SANYO

ENGINEERING SPECIFICATIONS

PASSIVE MATRIX LCD MODULE

LCM-5483-24NHK (640×480 dots)

(With cold fluorescent backlight)

Nonglare type

(TENTATIVE)

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This specifications may be changed without any notice in order to improve performance or quality.

HISTORY OF CHANGES

DATE	REVISION NO.	PAGE	DESCRIPTIONS

NOTE

■ MECHANICAL CHARACTERISTICS

Item	Specification	Unit
Package dimensions	244(W)×158(H)×9.0 [Max. 9.5] (D)	mm
Structure	640(W)×480(H)	dot
Dot size	0.24(W)×0.24(H)	mm
Dot pitch	0.27(W)×0.27(H)	mm
Effective area	179.0(W)×135.0(H)	mm
Weight	Approx. 390	g

■ ELECTRICAL ABSOLUTE MAXIMUM RATINGS

Item	Symbol	MIN.	MAX.	Unit	Remark
Power supply for logic	$V_{DD}-V_{SS}$	0	6.0	V	Ta=25℃
Power supply for LCD driver	$V_{DD}-V_{EE}$	0	30	V	Ta=25℃
Input voltage	V_I	0	V_{DD}	V	Ta=25℃

■ ELECTRICAL CHARACTERISTICS

$V_{EE}-V_{SS}$=-23±1V, Ta=25℃

Item	Symbol	Condition		MIN.	TYP.	MAX.	Unit
Power supply for Logic	$V_{DD}-V_{SS}$			4.75	5.0	5.25	V
Contrast adjust voltage (1/240 duty)	$V_{DD}-V_O$	Note1	Ta= 0℃	—	27.0	28.0	V
			Ta=25℃	—	24.0	—	V
			Ta=40℃	20.0	22.5	—	V
Input signal voltage	V_{IH}	High level		0.8 V_{DD}	—	V_{DD}	V
	V_{IL}	Low Level		0	—	0.2 V_{DD}	V
Supply current(Logic)	I_{DD}	V_{DD}=5.0V		—	—	40	mA
Supply current(LCD Driver)	I_{EE}	Note 2		—	—	40	mA

Note 1) The viewing angle ϕ at which the optimum contrast is obtained can be set by adjusting $V_{DD}-V_O$. Refer to ＊1 for the difinition of ϕ.

Note 2) Under the following conditions :

① $V_{DD}-V_O$ = 28.0 V

② UD_0-UD_3 = GND

③ Frame frequency = 74 Hz　　f_{CL2} = 2.84 MHz

■ ENVIRONMENTAL CONDITIONS

Item	Storage		Operating		Remark
	MIN.	MAX.	MIN.	MAX.	
Ambient temperature	-20℃	60℃	5℃	40℃	Note 1
Humidity	Note 2		Note 2		No condensation
Vibration		2.0 G		—	10~55 Hz, X/Y/Z Except for resonant frequency
Shock		50 G		—	XYZ 11 ms

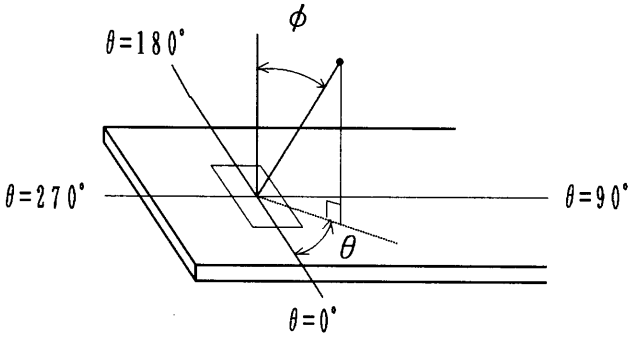
Note 1) Care should be taken so that the LCD unit may not be subjected to the temperature out of this specification.

Note 2) Ta≦40℃:85% RH MAX.

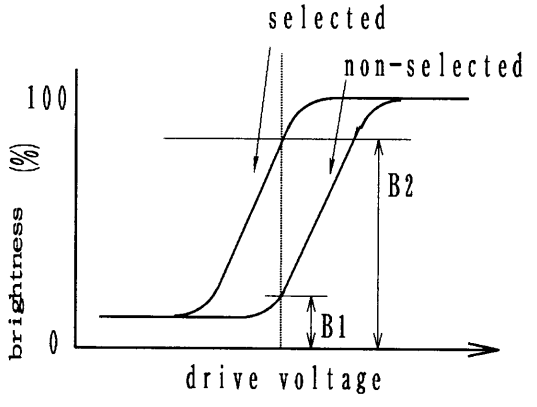
■ OPTICAL CHARACTERISTICS (1)

V_{DD}=5.0V, V_{DD}-V_O=Vkmax, f_{FLM}= 74Hz, Ta=25℃

Item		Symbol	Condition		Min.	Typ.	Max.	Unit	Remark
Viewing angle range		ϕ	K＞1.4	θ= 0°	10	—	—	deg.	*1
				θ=90°	30	—	—		
				θ=180°	20	—	—		
				θ=270°	30	—	—		
Contrast ratio		Kmax	ϕ=0°		7	13	—	—	*2 *4
Response time	Rise	tr	ϕ=0°		—	200	—	ms.	*3
	Fall	tf	ϕ=0°		—	200	—	ms.	

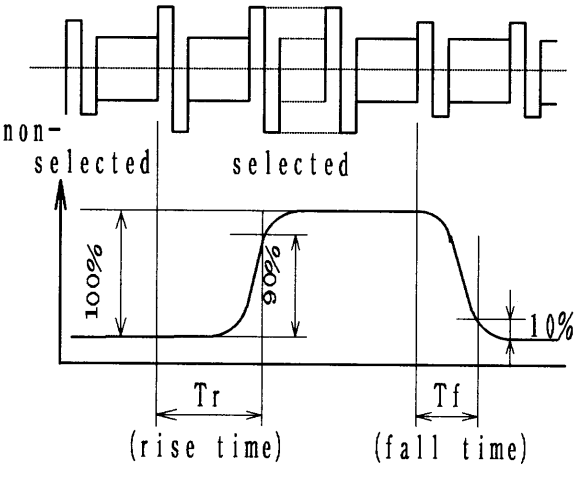


*1 ϕ and θ

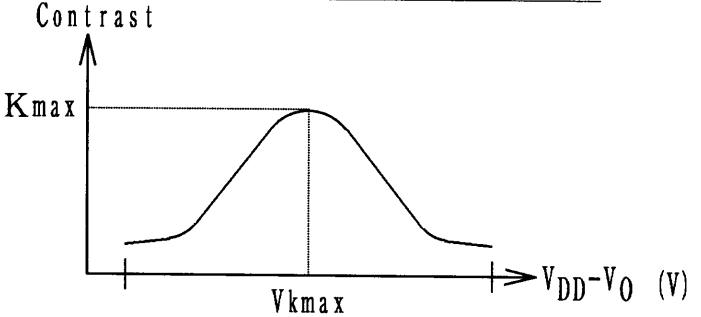


$$Kmax=\frac{B2 \text{ at } Vkmax,}{B1 \text{ at } Vkmax,}$$

*2 contrast ratio "K"



*3 response time



*4 definition of Vkmax

■ OPTICAL CHARACTERISTICS (2)

LCD Surface Brightness

Item	Min.	Typ.	Max.	Unit
Brightness	—	40	—	cd/m²

Note) The brightness shall be the average of the following five(5) measuring points.

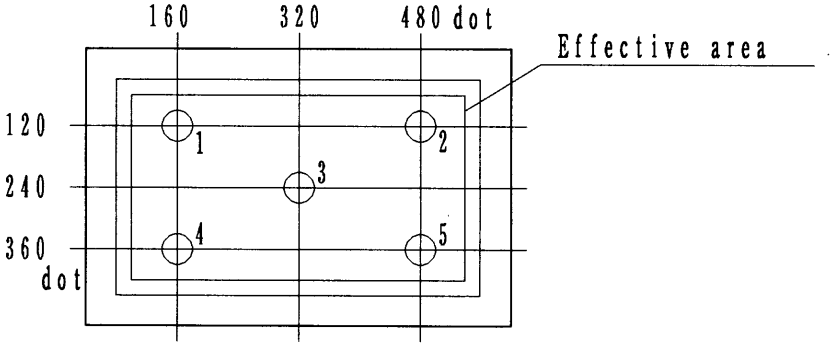


Fig. 1 Measuring points

Measurement equipment : BM-7 (TOPCON) or CA-1000 (MINOLTA)

Measurement condition

① Ambient temperature : 25℃

② LCD : All digits WHITE , $UD_0 \sim UD_3$=HIGH(WHITE) $LD_0 \sim LD_3$=HIGH(WHITE)
V_{DD}-V_O:Voltage at max.contrast ratio, f_{FLM}= 74Hz

③ Measurement after 30 minutes of CFL operating.

④ I_L= 7.5 mArms (CFP-37)

■ BACKLIGHT CHARACTERISTICS

CFL RATING Ambient temperature Ta=25℃

Item	Rating	
Non-load output voltage (V_S)	1000 Vrms Min. (*)	———
Lamp current (I_L)	3.5 mArms ~ 7.5 mArms	8.0 mArms max.
Lamp voltage (V_L)(at 5.0 mA)	270 Vrms Typ.	———
Operating life (at 5.0 mA)	7000 hours Min.	———

Within no conductor closed (CFL only)

* The circuit voltage (V_S) of the inverter should be designed to have some margin (reference value : 1400 Vrms Min.), because V_S may be increased due to the leak current which may be caused by wiring of CFL cables.

■ INTERNAL PIN CONNECTION

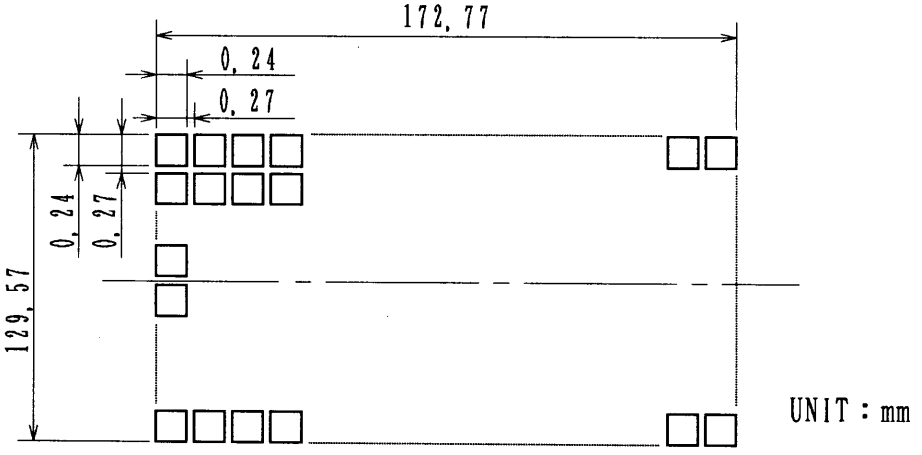
Pin No.	Symbol	Function
1	UD_0	Upper half data H -- ON, L -- OFF
2	UD_1	Upper half data H -- ON, L -- OFF
3	UD_2	Upper half data H -- ON, L -- OFF
4	UD_3	Upper half data H -- ON, L -- OFF
5	$\overline{DISP\ OFF}$	H -- display ON, L -- display OFF
6	FLM	The FLM signal indicates the beginning of each display cycle.
7	M	Control signal for AC driving.
8	V_{SS}	GND
9	CL1	The CL1 latches the serial data in the shift registers.
10	V_{SS}	GND
11	CL2	Clock signal for shifting the serial data.
12	LD_0	Lower half data H -- ON, L -- OFF
13	LD_1	Lower half data H -- ON, L -- OFF
14	LD_2	Lower half data H -- ON, L -- OFF
15	LD_3	Lower half data H -- ON, L -- OFF
16	V_{DD}	+5V
17	V_{SS}	GND
18	V_{EE}	-23V (power supply voltage for LCD)
19	V_{EE}	-23V (power supply voltage for LCD)
20	V_0	Operating voltage for LC driving.

・LCD Used connector : IL-402-20S-S1L-SA (JAE)
Suitable connector : 1mm pitch FPC Type. Refer to Package dimensions.

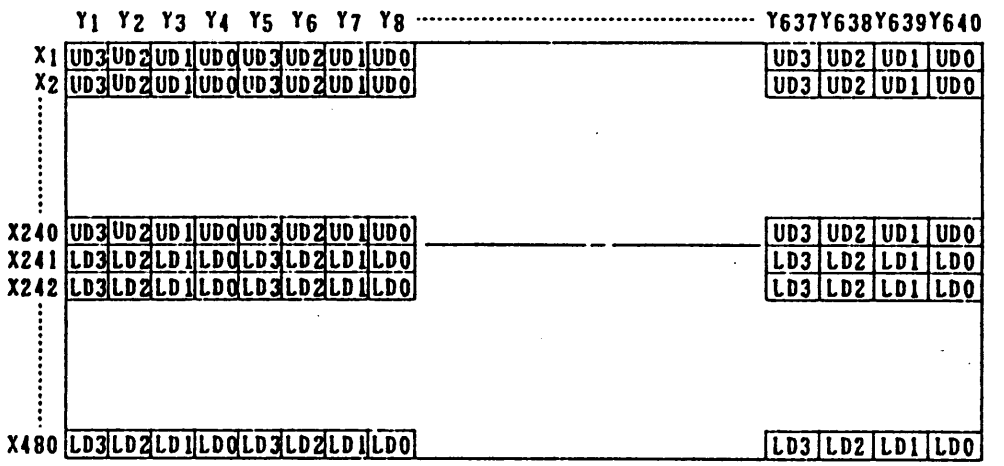
Interface	Pin No.	Symbol	Function
CFL	1	H.V	Power supply voltage for CFL
	2	N.C	———
	3	N.C	———
	4	GND	CFL GND

・CFL Used connector : XHP-4 (JST)
Suitable connector : B4B-XH-A or S4B-XH-A (JST)

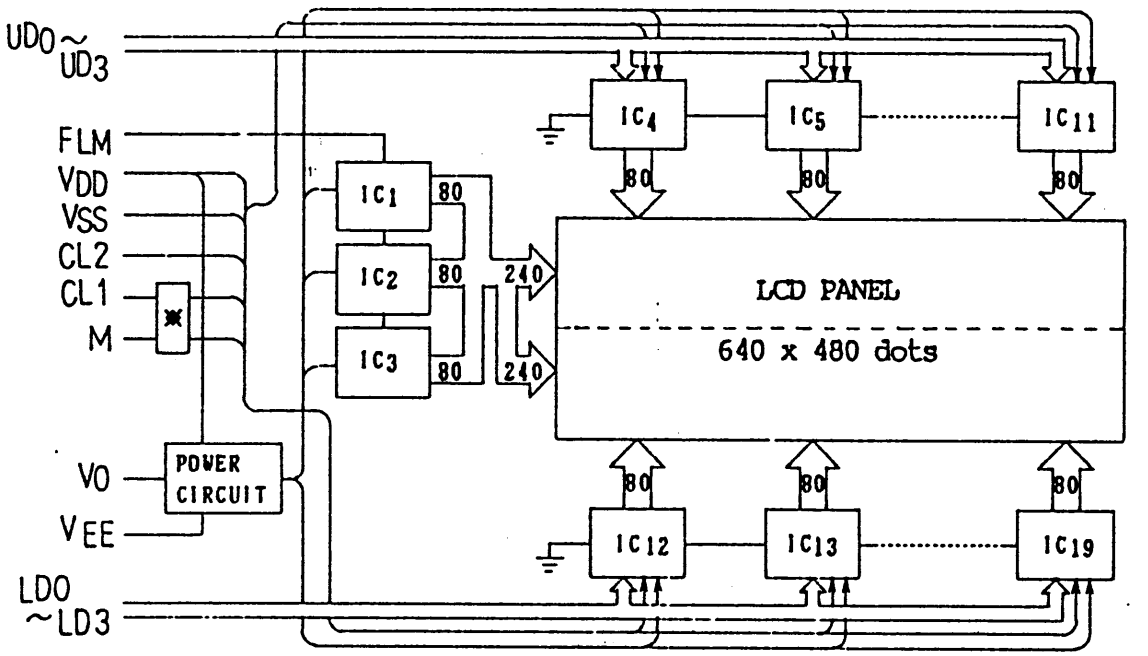
■ DISPLAY PATTERN



UNIT : mm

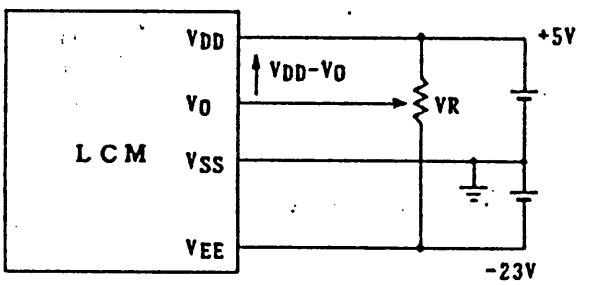


DISPLAY VS. DATA CORRESPONDING DIAGRAM



※ Timing Circuit

BLOCK DIAGRAM



VDD-V0: VLCD
VR: 10KΩ~20KΩ

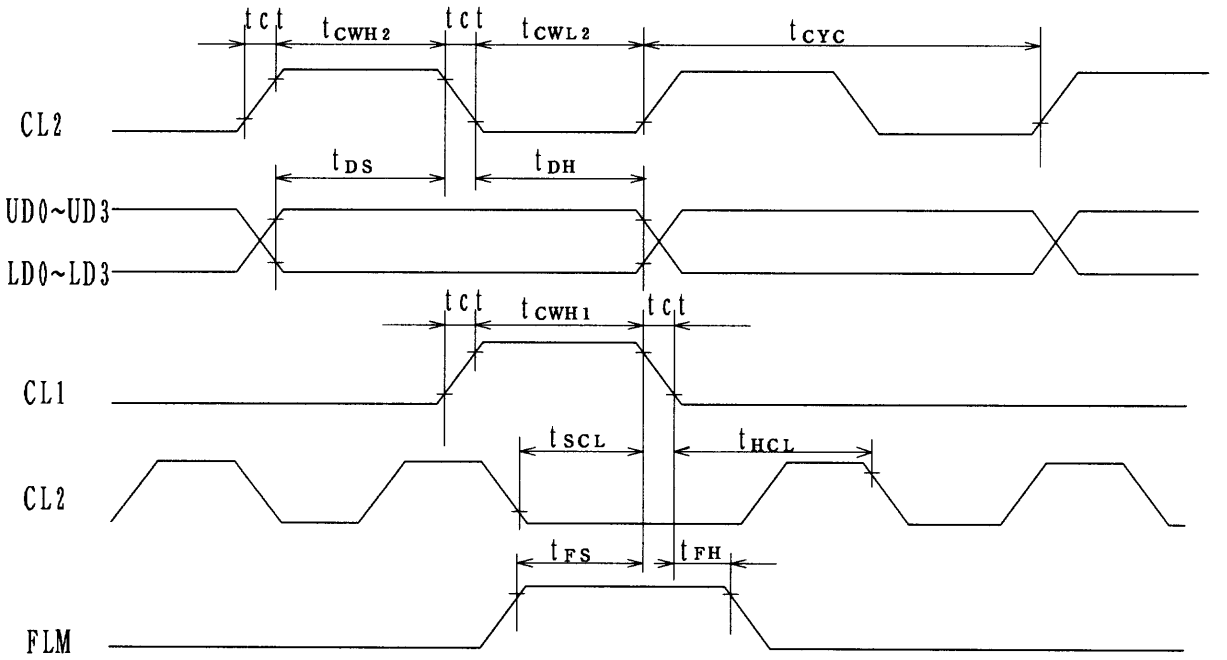
POWER SUPPLY

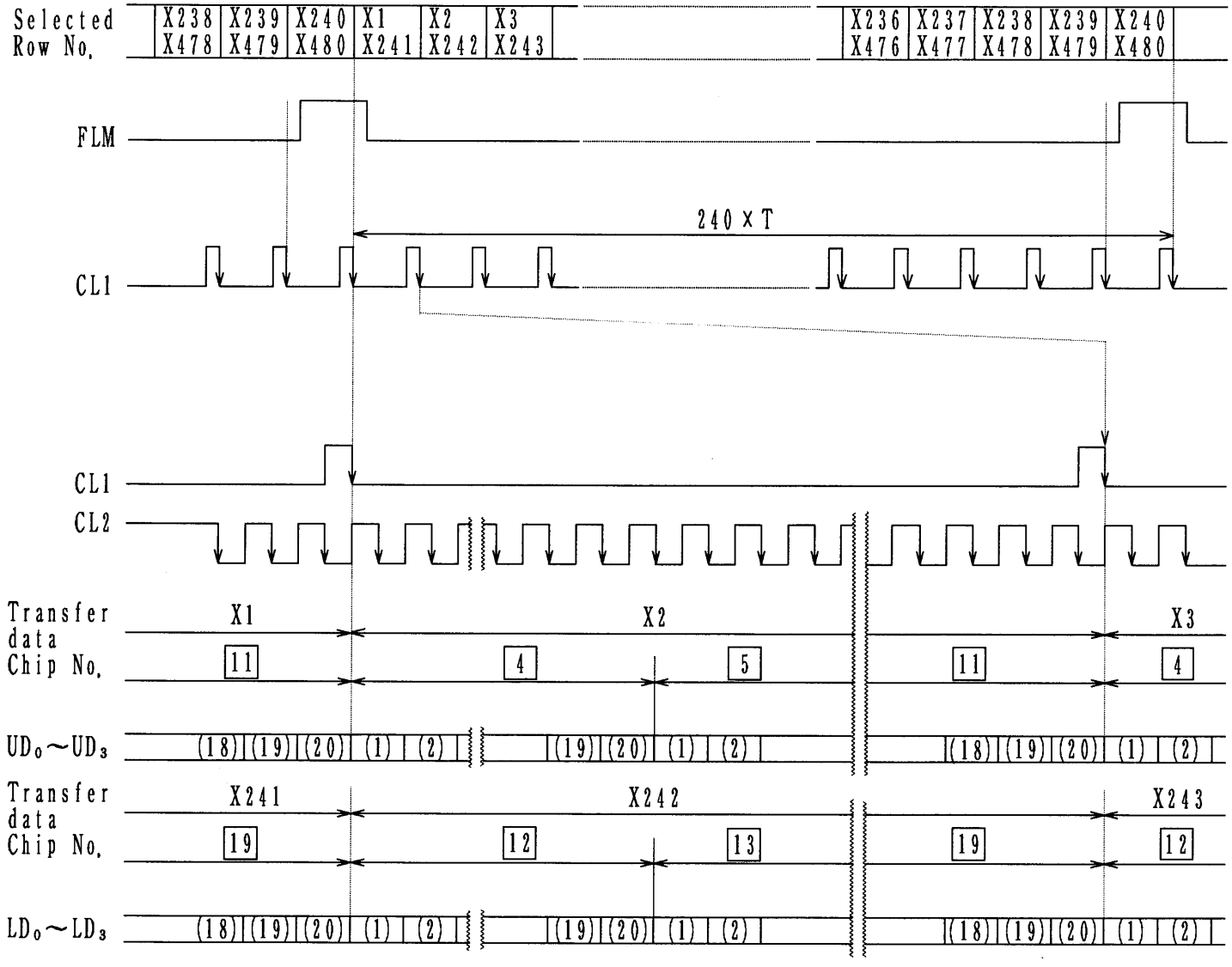
■ AC ELECTRICAL CHARACTERISTICS

V_{DD}=5.0V±10%, Ta=25℃

Item	Symbol	Min.	Typ.	Max.	Unit
Clock Cycle time	t_{CYC}	135	—	—	ns
CL2 High level width	t_{CWH2}	45	—	—	ns
CL2 Low level width	t_{CWL2}	45	—	—	ns
CL1 High level width	t_{CWH1}	45	—	—	ns
CL2 setup time	t_{SCL}	80	—	—	ns
CL2 hold time	t_{HCL}	80	—	—	ns
Clock rise/fall time	t_{ct}	—	—	50*	ns
Data setup time	t_{DS}	20	—	—	ns
Data hold time	t_{DH}	20	—	—	ns
FLM setup time	t_{FS}	100	—	—	ns
FLM hold time	t_{FH}	100	—	—	ns
Frame frequency	f_{FLM}	—	74	—	Hz

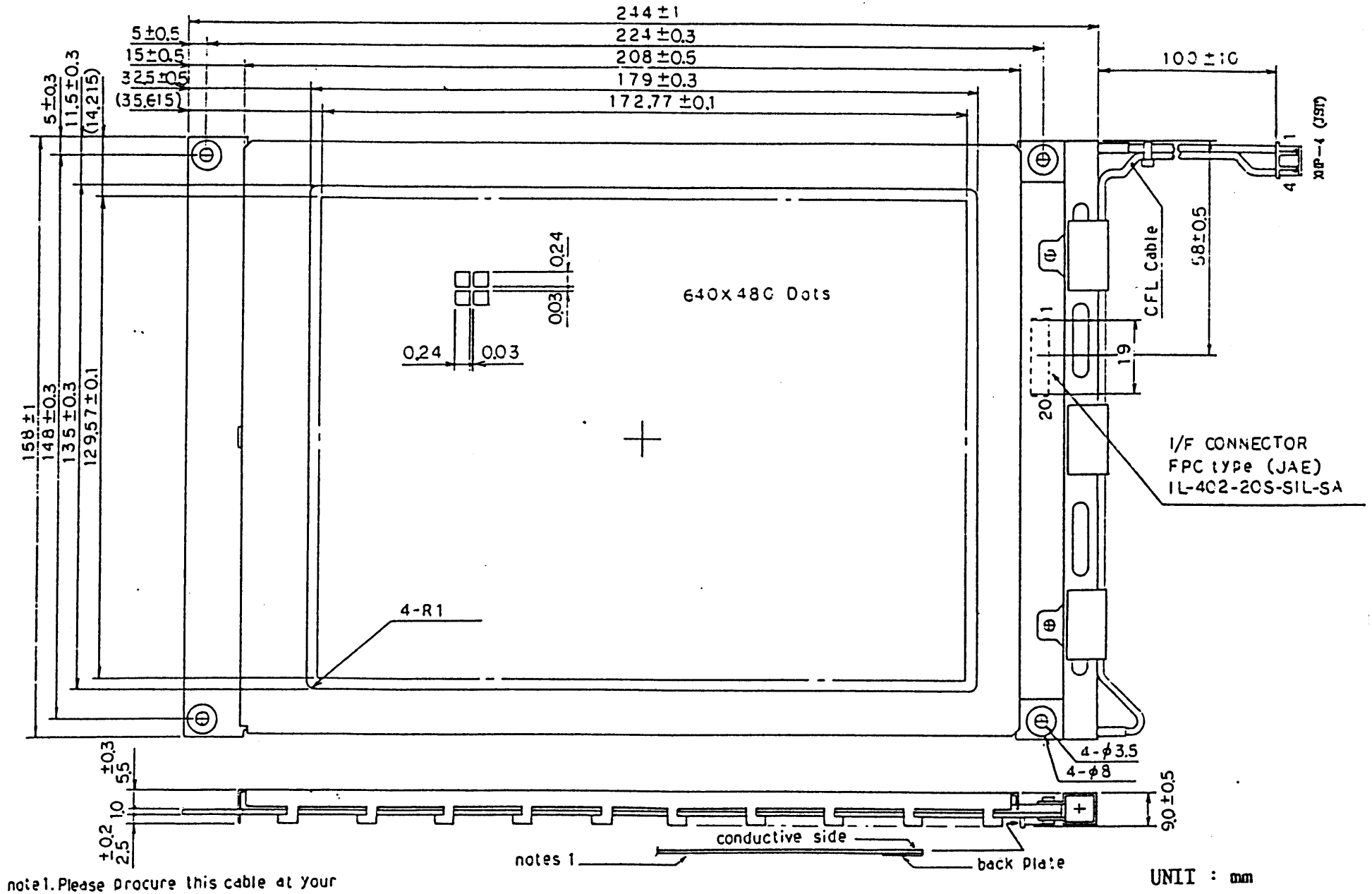
NOTE) *: $t_{ct} < (t_{CYC} - t_{CWH} - t_{CWL})/2$ and $t_{ct} \leqq 50$ns





NOTE : [4] ～ [19] Chip No. of column drivers

INTERFACE TIMING CHART



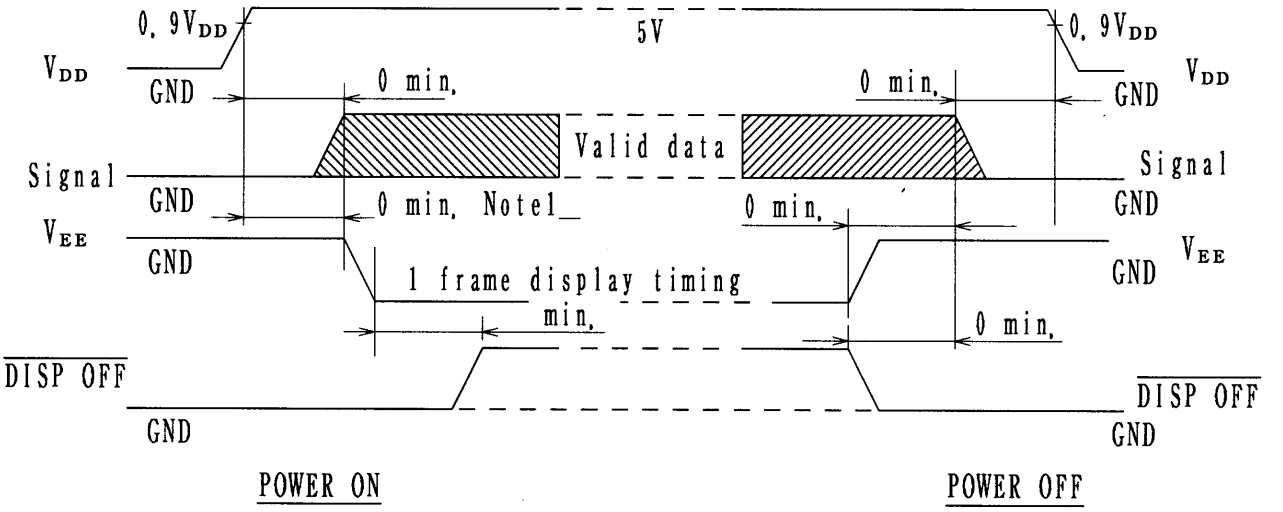
note1. Please procure this cable at your company.

UNIT : mm

PACKAGE DIMENSIONS

■ Power Supply Sequence

Do not apply DC voltage to the LCD panel because that induces the electro-chemical reaction and reduces its life time. Please follow the power supply ON/OFF sequence to prevent DC driving of LCD or latch-up of CMOS LSI, as shown below.



Note 1. In case of not using $\overline{\text{DISP OFF}}$ controling, it shoud be 1 frame display timing min.

Note 2. $\overline{\text{DISP OFF}}$ rise and fall time should be 100ns max.

Fig.2 Power ON/OFF sequence

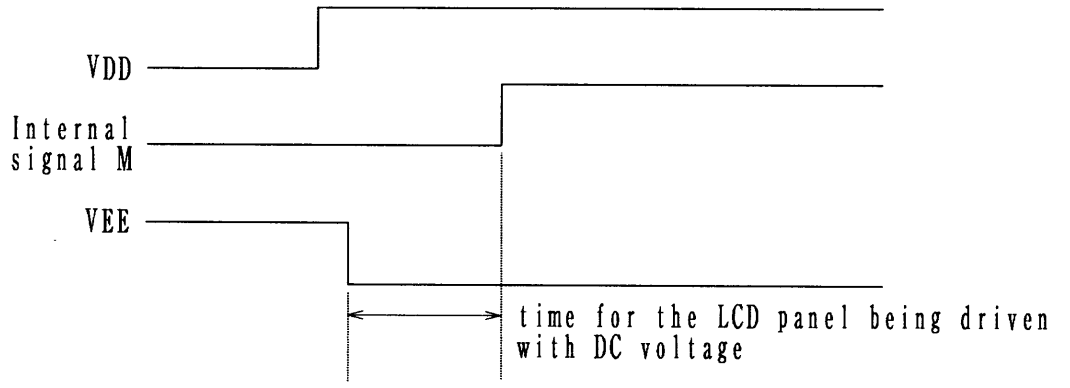


Fig.3 Time for the LCD panel being driven with DC voltage

At power on, if LC driving power supply voltage(V_{EE}) is applied before LCD panel AC driving signal(M) is input to LC module, the LCD panel is driven with DC voltage in the meantime. (Refer to Fig.3.)

■ Example to prevent LCD DC apply by using $\overline{\text{DISP OFF}}$

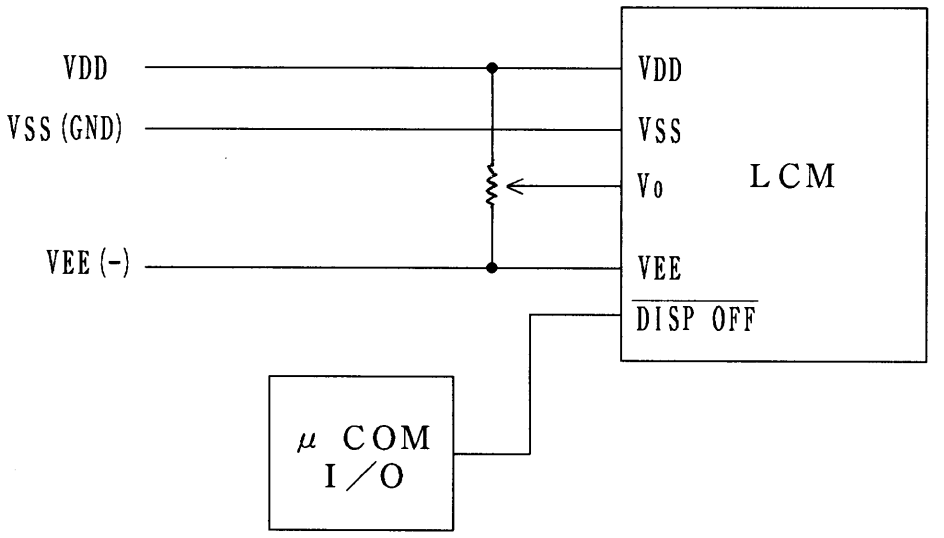


Fig. 4 Example to prevent LCD DC apply by using $\overline{\text{DISP OFF}}$

Connect I/O port of micro-computer in the main system with $\overline{\text{DISP OFF}}$ and control it. Until initialization of LC control LSI is finished after power ON, signal(M) isn't generated, so that DC voltage is applied to the LCD panel. (Refer to Fig.3.) During this time, switch I/O port($\overline{\text{DISP OFF}}$) to 'L' and force apply voltage to the LCD panel into 0V. After initialization of LC control LSI, switch I/O port($\overline{\text{DISP OFF}}$) to 'H', so that the LCD panel is returned to the normal driving voltage. (Refer to Fig.5.)

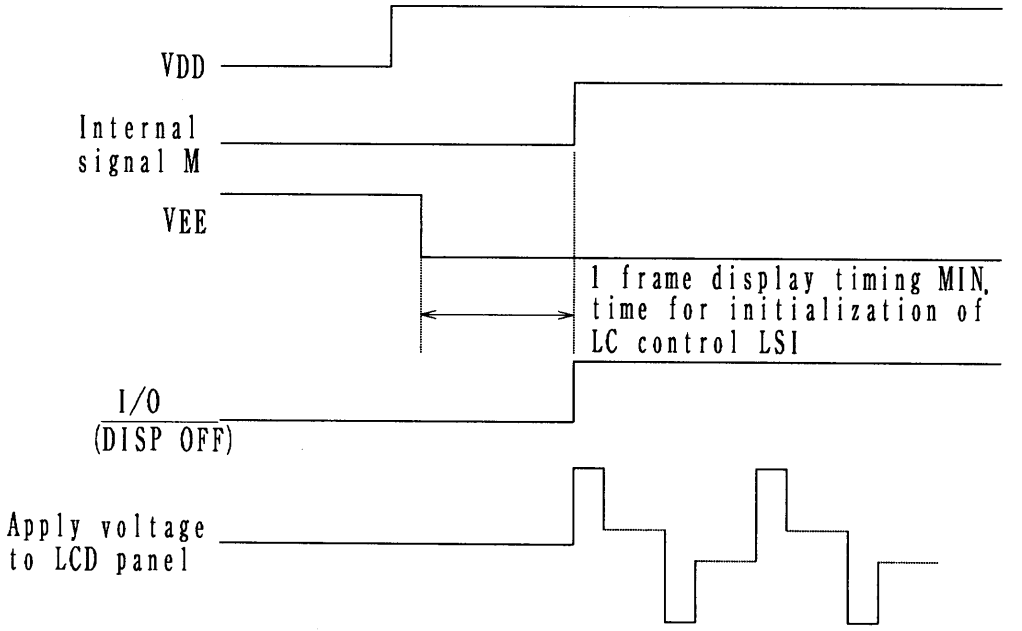


Fig. 5 Timing chart without DC apply to the LCD panel

■ PRECAUTION FOR USING

1. Handling

(1) Do not touch, press or rub the display panel with a hard, stiff tool or the like (e.g. tweezers) since the polarizers on the surface are easily scratched.

(2) Do not use organic solvents to clean the display panel as these solvents may adversely affect the polarizer. To clean the display panel dampen a bit of absorbent cotton with petroleum benzine and gently wipe the panel, or stick contaminations by using a scotch tape.

(3) Never touch terminals of electrodes of P.W.B. or LSI leads.

(4) Avoid using or storing the LCM under high temperature and high humidity conditions. At the storing, it is recommended that the device is packaged in a conductive polyethylene bag and placed under the condition where the temperature is relatively lower (10 - 30℃), and the direct sunlight or fluorescent lamp must be cut off.

(5) The casing for the module shall be designed taking account of the rise in temperature because of the heat from the backlight so that good quality of images can be provided on the screen.

(6) Do not suck in, drink or hands off the liquid crystal when it is flown out of the display element due to it's damage.
Wipe the liquid crystal off and wash up with soap or alcohol immediately when hands, clothes, ect. are stuck.

(7) Wash the liquid crystal with pure water for more than 15 minutes and have medical treatment by the doctor when it gets in the eyes.

(8) Follow to the ordinances or the regulations set by the self-governing body in disposing of CFLs.

2. Operation

(1) Never connect or disconnect the LCM from the main system while power is being supplied.

(2) Use the module within specified temperature; lower temperature causes the retardation of blinking speed of the display; higher temperature makes overall diaplay discolor. When the temperatute gets to be within normal limits, the display will operate normally.

(3) Adjust the operating voltage for driving (V_{DD} - Vo) sothatthedisplay shows optimumcontrast.

(4) When supplying an M signal from the external unit to a graphic display of LCM, 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 LCM.

3. Workmanship

(1) Never disassemble the module. After disassembling, in case that the module is assembled again and shows a disordered operation, the responsibility of the failure will not lie with vendor.

(2) Care should be taken as not to be charged static electricity, as the circuit of the module contains a CMOS LSI. The workman's body should be grounded with an earth-band. The material which prevents static electricity should be selected for a working clothes.

4. Precautions for handling of CFL cable

(1) Suspended capacity

Take enough precaution with wiring of the CFL cable when incorporating the module in PC unit, and suspended capacity caused by the external mold.

(2) High-frequency noise

Confirm with PC unit and, if necessary, measures should be taken.