

HITACHI

FOR MESSRS : _____

DATE: May.13,2008

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

SP14N01L6VLCA

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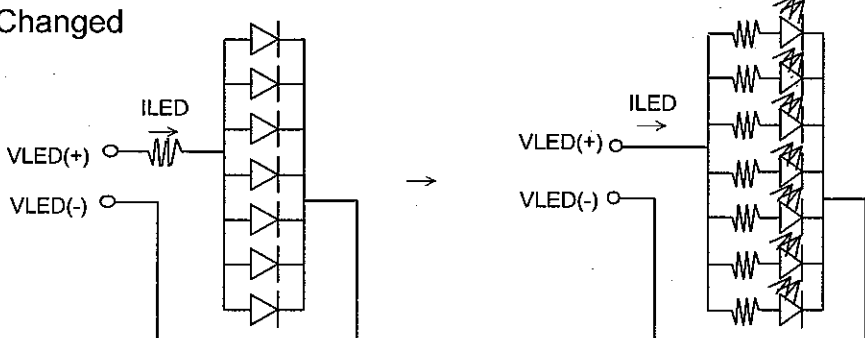
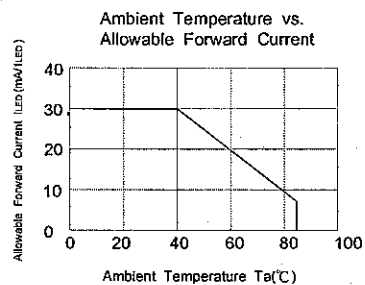
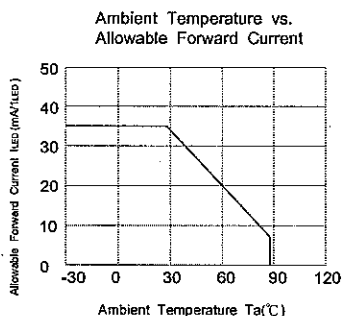
* When products will be discontinued , customers will be informed by HITACHI with twelve months prior announcement.

ACCEPTED BY: _____

PROPOSED BY: *Dan Cheng*

| | | | | |
|---|------------|------------------------------|------|-------|
| KAHHSIUNG HITACHI ELECTRONICS CO.,LTD. | Sh. No. | 7B64PS 2701- SP14N01L6VLCA-4 | PAGE | 1-1/1 |
|---|------------|------------------------------|------|-------|

RECORD OF REVISION

| DATE | SHEET No. | SUMMARY | | | | | | | | | | | | | | | | |
|------------------------------|--|--|-------------|------|------|------------------------------|------------|-----|------|------------|------|------------------------------|------|------|------------|-----|-----|-------------|
| Jun.17,'05 | 7B64PS 2705 – SP14N01L6VLCA-2 PAGE 5 – 1/1 | 5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT Changed  | | | | | | | | | | | | | | | | |
| May.28,'07 | 7B64PS 2704- SP14N01L6VLCA-3 Page 4-1/1 | 4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS Added Operating Life : (40,000h) | | | | | | | | | | | | | | | | |
| | 7B64PS 2705- SP14N01L6VLCA-3 Page 5-1/1 | 5.2 ELECTRICAL CHARACTERISTICS OF LED BACKLIGHT Revised <table border="1" data-bbox="740 896 1485 994"><thead><tr><th>ITEM</th><th>TYP.</th><th>MAX.</th></tr></thead><tbody><tr><td>Power Supply Current for LED</td><td>130</td><td>140</td></tr></tbody></table> <p style="text-align: center;">↓</p> <table border="1" data-bbox="740 1043 1485 1142"><thead><tr><th>ITEM</th><th>TYP.</th><th>MAX.</th></tr></thead><tbody><tr><td>Power Supply Current for LED</td><td>80</td><td>90</td></tr></tbody></table> <div style="display: flex; justify-content: space-around; align-items: flex-end;"><div style="text-align: center;"><p>Ambient Temperature vs. Allowable Forward Current</p></div><div style="text-align: center;">→</div><div style="text-align: center;"><p>Ambient Temperature vs. Allowable Forward Current</p></div></div> | ITEM | TYP. | MAX. | Power Supply Current for LED | 130 | 140 | ITEM | TYP. | MAX. | Power Supply Current for LED | 80 | 90 | | | | |
| ITEM | TYP. | MAX. | | | | | | | | | | | | | | | | |
| Power Supply Current for LED | 130 | 140 | | | | | | | | | | | | | | | | |
| ITEM | TYP. | MAX. | | | | | | | | | | | | | | | | |
| Power Supply Current for LED | 80 | 90 | | | | | | | | | | | | | | | | |
| | 7B64PS 2706- SP14N01L6VLCA-3 Page 6-3/3 | 6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT Revised : <table border="1" data-bbox="647 1673 1362 1771"><thead><tr><th>ITEM</th><th>MIN.</th><th>TYP.</th><th>NOTE</th></tr></thead><tbody><tr><td>Brightness</td><td>90</td><td>115</td><td>ILED=130mA</td></tr></tbody></table> <p style="text-align: center;">↓</p> <table border="1" data-bbox="647 1825 1362 1924"><thead><tr><th>ITEM</th><th>MIN.</th><th>TYP.</th><th>NOTE</th></tr></thead><tbody><tr><td>Brightness</td><td>140</td><td>170</td><td>ILED=(80)mA</td></tr></tbody></table> | ITEM | MIN. | TYP. | NOTE | Brightness | 90 | 115 | ILED=130mA | ITEM | MIN. | TYP. | NOTE | Brightness | 140 | 170 | ILED=(80)mA |
| ITEM | MIN. | TYP. | NOTE | | | | | | | | | | | | | | | |
| Brightness | 90 | 115 | ILED=130mA | | | | | | | | | | | | | | | |
| ITEM | MIN. | TYP. | NOTE | | | | | | | | | | | | | | | |
| Brightness | 140 | 170 | ILED=(80)mA | | | | | | | | | | | | | | | |

RECORD OF REVISION

| DATE | SHEET No. | SUMMARY | | | | | | | | | | | | |
|-----------------|--|--|----------------|----------------|-----------------|----------|--|----------------------|-----------------|--|-------|-----|-----------|----------------------|
| May.28,'07 | 7B64PS 2709- SP14N01L6VLCA-3 Page 9-3/3 | 9.3 Internal Pin Connection Changed : CFL I / F : Mitsumi M63M83 – 04 → JAE IL-G-4S-S3C2-SA | | | | | | | | | | | | |
| | 7B64PS 2712- SP14N01L6VLCA-3 Page 12-1/1 | 12. DESIGNATION OF LOT MARK Added <table><tr><th>REV No.</th><th>ITEM</th><th>LOT No.</th></tr><tr><td>-</td><td>CFL I/F Connector : Mitsumi M63M83 - 04</td><td>-</td></tr><tr><td>A</td><td>1.CFL I/F Connector : JAE IL-G-4S-S3C2-SA 2.Operating Life (40,000h)</td><td>7102T</td></tr></table> | REV No. | ITEM | LOT No. | - | CFL I/F Connector : Mitsumi M63M83 - 04 | - | A | 1.CFL I/F Connector : JAE IL-G-4S-S3C2-SA 2.Operating Life (40,000h) | 7102T | | | |
| REV No. | ITEM | LOT No. | | | | | | | | | | | | |
| - | CFL I/F Connector : Mitsumi M63M83 - 04 | - | | | | | | | | | | | | |
| A | 1.CFL I/F Connector : JAE IL-G-4S-S3C2-SA 2.Operating Life (40,000h) | 7102T | | | | | | | | | | | | |
| May.13,'08 | 7B64PS 2714- SP14N01L6VLCA-4 Page 14-1/3 | 14.1.2 OPERATING CONDITIONS Changed : <table><tr><th>ITEM</th><th>SPECIFICATIONS</th></tr><tr><td>Actuation Force</td><td>(10~50g)</td></tr></table> <p style="text-align: center;">↓</p> <table><tr><th>ITEM</th><th>SPECIFICATIONS</th></tr><tr><td>Actuation Force</td><td>1.2N max.</td></tr></table> | ITEM | SPECIFICATIONS | Actuation Force | (10~50g) | ITEM | SPECIFICATIONS | Actuation Force | 1.2N max. | | | | |
| | | ITEM | SPECIFICATIONS | | | | | | | | | | | |
| Actuation Force | (10~50g) | | | | | | | | | | | | | |
| ITEM | SPECIFICATIONS | | | | | | | | | | | | | |
| Actuation Force | 1.2N max. | | | | | | | | | | | | | |
| | | 14.2.1 INPUT METHOD & ACTUATION FORCE Changed : <table><tr><th>ITEM</th><th>SPECIFICATION</th><th>NOTE</th></tr><tr><td>PEN</td><td>(10~50g)</td><td>R0.8, Polyacetal pen</td></tr></table> <p style="text-align: center;">↓</p> <table><tr><th>ITEM</th><th>SPECIFICATION</th><th>NOTE</th></tr><tr><td>PEN</td><td>1.2N max.</td><td>R0.8, Polyacetal pen</td></tr></table> | ITEM | SPECIFICATION | NOTE | PEN | (10~50g) | R0.8, Polyacetal pen | ITEM | SPECIFICATION | NOTE | PEN | 1.2N max. | R0.8, Polyacetal pen |
| ITEM | SPECIFICATION | NOTE | | | | | | | | | | | | |
| PEN | (10~50g) | R0.8, Polyacetal pen | | | | | | | | | | | | |
| ITEM | SPECIFICATION | NOTE | | | | | | | | | | | | |
| PEN | 1.2N max. | R0.8, Polyacetal pen | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |

3. GENERAL SPECIFICATIONS

| | |
|-----------------------------|--|
| (1) Part Name | SP14N01L6VLCA |
| (2) Outer Dimensions | 159.4(W)mm x 101.0(H)mm x 12.8(D)mm (max.) |
| (3) Viewing Area | 123 mm min. x 68 mm min. |
| (4) Dot Size | 0.48(W)min. x 0.48(H)min. |
| (5) Dot Pitch | 0.50(W)mm x 0.50(H)mm |
| (6) Dot Number (Resolution) | 240 (W) x 128 (H) |
| (7) Duty Ratio | 1/128 |
| (8) LCD Type | Transmissive type F-STN With anti-glare type upper polarizer |
| (9) Viewing Direction | 6 O'clock |
| (10) Back Light Type | LED (Color : White). |
| (11) Touch Panel | Analog resistive Transparency : 76% min. Surface Type : Anti glare |
| (12) LCD Controller | T6963C / Toshiba |
| (13) DC/DC Circuit | BUILT-IN |

4. ABSOLUTE MAXIMUM RATINGS

4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

VSS=0V:STANDARD

| ITEM | SYMBOL | MIN. | MAX. | UNIT | COMMENT |
|------------------------|---------|------|---------|------|--------------|
| Power Supply For Logic | VDD-VSS | 0 | 7.0 | V | |
| Input Signal Voltage | V_i | -0.3 | VDD+0.3 | V | (Note 1) |
| Input Signal Current | I_i | 0 | 1 | A | |
| Static Electricity | VESD0 | - | ±100 | V | (Note 1,2,3) |
| | VESD1 | - | ±10 | kV | (Note 1,2,4) |

Note 1 : Make certain you are grounded when handling LCM.

Note 2 : Energy storage capacitance 200pF , discharge resistance 250Ω Ta=25℃ , 60%RH.

Note 3 : Contact discharge to I/F connector pins.

Note 4 : Contact discharge to front metal bezel.

4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

| ITEM | OPERATING | | STORAGE | | COMMENT |
|----------------------------|------------------------|---------------------------------|----------------|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| Ambient Temperature | -10℃ | 60℃ | -20℃ | 70℃ | (Note 2,3) |
| Humidity | (Note 1) | | (Note 1) | | without condensation |
| Vibration | - | 2.45m/s ² (0.25G) | - | 11.76m/s ² (1.2G) (Note 5) | (Note 4) 1h max. |
| Shock | - | 29.4m/s ² (3 G) | - | 490.0m/s ² (50 G) (Note 5) | XYZ directions |
| Corrosive Gas | Not Acceptable | | Not Acceptable | | |
| Operating Life (Note 7) | (40,000 h) (Note 6) | | - | | At 25℃ , I _{LED} =80mA max. |

Note 1 : Ta ≤ 40℃ : 85%RH max.

Ta > 40℃ : Absolute humidity must be lower than the humidity of 85%RH at 40℃

Note 2 : Ta at -20℃ < 48h, at 70℃ < 168h.

Note 3 : Background color changes slightly depending on ambient temperature.

This phenomenon is reversible.

Note 4 : 5Hz~100Hz (except resonance frequency)

Note 5 : This module should be operated normally after finishing the test.

Note 6 : When brightness reached 50% of initial brightness.

Note 7 : Life time is estimated data.

5. ELECTRICAL CHARACTERISTICS

5.1 ELECTRICAL CHARACTERISTICS

| I T E M | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---------|----------------------------|--------|--------|--------|------|
| Power Supply Voltage For Logic | VDD-VSS | - | 4.75 | 5.0 | 5.25 | V |
| Input Signal Voltage | Vi | H LEVEL | 0.8VDD | - | VDD | V |
| | | L LEVEL | 0 | - | 0.2VDD | V |
| Power Supply Current For Logic (Note 1) | IDD | VDD-VSS=5.0V | - | (40) | - | mA |
| Recommended LC Driving Voltage (Note 2,3) | VDD-V0 | Ta= 0°C , $\phi = 0^\circ$ | - | (16.9) | - | V |
| | | Ta=25°C , $\phi = 0^\circ$ | - | (15.8) | - | V |
| | | Ta=50°C , $\phi = 0^\circ$ | - | (15.2) | - | V |

Note 1 : Test pattern is all "Q", VDD-V0=(15.8)V , Ta=25°C

Note 2 : Recommended LC driving voltage may fluctuate about $\pm 1.0V$ by each module test pattern is all "Q".

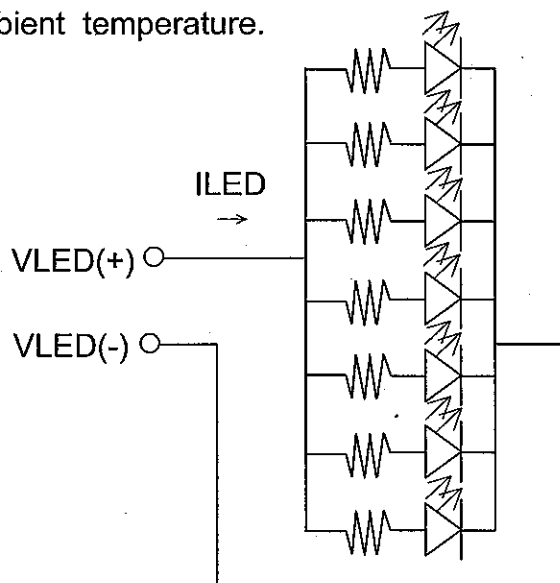
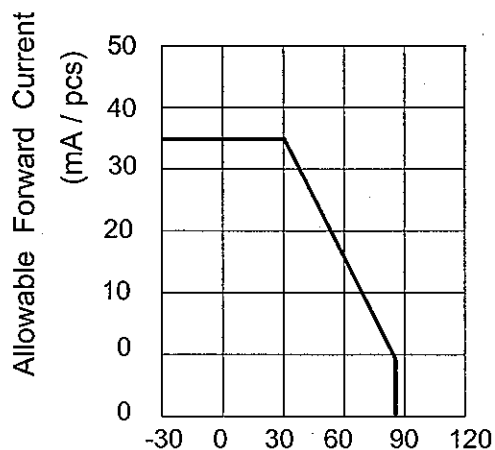
Note 3 : LC Driving voltage depend on the value of resistant between R_{VR1} and R_{VR2}.

5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

Ta=25°C

| I T E M | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------------|--------|-----------|------|------|------|------|
| Power Supply Voltage for LED | VLED | - | 4.8 | 5.0 | 5.2 | V |
| Power Supply Current for LED | ILED | VLED=5.0V | - | 80 | 90 | mA |

Note 1 : The ILED changes depending on ambient temperature.



6. OPTICAL CHARACTERISTICS

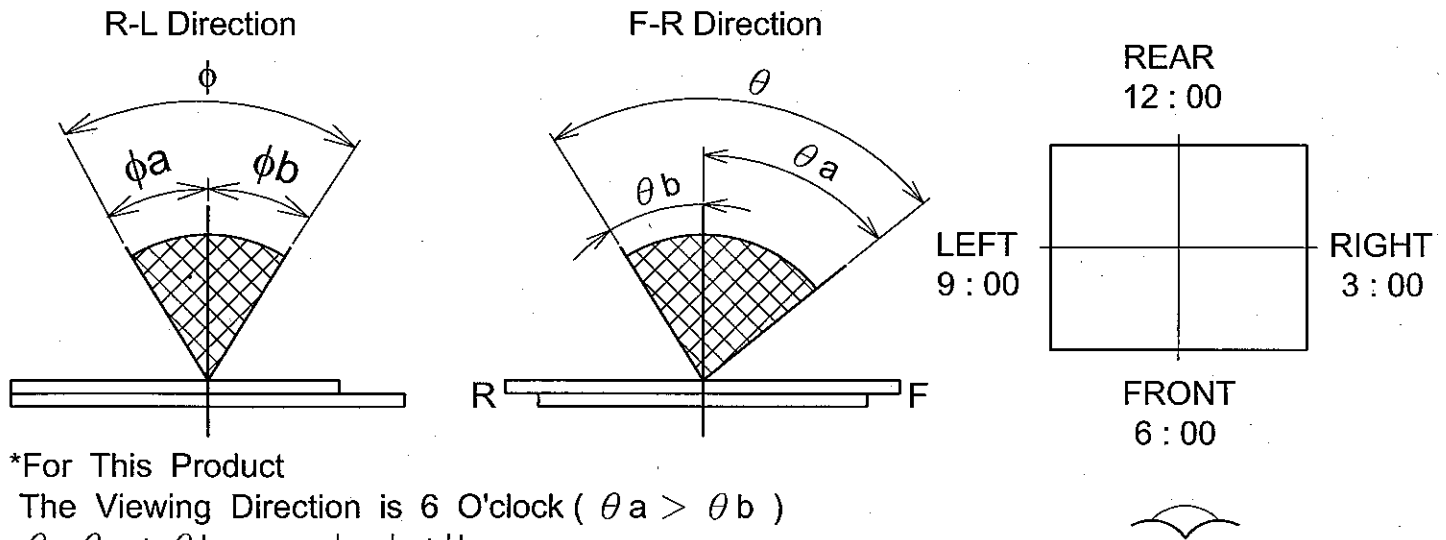
6.1 OPTICAL CHARACTERISTICS OF LCD

Ta=25°C (Backlight On)

| ITEM | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE |
|----------------------|----------|--------------------------------|------|-------|------|------|------|
| Viewing Area | θ | $K \geq 2.0$ | - | 90 | - | deg | 1 |
| | ϕ | | | 80 | | | |
| Contrast Ratio | K | $\phi=0^\circ, \theta=0^\circ$ | - | 20 | - | - | 2 |
| Response Time (Rise) | tr | $\phi=0^\circ, \theta=0^\circ$ | - | (330) | - | ms | 3 |
| Response Time (Fall) | tf | $\phi=0^\circ, \theta=0^\circ$ | - | (150) | - | ms | 3 |

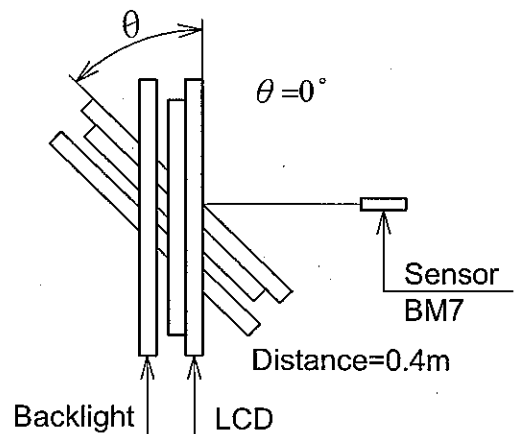
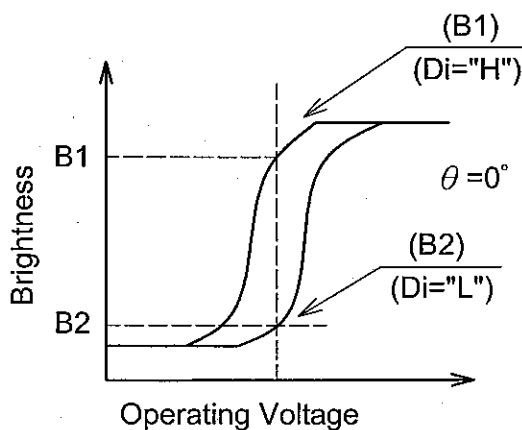
(Measure condition by HITACHI)

Note1. Definition of Viewing Angle

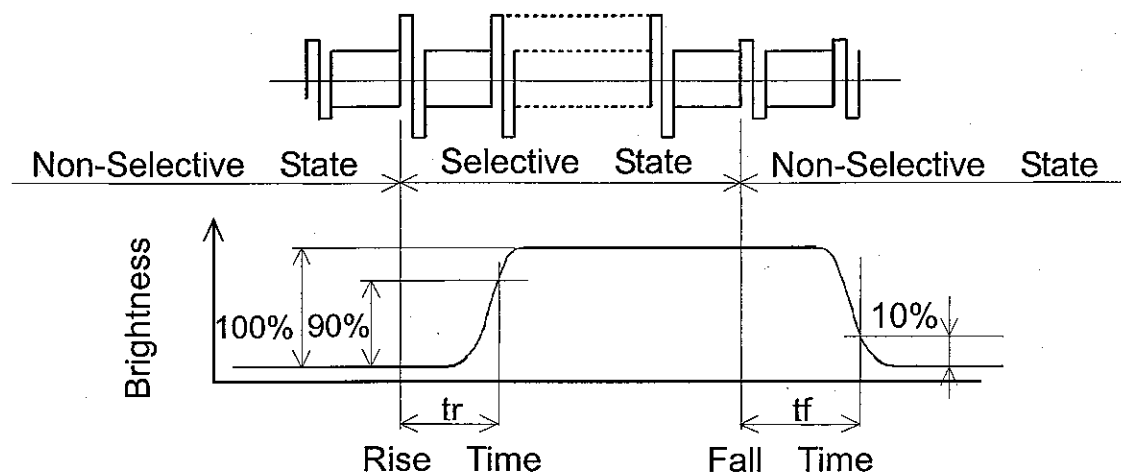


Note2. Definition of contrast "K"

$$K = \frac{\text{Brightness on selected dot (B1)}}{\text{Brightness on non-selected dot (B2)}}$$



Note 3 : Definition of optical response



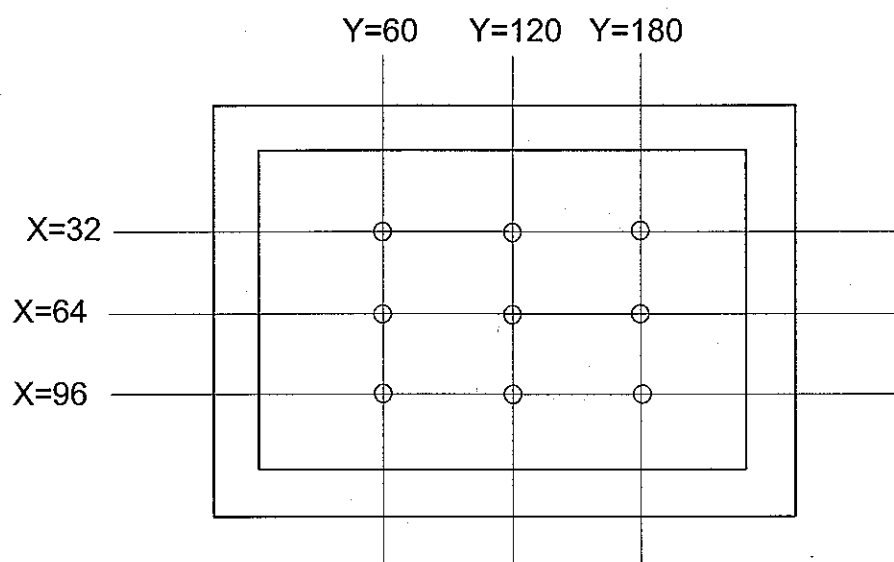
6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT

| I T E M | MIN. | TYP. | MAX. | UNIT | NOTE |
|-----------------------|------|------|------|-------------------|--------------------------|
| Brightness | 140 | 170 | - | cd/m ² | I _{LED} =(80)mA |
| Brightness Uniformity | - | - | ±35 | % | (Note 1,) |

T_a=25°C, Display data should be all "ON".

The LCD driving voltage should be adjusted at the voltage where the peak contrast is obtained.

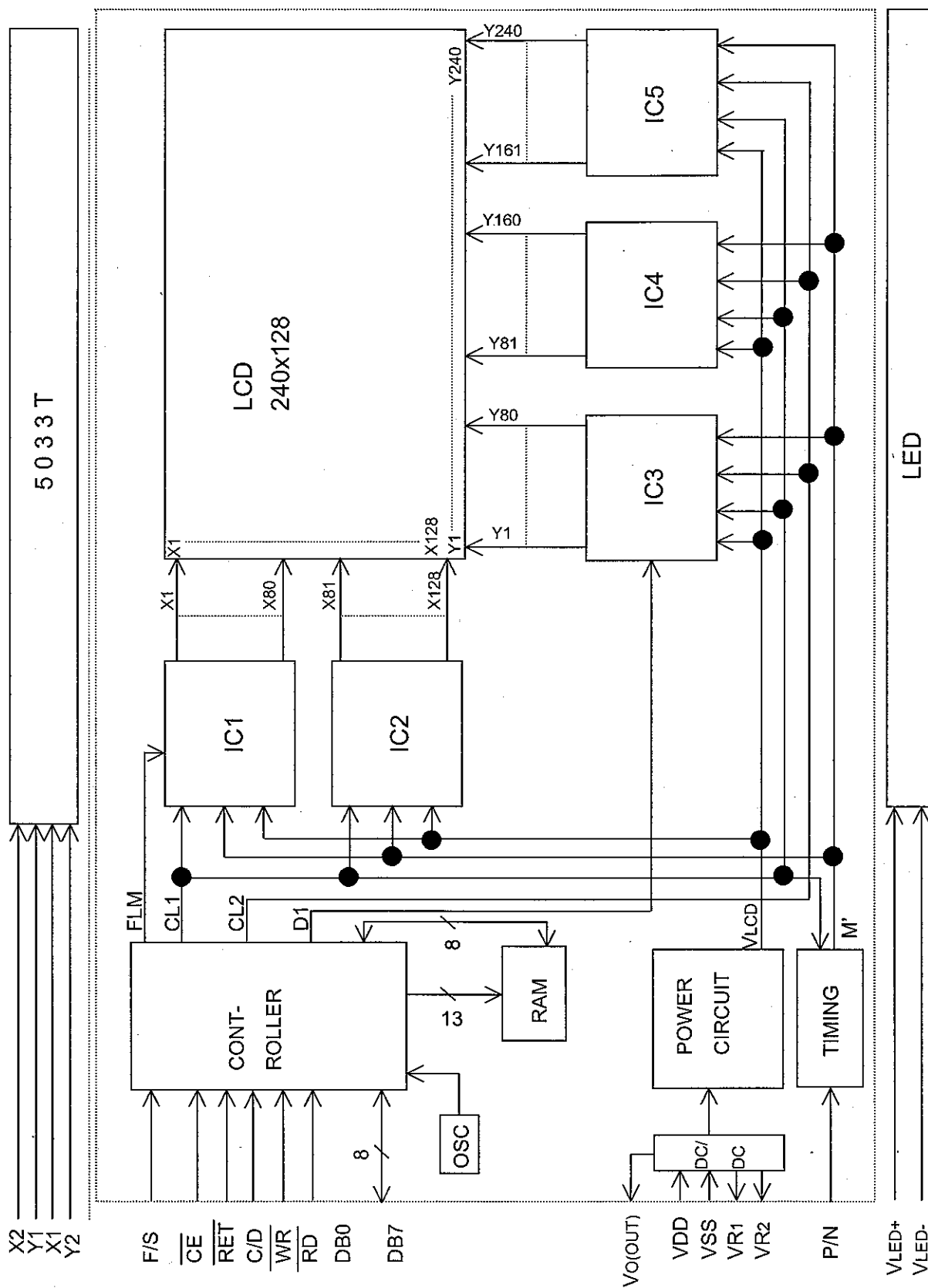
Note 1 : Measure of the following 9 places on the display.



Definition of the brightness tolerance.

$$\left(\frac{\text{Max. or min. Brightness} - \text{Average Brightness}}{\text{Average Brightness}} \right) \times 100$$

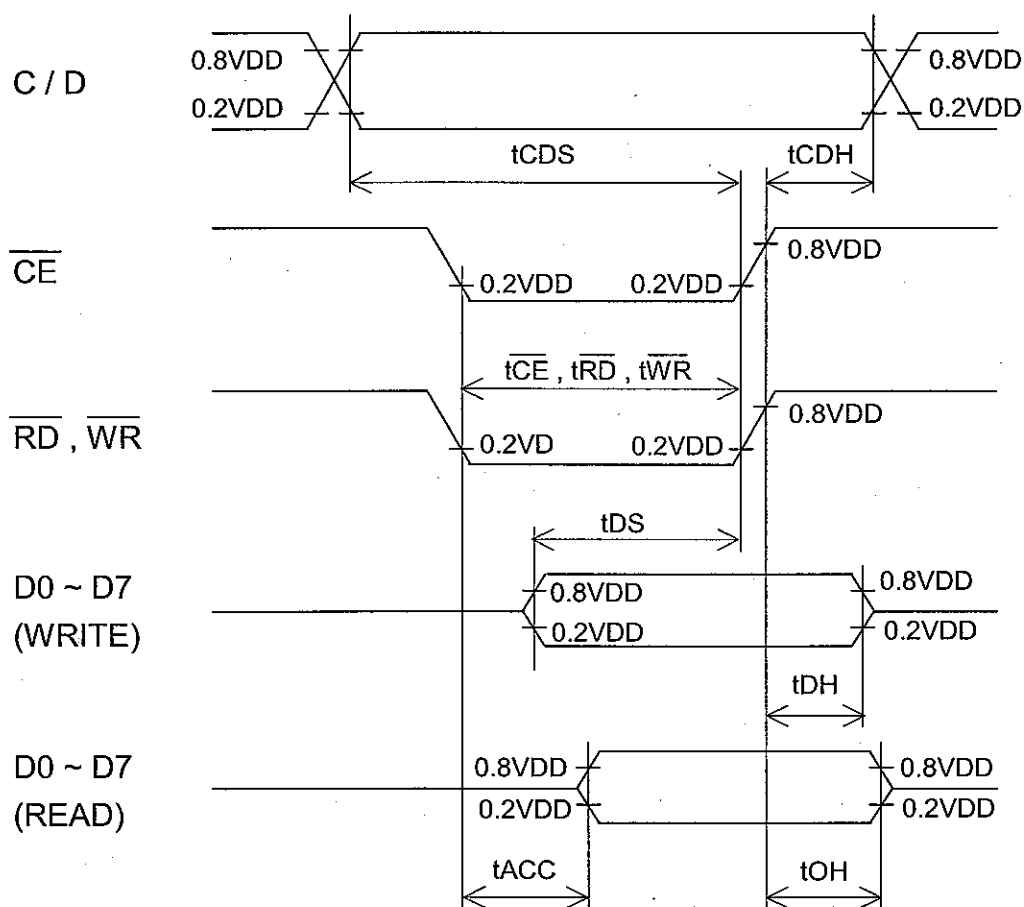
7. BLOCK DIAGRAM



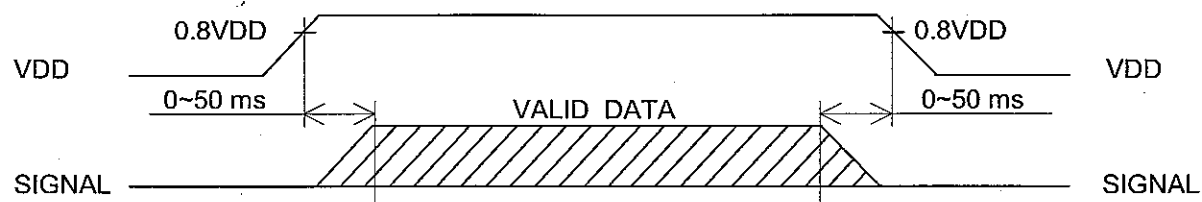
8. INTERFACE TIMING

8.1 INTERFACE TIMING

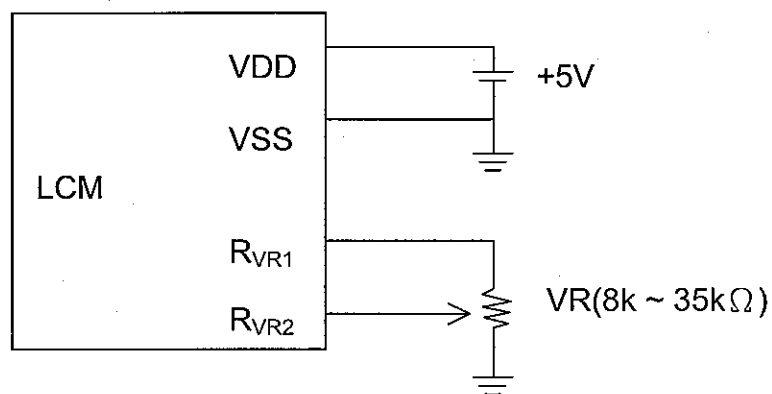
| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|------------------------|---------------|------|------|------|------|
| C/D Setup Time | tCDS | 100 | - | - | ns |
| C/D Hold Time | tCHD | 10 | - | - | ns |
| CE, RD, WR Pulse Width | tCE, tRD, tWR | 80 | - | - | ns |
| Data Setup Time | tDS | 80 | - | - | ns |
| Data Hold Time | tDH | 40 | - | - | ns |
| Access Time | tACC | - | - | 150 | ns |
| Output Hold Time | tOH | 10 | - | 50 | ns |



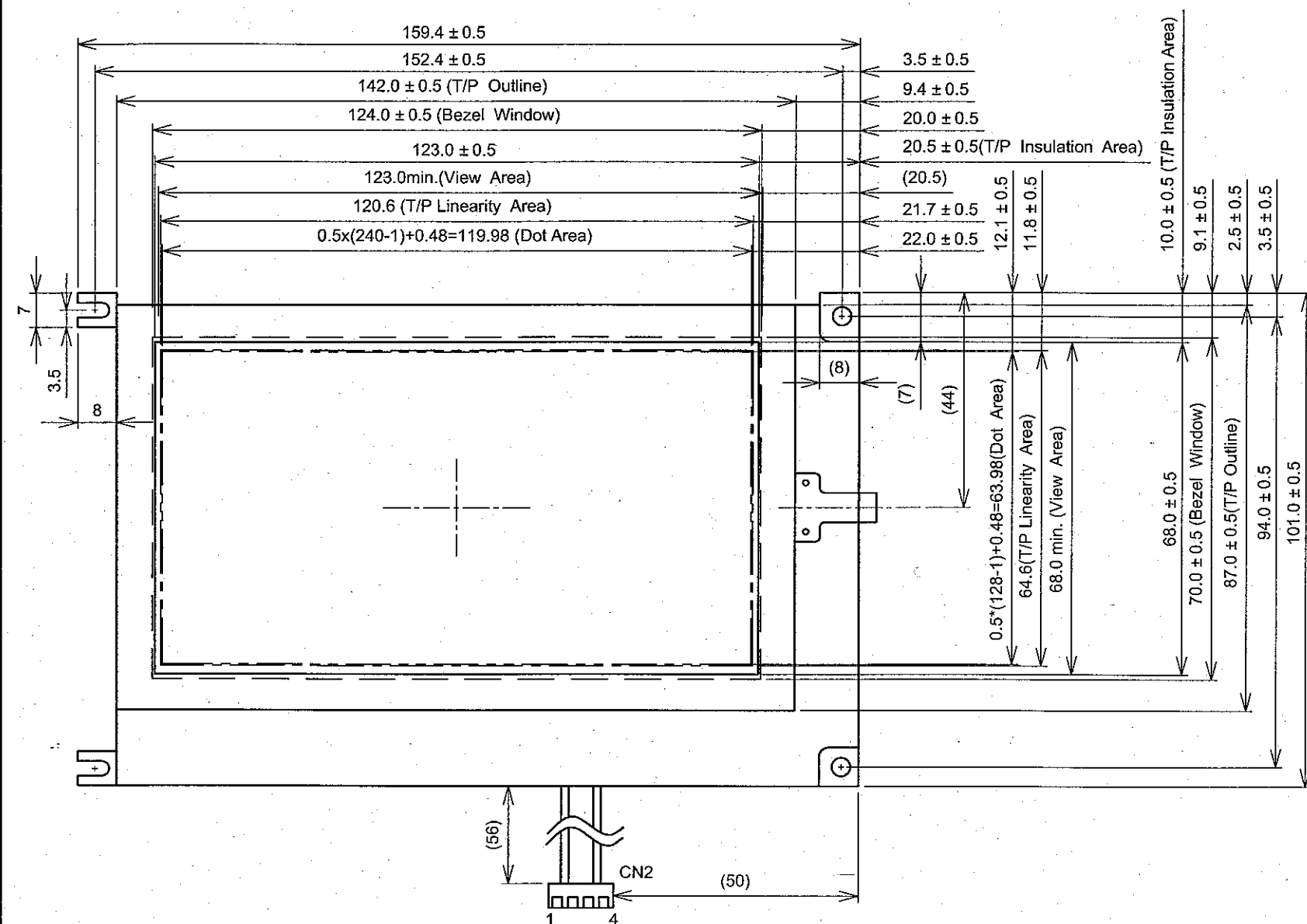
8.2 TIMING OF POWER SUPPLY AND INTERFACE SIGNAL



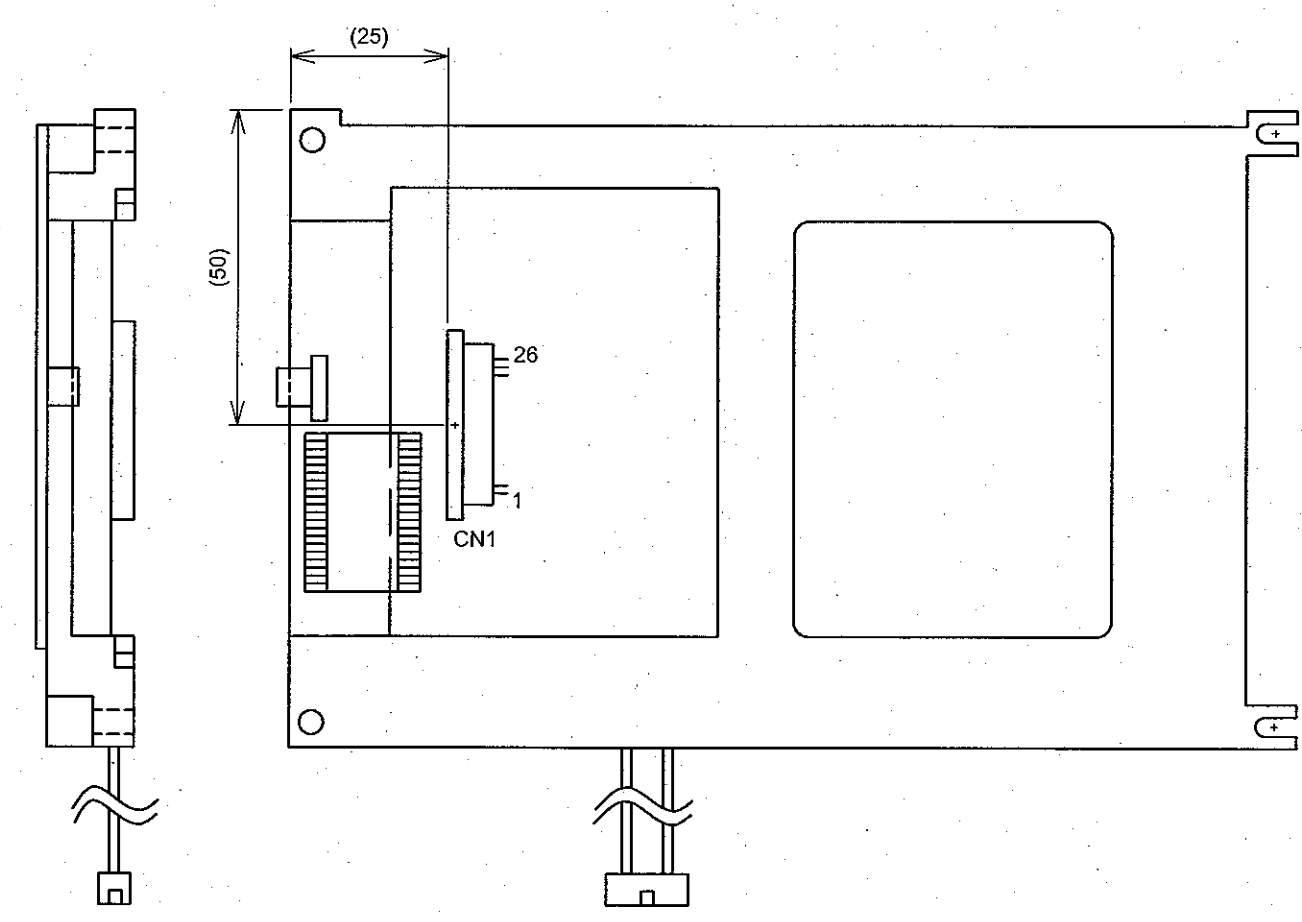
8.3 POWER SUPPLY FOR LCM



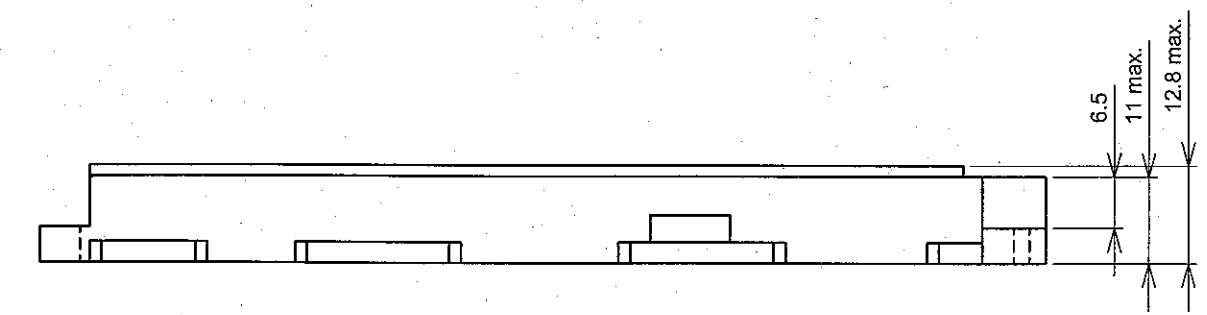
9. OUTLINE DIMENSIONS
9.1 OUTLINE DIMENSIONS



Front View

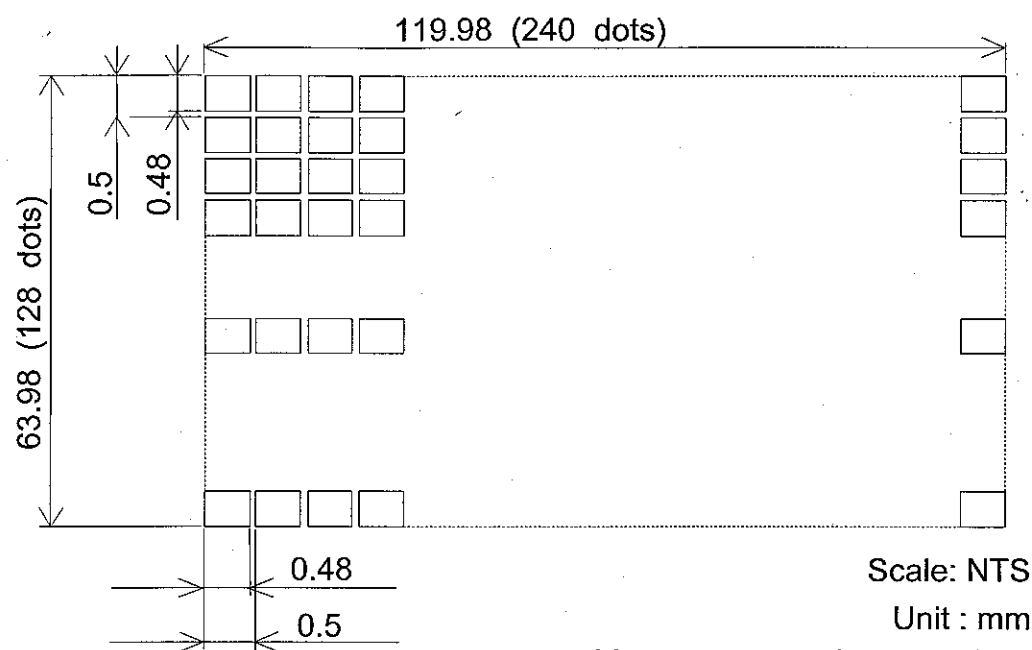


Rear View



Scale : NTS
Unit : mm

9.2 DISPLAY PATTERN



9.3 INTERNAL PIN CONNECTION

CN1 : Pitch 1.0mm, 26pins connector

Suitable connector (Molex : 52207-2690)

| PIN No. | SYMBOL | FUNCTION |
|---------|-----------|---|
| 1 | VSS | GND |
| 2 | VDD | Power Supply for Logic |
| 3 | V0(ref) | No Connection . It is a test pin for reference setting resistant between V_{VR1} and V_{VR2} |
| 4 | C/D | WR="L" : C/D="H" Command Write C/D="L" Data Write RD="L" : C/D="H" Status Read C/D="L" Data Rwad |
| 5 | WR | Data Write (Data Write at "L") |
| 6 | RD | Data Read (Read Data at "L") |
| 7 | DB0 | Data Bus |
| 8 | DB1 | |
| 9 | DB2 | |
| 10 | DB3 | |
| 11 | DB4 | |
| 12 | DB5 | |
| 13 | DB6 | |
| 14 | DB7 | |
| 15 | CE | Chip Enable (CE must be "L") |
| 16 | RET | Reset |
| 17 | NC | No Connection |
| 18 | DOFF | VDD/Display on , GND/Display off |
| 19 | F/S | Character Font Select : F/S="H" 6*8Font F/S="L" 8*8Font |
| 20 | P/N | Display Mode Reverse. |
| 21 | R_{VR1} | For Adjusting LC Driving Voltage |
| 22 | R_{VR2} | |
| 23 | Y2 | Analog signal digitizer bottom |
| 24 | X1 | Analog signal digitizer right |
| 25 | Y1 | Analog signal digitizer upper |
| 26 | X2 | Analog signal digitizer left |

CN2 : JAE IL-G-4S-S3C2-SA

| PIN No. | SYMBOL | FUNCTION |
|---------|--------|----------------------|
| 1 | VLED - | GND |
| 2 | NC | No Connection |
| 3 | NC | No Connection |
| 4 | VLED + | Power Supply for LED |

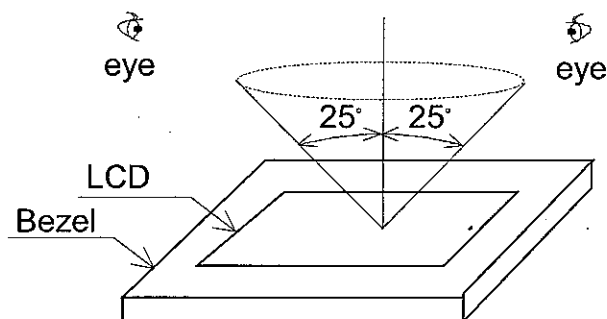
10. APPEARANCE STANDARD

10.1 APPEARANCE INSPECTION CONDITION

Visual inspection should be done under the following condition.

- (1) The inspection should be done under in the dark room.
- (2) The CFL should be lighted with the prescribed inverter.
- (3) The distance between eyes of an inspector and the LCD module is 25cm.
- (4) The viewing zone is shown the figure .

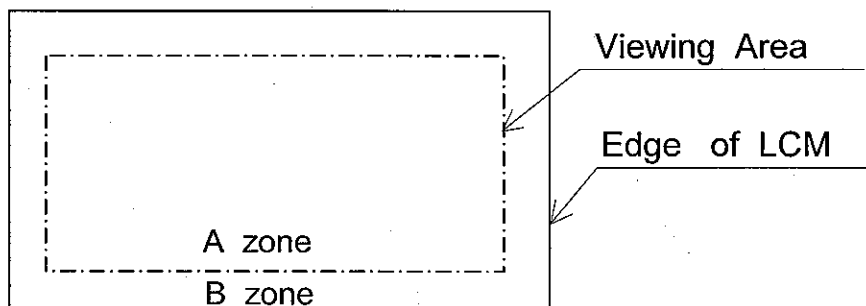
Viewing angle $\leq 25^\circ$



10.2 DEFINITION OF EACH ZONE

A zone : Within the Viewing Area specified at page 9-1/3 of this document.

B zone : Area between the Edge of LCM and the Viewing Area specified at page 9-1/3 of this document.



10.3 APPEARANCE SPECIFICATION

*) If a problem occurs in respect to any of these items ,
both parties(Customer and HITACHI) will discuss in more detail

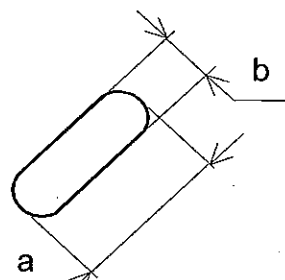
| No. | ITEM | CRITERIA | | | | A | B |
|------------------------------------|---|---|---------------------------------|------------------------------|---|---|---|
| L C D | Scratches | Distinguished one is not acceptable (To be judged by HITACHI limit sample) | | | | * | - |
| | Dent | Same as above | | | | * | - |
| | Wrinkles in Polarizer | Same as above | | | | * | - |
| | Bubbles | Average Diameter D(mm) | | Maximum Number Acceptable | | O | - |
| | | D≤0.2 | | Ignore | | | |
| | | 0.2<D≤0.3 | | 12 | | | |
| | | 0.3<D≤0.5 | | 3 | | | |
| | | 0.5<D | | None | | | |
| | Stains, Foreign Materials, Dark Spot | Filamentous | | | | O | - |
| | | Length L(mm) | Width W(mm) | Maximum Number Acceptable | | | |
| | | L≤2.0 | W≤0.03 | Ignore | | | |
| | | L≤3.0 | 0.03<W≤0.05 | 6 | | | |
| | | L≤2.5 | 0.05<W≤0.1 | 1 | | | |
| | | Round | | | | O | - |
| | | Average Diameter D(mm) | Maximum Number Acceptable | Minimum Space | | | |
| | | D<0.2 | Ignore | - | | | |
| | | 0.2 ≤D<0.33 | 8 | 10mm | | | |
| | | 0.33≤D | None | - | | | |
| | | Total | Filamentous + Round = 10 | | | | |
| | | Those wiped out easily are acceptable | | | | O | O |
| | Color Tone | To be judged by HITACHI limit sample | | | | O | - |
| | Color Uniformity | Same as above | | | | O | - |
| | Pinhole | Average Diameter D(mm) | | Maximum Number Acceptable | | O | - |
| D≤0.15 | | Ignore | | | | | |
| 0.15<D≤0.3 | | 10 | | | | | |
| C≤0.015 | | Ignore | | | | | |
| Contrast Irregularity (Spot) | Average Diameter D(mm) | Contrast | Maximum Number Acceptable | Minimum Space | O | - | |
| | D≤0.25 | To be judged by HITACHI | Ignore | - | | | |
| | 0.25<D≤0.35 | | 10 | 20mm | | | |
| | 0.35<D≤0.5 | | 4 | 20mm | | | |
| | 0.5 <D | | None | - | | | |

| No. | ITEM | CRITERIA | | | | A | B |
|-----------------|--|---------------|--------------|---------------------------|---------------|---|---|
| L C D | Contrast Irregularity (Line) (Filamentous) | Width W(mm) | Length L(mm) | Maximum Number Acceptable | Minimum Space | O | - |
| | | $W \leq 0.25$ | $L \leq 1.2$ | 2 | 20mm | | |
| | | $W \leq 0.2$ | $L \leq 1.5$ | 3 | 20mm | | |
| | | $W \leq 0.15$ | $L \leq 2.0$ | 3 | 20mm | | |
| | | $W \leq 0.1$ | $L \leq 3.0$ | 4 | 20mm | | |
| | Total | | 6 | | | | |
| Rubbing Scratch | To be judged by HITACHI standard | | | | O | - | |

| No. | ITEM | CRITERIA | | |
|-------------|--|------------------------|---------------|---------------------------|
| L E D | Dark Spots, White Spots Foreign Materials (Spot) | Average Diameter D(mm) | | Maximum Number Acceptable |
| | | $D \leq 0.4$ | | Ignore |
| | | $D > 0.4$ | | None |
| B / L | Foreign Materials (Line) | Width W(mm) | Length L(mm) | Maximum Number acceptable |
| | | $W \leq 0.2$ | $L < 2.5$ | ≤ 1 |
| | | $W \leq 0.2$ | $L > 2.5$ | None |
| | | $W > 0.2$ | - | None |
| | Scratches | Width W(mm) | Length L(mm) | Maximum Number Acceptable |
| | | $W \leq 0.1$ | - | Ignore |
| | | $0.1 < W \leq 0.2$ | $L \leq 11.0$ | ≤ 1 |
| | | $0.1 < W \leq 0.2$ | $L \geq 11.0$ | None |
| | | $W > 0.2$ | - | None |

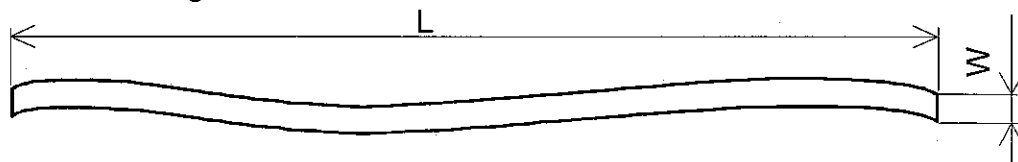
Note

(1) Definition of average diameter D

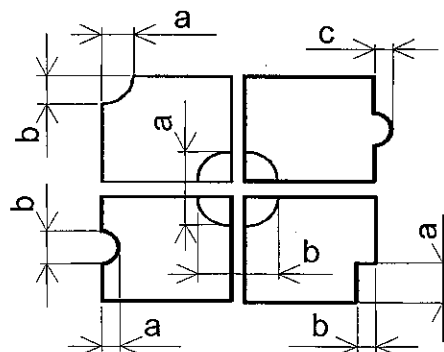


$$D = \frac{a+b}{2}$$

(2) Definition of length L and width W



(3) Definition of pinhole



C : Salience

11. PRECAUTION IN DESIGN

11.1 LC DRIVING VOLTAGE (VEE) AND VIEWING ANGLE RANGE.

Setting VEE out of the recommended condition will be a cause for a change of viewing angle range.

11.2 CAUTION AGAINST STATIC CHARGE

As this module is provided with C-MOS LSI, the care to take such a precaution as grounding the operator's body is required when handling it.

11.3 POWER ON SEQUENCE

Input signals should not be applied to LCD module before power supply voltage is applied and reaches to specified voltage.

If above sequence is not kept, C-MOS LSI of LCD modules may be damaged due to latch up problem.

11.4 PACKAGING

- (1) No leaving product is preferable in the place of high humidity for a long period of time.

For their storage in the place where temperature is 35°C or higher, special care to prevent them from high humidity is required.

A combination of high temperature and high humidity may cause them polarization degradation as well as bubble generation and polarizer peel-off.

Please keep the temperature and humidity within the specified range for use and storage.

- (2) Since upper/bottom polarizers tend to be easily damaged, they should be handled full with care so as not to get them touched, pushed or rubbed.

- (3) As the adhesives used for adhering upper/bottom polarizers are made of organic substances which will be deteriorated by a chemical reaction with such chemicals as acetone, toluene, ethanol and isopropyl alcohol.

The following solvents are recommended for use:
normal hexane

please contact us when it is necessary for you to use chemicals.

- (4) Lightly wipe to clean the dirty surface with absorbent cotton waste or other soft material like chamois, soaked in the chemicals recommended without scrubbing it hardly.

To prevent the display surface from damage and keep the appearance in good state, it is sufficient, in general, to wipe it with absorbent cotton.

- (5) Immediately wipe off saliva or water drop attached on the display area because its long period adherence may cause deformation or faded color on the spot.

- (6) Foggy dew deposited on the surface and contact terminals due to coldness will be caused for polarizer damage, stain and dirt on product.

When necessary to take out the products from some place at low temperature for test, etc.

It is required for them to be warmed up in a container once at the temperature higher than that of room.

- (7) Touching the display area and contact terminals with bare hands and contaminating them are prohibited, because the stain on the display area and poor insulation between terminals are often caused by being touched by bare hands.

(Some cosmetics are detrimental to polarizers.)

- (8) In general the quality of glass is fragile so that it tends to be cracked or chipped in handling, specially on its periphery.

Be careful not to give it sharp shock caused by dropping down, etc.

11.5 CAUTION FOR OPERATION

- (1) It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life.
An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current driver should be avoided.
- (2) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark blue color in them.
However those phenomena do not mean malfunction or out of order with LCD's which will come back in the specified operating temperature range.
- (3) IF the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- (4) A slight dew depositing on terminals is a cause for electrochemical reaction resulting in terminal open circuit.
Usage under the relative condition of 40 °C 50%RH or less is required.
- (5) Prevent continuous 4 hours or over same pattern displaying , to avoid Image-Sticking.

11.6 STORAGE

In case of storing for a long period of time (for instance, for years) for the purpose of replacement use , the following ways area recommended.

- (1) Storage in a polyethylene bag with the opening sealed , so the fresh air will not be entered from outside .
- (2) Placing in a dark place where neither exposure to direct sunlight nor light is , keeping temperature in the range from 0°C to 35°C .
- (3) Storing with no touch on polarizer surface by anything else.
(It is not recommended to store them as they have been contained in the inner container at the time of delivery from us.)

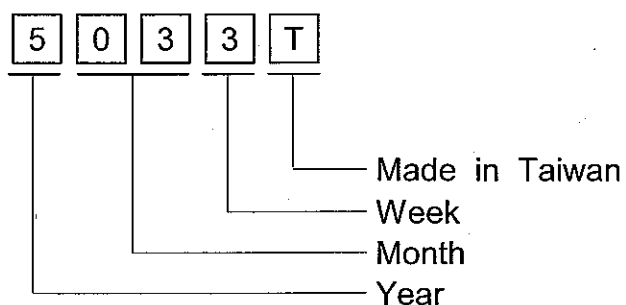
11.7 SAFETY

- (1) It is recommendable to crash damage or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol , which should be burned up later.
- (2) When any liquid leaked out of a damage glass call comes in contact with your hands, please wash it off well with soap and water.

12. DESIGNATION OF LOT MARK

12.1 Lot mark

Lot mark is consisted of 4 digital number.



| YEAR | FIGURE IN LOT MARK |
|------|--------------------|
| 2008 | 8 |
| 2009 | 9 |
| 2010 | 0 |
| 2011 | 1 |
| 2012 | 2 |

Note 1 : Some products have alphabet at the end or the first.

| MONTH | FIGURE IN LOT MARK | MONTH | FIGURE IN LOT MARK |
|-------|--------------------|-------|--------------------|
| Jan. | 01 | Jul. | 07 |
| Feb. | 02 | Aug. | 08 |
| Mar. | 03 | Sep. | 09 |
| Apr. | 04 | Oct. | 10 |
| May | 05 | Nov. | 11 |
| Jun. | 06 | Dec. | 12 |

| WEEK (DAY IN CALENDAR) | FIGURE IN LOT MARK |
|------------------------|--------------------|
| 1~7 | 1 |
| 8~14 | 2 |
| 15~21 | 3 |
| 22~28 | 4 |
| 29~31 | 5 |

12.2 REVISION

| REV No. | ITEM | LOT No. |
|---------|--|---------|
| - | CFL I/F Connector : Mitsumi M63M83 - 04 | - |
| A | 1.CFL I/F Connector :JAE IL-G-4S-S3C2-SA 2.Operating Life (40,000h) | 7102T |

12.3 LOCATION OF LOT MARK

on the back side of LCM

5033T

13. PRECAUTION FOR USE

13.1 A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity.

Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

13.2 On the following occasions, the handling of the problem should be decided through discussion and agreement between responsible persons of the both parties.

- (1) When a question is arisen in the specifications.
- (2) When a new problem is arisen which is not specified in this specifications.
- (3) When an inspection specifications change or operating condition change in customer is reported to HITACHI, and some problem is arisen in this specification due to the change.
- (4) When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

The precaution that should be observed when handling LCM have been explained above. If any points are unclear or if you have any request, please contact HITACHI.

14. TOUCH PANEL SPECIFICATION

14.1 RATINGS

14.1.1 ABSOLUTE MAXIMUM RATINGS

| ITEM | SPECIFICATION | COMMENT |
|-----------------------|--------------------|-------------------------|
| Operating Voltage | (7V) | Without Condensation |
| Contact Current | (20mA) | |
| Operating Temperature | (0~55℃ 20~85%RH) | |
| Storage Temperature | (-20~70℃ 20~85%RH) | |

14.1.2 OPERATING CONDITIONS

| ITEM | SPECIFICATION |
|-------------------|---------------|
| Operating Voltage | 5VDC |
| Contact Current | 10 ~ 20 mA |
| Actuation Force | 1.2N max. |

14.2 MECHANICAL STRENGTH

14.2.1 INPUT METHOD & ACTUATION FORCE

| INPUT METHOD | ACTUATION FORCE | COMMENT |
|--------------|-----------------|----------------------|
| PEN | 1.2N max. | R0.8, Polyacetal pen |

14.2.2 SURFACE HARDNESS

(2h min.)

14.3 OPTICAL CHARACTERISTICS

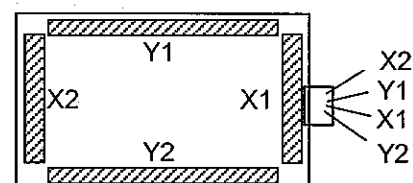
14.3.1 TRANSPARENCY : (76% min.)

14.3.2 HAZE : (5% max.)

14.4 ELECTRICAL CHARACTERISTICS

14.4.1 CONDUCTIVE RESISTANCE

| TERMINAL | CONDUCTIVE RESISTANCE |
|----------|-----------------------|
| X1-X2 | (150~1300Ω) |
| Y1-Y2 | (150~1300Ω) |



14.4.2 INSULATION RESISTANCE

| TERMINAL | INSULATION RESISTANCE | TESTING VOLTAGE |
|----------|-----------------------|-----------------|
| X-Y | (20MΩ) | 25VDC |

14.4.3 BOUNCE CHATTERING

10msec max.

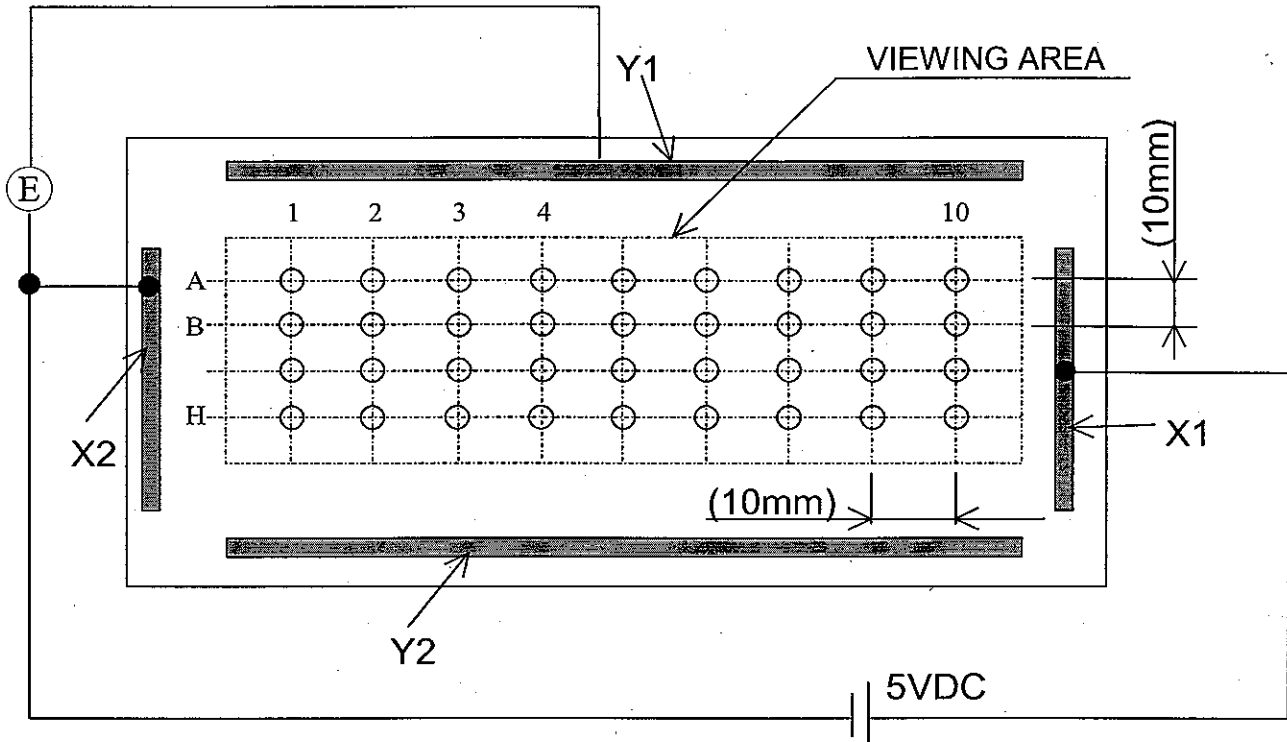
14.4.4 LINEARITY

(1) LINEARITY

LINEARITY DEVIATION : (2% max.)

(2) TESTING CIRCUIT

(a) X AXIS LINEARITY TESTING METHOD , 100g , VX1-VX2=5V , VOUT=VY1.

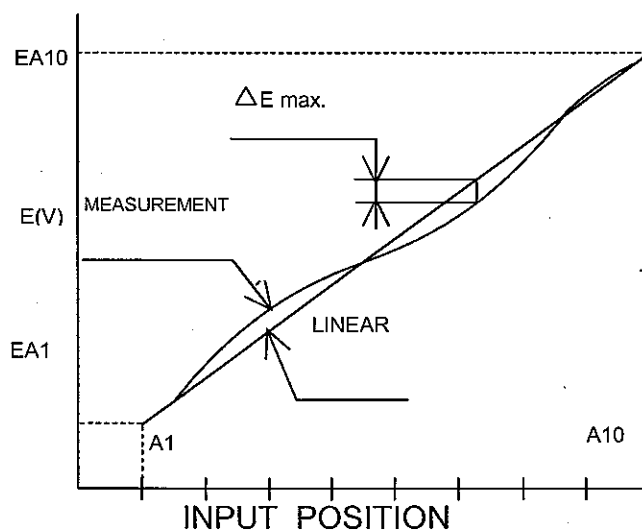


(b) Y AXIS LINEARITY METHOD VY1-Y2=5V, VOUT=VX1


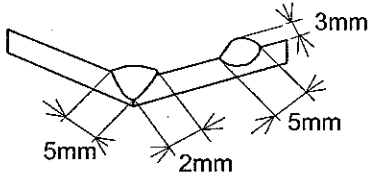
(3) CALCULATION

(a) X AXIS LINEARITY

$$\text{LINEARITY} = \frac{\Delta E \text{ max.}}{E A10 - E A1} \times 100(\%)$$



14.5 APPEARANCE SPECIFICATION

| Description | | Reject criteria |
|---------------------------------------|-----------|---|
| Foreign Material Between Glass & Film | Film dent | $D > 0.3$: To be zero |
| | Dot type | $0.3 \geq D > 0.2$: To be max 2points interval of faults is 50mm min. |
| | | $0.2 \geq D$: None-specify |
| | |  |
| | Line type | $W \geq 0.1$: refer to "Dot type" $0.1 > W \geq 0.05$ With $L \geq 5$: To be zero $0.1 > W \geq 0.05$ With $L < 5$: To be max 2points interval of faults is 50mm min. $0.5 > W$: None-specify W : Width [mm] L : Length [mm] |
| Scratch | | |
| Film dot type blur | | Area $0.5\text{mm}^2 \leq$: To be zero |
| Film hard-coat Missing | | Area $0.3\text{mm}^2 \leq < 0.5\text{mm}^2$: To be max. 5 points |
| | | Area $0.3\text{mm}^2 \leq$: None-specify |
| Glass flaw | | <p>To be no flaw which size is over the drawing specified as Below. Number of flaw is none-specify.</p> <p>Traveling flaw is none.</p> <p>Flaw of thickness-direction Size is glss-thickness max.</p>  |