

SPECIFICATIONS

TITLE HLM7048-010100

NUMBER

1 of 14
PAGE

1. FEATURES

- 1 Display Capacity : 400X120Dots(Graphic Type)
- 2 Display Mode : F-STN Negative Transmissive Type
- 3 Driving Method : 1/120Duty,1/11Bias
- 4 Power Supply : +5Volt,VDD-23Volt max.
- 5 Interface : C-MOS Level
- 6 Front Polarizer Hardness : Over 2H

2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Value	Unit
Supply Voltage(Logic)	VDD-VSS	-0.3~+7.0	V
Supply Voltage	VDD-VEE	35	V
Input Voltage	Vin	-0.3~VDD+0.3	V
Storage Temperature	Tstg	-20 ~ 60	°C
Operating Temperature	Top	0 ~ 50	°C

3. PHYSICAL DIMENSIONS

Item	Dimensions	Unit	Remark
Module Size	166.6(L)×53.7(W)×11MAX(D)	mm	
Viewing Area	124(L)×40(W)	mm	
Active Area	119.97(L)×35.97(W)	mm	
Dot Size	0.27(L)×0.27(W)	mm	
Dot Pitch	0.3(L)×0.3(W)	mm	

SPECIFICATIONS

TITLE HLM7048-010100

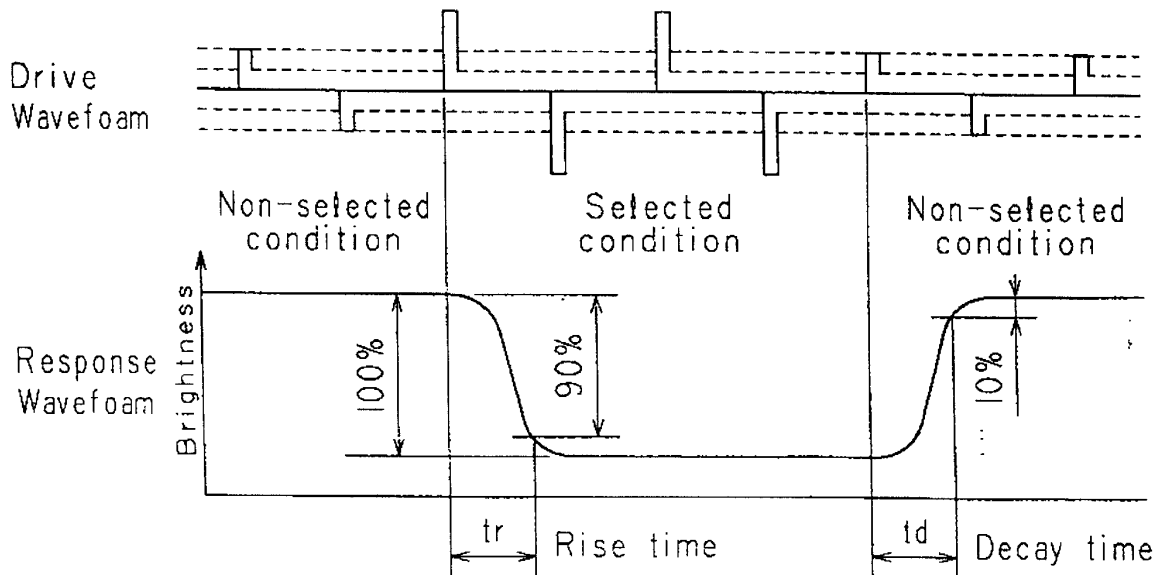
NUMBER

2 of 14
PAGE

4. OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Temp	Standard Value			Unit	Remark
				Min.	Typ.	Max.		
Response Time	Tr	VDD-V _{EE} =19.6V	25°C	—	180	250	ms	Note 1
	Td		25°C	—	80	150		Note 3
Contrast Ratio	C _R	$\theta = 0^\circ$ $\phi = 0^\circ$ VDD-V _{EE} =19.6V	25°C	10.0 10.0 ^Δ	18.0 18.0 ^Δ	—		Note 2 Note 3
Viewing Angle	$\theta \pm \theta_2$	$\phi = 0^\circ$ C _R ≥ 1.4 VDD-V _{EE} =19.6V	25°C	40	—	—	deg	Note 3

Note 1 : Definition of optical response time



SPECIFICATIONS

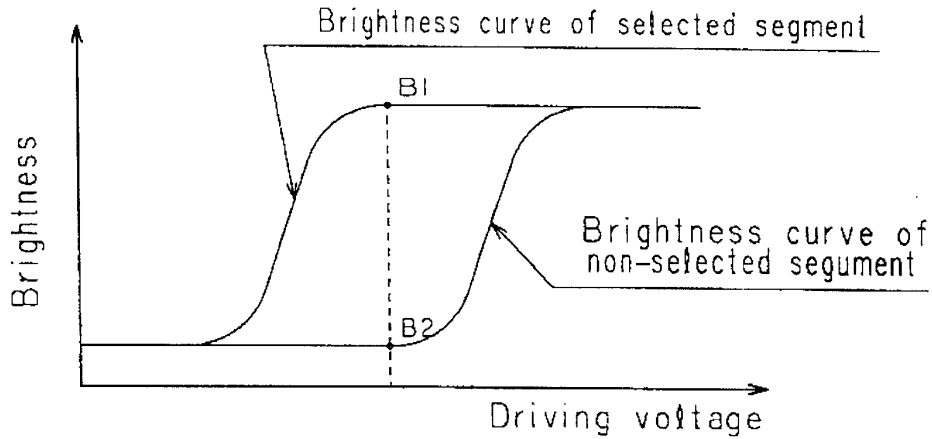
TITLE HLM7048-010100

NUMBER

3 of 14
PAGE

Note 2 : Definition of contrast ratio C_R

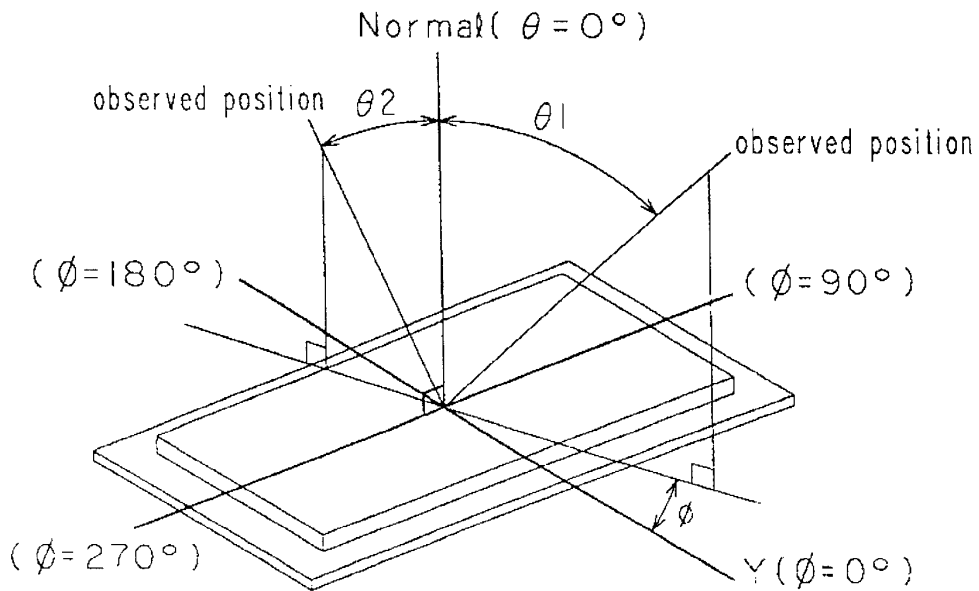
$$C_R = \frac{\text{Brightness in selected segment}(B1)}{\text{Brightness in non-selected segment}(B2)}$$



Note 3 : Definition of θ and ϕ

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

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



SPECIFICATIONS

TITLE HLM7048-010100

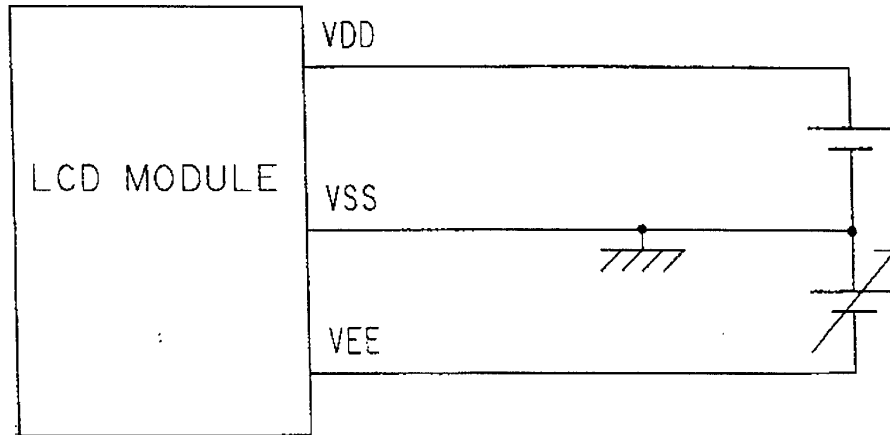
NUMBER

4 of 14
PAGE

5. ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Voltage (Logic)	VDD	—————	4.5	5.0	5.5	V
Supply Voltage (LCD)	VDD-VEE	$\theta = 0^\circ$	—	21.6	22.6	V
		$T_a = 0^\circ\text{C}$	—	19.6	—	
		$T_a = 25^\circ\text{C}$	17.4	18.4	—	
Supply Current Note 4	IDD	VDD=5V VEE=-14.6V Frame frequency=70Hz	—	3.5	7.0	mA
	IEE		—	3.0	6.0	

Note 4 : Except input/output current.



SPECIFICATIONS

TITLE HLM7048-010100

NUMBER

5 of 14
PAGE

6. INTERFACE

Pin No.	Pin Name	FUNCTION
1	FRP	Frame signal
2	LIP	Display Data latch signal
3	CLP	Display Data shift clock
4	DISP OFF	Display ON/OFF
5	M	LCD drive signal
6	VDD	Power supply voltage for logic circuit
7	VSS	Power supply voltage (GND.)
8	VEE	Control for LCD drive voltage
9	D0	Display Data
10	D1	Display Data
11	D2	Display Data
12	D3	Display Data

SPECIFICATIONS

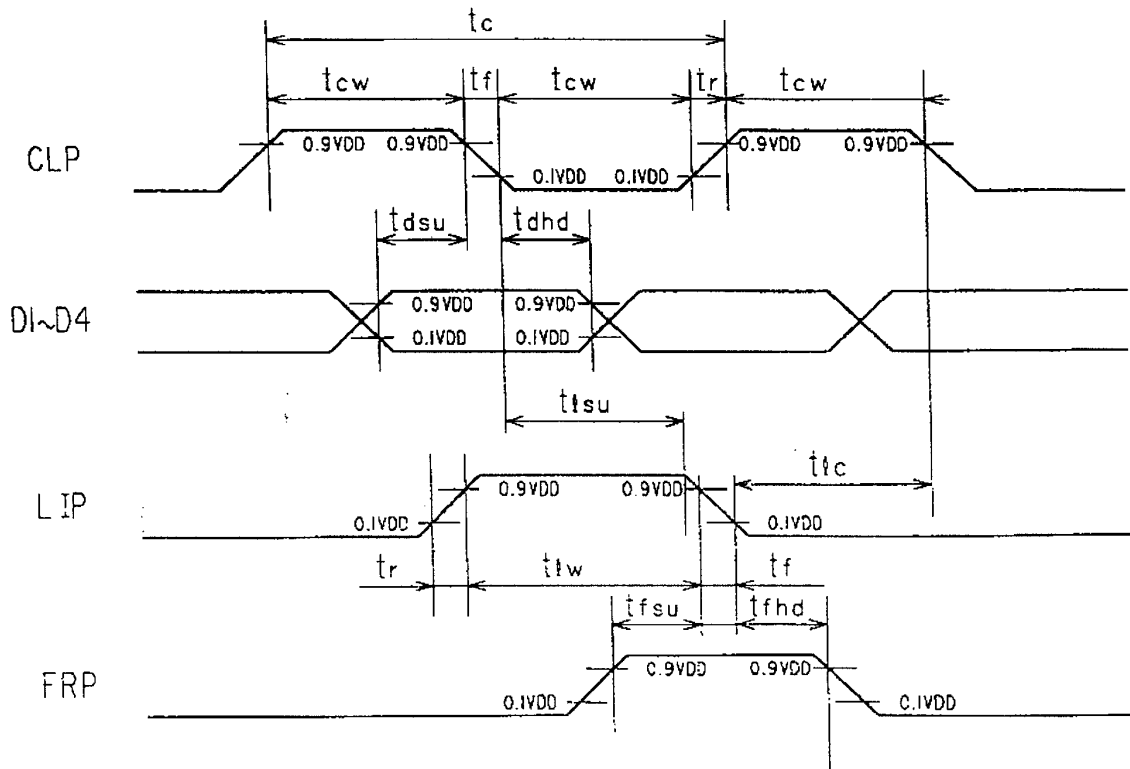
TITLE HLM7048-010100

NUMBER

6 of 14
PAGE

7. TIMING CHART

PARAMETER	SYMBOL	Min.	Max.	UNIT
CLP Cycle time	t_c	100	—	ns
CLP Pulse Width	t_{cw}	40	—	ns
CLP Rise/Fall Time	t_r, t_f	—	50	ns
DATA Set up Time	t_{dsu}	20	—	ns
DATA Hold Time	t_{dhd}	15	—	ns
CLP Set up Time	t_{tsu}	40	—	ns
LIP → CLP Time	t_{lc}	20	—	ns
LIP Pulse Wize	t_{lw}	40	—	ns
FRP Set Up Time	t_{fsu}	30	—	ns
FRP Hold Time	t_{fhhd}	25	—	ns

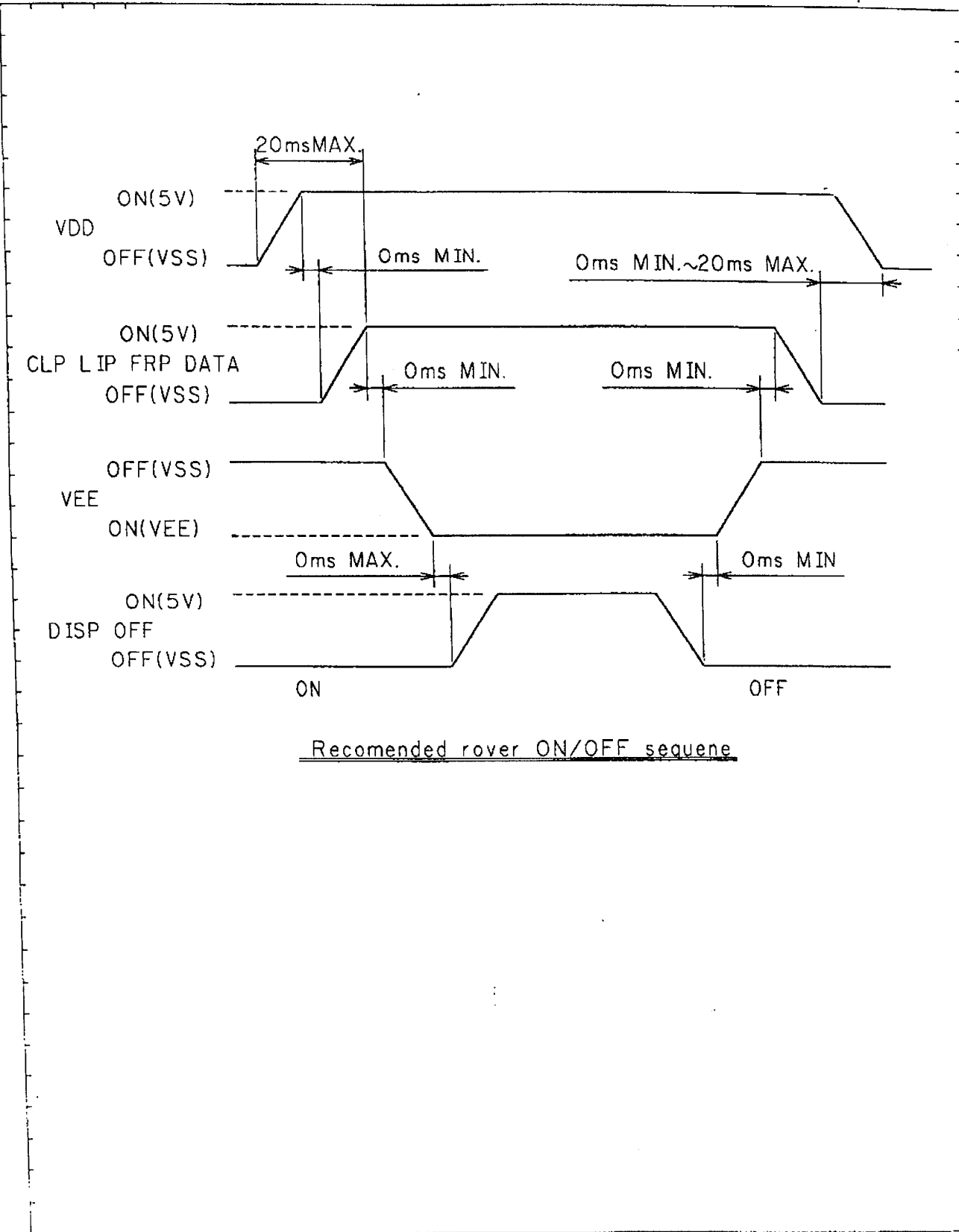


SPECIFICATIONS

TITLE HLM7048-010100

NUMBER

7 of 14
PAGE



Recomended rover ON/OFF sequene

SPECIFICATIONS

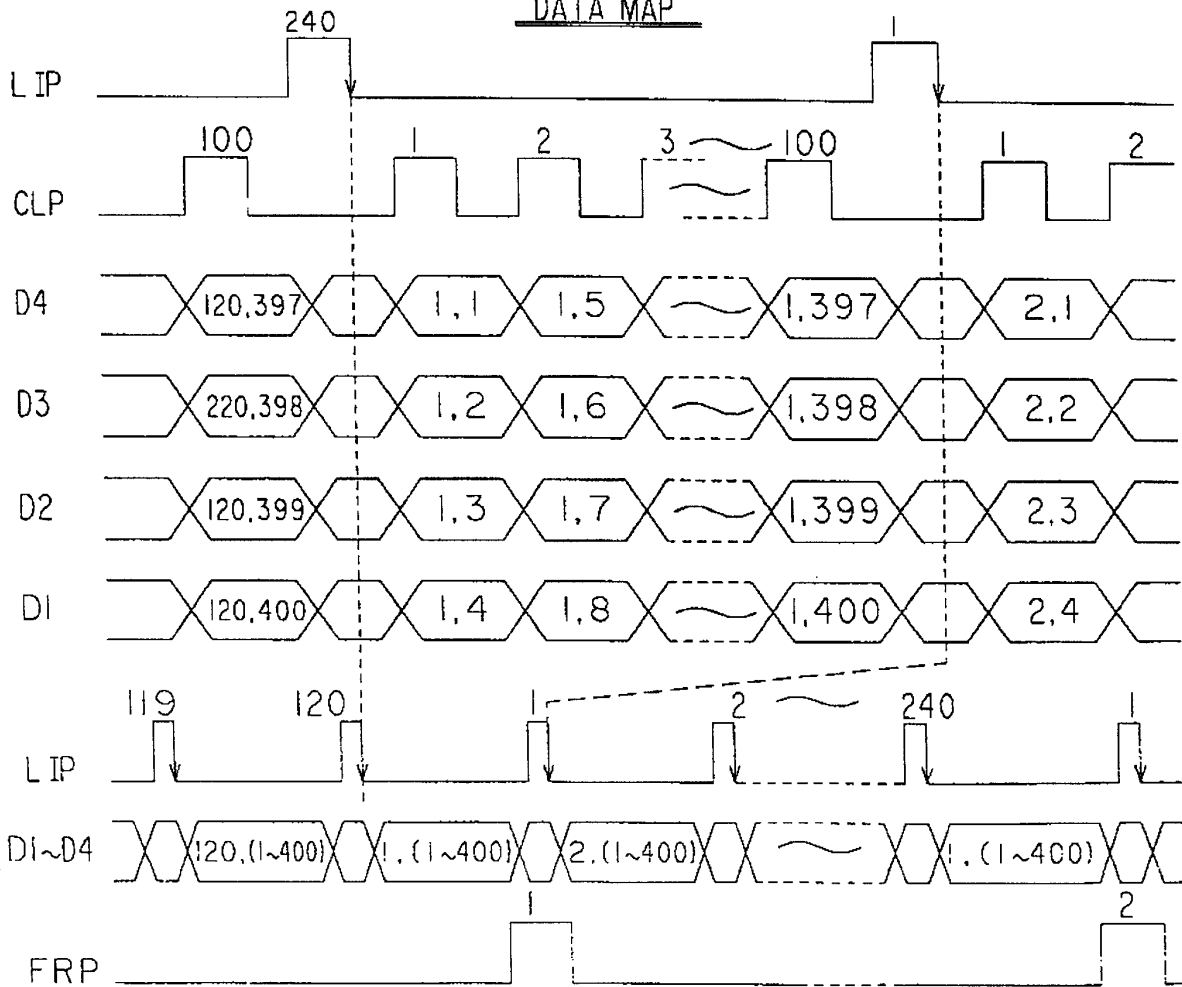
TITLE HLM7048-010100

NUMBER

8 of 14
PAGE

	1dot	2dot	3dot	4dot	~~~~~	400dot
1dot	1,1 D4	1,2 D3	1,3 D2	1,4 D1	-----	1,400 D1
2dot	2,1 D4	2,2 D3	2,3 D2	2,4 D1	-----	2,400 D1
	⋮	⋮	⋮	⋮		⋮
120dot	120,1 D4	120,2 D3	120,3 D2	120,4 D1	-----	120,400 D1

DATA MAP



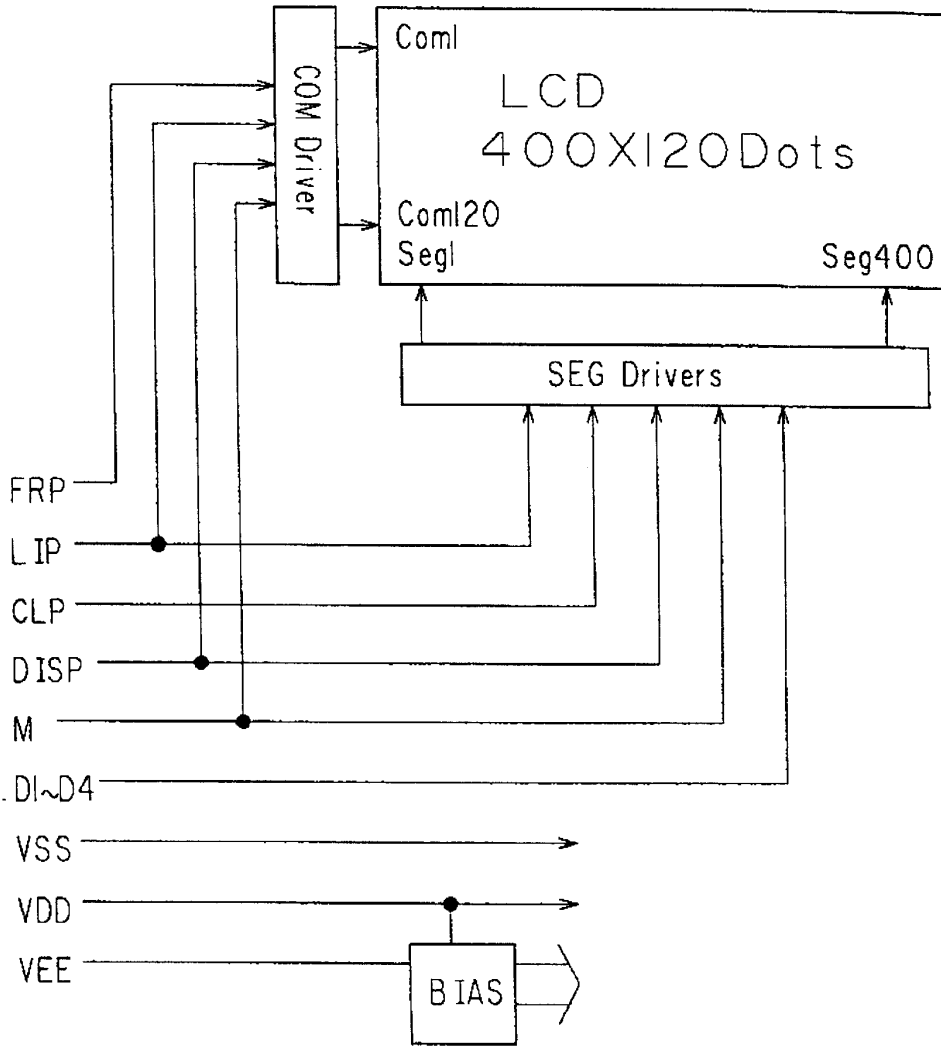
SPECIFICATIONS

TITLE HLM7048-010100

NUMBER

9 of 14
PAGE

8. BLOCK DIAGRAM



SPECIFICATIONS

TITLE HLM7048-010100

NUMBER

10 of 14
PAGE

9. BACKLIGHT

(1) Characteristics of Backlight

Condition : Ta=25°C
 Tube current : 5mA

Half-Brightness Life of Unit	10,000 Hours Min.
---------------------------------	-------------------

The definition of the half-brightness life is average brightness reach to 50% of initial average brightness

(2) Used lamp : $\phi 3.1=49$ (STANLEY) Ipc. Rating

Discharging tube current (IL)	5mA
Discharging tube voltage (VL)	180Vrms
Brightness (B)	29200NT
Power consumption (W)	0.9W
Stating tube voltage (VS)	300Vrms

(NOTE) Inverter : HIU-07A(HARISON)
 f=30(KHz)
 Ta=25°C

(3) INTERFACE

Pin.No.	Symbol	Function
1	HV	High Voltage
2	N.C	N.C
3	GND	Ground

Used Connector : BHR-03VS-I(JST)

(4) Example of Inverter

1. HIU-103 (HARSON)
2. CXA-L10L(TDK)

SPECIFICATIONS

TITLE HLM7048-010100

NUMBER

11 of 14
PAGE

10. RELIABILITY

Item	Condition
High temperature storage	60°C 96H
Low temperature storage	-20°C 96H
Damp heat storage	40°C 90%RH 96H
Thermal cycles	<p>60°C(60min.) room temp (5min.) -20°C(60min.) 1 cycle 5 cycles</p>
Vibration	Total amplitude: 1.5mm Frequency: 10~55~10Hz/min. Tested at above condition for X,Y,Z directions at each 60 min.
Shock	30G The above condition for X,Y,Z directions

Every test items shall meet following criteria.

<Criteria of judgement>

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

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

SPECIFICATIONS

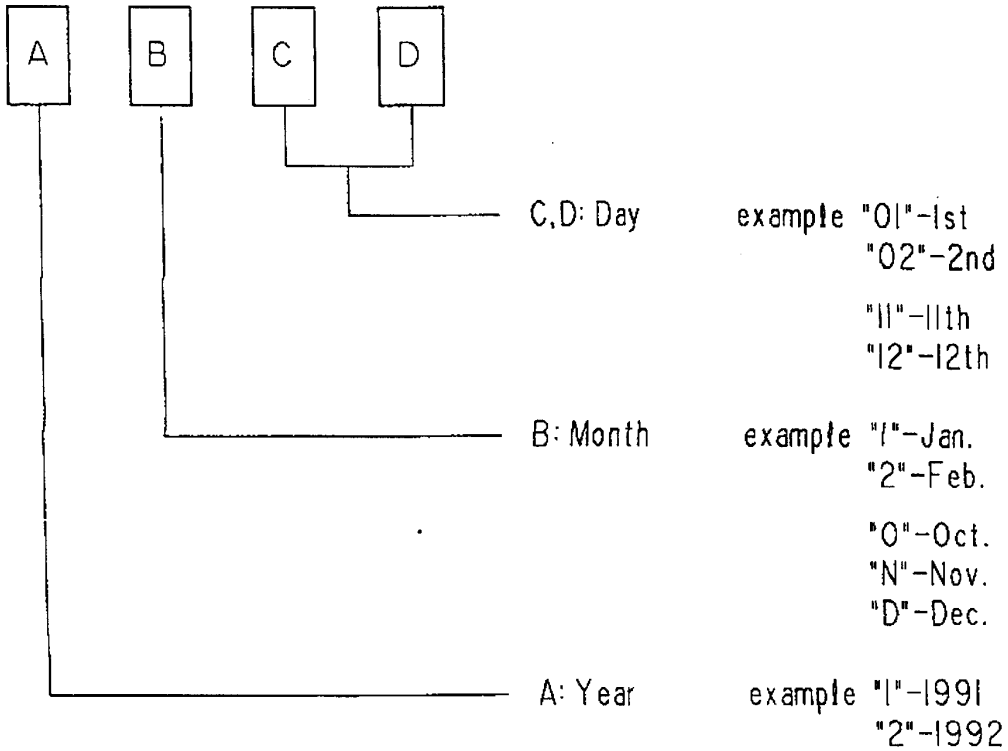
TITLE HLM7048-010100

NUMBER

12 of 14
PAGE

II. LOT No. MARKING

Manufacturing lot number be marked on the each module.



SPECIFICATIONS

TITLE HLM7048-010100

NUMBER

13 of 14
PAGE

12. HANDLING PRECAUTION

- 1) Since the liquid crystal cells are made of glass.
Do not apply strong impact to them. Handle with care.
- 2) If LCD should be broken, do not sip or drink the LC material.
If you should touch the LC material, wash at once with soap.
- 3) Reserve and use within ratings in order to keep performance and prevent damage.
- 4) Do not drop water or chemicals, etc., on the surface of the display.
- 5) Handle the polarizer with care as it is easily damaged. Do not press or rub them with a glass, a pin or any small, hard object. Take care not to push and drop them because a strong shock may damage them.
- 6) Contact terminal (transparent electrode part) may be damaged of by the sharp part of glass, etc. The excessively wire will be severed if the mechanical contact terminal is excessively rubbed. Please bring in contact with the transparent electrode part carefully.
- 7) Do not touch the surface of display and the part of transparent.
Electrode terminal with naked fingers. The LCD will be stained on the surface of display leading to less of insulation between terminals.
- 8) Soldering of TCP conductores should be less than 260°C 5 seconds.

13. 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 from the B/L date for faulty contracted commodity caused by production is under normal using and storage conditions.