

# HITACHI

KAOHSIUNG HITACHI  
ELECTRONICS CO.,LTD  
P.O. BOX 26-27  
2,13TH EAST ST. K.E.P.Z.  
KAOHSIUNG TAIWAN R.O.C.  
TEL:(07) 821-5811(7 LINE)  
FAX:(07) 821-5815

FOR MESSRS : \_\_\_\_\_

DATE : Aug.07,2003

## CUSTOMER'S ACCEPTANCE SPECIFICATIONS

### TX16D11VM2CBA

#### CONTENTS

| No. | ITEM                       | SHEET No.                   | PAGE        |
|-----|----------------------------|-----------------------------|-------------|
| 1   | COVER                      | 7B64PS 2701-TX16D11VM2CBA-1 | 1-1/1       |
| 2   | RECORD OF REVISION         | 7B64PS 2702-TX16D11VM2CBA-1 | 2-1/1       |
| 3   | GENERAL DATA               | 7B64PS 2703-TX16D11VM2CBA-1 | 3-1/1       |
| 4   | ABSOLUTE MAXIMUM RATINGS   | 7B64PS 2704-TX16D11VM2CBA-1 | 4-1/1       |
| 5   | ELECTRICAL CHARACTERISTICS | 7B64PS 2705-TX16D11VM2CBA-1 | 5-1/1       |
| 6   | OPTICAL CHARACTERISTICS    | 7B64PS 2706-TX16D11VM2CBA-1 | 6-1/3~3/3   |
| 7   | BLOCK DIAGRAM              | 7B64PS 2707-TX16D11VM2CBA-1 | 7-1/1       |
| 8   | INTERFACE TIMING CHART     | 7B64PS 2708-TX16D11VM2CBA-1 | 8-1/6~6/6   |
| 9   | DIMENSIONAL OUTLINE        | 7B63PS 2709-TX16D11VM2CBA-1 | 9-1/2~9-2/2 |
| 10  | APPEARANCE STANDARD        | 7B64PS 2710-TX16D11VM2CBA-1 | 10-1/4~4/4  |
| 11  | PRECAUTION IN DESIGN       | 7B64PS 2711-TX16D11VM2CBA-1 | 11-1/2~2/2  |
| 12  | DESIGNATION OF LOT MARK    | 7B64PS 2712-TX16D11VM2CBA-1 | 12-1/1      |
| 13  | PRECAUTION FOR USE         | 7B64PS 2713-TX16D11VM2CBA-1 | 13-1/1      |

\*When product will be discontinued, customer will be informed by HITACHI with twelve months prior announcement.

ACCEPTED BY: \_\_\_\_\_

PROPOSED BY: *H. Ojawa*

RECORD OF REVISION

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

### 3.GENERAL DATA

|                             |  |
|-----------------------------|--|
| (1) Part Name               | TX16D11VM2CBA  |
| (2) Module Dimensions       | 173.0(W)mm x 70.0(H)mm x (7.0)max.(D)mm              |
| (3) LCD Active Area         | 148.8(W)mm x 53.76(H)mm                              |
| (4) Dot Pitch               | 0.0775(W)mm x 3(R,G,B)(W) x 0.224(H)mm               |
| (5) Resolution              | 640 x 3(R,G,B))(W) x 240(H) dots                     |
| (6) Color Pixel Arrangement | R,G,B Vertical stripe                                |
| (7) LCD Type                | Transmissive Color TFT LCD (Normally White)          |
| (8) Display Type            | Active Matrix  |
| (9) Number of Colors        | 262k Colors (R,G,B 6bit parallel)                    |
| (10) Backlight              | Cold Cathode Fluorescent Tube (CFL) x 1              |
| (11) Weight                 | (110)g   |
| (12) Interface              | 40pin (C-MOS)  |
| (13) Power Supply Voltage   | 3.3V only (Include Timing Controller and Power Unit) |

## 4. ABSOLUTE MAXIMUM RATINGS

### 4.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS OF LCD

VSS=0V

| ITEM                   | SYMBOL | MIN. | MAX.    | UNIT | COMMENT    |
|------------------------|--------|------|---------|------|------------|
| Power Supply for Logic | VDD    | -0.3 | 4.0     | V    |            |
| Input Voltage          | VI     | -0.2 | VDD+0.2 |      | (Note 1)   |
| Input Current          | II     | 0    | 1       | A    |            |
| Static Electricity     | VESD0  | -    | (±100)  | V    | (Note 2,3) |
|                        | VESD1  | -    | (±8)    | kV   | (Note 2,4) |

Note 1 : DTMG,DCLK,RD0~RD5,GD0~GD5,BD0~BD5.

Note 2 : 200pF-250Ω 25°C - 70%RH

Note 3 : Interface Pin Connector.

Note 4 : The surface of metal bezel and LCD panel .

### 4.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

| ITEM                | OPERATING      |                               | STORAGE        |  | COMMENT                      |
|---------------------|----------------|-------------------------------|----------------|--|------------------------------|
|                     | MIN.           | MAX.                          | MIN.           | MAX.                                     |                              |
| Ambient Temperature | 0°C            | 50°C                          | -20°C          | 60°C                                     | (Note 2,3,6)                 |
| Humidity            | (Note 1)       |                               | (Note 1)       |  | Without condensation         |
| Vibration           | -              | 4.9m/s <sup>2</sup><br>(0.5G) | -              | 19.6m/s <sup>2</sup><br>(2G)<br>(Note 5) | (Note 4)                     |
| Shock               | -              | 29.4m/s <sup>2</sup><br>(3G)  | -              | 490m/s <sup>2</sup><br>(50G)<br>(Note 5) | XYZ directions<br>(Note 7,8) |
| Corrosive Gas       | Not Acceptable |                               | Not Acceptable |  |                              |

Note 1 : Ta ≤ 40°C :85%RH max.

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

Note 2 : Ta at -20°C for 48h , at 60°C for 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 LCM will resume normal operation after finishing the test.

Note 6 : The response time will be slower as low temperature.

Note 7 : Pulse Width : 10ms

Note 8 : The module has no mounting hole.

It should be fixed by the way of sandwiching-like method. (Fig.1)

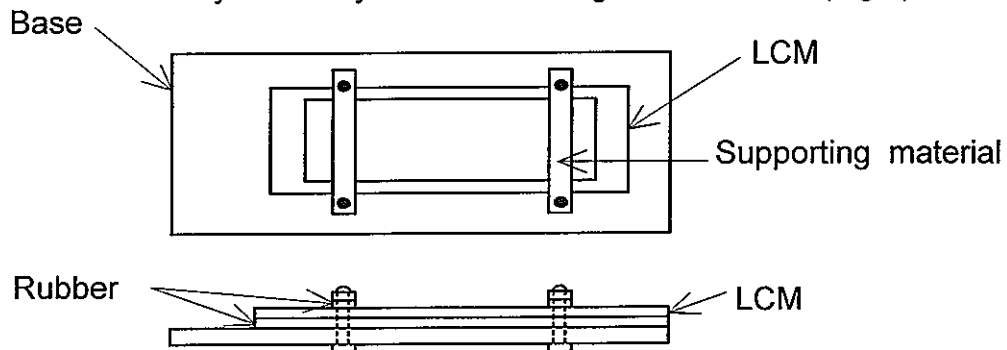


Fig.1

## 5. ELECTRICAL CHARACTERISTICS

### 5.1 ELECTRICAL CHARACTERISTICS OF LCD

Ta=25°C, VSS=0V

| ITEM                                | SYMBOL                     | CONDITION    | MIN.   | TYP.   | MAX.   | UNIT |
|-------------------------------------|----------------------------|--------------|--------|--------|--------|------|
| Power Supply Voltage                | VDD                        | -            | 3.0    | 3.3    | 3.6    | V    |
| Input Voltage for Logic<br>(Note 1) | VI                         | "H" level    | 2.0    | -      | VDD    | V    |
|                                     |                            | "L" level    | VSS    | -      | 0.8    |      |
| Power Supply Current<br>(Note 2)    | IDD for HVGA Display Mode  | VDD-VSS=3.3V | -      | (94)   | -      | mA   |
|                                     | IDD for VGA Display Mode   |              | -      | (110)  | -      |      |
| Vsync Frequency                     | fV                         | -            | (52)   | (60)   | (68)   | Hz   |
| Hsync Frequency                     | fH for HVGA Display Mode   | -            | (12.8) | (15.1) | (36.1) | kHz  |
|                                     | fH for VGA Display Mode    | -            | (25.3) | (29.5) | (36.1) |      |
| DCLK Frequency                      | fCLK for HVGA Display Mode | -            | (8.7)  | (10.7) | (26.7) | MHz  |
|                                     | fCLK for VGA Display Mode  | -            | (17.2) | (20.9) | (26.7) |      |

Note 1 : DTMG, DCLK, RD0~RD5, GD0~GD5, BD0~BD5.

Note 2 : fV=60Hz, Ta=25°C, Pattern used as display pattern : All Black.

Note 3 : Need to make sure of flickering and rippling of display when setting the frame frequency in your set.

### 5.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

| ITEM                         | SYMBOL         | MIN.   | TYP.  | MAX.  | UNIT | NOTE    |
|------------------------------|----------------|--------|-------|-------|------|---------|
| Lamp Voltage                 | VL             | -      | (450) | -     | Vrms | Ta=25°C |
| Frequency                    | fL             | -      | (55)  | -     | kHz  |         |
| Lamp Current (1Lamp)(Note 7) | IL             | (2.0)  | (5.0) | (7.0) | mA   | Ta=25°C |
| Starting Discharge Voltage   | VS<br>(Note 2) | (1300) | -     | -     | Vrms | Ta=5°C  |

Note 1 : Please design your lamp driving circuit (inverter) based on the above specifications, and inform HITACHI about it.

Note 2 : Starting discharge voltage is increased when LCM is operating under low temperature.

Please check the characteristics of your inverter before applying to your set.

Note 3 : Average life time of CFL will be decreased when LCM is operating under low temperature.

Note 4 : Under lower driving frequency of an inverter, a certain Backlight system (CFL & CFL reflection sheet) may generate a sound noise. Before designing the inverter, please consider the driving frequency and noise.

Note 5 : When IL is over 7.0mA, it may cause uneven contrast near CFL location, due to heat dispersion form CFL.

Note 6 : We recommend to equip protection circuit (To stop output) which works under abnormal operation to the inverter for CFL.

## 6. OPTICAL CHARACTERISTICS

### 6.1 OPTICAL CHARACTERISTICS OF LCD

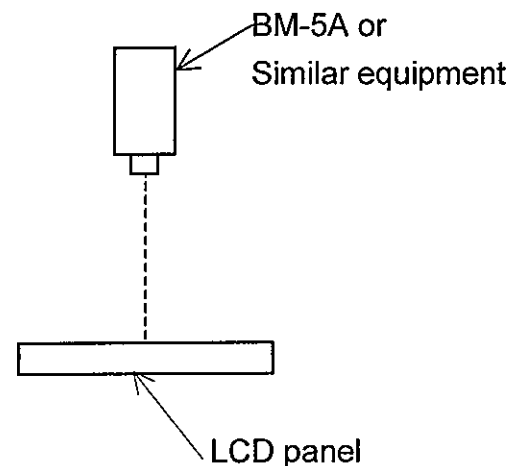
Ta=25°C (Backlight on)

| ITEM                          | SYMBOL      | CONDITION                      | MIN.                           | TYP.  | MAX.   | UNIT | NOTE |
|-------------------------------|-------------|--------------------------------|--------------------------------|-------|--------|------|------|
| Viewing Area                  | $\theta x$  | $\phi=0^\circ, K \geq 5.0$     | -                              | (60)  | -      | deg  | 1~5  |
|                               | $\theta x'$ | $\phi=180^\circ, K \geq 5.0$   |                                | (60)  |        | deg  | 1~5  |
|                               | $\theta y$  | $\phi=90^\circ, K \geq 5.0$    |                                | (45)  |        | deg  | 1~5  |
|                               | $\theta y'$ | $\phi=270^\circ, K \geq 5.0$   | -                              | (60)  | -      | deg  | 1~5  |
| Contrast Ratio                | K           | $\phi=0^\circ, \theta=0^\circ$ | (100)                          | (200) | -      | -    | 5    |
| Response Time (rise+fall)     | tr+tf       | $\phi=0^\circ, \theta=0^\circ$ | -                              | (45)  | -      | ms   | 6    |
| Color Tone<br>(Primary Color) | Red         | x                              | $\phi=0^\circ, \theta=0^\circ$ | -     | (0.62) | -    | -    |
|                               |             | y                              |                                | -     | (0.34) | -    | -    |
|                               | Green       | x                              |                                | -     | (0.30) | -    | -    |
|                               |             | y                              |                                | -     | (0.59) | -    | -    |
|                               | Blue        | x                              |                                | -     | (0.14) | -    | -    |
|                               |             | y                              |                                | -     | (0.09) | -    | -    |
|                               | White       | x                              |                                | -     | (0.29) | -    | -    |
|                               |             | y                              |                                | -     | (0.31) | -    | -    |

(Measurement condition : HITACHI standard)  
(Note 3~6) : See next page.

Note 1 : Driving Condition  
Display Pattern : White Raster  
ICFL Current : (5)mA

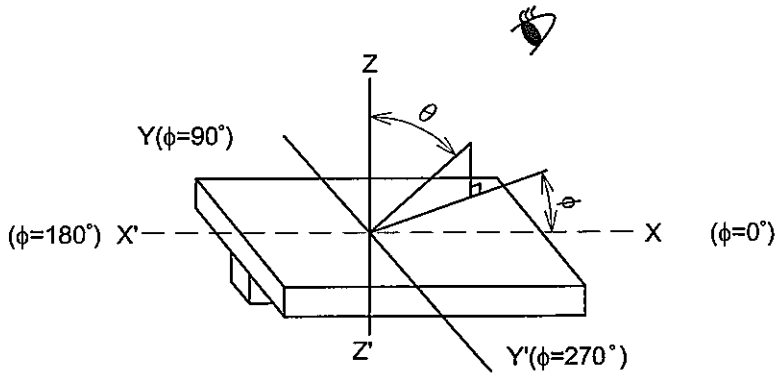
Note 2 : Measurement Condition  
(Transmittance)



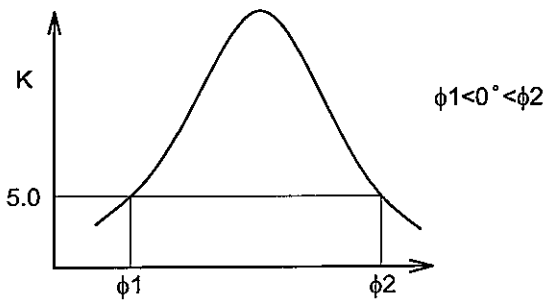
Note 3 : Definition of  $\theta$  and  $\phi$   
 (Normal)  
 Viewing direction

Note 5 : Definition of contrast "K"

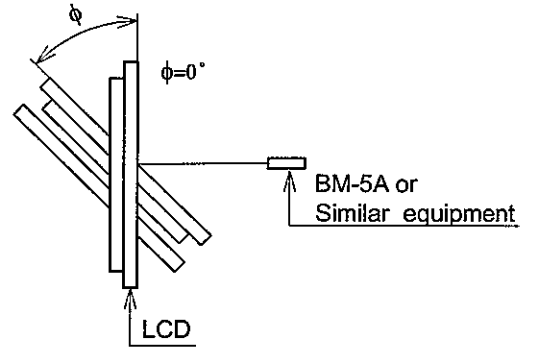
$$K = \frac{\text{White Brightness}}{\text{Black Brightness}}$$



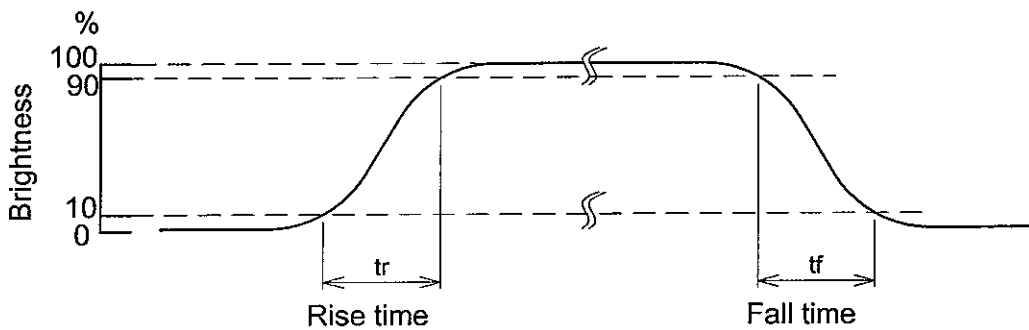
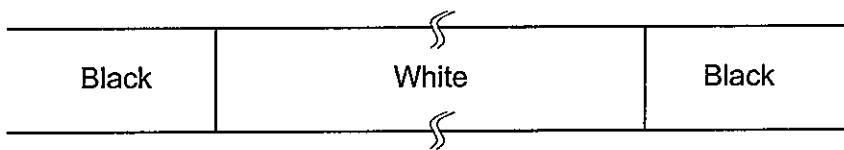
Note 4 : Definition of Viewing angle  $\phi_1$  and  $\phi_2$



Contrast ratio "K" vs Viewing angle " $\phi$ "



Note 6 : Definition optical response time



## 6.2 OPTICAL CHARACTERISTICS OF BACKLIGHT

| ITEM                  | MIN. | TYP.  | MAX.  | UNIT              | NOTE                            |
|-----------------------|------|-------|-------|-------------------|---------------------------------|
| Brightness            | -    | (250) | -     | cd/m <sup>2</sup> | IL=(5)mA (Note 1,2)             |
| Rise Time             | -    | (3)   | -     | Minute            | IL=(5)mA<br>Brightness 80%      |
| Brightness Uniformity | -    | -     | (±25) | %                 | Under mentioned<br>(Note 1,3,4) |

(Measurement condition : HITACHI standard)

CFL: 0h operation, Ta=25°C

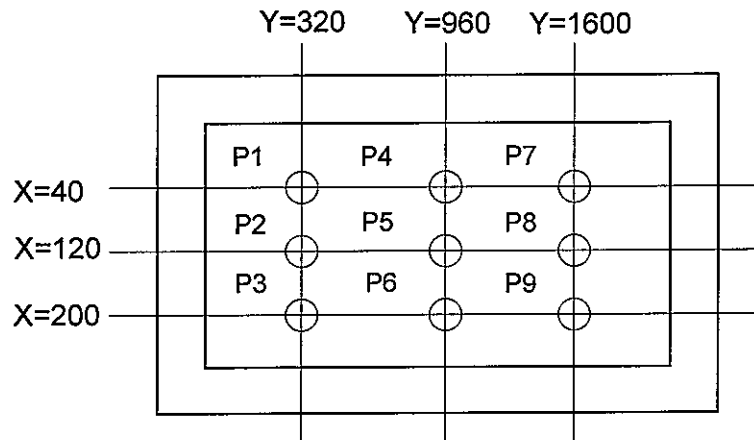
Display data should all be "ON"

Note 1 : Measurement after 10 minutes from CFL operating.

Average value of 9 points (Note 3)

Note 2 : Brightness control : 100%.

Note 3 : Measurement of the following 9 places on the display.

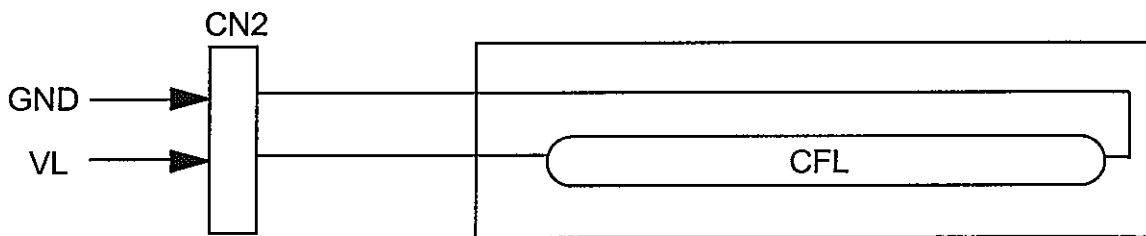
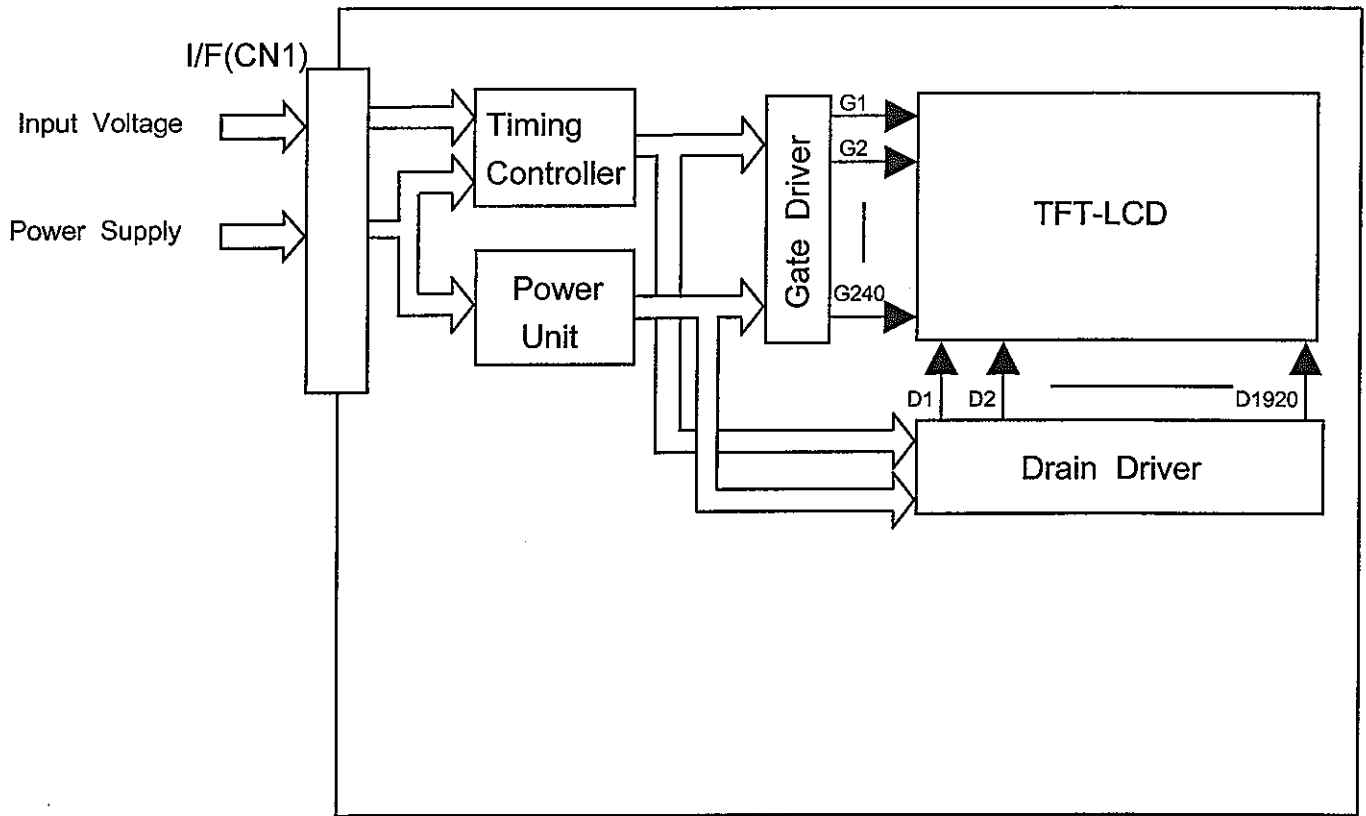


Note 4 : Definition of the brightness tolerance.

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



# 7.BLOCK DIAGRAM



## 8.INTERFACE TIMING

### 8.1.1 INTERFACE TIMING FOR HVGA DISPLAY MODE

| ITEM  |                        | MIN. | TYP.  | MAX.  | UNIT | SYMBOL                           | REMARKS       |
|-------|------------------------|------|-------|-------|------|----------------------------------|---------------|
| DCLK  | Cycle time             | 37.5 | (94)  | 114.9 | ns   | tCLK                             |               |
|       | Low level Width        | 15   | -     | -     |      | twCL                             |               |
|       | High level Width       | 15   | -     | -     |      | twCH                             |               |
|       | Rise time              | -    | -     | 25    |      | trCLK                            |               |
|       | Fall time              | -    | -     | 25    |      | tfCLK                            |               |
|       | Duty                   | 0.45 | 0.5   | 0.55  | -    | D                                | D= tCLKL/ CLK |
| Hsync | Set up time            | 5    | -     | -     | ns   | tSH                              | for DCLK      |
|       | Hold time              | 10   | -     | -     |      | tHH                              |               |
|       | Cycle                  | 679  | (709) | 739   | tCLK | tHP                              |               |
|       | Valid width            | 4    | 5     | 5     |      | tWH                              |               |
|       | Rise/Fall time         | -    | -     | 30    | ns   | T <sub>Hr</sub> ,t <sub>Hf</sub> |               |
| Vsync | Set up                 | 0    | -     | -     | tCLK | tSV                              | for Hsync     |
|       | Hold                   | 2    | -     | -     |      | tHV                              |               |
|       | Cycle                  | 245  | (251) | 533   | tHP  | tVP                              |               |
|       | Valid width            | 2    | 2     | 2     |      | tWV                              |               |
|       | Rise/Fall time         | -    | -     | 50    | ns   | tVr,tVf                          |               |
| DTMG  | Set up time            | 5    | -     | -     | ns   | tSI                              | for DCLK      |
|       | Hold time              | 10   | -     | -     |      | tHI                              |               |
|       | Rise/Fall time         | -    | -     | 30    | ns   | T <sub>Ir</sub> ,t <sub>If</sub> |               |
|       | Horizontal back porch  | 24   | (37)  | 50    | tCLK | tHBP                             |               |
|       | Horizontal front porch | 15   | (32)  | 49    |      | tHFP                             |               |
|       | Vertical back porch    | 4    | (7)   | 196   | tHP  | tVBP                             |               |
|       | Vertical front porch   | 1    | (4)   | 97    |      | tVFP                             |               |
| Data  | Set up time            | 5    | -     | -     | ns   | tSD                              | for DCLK      |
|       | Hold time              | 10   | -     | -     |      | tHD                              |               |
|       | Rise/Fall time         | -    | -     | 25    | ns   | T <sub>Dr</sub> ,t <sub>Df</sub> |               |

Note : Vsync Cycle No. should be set to odd.

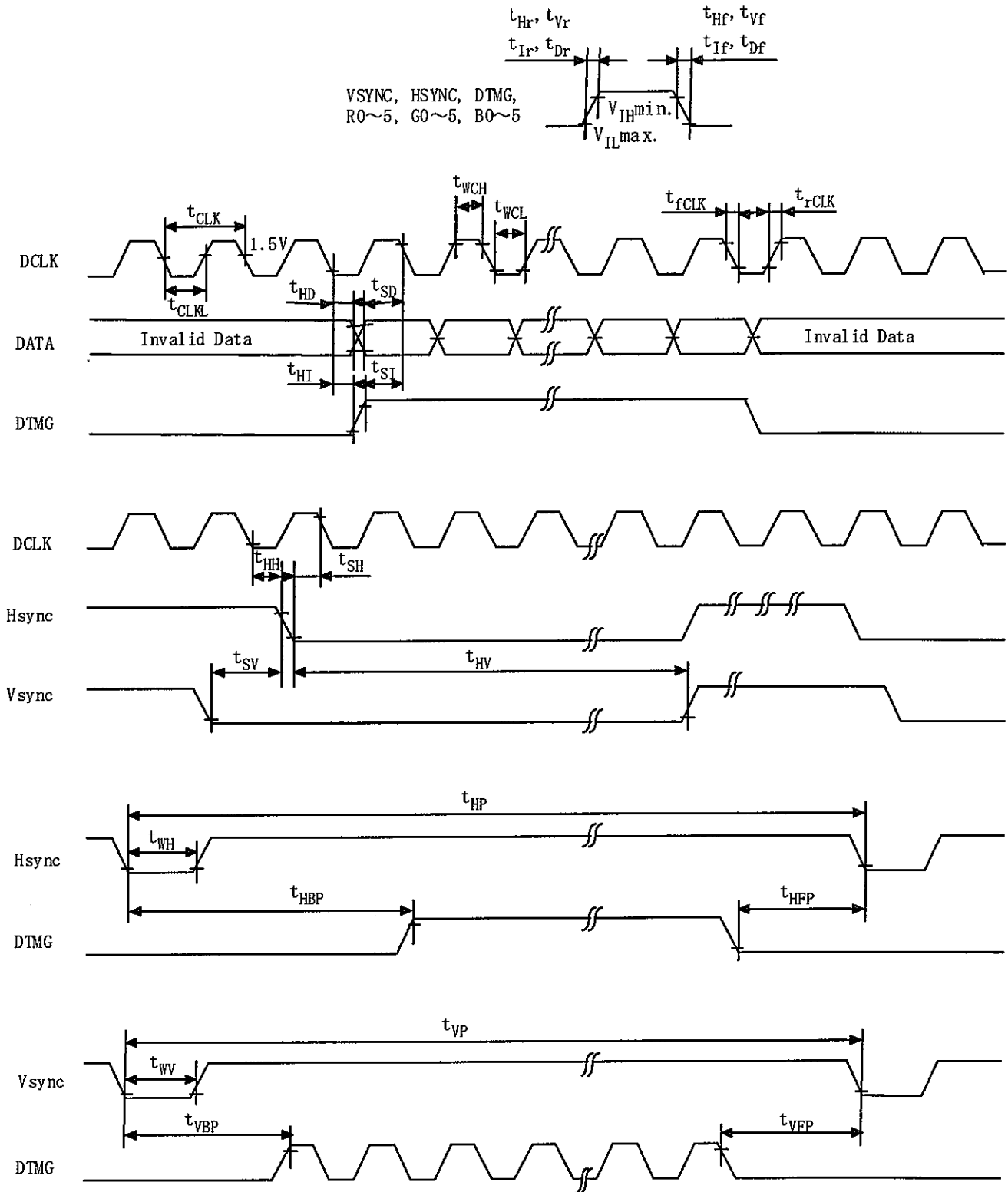
### 8.1.2 INTERFACE TIMING FOR VGA DISPLAY MODE

| ITEM  |                        | MIN. | TYP.   | MAX. | UNIT | SYMBOL                           | REMARKS       |
|-------|------------------------|------|--------|------|------|----------------------------------|---------------|
| DCLK  | Cycle time             | 37.4 | (47.8) | 58.1 | ns   | tCLK                             |               |
|       | Low level Width        | 15   | -      | -    |      | twCL                             |               |
|       | High level Width       | 15   | -      | -    |      | twCH                             |               |
|       | Rise time              | -    | -      | 25   |      | trCLK                            |               |
|       | Fall time              | -    | -      | 25   |      | tfCLK                            |               |
|       | Duty                   | 0.45 | 0.5    | 0.55 | -    | D                                | D= tCLKL/ CLK |
| Hsync | Set up time            | 5    | -      | -    | ns   | tSH                              | for DCLK      |
|       | Hold time              | 10   | -      | -    |      | tHH                              |               |
|       | Cycle                  | 679  | (709)  | 739  | tCLK | tHP                              |               |
|       | Valid width            | 4    | 5      | 5    |      | tWH                              |               |
|       | Rise/Fall time         | -    | -      | 30   | ns   | T <sub>HR</sub> ,t <sub>HF</sub> |               |
| Vsync | Set up                 | 0    | -      | -    | tCLK | tSV                              | for Hsync     |
|       | Hold                   | 2    | -      | -    |      | tHV                              |               |
|       | Cycle                  | 485  | (491)  | 533  | tHP  | tVP                              |               |
|       | Valid width            | 2    | 2      | 2    |      | tWV                              |               |
|       | Rise/Fall time         | -    | -      | 50   | ns   | t <sub>Vr</sub> ,t <sub>Vf</sub> |               |
| DTMG  | Set up time            | 5    | -      | -    | ns   | tSI                              | for DCLK      |
|       | Hold time              | 10   | -      | -    |      | tHI                              |               |
|       | Rise/Fall time         | -    | -      | 30   | ns   | T <sub>Ir</sub> ,t <sub>If</sub> |               |
|       | Horizontal back porch  | 24   | (37)   | 50   | tCLK | tHBP                             |               |
|       | Horizontal front porch | 15   | (32)   | 49   |      | tHFP                             |               |
|       | Vertical back porch    | 4    | (7)    | 28   | tHP  | tVBP                             |               |
|       | Vertical front porch   | 1    | (4)    | 25   |      | tVFP                             |               |
| Data  | Set up time            | 5    | -      | -    | ns   | tSD                              | for DCLK      |
|       | Hold time              | 10   | -      | -    |      | tHD                              |               |
|       | Rise/Fall time         | -    | -      | 25   | ns   | T <sub>Dr</sub> ,t <sub>Df</sub> |               |

Note : Vsync Cycle No. should be set to odd.

## 8.2 TIMING CHART

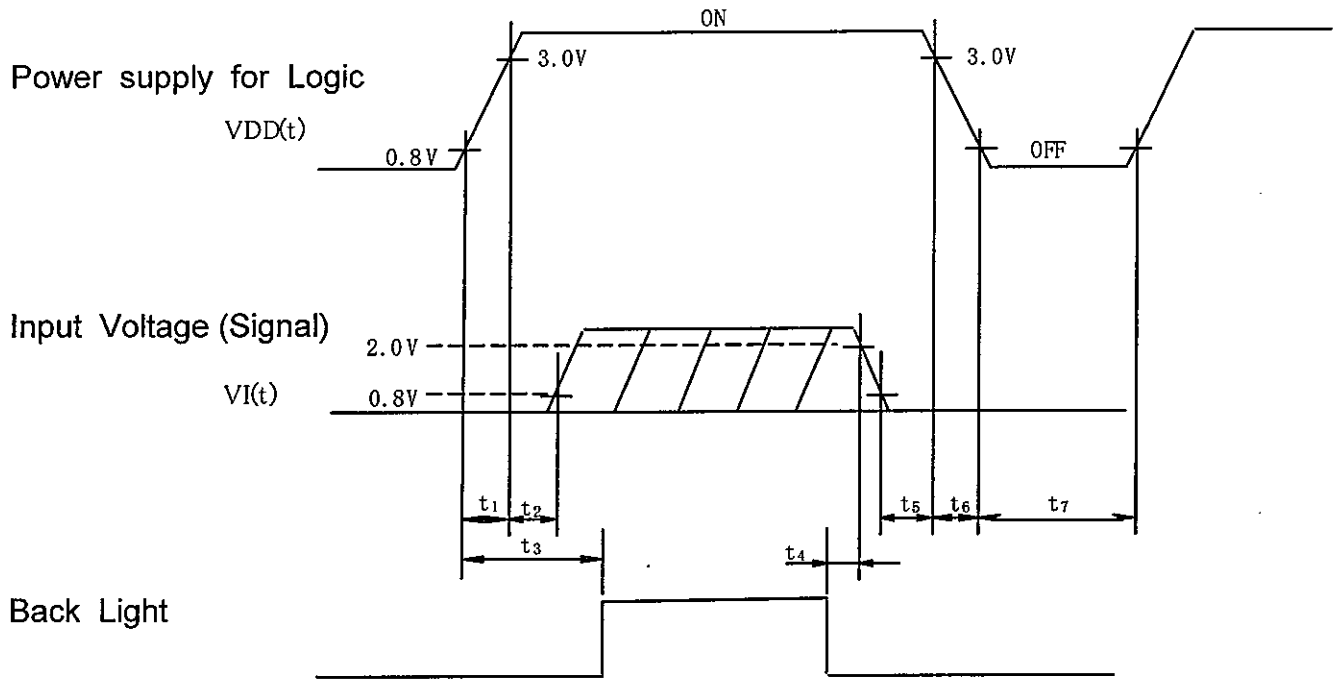
(Data is latched negative edge trigger of DCLK)



Note 1 : DTMG is definition of the above timing for Hsync and Vsync.

Note 2 : No matter when Hsync and Vsync is inputted ,this LCM can be drove only DTMG Signal. DTMG should be set to low level when it is not input valid data.

### 8.3 POWER ON/OFF SEQUENCE



**POWER ON**

- $t_1 \leq 15\text{ms}$
- $0\text{ms} < t_2 \leq 45\text{ms}$
- $0.1\text{s} \leq t_3$

**POWER OFF**

- $5\text{ms} \leq t_4$
- $0\text{ms} \leq t_5 \leq 45\text{ms}$
- $0\text{ms} \leq t_6 \leq 20\text{ms}$
- $0.4\text{s} \leq t_7$

Note 1 :  $0\text{V} \leq VI(t) \leq VDD(t)$

VI(t) and VDD(t) is a surfeit of condition for power on/off.

Note 2 : Input Voltage(Signal) should not be set high impedance when power on.

### 8.4 RELATIONSHIP BETWEEN DISPLAYED COLOR AND INPUT DATA

|               | COLOR & GRAY SCALE | GRAY SCALE LEVELS | DATA SIGNAL |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---------------|--------------------|-------------------|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|               |                    |                   | R0          | R1 | R2 | R3 | R4 | R5 | G0 | G1 | G2 | G3 | G4 | G5 | B0 | B1 | B2 | B3 | B4 | B5 |
| Basic Color   | Black              | -                 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|               | Blue               | -                 | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  |
|               | Green              | -                 | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
|               | Cyan               | -                 | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
|               | Red                | -                 | 1           | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|               | Magenta            | -                 | 1           | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  |
|               | Yellow             | -                 | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
|               | White              | -                 | 1           | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  | 1  |
| Red           | Black              | GS0               | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|               | ↑<br>Darker        | GS1               | 1           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|               |                    | GS2               | 0           | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|               | ↓                  |                   |             |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|               | ↑<br>Brighter      | GS61              | 1           | 0  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|               | ↓                  | GS62              | 0           | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|               | Red                | GS63              | 1           | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|               | Green              | Black             | GS0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| ↑<br>Darker   |                    | GS1               | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|               |                    | GS2               | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
| ↓             |                    |                   |             |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| ↑<br>Brighter |                    | GS61              | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| ↓             |                    | GS62              | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| Green         |                    | GS63              | 0           | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  | 0  | 0  | 0  | 0  | 0  | 0  |
| Blue          |                    | Black             | GS0         | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  |
|               | ↑<br>Darker        | GS1               | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  | 0  |
|               |                    | GS2               | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 0  | 0  | 0  |
|               | ↓                  |                   |             |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|               | ↑<br>Brighter      | GS61              | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 0  | 1  | 1  | 1  | 1  |
|               | ↓                  | GS62              | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  |
|               | Blue               | GS63              | 0           | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 0  | 1  | 1  | 1  | 1  | 1  | 1  |

### 8.5 INTERNAL PIN CONNECTION

CN1 JAE : FA5B040HP1(Suitable FPC : t0.3±0.05mm , 0.5±0.05mm pitch)

| PIN No. | SIGNAL | FUNCTION                          |
|---------|--------|-----------------------------------|
| 1       | VDD    | Power Supply for Logic            |
| 2       | VDD    | Power Supply for Logic            |
| 3       | VDD    | Power Supply for Logic            |
| 4       | VDD    | Power Supply for Logic            |
| 5       | NC     | No Connection                     |
| 6       | DTMG   | Timing Signal for Data            |
| 7       | VSS    | GND                               |
| 8       | DCLK   | Dot Clock                         |
| 9       | VSS    | GND                               |
| 10      | NC     | No Connection                     |
| 11      | VSS    | GND                               |
| 12      | B5     | Blue Data                         |
| 13      | B4     |                                   |
| 14      | B3     |                                   |
| 15      | VSS    | GND                               |
| 16      | B2     | Blue Data                         |
| 17      | B1     |                                   |
| 18      | B0     |                                   |
| 19      | VSS    | GND                               |
| 20      | G5     | Green Data                        |
| 21      | G4     |                                   |
| 22      | G3     |                                   |
| 23      | VSS    | GND                               |
| 24      | G2     | Green Data                        |
| 25      | G1     |                                   |
| 26      | G0     |                                   |
| 27      | VSS    | GND                               |
| 28      | R5     | Red Data                          |
| 29      | R4     |                                   |
| 30      | R3     |                                   |
| 31      | VSS    | GND                               |
| 32      | R2     | Red Data                          |
| 33      | R1     |                                   |
| 34      | R0     |                                   |
| 35      | Vcom   | Common Voltage (Generated by LCM) |
| 36      | VSS    | GND                               |
| 37      | NC     | No Connection                     |
| 38      | NC     | No Connection                     |
| 39      | NC     | No Connection                     |
| 40      | NC     | No Connection                     |

CN2 JST Housing : BHSR-02VS-1 (Suitable Connector : JST SM02B-BHSS-1)

Contact pin : SBHS-002T-P0.5

| PIN No. | SIGNAL | LEVEL | FUNCTION             |
|---------|--------|-------|----------------------|
| 1       | VCFL   | -     | Power Supply for CFL |
| 2       | VSS    | -     | GND for CFL          |

## 10. APPEARANCE STANDARD

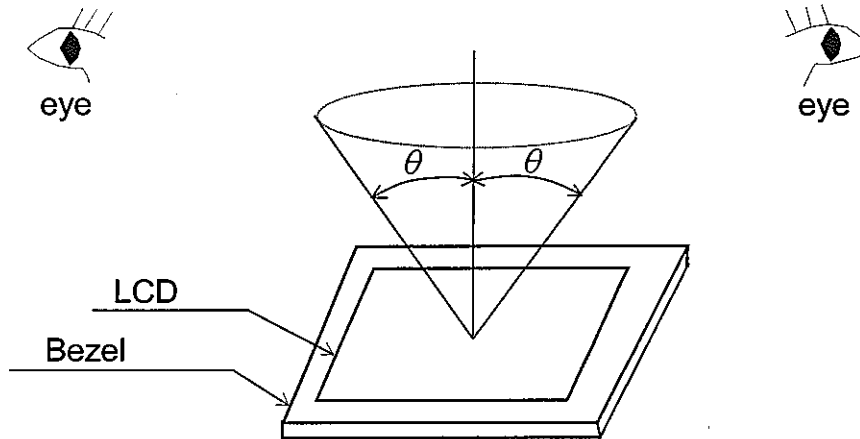
### 10.1 APPEARANCE INSPECTION CONDITION

Visual inspection should be done under the following condition.

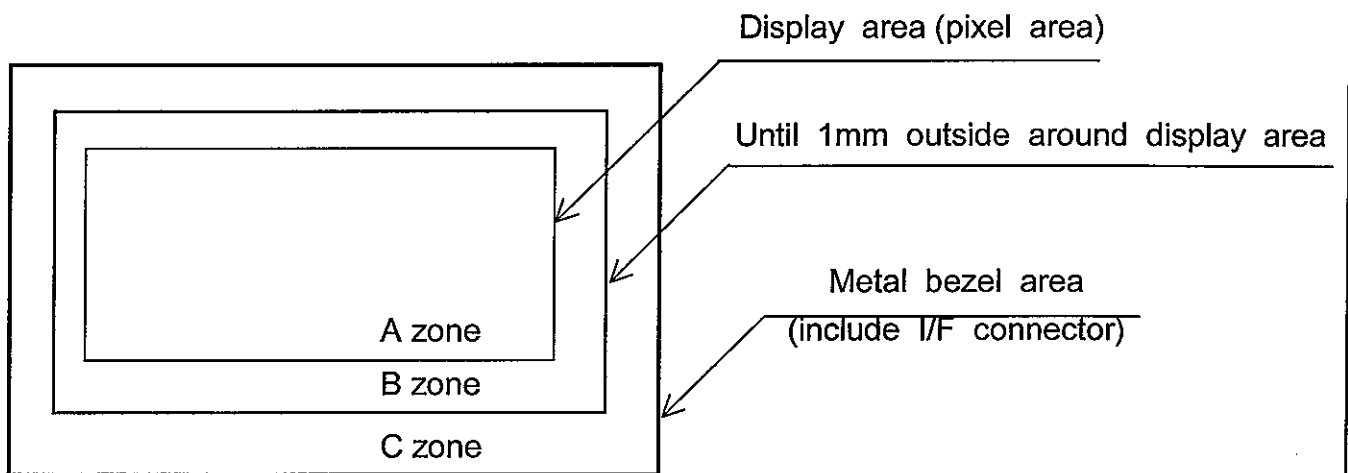
- (1) The inspection should be done in a dark room.(More than 1000(lx) and non-directive)
- (2) The distance between eyes of an inspector and the LCD module is 30cm.
- (3) The viewing zone is shown the figure.

The  $\theta$  is defined as  $\theta \leq 45^\circ$  for LCM power off

$\theta \leq 5^\circ$  for LCM power on



### 10.2 DEFINITION OF ZONE





### 10.3 APPEARANCE SPECIFICATION

#### (1)LCD Appearance

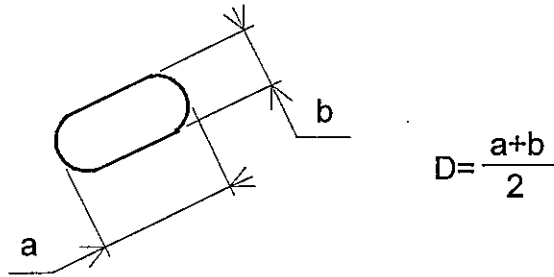
\*) If the problem related to this section occurs about this item, the responsible persons of both party (Customer and HITACHI) will discuss the matter in detail.

| No.                                   | ITEM                             | CRITERIA  |                           |                           |               | APPLIED ZONE |
|---------------------------------------|----------------------------------|---|---------------------------|---------------------------|---------------|--------------|
|                                       |                                  | Length<br>L(mm)   | Width<br>W(mm)            | Maximum number acceptable | Minimum space |              |
| L<br>C<br>D                           | Scratches                        | Length L(mm)  | Width W(mm)               | Maximum number acceptable | Minimum space | A,B          |
|                                       |                                  | Ignored   | $W \leq 0.02$             | Ignored                   | -             |              |
|                                       |                                  | $L \leq 40$   | $0.02 < W \leq 0.04$      | 10                        | -             |              |
|                                       |                                  | $L \leq 20$   | $W \leq 0.04$             | 10                        | -             |              |
|                                       | Dent                             | Distinguished one is acceptable<br>(To be judged by HITACHI standard) |                           |                           |               | A            |
|                                       | Wrinkles in Polarizer            | Same as above   |                           |                           |               | A            |
|                                       | Bubbles                          | Average diameter D(mm)  |                           | Maximum number acceptable |               | A            |
|                                       |                                  | $D \leq 0.2$  |                           | Ignored                   |               |              |
|                                       |                                  | $0.2 < D \leq 0.3$  |                           | 12                        |               |              |
|                                       |                                  | $0.3 < D \leq 0.5$  |                           | 3                         |               |              |
|                                       |                                  | $0.5 < D$   |                           | none                      |               |              |
|                                       | Stains<br>Foreign<br>Materials   | Filamentous (Line shape)  |                           |                           |               | A,B          |
|                                       |                                  | Length L(mm)  | Width W(mm)               | Maximum number acceptable |               |              |
|                                       |                                  | $L \leq 2.0$  | $W \leq 0.03$             | Ignored                   |               |              |
|                                       | Dark Spot                        | $L \leq 3.0$  | $0.03 < W \leq 0.05$      | 6.                        |               | A,B          |
|                                       |                                  | $L \leq 2.5$  | $0.05 < W \leq 0.1$       | 1                         |               |              |
|                                       |                                  | Round(Dot shape)  |                           |                           |               |              |
|                                       | Dot Defect                       | Average diameter D(mm)  | Maximum number acceptable | Minimum Space             |               | A,B          |
|                                       |                                  | $D < 0.2$   | Ignored                   | -                         |               |              |
|                                       |                                  | $0.2 \leq D < 0.3$  | 10                        | 10 mm                     |               |              |
| $0.3 \leq D < 0.4$                    |                                  | 5   | 30 mm                     |                           |               |              |
| $0.4 \leq D$                          |                                  | none  | -                         |                           |               |              |
| The total number                      |                                  | Filamentous + Round=10  |                           |                           |               |              |
| Those wiped out easily are acceptable |                                  |   |                           |                           |               |              |
| Color Tone                            | To be judged by HITACHI STANDARD |   |                           |                           | A             |              |
| Color Uniformity                      | Same as above                    |   |                           |                           | A             |              |
| Dot Defect                            |                                  |   | Maximum number acceptable |                           | A             |              |
|                                       | Sparkle mode                     | 1 dot   | 4                         |                           |               |              |
|                                       |                                  | 2 dots  | 1                         |                           |               |              |
|                                       |                                  | Total (Note.(3)-(f))  | 5                         |                           |               |              |
|                                       | Black mode                       | 1 dot   | 5                         |                           |               |              |
|                                       |                                  | 2 dots  | 2                         |                           |               |              |
|                                       |                                  | Total (Note.(3)-(f))  | 5                         |                           |               |              |
| Total (Note.(3)-(f))                  | 10                               |   |                           |                           |               |              |

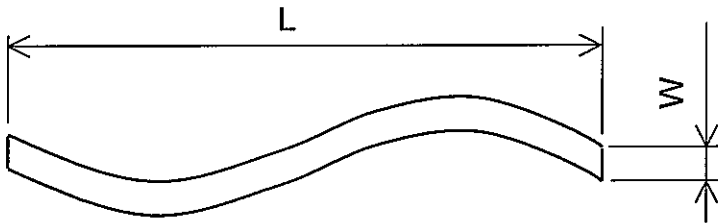
(2) CFL BACKLIGHT APPEARANCE

| No.                                       | ITEM                        | CRITERIA                  |                 |                              | APPLIED ZONE |
|---|-----------------------------|---------------------------|-----------------|------------------------------|--------------|
| C<br>F<br>L                               | Dark Spots                  | Average diameter<br>D(mm) |                 | Maximum number acceptable    | A            |
|   | White Spots                 | $D \leq 0.4$              |                 | ignored                      |              |
|   | Foreign Materials<br>(Spot) | $0.4 < D$                 |                 | none                         |              |
| B<br>A<br>C<br>K<br>L<br>I<br>G<br>H<br>T | Foreign Materials<br>(Line) | Width<br>W(mm)            | Length<br>L(mm) | Maximum number<br>acceptable | A            |
|   |                             | $W \leq 0.2$              | $L \leq 2.5$    | 1                            |              |
|   |                             | $0.2 < W$                 | $2.5 < L$       | None                         |              |
| L<br>I<br>G<br>H<br>T                     | Scratches                   | Width<br>W(mm)            | Length<br>L(mm) | Maximum number<br>acceptable | A            |
|   |                             | $W \leq 0.1$              | -               | ignored                      |              |
|   |                             | $0.1 < W \leq 0.2$        | $L \leq 11.0$   | 1                            |              |
|   |                             | $0.2 < W$                 | $11.0 < L$      | None                         |              |
|   |                             | $0.2 < W$                 | -               | none                         |              |

Note 1 : Definition of average diameter (D)



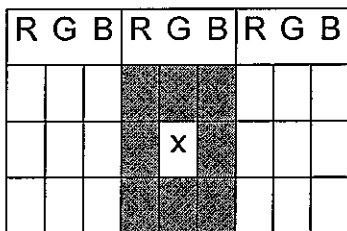
Note 2 : Definition of length (L) and width (W)




Note 3 : Definition of dot defect

- (a) Dot Defect : Defect Area  $> 1/2$  dot
- (b) Sparkle mode : Brightness of dot is more than 30% at Black raster.
- (c) Black mode : Brightness of dot is less than 70% at R.G.B raster.
- (d) 1 dot : Defect dot is isolated , not attached to other defect dot.
- (e) N dot : N defect dots are consecutive (fig.1).  
(N means the number of defect dots.)

( fig .1)



2 dots defect included defect dot "X" is defined as follows.

Adjacent dots to defect dot "X" : 

- (f) Counting definition of adjacent dots (1 set) : same as 1 dot defect.
- (g) Those wiped out easily are acceptable.

## 11. PRECAUTION IN DESIGN

### 11.1 PRECAUTIONS AGAINST ELECTROSTATIC DISCHARGE

As this module contains C-MOS LSIs, it is not strong against electrostatic discharge. Make certain that the operator's body is connected to the ground through a wrist band, etc. And don't touch I/F pins directly.

### 11.2 HANDLING PRECAUTIONS

- (1) As the adhesives used for adhering upper/lower polarizer's and frame 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 are recommended for use:  
normal hexane  
Please contact with us when it is necessary for you to use chemicals other than the above.
- (2) Lightly wipe to clean the dirty surface with absorbent cotton or other soft material like chamois, soaked in the recommended chemicals without scrubbing it hardly. Always wipe the surface horizontally or vertically. Never give a wipe in a circle. 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.
- (3) Immediately wipe off saliva or water drop attached on the display area because it may cause deformation or faded color.
- (4) Foggy dew deposited on the surface may cause a damage, stain or dirt to the polarizer.  
When you need to take out the LCD module from some place at low temperature for test, etc.  
It is required to be warmed them up to temperature higher than room temperature before taking them out.
- (5) Touching the display area or I/F pins with bare hands or contaminating them are prohibited, because the stain on the display area and poor insulation between terminals are often caused by being touched with bare hands.  
(Some cosmetics are detrimental to polarizer's.)
- (6) In general, the glass is fragile so that, especially on its periphery, tends to be cracked or chipped in handling. Please not give the LCD module sharp shocks by falling, etc.
- (7) Maximum pressure to the surface must be less than  $1.96 \times 10^4$  Pa.  
And if the pressure area is less than  $1\text{cm}^2$ , maximum pressure must be less than 1.96N.
- (8) Since the metal width is narrow on these locations (see page 9-1/2), please careful with handling.
- (9) Top sheets shall be cleaned gently using a soft cloth such as those used for glasses. Hard wiping accumulated dust will leave scars on the surface even using a cloth.

### 11.3 OPERATION PRECAUTION

- (1) Using a LCM module beyond its maximum ratings may result in its permanent destruction.  
LCM module's should usually be used under recommended operating conditions shown in chapter 4. Exceeding any of these conditions may adversely affect its reliability.
- (2) Response time will be extremely delayed at lower temperature than the specified operating temperature range and on the other hand LCD's shows dark blue at higher temperature.  
However those phenomena do not main defects of the LCD module. Those phenomena will disappear in the specified operating temperature range.
- (3) If the display area is pushed hard during operation, some display patterns will be abnormally display.
- (4) A slight dew depositing on terminals may cause electrochemical reaction which leads to terminal open circuit. Please operate the LCD module under the relative condition of 40°C 85%RH.

### 11.4 STORAGE

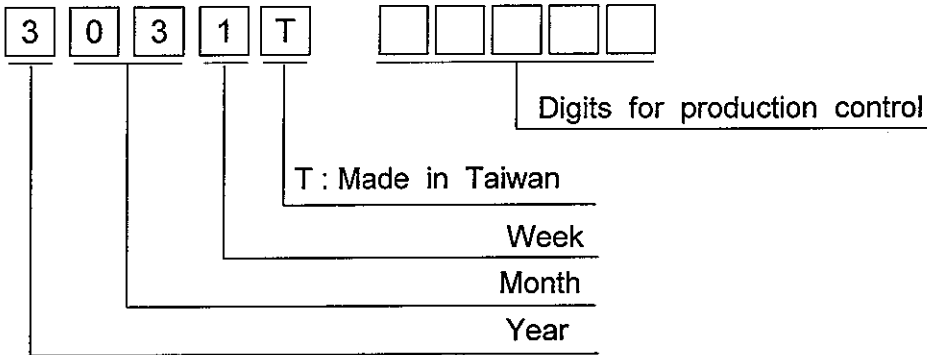
In case of storing LCD module for a long period of time (for instance, for years) for the purpose of replacement use, the following precautions necessary.

- (1) Store the LCD modules in a dark place; do not expose them to sunlight or ultraviolet rays.
- (2) Keep the temperature between 10°C and 35°C at normal humidity.
- (3) Store the LCD modules in the container which is used for shipping from us.
- (4) No articles shall be left on the surface over an extended period of time.

## 12. DESIGNATION OF LOT MARK

### 12.1 LOT MARK

Lot mark is consisted of 5 digits for production lot and 5 digits for production control.



| Year | Figure in lot mark |
|------|--------------------|
| 2003 | 3                  |
| 2004 | 4                  |
| 2005 | 5                  |
| 2006 | 6                  |
| 2007 | 7                  |

| 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                 |

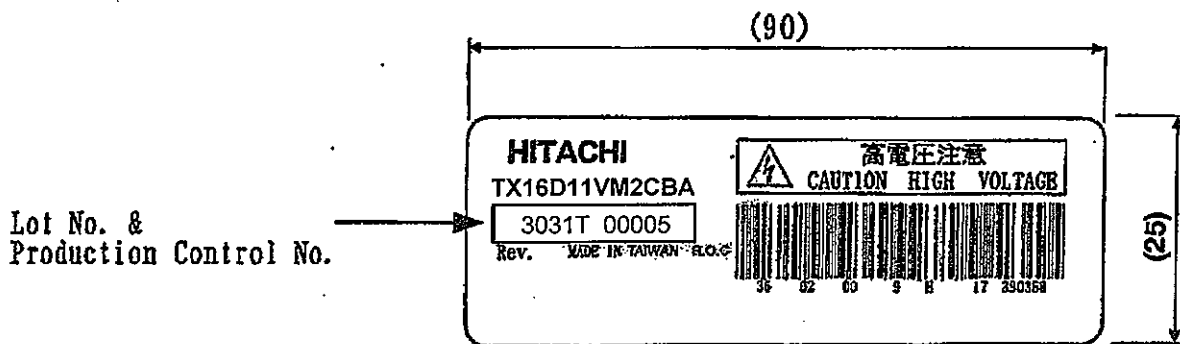
| Week (day in calendar) | Figure in lot mark |
|------------------------|--------------------|
| 1~7                    | 1                  |
| 8~14                   | 2                  |
| 15~21                  | 3                  |
| 22~28                  | 4                  |
| 29~31                  | 5                  |

### 12.2 SERIAL No.

Serial No. is consisted of 5 digits number (00001~99999).

### 12.3 LOCATION OF LOT MARK

Label is bring attached on the back side of module.



### 13. PRECAUTION FOR USE

(1) A limit sample should be provided by the both parties on an occasion when the both parties agree to its necessity.

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

(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 by customer is reported to HITACHI, and some problem is arisen in the specification due to the change.

(4) When a new problem is arisen at the customer's operating set for sample evaluation.

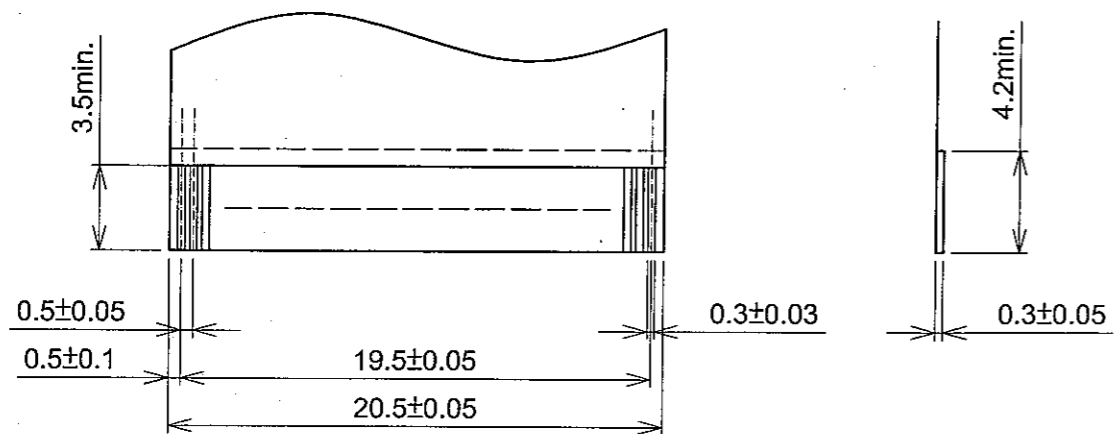
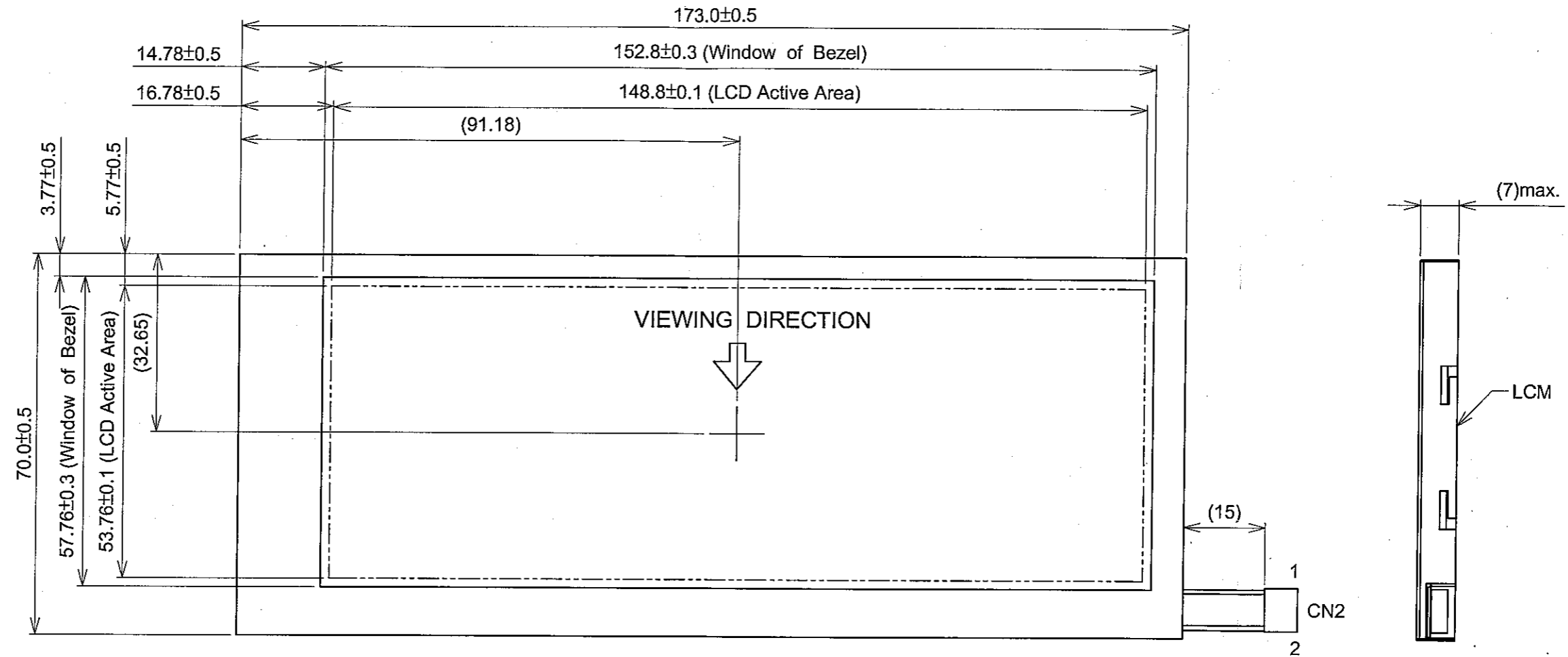
(3) Regarding the treatment for maintenance and repairing, both parties will discuss it in six months later after latest delivery of this product.

The precaution that should be observed when handling LCM have been explained above.

If any points are unclear or if you have any requests , please contact with HITACHI.

# 9. DIMENSIONAL OUTLINE

## 9.1 DIMENSIONAL OUTLINE OF LCM

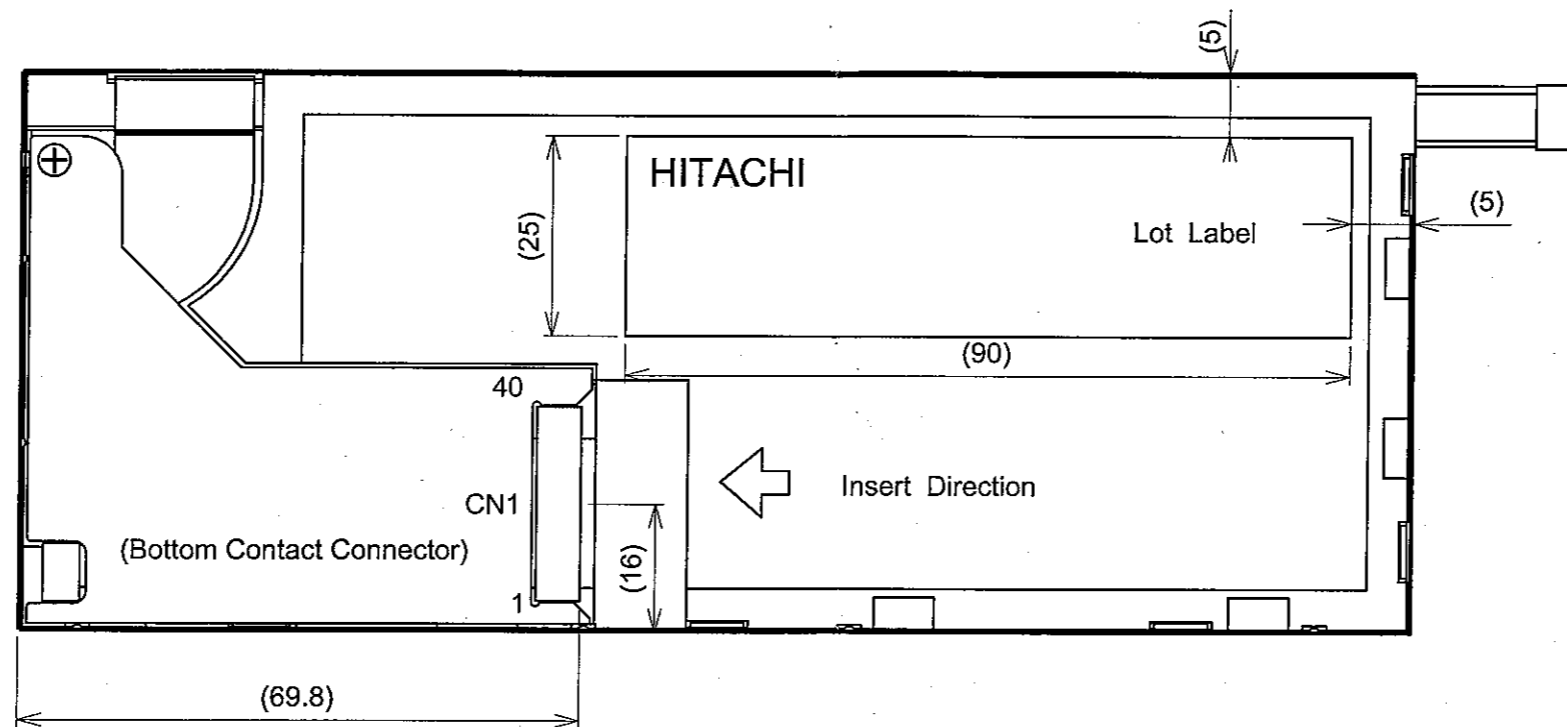


Recommended design rule for I/F FPC

Scale : NTS  
Unit : mm

|   |      |            |            |                             |      |       |
|---|------|------------|------------|-----------------------------|------|-------|
| KAOHSIUNG HITACHI<br>ELECTRONICS CO.,LTD. | DATE | Aug.07,'03 | Sh.<br>No. | 7B63PS 2709-TX16D11VM2CBA-1 | PAGE | 9-1/2 |
|---|------|------------|------------|-----------------------------|------|-------|





Scale : NTS  
Unit : mm

|   |      |            |            |                             |      |       |
|---|------|------------|------------|-----------------------------|------|-------|
| KAOHSIUNG HITACHI<br>ELECTRONICS CO.,LTD. | DATE | Aug.07,'03 | Sh.<br>No. | 7B63PS 2709-TX16D11VM2CBA-1 | PAGE | 9-2/2 |
|---|------|------------|------------|-----------------------------|------|-------|