SPECIFICATION

FOR

APPROVAL

( ) Preliminary Specification

(◆) Final Specification

Title	15.1" XGA TFT LCD

BUYER	DFI Inc.
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
MODEL	LM151X4
SUFFIX	A3

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

SIGNATURE	DATE
/	
/	
/	

APPROVED BY	DATE
S.H.Kang/ G.Manager	
REVIEWED BY Y.S.Baek / S.Engineer B.K.Kim / S.Engineer	
PREPARED BY B.Y.Kim / Engineer E.S.Jang / Engineer	

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

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

CONTENTS

RECORDS OF REVISIONS

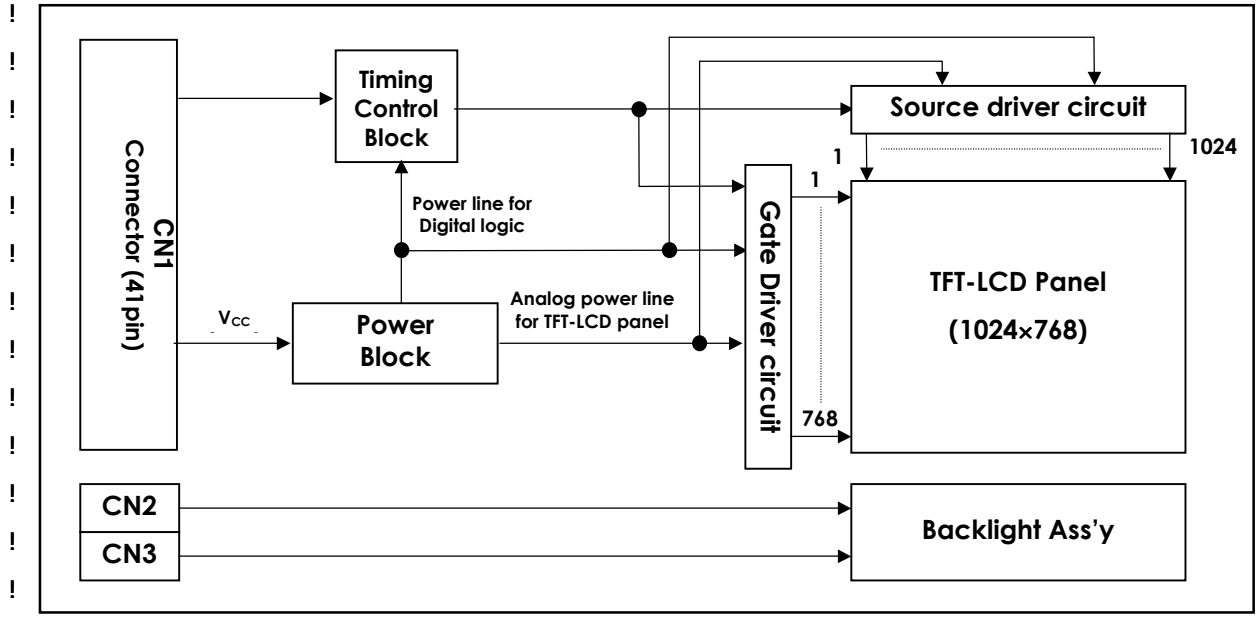
Version No	Date	Page	DESCRIPTION
0.0	DEC.14. 2000		First draft.
1.0	FEB.01. 2001		Second draft.
1.1	AUG.10. 2001	20	Changed the Reliability table. 1. Changed the High temperature & Humidity Storage. 2. Changed the High temperature & Humidity Operation. 3. Added the Thermal Shock.

1. General Description

The LM151X4-A3 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 inch 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 6-bit gray scale signal for each dot, thus, presenting a palette of more than 262,144 colors.

The LM151X4-A3 has been designed to apply the TTL interface method.

The LM151X4-A3 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 LM151X4-A3 characteristics provide an excellent flat panel display for office automation products such as monitors.



" ! " !##!

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	6-bit, 262,144 colors
Luminance,White	250 cd/m^2 (typ)
Power Consumption	1.9Watts Logic / 9.7 Watts CCFL (typ. With chess 8x6 pattern)
Weight	1500g (typ)
Display operating mode	transmissive mode, normally white
Surface treatments	hard coating(3H), anti-glare treatment of the front polarizer

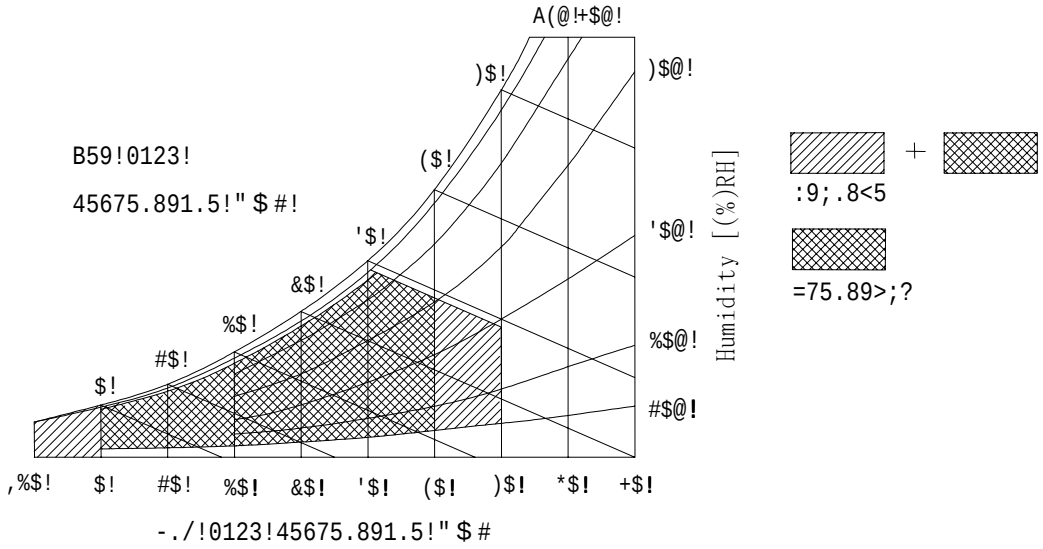
2. Absolute Maximum Ratings

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	+3.6	V	
Power Input Voltage	V_{CC}	-0.3	+3.6	Vdc	at 25℃±5
Operating Temperature	T_{OP}	0	+50	℃	1
Storage Temperature	T_{ST}	-20	+60	℃	1
Operating Ambient Humidity	H_{OP}	10	90	%RH	1
Storage Humidity	H_{ST}	10	90	%RH	1

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



3. Electrical Specifications

3-1. Electrical Characteristics

The LM151X4-A3 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_{CC}	3.0	3.3	3.6	Vdc	
Power Supply Input Current	I_{CC}	-	550	665	mA	1
Power Consumption	P_C	-	1.9	3.3	Watts	1
Input Data Logic Voltage	V_I	3.0	3.3	3.6	Vdc	
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℃		-	-	1020	V_{RMS}	
at 0℃		-	-	1400	V_{RMS}	
Operating Frequency	f_{BL}	30	50	60	kHz	5
Power Consumption	P_{BL}	-	9.7	10.6	Watts	6
Discharge Stabilization Time	T_S	-	-	3	Minutes	7
Life Time		30,000	-	-	Hrs	8

Note 1. The specified current and power consumption are under the V_{CC} = 3.3V , 25℃, fv = 60Hz condition whereas full black pattern is displayed and fv is the frame frequency.

2. The duration of rush current is about 20ms.
3. The variance of the voltage is ±10%.
4. 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.
5. 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.
6. The lamp power consumption shown above does not include loss of external inverter. The usedlamp current is the lamp typ current.
7. 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 usedlamp current is the lamp typ current.
8. The life time is determined as the time at which brightness of lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25 ±2℃.

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 occurs between lamp wire and conducting tape.

3-2. Interface Connections

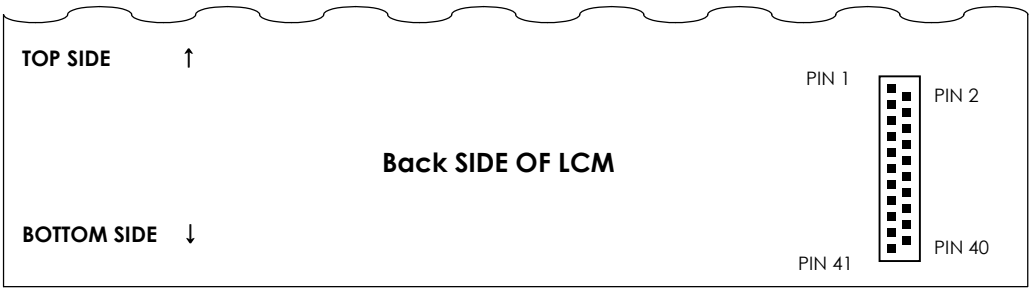
This LCD employs three interface connections, a 41 pin connector is used for the module electronics and two connectors, a three pin connector, are used for the integral backlight system.
The electronics interface connector is a model DF9B-41P-1V manufactured by Hirose, and Mating Connector is a model DF9-41S-1V 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. Note 1	2	DCLK	Data Input Clock
3	GND	System Ground	4	H_{sync}	H_{sync}. Horizontal Sync Signal
5	V_{sync}	V_{sync}. Vertical Sync Signal	6	GND	System Ground
7	GND	System Ground	8	GND	System Ground
9	R0	Red data 0 (LSB)	10	R1	Red data 1
11	R2	Red data 2	12	GND	System Ground
13	R3	Red data 3	14	R4	Red data 4
15	R5	Red data 5 (MSB)	16	GND	System Ground
17	GND	System Ground	18	GND	System Ground
19	G0	Green data 0 (LSB)	20	G1	Green data 1
21	G2	Green data 2	22	GND	System Ground
23	G3	Green data 3	24	G4	Green data 4
25	G5	Green data 5 (MSB)	26	GND	System Ground
27	GND	System Ground	28	GND	System Ground
29	B0	Blue data 0 (LSB)	30	B1	Blue data 1
31	B2	Blue data 2	32	GND	System Ground
33	B3	Blue data 3	34	B4	Blue data 4
35	B5	Blue data 5 (MSB)	36	GND	System Ground
37	DE	Data Enable Signal	38	V_{CC}	Power Supply for LCD Module
39	V_{CC}	Power Supply for LCD Module	40	V_{CC}	Power Supply for LCD Module
41	V_{CC}	Power Supply for LCD Module			

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

2. All V_{CC}(power input) pins should be connected together.



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, manufactured by JST, or equivalent. The pin configuration for the connector is shown in the table below.

Table 5 BACKLIGHT CONNECTOR PIN CONFIGURATION

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

Notes: 1. The input power terminal (High) is colored pink.
2. The lamp power terminal (Low) is colored white.

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.

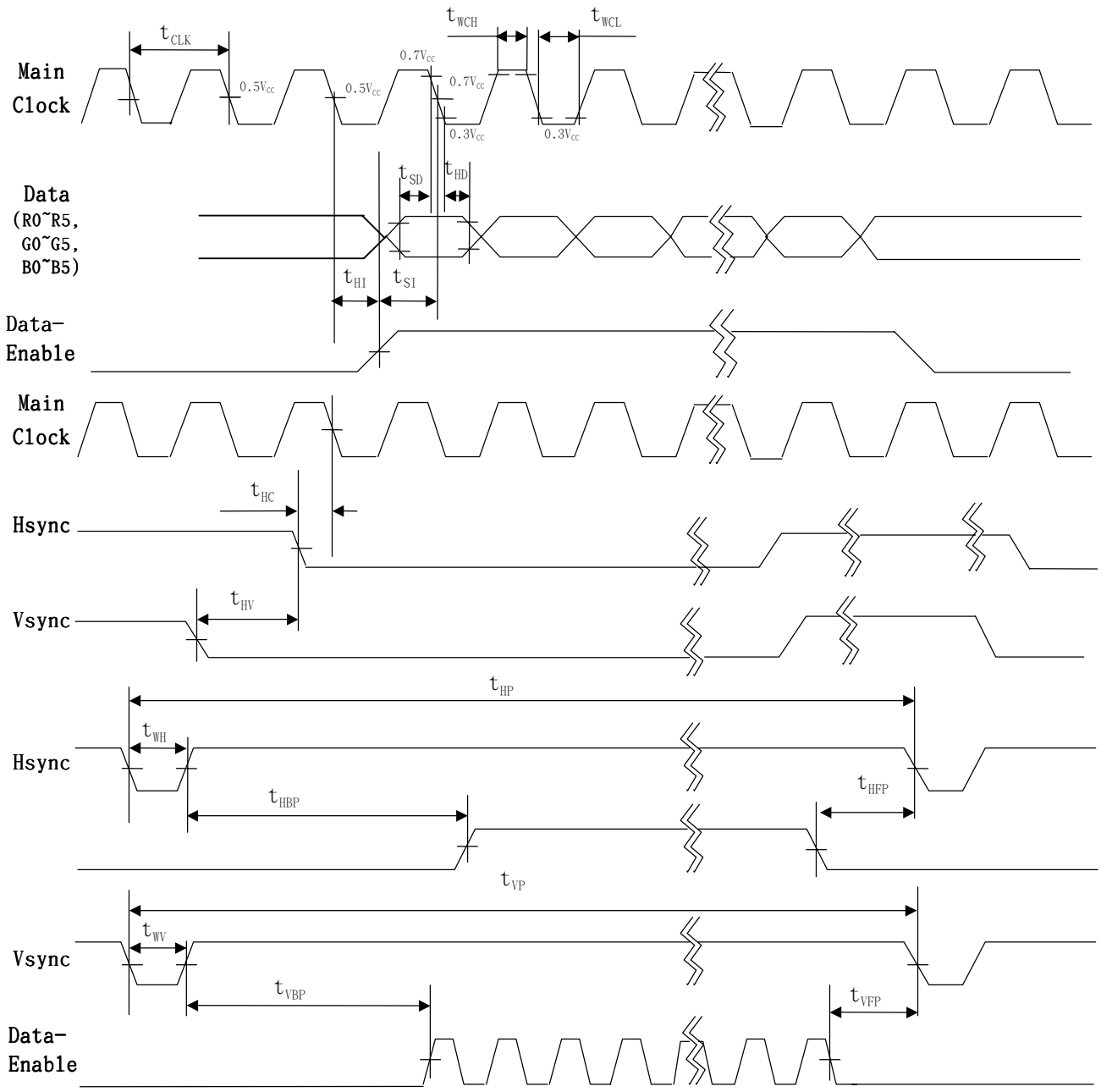
Table 6 Timing Table

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Dclk	Frequency	f_{CLK}	50	65	78.75	Mhz	
	Width-Low	t_{WCL}	0.45	0.5	0.55	t_{CLK}	
	Width-High	t_{WCH}	0.45	0.5	0.55	t_{CLK}	
	Duty	-	0.45	0.5	0.55	-	
Hsync	Period	t_{HP}	-	20.7	-	μs	Note 1
			1048	1344	1360	t_{CLK}	
	Width	t_{WH}	8	136	240		
Vsync	Period	t_{VP}	771	806	840	t_{HP}	
	Frequency	f_V	60	60	75	Hz	Note 2
	Width	t_{WV}	1	6	-	t_{HP}	
DE (Data Enable)	Horizontal Back Porch	t_{HBP}	8	160	-	t_{CLK}	
	Horizontal Valid	t_{HV}	1024	1024	1024		
	Horizontal Front Porch	t_{HFP}	8	24	-		
	Horizontal Blank	-	24	320	$t_{HP} - t_{HV}$		$t_{WH} + t_{HBP} + t_{HFP}$
	Vertical Back Porch	t_{VBP}	1	29	-		
	Vertical Valid	t_{VV}	768	768	768		
	Vertical Front Porch	t_{VFP}	1	3	-		
	Vertical Blank	-	3	38	$t_{VP} - t_{VV}$		$t_{WV} + t_{VBP} + t_{VFP}$
	Set up time	t_{SI}	3	-	-	ns	
	Hold time	t_{HI}	3	-	-	ns	
DATA	Set up time	t_{SD}	3	-	-	ns	
	Hold time	t_{HD}	3	-	-	ns	
Hsync-clock phase difference		t_{HC}	t_{CLK}-10	-	t_{WCL}	ns	
Hsync-Vsync phase difference		t_{HV}	-	-	t_{HP}-t_{WH}	ns	

Note 1. Do not change the Hsync period in vertical valid range, because LCM use the Hsync to control inner signals.

2. In case of lower frequency, the deterioration of display quality, flicker etc may be occurred.

3-4. Signal Timing Waveforms



3-5. Color Input Data Reference

The brightness of each primary color(red, green and blue) is based on the 6-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.

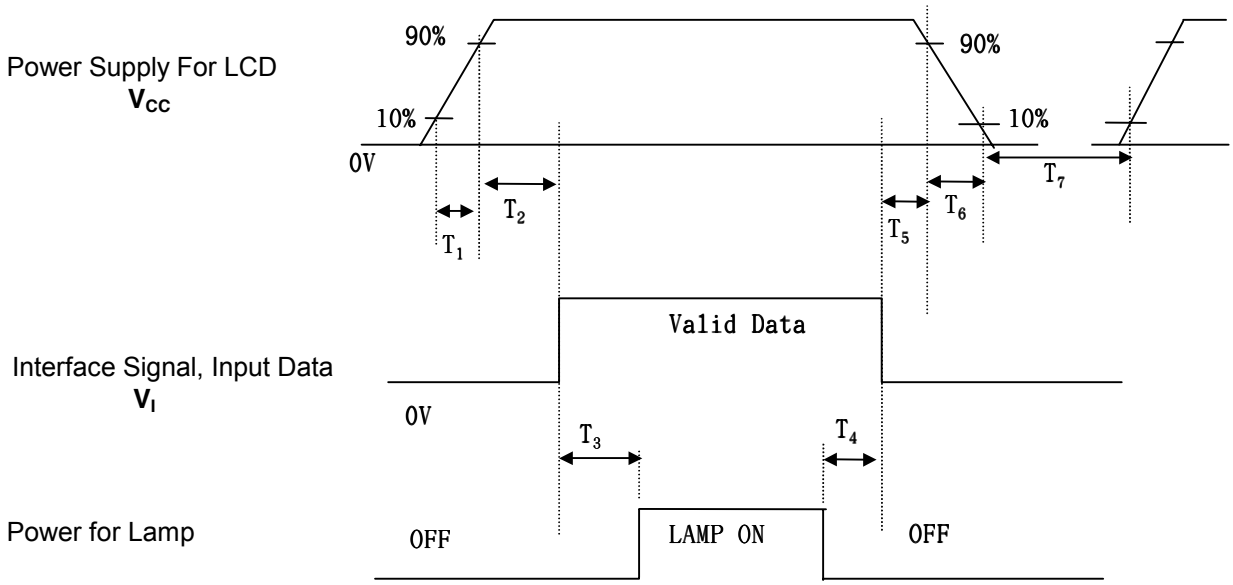
Table 8 COLOR DATA REFERENCE

Color			Input Color Data																	
			Red						Green						Blue					
			MSB					LSB	MSB					LSB	MSB					LSB
			R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red(63)		1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)		0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)		0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan		0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta		1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow		1	1	1	1	1	1	1	1	1	1	1	1	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
Red	Red(0)	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
			:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)		1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)		1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	Bright	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(0)	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
			:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)		0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)		0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	Bright	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Blue(0)	Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
			:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)		0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)		0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	Bright	0	0	0	0	0	0	0	0	0	0	0	0	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



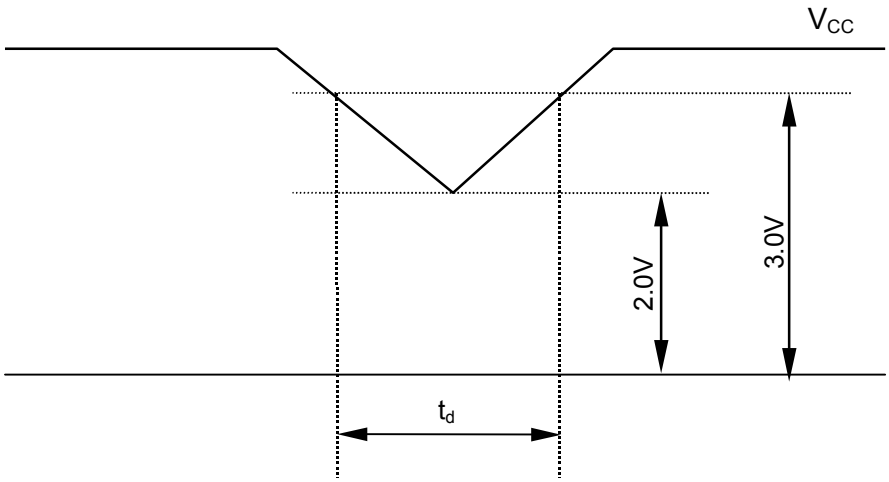
Parameter	Values			Units
	Min.	Typ.	Max.	
T_1	-	-	20	ms
T_2	0.01	-	50	ms
T_3	300	-	-	ms
T_4	300	-	-	ms
T_5	0.01	-	50	ms
T_6	0.01	-	20	ms
T_7	1	-	-	sec

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_{CC} to 0V.

3. Lamp power must be turn on after power supply for LCD and interface signal are valid.

3-7. V_{CC} Dip Condition



1) Dip condition
$2.0V \leq V_{CC} < 3.0V$, $t_d \leq 20ms$

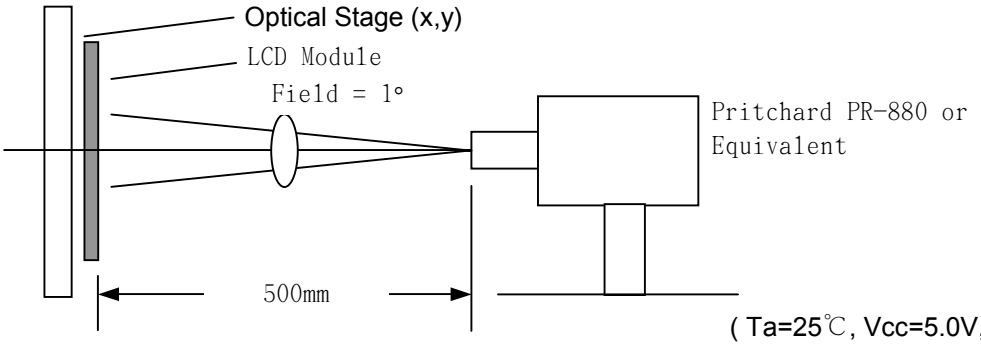
2)$V_{CC} < 2.0V$
V_{CC}-dip conditions should also follow the Power On/Off conditions for supply voltage.

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℃. 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.



(Ta=25℃, Vcc=5.0V, f_V =60Hz, Dclk=32.5MHz, I_{BL}=8mA)

Table 9 OPTICAL CHARACTERISTICS

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Contrast Ratio	CR	250	300	-		1
Surface Luminance, white	Lsw	200	250	-	cd/m^2	2
Surface Luminance Variation	Lsv	-	-	1.3		3
Luminance Uniformity(TCO'99)	L_R	-	-	1.7		4
Response Time	Tr		45	60	ms	5
Rise Time	Tr_R	-	10	15		
Decay Time	Tr_D	-	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						6
by CR ≥ 5						
x axis, right (Φ=0°)	θ_r	70	75	-	degree, °	
x axis, left(Φ=180°)	θ_l	70	75	-		
y axis, up(Φ=90°)	θ_u	50	55	-		
y axis, down (Φ=270°)	θ_d	55	60	-		
by CR ≥ 10						
x axis, right (Φ=0°)	θ_r	55	60	-		
x axis, left(Φ=180°)	θ_l	55	60	-		
y axis, up(Φ=90°)	θ_u	40	45	-		
y axis, down (Φ=270°)	θ_d	40	45	-		
Gamma Value(reference value)			2.2			7

Notes :

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

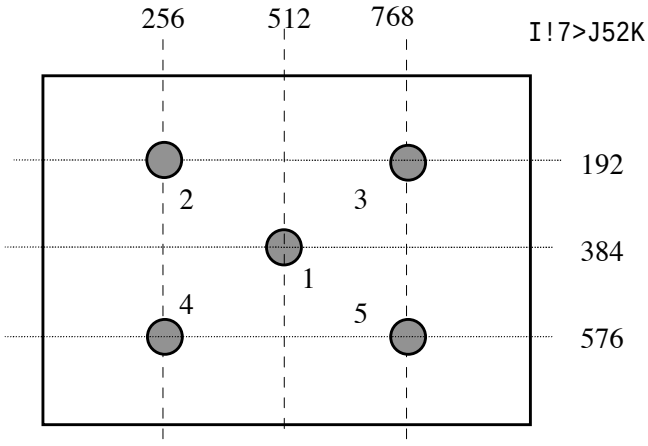
$$CR = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

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

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

$$\frac{\text{Maximum } (B_1, B_2, \ldots B_5)}{\text{Minimum } (B_1, B_2, \ldots B_5)}$$

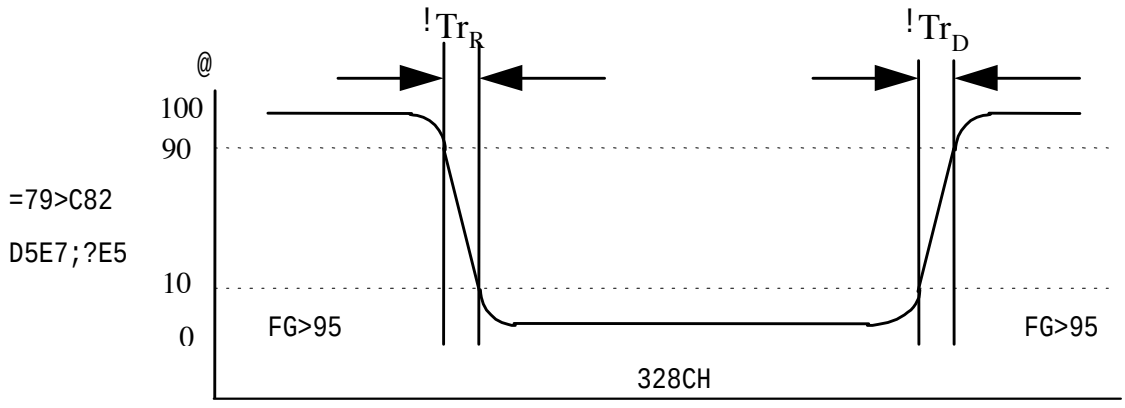
Where B1 to B5 are the Luminance with all pixels displaying white at 5 locations.



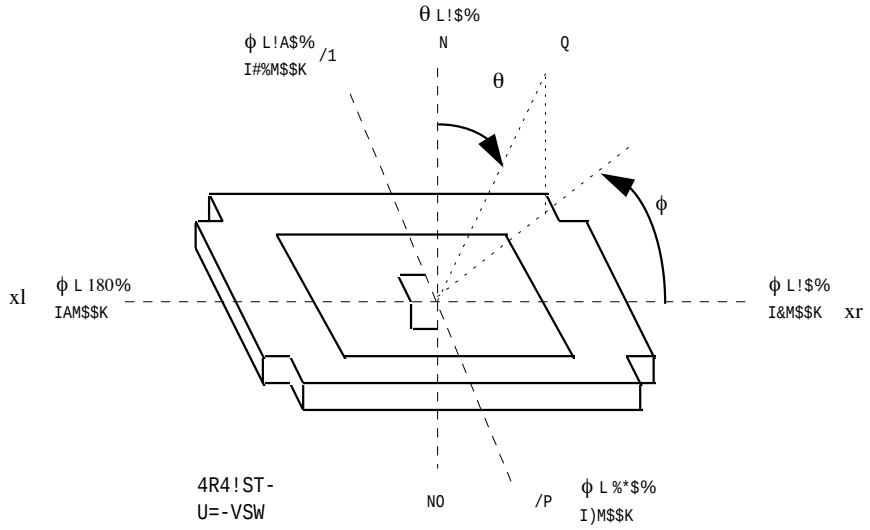
4. TCO' 99 Certification Requirements and test methods for environmental labelling of Displays [Flat] Report No.2 (X1.5.2 Luminance Uniformity)

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

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



6. Viewing angle is the angle at which the contrast ratio is greater than 5 and 10.
First of all, Viewing Angle by CR ≥ 10 should be control



7. Gray Scale specification is as following.

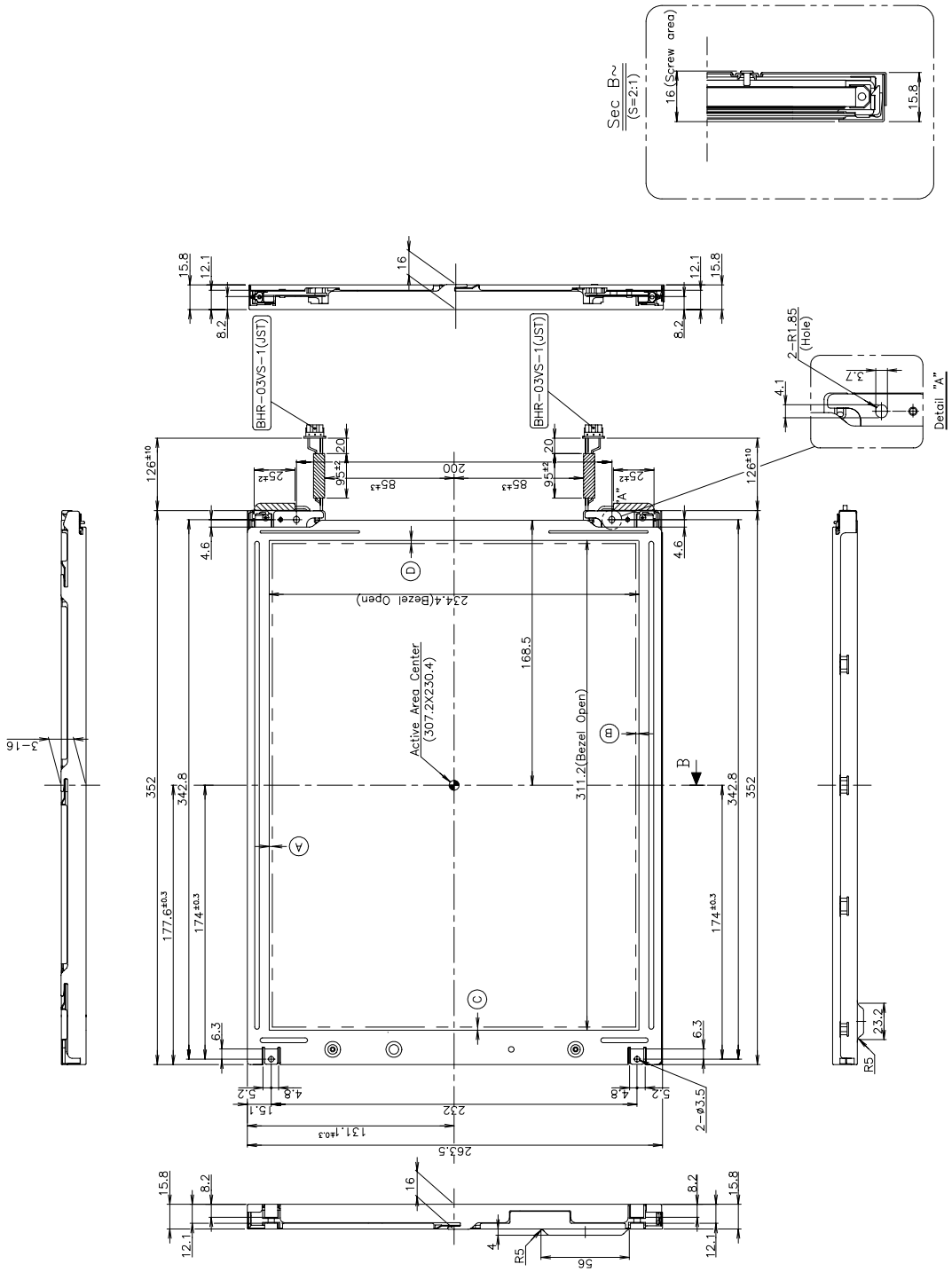
n	Gs(S)	Relative Brightness(%)	Remark
		typical	
0	0	0.28	
1	7	1.25	
2	15	4.09	
3	23	9.72	
4	31	19.5	
5	39	34.2	
6	47	54.8	
7	55	79.6	
8	63	100	

5. Mechanical Characteristics

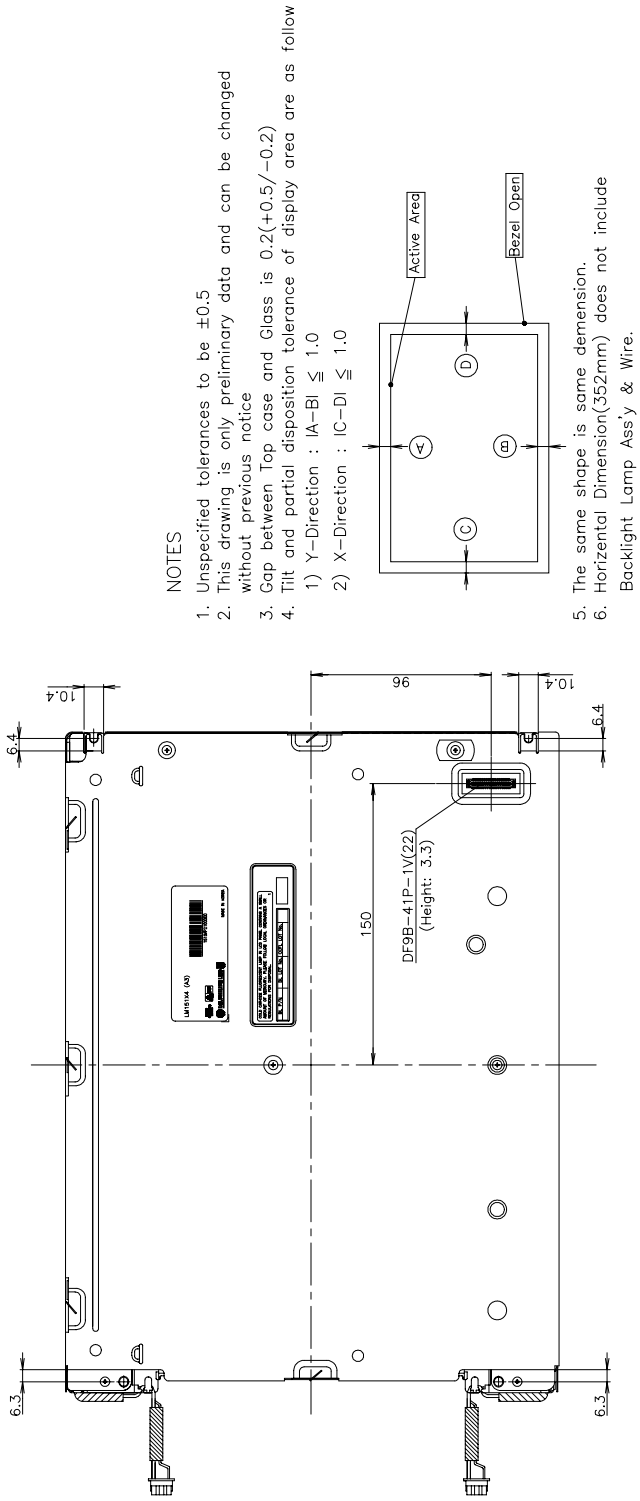
The chart below provides general mechanical characteristics for the model LM151X4-A3 LCD. In addition, the figure below is a detailed mechanical drawing of the LCD. Note that dimensions are given for reference purposes only.

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), 1575(max)	gram	-
Surface Treatment	Hard coating 3H. Anti-glare treatment of the front polarizer	-	-

< FRONT VIEW >

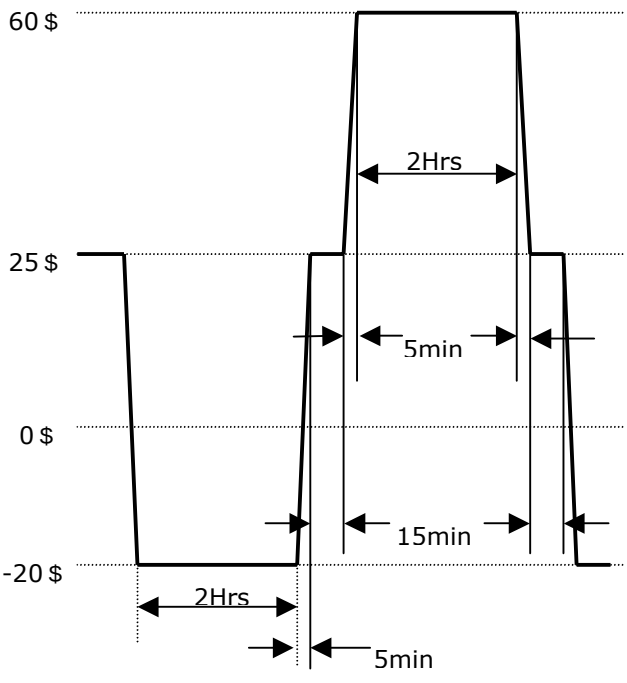

Sec B~
(S=2:1)
16 (Screw area)
15.8
BHR-03VS-1(JST)
2-R1.85
(Hole)
Detail "A"
234.4(Bezel Open)
Active Area Center
(307.2X230.4)
168.5
311.2(Bezel Open)
2-Ø3.5
263.5
232
131.1±0.3
56
R5
23.2

<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 ≦ 1.0
2) X-Direction : IC−DI ≦ 1.0
Active Area
Bezel Open
A
B
C
D
5. The same shape is same demension.
6. Horizental Dimension(352mm) does not include Backlight Lamp Ass'y & Wire.
10.4
96
10.4
6.4
6.4
150
DF9B-41P-1V(22)
(Height: 3.3)
6.3
6.3

6. Reliablity

- Environment test condition

No.	Test ITEM	Conditions
1	High temperature & Humidity storage test	Ta = 60℃, 40%, 240h (under non-condensing)
2	Low temperature storage test	Ta = -20℃ 240h
3	High temperature operation test	Ta = 50℃ 50%RH 240h
4	Low temperature & Humidity operation test	Ta = 40℃, 90%, 240h (under non-condensing)
5	Humidity Condition operation	10%RH ~ 90%RH
6	Humidity Condition storage	10%RH ~ 90%RH
7	Vibration test (non-operating)	Wave form : Sine Vibration level : 1.0G Bandwidth : 10-500Hz Duration : 60min / Axis(X,Y,Z) 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 storage/shipment	0 – 40,000 feet
10	Thermal Shock	

{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: Assemblely 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

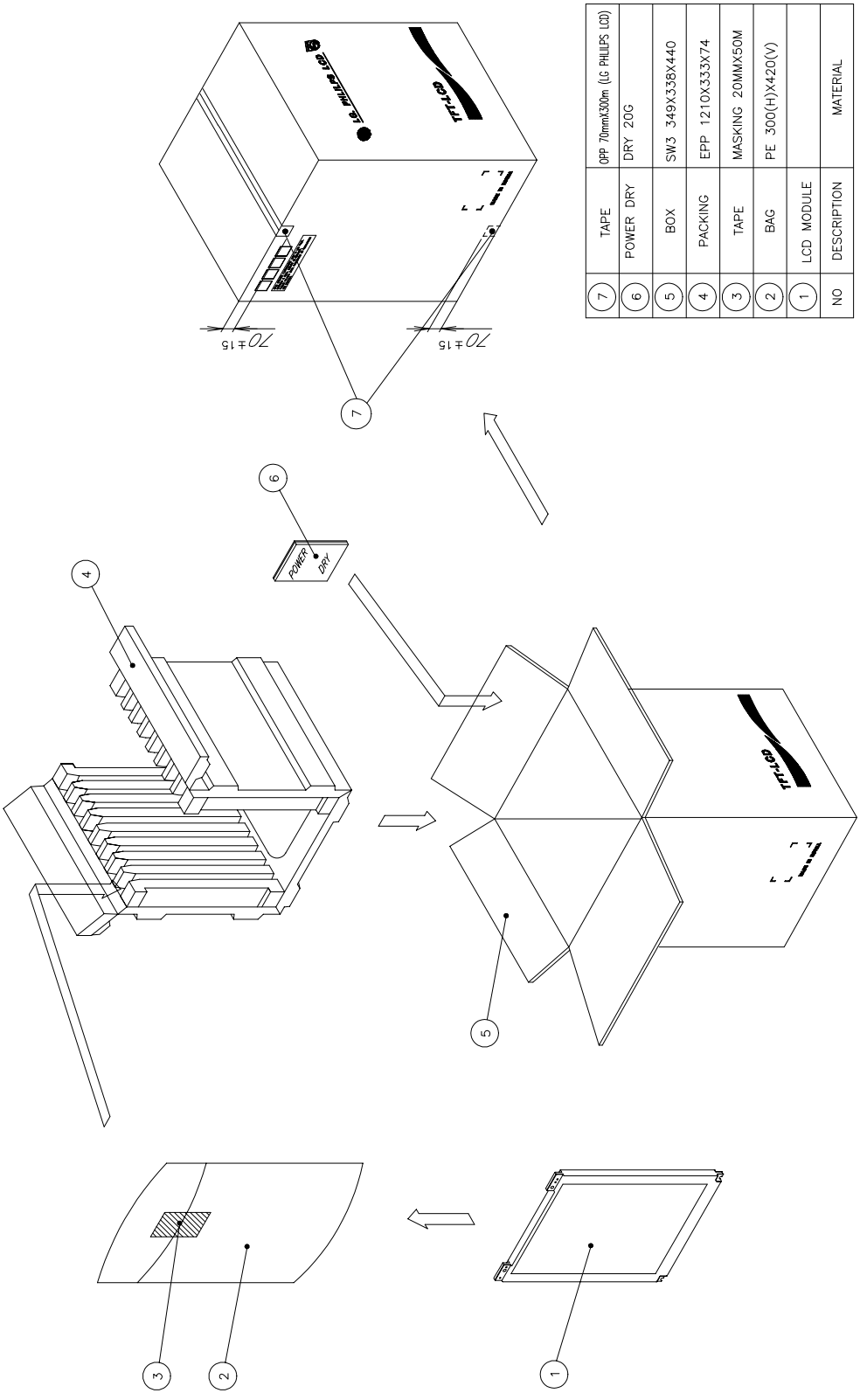
MONTH	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jun.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

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



NO	DESCRIPTION	MATERIAL
1	LCD MODULE	
2	BAG	PE 300(H)X420(V)
3	TAPE	MASKING 20MMX50M
4	PACKING	EPP 1210X333X74
5	BOX	SW3 349X338X440
6	POWER DRY	DRY 20G
7	TAPE	OPP 70mmX300m (LG PHILIPS LCD)

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 polalizer 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 petrolium 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 = ± 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) 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℃ 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) 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.