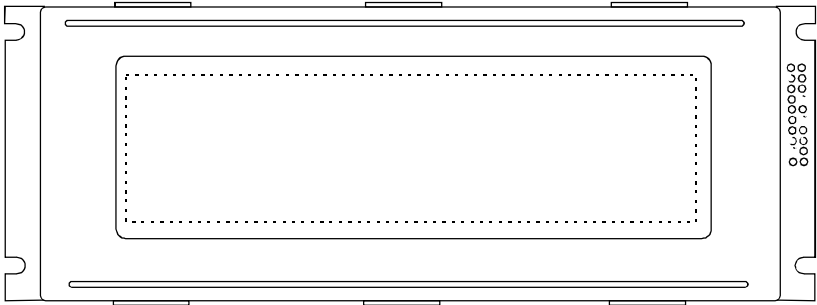




PRODUCT SPECIFICATION

HDM64GS24_-4

240x64 GRAPHICS
LCD DISPLAY MODULE



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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°C

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

Note 6 T_a at -30°C will be $< 48\text{hrs}$, at 80°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 LC Driving Voltage (Normal Temp. LCM)	VDD-VEE	Duty= 1/64	0°C	13.1	13.5	13.9	V
			25°C	11.9	12.5	13.1	
		Bias= 1/9	50°C	10.8	11.4	11.8	
Recommended LC Driving Voltage (Wide Temp. LCM)	VDD-VEE	Duty= 1/64	-20°C	11.7	12.1	12.5	V
			0°C	11.6	12.0	12.4	
		Bias= 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 VDD=5.0 V VDD-VEE=11.6 V	6.5	7.2	10.6	mA	
	IEE	PATTERN : 	1.6	1.8	2.4		
LED Power Supply Current	I _{LED}	V _{AK} = 5.0 V R ₁₈ = R ₁₉ = 10Ω	-	220	-	mA	
EL Power Supply Current	I _{EL}	V _{AK} = 110 V _{rms} 400HZ R ₁₈ = R ₁₉ = 0Ω	-	-	10.0	mA rms	
CCFL	Starting Voltage	V _{FLS}	-	-	900	-	V _{rms}
	Driving Voltage	V _{FLD}	-	-	450	-	V _{rms}
	Driving Current	I _{FLD}	V _{FLD} = 450V _{rms} f _{FLD} = 30KHZ	-	5.0	-	mA rms
	Driving Voltage	f _{FL}	-	15	30	50	KHZ

3. ELECTRICAL CHARACTERISTICS (White LED)

(VDD = 5V±10%)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT		
Input Voltage	V _{IH}	H level	0.7VDD	-	VDD	V		
	V _{IO}	L level	0	-	0.3VDD	V		
Recommended LC Driving Voltage (Normal Temp. LCM)	VDD-VEE	Duty= 1/64	0°C	-	13.3	13.8	V	
			25°C	11.7	12.5	13.1		
		Bias= 1/9	50°C	10.8	11.4	-		
Power Supply Current	I _{DD}	FLM=72 Hz VDD=5.0 V VDD-VEE=12.5V	-	9.0	14.0	mA		
	I _{EE}	PATTERN : 	-	2.0	3.5			
LED Power Supply Current	I _{LED}	V _{BL} = 5.0 V R _{BL} = 7.5 Ω	-	200	300	mA		
LCM	Surface Luminance	LED	VDD=5.0V VDD-VO=12.5V ILED=200 mA	PATTERN: (Dots All Off) 	-	6.6	-	cd/m ²
				PATTERN: (Dots All ON) 	-	27.1	-	cd/m ²

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4. OPTICAL CHARACTERISTICS

4-1 Optical Char. of Normal Temp. Mode

AT Vop

MODE	ITEM	Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (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 Vop

MODE	ITEM	Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (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_{OP}

ITEM		Cr(Contrast Ratio)		θ (Viewing Angle)		ϕ (Viewing Angle)	
		25°C		25°C		25°C	
MODE		MIN.	TYP.	MIN.	TYP.	MIN.	TYP.
T	G	—	10	—	70	—	60
note		NOTE6			NOTE5		

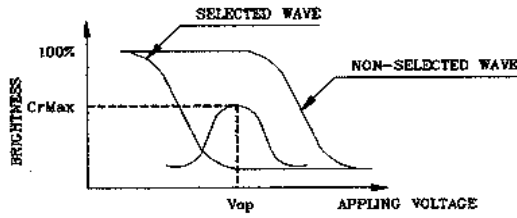
note:
T: TRANSMISSIVE
G: NORMALLY BLACK

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

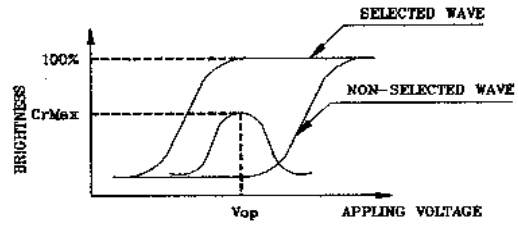
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	0°C	—	600	1200	ms	NOTE 2
		25°C	—	110	220		
		50°C	—	50	100		
Response Time (fall)	Tf	0°C	—	900	1500	ms	NOTE 2
		25°C	—	250	360		
		50°C	—	100	150		

(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



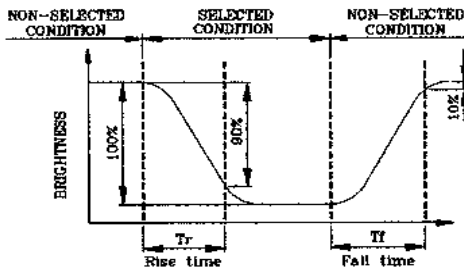
(negative type)

*Conditions

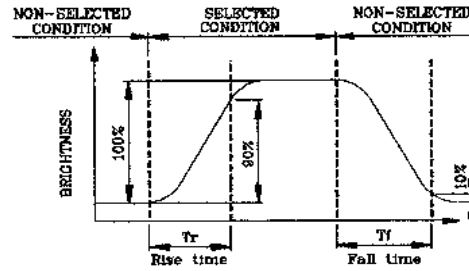
Viewing Angle : 0
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



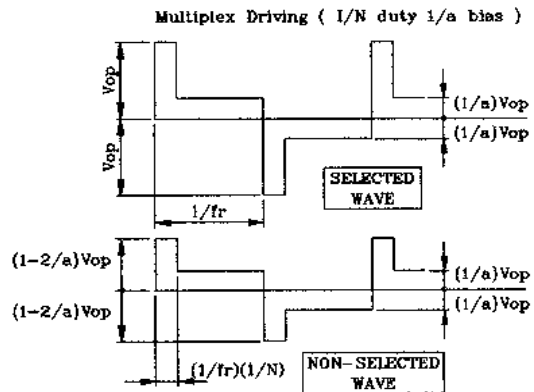
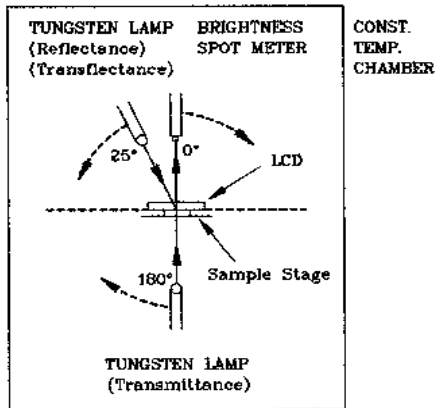
(negative type)

*Conditions

Operating Voltage : Vop
 Viewing Angle (θ,φ) : (0,0)
 Frame Frequency : 70Hz
 Applying Waveform : 1/N duty 1/a bias

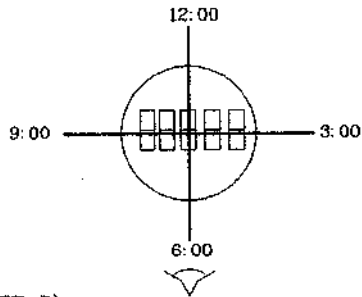
(NOTE 3)

Description of Measuring Equipment and Driving Waveforms



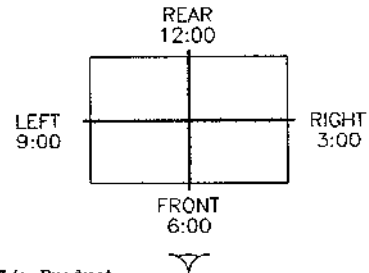
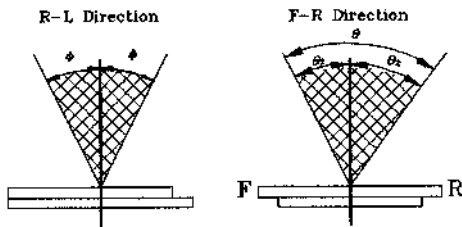
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



*For This Product
The Viewing Direction Is 6 O'clock
So $\theta_1 > \theta_2$

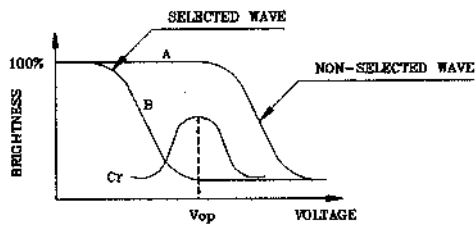
$$\theta = \theta_1 + \theta_2$$

*Conditions

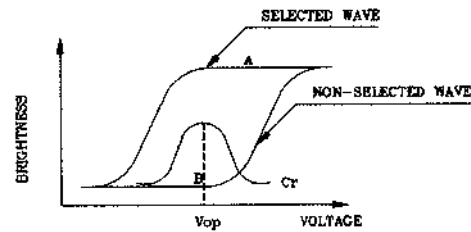
Operating Voltage : Vop
Frame Frequency : 70Hz
Applying Waveform : 1/N duty 1/a bias
Contrast Ratio : larger than 2

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type)



(negative type)

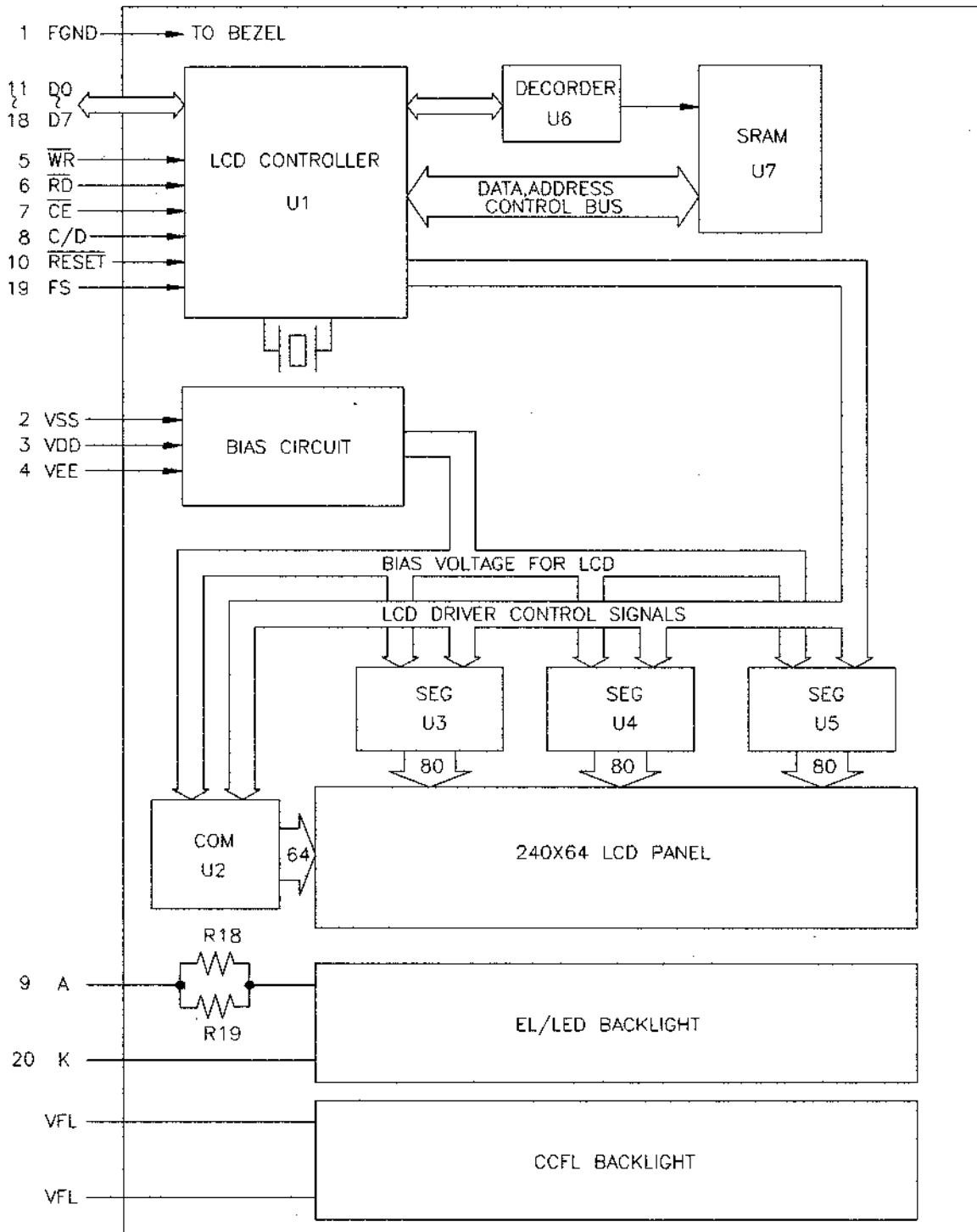
$$\text{Contrast Ratio : } Cr = A/B$$

*Conditions

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

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5. BLOCK DIAGRAM



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6. INTERNAL PIN CONNECTION

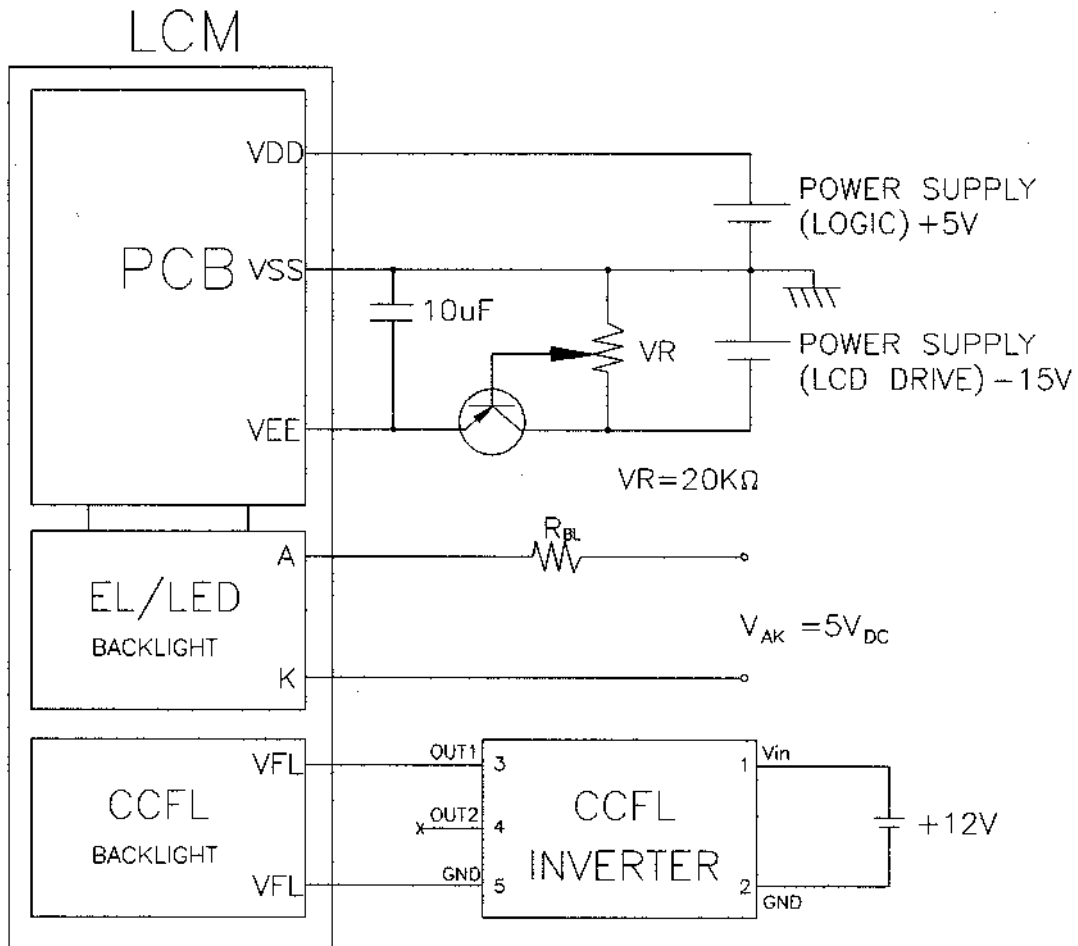
PIN NO.	SYMBOL	FUNCTION
1	FGND	FRAME GROUND (0V)
2	VSS	GROUND
3	VDD	POWER SUPPLY FOR LOGIC (+5V)
4	VEE	POWER SUPPLY FOR LC DRIVING
5	\overline{WR}	DATA WRITE
6	\overline{RD}	DATA READ
7	\overline{CE}	CHIP ENABLE
8	C/D	\overline{WR} ="L",C/D="H" :COMMAND WRITE \overline{WR} ="L",C/D="L" :DATA WRITE \overline{RD} ="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 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 SUUPLY FOR CCFL DRIVE
2	NC	-
3	NC	-
4	VFL	POWER SUUPLY FOR CCFL DRIVE

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7. POWER SUPPLY



Recommended Inverter : CXA-L10L (TDK)

Recommended Value for R_{BL} and V_{BL}

item Back Light interface	R_{BL}		V_{BL}	
	EL	LED (White)	EL	LED (White)
A,K PIN	0Ω	5Ω 7.5Ω	110V _{ac} 400HZ	5V _{dc}

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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

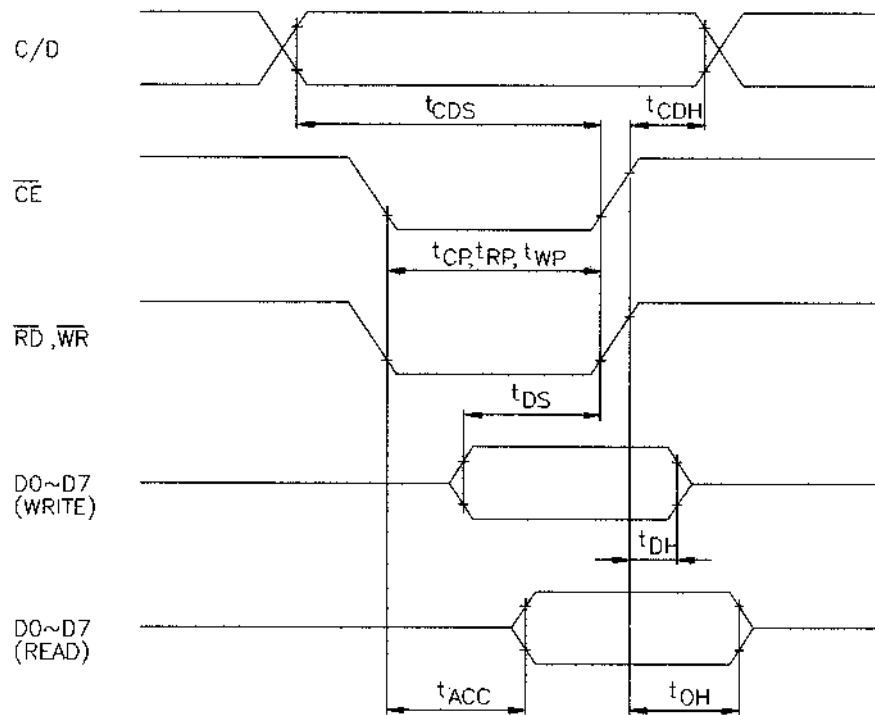
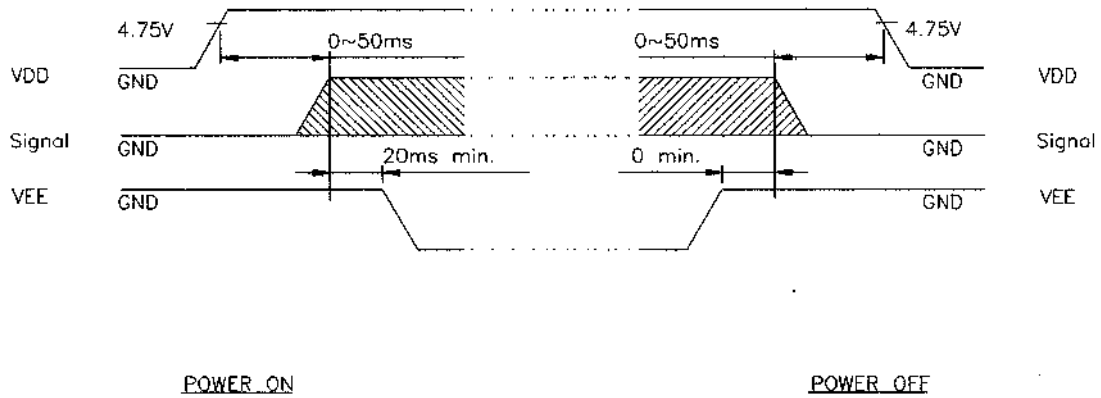


Fig. INTERFACE TIMING CHART

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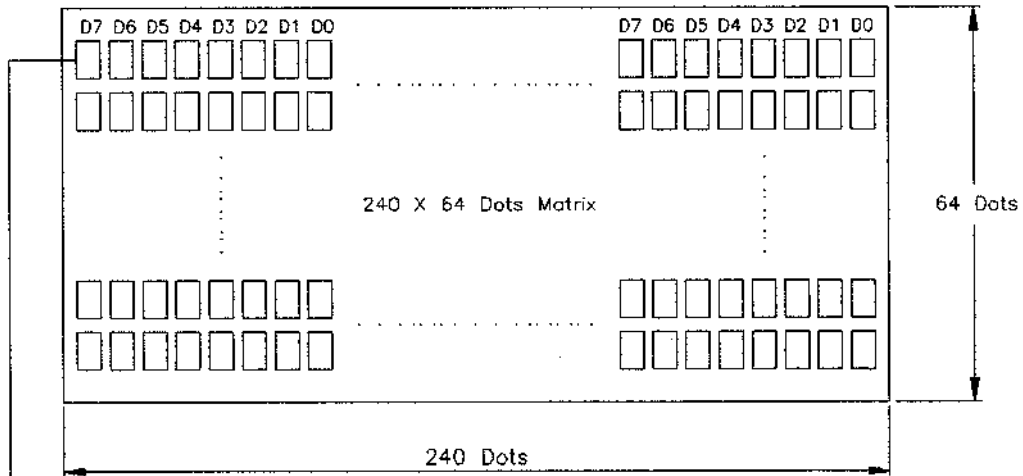
8-2 POWER ON/OFF TIMING



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

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8-3 DISPLAY PATTERN



Starting dot for the starting address of display RAM D0~D7 are 8 bits transmitted data ,where D0 is LSB and D7 is MSB.

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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 90%RH	120HR	Appearance without defect	
4	Thermal Shock	-20°C,30min → 25°C,5min → 70°C,30min → 25°C,5min (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

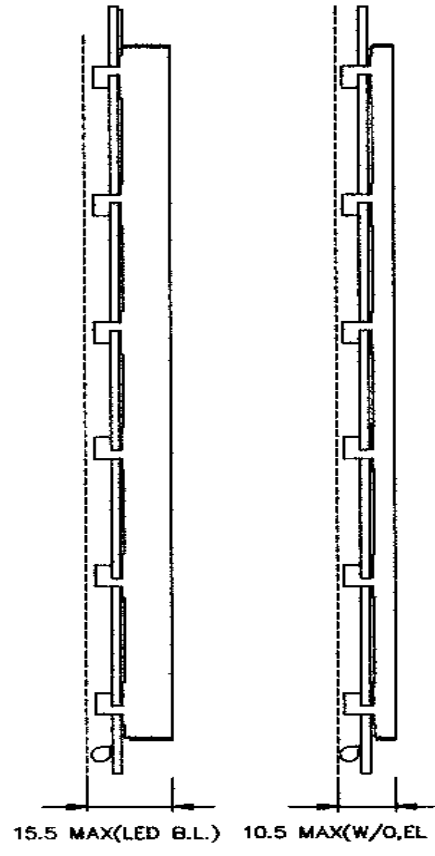
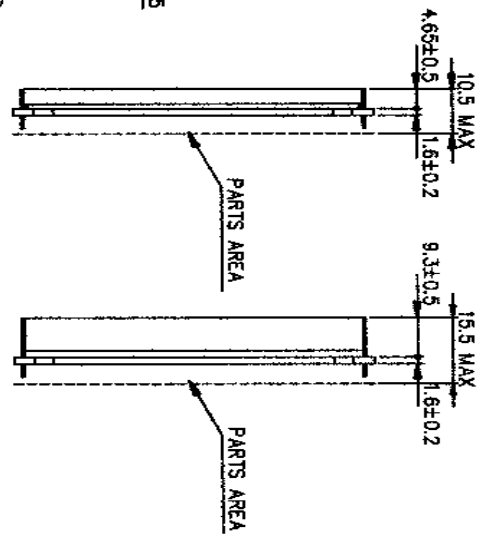
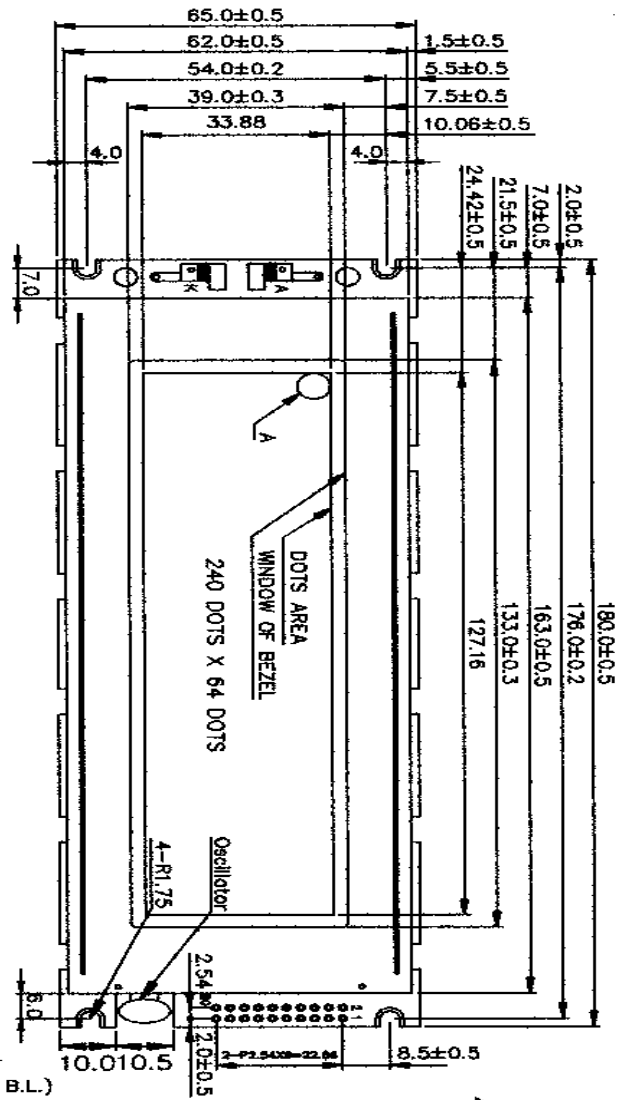
- 1.Acceptance inspection period
The period is within one month after the arrival of contracted commodity at the buyer's factory site.
- 2.Applicable warrant period
The period is within twelve months since the date of shipping out under normal using and storage conditions.

• THE OPERATING LIFE TIME OF BACK LIGHT

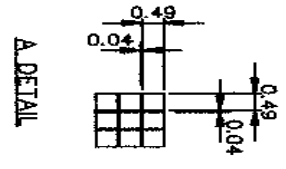
- EL : 5000hrs for AC 110Vrms, 400Hz, 20°C, 60%RH
CCFT : 20,000hrs for lamp-current 5mA, 30KHz, 25°C
White LED : 40,000hrs for ILED=200mA, 25°C
LED : 50,000hrs for ILED=220mA, 25°C

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

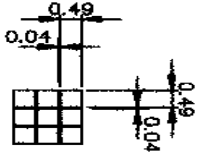
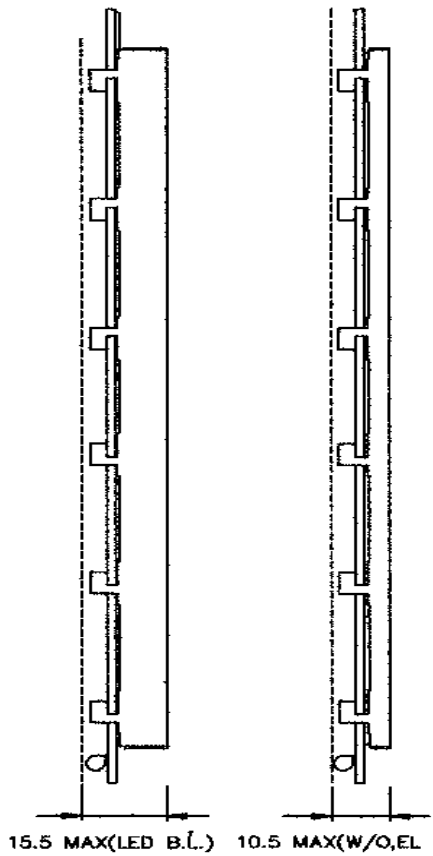
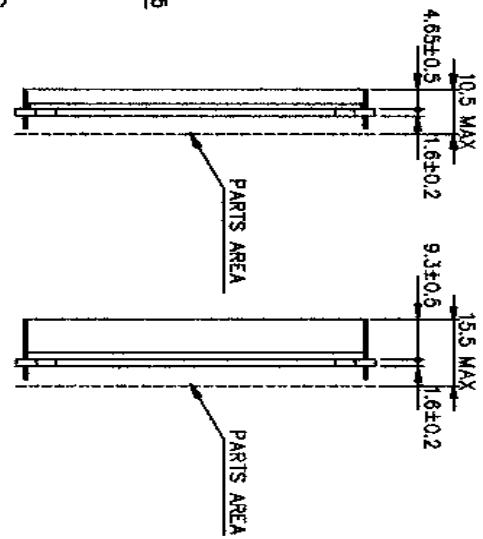
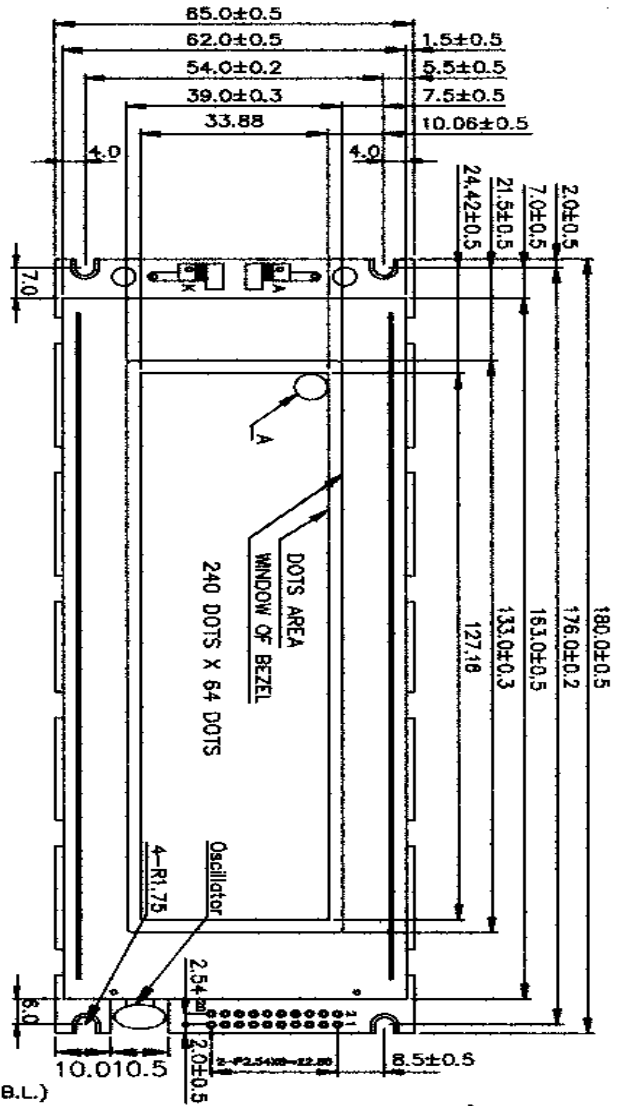
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PIN NO.	1	2	3	4	5	6	7	8	9	10
SYMBOL	FGND	VSS	VDD	VEE	WR	RD	OE	C/D	A	RESET
PIN NO.	11	12	13	14	15	16	17	18	19	20
SYMBOL	D0	D1	D2	D3	D4	D5	D6	D7	FS	K



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



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

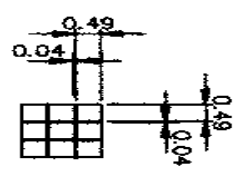
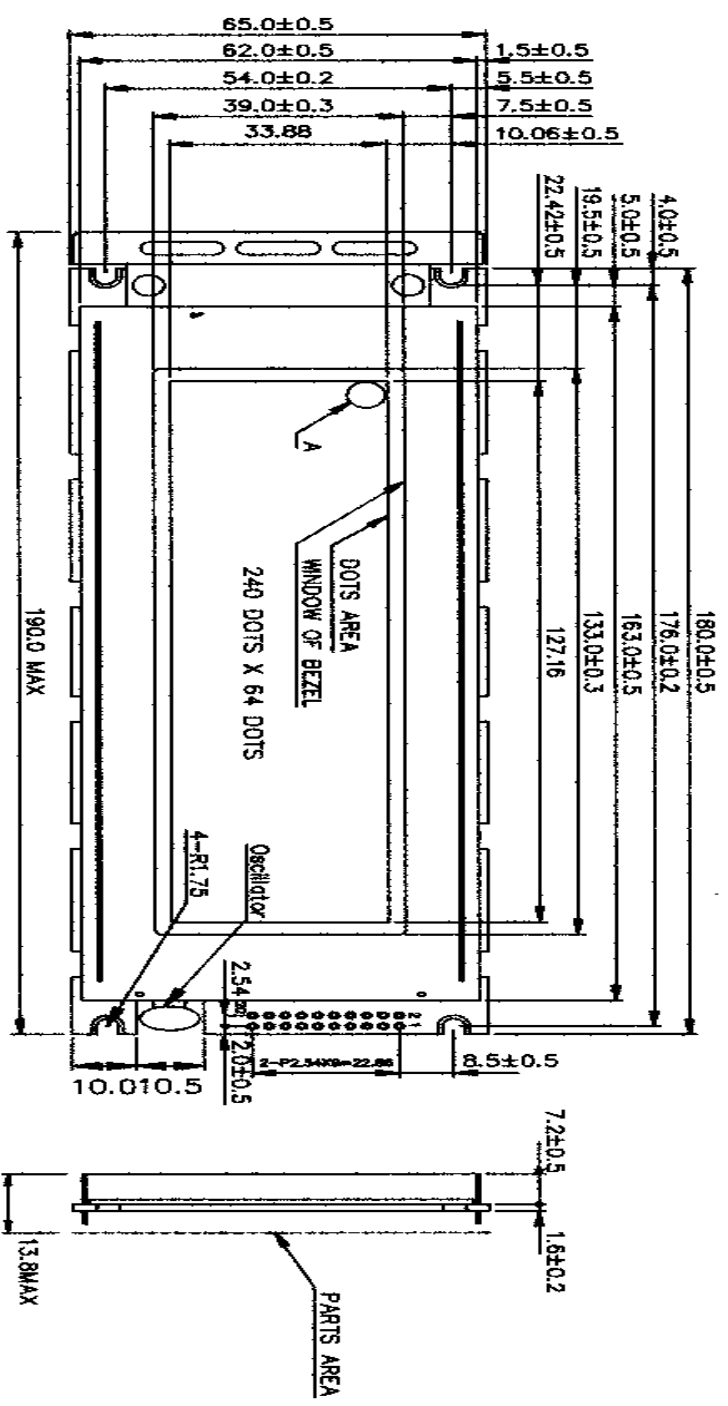
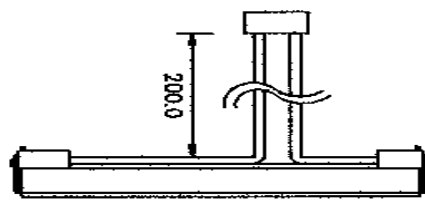
HANTRONIX, INC.
10080 BUBB RD.
CUPERTINO, CA 95014

Q.A.:
JK

REV.:
1.2

HDM64GS24_-4

SHEET 20 OF 22
DATE: 8/8/02

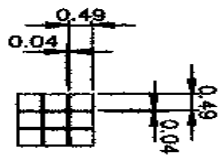
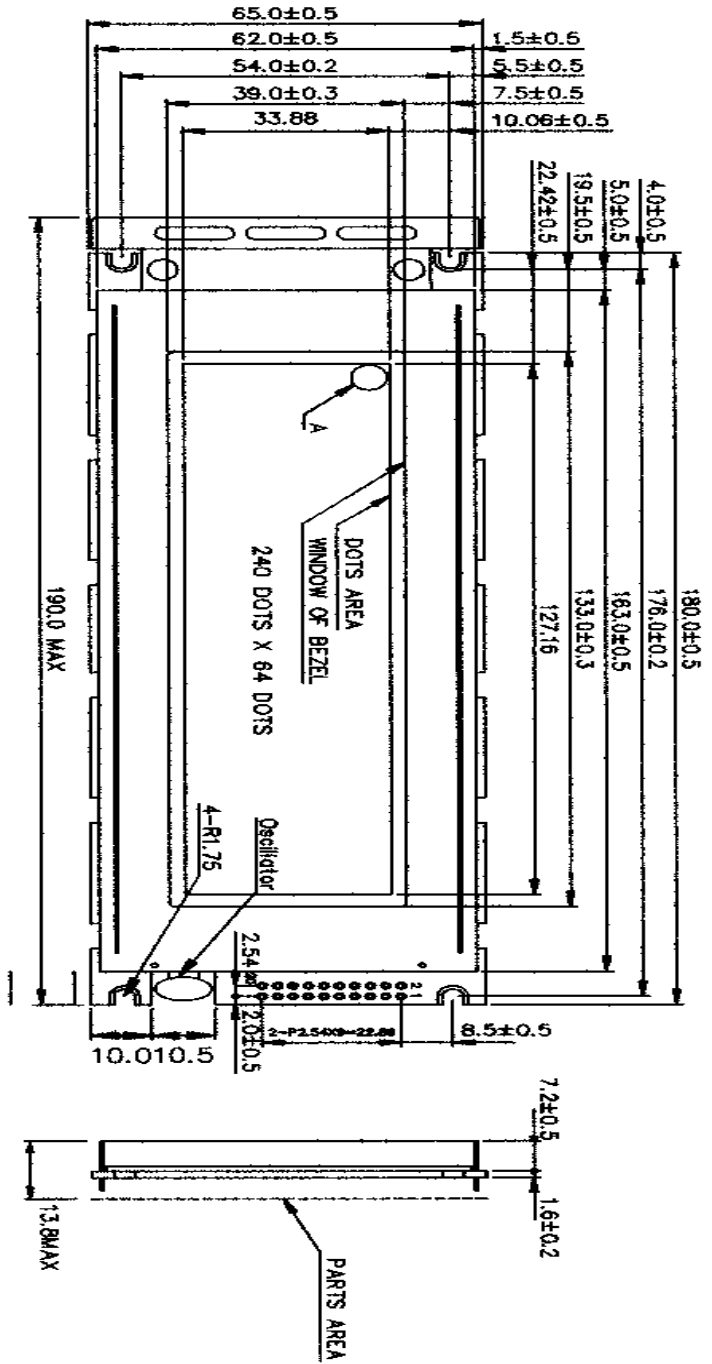
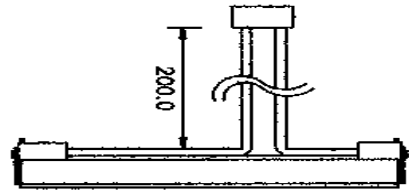


A DETAIL

PIN NO.	1	2	3	4	5	6	7	8	9	10
SYMBOL	FSND	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



A DETAIL

PN NO.	1	2	3	4	5	6	7	8	9	10
SYMBOL	FGND	VSS	VDD	VEE	WR	RD	CE	C/D	A	RESET
PN 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. Bezel Material : SPCC
5. General Tolerance : ±0.5 mm