

Product Specification

# SPECIFICATION FOR APPROVAL

- ( ) Preliminary Specification
- (●) Final Specification

Title	37.0" WUXGA TFT LCD
-------	---------------------

BUYER	General
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LC370WUD
SUFFIX	SAB1(RoHS Verified)

\*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
<b>O.H. Lee / Manager</b>	
<b>REVIEWED BY</b>	
<b>J.H. Lee / Engineer</b>	
<b>PREPARED BY</b>	
<b>D.E. Kim / Engineer</b>	

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

## Product Specification

**CONTENTS**

Number	ITEM	Page
	COVER	1
	CONTENTS	2
	RECORD OF REVISIONS	3
1	GENERAL DESCRIPTION	4
2	ABSOLUTE MAXIMUM RATINGS	5
3	ELECTRICAL SPECIFICATIONS	6
3-1	ELECTRICAL CHARACTERISTICS	6
3-2	INTERFACE CONNECTIONS	8
3-3	SIGNAL TIMING SPECIFICATIONS	11
3-4	SIGNAL TIMING WAVEFORMS	13
3-5	COLOR DATA REFERENCE	14
3-6	POWER SEQUENCE	15
4	OPTICAL SPECIFICATIONS	17
5	MECHANICAL CHARACTERISTICS	21
6	RELIABILITY	24
7	INTERNATIONAL STANDARDS	25
7-1	SAFETY	25
7-2	EMC	25
8	PACKING	26
8-1	DESIGNATION OF LOT MARK	26
8-2	PACKING FORM	26
9	PRECAUTIONS	27
9-1	MOUNTING PRECAUTIONS	27
9-2	OPERATING PRECAUTIONS	27
9-3	ELECTROSTATIC DISCHARGE CONTROL	28
9-4	PRECAUTIONS FOR STRONG LIGHT EXPOSURE	28
9-5	STORAGE	28
9-6	HANDLING PRECAUTIONS FOR PROTECTION FILM	28



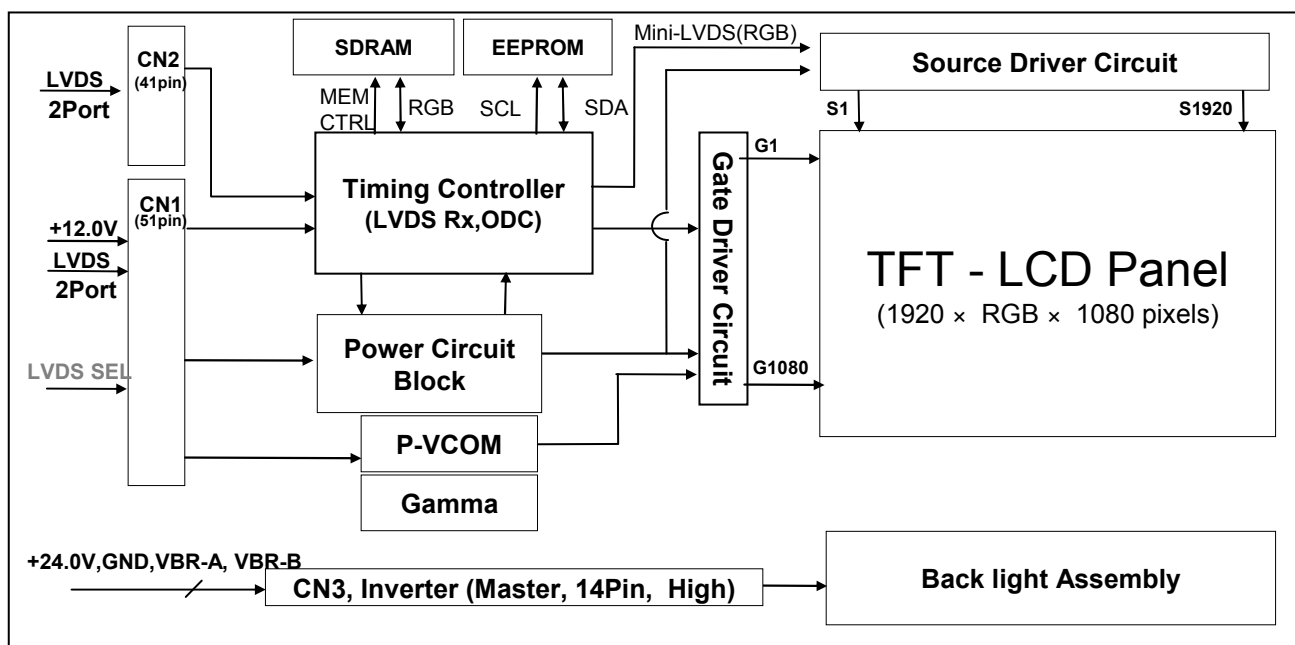
## Product Specification

## 1. General Description

The LC370WUD 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 operating in the normally black mode. It has a 37 inch diagonally measured active display area with WUXGA resolution (1080 vertical by 1920 horizontal pixel array). Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arrayed in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 10-bit gray scale signal for each dot. Therefore, it can present a palette of more than 1.07B (true) colors.

It has been designed to apply the 10-bit 4-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	37 inches(940.091mm) diagonal
Outline Dimension	877(H) x 516.8 (V) x 55.5 mm(D) (Typ.)
Pixel Pitch	0.42675 mm x 0.42675 mm
Pixel Format	1920 horiz. by 1080 vert. Pixels, RGB stripe arrangement
Color Depth	10-bit, 1.07 B colors
Luminance, White	500 cd/m <sup>2</sup> (Center 1point ,Typ.)
Viewing Angle (CR>10)	Viewing angle free ( R/L 178 (Typ.), U/D 178 (Typ.))
Power Consumption	Total 155.46 (Typ.) (Logic=5.46 W, Inverter=150W [VBR-A=1.65V] )
Weight	9.2Kg (Typ.)
Display Mode	Transmissive mode, Normally black
Surface Treatment	Hard coating(3H), Anti-glare treatment of the front polarizer (Haze 13%)

## Product Specification

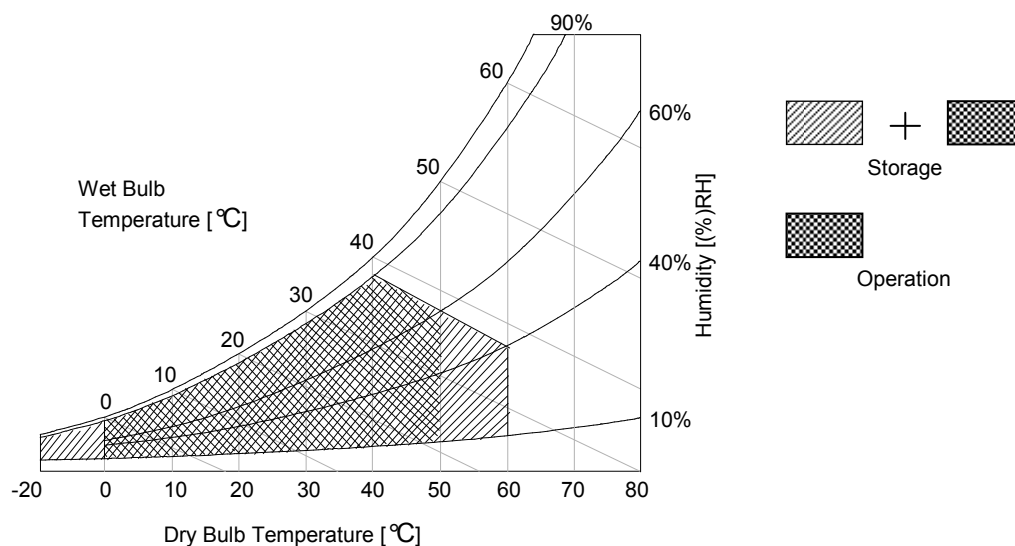
## 2. Absolute Maximum Ratings

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	Remark
			Min	Max		
Power Input Voltage	LCM	V <sub>LCD</sub>	+8.0	+14.0	V <sub>DC</sub>	at 25 ± 2 °C
	Backlight inverter	V <sub>BL</sub>	-0.3	+27.0	V <sub>DC</sub>	
ON/OFF Control Voltage		V <sub>ON/OFF</sub>	-0.3	+5.25	V <sub>DC</sub>	
Brightness Control Voltage		V <sub>BR</sub>	0	+5.0	V <sub>DC</sub>	
Operating Temperature		T <sub>OP</sub>	0	+50	°C	Note 1,2
Storage Temperature		T <sub>ST</sub>	-20	+60	°C	
Operating Ambient Humidity		H <sub>OP</sub>	10	90	%RH	
Storage Humidity		H <sub>ST</sub>	10	90	%RH	

- 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.  
2. Gravity mura can be guaranteed under 40 °C condition.



## Product Specification

### 3. Electrical Specifications

#### 3-1. Electrical Characteristics

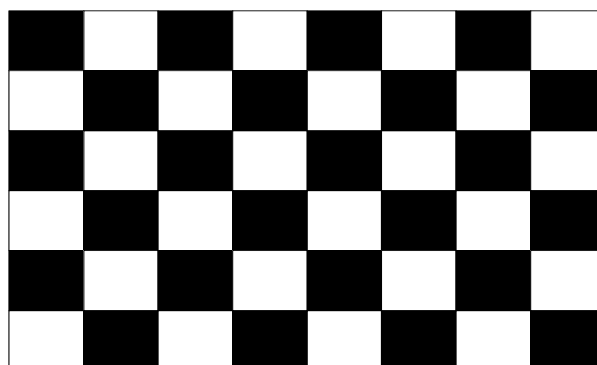
It requires two power inputs. One is employed to power for the LCD circuit. The other is used for the EEFL backlight and inverter circuit.

**Table 2. ELECTRICAL CHARACTERISTICS**

Parameter	Symbol	Value			Unit	Note
		Min	Typ	Max		
Circuit :						
Power Input Voltage	V <sub>LCD</sub>	11.4	12.0	12.6	V <sub>DC</sub>	
Power Input Current	I <sub>LCD</sub>	-	455	590	mA	1
		-	1,160	1,508	mA	2
Power Consumption	P <sub>LCD</sub>	-	5.46	7.10	Watt	1
Rush current	I <sub>RUSH</sub>	-	-	4.0	A	3

- Note :
1. The specified current and power consumption are under the  $V_{LCD}=12.0V$ ,  $25 \pm 2^{\circ}C$ ,  $f_V=120Hz$  condition whereas mosaic pattern(8 x 6) is displayed and  $f_V$  is the frame frequency.
  2. The current is specified at max current pattern.
  3. The duration of rush current is about 2ms and rising time of power input is 1ms (min.).

White : 1024Gray  
Black : 0Gray



Mosaic Pattern(8 x 6)

## Product Specification

Table 3. ELECTRICAL CHARACTERISTICS

Parameter		Symbol	Values			Unit	Notes	
			Min	Typ	Max			
Inverter :								
Power Supply Input Voltage		VBL	22.8	24.0	25.2	Vdc	1	
Power Supply Input Voltage Ripple			-	-	0.5	Vp-p	1	
Power Supply Input Current	After Aging	IBL_A	-	6.25	6.55	A	$V_{BR-A} = 1.65V \dots 1$	
			-	6.75	7.05	A	$V_{BR-A} = 3.3V \dots 1$	
	Before Aging	IBL_B	-	7.3	7.6	A	$V_{BR-A} = 1.65V \dots 2$	
			-	7.8	8.1	A	$V_{BR-A} = 3.3V \dots 2$	
Power Supply Input Current (In-Rush)		Irush	-	-	10	A	$V_{BL} = 22.8V$ $V_{BR-B} = 3.3V$ $V_{BR-A} = 1.65V$	
Power Consumption		PBL	-	150	157	W	$V_{BR-A} = 1.65V \dots 1$	
Input Voltage for Control System Signals	Brightness Adjust		$V_{BR-A}$	0.0	1.65	3.3	Vdc	
	On/Off	On	V on	2.5	-	5.0	Vdc	
		Off	V off	-0.3	0.0	0.8	Vdc	
	Brightness Adjust		$V_{BR-B}$	0	-	3.3	V	
Lamp:								
Discharge Stabilization Time		Ts			3	min	3	
Life Time			30,000			Hrs	4	

## Notes :

- Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 120 minutes at  $25 \pm 2^\circ\text{C}$ . The specified current and power consumption are under the typical supply Input voltage 24V and  $V_{BR}$  ( $V_{BR-A} : 1.65V$  &  $V_{BR-B} : 3.3V$ ), it is total power consumption.  
The ripple voltage of the power supply input voltage is under 0.5 Vp-p. LPL recommend Input Voltage is  $24.0V \pm 5\%$ .
- Electrical characteristics are determined within 30 minutes at  $25 \pm 2^\circ\text{C}$ .  
The specified currents are under the typical supply Input voltage 24V.
- The brightness of the lamp after lighted for 5minutes is defined as 100%.  
TS is the time required for the brightness of the center of the lamp to be not less than 95% at typical current.  
The screen of LCD module may be partially dark by the time the brightness of lamp is stable after turn on.
- Specified Values are for a single lamp which is aligned horizontally.  
The life time is determined as the time which luminance of the lamp is 50% compared to that of initial value at the typical lamp current ( $V_{BR-A} : 1.65V$  &  $V_{BR-B} : 3.3V$ ), on condition of continuous operating at  $25 \pm 2^\circ\text{C}$
- The duration of rush current is about 20ms.

## Product Specification

**3-2. Interface Connections**

This LCD module employs two kinds of interface connection, a 51-pin connector & 41pin connector are used for the module electronics and Master 14-pin connector is used for the integral backlight system.

**3-2-1. LCD Module**

- LCD Connector(CN1): FI-R51S-HF(manufactured by JAE)
- Mating Connector : FI-R51HL(JAE) or compatible

**Table 4-1. MODULE CONNECTOR(CN1) PIN CONFIGURATION**

No	Symbol	Description	No	Symbol	Description
1	GND	Ground	27	GND	Ground(Reserved)
2	NC	No Connection	28	RA2N	SECOND CHANNEL A-
3	NC	No Connection	29	RA2P	SECOND CHANNEL A+
4	NC	No Connection	30	RB2N	SECOND CHANNEL B-
5	NC	No Connection	31	RB2P	SECOND CHANNEL B+
6	NC	No Connection	32	RC2N	SECOND CHANNEL C-
7	LVDS Select	'H' =JEIDA , 'L' = VESA	33	RC2P	SECOND CHANNEL C+
8	NC	No Connection	34	GND	Ground
9	NC	No Connection	35	RCLK2N	SECOND CLOCK CHANNEL Clk-
10	NC	No Connection	36	RCLK2P	SECOND CLOCK CHANNEL Clk+
11	GND	Ground	37	GND	Ground
12	RA1N	FIRST CHANNEL A-	38	RD2N	SECOND CHANNEL D-
13	RA1P	FIRST CHANNEL A+	39	RD2P	SECOND CHANNEL D+
14	RB1N	FIRST CHANNEL B-	40	RE2N	SECOND CHANNEL E-
15	RB1P	FIRST CHANNEL B+	41	RE2P	SECOND CHANNEL E+
16	RC1N	FIRST CHANNEL C-	42	GND	Ground
17	RC1P	FIRST CHANNEL C+	43	GND	Ground
18	GND	Ground	44	GND	Ground (NSB)
19	RCLK1N	FIRST CLOCK CHANNEL Clk-	45	GND	Ground
20	RCLK1P	FIRST CLOCK CHANNEL Clk+	46	GND	Ground
21	GND	Ground	47	NC	No connection
22	RD1N	FIRST CHANNEL D-	48	VLCD	Power Supply +12.0V
23	RD1P	FIRST CHANNEL D+	49	VLCD	Power Supply +12.0V
24	RE1N	FIRST CHANNEL E-	50	VLCD	Power Supply +12.0V
25	RE1P	FIRST CHANNEL E+	51	VLCD	Power Supply +12.0V
26	GND	Ground	-	-	-

**Note :**

1. The pin no 44 is LCD Test option. "AGP" (Auto Generation LCM operates Pattern) or "NSB" (No Signal Black) is case that LVDS signals are out of frequency or abnormal condition in spite of 12 volt power supply. LPL recommends "NSB". ( AGP : "VCC" or "OPEN" / NSB : "GND" )
2. All GND(ground) pins should be connected together to the LCD module's metal frame.
3. All VLCD (power input) pins should be connected together.
4. All Input levels of LVDS signals are based on the IEA 664 Standard.
5. Specific pins(pin No. #1~#10) are used for internal data process of the LCD module.  
If not used, these pins are no connection.



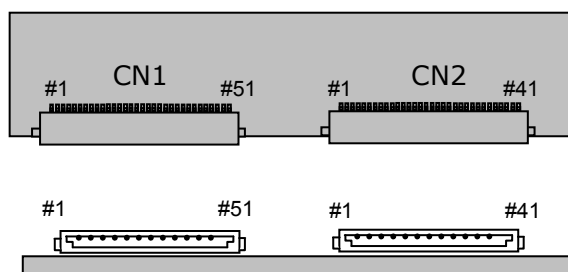
## Product Specification

- LCD Connector(CN2): FI-RE41S-HF, Refer to below table
- Mating Connector : FI-RE41HL

**Table 4-2. MODULE CONNECTOR(CN2) PIN CONFIGURATION**

No	Symbol	Description	No	Symbol	Description
1	NC	No connection(Reserved)	22	RE3N	Third CHANNEL E-
2	NC	No connection	23	RE3P	Third CHANNEL E+
3	NC	No connection	24	GND	Ground
4	NC	No connection	25	GND	Ground
5	NC	No connection	26	RA4N	Fourth CHANNEL A-
6	NC	No connection	27	RA4P	Fourth CHANNEL A+
7	NC	No connection	28	RB4N	Fourth CHANNEL B-
8	NC	No connection	29	RB4P	Fourth CHANNEL B+
9	GND	Ground	30	RC4N	Fourth CHANNEL C-
10	RA3N	Third CHANNEL A-	31	RC4P	Fourth CHANNEL C+
11	RA3P	Third CHANNEL A+	32	GND	Ground
12	RB3N	Third CHANNEL B-	33	RCLK4N	Fourth CLOCK CHANNEL Clk-
13	RB3P	Third CHANNEL B+	34	RCLK4P	Fourth CLOCK CHANNEL Clk+
14	RC3N	Third CHANNEL C-	35	GND	Ground
15	RC3P	Third CHANNEL C+	36	RD4N	Fourth CHANNEL D-
16	GND	Ground	37	RD4P	Fourth CHANNEL D+
17	RCLK3N	Third CLOCK CHANNEL Clk-	38	RE4N	Fourth CHANNEL E-
18	RCLK3P	Third CLOCK CHANNEL Clk+	39	RE4P	Fourth CHANNEL E+
19	GND	Ground	40	GND	Ground
20	RD3N	Third CHANNEL D-	41	GND	Ground
21	RD3P	Third CHANNEL D+	-		

Notes : 1. All GND(ground) pins should be connected together to the LCD module's metal frame.

**Rear view of LCM**

[CN1]

- Part/No. : FI-RE51S-HF(JAE)
- Mating connector : FI-RE51HL  
(Manufactured by JAE)

[CN2]

- Part/No. : FI-RE41S-HF(JAE)
- Mating connector : FI-RE41HL  
(Manufactured by JAE)

## Product Specification

**3-2-2. Backlight Inverter**

Inverter Connector : S14B-PH-SMC

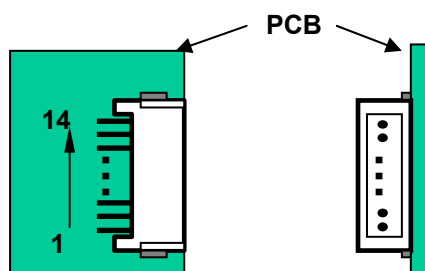
(manufactured by JST) or Equivalent

- Mating Connector : PHR-14 or Equivalent

**Table 5. INVERTER CONNECTOR PIN CONFIGURATION**

Pin No	Symbol	Description	Note
1	VBL	Power Supply +24.0V	
2	VBL	Power Supply +24.0V	
3	VBL	Power Supply +24.0V	
4	VBL	Power Supply +24.0V	
5	VBL	Power Supply +24.0V	
6	GND	Backlight Ground	1
7	GND	Backlight Ground	
8	GND	Backlight Ground	
9	GND	Backlight Ground	
10	GND	Backlight Ground	
11	VBR-A	Analog dimming voltage DC 0.0V ~ 3.3V (Typ : 1.65V)	2, 3
12	VON/OFF	0.0V ~ 5.0V	
13	VBR-B	Burst dimming voltage DC 0.0V ~ 3.3V	3
14	Status	Normal : Upper 3.0V Abnormal : Under 0.7V	4

- Note :
1. GND should be connected to the LCD module's metal frame.
  2. If Pin #11 is open, VBR-A = 1.65V. When apply over 1.65V( ~ 3.3V)continuously, its luminance is increasing however lamp's life time is decreasing.  
It could be usable for boost up luminance when using DCR (=Dynamic contrast ratio) function only.
  3. Minimum Brightness : VBR-B =0V Maximum Brightness : VBR-B = 3.3V
  4. Even though Pin #14 is open, there is no effect on inverter operating, The output terminal of inverter.
  5. Each impedance of pin #11,12 and 13 is 150 [KΩ] , 100 [KΩ] and 200 [KΩ].

**◆ Rear view of LCM**

## Product Specification

**3-3. Signal Timing Specifications**

Table 6 shows 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 normal operation.

**Table 6. TIMING TABLE for NTSC/ATSC (DE Only Mode)**

ITEM		Symbol	Min	Typ	Max	Unit	Note
Horizontal	Display Period	$t_{HV}$	480	480	480	$t_{CLK}$	1920/4
	Blank	$t_{HB}$	40	70	200	$t_{CLK}$	1
	Total	$t_{HP}$	520	550	680	$t_{CLK}$	
Vertical	Display Period	$t_{VV}$	1080	1080	1080	Lines	
	Blank	$t_{VB}$	10	45	86	Lines	1
	Total	$t_{VP}$	1090	1125	1166	Lines	

ITEM		Symbol	Min	Typ	Max	Unit	Note
Frequency	DCLK	$f_{CLK}$	66.97	74.25	75.00	MHz	
	Horizontal	$f_H$	121.8	135	136.4	KHz	2
	Vertical	$f_V$	108.2	120	121.2	Hz	2

- Note : 1. The Input of HSYNC & VSYNC signal does not have an effect on normal operation(DE Only Mode).  
If you use spread spectrum for EMI, add some additional clock to minimum value for clock margin.
2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate and the horizontal frequency.

## Product Specification

Table 7 shows 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 normal operation.

**Table7. TIMING TABLE for DVB/PAL (DE Only Mode)**

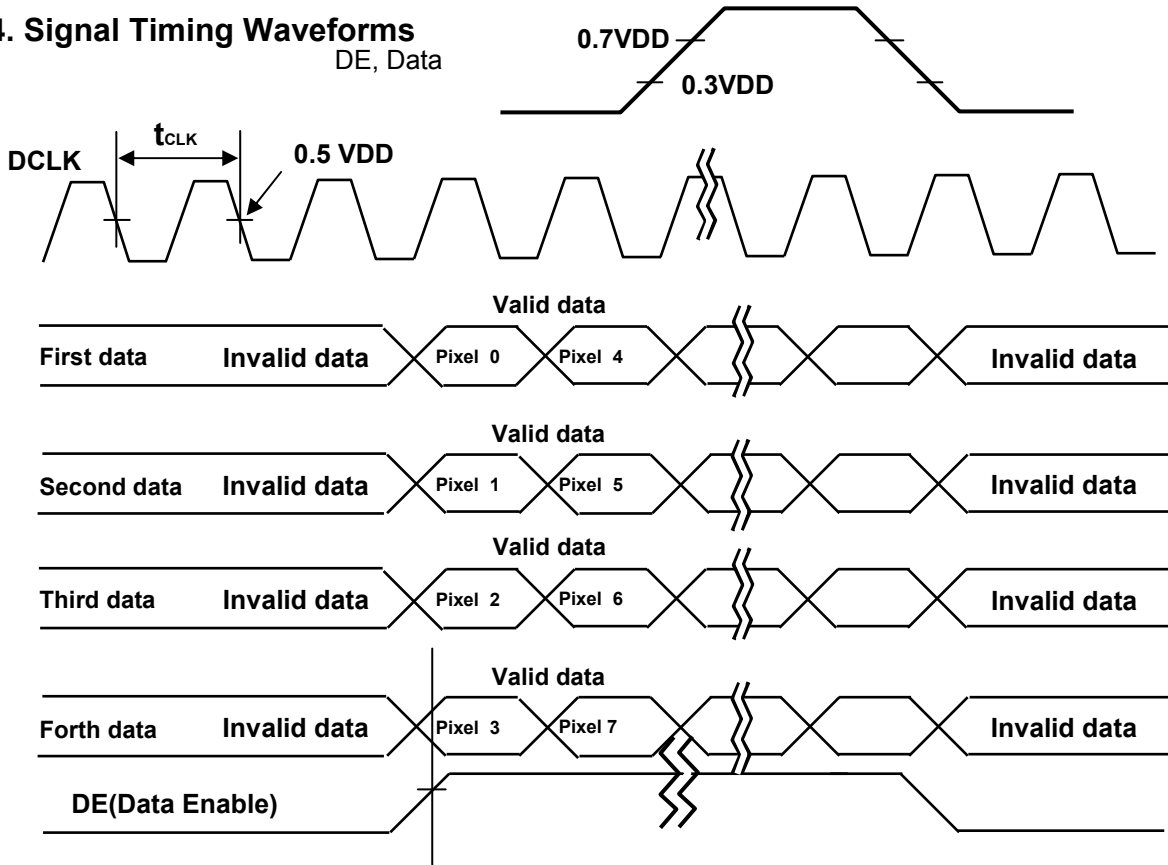
ITEM		Symbol	Min	Typ	Max	Unit	Note
Horizontal	Display Period	$t_{HV}$	480	480	480	$t_{CLK}$	1920/4
	Blank	$t_{HB}$	40	70	200	$t_{CLK}$	1
	Total	$t_{HP}$	520	550	680	$t_{CLK}$	
Vertical	Display Period	$t_{VV}$	1080	1080	1080	Lines	
	Blank	$t_{VB}$	228	270	300	Lines	1
	Total	$t_{VP}$	1308	1350	1380	Lines	

ITEM		Symbol	Min	Typ	Max	Unit	Note
Frequency	DCLK	$f_{CLK}$	66.97	74.25	75.00	MHz	
	Horizontal	$f_H$	121.8	135	136.4	KHz	2
	Vertical	$f_V$	95	100	103.7	Hz	2

- Note : 1. The Input of HSYNC & VSYNC signal does not have an effect on normal operation(DE Only Mode).  
If you use spread spectrum for EMI, add some additional clock to minimum value for clock margin.
2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate and the horizontal frequency.

Product Specification

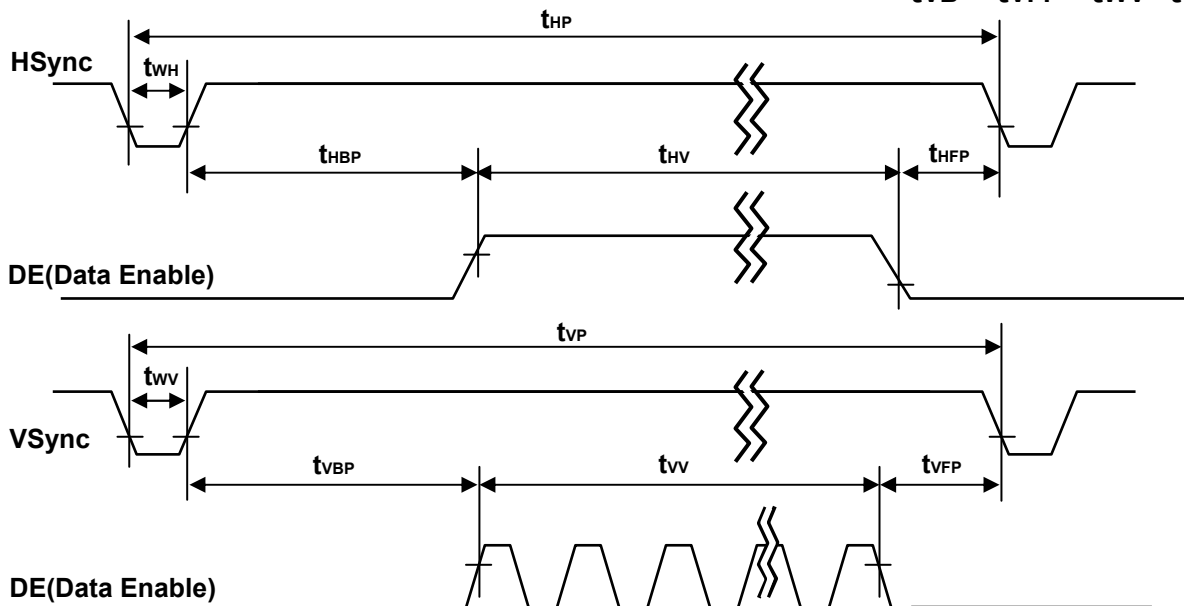
3-4. Signal Timing Waveforms



\* Reference : Sync. Relation

\*  $t_{HB} = t_{HFP} + t_{WH} + t_{HBP}$

\*  $t_{VB} = t_{VFP} + t_{WV} + t_{VBP}$



## Product Specification

## 3-5. Color Data Reference

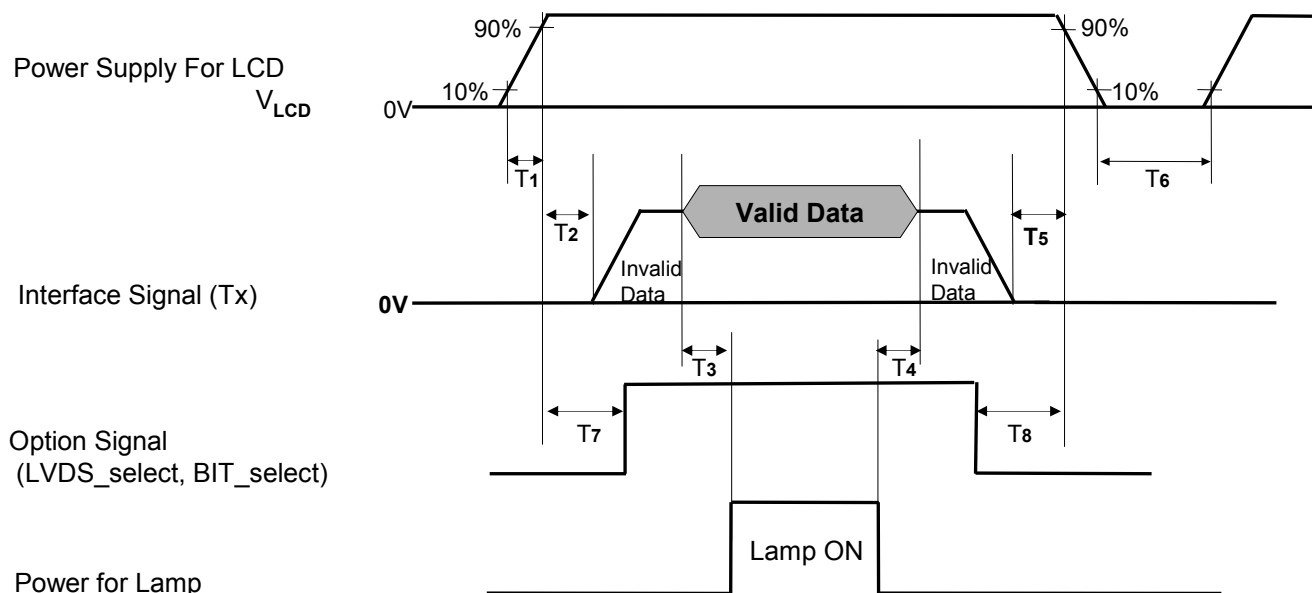
The brightness of each primary color(red,green,blue) is based on the 10-bit gray scale data input for the color. The higher binary input, the brighter the color. Table 10 provides a reference for color versus data input.

Table 8. COLOR DATA REFERENCE

Color		Input Color Data																													
		RED										GREEN										BLUE									
		MSB	LSB								MSB	LSB								MSB	LSB										
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	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	0	0	0	0	0	0
	Red (1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Blue (1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	0	0	1	1	1	1	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	1	1	0	0	0	0	0	0	0	0	0	0	1	1	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	1	1	1	1	0	0	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	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	0	0	0	0	0	
	RED (001)	0	0	0	0	0	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 (1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED (1023)	1	1	1	1	1	1	1	1	1	0	0	0	0	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	0	0	0	0	0	
	GREEN (001)	0	0	0	0	0	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 (1022)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	
	GREEN (1023)	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	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	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	0	0	0	0	0	1	
	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
	BLUE (1022)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	
	BLUE (1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	

### 3-6. Power Sequence

#### 3-6-1. LCD Driving circuit



**Table 9. POWER SEQUENCE**

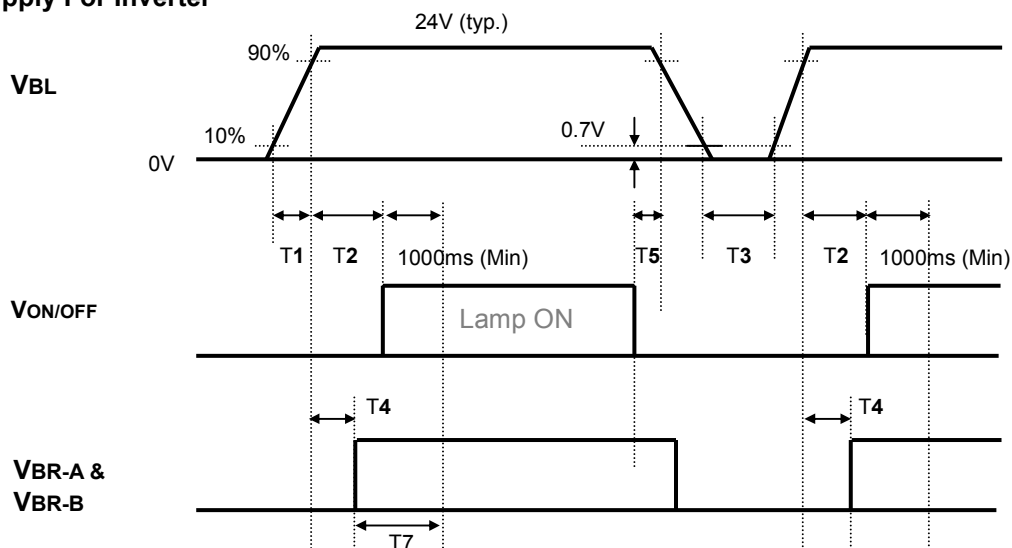
Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5	-	20	ms	
T2	0	-	-	ms	4
T3	200	-	-	ms	3
T4	200	-	-	ms	3
T5	0	-	-	ms	
T6	2.0	-	-	s	5
T7	0	-	T2	ms	4
T8	0	-	-	ms	4

- Note :
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  $V_{LCD}$  to 0V.
  3. The T3/T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.
  4. If the on time of signals (Interface signal and Option signals) precedes the on time of Power ( $V_{LCD}$ ), check the LCD logic Power ( $V_{CC}$ ) is under 0.8V, otherwise it will be happened abnormal display.
  5. T6 should be measured after the Module has been fully discharged between power off and on period.

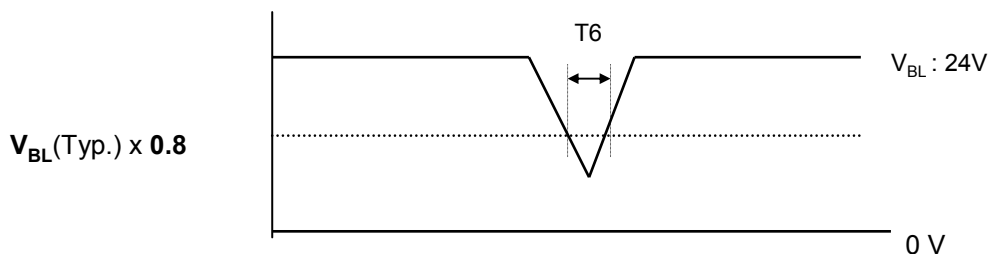
Product Specification

**3-6-2. Sequence for Inverter**

**Power Supply For Inverter**



**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	
T4	0	-	-	ms	2
T5	10	-	-	ms	
T6	-	-	10	ms	$V_{BL}(Typ) \times 0.8$
T7	1000	-	-	ms	3

- Notes :
1. T1 describes rising time of 0V to 24V and this parameter does not applied at restarting time.
  2. T4(max) is less than T2.
  3. In T7 section, VBR-A should be more than 1.65V and Vbr-B should be 3.3V



## Product Specification

#### 4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at  $25 \pm 2^\circ\text{C}$ . The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of  $\Phi$  and  $\theta$  equal to  $0^\circ$ .

FIG. 1 shows additional information concerning the measurement equipment and method.

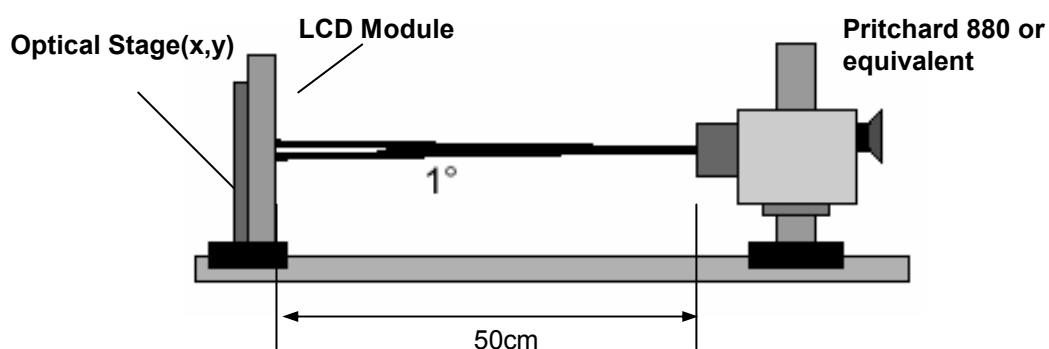


FIG. 1 Optical Characteristic Measurement Equipment and Method

Table 11. OPTICAL CHARACTERISTICS

$T_a = 25 \pm 2^\circ\text{C}$ ,  $V_{LCD} = 12.0\text{V}$ ,  $f_v = 120\text{Hz}$ ,  $D_{clk} = 297\text{MHz}$ ,  $V_{BR\_A} = 1.6\text{V}$ ,  $V_{br-B} = 3.3\text{V}$

Parameter	Symbol	Value			Unit	Note	
		Min	Typ	Max			
Contrast Ratio	CR	900	1300	-		1	
Surface Luminance, white	$L_{WH}$	400	500	-	$\text{cd}/\text{m}^2$	2	
Luminance Variation	$\delta_{WHITE}$ 5P	-	-	1.3		3	
Response Time	Gray-to-Gray	G to G	-	-	ms	4	
	MPRT		-	8			10
Color Coordinates [CIE1931]	RED	Rx	Typ -0.03	0.649	Typ +0.03		
		Ry		0.329			
	GREEN	Gx		0.220			
		Gy		0.670			
	BLUE	Bx		0.148			
		By		0.064			
	WHITE	Wx		0.279			
Wy	0.292						
Viewing Angle (CR>10)							
	x axis, right( $\phi=0^\circ$ )	$\theta_r$	89	-	-	degree	5
	x axis, left ( $\phi=180^\circ$ )	$\theta_l$	89	-	-		
	y axis, up ( $\phi=90^\circ$ )	$\theta_u$	89	-	-		
	y axis, down ( $\phi=270^\circ$ )	$\theta_d$	89	-	-		
Gray Scale			-	-	-		6

## Product Specification

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

$$\text{CR (Contrast Ratio)} = \frac{\text{Maximum CRn (n=1, 2, 3, 4, 5)}}{\text{Surface Luminance at position n with all white pixels}}$$

$$\text{CRn} = \frac{\text{Surface Luminance at position n with all white pixels}}{\text{Surface Luminance at position n with all black pixels}}$$

n = the Position number(1, 2, 3, 4, 5). For more information, see FIG 2.

2. Surface luminance are determined after the unit has been 'ON' and 30min after lighting the backlight in a dark environment at  $25 \pm 2^\circ\text{C}$ . Surface luminance 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 in surface luminance,  $\delta$  WHITE is defined as :

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

Where Lon1 to Lon5 are the luminance with all pixels displaying white at 5 locations .

For more information, see the FIG. 2.

4. MPRT is defined as the 10% to 90% blur-edge width Bij(pixels) and scroll speed U(pixels/frame)at the moving picture. For more 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 module surface. For more information, see the FIG. 5.

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.)
L0	0.08
L63	0.18
L127	1.08
L191	2.07
L255	4.51
L319	7.75
L383	12.05
L447	17.06
L511	22.36
L575	28.21
L639	35.56
L703	43.96
L767	53.00
L831	63.37
L895	74.66
L959	88.17
L1023	100

Product Specification

Measuring point for surface luminance & measuring point for luminance variation.

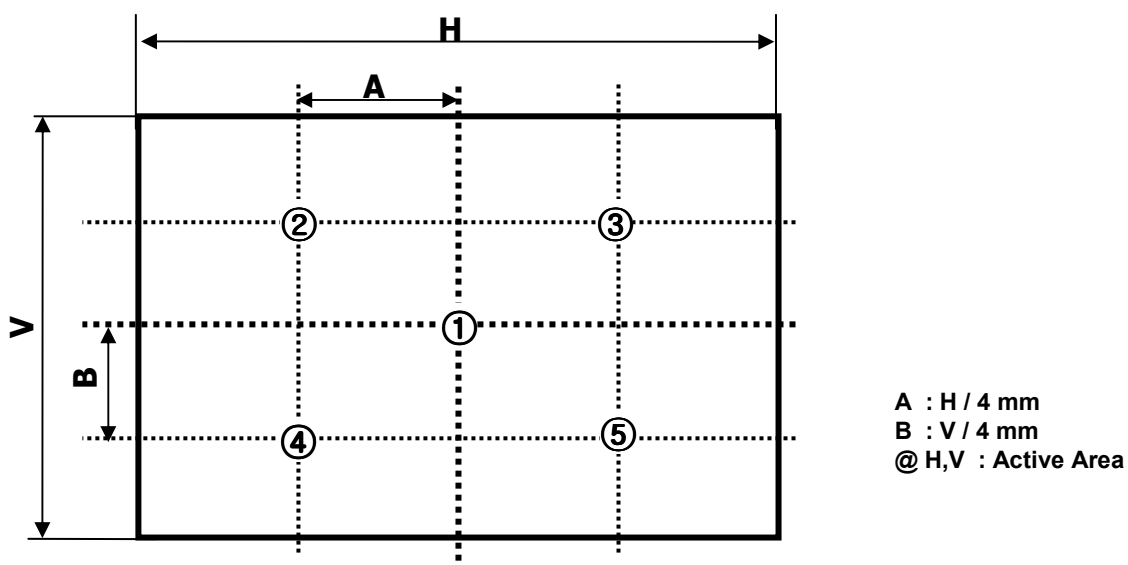
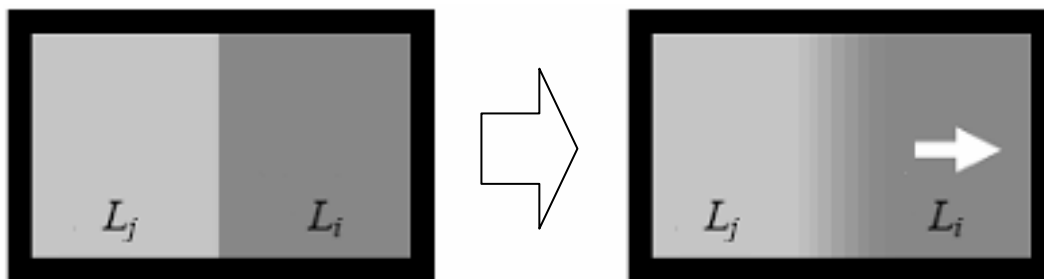


FIG. 2 5 Points for Luminance Measure

MPRT is defined as the 10% to 90% blur-edge with  $B_{ij}$ (pixels) and scroll speed  $U$ (pixels/frame)at the moving picture.



$$M = \frac{1}{U} B_{ij} \quad (i \neq j)$$

Example)  $B_{ij} = 12\text{pixels}$ ,  $U = 10\text{pixels} / 120\text{Hz}$   
 $M = 12\text{pixels} / (10\text{pixels} / 120\text{Hz})$   
 $= 12\text{pixels} / \{10\text{pixels} / (1/120)\text{s}\}$   
 $= 12 / 1,200 \text{ s}$   
 $= 10 \text{ ms}$

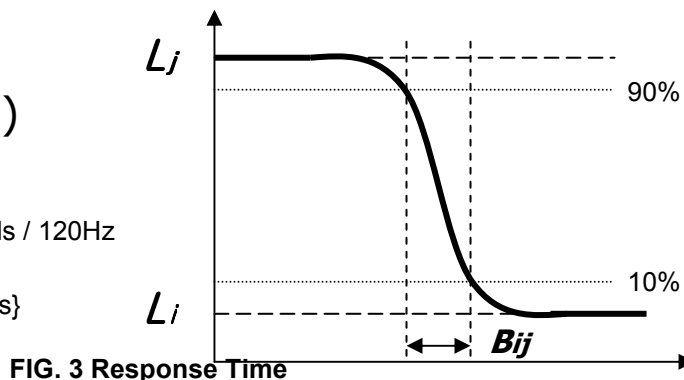


FIG. 3 Response Time

## Product Specification

Dimension of viewing angle range

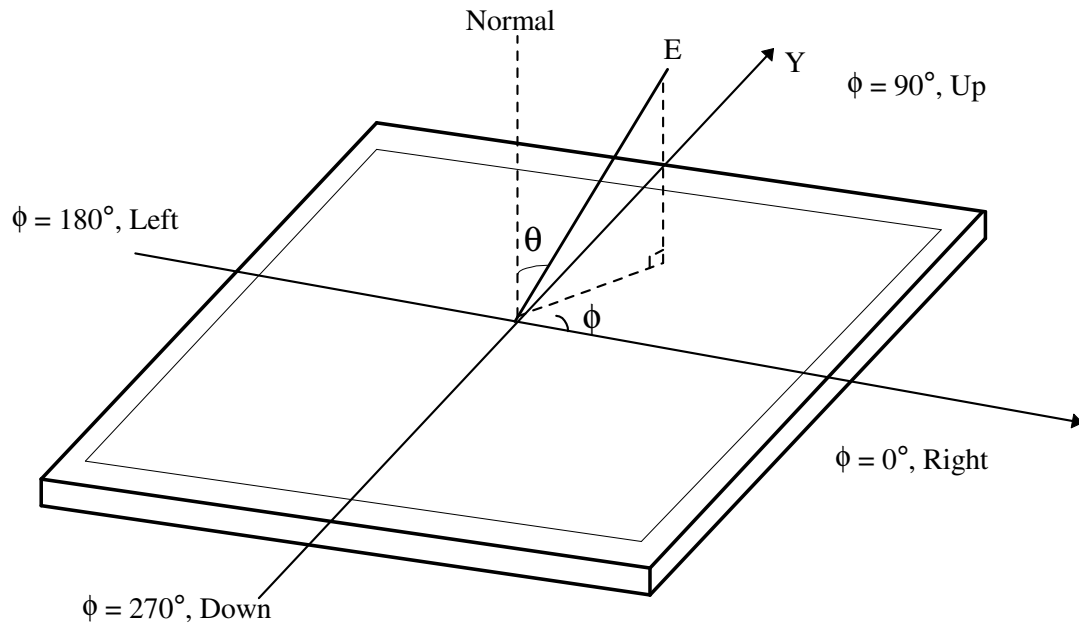


FIG. 4 Viewing Angle

## Product Specification

**5. Mechanical Characteristics**

Table 13 provides general mechanical characteristics.

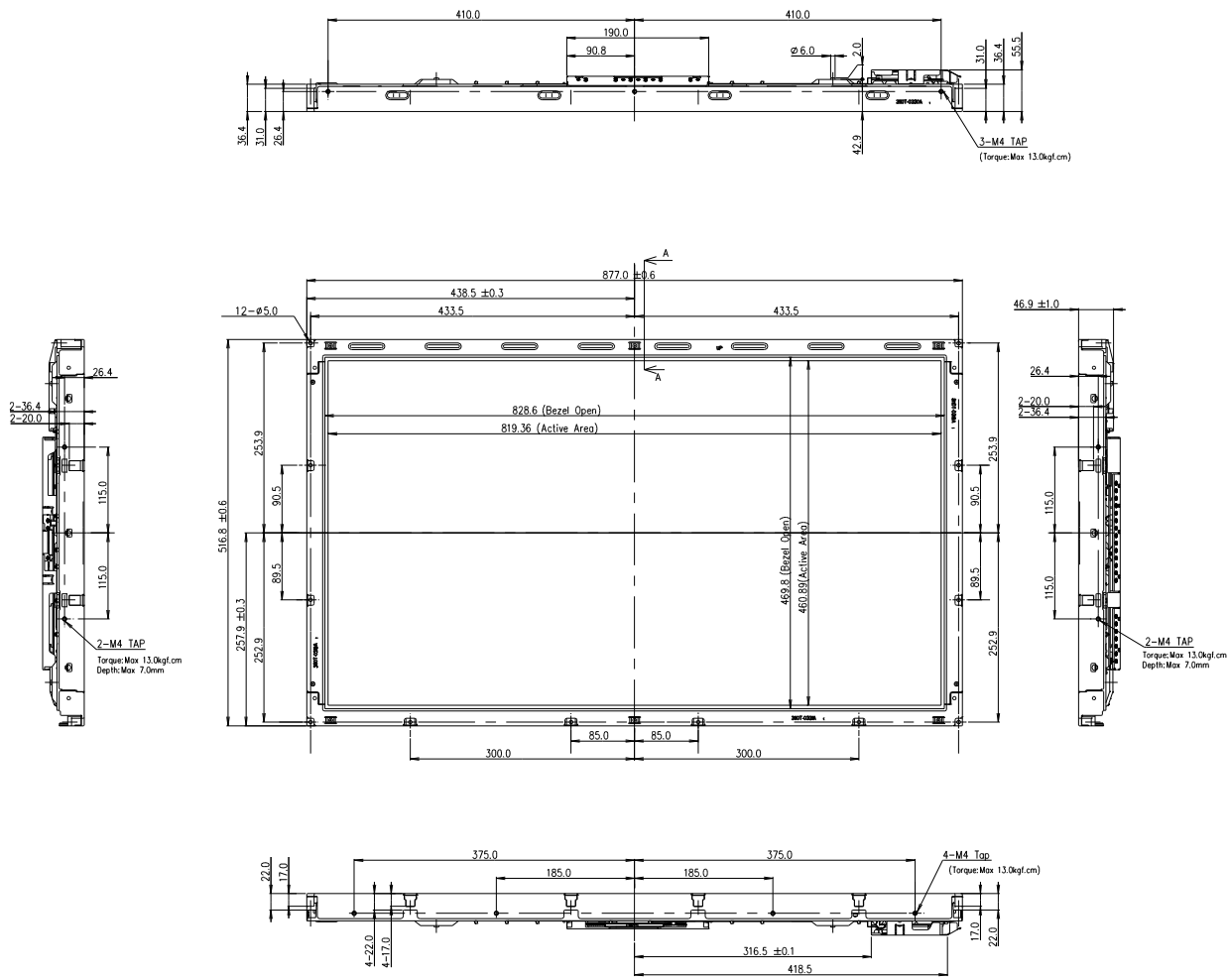
**Table 13. MECHANICAL CHARACTERISTICS**

Item	Value	
Outline Dimension	Horizontal	<b>877.0 mm</b>
	Vertical	<b>516.8 mm</b>
	Depth	<b>55.5 mm</b>
Bezel Area	Horizontal	<b>828.6 mm</b>
	Vertical	<b>469.8 mm</b>
Active Display Area	Horizontal	<b>819.36 mm</b>
	Vertical	<b>460.89 mm</b>
Weight	9200g(Typ.),9500g(MAX)	

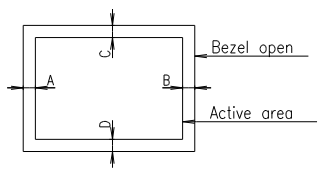
Note : Please refer to a mechanic drawing in terms of tolerance at the next page.

Product Specification

<FRONT VIEW>

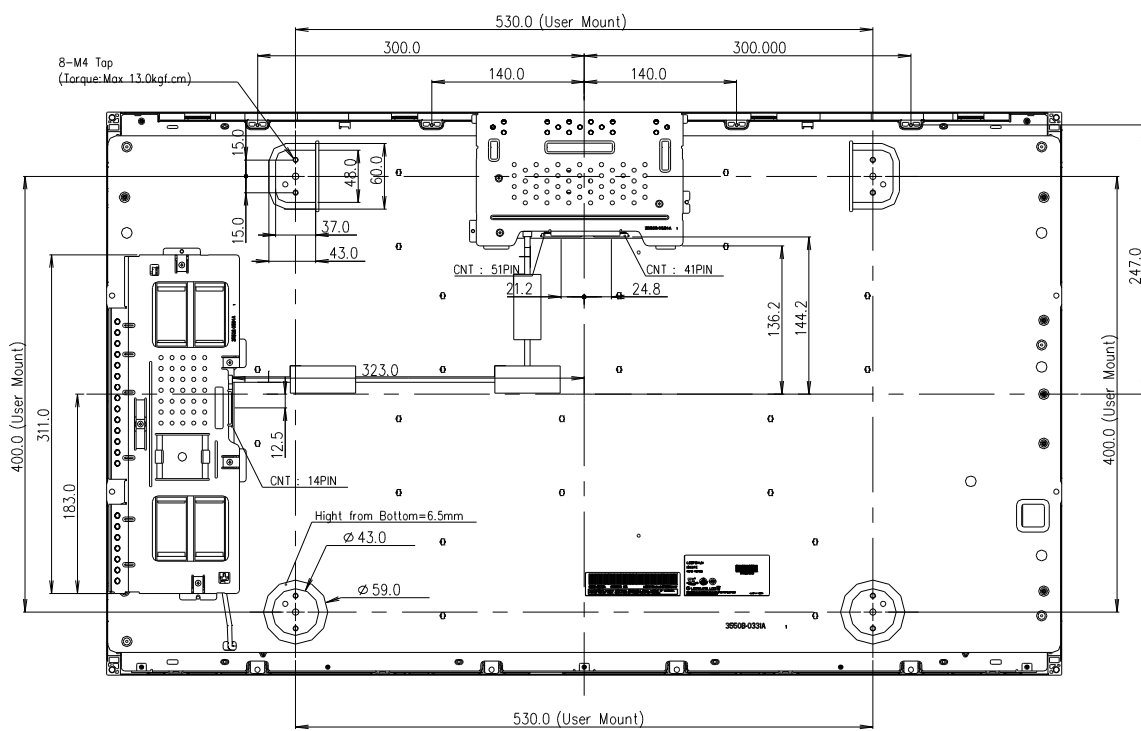


- NOTES
1. Unspecified tolerances are to be ±0.5mm.
  2. This drawing is only preliminary data and can be changed without notice.
  3. Tilt and partial disposition tolerance of display area is as following.
    - (1) X-Direction : IA-BI ≤ 1.5mm
    - (2) Y-Direction : IC-DI ≤ 1.5mm



Product Specification

<REAR VIEW>



## Product Specification

**6. Reliability****Table 14. ENVIRONMENT TEST CONDITION**

No.	Test Item	Condition
1	High temperature storage test	Ta= 60℃ 240h
2	Low temperature storage test	Ta= -20℃ 240h
3	High temperature operation test	Ta= 50℃ 50%RH 240h
4	Low temperature operation test	Ta= 0℃ 240h
5	Vibration test (non-operating)	Wave form : random Vibration level : 1.0Grms Bandwidth : 10-300Hz Duration : X,Y,Z, 10 min One time each direction
6	Shock test (non-operating)	Shock level : 100Grms Waveform : half sine wave, 2ms Direction : ± X, ± Y, ± Z One time each direction
7	Humidity condition Operation	Ta= 40 ℃ ,90%RH
8	Altitude operating storage / shipment	0 - 15,000 ft 0 - 40,000 ft

Note : Before and after Reliability test, LCM should be operated with normal function.



## 7. International Standards

### 7-1. Safety

- a) UL 60065, 7<sup>th</sup> Edition, dated June 30, 2003, Underwriters Laboratories, Inc., Standard for Audio, Video and Similar Electronic Apparatus.
- b) CAN/CSA C22.2, No. 60065:03, Canadian Standards Association, Standard for Audio, Video and Similar Electronic Apparatus.
- c) IEC60065:2001, 7<sup>th</sup> Edition CB-scheme and EN 60065:2002, Safety requirements for Audio, Video and Similar Electronic Apparatus..

### 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) CISPR13 "Limits and Methods of Measurement of Radio interference characteristics of Sound and Television broadcast receivers and associated equipment"  
CISPR22 "Limits and Methods of Measurement of Radio interference characteristics of Information Technology Equipment" International Special Committee on Radio Interference.
- c) EN55013 "Limits and Methods of Measurement of Radio interference characteristics of Sound and Television broadcast receivers and associated equipment"  
EN55022 "Limits and Methods of Measurement of Radio interference characteristics of Information Technology Equipment" European Committee for Electro Technical Standardization.(CENELEC), 1988(Including A1:2000)

## Product Specification

**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)

E : MONTH

D : YEAR

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	4	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 : 4 pcs

b) Box Size : 968mm X 366mm X 595mm

## 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 specified mounting holes (Details refer to the drawings).
- (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 :  
 $V = \pm 200\text{mV}$  (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't be operated its full characteristics perfectly.
- (8) A screw which is fastened up the steels should be a machine screw.  
(if not, it can cause conductive particles and deal LCM a fatal blow)
- (9) Please do not set LCD on its edge.
- (10) It is recommended to avoid the signal cable and conductive material over the inverter transformer for it can cause the abnormal display and temperature rising.

### 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.

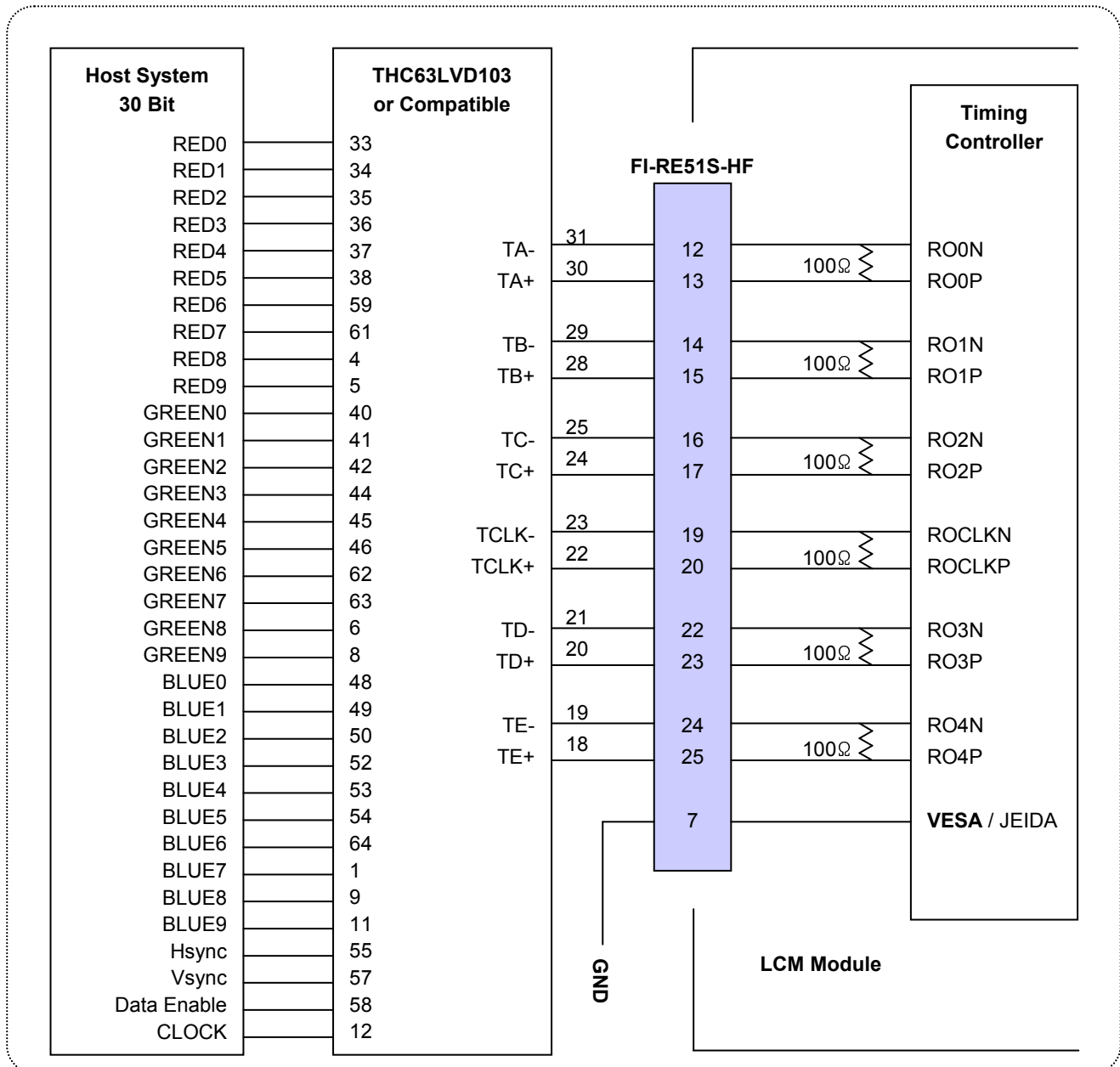
- (1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 35°C at normal humidity.
- (2) The polarizer surface should not come in contact with any other object.  
It is recommended that they be stored in the container in which they 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.

## # APPENDIX-I-1

## ■ Required signal assignment for Flat Link (Thine : THC63LVD103) Transmitter(Pin7="L")



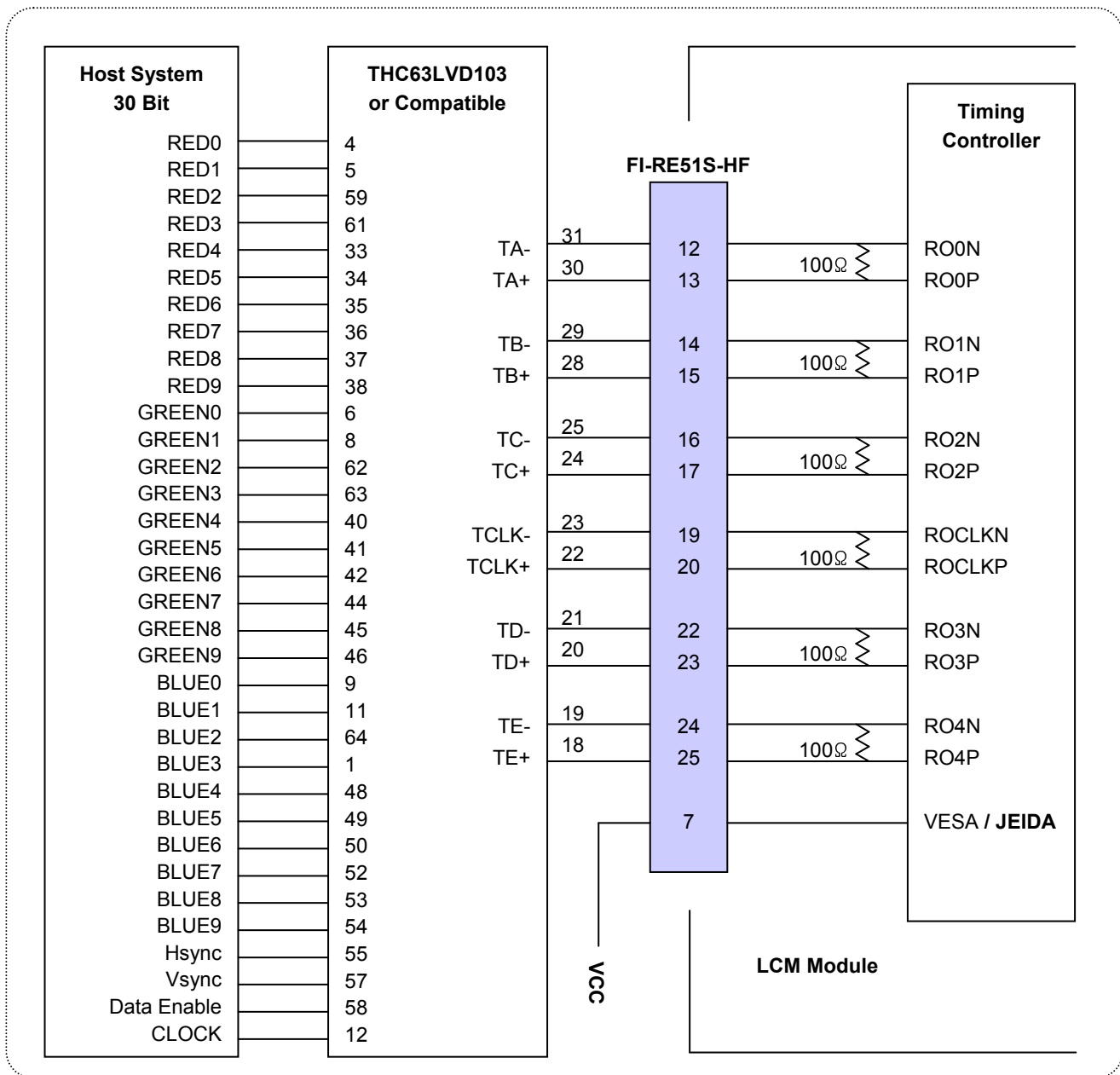
## Note:

1. The LCD module uses a 100 Ohm( $\Omega$ ) resistor between positive and negative lines of each receiver input.
2. Refer to LVDS transmitter data sheet for detail descriptions. (THC63LVD103 or Compatible)
3. '9' means MSB and '0' means LSB at R,G,B pixel data.

Product Specification

# APPENDIX-I-2

Required signal assignment for Flat Link (Thine : THC63LVD823) Transmitter(Pin7="H")



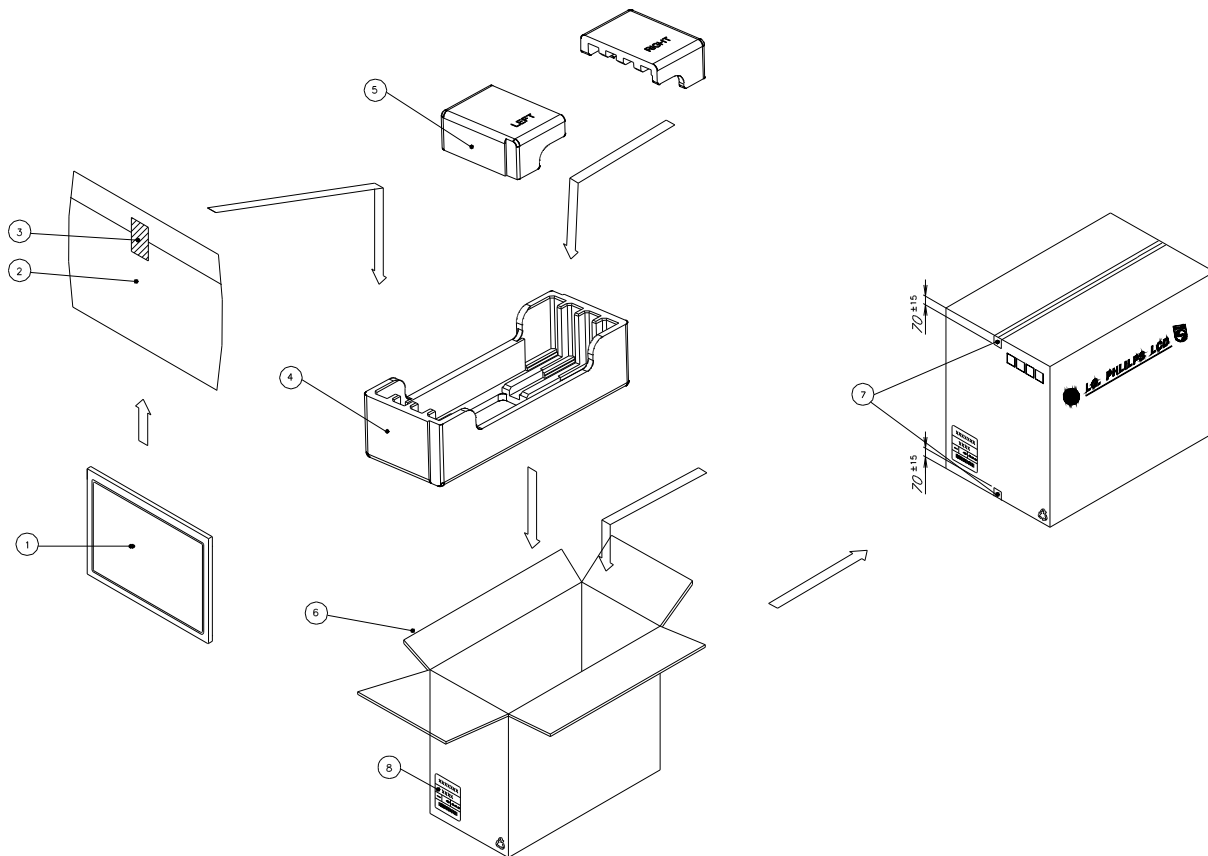
Note:

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. (THC63LVD103 or Compatible)
3. '9' means MSB and '0' means LSB at R,G,B pixel data.

Product Specification

# APPENDIX- II -1

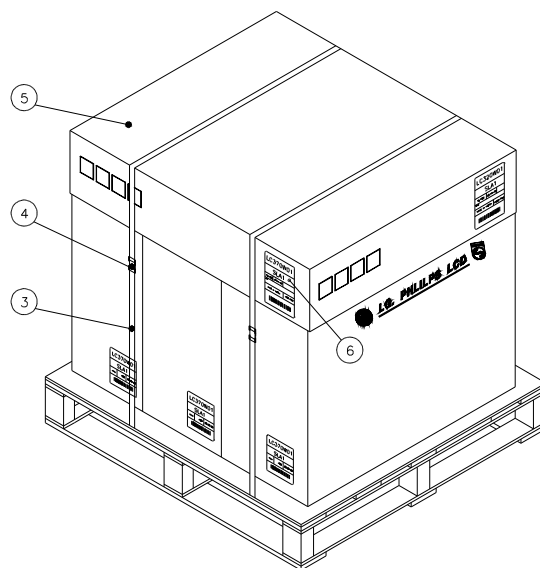
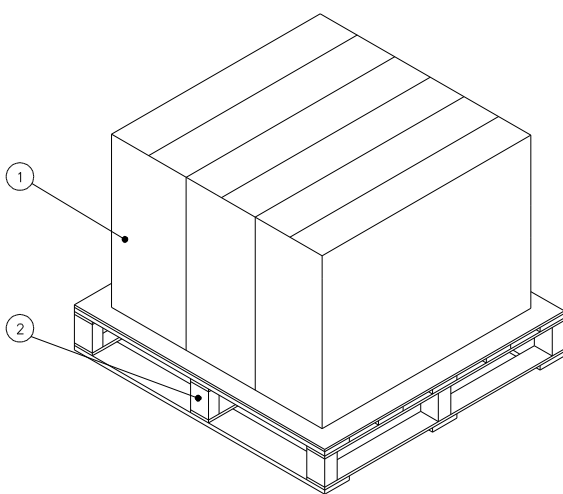
■ LC370WUD-SAB1 Packing Ass'y



NO.	DESCRIPTION	MATERIAL
1	LCD MODULE	
2	BAG	AL
3	TAPE	MASKING 20MM X 50M
4	PACKING, BOTTOM	EPS
5	PACKING, TOP R_L	EPS
6	BOX	PAPER_DW3
7	TAPE	OPP 70MMX300M
8	LABEL	YUPO PAPER 100X100

## # APPENDIX- II -2

## ■ LC370WUD-SAB1 Pallet Ass'y

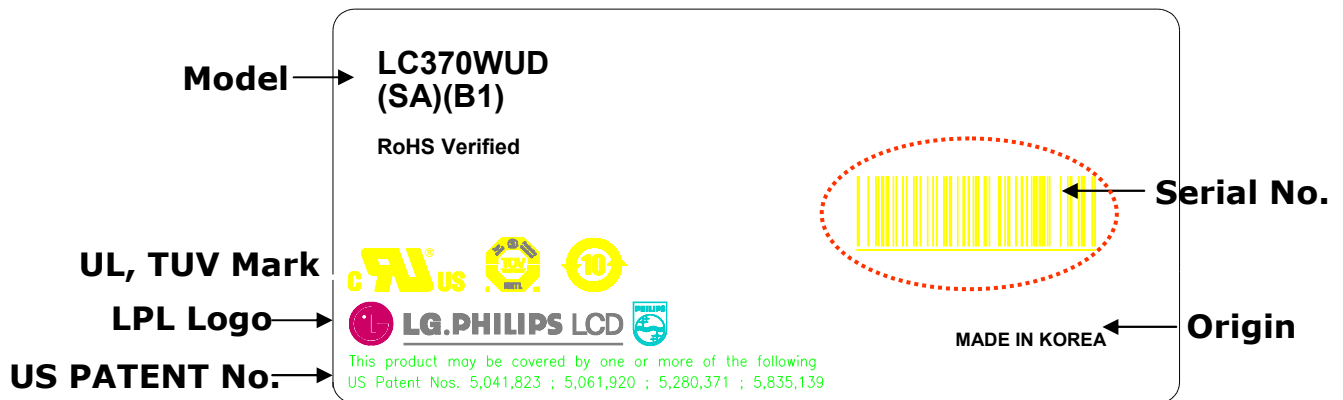


NO.	DESCRIPTION	MATERIAL
1	PACKING ASS'Y	
2	PALLET	Plywood_1140X990X130
3	ANGLE, COVER	DW3
4	LABEL	YUPO PAPER
5	TAPE	OPP
6	BAND	PP
7	BAND, CLIP	CLIP 18MM




# APPENDIX- II -3

■ LCM Label




# APPENDIX-II-4

■ Box Label

LC370WUD		
SAB1		
4 PCS	LOT/MM-DD	
MADE IN KOREA	RoHS Verified	
 *****		

■ Pallet Label

LC370WUD		
SAB1		
12 PCS	LOT/MM-DD	
MADE IN KOREA	RoHS Verified	
 *****		