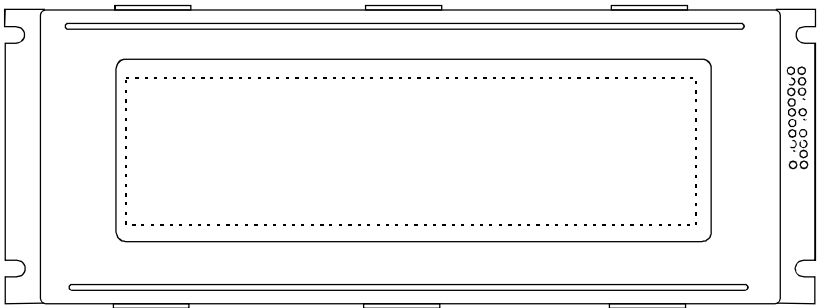




**PRODUCT SPECIFICATION**

**HDM64GS24\_-4**

240x64 GRAPHICS  
LCD DISPLAY MODULE



|                                                                 |             |              |              |                 |
|-----------------------------------------------------------------|-------------|--------------|--------------|-----------------|
| <b>HANTRONIX, INC.</b><br>10080 BUBB RD.<br>CUPERTINO, CA 95014 | Q.A.:<br>JK | REV.:<br>1.2 | HDM64GS24_-4 | SHEET 1 OF 22   |
|                                                                 |             |              |              | DATE:<br>8/8/02 |

# 1.MECHANICAL DATA

(1) Part Name HDM64GS24\_-4  
 (2) Module Size 180.0(W)mm X 65.0(H)mm X MAX10.5(D)mm  
 (W/O,EL B/L)  
 180.0(W)mm X 65.0(H)mm X MAX15.5(D)mm  
 (LED B/L)  
 190.0(W)mm X 65.0(H)mm X MAX13.8(D)mm  
 (CCFL B/L)  
 (3) Dot Size 0.49 (W)mm x 0.49 (H)mm  
 (4) Dot Pitch 0.53 (W)mm x 0.53 (H)mm  
 (5) Number of Dots 240 (W) x 64 (H)Dots  
 (6) Duty 1/64  
 (7) LCD Display Mode STN:☐ Gray Mode ☐ Yellow Mode ☐ Blue Mode  
 FSTN:☐ Black and White(Normal White/Positive Image)  
☐ Black and White(Normal Black/Negative Image)  
 Rear Polarizer: ☐ Reflective ☐ Transflective ☐ Transmissive  
 (8) Viewing Direction ☐ 6 O'clock ☐ 12 O'clock ☐ \_\_\_\_ O'clock  
 (9) Backlight ☐ W/O ☐ EL B/L ☐ LED B/L ☐ CCFL B/L  
 (10) Weight W/O B/L: 128.5 g EL B/L: 135.5 g  
 LED B/L: 164.0 g CCFL B/L: 173.0 g

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## 2.ABSOLUTE MAXIMUM RATINGS

### (1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V Standard

| ITEM                   | SYMBOL  | MIN  | MAX  | UNIT | COMMENT |
|------------------------|---------|------|------|------|---------|
| Power Supply for Logic | VDD-VSS | -0.3 | 7.0  | V    |         |
| Power Supply for LCM   | VDD-VEE | 0    | 20.0 | V    |         |
| Input Voltage          | VI      | -0.3 | VDD  | V    |         |
| Static Electricity     | -       | -    | -    | -    | Note 1  |

Note 1 LCM should be grounded during handling LCM.

### (2) ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

| ITEM                            | NORMAL TEMP. |      |          |      | WIDE TEMP. |      |          |      |
|---------------------------------|--------------|------|----------|------|------------|------|----------|------|
|                                 | OPERATING    |      | STORAGE  |      | OPERATING  |      | STORAGE  |      |
|                                 | MIN.         | MAX. | MIN.     | MAX. | MIN.       | MAX. | MIN.     | MAX. |
| Ambient Temperature             | 0            | 50   | -20      | 70   | -20        | 70   | -30      | 80   |
| Humidity (Without Condensation) | Note 2,4     |      | Note 3,5 |      | Note 4,5   |      | Note 4,6 |      |

Note 2  $T_a \leq 50^\circ\text{C}$  : 85%RH max

$T_a > 50^\circ\text{C}$  : Absolute humidity must be lower  
than the humidity of 85%RH at  $50^\circ\text{C}$

Note 3  $T_a$  at  $-20^\circ\text{C}$  will be  $< 48\text{hrs}$ , at  $70^\circ\text{C}$  will be  $< 120\text{hrs}$

Note 4 Background color changes slightly depending on ambient temperature.  
This phenomenon is reversible.

Note 5  $T_a \leq 70^\circ\text{C}$  : 75%RH max

$T_a > 70^\circ\text{C}$  : Absolute humidity must be lower  
than the humidity of 75%RH at  $70^\circ\text{C}$

Note 6  $T_a$  at  $-30^\circ\text{C}$  will be  $< 48\text{hrs}$ , at  $80^\circ\text{C}$  will be  $< 120\text{hrs}$

|                                                                 |             |              |              |               |
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### 3. ELECTRICAL CHARACTERISTICS (VDD = 5V±10%)

| ITEM                                                    |                  | SYMBOL                                                                                                                                                                                             | CONDITION                                                          | MIN.   | TYP. | MAX.   | UNIT             |
|---------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------|------|--------|------------------|
| Input Voltage                                           |                  | VIH                                                                                                                                                                                                | H level                                                            | 0.7VDD | —    | VDD    | V                |
|                                                         |                  | VIO                                                                                                                                                                                                | L level                                                            | 0      | —    | 0.3VDD | V                |
| Recommended<br>LC Driving Voltage<br>(Normal Temp. LCM) | VDD-VEE          | Duty=<br>1/64                                                                                                                                                                                      | 0°C                                                                | 13.1   | 13.5 | 13.9   | V                |
|                                                         |                  |                                                                                                                                                                                                    | 25°C                                                               | 11.9   | 12.5 | 13.1   |                  |
|                                                         |                  | Bias=<br>1/9                                                                                                                                                                                       | 50°C                                                               | 10.8   | 11.4 | 11.8   |                  |
| Recommended<br>LC Driving Voltage<br>(Wide Temp. LCM)   | VDD-VEE          | Duty=<br>1/64                                                                                                                                                                                      | -20°C                                                              | 11.7   | 12.1 | 12.5   | V                |
|                                                         |                  |                                                                                                                                                                                                    | 0°C                                                                | 11.6   | 12.0 | 12.4   |                  |
|                                                         |                  | Bias=<br>1/9                                                                                                                                                                                       | 25°C                                                               | 11.5   | 11.9 | 12.3   |                  |
|                                                         |                  |                                                                                                                                                                                                    | 50°C                                                               | 11.4   | 11.8 | 12.2   |                  |
|                                                         |                  |                                                                                                                                                                                                    | 70°C                                                               | 11.3   | 11.7 | 12.1   |                  |
| Power Supply Current                                    | IDD              | FLM=72 Hz<br>VDD=5.0 V<br>VDD-VEE=11.6 V                                                                                                                                                           |                                                                    | 6.5    | 7.2  | 10.6   | mA               |
|                                                         | IEE              | PATTERN :<br><div> <div>□</div> <div>■</div> <div>□</div> <div>■</div> <div>□</div> <div>■</div> </div> <div> <div>■</div> <div>□</div> <div>■</div> <div>□</div> <div>■</div> <div>□</div> </div> |                                                                    | 1.6    | 1.8  | 2.4    |                  |
| LED Power Supply Current                                | I <sub>LED</sub> | V <sub>AK</sub> = 5.0 V<br>R <sub>18</sub> = R <sub>19</sub> = 10Ω                                                                                                                                 |                                                                    | —      | 220  | —      | mA               |
| EL Power Supply Current                                 | I <sub>EL</sub>  | V <sub>AK</sub> = 110 V <sub>rms</sub><br>400HZ<br>R <sub>18</sub> = R <sub>19</sub> = 0Ω                                                                                                          |                                                                    | —      | —    | 10.0   | mA rms           |
| CCFL                                                    | Starting Voltage | V <sub>FLS</sub>                                                                                                                                                                                   | —                                                                  | —      | 900  | —      | V <sub>rms</sub> |
|                                                         | Driving Voltage  | V <sub>FLD</sub>                                                                                                                                                                                   | —                                                                  | —      | 450  | —      | V <sub>rms</sub> |
|                                                         | Driving Current  | I <sub>FLD</sub>                                                                                                                                                                                   | V <sub>FLD</sub> = 450V <sub>rms</sub><br>f <sub>FLD</sub> = 30KHZ | —      | 5.0  | —      | mA rms           |
|                                                         | Driving Voltage  | f <sub>FL</sub>                                                                                                                                                                                    | —                                                                  | 15     | 30   | 50     | KHZ              |

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### 3. ELECTRICAL CHARACTERISTICS (White LED)

( VDD = 5V±10% )

| ITEM                                                    |                      | SYMBOL  |                                         | CONDITION                                           |      | MIN.   | TYP. | MAX.   | UNIT              |
|---------------------------------------------------------|----------------------|---------|-----------------------------------------|-----------------------------------------------------|------|--------|------|--------|-------------------|
| Input Voltage                                           |                      | VIH     |                                         | H level                                             |      | 0.7VDD | —    | VDD    | V                 |
|                                                         |                      | VIO     |                                         | L level                                             |      | 0      | —    | 0.3VDD | V                 |
| Recommended<br>LC Driving Voltage<br>(Normal Temp. LCM) |                      | VDD-VEE |                                         | Duty=<br>1/64<br><br>Bias=<br>1/9                   | 0°C  | —      | 13.3 | 13.8   | V                 |
|                                                         |                      |         |                                         |                                                     | 25°C | 11.7   | 12.5 | 13.1   |                   |
|                                                         |                      |         |                                         |                                                     | 50°C | 10.8   | 11.4 | —      |                   |
| Power Supply Current                                    |                      | IDD     |                                         | FLM=72 Hz<br>VDD=5.0 V<br>VDD-VEE=12.5V             |      | —      | 9.0  | 14.0   | mA                |
|                                                         |                      | IEE     |                                         | PATTERN :<br>□ ■ □ ■ □ ■<br>■ □ ■ □ ■ □             |      | —      | 2.0  | 3.5    |                   |
| LED Power Supply Current                                |                      | I LED   |                                         | VBL = 5.0 V<br>RBL = 7.5 Ω                          |      | —      | 200  | 300    | mA                |
| LCM                                                     | Surface<br>Luminance | LED     | VDD=5.0V<br>VDD-VO=12.5V<br>ILED=200 mA | PATTERN:<br>(Dots All<br>Off)<br>■ ■ ■ ■<br>■ ■ ■ ■ |      | —      | 6.6  | —      | cd/m <sup>2</sup> |
|                                                         |                      |         |                                         | PATTERN:<br>(Dots All<br>ON)<br>□ □ □ □<br>□ □ □ □  |      | —      | 27.1 | —      | cd/m <sup>2</sup> |

## 4.OPTICAL CHARACTERISTICS

### 4-1 Optical Char. of Normal Temp. Mode

AT Vop

| MODE | ITEM | Cr(Contrast Ratio) |      | $\theta$ (Viewing Angle) |       | $\phi$ (Viewing Angle) |      |
|------|------|--------------------|------|--------------------------|-------|------------------------|------|
|      |      | 25°C               |      | 25°C                     |       | 25°C                   |      |
|      |      | MIN.               | TYP. | MIN.                     | TYP.  | MIN.                   | TYP. |
| R    | A, B | 3.5                | 4.5  | 50                       | 75    | 20                     | 30   |
|      | C, D | 6.0                | 9.0  | 60                       | 85    | 20                     | 35   |
|      | J    | 4.5                | 7.5  | 55                       | 80    | 20                     | 35   |
| S    | A, B | 3.0                | 4.2  | 50                       | 75    | 20                     | 30   |
|      | C, D | 5.0                | 8.0  | 55                       | 85    | 20                     | 35   |
|      | J    | 4.0                | 7.0  | 50                       | 75    | 20                     | 35   |
| T    | A    | 2.0                | 2.5  | 40                       | 60    | 18                     | 25   |
|      | E, F | 3.0                | 4.0  | 50                       | 70    | 20                     | 35   |
|      | J, K | 3.0                | 4.0  | 50                       | 70    | 20                     | 35   |
| note |      | NOTE6              |      |                          | NOTE5 |                        |      |

AT  $\phi=0^\circ$   $\theta=0^\circ$

| ITEM                 | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE   |
|----------------------|--------|-----------|------|------|------|------|--------|
| Response Time (rise) | Tr     | 0°C       | —    | 600  | 1200 | ms   | NOTE 2 |
|                      |        | 25°C      | —    | 110  | 220  |      |        |
|                      |        | 50°C      | —    | 50   | 100  |      |        |
| Response Time (fall) | Tf     | 0°C       | —    | 900  | 1500 | ms   | NOTE 2 |
|                      |        | 25°C      | —    | 250  | 360  |      |        |
|                      |        | 50°C      | —    | 100  | 150  |      |        |

note:

R: REFLECTIVE  
 S: TRANSFLECTIVE  
 T: TRANSMISSIVE  
 A: GRAY  
 C: YELLOW  
 E: BLUE  
 G: NORMALLY BLACK  
 J: NORMALLY WHITE

|                                                                 |             |              |              |               |
|-----------------------------------------------------------------|-------------|--------------|--------------|---------------|
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## 4-2 Optical Char. of Wide Temp. Mode

AT V<sub>OP</sub>

| MODE | ITEM | Cr(Contrast Ratio) |      | $\theta$ (Viewing Angle) |      | $\phi$ (Viewing Angle) |      |
|------|------|--------------------|------|--------------------------|------|------------------------|------|
|      |      | 25°C               |      | 25°C                     |      | 25°C                   |      |
|      |      | MIN.               | TYP. | MIN.                     | TYP. | MIN.                   | TYP. |
| R    | A    | 3.5                | 4.2  | 50                       | 68   | 20                     | 30   |
|      | C    | 5.0                | —    | 50                       | —    | 30                     | 35   |
|      | J    | 6.0                | 8.0  | 50                       | 70   | 20                     | 38   |
| S    | A    | 3.5                | 4.0  | 50                       | 65   | 20                     | 30   |
|      | C    | 5.0                | —    | 50                       | —    | 25                     | 35   |
|      | J    | 5.0                | 7.0  | 50                       | —    | 25                     | 35   |
| T    | E    |                    |      |                          |      |                        |      |
|      | G    |                    |      |                          |      |                        |      |
| note |      | NOTE6              |      | NOTE5                    |      |                        |      |

AT  $\phi=0^\circ$   $\theta=0^\circ$

| ITEM                 | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE   |
|----------------------|--------|-----------|------|------|------|------|--------|
| Response Time (rise) | Tr     | -20°C     | —    | 2100 | 3200 | ms   | NOTE 2 |
|                      |        | 0°C       | —    | 450  | 680  |      |        |
|                      |        | 25°C      | —    | 150  | 250  |      |        |
|                      |        | 50°C      | —    | 110  | 170  |      |        |
|                      |        | 70°C      | —    | 70   | 90   |      |        |
| Response Time (fall) | Tf     | -20°C     | —    | 2100 | 3200 | ms   | NOTE 2 |
|                      |        | 0°C       | —    | 400  | 600  |      |        |
|                      |        | 25°C      | —    | 120  | 180  |      |        |
|                      |        | 50°C      | —    | 60   | 100  |      |        |
|                      |        | 70°C      | —    | 30   | 50   |      |        |

note:

R: REFLECTIVE  
 S: TRANSFLECTIVE  
 T: TRANSMISSIVE  
 A: GRAY  
 C: YELLOW  
 E: BLUE  
 G: NORMALLY BLACK  
 J: NORMALLY WHITE

|                                                                 |             |              |              |               |
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## 4.OPTICAL CHARACTERISTICS (White LED)

AT V<sub>OP</sub>

| ITEM<br>MODE |   | Cr(Contrast Ratio) |      | $\theta$ (Viewing Angle) |      | $\phi$ (Viewing Angle) |      |
|--------------|---|--------------------|------|--------------------------|------|------------------------|------|
|              |   | 25°C               |      | 25°C                     |      | 25°C                   |      |
|              |   | MIN.               | TYP. | MIN.                     | TYP. | MIN.                   | TYP. |
| T            | G | —                  | 10   | —                        | 70   | —                      | 60   |
| note         |   | NOTE6              |      | NOTE5                    |      |                        |      |

note:  
T: TRANSMISSIVE  
G: NORMALLY BLACK

AT  $\phi=0^\circ$   $\theta=0^\circ$

| ITEM                 | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | NOTE   |
|----------------------|--------|-----------|------|------|------|------|--------|
| Response Time (rise) | Tr     | 0°C       | —    | 600  | 1200 | ms   | NOTE 2 |
|                      |        | 25°C      | —    | 110  | 220  |      |        |
|                      |        | 50°C      | —    | 50   | 100  |      |        |
| Response Time (fall) | Tf     | 0°C       | —    | 900  | 1500 | ms   | NOTE 2 |
|                      |        | 25°C      | —    | 250  | 360  |      |        |
|                      |        | 50°C      | —    | 100  | 150  |      |        |

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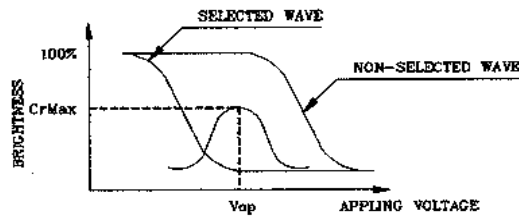
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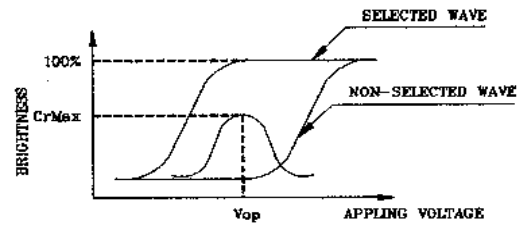


(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



(negative type)

\*Conditions

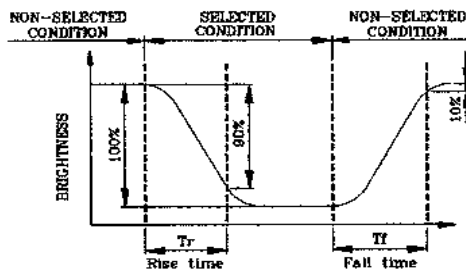
Viewing Angle : 0

Frame Frequency : 70Hz

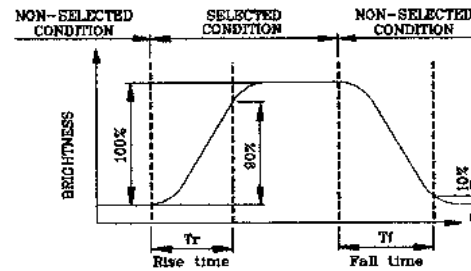
Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



(negative type)

\*Conditions

Operating Voltage : Vop

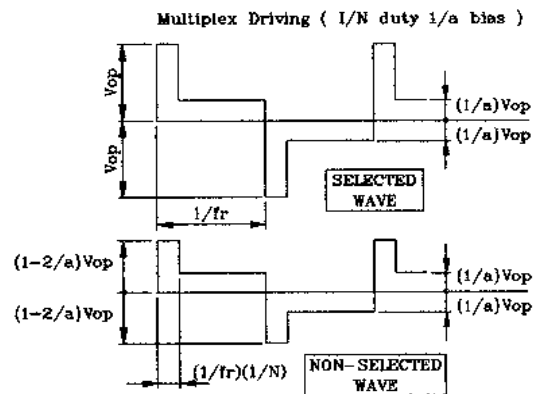
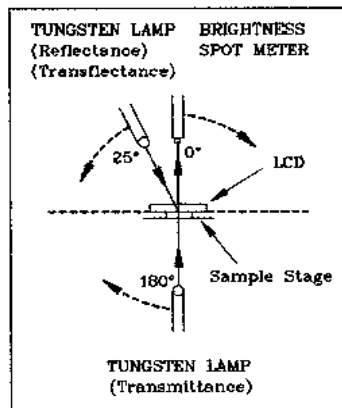
Viewing Angle (θ,φ) : (0,0)

Frame Frequency : 70Hz

Applying Waveform : 1/N duty 1/a bias

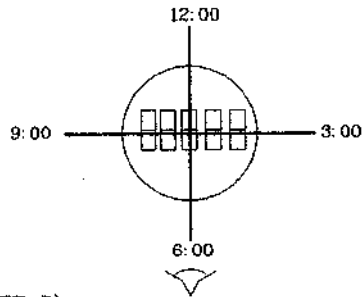
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



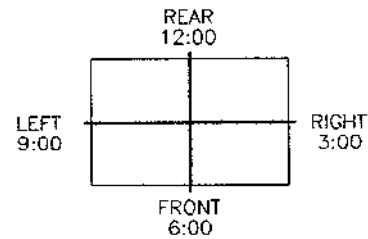
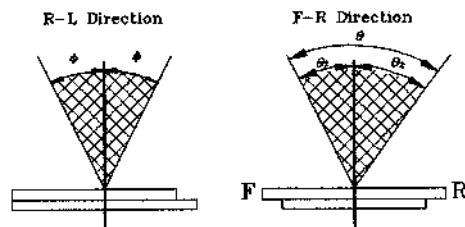
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



\*For This Product

The Viewing Direction Is 6 O'clock  
So  $\theta_1 > \theta_2$

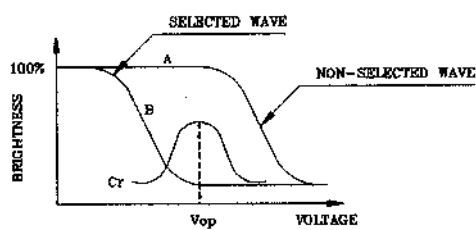
$$\theta = \theta_1 + \theta_2$$

\*Conditions

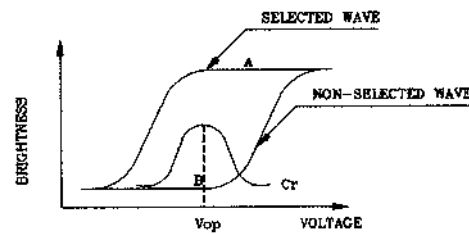
Operating Voltage :  $V_{op}$   
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias  
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

$$\text{Contrast Ratio : } Cr = A/B$$

\*Conditions

Viewing Angle : 0  
Frame Frequency : 70Hz  
Applying Waveform : 1/N duty 1/a bias

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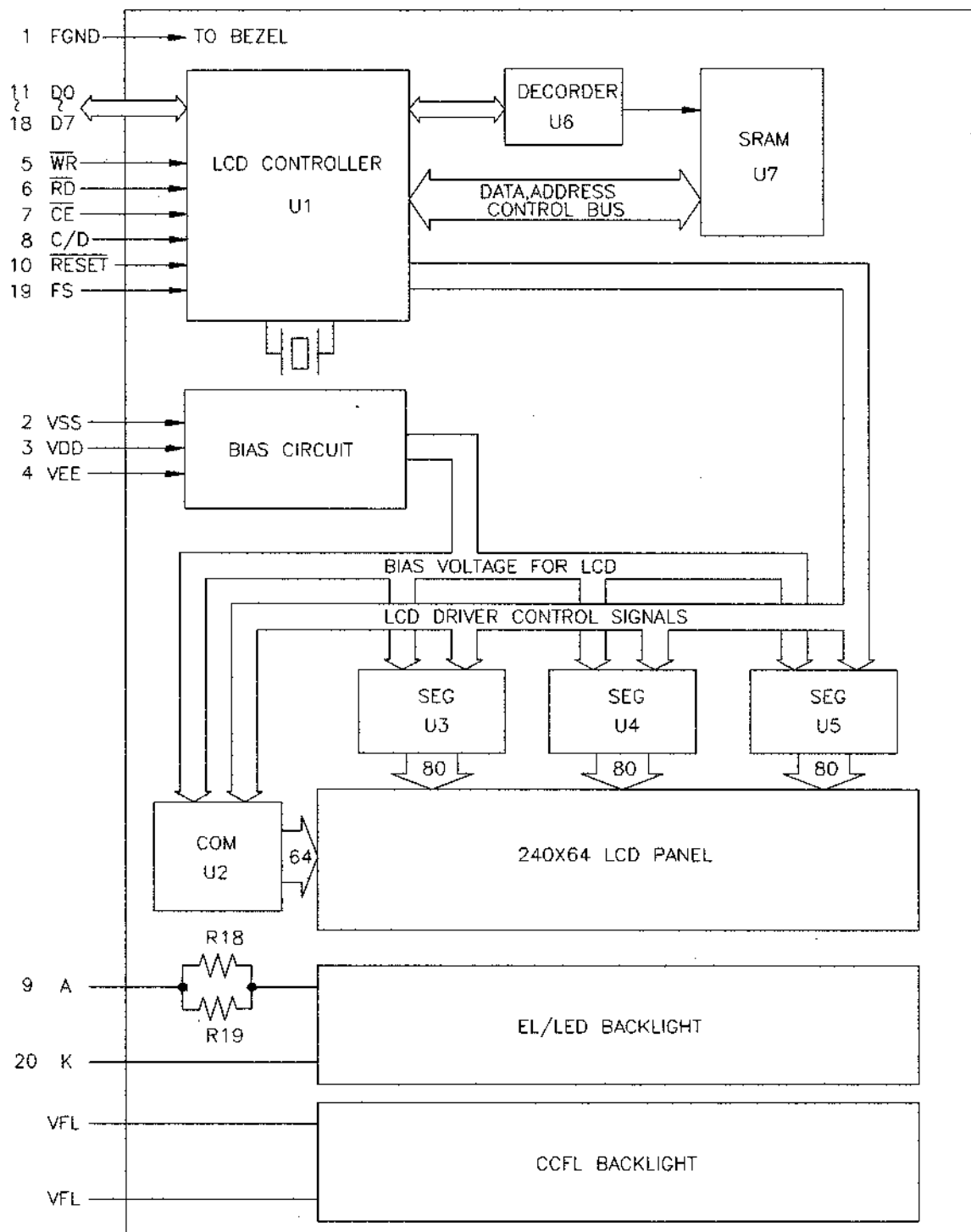
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## 5. BLOCK DIAGRAM



## 6.INTERNAL PIN CONNECTION

| PIN NO. | SYMBOL             | FUNCTION                                                                                                                                                                  |
|---------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | FGND               | FRAME GROUND (0V)                                                                                                                                                         |
| 2       | VSS                | GROUND                                                                                                                                                                    |
| 3       | VDD                | POWER SUPPLY FOR LOGIC (+5V)                                                                                                                                              |
| 4       | VEE                | POWER SUPPLY FOR LC DRIVING                                                                                                                                               |
| 5       | $\overline{WR}$    | DATA WRITE                                                                                                                                                                |
| 6       | $\overline{RD}$    | DATA READ                                                                                                                                                                 |
| 7       | $\overline{CE}$    | CHIP ENABLE                                                                                                                                                               |
| 8       | C/D                | $\overline{WR}$ ="L",C/D="H" :COMMAND WRITE $\overline{WR}$ ="L",C/D="L" :DATA WRITE<br>$\overline{RD}$ ="L",C/D="H" :STATUS READ $\overline{RD}$ ="L",C/D="L" :DATA READ |
| 9       | A                  | Anode of LED B/L and EL B/L                                                                                                                                               |
| 10      | $\overline{RESET}$ | CONTROLLER RESET                                                                                                                                                          |
| 11      | D0                 | DATA INPUT/OUTPUT                                                                                                                                                         |
| 12      | D1                 | DATA INPUT/OUTPUT                                                                                                                                                         |
| 13      | D2                 | DATA INPUT/OUTPUT                                                                                                                                                         |
| 14      | D3                 | DATA INPUT/OUTPUT                                                                                                                                                         |
| 15      | D4                 | DATA INPUT/OUTPUT                                                                                                                                                         |
| 16      | D5                 | DATA INPUT/OUTPUT                                                                                                                                                         |
| 17      | D6                 | DATA INPUT/OUTPUT                                                                                                                                                         |
| 18      | D7                 | DATA INPUT/OUTPUT                                                                                                                                                         |
| 19      | FS                 | FONT SELECT    CONNECT TO VDD :6X8 PIXELS/CHARACTER<br>CONNECT TO GND :8X8 PIXELS/CHARACTER                                                                               |
| 20      | K                  | Cathode of LED B/L and EL B/L                                                                                                                                             |

CCFL Connector : J.A.E/IL-G-4S-S3C2

| PIN NO. | SYMBOL | FUNCTION                    |
|---------|--------|-----------------------------|
| 1       | VFL    | POWER SUPPLY FOR CCFL DRIVE |
| 2       | NC     | —                           |
| 3       | NC     | —                           |
| 4       | VFL    | POWER SUPPLY FOR CCFL DRIVE |

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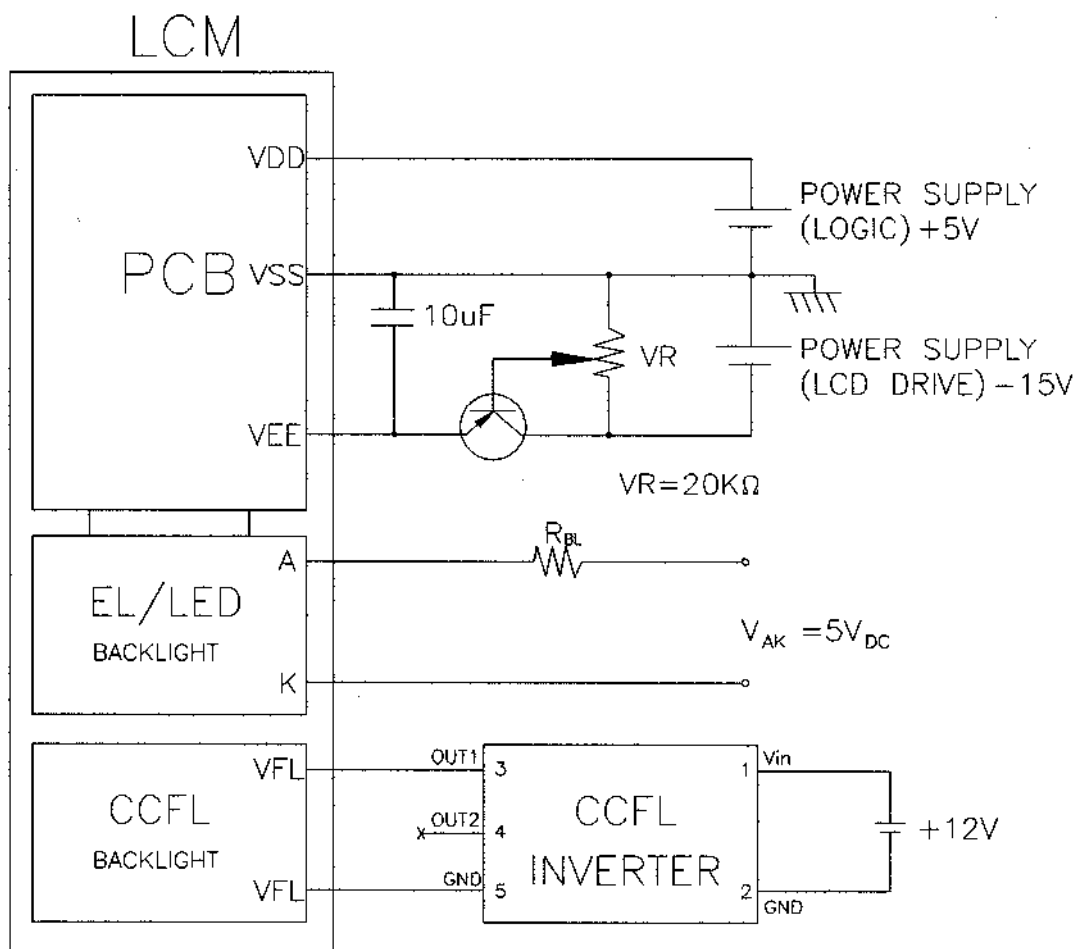
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## 7. POWER SUPPLY



Recommended Inverter : CXA-L10L (TDK)

Recommended Value for R<sub>BL</sub> and V<sub>BL</sub>

| item<br>Back Light<br>interface | R <sub>BL</sub> |                            | V <sub>BL</sub>             |                  |
|---------------------------------|-----------------|----------------------------|-----------------------------|------------------|
|                                 | EL              | LED (White)                | EL                          | LED (White)      |
| A,K PIN                         | 0 $\Omega$      | 5 $\Omega$<br>7.5 $\Omega$ | 110V <sub>AC</sub><br>400HZ | 5V <sub>DC</sub> |

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## 8. TIMING CHARACTERISTICS

### 8-1 INTERFACE TIMING

| ITEM                                                      | ITEM                     | CONDITION | MIN. | MAX. | UNIT |
|-----------------------------------------------------------|--------------------------|-----------|------|------|------|
| C/D SET UP TIME                                           | $t_{CDS}$                | Fig.      | 100  | —    | ns   |
| C/D HOLD TIME                                             | $t_{CDH}$                | Fig.      | 10   | —    | ns   |
| $\overline{CE}, \overline{RD}, \overline{WR}$ CLOCK WIDTH | $t_{CP}, t_{RP}, t_{WP}$ | Fig.      | 80   | —    | ns   |
| DATA SET UP TIME                                          | $t_{DS}$                 | Fig.      | 80   | —    | ns   |
| DATA HOLD TIME                                            | $t_{DH}$                 | Fig.      | 40   | —    | ns   |
| ACCESS TIME                                               | $t_{ACC}$                | Fig.      | —    | 150  | ns   |
| DATA OUTPUT HOLD TIME                                     | $t_{OH}$                 | Fig.      | 10   | 50   | ns   |

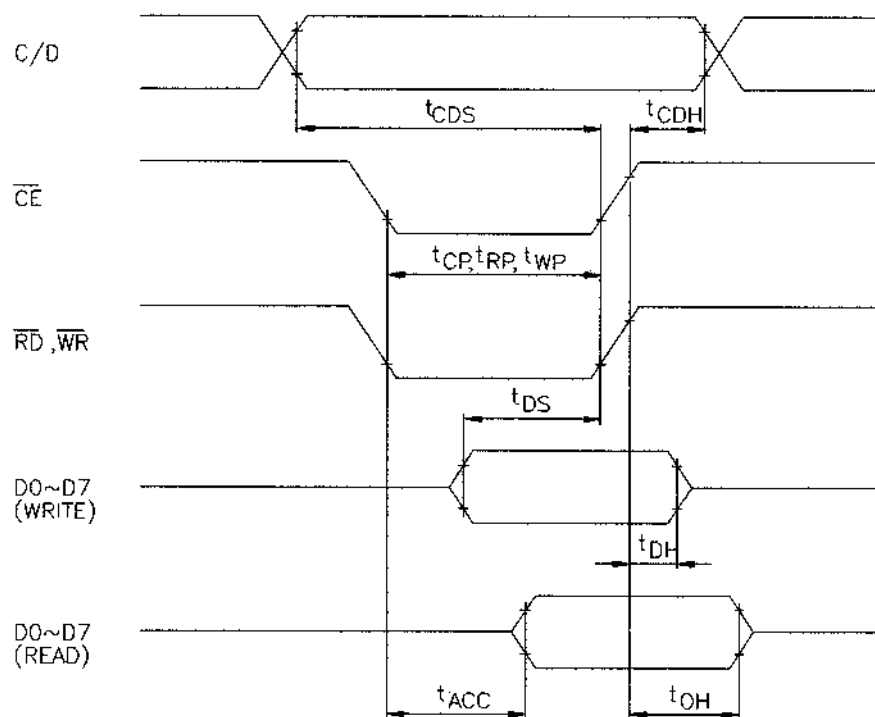
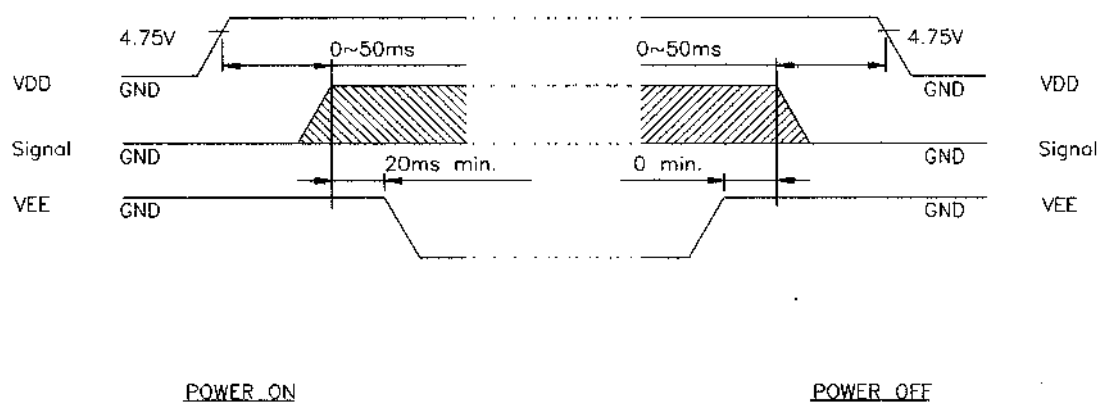


Fig. INTERFACE TIMING CHART

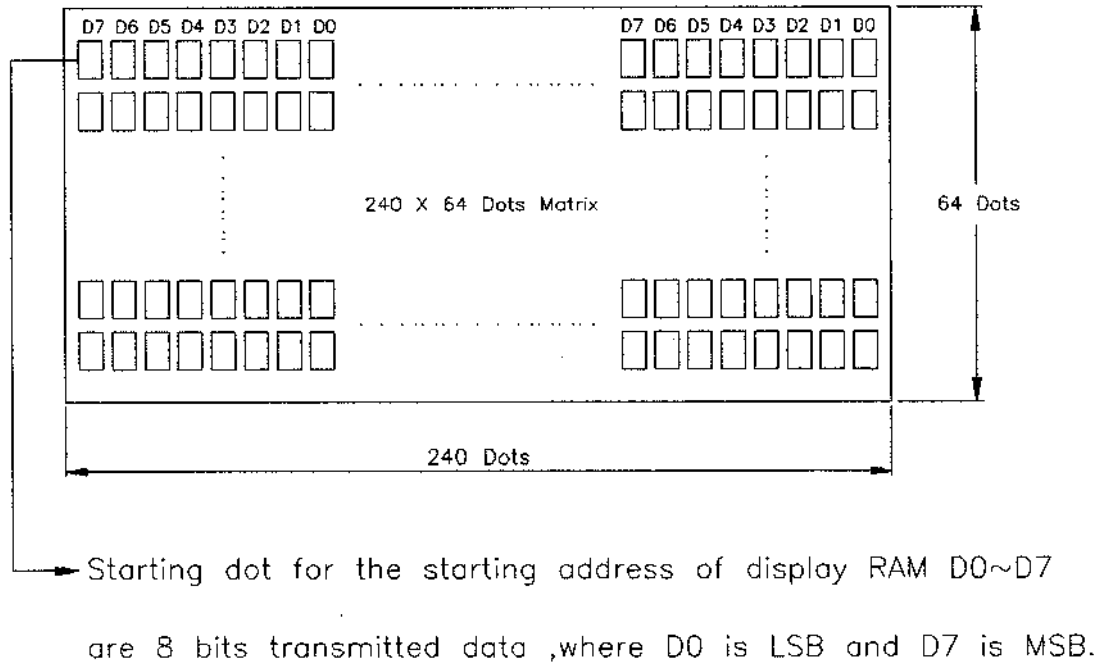
## 8-2 POWER ON/OFF TIMING



The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

|                                                                 |             |              |                     |                |
|-----------------------------------------------------------------|-------------|--------------|---------------------|----------------|
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# 8-3 DISPLAY PATTERN



|                                                          |             |              |              |                |
|----------------------------------------------------------|-------------|--------------|--------------|----------------|
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## 9. RELIABILITY TEST

| NO | ITEM                            | CONDITION                                                  |       |  | STANDARD                  | NOTE     |
|----|---------------------------------|------------------------------------------------------------|-------|--|---------------------------|----------|
| 1  | High Temp. Storage              | 70°C                                                       | 120HR |  | Appearance without defect |          |
| 2  | Low Temp. Storage               | -20°C                                                      | 120HR |  | Appearance without defect |          |
| 3  | High Temp. & High Humi. Storage | 40°C<br>90%RH                                              | 120HR |  | Appearance without defect |          |
| 4  | Thermal Shock                   | -20°C,30min→25°C,5min<br>→70°C,30min→25°C,5min<br>(1cycle) |       |  | Appearance without defect | 5 cycles |

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NOTICE:

• SAFETY

- 1.If the LCD panel breaks, be careful not to get the liquid crystal to touch your skin.
- 2.If the liquid crystal touches your skin or clothes, please wash it off immediately by using soap and water.

• HANDLING

- 1.Avoid static electricity which can damage the CMOS LSI.
- 2.Do not remove the panel or frame from the module.
- 3.The polarizing plate of the display is very fragile. So, please handle it very carefully.
- 4.Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- 5.Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.

• STORAGE

- 1.Store the panel or module in a dark place where the temperature is  $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$  and the humidity is below 65% RH.
- 2.Do not place the module near organics solvents or corrosive gases.
- 3.Do not crush, shake, or jolt the module.

• TERMS OF WARRANT

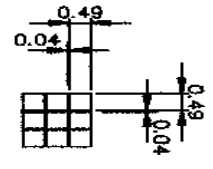
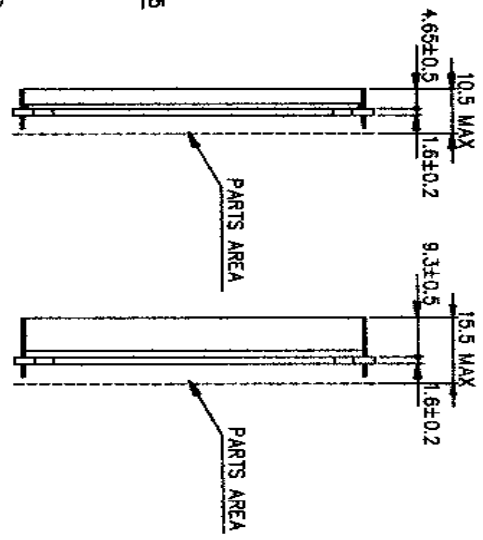
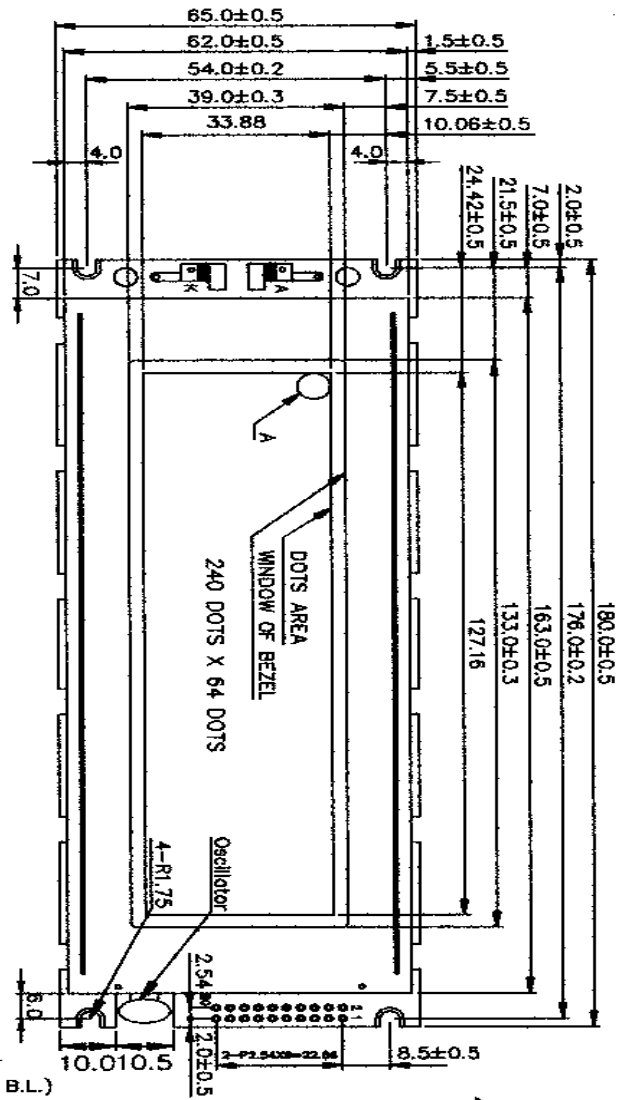
- 1.Acceptance inspection period  
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- 2.Applicable warrant period  
The period is within twelve months since the date of shipping out under normal using and storage conditions.

• THE OPERATING LIFE TIME OF BACK LIGHT

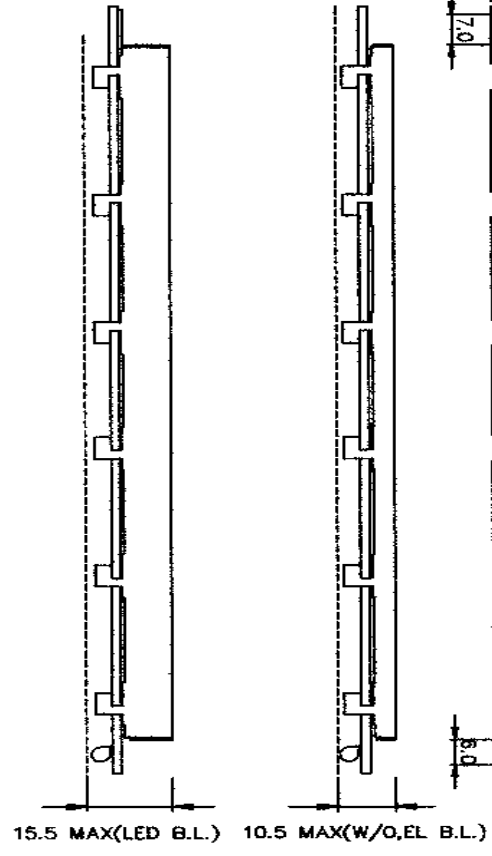
- EL : 5000hrs for AC 110Vrms, 400Hz, 20°C, 60%RH  
CCFT : 20,000hrs for lamp-current 5mA, 30KHz, 25°C  
White LED : 40,000hrs for ILED=200mA, 25°C  
LED : 50,000hrs for ILED=220mA, 25°C

(Operating life time is defined as follows : The final brightness is at 50% of original brightness.)

|                                                          |                 |                  |              |                |
|----------------------------------------------------------|-----------------|------------------|--------------|----------------|
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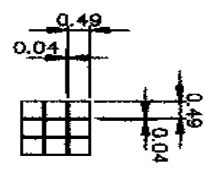
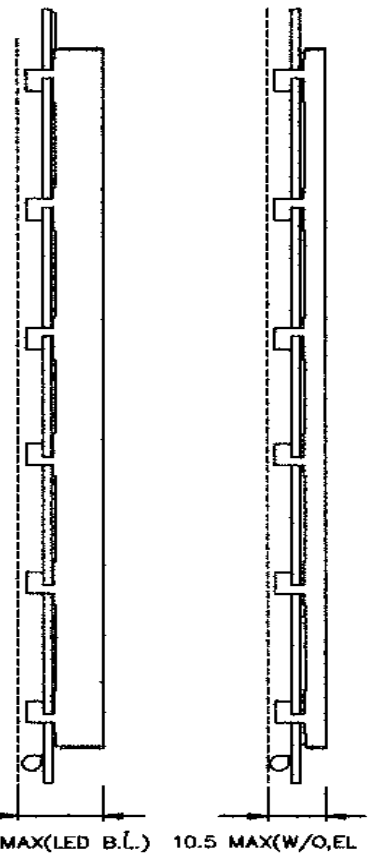
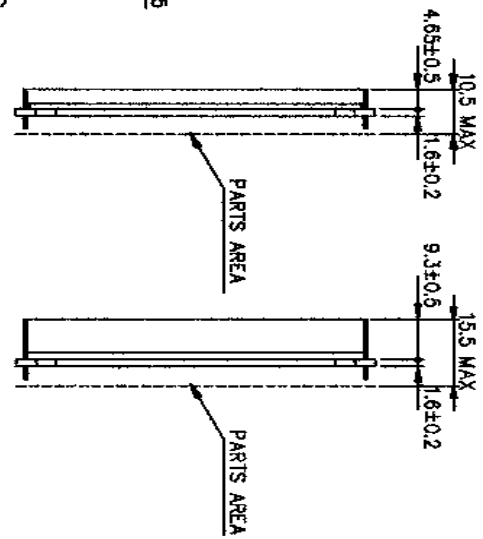
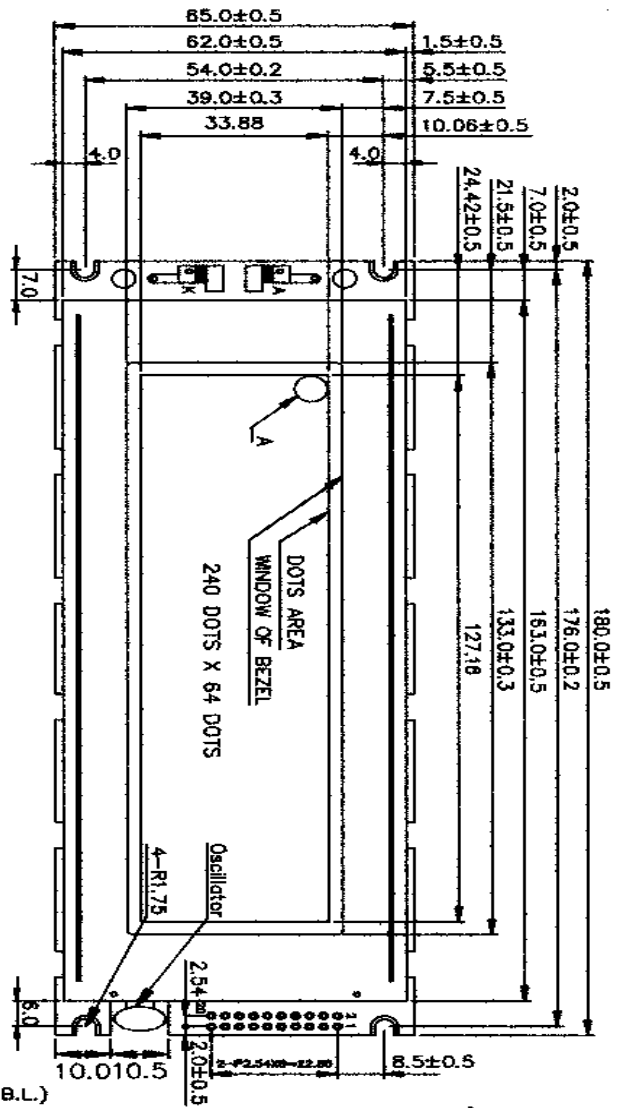


| PIN NO. | 1    | 2   | 3   | 4   | 5  | 6  | 7  | 8   | 9  | 10    |
|---------|------|-----|-----|-----|----|----|----|-----|----|-------|
| SYMBOL  | FGND | VSS | VDD | VEE | WR | RD | CE | C/D | A  | RESET |
| PIN NO. | 11   | 12  | 13  | 14  | 15 | 16 | 17 | 18  | 19 | 20    |
| SYMBOL  | D0   | D1  | D2  | D3  | D4 | D5 | D6 | D7  | FS | K     |



- NOTES:
1. Resolution: 240 x 64 Dots
  2. Controller: Built-in
  3. DC/DC Converter: Without

W/O,EL B/L LED B/L



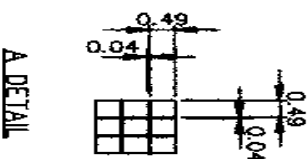
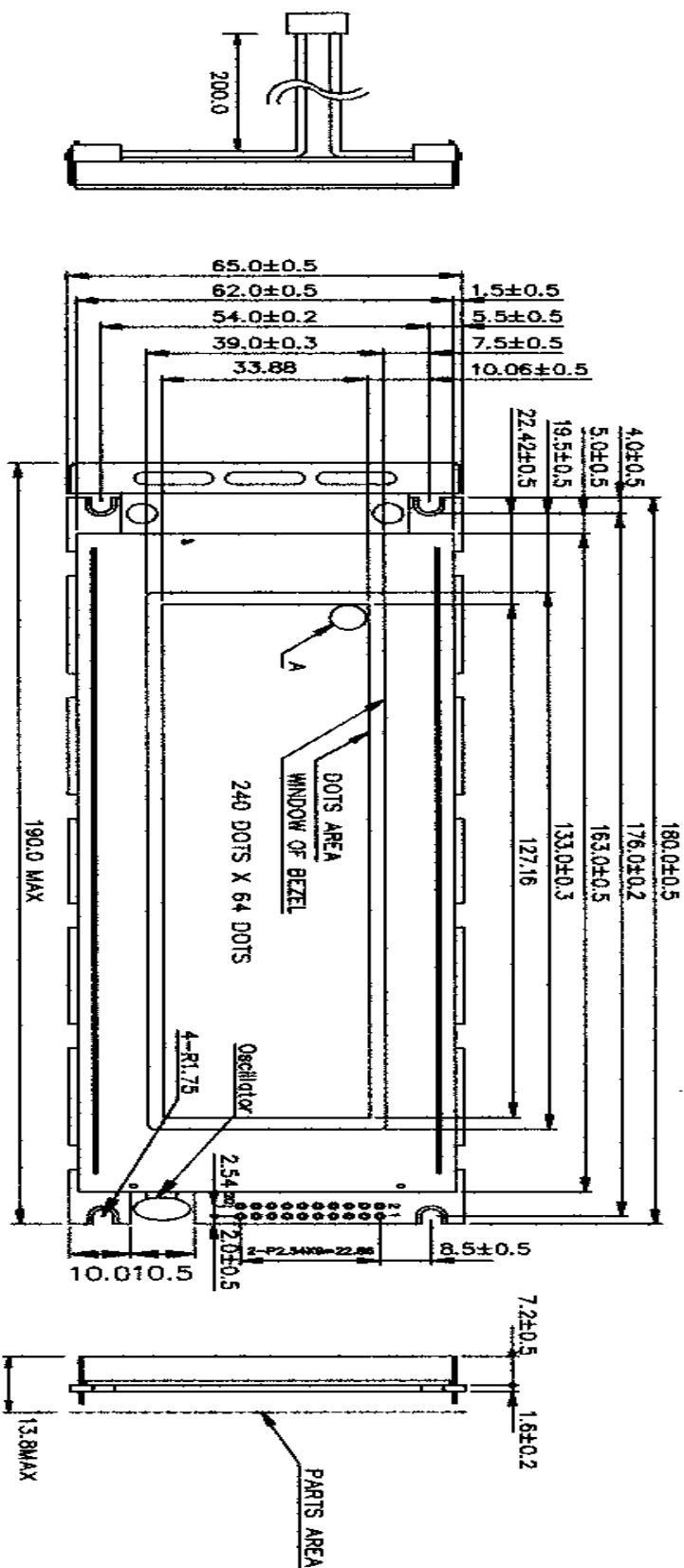
A DETAIL

| PIN NO. | 1    | 2   | 3   | 4   | 5  | 6  | 7  | 8   | 9  | 10    |
|---------|------|-----|-----|-----|----|----|----|-----|----|-------|
| SYMBOL  | FGND | VSS | VDD | VEE | WR | RD | OE | C/D | A  | RESET |
| PIN NO. | 11   | 12  | 13  | 14  | 15 | 16 | 17 | 18  | 19 | 20    |
| SYMBOL  | D0   | D1  | D2  | D3  | D4 | D5 | D6 | D7  | FS | K     |

NOTES:

1. Resolution : 240 x 64 Dots
2. Controller : T6963C(Compatible)
3. DC/DC Converter : Without
4. J1 didn't add 0Ω, Disconnect Pin1(FGND) and Pin2(GND)
5. General Tolerance : ±0.5 mm

W/O,EL B/L LED B/L



| PIN NO. | 1    | 2   | 3   | 4   | 5  | 6  | 7  | 8   | 9  | 10    |
|---------|------|-----|-----|-----|----|----|----|-----|----|-------|
| SYMBOL  | FGND | VSS | VDD | VEE | WR | RD | CE | C/D | A  | RESET |
| PIN NO. | 11   | 12  | 13  | 14  | 15 | 16 | 17 | 18  | 19 | 20    |
| SYMBOL  | D0   | D1  | D2  | D3  | D4 | D5 | D6 | D7  | FS | K     |

# NOTES:

1. Resolution: 240 x 64 Dots
2. Controller: Built-in
3. DC/DC Converter: Without

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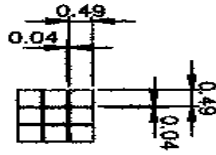
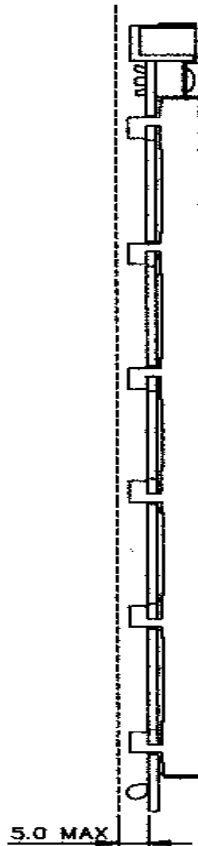
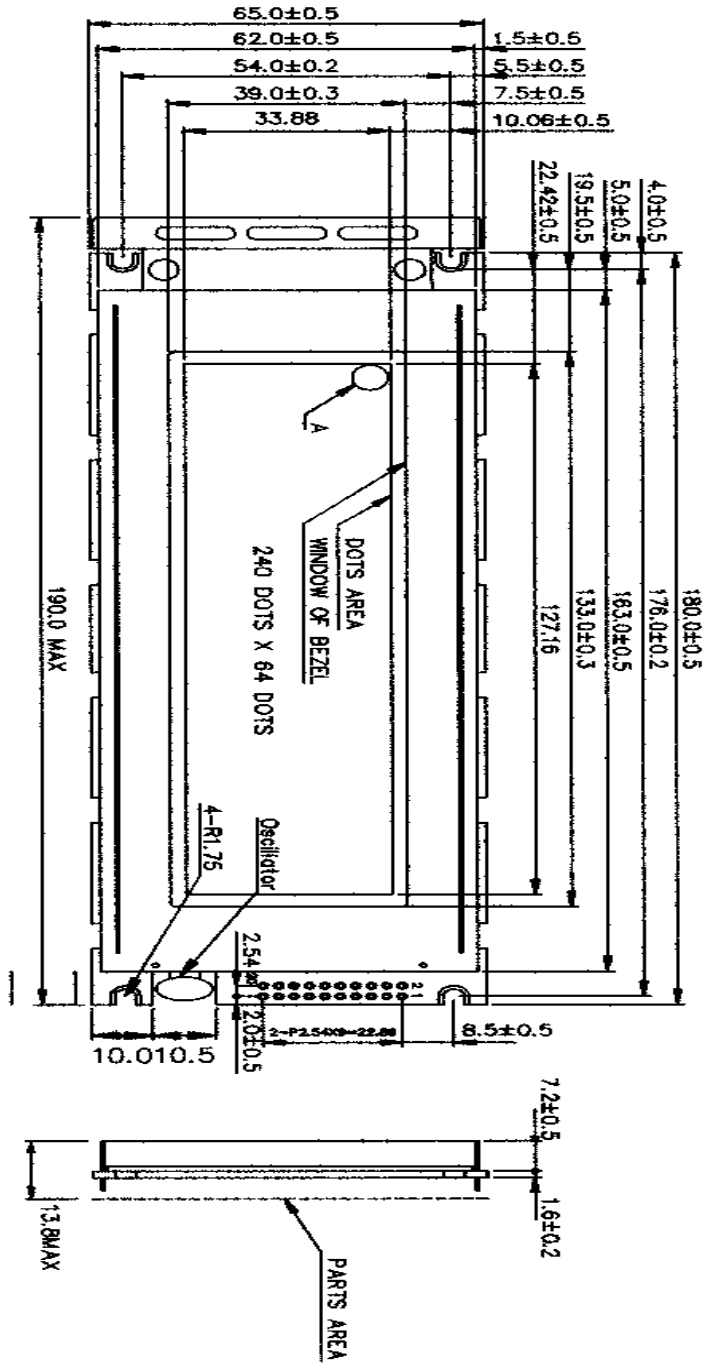
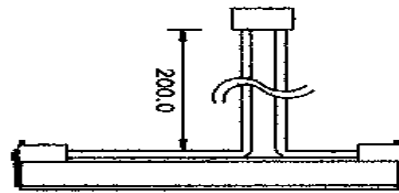
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A DETAIL

| PN NO. | 1    | 2   | 3   | 4   | 5  | 6  | 7  | 8   | 9  | 10    |
|--------|------|-----|-----|-----|----|----|----|-----|----|-------|
| SMBOL  | FGND | VSS | VDD | VEE | WR | RD | CE | C/D | A  | RESET |
| PN NO. | 11   | 12  | 13  | 14  | 15 | 16 | 17 | 18  | 19 | 20    |
| SMBOL  | D0   | D1  | D2  | D3  | D4 | D5 | D6 | D7  | FS | K     |

NOTES:

1. Resolution : 240 x 64 Dots
2. Controller : T6963C(Compatible)
3. DC/DC Converter : Without
4. Bezel Material : SPCC
5. General Tolerance :  $\pm 0.5$  mm

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