SPECIFICATION
FOR
APPROVAL

( ) Preliminary Specification
(●) Final Specification

Title	42.0” WXGA HCFL TFT LCD

BUYER	General
MODEL	-

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LC420WX2
SUFFIX	SLA1(Lead Free Phase II)

*When you obtain standard approval,
please use the above model name without suffix

APPROVED BY	SIGNATURE DATE
/	
/	
/	

Please return 1 copy for your confirmation with your signature and comments.

APPROVED BY	SIGNATURE DATE
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TV Products Engineering Dept.
LG. Philips LCD Co., Ltd

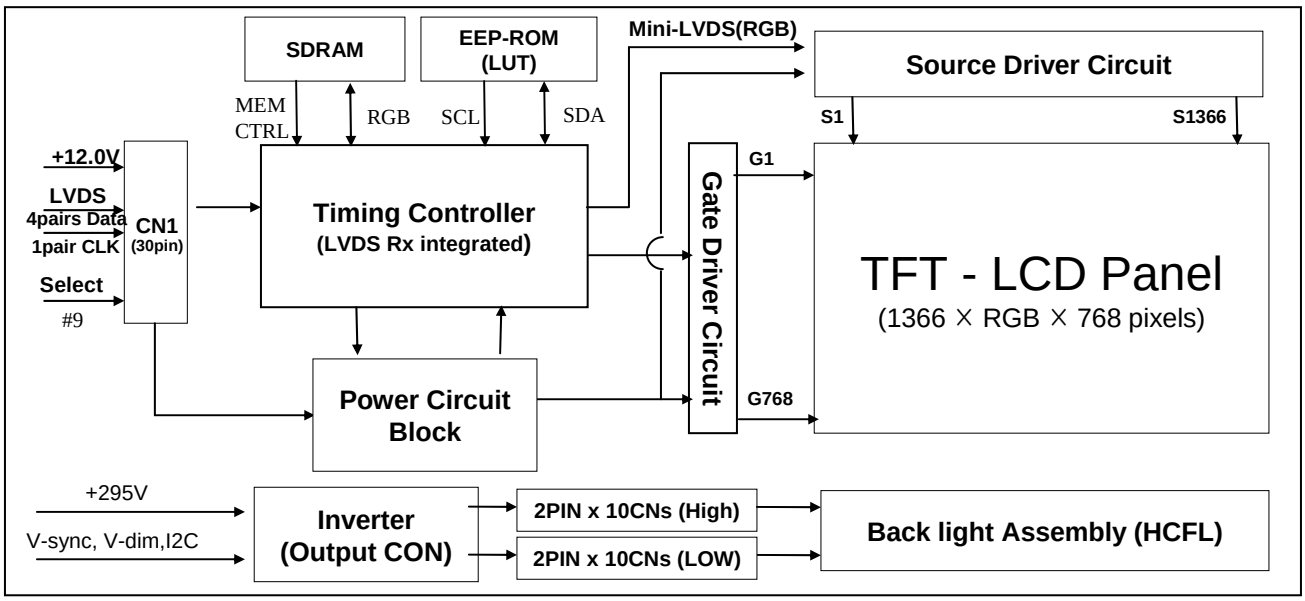
Contents

RECORD OF REVISIONS

Revision No	Revision Date	Page	DESCRIPTION
0.0	Nov. 08, 2006	-	**Final Specification.**

1. General Description

LC420WX2 is a Color Active Matrix Liquid Crystal Display with an integral Hot Cathode Fluorescent Lamp(HCFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally black mode. It has a 42.0 inch diagonally measured active display area with WXGA resolution (768 vertical by 1366 horizontal pixel array) Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 8-bit gray scale signal for each dot, thus, presenting 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, fast response time and superior performance in moving picture by Scanning Back Light system are important.



General Features

Active Screen Size	42.02 inches(1067.308mm) diagonal
Outline Dimension	**983** mm(H) x **576** mm(V) x **59.7** mm(D) (Typ.)
Pixel Pitch	0.681X0.227(mm x mm x RGB)
Pixel Format	1366 horiz. By 768 vert. Pixels RGB strip arrangement
Color Depth	8-bit, 16.7 M colors
Luminance, White	550 cd/m^2 (Center 1-point) (Typ.)
Viewing Angle (CR>10)	Viewing Angle Free (R/L 178 (Typ.), U/D 178(Typ))
Power Consumption	Total 180W (Typ.) (Logic= 6.36 W, Inverter= 170 W [I_{BL}= 0.58mA])
Weight	11,800g(Typ.), 12,600g(Max.)
Display Operating Mode	Transmissive mode, normally black
Surface Treatment	Hard coating(3H), Anti-glare treatment of the front polarizer

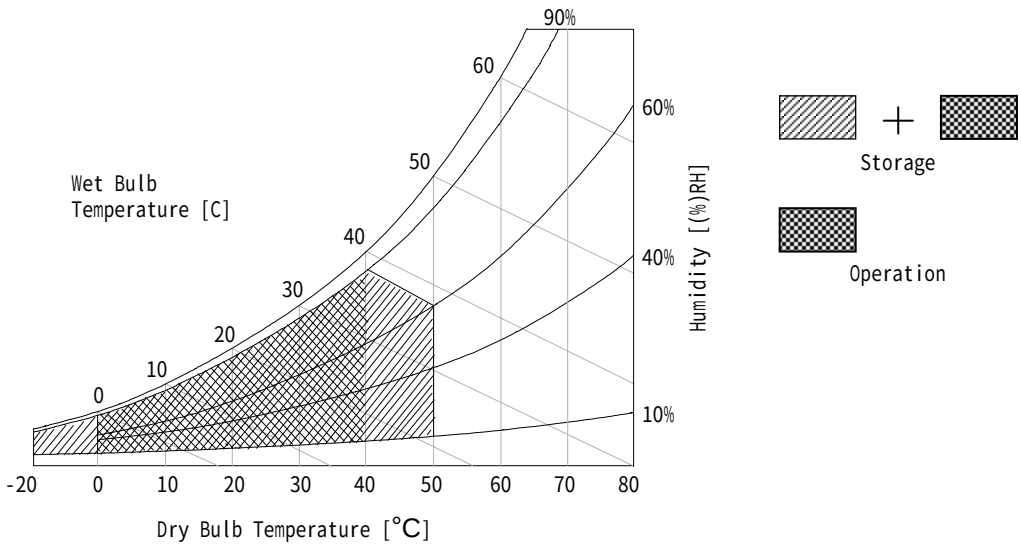
2. Absolute Maximum Ratings

The followings are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Values		Units	Notes
			Min	Max		
Power Input Voltage	LCM	V_{LCD}	-0.3	+14.0	Vdc	at 25 ± 2 °C
	Backlight inverter	V_{BL}	-0.5	350	Vdc	
I2C Voltage		SCL/SDA	-0.5	+5.5	Vdc	3
Brightness Control Voltage		V_{Br}	-0.5	+5.5	Vdc	
Operating Temperature		T_{OP}	0	+40	°C	1,2
Storage Temperature		T_{ST}	-20	+50	°C	
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 °C Max, and no condensation of water.
2. Operating after 2 days storage minimum, it is possible to show Partial Darkness.
3. On/Off control can be set via I2C.



3. Electrical Specifications

3-1. Electrical Characteristics

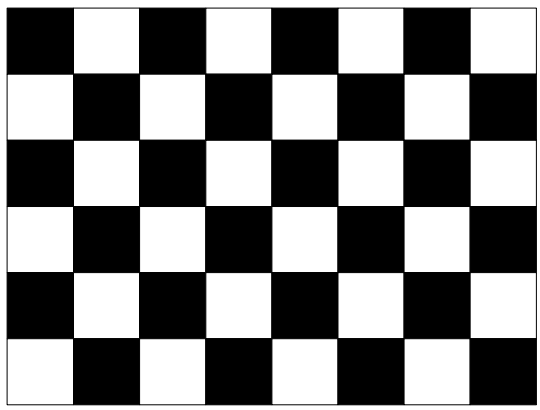
It requires two different power inputs.
One for the LCD electronics , TFT array and liquid crystal.
The other for the HCFL/Backlight inverter.

Table 2_1. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
MODULE :						
Power Supply Input Voltage	V_{LCD}	11.4	12.0	12.6	Vdc	
Power Supply Input Current	I_{LCD}	371	530	689	mA	1
		564	806	1047	mA	2
Power Consumption	P_{LCD}		6.36	8.26	Watt	1
Rush current	I_{RUSH}	-	-	3.0	A	3

Notes :
1. The specified current and power consumption are under the V_{LCD}=12.0V, 25 ± 2°C,f_V=75Hz 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(Full White).
3. The duration of rush current is about 2ms and rising time of power Input is 1ms(min.).

White : 255Gray
Black : 0Gray



Mosaic Pattern(8 x 6)

Table 2_2. ELECTRICAL CHARACTERISTICS

Parameter			Symbol	Values			Unit	Notes
				Min	Typ	Max		
Inverter :								
Start Up Time(Cold)			Ts	3.0	3.5	4.0	Sec	4
Additional time at max duty cycle (at cold start-up)			Td			1.0		5
Power Supply Input Voltage			VBL	280	295	310	Vdc	1
Permissible Input Ripple Voltage			VRP	-	-	400	mVp-p	
Power Consumption			PBL	150	170	200	W	1
Input Voltage for Control System Signals	Brightness Adjust		VBR	0.0		3.3	Vdc	2
	On/Off	On	V on	2.0	3.3	5.25	Vdc	I2C(SDA)
		Off	V off	-0.3	0.0	0.8	Vdc	I2C(SDA)
Lamp :								
Life Time	Ambient Temperature		25 °C	50,000			Hrs	3

Notes :

1. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 120 minutes at 25±2°C
   The specified current and power consumption are under the typical supply Input voltage, it is total power consumption.
2. Brightness Control.
   This VBR Voltage control brightness.

VBR Voltage	Function
3.3V	Maximum Brightness (Duty Cycle 40%)
0V	Minimum Brightness.(Duty Cycle 4%)

   Recommended minimum duty cycle is 12.8%.
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°C.
   Specified value is when lamp is aligned horizontally. And partial luminance difference should not be used for life decision.
4. Start up time(Cold) is for preheating the lamp electrodes. The start up time is measured from the moment that the power supply voltage Vin > Vin-min until the lamp current in the first lamp starts to flow.
5. After completing the startup time the BLS will operate for 1 sec at full duty cycle.

3-2. Interface Connections

This LCD employs Two interface connections, a 30 pin connector is used for the module electronics and 5Pin / 3Pin Connector is used for the scanning backlight system.

3-2-1. LCD Module

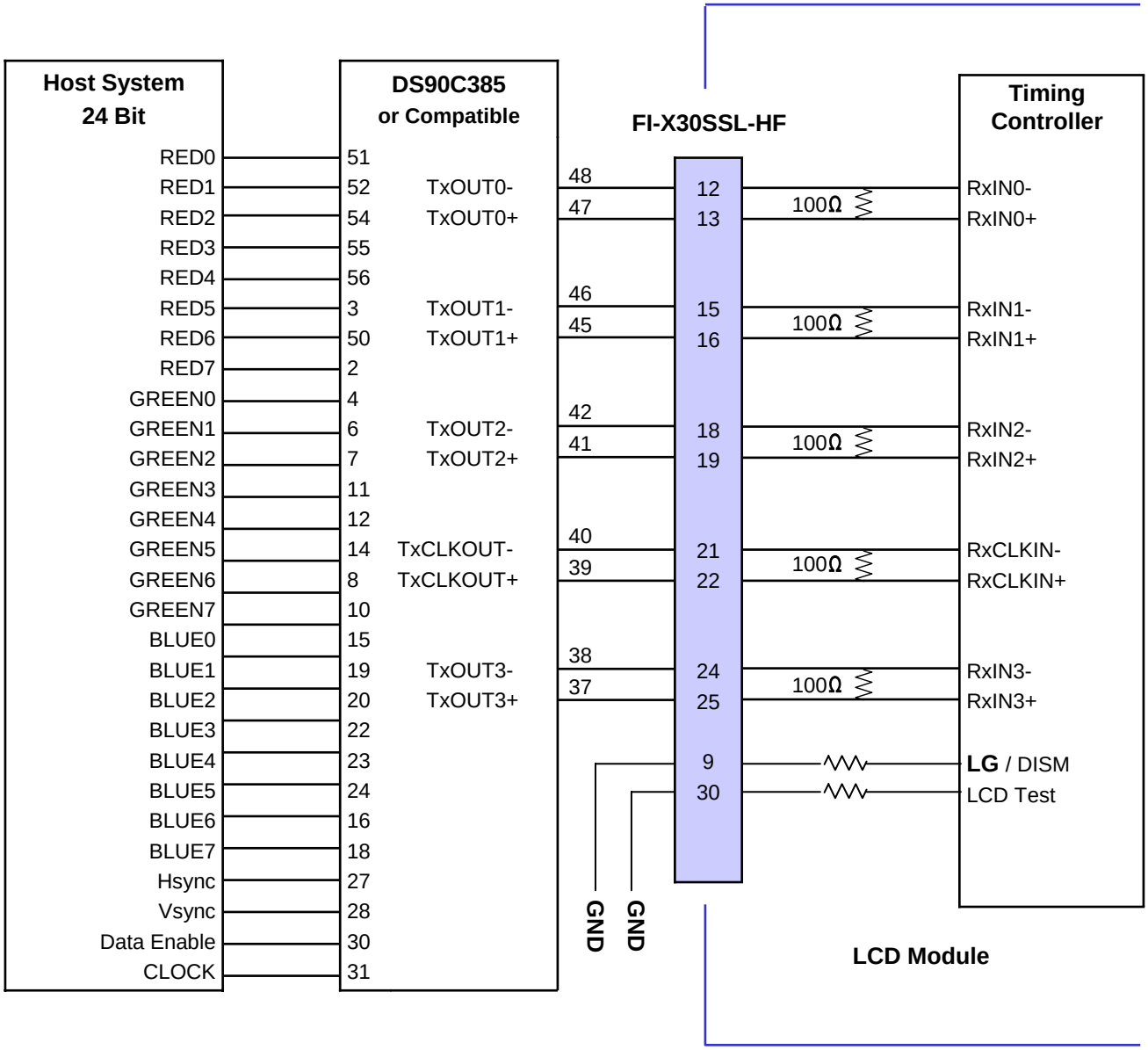
- LCD Connector(CN1) : FI-X30SSL-HF (Manufactured by JAE) or Equivalent
- Mating Connector : FI-X30C2L (Manufactured by JAE) or Equivalent

Table 3. MODULE CONNECTOR(CN1) PIN CONFIGURATION

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

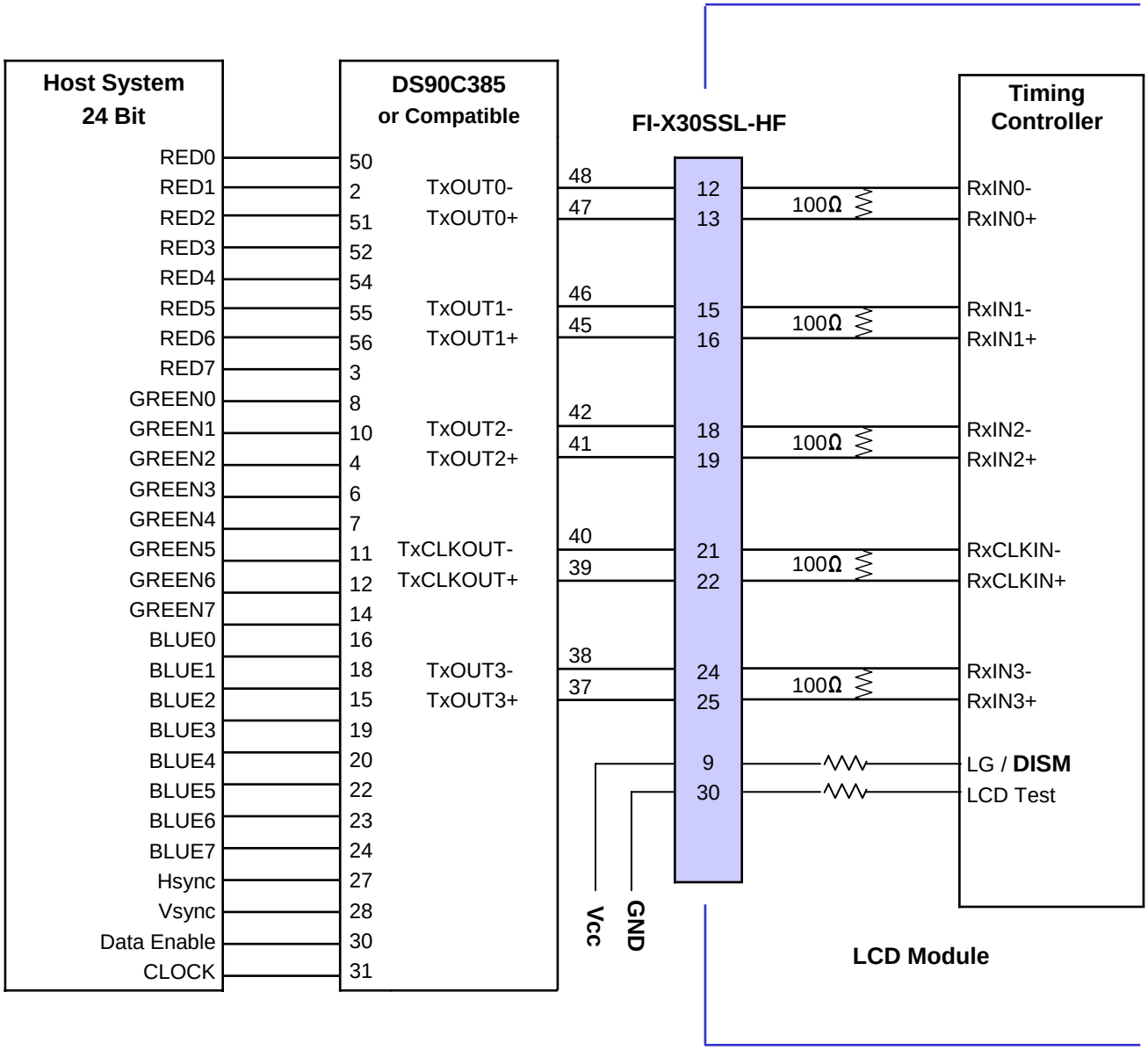
Note: 1. If Pin9 is Ground, Interface format is “LG”, and if Pin9 is Vcc(3.3V), Interface format is “DISM”
See page 9 and 10.
2. Pin30 should be ground, this pin is necessary for LCD test.
3. All GND(ground) pins should be connected together, which should also be connected to the LCD’s metal frame.
4. All V_{LCD} (power input) pins should be connected together.
5. Input Level of LVDS signal is based on the IEA 664 Standard.

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



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

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



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

3-2-2. Backlight Inverter

- Inverter Power Connector : S3B-XH-SM4-TB(Manufactured by JST)or equivalent
- Mating Connector : XHP-3 or equivalent
- S5B-PH-SM4-TB (Manufactured by JST)or equivalent
- Mating Connector : 5KR-8M or equivalent

Table 6. INVERTER CONNECTOR PIN CONFIGULATION

(Power Connector)

Pin No	Symbol	Description
1	VBL	Power Supply (295Vdc)
2	NC	not connected
3	GND	Power Ground

(Control Connector)

Pin No	Symbol	Description
1	Sync input	(3.3v trigger negative flank)
2	Burst dimm.	Brightness Adjustable Voltage (Max Brightness:3.3V / Min Brightness :0.0V)
3	GND	Power Ground
4	SCL	I2C SCL INPUT
5	SDA	I2C SDA INPUT System on off(ON:3.3V / OFF :0.0V)

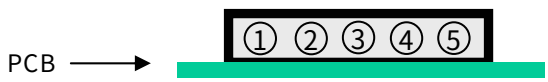
Note : 1. Minimum Brightness : V_{BR} = 0.0V
Maximum Brightness : V_{BR} = 3.3V

2. GND should be connected to the LCD module's metal frame.

• Inverter Power Connector

S3B-XH-SM4-TB
(JST : Japan Solderless Terminal Co.,Ltd.)

• Inverter Dimming and I2C Connector



S5B-PH-SM4-TB
(JST : Japan Solderless Terminal Co.,Ltd.)

3-3. Signal Timing Specifications

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

Table 7-1. Timing Table - 75 Hz

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Period	t_{CLK}	11.62	11.76	11.83	ns	
	Frequency	-	84	85	86	MHz	
Hsync	Period	t_{HP}	1446	1446	1446	t_{CLK}	
	Frequency	f_H	60.975	60.975	60.975	KHz	
	Width	t_{WH}	16	16	16	t_{CLK}	
Vsync	Period	t_{VP}	779	784	793	t_{HP}	Note 1) 73~76Hz
	Frequency	f_V	73	75	76	Hz	
	Width	t_{WV}	1	5	6	t_{HP}	
DE (Data Enable)	Horizontal Valid	t_{HV}	1366	1366	1366	t_{CLK}	Note 2)3)4)
	Horizontal Back Porch	t_{HBP}	40	40	40		
	Horizontal Front Porch	t_{HFP}	24	24	24		
	Horizontal Blank	-	80	80	80		
	Vertical Valid	t_{VV}	768	768	768	t_{HP}	Note 2)3)4)
	Vertical Back Porch	t_{VBP}	2	5	7		
	Vertical Front Porch	t_{VFP}	8	10	12		
	Vertical Blank	-	**11**	20	**25**		

Note: Hsync Period and Hsync Width should be even number times of t_{CLK}. If the value is odd number times of t_{CLK}, display control signal can be asynchronous. In order to operate this LCD module, Hsync, Vsync and DE(data enable) signals should be used.

1. : The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate.

2. Vsync and Hsync should be kept within the above specification.
3. Hsync Period, Hsync Width and Horizontal Back Porch should be any times of character number(4).
4. Timing should be set based on clock frequency.
5. The BL system Vsync≥ 25us

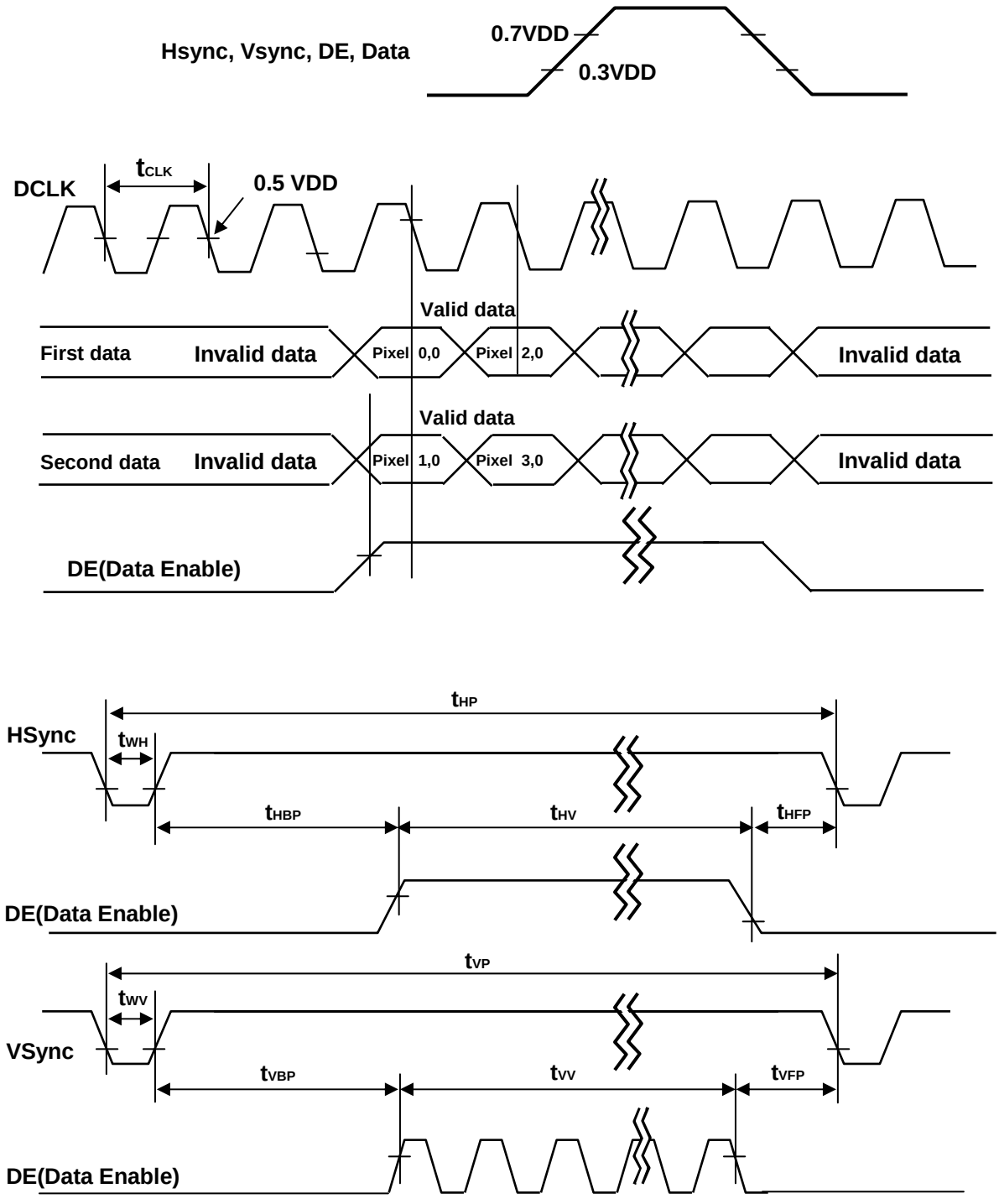
Table 7-2. TIMING TABLE- 60 Hz

ITEM	Symbol		Min	Typ	Max	Unit	Remark
DCLK	Period	t_{CLK}	12.5	13.8	14.7	ns	
	Frequency	-	63	72	80	MHz	
Hsync	Period	t_{HP}	1456	1528	1776	t_{CLK}	
	Frequency	f_H	45	47.4	50	KHz	
	Width	t_{WH}	8	32	-	t_{CLK}	
Vsync	Period	t_{VP}	775	790	1063	t_{HP}	Note 1) 47~63Hz
	Frequency	f_V	47	60	63	Hz	
	Width	t_{WV}	2	5	-	t_{HP}	
DE (Data Enable)	Horizontal Valid	t_{HV}	1366	1366	1366	t_{CLK}	Note 2)3)
	Horizontal Back Porch	t_{HBP}	24	80	-		
	Horizontal Front Porch	t_{HFP}	24	48	-		
	Horizontal Blank	-	t_{HP}- t_{HV}	162	t_{HP}- t_{HV}		
	Vertical Valid	t_{VV}	768	768	768	t_{HP}	Note 2)3)
	Vertical Back Porch	t_{VBP}	4	15	-		
	Vertical Front Porch	t_{VFP}	1	2	-		
	Vertical Blank	-	t_{VP}- t_{VV}	22	t_{VP}- t_{VV}		

Note : Hsync Period and Hsync Width should be even number times of tCLK. If the value is odd number times of tCLK, display control signal can be asynchronous. In order to operate the LCD, Hsync, Vsync and DE(Data Enable) signals should be used.

1. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate.
2. Vsync and Hsync should be kept within the above specification.
3. Timing should be set based on clock frequency.
4. The BL system Vsync≥ 25us

3-4. Signal Timing Waveforms



3-5. Color Data Reference

The Brightness of each primary color(red,green,blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Table 8. COLOR DATA REFERENCE

Color		Input Color Data																							
		RED								GREEN								BLUE							
		MSB							LSB	MSB							LSB	MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	...	...								...								...							
	RED (254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	...	...								...								...							
	GREEN (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	...	...								...								...							
	BLUE (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note : Users should input true 8 Bit data streams via LVDS transmitter.

3-6. Power Sequence

3-6-1. LCD Driving circuit

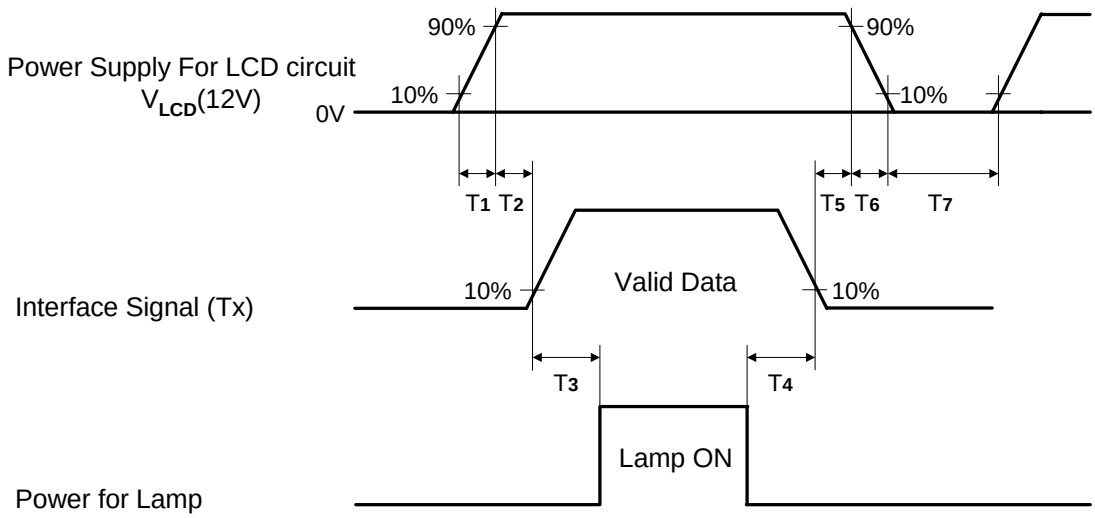
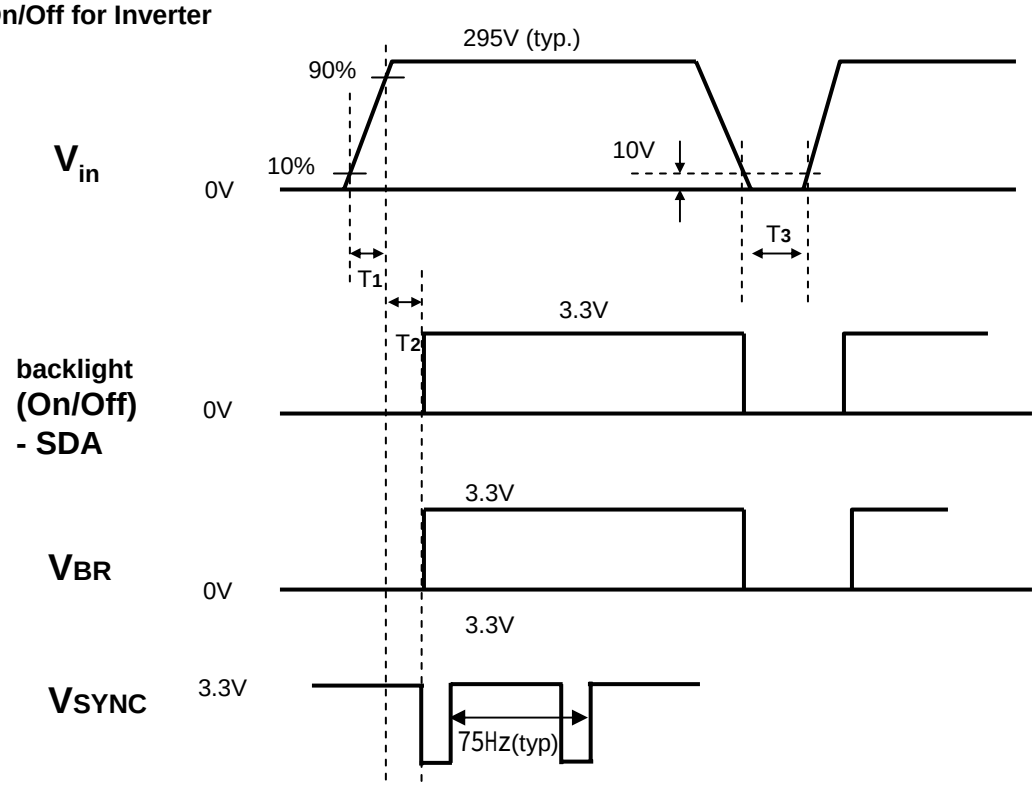


Table 9. POWER SEQUENCE

Parameter	Value			Unit	Note
	Min	Typ	Max		
T1	1.0	-	20	ms	
T2	5.0	-	50	ms	4
T3	200	-	-	ms	5
T4	200	-	-	ms	
T5	0.5	-	50	ms	4
T6	-	-	300	ms	
T7	2.0	-	-	s	3

Note :1. Please avoid the floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply V_{LCD}(12 V Typ)to 0V.
3. Flicker would come out when power on-off(T7=1s) is tested over several ten-times.
4. The case when the T2/T5 exceed maximum specification, it operates protection pattern(Black pattern) till valid signal input. There is no reliability problem.
5. 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.
6. Refer to Table.2-2 About Lamp On(Start up time).

3-6-2. On/Off for Inverter



3-6-3. Deep condition for Inverter

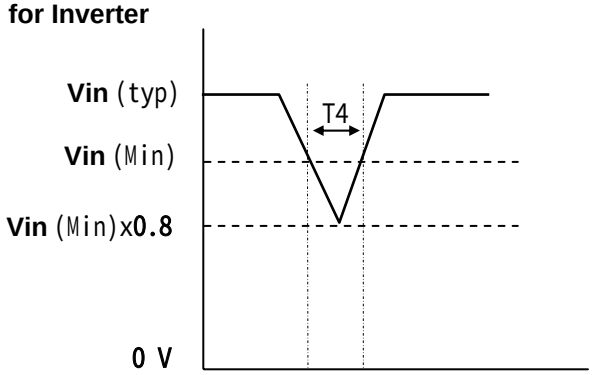


Table 9-1. Power Sequence for Inverter

Parameter	Values			Units	Remarks
	Min	Typ	Max		
T1	2	-	-	ms	inverters connected condition
T2	350	-	-	ms	Start-up time DSP
T3	200	-	-	ms	Reset time
T4	-	-	10	ms	V_{BL}(Min) x 0.8

Note : 1. After input dip, backlight unit operates normally

4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30Min in a dark environment at 25±2°C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 °.
FIG. 1 presents additional information concerning the measurement equipment and method.

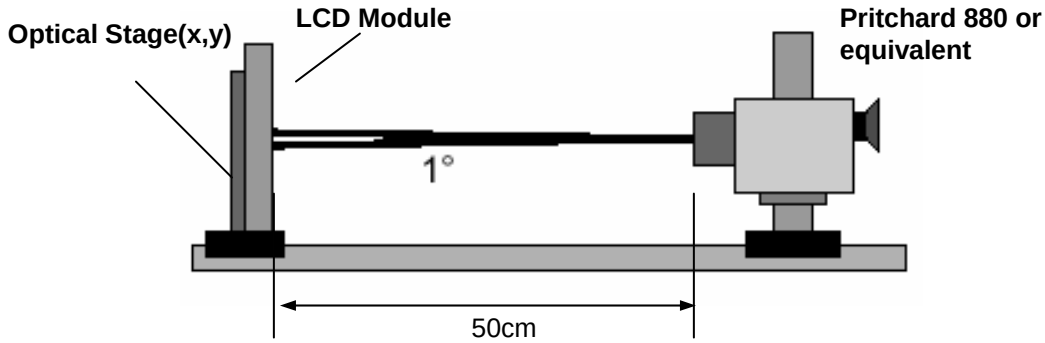


FIG. 1 Optical Characteristic Measurement Equipment and Method

Table 10. OPTICAL CHARACTERISTICS

Ta= 25±2°C, V_{LCD}=12.0V, fv=75Hz, Dclk=85MHz

Parameter		Symbol	Values			Units	Notes
			Min	Typ	Max		
Contrast Ratio		CR	560	800			1
Surface Luminance, white		L_{WH}	440	550		cd/m^2	2
Luminance Variation		δ_{WHITE} 5P			1.3		3
Response Time (Gray-to-Gray)	Rise Time	Tr_R	-	8	12	ms	4
	Decay Time	Tr_D	-	10	14	ms	4
	G to G (with ODC)			8	12		
Color Coordinates [CIE1931]	RED	Rx	Typ -0.03	0.630	Typ +0.03		5
		Ry		0.343			5
	GREEN	Gx		0.272			5
		Gy		0.607			5
	BLUE	Bx		0.147			5
		By		0.068			5
	WHITE	Wx		0.285			5
		Wy		0.293			5
Viewing Angle (CR>10)							
	x axis, right(ϕ=0°)	θr	85	89	-	degree	6
	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							7

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

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

It is measured at center 1-point

2. Surface Luminance(L_{WH}) is the luminance value at center 1-point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see the FIG. 2. The luminance is determined by taking the average of 10 measurements.

3. The variation in surface luminance , δ WHITE is defined as :
δ WHITE(5P) = Maximum(L_{on1},L_{on2}, L_{on3}, ... , L_{on5}) / Minimum(L_{on1},L_{on2}, L_{on3}, ... , L_{on5})
Where L_{on1} to L_{on5} are the luminance with all pixels displaying white at 5 locations .
For more information, see FIG 2.

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

5. The color coordinate is determined by taken the average of 10 measurements

6. 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.

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

8. Color coordinates and luminance are based on 0 hour operation

Table 11. Gray Scale Specification

Gray Level	Luminance [%] (Typ)
L0	0.14
L15	0.31
L31	1.00
L47	2.35
L63	4.45
L79	7.55
L95	11.58
L111	16.27
L127	21.14
L143	27.37
L159	35.16
L175	44.16
L191	53.87
L207	64.86
L223	76.54
L239	90.07
L255	100.00

Measuring point for surface luminance & measuring point for luminance variation

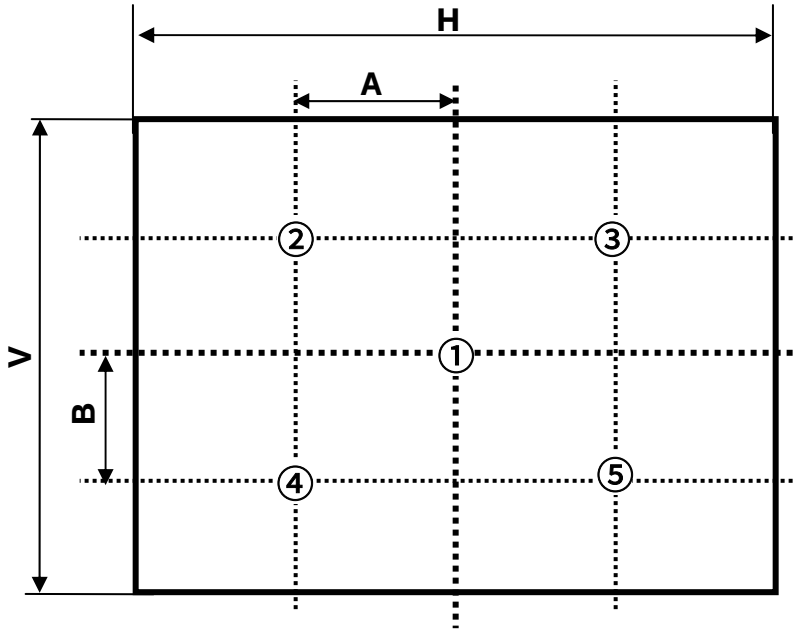


FIG. 2 Measure Point for Luminance

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

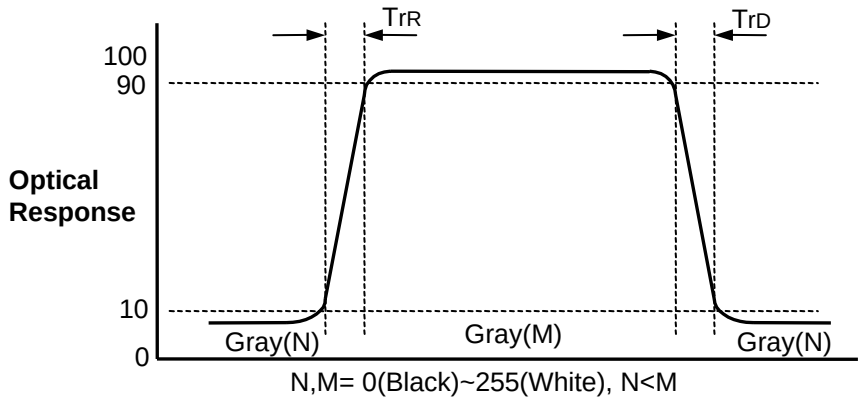


FIG. 3 Response Time (Reference data/ measured by non scanning backlight)

Dimension of viewing angle range

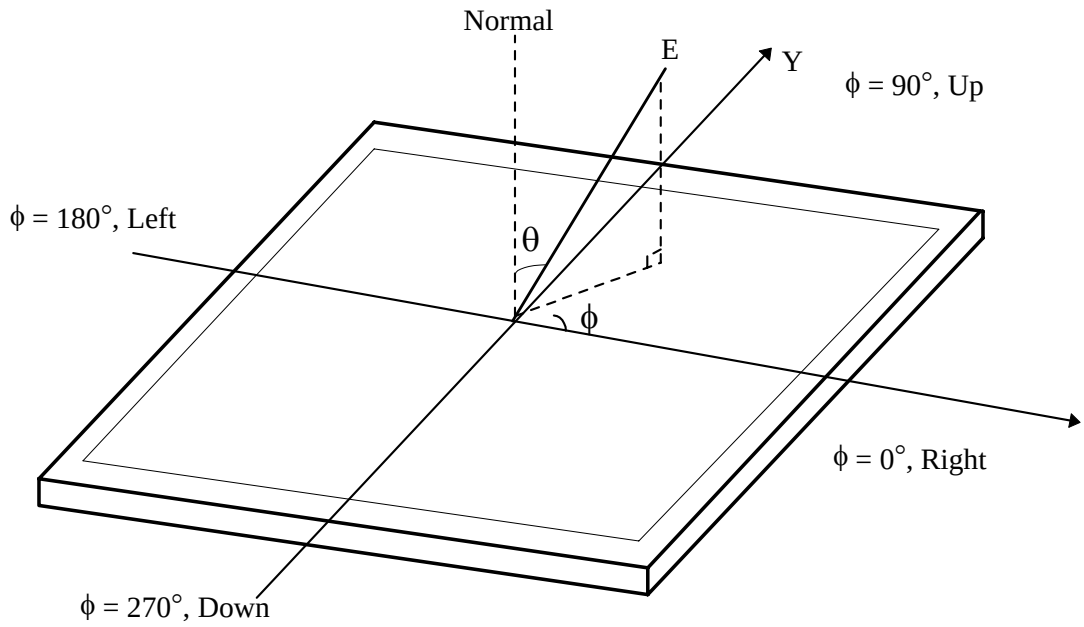


FIG. 4 Viewing angle

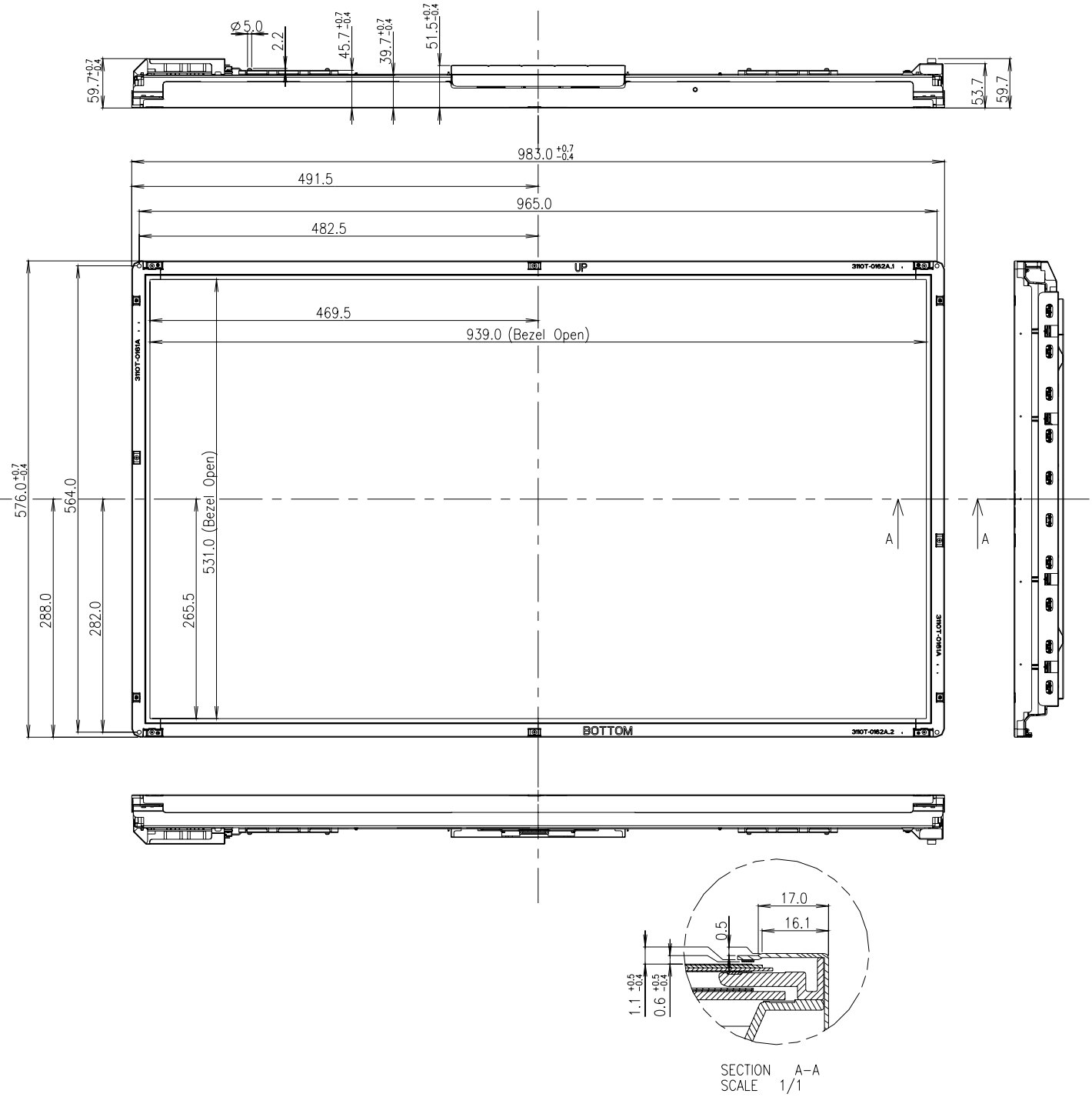
5. Mechanical Characteristics

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

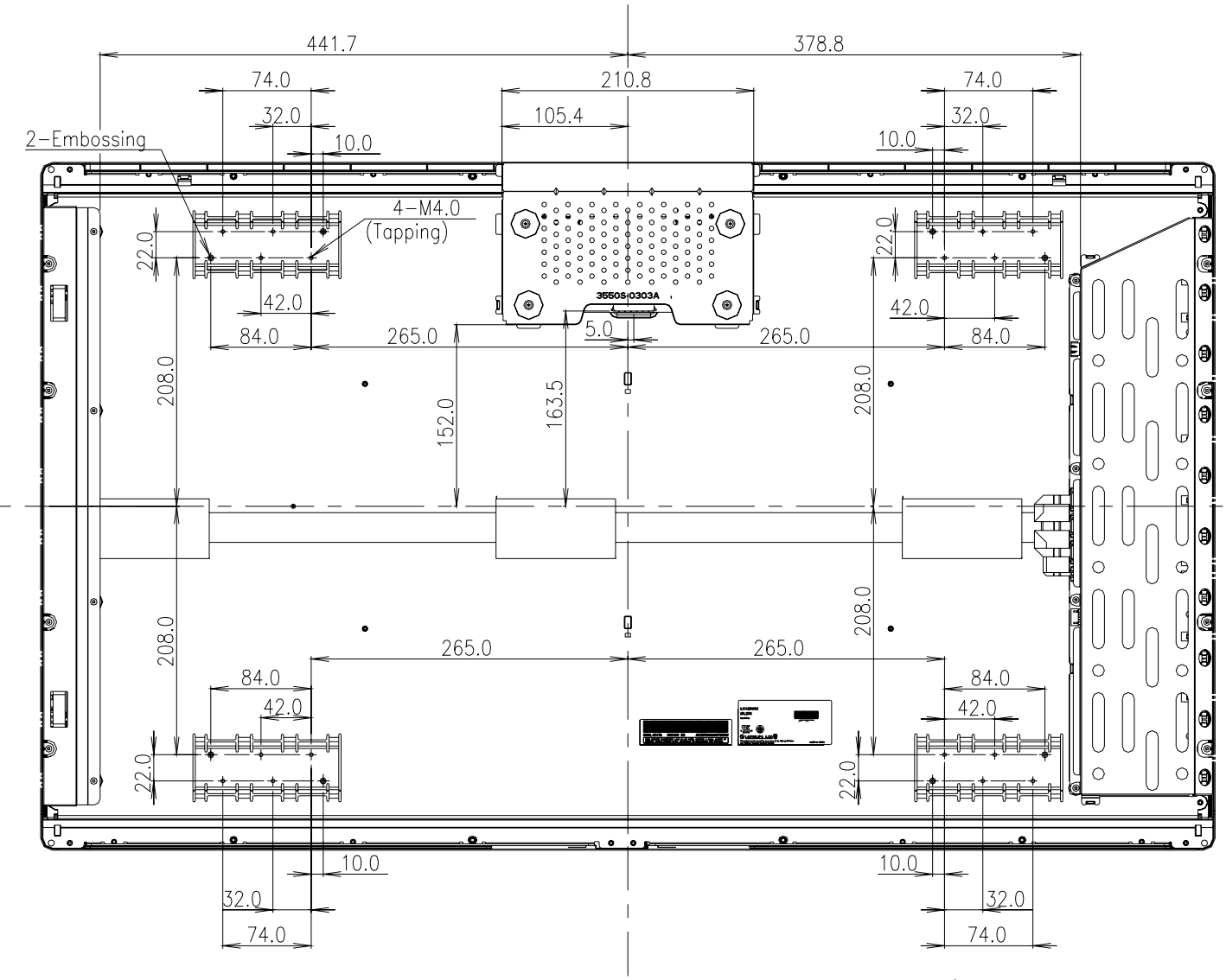
Outline Dimension	Horizontal	983.0 mm
	Vertical	576.0 mm
	Depth	59.7 mm
Bezel Area	Horizontal	939mm
	Vertical	531mm
Active Display Area	Horizontal	930.25mm
	Vertical	523.01mm
Weight	11,800g(Typ.), 12,600g(Max.)	
Surface Treatment	Hard coating(3H) Anti-glare treatment of the front polarizer	

Notes : Please refer to the drawings in terms of tolerance at the next page.

<FRONT VIEW>

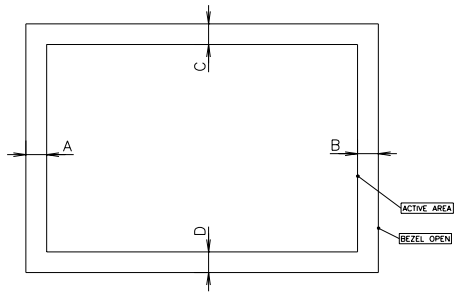

Ø5.0
2.2
45.7 +0.7 -0.4
39.7 +0.7 -0.4
51.5 +0.7 -0.4
59.7 +0.7 -0.4
53.7
59.7
983.0 +0.7 -0.4
491.5
965.0
482.5
UP
469.5
939.0 (Bezel Open)
576.0 +0.7 -0.4
564.0
531.0 (Bezel Open)
288.0
282.0
265.5
A
A
BOTTOM
17.0
16.1
0.5
1.1 +0.5 -0.4
0.6 +0.5 -0.4
SECTION A-A
SCALE 1/1

<REAR VIEW>



NOTE

1. UNSPECIFIED TOLERANCE IS ±1.0mm
2. GAP BETWEEN TOP CASE AND GLASS IS $0.6^{+0.5}_{-0.4}$
3. TILT AND A PARTIAL DISPOSITION TOLERANCE OF DISPLAY AREA ARE AS FOLLOW.
   1) X-DIRECTION : | A-B | ≤ 1.5mm
   1) Y-DIRECTION : | C-D | ≤ 1.5mm



6. Reliability

Environment test condition

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

7. International standards

7-1. Safety

a) UL 60950-1:2003, First Edition, Underwriters Laboratories, Inc.,
Standard for Safety of Information Technology Equipment.
b) CAN/CSA C22.2, No. 60950-1-03 1st Ed. April 1, 2003, Canadian Standards Association,
Standard for Safety of Information Technology Equipment.
c) EN 60950-1:2001, First Edition,
European Committee for Electrotechnical Standardization(CENELEC)
European Standard for Safety of Information Technology Equipment.
d) IEC60065:2001, 7th Edition and IEC60950-1:2001, First Edition

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

2. MONTH

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

3. PANEL CODE

Panel Code	P1 Factory	P2 Factory	P3 Factory	P4 Factory	P5 Factory	Hydis Panel
Mark	1	2	3	4	5	H

4. FACTORY CODE

Factory Code	LPL Gumi	LPL Nanjing	Hee Sung
Mark	K	C	D

5. SERIAL NO.

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

b) Location of Lot Mark

Serial NO. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

8-2. Packing Form

a)Package quantity in one Pallet : 10pcs

b) Pallet Size : 1140 x 1000 x 810

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 benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

9-2. OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change.
Condensation can cause soft failure, 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.
Recommendation : 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.
(3) Partial darkness can be seen when turn on after 2 days of storage.
Especially, This phenomenon can be happened easily at low temperature storage condition.

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.

9-7. Others

(1) Color difference can be seen in LCMs before 100hrs(max.) aging time
(2) Changing color can happen in 25±2°C condition by Wx ± 0.003, Wy ± 0.003 after 100 hours aging

Appendix A : Black Level and Black Uniformity

This is only the reference data of black level and black uniformity for LC420WX2-SLA1 model.

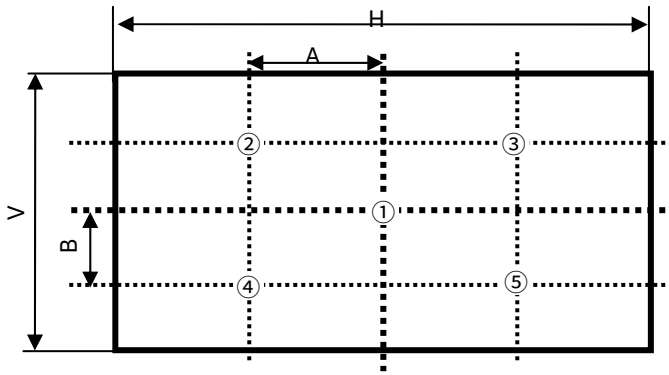
1. Black Level :
   Surface Luminance of Black (L_{BLACK}) is the luminance value at center 1-point.

2. Black Uniformity
   The variation of surface luminance of black , δ BLACK is defined as :
   δ BLACK = Maximum(L_{on1},L_{on2}, L_{on3}, L_{on4}, L_{on5}) / Minimum(L_{on1},L_{on2}, L_{on3}, L_{on4}, L_{on5})

3. Sampling Size : 5 pcs

4. Measurement Method : Follow the same rule as optical characteristics measurement.

5. Measurement location: refer to below.



A : H / 4 mm
B : V / 4 mm
H : 930.25 mm
V : 523.01 mm
@ H,V : Active Area

6. Current Status

   Below table is actual data of production on 24th Feb 2006.

No.	Luminance	Black Level
1	598	0.68
2	630	0.77
3	624	0.73
4	620	0.70
5	609	0.69

7. Black Level and Black Uniformity Control Method

   -. LPL will continue to monitor the quality level of mass production regularly in terms of black level and black uniformity.