

# HITACHI

FOR MESSRS. \_\_\_\_\_

DATE. Dec.05.2001

## CUSTOMER'S ACCEPTANCE SPECIFICATIONS

### SP14Q003-C1A

### C O N T E N T S

| No. | ITEM                               | SHEET No.                   | PAGE       |
|-----|------------------------------------|-----------------------------|------------|
| 1   | COVER                              | 7B64PS 2701-SP14Q003-C1A-1  | 1-1/1      |
| 2   | RECORD OF REVISION                 | 7B64PS 2702- SP14Q003-C1A-1 | 2-1/1      |
| 3   | GENERAL SPECIFICATION              | 7B64PS 2703- SP14Q003-C1A-1 | 3-1/1      |
| 4   | ABSOLUTE MAXIMUM RATINGS           | 7B64PS 2704- SP14Q003-C1A-1 | 4-1/1      |
| 5   | ELECTRICAL CHARACTERISTICS         | 7B64PS 2705- SP14Q003-C1A-1 | 5-1/2~2/2  |
| 6   | OPTICAL CHARACTERISTICS            | 7B64PS 2706- SP14Q003-C1A-1 | 6-1/2~2/2  |
| 7   | BLOCK DIAGRAM                      | 7B64PS 2707- SP14Q003-C1A-1 | 7-1/1      |
| 8   | INTERFACE TIMING                   | 7B64PS 2708- SP14Q003-C1A-1 | 8-1/3~3/3  |
| 9   | OUTLINE DIMENSIONS                 | 7B63PS 2709- SP14Q003-C1A-1 | 9-1/2~2/2  |
| 10  | QUALITY STANDARD                   | 7B64PS 2710- SP14Q003-C1A-1 | 10-1/3~3/3 |
| 11  | PRECAUTION IN DESIGN               | 7B64PS 2711- SP14Q003-C1A-1 | 11-1/3~3/3 |
| 12  | DESIGNATION OF LOT MARK            | 7B64PS 2712- SP14Q003-C1A-1 | 12-1/1     |
| 13  | PRECAUTION FOR USE                 | 7B64PS 2713- SP14Q003-C1A-1 | 13-1/1     |
| 14  | DIGITIZER TECHNICAL SPECIFICATLION | 7B64PS 2714- SP14Q003-C1A-1 | 14-1/4~4/4 |

\* WHEN PRODUCT WILL BE DISCONTINUED , CUSTOMER WILL BE INFORMED BY HITACHI WITH TWELVE MONTHS PRIOR ANNOUNCEMENT.

ACCEPTED BY; \_\_\_\_\_

PROPOSED BY; \_\_\_\_\_

|   |            |                             |      |       |
|---|------------|-----------------------------|------|-------|
| KAOHSIUNG HITACHI<br>ELECTRONICS CO.,LTD. | Sh.<br>No. | 7B64PS 2701- SP14Q003-C1A-1 | PAGE | 1-1/1 |
|---|------------|-----------------------------|------|-------|

## RECORD OF REVISION

| DATE | SHEET No. | SUMMARY |
|------|-----------|---------|
|      |           |         |

### 3. GENERAL SPECIFICATIONS

|                             |   |
|-----------------------------|---|
| (1) PART NAME               | SP14Q003-C1A  |
| (2) OUTER DIMENSIONS        | 167.0(W)mm×109.0(H)mm×11.4(D)mm(max.)   |
| (3) EFFECTIVE DISPLAY AREA  | 120 mm min. × 89 mm min   |
| (4) DOT SIZE                | 0.345(W)min. × 0.345(H)min  |
| (5) DOT PITCH               | 0.360(W)mm × 0.360(H)mm   |
| (6) DOT NUMBER (RESOLUTION) | 320 (W) × 240 (H)   |
| (7) DUTY RATIO              | 1/240   |
| (8) LCD TYPE                | BLUE TYPE STN<br>WITH GLARE TYPE UPPER POLARIZER                                |
| (9) VIEWING DIRECTION       | 6 O'CLOCK   |
| (10) BACK LIGHT TYPE        | COLD CATHODE FLUORESCENT LAMP.  |
| (11) TOUCH PANEL            | ANALOG RESISTANCE 4wires<br>TRANSPARENCY : 76% min<br>SURFACE TYPE : ANTI GLARE |

## 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    |            |
| POWER SUPPLY FOR LC DRIVE | VDD-VEE | 0    | 30      | V    |            |
| INPUT VOLTAGE             | $V_i$   | -0.3 | VDD+0.3 | V    | NOTE 1     |
| INPUT CURRENT             | $I_i$   | 0    | 1       | A    |            |
| STATIC ELECTRICITY        | VESD0   | -    | +/-100  | V    | NOTE 2,3,4 |
|                           | VESD1   | -    | +/-10   | KV   | NOTE 2,3,5 |

NOTE (1) :  $\overline{\text{DISP.OFF}}$  , FRAME , LOAD , CP , D0~D3.

NOTE (2) : MAKE CERTAIN YOU ARE GROUNDED WHEN HANDLING LCM.

NOTE (3) : ENERGY STORAGE CAPACITANCE 200PF , DISCHARGE RESISTANCE 250 $\Omega$   
 $T_a=25^\circ\text{C}$  , 60%RH.

NOTE (4) : CONTACT DISCHARGE TO I/F CONNECTOR PINS.

NOTE (5) : CONTACT DISCHARGE TO FRONT METAL BEZEL.

### 4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS.

| ITEM                | OPERATING          |                                 | STORAGE              |   | COMMENT               |
|---------------------|--------------------|---------------------------------|----------------------|---|-----------------------|
|                     | MIN.               | MAX.                            | MIN.                 | MAX.                                      |                       |
| AMBIENT TEMPERATURE | 0 $^\circ\text{C}$ | 60 $^\circ\text{C}$             | -20 $^\circ\text{C}$ | 70 $^\circ\text{C}$                       | NOTE 2,3              |
| HUMIDITY            | NOTE 1             |                                 | NOTE 1               |   | WITHOUT CONDENSATION  |
| VIBRATION           | -                  | 2.45m/s <sup>2</sup><br>(0.25G) | -                    | 11.76m/s <sup>2</sup><br>(1.2G)<br>NOTE 5 | NOTE 4<br>1 HOUR MAX. |
| SHOCK               | -                  | 29.4m/s <sup>2</sup><br>(3 G)   | -                    | 490.0m/s <sup>2</sup><br>(50 G)<br>NOTE 5 | XYZ DIRECTIONS        |
| CORROSIVE GAS       | NOT ACCEPTABLE     |                                 | NOT ACCEPTABLE       |   |                       |

NOTE (1)  $T_a \leq 40^\circ\text{C}$  : 85%RH max.

$T_a > 40^\circ\text{C}$  : ABSOLUTE HUMIDITY MUST BE LOWER.  
 THAN THE HUMIDITY OF 85%RH AT 40 $^\circ\text{C}$

NOTE (2)  $T_a$  AT -20 $^\circ\text{C}$  ----- < 48HRS, AT 60 $^\circ\text{C}$  < 168HRS.

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 FINISH THE TEST.

NOTE (6) WHEN LCM WILL BE OPERATED AT 0 $^\circ\text{C}$  , THE LIFE TIME OF CFL WILL BE REDUCED. NEED TO MAKE SURE OF VALUE OF THE CHARACTERISTICS OF INVERTER. ALSO THE RESPONSE TIME AT 0 $^\circ\text{C}$  WILL BE SLOWER.

NOTE (7) THERE ARE POSSIBILITY THAT COLOR UN-UNIFORMITY HAPPENED WHILE OPERATING AT OVER 40 $^\circ\text{C}$ .

## 5. ELECTRICAL CHARACTERISTICS

### 5.1 ELECTRICAL CHARACTERISTICS

| ITEM                                       | SYMBOL  | CONDITION                       | MIN.   | TYP.  | MAX.   | UNIT |
|--|---------|---------------------------------|--------|-------|--------|------|
| POWER SUPPLY VOLTAGE FOR LOGIC             | VDD-VSS | -                               | 5.0-5% | 5.0   | 5.0+5% | V    |
|  |         |                                 | 3.3-5% | 3.3   | 3.3+5% |      |
| POWER SUPPLY VOLTAGE FOR LC DRIVING        | VEE-VSS | -                               | -23.1  | -22.0 | -20.9  | V    |
| INPUT VOLTAGE NOTE 1                       | VI      | H LEVEL                         | 0.8VDD | -     | VDD    | V    |
|  |         | L LEVEL                         | 0      | -     | 0.2VDD | V    |
| POWER SUPPLY CURRENT FOR LOGIC NOTE 4      | IDD     | VDD-VSS=5.0V<br>VEE-VSS= -22.0V | -      | 6.0   | -      | mA   |
| POWER SUPPLY VOLTAGE FOR LC DRIVING NOTE 4 | IEE     | VDD-VSS=5.0V<br>VEE-VSS= -22.0V | -      | 5.0   | -      | mA   |
| RECOMMENDED LC DRIVING VOLTAGE NOTE 3      | VDD-V0  | Ta= 0°C , φ= 0°                 | -      | 22.0  | -      | V    |
|  |         | Ta=25°C , φ= 0°                 | -      | 21.0  | -      | V    |
|  |         | Ta=50°C , φ= 0°                 | -      | 19.0  | -      | V    |
| FRAME FREQUENCY                            | fFRAME  | -                               | 70     | 75    | 80     | Hz   |

NOTE 1  $\overline{\text{DISP.OFF}}$  , FRAME , LOAD , CP , D0~D3.

NOTE 2 RECOMMENDED LC DRIVING VOLTAGE MAY FLUCTUATE ABOUT +/-1.0V BY EACH MODULE.

NOTE 3 NEED TO MAKE SURE OF FLICKERING AND RIPPLING OF DISPLAY WHEN SETTING THE FRAME FREQUENCY IN YOU SET.  
TEST PATTERN IS ALL "Q"

NOTE 4 fFRAME=75Hz ,TEST PATTERN IS ALL "Q".  
VDD-V0=21.0V , Ta=25°C

### 5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

| ITEM                       | SYMBOL       | MIN.   | TYP.  | MAX. | UNIT  | NOTE    |
|----------------------------|--------------|--------|-------|------|-------|---------|
| LAMP VOLTAGE               | VL           | -      | (300) | -    | Vrms  | Ta=25°C |
| FREQUENCY                  | fL           | -      | 70    | 85   | kHz   | Ta=25°C |
| LAMP CURRENT               | IL           | 4      | 5     | 6    | mArms | Ta=25°C |
| STARTING DISCHARGE VOLTAGE | VS<br>NOTE 2 | (1000) | -     | -    | Vrms  | Ta=25°C |

PLEASE CERTAINLY INFORM HITACHI BEFORE DESIGNING LAMP DRIVE CIRCUIT ACCORDING TO THE ABOVE SPECIFICATIONS.

NOTE 1 PLEASE MAKE SURE THAT YOUR INVERTER IS DESIGNED TO MEET THE ABOVE SPECIFICATIONS.

NOTE 2 STARTING DISCHARGE VOLTAGE IS INCREASED WHEN LCM IS OPERATING AT LOWER TEMPERATURE  
PLEASE CHECK THE CHARACTERISTICS OF YOUR INVERTER BEFORE APPLING TO YOUR SET.

NOTE 3 AVERAGE LIFE TIME OF CFL WILL BE DECREASED WHEN LCM IS OPERATING AT LOWER TEMPERATURE.

NOTE 4 UNDER LOWER DRIVING FREQUENCY OF AN INVERTER ,A CERTAIN BACKLIGHT SYSTEM (CFL & CFL REFLECTION SHEET) MAY GENERATE A SOUND NOISE.

NOTE 5 WHEN ICFL IS USED OVER 5.5mA ,IT MAY CAUSE UNEVEN CONTRAST NEAR CFL LOCATION ,DUE TO HEAT DISPERSION FROM CFL.

# 6. OPTICAL CHARACTERISTICS

## 6.1 OPTICAL CHARACTERISTICS

Ta=25°C(BACKLIGHT ON)

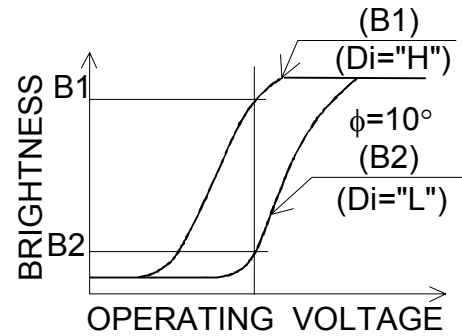
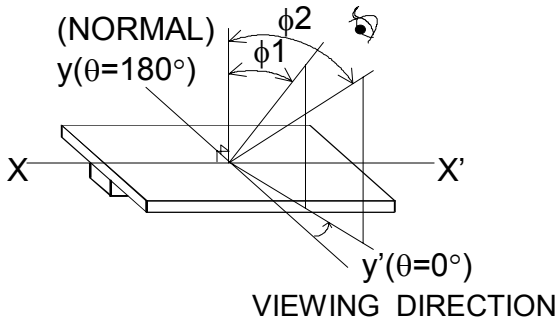
| ITEM                 | SYMBOL          | CONDITIONAL                        | MIN. | TYP. | MAX. | UNIT | NOTE |
|----------------------|-----------------|------------------------------------|------|------|------|------|------|
| VIEWING AREA         | $\phi 2-\phi 1$ | $K \geq 2.0$                       | -    | 40   | -    | deg  | 1,2  |
| CONTRAST RATIO       | K               | $\phi = 0^\circ, \theta = 0^\circ$ | -    | (6)  | -    | -    | 3    |
| RESPONSE TIME (RISE) | tr              | $\phi = 0^\circ, \theta = 0^\circ$ | -    | 120  | -    | ms   | 4    |
| RESPONSE TIME (FALL) | tf              | $\phi = 0^\circ, \theta = 0^\circ$ | -    | 150  | -    | ms   | 4    |

(MEASURE CONDITION BY HITACHI)

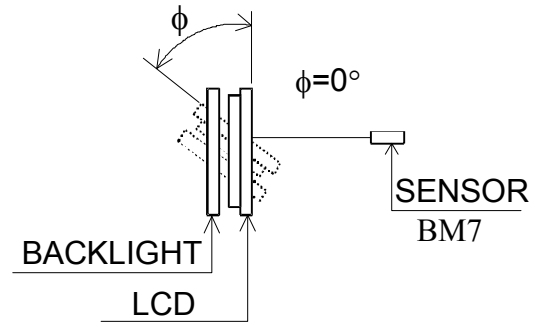
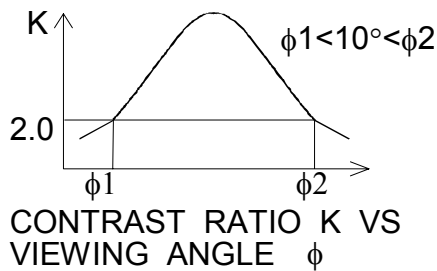
NOTE 3. DEFINITION OF CONTRAST "K"

NOTE 1. DEFINITION OF  $\theta$  AND  $\phi$

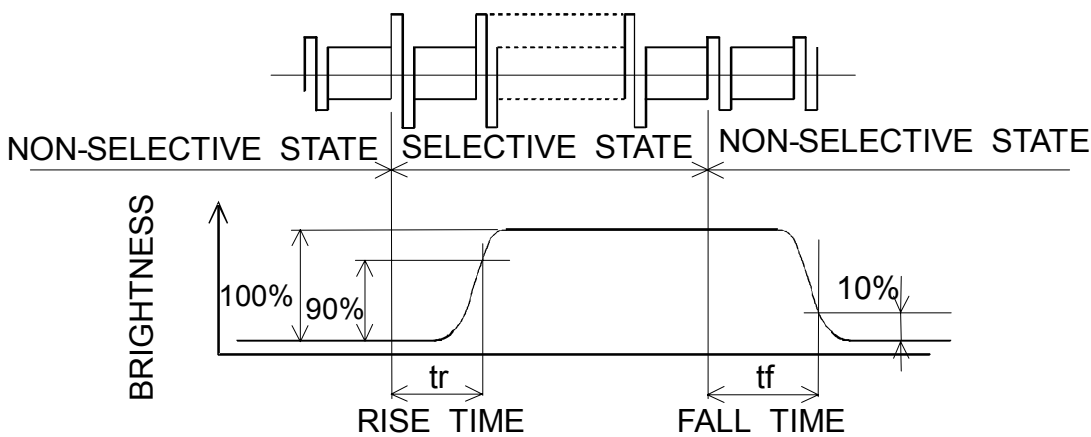
$$K = \frac{\text{BRIGHTNESS ON SELECTED DOT (B1)}}{\text{BRIGHTNESS ON NON-SELECTED DOT (B2)}}$$



NOTE 2. DEFINITION OF VIEWING ANGLE  $\phi 1$  AND  $\phi 2$ .



NOTE 4. DEFINITION OF OPTICAL RESPONSE



## 6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT

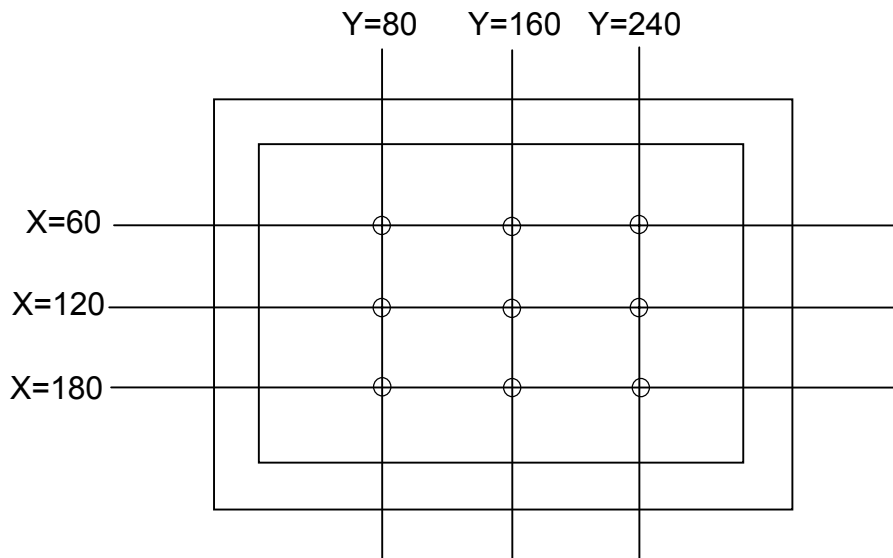
| I T E M               | MIN. | TYP. | MAX.  | UNIT              | NOTE                       |
|-----------------------|------|------|-------|-------------------|----------------------------|
| BRIGHTNESS            | -    | (80) | -     | cd/m <sup>2</sup> | IL=5mA<br>NOTE 1,2         |
| RISE TIME             | -    | 5    | -     | MINUTE            | IL=5mA<br>BRIGHTNESS 80%   |
| BRIGHTNESS UNIFORMITY | -    | -    | +/-30 | %                 | UNDERMENTIONED<br>NOTE 1,3 |

CFL : INITIAL, Ta=25°C, VDD-V0=21.0V  
DISPLAY DATA SHOULD BE ALL "ON".

NOTE 1. MEASUREMENT AFTER 10 MINUTES OF CFL OPERATING.

NOTE 2. BRIGHTNESS CONTROL : 100%

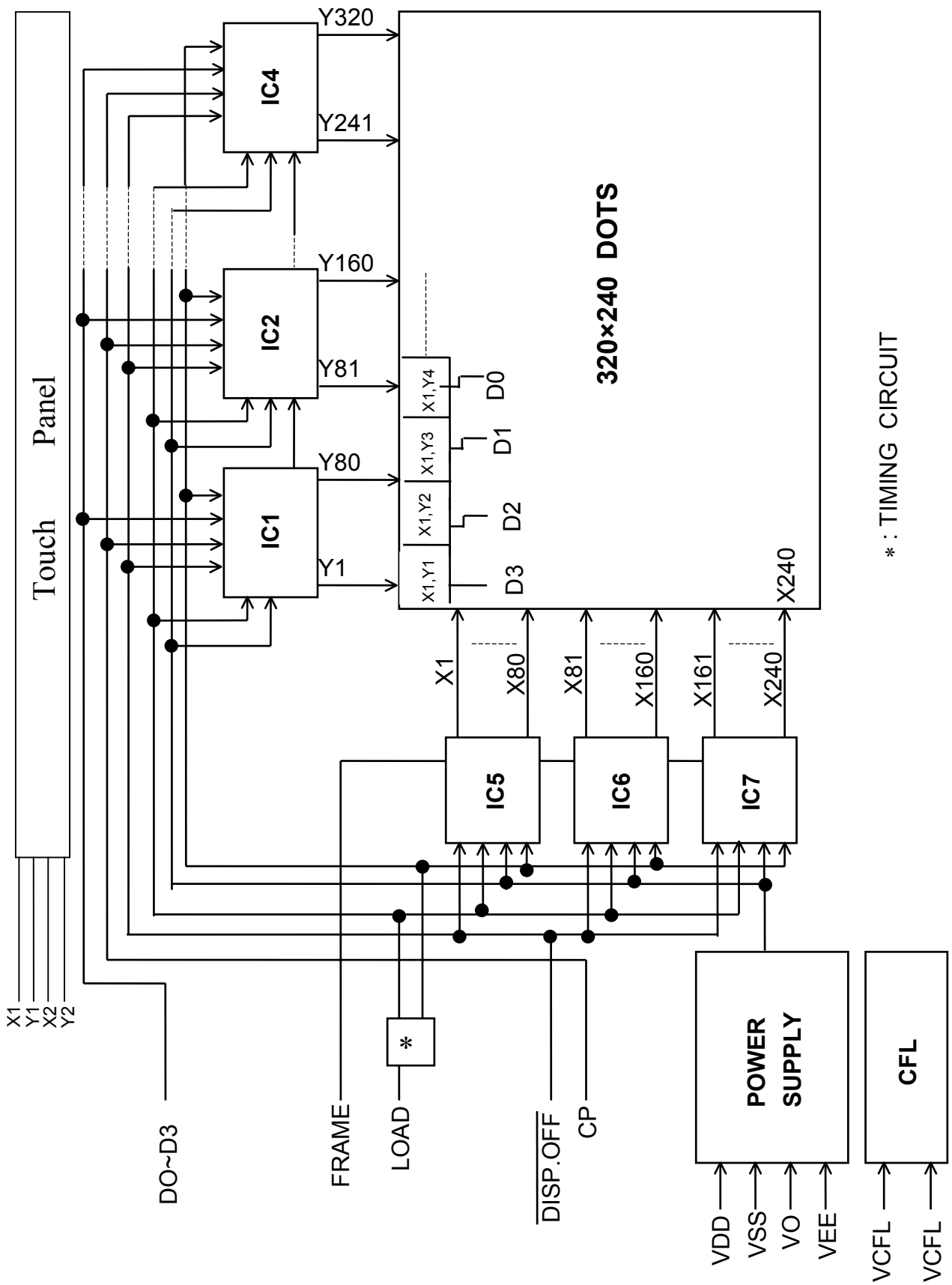
NOTE 3. MEASURE OF THE FOLLOWING 9 PLACES ON THE DISPLAY.



DEFINITION OF THE BRIGHTNESS TOLERANCE.

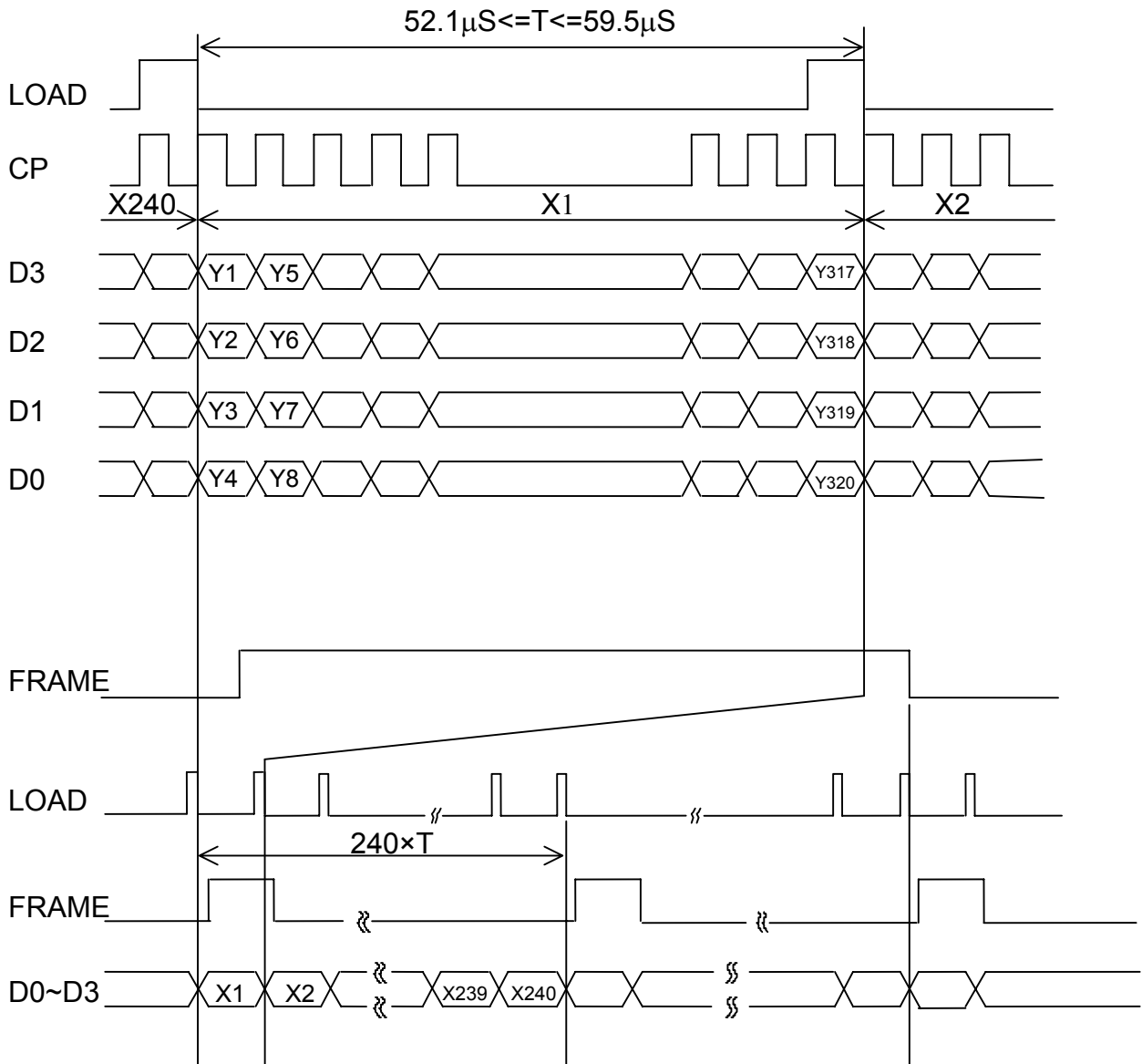
$$\left( \frac{\text{MAX OR MIN BRIGHTNESS} - \text{AVERAGE BRIGHTNESS}}{\text{AVERAGE BRIGHTNESS}} \right) \times 100\%$$

# 7. BLOCK DIAGRAM



# 8. INTERFACE TIMING CHART

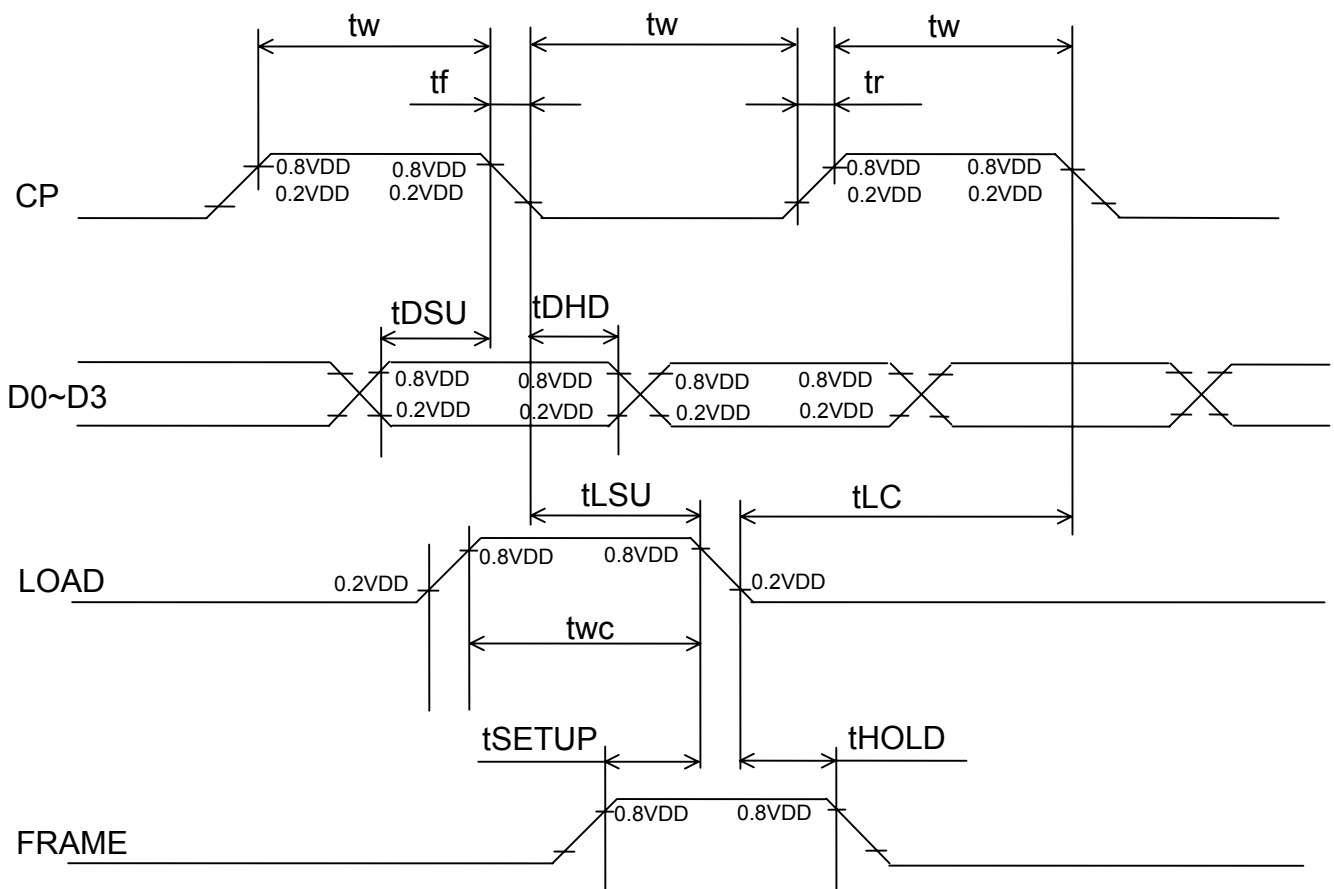
## 8.1 INTERFACE TIMING CHART



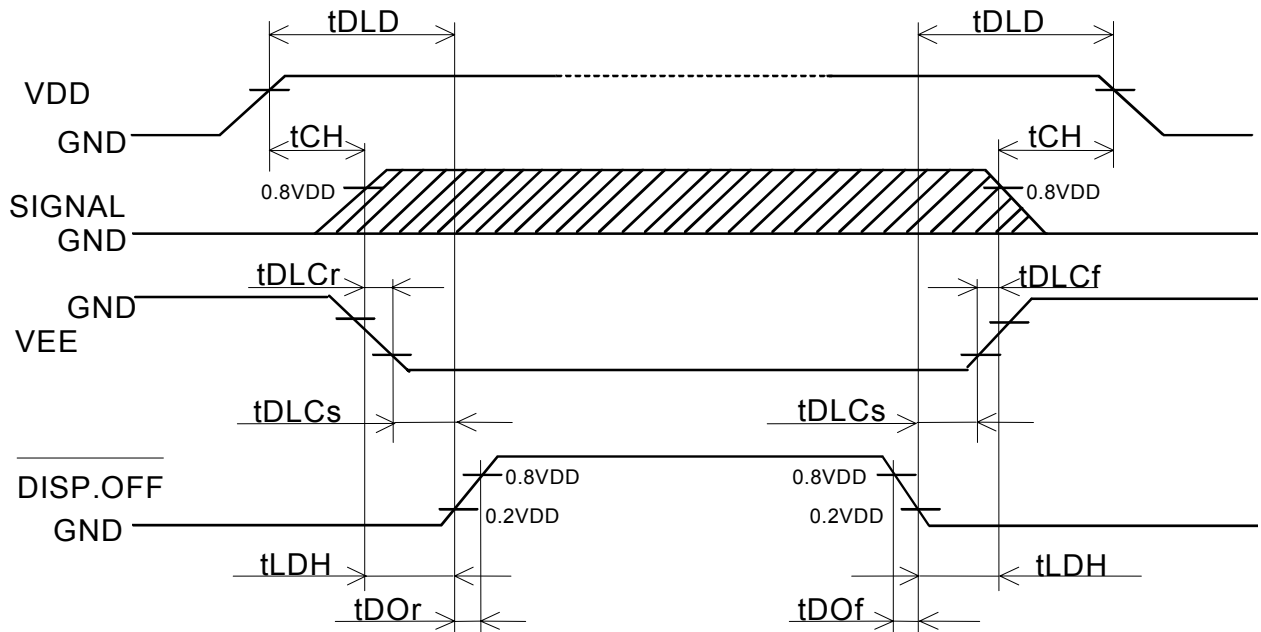
## 8.2 TIMING CHARACTERISTICS

$0^{\circ}\text{C} \leq T_a = 50^{\circ}\text{C}, V_{DD} = 5.0\text{V} \pm 5\%$

| ITEM                  | SYMBOL                          | MIN. | TYP. | MAX. | UMIT |
|-----------------------|---------------------------------|------|------|------|------|
| CLOCK FREQUENCY       | f <sub>CP</sub>                 | -    | -    | 6.5  | MHz  |
| CLOCK PULSE WIDTH     | t <sub>w</sub>                  | 45   | -    | -    | ns   |
| CLOCK RISE, FALL TIME | t <sub>r</sub> , t <sub>f</sub> | -    | -    | 15   | ns   |
| DATA SET UP TIME      | t <sub>DSU</sub>                | 30   | -    | -    | ns   |
| DATA HOLD TIME        | t <sub>DHD</sub>                | 30   | -    | -    | ns   |
| LOAD SET UP TIME      | t <sub>LSU</sub>                | 80   | -    | -    | ns   |
| LOAD CLOCK TIME       | t <sub>LC</sub>                 | 120  | -    | -    | ns   |
| "FRAME" SET UP TIME   | t <sub>SETUP</sub>              | 100  | -    | -    | ns   |
| "FRAME" HOLD TIME     | t <sub>HOLD</sub>               | 100  | -    | -    | ns   |
| "LOAD" PULSE WIDTH    | t <sub>wc</sub>                 | 125  | -    | -    | ns   |



### 8.3 POWER ON/OFF TIMING SEQUENCE

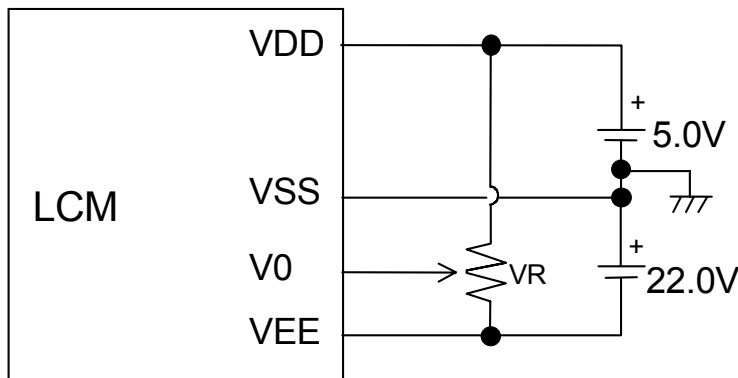


| SYMBOL | MIN | MAX | UNIT | COMMENT  |
|--------|-----|-----|------|----------|
| tDLD   | 200 | -   | ms   | (NOTE 1) |
| tCH    | 0   | 200 | ms   |          |
| tLDH   | 0   | -   | ms   |          |
| tDOr   | -   | 100 | ns   | (NOTE 2) |
| tDOf   | -   | 100 | ns   |          |
| tDLCr  | 0   | -   | ms   |          |
| tDLCf  | 0   | -   | ms   |          |
| tDLCs  | 20  | -   | ms   |          |

NOTE 1 PLEASE KEEP THE SPECIFIED SEQUENCE BECAUSE WRONG SEQUENCE MAY CAUSE PERMANENT DAMAGE TO THE LCD PANEL.

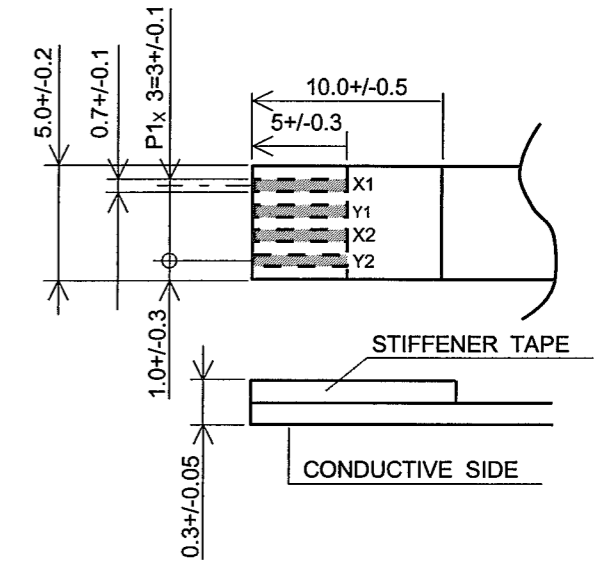
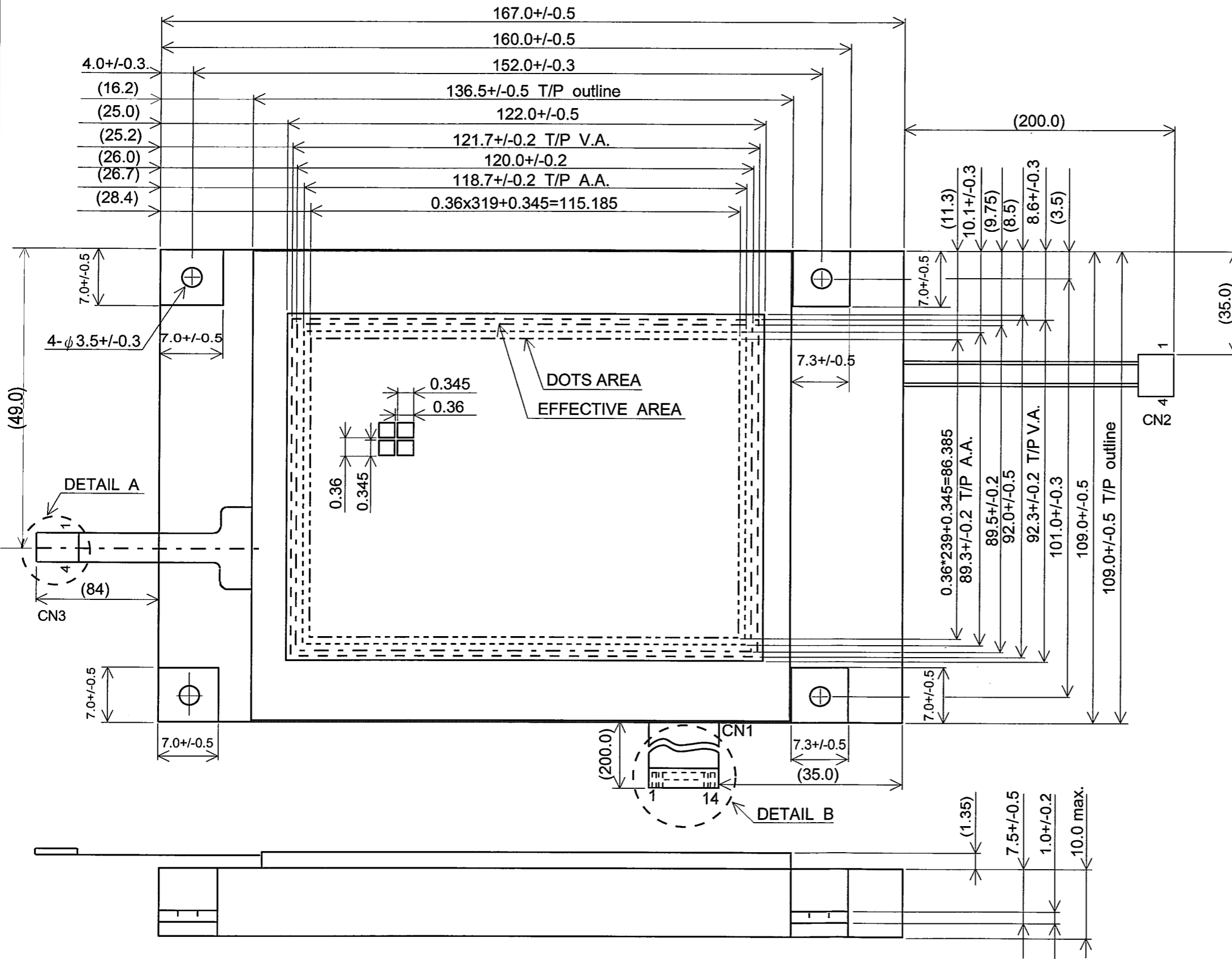
NOTE 2 HITACHI RECOMMENDS YOU TO USE DISP.OFF FUNCTION. DISPLAY QUALITY MAY DETERIORATE IF YOU DON'T USE DISP.OFF FUNCTION.

### 8.4 POWER SUPPLY FOR LCM (EXAMPLE)

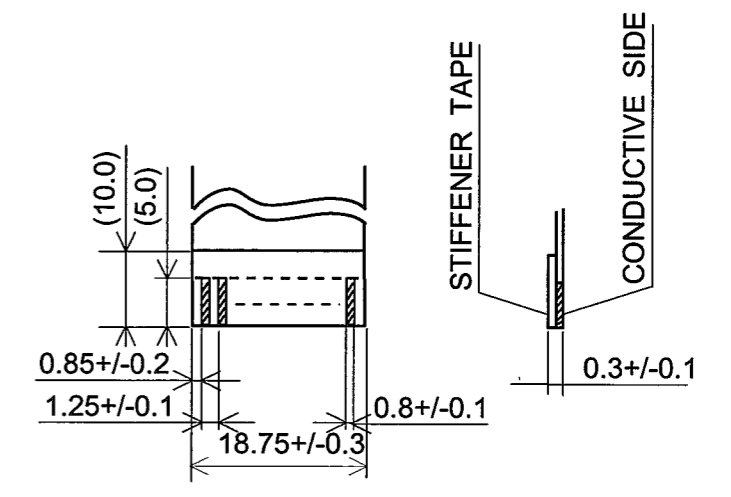


NOTE (1) : VR : 10kΩ

9.DIMENSIONAL OUTLINE  
9.1DIMENSIONAL OUTLINE

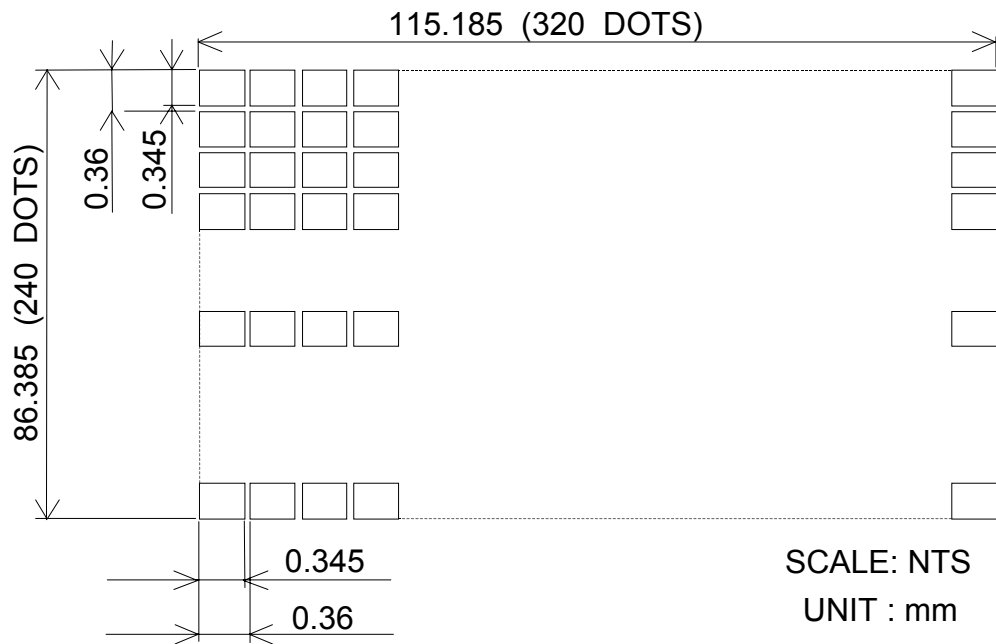


DETAIL A



DETAIL B

## 9.2 DISPLAY PATTERN



MEASUREMENT TOLERANCE : +/-0.1

## 9.3 INTERFACE PIN CONNECTION

FFC : PITCH 1.25mm 14 PINS

| INTERFACE | PIN No. | SIGNAL | LEVEL    | FUNCTION |                              |
|-----------|---------|--------|----------|----------|------------------------------|
| LCM       | CN1     | 1      | D0       | H/L      | DISPLAY DATA                 |
|           |         | 2      | D1       |          |                              |
|           |         | 3      | D2       |          |                              |
|           |         | 4      | D3       |          |                              |
|           |         | 5      | DISP.OFF | H/L      | H : ON / L : OFF             |
|           |         | 6      | FRAME    | H        | FIRST LINE MARKER            |
|           |         | 7      | N.C      | -        | -                            |
|           |         | 8      | LOAD     | H→L      | DATA LATCH                   |
|           |         | 9      | CP       | H→L      | DATA SHIFT                   |
|           |         | 10     | VDD      | -        | POWER SUPPLY FOR LOGIC       |
|           |         | 11     | VSS      | -        | GND                          |
|           |         | 12     | VEE      | -        | POWER SUPPLY FOR LC          |
|           |         | 13     | V0       | -        | OPERATING VOLTAGE LC DRIVING |
|           |         | 14     | VSS      | -        | GND                          |

RECOMMEND SUITABLE CONNECTOR : (MOLEX) 5597-14APB

| INTERFACE | PIN No. | SIGNAL | LEVEL | FUNCTION             |
|-----------|---------|--------|-------|----------------------|
| CFL       | CN2     | 1      | VCFL  | POWER SUPPLY FOR CFL |
|           |         | 2      | N.C   | -                    |
|           |         | 3      | N.C   | -                    |
|           |         | 4      | VCFL  | CFL GND              |

CFL I/F : J.A.E./ IL - G - 4S -S3C2

FPC : PITCH 1.0mm 4PINS

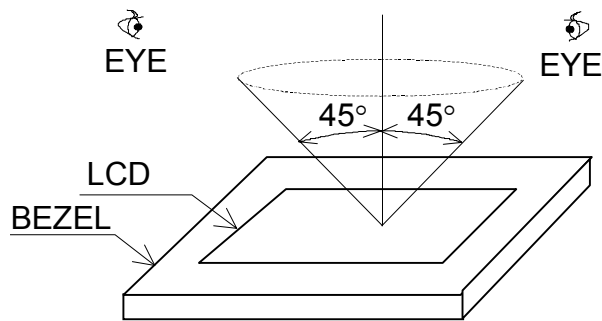
| INTERFACE | PIN No. | SIGNAL | FUNCTION                               |
|-----------|---------|--------|--|
| T/P       | CN3     | 1      | X1 ANALOG SIGNAL FROM DIGITIZER RIGHT  |
|           |         | 2      | Y1 ANALOG SIGNAL FROM DIGITIZER UP     |
|           |         | 3      | X2 ANALOG SIGNAL FROM DIGITIZER LFET   |
|           |         | 4      | Y2 ANALOG SIGNAL FROM DIGITIZER BOTTOM |

RECOMMEND SUITABLE CONNECTOR : (HIROSE) FH12-10(4)SA-ISH

## 10. APPEARANCE STANDARD

10.1 APPEARANCE INSPECTION CONDITIONS (IN THE EFFECTIVE VIEWING AREA) VISUAL INSPECTION SHOULD BE UNDER THE FOLLOWING CONDITION.

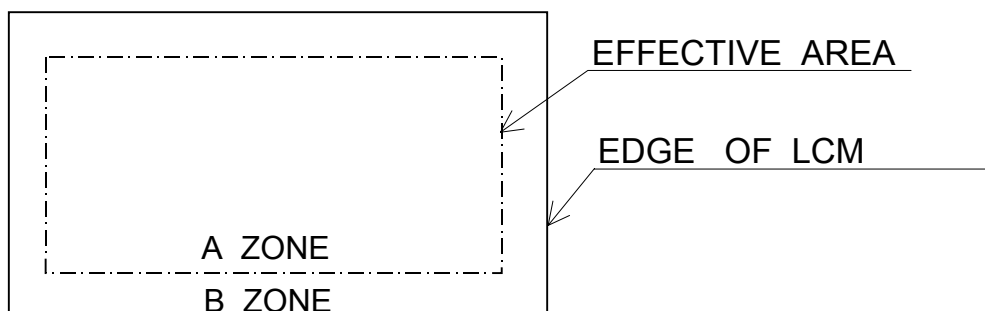
- (1) IN THE DARK ROOM.
- (2) WITH CFL PANEL LIGHTED WITH PRESCRIBED INVERTER CIRCUIT.
- (3) WITH EYE TO LCD DISTANCE IS 25CM.
- (4) VIEWING ANGLE WITHIN 45 DEGREES FROM THE PERPENDICULAR TO THE CENTER LCD.



### 10.2 DEFINITION OF EACH ZONE

A ZONE : WITHIN THE VIEWING AREA SPECIFIED AT PAGE 9-1/2 OF THIS DOCUMENT.

B ZONE : AREA BETWEEN THE EDGE LINE OF LCD GLASS AND THE VIEWING AREALINE SPECIFIED AT PAGE 9-1/2 OF THIS DOCUMENT.



### 10.3 APPEARENCE SPECIFICATION

\*) IF A PROBLEM OCCURS IN RESPECT TO ANY OF THESE ITEMS , RESPONSIBLES OF BOTH PARTIES (CUSTOMER AND HITACHI) WILL DISCUSS IN MORE DETAIL.

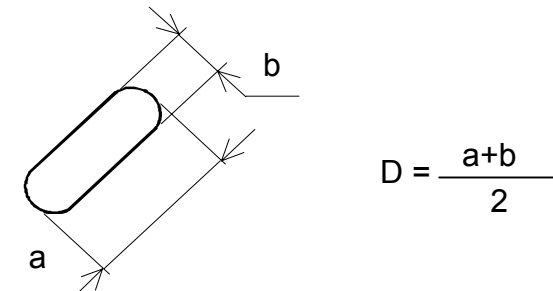
| No.                                | ITEM  | CRITERIA  |                                 |                              | A | B |   |
|------------------------------------|---|---|---------------------------------|------------------------------|---|---|---|
| L<br>C<br>D                        | SCRATCHES                                     | DISTINGUISHED ONE IS NOT ACCEPTABLE<br>(TO BE JUDGED BY HITACHI LIMIT SAMPLE) |                                 |                              | * | - |   |
|                                    | DENT  | SAME AS ABOVE   |                                 |                              | * | - |   |
|                                    | WRINKLES IN POLARIZER                         | SAME AS ABOVE   |                                 |                              | * | - |   |
|                                    | BUBBLES                                       | AVERAGE DIAMETER<br>D(mm)   |                                 | MAXIMUM NUMBER<br>ACCEPTABLE |   | 0 | - |
|                                    |   | D<=0.2  |                                 | IGNORE                       |   |   |   |
|                                    |   | 0.2<D<=0.3  |                                 | 12                           |   |   |   |
|                                    |   | 0.3<D<=0.5  |                                 | 3                            |   |   |   |
|                                    |   | 0.5<D   |                                 | NONE                         |   |   |   |
|                                    | STAINS,<br>FOREIGN<br>MATERIALS,<br>DARK SPOT | FILAMENTOUS   |                                 |                              | 0 | - |   |
|                                    |   | LENGTH<br>L(mm)   | WIDTH<br>W(mm)                  | MAXIMUM NUMBER<br>ACCEPTABLE |   |   |   |
|                                    |   | L<=2.0  | W<=0.03                         | IGNORE                       |   |   |   |
|                                    |   | L<=3.0  | 0.03<W<=0.05                    | 6                            |   |   |   |
|                                    |   | -   | 0.05<W                          | JUDGED BY<br>"ROUND" SHAPE   |   |   |   |
|                                    |   | ROUND   |                                 |                              | 0 | - |   |
|                                    |   | AVERAGE DIA-<br>METER D(mm)   | MAXIMUM NUMBER<br>ACCEPTABLE    | MINIMUM<br>SIZE              |   |   |   |
|                                    |   | 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         |   |                                 | 0                            | 0 |   |   |
|                                    | COLOR TONE                                    | TO BE JUDGED BY HITACHI LIMIT SAMPLE  |                                 |                              | 0 | - |   |
|                                    | COLOR UNIFORMITY                              | SAME AS ABOVE   |                                 |                              | 0 | - |   |
|                                    | PINHOLE                                       | AVERAGE DIAMETER<br>D(mm)   |                                 | MAXIMUM NUMBER<br>ACCEPTABLE |   | 0 | - |
|                                    |   | D<=0.15   |                                 | IGNORE                       |   |   |   |
|                                    |   | 0.15<D<=0.3   |                                 | 10                           |   |   |   |
|                                    |   | C<=0.015  |                                 | IGNORE                       |   |   |   |
| CONTRAST<br>IRREGULARITY<br>(SPOT) | AVERAGE<br>DIAMETER<br>D(mm)                  | CONTRAST  | MAXIMUM<br>NUMBER<br>ACCEPTABLE | MINIMUM<br>SIZE              | 0 | - |   |
|                                    | D<=0.25                                       | TO BE<br>JUDGED BY<br>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<br>C<br>D | CONTRAST<br>IRREGULARITY<br>(LINE)<br>(FILAMENTOUS) | WIDTH<br>D(mm)                   | LENGTH<br>L(mm) | MAXIMUM<br>NUMBER<br>ACCEPTABLE | MINIMUM<br>SIZE | 0 | - |
|             |   | $W \leq 0.25$                    | $L \leq 1.2$    | 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 |                 |                                 |                 | 0 | - |

| No.                        | ITEM                     | CRITERIA           |               |          |
|----------------------------|--------------------------|--------------------|---------------|----------|
| C<br>F<br>L<br>B<br>/<br>L | DARK SPOTS, WHITE SPOTS  | $D \leq 0.4$       |               | IGNORE   |
|                            |                          | $D > 0.4$          |               | NONE     |
|                            | FOREIGN MATERIALS (SPOT) | $W \leq 0.2$       | $L < 2.5$     | $\leq 1$ |
|                            |                          | $W \leq 0.2$       | $L > 2.5$     | NONE     |
|                            | FOREIGN MATERIALS (LINE) | $W > 0.2$          |               | NONE     |
|                            |                          | $W \leq 0.1$       |               | IGNORE   |
|                            | SCRATCHES                | $0.1 < W \leq 0.2$ | $L \leq 11.0$ | $\leq 1$ |
|                            |                          | $0.1 < W \leq 0.2$ | $L > 11.0$    | NONE     |
|                            |                          | $W < 0.2$          |               | NONE     |
|                            |                          |                    |               |          |

NOTE

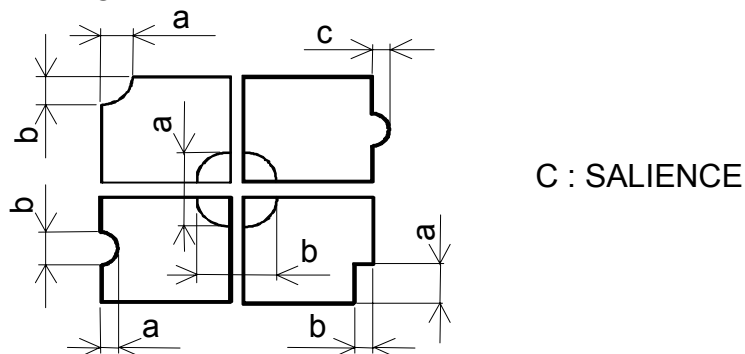
(1) DEFINITION OF AVERAGE DIAMETER D



(2) DEFINITION OF LENGTH L AND WIDTH W



(3) DEFINITION OF PINHOLE



## 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 (5V+/-0.5%).

IF ABOVE SEQUENCE IS NOT KEPT, C-MOS LSIS 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 DEGREE 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 POLERIZERS ARE MADE OF ORGANIC SUBSTANCES WHICH WILL BE DETERIORATED BY A CHEMICAL REACTION WITH SUCH CHEMICALS AS ACETONE, TULUENE, ETHANOLE AND ISOPROPYLALCOHOL. 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 CHAMICALS 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 ADHERANCE MAY CAUSE DEFORMATION OR FADED COLOR ON THE SPOT.
- (6) FOGY 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 FORM 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. (THERE ARE SOME COSMETICS 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 LCDS 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 LCDS 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 LCDS SHOW DARK BULL COLOR IN THEM. HOWEVER THOSE PHENOMENA DO NOT MEAN MALFUNCTION OR OUT OF ORDER WITH LCDS 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 DEGREE C 50%RH OR LESS IS REQUIRED.

## 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 ARE RECOMMENDED.

- (1) STORAGE IN A POLYETHYLENE BAG WITH THE OPENING SEALED SO AS NOT TO ENTER FRESH AIR OUTSIDE IN IT , AND WITH NO DESICCANT.
- (2) PLACING IN A DARK PLACE WHERE NEITHER EXPOSURE TO DIRECT SUNLIGHT NOR LIGHT IS , KEEPING TEMPERATURE IN THE RANGE FROM 0 DEGREE C TO 35 DEGREE C.
- (3) STORAGE WITH NO TOUCH ON POLARIZER SURFACE BY ANYTHING ELSE. (IT IS RECOMMENDED TO STORE THEM AS THEY HAVE BEEN CONTAINED IN THE INNER CONTAINER AT THE TIME OF DELIVERY FROM US.)

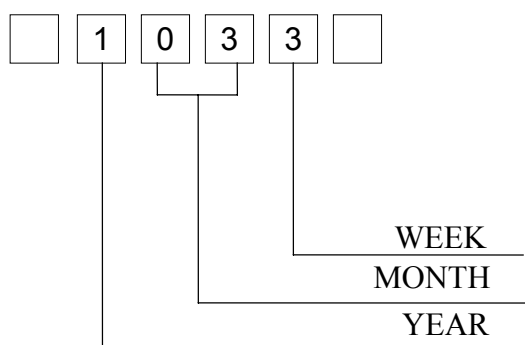
## 11.7 SAFETY

- (1) IT IS RECOMMENDABLE TO CRASH DAMAGED OR UNNECESSARY LCDS 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 DAMAGED GLASS CELL COMES IN CONTACT WITH YOUR HANDS , PLEASE WASH IT OFF WELL WITH SOAP AND WATER.

## 12. DESIGNATION OF LOT MARK

LOT MARK

LOT MARK IS CONSISTED OF 4 DIGIT NUMBER.



| YEAR | FIGURE IN LOT MARK |
|------|--------------------|
| 2001 | 1                  |
| 2002 | 2                  |
| 2003 | 3                  |
| 2004 | 4                  |
| 2005 | 5                  |

NOTE 1. SOME PRODUCTS HAVE ALPHABET AT THE END OR THE FIRST.

| MONTH | FIGURE IN LOT MARK | MONTH | FIGURE IN LOT MARK |
|-------|--------------------|-------|--------------------|
| JAN.  | 01                 | JULY. | 07                 |
| FEB.  | 02                 | AUG.  | 08                 |
| MAR.  | 03                 | SEPT. | 09                 |
| APR.  | 04                 | OCT.  | 10                 |
| MAY.  | 05                 | NOV.  | 11                 |
| JUNE. | 06                 | DEC.  | 12                 |

| WEEK (DAY IN CALENDAR) | FIGURE IN LOT MARK |
|------------------------|--------------------|
| 01~07                  | 1                  |
| 08~14                  | 2                  |
| 15~21                  | 3                  |
| 22~28                  | 4                  |
| 29~31                  | 5                  |

LOCATION OF LOT MARK : ON THE BACK SIDE OF LCM

1 0 3 3 T

T : MADE IN TAIWAN.

### 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. JUDGEMENT 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. DIGITIZER TECHNICAL SPECIFICATION

### 14.1 RATINGS

#### 14.1.1 ABSOLUTE MAXIMUM RATINGS

| ITEM                     | SPECIFICATION      | COMMENT                 |
|--------------------------|--------------------|-------------------------|
| OPERATING VOLTAGE        | 7V                 | WITHOUT<br>CONDENSATION |
| CONTACT CURRENT          | 20mA               |                         |
| OPERATING TEMPERATURE ** | 0~50°C 80%RH MAX   |                         |
| STORAGE TEMPERATURE **   | -20~70°C 90%RH MAX |                         |

#### 14.1.2 OPERATING CONDITIONS

| ITEM              | SPECIFICATION |
|-------------------|---------------|
| OPERATING VOLTAGE | 5VDC          |
| CONTACT CURRENT   | 10 ~ 20 mA    |
| ACTUATION FORCE   | TBD           |

### 14.2 MECHANICAL STRENGTH

#### 14.2.1 INPUT METHOD & ACTUATION FORCE

| INPUT METHOD | ACTUATION FORCE | COMMENT              |
|--------------|-----------------|----------------------|
| PEN          | 80g MAX         | R0.8, POLYACETAL PEN |
| FINGER       | 100MAX          | R8, SILICONE RUBBER  |

#### 14.2.2 SURFACE HARDNESS

2H

### 14.3 OPTICAL CHARACTERISTICS

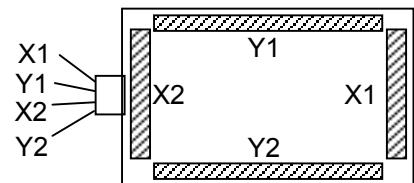
14.3.1 TRANSPARENCY : 76%.min

14.3.2 WAVE LENGTH : 450 ~ 700nm

### 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 CAPACITANCE

TBD

#### 14.4.5 RESISTANCE FACTOR

| TERMINAL |         |
|----------|---------|
| X1-X2    | 10% max |
| Y1-Y2    | 10% max |

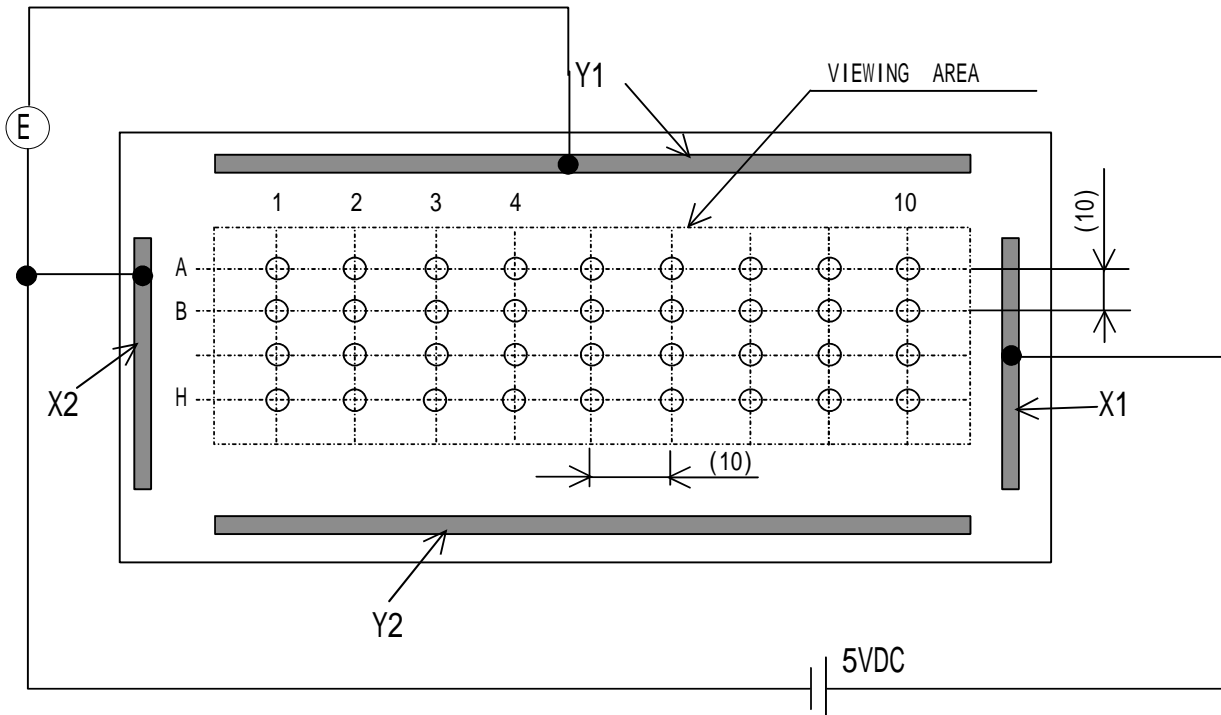
### 14.4.4 LINEARITY

#### (1) LINEARITY

LINEARITY DEVIATION : 2% max

#### (2) TESTING CIRCUIT

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

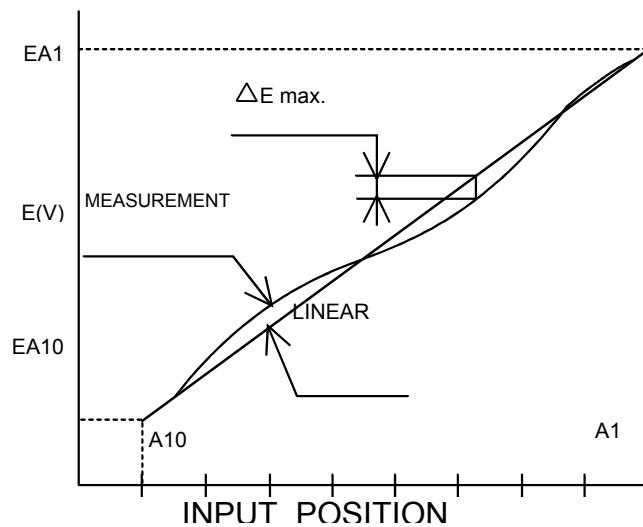


(b) X AXIS LINEARITY METHOD , VY1 - VY2=5V , VOUT=VX1

#### (3) CALCULATION

(a) Y AXIS LINEARITY

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



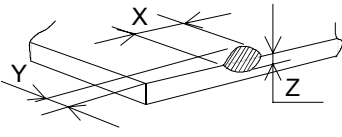
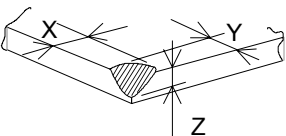
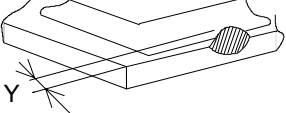
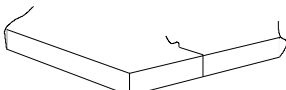
## 14.5 ENVIRONMENTAL TESTING

| ITEM                     | CONDITIONS  | CRITERIA   |
|--------------------------|---|--|
| HIGH TEMPERATURE STORAGE | 60°C : 120hrs & 25°C : 24hrs  | AFTER TESTING MUST TO MEET THE SPECIFICATIONS OF THE ELECTRICAL, MECHANICAL & OPTICAL CHARACTERISTICS. |
| LOW TEMPERATURE STORAGE  | -20°C : 120hrs & 25°C : 24hrs   |  |
| TEMPERATURE CYCLE        | -20°C ←→ 70°C : 10 CYCLES WITHIN (30) (60) (30) : MINUTES & 25°C : 24hrs (WITHOUT CONDENSATION) |  |
| HUMIDITY STORAGE         | 60°C , 90%RH. 120hrs  |  |
| DURABILITY FOR KEYSTROKE | 150g , R8, HS40 SILICON RUBBER (SPEED : 330mm/SEC)<br><br>: 1000000 ACTIVATIONS                 |  |

## 14.6 APPEARANCE SPECIFICATION

| No.         | ITEM                     | CRITERIA                  |                              |                                 | A | B |
|-------------|--------------------------|---------------------------|------------------------------|---------------------------------|---|---|
| T<br>/<br>P | Hair Flaws               | FILAMENTOUS               |                              |                                 | O | - |
|             |                          | LENGTH<br>L(mm)           | WIDTH<br>W(mm)               | MAXIMUM<br>NUMBER<br>ACCEPTABLE |   |   |
|             |                          | L<=12                     | W<=0.05                      | IGNORE                          |   |   |
|             |                          | L<=5                      | 0.05<W<=0.1                  | 3                               |   |   |
|             |                          | L>2                       | 0.1 <W                       | NONE                            |   |   |
|             | DOT-SHAPED<br>IMPURITIES | AVERAGE DIAMETER<br>D(mm) | MAXIMUM NUMBER<br>ACCEPTABLE |                                 | O | - |
|             |                          | D<=0.1                    | IGNORE                       |                                 |   |   |
|             |                          | 0.1<D<=0.3                | 5                            |                                 |   |   |
|             |                          | 0.3<D                     | NONE                         |                                 |   |   |
|             | SCRATCH                  | FILAMENTOUS               |                              |                                 | O | - |
|             |                          | LENGTH<br>L(mm)           | WIDTH<br>W(mm)               | MAXIMUM<br>NUMBER<br>ACCEPTABLE |   |   |
|             |                          | L<=12                     | W<=0.05                      | IGNORE                          |   |   |
|             |                          | L<=12                     | 0.05<W<=0.1                  | 5                               |   |   |
|             |                          | L>12                      | 0.1<W                        | NONE                            |   |   |

### 14.6.1 GLASS INDENTATION

| ITEM                       | SPECIFICATIONS   |          |   |   |            |            |          |
|----------------------------|--|----------|---|---|------------|------------|----------|
| COMMON INDENTATION         |  <table border="1" data-bbox="1082 235 1372 336"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td><math>\leq 5.0</math></td> <td><math>\leq 3.0</math></td> <td><math>\leq t</math></td> </tr> </table> <p>BUT, INDENTATION CAN NOT INCLUDING SEAL AREA.<br/>t: GLASS THICKNESS.</p> | X        | Y | Z | $\leq 5.0$ | $\leq 3.0$ | $\leq t$ |
| X                          | Y  | Z        |   |   |            |            |          |
| $\leq 5.0$                 | $\leq 3.0$   | $\leq t$ |   |   |            |            |          |
| CORNER BROKEN              |  <table border="1" data-bbox="1104 555 1401 656"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td><math>\leq 2.0</math></td> <td><math>\leq 5.0</math></td> <td><math>\leq t</math></td> </tr> </table> <p>BUT, INDENTATION CAN NOT INCLUDING SEAL AREA.</p>                         | X        | Y | Z | $\leq 2.0$ | $\leq 5.0$ | $\leq t$ |
| X                          | Y  | Z        |   |   |            |            |          |
| $\leq 2.0$                 | $\leq 5.0$   | $\leq t$ |   |   |            |            |          |
| INDENTATION WITHIN PATTERN |  <p><math>Y \leq 1</math> IS IGNORE.<br/>BUT, MUST TO MEET THE SPECIFICATION OF CONDUCTING PATTERN INDENTATION.</p>   |          |   |   |            |            |          |
| PROCEEDING CRACK           |  <p>NONE</p>  |          |   |   |            |            |          |

### 14.6.2 BLISTERING (PUFFNES): 0.4mm max

