SPECIFICATION
FOR
APPROVAL

( ) Preliminary Specification
(●) Final Specification

Title	17” XGA TFT LCD

BUYER	
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LB170X01
SUFFIX	TL01

*When you obtain standard approval,
please use the above model name without suffix

SIGNATURE	DATE
/	
/	
/	

Please return 1 copy for your confirmation
With your signature and comments.

APPROVED BY	DATE
S. D. Jung / G. Manager	
REVIEWED BY	
J. Y. Kim / Manager	
PREPARED BY	
I. H. Yeo / Engineer	

Product Engineering Dept.
LG Display Co., Ltd

Contents

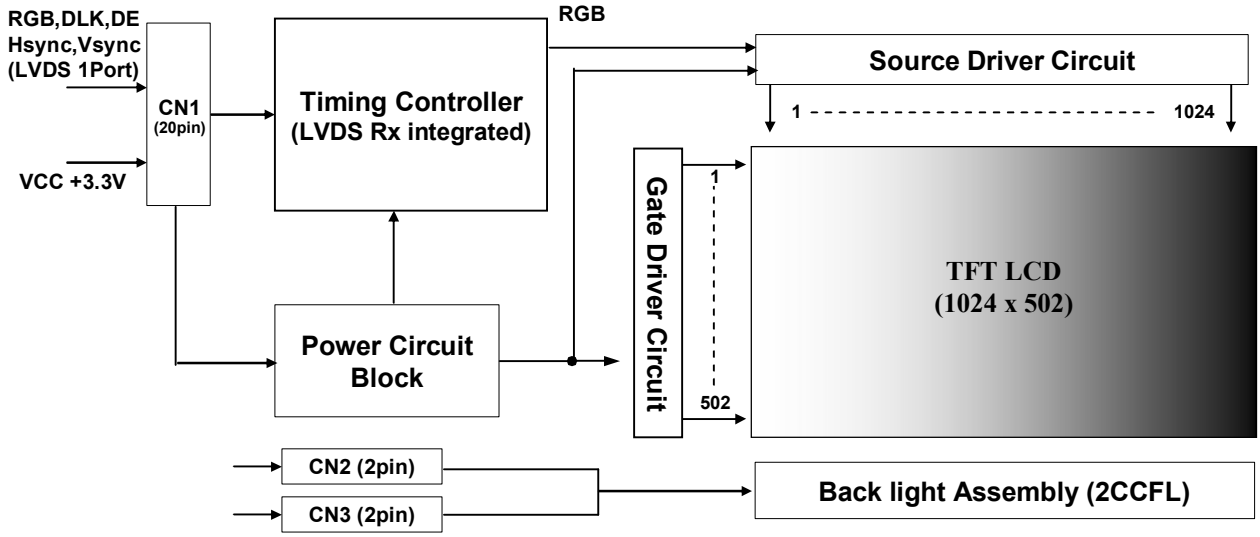
RECORD OF REVISIONS

Revision No	Revision Date	Page	DESCRIPTION
0.0	Apr, 17, 2008	-	Final CAS

1. General Description

The LB170X01 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 17 inches diagonally measured active display area with special resolution(502 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 6-bit gray scale signal for each dot, thus, presenting a palette of more than 262,144 colors.
It has been designed to apply the 6-bit 1 port LVDS interface.
It is intended to support applications where high brightness, super wide viewing angle, high color saturation, and high color are important.
Caution : The LB170X01's timing is XGA, but it is not displayed from 503th vertical data to 768th vertical data.

FIG. 1 Block diagram



General Features

Active Screen Size	17.0 inches(431.082mm) diagonal
Outline Dimension	407.5(H) x 214.5 (V) x 14.5(D) mm (Typ.)
Pixel Pitch	0.378mm x 0.378mm
Pixel Format	1024 horiz. By 502 vert. Pixels RGB strip arrangement
Color Depth	262,144 colors (6-bit)
Luminance, White	250 cd/m^2 (Center 1 point Typ.)
Viewing Angle (CR>10)	L/R:65/65(Typ.), U/D :45/55(Typ)
Power Consumption	Total 11.72 Watt(Typ.) (1.5 Watt@ VCC, 10.22 Watt@ Typical Lamp Current)
Weight	1,194 g (Typ.), 1,250 g (Max.)
Display Operating Mode	Transmissive mode, normally white
Surface Treatment	Hard coating(3H) & Anti-glare treatment of the front polarizer

2. Absolute Maximum Ratings

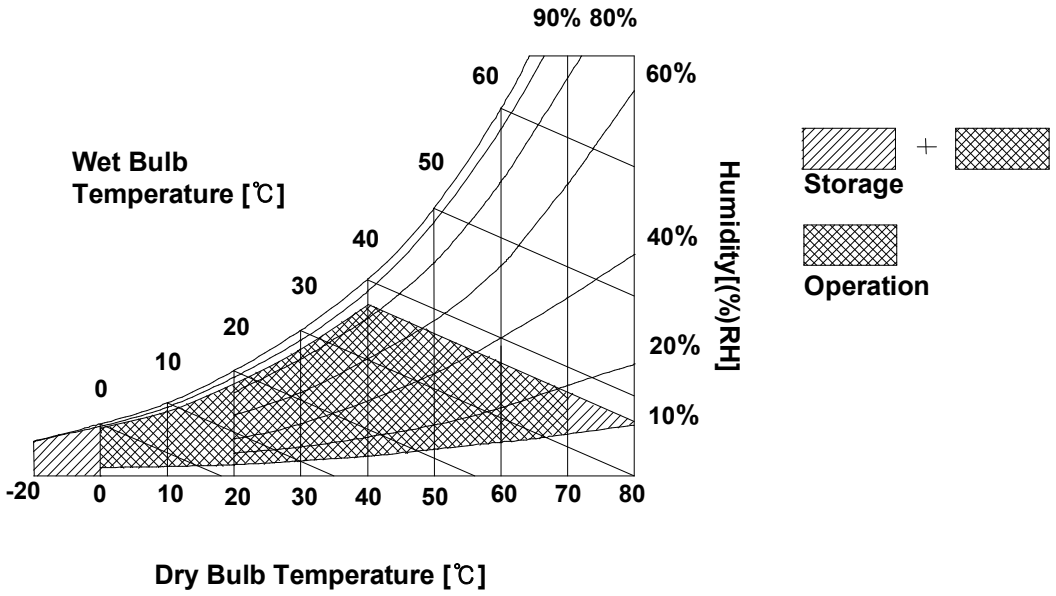
The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Values		Units	Notes
		Min	Max		
Power Input Voltage	VCC	-0.3	+3.6	Vdc	at 25 ± 2 °C
Operating Temperature	TOP	0	70	°C	1
Storage Temperature	TST	-20	80	°C	1
Operating Ambient Humidity	HOP	10	85	%RH	1
Storage Humidity	HST	10	85	%RH	1

Note : 1. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 36°C Max, and no condensation of water.

FIG. 2 Temperature and relative humidity



3. Electrical Specifications

3-1. Electrical Characteristics

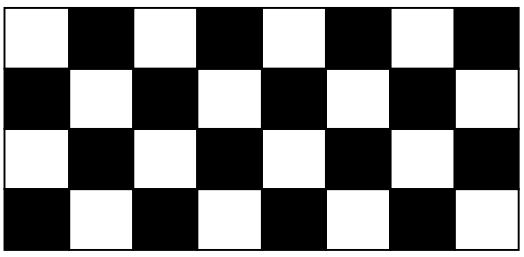
It requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input power for the CCFL, is typically generated by an inverter. The inverter is an external unit to the LCDs.

Table 2-1. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
MODULE :						
Power Supply Input Voltage	VCC	3.0	3.3	3.6	Vdc	
Power Supply Input Current	ICC	370	450	510	mA	1
Power Consumption	Pc	1.1	1.5	1.8	Watt	1
Rush current	IRUSH	-	1.3	2.0	A	2

Notes :
1. The specified current and power consumption are under the V_{LCD}=3.3V, 25 ± 2°C,f_V=60Hz condition whereas mosaic pattern(8 x 4) is displayed and f_V is the frame frequency.
2. The duration of rush current is about 2ms and rising time of power Input is 1ms(min).

White : 63Gray
Black : 0Gray



Mosaic Pattern(8 x 4)

Table 2-2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
LAMP :						
Operating Voltage	V_{BL}	700 (8mArms)	730 (7mArms)	850 (3mArms)	V_{RMS}	1, 2
Operating Current	I_{BL}	3.0	7.0	8.0	mA_{RMS}	1
Established Starting Voltage	Vs					1, 3
at 25 °C		-	-	1,250	V_{RMS}	
at 0 °C		-	-	1,550	V_{RMS}	
Operating Frequency	f_{BL}	40	60	80	kHz	1, 4
Discharge Stabilization Time	Ts	-	-	3	Min	1, 5
Power Consumption	P_{BL}	-	10.22	11.24	Watt	6
Life Time		40,000	-	-	Hrs	1, 7

Notes :

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 you instrument.

※ Do not attach a conducting tape to lamp connecting wire. If the lamp wire attach to a conducting tape, TFT-LCD Module has a low luminance and the inverter has abnormal action.
Because leakage current is occurred between lamp wire and conducting tape.

1. Specified values are for a single lamp.
2. Operating voltage is measured at 25 ± 2°C. The variance of the voltage is ± 10%.
3. The voltage above V_S should be applied to the lamps for more than 1 second for start-up.
   (Inverter open voltage must be more than lamp starting voltage.)

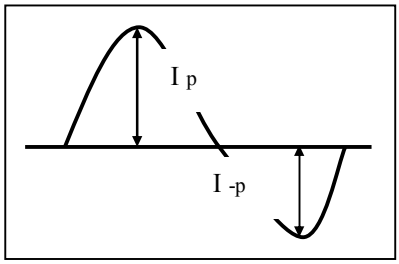
Otherwise, the lamps may not be turned on. The used lamp current is the lamp typical current.

4. Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.
5. 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%.
6. The lamp power consumption shown above does not include loss of external inverter.
   The used lamp current is the lamp typical current. ($P_{BL} = V_{BL} \times I_{BL} \times N_{Lamp}$)
7. The life is determined as the time at which brightness of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25 ± 2°C.

8. 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. Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp, are following.It shall help increase the lamp lifetime and reduce leakage current.

a. The asymmetry rate of the inverter waveform should be less than 10%.
b. The distortion rate of the waveform should be within $\sqrt{2}$ ±10%.

* Inverter output waveform had better be more similar to ideal sine wave.



* Asymmetry rate:

$| I_p - I_{-p} | / I_{RMS} * 100\%$

* Distortion rate

I_p (or I_{-p}) / I_{RMS}

9. The inverter which is combined with this LCM, is highly recommended to connect coupling(ballast) condenser at the high voltage output side. When you use the inverter which has not coupling(ballast) condenser, it may cause abnormal lamp lighting because of biased mercury as time goes.
10. In case of edgy type back light with over 4 parallel lamps, input current and voltage wave form should be synchronized

3-2. Interface Connections

- LCD Connector(CN1) : FI-SEB20P-HFE(Manufactured by JAE)
- Mating Connector : FI-SE20S(Manufactured by JAE)

Table 3. MODULE CONNECTOR(CN1) PIN CONFIGURATION

Pin	Symbol	Description	Notes	
1	VCC	Power Supply, 3.3V Typ.		■ Interface chips - LCD : KE5M6U2730WFP (LCD Controller) including LVDS Receiver - System : THC63LVDM63R / 83R ■ Connector - LCD : FI-SEB20P-HFE(JAE) - Mating Discrete Wire type :FI-SE20S(JAE)
2	VCC	Power Supply, 3.3V Typ.		
3	GND	Ground		
4	GND	Ground		
5	A1M	Negative LVDS difference data input		
6	A1P	Positive LVDS difference data input		
7	GND	Ground		
8	A2M	Negative LVDS difference data input		
9	A2P	Positive LVDS difference data input		
10	GND	Ground		
11	A3M	Negative LVDS difference data input		
12	A3P	Positive LVDS difference data input		
13	GND	Ground		
14	CLKM	Negative LVDS difference data input		
15	CLKP	Positive LVDS difference data input		
16	GND	Ground		
17	NC	NC		
18	NC	NC		
19	GND	Ground		
20	GND	Ground		

Notes: 1. All GND(ground) pins should be connected together.
2. All VCC (power input) pins should be connected together.
3. Input Level of LVDS signal is based on the IEA 664 Standard.

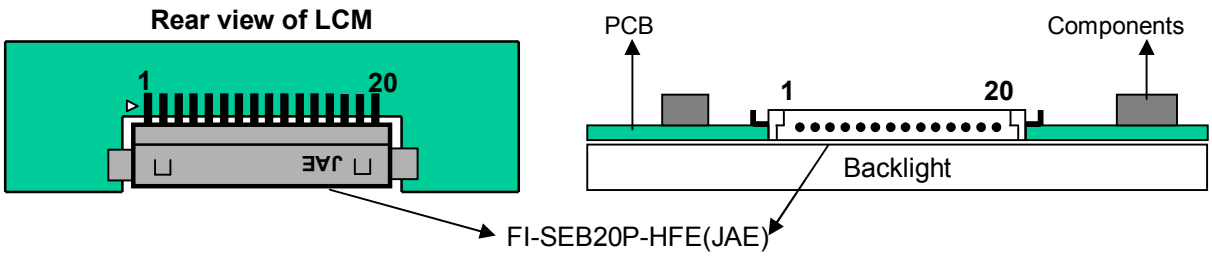
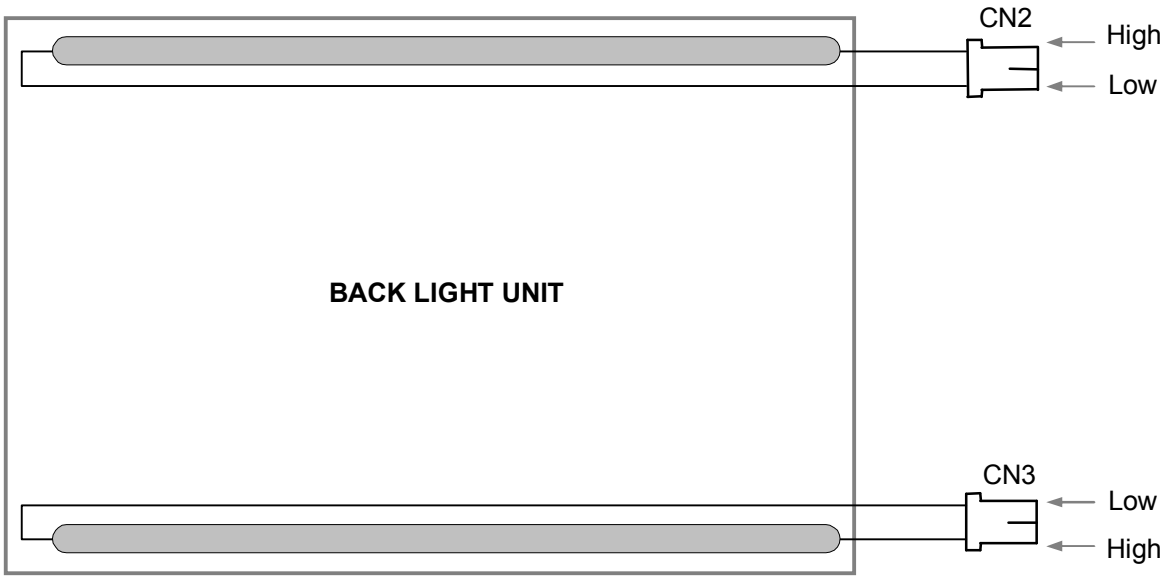


Table 4. BACKLIGHT CONNECTOR PIN CONFIGURATION(CN2,CN3)

The backlight interface connector is a model BHSR-02VS-2(CN2/CN3), manufactured by JST. The mating connector part number is SM02(8.0)B-BHSS-1-TB. The pin configuration for the connector is shown in the table below.

No	Pin	Symbol	Description	Notes
CN2	1	H1	Power supply for lamp 1(High voltage side), Pink	1
	2	L1	Power supply for lamp 1 (Low voltage side), White	2
CN3	1	H2	Power supply for lamp 2 (High voltage side), Pink	1
	2	L2	Power supply for lamp 2 (Low voltage side), White	2

Notes: 1. The high voltage power terminal is colored Pink.
2. The low voltage pin is colored White.



3-3. Signal Timing Specifications

This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications and specifications of LVDS Tx(THC63LVDM63R) / Rx for its proper operation.

Table 5. LVDS Input DC Specification

Symbol	Parameter	Min	Typ	Max	Unit
Vic	LVDS common voltage	0.6	1.2	1.8	V
Vth	LVDS differential High threshold	-	-	+100	mV
Vtl	LVDS differential Low threshold	-100	-	-	mV
| Vid |	LVDS differential Input voltage	100	-	600	mV
Iin	LVDS Input current	-	-	±10	μA

Table 6. LVDS Input AC Timing

Symbol	Parameter	Min	Typ	Max	Unit
tCLK	LVDS CLK Period	12.7	-	20	ns
tRIP1	Input Data Position 0	-0.4	0.0	0.4	ns
tRIP0	Input Data Position 1	T/7-0.4	T/7	T/7+0.4	ns
tRIP6	Input Data Position 2	2T/7-0.4	2T/7	2T/7+0.4	ns
tRIP5	Input Data Position 3	3T/7-0.4	3T/7	3T/7+0.4	ns
tRIP4	Input Data Position 4	4T/7-0.4	4T/7	4T/7+0.4	ns
tRIP3	Input Data Position 5	5T/7-0.4	5T/7	5T/7+0.4	ns
tRIP2	Input Data Position 6	6T/7-0.4	6T/7	6T/7+0.4	ns

※ T = Input CLKP period time
ex) T= 15.4ns @ XGA, 60Hz

Table 7. Timing Table

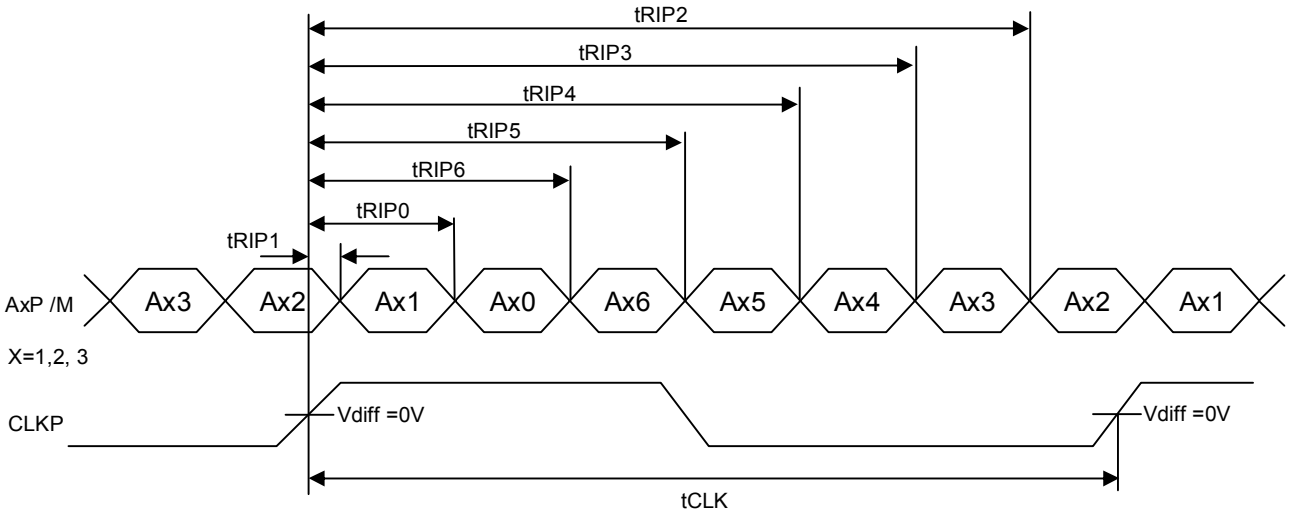
ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Period	t_{CLK}	12.70	15.38	20.00	ns	
	Frequency	-	50	65	79	MHz	
Hsync	Period	t_{HP}	1096	1344	1360	t_{CLK}	
	Width	t_{WH}	8	136	320	t_{CLK}	
Vsync	Period	t_{VP}	780	806	862	t_{HP}	
	Frequency	f_V	50	60	75	Hz	
	Width	t_{WV}	2	6	88	t_{HP}	
DE (Data Enable)	Horizontal Valid	t_{HV}	1024	1024	1024	t_{CLK}	
	Horizontal Back Porch	t_{HBP}	8	160	320		
	Horizontal Front Porch	t_{HFP}	8	24	320		
	Vertical Valid	t_{VV}	768	768	768	t_{HP}	
	Vertical Back Porch	t_{VBP}	4	29	90		
	Vertical Front Porch	t_{VFP}	2	3	88		

Notes: Hsync period and Hsync width-active should be even number times of t_{CLK}. If the value is odd number times of t_{CLK}, display control signal can be asynchronous. In order to operate this LCM a Hsync, Vsync, and DE(data enable) signals should be used.

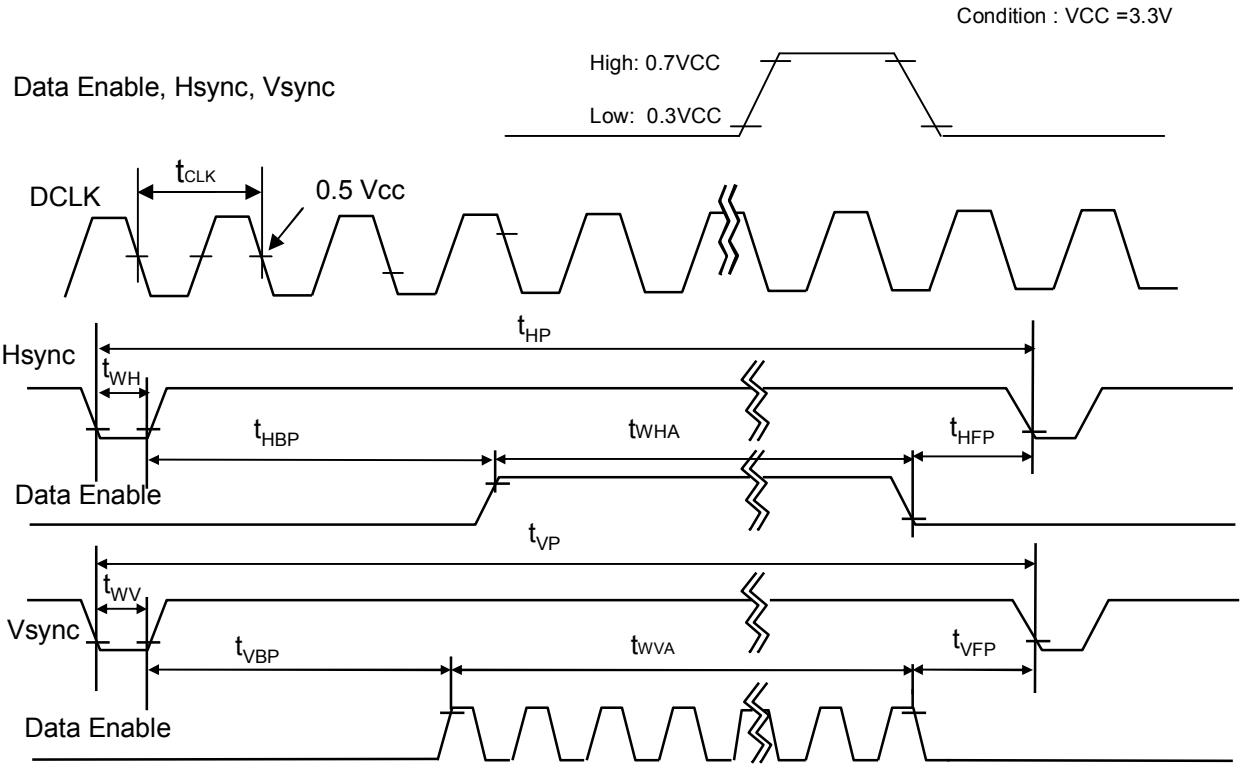
1. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rates.
2. Vsync and Hsync should be keep the above specification.
3. Hsync Period, Hsync Width, and Horizontal Back Porch should be any times of character of number(8).
4. Although XGA Timing is entered, this LCM is displayed to the vertical direction until 502 line.

3-4. Signal Timing Waveforms

3.4.1 LVDS Rx input wave form



3.4.2 TTL wave form



3-5. Color Input Data Reference

The brightness of each primary color (red,green and blue) is based on the 6-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 8. COLOR DATA REFERENCE

Color		Input Color Data																	
		RED						GREEN						BLUE					
		MSB					LSB	MSB					LSB	MSB					LSB
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
RED	RED (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (01)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	…			…						…						…			
	RED (62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (01)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	...			...						...						...			
	GREEN (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	…			…						…						…			
	BLUE (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Notes : Users should be input true 6 Bit data streams via LVDS transmitter.

3-6. Power Sequence

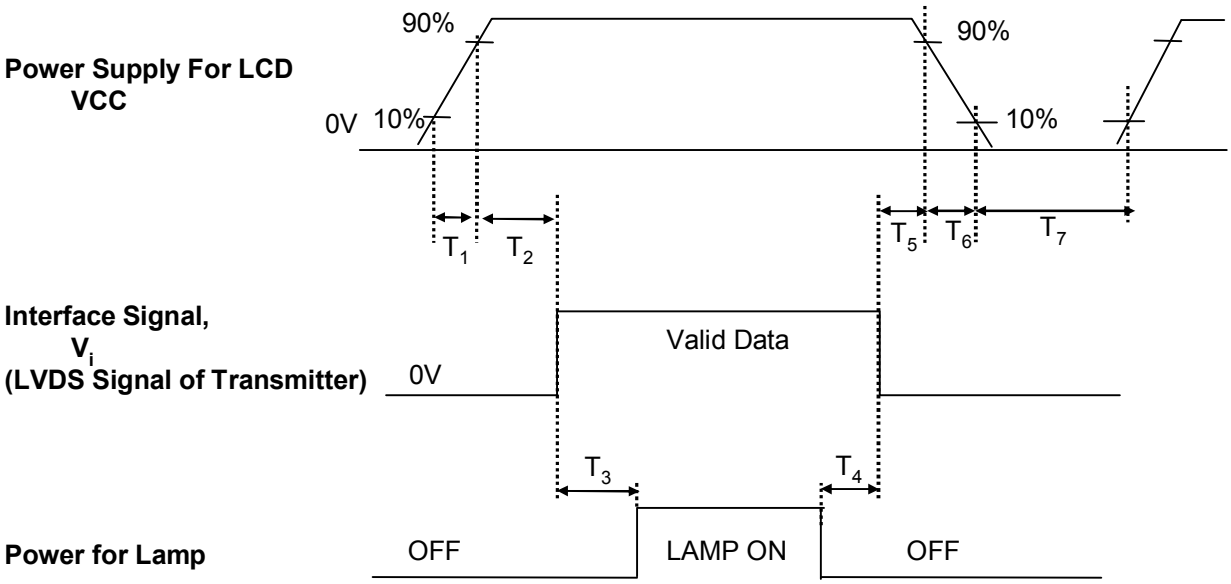


Table 9. POWER SEQUENCE TABLE

Parameter	Value			Units
	Min.	Typ.	Max.	
T_1	-	-	10	(ms)
T_2	0	-	50	(ms)
T_3	200	-	-	(ms)
T_4	200	-	-	(ms)
T_5	0	-	50	(ms)
T_6	-	-	10	(ms)
T_7	500	-	-	(ms)

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

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25±2°C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 °.
FIG. 1 presents additional information concerning the measurement equipment and method.

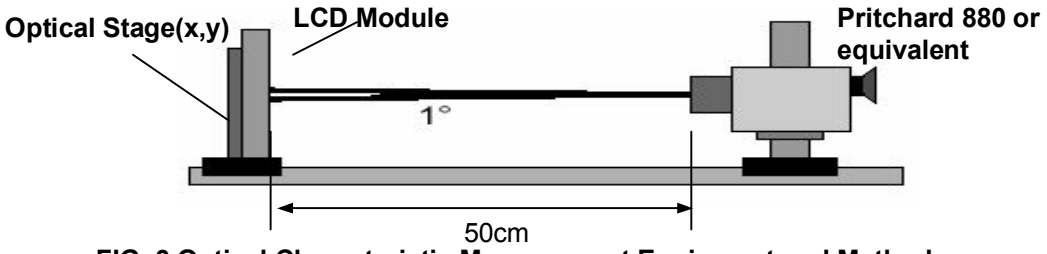


FIG. 3 Optical Characteristic Measurement Equipment and Method

Table 10. OPTICAL CHARACTERISTICS Ta= 25±2°C, VCC=3.3V, fv=60Hz, Dclk=65MHz, I_{Lamp}=7mA

Parameter		Symbol	Values			Units	Notes
			Min	Typ	Max		
Contrast Ratio		CR	400	500	-		1
Surface Luminance, white		L_{WH}	200	250	-	cd/m^2	2
Luminance Variation		δ_{WHITE} 5P	-	1.25	1.45	-	3
Response Time	Rise Time	Tr_R	-	6	10	ms	4
	Decay Time	Tr_D	-	10	20	ms	
Color Coordinates [CIE1931]	RED	Rx	0.608	0.638	0.668	-	reference
		Ry	0.315	0.345	0.375	-	reference
	GREEN	Gx	0.266	0.296	0.326	-	reference
		Gy	0.587	0.617	0.647	-	reference
	BLUE	Bx	0.115	0.145	0.175	-	reference
		By	0.043	0.073	0.103	-	reference
	WHITE	Wx	0.283	0.313	0.343	-	
		Wy	0.299	0.329	0.359	-	
Viewing Angle (CR>10)							
	x axis, right(ϕ=0°)	θr	55	65	-	degree	5
	x axis, left (ϕ=180°)	θl	55	65	-		
	y axis, up (ϕ=90°)	θu	40	45	-		
	y axis, down (ϕ=270°)	θd	50	55	-		
Viewing Angle (CR>5)							
	x axis, right(ϕ=0°)	θr	70	80	-	degree	5
	x axis, left (ϕ=180°)	θl	70	80	-		
	y axis, up (ϕ=90°)	θu	50	60	-		
	y axis, down (ϕ=270°)	θd	70	80	-		

Notes 1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

at center point (1)

2. Surface luminance is luminance value at center point (1) across the LCD surface 50cm from the surface with all pixels displaying white.
For more information see FIG 3 and FIG 4.

3. The variation in surface luminance , δ WHITE is defined as :

δ WHITE(5P) = Maximum(L_1,L_2, L_3, L_4, L_5) / Minimum(L_1,L_2, L_3, L_4, L_5)

Where L_1 to L_5 are the luminance with all pixels displaying white at 5 locations .

For more information see FIG 4.

4. Response time is the time required for the display to transition from white to black(Rise Time, Tr_R) and from black to white(Decay Time, Tr_D). For additional information see FIG 3.

5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 4.

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Measuring point for surface luminance & measuring point for luminance variation

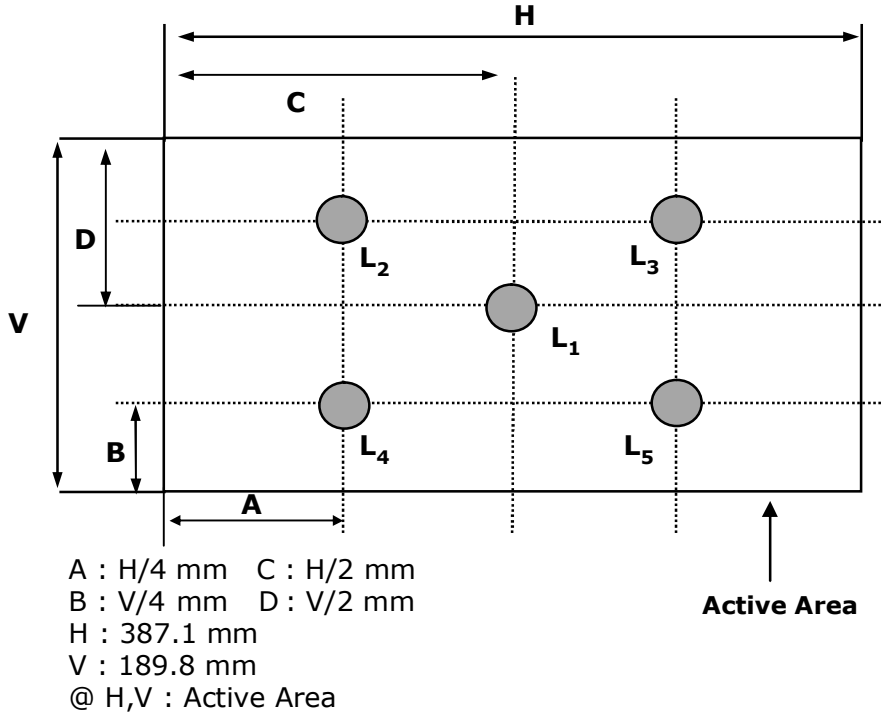


FIG. 4 Measure Point for Luminance

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

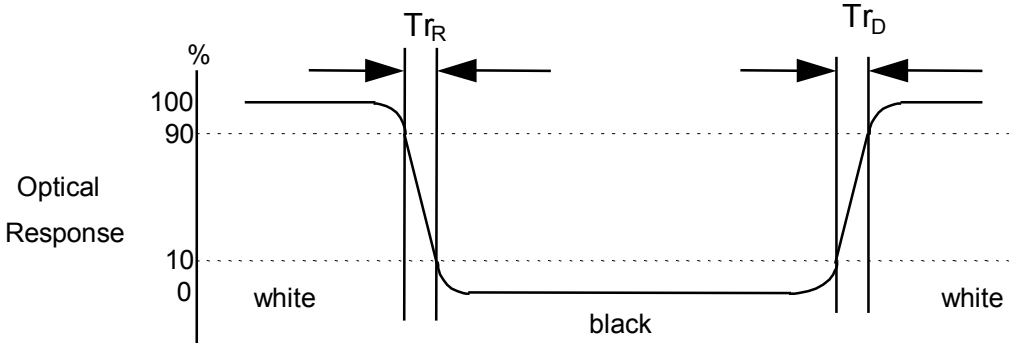


FIG. 5 Response Time

Dimension of viewing angle range

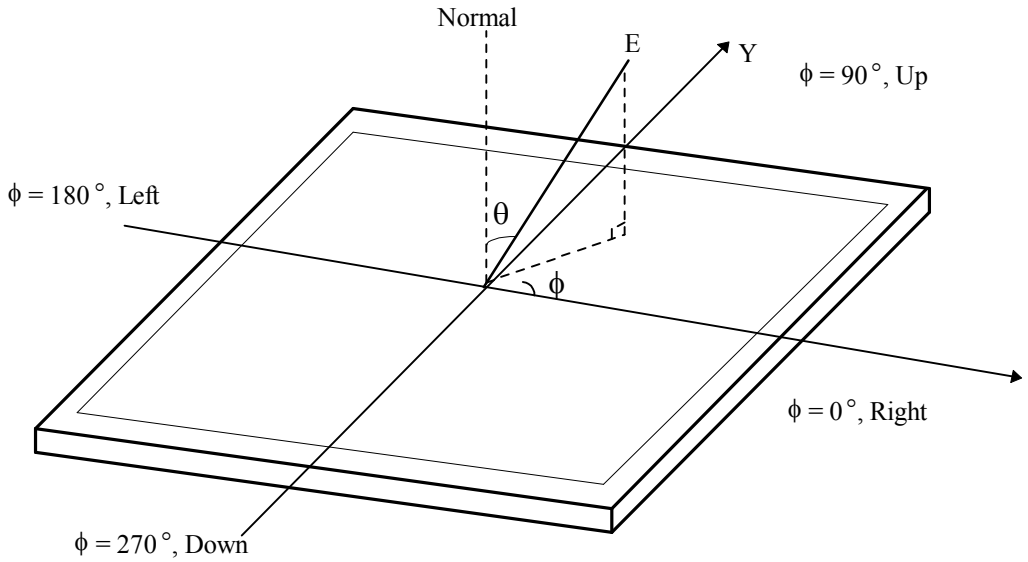


FIG. 6 Viewing angle

5. Mechanical Characteristics

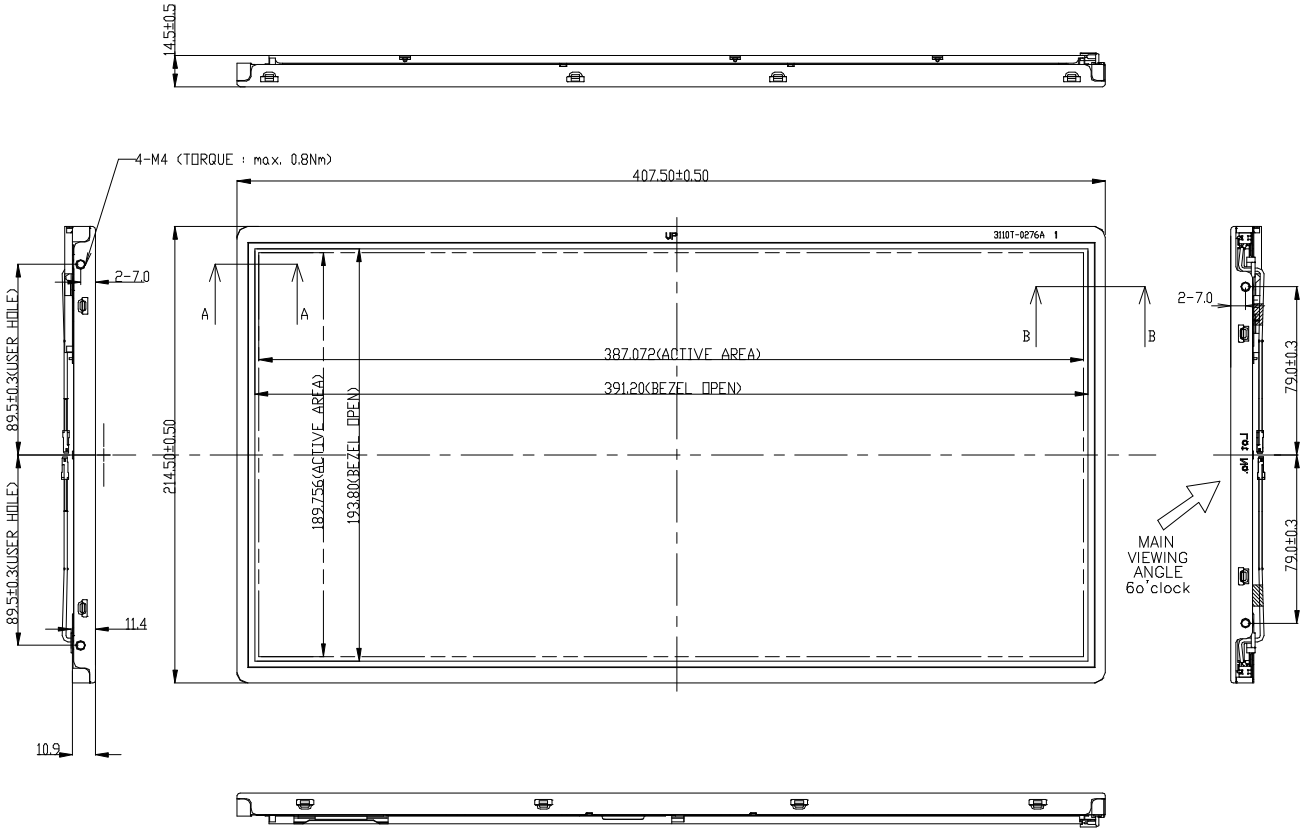
The contents provide general mechanical characteristics. In addition the figures in the next page are detailed mechanical drawing of the LCD.

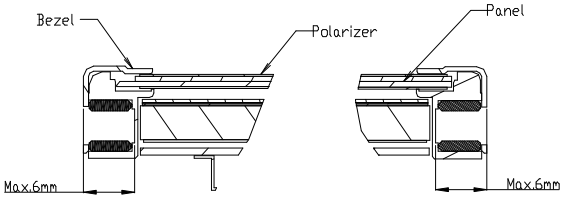
Outline Dimension	Horizontal	407.5mm
	Vertical	214.5mm
	Depth	14.5mm
Bezel Area	Horizontal	391.2 mm
	Vertical	193.8 mm
Active Display Area	Horizontal	387.072mm
	Vertical	189.756mm
Weight	1,194 g(Typ.), 1,250 g(Max.)	
Surface Treatment	Hard coating(3H) Anti-glare treatment of the front polarizer	

Notes : Please refer to a mechanic drawing in terms of tolerance at the next page.

<FRONT VIEW>

Note) Unit:[mm], General tolerance: ± 0.5mm



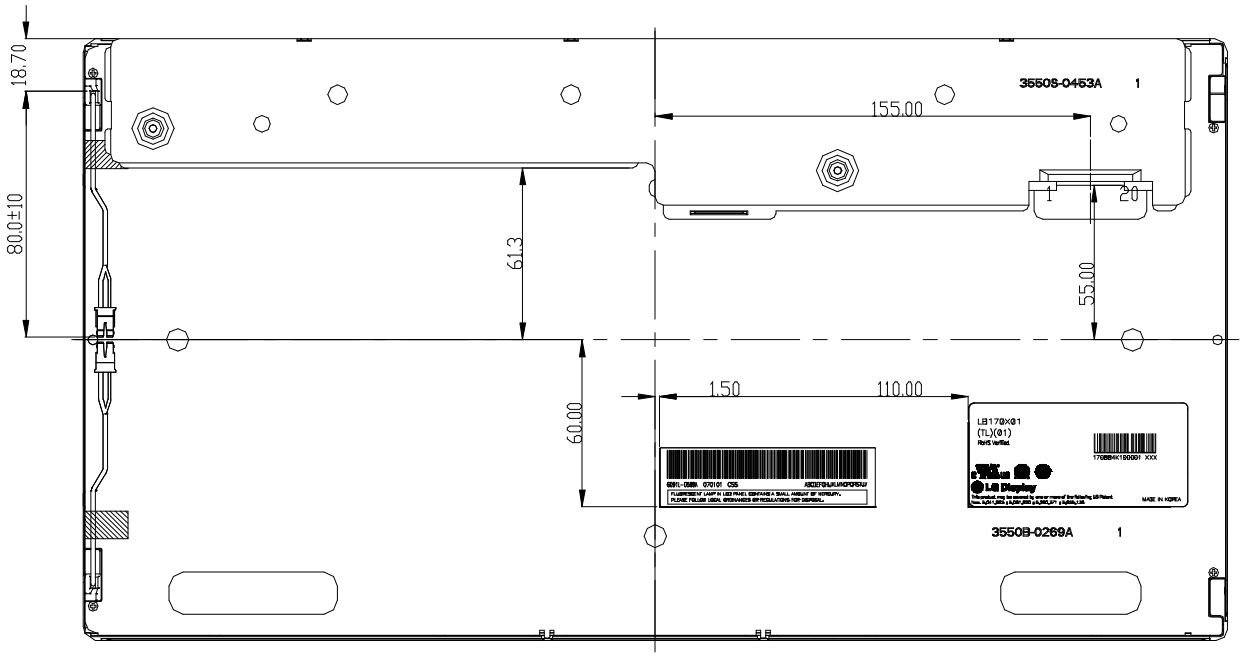


SECTION A-A
SCALE 2/1

SECTION B-B
SCALE 2/1

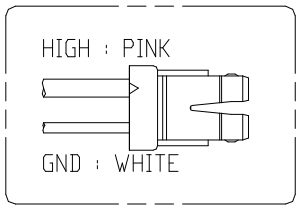
<REAR VIEW>

Note) Unit:[mm], General tolerance: ± 0.5mm



NOTES

1. Backlight : 2 Cold Cathode Fluorescent Lamps.
2. Lamp Connector Specification.
   – JST BHSR-02VS-2 Only.
3. Depth of user hole screw insertion : Max 6.0mm.
4. Torque of user hole : Max 0.8Nm
5. Lamp(CCFL) lot No. is marked at backlight connector.



6. Do not wind conductive tape aroud the backlight wires.
7. Unspecified tolerances to be ±0.5mm.

6. Reliability

Environment test condition

No.	Test Item	Conditions
1	High temperature operation test	Ta= 70°C, 240h
2	Low temperature operation test	Ta= 0°C, 240h
3	High temperature storage test	Ta= 80°C, 240h
4	Low temperature storage test	Ta= -20°C, 240h
5	High Temp. High Humidity	Ta=40℃ 85%RH 240h
6	Vibration test (operating)	Wave form : random Vibration level : 1.0G RMS Bandwidth : 10-500Hz Duration : X,Y,Z, 30 min One time each direction
7	Shock test (operating)	Shock level : 120G Waveform : half sine wave, 2ms Direction : ±X, ±Y, ±Z One time each direction
8	ESD operating C:150pF, R:0Ω	Panel surface ±15Kv(Contact 5time) Top case ±12Kv(Air 5time)

[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.

7. International Standards

7-1. Safety

a) UL 60950-1:2003, First Edition, Underwriters Laboratories, Inc.,
Standard for Safety of Information Technology Equipment.
b) CAN/CSA C22.2, No. 60950-1-03 1st Ed. April 1, 2003, Canadian Standards Association,
Standard for Safety of Information Technology Equipment.
c) EN 60950-1:2001, First Edition,
European Committee for Electrotechnical Standardization(CENELEC)
European Standard for Safety of Information Technology Equipment.
d) RoHS, Directive 2002/09/EC of the European Parliament and of the council of 27 January 2003

7-2. EMC

a) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHZ to 40GHz. “American National Standards Institute(ANSI),1992
b) C.I.S.P.R “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.“ International Special Committee on Radio Interference.
c) EN 55022 “Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment.“ European Committee for Electrotechnical Standardization.(CENELEC), 1998 (Including A1: 2000)

8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L	M

A,B,C : SIZE(INCH)
D : YEAR
E : MONTH
F ~ M : SERIAL NO.

Note

1. YEAR

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mark	1	2	3	4	5	6	7	8	9	0

2. MONTH

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	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.

8-2. Packing Form

a) Package quantity in one box : 9 pcs

b) Box size : 331mm X 284mm X 474mm.

9. PRECAUTIONS

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

9-1. MOUNTING PRECAUTIONS

(1) You must mount a module using holes arranged in four corners or four sides.
(2) 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.
(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) 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.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And 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.)
(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

9-2. OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
(4) 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.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
(7) Please do not give any mechanical and/or acoustical impact to LCM. Otherwise, LCM can not be operated its full characteristics perfectly.
(8) A screw which is fastened up the steels should be a machine screw (if not, it causes metallic foreign material and deal LCM a fatal blow)
(9) Please do not set LCD on its edge.

9-3. 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.

9-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

9-5. STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
(2) 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.

9-6. HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) The protection film is attached to the bezel with a small masking tape.
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.
(2) 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 bezel after the protection film is peeled off.
(3) You can remove the glue easily. When the glue remains on the bezel surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.