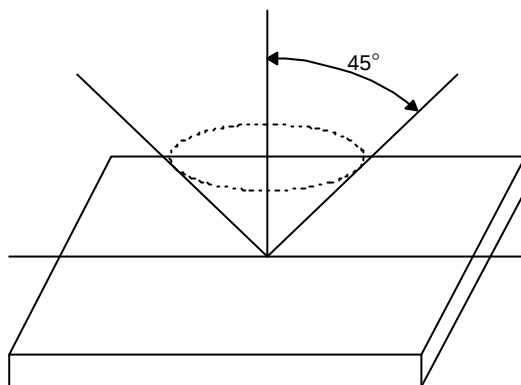
## 6.Appearance Standards

### 6.1.Inspection conditions

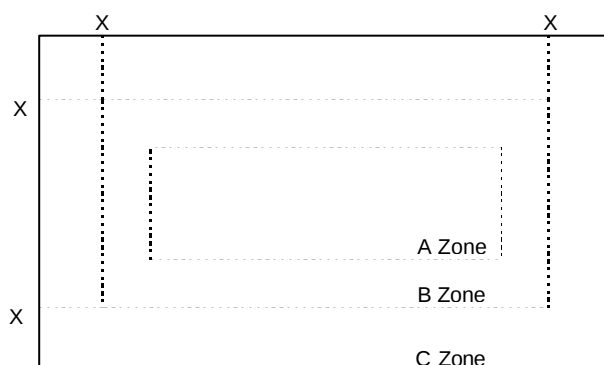
The LCD shall be inspected under 40W white fluorescent light.

The distance between the eyes and the sample shall be more than 30cm.

All directions for inspecting the sample should be within 45°against perpendicular line.



### 6.2.Definition of applicable Zones



X : Maximum Seal Line

A Zone : Active display area

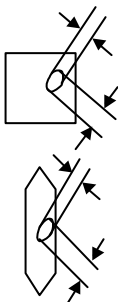
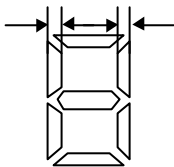
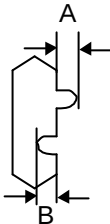
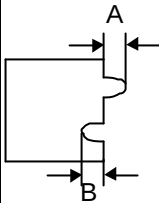
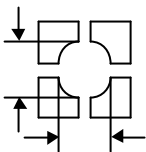
B Zone : Out of active display area ~ Maximum seal line

C Zone : Rest parts

A Zone + B Zone = Validity viewing area

## 6.3.Standards(E rank, LED)

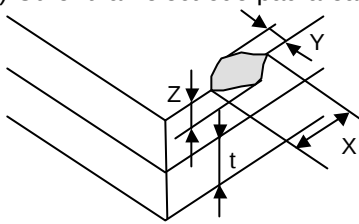
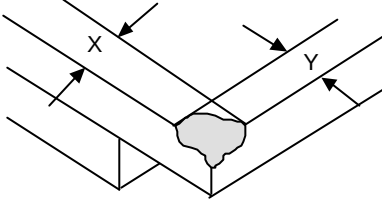
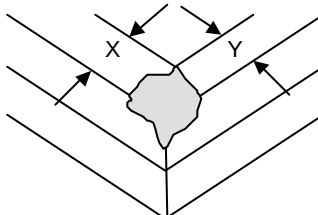
 $D = ( \text{Long} + \text{Short} ) / 2$  \* : Disregard Units : mm

| No.                                                                                                                                                                                                                                                                                                                                                                                   | Parameter                                                                                                | Criteria                                                                                                                                                                                                                                      |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------|----------------------|---------------------------------------------------------|
| 1                                                                                                                                                                                                                                                                                                                                                                                     | The Shape of Dot                                                                                         | (1) Pin Hole                                                                                                                                                                                                                                  |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                          |                                                                                                                                                              |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                          | <table><tr><th>Dimension</th><th>Acceptable Number</th></tr><tr><td><math>D \leq 0.10</math></td><td>*</td></tr><tr><td><math>0.10 &lt; D \leq 0.15</math></td><td>1 pc / dot(only segment)or less<br/>2 pcs / cell or less</td></tr></table> | Dimension                                               | Acceptable Number                          | $D \leq 0.10$        | *                                                                                                        | $0.10 < D \leq 0.15$ | 1 pc / dot(only segment)or less<br>2 pcs / cell or less |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                          | Dimension                                                                                                                                                                                                                                     | Acceptable Number                                       |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                          | $D \leq 0.10$                                                                                                                                                                                                                                 | *                                                       |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                          | $0.10 < D \leq 0.15$                                                                                                                                                                                                                          | 1 pc / dot(only segment)or less<br>2 pcs / cell or less |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                          | (2) Pattern Shift                                                                                                                                                                                                                             |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                          |                                                                                                                                                              |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                          | $ A - B  \leq 0.15$                                                                                                                                                                                                                           |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                          | (3) Breakage or Chips / Deformation                                                                                                                                                                                                           |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| 1.Segment Type                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                          |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                    |                                                                                                          |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| <table><tr><th>Dimension</th><th>Acceptable Number</th></tr><tr><td><math>A \leq 0.10</math></td><td>*</td></tr><tr><td><math>B \leq 0.10</math></td><td>*</td></tr></table>                                                                                                                                                                                                          | Dimension                                                                                                | Acceptable Number                                                                                                                                                                                                                             | $A \leq 0.10$                                           | *                                          | $B \leq 0.10$        | *                                                                                                        |                      |                                                         |
| Dimension                                                                                                                                                                                                                                                                                                                                                                             | Acceptable Number                                                                                        |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| $A \leq 0.10$                                                                                                                                                                                                                                                                                                                                                                         | *                                                                                                        |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| $B \leq 0.10$                                                                                                                                                                                                                                                                                                                                                                         | *                                                                                                        |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| 2.Dot Type                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                          |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                    |                                                                                                          |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| <table><tr><th>Dimension</th><th>Acceptable Number</th></tr><tr><td><math>A \leq 0.10</math></td><td>*<br/>(Should not be connected to next dot)</td></tr><tr><td><math>0.10 &lt; A \leq 0.15</math></td><td>1 pc / dot(only segment)or less<br/>2 pcs / cell or less<br/>(Should not be connected to next dot)</td></tr><tr><td><math>B \leq 0.10</math></td><td>*</td></tr></table> | Dimension                                                                                                | Acceptable Number                                                                                                                                                                                                                             | $A \leq 0.10$                                           | *<br>(Should not be connected to next dot) | $0.10 < A \leq 0.15$ | 1 pc / dot(only segment)or less<br>2 pcs / cell or less<br>(Should not be connected to next dot)         | $B \leq 0.10$        | *                                                       |
| Dimension                                                                                                                                                                                                                                                                                                                                                                             | Acceptable Number                                                                                        |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| $A \leq 0.10$                                                                                                                                                                                                                                                                                                                                                                         | *<br>(Should not be connected to next dot)                                                               |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| $0.10 < A \leq 0.15$                                                                                                                                                                                                                                                                                                                                                                  | 1 pc / dot(only segment)or less<br>2 pcs / cell or less<br>(Should not be connected to next dot)         |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| $B \leq 0.10$                                                                                                                                                                                                                                                                                                                                                                         | *                                                                                                        |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| 3.Defective type extends over multiple numbers of dots                                                                                                                                                                                                                                                                                                                                |                                                                                                          |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
|                                                                                                                                                                                                                                                                                                    |                                                                                                          |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| <table><tr><th>Dimension</th><th>Acceptable Number</th></tr><tr><td><math>D \leq 0.10</math></td><td>*</td></tr><tr><td><math>0.10 &lt; D \leq 0.15</math></td><td>1 pc / dot(only segment)or less<br/>2 pcs / cell or less<br/>(Individual dot must secure 1/2 area or more)</td></tr></table>                                                                                       | Dimension                                                                                                | Acceptable Number                                                                                                                                                                                                                             | $D \leq 0.10$                                           | *                                          | $0.10 < D \leq 0.15$ | 1 pc / dot(only segment)or less<br>2 pcs / cell or less<br>(Individual dot must secure 1/2 area or more) |                      |                                                         |
| Dimension                                                                                                                                                                                                                                                                                                                                                                             | Acceptable Number                                                                                        |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| $D \leq 0.10$                                                                                                                                                                                                                                                                                                                                                                         | *                                                                                                        |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |
| $0.10 < D \leq 0.15$                                                                                                                                                                                                                                                                                                                                                                  | 1 pc / dot(only segment)or less<br>2 pcs / cell or less<br>(Individual dot must secure 1/2 area or more) |                                                                                                                                                                                                                                               |                                                         |                                            |                      |                                                                                                          |                      |                                                         |

$$D = ( \text{Long} + \text{Short} ) / 2 \quad * : \text{Disregard} \quad \text{Units : mm}$$

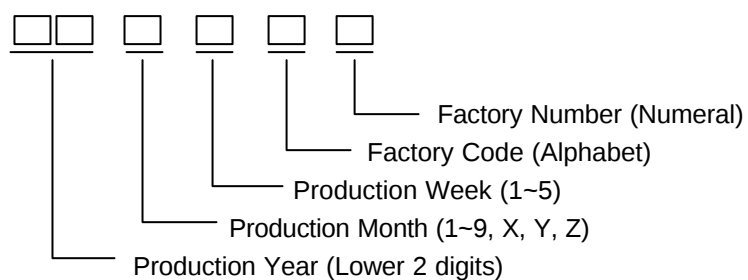
| No.                  | Parameter                                            | Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                   |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
|----------------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|--|--|---|---|---|---------------|---|---|---|----------------------|---|---|---|----------------------|---|---|---|----------------------|---|-------------------|---|--|---|---|---|--------------|---------------|---|---|---|--------------|----------------------|---|---|---|---|------------|---------------------|--|---|
| 2                    | Black and White Spots, Foreign Substances            | <div>(1) Round Shape</div> <table><tr><th rowspan="2">Zone<br/>Dimension</th><th colspan="3">Acceptable Number</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td><math>D \leq 0.10</math></td><td>*</td><td>*</td><td>*</td></tr><tr><td><math>0.10 &lt; D \leq 0.20</math></td><td>6</td><td>6</td><td>*</td></tr><tr><td><math>0.20 &lt; D \leq 0.30</math></td><td>2</td><td>2</td><td>*</td></tr></table> <div>Individual dot must secure 1/2 area or more.</div> <div>(2) Line Shape</div> <table><tr><th colspan="2" rowspan="2">Zone<br/>Length Width</th><th colspan="3">Acceptable Number</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td><math>L \leq 2.0</math></td><td><math>W \leq 0.03</math></td><td>*</td><td>*</td><td>*</td></tr><tr><td><math>L \leq 2.0</math></td><td><math>0.03 &lt; W \leq 0.05</math></td><td>4</td><td>4</td><td>*</td></tr><tr><td>*</td><td><math>0.05 &lt; W</math></td><td colspan="2">In the same way (1)</td><td>*</td></tr></table> <div>No more than 7pcs as total.<br/>(Refer to “Complex Foreign Substance Defects”)</div> | Zone<br>Dimension | Acceptable Number |  |  | A | B | C | $D \leq 0.10$ | * | * | * | $0.10 < D \leq 0.20$ | 6 | 6 | * | $0.20 < D \leq 0.30$ | 2 | 2 | * | Zone<br>Length Width |   | Acceptable Number |   |  | A | B | C | $L \leq 2.0$ | $W \leq 0.03$ | * | * | * | $L \leq 2.0$ | $0.03 < W \leq 0.05$ | 4 | 4 | * | * | $0.05 < W$ | In the same way (1) |  | * |
| Zone<br>Dimension    | Acceptable Number                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
|                      | A                                                    | B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | C                 |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| $D \leq 0.10$        | *                                                    | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | *                 |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| $0.10 < D \leq 0.20$ | 6                                                    | 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | *                 |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| $0.20 < D \leq 0.30$ | 2                                                    | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | *                 |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| Zone<br>Length Width |                                                      | Acceptable Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
|                      |                                                      | A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | B                 | C                 |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| $L \leq 2.0$         | $W \leq 0.03$                                        | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | *                 | *                 |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| $L \leq 2.0$         | $0.03 < W \leq 0.05$                                 | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 4                 | *                 |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| *                    | $0.05 < W$                                           | In the same way (1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   | *                 |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| 3                    | Color Variation                                      | Not to be conspicuous defects.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| 4                    | Air Bubbles (between glass & polarizer)              | <table><tr><th rowspan="2">Zone<br/>Dimension</th><th colspan="3">Acceptable Number</th></tr><tr><th>A</th><th>B</th><th>C</th></tr><tr><td><math>D \leq 0.15</math></td><td>*</td><td>*</td><td>*</td></tr><tr><td><math>0.15 &lt; D \leq 0.30</math></td><td>2</td><td>3</td><td>*</td></tr><tr><td><math>0.30 &lt; D \leq 0.50</math></td><td>1</td><td>2</td><td>*</td></tr><tr><td><math>0.50 &lt; D \leq 1.00</math></td><td>0</td><td>1</td><td>*</td></tr></table> <div>No more than 3pcs as total.<br/>(Refer to “Complex Foreign Substance Defects”)</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Zone<br>Dimension | Acceptable Number |  |  | A | B | C | $D \leq 0.15$ | * | * | * | $0.15 < D \leq 0.30$ | 2 | 3 | * | $0.30 < D \leq 0.50$ | 1 | 2 | * | $0.50 < D \leq 1.00$ | 0 | 1                 | * |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| Zone<br>Dimension    | Acceptable Number                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
|                      | A                                                    | B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | C                 |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| $D \leq 0.15$        | *                                                    | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | *                 |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| $0.15 < D \leq 0.30$ | 2                                                    | 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | *                 |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| $0.30 < D \leq 0.50$ | 1                                                    | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | *                 |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| $0.50 < D \leq 1.00$ | 0                                                    | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | *                 |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| 5                    | Polarizer Scratches                                  | Not to be conspicuous defects.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| 6                    | Polarizer Dirts                                      | If the stains are removed easily from LCDP surface, the module is not defective.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| 7                    | Complex Foreign Substance Defects                    | Black spots, line shaped foreign substances or air bubbles between glass & polarizer should be 7pcs maximum in total.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |
| 8                    | Distance between Different Foreign Substance Defects | 20mm or more                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |                   |  |  |   |   |   |               |   |   |   |                      |   |   |   |                      |   |   |   |                      |   |                   |   |  |   |   |   |              |               |   |   |   |              |                      |   |   |   |   |            |                     |  |   |

$$D = ( \text{Long} + \text{Short} ) / 2 \quad * : \text{Disregard} \quad \text{Units : mm}$$

| No.                     | Parameter                  | Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                         |      |       |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
|-------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------|-------|-------------------------|--|--|---|---|---|---|---|---|---|------|---|---|------|---|------|------|----|------|------|----|------|------|-------|------|------|-------|------|------|-------|------|------|-------|-------------------------|----------------------------|-----|-----|------|------|-------------------------|----------------------------|-----|-----|------|------|
| 9                       | Chipped Glass              | <div><div>(1) Other than electrode pad areas and corner areas</div><div></div><div><table><tr><th colspan="3">"A" size:0.82or more</th><th colspan="3">"A" size:Less than 0.82</th></tr><tr><th>X</th><th>Y</th><th>Z</th><th>X</th><th>Y</th><th>Z</th></tr><tr><td>*</td><td>≤0.4</td><td>*</td><td>*</td><td>≤0.3</td><td>*</td></tr><tr><td>≤2.5</td><td>≤0.7</td><td>=t</td><td>≤2.0</td><td>≤0.5</td><td>=t</td></tr><tr><td>≤3.5</td><td>≤1.0</td><td>≤1/2t</td><td>≤3.0</td><td>≤0.5</td><td>≤1/2t</td></tr><tr><td>≤5.5</td><td>≤1.5</td><td>≤1/3t</td><td>≤4.5</td><td>≤1.2</td><td>≤1/3t</td></tr></table></div></div> <div><div>(2) Corner Areas</div><div><div>1.Lead Areas</div><div></div><div><table><tr><th>"A" size<br/>0.82or more</th><th>"A" size<br/>Less than 0.82</th></tr><tr><td>X+Y</td><td>X+Y</td></tr><tr><td>≤4.0</td><td>≤3.0</td></tr></table></div></div><div><div>2.Other than electrode pad Areas</div><div></div><div><table><tr><th>"A" size<br/>0.82or more</th><th>"A" size<br/>Less than 0.82</th></tr><tr><td>X+Y</td><td>X+Y</td></tr><tr><td>≤3.0</td><td>≤2.0</td></tr></table></div></div><div><p>The total number of chipped glass defects shall be up to 5 spots.</p><p>The chipped glass shall be judged only from the size of the defect.</p><p>If the chipped area touches the seal line, the LCD is not acceptable.</p></div></div> | "A" size:0.82or more    |      |       | "A" size:Less than 0.82 |  |  | X | Y | Z | X | Y | Z | * | ≤0.4 | * | * | ≤0.3 | * | ≤2.5 | ≤0.7 | =t | ≤2.0 | ≤0.5 | =t | ≤3.5 | ≤1.0 | ≤1/2t | ≤3.0 | ≤0.5 | ≤1/2t | ≤5.5 | ≤1.5 | ≤1/3t | ≤4.5 | ≤1.2 | ≤1/3t | "A" size<br>0.82or more | "A" size<br>Less than 0.82 | X+Y | X+Y | ≤4.0 | ≤3.0 | "A" size<br>0.82or more | "A" size<br>Less than 0.82 | X+Y | X+Y | ≤3.0 | ≤2.0 |
| "A" size:0.82or more    |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | "A" size:Less than 0.82 |      |       |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| X                       | Y                          | Z                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | X                       | Y    | Z     |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| *                       | ≤0.4                       | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | *                       | ≤0.3 | *     |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| ≤2.5                    | ≤0.7                       | =t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | ≤2.0                    | ≤0.5 | =t    |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| ≤3.5                    | ≤1.0                       | ≤1/2t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ≤3.0                    | ≤0.5 | ≤1/2t |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| ≤5.5                    | ≤1.5                       | ≤1/3t                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ≤4.5                    | ≤1.2 | ≤1/3t |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| "A" size<br>0.82or more | "A" size<br>Less than 0.82 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |      |       |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| X+Y                     | X+Y                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |      |       |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| ≤4.0                    | ≤3.0                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |      |       |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| "A" size<br>0.82or more | "A" size<br>Less than 0.82 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |      |       |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| X+Y                     | X+Y                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |      |       |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |
| ≤3.0                    | ≤2.0                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                         |      |       |                         |  |  |   |   |   |   |   |   |   |      |   |   |      |   |      |      |    |      |      |    |      |      |       |      |      |       |      |      |       |      |      |       |                         |                            |     |     |      |      |                         |                            |     |     |      |      |

## 7.Code System of Production Lot

The production lot of module is specified as follows.



## 8.Type Number

The type number of module is specified as follows.

C-51505NFQJ-LB-AE

## 9.Applying Precautions

Please contact us when questions and/or new problems not specified in this specifications arise.

## 10. Precautions Relating Product Handling

The Following precautions will guide you in handling our product correctly.

- 1) Liquid crystal display devices
  1. The liquid crystal display device panel used in the liquid crystal display module is made of plate glass. Avoid any strong mechanical shock. Should the glass break handle it with care.
  2. The polarizer adhering to the surface of the LCD is made of a soft material. Guard against scratching it.
- 2) Care of the liquid crystal display module against static electricity discharge.
  1. When working with the module, be sure to ground your body and any electrical equipment you may be using. We strongly recommend the use of anti static mats ( made of rubber ), to protect work tables against the hazards of electrical shock.
  2. Avoid the use of work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
  3. Slowly and carefully remove the protective film from the LCD module, since this operation can generate static electricity.
- 3) When the LCD module alone must be stored for long periods of time:
  1. Protect the modules from high temperature and humidity.
  2. Keep the modules out of direct sunlight or direct exposure to ultraviolet rays.
  3. Protect the modules from excessive external forces.
- 4) Use the module with a power supply that is equipped with an overcurrent protector circuit, since the module is not provided with this protective feature.
- 5) Do not ingest the LCD fluid itself should it leak out of a damaged LCD module. Should hands or clothing come in contact with LCD fluid, wash immediately with soap.
- 6) Conductivity is not guaranteed for models that use metal holders where solder connections between the metal holder and the PCB are not used. Please contact us to discuss appropriate ways to assure conductivity.
- 7) For models which use CFL:
  1. High voltage of 1000V or greater is applied to the CFL cable connector area. Care should be taken not to touch connection areas to avoid burns.
  2. Protect CFL cables from rubbing against the unit and thus causing the wire jacket to become worn.
  3. The use of CFLs for extended periods of time at low temperatures will significantly shorten their service life.
- 8) For models which use touch panels:
  1. Do not stack up modules since they can be damaged by components on neighboring modules.
  2. Do not place heavy objects on top of the product. This could cause glass breakage.
- 9) For models which use COG, TAB, or COF:
  1. The mechanical strength of the product is low since the IC chip faces out unprotected from the rear. Be sure to protect the rear of the IC chip from external forces.
  2. Given the fact that the rear of the IC chip is left exposed, in order to protect the unit from electrical damage, avoid installation configurations in which the rear of the IC chip runs the risk of making any electrical contact.

10) Models which use flexible cable, heat seal, or TAB:

1. In order to maintain reliability, do not touch or hold by the connector area.
2. Avoid any bending, pulling, or other excessive force, which can result in broken connections.

11) In case of buffer material such as cushion / gasket is assembled into LCD module, it may have an adverse effect on connecting parts ( LCD panel-TCP / HEAT SEAL / FPC / etc., PCB-TCP / HEAT SEAL / FPC etc., TCP-HEAT SEAL, TCP-FPC, HEAT SEAL-FPC, etc.,) depending on its materials.  
Please check and evaluate these materials carefully before use.

12) In case of acrylic plate is attached to front side of LCD panel, cloudiness ( very small cracks ) can occur on acrylic plate, being influenced by some components generated from polarizer film.. Please check and evaluate those acrylic materials carefully before use.

## 11. Warranty

This product has been manufactured to your company's specifications as a part for use in your company's general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in medical devices, nuclear power control equipment, aerospace equipment, fire and security systems, or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required. If the product is to be used in any of the above applications, we will need to enter into a separate product liability agreement.

1. We cannot accept responsibility for any defect, which may arise from additional manufacturing of the product (including disassembly and reassembly), after product delivery.
2. We cannot accept responsibility for any defect, which may arise after the application of strong external force to the product.
3. We cannot accept responsibility for any defect, which may arise due to the application of static electricity after the product has passed your company's acceptance inspection procedures.
4. When the product is in CFL models, CFL service life and brightness will vary according to the performance of the inverter used, leaks, etc. We cannot accept responsibility for product performance, reliability, or defect, which may arise.
5. We cannot accept responsibility for intellectual property of a third party, which may arise through the application of our product to your assembly with exception to those issues relating directly to the structure or method of manufacturing of our product.
6. Optrex will not be held responsible for any quality guarantee issue for defect products judged as Optrex-origin longer than 2 (two) years from Optrex production or 1(one) year from Optrex, Optrex America, Optrex Europe delivery whichever ever comes later.