

# DATA DISPLAY AG

## LM151X3-A2 15.1" XGA TFT LCD

### PRELIMINARY SPECIFICATION

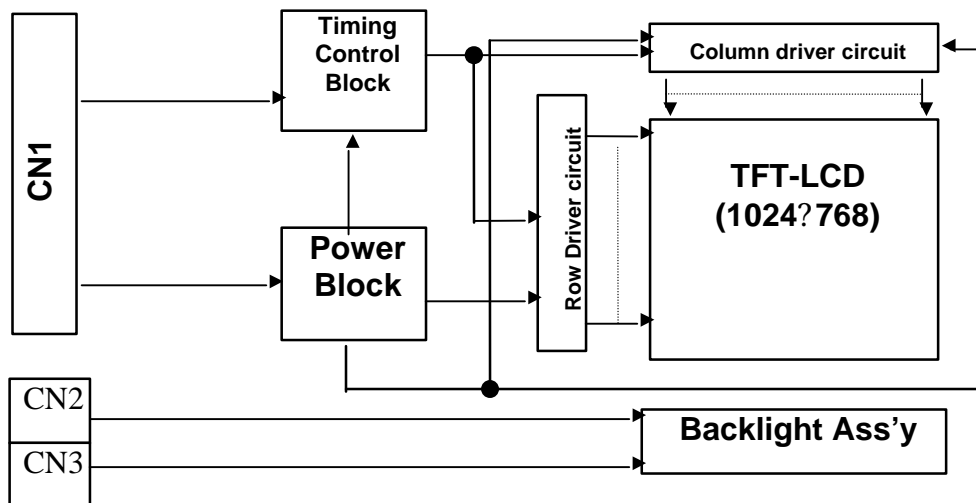
The information given in this document is carefully checked and believed to be reliable. Data Display reserves the right to make changes in product or specification at any time and without further notice. Data Display products are not intended for use in systems in which failures of product could result in personal injury. All mentioned trademarks are registered trademarks of their owner.

LG.Philips LCD: Rev. 0.1, Nov. 19, 1999



**1. GENERAL DESCRIPTION**

The LM151X3-A2 is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Lamp(CCFL) back light 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 15.1 inch 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 16,777,216 colors. The LM151X3-A2 has been designed to apply the TTL interface method. The LM151X3 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 LM151X3 characteristics provide an excellent flat panel display for office automation products such as monitors, Kiosk-Terminals or Point-of-Information terminals.**



**General Features**

Active screen size	15.1 inches(307.2 x 230.4mm) diagonal
Outline dimensions	352.0(H) × 263.5(V) × 16.0(D) mm (typ) without user connector
Pixel pitch	0.300 mm × 0.300 mm
Pixel format	1024 horiz. By 768 vert. pixels RGB stripe arrangement
Color depth	8-bit, 16,777,216 colors
Luminance, White	250 cd/m <sup>2</sup> (typ)
Power Consumption	2.1 Watts Logic / 9.7 Watts CCFL (typ. with 64 Gray pattern)
Weight	1500g (typ)
Display operating mode	transmissive mode, normally white
Surface treatments	hard coating(3H), anti-glare treatment of the front polarizer



## 2. ABSOLUTE MAXIMUM RATINGS

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

**Table 1: ABSOLUTE MAXIMUM RATINGS**

Parameter	Symbol	Values		Units	Notes
		Min.	Max.		
Power Input Voltage	$V_{CC}$	-0.5	+5.8	Vdc	at 25°
Operating Temperature	$T_{OP}$	0	+55	°C	1,2
Storage Temperature	$T_{ST}$	-20	+60	°C	1,2

Note 1: Temperature at 5mm above display center of LCD Module.

$T_a = 40^\circ$ : 90%RH Max

$T_a \leq 40^\circ$ : Absolute Humidity shall be less than  $T_a = 40^\circ$  90%RH .

These shall be no dew condensation.

Note 2: Humidity Min. 5%RH, Max. 90%RH

## 3. ELECTRICAL SPECIFICATIONS

### 3.1 Electrical Characteristics

The LM151X3-A2 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input 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.		
<b>MODULE:</b>						
Power Supply Input Voltage	$V_{CC}$	4.5	5.0	5.5	Vdc	
Power Supply Input Current	$I_{CC}$	-	0.420	0.550	A	1
Power Consumption	$P_c$	-	2.1	3.3	Watts	1
<b>LAMP</b>						
Operating Voltage	$V_{BL}$	585 (9mA)	605 (8mA)	720 (3mA)	$V_{RMS}$	2
Operating Current	$I_{BL}$	3.0	8.0	9.0	mA	
Established Starting Voltage						3
at 25°		-	-	1020	$V_{RMS}$	
at 0°		-	-	1400	$V_{RMS}$	
Operating Frequency	$f_{BL}$	30	50	60	kHz	
Power Consumption	$P_{BL}$	-	4.85	5.27	Watts	4
					Hrs	5
Half Life Time		25,000	40,000	-		less than 8mA
		20,000	30,000	-		with 9mA



- Note 1: The specified current and power consumption are under the  $V_{cc} = 5.0V$ ,  $25^{\circ}$ ,  $f_v = 60Hz$  condition Power supply input current and typ. Power consumption is measured while 64 gray pattern is displayed. The max. power consumption is measured while full black pattern is displayed.
- Note 2: The variance of the voltage is  $\pm 10\%$ .
- Note 3: The transformer output voltage in the inverter must be high considering to the loss of the ballast capacitor in the inverter.
- Note 4: The lamp power consumption shown above does not include loss of external inverter.
- Note 5: The life time is determined as the time at which brightness of lamp is 50% compare to that of initial value at the typical lamp current on condition of continuous operating on the normal temperature.



### 3.2 Interface Connections

This LCD employs three interface connections, a 80 pin connector is used for the module electronics and two connectors, a three pin connector, are used for the integral backlight system. The electronics interface connector is a model 53475 (53643) manufactured by Molex. The pin configuration for the connector is shown in the table below. (LCD Connector: Molex 53475, Mating Connector: Molex 52760)

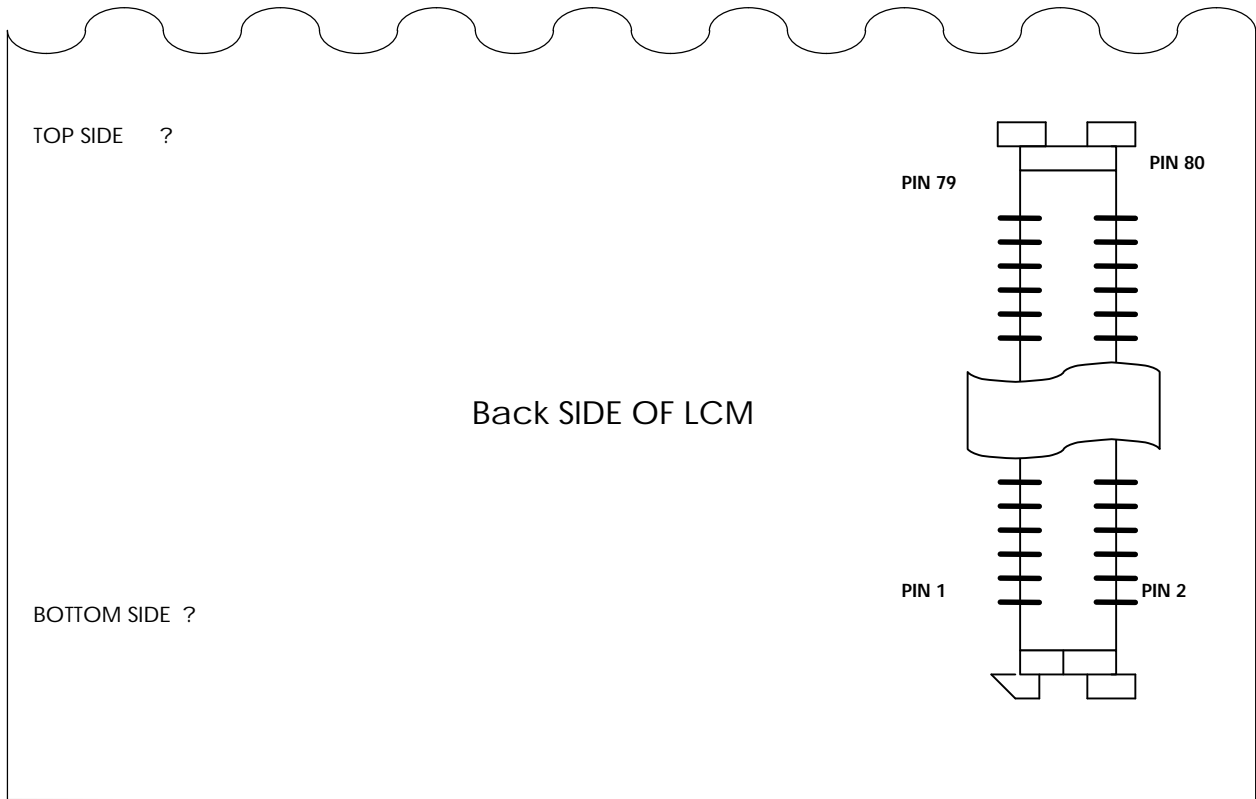
**Table 4: MODULE CONNECTOR PIN CONFIGURATION**

Pin	Symbol	Description	Pin	Symbol	Description
1	GND	System Ground	41	GND	System Ground
2	RO0	Red Data 0 (Odd), LSB	42	GE0	Green Data 0 (Even), LSB
3	RO1	Red Data 1 (Odd)	43	GE1	Green Data 1 (Even)
4	RO2	Red Data 2 (Odd)	44	GE2	Green Data 2 (Even)
5	RO3	Red Data 3 (Odd)	45	GE3	Green Data 3 (Even)
6	GND	System Ground	46	GND	System Ground
7	RO4	Red Data 4 (Odd)	47	GE4	Green Data 4 (Even)
8	RO5	Red Data 5 (Odd)	48	GE5	Green Data 5 (Even)
9	RO6	Red Data 6 (Odd)	49	GE6	Green Data 6 (Even)
10	RO7	Red Data 7 (Odd), MSB	50	GE7	Green Data 7 (Even), MSB
11	GND	System Ground	51	GND	System Ground
12	GO0	Green Data 0 (Odd), LSB	52	BE0	Blue Data 0 (Even), LSB
13	GO1	Green Data 1 (Odd)	53	BE1	Blue Data 1 (Even)
14	GO2	Green Data 2 (Odd)	54	BE2	Blue Data 2 (Even)
15	GO3	Green Data 3 (Odd)	55	BE3	Blue Data 3 (Even)
16	GND	System Ground	56	GND	System Ground
17	GO4	Green Data 4 (Odd)	57	BE4	Blue Data 4 (Even)
18	GO5	Green Data 5 (Odd)	58	BE5	Blue Data 5 (Even)
19	GO6	Green Data 6 (Odd)	59	BE6	Blue Data 6 (Even)
20	GO7	Green Data 7 (Odd), MSB	60	BE7	Blue Data 7 (Even), MSB
21	GND	System Ground	61	GND	System Ground
22	BO0	Blue Data 0 (Odd), LSB	62	GND	System Ground
23	BO1	Blue Data 1 (Odd)	63	DCLK	Data Input Clock
24	BO2	Blue Data 2 (Odd)	64	GND	System Ground
25	BO3	Blue Data 3 (Odd)	65	GND	System Ground
26	GND	System Ground	66	HSYNC	Horizontal Sync Signal
27	BO4	Blue Data 4 (Odd)	67	GND	System Ground
28	BO5	Blue Data 5 (Odd)	68	GND	System Ground
29	BO6	Blue Data 6 (Odd)	69	DE	Data Enable Signal
30	BO7	Blue Data 7 (Odd), MSB	70	VSYNC	Vertical Sync Signal
31	GND	System Ground	71	VDD	Power Supply for LCD Module
32	RE0	Red Data 0 (Even), LSB	72	VDD	Power Supply for LCD Module
33	RE1	Red Data 1 (Even)	73	VDD	Power Supply for LCD Module
34	RE2	Red Data 2 (Even)	74	VDD	Power Supply for LCD Module
35	RE3	Red Data 3 (Even)	75	VDD	Power Supply for LCD Module
36	GND	System Ground	76	N.C	
37	RE4	Red Data 4 (Even)	77	N.C	
38	RE5	Red Data 5 (Even)	78	N.C	
39	RE6	Red Data 6 (Even)	79	N.C	
40	RE7	Red Data 7 (Even), MSB	80	GND	System Ground



Note 1: All GND (ground) pins should be connected together and to V<sub>SS</sub> which should also be connected to the LCD's metal frame.

Note 2: All V<sub>DD</sub>(power input) pins should be connected together.



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 below.

**Table 5: BACKLIGHT CONNECTOR PIN CONFIGURATION**

Pin	Symbol	Description	Notes
1	HV	Lamp power input (high)	1
2	NC	No connect	
3	LV	Ground	2

Note 1: The input power terminal is colored pink.

Note 2: The backlight ground should be common with V<sub>SS</sub>.

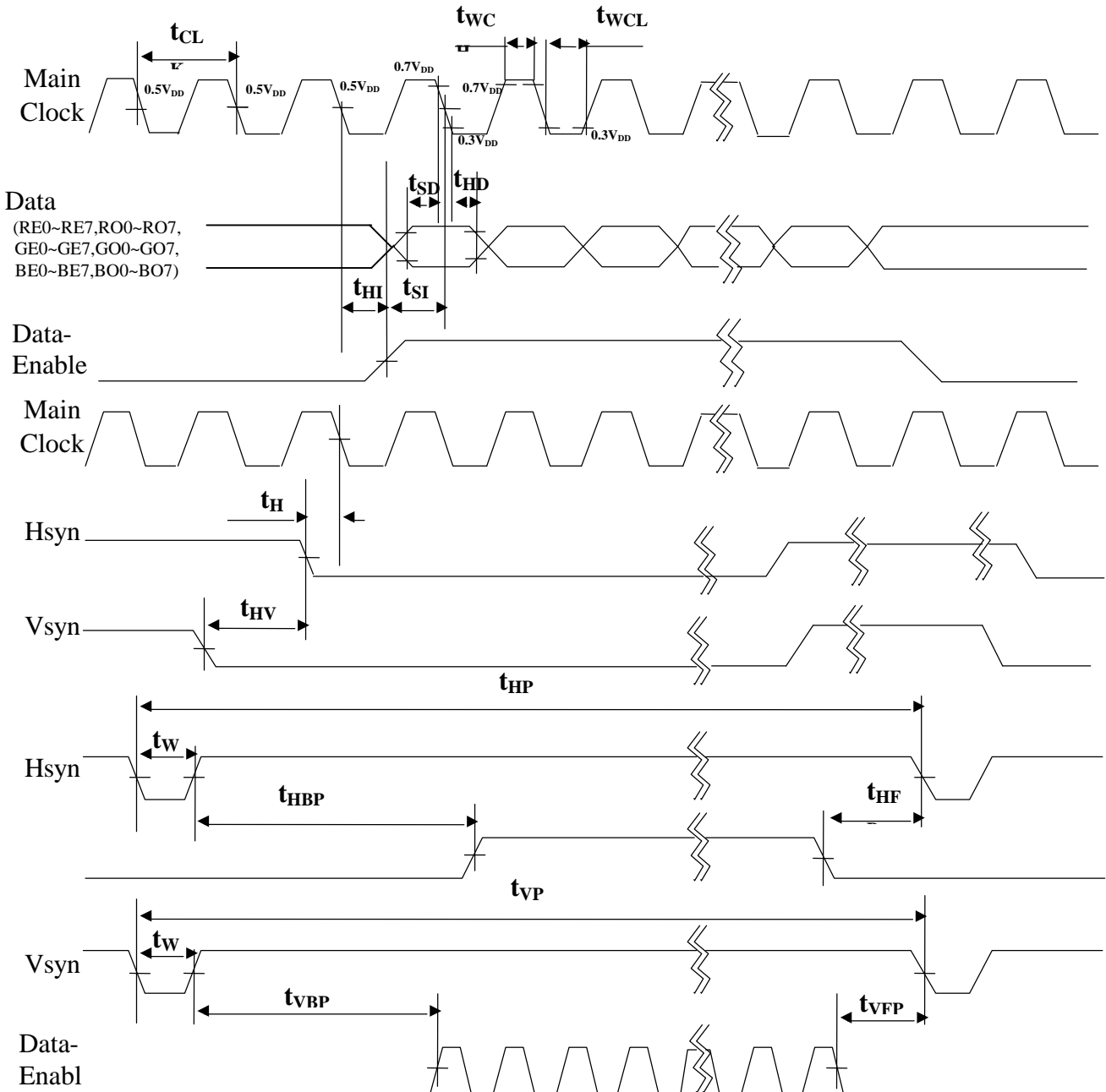
### 3.3 Signal Timing Specifications

This is the signal timing required, all of the interface signal timing should be satisfied with the following specifications for it's proper operation.

**Table 6: TIMING TABLE**

	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Dclk	Frequency	$t_{CLK}$	-	32.5	39.5	Mhz	
	Width-Low	$T_{WCL}$	7	-	-	ns	
	Width-hHigh	$T_{WCH}$	7	-	-	ns	
Hsync	Period	$t_{HP}$	528	672	-	$t_{CLK}$	
	Width-Active	$t_{WH}$	4	68	-		
	Setup time	$t_{HC}$	5	-	-	ns	for $D_{CLK}$
Vsync	Period	$t_{VP}$	777	806	-	$t_{HP}$	
	Frequency	$f_V$	-	60	75	Hz	
	Width-Active	$t_{WV}$	1	-	-	$t_{HP}$	
DE (Data Enable)	Horizontal Back Porch	$t_{HBP}$	4	-	-	$t_{CLK}$	
	Horizontal Front Porch	$t_{HFP}$	4	-	-		
	Vertical Back Porch	$t_{VBP}$	1	-	-	$t_{HP}$	
	Vertical Front Porch	$t_{VFP}$	1	-	-		
	Set up time	$t_{SI}$	5	-	-	ns	For $D_{CLK}$
	Hold time	$t_{HI}$	5	-	-	ns	For $D_{CLK}$
DATA	Set up time	$t_{SD}$	4	-	-	ns	For $D_{CLK}$
	Hold time	$t_{HD}$	4	-	-	ns	For $D_{CLK}$

### 3.4 Signal Timing Waveforms





**Color Input Data Reference**

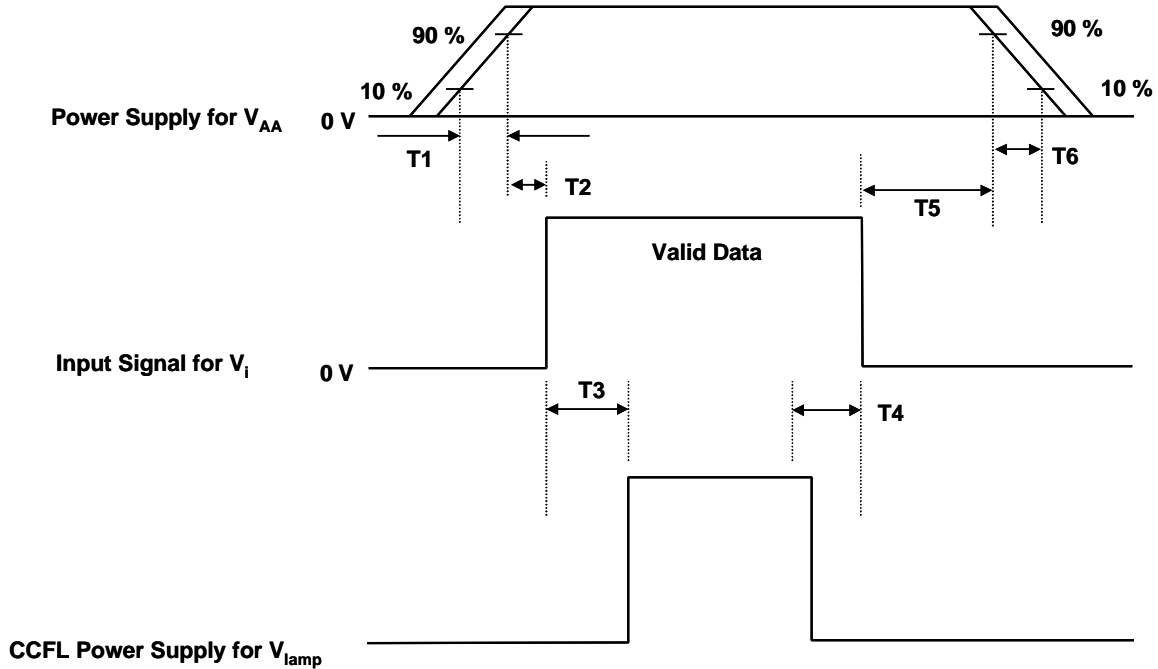
The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

**Table 7: COLOR DATA REFERENCE**

Color		Input Color Data																							
		Red								Green								Blue							
		MSB				LSB				MSB				LSB				MSB				LSB			
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red(000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(002)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	-----	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255) Bright	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(000)Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	Green(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	-----	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Green(255)Bright	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
Blue	Blue(000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	-----	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0
	Blue(255) Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1



3.5 Power Sequence

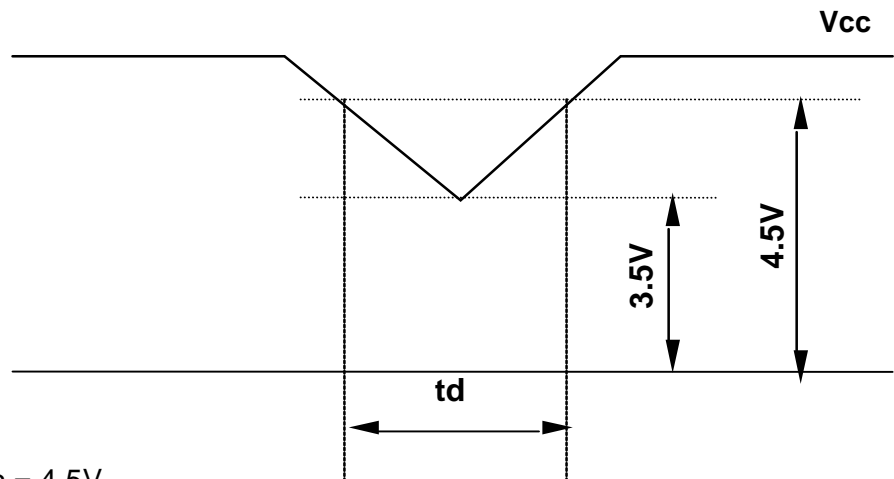


Parameter	Values			Units
	Min.	Typ.	Max.	
$T_1$	-	-	15	ms
$T_2$	0.01	-	20	ms
$T_3$	300	-	-	ms
$T_4$	300	-	-	ms
$T_5$	0.01	-	20	ms
$T_6$	0.01	-	10	ms
$T_7$	1	-	-	ms

- Note 1: Please avoid floating state of interface signal at invalid period.
- Note 2: When the interface signal is invalid, be sure to pull down the power supply for LCD  $V_{CC}$  to 0V.
- Note 3: Lamp power must be turn on after power supply for LCD and interface signal are valid.



### 3.6 Vcc Dip Condition



Note 1: 3.5V = Vcc = 4.5V  
td = 20ms

Note 2: Vcc < 5.5V  
Vcc-dip conditions should also follow the Power Up/Down conditions for supply voltage

**Note 3: This phenomenon is caused by row driver IC initialization after power on (1 vertical period) .**



**4. OPTICAL SPECIFICATIONS**
**4.1 Optical Specifications**

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25°. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of ? and ? equal to 0° and aperture 1 degree. The test equipment is PhotoResearch Prichard SpectroRadiometer Model 1980B-SC or equivalent. The input signal voltage and timing specification are  $V_{DD}$  of 5.0Vdc, and VESA XGA @ 60Hz respectively. The input current of backlight is 8mA ( $F_{BL} = 50\text{KHz}$ ) at the ground terminals.

**Table 3: OPTICAL CHARACTERISTICS**

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Contrast Ratio	CR	250	300	-		1
Brightness, white	$SB_{WH}$	200	250	-	cd/m <sup>2</sup>	2
Brightness Variation	$SB_V$	-	-	30	%	3
Luminance Uniformity(TCO'99)	$L_R$			1.25		4
Response Time	$T_r$		45	55	msec	5
Rise Time	$T_{rR}$	-	10	15		
Decay Time	$T_{rD}$	-	35	40		
CIE Color Coordinates						
Red	$x_R$	0.610	0.640	0.670		
	$y_R$	0.310	0.340	0.370		
Green	$x_G$	0.275	0.305	0.335		
	$y_G$	0.580	0.610	0.640		
Blue	$x_B$	0.110	0.140	0.170		
	$y_B$	0.085	0.115	0.145		
White	$x_W$	0.283	0.313	0.343		
	$y_W$	0.299	0.329	0.359		
Viewing Angle by CR ? 5					degree,	6
x axis, right (F=0°)		70	75	-	°	
x axis, left (F=180°)		70	75	-		
y axis, up (F=90°)		55	60	-		
y axis, down (F=270°)		50	55	-		
Cross talk				1.2	%	7
Gray Scale		-	-	-		8



Note 1: Contrast Ratio (CR) is defined mathematically as:

$$\frac{\text{(Surface Brightness with all white pixels)}}{\text{(Surface Brightness with all black pixels)}}$$

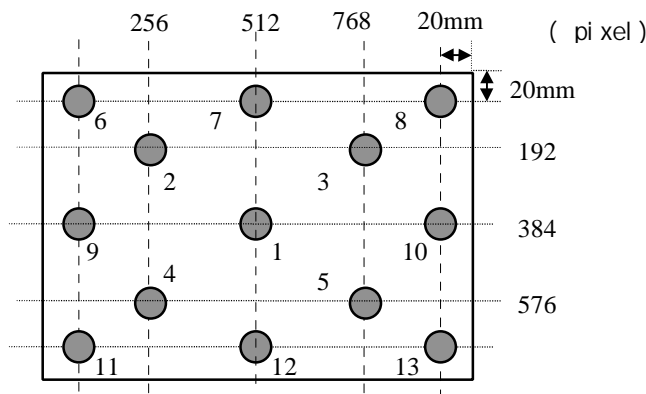
Contrast ratio shall be measured at the center of the display (Location 1).

Note 2: The Brightness is brightness value at center point with full white screen.

Note 3: The variation in surface brightness,  $SB_V$  is defined as :

$$\frac{\text{Maximum } (B_1, B_2, \dots, B_{13}) - \text{Minimum } (B_1, B_2, \dots, B_{13})}{\text{Average } (B_1, B_2, \dots, B_5)} \times 100(\%)$$

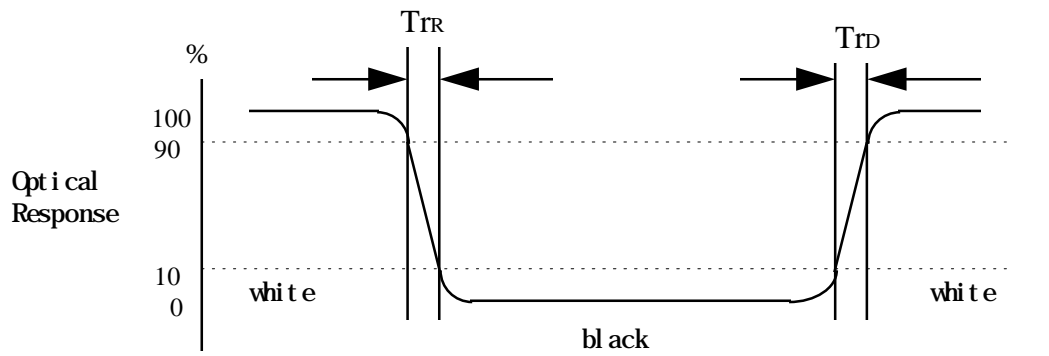
Where B1 to B13 are the brightness with all pixels displaying white at 13 locations.



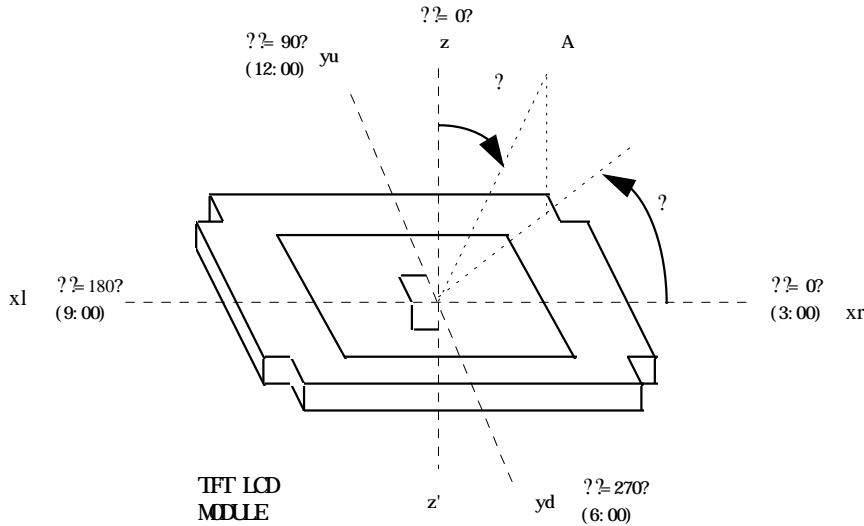
Note 4: TCO' 99 Certification Requirements and test methods for environmental labelling of Displays [Flat] Report No.2 ( X1.5.2 Luminance Uniformity)

$$L_R = ((L_{\max,+30\text{deg.}} / L_{\min,+30\text{deg.}}) + (L_{\max,-30\text{deg.}} / L_{\min,-30\text{deg.}})) / 2$$

Note 5: The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



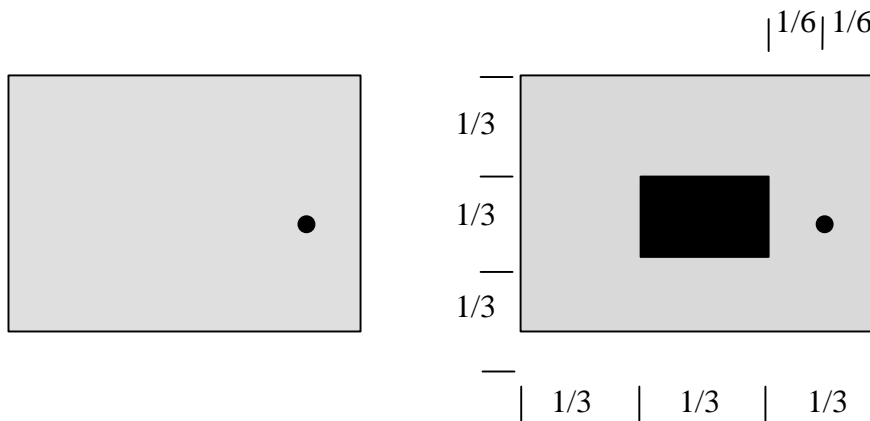
Note 6: Viewing angle is the angle at which the contrast ratio is greater than 5.



Note 7: Cross talk shall be measured at one point.

$$\text{Crosstalk Ratio} = 100 \times \frac{\text{Brightness at pattern A} - \text{Brightness at pattern B}}{\text{Brightness at pattern A}}$$

Pattern A (Mid-gray : Gs(S)=127)      Pattern B (Background:Gs(S)=127, Rectangular:Gs(S)=0)



Note 8: Gray Scale

n	Gs(S)	Relative Brightness(%)	Remarks
		typical	
0	0	0.28	
1	31	1.0	
2	63	3.3	
3	95	8.2	
4	127	15.9	
5	159	28.1	
6	191	46.1	
7	223	68.3	
8	255	100	



## 5. MECHANICAL CHARACTERISTICS

The contents provide general mechanical characteristics for the model LP133X9-A2LG LCD. In addition, the figures in the next page are detailed mechanical drawings of the LCD.

### Outside dimensions

Horizontal	352.0
Vertical	263
Depth	16.0

### Bezel area

Horizontal	311.2
Vertical	234.4

### Active Display area

Horizontal	307.2 mm
Vertical	230.4 mm

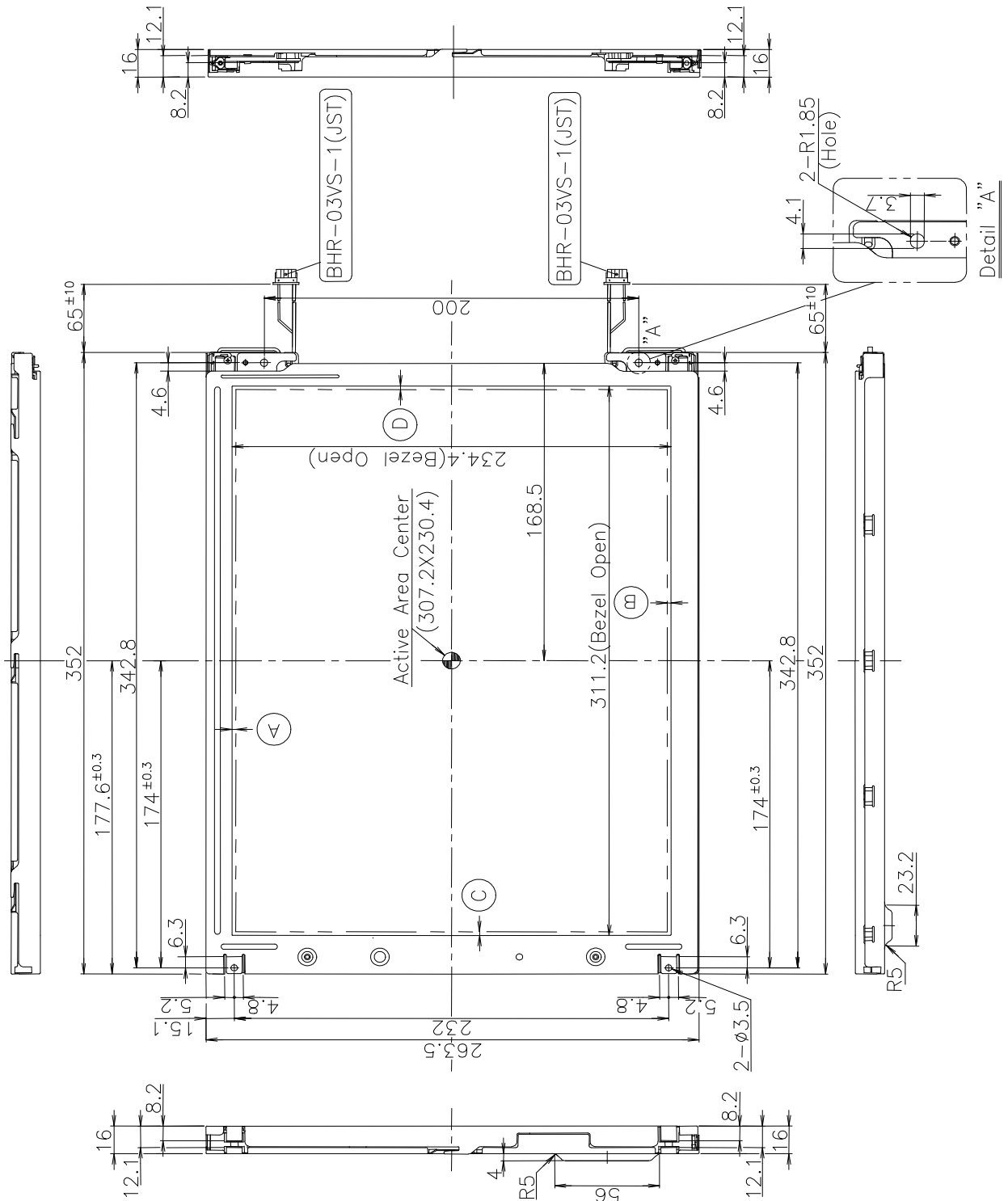
**Weight (approximate)** 1500g (typ), 1600g(max)

**Surface Treatment** Hard coating 3H.  
Anti-glare treatment of the front polarizer



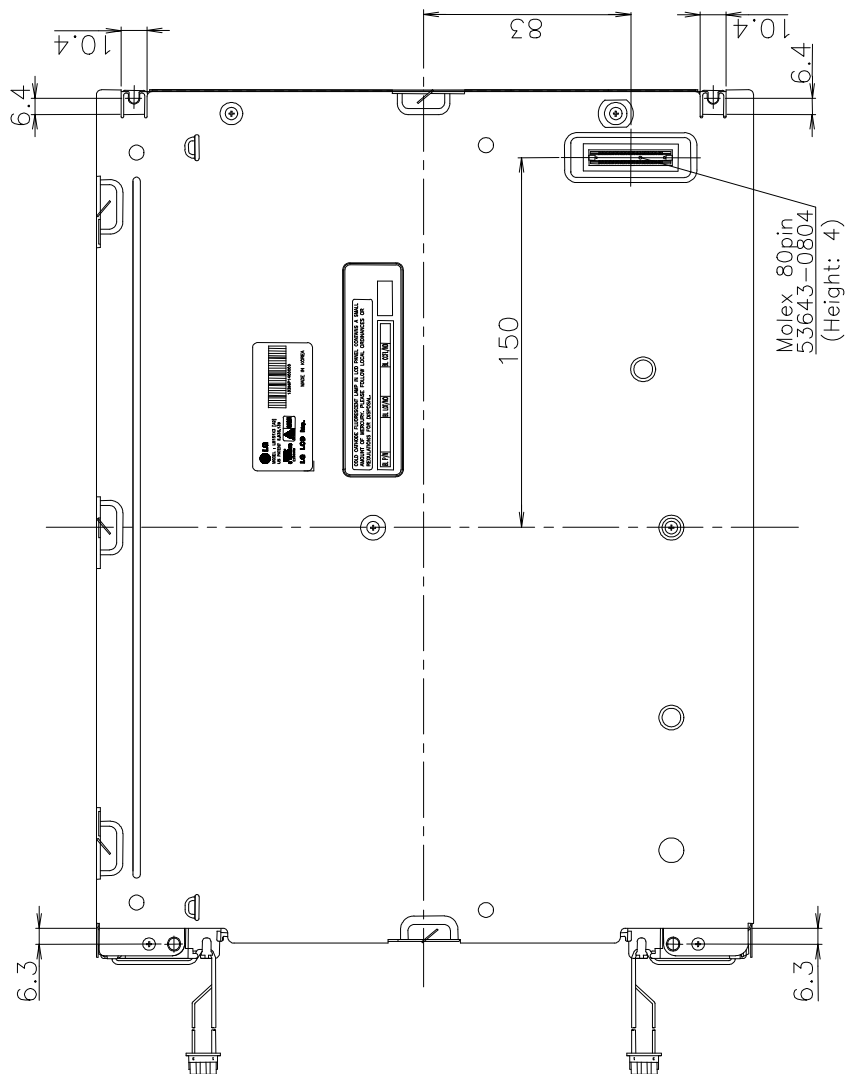
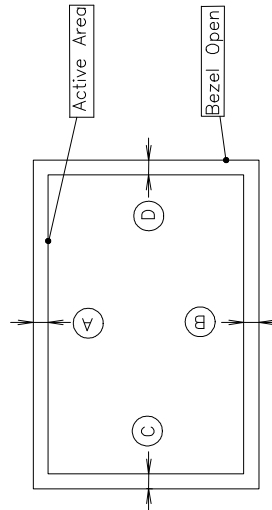


< FRONT VIEW >



**NOTES**

1. Unspecified tolerances to be  $\pm 0.5$
2. This drawing is only preliminary data and can be changed without previous notice
3. Gap between Top case and Glass is  $0.2(+0.5/-0.2)$
4. Tilt and partial disposition tolerance of display area are as follow
  - 1) Y-Direction :  $IA-BI \leq 1.0$
  - 2) X-Direction :  $IC-DI \leq 1.0$



**6. RELIABILITY**

Environment test condition

No.	Test Item	Conditions
1	High temperature storage test	Ta = 60° 240h
2	Low temperature storage test	Ta = -20° 240h
3	High temperature operation test	Ta = 50° 50% RH 240h
4	Low temperature operation test	Ta = 0° 240h
5	Vibration test (non-operating)	Wave form: random Vibration level: 1.0G RMS Bandwidth: 10-500Hz Duration: X,Y,Z, 20 min One time each direction
6	Shock test (non-operating)	Shock level: 120G Waveform: half sine wave, 2ms Direction: ±X, ±Y, ±Z One time each direction
7	Altitude	Operating: 12,000ft Storage: 40,000ft

**Result Evaluation Criteria**

There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.

- ON/OFF Cycle: The display module will be capable of being operated over 24,000 ON/OFF cycles (Lamp power & Vcc ON/OFF)

**6. INTERNATIONAL STANDARDS**

**6.1 Safety**

- a) UL 1950 Third Edition, Underwriters Laboratories, Inc. Jan. 28, 1995.  
Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.
- b) CAN/CSA C22.2 No. 950-95 Third Edition, Canadian Standards Association, Jan. 28, 1995.  
Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.
- c) EN 60950 : 1992 + A1 : 1993 + A2 : 1993 + A3 : 1995 + A4 : 1997 + A11 : 1997  
EC 950 : 1991 + A1 : 1992 + A2 : 1993 + A3 : 1995 + A4 : 1996  
European Committee for Electrotechnical Standardization (CENELEC)  
EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.



**6.2 EMC**

- ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz.” American National Standards Institute(ANSI),1992.
- C.I.S.P.R “Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.” International Special Committee on Radio Interference
- EN 55022 “Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.” European Committee for Electrotechnical Standardization (CENELEC),1988

**7. PACKING**

**7.1 Designation of Lot Mark**



A, B, C      Inch CODE  
 D            YEAR  
 E            MONTH  
 F,G         Panel Code  
 H            Assembly Code  
 I, J, K, L,M SERIAL NO.

**Note 1: YEAR**

YEAR	98	99	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mark	8	9	0	1	2	3	4	5	6	7	8

**Note 2: MONTH**

MONTH	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jun.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

Serial NO. is printed on the label. The label is attached to the backside of the LCD module.This is subject to change without prior notice.

**7.2 Packing Form**

- a) Package quantity in one box: 8 pcs
- b) Box Size: 365 mm x 345 mm x 449 mm



## 8. PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD module.

### 8.1 MOUNTING PRECAUTIONS

- You must mount a module using holes arranged in four corners or four sides.
- You should consider the mounting structure so that uneven force (ex. twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- Please attach a transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to resist external force.
- You should adopt radiation structure to satisfy the temperature specification.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. Please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaked with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluen and alcohol because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- Do not open the case because inside circuits do not have sufficient strength.

### 8.2 OPERATING PRECAUTIONS

- The spike noise causes the mis-operation of circuits. It should be lower than following voltage:  $V = ? 200\text{mV}$  (Over and under shoot voltage).
- Response time depends on the temperature (in lower temperature, it becomes longer) .
- Brightness depends on the temperature (in lower temperature, it becomes lower). In lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
- Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- When fixed patterns are displayed for a long time, remnant image is likely to occur.



- A module has high frequency circuit. If you need to shield the electromagnetic noise, please do in yours. When a Back-light unit is operating, it sounds. If you need to shield the noise, please do in yours.

### 8.3 ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc . And don't touch interface pin directly.

### 8.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

### 8.5 STORAGE

- When storing modules as spares for a long time, the following precautions are necessary.
- Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5° and 35° at normal humidity.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.

### 8.6 HANDLING PRECAUTIONS FOR PROTECTION FILM

- When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion- blown equipment or in such a condition, etc.
- The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer. Please carefully peel off the protection film without rubbing it against the polarizer.
- When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

