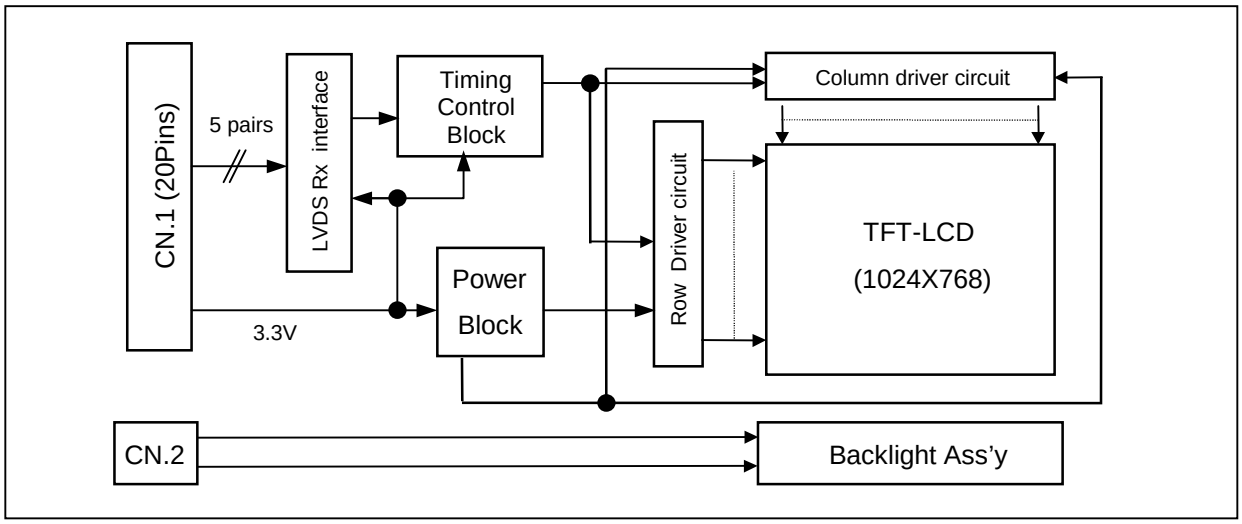
1. General Description

The LM150X06-A3 is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Lamp(CCFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally white mode. This TFT-LCD has a 15.0 inches diagonally measured active display area with XGA resolution(768 vertical by 1024 horizontal pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot, thus, presenting a palette of more than 16M colors.

The LM150X06-A3 has been designed to apply the LVDS(8-bit,1-port) interface method.

The LM150X06-A3 LCD is intended to support applications where high brightness, wide viewing angle, high color saturation, and high color depth are very important. In combination with the vertical arrangement of the sub-pixels, the LM150X06-A3 characteristics provide an excellent flat panel display for office automation products such as monitors.



[Figure 1] Block diagram

General Features

Active screen size	15.0 inches(304.128 x 228.096) diagonal
Outline Dimension	331.3(H) × 257.9(V) × 11.0(D) mm (Typ.)
Pixel Pitch	0.297 mm x 0.297mm
Pixel format	1024 Horiz. by 768 Vert. Pixels RGB stripes arrangement
Color depth	16M colors (6-bit with FRC)
Luminance, white	250 cd/m^2(Typ.)
Power Consumption	9.1254 Watt(Typ.)
Weight	930 g (Typ.), 1000 g (Max.)
Display operating mode	Transmissive mode, normally white
Surface treatments	Hard coating(3H) Anti-glare treatment of the front polarizer

2. Electrical Specifications

The LM150X06-A3 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. Another which powers the CCFL, is typically generated by an inverter. The inverter is an external unit to the LCD.

Table 2. Electrical characteristics

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
MODULE :						
Signal Input Voltage	V_I	3.0	3.3	3.6	V	
Power Supply Input Voltage	V_{CC}	3.15	3.3	3.45	V	
Permissive power input ripple	V_{RF}	-	-	0.1	V_{PP}	
Power Supply Input Current	I_{CC}	-	0.438	0.638	A	1
Power Consumption	P_{CC}	-	1.4454	2.2968	Watts	
Rush Current	I_{RUSH}		1.0	2.0	A	2
LAMP :						
Operating Voltage	V_{BL}	460	480	590	V_{RMS}	3
Operating Current	I_{BL}	3.0	8.0	9.0	mA	
Established Starting Voltage	V_{BS}					4
at 25 °C		-	-	850	V_{RMS}	
at 0 °C		-	-	1100	V_{RMS}	
Operating Frequency	f_{BL}	45	60	80	kHz	5
Discharge Stabilization Time	T_S			3	Minutes	6
Power Consumption	P_{BL}	-	7.68	8.44	Watts	7
Life Time		40,000	-	-	Hrs	8

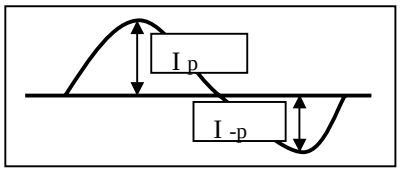
Note. The design of the inverter must have specifications for the lamp in LCD Assembly.
The performance of the Lamp in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC Inverter. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter. When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter(no lighting,flicker,etc) never occurs.When you confirm it,the LCD Assembly should be operated in the same condition as installed in your instrument.

Note. Do not attach a conducting tape to lamp connecting wire.. If the lamp wire attach to conducting tape, TFT-LCD Module have a low luminance and the inverter has abnormal action because leakage current occurs between lamp wire and conducting tape.

1. The specified current and power consumption are under the V_{CC}=3.3V, 25°C, f_V(frame frequency) =60Hz condition whereas mosaic(black & white) pattern shown in the [Figure 3] is displayed.
2. The duration of rush current is about 20ms.
3. Operating voltage is measured under 25℃.The variance of the voltage is ±10%.
4. The voltage above V_{BS} should be applied to the lamps for more than 1 second for start-up. Otherwise,the lamps may not be turned on.

5. The output of the inverter must have symmetrical(negative and positive) voltage waveform and symmetrical current waveform.(Unsymmetrical ratio is less than 10%) Please do not use the inverter which has unsymmetrical voltage and unsymmetrical current and spike wave.
   Lamp frequency may produce interference with horizontal synchronous frequency and as a result this may cause beat on the display.Therefore lamp frequency shall be as away as possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.
6. Let's define the brightness of the lamp after being lighted for 5 minutes as 100%.
   T_s is the time required for the brightness of the center of the lamp to be not less than 95%.
   The used lamp current is the lamp typical current.
7. The lamp power consumption shown above does not include loss of external inverter under 25℃.
   The used lamp current is the lamp typical current.
8. The life time is determined as the time at which brightness of lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25 ±2℃.

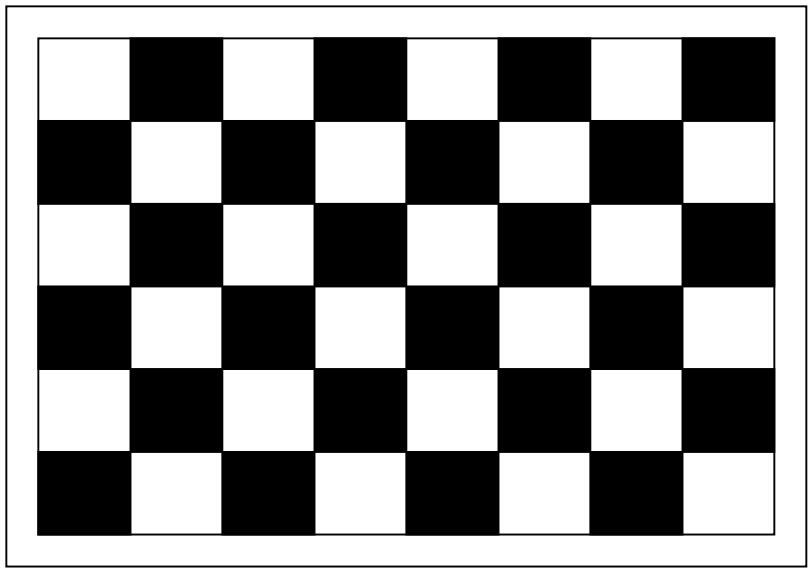
9. Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp.
   It shall help increase the lamp lifetime and reduce its leakage current.
   a. The unbalance rate of the inverter waveform should be 10% below;
   b. The distortion rate of the waveform should be within √2 ±10%;
   c. The ideal sine wave form shall be symmetric in positive and negative polarities.



*** Asymmetry rate = $| I_p - I_{-p} | / I_{rms}$ * 100%**

*** Distortion rate = I_p (or I_{-p}) / I_{rms}**

10. Inverter open voltage must be more than lamp starting voltage.



[Figure 3] Mosaic pattern for power consumption measurement

3. Interface Connections

This LCM has three interface connections, a 20-pin connector is used for the module electronics and two three pin connectors are used for the integral back light system.
The interface pin configuration for the connector is shown in the table below.
LCD LVDS Connector : DF14H-20P-1.25H(Hirose) or IN-20-OA 125(UJU)
Mating Connector : DF14-20S-1.25C(Hirose)

Table 3. Module connector pin's configuration

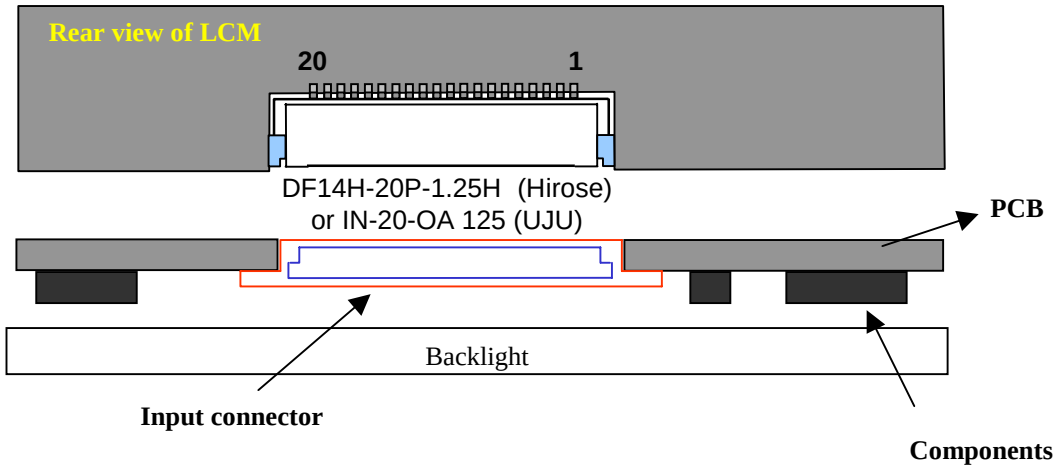
Pin	Symbol	Description	Notes
1	Vcc	Power Supply +3.3V	**Interface chips** LCD : Single 8-bit Input LVDS(NS) One Chip System : THC63LVDM83R(Thine) or compatible transmitters *The signal pin's assignment of transmitter is shown in the Table 4.
2	Vcc	Power Supply +3.3V	
3	GND	GND	
4	GND	GND	
5	Rx0-	LVDS signal(-)	
6	Rx0+	LVDS signal(+)	
7	GND	GND	
8	Rx1-	LVDS signal(-)	
9	Rx1+	LVDS signal(+)	
10	GND	GND	
11	Rx2-	LVDS signal(-)	
12	Rx2+	LVDS signal(+)	
13	GND	GND	
14	RxC-	LVDS signal(-)	
15	RxC+	LVDS signal(+)	
16	GND	GND	
17	Rx3-	LVDS signal(-)	
18	Rx3+	LVDS signal(+)	
19	GND	GND	
20	NC	No Connection	

Note 1. All GND(ground) pins should be connected together and to Vss which should also be connected to the LCD's metal frame.
2. All V_{CC}(power input) pins should be connected together.

Table 4. Required signal assignment for FlatLink's transmitter

Pin #	Pin Name	Require Signals	IN/OUT	Pin #	Pin Name	Require Signals	IN/OUT
1	VCC	Vcc		56	TXIN4	R4	I
2	TXIN5	R7(MSB)	I	55	TXIN3	R3	I
3	TXIN6	R5	I	54	TXIN2	R2	I
4	TXIN7	G0(LSB)	I	53	GND	GND	
5	GND	GND		52	TXIN1	R1	I
6	TXIN8	G1	I	51	TXIN0	R0(LSB)	I
7	TXIN9	G2	I	50	TXIN27	R6	I
8	TXIN10	G6	I	49	LVDSGND	LVDSGND	
9	VCC	Vcc		48	TXOUT0-	TX0-	O
10	TXIN11	G7(MSB)	I	47	TXOUT0+	TX0+	O
11	TXIN12	G3	I	46	TXOUT1-	TX1-	O
12	TXIN13	G4	I	45	TXOUT1+	TX1+	O
13	GND	GND		44	LVDSVCC	LVDSVCC	
14	TXIN14	G5	I	43	LVDSGND	LVDSGND	
15	TXIN15	B0(LSB)	I	42	TXOUT2-	TX2-	O
16	TXIN16	B6	I	41	TXOUT2+	TX2+	O
17	R_FB	R_FB	I	40	TXCOUT-	TXC-	O
18	TXIN17	B7(MSB)	I	39	TXCOUT+	TXC+	O
19	TXIN18	B1	I	38	TXOUT3-	TX3-	O
20	TXIN19	B2	I	37	TXOUT3+	TX3+	O
21	GND	GND		36	LVDSGND	LVDSGND	
22	TXIN20	B3	I	35	PLLGND	PLLGND	
23	TXIN21	B4	I	34	PLLVCC	PLLVCC	
24	TXIN22	B5	I	33	PLLGND	PLLGND	
25	TXIN23	RES	I	32	PD	PD	I
26	VCC	Vcc		31	TXCIN	DCLK	I
27	TXIN24	Hsync.	I	30	TXIN26	DATA ENABLE	I
28	TXIN25	Vsync.	I	29	GND	GND	

Notes 1. Refer to LVDS transmitter data sheet for detail descriptions.
2. 7 means MSB and 0 means LSB at R,G,B pixel data



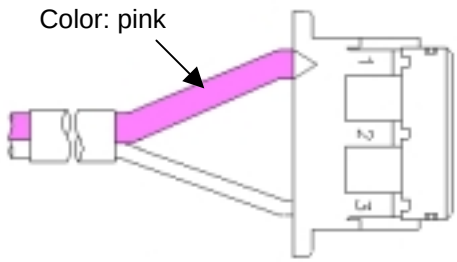
[Figure 4] Connector diagram

The backlight interface connector is a model BHR-03VS-1, manufactured by JST. The mating connector part number is SM02(8.0)B-BHS-1-TB or equivalent.
The pin configuration for the connector is shown in the table 5.

Table 5. Backlight connector pin's configuration

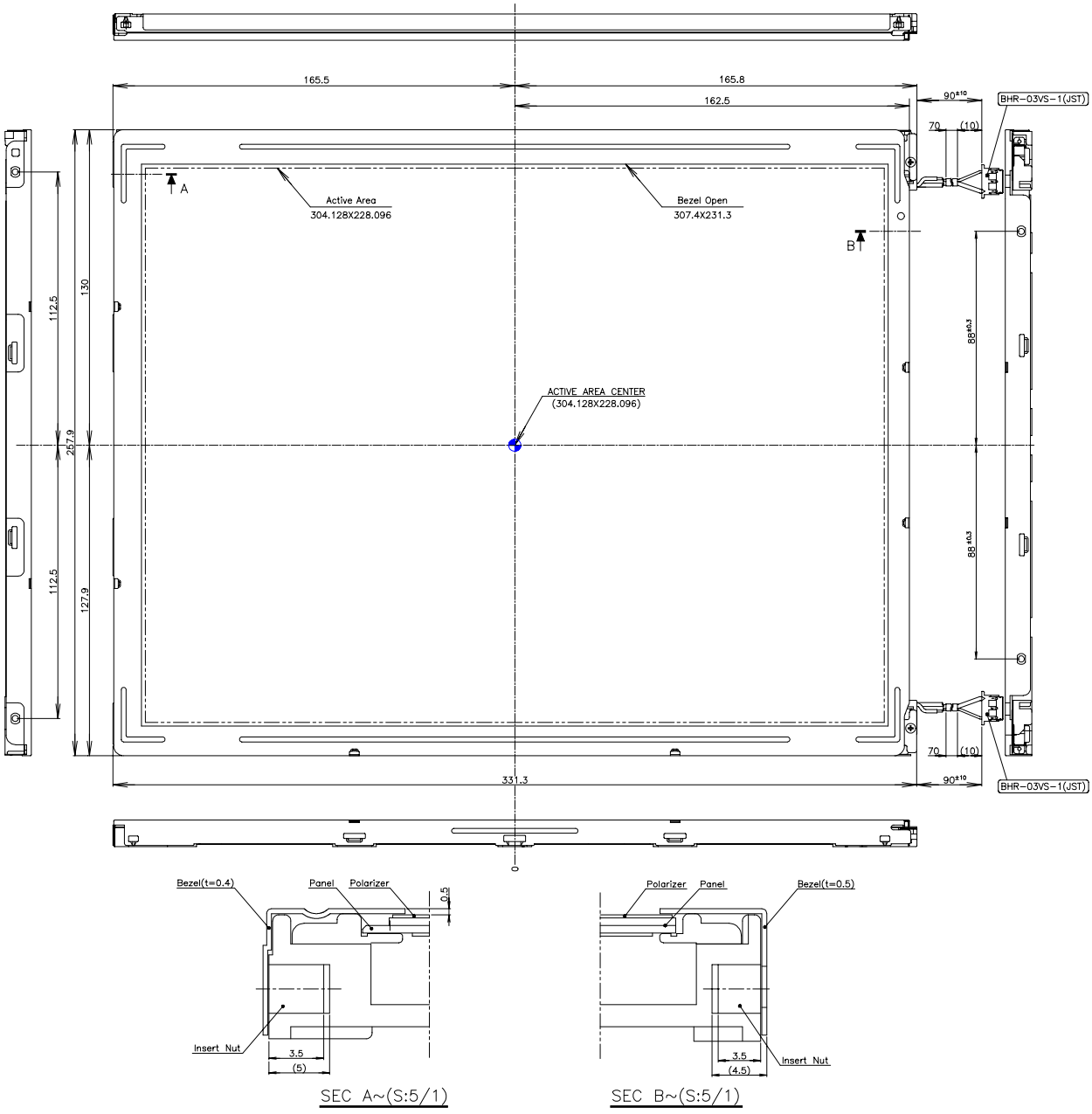
Pin	Symbol	Description	Notes
1	HV	Power supply for lamp (High voltage side)	1
2	NC	No Connect	
3	LV	Power supply for lamp (Low voltage side)	

Notes : 1. The high voltage side terminal is colored pink.

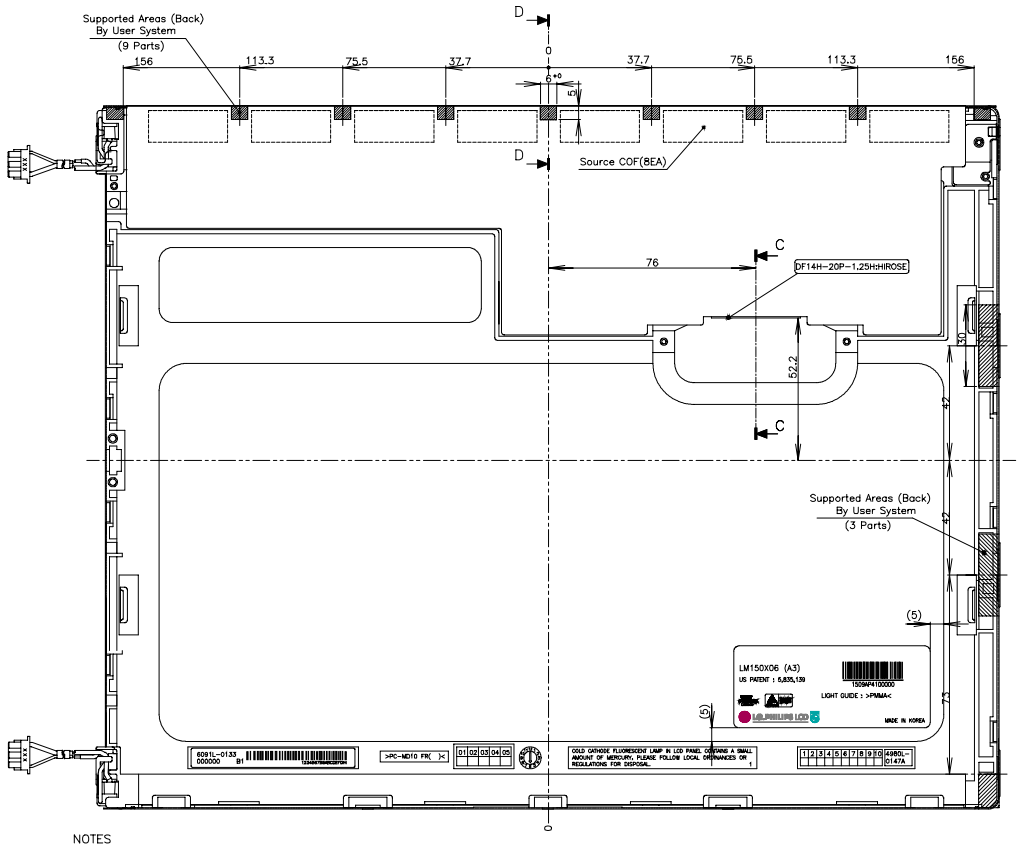


[Figure 5] Backlight connector view

[Figure 13] LM150X06-A3 Front View

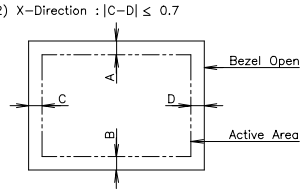


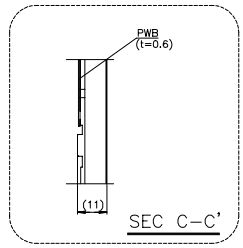
[Figure 14] LM150X06-A3 Rear View

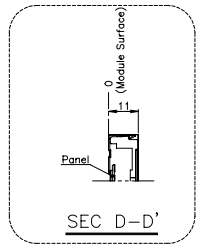


NOTES

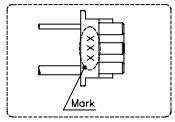
1. Unspecified tolerances to be ±0.5
2. Backlight wires and contraction tubes are excluded from outline dimensions.
3. Tilt and partial disposition tolerance of display area as following.
   (1) Y-Direction : |A−B| ≤ 0.7
   (2) X-Direction : |C−D| ≤ 0.7







5. Lamp(CCFL) Lot No. is marked at backlight connector.



6. Do not wind conductive tape around the backlight wires.

4. Precautions

The LCD Products listed on this documents are not suitable for use of Military, Industry, Medical etc. System
If customers intend to use these LCD products for above application, Please contact sales people In advance.