SPECIFICATION
FOR
APPROVAL

( ) Preliminary Specification
(●) Final Specification

Title	32.0” WXGA TFT LCD

BUYER	General
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LC320W01
MODEL	B6K3

*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	SIGNATURE DATE
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W. K . Min / Engineer	

TV Product Development Dept.
LG. Philips LCD Co., Ltd

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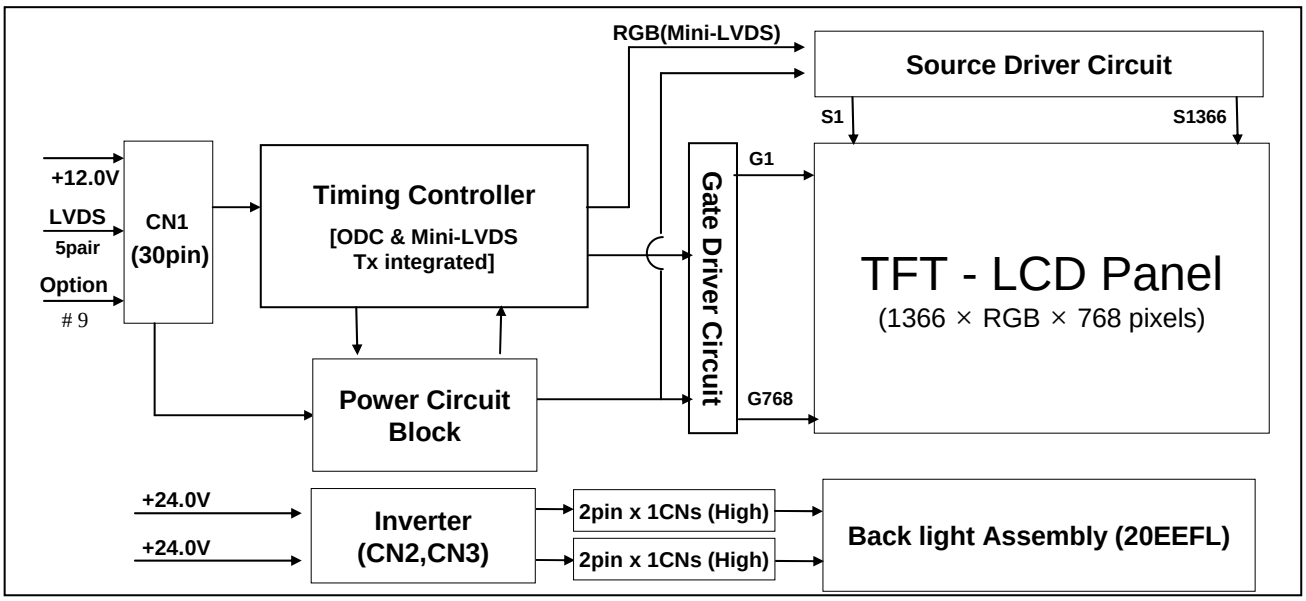
			Final Specification

1. General Description

The LC320W01 is a Color Active Matrix Liquid Crystal Display with an integral External Electrode Fluorescent Lamp(EEFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive display type which is operated in the normally black mode. It has a 31.51 inch diagonally measured active display area with WXGA resolution (768 vertical by 1366 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 luminance of the sub-pixel color is determined with a 8-bit gray scale signal for each dot, Therefore it can present a palette of more than 16.7M(true) colors.
It has been designed to apply the 8Bit 1 port LVDS interface.
It is intended to support LCD TV, PCTV where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.



General Features

Active Screen Size	31.51 inches(800.4mm) diagonal
Outline Dimension	760.0 mm(H) x 450.0 mm(V) x 53.5 mm(D) (Typ.)
Pixel Pitch	170.25㎛ x 510.75㎛ x RGB
Pixel Format	1366 horiz. by 768 vert. pixels RGB stripe arrangement
Color Depth	8bit, 16,7 M colors
Luminance, White	500 cd/m^2 (Center 1 point) (Typ.)
Viewing Angle (CR>10)	Viewing angle free (R/L 178(Typ.), U/D 178(Typ.))
Power Consumption	Total 89.1Watt (Typ.) (Logic=(5.1W), Lamp=84W [I_{BL}=85mA])
Weight	7,200 g (Typ.)
Display Operating Mode	Transmissive mode, normally black
Surface Treatment	Hard coating(3H), anti-glare treatment of the front polarizer

2. Absolute Maximum Ratings

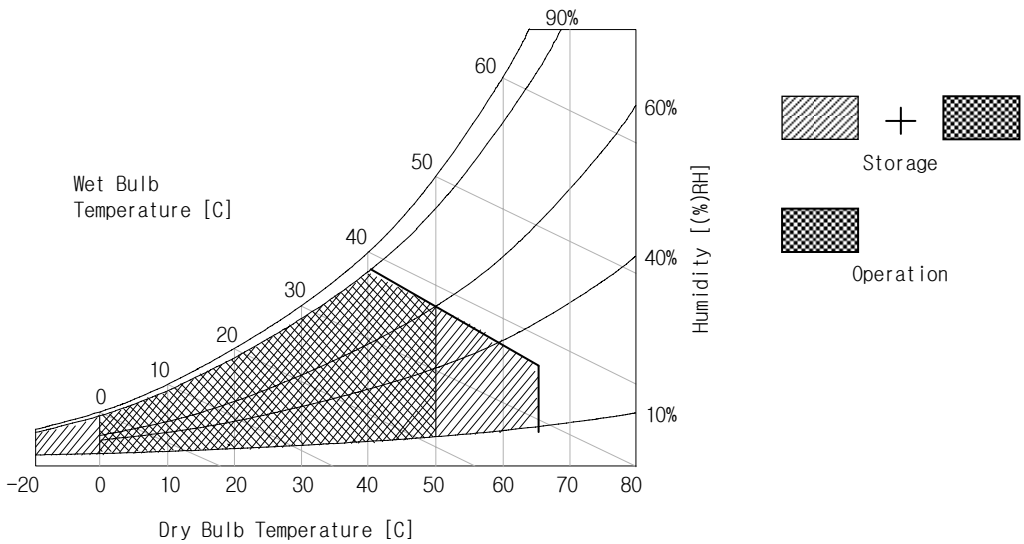
The following items are maximum values which, if exceeded, may cause faulty operation or damage to the LCD module.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Value		Unit	Note
			Min	Max		
Power Input Voltage	LCM	VLCD	-0.3	+14.0	VDC	at 25 ± 2 °C
	Backlight inverter	VBL	-0.3	+27.0	VDC	
ON/OFF Control Voltage		VON/OFF	-0.3	+5.25	VDC	
Brightness Control Voltage		VBR-A	0	+5.25	VDC	
Operating Temperature (Ambient Temp.)		TOP	0	+50	°C	1
		TSUR	0	+65	°C	2
Storage Temperature		TST	-20	+65	°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.
2. Abnormal visual problems by panel surface temperature can be occurred in specific range (60 °C ~ 65 °C), But materials(ex : polarizer) are not damaged permanently in this range, TSUR.



3. Electrical Specifications

3-1. Electrical Characteristics

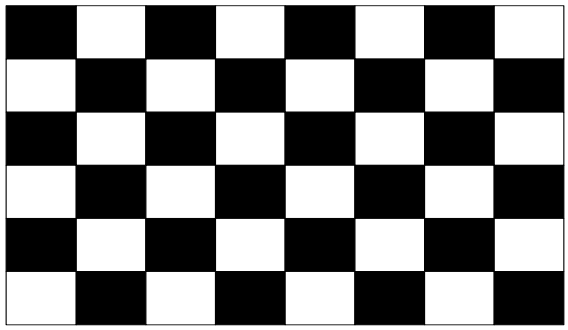
It requires two power inputs. One is employed to power for the LCD circuit. The other input power for the EEFL/Backlight is to power inverter.

Table 2-1. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Value			Unit	Note
		Min	Typ	Max		
Circuit :						
Power Input Voltage	V_{LCD}	11.4	12.0	12.6	V_{DC}	
Permissible Input Ripple Voltage	V_{RP}	-	-	200	mV_{P-P}	
Power Input Current	I_{LCD}	298	425	553	mA	1
		399	570	741	mA	2
Power Consumption	P_{LCD}	3.6	5.1	6.6	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 ± 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. INVERTER ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	Value			Unit	Note
			Min.	Typ.	Max.		
Inverter :							
Input Voltage	V_{BL}		21.6	24.0	25.2	V_{DC}	
Input Current	I_{BL}	V_{BR}-A(max) = 3.3V	-	4.10	4.35	A	1, 3
		V_{BR}-A(Typ) = 1.65V	-	3.5	3.75	A	1, 3
Input Current(In-Rush)	I_{RUSH}	V_{BL}=21.6V V_{BR}-A=3.3V $EXTV_{BR}$-B=100%	-	-	6.3	A	
Power Consumption	P_{BL}	V_{BR}–A =1.65V	-	84.0	104.4	Watt	1, 3
B/L on/off control	$V_{ON/OFF}$	Lamp ON = High	2.4	-	5.0	V_{DC}	
		Lamp OFF =Low	0.0		0.6	V_{DC}	
Brightness Adj (Analog mode)	V_{BR}-A		0	-	3.3	V_{DC}	
Brightness Adj (Burst mode)	$EXTV_{BR}$-B	External Input (PWM)	20	-	100	%	4
Frequency (PWM) (Burst mode)	f-B	V_{BL}=24V $EXTV_{BR}$-B=PWM	155	165	175	Hz	
Pulse Duty(PWM) (Burst mode)		High Level	2.5	-	5.0	V_{DC}	
		Low Level	0.0	-	0.6	V_{DC}	
Lamp :							
Life Time			50,000	60,000		Hrs	2

Notes :

1. The specified current and power consumption are under the typical supply Input voltage, 24.0V.
   The ripple voltage of the power supply input voltage is under 0.5 Vp-p.
   Inrush current of the power supply input current is under +10% of the typical current
2. Specified values are for a single lamp which is aligned horizontally.
   The life is determined as the time at which luminance 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.
   Specified value is when lamp is aligned horizontally.
3. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 2Hrs in a dark environment at 25 °C± 2°C.
4. Burst mode is controlled by TV system.High Level of Ext-PWM is min 2.5V. On duty ratio of output.

3-2. Interface Connections

This LCD module employs two kinds of interface connection, a 30-pin connector is used for the module electronics and two 12-pin connectors are used for the integral backlight system.

3-2-1. LCD Module

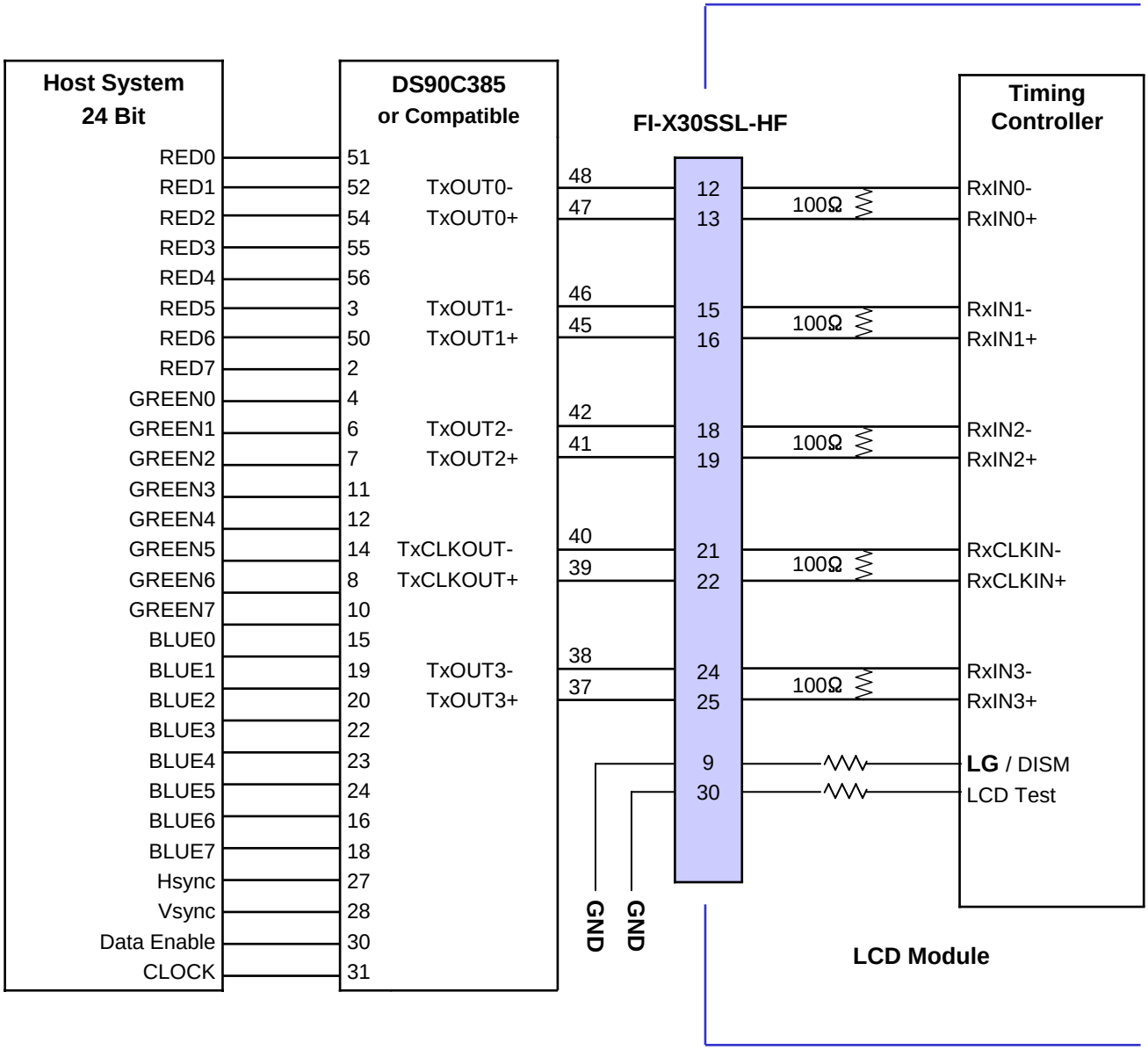
- LCD Connector(CN1) : FI-X30SSL-HF (Manufactured by JAE) or Equivalent
- Mating Connector : FI-30C2L (Manufactured by JAE) or Equivalent

Table 3. MODULE CONNECTOR(CN1) PIN CONFIGURATION

Pin No	Symbol	Description	Note
1	V_{LCD}	Power Supply +12.0V	
2	V_{LCD}	Power Supply +12.0V	
3	V_{LCD}	Power Supply +12.0V	
4	V_{LCD}	Power Supply +12.0V	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	Select	Select LVDS Data format	1
10	NC	NC	
11	GND	Ground	
12	RA-	LVDS Receiver Signal(-)	
13	RA+	LVDS Receiver Signal(+)	
14	GND	Ground	
15	RB-	LVDS Receiver Signal(-)	
16	RB+	LVDS Receiver Signal(+)	
17	GND	Ground	
18	RC-	LVDS Receiver Signal(-)	
19	RC+	LVDS Receiver Signal(+)	
20	GND	Ground	
21	RCLK-	LVDS Receiver Clock Signal(-)	
22	RCLK+	LVDS Receiver Clock Signal(+)	
23	GND	Ground	
24	RD-	LVDS Receiver Signal(-)	
25	RD+	LVDS Receiver Signal(+)	
26	GND	Ground	
27	NC	NC	
28	NC	NC	
29	GND	Ground	
30	GND	Ground	

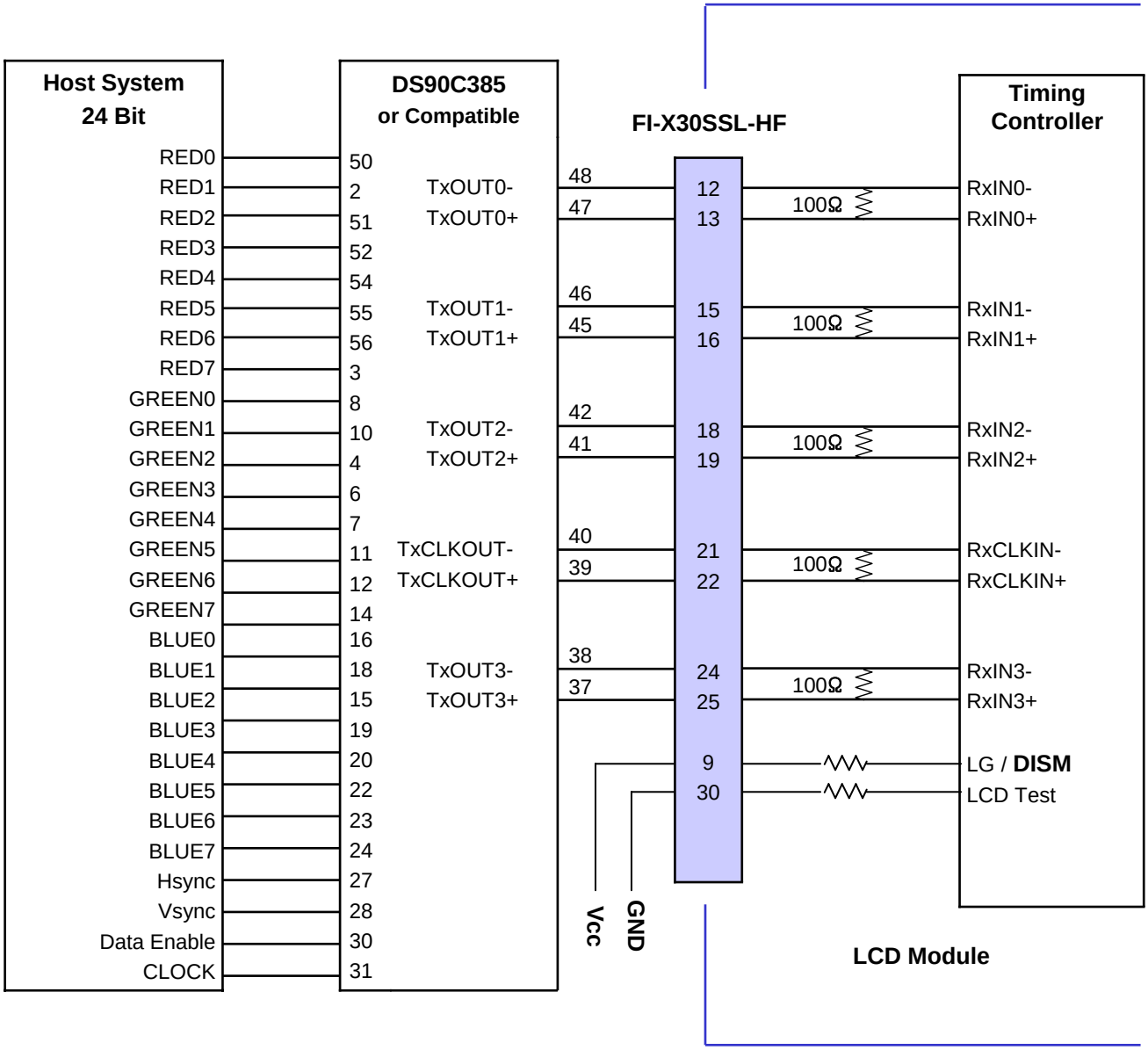
Note: 1. If the Pin 9 is Ground, Interface format is “LG”, and if the Pin 9 is Vcc(3.3V), Interface format is “DISM”. See page 9 and 10.
2. The pin 30 should be ground, this pin 30 is necessary for LCD module test.
3. All GND(ground) pins should be connected together to the LCD module’s metal frame.
4. All V_{LCD} (power input) pins should be connected together.
5. Input Level of LVDS signal is based on the IEA 664 Standard.

Table 4. REQUIRED SIGNAL ASSIGNMENT FOR LVDS TRANSMITTER (Pin9="L" or "Open")



Note: 1. The LCD Module uses a 100 Ohm [Ω] resistor between positive and negative lines of each receiver input.
2. Refer to LVDS Transmitter Data Sheet for detail descriptions. (DS90C385 or Compatible)
3. '7' means MSB and '0' means LSB at R,G,B pixel data.

Table 5. REQUIRED SIGNAL ASSIGNMENT FOR LVDS TRANSMITTER (Pin9="H")



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2. Refer to LVDS Transmitter Data Sheet for detail descriptions. (DS90C385 or Compatible)
3. '7' means MSB and '0' means LSB at R,G,B pixel data.

3-2-2. Backlight Inverter

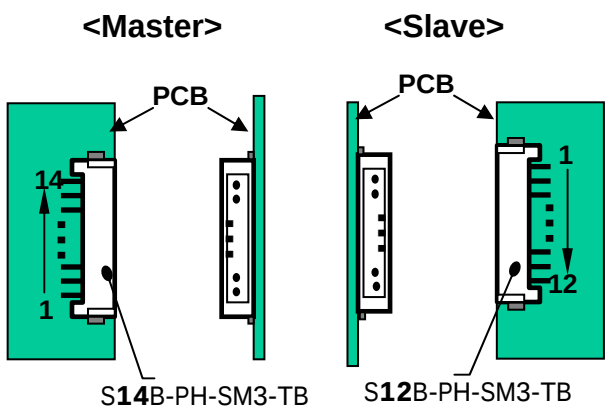
The inverter connector is S14B-PH-SM3-TB top entry type (manufactured by JST) or equivalent
The pin configuration for the 14 pin connector is shown in the table below.

Table 6. INVERTER CONNECTOR PIN CONFIGULATION

Pin	Symbol	Signal assignment		Note
		Master(CN2)	Slave(CN3)	
1	V_{BL}	24V Power Input	24V Power Input	
2	V_{BL}	24V Power Input	24V Power Input	
3	V_{BL}	24V Power Input	24V Power Input	
4	V_{BL}	24V Power Input	24V Power Input	
5	V_{BL}	24V Power Input	24V Power Input	
6	GND	GROUND	GROUND	1
7	GND	GROUND	GROUND	
8	GND	GROUND	GROUND	
9	GND	GROUND	GROUND	
10	GND	GROUND	GROUND	
11	V_{BR}-A	Analog dimming	Don't care	0V(min) ~ 3.3V(max)
12	ON / OFF	Backlight ON/OFF control	Don't care	ON : 2.4 ~ 5.0V OFF : 0.0 ~ 0.6V
13	$EXTV_{BR}$-B	External PWM signal		Rising edge : Lamp on Falling edge: Lamp off
14	Error out	Backlight status output		Normal : 0V Abnormal : External pull-up voltage

1. Connector
   1) Connector(Receptacle)
      : S14B-PH-SM3-TB (JST) &
        S12B-PH-SM3-TB (JST)
   2) Mating Connector(Plug)
      : PHR14 (JST) &
        PHR12 (JST)

* JST : Japan solderless Terminal Co.,Ltd.



Notes : Pin 5~14 should connect to master and slave connector.
1. GROUND is connected to the LCD's metal frame.

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 specification for it's proper operation.

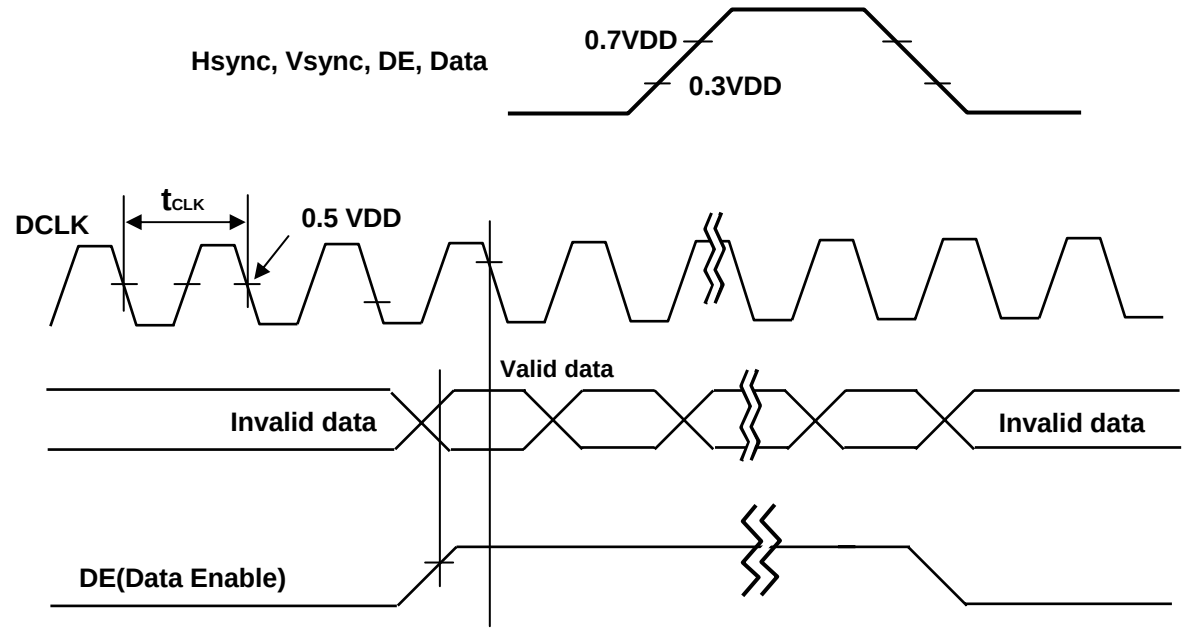
Table 7. TIMING TABLE

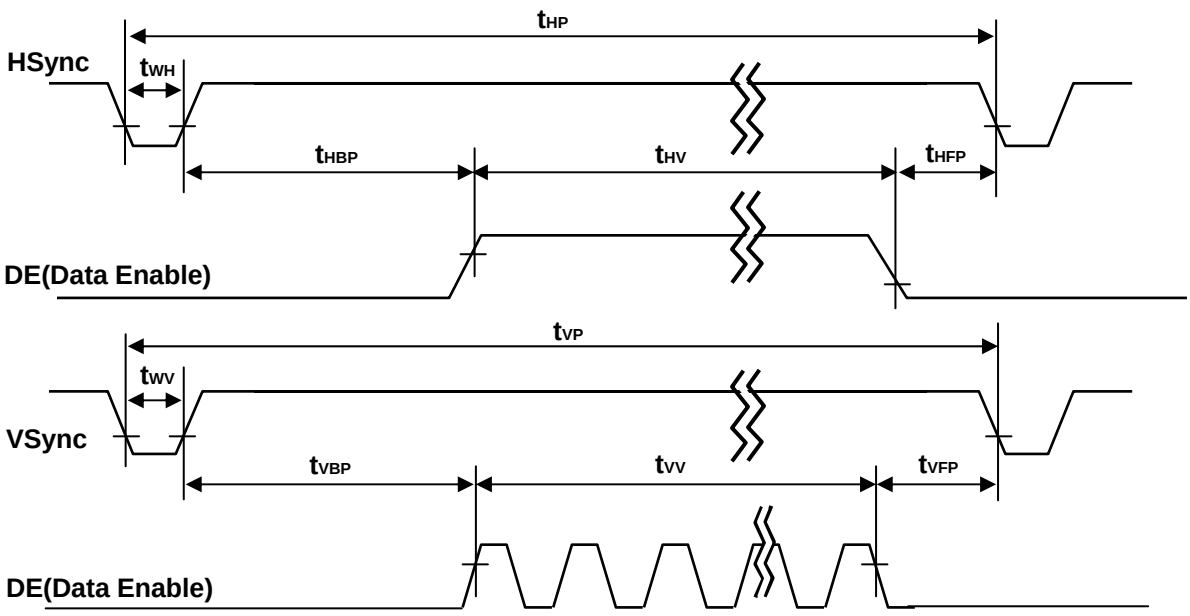
ITEM	Symbol		Min	Typ	Max	Unit	Remark
DCLK	Period	t_{CLK}	12.5	13.8	14.7	ns	
	Frequency	-	68	72.3	80	MHz	
Hsync	Period	t_{HP}	1468	1528	1776	t_{CLK}	
	Frequency	f_H	45	47.4	50	KHz	
	Width	t_{WH}	8	32	-	t_{CLK}	
Vsync	Period	t_{VP}	775	790	1063	t_{HP}	Note 1) PAL : 47~53Hz NTSC : 57~63Hz
	Frequency	f_V	47	60	63	Hz	
	Width	t_{WV}	2	5	-	t_{HP}	
DE (Data Enable)	Horizontal Valid	t_{HV}	1366	1366	1366	t_{CLK}	
	Horizontal Back Porch	t_{HBP}	24	80	-		
	Horizontal Front Porch	t_{HFP}	24	48	-		
	Horizontal Blank	-	t_{HP}- t_{HV}	162	t_{HP}- t_{HV}		
	Vertical Valid	t_{VV}	768	768	768	t_{HP}	
	Vertical Back Porch	t_{VBP}	4	15	-		
	Vertical Front Porch	t_{VFP}	1	2	-		
	Vertical Blank	-	7	22	t_{VP}- t_{VV}		

Note : Hsync Period and Hsync Width 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 the LCD, 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 rate.
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 number(4).

3-4. Signal Timing Waveforms





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 below table 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

3-6-1. LCD Driving circuit

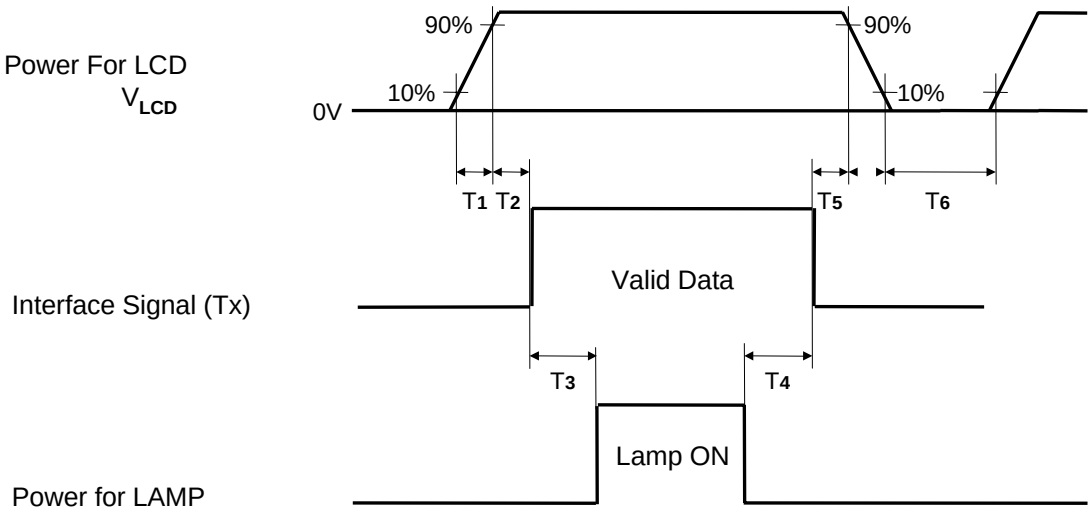
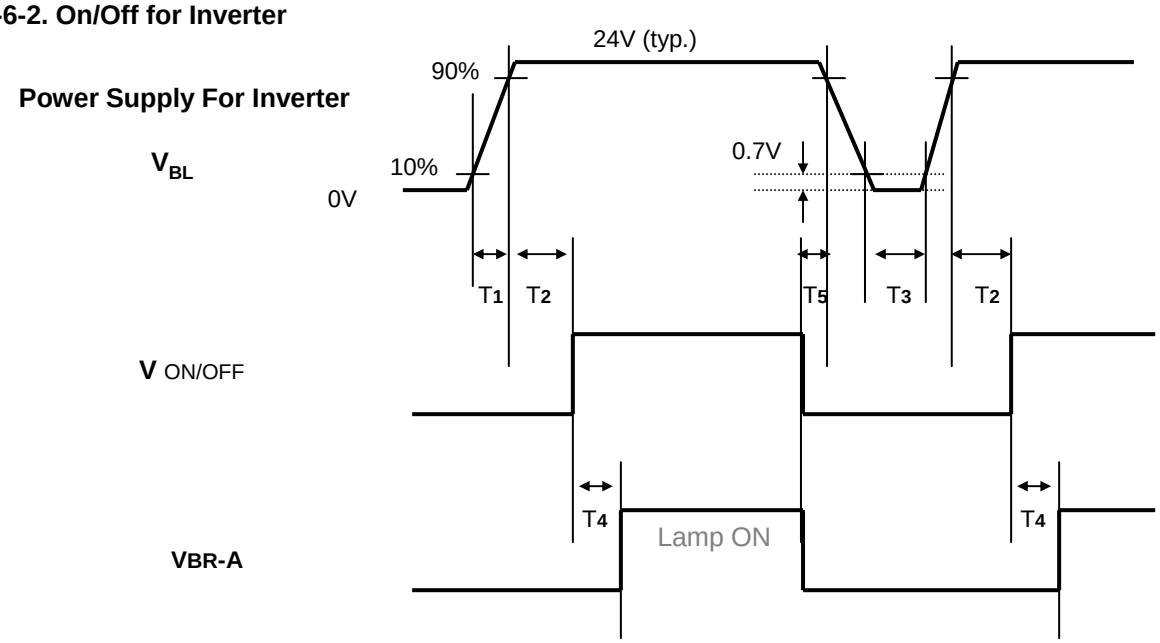


Table 9. POWER SEQUENCE FOR LCD DRIVING CIRCUIT

Parameter	Value			Unit
	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	2000	-		ms

Note : 1. Please avoid the floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply V_{LCD} to 0V.
3. Lamp power must be turn on after power supply for a LCD interface signal are valid.
4. T6 should be measured after the module has been fully discharged between power off and on period.

3-6-2. On/Off for Inverter



EXTVBR-B : 1. EXTVBR-B has Same sequence with VBR-A.

3-6-3. Deep condition for Inverter

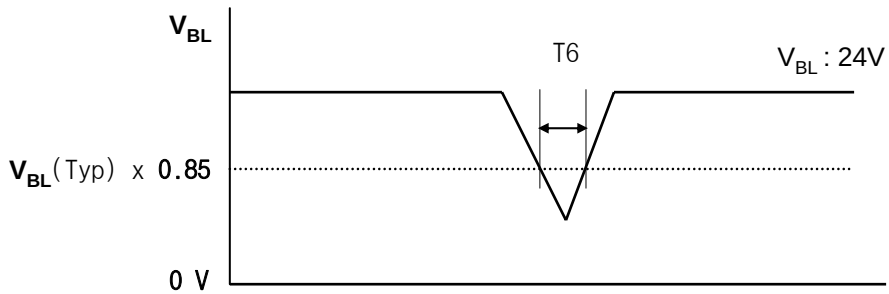


Table 10. Power Sequence for Inverter

Parameter	Values			Units	Remarks
	Min	Typ	Max		
T1	20	-	-	ms	1
T2	500	-	-	ms	
T3	200	-	-	ms	2
T4	-500	-	120	ms	4
T5	10	-	-	ms	
T6	-	-	10	ms	V_{BL}(Typ) x 0.85

Note : 1. T1 describes rising time of 0V to 24V and is not applied at restarting time.
2. When the Inverter is shut-down by ARC protection, T3 need 3.3sec
3. When V_{BL} (24V) is supplied always, there is no reliability problem.
4.ExtVbr-B should be duty 100% in T4 section and Vbr-A recommend 1.65V.

4. Optical Specification

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

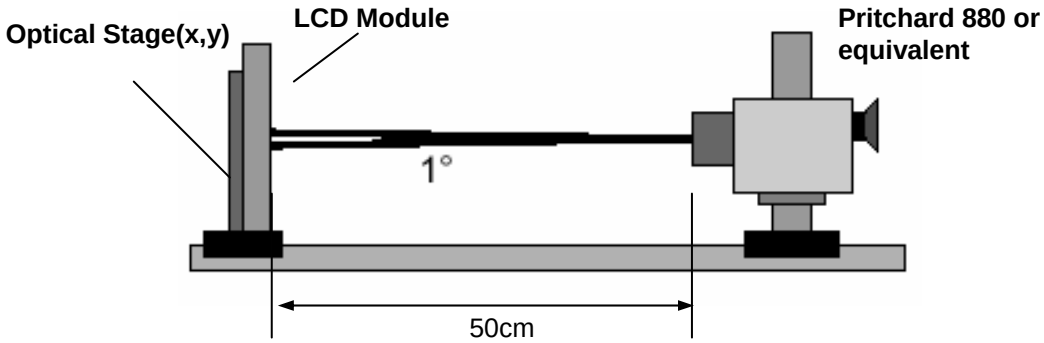


FIG. 1 Optical Characteristic Measurement Equipment and Method

Table 11. OPTICAL CHARACTERISTICS

Ta= 25±2°C, V_{LCD}=12.0V, fv=60Hz, Dclk=72.3MHz, VBR-A =1.65V, EXTVBR-B=H)

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Contrast Ratio		CR	450	600			1
Surface Luminance, white		L_{WH}	350	500		cd/m^2	2
Luminance Variation		δ_{WHITE} 5P			1.3		3
Response Time	Rise Time	Tr_R	-	8	15	ms	4
	Decay Time	Tr_D	-	10	15		
	G to G		-	10	14		
Color Coordinates [CIE1931]	RED	Rx	Typ -0.03	0.631	Typ +0.03		
		Ry		0.343			
	GREEN	Gx		0.280			
		Gy		0.600			
	BLUE	Bx		0.145			
		By		0.060			
	WHITE	Wx	Typ -0.025	0.280	Typ +0.025		
		Wy		0.285			
Viewing Angle (CR>10)							
	x axis, right(ϕ=0°)	θr	85	89	-	degree	5
	x axis, left (ϕ=180°)	θl	85	89	-		
	y axis, up (ϕ=90°)	θu	85	89	-		
	y axis, down (ϕ=270°)	θd	85	89	-		
Gray Scale				2.2			6

Note :

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

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

It is measured at center 1-point.

2. Surface Luminance(L_{WH}) is the luminance value at center 1-point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see the FIG. 2.

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

$$\delta \text{ WHITE(5P)} = \text{Maximum}(L_{on1}, L_{on2}, L_{on3}, L_{on4}, L_{on5}) / \text{Minimum}(L_{on1}, L_{on2}, L_{on3}, L_{on4}, L_{on5})$$

Where L_{on1} to L_{on5} are the luminance with all pixels displaying white at 5 locations .
For more information, see the FIG. 2.

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

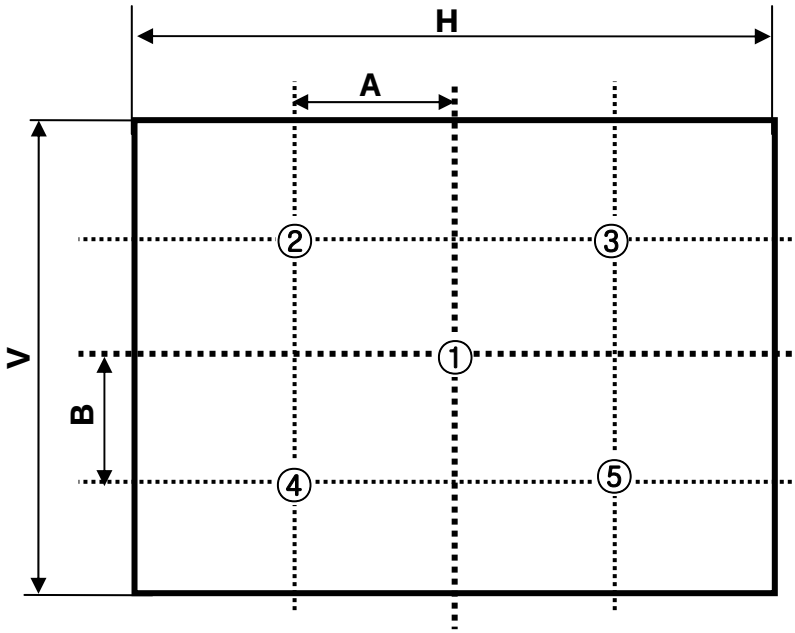
5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD module surface. For more information, see the FIG. 4.

6. Gray scale specification
Gamma Value is approximately 2.2. For more information, see the Table 12.

Table 12. GRAY SCALE SPECIFICATION

Gray Level	Luminance [%] (Typ)		
	Min.	Typ.	Max.
L0	–	0.18	0.30
L15	0.15	0.27	1.00
L31	0.35	1.00	2.40
L47	1.00	2.40	4.60
L63	2.00	4.60	7.60
L79	3.90	7.60	11.40
L95	6.60	11.40	16.80
L111	10.40	16.00	22.60
L127	14.70	21.60	29.50
L143	20.10	28.00	37.40
L159	26.20	35.40	45.70
L175	33.40	43.70	54.50
L191	41.70	53.00	64.80
L207	52.00	63.20	76.50
L223	63.20	74.50	88.50
L239	80.00	88.00	97.00
L255	100.00	100.00	100.00

Measuring point for surface luminance & measuring point for luminance variation



A : H / 4 mm
B : V / 4 mm
H : 697.685 mm
V : 392.256 mm
@ H,V : Active Area

FIG. 2 The Position of Points for Luminance Measure

Response time is defined as the following figure and shall be measured by switching the input signal for "Gray(N)" and "Gray(M)".

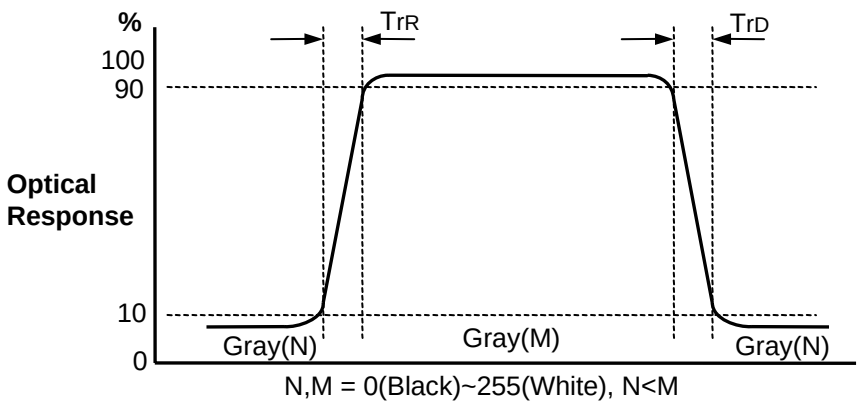


FIG. 3 Response Time

Dimension of viewing angle range

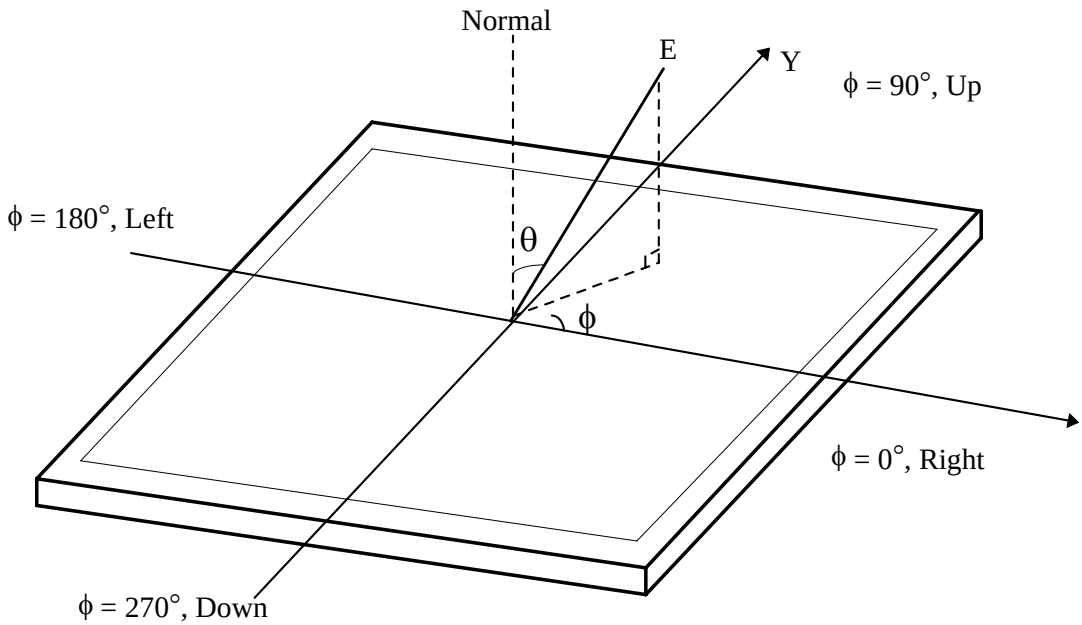
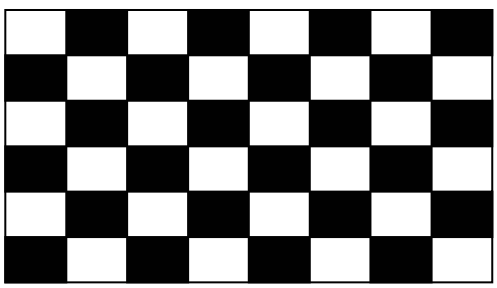


FIG. 4 Viewing Angle

7. Image sticking

When it changes into pattern-B after a 1-hour drive by pattern-A, it disappears within 10 minutes.

<Pattern-A, Chess board (8x6)>



<Pattern-B, Mid-gray(127 gray)>

5. Mechanical Characteristics

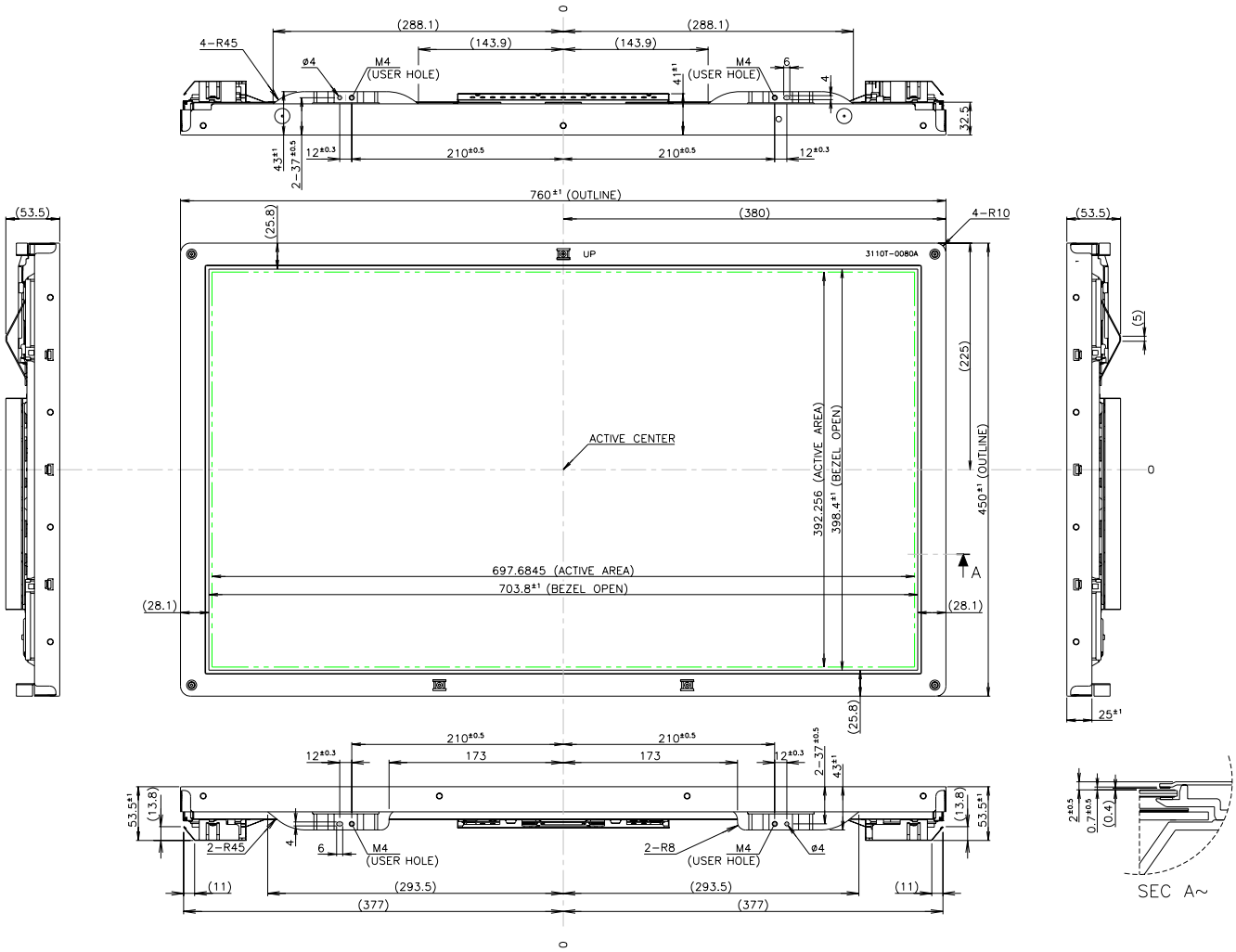
The following items provide general mechanical characteristics. In addition, the figures in the next page show the detail information of mechanical drawing for LCD module.

Table 13. MECHANICAL CHARACTERISTICS

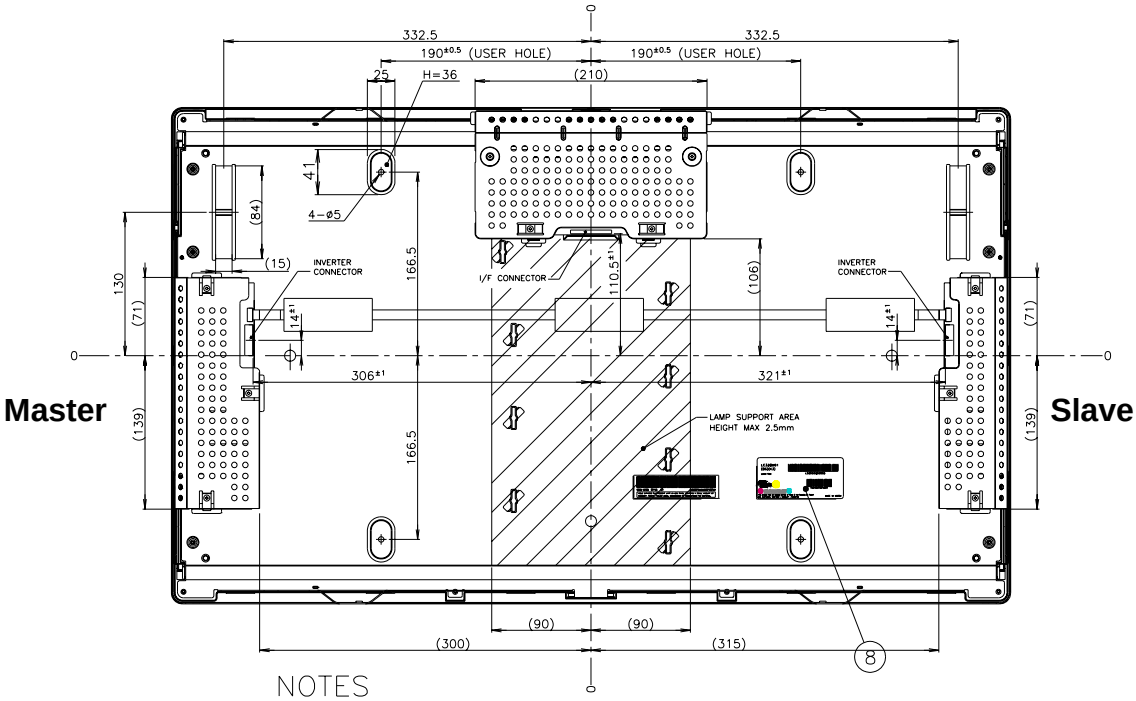
Outline Dimension	Horizontal	760.0mm
	Vertical	450.0 mm
	Depth	53.5 mm
Bezel Area	Horizontal	703.8mm
	Vertical	398.4mm
Active Display Area	Horizontal	697.685mm
	Vertical	392.256mm
Weight	7,200 g(Typ.), 7,600 g(Max)	
Surface Treatment	Hard coating(3H) Anti-glare treatment of the front polarizer	

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

<FRONT VIEW>

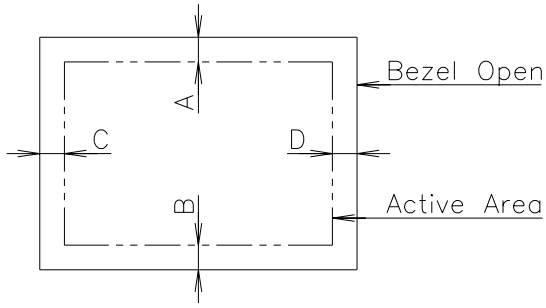

(288.1)
(288.1)
(143.9)
(143.9)
4-R45
ø4
M4
(USER HOLE)
M4
(USER HOLE)
6
4
32.5
4.3±1
2-37±0.5
12±0.3
210±0.5
210±0.5
12±0.3
760±1 (OUTLINE)
(380)
(53.5)
(25.8)
4-R10
UP
3110T-0080A
(225)
(5)
ACTIVE CENTER
392.256 (ACTIVE AREA)
398.4±1 (BEZEL OPEN)
450±1 (OUTLINE)
697.6845 (ACTIVE AREA)
703.8±1 (BEZEL OPEN)
A
(28.1)
(28.1)
(25.8)
25±1
210±0.5
210±0.5
173
173
12±0.3
12±0.3
2-37±0.5
4.3±1
53.5±1
(13.8)
(13.8)
53.5±1
2-R45
4
6
M4
(USER HOLE)
2-R8
M4
(USER HOLE)
ø4
(11)
(293.5)
(293.5)
(11)
(377)
(377)
2±0.5
0.7±0.5
(0.4)
SEC A~

<REAR VIEW>



NOTES

1. I/F Connector Specification.
   – FI-X30SSL-HF(JAE) or Equivalent.
2. INVERTER Connector Specification.
   – B14B-PH-SM3(JST) or Equivalent : Top entry type
3. Depth of user hole screw insertion : Max 4mm.
4. Torque of user hole : Max 5.0kgf-cm.
5. Gap between Bezel and Panel : Max 1.2mm.
6. Tilt and partial disposition tolerance of display area as following.
   (1) Y-Direction : $|A-B| \leq 1.5$
   (2) X-Direction : $|C-D| \leq 1.5$



7. Unspecified tolerances to be ±0.5mm.

6. Reliability

Table 14. ENVIRONMENT TEST CONDITION

No.	Test Item	Condition
1	High temperature storage test	Ta= 60°C, 500h
2	Low temperature storage test	Ta= -20°C, 500h
3	High temperature operation test	Ta= 50°C, 80%RH, 500h Ta= 60°C, 500h(2000h)
4	Low temperature operation test	Ta= 0°C, 500h(1000h)
5	Heat cycle test	Ta= -20 °C ~ 60 °C, 30min/5min/30min, 100cycles
6	Soldering heat cycle test	Ta= -40 °C ~ 80 °C, 30min/5min/30min, 200cycles
7	Vibration test (non-operating)	Wave form : random Vibration level : 1.0Grms Bandwidth : 10-500Hz Duration : X,Y,Z, 10 min One time each direction
8	Shock test (non-operating)	Shock level : 100Grms Waveform : half sine wave, 2ms Direction : ±X, ±Y, ±Z One time each direction

7. International standards

7-1. Safety

a) UL 60950, Third Edition, Underwriters Laboratories, Inc., Dated Dec. 11, 2000.
Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment.
b) CAN/CSA C22.2, No. 60950, Third Edition, Canadian Standards Association, Dec. 1, 2000.
Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment.
c) EN 60950 : 2000, Third Edition
IEC 60950 : 1999, Third Edition
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
(Including A1: 2000)

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 : FACTORY CODE
G : ASSEMBLY CODE
H ~ 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

3. FACTORY CODE

Factory Code	LPL Gumi	LPL Nanjing	HEESUNG
Mark	K	C	D

4. SERIAL NO.

Mark	100001~199999, 200001~299999, 300001~399999, …., A00001~A99999, ….., Z00001~Z99999

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 : 880mm X 500mm X 570mm

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 benzine. 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't 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.