LG.PHILIPS LCD

Product Specification

SPECIFICATION
FOR
APPROVAL

(●) Preliminary Specification

( ) Final Specification

Title	15.0" XGA TFT LCD

BUYER	General
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LM150X08
SUFFIX	TLB1

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

APPROVED BY	SIGNATURE DATE
/	
/	
/	

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

APPROVED BY	DATE
K.J.Kwon / G.Manager	

REVIEWED BY

J.Y.Lee / Manager [C]

K.H.Moon / Manager [M]

K.T.Kim / Manager [P]

PREPARED BY

J.Y.Lee / Engineer

**Product Engineering Dept.
LG. Philips LCD Co., Ltd**

Contents

RECORD OF REVISIONS

| Revision No	Revision Date	Page	DESCRIPTION
0.0	2006.12.29	-	Preliminary Specification
1.0	2007.04.25	-	Final Specification

1. General Description

LM150X08-TLB1 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. It has a 15.0 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 16M colors.
It has been designed to apply the 8-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.
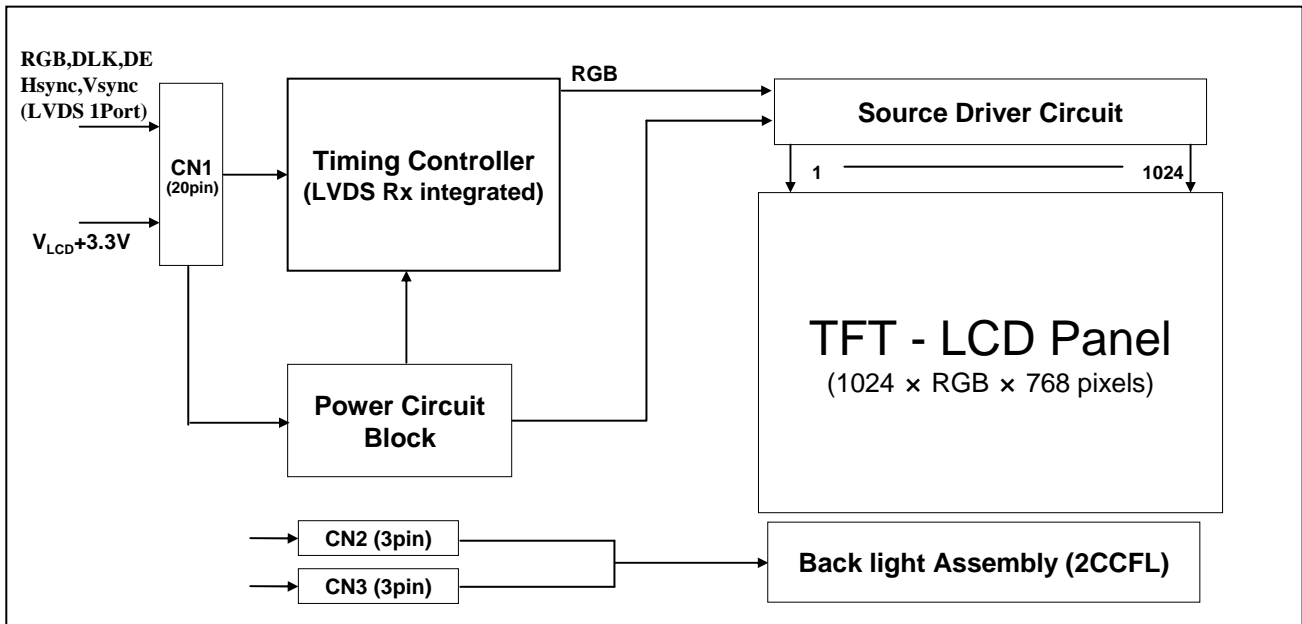
General Features

|	
Active Screen Size	15.0 inches(38.016cm) diagonal (Aspect ratio 4:3)
Outline Dimension	326.5(H) x 253.5 (V) x 11.2(D) mm (Typ.)
Pixel Pitch	0.297mm x 0.297mm
Pixel Format	1024 horiz. By 768 vert. Pixels RGB strip arrangement
Color Depth	16.7M colors (6-bit with A-FRC)
Luminance, White	250 cd/m^2 (Center 1 points Typ.)
Viewing Angle (CR>10)	R/L 140(Typ.), U/D 140(Typ)
Power Consumption	Total 10.77 Watt(Typ.) (1.81Watt@V_{LCD}, 8.96 Watt@250cd/[Lamp=8mA])
Weight	1,000 g (Typ.)
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	V$_{LCD}$	-0.3	+3.6	Vdc	at 25 ± 2 °C
Operating Temperature	T$_{OP}$	0	50	°C	1
Storage Temperature	T$_{ST}$	-20	60	°C	1
Operating Ambient Humidity	H$_{OP}$	10	90	%RH	1
Storage Humidity	H$_{ST}$	10	90	%RH	1

Note : 1. Temperature and relative humidity range are shown in the figure below.
        Wet bulb temperature should be 39 °C Max, and no condensation of water.

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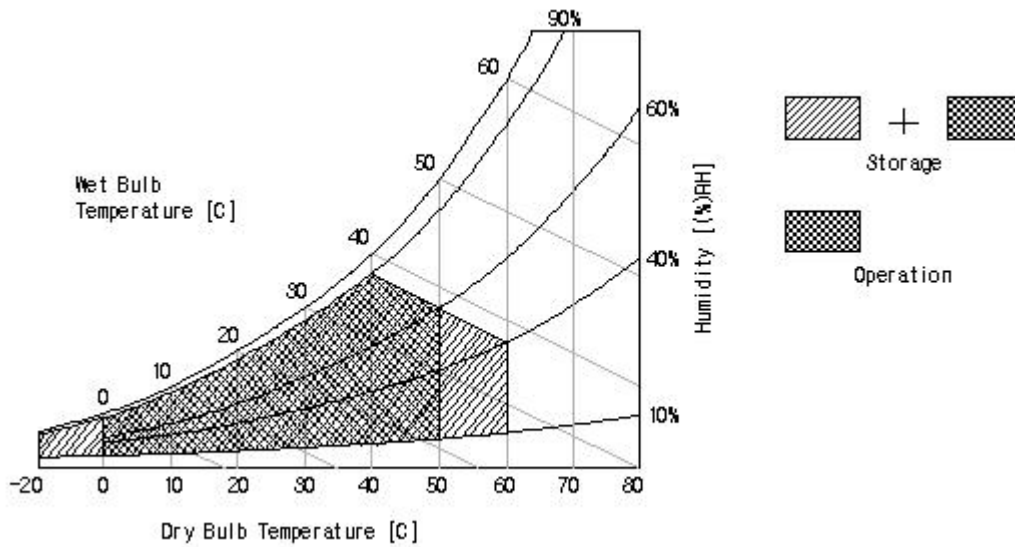
3. Electrical Specifications

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.
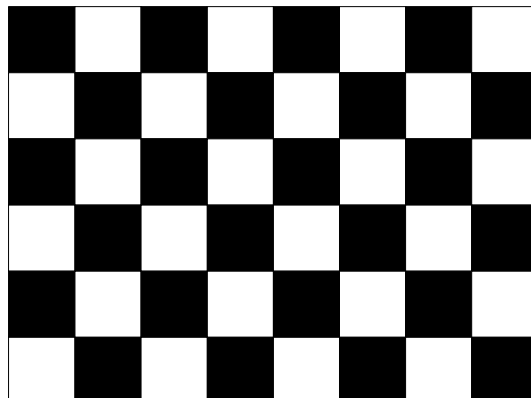
Table 2_1. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
MODULE :						
Power Supply Input Voltage	V_{LCD}	3.15	3.30	3.45	Vdc	
Power Supply Input Current	I_{LCD}	-	548	630	mA	1
		-	625	718	mA	2
Power Consumption	P_{LCD}	-	1.81	2.17	Watt	1
Rush current	I_{RUSH}	-	-	2.0	A	3

Note :
1. The specified current and power consumption are under the V_{LCD}=3.3V, 25 $\pm$ 2°C, f_V=60Hz condition whereas mosaic pattern(8 x 6) is displayed and f_V is the frame frequency.
2. The current is specified at the maximum current pattern.
3. The duration of rush current is about 2ms and rising time of power Input is 1ms(min.).

White : 255Gray
Black : 0Gray

Mosaic Pattern(8 x 6)

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Table 2_2. ELECTRICAL CHARACTERISTICS

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
LAMP :							
Operating Voltage		V_{BL}	550(9mA)	560(8mA)	650(3mA)	V_{RMS}	1, 2
Operating Current		I_{BL}	3.0	8.0	9.0	mA_{RMS}	1
Established Starting Voltage		Vs					1, 3
	at 25 °C				850	V_{RMS}	
	at 0 °C				1,100	V_{RMS}	
Operating Frequency		f_{BL}	45	60	80	kHz	4
Discharge Stabilization Time		Ts			3	Min	1, 5
Power Consumption		P_{BL}		8.96	9.86	Watt	6
Life Time			40,000			Hrs	1, 7

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 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 $25 \pm 2°C$. The variance of the voltage is $\pm$ 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 $25 \pm 2°C$.

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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 $2 \pm 10\%$.
      * Inverter output waveform had better be more similar to ideal sine wave.
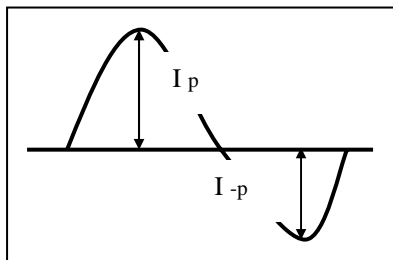
* Asymmetry rate:

$$| I_p - I_{-p} | / I_{rms} \times 100\%$$

* Distortion rate

$$I_p \ (\text{or } I_{-p}) / I_{rms}$$

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

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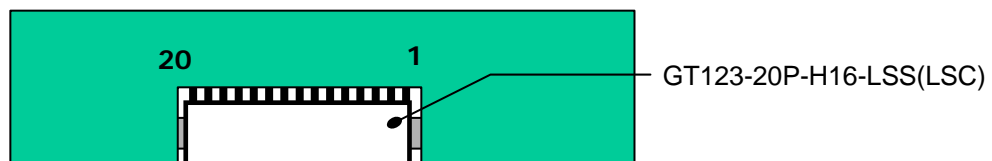Product Specification

3-2. Interface Connections

- LCD Connector(CN1) : GT123-20P-H16-LSS(Manufactured by LS Cable) or Equivalent
- Mating Connector : GT123-20S-CS(Manufactured by LS Cable) or Equivalent

Table 3. MODULE CONNECTOR(CN1) PIN CONFIGURATION

Pin No	Symbol	Description	Output Pin # (LVDS Tx)
1	VLCD	Power Supply +3.3V	
2	VLCD	Power Supply +3.3V	
3	GND	Power Ground.	
4	GND	Power Ground	
5	RXIN0-	LVDS Receiver Signal(-)	PIN#48
6	RXIN0+	LVDS Receiver Signal(+)	PIN#47
7	GND	Ground	
8	RXIN1-	LVDS Receiver Signal(-)	PIN#46
9	RXIN1+	LVDS Receiver Signal(+)	PIN#45
10	GND	Ground	
11	RXIN2-	LVDS Receiver Signal(-)	PIN#42
12	RXIN2+	LVDS Receiver Signal(+)	PIN#41
13	GND	Ground	
14	RXCLK IN-	LVDS Receiver Clock Signal(-)	PIN#40
15	RXCLK IN+	LVDS Receiver Clock Signal(+)	PIN#39
16	GND	Ground	
17	RXIN3-	LVDS Receiver Signal(-)	PIN#38
18	RXIN3+	LVDS Receiver Signal(+)	PIN#37
19	GND	Ground	
20	GND	Ground	**Note 1**

Note: 1. 20nd Pin should be ground.
2. All GND(ground) pins should be connected together and to Vss which should also be connected to the LCD's metal frame.
3. All VLCD (power input) pins should be connected together.
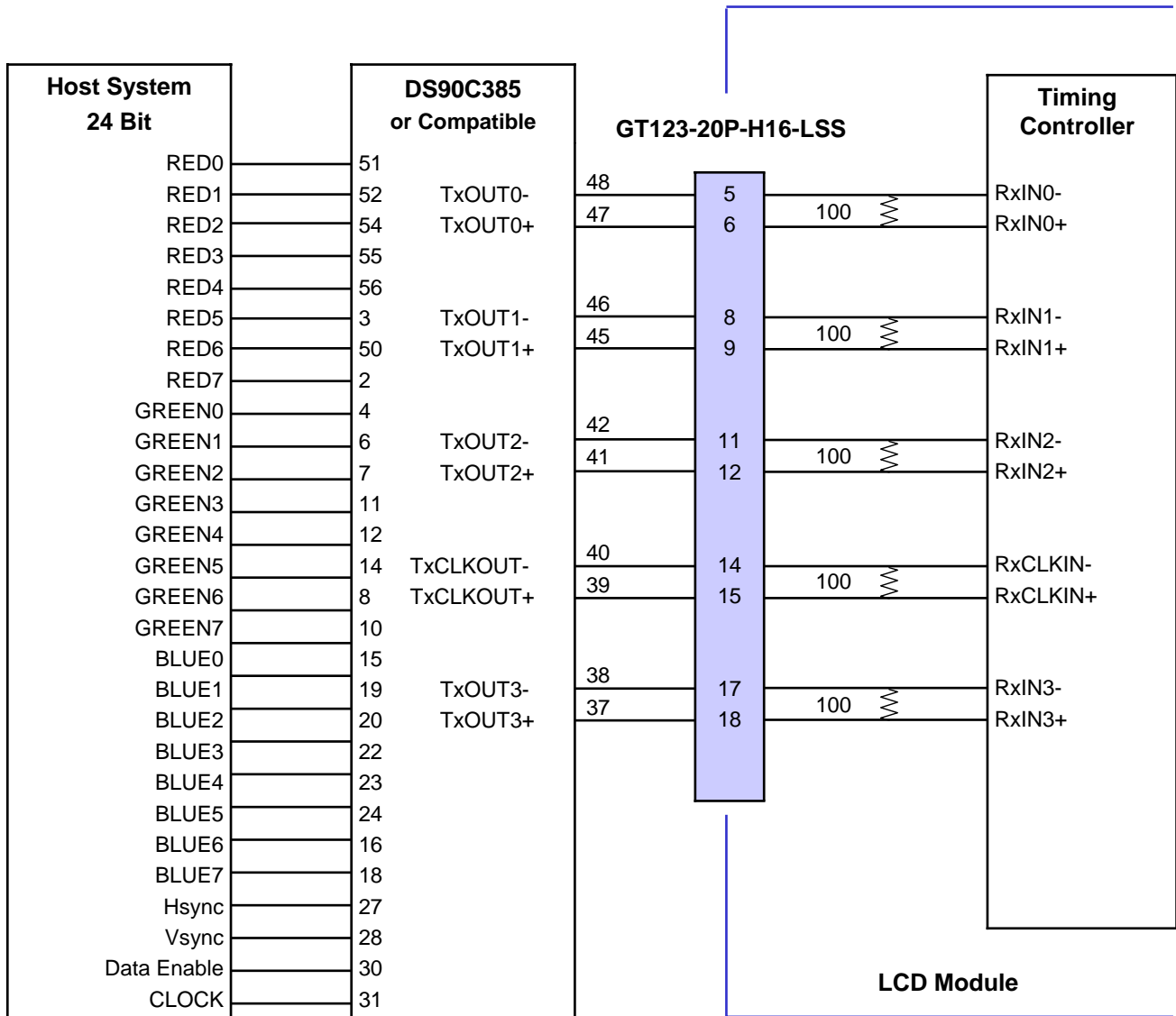4. Input Level of LVDS signal is based on the IEA 664 Standard.

Rear view of LCM

20　　　**1**

GT123-20P-H16-LSS(LSC)

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Table 4. REQUIRED SIGNAL ASSIGNMENT FOR LVDS Transmitter (DS90C385 or Compatible)

Pin #	Pin Name	Symbol	Description	Output
51	TxIN0	Red0 [LSB]	Red Pixel Data	Rx0- Rx0+
52	TxIN1	Red1	Red Pixel Data	
54	TxIN2	Red2	Red Pixel Data	
55	TxIN3	Red3	Red Pixel Data	
56	TxIN4	Red4	Red Pixel Data	
2	TxIN5	Red7 [MSB]	Red Pixel Data	Rx3- Rx3+
3	TxIN6	Red5	Red Pixel Data	Rx0- Rx0+
4	TxIN7	Green0 [LSB]	Green Pixel Data	
6	TxIN8	Green1	Green Pixel Data	Rx1- Rx1+
7	TxIN9	Green2	Green Pixel Data	
8	TxIN10	Green6	Green Pixel Data	Rx3- Rx3+
10	TxIN11	Green7 [MSB]	Green Pixel Data	
11	TxIN12	Green3	Green Pixel Data	Rx1- Rx1+
12	TxIN13	Green4	Green Pixel Data	
14	TxIN14	Green5	Green Pixel Data	
15	TxIN15	Blue0 [LSB]	Blue Pixel Data	
16	TxIN16	Blue6	Blue Pixel Data	Rx3- Rx3+
18	TxIN17	Blue7 [MSB]	Blue Pixel Data	
19	TxIN18	Blue1	Blue Pixel Data	Rx1- Rx1+
20	TxIN19	Blue2	Blue Pixel Data	Rx2- Rx2+
22	TxIN20	Blue3	Blue Pixel Data	
23	TxIN21	Blue4	Blue Pixel Data	
24	TxIN22	Blue5	Blue Pixel Data	
25	TxIN23	RES		Rx3- Rx3+
27	TxIN24	Hsync.	No connection, If unnecessary	Rx2- Rx2+
28	TxIN25	Vsync.	No connection, If unnecessary	
30	TxIN26	EN	Data Enable	
50	TxIN27	Red6	Red Pixel Data	Rx3- Rx3+

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.

Table 5. REQUIRED SIGNAL ASSIGNMENT FOR LVDS TRANSMITTER (DS90C385 or Compatible)

Host System 24 Bit		DS90C385 or Compatible	GT123-20P-H16-LSS		Timing Controller
RED0	51				
RED1	52	TxOUT0-	48 → 5		RxIN0-
RED2	54	TxOUT0+	47 → 6	100	RxIN0+
RED3	55				
RED4	56				
RED5	3	TxOUT1-	46 → 8		RxIN1-
RED6	50	TxOUT1+	45 → 9	100	RxIN1+
RED7	2				
GREEN0	4				
GREEN1	6	TxOUT2-	42 → 11		RxIN2-
GREEN2	7	TxOUT2+	41 → 12	100	RxIN2+
GREEN3	11				
GREEN4	12				
GREEN5	14	TxCLKOUT-	40 → 14		RxCLKIN-
GREEN6	8	TxCLKOUT+	39 → 15	100	RxCLKIN+
GREEN7	10				
BLUE0	15				
BLUE1	19	TxOUT3-	38 → 17		RxIN3-
BLUE2	20	TxOUT3+	37 → 18	100	RxIN3+
BLUE3	22				
BLUE4	23				
BLUE5	24				
BLUE6	16				
BLUE7	18				
Hsync	27				
Vsync	28				
Data Enable	30				
CLOCK	31				

LCD Module

Note : 1. The LCD Module uses a 100Ohm resistor between positive and negative lines of each receiver input.

Table 6. BACKLIGHT CONNECTOR PIN CONFIGURATION(CN2,CN3)

The backlight interface connector is a model BHR-03VS-1(CN2/CN3), 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.

No	Pin	Symbol	Description	Notes
CN2	1	H1	Power supply for lamp 1(High voltage side), Sky Blue	1
	2	NC	No Connect	
	3	L1	Power supply for lamp 1 (Low voltage side), Black	2
CN3	1	H2	Power supply for lamp 2 (High voltage side), Sky Blue	1
	2	NC	No Connect	
	3	L2	Power supply for lamp 2 (Low voltage side), Black	2

Notes: 1. The high voltage power terminal is colored Sky Blue.
             2. The low voltage pin is colored Black.

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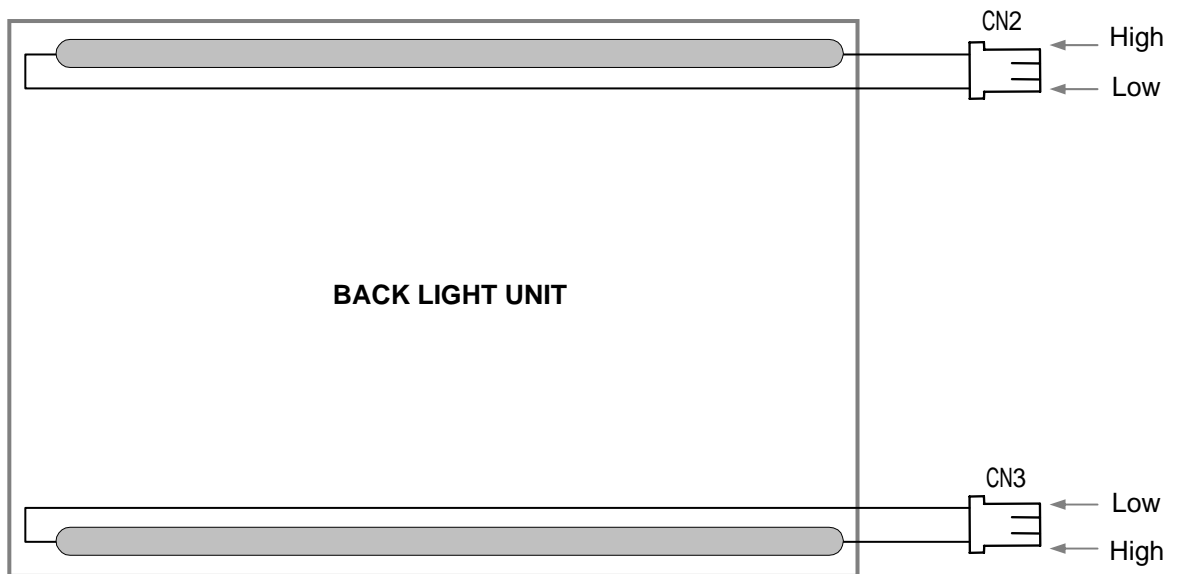
3-3. Signal Timing Specifications

This is the signal timing required at the input of the LVDS Transmitter. All of the interface signal timing should be satisfied with the following specifications for it's proper operation.
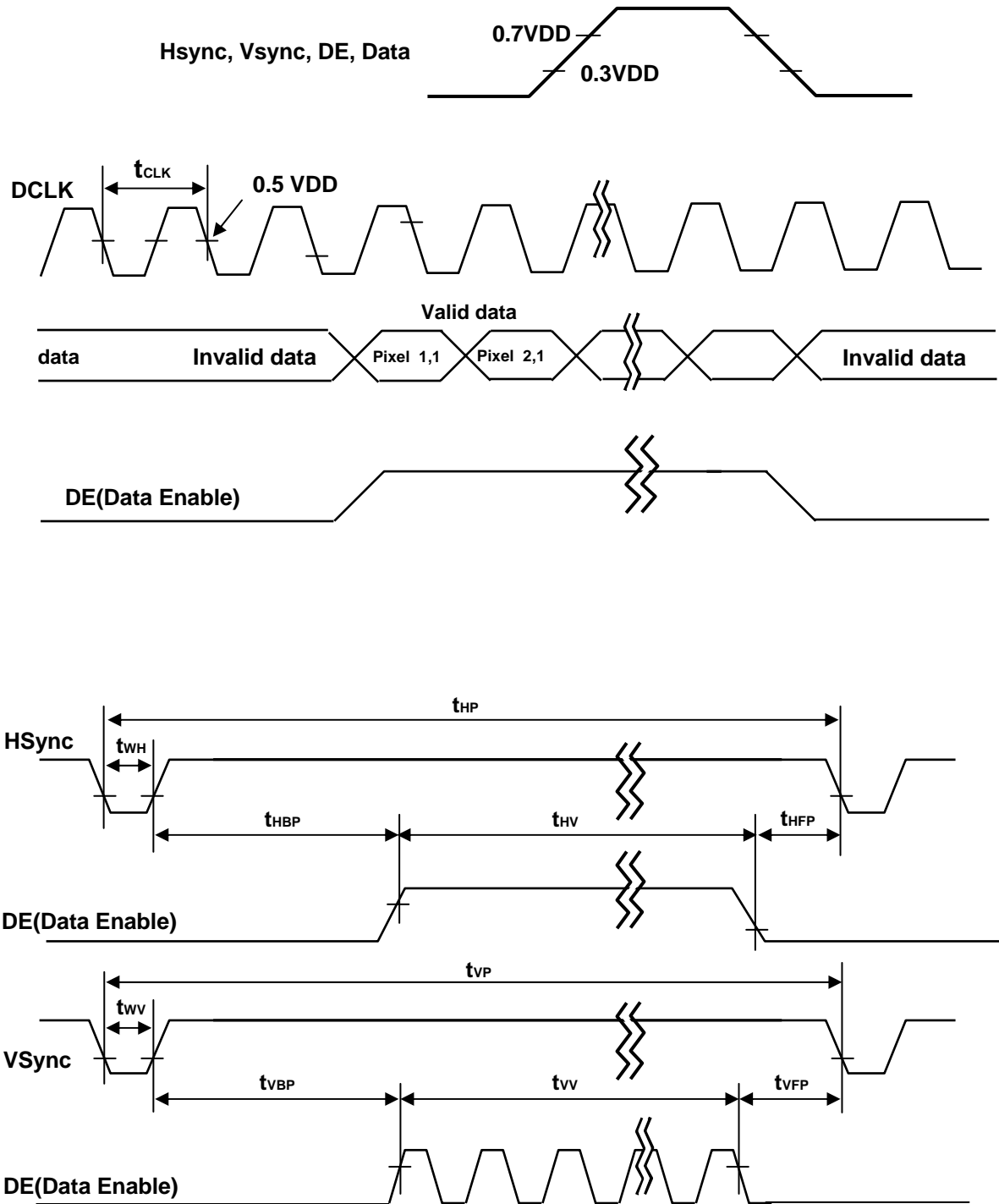
Table 7. Timing Table

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Period	tCLK	12.70	15.38	20.00	ns	
	Frequency	-	50	65	79	MHz	
Hsync	Period	tHP	1096	1344	1360	tCLK	
	Width	tWH	8	136	320	tCLK	
Vsync	Period	tVP	780	806	862	tHP	
	Frequency	fV	50	60	75	Hz	
	Width	tWV	2	6	88	tHP	
DE (Data Enable)	Horizontal Valid	tHV	1024	1024	1024	tCLK	
	Horizontal Back Porch	tHBP	8	160	320		
	Horizontal Front Porch	tHFP	8	24	320		
	-	-	-	-	-		
	Vertical Valid	tVV	768	768	768	tHP	
	Vertical Back Porch	tVBP	4	29	90		
	Vertical Front Porch	tVFP	2	3	88		
	-	-	-	-	-		

Note: Hsync period and Hsync width-active should be even number times of tCLK. If the value is odd number times of tCLK, display control signal can be asynchronous. In order to operate this LCM a Hsync, Vsyn, 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 of character number(8).

3-4. Signal Timing Waveforms

Hsync, Vsync, DE, Data

0.7VDD

0.3VDD

DCLK t_{CLK} 0.5 VDD

data   **Invalid data**   **Valid data**   Pixel 1,1   Pixel 2,1   **Invalid data**

DE(Data Enable)

HSync t_{WH} t_{HP}

t_{HBP} t_{HV} t_{HFP}

DE(Data Enable)

VSync t_{WV} t_{VP}

t_{VBP} t_{VV} t_{VFP}

DE(Data Enable)

3-5. Color Data Reference

The Brightness of each primary color(red,green,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 8. 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 Color	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 (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)	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	0	1	0	0	0	0	0	0	0	0	
	...			...								...								...						
	GREEN (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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	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 (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	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	

Note : Users should be input true 8 Bit data streams via LVDS transmitter.

3-6. Power Sequence
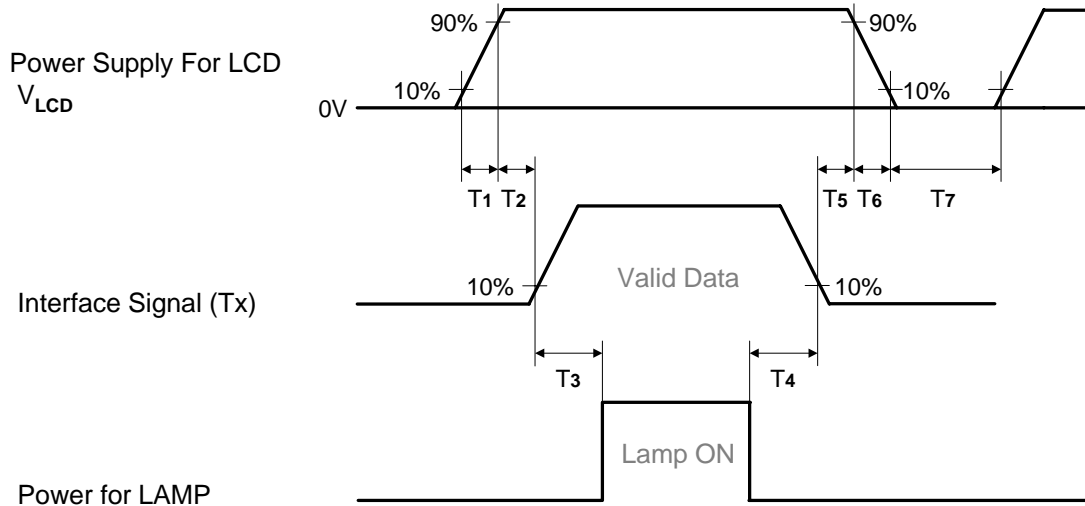
Table 9. POWER SEQUENCE

Parameter	Values			Units
	Min	Typ	Max	
T1	0.01	-	10	ms
T2	0.01	-	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0.01	-	50	ms
T6	0.01	-	10	ms
T7	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 V_{LCD} to 0V.
3. Lamp power must be turn on after power supply for LCD an interface signal are valid.

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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.
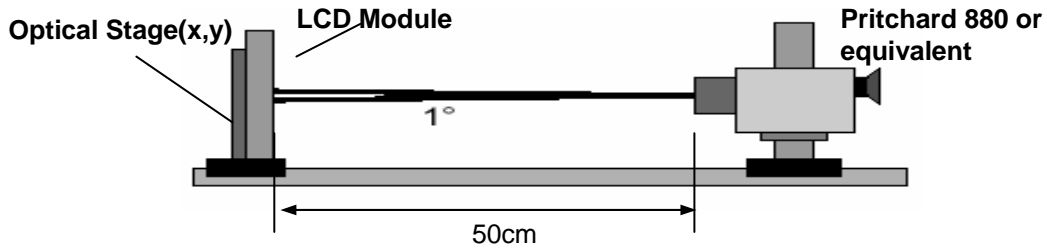
FIG. 1 Optical Characteristic Measurement Equipment and Method

Table 10. OPTICAL CHARACTERISTICS   Ta= 25± 2°C, V_{LCD}=3.3V, fv=60Hz, Dclk=65MHz, I_{Lamp}=8mA

Parameter		Symbol		Values			Units	Notes
				Min	Typ	Max		
Contrast Ratio		CR		500	800	-		1
Surface Luminance, white		L_{WH}		200	250	-	cd/m^2	2
Luminance Variation	δ_{WHITE}	9P		-		1.33	-	3
Response Time	Rise Time	Tr_R		-	2	5	ms	4
	Decay Time	Tr_D		-	6	11	ms	
Color Coordinates [CIE1931]	RED	Rx			0.610			
		Ry			0.339			
	GREEN	Gx			0.304			
		Gy		Typ -0.03	0.594	Typ +0.03		
	BLUE	Bx			0.150			
		By			0.086			
	WHITE	Wx			0.313			
		Wy			0.329			
Viewing Angle (CR>10)					140/140			
	x axis, right(φ=0°)	θr		60	70	-	degree	5
	x axis, left (φ=180°)	θl		60	70	-		
	y axis, up (φ=90°)	θu		55	65	-		
	y axis, down (φ=270°)	θd		65	75	-		
Viewing Angle (CR>5)					150/145			
	x axis, right(φ=0°)	θr		65	75	-		
	x axis, left (φ=180°)	θl		65	75	-		
	y axis, up (φ=90°)	θu		60	70	-		
	y axis, down (φ=270°)	θd		65	75	-		
Gray Scale				-	2.2	-		6
Crosstalk				-	-	1.8	%	

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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 2.

3. The variation in surface luminance , δ WHITE is defined as :
δ WHITE(9P) = Maximum($L_{on1}, L_{on2}, L_{on3}, ..., L_{on9}$) / Minimum($L_{on1}, L_{on2}, L_{on3}, ..., L_{on9}$)
Where L_{on1} to L_{on9} are the luminance with all pixels displaying white at 9 locations .
For more information see FIG 2.

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.

6. Gray scale specification
Gamma Value is approximately 2.2. For more information see Table 11.

7. This is designed to meet TCO'03 RGB settings standard.

Table 11. Gray Scale Specification

Gray Level	Luminance [%] (Typ)
L0	0. 1
L15	0. 25
L31	1. 2
L47	2. 5
L63	4. 7
L79	7. 8
L95	11. 7
L111	16. 0
L127	21. 2
L143	27. 7
L159	35. 2
L175	43. 5
L191	53. 0
L207	63. 7
L223	75. 4
L239	86. 4
L255	100

Measuring point for surface luminance & measuring point for luminance variation

A : H/10 mm C : 1/2H
B : V/10 mm D : 1/2V
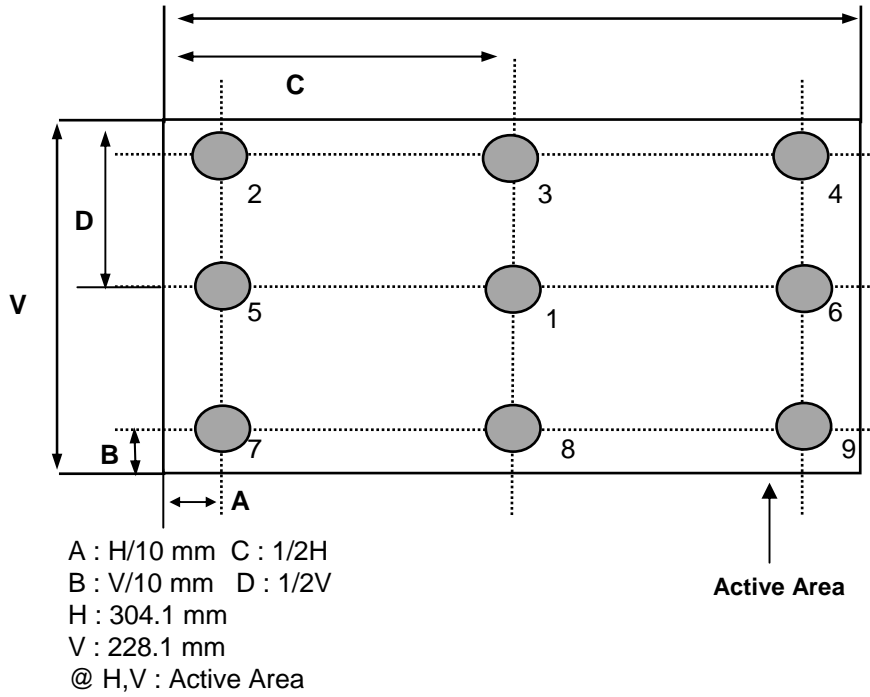H : 304.1 mm
V : 228.1 mm
@ H,V : Active Area

FIG. 2 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".
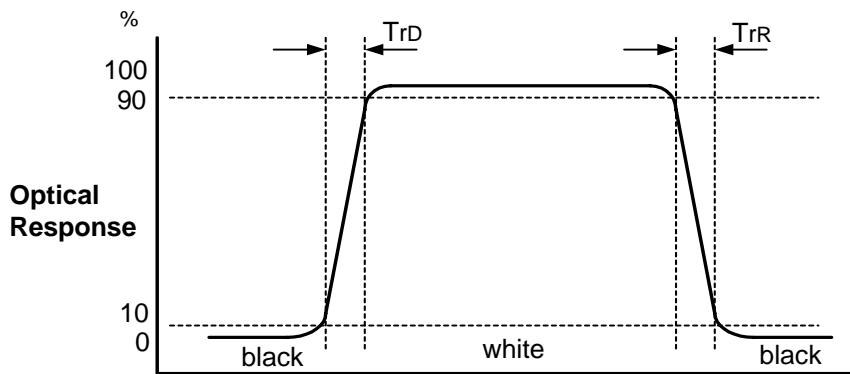
FIG. 3 Response Time

LG.PHILIPS LCD

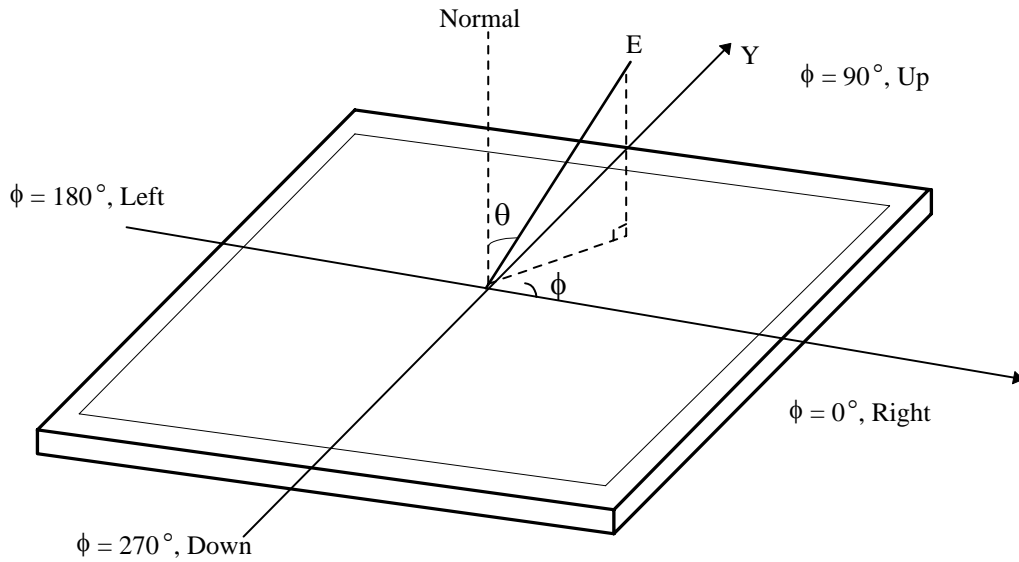Product Specification

Dimension of viewing angle range

FIG. 4 Viewing angle

Crosstalk is defined as:

$$(|L_{A[or\ C]2} - L_{A[or\ C]1}| / L_{A[or\ C]1}) \times 100(\%) [Vertical],$$
$$(|L_{B[or\ D]2} - L_{B[or\ D]1}| / L_{B[or\ D]1}) \times 100(\%) [Horizontal]$$
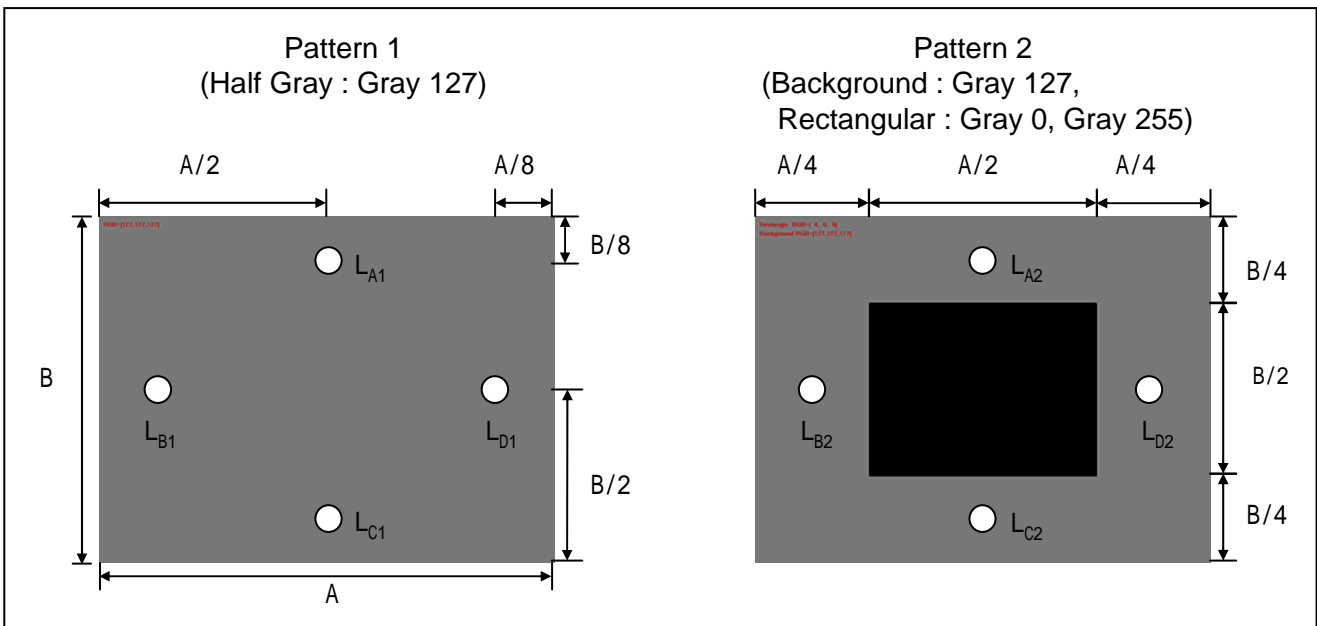
FIG. 5 Crosstalk

5. Mechanical Characteristics

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

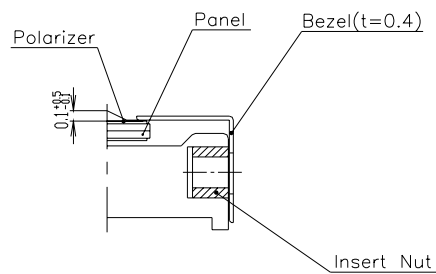|		
	Horizontal	326.5mm
Outline Dimension	Vertical	253.5mm
	Depth	11.2mm
Bezel Area	Horizontal	307.4 mm
	Vertical	231.3 mm
Active Display Area	Horizontal	304.128mm
	Vertical	228.096mm
Weight	1,000 g(Typ.), 1,050 g(Max.)	
Surface Treatment	Hard coating(3H) Anti-glare treatment of the front polarizer	

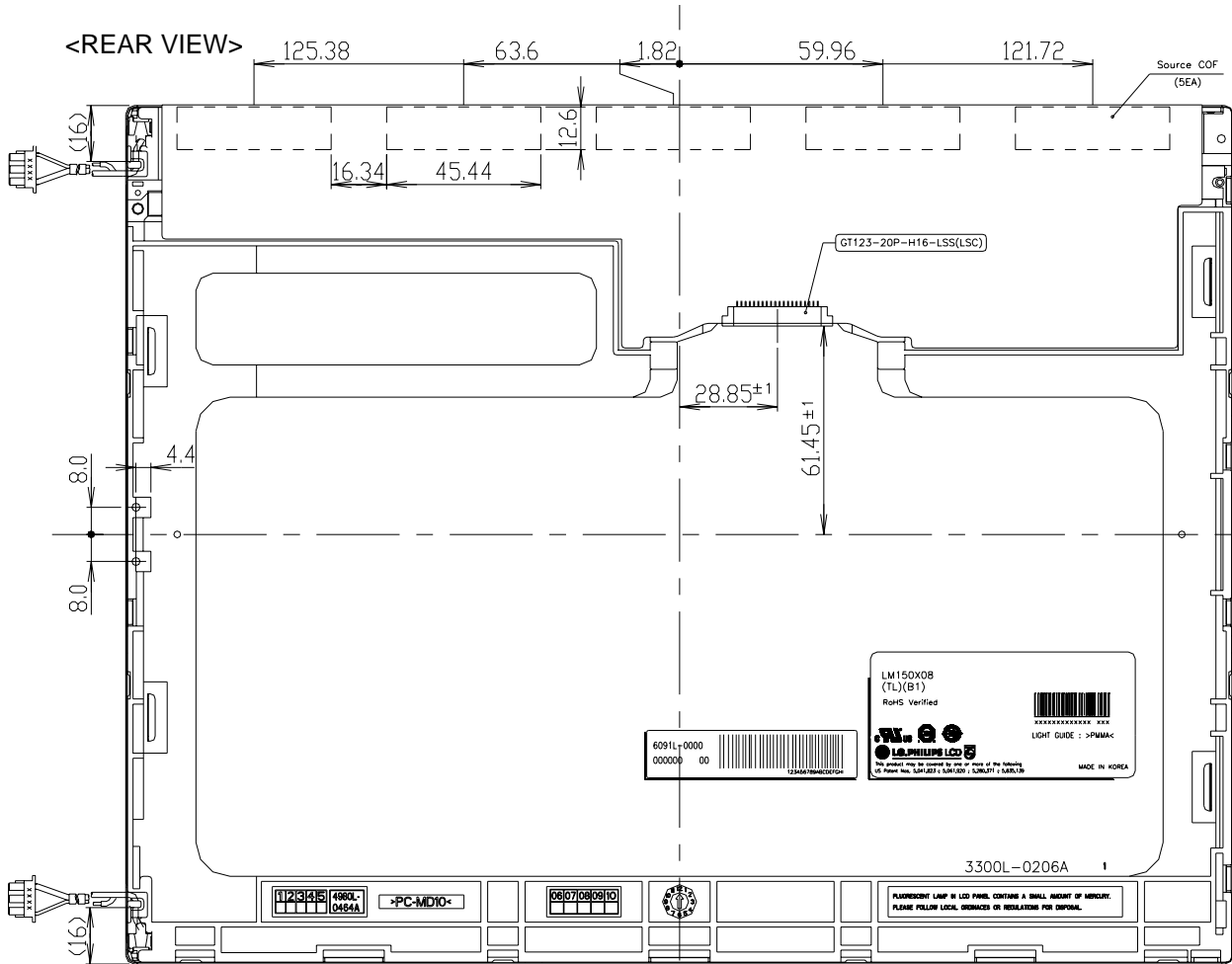Notes : Please refer to a mechanic drawing in terms of tolerance at the next page.

LG.PHILIPS LCD

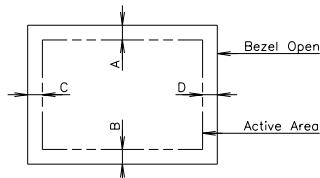Product Specification

<FRONT VIEW>

Active Area
304.128X228.096

Bezel Open
307.4X231.3

ACTIVE AREA CENTER

UP

3110T-0257A

4-M3
(Torque:2.5~
3.5kgf.cm)

11.2
5.5±0.3
112±0.3
126.75
253.5
112±0.3
163.25
326.5

140±5
120
(10)
BHR-03VS-1(JST)

88±0.3
88±0.3

120
140±5
(10)
BHR-03VS-1(JST)

A

B

Bezel(t=0.4)   Panel   Polarizer

0.5
Insert Nut
4.2(Max)

SEC A~

Polarizer   Panel   Bezel(t=0.4)

0.1±0.5
Insert Nut

SEC B~

<REAR VIEW>

125.38   63.6   1.82   59.96   121.72   Source COF (5EA)

16.34   45.44   12.6

GT123-20P-H16-LSS(LSC)

28.85±1   61.45±1

LM150X08
(TL)(B1)
RoHS Verified
XXXXXXXXXXX XXX
LIGHT GUIDE : >PMMA<

6091L-0000
000000   00

MADE IN KOREA

3300L-0206A

8.0   4.4   8.0

1 2 3 4 5 4990L- 0464A   >PC-MD10<   06 07 08 09 10

FLUORESCENT LAMP IN LCD PANEL CONTAINS A SMALL AMOUNT OF MERCURY.
PLEASE FOLLOW LOCAL ORDINANCE OR REGULATIONS FOR DISPOSAL.

NOTES

1. Unspecified tolerances to be ±0.5
2. Backlight wires and contraction tubes are excluded from outline dimensions.
3. I/F Connector Specification.
   – GT123-20P-H16-LSS(LSC) or Equivalent.
4. Lamp Connector Specification.
   – BHR-03VS-1(JST) or Equivalent.
5. Torque of user hole : 2.5~3.5 kgf-cm
6. The COF area is weak & sensitive, So, please don't press the COF area.
7. Tilt and partial disposition tolerance of display area as following.
   (1) Y-Direction : |A-B| ≤ 0.7
   (2) X-Direction : |C-D| ≤ 0.7

A   C   D   B   Bezel Open   Active Area

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

Mark
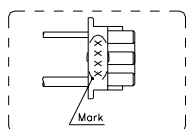
9. Do not wind conductive tape around the backlight wires.

Product Specification

6. Reliability

Environment test condition

No	Test Item	Condition
1	High temperature storage test	Ta= 60°C 240h
2	Low temperature storage test	Ta= -20°C 240h
3	High temperature operation test	Ta= 50°C 50%RH 240h
4	Low temperature operation test	Ta= 0°C 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 storage / shipment	0 - 10,000 feet(3048m) 0 - 40,000 feet(12,192m)

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 : 14pcs
b) Box size : 370mm X 320mm X 413mm.

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.