



# SPECIFICATIONS

TITLE : 320x240 MONO STN DISPLAY

NUMBER : HLM8619-010300 REV.A PAGE 1

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## **HOSIDEN CORPORATION**

**HLM 8619 - 010300 - HIGH GRADE**

**PASSIVE MONOCHROME  
HIGH GRADE LCD DISPLAY**

**TRANSFLECTIVE TYPE**

**320 x 240 DOTS**

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## 1. FEATURES

|                |                                                               |
|----------------|---------------------------------------------------------------|
| Display Format | 320 x 240 Dots (Graphic Type)                                 |
| Display Mode   | STN Positive transfective type, F-STN Mode with CFL Backlight |
| Screen Area    | 121 x 91,6 mm                                                 |
| Contrast Ratio | 12:1 (typ.)                                                   |
| Driving Method | 1/240 duty                                                    |
| Power Supply   | +5V (V <sub>CC</sub> ) / -23V (V <sub>EE</sub> )              |
| Interface      | 5V CMOS Level                                                 |
| Backlight      | CFL edgelight system                                          |

## 2. ABSOLUTE MAXIMUM RATINGS

| Item                           | Symbol                           | Value                                               | Unit | Remark |
|--------------------------------|----------------------------------|-----------------------------------------------------|------|--------|
| Supply Voltage (Logic)         | V <sub>DD</sub> -V <sub>SS</sub> | 6 max.                                              | V    |        |
| Supply Voltage                 | V <sub>DD</sub> -V <sub>EE</sub> | 30 max.                                             | V    |        |
| Input Voltage                  | V <sub>in</sub>                  | V <sub>SS</sub> ≤ V <sub>IN</sub> ≤ V <sub>DD</sub> | V    |        |
| Storage Temperature            | T <sub>stg</sub>                 | -20 ... 60                                          | °C   |        |
| Operating Temperature          | Top                              | 0 ... 50                                            | °C   |        |
| Extended Operating Temperature | Top                              | -5 ... 55                                           | °C   | Note 1 |

Note 1 : Maximum temperature range with reduced optical parameters

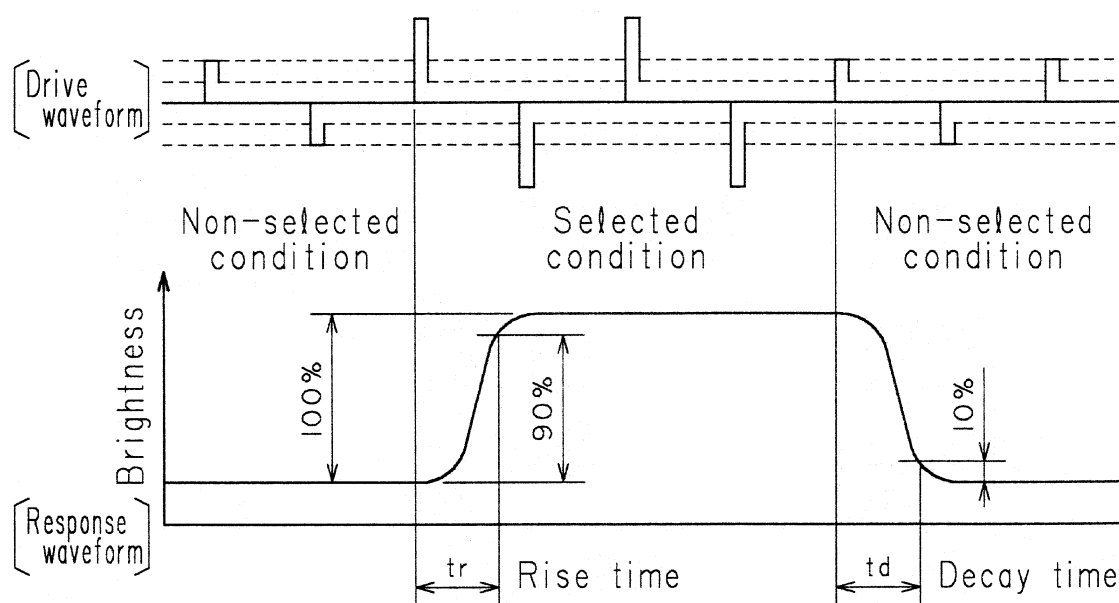
## 3. MECHANICAL CHARACTERISTICS

| Item         | Standard Value       | Unit  | Remark           |
|--------------|----------------------|-------|------------------|
| Module Size  | 157,8 x 121,6 x 11,5 | mm    | Except FFC Cable |
| Viewing Area | 121 x 91,6           | mm    |                  |
| Active Area  | 115,17 x 86,37       | mm    |                  |
| Dot Size     | 0,33 x 0,33          | mm    |                  |
| Dot Pitch    | 0,36 x 0,36          | mm    |                  |
| Weight       | 230 (typ.)           | grams |                  |

## 4. OPTICAL CHARACTERISTICS

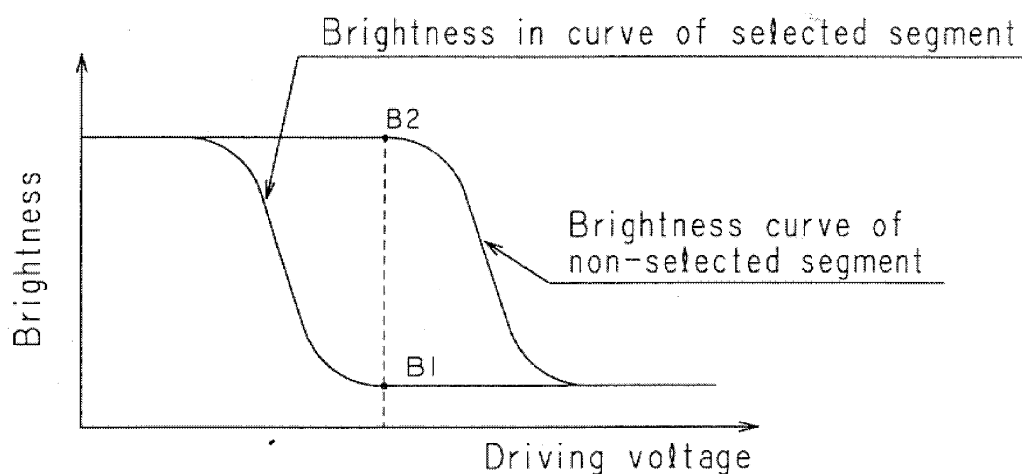
| Item              | Symbol                | Condition                                                      | Min | Typ  | Max | Unit    | Remark |
|-------------------|-----------------------|----------------------------------------------------------------|-----|------|-----|---------|--------|
| Response Time     | Rise $T_r$            | $T_a=25^{\circ}\text{C}$<br>$\theta=0^{\circ}, \phi=0^{\circ}$ | -   | 140  | 250 | ms      | Note 1 |
|                   | Fall $T_d$            |                                                                | -   | 270  | 400 | ms      | Note3  |
| Contrast Ratio    | CR                    | $T_a=25^{\circ}\text{C}, \theta=0^{\circ}, \phi=0^{\circ}$     | 8   | 12   | -   |         | Note2  |
| Viewing Angle     | $\theta_1 + \theta_2$ | $T_a=25^{\circ}\text{C}, \phi=0^{\circ}, \text{CR} \geq 1,4$   | 45  | -    | -   | deg     | Note 3 |
| Frame Frequency   |                       |                                                                | 65  | 70   | 75  | Hz      |        |
| Viewing Direction |                       |                                                                |     | 6:00 |     | o'clock |        |

**NOTE 1** : Definition of optical response time



Note 2 : Definition of contrast ratio  $C_R$

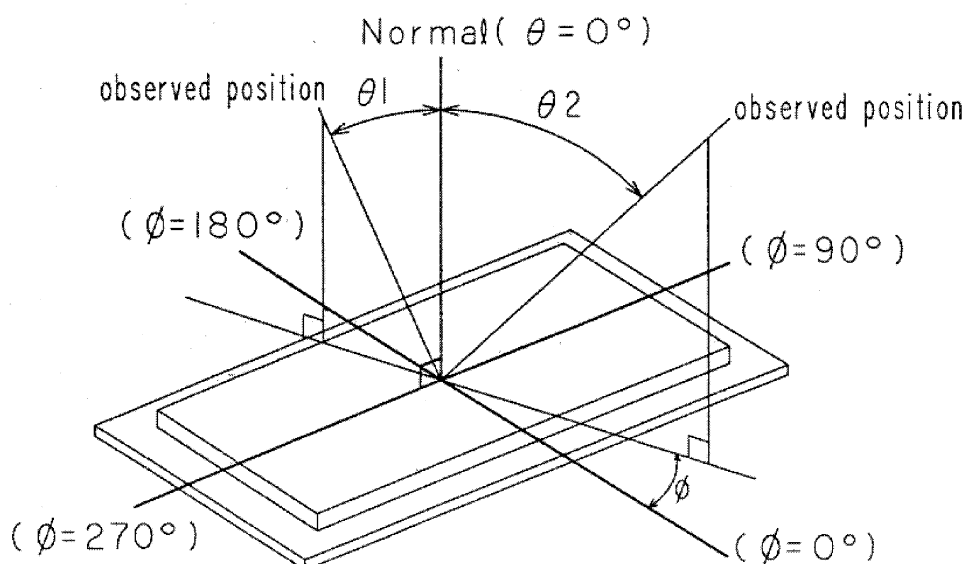
$$C_R = \frac{\text{Brightness in selected segment}(B1)}{\text{Brightness in non-selected segment}(B2)}$$



Note 3 : Viewing direction  $\theta$  and  $\phi$

$\theta$  : Angle of between observed position and Normal. ( $0^\circ \leq \theta \leq 90^\circ$ )

$\phi$  : Angle of between observed position and Y axis. ( $0^\circ \leq \phi \leq 360^\circ$ )



## 5. ELECTRICAL CHARACTERISTICS (LCD)

| Item                   | Symbol                        | Condition                                   | Min | Typ  | Max | Unit |
|------------------------|-------------------------------|---------------------------------------------|-----|------|-----|------|
| Supply Voltage (Logic) | V <sub>DD</sub>               | V <sub>DD</sub> ± 10%                       | 4,5 | 5    | 5,5 | V    |
| Supply Voltage (LCD)   | V <sub>DD-V<sub>O</sub></sub> | θ=0°, φ=0° Ta=0°C                           | -   | 24,4 | -   | V    |
|                        |                               | θ=0°, φ=0° Ta=25°C                          | -   | 23,7 | -   | V    |
|                        |                               | θ=0°, φ=0° Ta=50°C                          | -   | 23   | -   | V    |
| Supply current (Logic) | I <sub>DD</sub>               | V <sub>DD</sub> =5V, V <sub>O</sub> =-18,3V |     | 3,8  | 12  | mA   |
| Supply Current (LCD)   | I <sub>EE</sub>               | Frame Signal = 70Hz                         | -   | 2,4  | 10  | mA   |

## 6. INTERFACE CABLE

1 mm pitch FFC Cable is fixed on the display.

Suitable Interface to standard 2,54 connector : IF155 (Data Display)

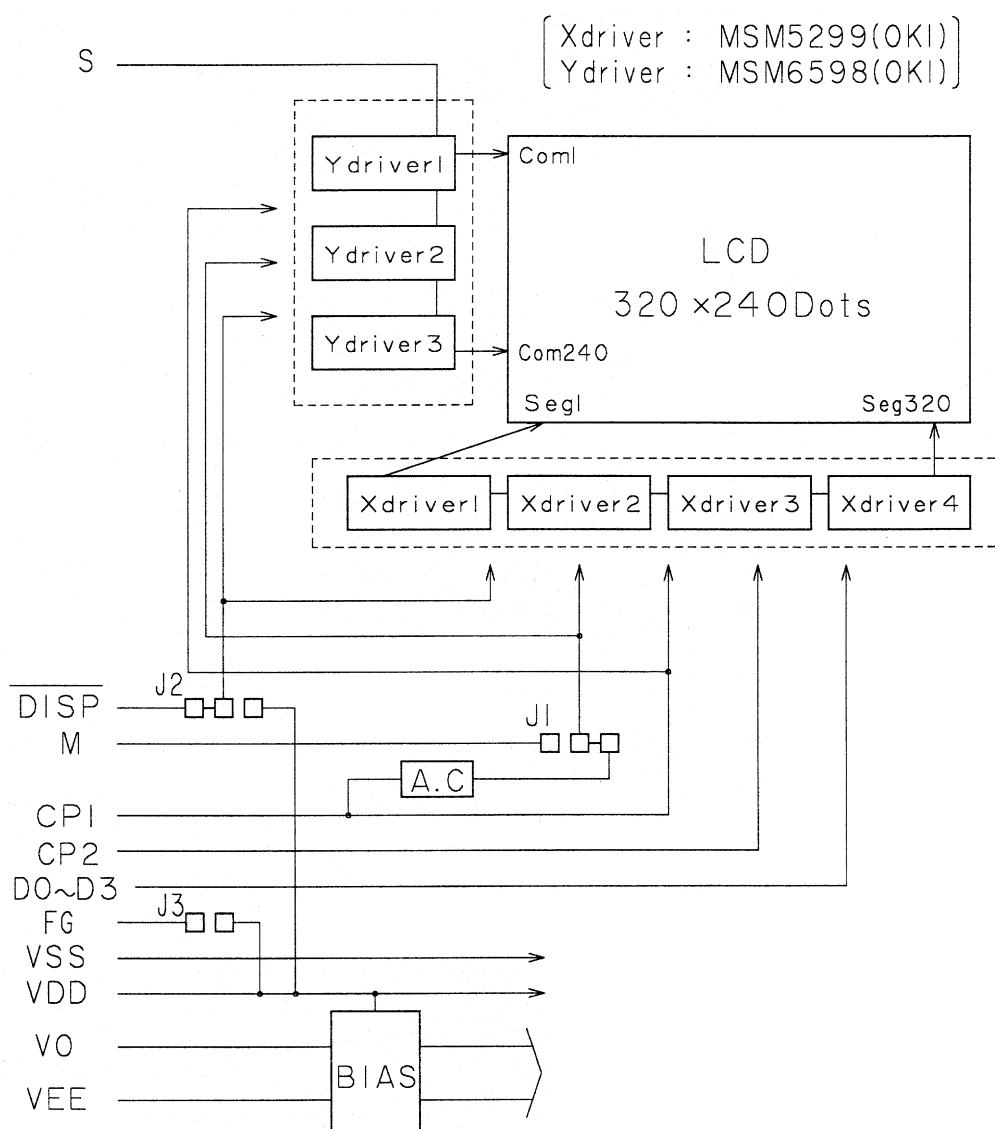
Suitable connectors for through hole (90/180°) or surface mount (90°)

are available on request

| Pin No. | Signal Name     | Function                           |
|---------|-----------------|------------------------------------|
| 1       | V <sub>O</sub>  | Control for LCD drive voltage      |
| 2       | V <sub>EE</sub> | Power supply voltage for LCD drive |
| 3       | D3              | Display Data 3                     |
| 4       | D2              | Display Data 2                     |
| 5       | D1              | Display Data 1                     |
| 6       | D0              | Display Data 0                     |
| 7       | M               | LCD drive signal (AC signal) *1    |
| 8       | V <sub>SS</sub> | Ground                             |
| 9       | V <sub>DD</sub> | +5V Logic Supply Voltage           |
| 10      | CP2             | Display Data Shift Clock           |
| 11      | CP1             | Display Data Latch Clock           |
| 12      | S               | Frame Signal (Sync. of display)    |
| 13      | DISP OFF        | Display ON (H) / OFF (L)           |
| 14      | F.G.            | Frame Ground                       |

\*1 Note : M is generated on board or supplied externally (see block diagram)  
Default setting is internal generation (no external signal necessary)

## 7. BLOCK DIAGRAM



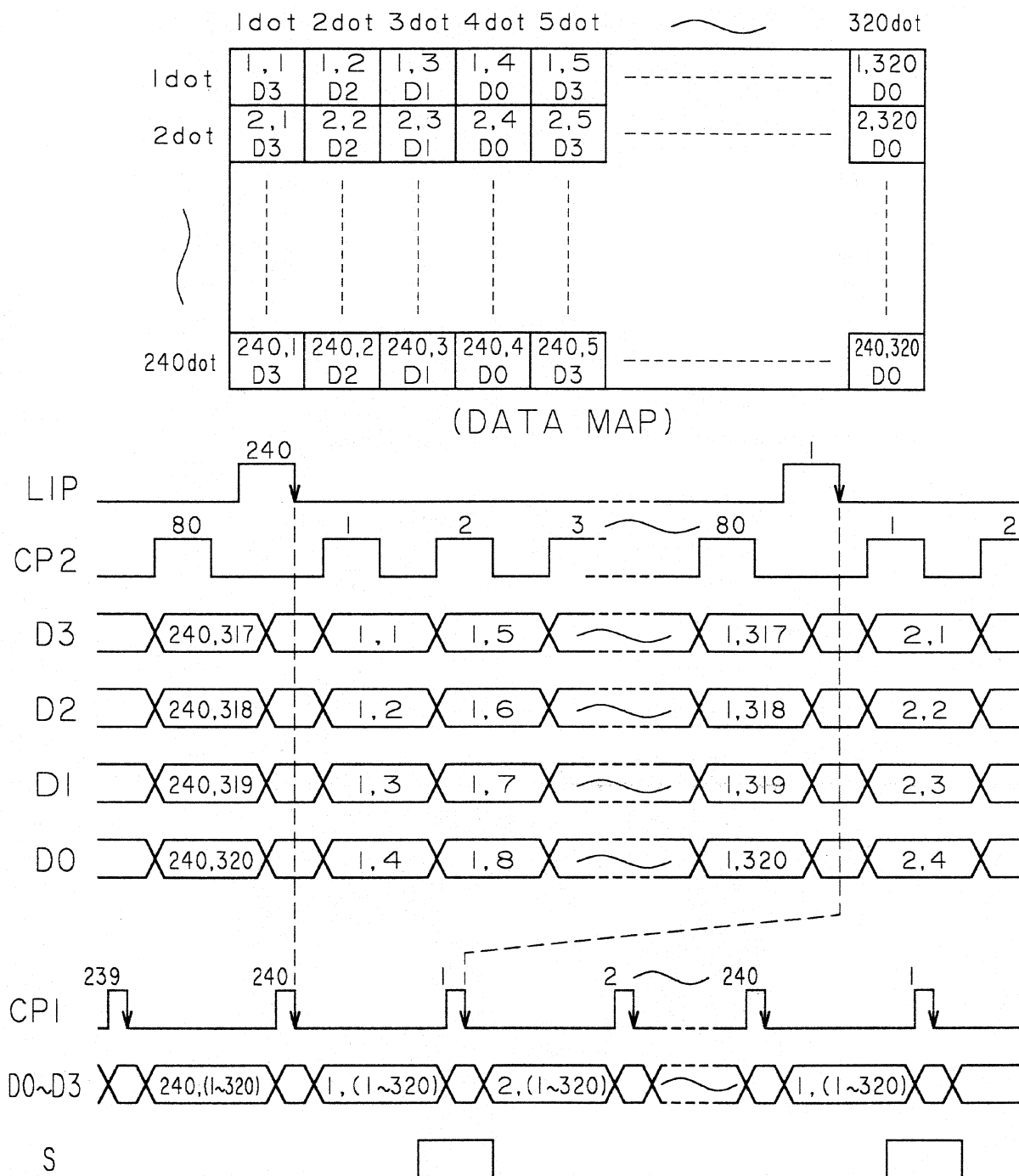
- A.C. : M-signal generation circuit  
M-signal may be optionally supplied externally (change J1 setting)
- BIAS : BIAS voltage generation circuit

To avoid latch-up effects the power on/off sequencing should be as following :

ON : Logic voltage (VDD) should be applied before or at same time with LCD voltage (VEE)

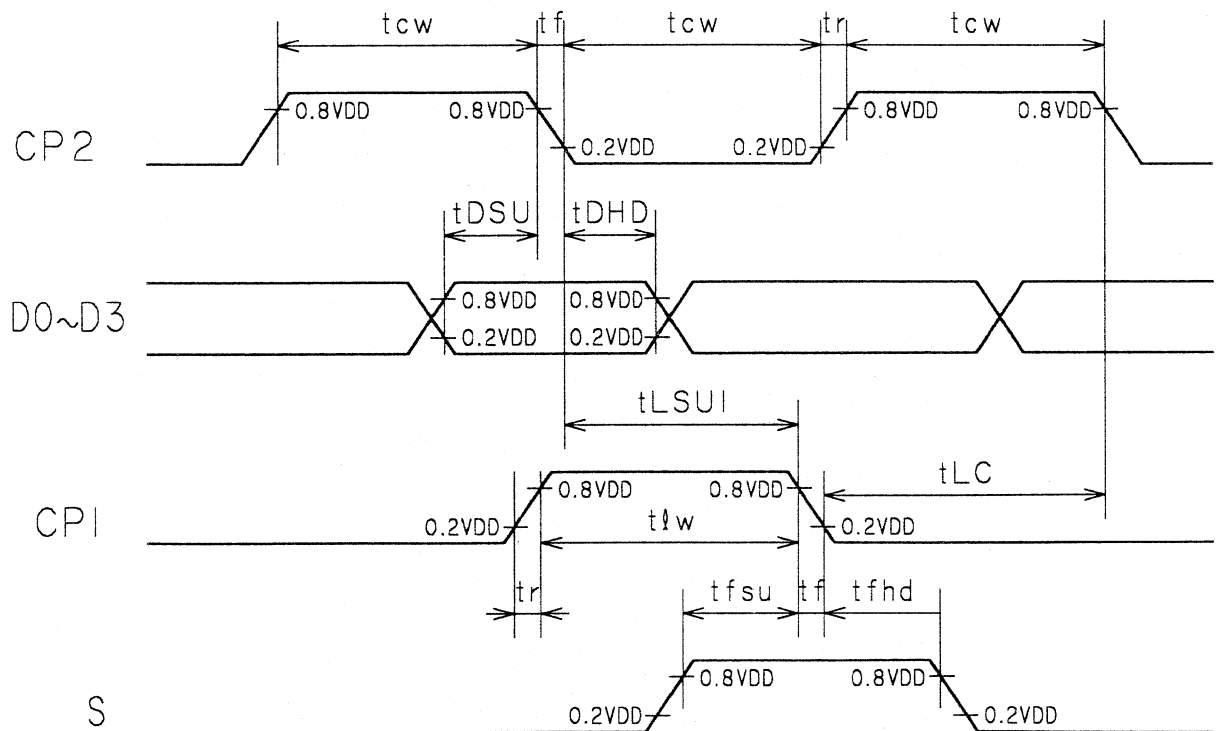
OFF : LCD voltage (VEE) should be removed before or at the same time as Logic voltage (VDD)

## 8. INTERFACE TIMING



## 8-1 TIMING CHART

|                      | Symbol     | Condition | Min | Typ | Max | Unit |
|----------------------|------------|-----------|-----|-----|-----|------|
| CLP Frequency        | $f_{CP}$   | Duty=50%  | 3,4 | -   | -   | MHz  |
| CLP Pulse Width      | $t_{CW}$   | -         | 100 | -   | -   | ns   |
| CLP Rise / Fall Time | $t_r, t_f$ | -         | -   | -   | 50  | ns   |
| Data Setup Time      | $t_{DSU}$  | -         | 50  | -   | -   | ns   |
| Data Hold Time       | $t_{DHD}$  | -         | 80  | -   | -   | ns   |
| CLP Setup Time       | $t_{ESUI}$ | -         | 90  | -   | -   | ns   |
| LIP -> CLP Time      | $t_{LC}$   | -         | 200 | -   | -   | ns   |
| LIP Pulse Width      | $t_{lw}$   | -         | 100 | -   | -   | ns   |
| FRP Setup Time       | $t_{fsu}$  | -         | 100 | -   | -   | ns   |
| FRP Hold Time        | $t_{fhd}$  | -         | 100 | -   | -   | ns   |



## 9. CFL UNIT

### 9-1 CCFL Lamp

| Item                     | Symbol | Value  | Unit |
|--------------------------|--------|--------|------|
| Discharging Tube current | (IL)   | 5      | mA   |
| Discharging Tube voltage | (VL)   | 295    | Vrms |
| Starting Tube Voltage    | (VS)   | 1050   | Vrms |
| Brightness (Tube)        | (B)    | 33.000 | Nit  |
| Tube diameter            | Ø      | 3      | mm   |
| Tube length              | l      | 86     | mm   |
| Half Brightness Time     | min    | 18.000 | h    |
| Half Brightness Time     | typ    | 23.000 | h    |

The definition of half brightness time is average brightness decreased to 50% of initial average brightness value (@ 5mA, 25°C).

### 9-2 Example of Inverter

Inverter : TDK TAD170 (5V) or 8m8619 (5V or 12V)  
 Input current : 0,2A  
 Output current : 5,0 mArms  
 Drive frequency : 30 kHz (typ)

### 9-3 Interface connector

Used connector : IL-G-4S-S3C2 (\*1)  
 Manufacturer : JAE

| Pin No. | Signal Name | Function      |
|---------|-------------|---------------|
| 1       | HV          | High Voltage  |
| 2       | NC          | Not connected |
| 3       | NC          | Not connected |
| 4       | GND         | Ground        |

\*1 Suitable through hole connectors (90°/180°) are available on request.

## 10. UNIFORMITY CHARACTERISTICS

### 10-1 Standard Value

Non-uniformity =  $\left| \frac{\text{Max. Value} - \text{Mean Value}}{\text{Mean Value}} \right| \times 100 \leq 30\%$

Non-uniformity =  $\left| \frac{\text{Min. Value} - \text{Mean Value}}{\text{Mean Value}} \right| \times 100 \leq 30\%$

Max. Value : Maximum Contrast

Mean Value : Mean Contrast

Min. Value : Minimum Contrast

: Absolute Value

### 10-2 Measurement conditions

Contrast is measured at 9 locations and the mean contrast is calculated. (Point A ... I)

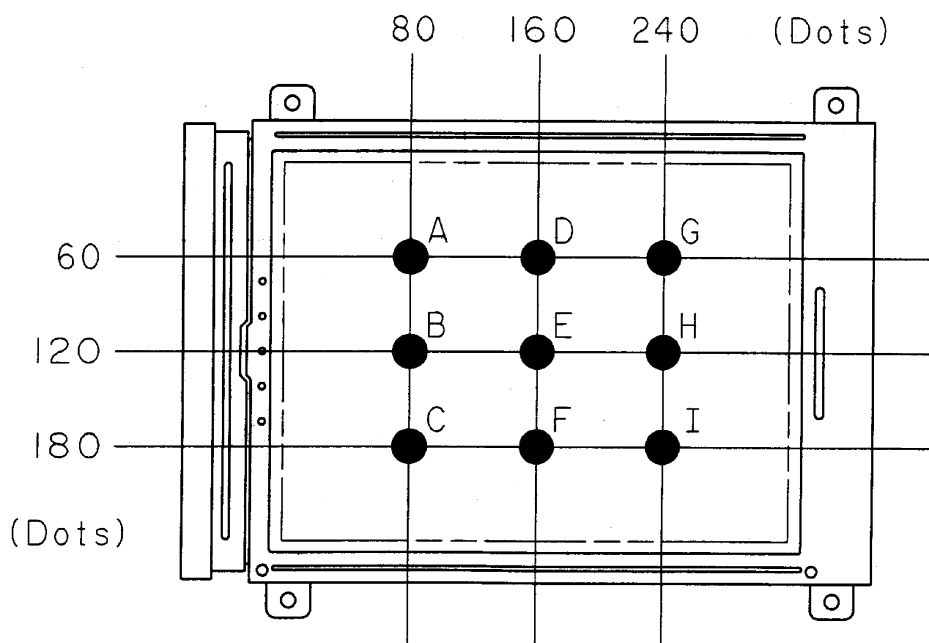
CCFL Backlight power-on time : 10 minutes

Discharging Tube Current (IL) : 5 mA

Temperature : 25°C

VDD - VO : 23.3 V

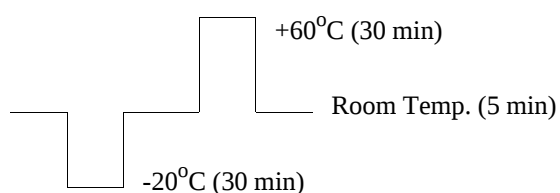
Measurement diameter : 8 mm



## 10. RELIABILITY

| Item                     | Condition                                                                                                             |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------|
| High temperature storage | 60°C 120h                                                                                                             |
| Low temperature storage  | -20°C 120h                                                                                                            |
| Damp heat storage        | 40°C / 90% RH 120h                                                                                                    |
| Thermal cycles           | 5 cycles see below diagram                                                                                            |
| Vibration                | Total amplitude : 1,5 mm Frequency : 10 .. 55 .. 10 Hz<br>Tested at above condition for X,Y,Z directions 60 min. each |

### Temperature Cycle Diagram



### 10-1 Evaluation Criteria

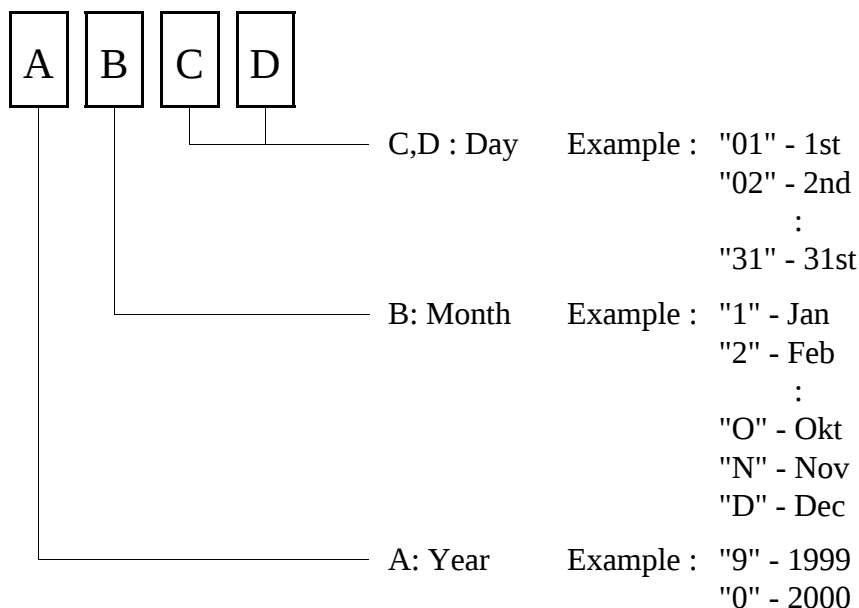
Every test item should meet the following criteria :

- All of the segments (dots) should be not blurred
- All segments (dots) should be usually displayed

Judgements should be made after exposure in room temperature condition for 4 hours.

## 11. LOT MARKING

The manufacturing lot number is marked on each module



## 12. HANDLING PRECAUTION

1. Do not disassemble the module
2. Since the LCD cell is made of glass, do not apply strong mechanical impact or static load onto it. Handle with care, and do not twist or bend the LCD module.
3. In case the LCD cell is broken, do not sip or drink leaked liquid crystal material. If the liquid crystal material touched your skin, wash it out with soap immediately.
4. Store and use within ratings in order to keep performance and prevent damage.
5. Do not drop water or any chemicals onto the display surface.
6. Handle the polarizers with care as it maybe easily scratched. Do not press or rub them with any hard object.
7. Do not apply high electrostatic voltage to the LCD module. It may damage CMOS / LSI circuit in the LCD module. Ground yourself when you touch the LCD module directly.
8. When you handle the LCD module for incoming inspection or assembly, use soft fingerstalls or gloves in order to keep the display quality.
9. Do not pull or fold the CCFL cable

## **13. TERMS OF WARRANTY**

### **13-1 Incoming Inspection**

Incoming inspection by the customer shall be performed within thirty (30) days from the shipping date.

### **13-2 Warranty Period**

HOSIDEN warrants the LCD modules for a period of 6 months from the shipping date when stored or used under normal conditions.

## **14. DRAWING**

See following page.

If a more detailed drawing is necessary please contact HOSIDEN or its representatives.

