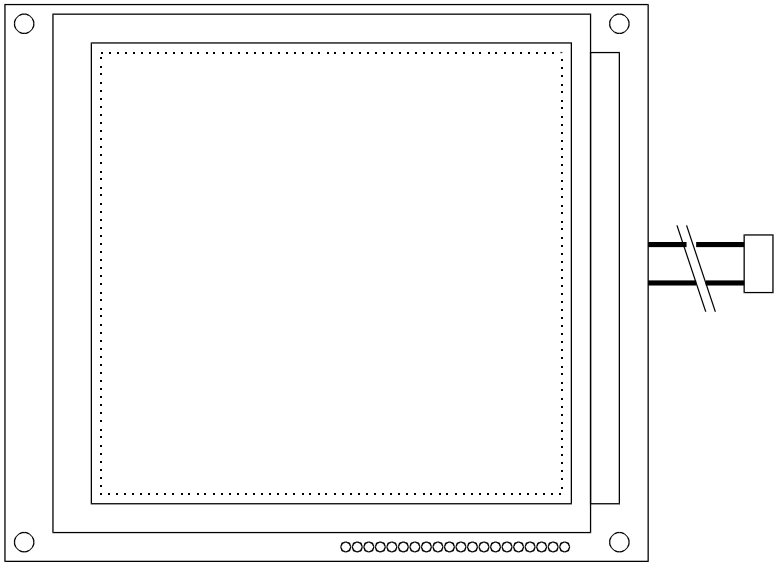
HANTRONIX

PRODUCT SPECIFICATION

HDM3224-7

320x240 GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JB	**REV.:** 1.0	HDM3224-7	SHEET 1 OF 17 **DATE:** 12/11/97

MECHANICAL DATA

(1) Product No.		
(2) Module Size		166.0 (W)mm x 134.0(H)mm x MAX 15.1 (D)mm (CCFL B/L)
(3) Dot Size		0.32 (W)mm x 0.39 (H)mm
(4) Dot Pitch		0.36 (W)mm x 0.43 (H)mm
(5) Number of Dots		320 (W) x 240 (H)Dots
(6) Duty		1/240
(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 ☐ CCFL B/L
(10) Weight		CCFL B/L 350 g(approx.)
(11) Controller		Without
(12) DC/DC Converter		Whitout

Note :

LM_GD_148_ ___

Back Light
- A : None Back Light
- B : CCFL Back Light
- C : LED Back Light
- D : EL Back Light

Reflective/Transmissive
- R : Reflective
- S : Transflective(Normal)
- P : Transflective(Medium Transparency)
- H : Transflective(High Transparency)
- T : Transmissive

Option
- C : Anti-Glare
- K : High Contrast Ratio LC

1
2
⋮ : Version
9

Mode/View Angle
- A : Gray , 6 Clock
- B : Gray , 12 Clock
- C : Yellow , 6 Clock
- D : Yellow , 12 Clock
- E : Blue , 6 Clock
- F : Blue , 12 Clock
- G : Normally Black , 6 Clock
- H : Normally Black , 12 Clock
- J : Normally White , 6 Clock
- K : Normally White , 12 Clock

ABSOLUTE MAXIMUM RATINGS

(1) ELECTRICAL ABSOLUTE RATINGS

VSS=0V

ITEM	SYMBOL	MIN	MAX	UNIT	COMMENT
Power Supply for Logic	VDD−VSS	−0.3	7.0	V	
Power Supply for LC Drive	VDD−VLC	−0.3	30.0	V	
Input Voltage	VI	0	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 1,3		Note 2,3		Note 3,4		Note 3,5	

Note 1 Ta ≦ 50°C : 85%RH max.
Ta > 50°C : Absolute humidity must be lower than the humidity of 85%RH at 50°C

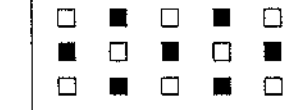
Note 2 Ta at −20°C will be < 48hrs, at 70°C will be < 120hrs

Note 3 Background color changes slightly depending on ambient temperature. This phenomenon is reversible.

Note 4 Ta ≦ 70°C : 75%RH max
Ta > 70°C : Absolute humidity must be lower than the humidity of 75%RH at 70°C

Note 5 Ta at −30°C will be < 48hrs, at 80°C will be < 120hrs

ELECTRICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT
Logic Circuit Power Supply		VDD−VSS	−		4.75	5.0	5.25	V
Recommended LCD Driving Voltage		VDD−VO	Duty=1/240 VDD=5.0V	−20°C	−	24.5	−	V
				0°C	−	23.1	−	
				25°C	−	22.2	−	
				50°C	−	21.4	−	
				70°C	−	20.3	−	
Input Voltage		VIH	H level		0.8VDD	−	VDD	V
		VIL	L level		0	−	0.2VDD	V
Supply Current for Logic		IDD	VDD = 5.0V VO = −18.7V PATTERN :		1.9	4.3	−	mA
Supply Current for LCD		IO			1.7	4.1	−	mA
CCFL B/L	Open Voltage	VOPEN	Lamp Current = 5 mArms Frequence = 30 KHz		−	−	1500	Vrms
	Lamp Voltage	VL			−	260	−	Vrms
	Brightness	B			−	350	−	cd/m²
	Color Degree	X			−	0.331	−	−
		Y			−	0.377	−	

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OPTICAL CHARACTERISTICS

AT V_{OP}

ITEM / MODE		Cr(Contrast Ratio) 25℃ MIN.	Cr(Contrast Ratio) 25℃ TYP.	θ(Viewing Angle) 25℃ MIN.	θ(Viewing Angle) 25℃ TYP.	φ(Viewing Angle) 25℃ MIN.	φ(Viewing Angle) 25℃ TYP.
R	A,B	–	–	–	–	–	–
	C,D	–	–	–	–	–	–
	J	–	–	–	–	–	–
S	J	–	4.1	–	30	–	50
note		NOTE6		NOTE5			

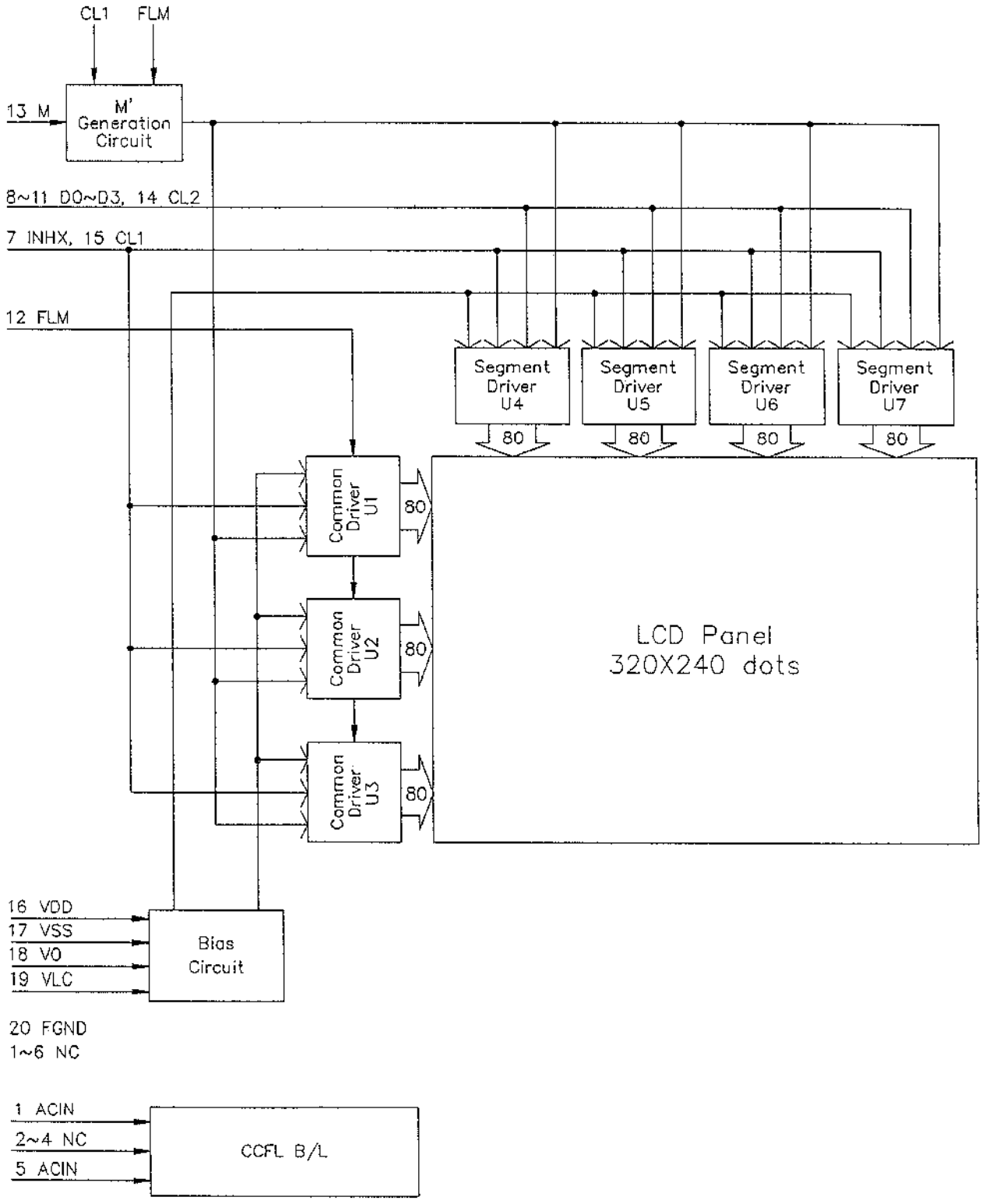
AT $\phi=0°$ $\theta=0°$

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Response Time (rise)	Tr	-20℃	—	3460	—	ms	NOTE 2
		0℃	—	725	1200		
		25℃	—	245	400		
		50℃	—	140	200		
		70℃	—	80	150		
Response Time (fall)	Tf	-20℃	—	3000	—	ms	NOTE 2
		0℃	—	1290	2100		
		25℃	—	430	700		
		50℃	—	200	400		
		70℃	—	130	250		

note:

R: REFLECTIVE
S: TRANSFLECTIVE
A,B: GRAY
C,D: YELLOW
J: NORMALLY WHITE

BLOCK DIAGRAM



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INTERNAL PIN CONNECTION

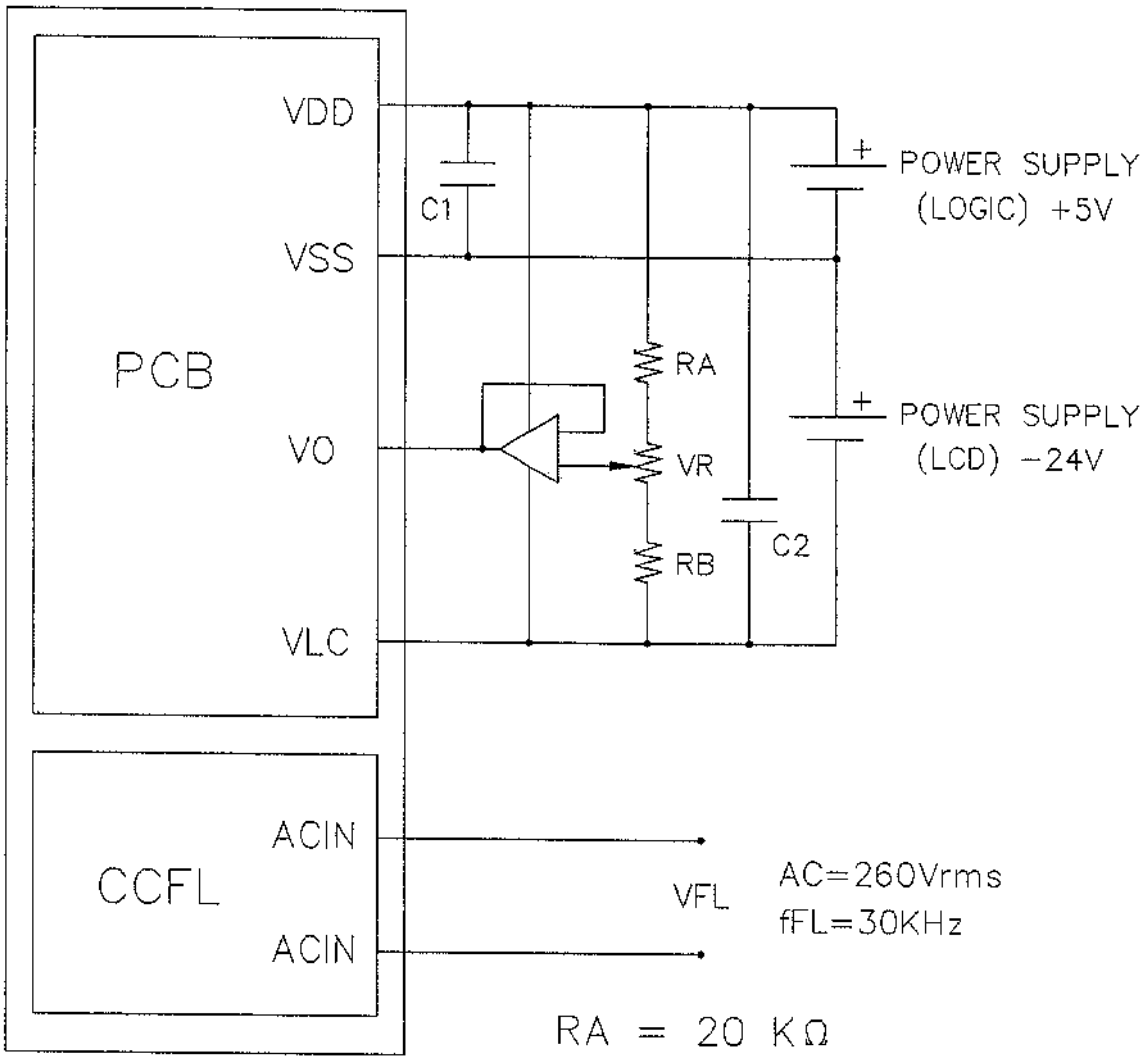
LCD

Pin No.	Symbol	Function
1	NC	Not Connected
2	NC	Not Connected
3	NC	Not Connected
4	NC	Not Connected
5	NC	Not Connected
6	NC	Not Connected
7	INHX	Display ON/OFF Control Signal :1=ON 0=OFF
8	D0	Display Data Input
9	D1	Display Data Input
10	D2	Display Data Input
11	D3	Display Data Input
12	FLM	First Line Marker
13	M	Liquid Crystal AC Drive Control Signal
14	CL2	Data Shift Clock
15	CL1	Data Lacth Clock
16	VDD	Logic Power Supply (+)
17	VSS	GND (0V)
18	V0	Liquid Crystal Contrast Adjustment
19	VLC	Liquid Crystal Drive Voltage
20	FGND	Frame Ground

CCFL B/L

Pin No.	Symbol	Function
1	AC IN	AC Power Input
2	NC	Not Connected
3	NC	Not Connected
4	NC	Not Connected
5	AC IN	AC Power Input

POWER SUPPLY



RA = 20 KΩ
RB = 0.1 KΩ
VR = 10 KΩ(VARIABLE)
C1,C2 = 10 μF

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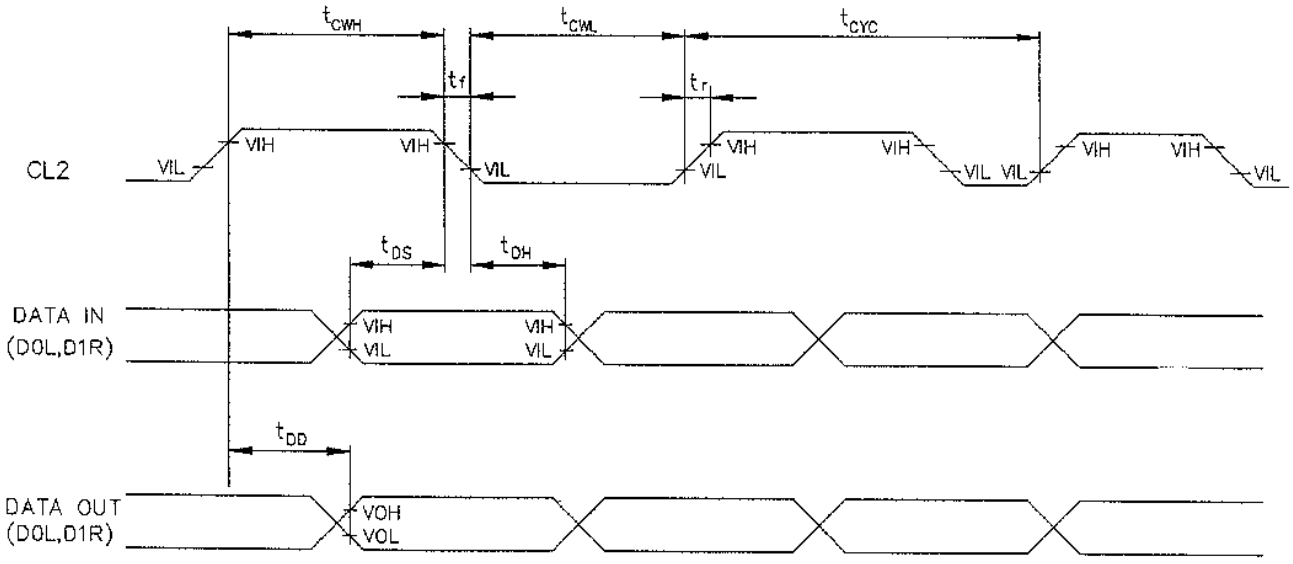
TIMING CHARACTERISTICS

8-1 COMMON DRIVER OPERATION TIMING

VDD=2.7~4.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK CYCLE TIME	t_{CYC}	10	–	–	μs
CLOCK HIGH LEVEL WIDTH	t_{CWH}	80	–	–	ns
CLOCK LOW LEVEL WIDTH	t_{CWL}	1.0	–	–	μs
CLOCK RISE/FALL TIME	t_r , t_f	–	–	30	ns
DATA SETUP TIME	t_{DS}	100	–	–	ns
DATA HOLD TIME	t_{DH}	100	–	–	ns
DATA OUTPUT DELAY TIME	t_{DD}	–	–	7.0	μs



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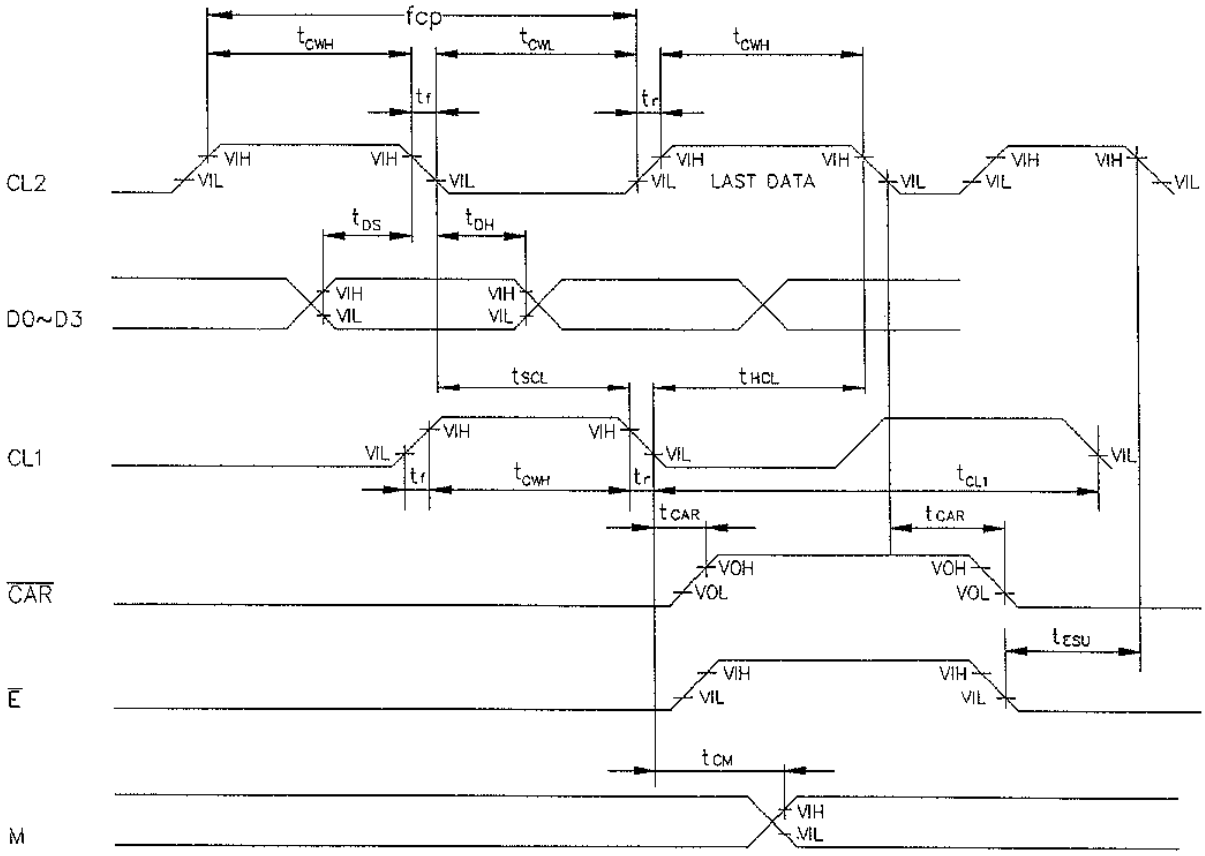
SEGMENT DRIVER OPERATION TIMING

VDD=2.7~4.5V

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLOCK FREQUENCY	f_{CL2}	–	–	6.5	MHZ
CLOCK CYCLE TIME	t_{CYC}	152	–	–	ns
CLOCK PULSE WIDTH	t_{CWH},t_{CWL}	65	–	–	ns
CLOCK RISE,FALL TIME	t_r , t_f	–	–	1	ns
CLOCK SETUP TIME	t_{SCL}	80	–	–	ns
CLOCK HOLD TIME	t_{HCL}	120	–	–	ns
DATA SETUP TIME	t_{DS}	50	–	–	ns
DATA HOLD TIME	t_{DH}	50	–	–	ns
ENABLE SETUP TIME	t_{ESU}	30	–	–	ns
CARRY OUTPUT DELAY TIME	t_{CAR}	–	–	100	ns
M PHASE DIFFERENCE	t_{CM}	–	–	300	ns
CL1 CYCLE TIME	t_{CL1}	tcycX50	–	–	ns



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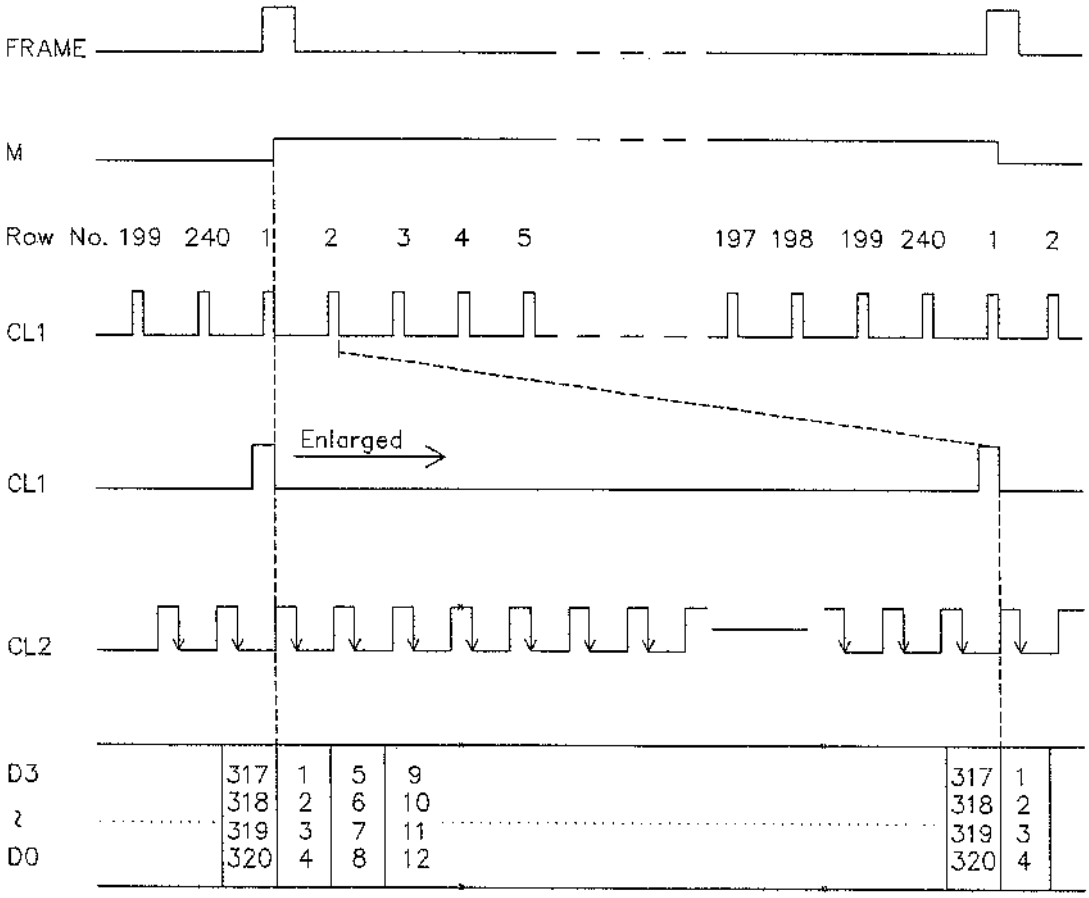
TIMING CHART OF INPUT SIGNALS



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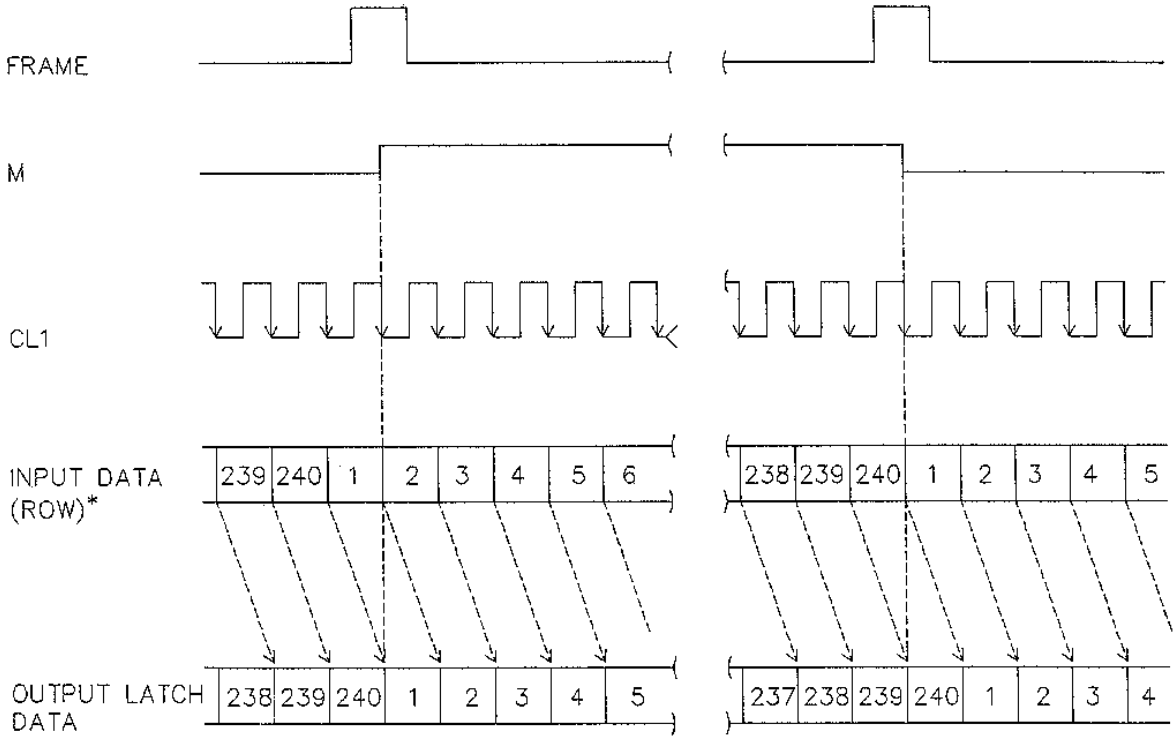
RELATION OF INPUT DATA AND OUTPUT LATCH DATA



* ONE ROW DATA INCLUDE 80 COLUMN DATA,
ONE COLUMN DATA INCLUDE 4 BIT DATA

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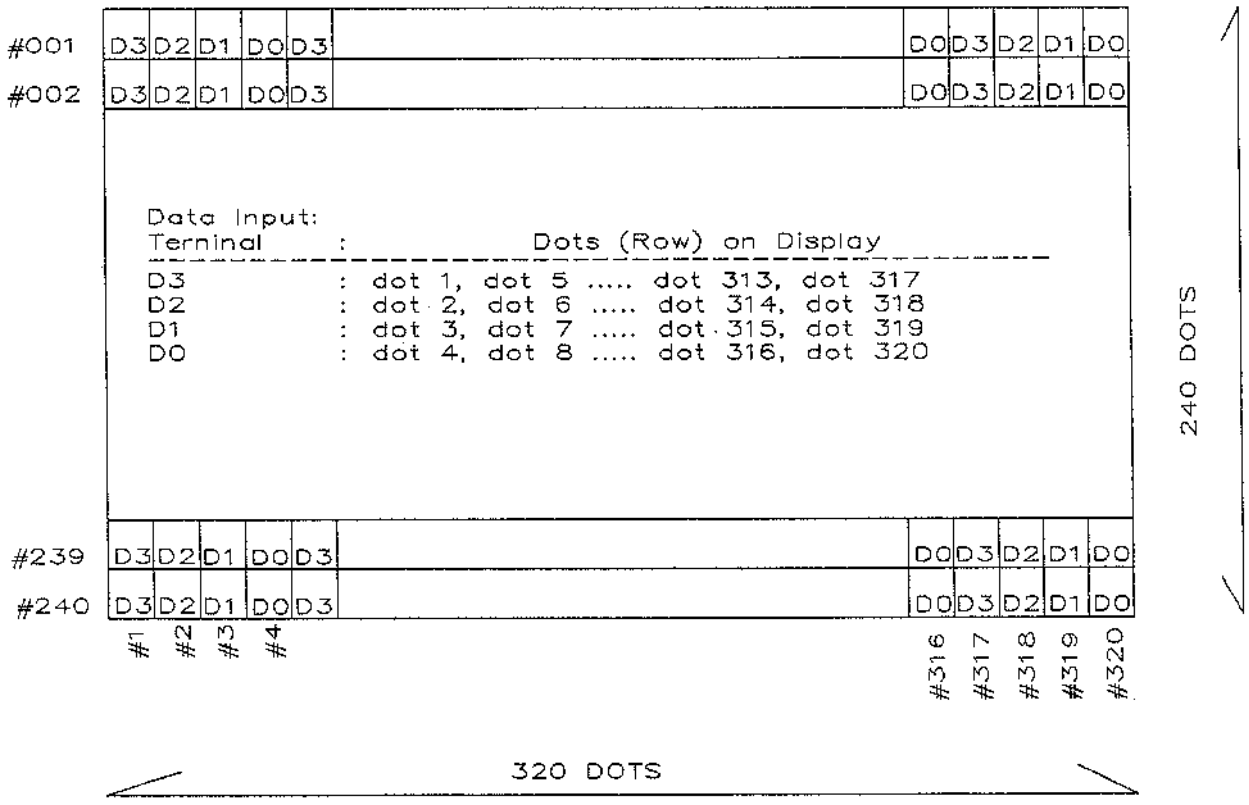
DISPLAY PATTERN



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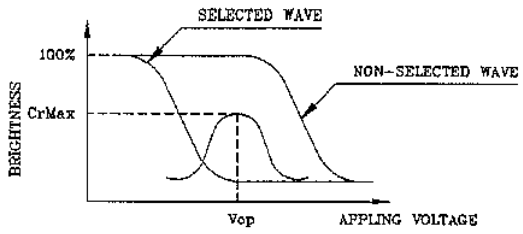
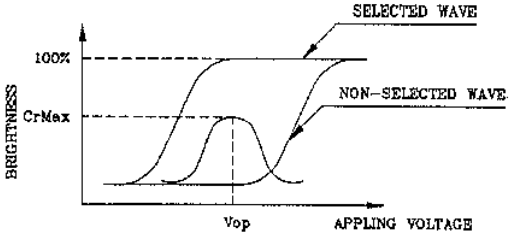
(NOTE 1)

Definition of Operation Voltage(Vop)



(positive type)



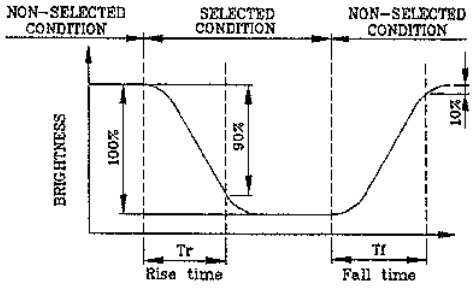
(negative type)

*Conditions

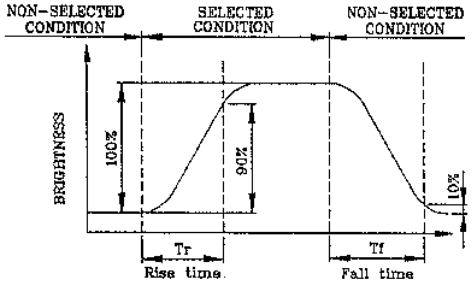
Viewing Angle : 0
Frame Frequency : 70Hz
Appling Waveform : I/N duty 1/a bias

(NOTE 2)

Definition of Response Time(Tr,Tf)



(positive type)



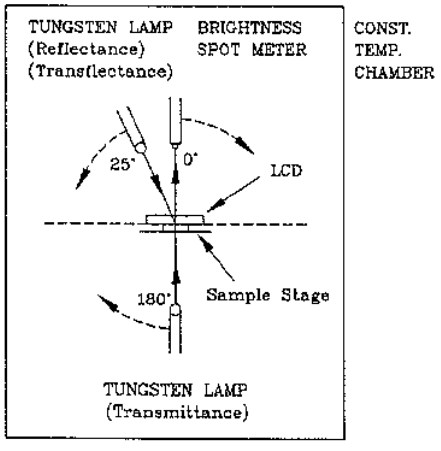
(negative type)

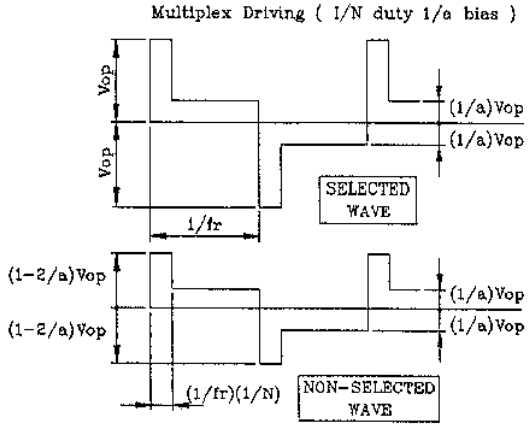
*Conditions

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

(NOTE 3)

Description of Measuring Equipment and Driving Waveforms





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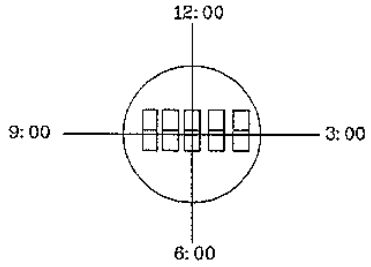
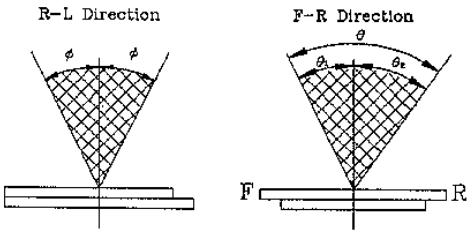
(NOTE 4)

Definition of Viewing Direction



(NOTE 5)

Definition of Viewing Angle



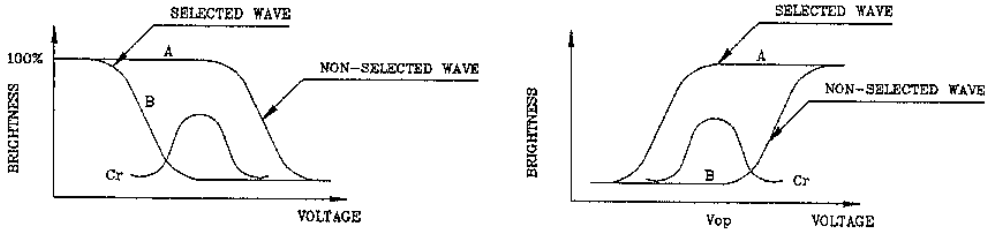
$\theta = \theta_1 + \theta_2$

*Conditions

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

(NOTE 6)

Definition of Contrast Ratio (Cr)



(positive type) (negative type)

Contrast Ratio : Cr=A/B

*Conditions

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

(2) NOTE:

- 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°C±5°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
  LED : 50,000HR
  EL : 5,000HR
  CCFT : 10,000HR

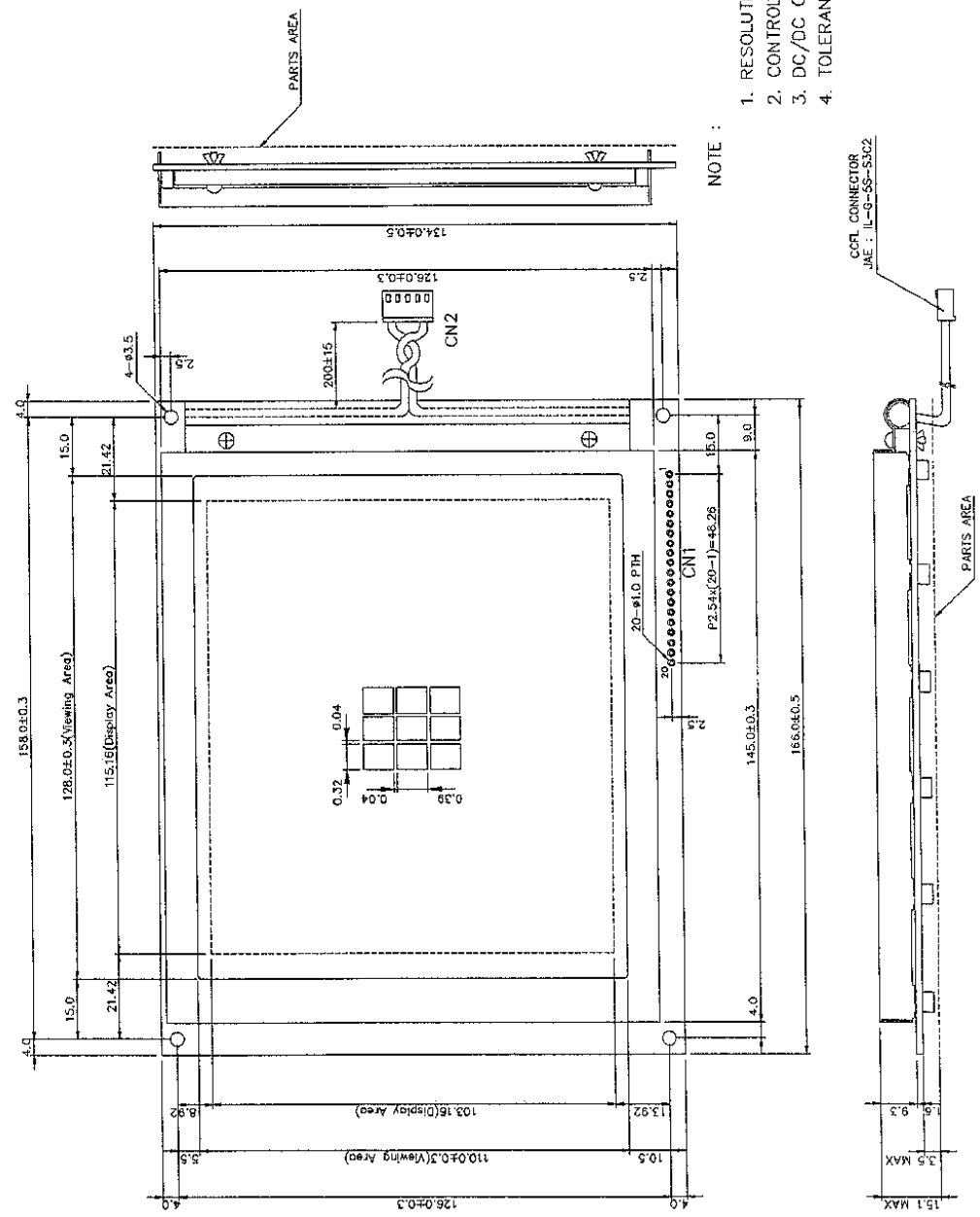
CN1 PIN CONNECTION

NO.	Symbol	NO.	Symbol
1	NC	11	D3
2	NC	12	FLM
3	NC	13	M
4	NC	14	CL2
5	NC	15	CL1
6	NC	16	VDD
7	INHX	17	VSS
8	D0	18	V0
9	D1	19	VLC
10	D2	20	FGND

CN2 CCFL PIN CONNECTION

NO.	Symbol
1	AC IN
2	NC
3	NC
4	NC
5	AC IN

NOTE :
1. RESOLUTIONS : 320 x 240 DOTS
2. CONTROLLER : WITHOUT
3. DC/DC CONVERTER : WITHOUT
4. TOLERANCE NO SPECIFIED : ±0.5 mm



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