LG.PHILIPS LCD

Product Specification

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SPECIFICATION
FOR
APPROVAL

(●)　Preliminary Specification

(　　)　Final Specification

Title	17.1" WXGA TFT LCD

BUYER	-
MODEL	-

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LC171W03
SUFFIX	A4

*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.	

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RECORD OF REVISIONS

Revision No	Revision Date	Page	DESCRIPTION
0.1	Apr.01.2003	-	Preliminary Specification

1. General Description

LC171W03 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 black mode. It has a 17.1 inch diagonally measured active display area with WXGA resolution (768 vertical by 1280 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, a palette of more than 16,7M(true) colors.

It has been designed to apply the 8 bit LVDS interface.

It is intended to support LCD TV, PCTV where high brightness, wide viewing angle, high color saturation, and high color are important.
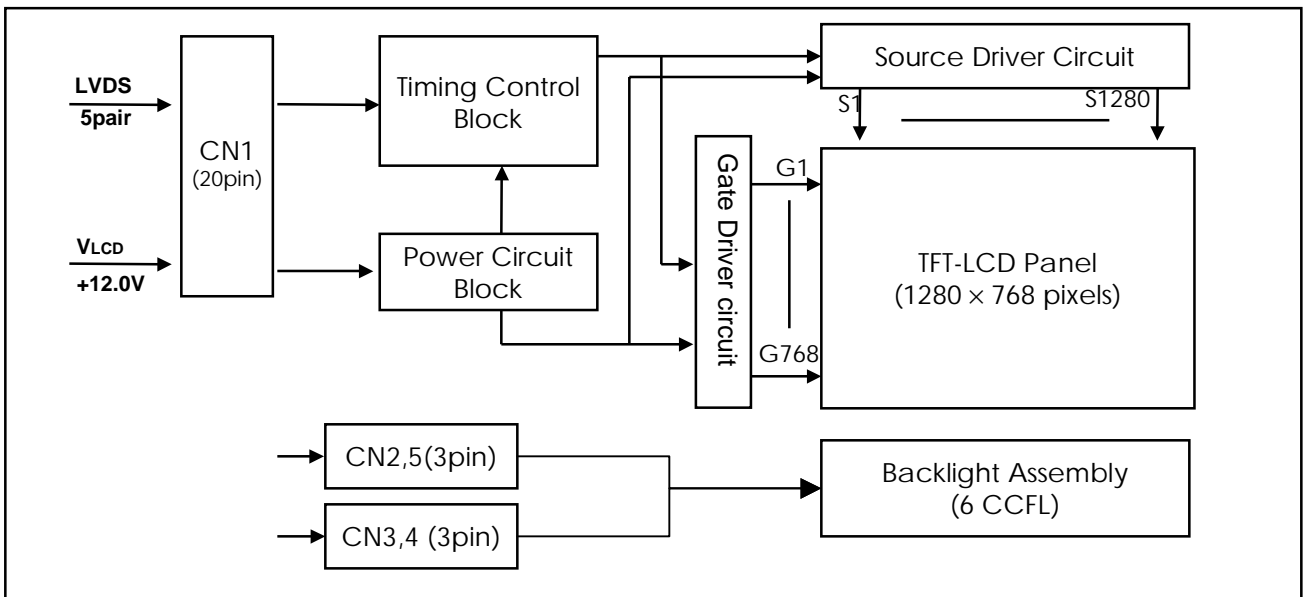
General Features

|	
Active Screen Size	17.1 inches(434.38mm) diagonal
Outline Dimension	400.0(H) x 258.0(V) x 22.0(D) mm(Typ.)
Pixel Pitch	0.291mm x 0.291mm
Pixel Format	1280 horiz. By 768 vert. Pixels RGB stripe arrangement
Color Depth	8-bits, 16,7M colors
Luminance, White	450 cd/m^2 (Center 1 point (Typ.))
Viewing Angle (CR>10)	Viewing Angle Free [R/L 176(Typ.), U/D 176(Typ.)]
Power Consumption	Total 30.4 Watt(Typ.), (2.2 Watt@VLCD, 28.2 Watt@450cd/[LAMP=7mA])
Weight	2,200 g (Typ.) , 2,350 g (Max)
Display Operating Mode	Transmissive mode, normally black
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	VLCD	-0.3	+14.0	Vdc	
Operating Temperature	TOP	0	50	°C	1
Storage Temperature	TST	-20	60	°C	1
Operating Ambient Humidity	HOP	10	90	%RH	1
Storage Humidity	HST	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.
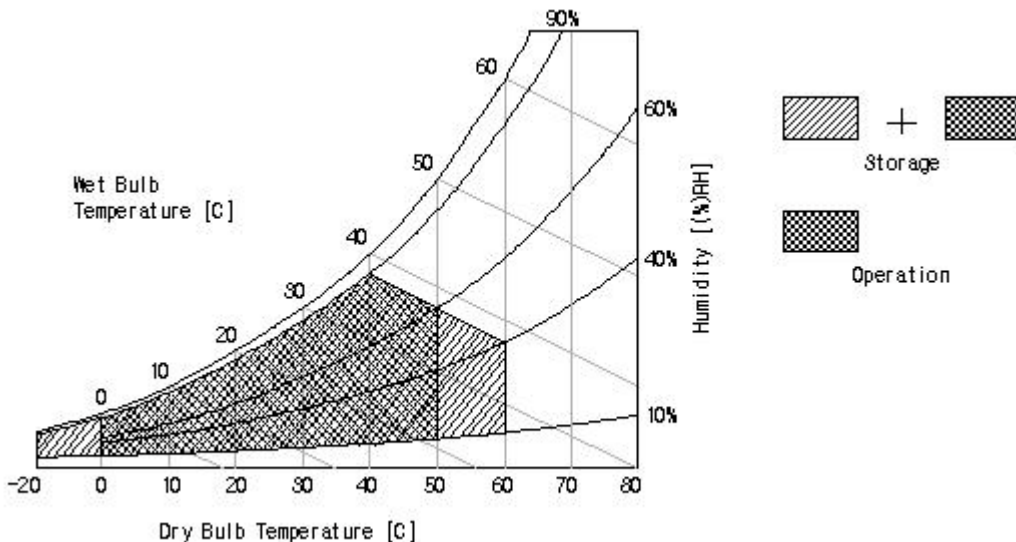
3. Electrical Specifications

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 /Backlight, is typically generated by an inverter. The inverter is an external unit to the LCDs.
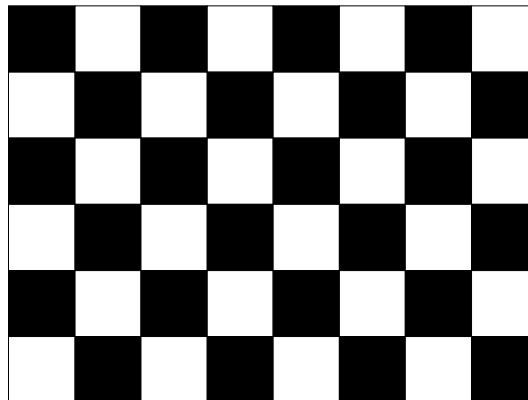
Table 2_1. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
MODULE :						
Power Supply Input Voltage	V_{LCD}	11.4	12.0	12.6	Vdc	
Power Supply Input Current	I_{LCD}	-	180	253	mA	1
		-	276	359	mA	2
Power Consumption	P_{LCD}	-	2.16	2.49	Watt	1
Rush current	I_{RUSH}	-	-	3.0	A	3

Note :
1. The specified current and power consumption are under the V_{LCD}=12.0V, $25 \pm 2°C$, 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)

Table 2_2. ELECTRICAL CHARACTERISTICS

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
LAMP :							
Operating Voltage		V_{BL}	660(7.5mA)	670(7mA)	770(3mA)	V_{RMS}	1, 2
Operating Current		I_{BL}	3.0	7.0	7.5	mA_{RMS}	1
Established Starting Voltage		Vs					1, 3
	at 25 °C				1,030	V_{RMS}	
	at 0 °C				1,340	V_{RMS}	
Operating Frequency		f_{BL}	45	60	80	kHz	4
Discharge Stabilization Time		Ts			3	Min	1, 5
Power Consumption		P_{BL}		28.20	31.10	Watt	6
Life Time			50,000			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 ± 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. ($P_{BL} = V_{BL}$ x I_{BL} x 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.

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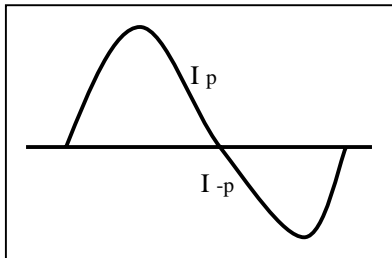
* Asymmetry rate:

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

* 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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3-2. Interface Connections

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─LCD Connector(CN1): GT123-20P-H16 (Manufactured by LG) or Equivalent
─Mating Connector : DF14-20S-1.25C (Manufactured by Hirose) or Equivalent

Table 3. MODULE CONNECTOR(CN1) PIN CONFIGURATION

Pin No	Symbol	Description	Polarity	Output Pin # (LVDS Tx)
1	V_{LCD}	Power Supply +12.0V		
2	V_{LCD}	Power Supply +12.0V		
3	GND	Power Ground.		
4	GND	Power Ground		
5	RXIN0-	LVDS Receiver Signal(-)	Negative	PIN#48
6	RXIN0+	LVDS Receiver Signal(+)	Positive	PIN#47
7	GND	Ground		
8	RXIN1-	LVDS Receiver Signal(-)	Negative	PIN#46
9	RXIN1+	LVDS Receiver Signal(+)	Positive	PIN#45
10	GND	Ground		
11	RXIN2-	LVDS Receiver Signal(-)	Negative	PIN#42
12	RXIN2+	LVDS Receiver Signal(+)	Positive	PIN#41
13	GND	Ground		
14	RXCLK IN-	LVDS Receiver Clock Signal(-)	Negative	PIN#40
15	RXCLK IN+	LVDS Receiver Clock Signal(+)	Positive	PIN#39
16	GND	Ground		
17	RXIN3-	LVDS Receiver Signal(-)	Negative	PIN#38
18	RXIN3+	LVDS Receiver Signal(+)	Positive	PIN#37
19	GND	Ground		
20	GND	Ground		**Note 1**

Note:　1. 20th 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 V_{LCD} (power input) pins should be connected together.
　　　　4. Input Level of LVDS signal is based on the IEA 664 Standard.

Rear view of LCM
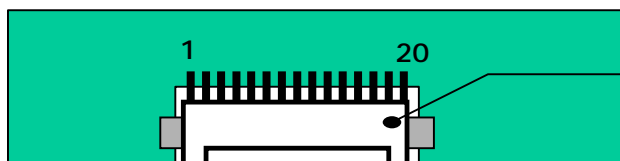
GT123-20P-H16(LG)

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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.

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Table 5. REQUIRED SIGNAL ASSIGNMENT FOR LVDS TRANSMITTER (DS90C385 or Compatible)
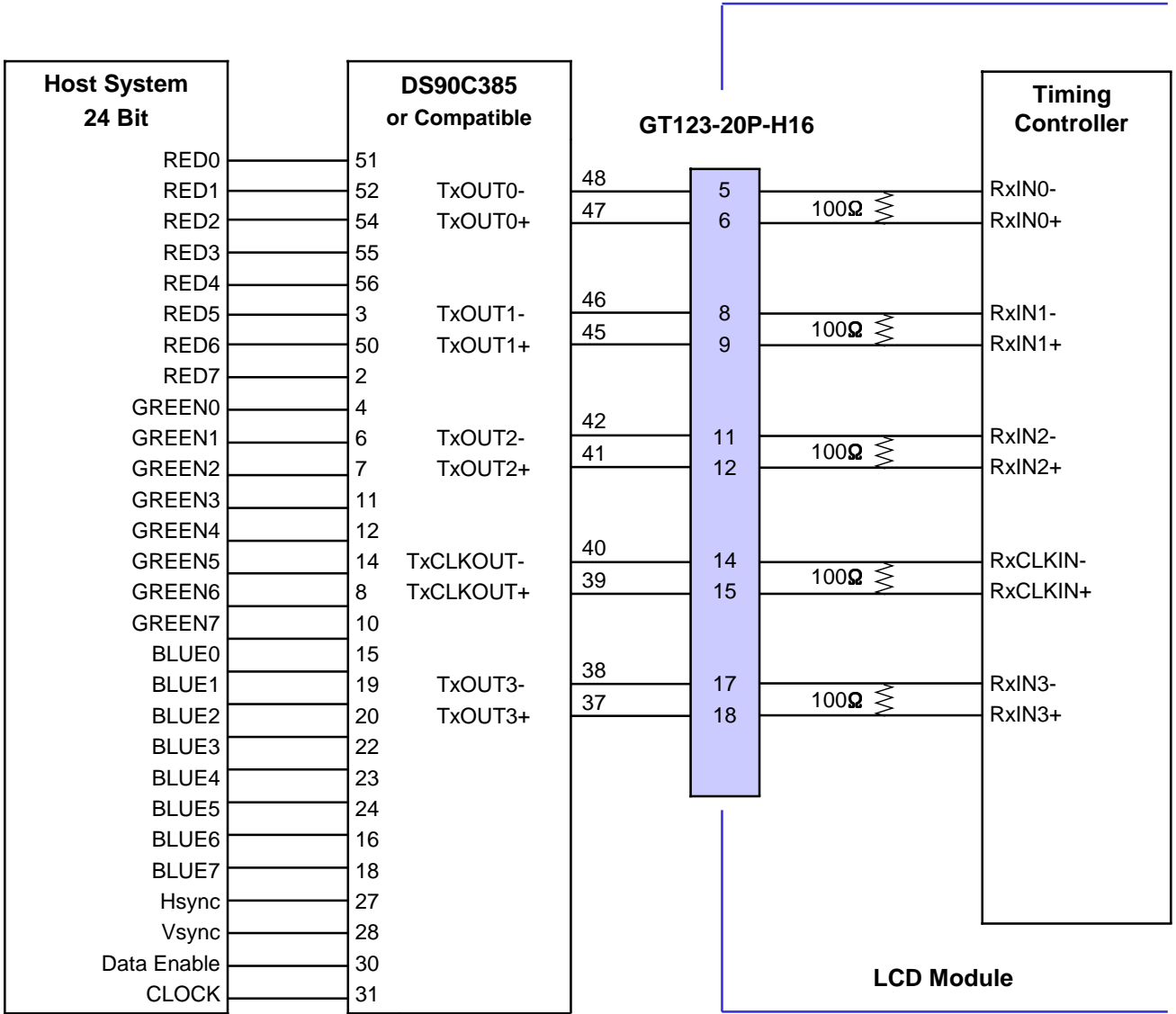
Notes : The LCD Module uses a 100 Ohm resistor between positive and negative lines of each receiver input.

Table 6. BACKLIGHT CONNECTOR PIN CONFIGURATION(CN2,CN3,CN4,CN5)   www.DataSheet4U.com

The backlight interface connector is a model PHR-3(CN3/CN4) and BHR-03VS-1(CN2/CN5) manufactured by JST. The mating connector part number are S 3B-PH-KL (3pin), SM03(4.0)B-BHS-1-TB (3pin) 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) –White	1
	2	H2	Power supply for lamp 2 (High voltage side) –Sky Blue	1
	3	H3	Power supply for lamp 3 (High voltage side) -Gray	1
CN3	1	L1	Power supply for lamp 1 (Low voltage side) -White	2
	2	L2	Power supply for lamp 2 (Low voltage side) -Blue	2
	3	L3	Power supply for lamp 3 (Low voltage side) -Black	2
CN4	1	L4	Power supply for lamp 4 (Low voltage side) -White	2
	2	L5	Power supply for lamp 5 (Low voltage side) -Blue	2
	3	L6	Power supply for lamp 6 (Low voltage side) -Black	2
CN5	1	H4	Power supply for lamp 4 (High voltage side) -White	1
	2	H5	Power supply for lamp 5 (High voltage side) –Sky Blue	1
	3	H6	Power supply for lamp 6 (High voltage side) -Gray	1

Notes: 1.   The high voltage power terminal is colored white,sky blue,gray.
2.   The low voltage pin color is white,dark blue,black .
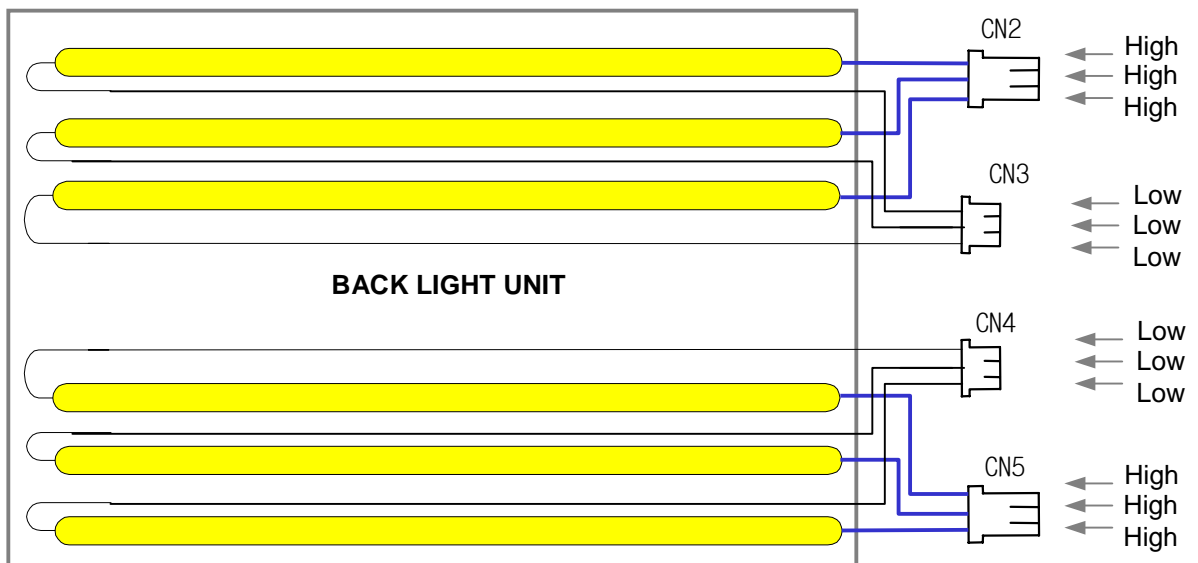
3-3. Signal Timing Specifications

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 for it's proper operation.
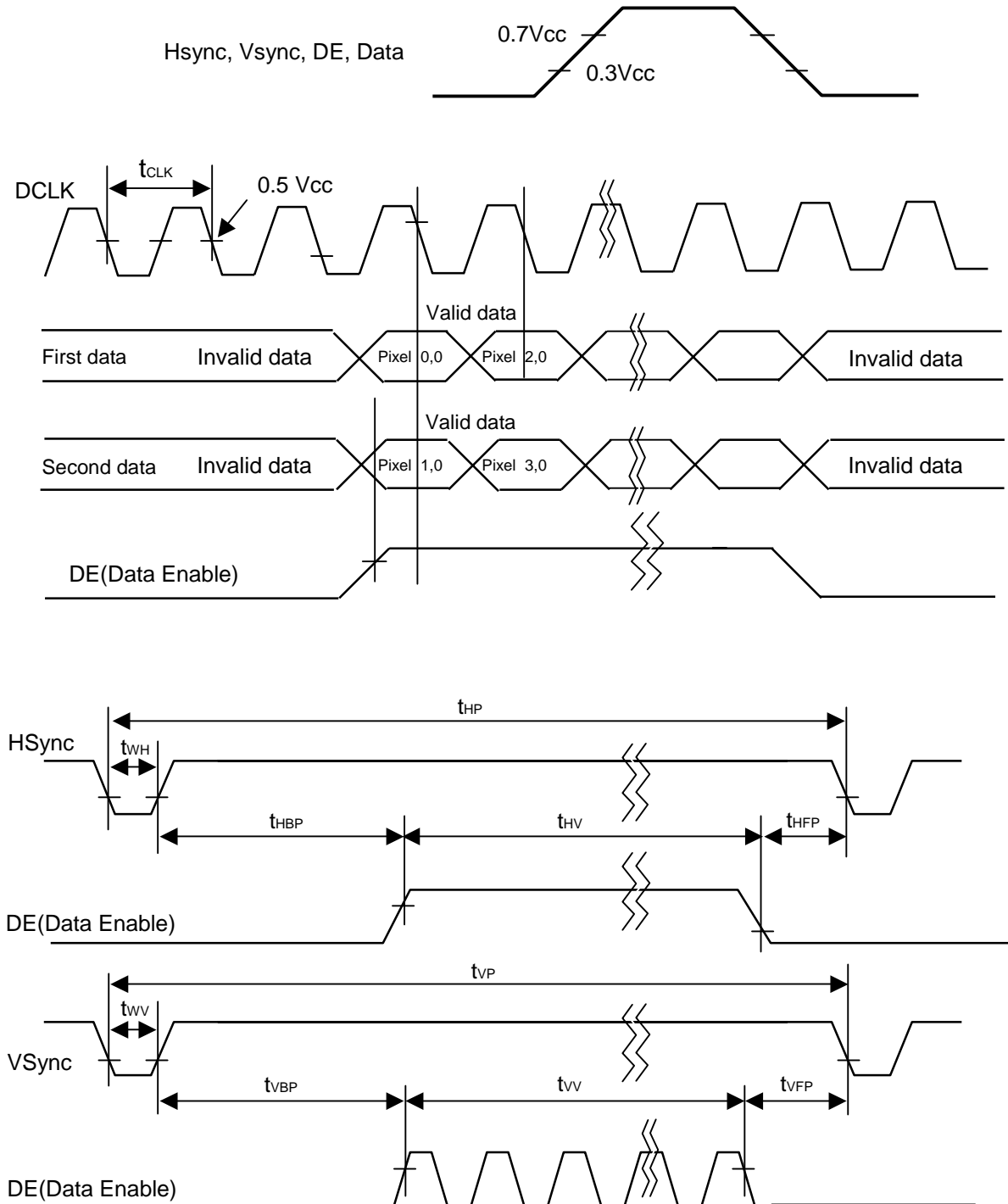
Table 7. Timing Table

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Period	tCLK	12.20	14.65	18.52	ns	
	Frequency		54.00	68.25	82.00	MHz	
Hsync	Period	tHP	1328	1440	1800	tCLK	
	Width	tWH	16	32	-	tCLK	
Vsync	Period	tVP	773	790	1100	tHP	Note 1) PAL : 47~53Hz NTSC : 57~63Hz
	Frequency	fV	47	60	63	Hz	
	Width	tWV	2	7	-	tHP	
DE (Data Enable)	Horizontal Valid	tHV	1280	1280	1280	tCLK	
	Horizontal Back Porch	tHBP	16	80	-		
	Horizontal Front Porch	tHFP	16	48	-		
	Horizontal Blank	-	48	160	-		
	Vertical Valid	tVV	768	768	768	tHP	
	Vertical Back Porch	tVBP	2	13	-		
	Vertical Front Porch	tVFP	1	2	-		
	Vertical Blank	-	5	22	-		

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, 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, Hsync should be keep the above specification.
3. Hsync Period, Hsync Width and Horizontal Back Porch should be any times of a character number (8).

3-4. Signal Timing Waveforms

Hsync, Vsync, DE, Data

0.7Vcc

0.3Vcc

DCLK

t_{CLK}

0.5 Vcc

First data   Invalid data   Valid data   Pixel 0,0   Pixel 2,0   Invalid data

Second data   Invalid data   Valid data   Pixel 1,0   Pixel 3,0   Invalid data

DE(Data Enable)

HSync

t_{HP}

t_{WH}

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

DE(Data Enable)

VSync

t_{VP}

t_{WV}

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

DE(Data Enable)

3-5. Color Input Data Reference

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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)	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)	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)	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

3-6. Power Sequence

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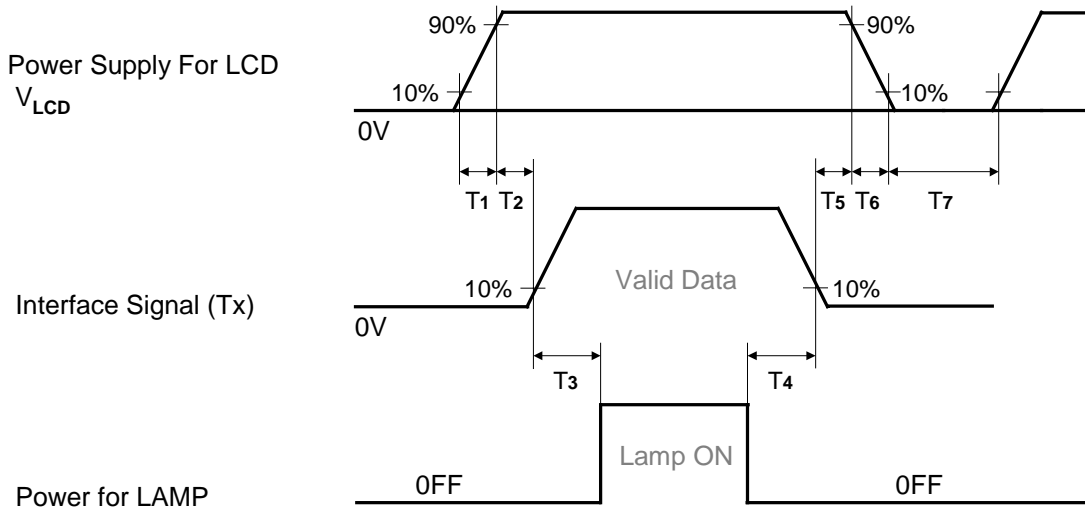
Table 9. POWER SEQUENCE

Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0.5	-	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0.5	-	50	ms
T6	-	-	100	ms
T7	1	-	-	s

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

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Optical characteristics are determined after the unit has been 'ON' for 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.
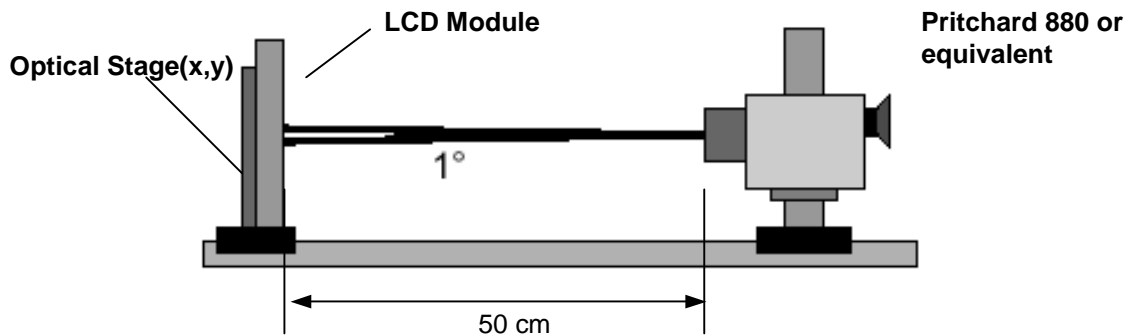
FIG. 1 Optical Characteristic Measurement Equipment and Method

Table 10. OPTICAL CHARACTERISTICS

Ta= 25±2°C, V$_{LCD}$=12.0V, f$_V$=60HzDclk=68.25MHz, I$_{BL}$=7mA

Parameter		Symbol		Values			Units	Notes
				Min	Typ	Max		
Contrast Ratio		CR		300	400	-		1
Surface Luminance, white		L$_{WH}$		360	450	-	cd/m^2	2
Luminance Variation		δ$_{WHITE}$	5P			1.3		3
Response Time	Rise Time	Tr$_R$		-	12		ms	4
	Decay Time	Tr$_D$		-	13		ms	4
Color Coordinates [CIE1931]	RED	Rx			0.633			
		Ry			0.341			
	GREEN	Gx			0.280			
		Gy		Typ -0.03	0.603	Typ +0.03		
	BLUE	Bx			0.145			
		By			0.069			
	WHITE	Wx			0.289			
		Wy			0.303			
Viewing Angle (CR>10)								
	x axis, right(φ=0°)	θr		85	88		degree	5
	x axis, left (φ=180°)	θl		85	88			
	y axis, up (φ=90°)	θu		85	88			
	y axis, down (φ=270°)	θd		85	88			
Gray Scale					-			6

Product Specification

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

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

It is measured 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(5P) = Maximum($L_{on1}, L_{on2}, L_{on3}, ..., L_{on5}$) / Minimum($L_{on1}, L_{on2}, L_{on3}, ..., L_{on5}$)
Where L_{on1} to L_{on5} are the luminance with all pixels displaying white at 5 locations .
For more information see FIG 2.

4. Response time is the time required for the display to transition from black to white(Rise Time, Tr_R) and from white to black(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.   .

Table 11. Gray Scale Specification

Gray Level	Luminance [%] (Typ)
L0	0.25
L15	0.37
L31	1.01
L47	2.23
L63	4.10
L79	7.63
L95	12.2
L111	17.5
L127	23.1
L143	30.6
L159	39.3
L175	49.1
L191	59.2
L207	70.1
L223	81.4
L239	91.7
L255	100

Measuring point for surface luminance & measuring point for luminance variation

A : H / 4 mm
B : V / 4 mm
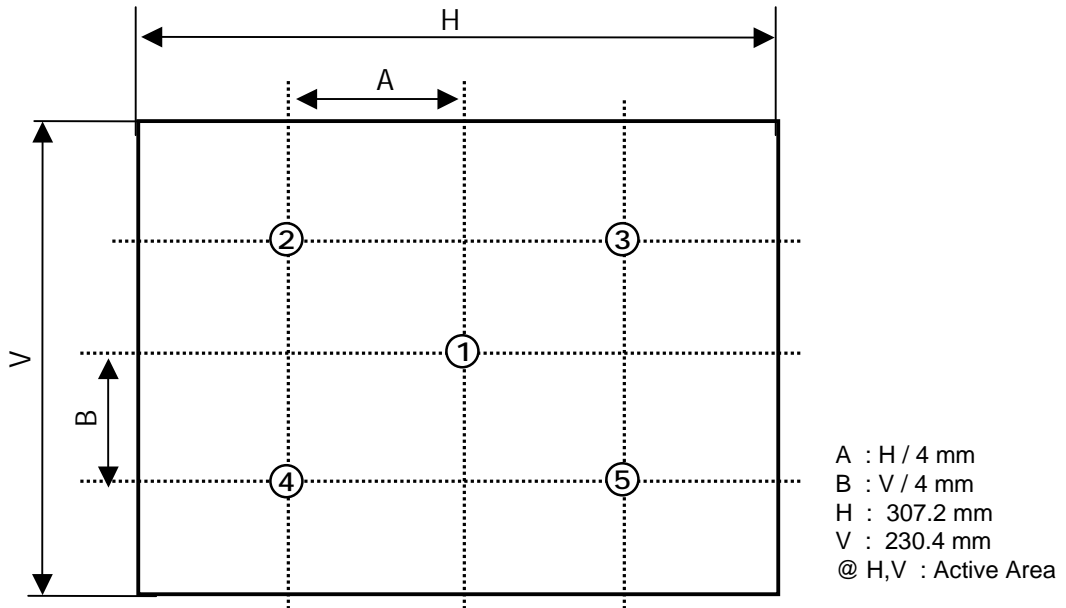H : 307.2 mm
V : 230.4 mm
@ H,V : Active Area

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".
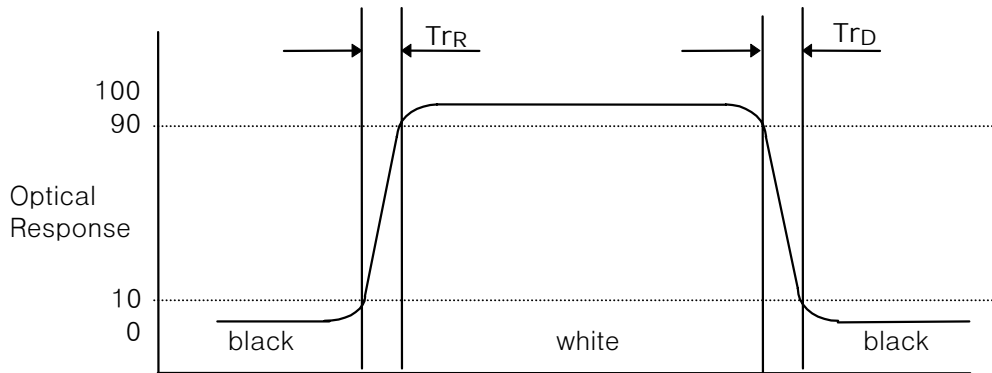

FIG. 3 Response Time

Product Specification

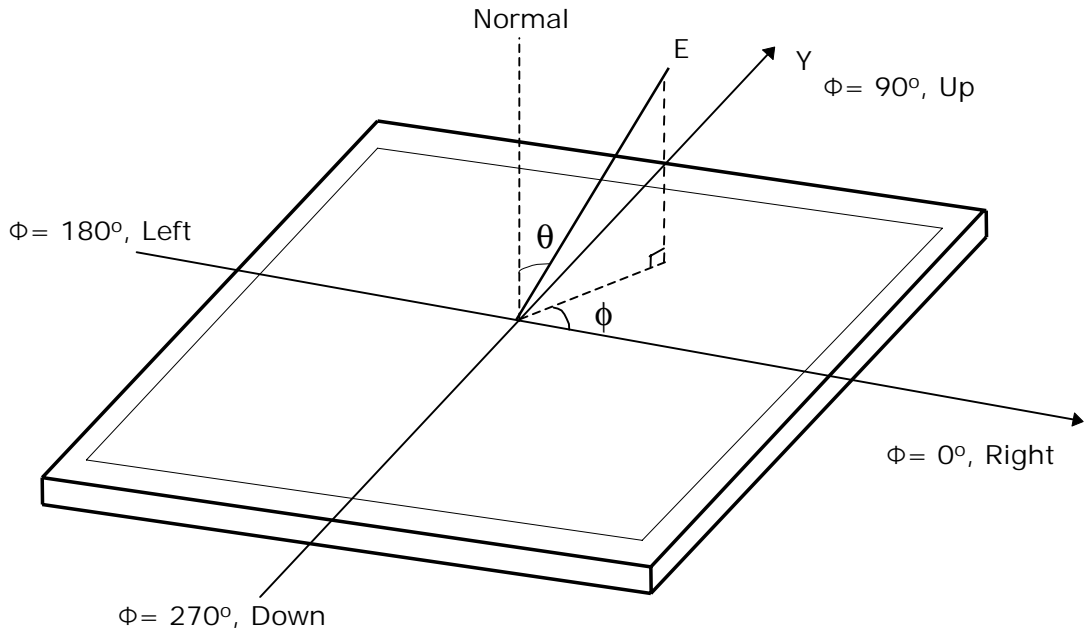www.DataSheet4U.com

Dimension of viewing angle range

FIG. 4 Viewing angle

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5. Mechanical Characteristics

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

	Horizontal	400.0mm
Outline Dimension	Vertical	258.0mm
	Depth	22.0 mm
Bezel Area	Horizontal	376.6 mm
	Vertical	227.6mm
Active Display Area	Horizontal	372.48mm
	Vertical	223.488mm
Weight	2200g (Typ.), 2350g(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.
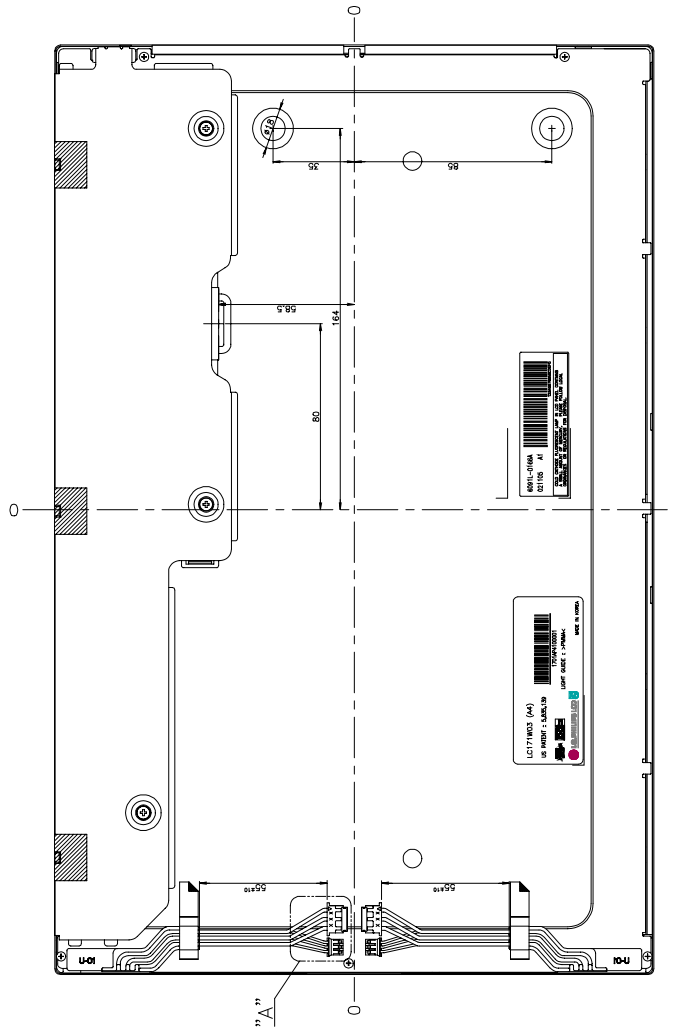
Product Specification

<FRONT VIEW>

Product Specification
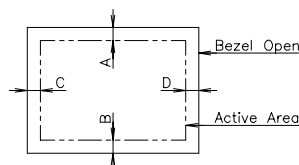
<REAR VIEW>
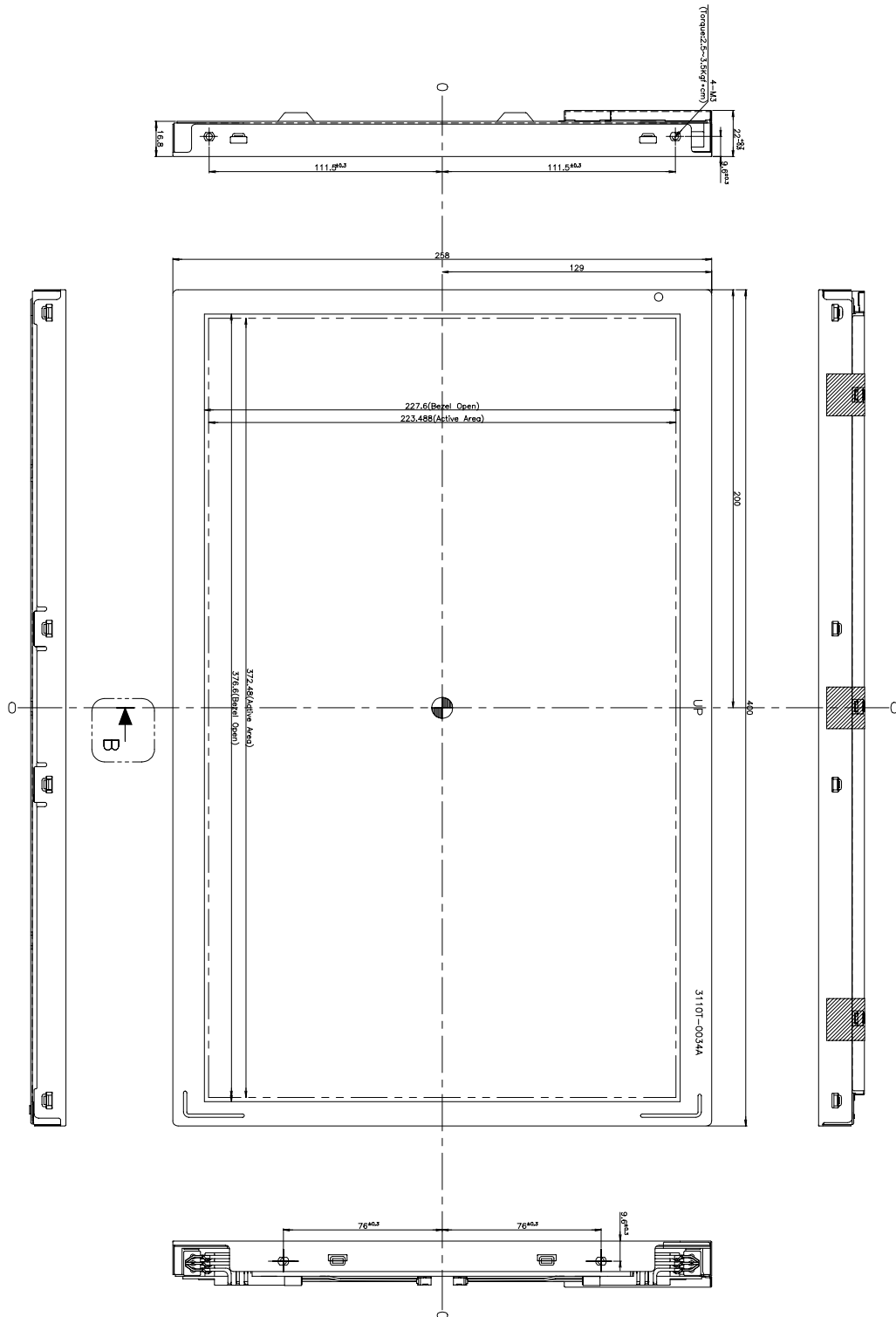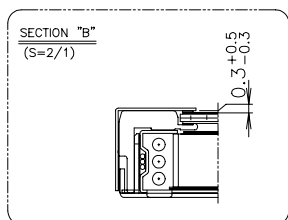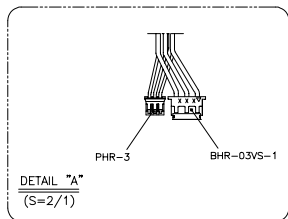
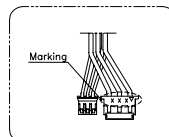NOTES

1. Unspecified tolerances to be ±0.5
2. Gap between Case Top Ass'y and Glass is $0.3^{+0.5}_{-0.3}$
3. Backlight cables and contraction tubes are excluded from outline dimensio
4. Tilt and partial disposition tolerance of display area
   as following.
   (1) Y-Direction : |A-B| < 1
   (2) X-Direction : |C-D| < 1

DETAIL "A"
(S=2/1)

PHR-3   BHR-03VS-1

SECTION "B"
(S=2/1)

$0.3^{+0.5}_{-0.3}$

Bezel Open

Active Area

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

Marking

6. 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 : 100G Waveform : half sine wave, 2ms Direction : $\pm$X, $\pm$Y, $\pm$Z 　　　　　One time each direction
7	Altitude 　　　operating 　　　storage / shipment	0 - 10,000 feet(3048m) 0 - 40,000 feet(12,192m)

7. International Standards

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7-1. 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
IEC 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.

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

8. Packing

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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
D : YEAR
E : MONTH
F,G : PANEL CODE
H : ASSEMBLY CODE
I,J,K,L,M : SERIAL NO.

Note
1. YEAR

Year	97	98	99	2000	2001	2002	2003	2004	2005	2006	2007
Mark	7	8	9	0	1	2	3	4	5	6	7

2. MONTH

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

3. Serial No.

Year	1 ~ 99999	100000 ~
Mark	00001 ~ 99999	A0001 ~ A9999, ... , Z9999

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 : 5 pcs

b) Box Size : 490mm × 277mm × 322mm

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 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 minimize 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 metal foreign material and deal LCM a fatal blow)
(9) Please do not set LCD on its edge.

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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.