SPECIFICATION
FOR
APPROVAL

( ) **Preliminary Specification**
(●) **Final Specification**

Title	17" WXGA TFT LCD

BUYER	General
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LC170WXN
SUFFIX	SAA1 (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
J.H. Lee /Senior Manager	
REVIEWED BY	
H.I.Jang / Manager	
PREPARED BY	
Y.J. Kim / Engineer	

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

CONTENTS

RECORD OF REVISIONS

Revision No.	Revision Date	Page	Description
1.0	**Nov, 22, 2007**	**-**	**Final Specification**

1. General Description

The LC170WXN 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 16.8 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 arrayed 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 8-bit 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.

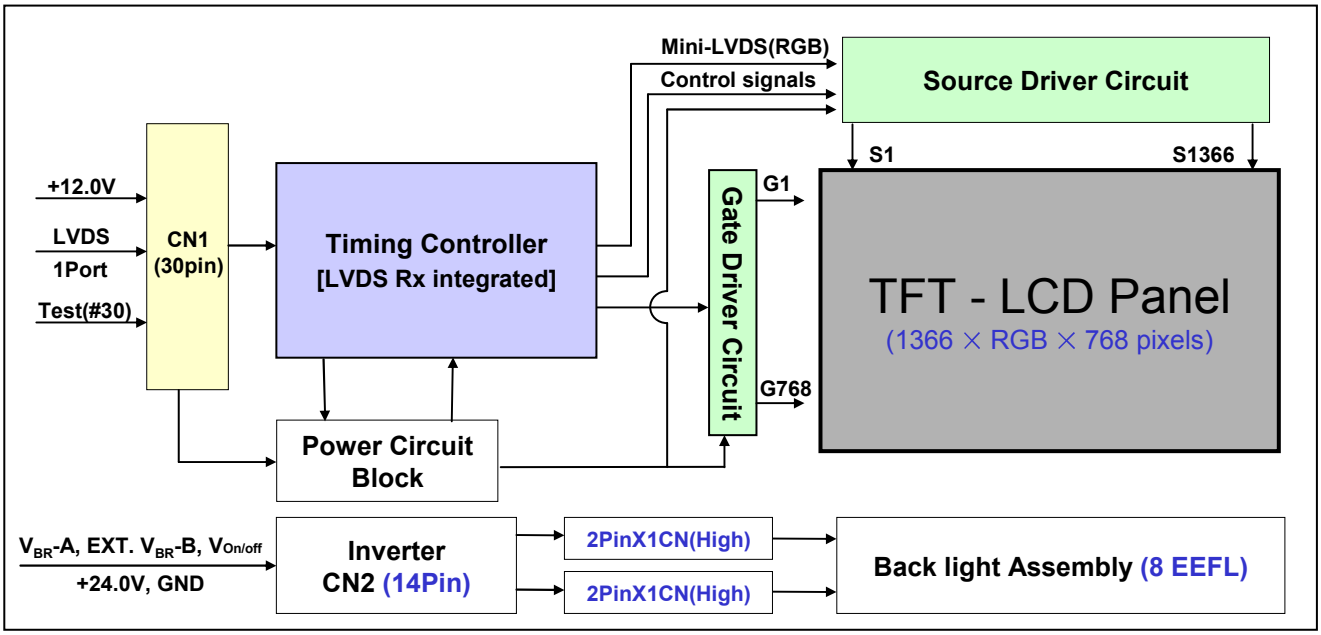


Figure 1. Block diagram

General Features

Active Screen Size	16.84 inches(427.816mm) diagonal
Outline Dimension	413.0(H) x 252.0 (V) x 43.6 mm(D) (Typ.)
Pixel Pitch	0.091(H) x 0.273(V) mm x RGB
Pixel Format	1366 horiz. by 768 vert. Pixels, RGB stripe arrangement
Color Depth	8-bit, 16.7 M colors
Luminance, White	350 cd/m^2 (Center 1point ,Typ.)
Viewing Angle (CR>10)	Viewing angle free (R/L 178 (Typ.), U/D 178 (Typ.))
Power Consumption	Total 36.1 W (Typ.) (Logic=2.5 W, Inverter=33.6W [VBR-A=1.65V])
Weight	2100g (Typ.)
Display Mode	Transmissive mode, Normally black
Surface Treatment	Hard coating(3H), Anti-glare treatment of the front polarizer (Haze 13%)

2. Absolute Maximum Ratings

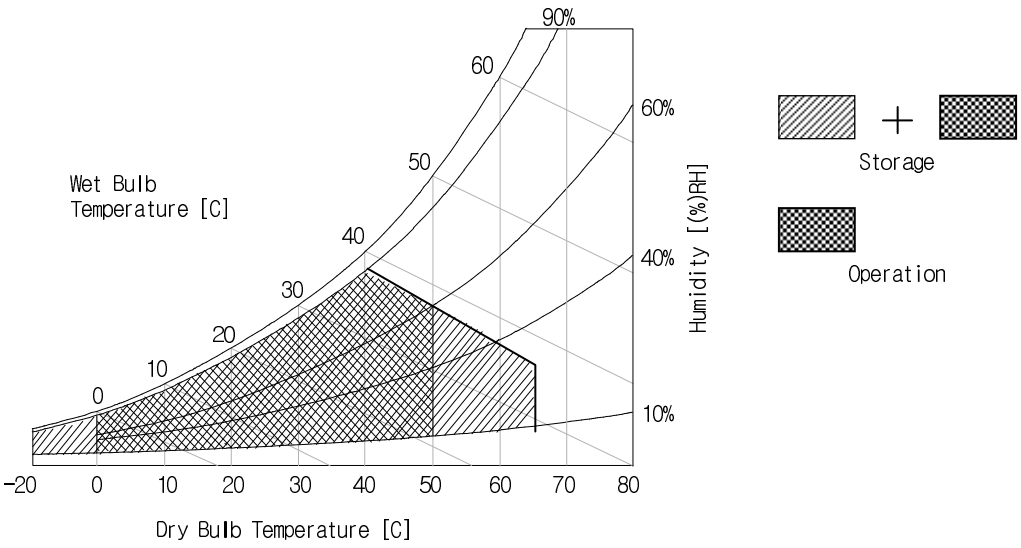
The following items are maximum values which, if exceeded, may cause faulty operation or damage to the LCD module.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Value		Unit	Remark
			Min	Max		
Power Input Voltage	LCM	V_{LCD}	-0.3	+14.0	V_{DC}	at 25 ± 2 ℃
	Backlight inverter	V_{BL}	-0.3	+27.0	V_{DC}	
ON/OFF Control Voltage		VON/OFF	-0.3	+5. 5	V_{DC}	
Brightness Control Voltage		V_{BR}	0	+5.0	V_{DC}	
Operating Temperature		T_{OP}	0	+50	℃	Note 1,2
Storage Temperature		T_{ST}	-20	+65	℃	
Operating Ambient Humidity		H_{OP}	10	90	%RH	
Storage Humidity		H_{ST}	10	90	%RH	

Notes :

1. Temperature and relative humidity range are shown in the figure below.
   Wet bulb temperature should be 39 ℃ Max, and no condensation.
2. Gravity mura can be guaranteed under 40℃condition.
3. Abnormal visual problems by panel front side surface temperature can be occurred in specific range (60 ℃ ~ 65 ℃), But materials (exp : 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 Is used for the EEFL backlight and inverter circuit.

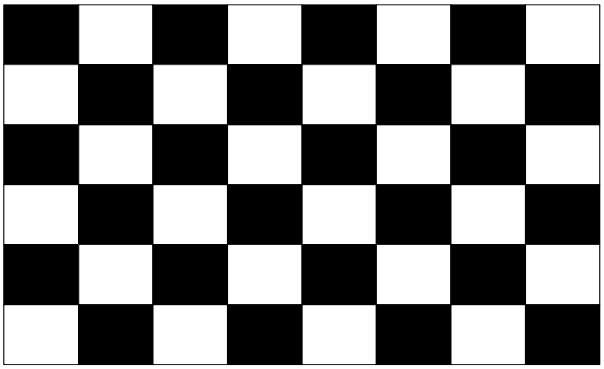
Table 2. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Value			Unit	Note
		Min	Typ	Max		
Circuit :						
Power Input Voltage	V_{LCD}	11.4	12.0	12.6	V_{DC}	
Power Input Current	I_{LCD}	-	205	250	mA	1
		-	245	300	mA	2
Power Consumption	P_{LCD}	-	2.5	3.0	Watt	1
Rush current	I_{RUSH}	-	-	2.2	A	3

Notes:

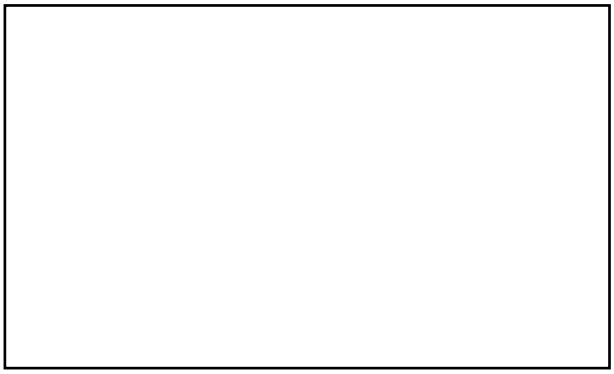
1. The specified current and power consumption are under the V_{LCD}=12.0V, 25 ± 2℃, f_V=60Hz condition whereas mosaic pattern(8 x 6) is displayed and f_V is the frame frequency.
2. The current is specified at full white pattern.
3. The duration of rush current is about 2ms and rising time of power input is 1ms (min.).

White : 255Gray
Black : 0Gray



Mosaic Pattern(8 x 6)

White : 255 Gray



Full White pattern

Table 3. ELECTRICAL CHARACTERISTICS (Continue)

Parameter			Symbol	Values			Unit	Notes
				Min	Typ	Max		
Inverter :								
Power Supply Input Voltage			VBL	21.6	24.0	25.2	Vdc	1
Power Supply Input Voltage Ripple				-	-	0.5	Vp-p	1
Power Supply Input Current	After Aging		IBL_A	-	1.4	1.6	A	V_{BR}-A = 1.65V … 1
				-	1.55	1.75	A	V_{BR}-A = 3.3V … 1
	Before Aging		IBL_B	-	1.5	1.7	A	V_{BR}-A = 1.65V … 2
				-	1.65	1.85	A	V_{BR}-A = 3.3V … 2
Power Supply Input Current(In-Rush)			Irush	-	-	4	A	VBL = 24V EXTVbr-B=100% V_{BR}-A = 1.65V
Power Consumption			PBL	-	33.6	38.4	W	1
Input signal for Inverter control	On/Off	On	V on	2.5	-	5.0	Vdc	
		Off	V off	-0.3	0.0	0.8	Vdc	
	Brightness Adjust		V_{BR}-A	0.0	1.65	3.3	Vdc	
			EXT V_{BR}-B	20		100	%	On duty
PWM Frequency for NTSC & PAL			NTSC/PAL	85/95	90/100	95/105	Hz	3
Pulse Duty Level(PWM) (Burst mode)			High Level	2.5	-	5.0	Vdc	HIGH: Lamp on LOW:Lamp off
			Low Level	0.0	-	0.8	Vdc	
Lamp :								
Lamp Voltage (ExtVbr-B = 100%)			Vout	680/650	820/790	970/940	V(rms)	V_{BR}-A = Typ
Lamp Current (ExtVbr-B = 100%)			IO-MAX	53/55	58/60	63/65	mA(rms)	V_{BR}-A = Max
			IO-TYP	48/50	53/55	58/60	mA(rms)	V_{BR}-A = TYP
			IO-MIN	43/45	48/50	53/55	mA(rms)	V_{BR}-A = Min
Life Time			Boost(0V~3.3V)	50,000			Hrs	4

Notes :

1. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 120 minutes at 25± 2℃. The specified current and power consumption are under the typical supply Input voltage 24V and Vbr 1.65V, 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 ± 5%.
2. Electrical characteristics are determined within 30 minutes at 25± 2℃.
   The specified currents are under the typical supply Input voltage 24V.
3. LPL recommend that the PWM freq. is synchronized with 1.5 times (NTSC) or double (PAL) harmonic of Vsync signal of system.
4. 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/ maximum lamp current on condition of continuous operating at 25 ± 2℃
5. The duration of rush current is about 5ms.

3-2. Interface Connections

This LCD employs Two interface connections, a 30 pin connector is used for the module electronics and 14Pin Connector is used for the backlight system.

3-2-1. LCD Module

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

Table 4. MODULE CONNECTOR(CN1) PIN CONFIGURATION

Pin No	Symbol	Description	Note
1	VCC	Power Supply +12.0V	
2	VCC	Power Supply +12.0V	
3	VCC	Power Supply +12.0V	
4	VCC	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	No Connection	
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	No Connection	
28	NC	No Connection	
29	GND	Ground	
30	RBF	No Signal Processing select	2

Rear view of LCM

Notes:

1. Interface data format is “LG Format, VESA”, please Refer to Appendix for further details.
2. Pin30 should be ground, this pin is necessary for LCD test.
   Vcc(3.3V) : AGP(Auto Generation Pattern), Ground : Black Display
3. All GND(ground) pins should be connected together, which should also be connected to the LCD’s metal frame.
4. All VLCD (power input) pins should be connected together.
5. Input Level of LVDS signal is based on the IEA 664 Standard.

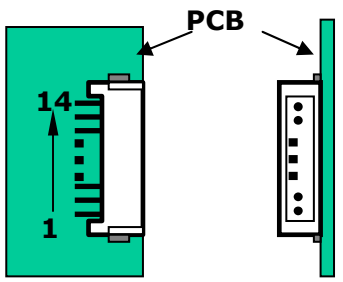
3-2-2. Backlight Inverter

-Inverter Connector : S14B-PH-SM3(manufactured by JST)
- Mating Connector : PHR-14

Table 5. INVERTER CONNECTOR PIN CONFIGULATION

Pin No	Symbol	Description	Note
1	V_{BL}	Power Supply +24.0V	
2	V_{BL}	Power Supply +24.0V	
3	V_{BL}	Power Supply +24.0V	
4	V_{BL}	Power Supply +24.0V	
5	V_{BL}	Power Supply +24.0V	
6	GND	Backlight Ground	
7	GND	Backlight Ground	
8	GND	Backlight Ground	1
9	GND	Backlight Ground	
10	GND	Backlight Ground	
11	V_{BR}-A	DC(0.0V ~ 3.3V) input	2
12	$V_{ON/OFF}$	0.0V ~ 5.0V	3
13	EXTV_{BR}-B	PWM signal (0.0V ~ 3.3V) input	4
14	Status	Normal : Under 0.7V Abnormal : External Pull up	

Notes :
1. GND should be connected to the LCD module's metal frame.
2. Minimum Brightness : Boost = 0.0V Maximum Brightness : Boost = 3.3V "OPEN" : Boost = 1.65V
3. Rising Edge : Lamp "ON" / Falling Edge : Lamp "OFF"
4. Pin#13 can be opened. (if Pin #13 is open , EXTVBR-B is 100%)
5. Pin#14 can be opened. (GND or NC)
6. Each impedance of pin #11, 12 and 13 is 146[KΩ] , 37.6[KΩ] and 54.7[KΩ].



<Input connector>

3-3. Signal Timing Specifications

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

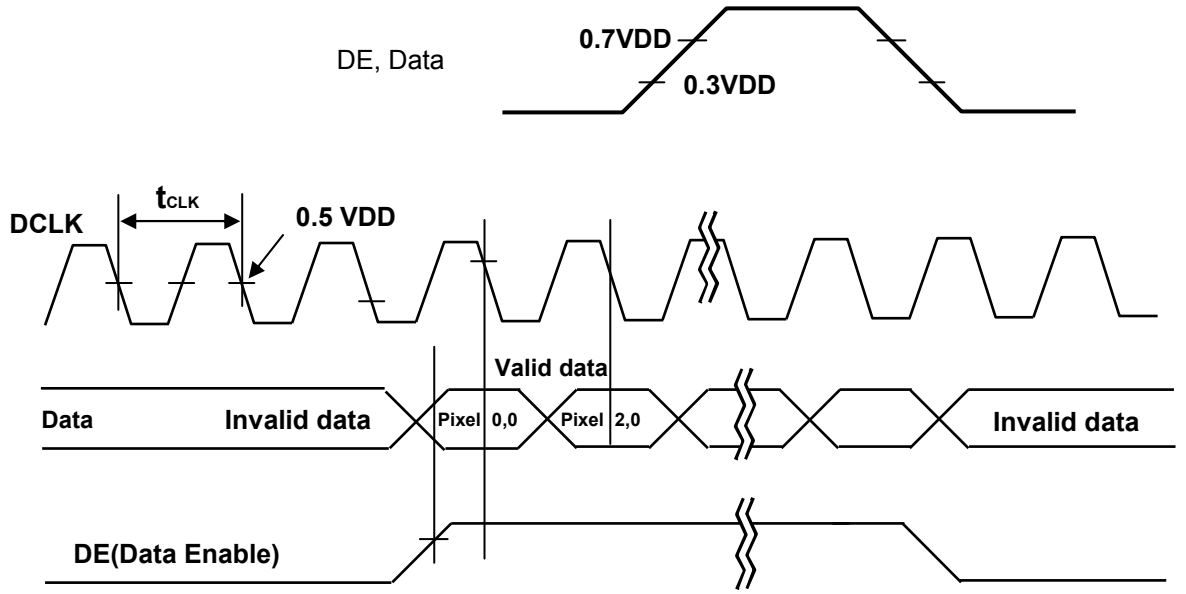
Table 6. Timing Table

ITEM		SYMBOL	Min.	Typ.	Max.	Unit	Note
Clock	Period	t_{CLK}	12.5	13.8	14.7	ns	
	Frequency	f_{CLK}	68	72.3	80	MHz	
Hsync	Frequency	f_H	45	47.4	53	KHZ	3
	Display Valid	t_{HV}	1366	1366	1366	Clks	
	Blank	t_{HT}-t_{HV}	90	162	410	Clks	
	Total	t_{HT}	1456	1528	1776	Clks	
Vsync	Frequency	f_V	47	60	66	HZ	3
	Display Valid	t_{VV}	768	768	768	Lines	PAL: 47~53Hz, NTSC : 57~66Hz
	Blank	t_{VT}-t_{VV}	7	22	295	Lines	
	Total	t_{VT}	775	790	1063	Lines	

Notes:

1. The performance of the electro-optical characteristics are may be influenced by variance of the vertical refresh rates.
2. Above timing table is only valid for DE Mode.
3. H sync ,V sync don't care.(for only DE Mode)

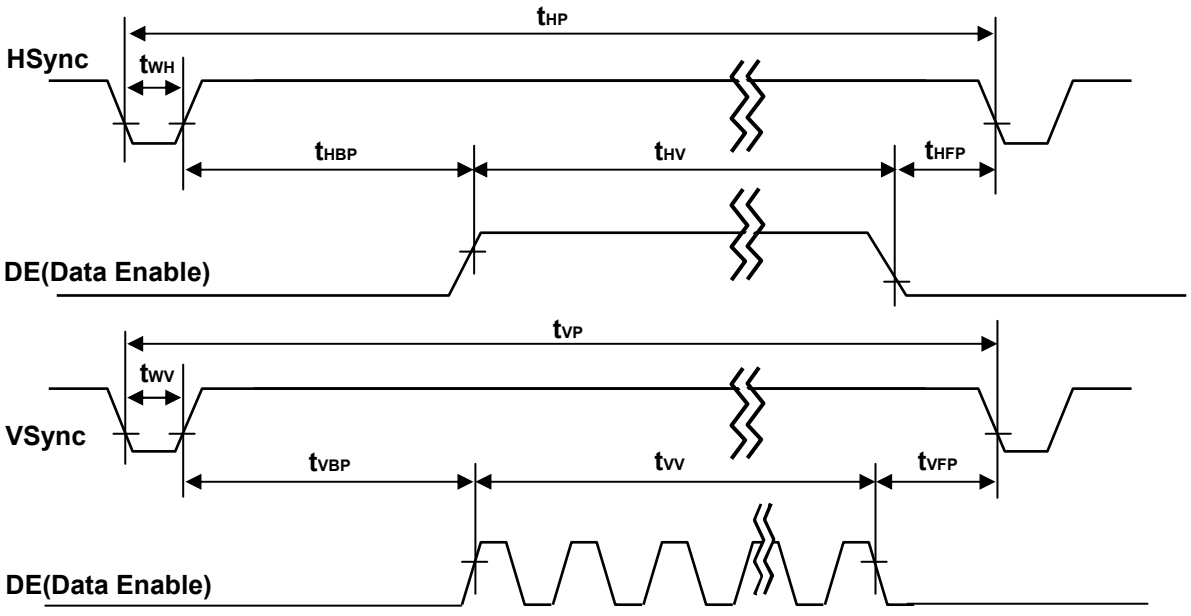
3-4. Signal Timing Waveforms



*** Reference : Sync. Relation**

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

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



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 binary input, the brighter the color. Table 10 provides a reference for color versus data input.

Table 7. 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

3-6. Power Sequence

3-6-1. LCD Driving circuit

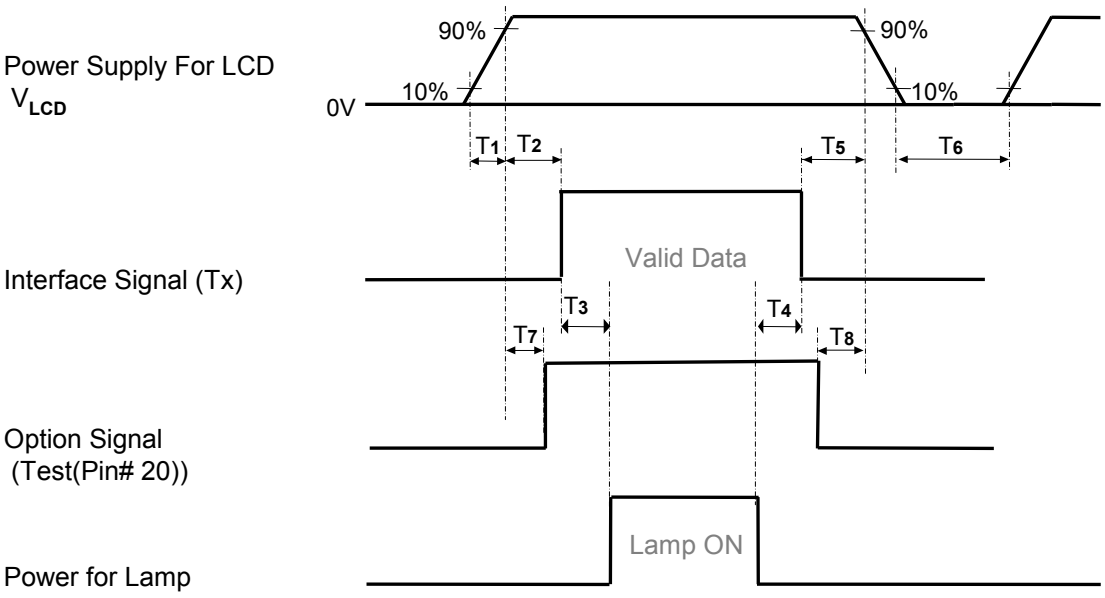


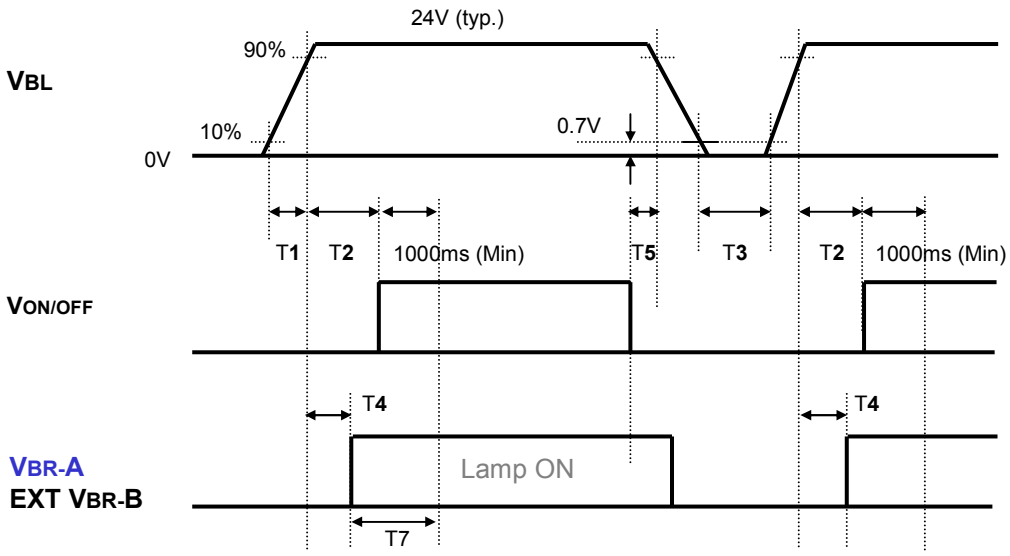
Table 8. POWER SEQUENCE

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5	-	20	ms	
T2	0.5	-	3 x (1/f_V)	ms	3,5
T3	200	-	-	ms	4
T4	200	-	-	ms	4
T5	0	-	-	ms	3,5
T6	2.0	-	-	s	2,6
T7	0	-	T2	ms	5
T8	0	-	T5	ms	5

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 case when the T2/T5 exceed 3x(1/fv), it operates protection pattern (Black pattern) till valid signal inputted. There is no reliability problem. (ex. 60Hz : 3x(1/60Hz) = 50ms)
4. 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.
5. If the on time of signals(Interface signal and Option signals) precedes the on time of Power(V_{LCD}), check the LCD logic Power(Vcc) is under 0.8V, otherwise it will be happened abnormal display.
6. T6 should be measured after the Module has been fully discharged between power off and on period.

3-6-2. Sequence for Inverter



3-6-3. Deep condition for Inverter

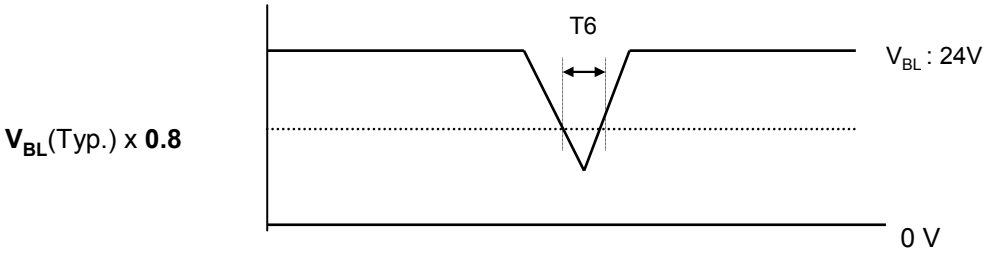


Table 9. Power Sequence for Inverter

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) x **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. For 1 second after lamp on(T7), V_{BR-A} should be more than 1.65V and V_{BR-B} should be 3.3V.

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at 25± 2℃. 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 shows additional information concerning the measurement equipment and method.

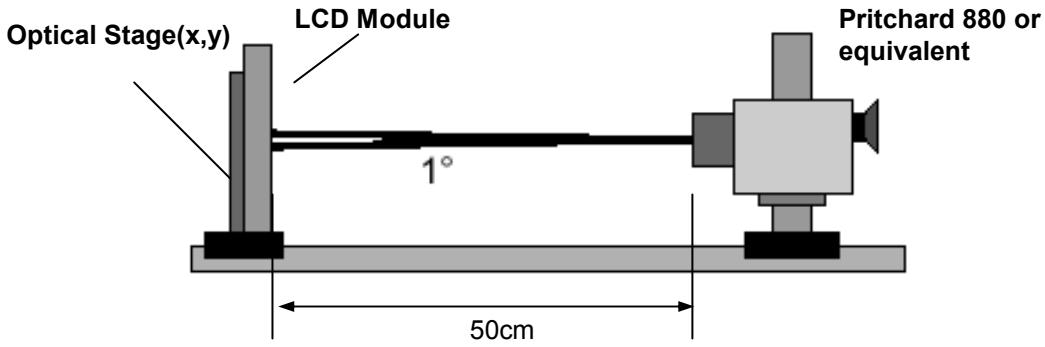


FIG. 1 Optical Characteristic Measurement Equipment and Method

Table 10. OPTICAL CHARACTERISTICS

Ta= 25± 2℃, V_{LCD}=12.0V, fv=60Hz, Dclk=72.3MHz VBR_A=1.65V, EXT. VBR_B=100%

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Contrast Ratio		CR	680	900	-		1
Surface Luminance, white		L_{WH}	280	350	-	cd/m^2	2
Luminance Variation		δ_{WHITE} 5P	-	-	1.3		3
Response Time	Rise Time	Tr_R	-	8	12	ms	4,5
	Decay Time	Tr_D	-	9	14		
Color Coordinates [CIE1931]	RED	Rx	Typ -0.03	0.635	Typ +0.03		
		Ry		0.340			
	GREEN	Gx		0.292			
		Gy		0.612			
	BLUE	Bx		0.145			
		By		0.063			
	WHITE	Wx		0.279			
		Wy		0.292			
Viewing Angle (CR>10)							
	x axis, right(ϕ=0°)	θr	89	-	-	degree	6
	x axis, left (ϕ=180°)	θl	89	-	-		
	y axis, up (ϕ=90°)	θu	89	-	-		
	y axis, down (ϕ=270°)	θd	89	-	-		
Gray Scale			-	-	-		7

Notes :

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

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

It is measured at center 1-point.

2. Surface luminance are determined after the unit has been 'ON' and 30min after lighting the backlight in a dark environment at 25± 2℃. 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 , δ WHITE and δ BLACK are defined as :
- δ WHITE(5P) = Maximum(L_{on1},L_{on2}, L_{on3}, L_{on4}, L_{on5}) / 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. 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 module surface. For more information, see the FIG. 4.

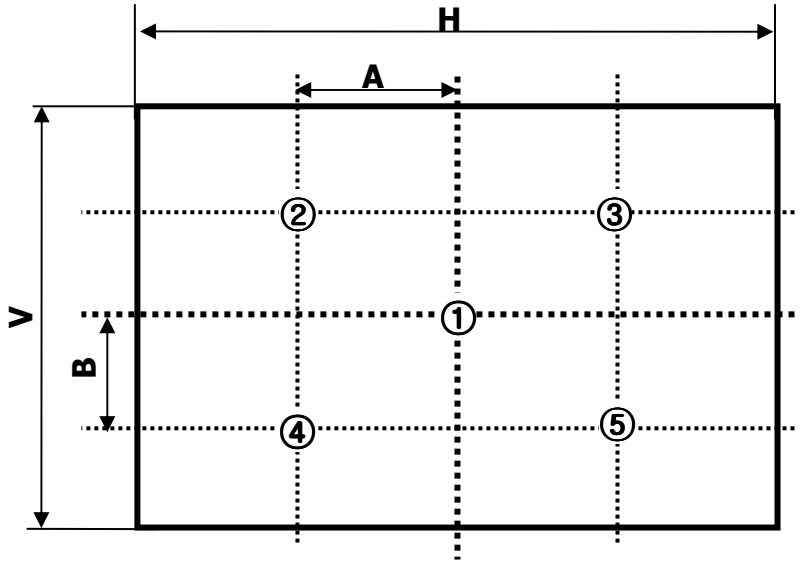
6. Gray scale specification
Gamma Value is approximately 2.2. For more information, see the Table 11.

7. Image sticking
When it changes into pattern-B after a 1-hour drive by pattern-A, it disappears within 10 minutes.
For more information, see the FIG. 4.

Table 11. GRAY SCALE SPECIFICATION

Gray Level	Luminance [%]		
	Minimum	Typical	Maximum
L0	0	0.113	0.65
L15	0	0.27	1.4
L31	0	1.00	2.7
L47	0	2.40	5
L63	0.5	4.60	9.1
L79	1.7	7.60	13.7
L95	4.0	11.4	19.1
L111	7.5	16.0	25.1
L127	11.8	21.6	32.9
L143	16.3	28.0	42
L159	22.0	35.4	50.5
L175	29.7	43.7	59.7
L191	39.4	53.0	69.5
L207	48.8	63.2	80.3
L223	61.5	74.5	90.6
L239	76.9	88.0	96.6
L255	100	100	100

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



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

FIG. 2 5 Points for Luminance Measure

The response time is defined as the following figure and shall be measured by switching the input signal for Black to White and White to Black.

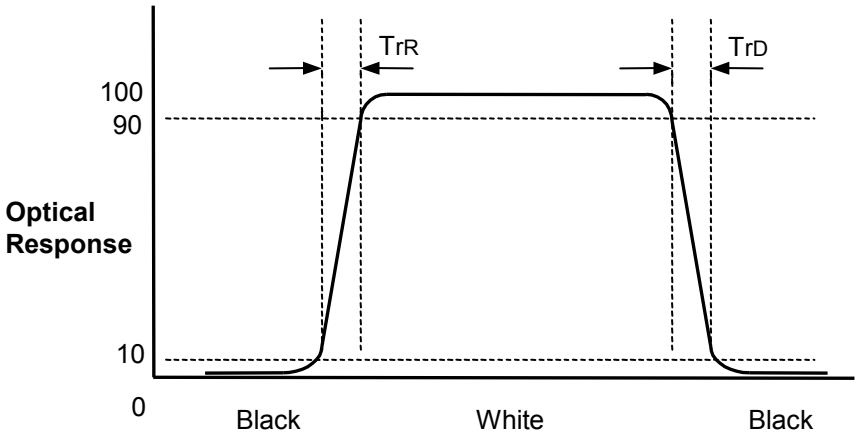


FIG. 3 Response Time

Dimension of viewing angle range

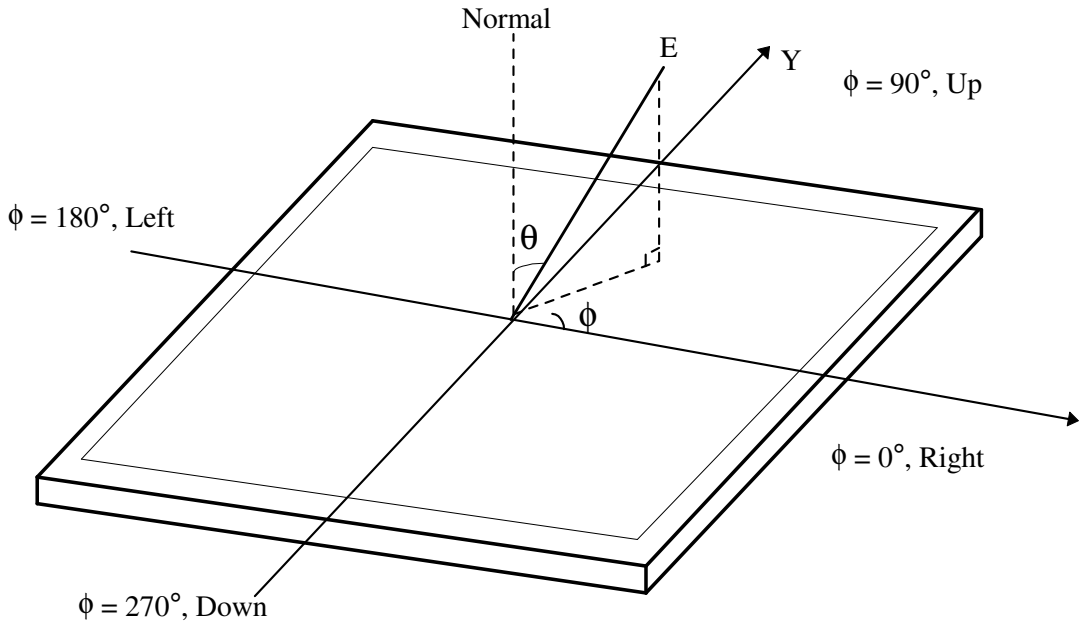
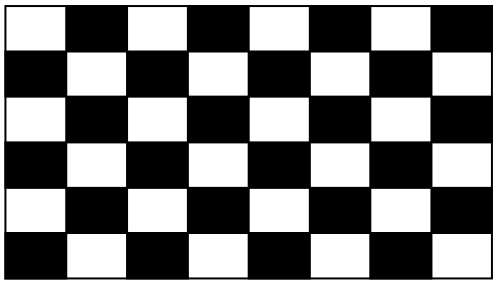


FIG. 4 Viewing Angle

7. Image sticking

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



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

FIG. 6 Image sticking Test pattern

5. Mechanical Characteristics

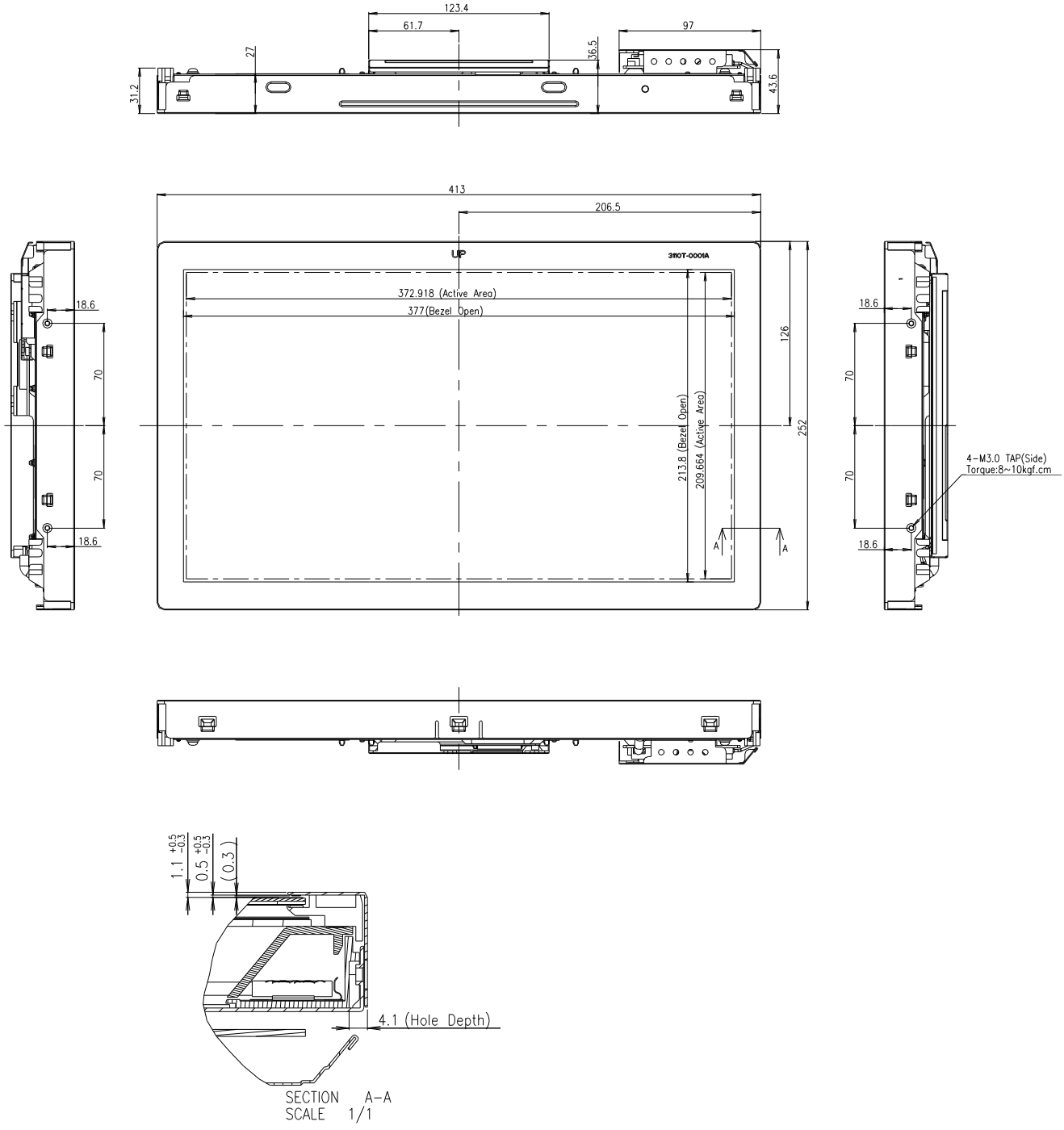
Table 15 provides general mechanical characteristics.

Table 12. MECHANICAL CHARACTERISTICS

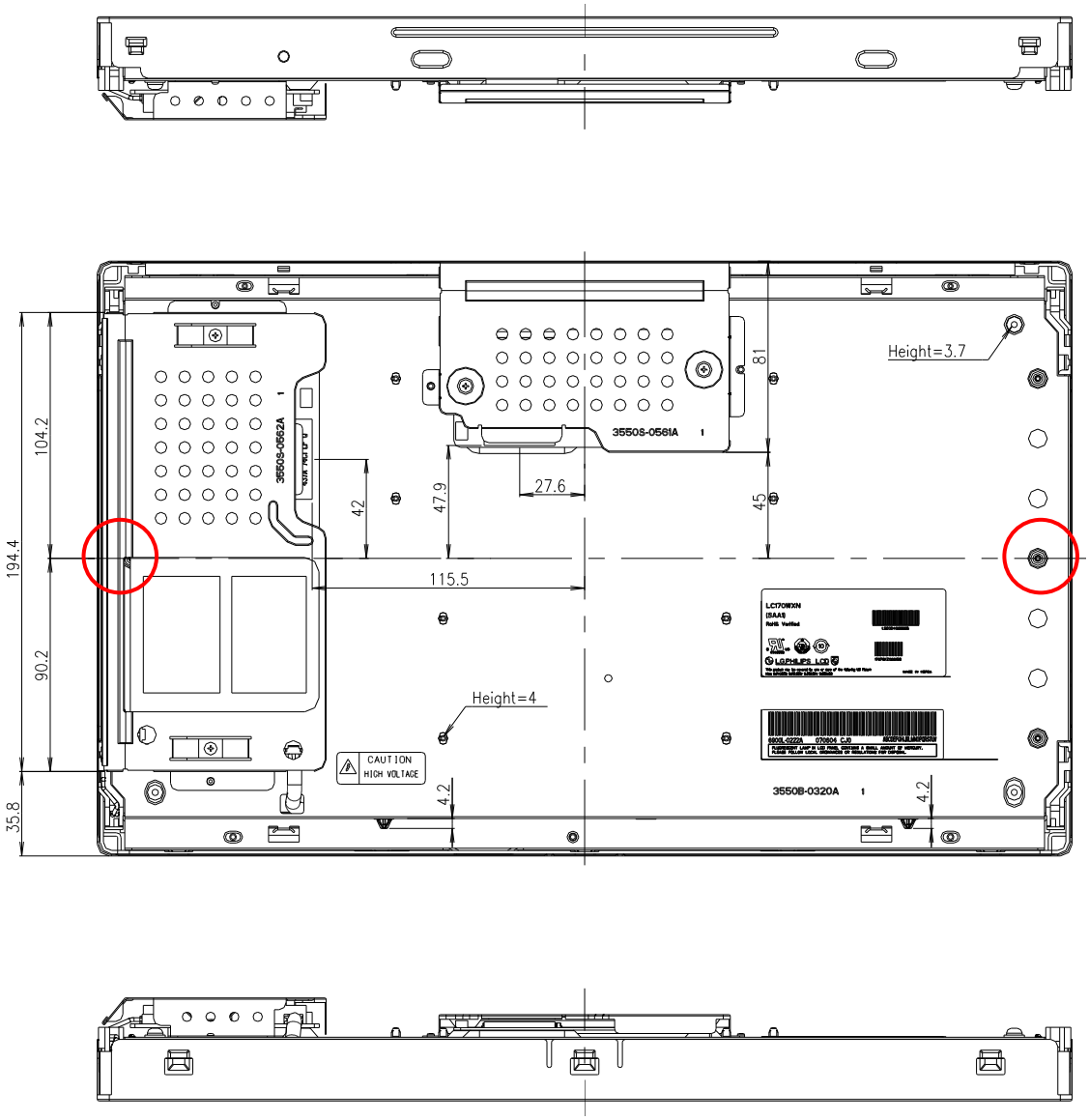
Item	Value	
Outline Dimension	Horizontal	413.0 mm
	Vertical	252.0 mm
	Depth	43.6 mm
Bezel Area	Horizontal	377.0 mm
	Vertical	213.8 mm
Active Display Area	Horizontal	372.918 mm
	Vertical	209.664 mm
Weight	2100g (Typ.) , 2210g (Max.)	

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

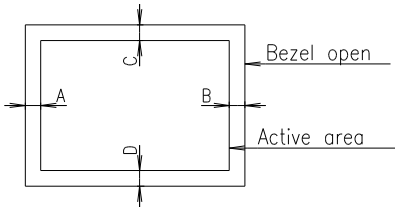
<FRONT VIEW>


123.4
61.7
97
27
36.5
31.2
43.6
413
206.5
372.918 (Active Area)
377(Bezel Open)
126
252
213.8 (Bezel Open)
209.664 (Active Area)
18.6
70
70
18.6
4-M3.0 TAP(Side)
Torque:8~10kgf.cm
1.1 +0.5 -0.3
0.5 +0.5 -0.3
(0.3)
4.1 (Hole Depth)
SECTION A-A
SCALE 1/1

<REAR VIEW>



NOTES
1. Unspecified tolerances are to be ±0.5mm.
2. Tilt and partial disposition tolerance of display area are as following.
   (1) X-Direction : IA-BI ≤ 1.0mm
   (2) Y-Direction : IC-DI ≤ 1.0mm



6. Reliability

Table 13. ENVIRONMENT TEST CONDITION

No.	Test Item	Condition
1	High temperature storage test	Ta= 60℃, 500h
2	Low temperature storage test	Ta= -20℃, 500h
3	High temperature operation test	Ta= 50℃, 80%RH, 500h Ta= 60℃, 500h(2000h)
4	Low temperature operation test	Ta= 0℃, 500h(1000h)
5	Heat cycle test	Ta= -20 ℃ ~ 60 ℃, 30min/5min/30min, 100cycles
6	Soldering heat cycle test	Ta= -40 ℃ ~ 80 ℃, 30min/5min/30min, 200cycles
7	Vibration test (non-operating)	Wave form : random Vibration level : 1.0Grms Bandwidth : 10-300Hz Duration : X,Y,Z, 30 min One time each direction
8	Shock test (non-operating)	Shock level : 120Grms Waveform : half sine wave, 2ms Direction : ±X, ±Y, ±Z One time each direction
9	ESD test	Condition : 150pF, 330 ohm Case , air Evaluation : ± 15kV
10	Humidity storage test	Ta= 40 ℃, 70%RH, 240h

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

7. International Standards

7-1. Safety

a) UL 60065, 7th 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, 7th 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)

8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

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

A,B,C : SIZE(INCH)
D : YEAR
E : MONTH
F : PANEL CODE
G : FACTORY CODE
H : ASSEMBLY CODE
I,J,K,L,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 Pallet : 7 pcs

b) box Size : 375 mm X 320 mm X 484 mm.

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.

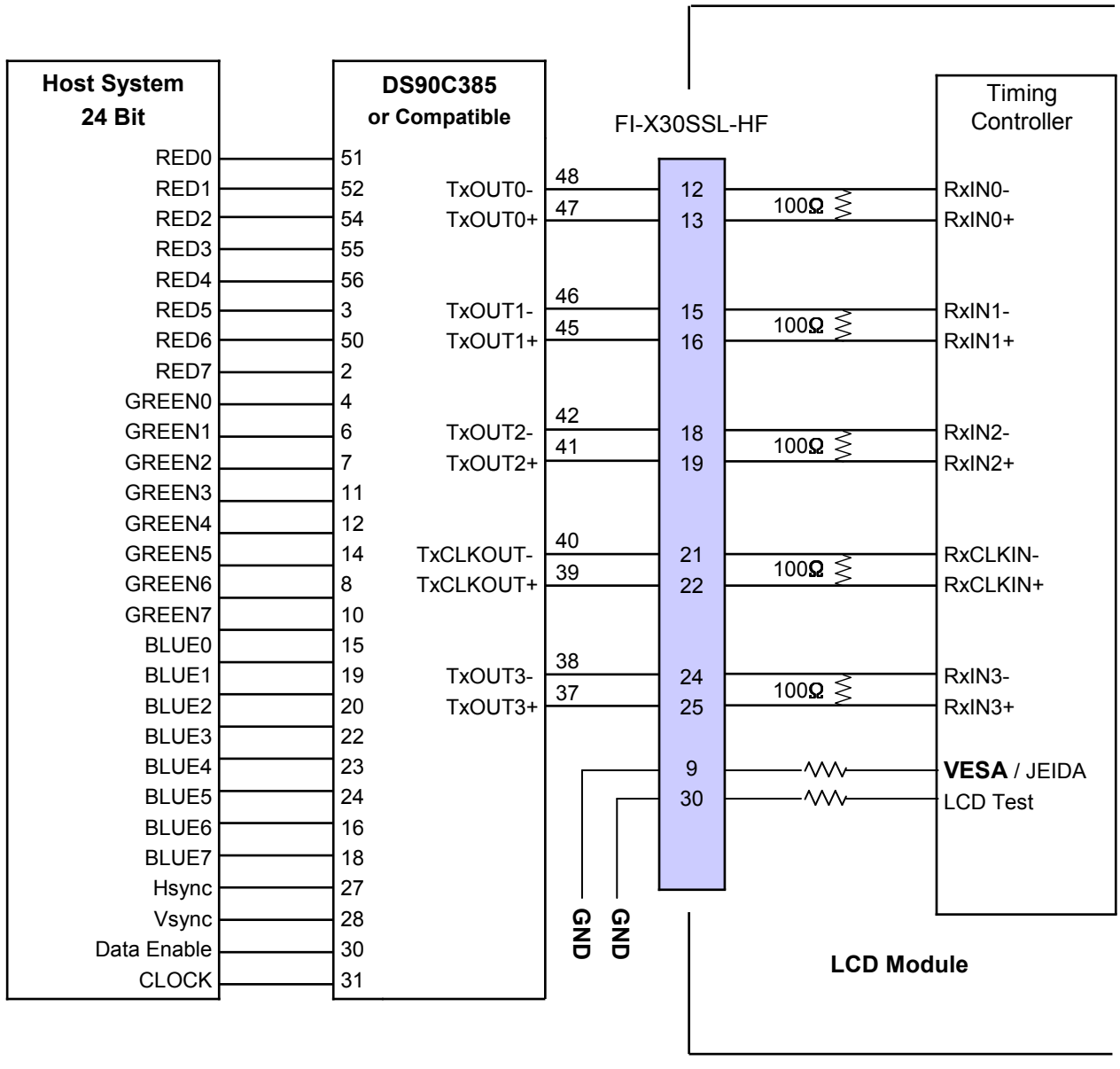
(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were 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 (DS90C385) Transmitter(Pin9="L")**



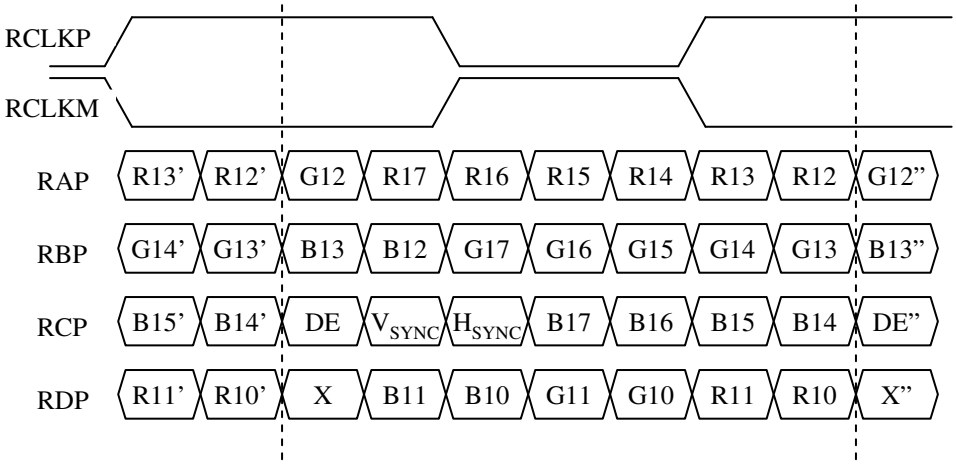
Notes:

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. (THC63LVD823 or Compatible)
3. '7' means MSB and '0' means LSB at R,G,B pixel data.

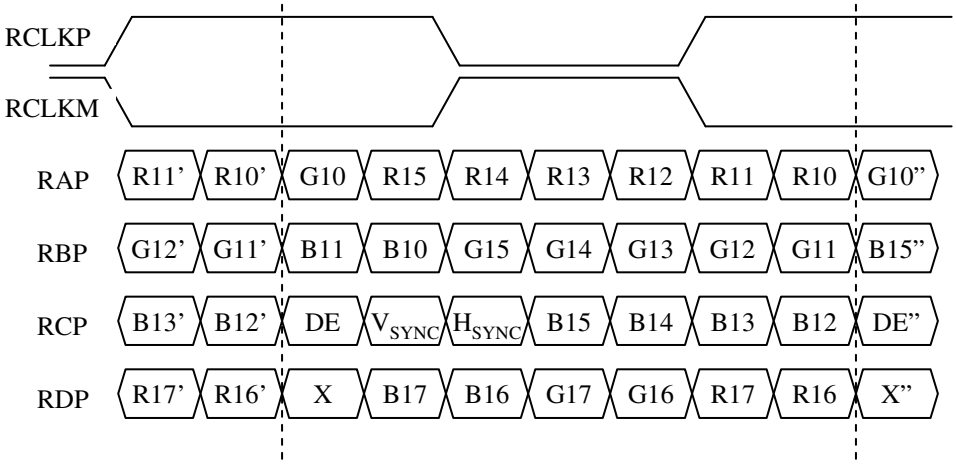
 # APPENDIX- -I-2

LVDS Data-Mapping info. (8bit)

■ LVDS Select : “H” Data-Mapping (JEIDA format)

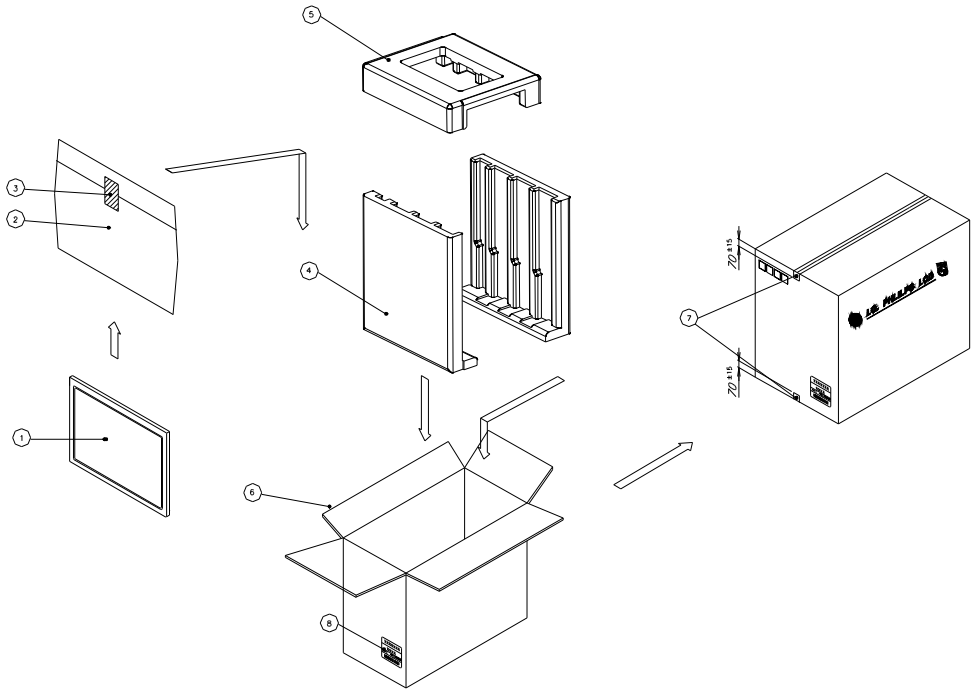


■ LVDS Select : “L” Data-Mapping (LG format, VESA)



APPENDIX-Ⅱ-1

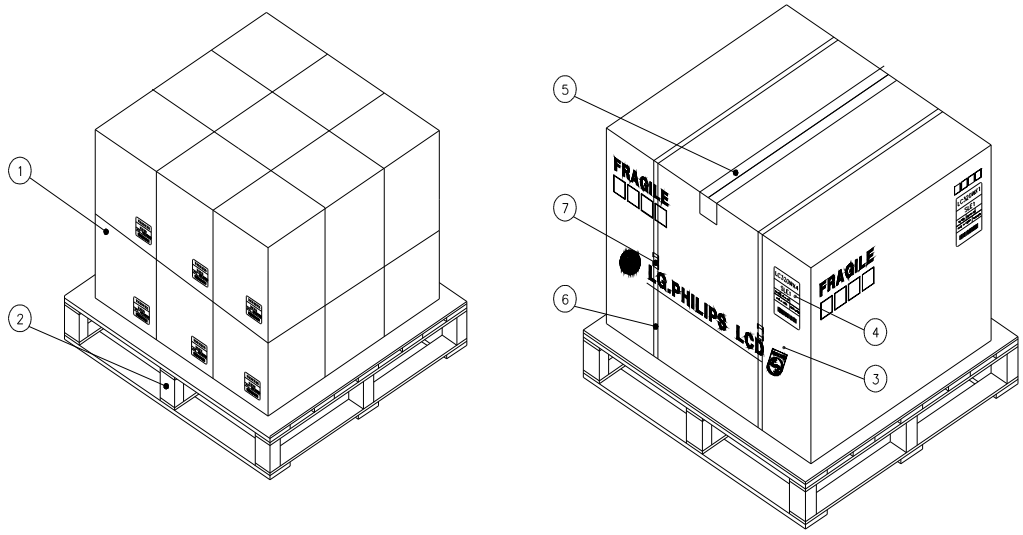
■ Packing Ass'y



NO.	DESCRIPTION	MATERIAL
1	LCD MODULE	
2	BAG	AL
3	TAPE	MASKING 20MM X 50M
4	PACKING, BOTTOM	EPS
5	PACKING, TOP	EPS
6	BOX	PAPER_SW3
7	TAPE	OPP 70MMX300M
8	LABEL	YUPO PAPER 100X100

APPENDIX-Ⅱ-2

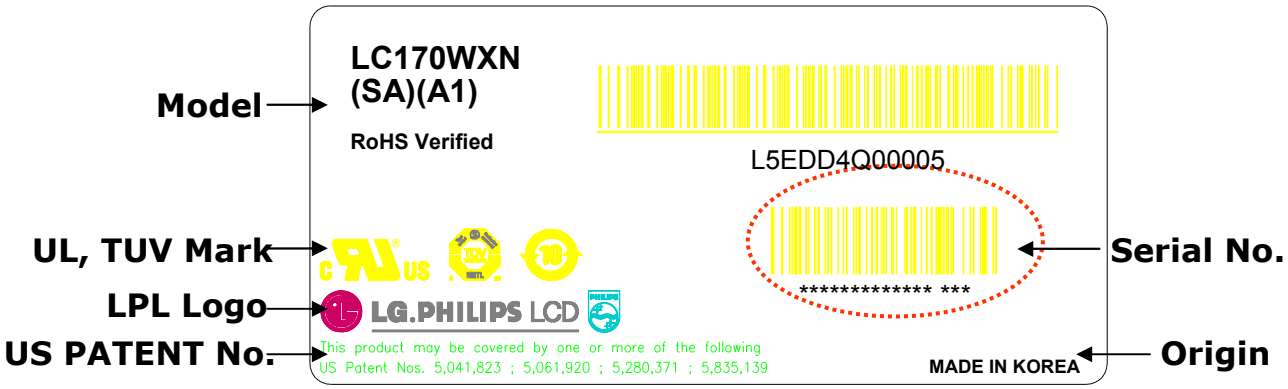
■ Pallet Ass'y



NO.	DESCRIPTION	MATERIAL
1	PACKING ASS'Y	
2	PALLET	Plywood_1140X990X117.5
3	ANGLE, PACKING	SWR4
4	LABEL	YUPO PAPER
5	TAPE	OPP
6	BAND	PP
7	BAND, CLIP	CLIP 18MM

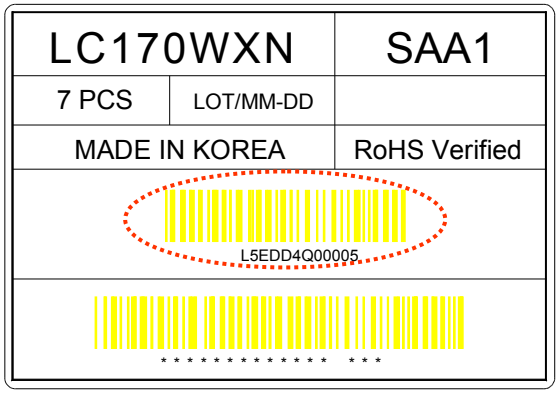
APPENDIX- II -3

■ LCM Label



APPENDIX- II -4

■ Box Label



■ Pallet Label