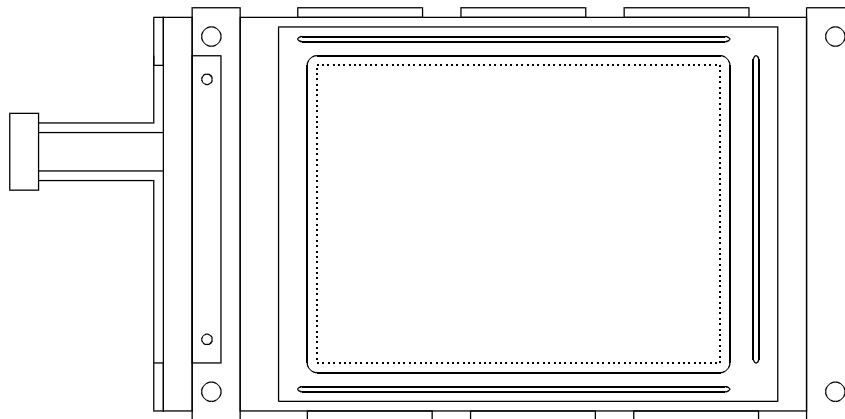


HANTRONIX

PRODUCT SPECIFICATION

HDM3224

320x240 GRAPHICS
LCD DISPLAY MODULE



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1. FEATURES

3224-4-A4000 is a low-power consumption LCD module with a high contrast LCD panel.

- 1) Driving method : 1/240 duty
- 2) Display mode : STN Yellow
- 3) Display type : Positive
- 4) Data transfer rate : 4.0 MHz
- 5) EL Backlight (White)
- 6) X/Y Driver : HD66204 / HD66205 - - QFP TYPE

2. MECHANICAL DATA

Module size - - - - - 143.0W X 96.8H X 12.0T mm
 Min. viewing area - - - - - 104W X 79.3H mm
 Active viewing area - - - - - 95.97W X 71.97H mm
 Number of dots - - - - - 320W X 240H dots
 Dot size - - - - - 0.27W X 0.27H mm
 Dot pitch - - - - - 0.3W X 0.3H mm
 Weight - - - - - about 170 g

3. ABSOLUTE MAXIMUM RATINGS

ITEM		SYMBOL	TEST CONDITION	STANDARD VALUE		UNIT
				MIN.	MAX.	
Power Supply	Logic	V _{DD} -V _{SS}	Ta=25℃	0	7.0	V
	LCD Drive	V _{DD} -V _{EE}	Ta=25℃	0	30.0	V
Input Voltage		V _I	Ta=25℃	0	V _{DD}	V
Operating Temperature		T _{OP}	-	0	40	℃
Storage Temperature		T _{STG}	-	-20	60	℃

4. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	TEST CONDITION	STANDARD VALUE			UNIT
			MIN.	TYP.	MAX.	
Supply Voltage	V_{DD}	-	4.5	5.0	5.5	V
	V_{EE}	-	-	- 17.5	-	V
Power Supply Current	I_{DD}	$V_{DD} = 5.0 \text{ V}$	-	8.0	16.0	mA
	- I_{EE}	$V_{EE} = -17.5 \text{ V}$	-	7.0	14.0	mA
Input High Voltage	V_{IH}	-	4.2	-	5.0	V
Input Low Voltage	V_{IL}	-	0	-	+ 0.8	V
Brightness	B	$V_{EL}=100\text{V(AC)}$ $f_{EL}=400 \text{ Hz}$	8.5	10.0	-	NIT
Frame Frequency	f_{FP}	-	65	72	80	Hz
Power supply for LCD (NOTE)	$V_{DD}-V_L$	$T_a= 25^{\circ}\text{C}$	-	23.5	-	V

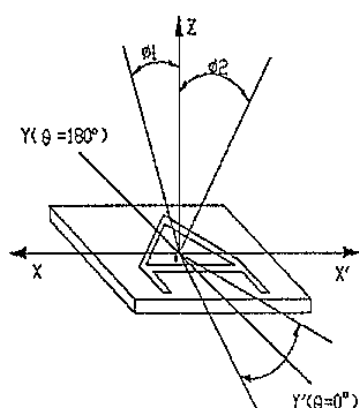
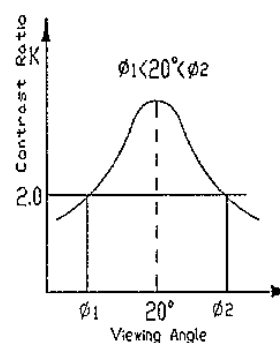
Note : Power supply for LCD is available with R_L in accordance with contrast.

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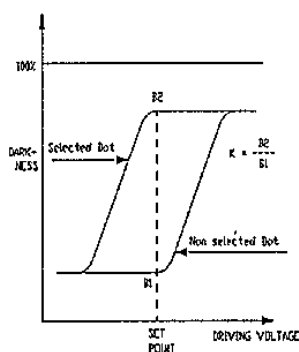
ELECTRO-OPTICAL CHARACTERISTICS

(Ta = 25 °C)

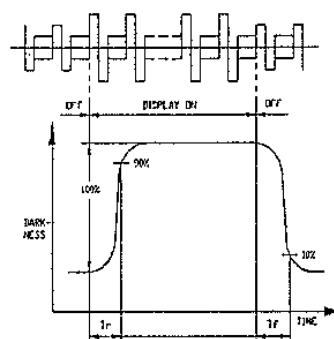
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Viewing angle	$\phi_2 - \phi_1$	$K = 2.0$	50	-	-	deg.	1, 2
	θ		-40	-	+40		
Contrast ratio	K	$\phi=20^\circ, \theta=0^\circ$	-	10	-	-	3
Response time (rise)	T_r	$\phi=20^\circ, \theta=0^\circ$	-	200	250	mS	4
Response time (fall)	T_f	$\phi=20^\circ, \theta=0^\circ$	-	250	350	mS	4

NOTE1. Definition of angle θ and ϕ NOTE2. Definition viewing angle ϕ_1 and ϕ_2 

NOTE3. Definition of contrast K



NOTE4. Definition of optical response



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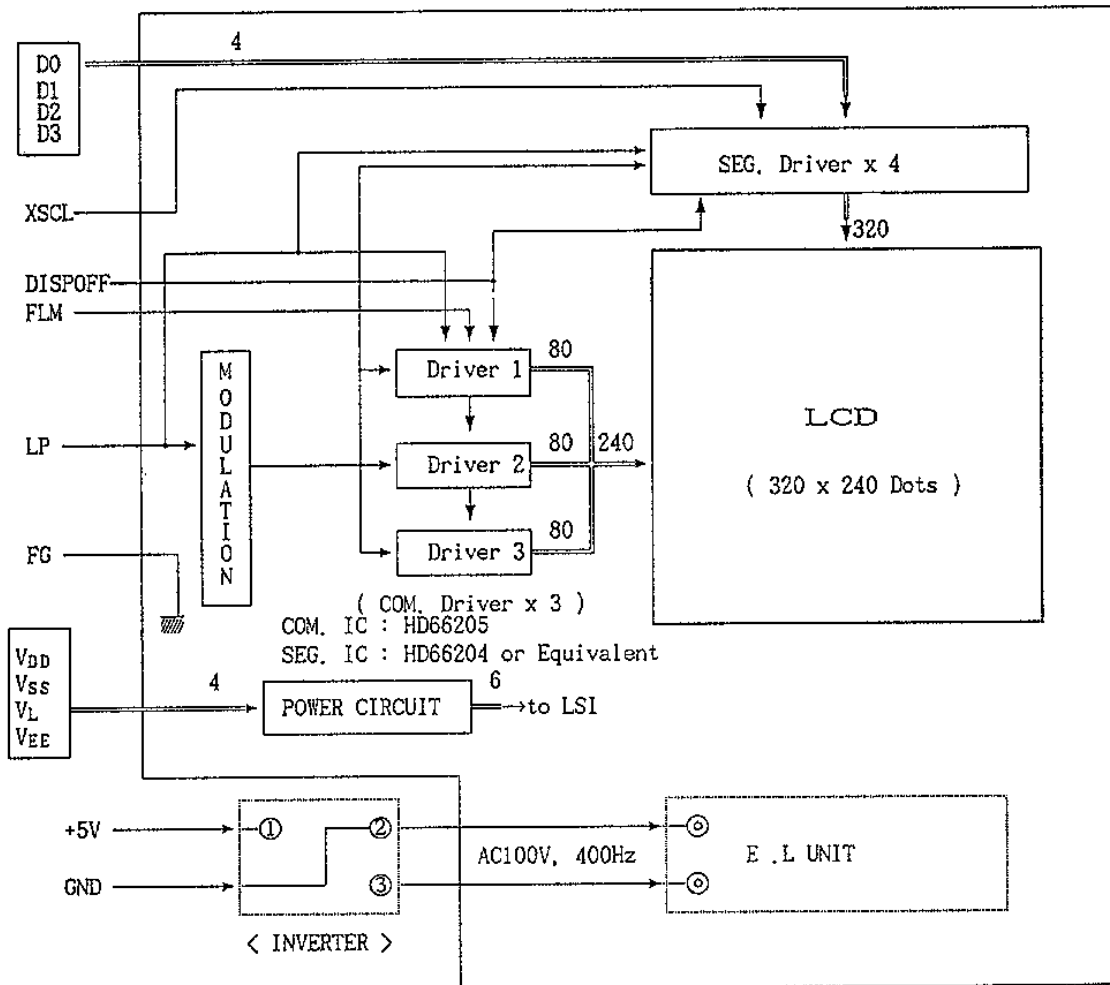
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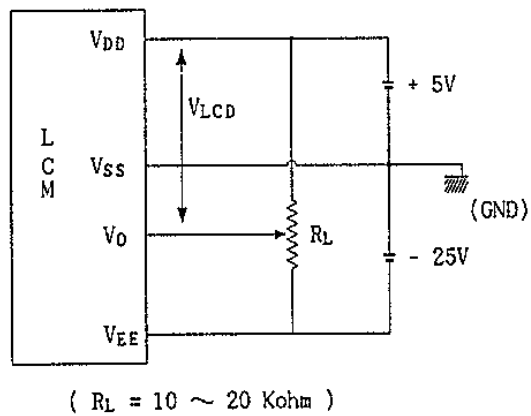
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BLOCK DIAGRAM

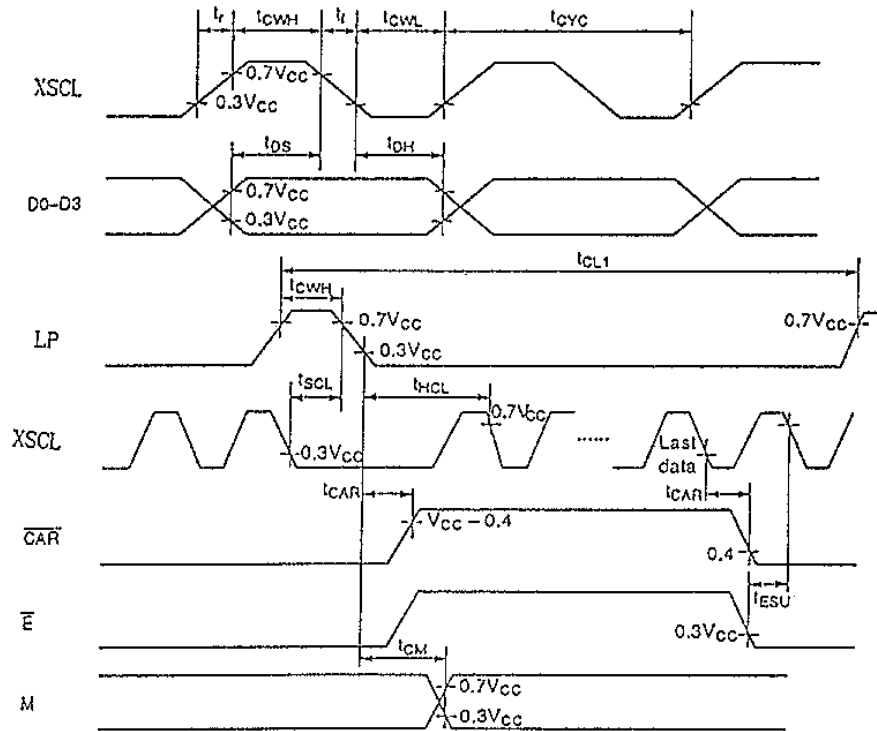


11. POWER SUPPLY

(DOUBLE POWER)



TIMING CHARACTERISTICS
TIMING CHART



TIMING TYPICAL

Item	Symbol	Min.	Typ.	Max.	Unit
Clock Frequency	fscp	-	-	6	M Hz
SCP Pulse Width	t _{cwh} , t _{cwl}	60	-	-	n s
Rise / Fall Time	t _r , t _f	-	-	30	n s
Data Set up Time	t _{dsu}	30	-	-	n s
Data Hold Time	t _{dhd}	30	-	-	n s
LP Set up Time	t _{lsu}	60	-	-	n s
LP Hold Time	t _{lhd}	70	-	-	n s
LP Pulse Width	t _{lwh}	60	-	-	n s
Clock Margin Time (SCP -> LP)	t _{sl}	20	-	-	n s
Clock Margin Time (LP -> SCP)	t _{ls}	20	-	-	n s
FP Set Up Time	t _{fsu}	10	-	-	n s
FP Hold Time	t _{fhd}	40	-	-	n s
FP Frequency	f _{fp}	70	72	145	Hz

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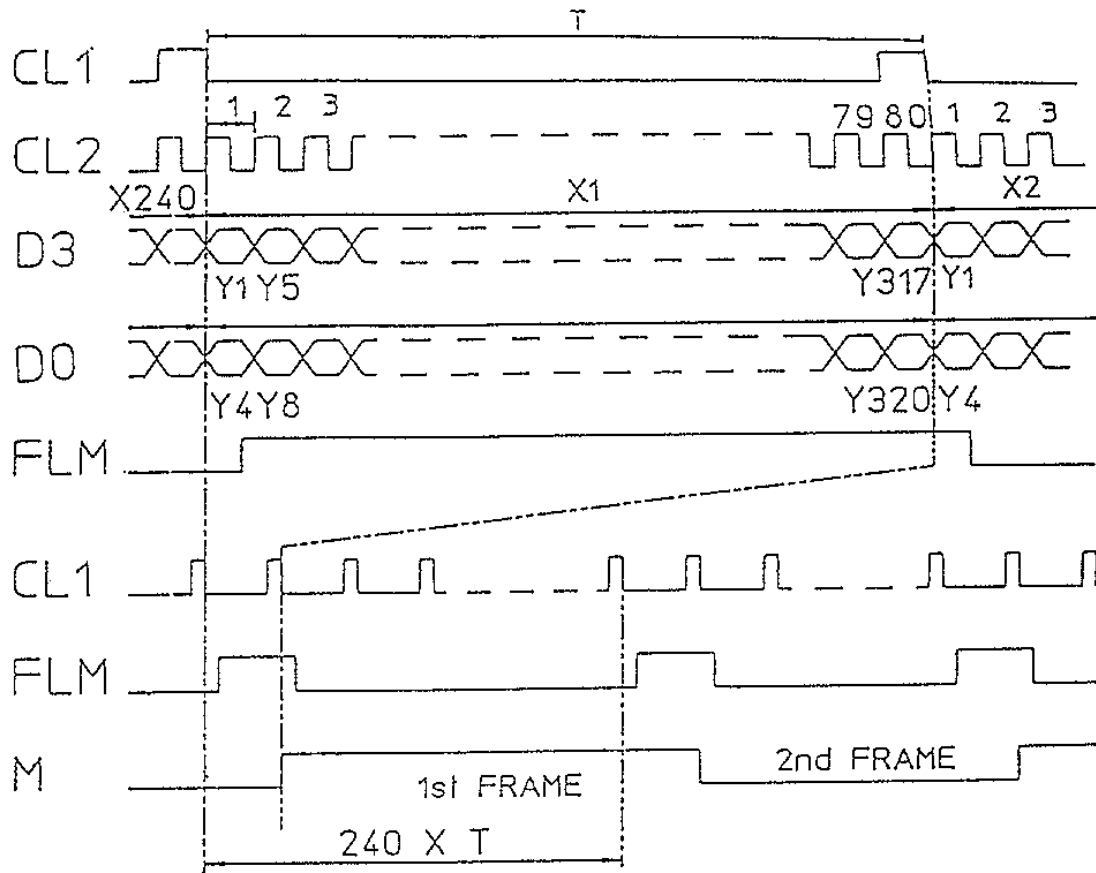
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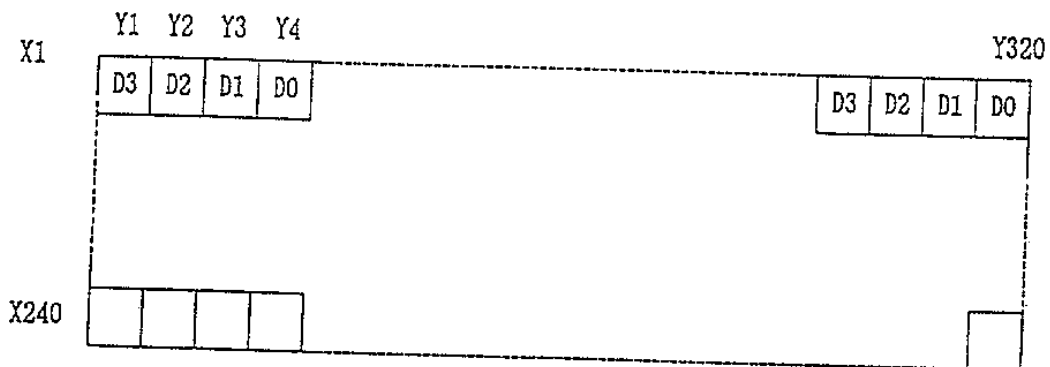
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TIMING DIAGRAM



DATA MAP



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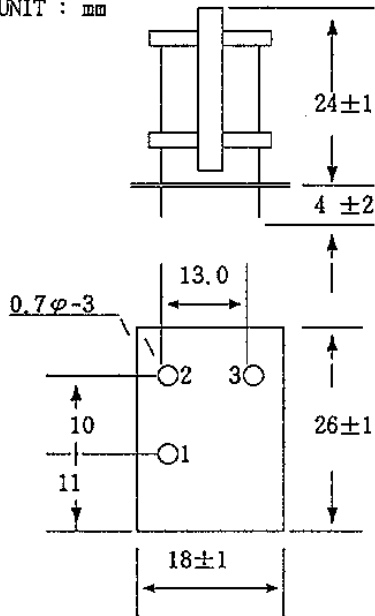
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ELECTRO-LUMINESCENT LAMP (E. L)

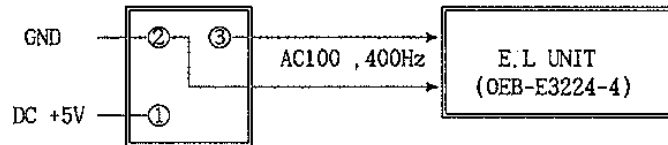
- 1) Several color can be obtained by using wavelength transfer materials.
White, Blue-Green, Green, Orange, Blue and Red are available.
- 2) INVERTER shall be used to drive E.L in case of BATTERY operation or DC voltage.
- 3) Recommended INVERTER : 5E (Manufacture : JAPAN ELSTAR CO., LTD.)
- 4) Brightness : MIN. 30 NIT (Measured on the bare E.L)
- 5) Connection method with the INVERTER.

UNIT : mm

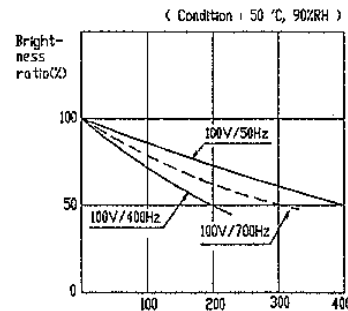
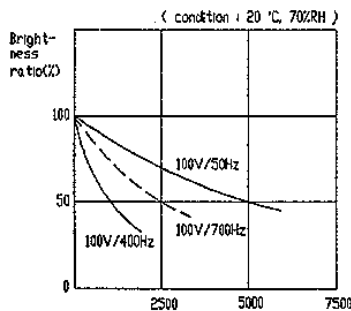


* PIN CONNECTION

PIN NO.	DESCRIPTION
1	DC + 5V input
2	Common (GND & output)
3	Output



- 5) Life time according to the environmental condition (unit : HOURS)



NOTE : ———— ; constant voltage / frequency drive
 - - - - - ; inverter drive

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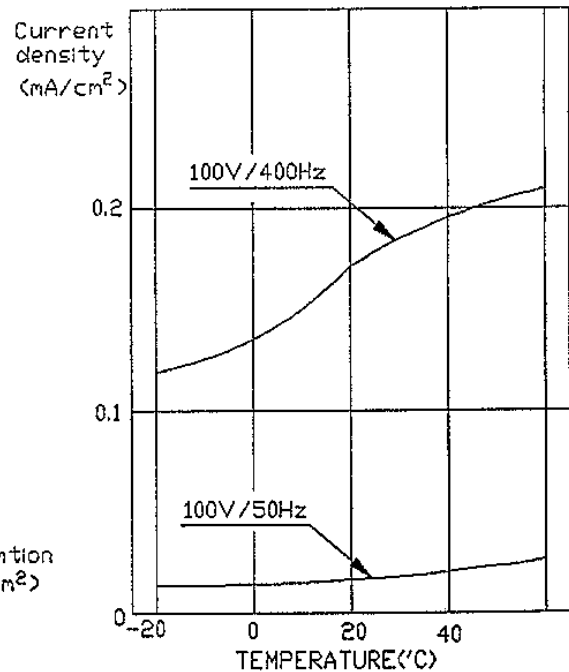
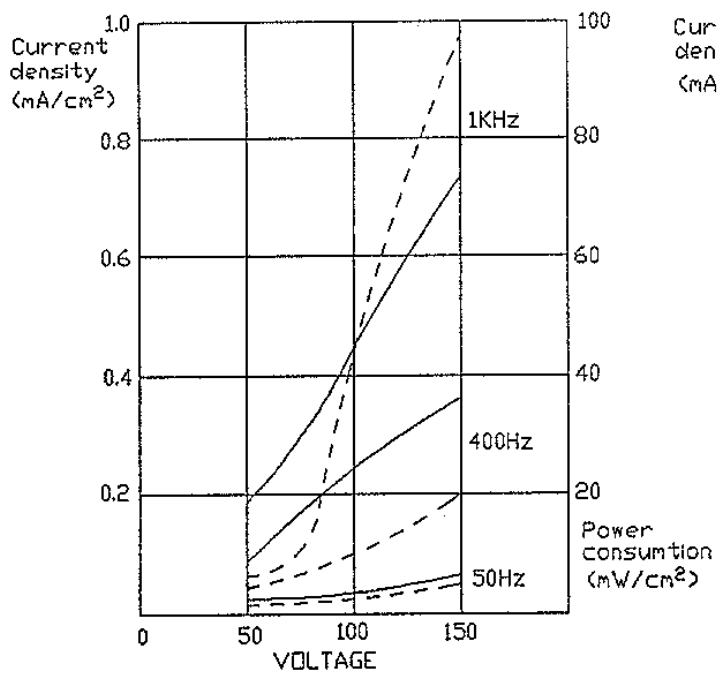
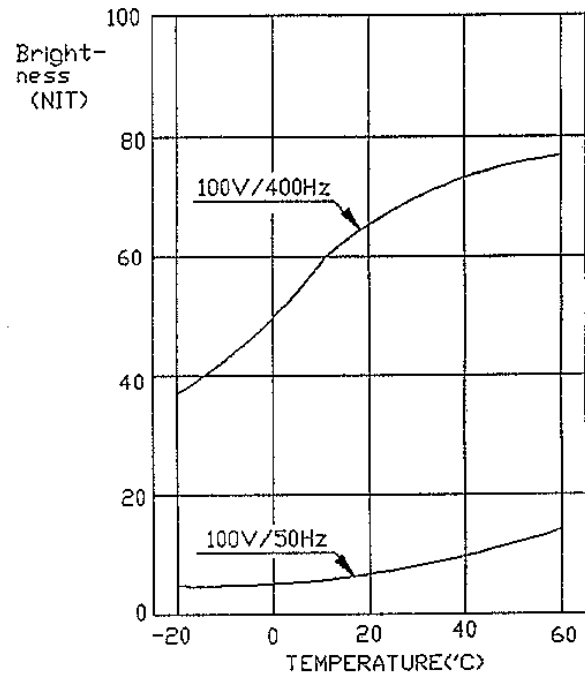
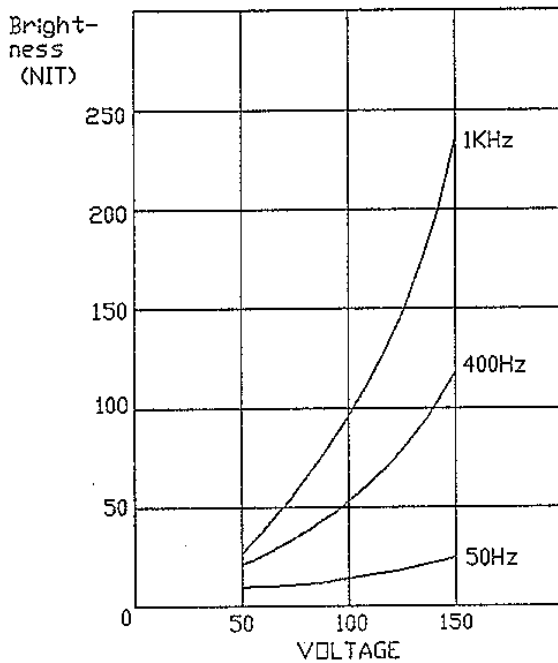
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Temperature characteristics

* Operating temperature range : from 0°C to 50°C

* Storang temperature range : from -20°C to 60°C

Electrical characteristics



NOTE : ——— : current density
 - - - - : power consumption

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PRECAUTION FOR USING
HANDLING

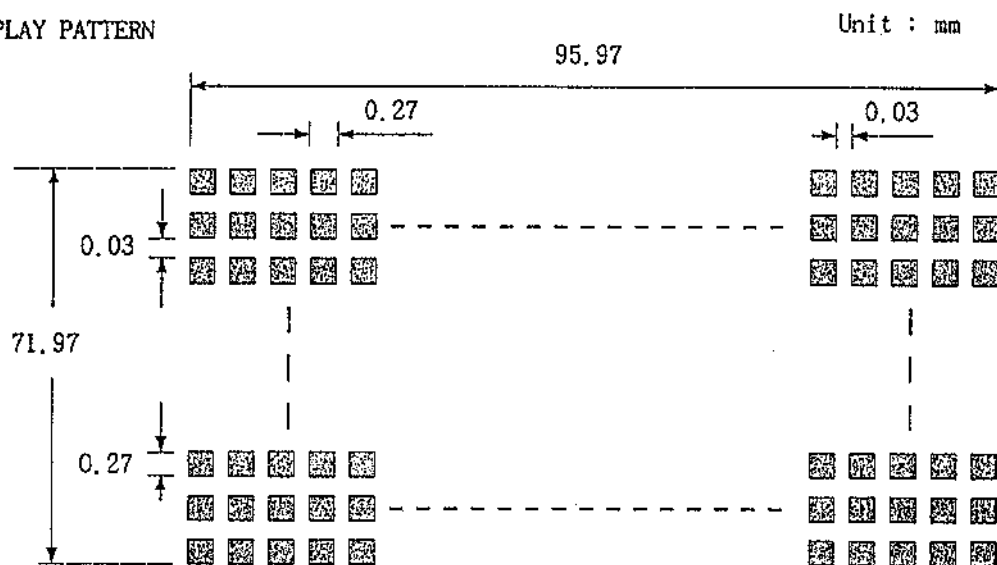
- 1) Refrain from storing mechanical shock and from applying any force to LCD MODULE.
It may cause misoperation or damage of LCD.
- 2) Do not touch, press or rub the display panel with a hard, stiff tool or object as the polarizers in the panel are easily scratched.
- 3) If LCD is broken and liquid crystal material flow out, ingestion, inhalation, or contact with skin should be avoided. If liquid crystal material contact with skin, wash immediately with alcohol and rinse thoroughly with water.
- 4) Never use organic solvents to clear the display panel as these solvent may adversely affect the polarizer. To clean the display panel dampen a bit of absorbent cotton with petroleum benzene and gently wipe the panel, or contaminations by using a scotch tape.
- 5) Refrain from discharge of high electro-static voltage, it will damage C-MOS LSI in the MODULE.
- 6) Do not leave the MODULE in high temperature, especially in high humidity for a long time. It is recommended to store the MODULE where the temperature is in the range of 0°C to 35°C and the humidity is lower than 70%.
- 7) Store the MODULE without exposure to direct sunlight or fluorescent lamp.
- 8) Ultra violet cut filter is necessary for outdoor operation.
- 9) Avoid condensation of water, it may cause misoperation or disconnection of electrode.

OPERATION

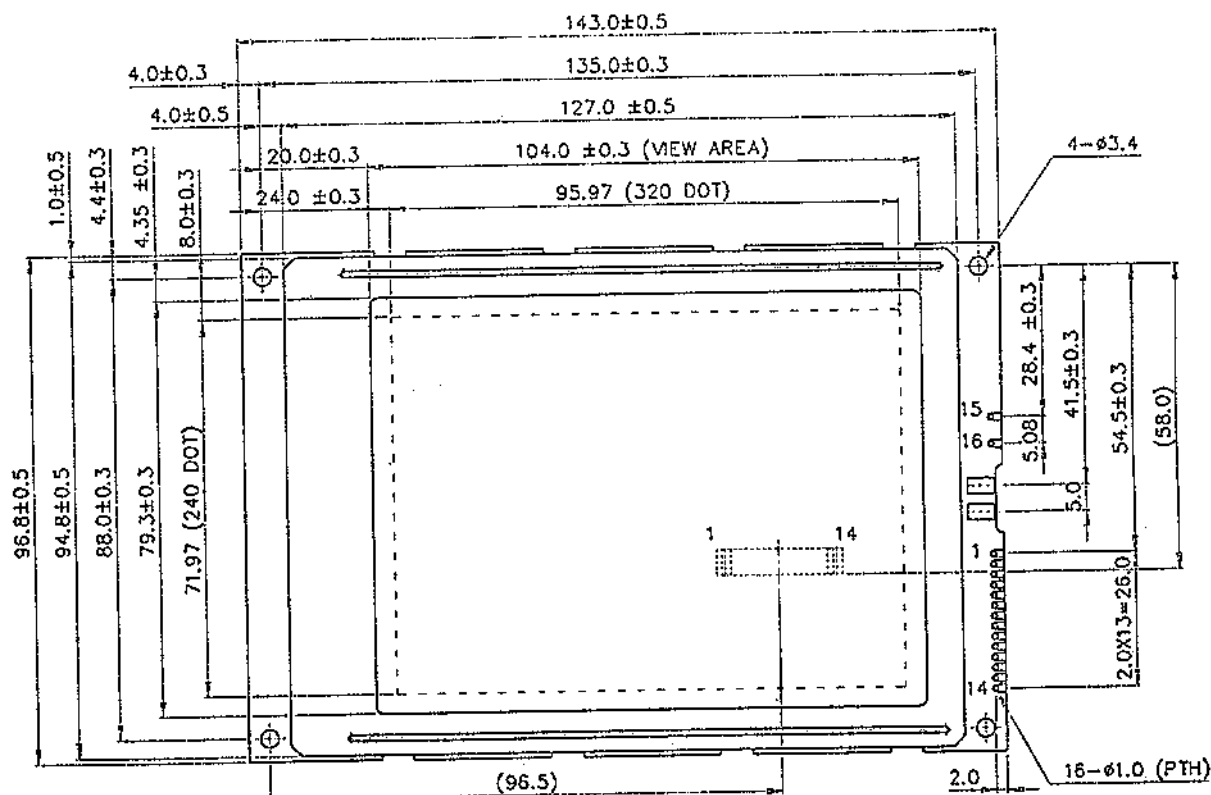
- 1) Never connect or disconnect the LCD MODULE from the main system while power is being supplied.
- 2) When supplying the M signal from the external unit to a GRAPHIC MODULE, set the duty to 50%±1%.
If the duty deviates too greatly from the value, a DC voltage will be applied to the liquid crystal, which could induce an electrochemical reaction and reduce the life of the MODULE.
- 3) Do not exceed the maximum rating values under the worst conditions taking account of the supply voltage variation, input voltage variation, and environmental temperature, etc. Otherwise LCD module may be damaged.

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DISPLAY PATTERN



EXTERNAL DIMENSION



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