SPECIFICATIONS

VGA 6448C-8.2

8,2 INCH, 640 x 480 DOTS

HIGH CONTRAST DUAL-SCAN LCD

1. MECHANICAL DATA

(1) Part name	VGA 6448C-8.2
(2) Module size	203 (W) mm * 142.5 (H) mm * 6.0 typ (D) mm
(3) Display size	167.02 (W) mm * 125.26 (H) mm Diagonal size 21cm (8.2")
(4) Dot pitch	0.087 (W) mm * 0.261 (H) mm
(5) Number of dots	640 * 3 (R,G,B) (W) * 480 (H) Dots
(6) Duty	1/240
(7) LCD	Film type (negative type) The upper polarizer is an anti-glare type.(Hardness : 3H)
(8) Viewing direction	12 O'clock
(9) Back light	Cold Cathode Fluorescent Lamp (CFL) * 1
(10) Weight	(230)g typ
(11) Power supply Voltage	3.3V only

2. ABSOLUTE MAXIMUM RATINGS

2.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	COMMENT
Power Supply for Logic	VDD-VSS	0	6.0	V	
Contrast Adjustment Voltage	VCON-VSS	0	VDD	V	
Input Voltage	Vi	-0.3	VDD+0.3	V	Note 1
Input Current	Ii	0	1	A	
Static Electricity	-	-	-	-	Note 2

Note 1 DISP OFF , FLM , CL1 , CL2 , UD0~UD7 , LD0~LD7.
Note 2 Make certains you are grounded when handling LCM.

4.1 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		COMMENT
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	0°C	50°C	-20°C	60°C	Note 2,3,7
Humidity	Note 1		Note 1		Without condensation
Vibration	-	2.45 m/s^2 (0.25G)	-	2.45 m/s^2 (1.5G) Note 5	Note 4 Time : 3min/sweep
Shock	-	147 m/s^2 (15G)	-	490 m/s^2 (50G) Note 5	XYZ direction Time : 18ms
Corrosive Gas	Not Acceptable		Not Acceptable		
Altitude	0~300m (10000 feet)				

Note 1 Ta<=40°C : 85%RH max.
Ta> 40°C : Absolute humidity must be lower.
than the humidity of 85%RH at 40°C.
Note 2 Ta at -20°C ------- <48h, at 60°C -------<168h
Note 3 Background color changes slightly depending on ambient temperature.
This phenomenon is reversible.
Note 4 10Hz~200Hz (Except resonance frequency)
Note 5 This should be operated normally after finish the test.
Note 6 When LCM is operated at 5°C, the life time of CFL will be reduced.
Need to make sure of value of IL and characteristics of inverter.
Also the response time at 5°C will be slower.
Note 7 There are possibility that color un-uniformity happened over 40°C operating.

3. ELECTRICAL CHARACTERISTICS

3.1 ELECTRICAL CHARACTERISTICS OF LCD VSS = 0V

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Power Supply Voltage	VDD	VDD-VSS=3.3V	3.315	3.30	3.465	V
Contrast Adjustment Voltage (Note 1)	VCON	-	0.8	-	2.8	V
Input Voltage for Logic Circuit (Note 2)	Vi	"H" level	0.8VDD	-	VDD	V
		"L" level	0	-	0.2VDD	
Power Supply Current (Note 4)	IDD	VDD-VSS=3.3V	-	30	46	mA
Input Leak Current	I con (Note 5)	Vcon=0.8~2.8V	-	-	(20)	μA
	I in (Note 2)	Nin=VDDorVSS	-	-	+/-1.0	
Contrast Adjustment Voltage (Note 6)	VCON	Ta= 5°C,ϕ=0°	0.8	-	-	V
		Ta=25°C,ϕ=0°	-	(1.8)	-	
		Ta=40°C,ϕ=0°	-	-	2.8	
Frame Frequency (Note 7)	fFLM	-	100	120	150	Hz

(Note 1) In proportion as the VCON voltage decrease the brightness will increase.
(Note 2) DISP OFF , FLM , CL1 , CL2 , UD0~UD7 , LD0~LD7.
(Note 3) fFLM=120Hz, Ta=25°C, Display pattern : Checker pattern.
(Note 4) Rush Current of Power ON : A(PK) * ms + A(PK) * ms
(Note 5) VCON
(Note 6) Recommended Contrast Adjustment Voltage fluctautes about =/-0.3V by each module. (only TYP values)
(Note 7) Need to make sure of flickering and rippling of display when setting the Frame Frequency in your set.
(Note 8) Absolute maximum ratings voltage of CFL cable for this madule is as follows.
VCFL side : 2kV
VSS side : 300V
This inverter design shall not exceed the rated voltage.

3.2 ELECTRICAL CHARACTERISTICS OF BACKLIGHT

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Lamp Voltage	VL	-	(500)	-	Vrms	Ta=25°C
Frequency	fL	-	(60)	-	kHz	
Lamp Current (1Lamp) Note 7	IL	(1.2) (Note 2)	(1.8)	(2.5) (Note 2)	mA	Ta=25°C
Starting discharge Voltage	VS (Note 2)	(1400)	-	-	Vrms	Ta=25°C

(Note 1) Please design your lamp driving circuit (inverter) according to the above. Specifications, missmatching of inverter will decrease lifetime of CCFL.

(Note 2) Starting discharge voltage is increased when LCM is operating at lower temperature.
Please check the characteristics of your inverter before appling to your set.

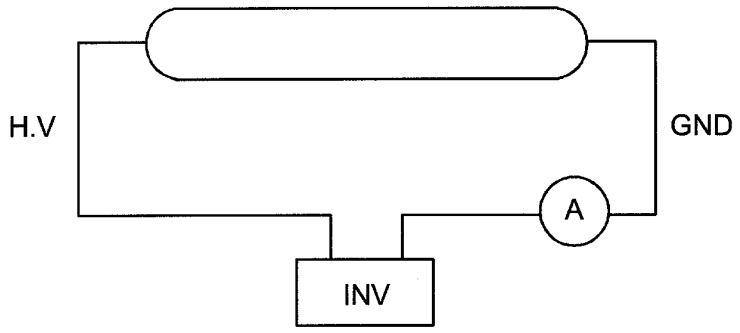
(Note 3) Average life time of CFL will be decreased when LCM is operating at lower temperature.

(Note 4) Under lower driving frequency of an inverter, a certain backlight system (CFL & CFL reflection sheet) may generate a sound noise. Before designing the inverter, please consider the driving frequency and the noise.

(Note 5) When ICFL is used over 5.0mA, it may cause contrast near CFL location, due to heat dispersion from CFL.

(Note 6) Under lower temperature, please check CFL characteristics on your inverter.

(Note 7)



4. OPTICAL CHARACTERISTICS

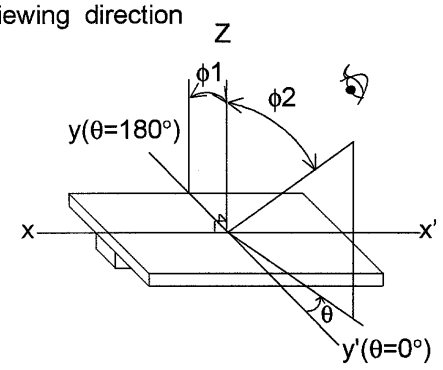
4.1 OPTICAL CHARACTERISTICS OF LCD

Ta=25°C(Backlight On)

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT.	NOTE
Viewing area		φ2-φ1	θ=0° , K>=2.0	-	(40)	-	deg	1),2)
Contrast ration		K	φ=0° , θ=0°	(25)	(50)	-	-	3),5),6)
Response time (rise)		tr	φ=0° , θ=0°	-	(190)	-	ms	4)
Response time (rise)		tf	φ=0° , θ=0°	-	(160)	-	ms	4)
Color tone (Primary color)	Red	x	φ=0° θ=0°	-	(0.54)	-	-	7)
		y		-	(0.33)	-	-	
	Green	x		-	(0.31)	-	-	
		y		-	(0.51)	-	-	
	Red	x		-	(0.17)	-	-	
		y		-	(0.17)	-	-	
	Green	x		-	(0.29)	-	-	
		y		-	(0.31)	-	-	

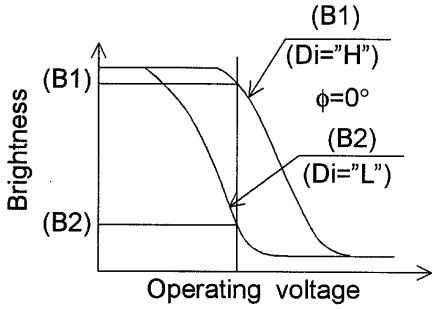
Note 1) ~ : See next page

Note 1.Definition of θ and ϕ
(Normal)
Viewing direction

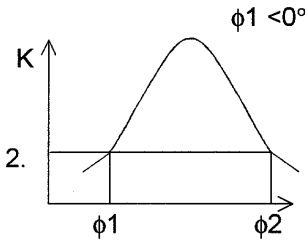


Note 3. Definition of contrast "K"

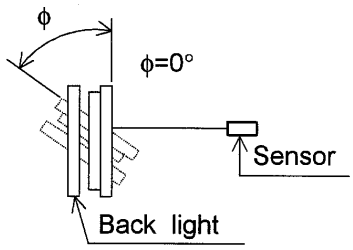
$$K=\frac{\text{Brightness on selected area (B1)}}{\text{Brightness on non-selected area (B2)}}$$



Note 2. Definition of viewing angle ϕ1 and ϕ2

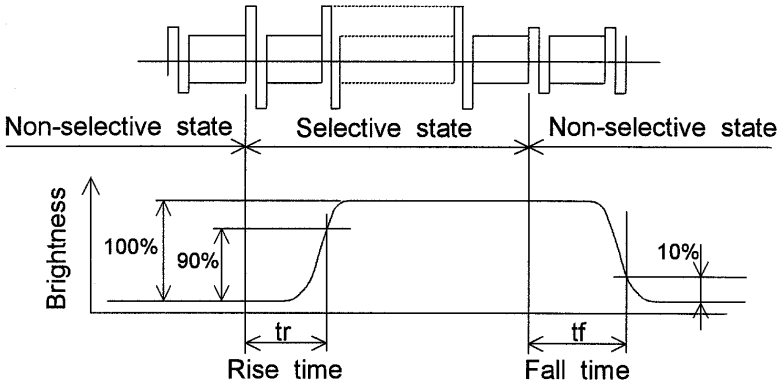


Contrast ratio K vs viewing angle ϕ



Senser : BM-7 or correspondence equipment

Note 4. Definition of optical response time



Note 5: DISTEC will not do 100% inspection for minimum value.
Minimum value is for reference.

Note 6: DISTEC will do sampling inspection for minimum value.

Note 7: The LCD driving voltage should be adjusted at the voltage where the contrast is obtained.

4.2 OPTICAL CHARACTERISTICS OF BACKLIGHT

ITEM	MIN	TYP	MAX	UNIT	NOTE
Brightness	-	120	-	Cd/m²	IL = 2,5mA
Rise time	-	5	-	Minute	IL = 2,5mA Brightness 80%
Brightness Uniformity	-	-	+/-30	%	Undermentioned Note1), 4)

Lifetime CCFL: typ. 16.000 hrs at IL 2,5mA (half-brightness time)

CFL : INITIAL Ta=25°C

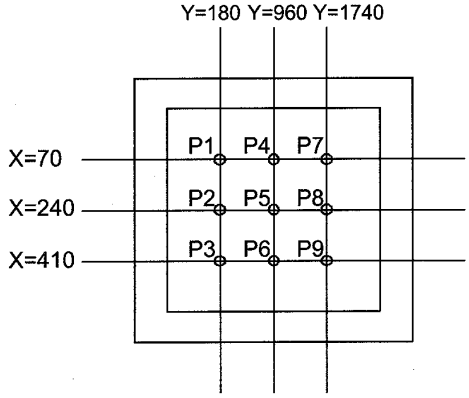
Display data should be all "ON"

The LCD driving voltage should be adjusted at the voltage where the peak Contrast is obtained, when set pattern is all "Q".

(Note 1) Measurement after 10 minutes from CFL operating.
Average value of 9 points (Note 3)

(Note 2) Brightness control : 100%

(Note 3) Measurement of the following 9 places on the display.



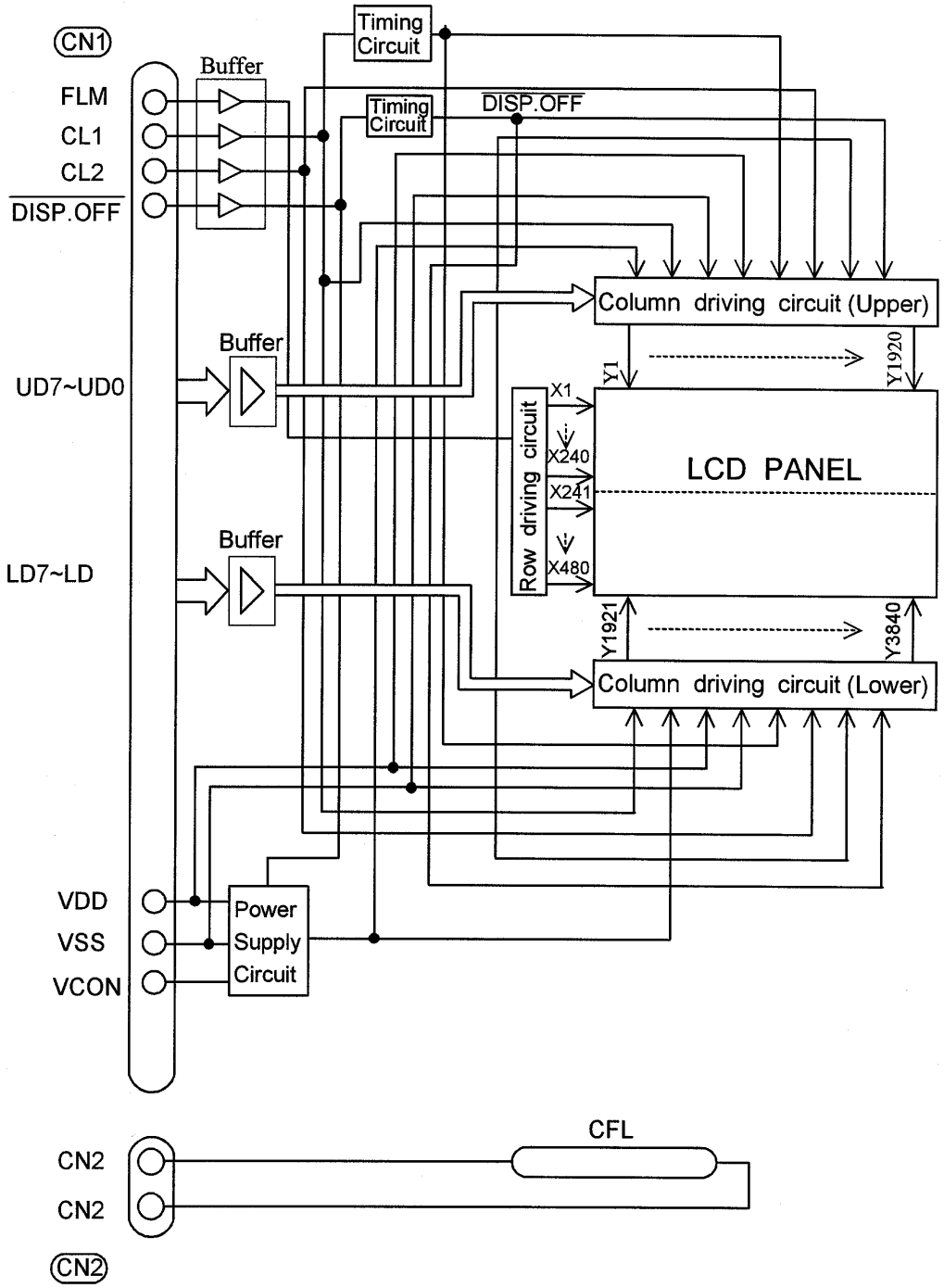
(Note 4) Definition of the brightness tolerance.

$$\left(\frac{\text{Max brightness or Min brightness} - \text{Average brightness}}{\text{Average brightness}}\right) * 100$$

Recommended Inverter: ZI 02 026

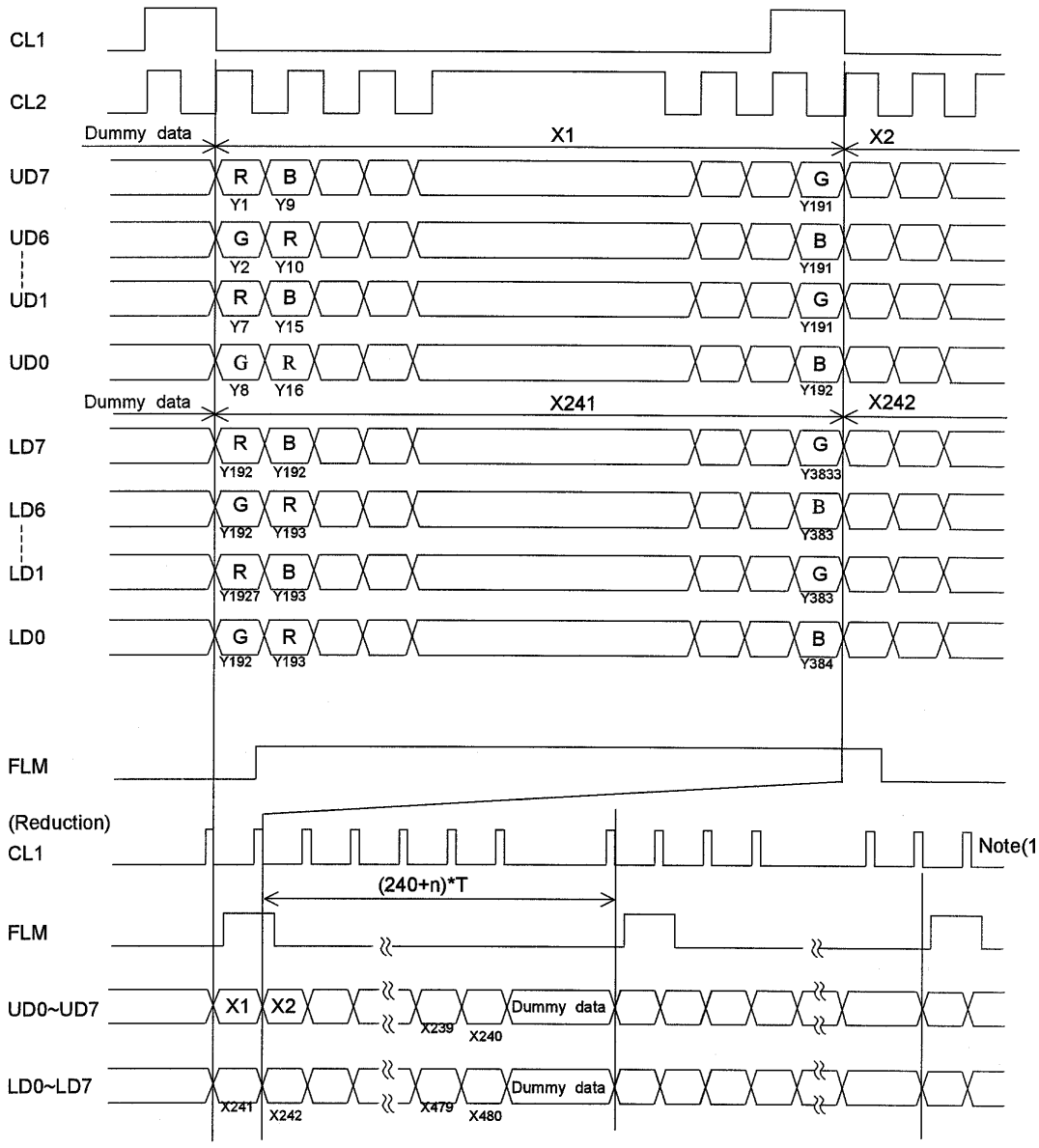
Lamp current has to be adjusted to above values.

5. BLOCK DIAGRAM



6. INTERFACE TIMING CHART

6.1 TIMING CHART

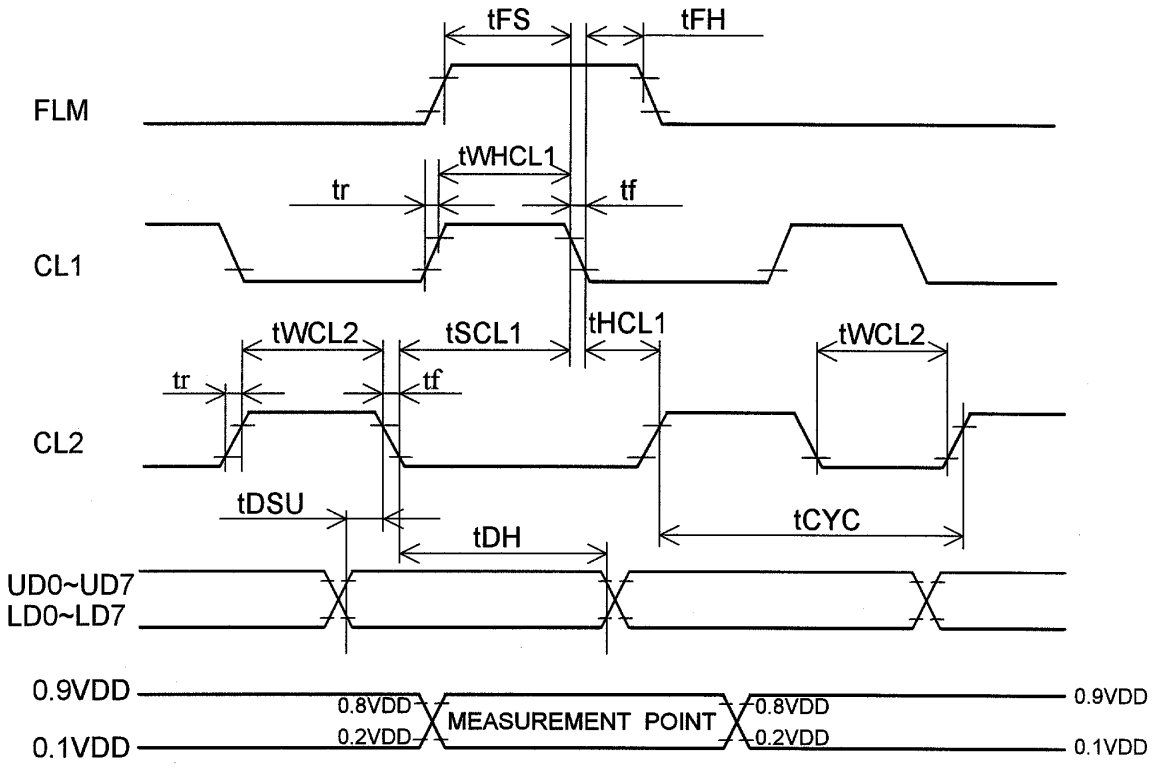


Note (1) : The interval of CL1 pulse must be same including the vertical blanking period.

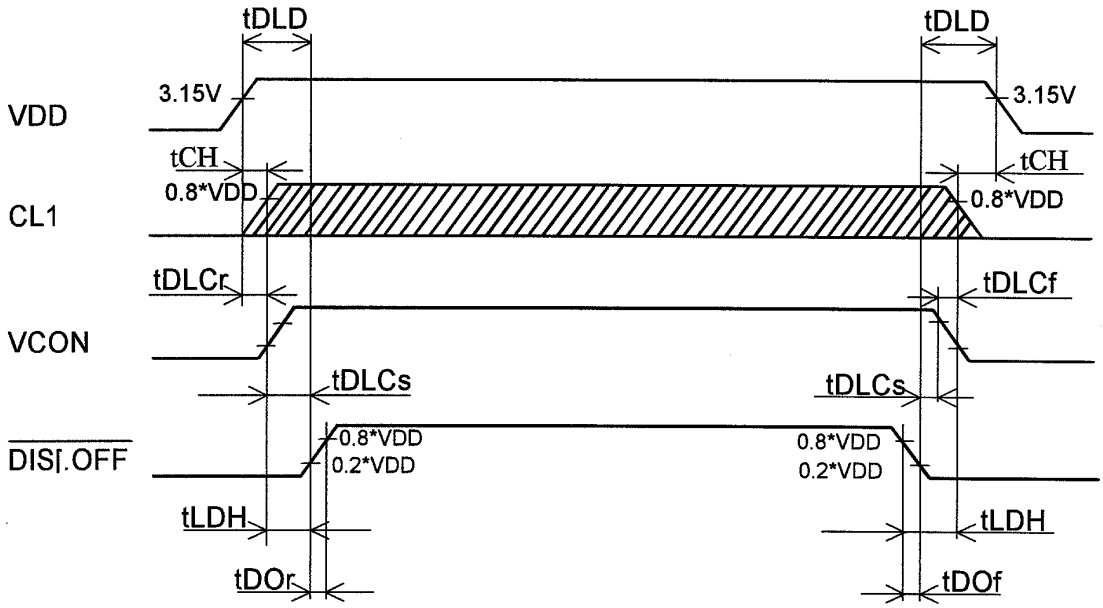
6.2 INTERFACE TIMING SPECIFICATION

(VDD=3.3+/-0.15V, VSS=0V, Vcon=0.8~2.8V, Ta=+5°C~+40°C)

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CL1 pulse width "H"	tWHCL1	65	-	-	ns
Clock cycle time	tCYC	40	-	-	ns
CL2 pulse width	tWCL2	15	-	-	ns
Clock set up time	tSCL1	20	-	-	ns
Clock hold time	tHCL1	50	-	-	ns
Clock rise fall time	tr,tf	-	-	30	ns
Data set time	tDSU	10	-	-	ns
Data hold time	tDH	10	-	-	ns
"FLM" set up time	tFS	100	-	-	ns
"FLM" hold time	tFH	50	-	-	ns



6.3 POWER ON/OFF SEQUENCE



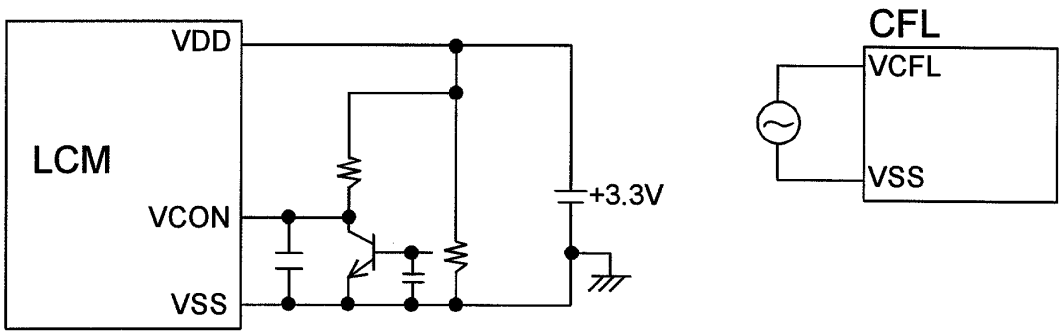
SYMBOL	MIN	MAX	UNIT	COMMENT
tDLD	200		ms	(Note 1)
tCH	0		ms	
tLDH	20		ms	
tDOr		100	ns	(Note 2)
tDOf		100	ns	
tDLCr	0		ms	
tDLCf	0		ms	
tDLCs	20		ms	

Note 1: Please keep the specified sequence because wrong sequence may cause permanet damage to the LCD panel.

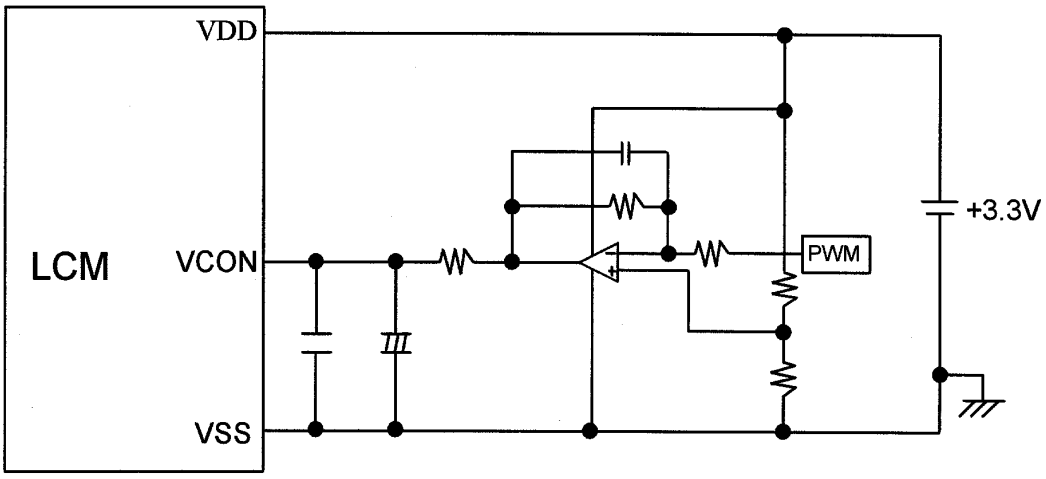
Note 2: DISTEC recommands you to use DISP.OFF function.
The display quality may deteriorate if you don´t use DISP.OFF function.

6.4 POWER SUPPLY FOR LCM

Example 1



Example 2



IC=3-terminal Voltage Regulator.

6.5 INPUT DATA ALLOCA

Data Signal		UD7	UD6	UD5	UD4	UD3	UD2	UD1	UD0	UD7	UD6	UD5	UD4	------	UD4	UD3	UD2	UD1	UD0
Y / X		1	2	3	4	5	6	7	8	9	10	11	12		1916	1917	1918	1919	1920
UPPERER PANEL	1	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	2	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	3	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	4	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	5	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		⋮	⋮	⋮	⋮	⋮
	238	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	239	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	240	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
LOWER PANEL	241	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	242	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	243	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	244	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	245	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		⋮	⋮	⋮	⋮	⋮
	478	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	479	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
	480	R	G	B	R	G	B	R	G	B	R	G	B		G	B	R	G	B
X / Y		1921	1921	1921	1921	1921	1921	1921	1921	1921	1921	1921	1921		3936	3937	3938	3939	3940
Data Signal		LD7	LD6	LD5	LD4	LD3	LD2	LD1	LD0	LD7	LD6	LD5	LD4		LD4	LD3	LD2	LD1	LD0

R : RED
G : DREEN
B : BLUE

6.6 INTERNAL PIN CONNECTION

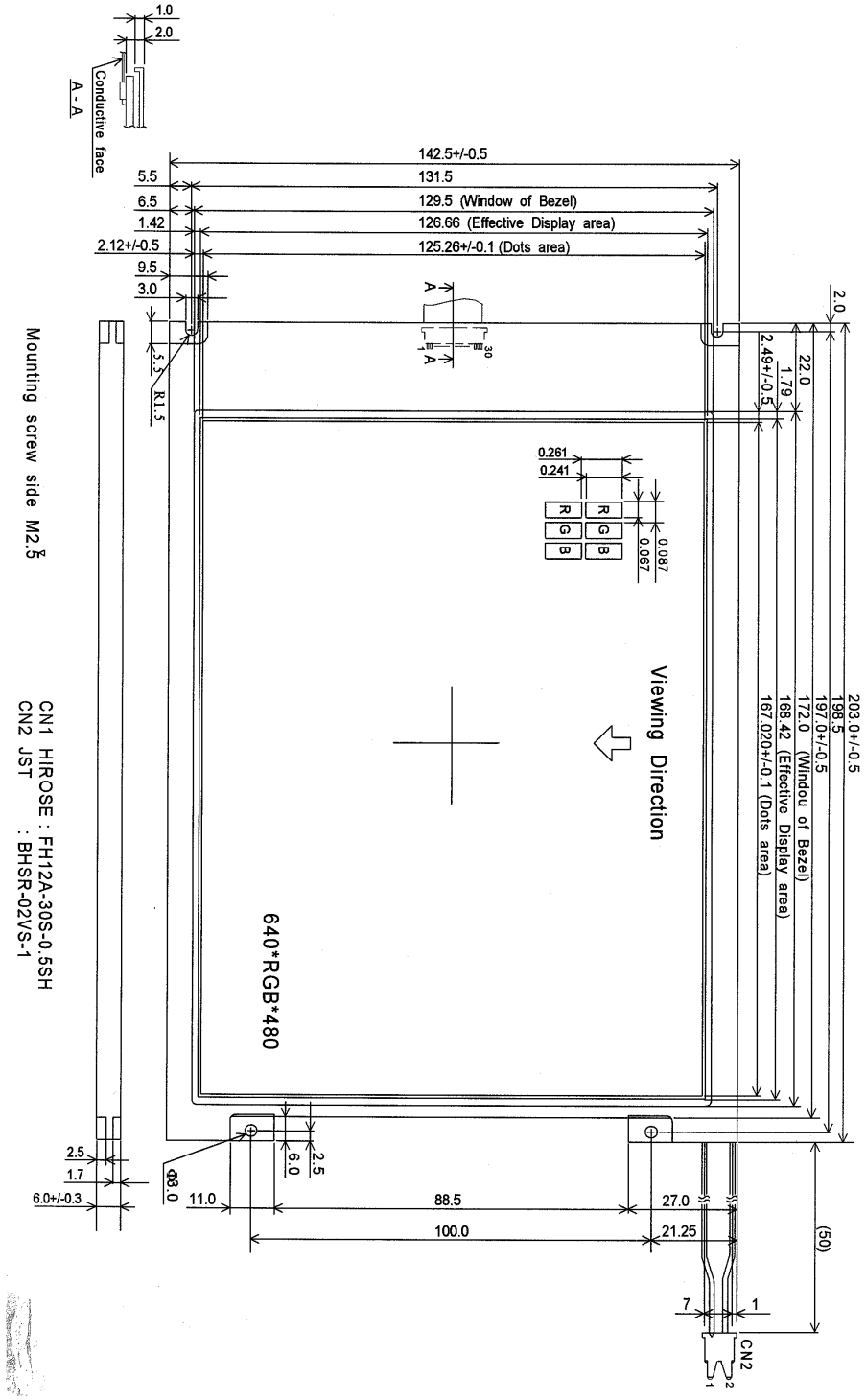
CN1 HIROSE FH12A-30S-0.5SH

PIN No.	SIGNAL	LEVEL	FUNCTION
1	LD0	H/L	Display Data (Lower Column)
2	LD1	H/L	Display Data (Lower Column)
3	LD2	H/L	Display Data (Lower Column)
4	LD3	H/L	Display Data (Lower Column)
5	VDD	-	GND
6	LD4	H/L	Display Data (Lower Column)
7	LD5	H/L	Display Data (Lower Column)
8	LD6	H/L	Display Data (Lower Column)
9	LD7	H/L	Display Data (Lower Column)
10	VSS	-	GND
11	FLM	H	First Line Marker
12	DISO.OFF	H/L	H : ON / L : OFF
13	CL1	H/L	Sata Latch
14	CL1	-	GND
15	VSS	H→L	Data Shift
16	CL2	-	GND
17	VSS	-	Power Supply for Logic
18	VDD	-	Power Supply for Logic
19	VCON	-	Contrast Adjust
20	VSS	-	GND
21	VSS	-	GND
22	UD0	H/L	Display Data (upper Column)
23	UD1	H/L	Display Data (upper Column)
24	UD2	H/L	Display Data (upper Column)
25	UD3	H/L	Display Data (upper Column)
26	VSS	-	GND
27	UD4	H/L	Display Data (upper Column)
28	UD5	H/L	Display Data (upper Column)
29	UD6	H/L	Display Data (upper Column)
30	UD7	H/L	Display Data (upper Column)

CN2 JST : BHSR-02V-1 (Suitable Connector : JST BHSMR-02VS)

PIN No.	SIGNAL	LEVEL	FUNCTION
1	VCFL	AC	Power Supply for CFL
2	VSS	-	GND for CFL

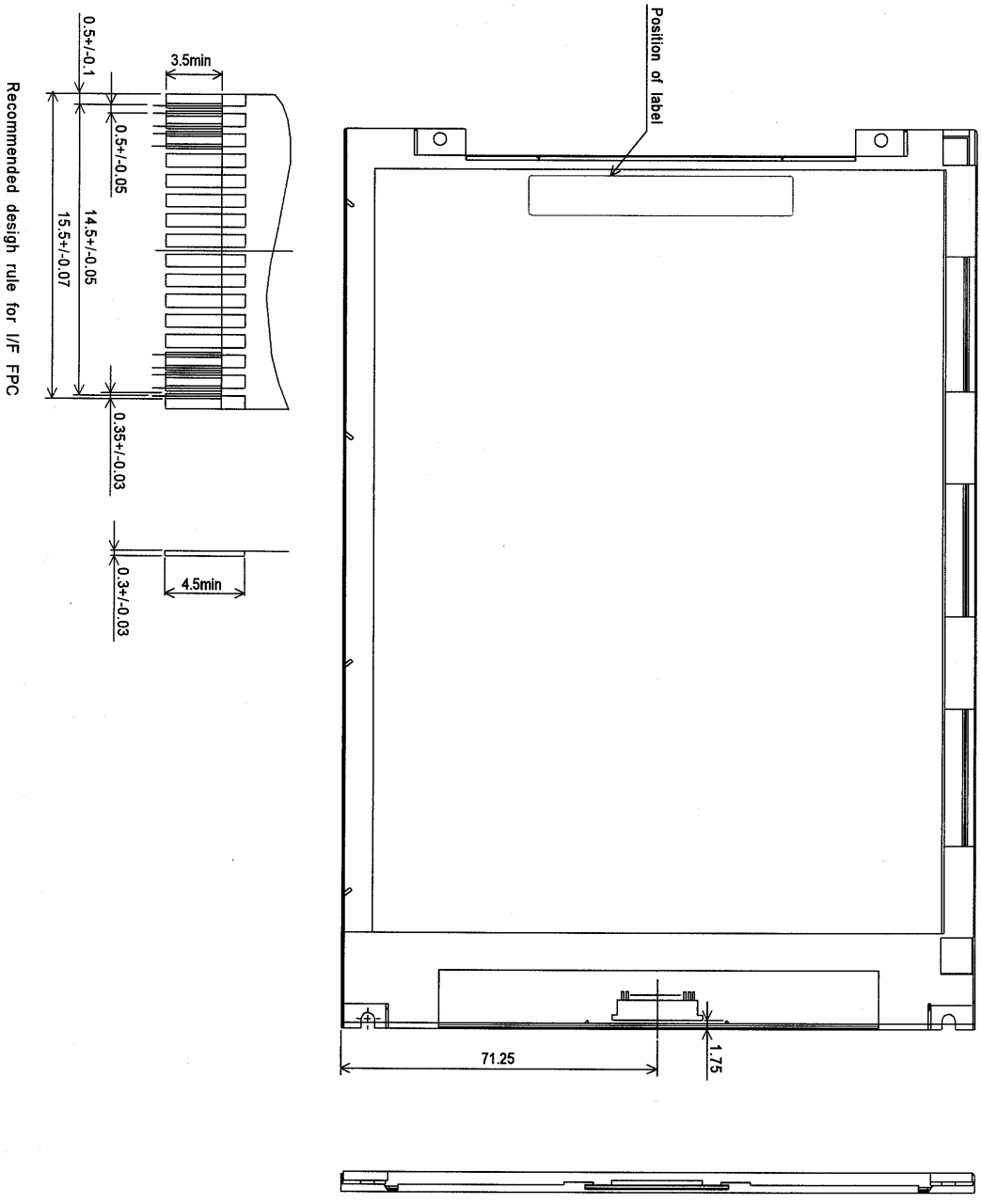
7.1 DIMENSIONAL OUTLINE



Note 1: Measurement when adding 9.8*1^{4}0 P (1.0kgf/cm^2) at the measuring point.

Units: mm
Scrale: NTS
Tolerance: +/- 0.3

7.2 BACKSIDE

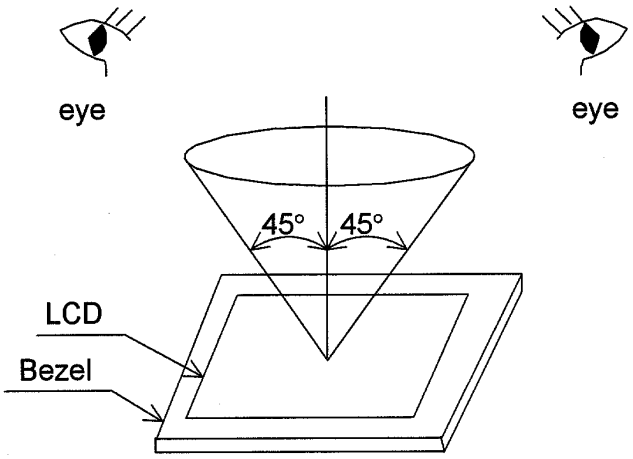

Recommended desigh rule for I/F FPC
0.5+/-0.1
3.5min
0.5+/-0.05
15.5+/-0.07
14.5+/-0.05
0.35+/-0.03
0.3+/-0.03
4.5min
Position of label
71.25
1.75

8. APPEARANCE STANDARD

8.1 APERANCE INSPECTION CONDITION

Visual inspection should be done under the following conditions:

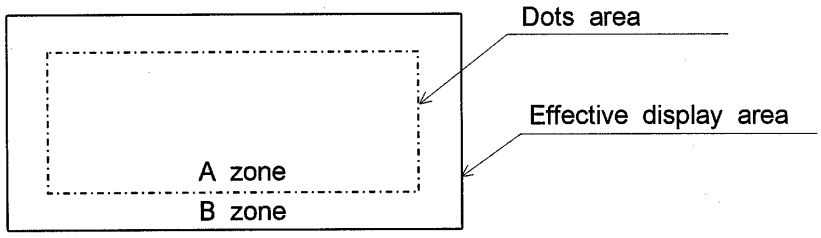
(1) The inspecion should be done in a dark room.
(2) The CFL should be lighted with the prescribed inverter.
(3) The distance between eyes of an inspector and the LCD Module is 25cm.
(4) The viewing zone is shown the figure.
Viewing anlge <=45°



8.2 DEFINITION OF ZONE

A zone : The effective display area specified at page 9-1/2 of this document.

B zone : Area between the window of bezel line and effective display area (A zone) line specified at page 9-1/2 of this document.



8.3 APPEARANCE SPECIFICATION

LCD APPEARANCE

If the problem to this section about this item, the responsible persons of both parties (customer and DISTEC) will discuss the matter in detail.

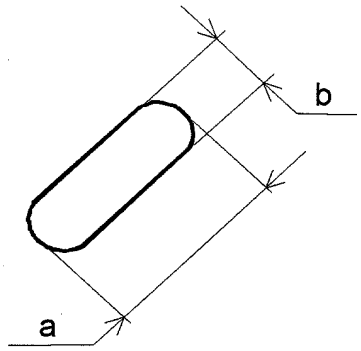
No.	ITEM	CRITERIA			APPLIED ZONE
LCD	Scratches	Set limit sample as required.			A
	Dent	Same as above			A
	Wrinkles in Poralizer	Same as above			A
	Bubbles	Average diameter D(mm)	Maximum acceptable number		A
		D<=0.2	ignored		
		0.2<D<=0.3	12		
		0.3<D<=0.5	3		
		0.5<D	none		
		Filamentous (Line shape)			A,B
	Stains, Foreign Materials Dark spot	Length L(mm)	Width W(mm)	Maximum acceptable number	
		L<=2.0	W<=0.03	ignored	
		L<=3.0	0.03<W<=0.05	6	
		L<=2.5	0.05<W<=0.1	1	
		Round (Dot shape)			A,B
		Average diameter D(mm)	Maximum acceptable number	Minimum space	
		D<0.2	Ignored	-	
		0.2<=D<=0.3	10	10 mm	
		0.3<=D<0.4	5	30 mm	
		0.4<=D	none	-	
		The total number	Filamentous Round = 10		
		Those wiped out easily are acceptable			A,B
	Color tone	Set limit samle as required.			A
	Color uniformity	Same as above			A

No.	ITEM	CRITERIA				APPLIED ZONE
L C D	Contrast irregularity (Spot)	Average diameter D(mm)	Contrast	Maximum acceptable number	Minimum space	A
		D<=0.25		ignored	-	
		0.25<D<=0.35		10	20 mm	
		0.35<D<0.5		4	20 mm	
		0.5 <D<0.7		3	50 mm	
		0.7 <D		none	-	
	Contrast irregularity (Line) (A pair of scratches)	Width W(mm)	Length L(mm)	Maximum acceptable number	Minimum space	A
		W<=0.25	L<=1.2	2	20 mm	
		W<=0.2	L<=1.5	3	20 mm	
		W=0.15	L<=2.0	3	20 mm	
		W<=0.1	L<=3.0	4	20 mm	
		The whole number		6		
	Rubbing Scratch	Set limit samle as required				

No.	ITEM	CRITERIA			APPLIED ZONE
C F L	Dark spots White spots Foreign materials (spot)	Average diameter D(mm)		Maximum acceptable number	A
		D<=0.4		ignored	
		0.4<D		none	
B A C K L I G H T	Foreign materials (Line)	Width W(mm)	Length L(mm)	Maximum acceptable number	A
		W<=0.2	L<=2.5	1	
			0.2<L	none	
		0.2<W	-	none	
	Scratches	Width W(mm)	Length L(mm)	Maximum acceptable number	A
		W<=0.1	-	ignored	
		0.1<W<=0.2	L<=11.0	1	
			11.0<L	none	
		0.2<W	-	none	

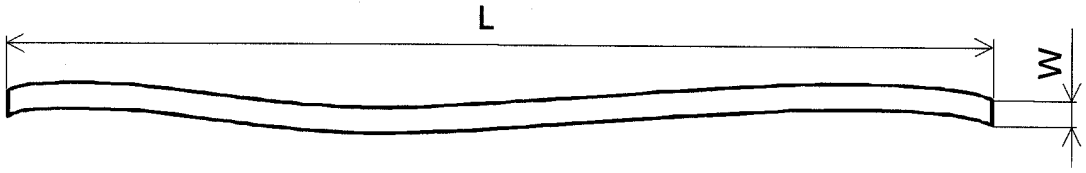
Note

(1) Definition of Average diameter (D)



$$b=\frac{a+b}{2}$$

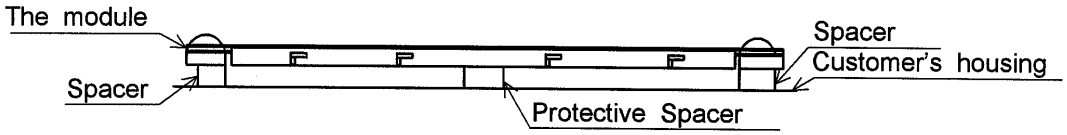
(2) Definition of Length (D) and Width (W)



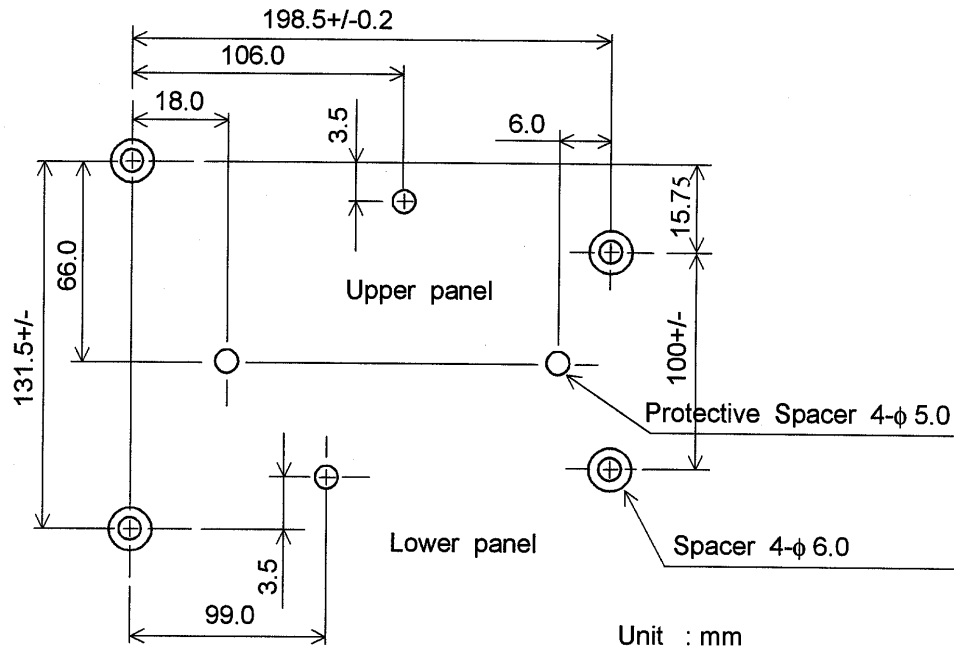
9. PRECAUTION IN DESIGN

MOUNTING PRECAUTION

Please mount the LCD Module using mounting holes arranged in 4 corners, and Please pay attention to the followings.



Example of mounting



Location of spacers

(1) To prevent the module cover from being pressed, the distance between the module and the fitting plate, which means the length of the spacers, should be shorter 1.0mm.
(2) We recommend you to use protective spacers in the order to protect the module from any kinds of shocks to you set.

PRECAUTIONS AGAINST ELECTROSTATIC DISCHARGE
As this module contains C-MOS LSIs, it is not strong against electrostatic discharge.
Make certain that the operator's body is connected to the through a list band etc And don't touch I/F pins directly.

POWER ON SEQUENCE

input signals should not be applied to LCD module before power supply voltage is Applied and reaches to specified voltage (3+/-0.15V).

HANDLING PRECAUTIONS

(1) Since the polarizer on the top, and aluminum plate on the bottom tend to be easily damaged, they should be with full care so as not to get them touched, pushed or rubbed by a piece of glass, tweezers and anything else which are a pencil lead 3H.

(2) As the adhesives used for adhering upper/lower polarizers and aluminum plate are made of organic substances which will be deteriorated by a chemical reaction with such chemicals as acetone, tuluene. ethanole and isopropylalcohol. The following solvents are recommended for use :

Normal hexane

Please contact us when it is necessary for you to use chamicals other than above.

(3) Lightly wipe to clean the dirty surface with absorbent cotter or soft material like chamois, soaked in the recommended chemicals without scrubbing it hardly.

To prevent the display surface from damage and keep the appearance in good State, it is sufficient, in general, to wipe it with absorbent cotton.

(4) Immediately wipe off saliva or water drop attached on display area because it may cause deformation or faded color.

(5) Fogy dew deposited on the surface may cause a damage, stain or dirt to the polarizer.

When you need to take out the LCD module from some place at low temperature For test, etc.

It is required to be warmed them up to the temperature higher than room Temperature before taking them out.

(6) Touching the display area or I/F pins with bare hands or contaminating them are prohibited, because the stain on the display area and poor insulation between terminals are often caused by being touched with bare hands. (Some cosmetics are detrimental to polarizers.)

(7) In general, the glass is fragile so that it, especially on it its periphery, tends to be cracked or chipped in handling. Please do not give the LCD module sharp shocks caused by falling etc.

(8) Maximum pressure to the surface must be less than $1.96*10^4$Pa($0.2kgf/cm^2$) And if the pressure area is less than $1cm^2$, maximum pressure must be less than 1.96N (0.2kgf).

(9) While handling LCM, please do not press DC/DC CONVERTER on the back. (location; see page 9-1/2, Note(2) by fingers.

(10) Since the metal width is narrow on these locations (see page 9-1/2, Note(3)), please be careful with handling.

OPERATING PRECAUTION

(1) Using a LCM module beyond its maximum ratings may result in its permanent destruction.
LCM module's should usually be used recommended operating conditions shown In chapter 5. Exceeding any of these conditions may adversely affect its reliability.

(2) Response time will be extremely delayed at lower temperature than the specified operating temperature range and the other hand LCD's shows dark blue color at higher temperature.
However those phenomena do not mean defects of the LCD module. Those Phenomenon will disappear in the specified operating temperature range.

(3) If the display area is pushed hard during operation, some display patterns will be abnormally display.

(4) A slight dew depositing on terminals may cause electrochemical reaction which leads to terminal open circuit. Please operate the LCD module the relative condition of 40°C 85%RH.

STORAGE

In case of storing LCD module for a long period of time (for instance, for years) For The purpose of replacement use, the following precautions are necessary.

(1) Store the LCD modules in a dark place; do not expose them to sunlight or ultraviolet rays.

(2) Keep the temperature between 10°C and 35°C at normal humidity.

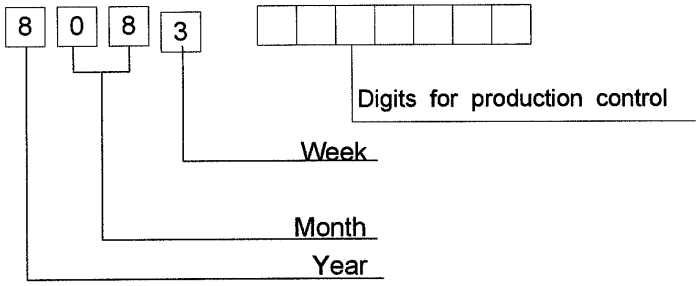
(3) Store the LCD modules in the container which is used for shipping from us.

SAFETY

The LCD modules include Cold Cathode Fulorescent Lamp (CFL). Contains a small Amount of mercury. Please follow local ordinances or regulations for disposal.

10. DESIGNATION OF LOT MARK

Lot mark is considered of 4 digits for production lot and 6 or 7 digits for production control.



YEAR	FIGURE IN LOT MARK
1998	8
1999	9
2000	0
2001	1

MONTH	FIGURE IN LOT MARK	MONTH	FIGURE IN LOT MARK
JAN.	01	JULY.	07
FEB.	02	AUG.	08
MAR.	03	SEPT.	09
APR.	04	OCT.	10
MAY.	05	NOV.	11
JUNE.	06	DEC.	12

WEEK (DAY IN CALENDER	FIGURE IN LOT MARK
1~7	1
8~14	2
15~21	3
22~28	4
29~31	5