SPECIFICATIONS

HOSIDEN CORPORATION

HLM 6323 - 013211

CCFL BACKLIGHT

PASSIVE MONOCHROME
LCD DISPLAY

320 x 240 DOTS

CONTENTS

1. FEATURES

Display Format	320 x 240 Dots (Graphic Type)
Display Mode	STN Negative Transmissive type, F-STN Mode with CFL Backlight
Screen Area	121 x 91,6 mm
Contrast Ratio	15:1 (typ.)
Brightness	120 cd/m^2 (typ) / If = 5 mA
Driving Method	1/240 duty
Power Supply	+5V (V_{CC}) / -23V (V_{EE})
Interface	5V CMOS Level
Backlight	CFL edgelight system

2. ABSOLUTE MAXIMUM RATINGS

Item	**Symbol**	**Value**	Unit
Supply Voltage (Logic)	V_{DD} -V_{SS}	6 max.	V
Supply Voltage	V_{DD}-V_{EE}	30 max.	V
Input Voltage	Vin	$V_{SS} \le V_{IN} \le V_{DD}$	V
Storage Temperature	Tstg	-20 ... 60	°C
Operating Temperature	Top	0 ... 40	°C

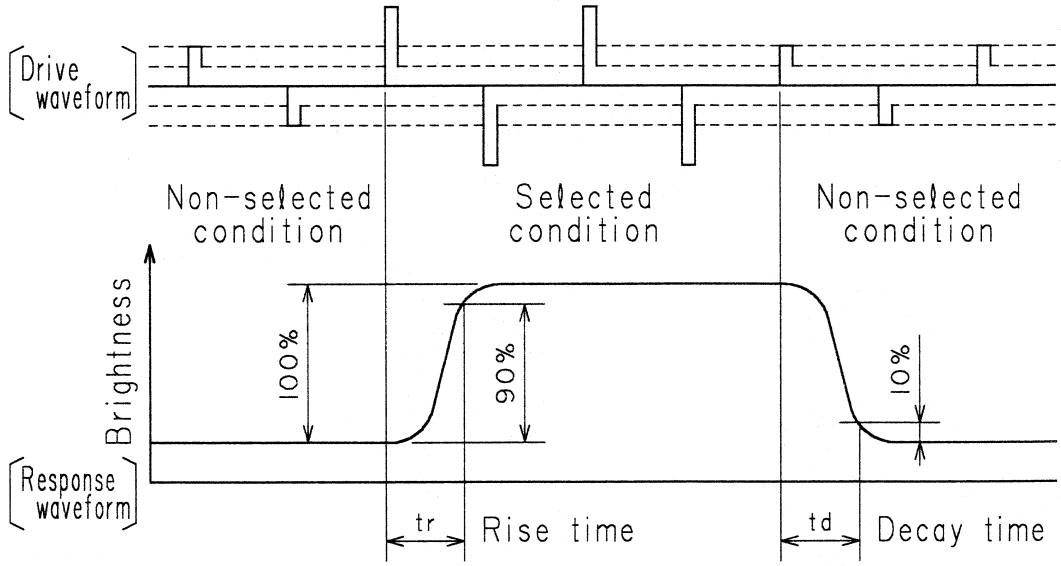
3. MECHANICAL CHARACTERISTICS

Item	Standard Value	Unit	Remark
Module Size	157,8 x 121,6 x 11,5	mm	Except FFC Cable
Viewing Area	121 x 91,6	mm	
Active Area	115,17 x 86,37	mm	
Dot Size	0,33 x 0,33	mm	
Dot Pitch	0,36 x 0,36	mm	
Weight	230 (typ.)	grams	

4. OPTICAL CHARACTERISTICS

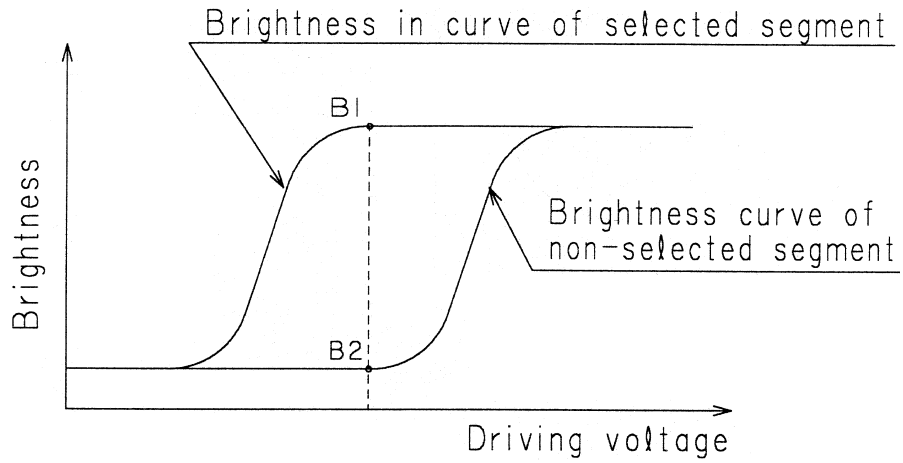
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Response Rise	T_r	Ta=25°C	-	120	200	ms	Note 1
Time Fall	T_d	θ=0° , ϕ=0°	-	70	120	ms	Note3
Contrast Ratio	CR	Ta=25°C, θ=0° , ϕ=0°	6	15	-		Note2,3
Viewing Angle	θ1 + θ2	Ta=25°C, ϕ=0°, CR≥2	45	-	-	deg	Note 3
Viewing Angle	θ3 + θ4	Ta=25°C, ϕ=0°, CR≥2	60	-	-	deg	Note 3
Frame Frequency			-	70	-	Hz	
Brightness		I_f = 5 mA	100	120		cd/m^2	
Viewing Direction				6:00		o'clock	

NOTE 1 : Definition of optical response time

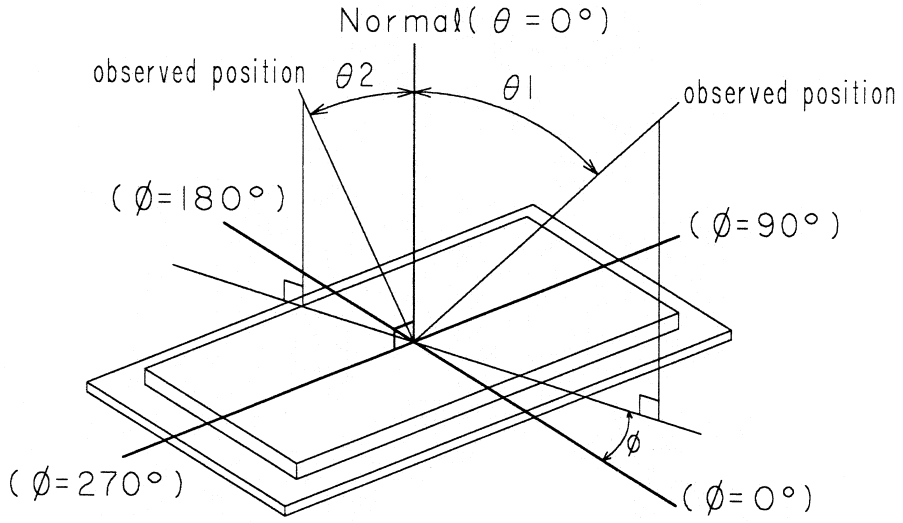


NOTE 2 : Definition of contrast ratio CR

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



NOTE 3 : Definition of viewing direction θ and ϕ



5. ELECTRICAL CHARACTERISTICS (LCD)

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage (Logic)	V_{DD}	VDD ± 10%	4,5	5	5,5	V
Supply Voltage (LCD)	V_{DD}-V_O	θ=0° , ϕ=0° Ta=0°C	-	28,1	-	V
		θ=0° , ϕ=0° Ta=25°C	-	24,0	-	V
		θ=0° , ϕ=0° Ta=50°C	-	22,5	-	V
Supply current (Logic)	I_{DD}	VDD=5V, V_O=-19V		3,2	10	mA
Supply Current (LCD)	I_{EE}	Frame Signal = 70Hz	-	2,0	8	mA

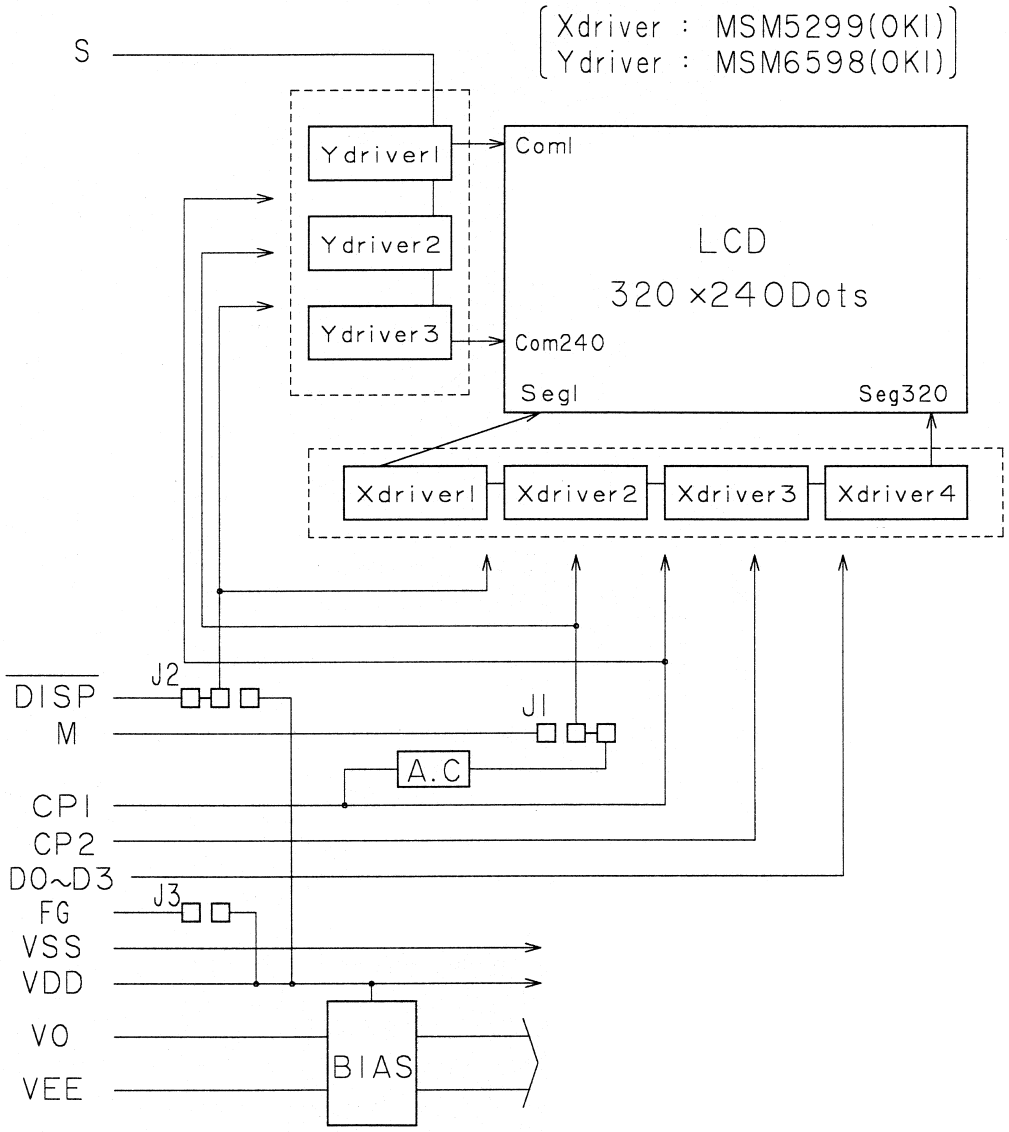
6. INTERFACE CABLE

1 mm pitch FFC Cable is fixed on the display.
Suitable Interface to standard 2,54 connector : IF155 (Data Display)
Suitable connectors for through hole (90/180°) or surface mount (90°) are available on request

Pin No.	Signal Name	Function
1	V_O	Control for LCD drive voltage
2	V_{EE}	Power supply voltage for LCD drive
3	D3	Display Data 3
4	D2	Display Data 2
5	D1	Display Data 1
6	D0	Display Data 0
7	NC / M	LCD drive signal (AC signal) *1
8	V_{SS}	Ground
9	V_{DD}	+5V Logic Supply Voltage
10	CP2	Display Data Shift Clock
11	CP1	Display Data Latch Clock
12	S	Frame Signal (Sync. of display)
13	DISP OFF	Display ON (H) / OFF (L)
14	F.G.	Frame Ground

*1 Note : M is generated on board or supplied externally (see block diagram)
Default setting is internal generation (no external signal necessary)

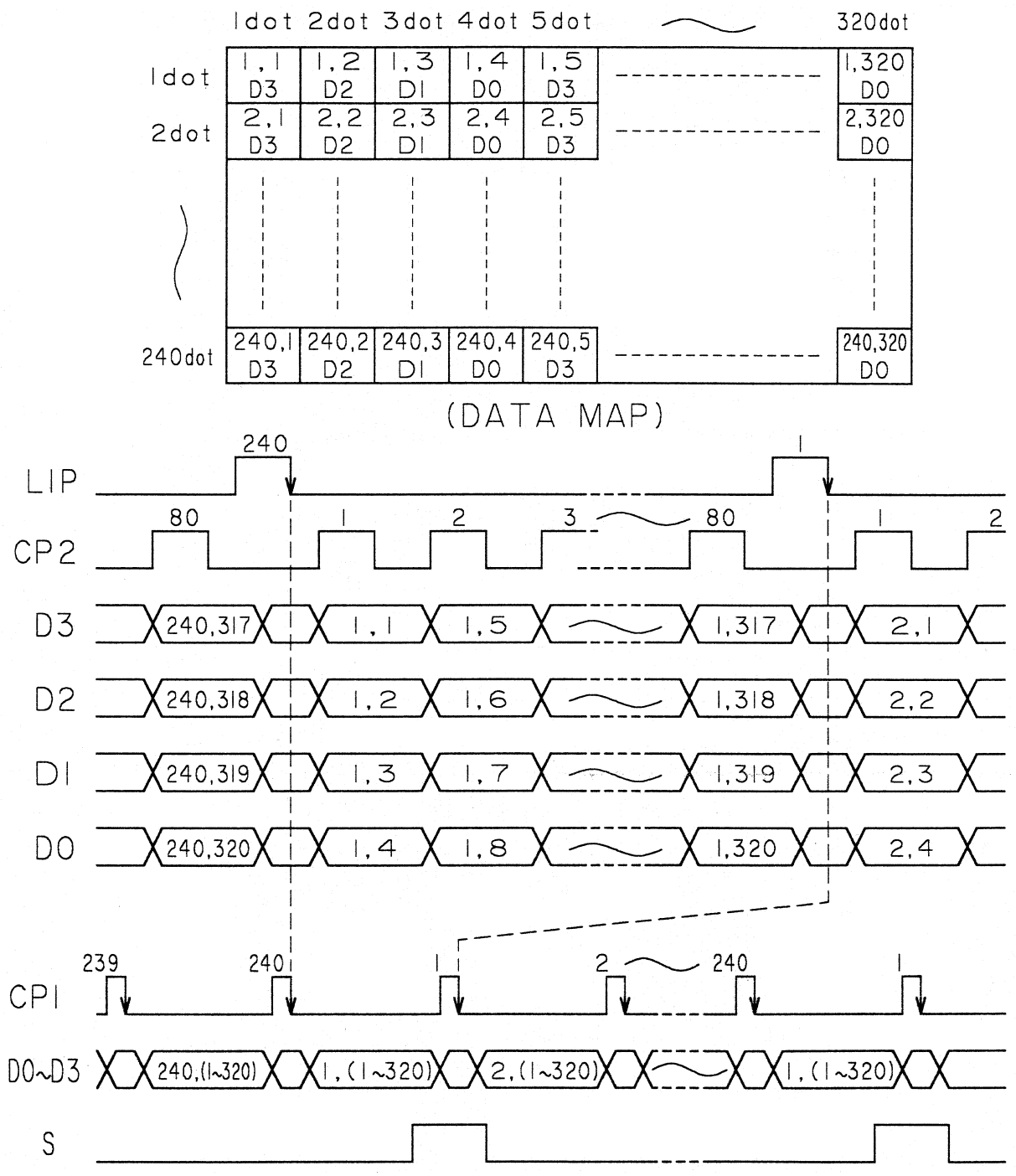
7. BLOCK DIAGRAM



A.C. : M-signal generation circuit
M-signal may be optionally supplied externally (change J1 setting)
BIAS : BIAS voltage generation circuit

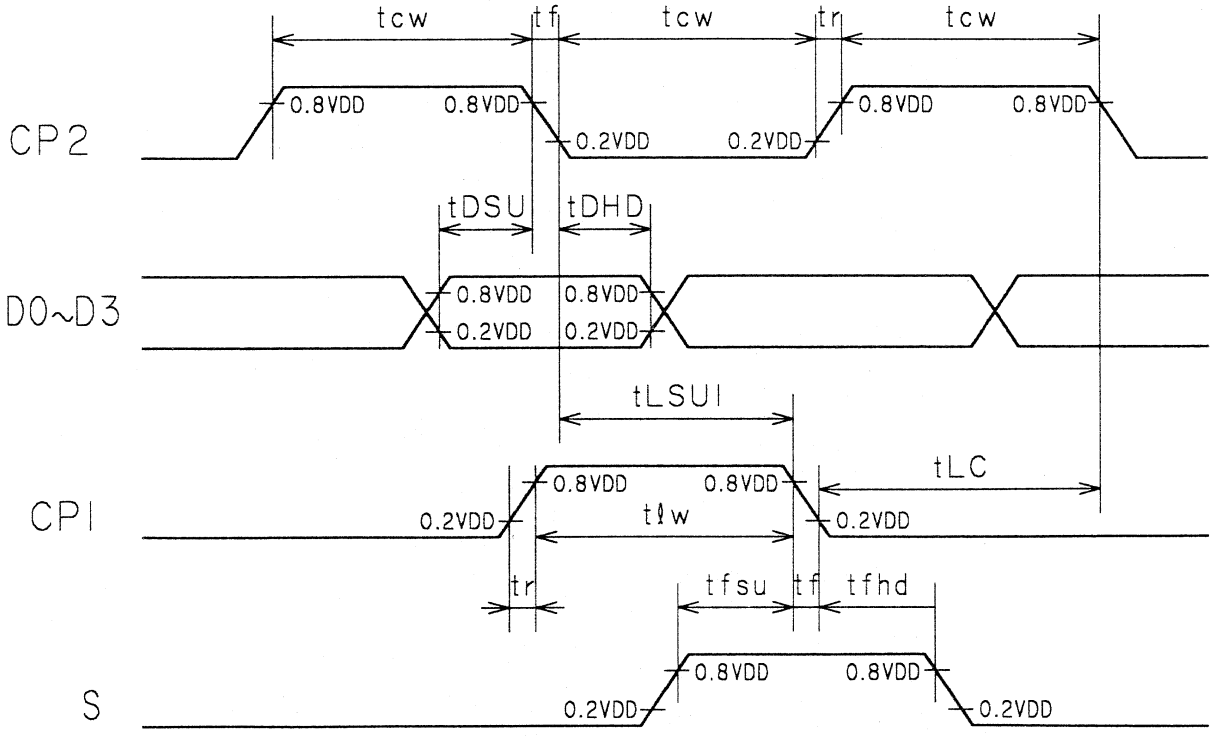
To avoid latch-up effects the power on/off sequencing should be as following :
ON : Logic voltage (V_{DD}) should be applied before or at same time with LCD voltage (V_{EE})
OFF : LCD voltage (V_{EE}) should be removed before or at the same time as Logic voltage (V_{DD})

8. INTERFACE TIMING



8-1 TIMING CHART

	Symbol	Condition	Min	Typ	Max	Unit
CLP Frequency	f_{CP}	Duty=50%	3,4	-	-	MHz
CLP Pulse Width	t_{CW}	-	100	-	-	ns
CLP Rise / Fall Time	t_r,t_f	-	-	-	50	ns
Data Setup Time	t_{DSU}	-	50	-	-	ns
Data Hold Time	t_{DHD}	-	80	-	-	ns
CLP Setup Time	t_{ESUI}	-	90	-	-	ns
LIP -> CLP Time	t_{LC}	-	200	-	-	ns
LIP Pulse Width	t_{lw}	-	100	-	-	ns
FRP Setup Time	t_{fsu}	-	100	-	-	ns
FRP Hold Time	t_{fhd}	-	100	-	-	ns



9. CFL UNIT

9-1 CCFL Lamp

Item	Symbol	Value	Unit
Discharging Tube current	(IL)	5	5mA
Discharging Tube voltage	(VL)	275	Vrms
Starting Tube Voltage	(VS)	1000	Vrms
Brightness (Tube)	(B)	23.300	Nit
Tube diameter	∅	3	mm
Tube length	l	86	mm
Half Brightness Time	min	10.000	h
Half Brightness Time	typ	15.000	h

The definition of half brightness time is either average brightness decreased to 50% of initial average brightness value.

9-2 Example of Inverter

Inverter : CXA K10A (5V) or 8m6323 (5Vor 12V)
Input current : 0,2A
Output current : 5,0 mArms
Drive frequency : 30 kHz (typ)

9-3 Interface connector

Used connector : VHR-4N
Manufacturer : JST

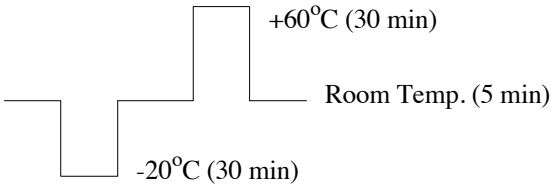
Pin No.	Signal Name	Function
1	HV	High Voltage
2	NC	Not connected
3	NC	Not connected
4	GND	Ground

*1 Suitable through hole connectors (90^{o}/180^{o}) are available on request.

10. RELIABILITY

Item	Condition	
High temperature storage	60°C	120h
Low temperature storage	-20°C	120h
Damp heat storage	40°C / 90% RH	120h
Thermal cycles	5 cycles	see below diagram
Vibration	Total amplitude : 1,5 mm Frequency : 10 .. 55 .. 10 Hz Tested at above condition for X,Y,Z directions 60 min. each	

Temperature Cycle Diagram



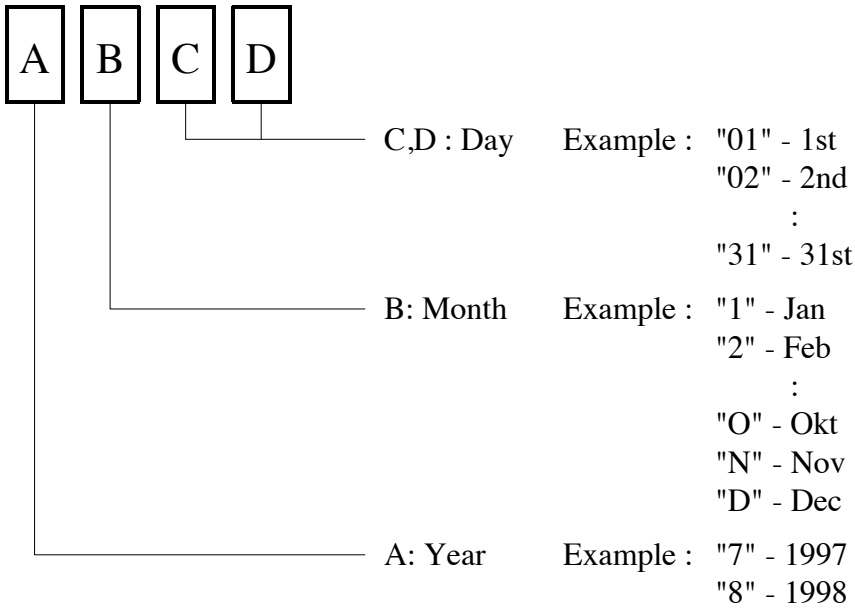
10-1 Evaluation Criteria

Every test item should meet the following criteria :
- All of the segments (dots) should be not blurred
- All segments (dots) should be usually displayed

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

11. LOT MARKING

The manufacturing lot number is marked on each module



12. HANDLING PRECAUTION

1. Do not disassemble the module
2. Since the LCD cell is made of glass, do not apply strong mechanical impact or static load onto it. Handle with care, and do not twist or bend the LCD module.
3. In case the LCD cell is broken, do not sip or drink leaked liquid crystal material. If the liquid crystal material touched your skin, wash it out with soap immediately.
4. Store and use within ratings in order to keep performance and prevent damage.
5. Do not drop water or any chemicals onto the display surface.
6. Handle the polarizors with care as it maybe easily scratched. Do not press or rub them with any hard object.
7. Do not apply high electrostatic voltage to the LCD module. It may damage CMOS / LSI circuit in the LCD module. Ground yourself when you touch the LCD module directly.
8. When you handle the LCD module for incoming inspection or assembly, use soft fingerstalls or gloves in order to keep the display quality.
9. Do not pull or fold the CCFL cable

13. TERMS OF WARRANTY

13-1 Incoming Inspection

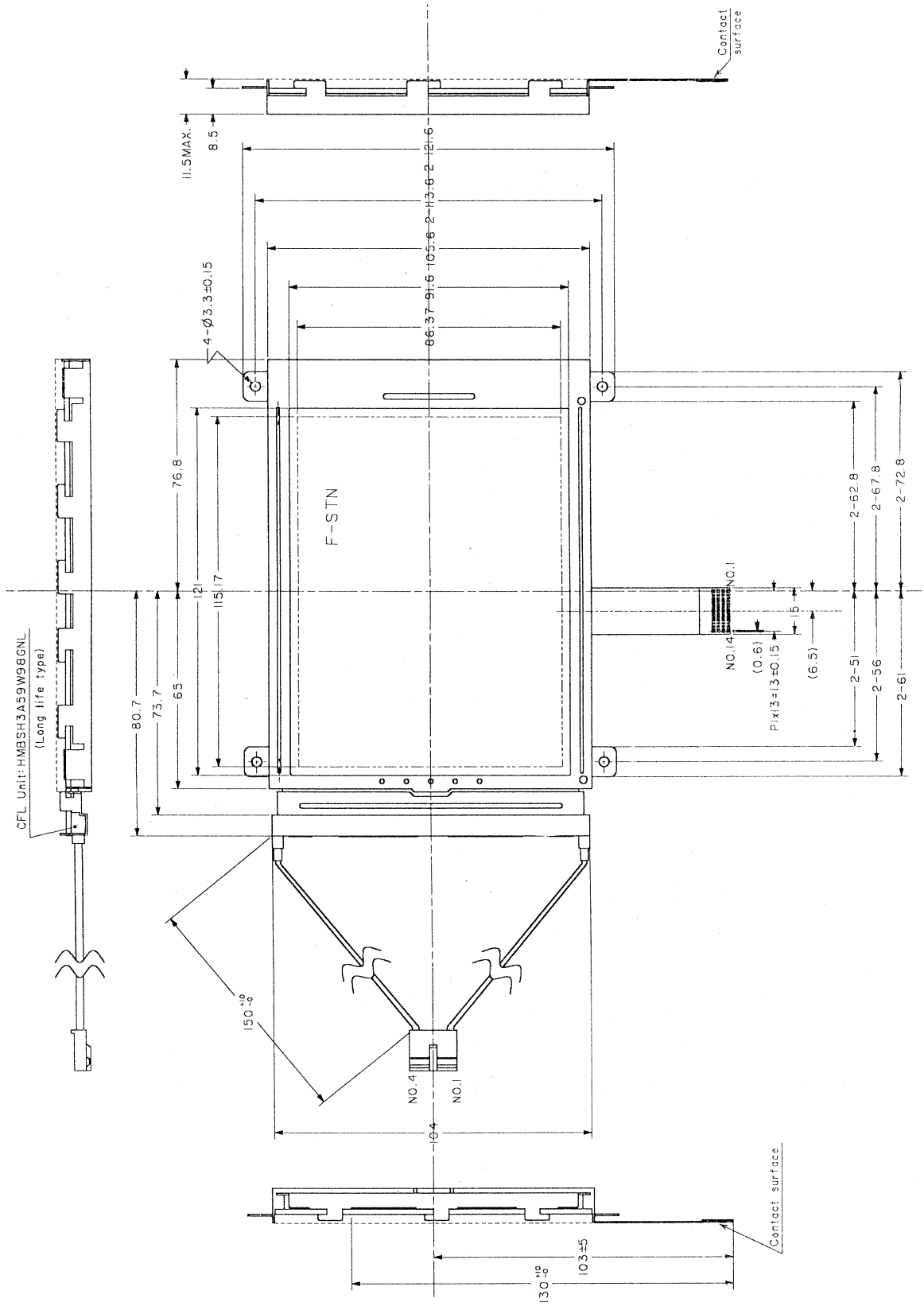
Incoming inspection by the customer shall be performed within thirty (30) days from the shipping date.

13-2 Warranty Period

HOSIDEN warrants the LCD modules for a period of 6 months from the shipping date when stored or used under normal conditions.

14. DRAWING

See following page.
If a more detailed drawing is necessary please contact HOSIDEN or its representatives.


Contact surface
11.5MAX.
8.5
86.37 91.6 105.6 2-H3.6 2 121.6
4-Ø3.3±0.15
76.8
121
115.17
F-STN
80.7
73.7
65
CFL Unit: HWBSH3A59W98GNL
(Long life type)
NO.14
NO.1
(0.6)
Pix(3=13±0.15
(6.5)
15
2-62.8
2-67.8
2-72.8
2-51
2-56
2-61
150 +0 -0
NO.4
NO.1
104
Contact surface
103±5
130 +0 -0