LG.PHILIPS LCD

Product Specification

SPECIFICATION
FOR
APPROVAL

( ) **Preliminary Specification**

(●) **Final Specification**

Title	42.0" WUXGA TFT LCD

BUYER	General
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LC420WU3
SUFFIX	SLA1 (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.Yoon / Senior.Manager	
REVIEWED BY J. T. Kim / Manager	
PREPARED BY J. B. CHUN / Engineer	

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

Product Specification

CONTENTS

RECORD OF REVISIONS

| Revision No.	Revision Date	Page	Description
1.0	Mar. 30, 2007		**Final Specification**

Product Specification

1. General Description

The LC420WU3 is a Color Active Matrix Liquid Crystal Display with an integral Cold Cathode Fluorescent Lamp(CCFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive display type which is operating in the normally black mode. It has a 42.02 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 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 2-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.
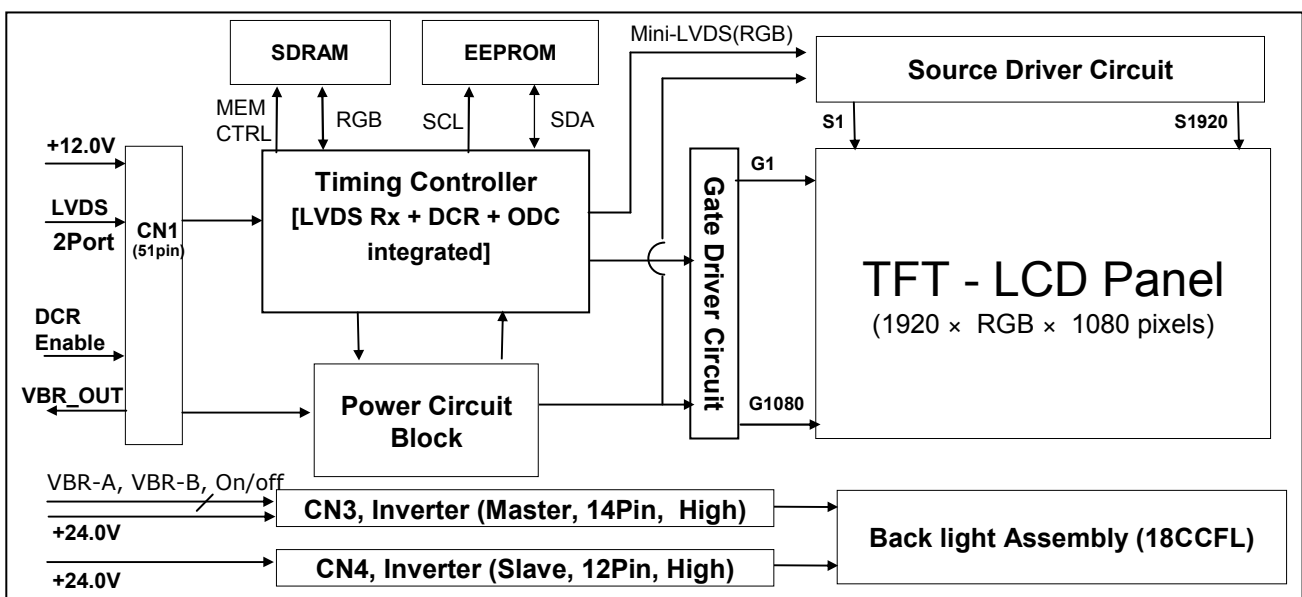
General Features

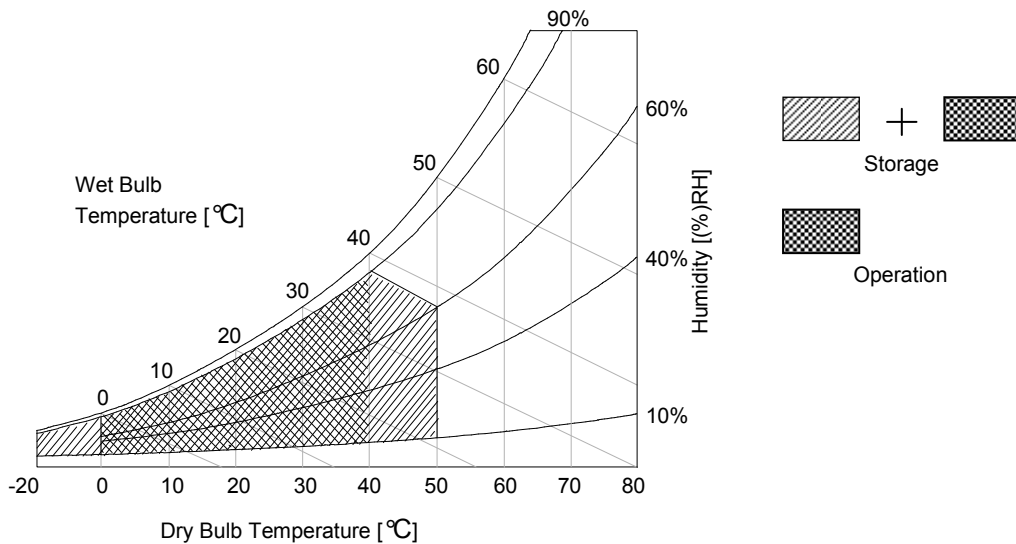|	
Active Screen Size	42.02 inches(1067.31mm) diagonal
Outline Dimension	983.0(H) x 576.0 (V) x 51.0 mm(D) (Typ.)
Pixel Pitch	0.4845 mm x 0.4845 mm
Pixel Format	1920 horiz. by 1080 vert. Pixels, RGB stripe arrangement
Color Depth	8-bit, 16.7 M colors
Luminance, White	500 cd/m^2 (Center 1point ,Typ.)
Viewing Angle (CR>10)	Viewing angle free (R/L 178 (Typ.), U/D 178 (Typ.))
Power Consumption	Total 167.3 W (Typ.) (Logic=7.3 W, Inverter=160W [I_{BL}=6.8 mA])
Weight	11.5Kg (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}	+21.6	+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	+40	℃	Note 1,2
Storage Temperature		T_{ST}	-20	+50	℃	
Operating Ambient Humidity		H_{OP}	10	90	%RH	
Storage Humidity		H_{ST}	10	90	%RH	

Note : 1. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 ℃ Max. and no condensation of water.
2. Gravity mura can be guaranteed under 40℃ condition.

3. Electrical Specifications
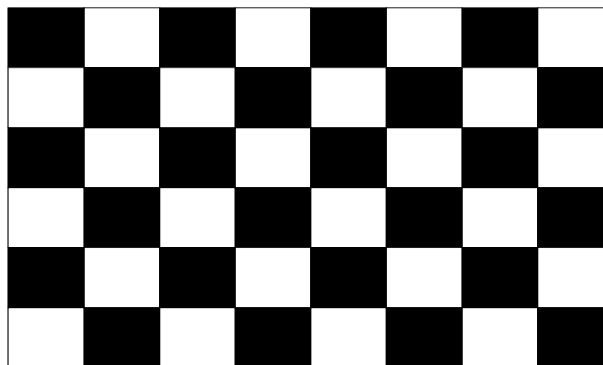
3-1. Electrical Characteristics

It requires two power inputs. One is employed to power for the LCD circuit. The other Is used for the CCFL 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	-	610	793	mA	1
		-	820	1066	mA	2
Power Consumption	P_LCD	-	7.3	9.5	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)

Product Specification

Table 3. ELECTRICAL CHARACTERISTICS (Continue)

Parameter			Symbol	Values			Unit	Notes
				Min	Typ	Max		
Inverter :								
Power Supply Input Voltage			V$_{BL}$	22.8	24.0	25.2	Vdc	
Power Supply Input Voltage Ripple				-	-	0.5	Vp-p	
Power Supply Input Current	Operating		I$_{BL}$	-	6.7	7.3	A	1
	Turn-on		I$_{BL}$		7.9	8.5	A	
Power Consumption			P$_{BL}$	-	160	175	W	
Power Supply Input Current(In-Rush)			Irush	-	-	11	A	V$_{BL}$ = 22.8V V$_{BR-B}$=3.3V V$_{BR-A}$=1.65V
Input Voltage for Control System Signals	Brightness Adjust		V$_{BR-B}$	0.0	-	3.3	Vdc	2
	On/Off	On	V on	2.5	-	5.25	Vdc	
		Off	V off	-0.3	0.0	0.8	Vdc	
Lamp:								
Discharge Stabilization Time			Ts			3	min	3
Life Time				50,000			Hrs	3,4

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 0.4 Vp-p.
   LPL recommend Input Voltage is 24.0V ± 5%.
2. Brightness Control.
   This Vbr-B Voltage control brightness.

V$_{BR-B}$ Voltage	Function
3.3V	Maximum Brightness (100%)
0V	Minimum Brightness (25%)

3. 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℃.
    Specified value is when lamp is aligned horizontally.

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 lamp current (VBR-A=1.65V) on condition of continuous operating at 25 ± 2℃

5. 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.

Product Specification

3-2. Interface Connections

This LCD module employs two kinds of interface connection, a 51-pin connector is used for the module electronics and Master 14-pin and Slave 12-pin connectors are used for the integral backlight system.

3-2-1. LCD Module

- LCD Connector(CN1): FI-R51S-HF(manufactured by JAE) or KN25-51P-0.5SH(manufactured by Hirose)
- Mating Connector : FI-R51HL(JAE) or compatible

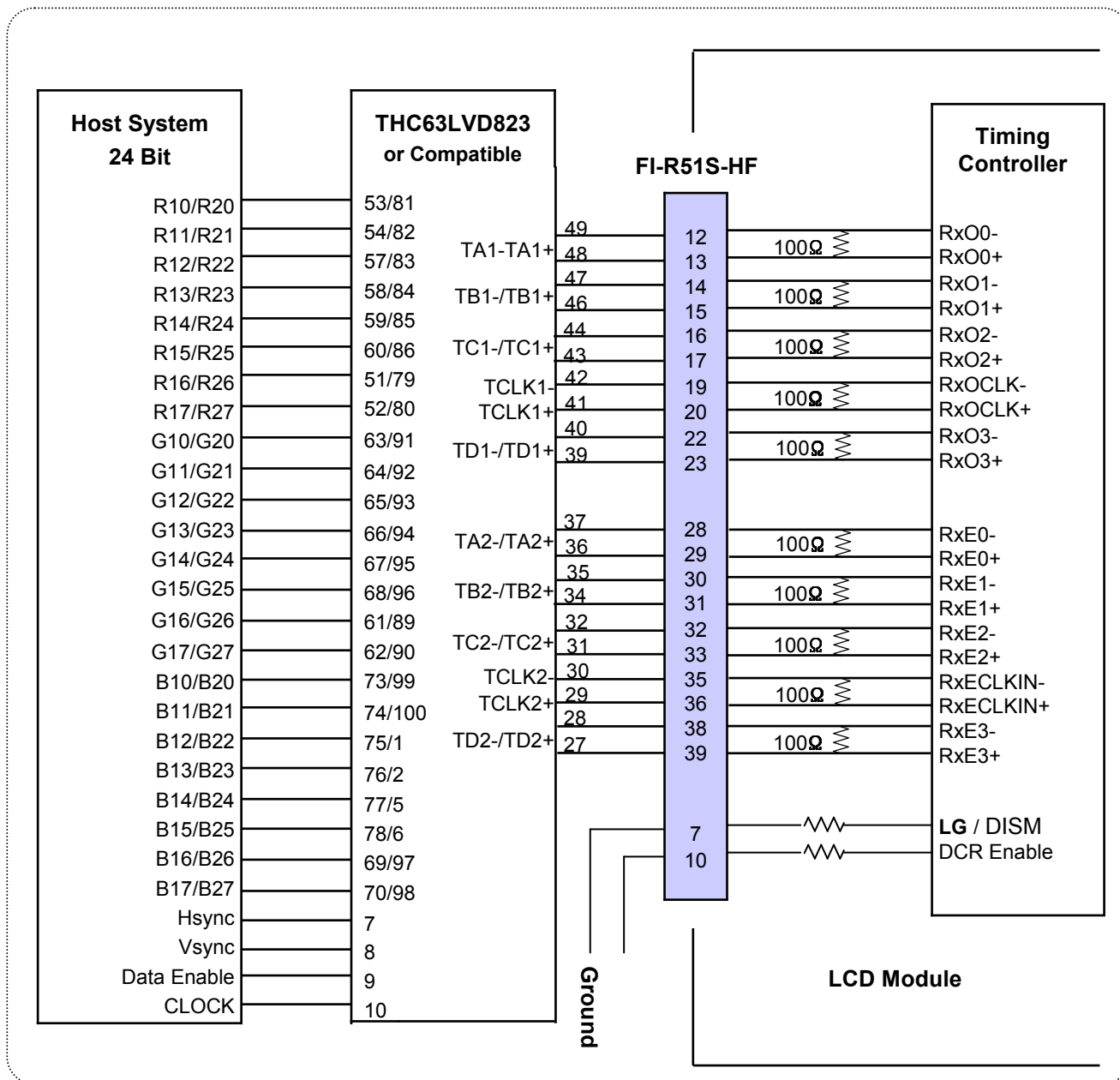### Table 4. MODULE CONNECTOR(CN1) PIN CONFIGURATION

No	Symbol	Description	No	Symbol	Description
1	GND	Ground	27	Reserved	No connection or GND
2	Reserved(NC)	No Connection	28	RE0N	SECOND CHANNEL 0-
3	Reserved(NC)	No Connection	29	RE0P	SECOND CHANNEL 0+
4	Reserved(NC)	No Connection	30	RE1N	SECOND CHANNEL 1-
5	Reserved(NC)	No Connection	31	RE1P	SECOND CHANNEL 1+
6	Reserved(NC)	No connection	32	RE2N	SECOND CHANNEL 2-
7	LVDS Select	Select LVDS Data format	33	RE2P	SECOND CHANNEL 2+
8	VBR_EXT	External VBR	34	GND	Ground
9	VBR_OUT	VBR output	35	RECLKN	SECOND CLOCK CHANNEL C-
10	DCR Enable	'H' = Enable , 'L' = Disable	36	RECLKP	SECOND CLOCK CHANNEL C+
11	GND	Ground	37	GND	Ground
12	RO0N	FIRST CHANNEL 0-	38	RE3N	SECOND CHANNEL 3-
13	RO0P	FIRST CHANNEL 0+	39	RE3P	SECOND CHANNEL 3+
14	RO1N	FIRST CHANNEL 1-	40	Reserved (NC)	No Connection
15	RO1P	FIRST CHANNEL 1+	41	Reserved (NC)	No Connection
16	RO2N	FIRST CHANNEL 2-	42	Reserved	No connection or GND
17	RO2N	FIRST CHANNEL 2+	43	Reserved	No connection or GND
18	GND	Ground	44	GND	Ground
19	ROCLKN	FIRST CLOCK CHANNEL C-	45	GND	Ground
20	ROCLKP	FIRST CLOCK CHANNEL C+	46	GND	Ground
21	GND	Ground	47	NC	No connection
22	RO3N	FIRST CHANNEL 3-	48	VLCD	Power Supply +12.0V
23	RO3P	FIRST CHANNEL 3+	49	VLCD	Power Supply +12.0V
24	Reserved (NC)	No Connection	50	VLCD	Power Supply +12.0V
25	Reserved (NC)	No Connection	51	VLCD	Power Supply +12.0V
26	Reserved	No connection or GND	-	-	-

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.
6. If DCR function should be enable('H'), 10th pin must be connected to serial resistor which value is under 1k ohm.

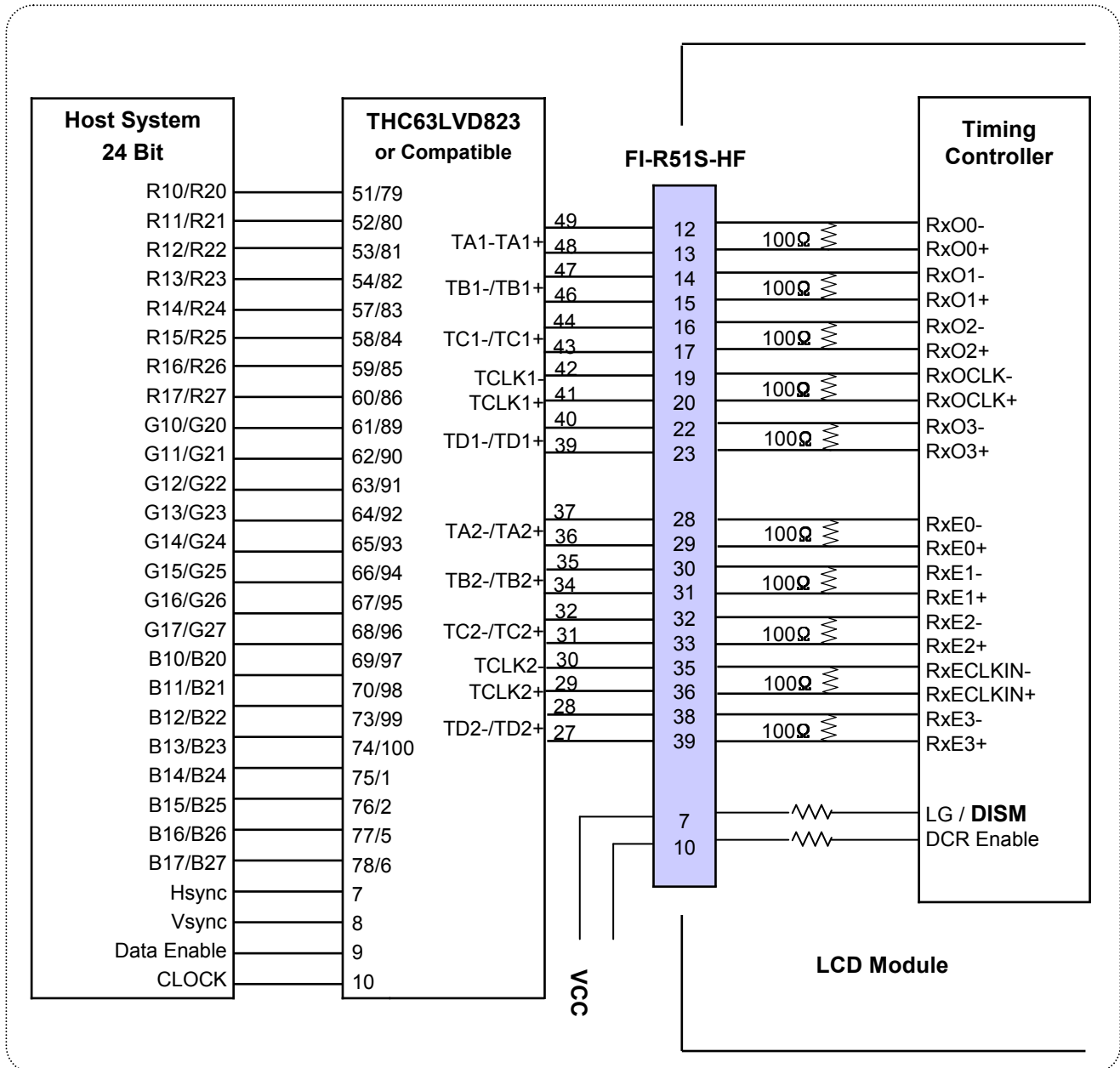**Table 5. Required signal assignment for Flat Link (Thine : THC63LVD823) Transmitter(Pin7="L")**

Host System 24 Bit	THC63LVD823 or Compatible		FI-R51S-HF		Timing Controller
R10/R20	53/81				
R11/R21	54/82	49 TA1-TA1+	12	100Ω	RxO0-
R12/R22	57/83	48	13		RxO0+
R13/R23	58/84	47 TB1-/TB1+	14	100Ω	RxO1-
R14/R24	59/85	46	15		RxO1+
R15/R25	60/86	44 TC1-/TC1+	16	100Ω	RxO2-
R16/R26	51/79	43	17		RxO2+
R17/R27	52/80	42 TCLK1-	19	100Ω	RxOCLK-
G10/G20	63/91	41 TCLK1+	20		RxOCLK+
G11/G21	64/92	40 TD1-/TD1+	22	100Ω	RxO3-
G12/G22	65/93	39	23		RxO3+
G13/G23	66/94	37 TA2-/TA2+	28	100Ω	RxE0-
G14/G24	67/95	36	29		RxE0+
G15/G25	68/96	35 TB2-/TB2+	30	100Ω	RxE1-
G16/G26	61/89	34	31		RxE1+
G17/G27	62/90	32 TC2-/TC2+	32	100Ω	RxE2-
B10/B20	73/99	31	33		RxE2+
B11/B21	74/100	30 TCLK2-	35	100Ω	RxECLKIN-
B12/B22	75/1	29 TCLK2+	36		RxECLKIN+
B13/B23	76/2	28 TD2-/TD2+	38	100Ω	RxE3-
B14/B24	77/5	27	39		RxE3+
B15/B25	78/6				
B16/B26	69/97		7		**LG** / DISM
B17/B27	70/98		10		DCR Enable
Hsync	7				
Vsync	8		Ground		LCD Module
Data Enable	9				
CLOCK	10				

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

LG.PHILIPS LCD

Table 6. Required signal assignment for Flat Link (Thine : THC63LVD823) Transmitter(Pin7="H")

Host System 24 Bit	THC63LVD823 or Compatible		FI-R51S-HF		Timing Controller
R10/R20	51/79				
R11/R21	52/80	49	12		RxO0-
R12/R22	53/81	TA1-TA1+ 48	13	100Ω	RxO0+
R13/R23	54/82	47	14		RxO1-
R14/R24	57/83	TB1-/TB1+ 46	15	100Ω	RxO1+
R15/R25	58/84	44	16		RxO2-
R16/R26	59/85	TC1-/TC1+ 43	17	100Ω	RxO2+
R17/R27	60/86	TCLK1- 42	19		RxOCLK-
G10/G20	61/89	TCLK1+ 41	20	100Ω	RxOCLK+
G11/G21	62/90	TD1-/TD1+ 40	22		RxO3-
G12/G22	63/91	39	23	100Ω	RxO3+
G13/G23	64/92	37	28		RxE0-
G14/G24	65/93	TA2-/TA2+ 36	29	100Ω	RxE0+
G15/G25	66/94	35	30		RxE1-
G16/G26	67/95	TB2-/TB2+ 34	31	100Ω	RxE1+
G17/G27	68/96	32	32		RxE2-
B10/B20	69/97	TC2-/TC2+ 31	33	100Ω	RxE2+
B11/B21	70/98	TCLK2- 30	35		RxECLKIN-
B12/B22	73/99	TCLK2+ 29	36	100Ω	RxECLKIN+
B13/B23	74/100	TD2-/TD2+ 28	38		RxE3-
B14/B24	75/1	27	39	100Ω	RxE3+
B15/B25	76/2				
B16/B26	77/5		7	⌇	LG / **DISM**
B17/B27	78/6		10	⌇	DCR Enable
Hsync	7				
Vsync	8				
Data Enable	9			VCC	**LCD Module**
CLOCK	10				

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

LG.PHILIPS LCD

Product Specification

3-2-2. Backlight Inverter

Master
-Inverter Connector : S14B-PH-SMC
　　　　　　　(manufactured by JST) or Equivalent
- Mating Connector : PHR-14 or Equivalent

Slave
-Inverter Connector : S12B-PH-SMC
　　　　　　　(manufactured by JST) or Equivalent
-Mating Connector : PHR-12 or Equivalent

Table 7. INVERTER CONNECTOR PIN CONFIGULATION

Pin No	Symbol	Description	Master	Slave	Note
1	V_{BL}	Power Supply +24.0V	V_{BL}	V_{BL}	
2	V_{BL}	Power Supply +24.0V	V_{BL}	V_{BL}	
3	V_{BL}	Power Supply +24.0V	V_{BL}	V_{BL}	
4	V_{BL}	Power Supply +24.0V	V_{BL}	V_{BL}	
5	V_{BL}	Power Supply +24.0V	V_{BL}	V_{BL}	
6	GND	Backlight Ground	GND	GND	
7	GND	Backlight Ground	GND	GND	
8	GND	Backlight Ground	GND	GND	1
9	GND	Backlight Ground	GND	GND	
10	GND	Backlight Ground	GND	GND	
11	V_{BR-A}	Analog dimming DC 0.0V ~ 3.3V (Typ : 1.65V)	V_{BR-A}	Don't care	2, 3
12	$V_{ON/OFF}$	0.0V ~ 5.0V	On/Off	Don't care	Open/High for B/L on as default
13	V_{BR-B}	Burst dimming DC 0.0V ~ 3.3V	V_{BR-B}	-	3
14	Status	Normal : Upper 3.0V Abnormal : Under 0.7V	Status	-	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), 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 =0V　Maximum Brightness : VBR = 3.3V
　　　　4. Even though Pin #14 is open, there is no effect on inverter operating, The output terminal of inverter

◆ Rear view of LCM

<Master>　　　<Slave>
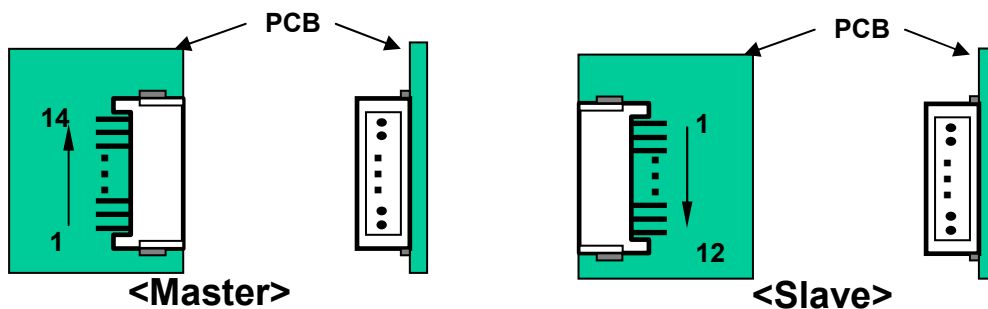
Product Specification

3-3. Signal Timing Specifications

Table 8 and Table9 show 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 8. TIMING TABLE for NTSC

ITEM		SYMBOL	Min.	Typ.	Max.	Unit	Notes
DCLK Period		t_{CLK}	12.98	13.47	13.98	nsec	
DCLK Frequency		f_{CLK}	71.55	74.25	77	MHz	=148.5 /2
Vertical	Frequency	f_V	57	60	63	Hz	
	Valid	t_{VV}	-	1080	-	Line	
	Blank	$t_{VT} - t_{VV}$	11	45	69	Line	
	Total	t_{VT}	1091	1125	1149	Line	
Horizontal	Frequency	f_H	65.46	67.5	68.94	KHz	
	Valid	t_{HV}	-	960	-	t_{CLK}	
	Blank	$t_{HT} - t_{HV}$	100	140	320	t_{CLK}	
	Total	t_{HT}	1060	1100	1280	t_{CLK}	=2200/2

Table 9. TIMING TABLE for PAL

ITEM		SYMBOL	Min.	Typ.	Max.	Unit	Notes
DCLK Period		t_{CLK}	15.84	16.16	16.49	nsec	
DCLK Frequency		f_{CLK}	60.64	61.88	63.13	MHz	=123.75 /2
Vertical	Frequency	f_V	49	50	51	Hz	
	Valid	t_{VV}	-	1080	-	Line	
	Blank	$t_{VT} - t_{VV}$	25	45	65	Line	
	Total	t_{VT}	1105	1125	1145	Line	
Horizontal	Frequency	f_H	55.25	56.25	57.25	KHz	
	Valid	t_{HV}	-	960	-	t_{CLK}	
	Blank	$t_{HT} - t_{HV}$	100	140	240	t_{CLK}	
	Total	t_{HT}	1060	1100	1200	t_{CLK}	=2200/2

Note :
1. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate.
2. Above Timing Tables are only valid for DE Mode.

3-4. Signal Timing Waveforms

DE, Data

0.7VDD

0.3VDD

DCLK t_{CLK} **0.5 VDD**

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

Valid data

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

DE(Data Enable)

t_{HV}

t_{HT}

DE(Data Enable)   1   1080

t_{VV}

t_{VT}
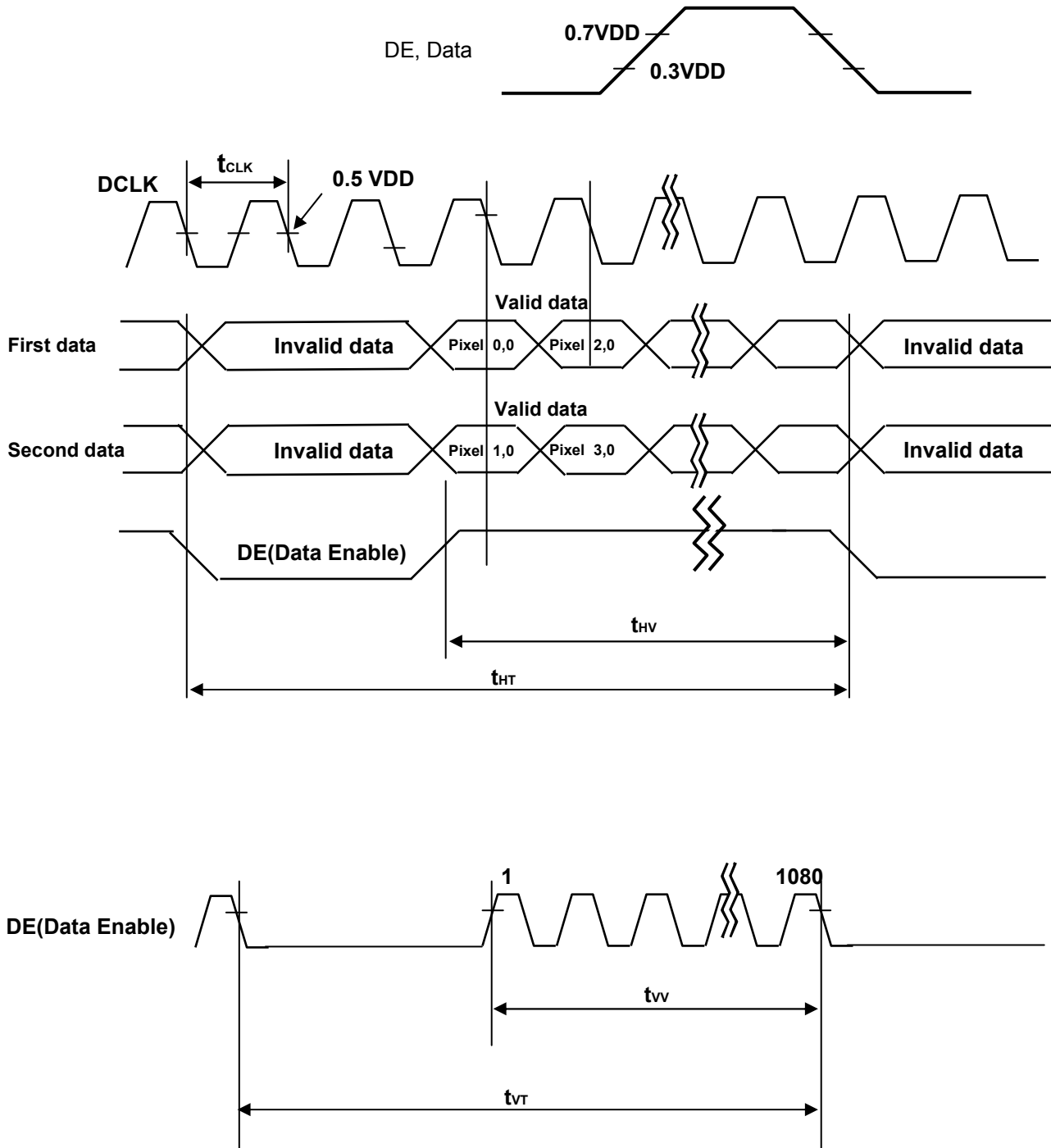
3-5. Color Data Reference

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 10. 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
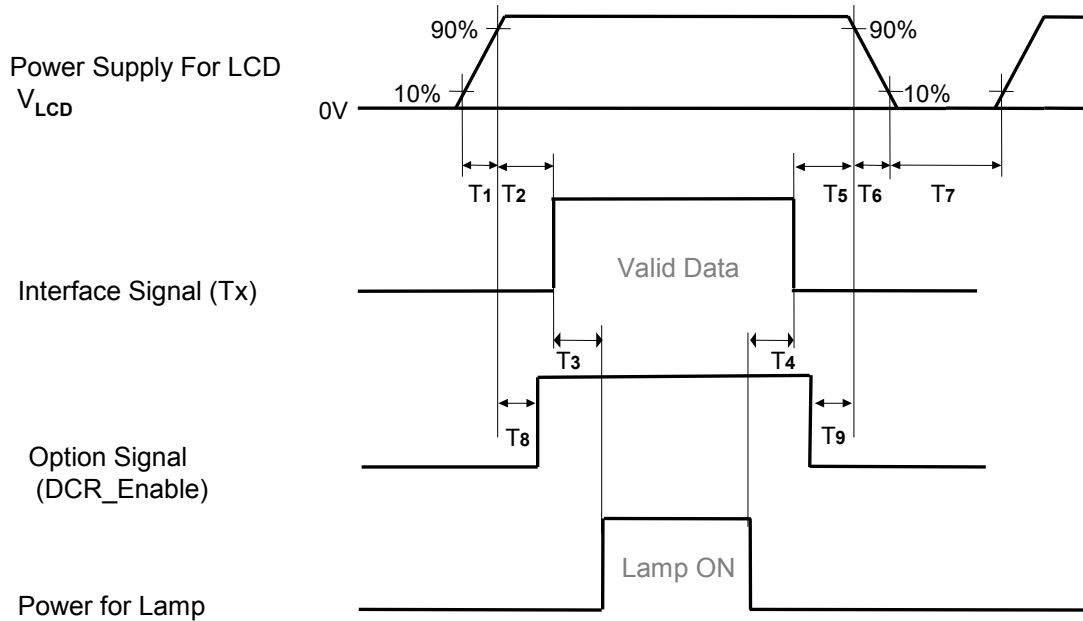
Table 11. POWER SEQUENCE

Parameter	Value			Unit
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0.5	-	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0.5	-	50	ms
T6	-	-	300	ms
T7	1.0	-	-	s
T8	0 < T8 < T2			ms
T9	0 < T9 < T5			ms

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 maximum specification, it operates protection
      pattern(Black pattern) till valid signal inputted. There is no reliability problem.
   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 option signal(DISM or AI_Enable) precedes the on time of Power(VLCD),check the LCD logic
      Power(Vcc) is under 0.8V, otherwise it will be happened abnormal display.
   6. Flicker would come out when power on-off(T7=under 1s) is continuously tested over several ten-times

3-6-2. Sequence for Inverter

Power Supply For Inverter
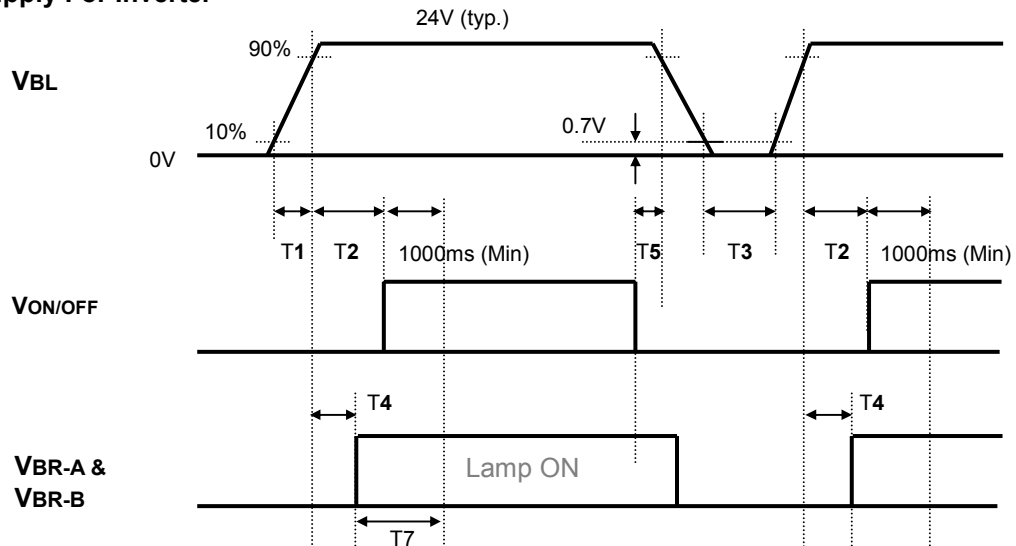
3-6-3. Deep condition for Inverter
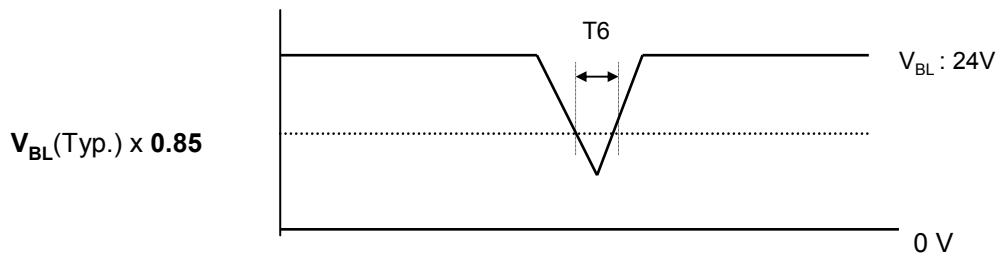
Table 12. Power Sequence for Inverter

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 **0.85**
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-B is recommended 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± 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.
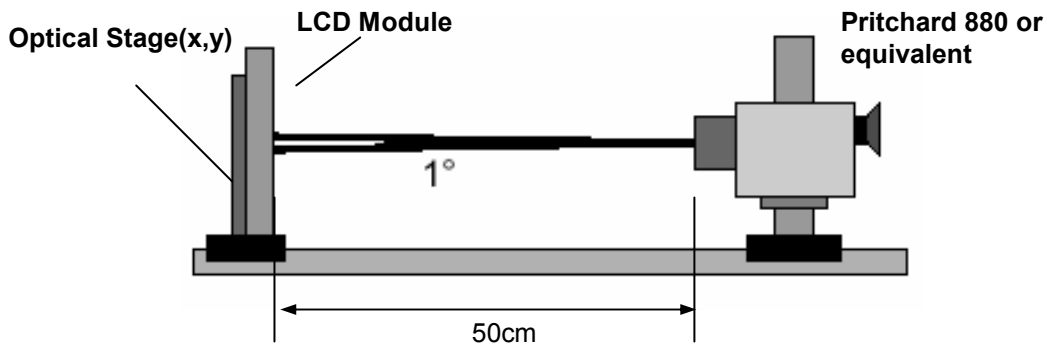
FIG. 1 Optical Characteristic Measurement Equipment and Method

Table 13. OPTICAL CHARACTERISTICS

Ta= 25± 2℃, V_{LCD}=12.0V, fv=60Hz, Dclk=148.5MHz VBR_A=1.6V, VBR_B=3.3V

Parameter		Symbol		Value			Unit	Note
				Min	Typ	Max		
Contrast Ratio		CR		650	900	-		1
		DCR		-	-	-	Appendix IV, V	
Surface Luminance, white		L_{WH}		400	500	-	cd/m²	2
Luminance Variation		δ_{WHITE}	5P	-	-	1.3		3
Response Time (Gray-to-Gray)	Gray-to-Gray	G to G		-	8	16	ms	4
	Rise + decay	$Tr_{R}+Tr_{D}$		-	18	-		
Color Coordinates [CIE1931]	RED	Rx			0.640			
		Ry			0.343			
	GREEN	Gx			0.286			
		Gy		Typ -0.03	0.615	Typ +0.03		
	BLUE	Bx			0.143			
		By			0.066			
	WHITE	Wx			0.279			
		Wy			0.292			
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								6

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

CR(Contrast Ratio) = Maximum CRn (n=1, 2, 3, 4, 5)

DCR(Dynamic CR) = Maximum CRn (n=1, 2, 3, 4, 5)

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

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 $25\pm 2°C$. 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 , δ WHITE is 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 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 13.

Table 14. GRAY SCALE SPECIFICATION

Gray Level	Luminance [%] (Typ.)
L0	0.19
L15	0.39
L31	1.16
L47	2.61
L63	4.80
L79	7.77
L95	11.6
L111	16.2
L127	21.7
L143	28.2
L159	35.5
L175	43.8
L191	53.0
L207	63.3
L223	74.5
L239	86.7
L255	100

Product Specification

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

FIG. 2 5 Points for Luminance Measure

A : H / 4 mm
B : V / 4 mm
H : 930.24 mm
V : 523.26 mm
@ H,V : Active Area

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

N,M = 0(Black)~255(White), N<M

Dimension of viewing angle range
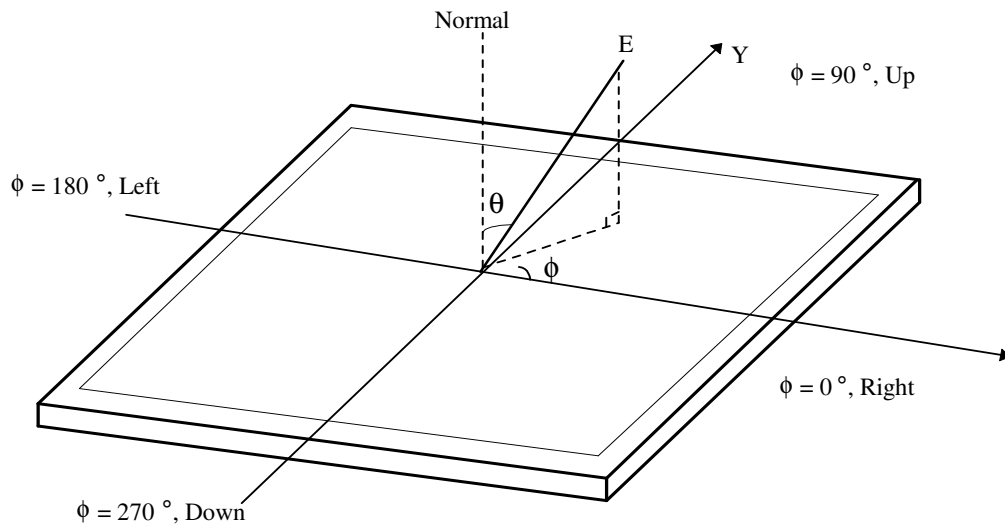
FIG. 4 Viewing Angle

5. Mechanical Characteristics

Table 15 provides general mechanical characteristics.

Table 15. MECHANICAL CHARACTERISTICS

Item	Value	
Outline Dimension	Horizontal	983.0 mm
	Vertical	576.0 mm
	Depth	51.0 mm
Bezel Area	Horizontal	939.0 mm
	Vertical	531.0 mm
Active Display Area	Horizontal	930.25 mm
	Vertical	523.01 mm
Weight	11.5 Kg (Typ.) , 12.5Kg (Max.)	
Surface Treatment	Hard coating(3H) Anti-glare treatment of the front polarizer (Haze 13%)	

Note : 1.Please refer to a mechanic drawing in terms of tolerance at the next page.

Product Specification

<FRONT VIEW>
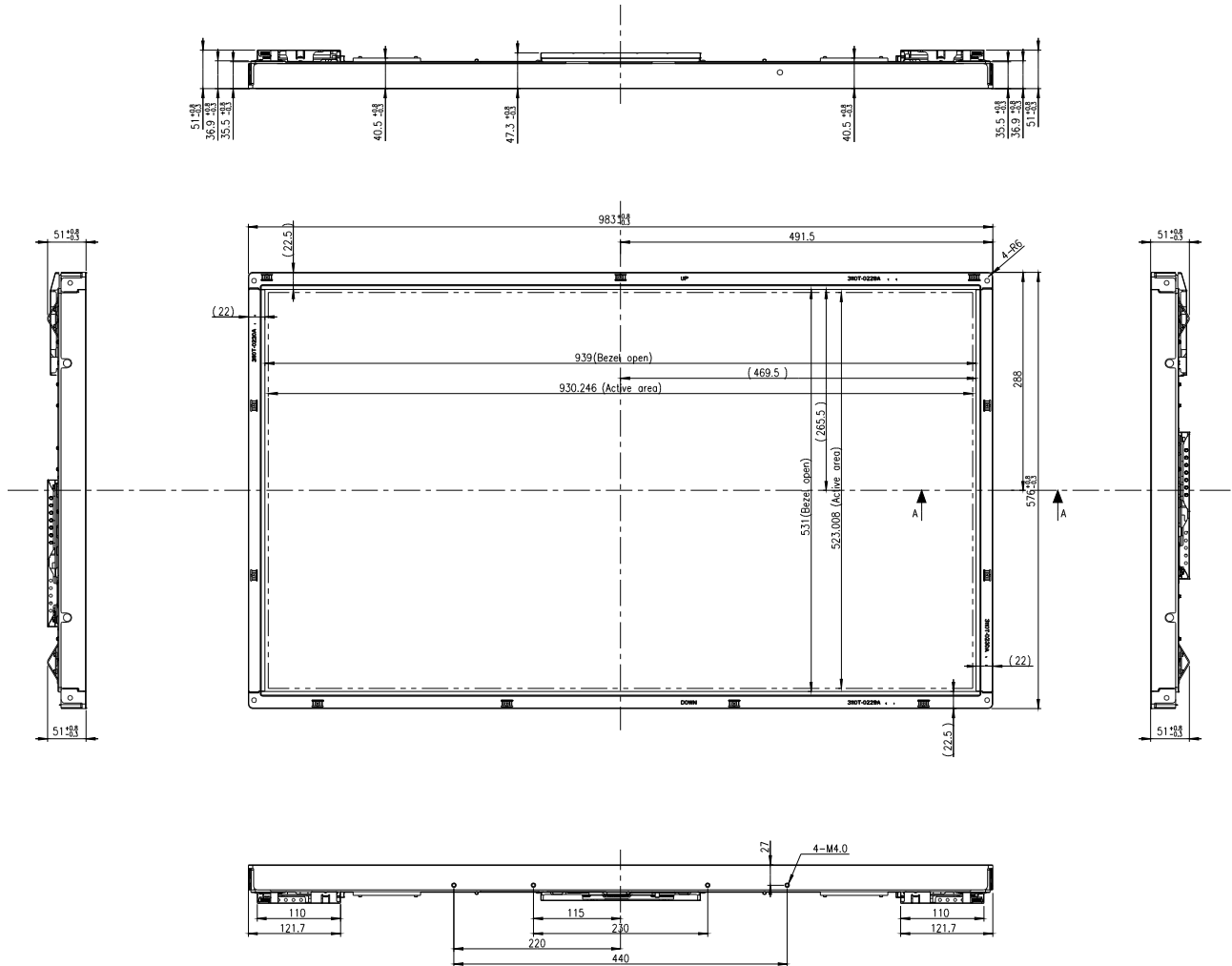
NOTES
1. UNSPECIFIED DIMENSIONAL TOLERANCES TO BE ±0.5mm.
2. TILT AND A PARTIAL DISPOSITION TOLERANCE OF DISPLAY AREA ARE AS FOLLOW.
   1) X-DIRECTION : |A-B| < 1.5mm
   2) Y-DIRECTION : |C-D| < 1.5mm

SECTION A-A
SCALE 1/1

Product Specification

<REAR VIEW>

Inverter connector
S14B-PH-SM3-TB, Maker : JST

I/F Connector
FI-X30SSL-HF, Maker : JAE

Inverter connector
S12B-PH-SM3-TB, Maker : JST

16-M4.0

SECTION B-B
SCALE 1/1
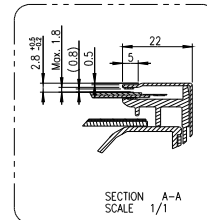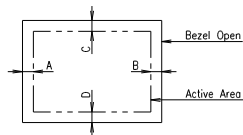
6. Reliability

Table 16. ENVIRONMENT TEST CONDITION

No.	Test Item	Condition
1	High temperature storage test	Ta= 50℃ 240h
2	Low temperature storage test	Ta= -20℃ 240h
3	High temperature operation test	Ta= 40℃ 50%RH 240h
4	Low temperature operation test	Ta= 0℃ 240h
5	Vibration test (operating)	Wave form : random Vibration level : 1.0Grms Bandwidth : 10-300Hz Duration : X,Y,Z, 30 min 　　　　One time each direction
6	Shock test (operating)	Shock level : 50Grms Waveform : half sine wave, 11ms Direction : ±X, ±Y, ±Z 　　　　One time each direction
7	Humidity condition Operation	Ta= 40 ℃ ,90%RH
8	Altitude　　operating 　　　　　storage / shipment	0 - 14,000 feet(4267.2m) 0 - 40,000 feet(12192m)

Product Specification

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) CISPR22 "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 Electro technical Standardization.(CENELEC), 1998
(Including A1: 2000)

8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

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

A,B,C : SIZE(INCH)
D : YEAR   E : MONTH
F : 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 : 12 pcs

b) Pallet Size : 1150 mm X 1020 mm X 815 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.

Product Specification

APPENDIX- I

■LC420WU3-SLA1 – Pallet Ass'y
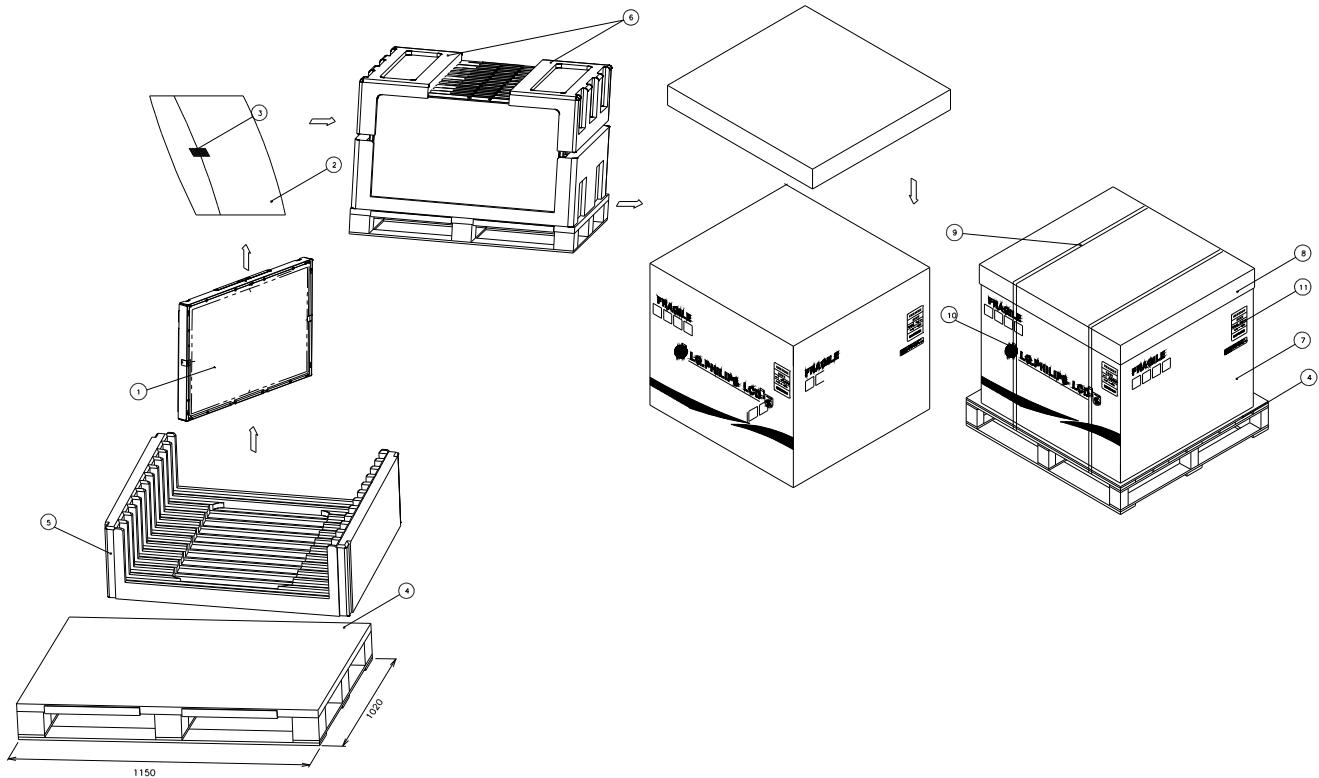
NO.	DESCRIPTION	MATERIAL
1	LCD Module	
2	BAG	42INCH
3	TAPE	MASKING 20MM X 50M
4	PALLET	PAPER 1140X1000X138MM
5	PACKING	EPS
6	PACKING	EPS
7	ANGLE PACKING	PAPER
8	ANGLE COVER	PAPER
9	BAND,CLIP	STEEL
10	BAND	PP
11	LABEL	YUPO PAPER 80G 100X100

 # APPENDIX- II

■ LCM Label

Model → LC420WU3
(SL)(A1)

RoHS Verified

UL, TUV Mark →

E200909

LPL Logo → **LG.PHILIPS LCD**

US PATENT No. → This product may be covered by one or more of the following US Patent
Nos. 5,041,823 ; 5,061,920 ; 5,280,371 ; 5,835,139

← Serial No.

****

MADE IN KOREA ← Origin
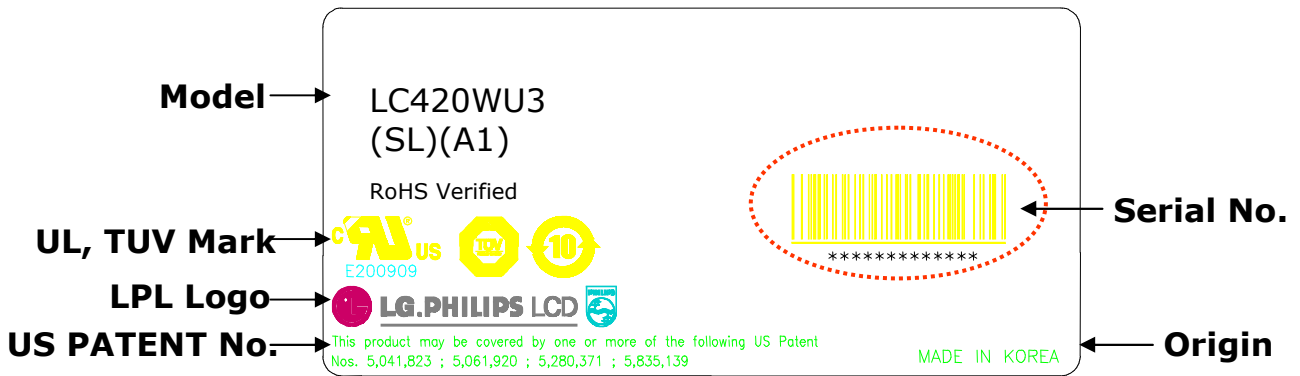
■ **Serial No. (See CAS 26page for more information)**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |

Inch   Year   Month   Serial No.

M Ass'y Factory code
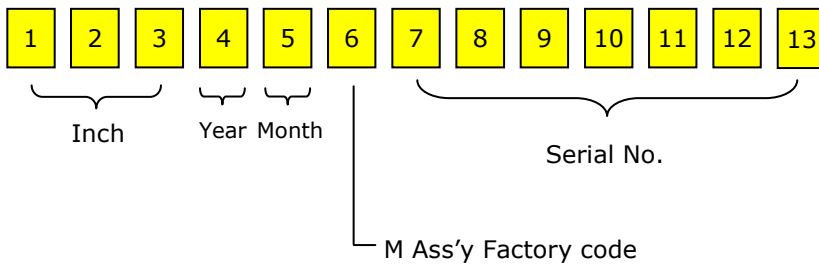
APPENDIX- Ⅲ

■ Pallet Label

```
┌─────────────────────────────┐
│  ┌───────────────────────┐  │
│  │      LC420WU3         │  │
│  ├───────────────────────┤  │
│  │        SLA1           │  │
│  ├───────────┬───────────┤  │
│  │  12 PCS   │ 001/01-01 │  │
│  ├───────────┴───────────┤  │
│  │ REMARK                │  │
│  │                       │  │
│  ├───────────────┬───────┤  │
│  │ MADE IN KOREA │ RoHS  │  │
│  │               │Verified│ │
│  ├───────────────┴───────┤  │
│  │  ‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖     │  │
│  │   ************ ***    │  │
│  └───────────────────────┘  │
└─────────────────────────────┘
```

APPENDIX- IV

■ LCM DCR Only (Reference)
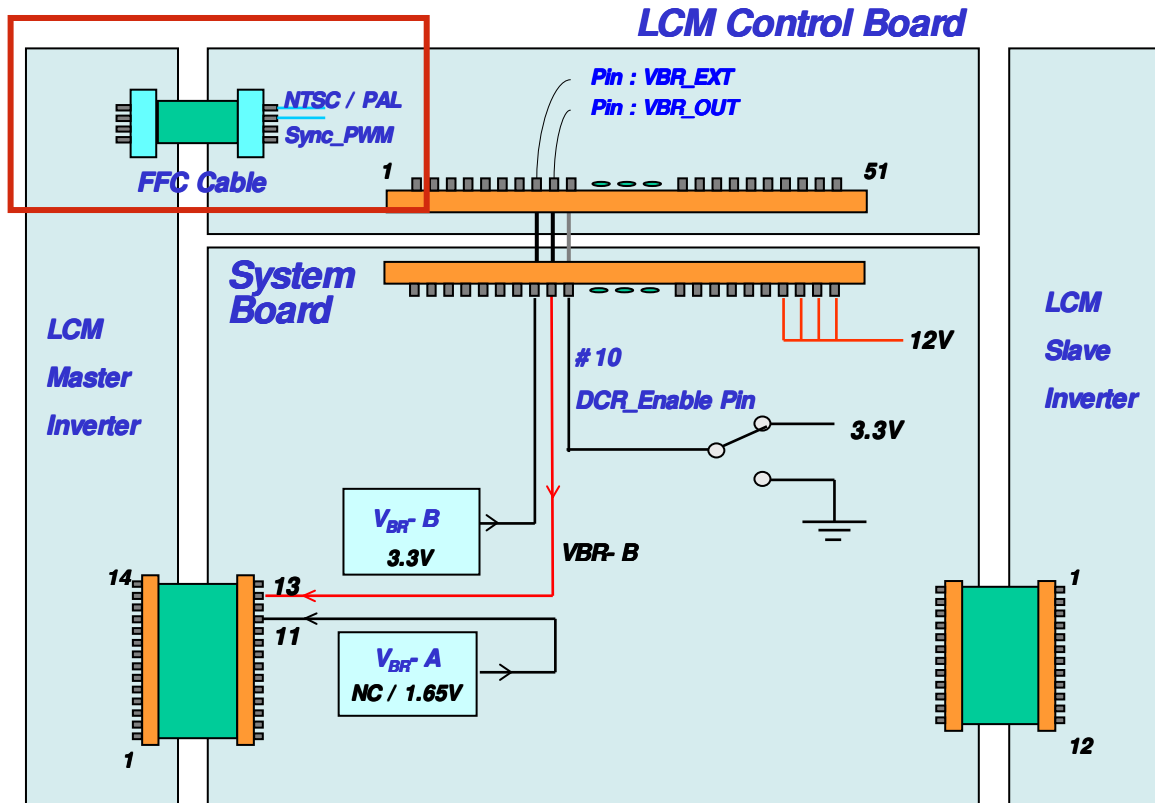
■ DCR_Enable Option Pin Description

DCR_Enable	On(3.3V)	Off (0V)
VBR_OUT (V_{BR}-B) Signal Source	From T-Con (ASIC)	From System (VBR_EXT Pin)
V_{BR}-B	0V ~ 3.3V	3.3V
V_{BR}-A	1.65V or NC	1.65V or NC
DCR Level	2000 : 1	1000 : 1

APPENDIX- V

■ **System DCR (Dynamic Contrast Ratio)- Max 5000:1 (Reference)**

V$_{BR}$-B	0V ~ 3.3V	3.3V
V$_{BR}$-A	0V ~ 3.3V	1.65V
DCR Level	5000 : 1	1000 : 1

Note : 1. To make DCR Max 5000:1, V$_{BR}$-A and V$_{BR}$-B must be given by system.

2. DCR Max 5000:1 is defined mathematically as :
   DCR = Maximum DCRn (n=1, 2, 3, 4, 5)

$$DCRn = \frac{\text{Surface Luminance at position n with all white pixels (VBR-B=3.3V, VBR-A=3.3V)}}{\text{Surface Luminance at position n with all black pixels (VBR-B=0V, VBR-A=0V)}}$$

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

3. Measurement Sequence (aging time 10 min each pattern) :
   ① Turn On LCM
   ② Measure Black Luminance (VBR-B=0V, VBR-A=0V)
   ③ Measure White Luminance (VBR-B=3.3V, VBR-A=3.3V)