

SPECIFICATION FOR APPROVAL

(◆) Preliminary Specification

() Final Specification

Title	15.1" XGA TFT LCD
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BUYER	
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
MODEL	LM151X3
SUFFIX	C3C1

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

SIGNATURE	DATE
/	_____
/	_____
/	_____

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

APPROVED BY	DATE
Paul Lee / G.Manager	_____
REVIEWED BY	
S. G. Hong / S.Engineer	_____
PREPARED BY	
Khan Seo /Engineer	_____

Product Engineering Dept.
LG.Philips LCD Co., Ltd.

CONTENTS

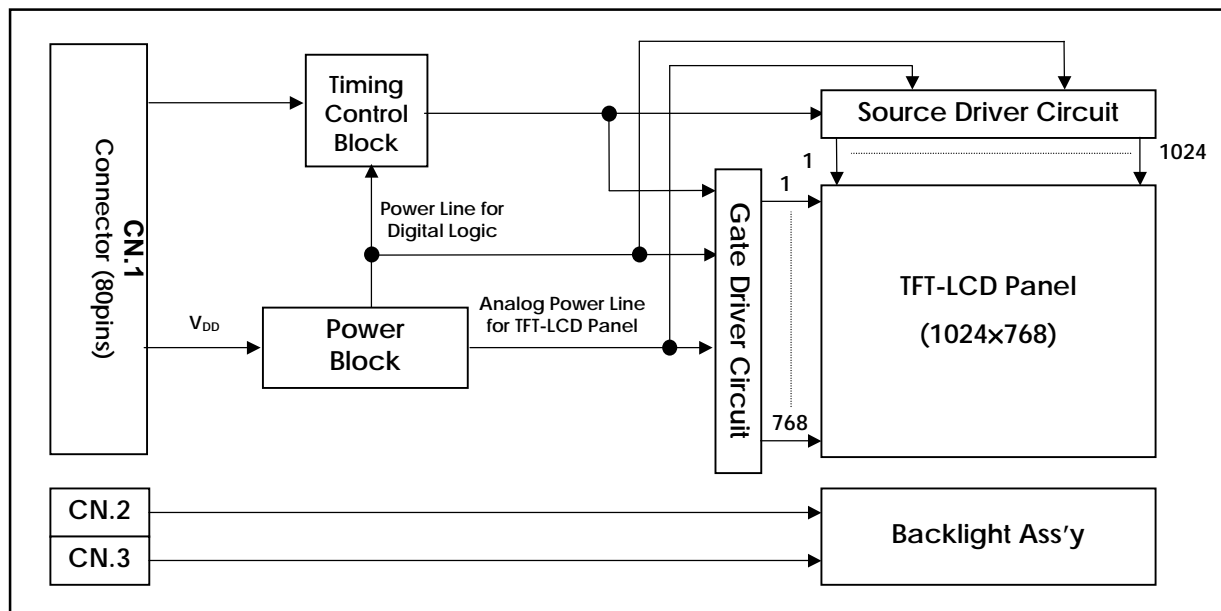
NO.	ITEM	Page
-	COVER	1
-	CONTENTS	2
-	RECORD OF REVISIONS	3
1	GENERAL DESCRIPTION	4
2	ABSOLUTE MAXIMUM RATINGS	5
3	ELECTRICAL SPECIFICATIONS	6
3-1	ELECTRICAL CHARACTERISTICS	6
3-2	INTERFACE CONNECTIONS	7
3-3	SIGNAL TIMING SPECIFICATIONS	9
3-4	SIGNAL TIMING WAVEFORMS	10
3-5	COLOR INPUT DATA REFERENCE	11
3-6	POWER SEQUENCE	12
4	OPTICAL SPECIFICATIONS	13
5	MECHANICAL CHARACTERISTICS	17
6	RELIABILITY	20
7	INTERNATIONAL STANDARDS	21
7-1	SAFETY	21
7-2	EMC	21
8	PACKING	22
8-1	DESIGNATION OF LOT MARK	22
8-2	PACKING FORM	22
9	PRECAUTIONS	25

1. General Description

The LM151X3-C3C1 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 type display operating in the normally white mode. This TFT-LCD has a 15.1 inches diagonally measured active display area with XGA resolution (768 vertical by 1024 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 brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot, thus, presenting a palette of more than 16,777,216 colors.

The LM151X3-C3C1 has been designed to apply the 2-port-TTL(2-pixel 1-clock) interface method.

The LM151X3-C3C1 LCD is intended to support applications where high brightness, wide viewing angle, high color saturation, and high color depth are very important. In combination with the vertical arrangement of the sub-pixels, the LM151X3-C3C1 characteristics provide an excellent flat panel display for office automation products such as monitors.



[Fig. 1]

General Features

Active screen size	15.1 inches(307.2 x 230.4mm) diagonal
Outline dimensions	352.0(H) × 263.5(V) × 16.0(D) mm (typ) without user connector
Pixel pitch	0.300 mm × 0.300 mm
Pixel format	1024 horiz. by 768 vert. pixels
	RGB stripe arrangement
Color depth	8-bit, 16,777,216 colors
Luminance,White	250 cd/m ² (typ.)
Power Consumption	2.1Watts Logic / 9.7 Watts CCFL (typ. With 64 Gray pattern)
Weight	1500g (typ.) , 1575g(max.)
Display operating mode	transmissive mode, normally white
Surface treatments	hard coating(3H.), anti-glare treatment of the front polarizer

Product Specification

2. Absolute Maximum Ratings

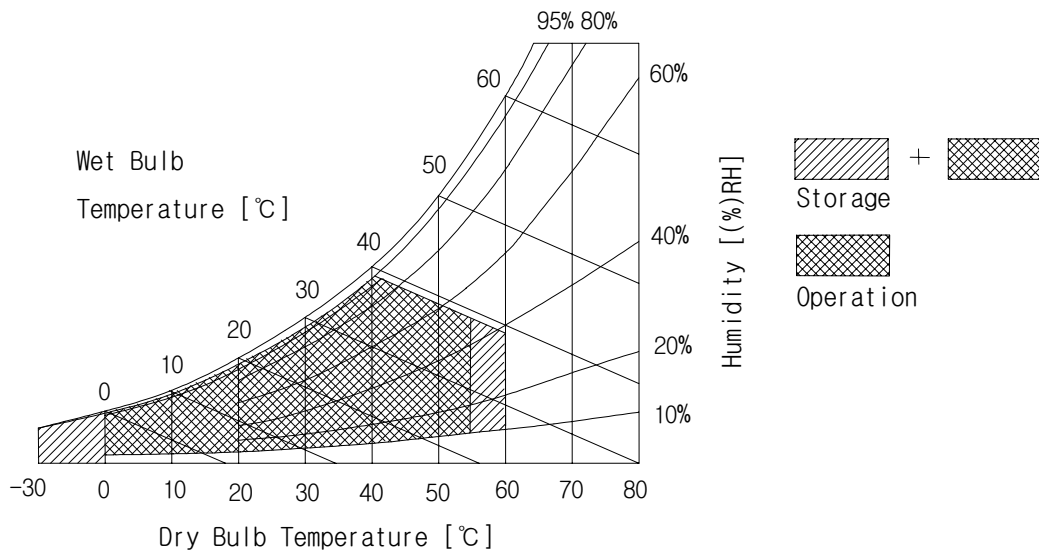
The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 1 ABSOLUTE MAXIMUM RATINGS

Parameter	symbol	Values		Units	Notes
		Min.	Max.		
Signal Input Voltage	V _I	-0.3	4.0	V	at 25°C±5
Power Input Voltage	V _{CC}	-0.5	+5.5	Vdc	at 25°C±5
Operating Temperature	T _{OP}	0	+55	°C	1
Storage Temperature	T _{ST}	-30	+60	°C	1
Operating Ambient Humidity	H _{OP}	10	95	%RH	1
Storage Humidity	H _{ST}	10	95	%RH	1

Note: 1. Temperature and relative humidity range are shown in the figure below.

Wet bulb temperature should be 39°C Max, and no condensation of water



3. Electrical Specifications

3-1. Electrical Characteristics

The LM151X3-C3C1 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input which powers the CCFL, is typically generated by an inverter. The inverter is an external unit to the LCD.

Table 2 ELECTRICAL CHARACTERISTICS:

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
MODULE:						
Power Supply Input Voltage	V_{DD}	4.75	5.0	5.25	Vdc	
Power Supply Input Current	I_{DD}	-	420	550	mA	1
Power Consumption	P_C	-	2.1	3.025	Watts	1
Input Data Logic Voltage	V_I	3.0	3.3	3.6	V	
Rush current	I_{RUSH}	-	-	2.5	A	2
LAMP						
Operating Voltage	V_{BL}	585(9mA)	605(8mA)	720(3mA)	V_{RMS}	3
Operating Current	I_{BL}	3.0	8.0	9.0	mA	
Established Starting Voltage	V_{BS}					4
at 25°C		-	-	1020	V_{RMS}	
at 0°C		-	-	1400	V_{RMS}	
Operating Frequency	f_{BL}	30	50	60	kHz	5
Discharge Stabilization Time	T_S	-	-	3	Minutes	6
Power Consumption	P_{BL}	-	9.7	10.5	Watts	7
Life Time at 8mA _{rms}		30,000	(40,000)	-	Hrs	8
at 7mA _{rms}		40,000	(50,000)	-	Hrs	

- Note**
- The specified current and power consumption are under the $V_{DD} = 5.0V$, $25^\circ C$, $f_v = 60Hz$ condition whereas full black pattern is displayed and f_v is the frame frequency.
 - The duration of rush current is about 20ms.
 - The variance of the voltage is $\pm 5\%$.
 - The voltage above V_{BS} should be applied to the lamps for more than 1second for start-up. Otherwise, the lamps may not be turned on.
 - The output of the inverter must have symmetrical (negative and positive) voltage waveform and symmetrical current waveform.(Unsymmetrical ratio is less than 10%)
Please do not use the inverter which has unsymmetrical voltage and unsymmetrical current and spike wave. Lamp frequency may produce interference with horizontal synchronous frequency and as a result this may cause beat on the display.
Therefore lamp frequency shall be as away as possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.
 - Let's define the brightness of the lamp after being lighted for 5 minutes as 100%.
 T_s is the time required for the brightness of the center of the lamp to be not less than 95%.
 - The lamp power consumption shown above does not include loss of external inverter.
 - The life time is determined as the time at which brightness of lamp is 50% compared to that of initial value at the assigned lamp current on condition of continuous operating at $25 \pm 2^\circ C$.

Note. The design of the inverter must have specifications for the lamp in LCD Assembly.
The performance of the Lamp in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC Inverter. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.
When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter(no lighting, flicker, etc) never occurs. When you confirm it, the LCD Assembly should be operated in the same condition as installed in your instrument.

Note. Do not attach a conducting tape to lamp connecting wire. If the lamp wire attach to conducting tape, TFT-LCD Module have a low luminance and the inverter has abnormal action because leakage current

Product Specification

occurs between lamp wire and conducting tape.

Product Specification

3-2. Interface Connections

This LCD employs three interface connections, a 80 pins connector is used for the module electronics and two connectors, a three pins connector, are used for the integral backlight system.

The electronics interface connector is a model 53475(53643) manufactured by Molex, and Mating Connector is a model 52760(52885) manufactured by Hirose. The pin configuration for the connector is shown in the table below.

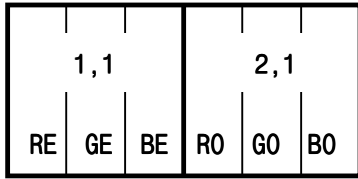
Table 4 MODULE CONNECTOR PIN CONFIGURATION

Pin	Symbol	Description	Pin	Symbol	Description
1	GND	System Ground	41	GND	System Ground
2	R00	Red Data 0 (Odd), LSB	42	GE0	Green Data 0 (Even), LSB
3	R01	Red Data 1 (Odd)	43	GE1	Green Data 1 (Even)
4	R02	Red Data 2 (Odd)	44	GE2	Green Data 2 (Even)
5	R03	Red Data 3 (Odd)	45	GE3	Green Data 3 (Even)
6	GND	System Ground	46	GND	System Ground
7	R04	Red Data 4 (Odd)	47	GE4	Green Data 4 (Even)
8	R05	Red Data 5 (Odd)	48	GE5	Green Data 5 (Even)
9	R06	Red Data 6 (Odd)	49	GE6	Green Data 6 (Even)
10	R07	Red Data 7 (Odd), MSB	50	GE7	Green Data 7 (Even), MSB
11	GND	System Ground	51	GND	System Ground
12	G00	Green Data 0 (Odd), LSB	52	BE0	Blue Data 0 (Even), LSB
13	G01	Green Data 1 (Odd)	53	BE1	Blue Data 1 (Even)
14	G02	Green Data 2 (Odd)	54	BE2	Blue Data 2 (Even)
15	G03	Green Data 3 (Odd)	55	BE3	Blue Data 3 (Even)
16	GND	System Ground	56	GND	System Ground
17	G04	Green Data 4 (Odd)	57	BE4	Blue Data 4 (Even)
18	G05	Green Data 5 (Odd)	58	BE5	Blue Data 5 (Even)
19	G06	Green Data 6 (Odd)	59	BE6	Blue Data 6 (Even)
20	G07	Green Data 7 (Odd), MSB	60	BE7	Blue Data 7 (Even), MSB
21	GND	System Ground	61	GND	System Ground
22	B00	Blue Data 0 (Odd), LSB	62	GND	System Ground
23	B01	Blue Data 1 (Odd)	63	DCLK	Data Input Clock
24	B02	Blue Data 2 (Odd)	64	GND	System Ground
25	B03	Blue Data 3 (Odd)	65	GND	System Ground
26	GND	System Ground	66	HSYNC	Horizontal Sync Signal
27	B04	Blue Data 4 (Odd)	67	GND	System Ground
28	B05	Blue Data 5 (Odd)	68	GND	System Ground
29	B06	Blue Data 6 (Odd)	69	DE	Data Enable Signal
30	B07	Blue Data 7 (Odd), MSB	70	VSYNC	Vertical Sync Signal
31	GND	System Ground	71	V _{DD}	Power Supply for LCD Module
32	RE0	Red Data 0 (Even), LSB	72	V _{DD}	Power Supply for LCD Module
33	RE1	Red Data 1 (Even)	73	V _{DD}	Power Supply for LCD Module
34	RE2	Red Data 2 (Even)	74	V _{DD}	Power Supply for LCD Module
35	RE3	Red Data 3 (Even)	75	V _{DD}	Power Supply for LCD Module
36	GND	System Ground	76	N.C	
37	RE4	Red Data 4 (Even)	77	N.C	
38	RE5	Red Data 5 (Even)	78	N.C	
39	RE6	Red Data 6 (Even)	79	N.C	
40	RE7	Red Data 7 (Even), MSB	80	GND	System Ground

Product Specification

Note 1. Correspondence between input data and screen image.

Display data of 2-pixels are latched by 1-cycle of DCLK.

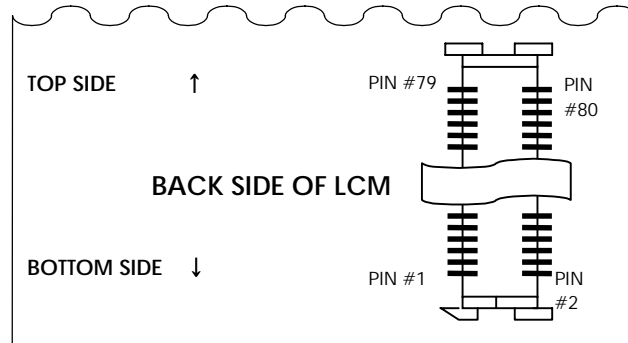


Even data refers to First pixel data.
Odd data refers to Second pixel data

Pixel assignment of LCD active area

1,1	2,1	3,1	1024,1
1,2	2,2	3,2	1024,2
1,3	2,3	3,3	1024,3
.....
1,768	2,768	3,768	1024,768

- 2. All GND(ground) pins should be connected together and to Vss which should also be connected to the LCD's metal frame.
- 3. All V_{DD}(power input) pins should be connected together.



- 4. The backlight interface connector is a model BHR-03VS-1, manufactured by JST. The mating connector part number is SM02(8.0)B-BHS-1-TB or equivalent. The pin configuration for the connector is shown in the table below.

Table 5 BACKLIGHT CONNECTOR PIN CONFIGURATION

Pin	Symbol	Description	Note
1	HV	Lamp power input(High)	1
2	NC	No connect	
3	LV	Lamp power input(Low)	

Note 1. The input power terminal(High) is colored pink.

Product Specification

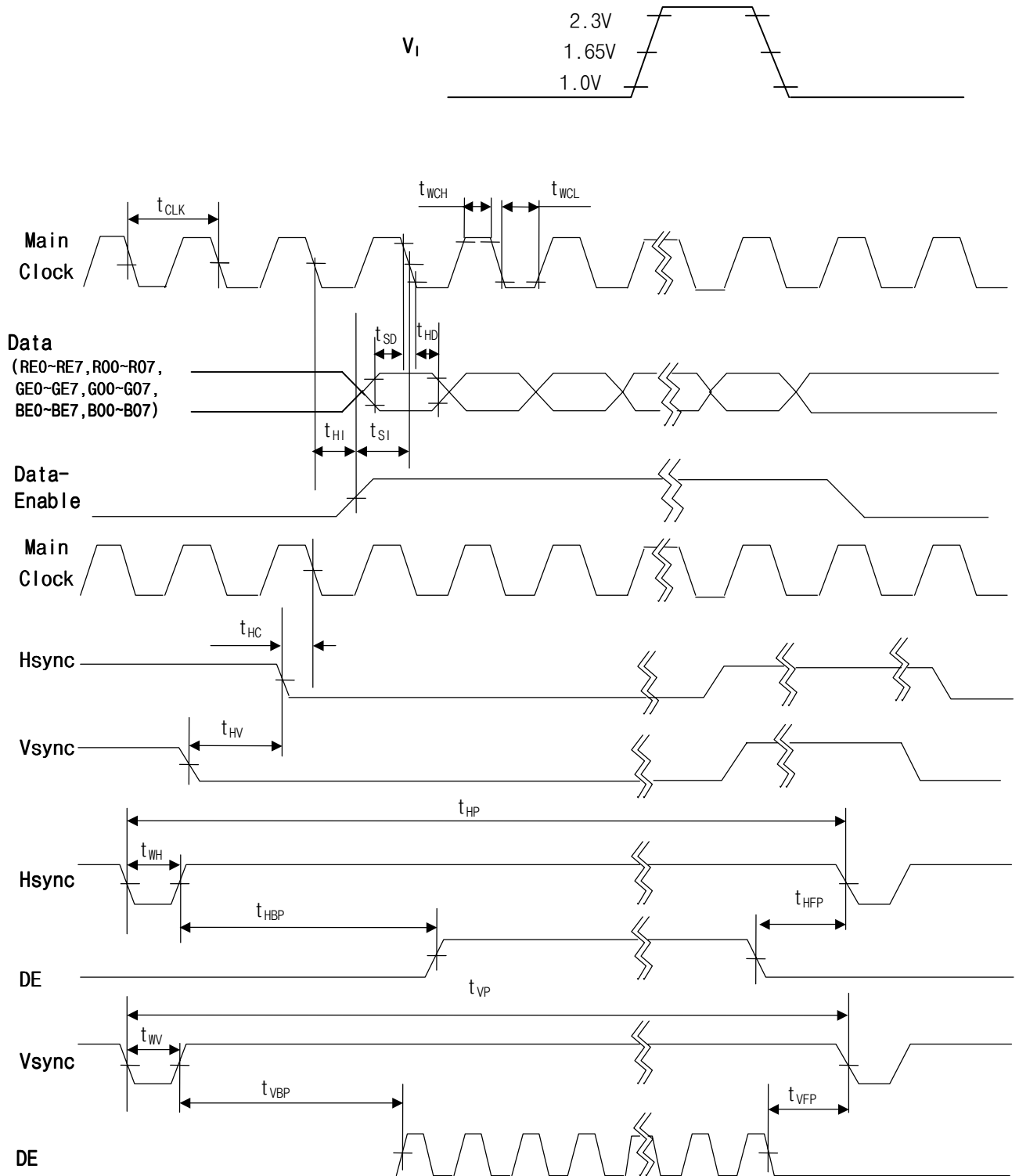
3-3. Signal Timing Specifications

This is the signal timing required at the input of the User connector. 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
Dclk	Frequency	f_{CLK}	25	32.5	39.375	Mhz	
	Width-Low	T_{WCL}	$0.45 t_{CLK}$	$0.50 t_{CLK}$	$0.55 t_{CLK}$	ns	
	Width-High	T_{WCH}	$0.45 t_{CLK}$	$0.50 t_{CLK}$	$0.55 t_{CLK}$	ns	
Hsync	Period	t_{HP}	528	672	-	t_{CLK}	
	Width-Active	t_{WH}	4	68	-		
	Setup time	t_{HC}	5	-	-	ns	For DCLK
Vsync	Period	t_{VP}	777	806	-	t_{HP}	
	Frequency	f_V	-	60	75	Hz	
	Width-Active	t_{WV}	2	6	-	t_{HP}	
DE (Data Enable)	Horizontal Back Porch	t_{HBP}	4	84	-	t_{CLK}	
	Horizontal Front Porch	t_{HFP}	4	12	-		
	Vertical Back Porch	t_{VBP}	5	29	-	t_{HP}	
	Vertical Front Porch	t_{VFP}	2	3	-		
	Set up time	t_{SI}	5	-	-		ns
		Hold time	t_{HI}	5	-	-	ns
DATA	Set up time	t_{SD}	4	-	-	ns	For DCLK
	Hold time	t_{HD}	4	-	-	ns	For DCLK

3-4. Signal Timing Waveforms



Product Specification

3-5. Color Input Data Reference

The brightness of each primary color(red, green and 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.

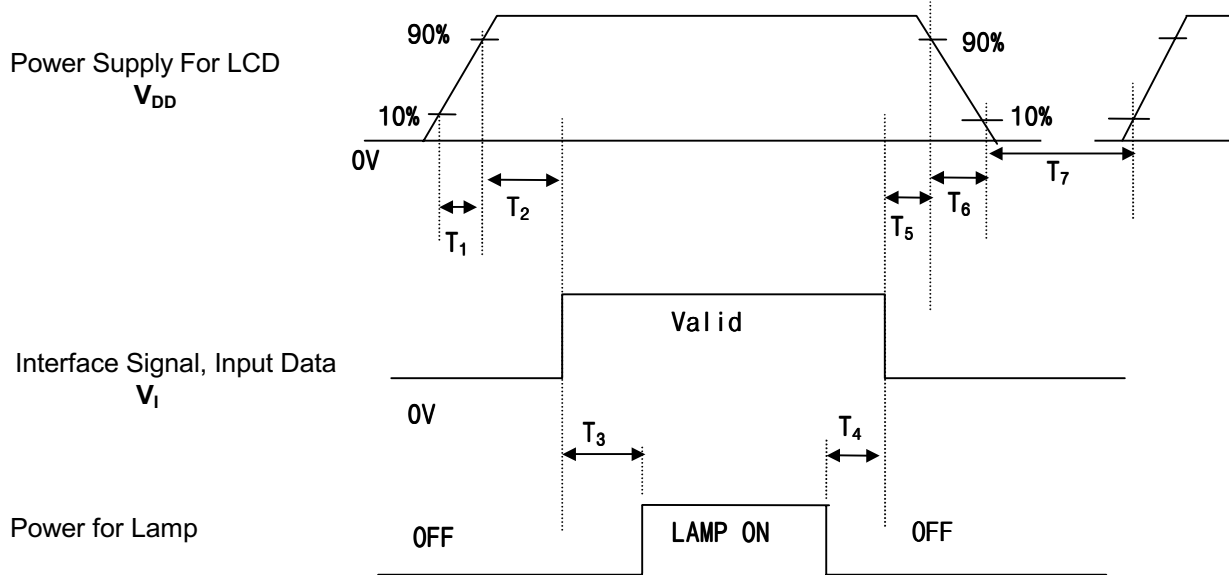
Table 7 COLOR DATA REFERENCE

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 Colors	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(002)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	-----	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	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) Bright	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	1	0	0	0	0	0	0	0	0	0
	Green(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	-----	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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)Bright	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(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	-----	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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 1. Define of gray scale
 Color(n) : n indicates gray scale level.
 Higher n means brighter level.

2. Data : "1" – High, "0" – Low

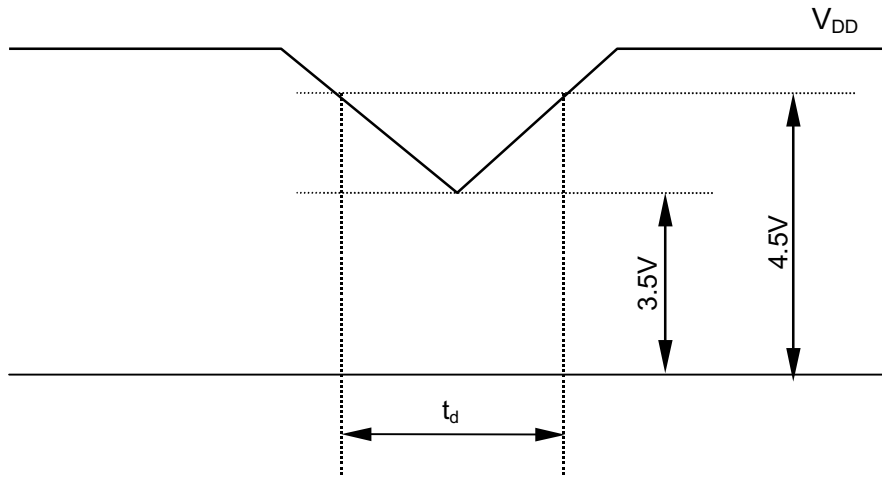
3-6. Power Sequence



Parameter	Values			Units
	Min.	Typ.	Max.	
T_1	-	-	10	ms
T_2	0.01	-	50	ms
T_3	300	-	-	ms
T_4	300	-	-	ms
T_5	0.01	-	50	ms
T_6	0.01	-	10	ms
T_7	1000	-	-	ms

- Notes:
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 for LCD V_{DD} to 0V.
 3. Lamp power must be turn on after power supply for LCD and interface signal are valid.

3-7. V_{DD} Dip Condition



1) $3.5V \leq V_{DD} < 4.5V$, $t_d \leq 20ms$

2) $V_{DD} < 5.5V$

V_{DD} -dip conditions should also follow the Power Up/Down conditions for supply voltage

Note. This phenomenon is caused by row driver IC initialization after power on (1 vertical period).

4. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25°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.

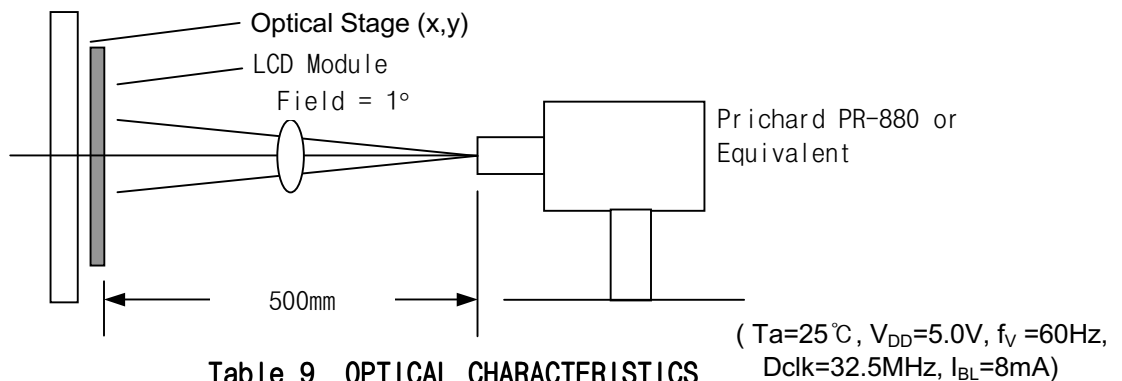


Table 9 OPTICAL CHARACTERISTICS

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Contrast Ratio	CR	300	350	-		1
Surface Luminance, white	L _{sw}	200	250	-	cd/m ²	2
Surface Luminance Variation	L _{sv}	80	90	-	%	3
Luminance Uniformity(TCO'99)	L _R	-	-	1.7		4
Response Time	T _r		45	60	ms	5
Rise Time	T _{rR}	-	10	15		
Decay Time	T _{rD}	-	35	45		
CIE Color Coordinates						
Red	x _R	0.610	0.640	0.670		
	y _R	0.310	0.340	0.370		
Green	x _G	0.275	0.305	0.335		
	y _G	0.580	0.610	0.640		
Blue	x _B	0.110	0.140	0.170		
	y _B	0.085	0.115	0.145		
White	x _W	0.283	0.313	0.343		
	y _W	0.299	0.329	0.359		
Viewing Angle by CR ≥ 5						6
x axis, right (Φ=0°)	Δ r	70	75	-	degree,	
x axis, left(Φ=180°)	Δ l	70	75	-		
y axis, up(Φ=90°)	Δ u	50	55	-		
y axis, down (Φ=270°)	Δ d	55	60	-		
Viewing Angle by CR ≥ 10						
x axis, right (Φ=0°)	Δ r	55	60	-		
x axis, left(Φ=180°)	Δ l	55	60	-		
y axis, up(Φ=90°)	Δ u	40	45	-		
y axis, down (Φ=270°)	Δ d	40	45	-		
Flicker				-20	dB	
Crosstalk						
Horizontal		-	-	1.2	%	7
Gamma Value(reference value)			2.7			8

Product Specification

Notes :

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

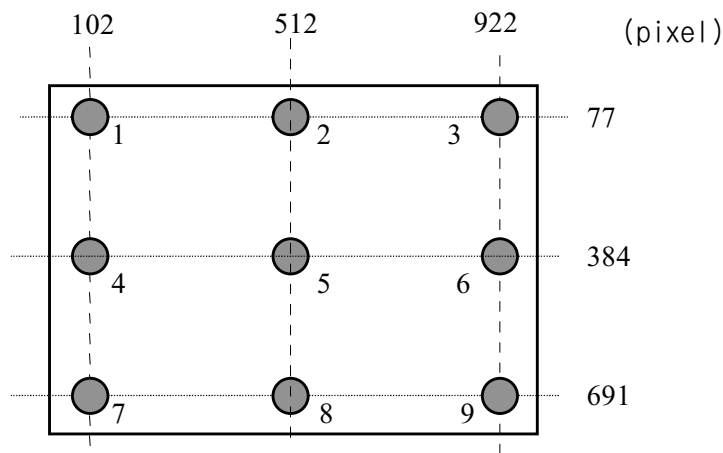
$$CR = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. The Luminance Lsw is luminance value at center point with full white screen.

3. The variation in surface Luminances, Lsv is defined as :

$$\frac{\text{Minimum } (B_1, B_2, \dots, B_9)}{\text{Maximum } (B_1, B_2, \dots, B_9)} \times 100(\%)$$

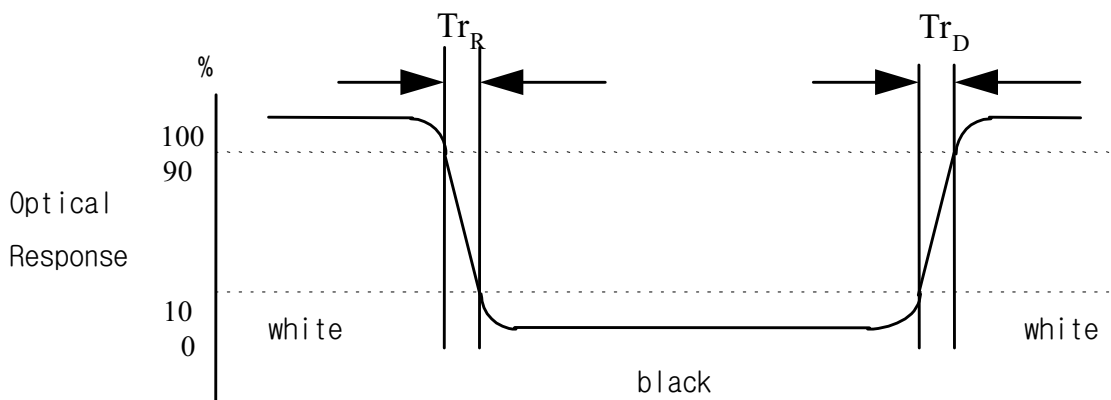
Where B1 to B9 are the Luminance with all pixels displaying white at 9 locations.



4. TC0' 99 Certification Requirements and test methods for environmental labelling of Displays [Flat] Report No.2 (X1.5.2 Luminance Uniformity)

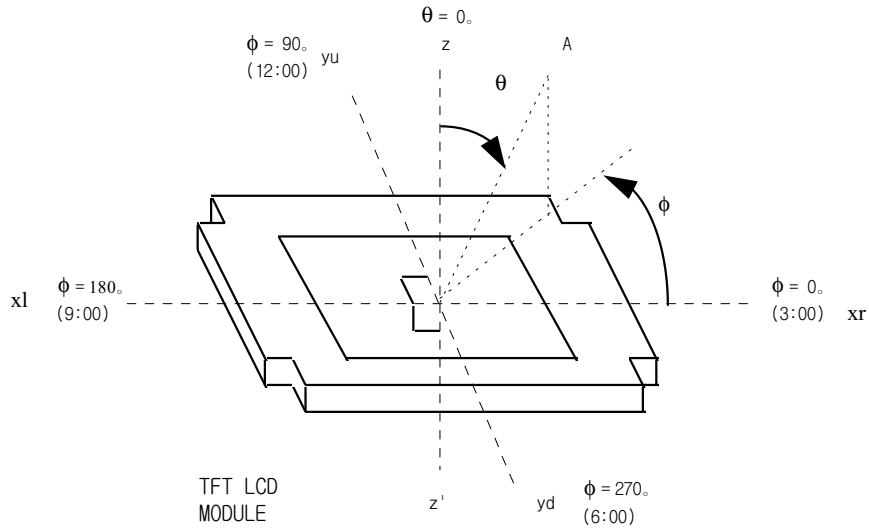
$$L_R = ((L_{\max, +30\text{deg.}} / L_{\min, +30\text{deg.}}) + (L_{\max, -30\text{deg.}} / L_{\min, -30\text{deg.}})) / 2$$

5. The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



Product Specification

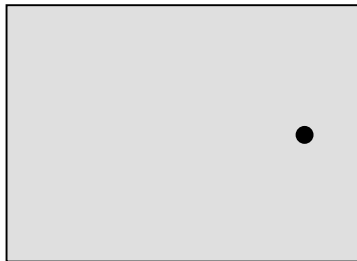
6. Viewing angle is the angle at which the contrast ratio is greater than 5.



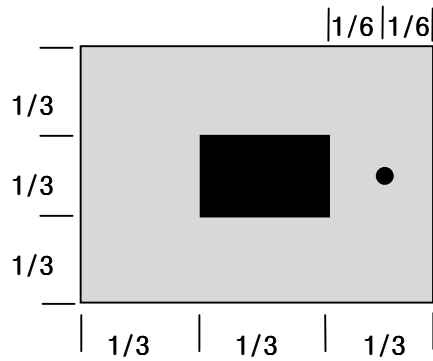
7. Cross talk shall be measured at one point.

$$\text{Crosstalk Ratio} = 100 \times \frac{|\text{Luminance at pattern A} - \text{Luminance at pattern B}|}{\text{Luminance at pattern A}}$$

Pattern A
(Mid-gray : Gs(S)=127)



Pattern B
(Background:Gs(S)=127, Rectangular:Gs(S)=0)



Product Specification

8. Gray Scale

n	Gs(S)	Relative Brightness(%)	Remark
		typical	
0	0	0.28	
1	31	1.0	
2	63	3.3	
3	95	8.2	
4	127	15.9	
5	159	28.1	
6	191	46.1	
7	223	68.3	
8	255	100	

Product Specification

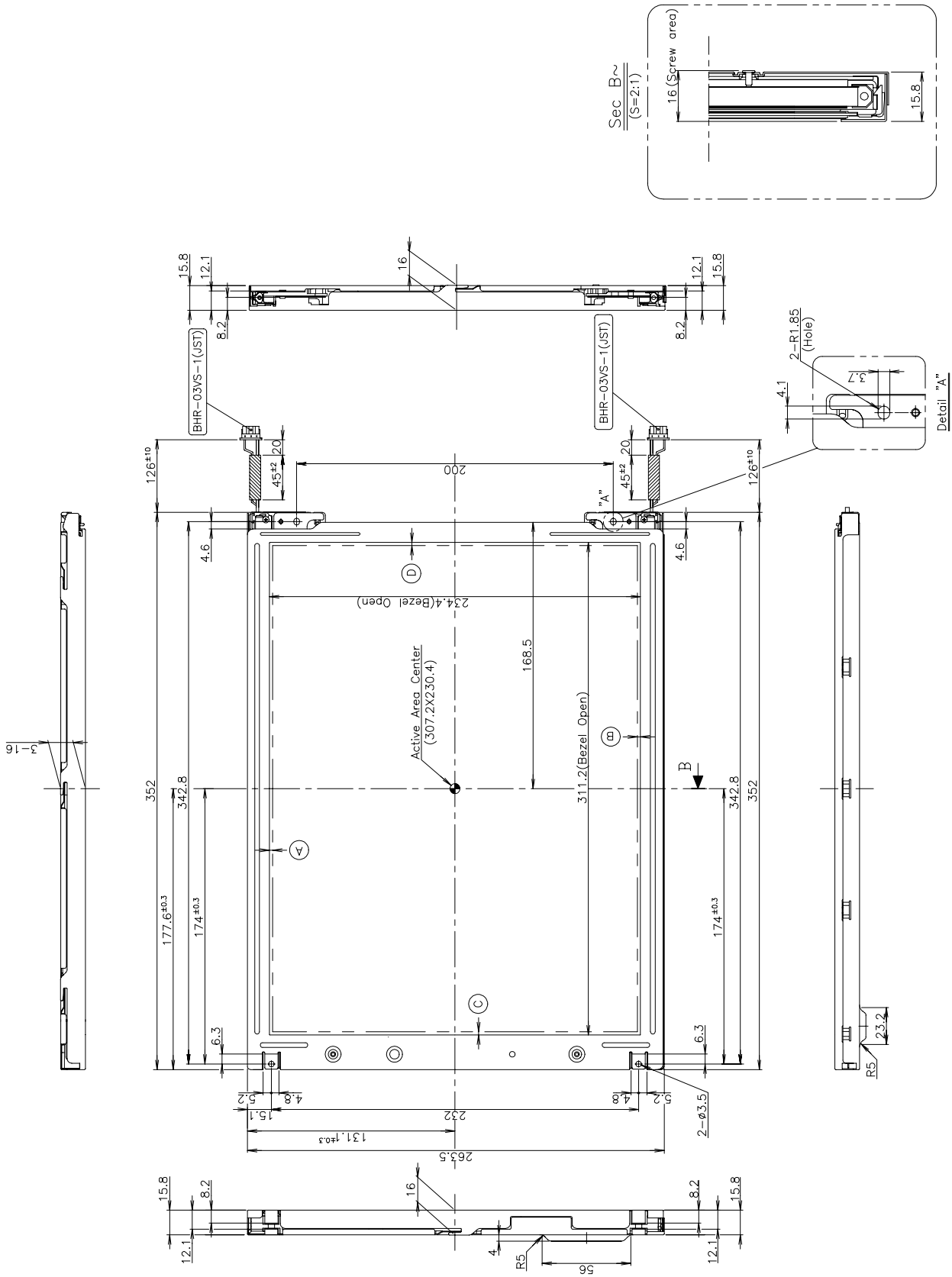
5. Mechanical Characteristics

The chart below provides general mechanical characteristics for the model LM151X3-C3 LCD. In addition, the figure below is a detailed mechanical drawing of the LCD. Note that dimensions are given for reference purposes only.

Parameters	Value	Unit	Notes
Outside dimensions Horizontal Vertical Depth	352.0 263.5 16.0	mm	Depth : without user connector
Bezel area Horizontal Vertical	311.2 234.4	mm	-
Active Display area Horizontal Vertical	307.2 230.4	mm	-
Weight	1500(typ.)	gram	-
Surface Treatment	Hard coating 3H. Anti-glare treatment of the front polarizer	-	-

Product Specification

< FRONT VIEW >

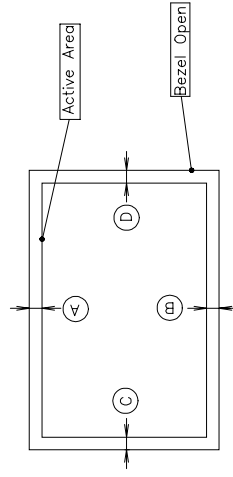


Product Specification

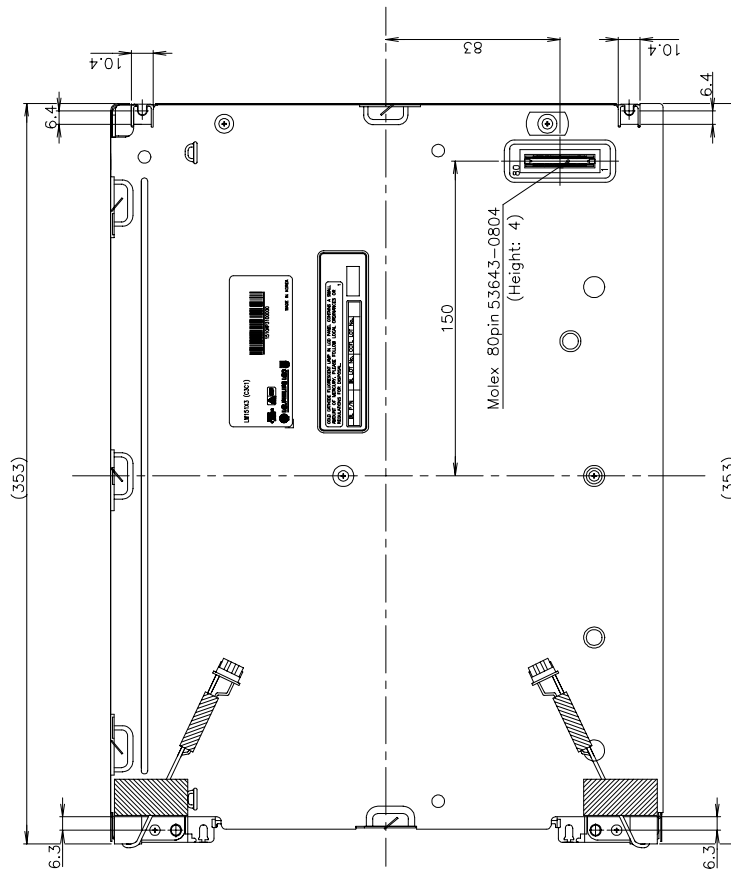
<REAR VIEW>

NOTES

1. Unspecified tolerances to be ± 0.5
2. This drawing is only preliminary data and can be changed without previous notice
3. Gap between Top case and Glass is $0.2(+0.5/-0.2)$
4. Tilt and partial disposition tolerance of display area are as follow
 - 1) Y-Direction : $IA-BI \leq 1.0$
 - 2) X-Direction : $IC-DI \leq 1.0$



5. The same shape is same dimension.
6. Horizontal Dimension(352mm) does not include Backlight Lamp AY & Wire



Do not wind conductive tape around the backlight

Product Specification

6. Reliability

- Environment test condition

No.	Test ITEM	Conditions
1	High temperature storage test	Ta = 60°C 240h
2	Low temperature storage test	Ta = -30°C 240h
3	High temperature operation test	Ta = 55°C 50%RH 240h
4	Low temperature operation test	Ta = 0°C 240h
5	Humidity Condition operation	10%RH ~ 95%RH
6	Humidity Condition storage	10%RH ~ 95%RH
7	Vibration test (non-operating)	Wave form:random Vibration level:1.0G RMS Bandwidth:10-500Hz Duration:X,Y,Z, 20 min One time each direction
8	Shock test (non-operating)	Shock level:120G Waveform:half sine wave, 2ms Direction: ±X, ±Y, ±Z One time each direction
9	Altitude operating storage/shipment	0 - 12,000 feet 0 - 40,000 feet
10	ESD test (Non-operation)	Condition : 150pF 330Ω Terminal: 700V Chassis : 12kV

{Result Evaluation Criteria}

There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.

7. International Standards

7-1. Safety

- a) UL 1950 Third Edition, Underwriters Laboratories, Inc. Jan. 28, 1995.
Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.
- b) CAN/CSA C22.2 No. 950-95 Third Edition, Canadian Standards Association, Jan. 28, 1995.
Standard for Safety of Information Technology Equipment Including Electrical Business Equipment.
- c) EN 60950 : 1992 + A1 : 1993 + A2 : 1993 + A3 : 1995 + A4 : 1997 + A11 : 1997
IEC 950 : 1991 + A1 : 1992 + A2 : 1993 + A3 : 1995 + A4 : 1996
European Committee for Electrotechnical Standardization (CENELEC)
EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

7-2. EMC

- a) ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz." American National Standards Institute(ANSI),1992.
- b) C.I.S.P.R "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment." International Special Committee on Radio Interference
- c) EN 55022 "Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment." European Committee for Electrotechnical Standardization (CENELEC),1988

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 : Inch CODE

D:YEAR

E : MONTH

F,G : Panel Code

H: Assembly Code

I, J, K, L,M : SERIAL NO.

Note : 1. YEAR

YEAR	98	99	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mark	8	9	0	1	2	3	4	5	6	7	8

2. MONTH

MONTH	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jun.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

Serial NO. is printed on the label. The label is attached to the backside of the LCD module.

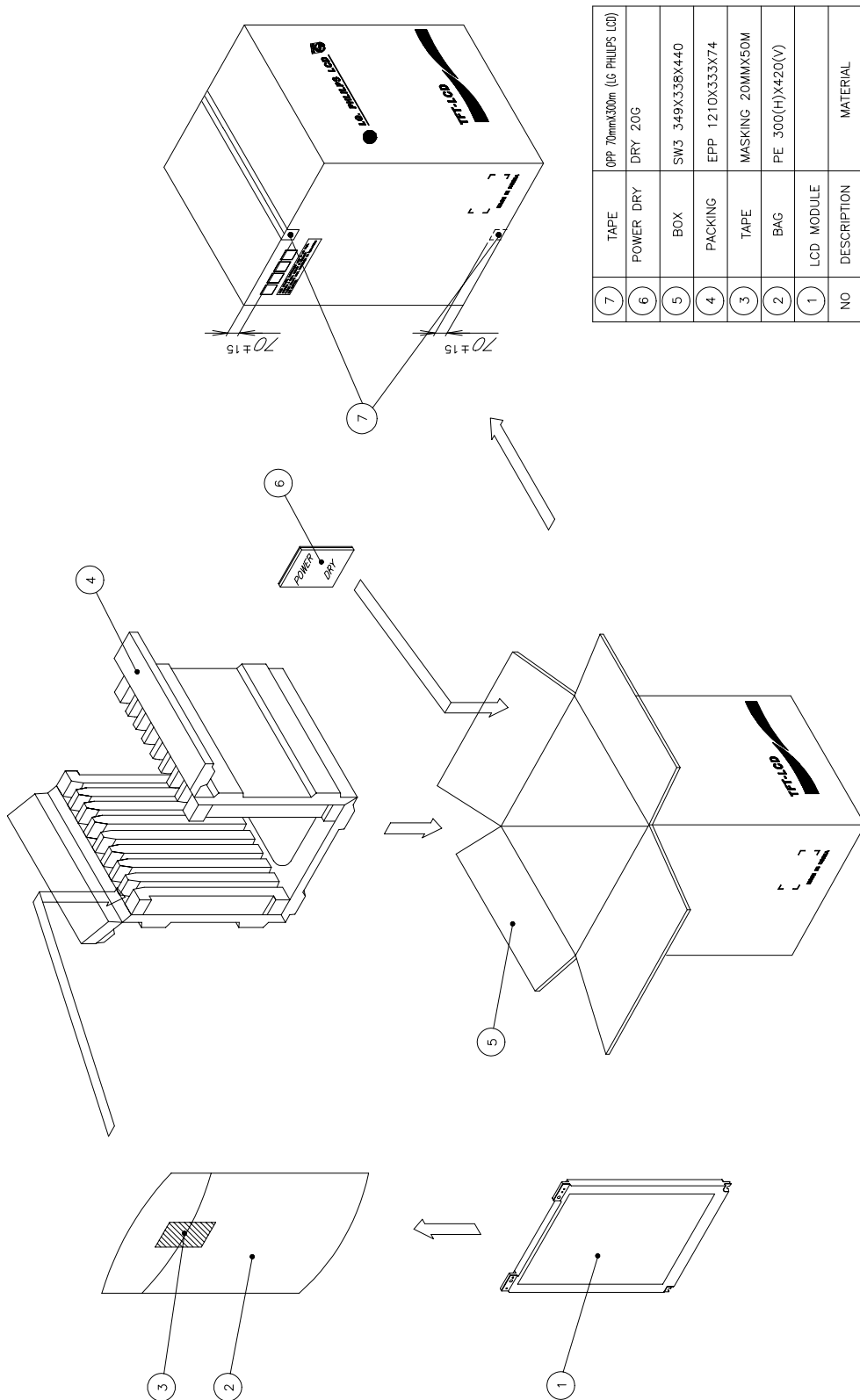
This is subject to change without prior notice.

8-2. Packing Form

a) Package quantity in one box : 8 pcs

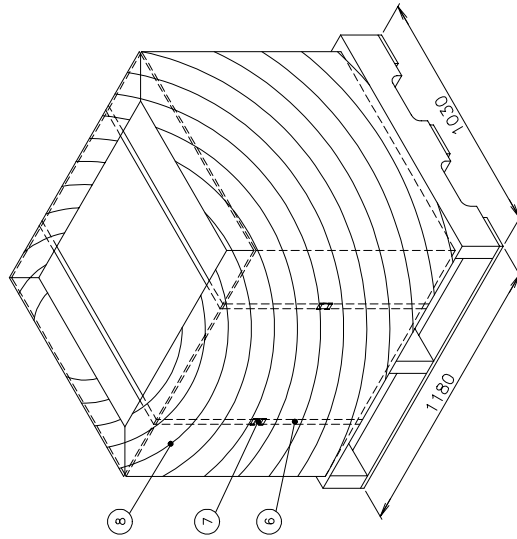
b) Box Size : 349mm × 338mm × 440mm

Product Specification

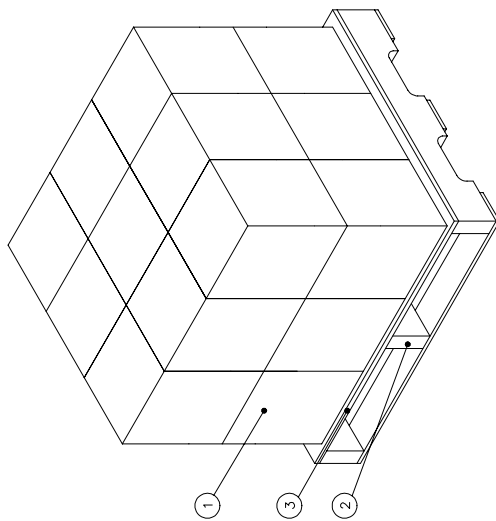
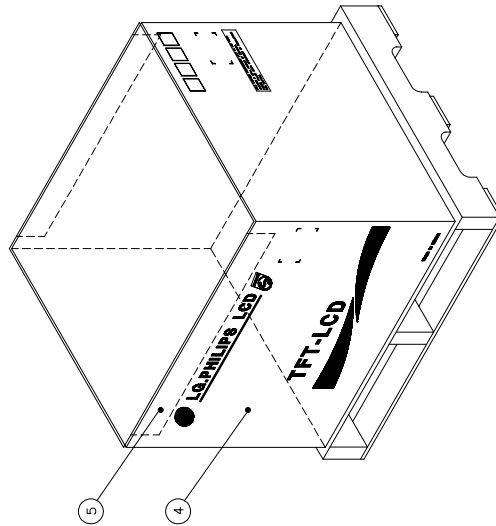


NO	DESCRIPTION	MATERIAL
7	TAPE	OPP 70mmx300m (LG PHILIPS LCD)
6	POWER DRY	DRY 20G
5	BOX	SW3 349X338X440
4	PACKING	EPP 1210X333X74
3	TAPE	MASKING 20MMX50M
2	BAG	PE 300(H)X420(V)
1	LCD MODULE	

Product Specification



NO	DESCRIPTION	MATERIAL
8	WRAP, FILM	LDPE
7	BAND, CLIP	STEEL
6	BAND, PACKING	P.P
5	ANGLE, COVER	DW
4	ANGLE, PACKING	DW
3	SHEET	DW
2	PALLET	WOOD
1	PACKING ASSY	



18 UNITS / 1 PALLET

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 a transparent protective plate to the surface in order to protect the polarizer.
Transparent protective plate should have sufficient strength in order to resist external force.
- (4) You should adopt radiation structure to satisfy the temperature specification.
- (5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- (6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And Please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth. (Some cosmetics are detrimental to the polarizer.)
- (7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaked with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluen and alcohol because they cause chemical damage to the polarizer.
- (8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (9) Do not open the case because inside circuits do not have sufficient strength.

9.2 OPERATING PRECAUTIONS

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
 $V = \pm 200\text{mV}$ (Over and under shoot voltage).
- (2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
- (3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
- (4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (6) A module has high frequency circuit. If you need to shield the electromagnetic noise, please do in yours. When a back-light unit is operating, it sounds. If you need to shield the noise, please do in yours.

9.3 ELECTROSTATIC DISCHARGE CONTROL

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc . And don't touch interface pin directly.

9.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

9.5 STORAGE

When storing modules as spares for a long time, the following precautions are necessary.

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

9.6 HANDLING PRECAUTIONS FOR PROTECTION FILM

- (1) 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) The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer.
Please carefully peel off the protection film without rubbing it against the polarizer.
- (3) 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 polarizer after the protection film is peeled off.
- (4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane .