TO: **TOSHIBA CORPORATION**

DATE: **'06.05.16**

Specification of 15.4" TFT/LCD
MODEL: LP154W01 (TLAG)

Prepared	Checked	Approved	
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NOTICE of RECEIPT
We accepted this specification. **OME Operations, TOSHIBA Corp.**

Purchasing Dept.	Eng.	Senr. Eng.	Senr. Mgr
PC Hardware Dept.	Eng.	Senr. Eng.	Senr. Mgr

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Record of Revision

Date	Rev. No.	Sheet(New)	Item	Old	New	Reason
06.03.24	0.0	All				
06.05.16	1.0	21 page	Rush current	3.0ms	2.0ms	
		26 page	DC/DC frequency	-	Update Min/Typ/Max	
		34 page	T7	400ms	200ms	
		43 page	B/L repair parts kit	6913L0269E	6913L-0275R	

1. Scope

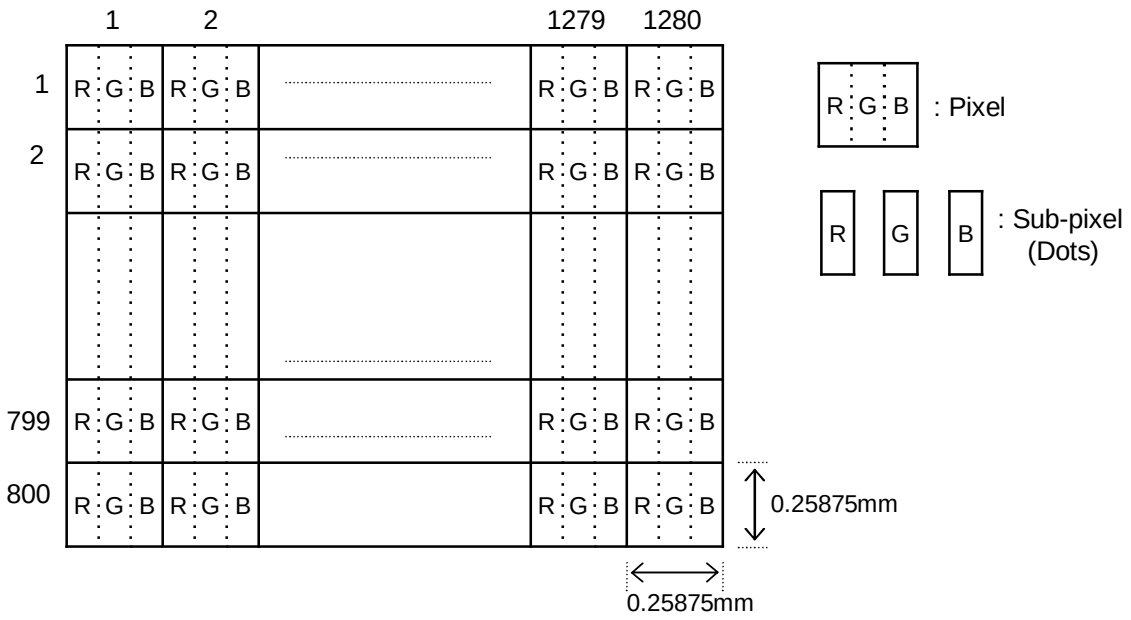
This specification is applicable to LCD manufacturer's 15.4" diagonal size TFT-LCD module "LP154W01(TLAG)" designed for Personal Computer.

2. General Specification

2.1. Features

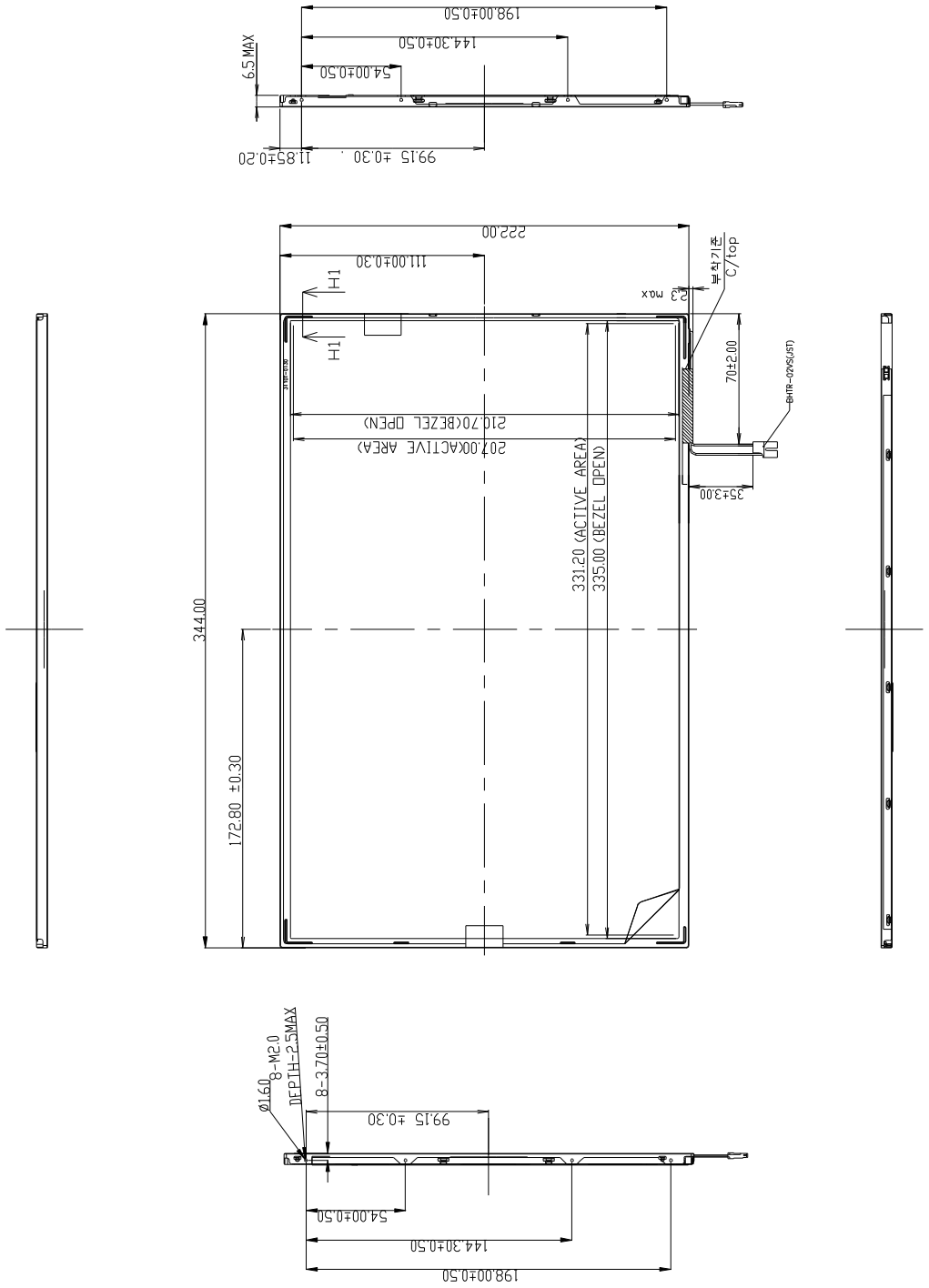
Item	Specifications
Display area (Active area)	331.2 (W) × 207.0 (H) (mm) (15.4 " diagonal)
Driving Method	TFT active matrix
Number of Pixels	1280 (W) × 800 (H) × R,G,B (WXGA) (pixels) 1)
Pixel pitch	0.25875 (H) × 0.25875 (V) (mm) 1)
Pixel Arrangement	RGB vertical stripes 1)
Display color	262,144 (colors)
Display Mode	Transmissive mode, Normally white
Viewing Direction	6 o'clock (in direction of maximum contrast)
Surface Treatment	Glare & hard coating(2H)
Interface	LVDS
Backlight	Single cold-cathode fluorescent lamp for side-lighting
Dimensional Outline	344.0±0.5 (W) × 222.0±0.5 (H) / 6.5(Max) (D) (mm)
Bezel Opening	335.0±0.5 (W) × 210.7±0.5 (H) (mm)
Weight	550g(Typ.) 565g(Max.)

Note 1)

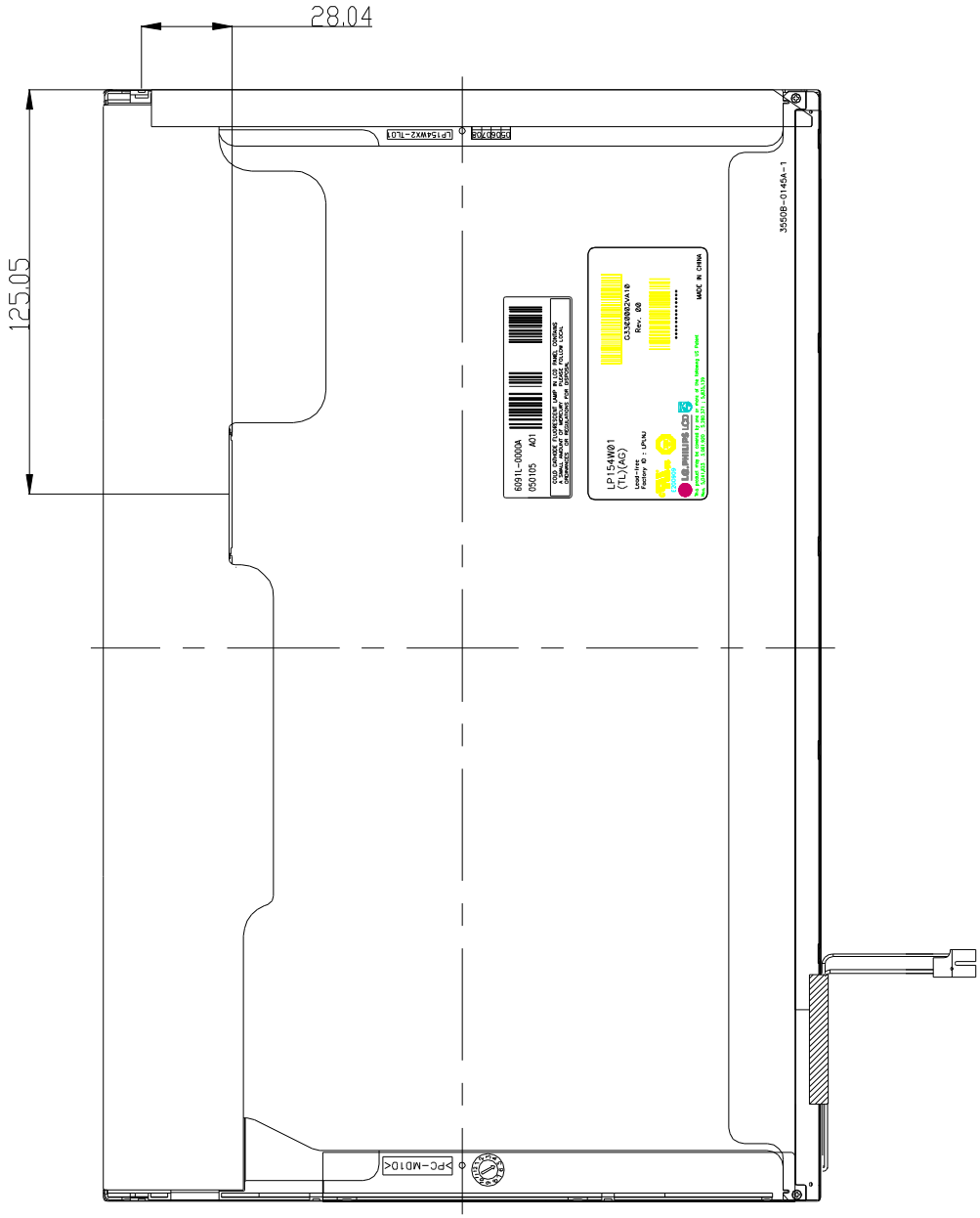


2.2. Dimensional Outline

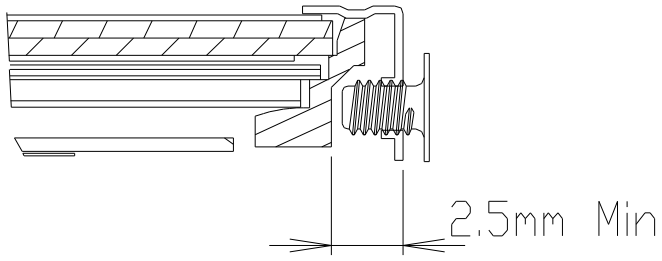
(Front figure)



(Back figure)



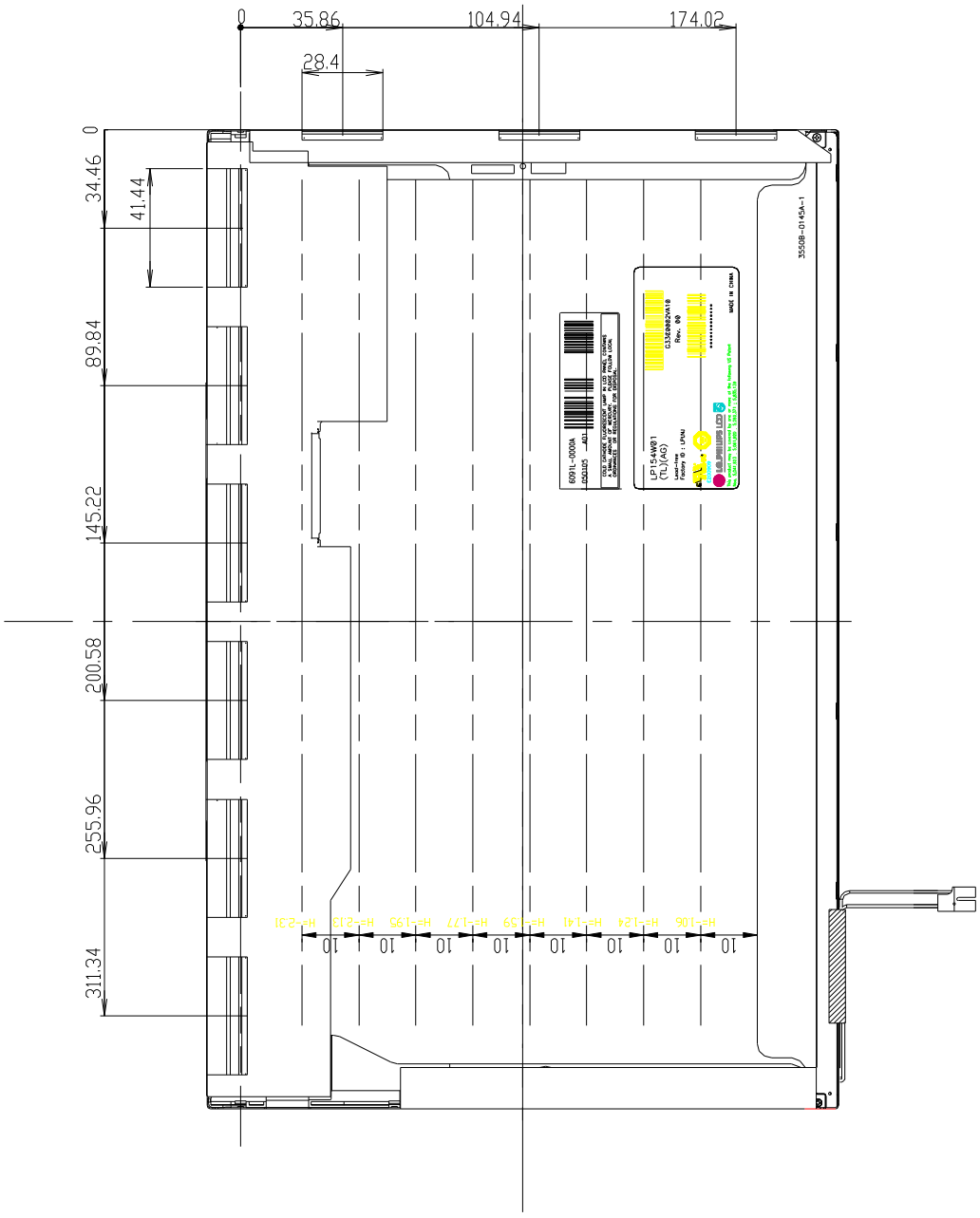
(Detail description of side mounting screw)



SECTION H1-H1

*SCREW(8EA) TORQUE : 2.5kgf.cm max
*Screw Hole Depth : 2.5mm min
*Screw Length : max 2.5, min2.0

(Detail description of height of LCM back side & TAB Zone)

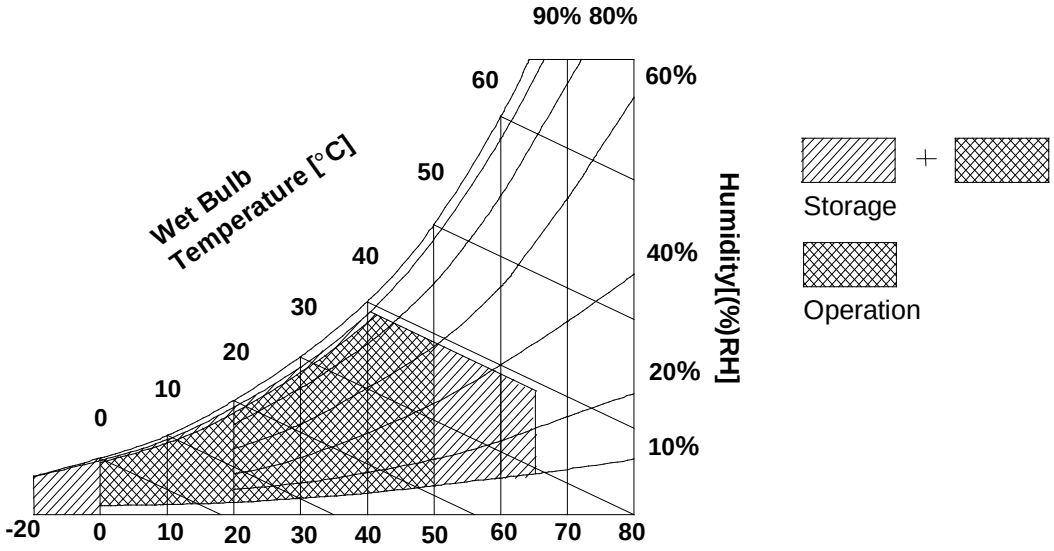


3. Absolute Maximum Ratings

3.1. Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit	Note
Operating Ambient Temperature	TOP	0	+50	°C	(1)
Operating Temperature for Panel	-	0	+50	°C	(2)
Storage Temperature	TSTG	-20	+60	°C	(1)
Operating Ambient Humidity	HOP	10	90	%RH	(1)
Storage Humidity	HSTG	10	90	%RH	(1)
Air Pressure	-	57	101.3	kPa	Operation
Air Pressure	-	12	101.3	kPa	Non-operation
Altitude	-	-	15000	feet	Operation
Altitude	-	-	40000	feet	Non-operation

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.



Note 2) The surface temperature caused by self heat radiation of cell itself is specified on this item.

3.2. Electrical Absolute Maximum

(1) TFT LCD Module

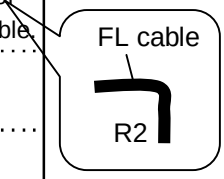
Item	Symbol	Min	Max	Unit	Note
Power Supply Voltage	V_{DD}	-0.3	+4.0	V	at 25 ± 5°C
Logic Input Voltage	V_{IN}	-0.3	VDD+0.3	V	LVDS interface

(2) Back Light Unit

Item	Symbol	Min	Max	Unit	Note
Lamp Voltage	V_L		5000	V_{RMS}	Broken lamp Max Voltage
Lamp Current	I_L	2.0	6.5	mA_{RMS}	
Lamp Frequency	F_L	45	80	kHz	

3.3. Mechanical Ratings

Test Item	Test Conditions		Note
Mechanical Vibration	Frequency Range 5 - 500 Hz, 14.7m/s^2 1.5G) constant, 0.5Hrs each axis (X, Y, Z direction).		Non Operation
	Frequency Range 5 - 500 Hz, 4.9m/s^2 (0.5G) constant, 0.5Hrs each axis (X, Y, Z direction).		Operation
Mechanical Shock LCD fix condition -> See Note (2)	* 240G, Pulse width 2 ms, Sine Wave, ±X, ±Y, ±Z direction. 70G, Pulse width 11ms, Sine Wave ±X, ±Y, ±Z direction. * Note) Normal function is only checking points.		Non Operation
	98 m/s^2 (10G), Pulse width 11 ms, Sine Wave, ±X, ±Y, ±Z direction.		Operation
Pressure Resistanace -> See Note (1)	No Destruction with the force 196 N (20 kgf, 16 mm in diameter) to the display surface at the vertical direction.		Non Operation Fig 1-1 Fig 1-2 Fig 1-3
	No Destruction with the force 294.2 N (30 kgf, 30 mm in diameter) to the back of the display surface at the vertical direction. Only the breakage of below items will not happen after test. (Glass.Lamp & Circuit parts)		
Strength of FL Cable	Strength of Rotation force	Cable : No disconnection of cable to the 5 trial of 360 degree rotation. See a bended state of cable.	Non Operation
		Connector : No disconnection of cable to 10 trial of 180 degree rotation. See a bended state of cable.	
	Lead Pull Test	Soldering portion 29.4N(3.0kgf) 10mins *1.08mm Wire applied	
		Connector : 12.9N (1.32kgf) 1 sec *1.08mm Wire applied	
Connector tension test	Input connector : With 50 times of connector trial there must be no damage to the shape and functionaly.		Non Operation
	Back light connector : With 50 times of connector trial there must be no damage to the shape and functionaly.		
Assured torque value at side-mout part	M2 : Max 3.0 kgf		Non Operation
Rescrewed test	15 times under Max. torque		Non Operation
Tapping test	Tapping area : All bezel(Metal cover) side, LCD: Full-screen gray (L32). “Ripple (Pooling)” can not be seen in Active Area Tapping Force: Max 3kgf.cm		Operation



Definitions of failure for judgment shall be as follows:

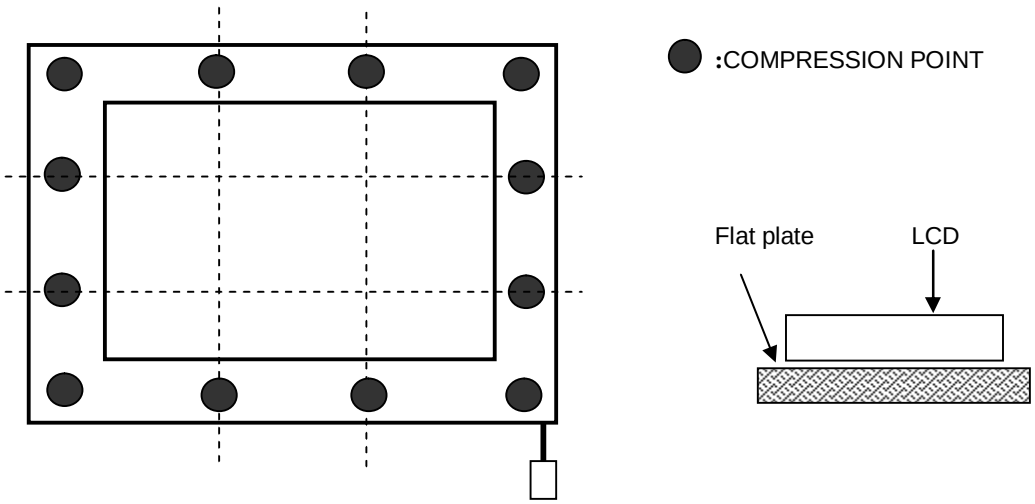
(1) Function of the module should be maintained.
(2) Current consumption should be smaller than the specified value.
(3) Appearance and display quality should not have distinguished degradation.
(4) Luminance should be larger than the minimum value specified in optical specification.

Note 1)

(1) The compression condition of front side

(a) Compression point : 12 points (refer to Fig 1-1)

(b) Compression condition: 20kgf, 3 sec, Tool diameter: 16 mm in diameter (refer to Fig 1-3)

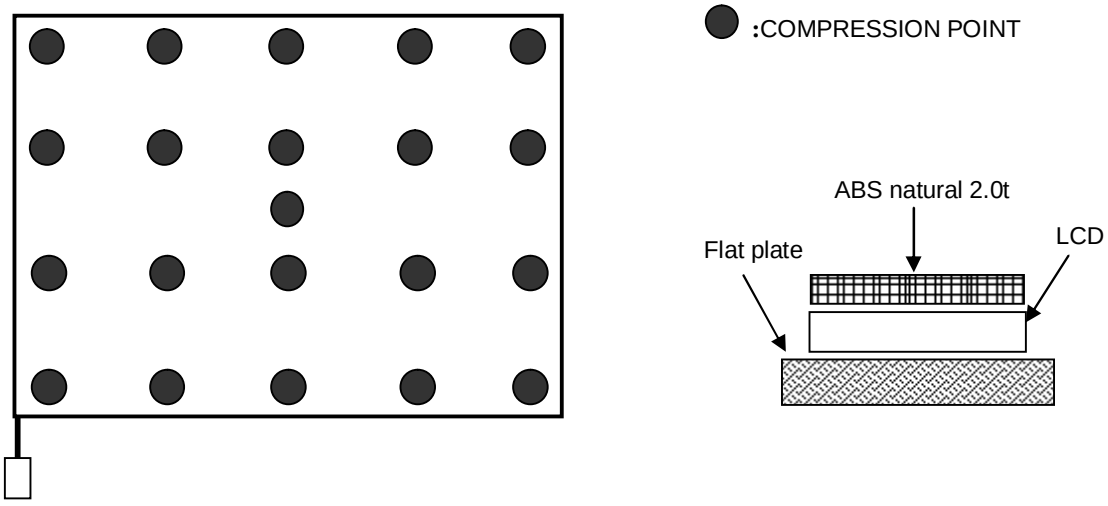


[Fig 1-1]

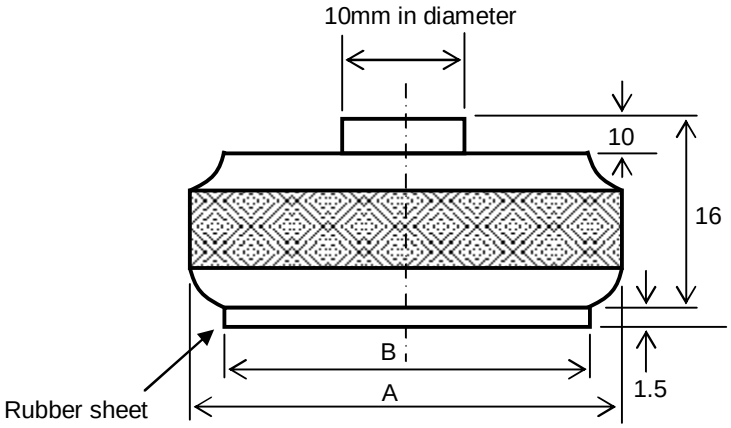
(2) The compression condition of rear side

(a) Compression point : 21 points (refer to Fig 1-2)

(b) Compression condition : 30kgf, 3 sec, Tool radius: 30 mm in diameter (refer to Fig 1-3)



[Fig 1-2]



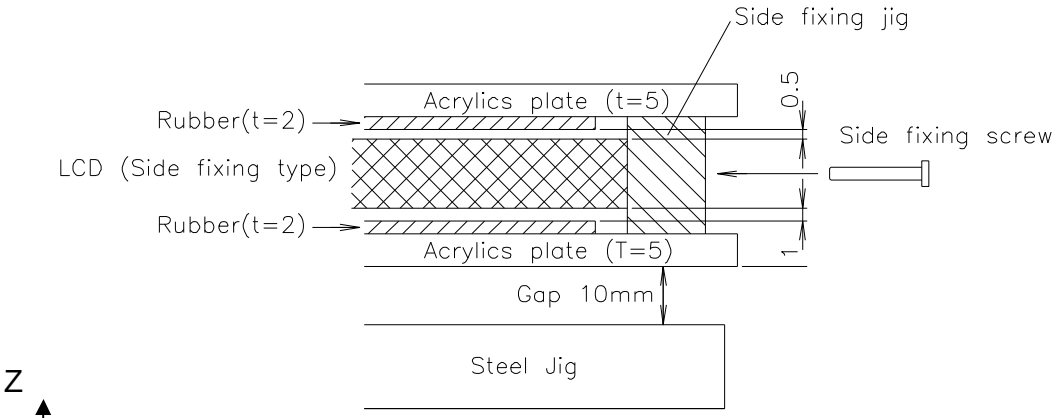
[Fig 1-3]

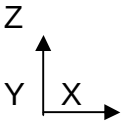
(3) Dimension of the compression jig

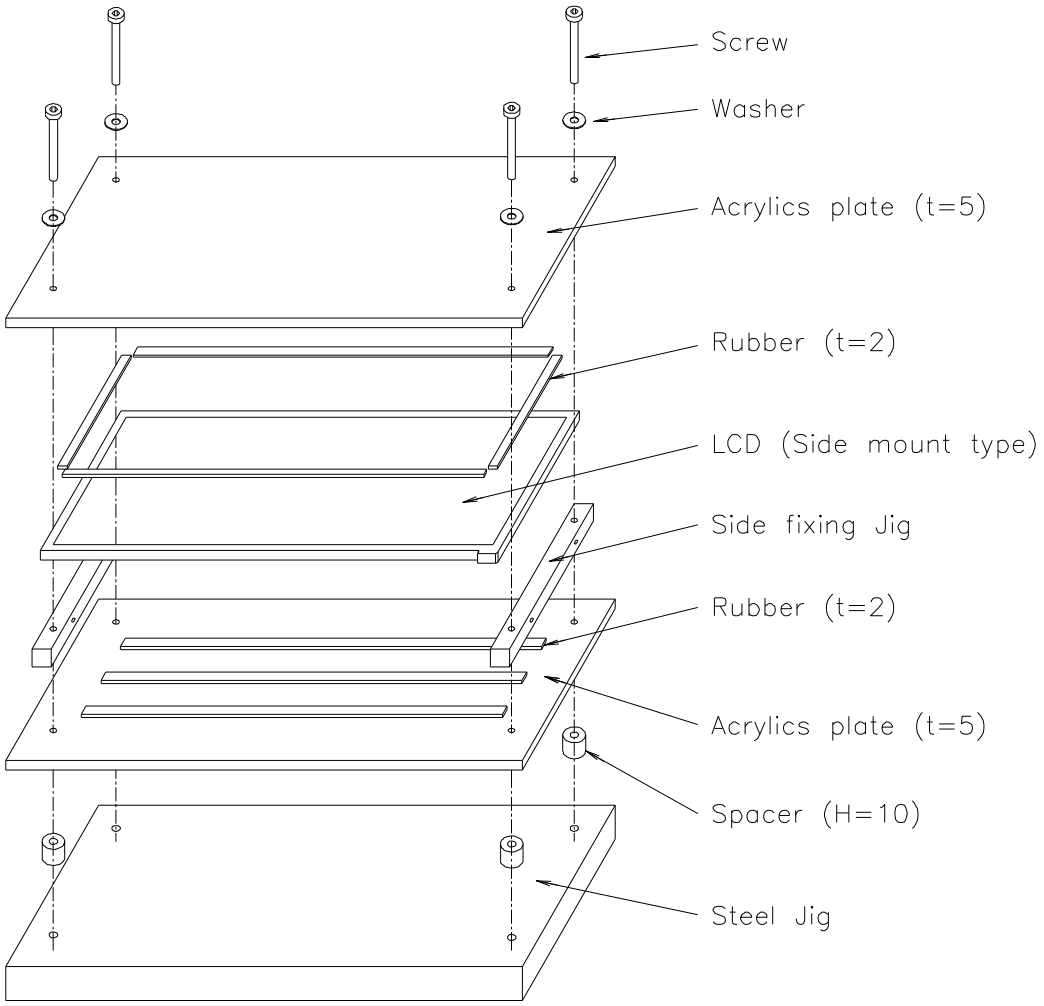
(a) compression jig for front side A = 16 mm in diameter
B = 16 mm in diameter

(b) compression jig for rear side A = 30 mm in diameter
B = 28 mm in diameter

Note 2) LCD fixing condition for z direction.







3.4. The Others

(1) Static electricity pressure resistance

Item	Testing conditions	Operation	Non Operation
Contact discharge	150pF, 330 ohm	±12KV	± 12 kV
Air discharge	150pF, 330 ohm	±15KV	±15 KV

(2) Sound noise

There should be no uncomfortable noise.

Being used under whatever surrounds, when power on/off, the panel should not generate uncomfortable noise. And regarding specified values are negotiated if it is needed.

(3) Open / Short

No smoke, no fiery at any open/ short test

(4) MTBF : 50,000 Hr (except for backlight lamp)

4. Optical Characteristics

4.1. Test Conditions

Ambient Temperature : T_a 25±5°C
Ambient Humidity : H_a 65±20%RH
Supply Voltage : V_{DD} 3.3V
Input Signal : According to typical value in "Electrical Characteristics"
FL Input Current : I_L = 6.0mA_{RMS}
FL Driving Frequency : f_{LF} = (60±5 kHz)
FL Inverter : LG Inverter (6632Z-1301A)

The measuring method is shown in 4.2. The following items are measured under stable conditions. The optical characteristics should be measured in a dark room (Screen illuminance < 2 lx) or equivalent state with the methods shown in Note (6).

4.2. Optical Specifications

Item		Symbol	Conditions		Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center 1 Point)		CR	θ=0°, ϕ=0° Viewing normal angle		250	300	-	-	(2), (6)
Response Time		t_{ON}			-	10	15	ms	(3)
		t_{OFF}			-	20	30	ms	
Average luminance (5 Point Average)		Y_L			145	170	-	cd/m²	*I_{FL}=6.0mA_{RMS} F_L=60±5kHz Gray Scale Level = L63 (White)
Cross Modulation		D_{SHA}			-	-	2.0	%	(5)
Luminance Uniformity Chromaticity	Red	Rx			0.560	0.590	0.620	-	(1), (6) PR650 Only for Color Coordinate (Color Coordinate of the R,G,B is based on LPL's equipment, and Color Coordinate of the W is based on LPL's equipment)
		Ry			0.314	0.344	0.374		
	Green	Gx			0.294	0.324	0.354		
		Gy			0.505	0.535	0.565		
	Blue	Bx			0.127	0.157	0.187		
		By			0.108	0.138	0.168		
	White	Wx			0.283	0.313	0.343		
		Wy			0.299	0.329	0.359		
Viewing Angle	Hor.	θ_L	CR>=10	ϕ = 180	40	45	-	deg.	
		θ_R		ϕ = 0°	40	45	-		
	Ver.	θ_{up}		ϕ = 90°	10	15	-		
		θ_{Low}		ϕ = -90°	30	35	-		
	Hor.	θ_L	CR>=5	ϕ = 180	45	50	-		
		θ_R		ϕ = 0°	45	50	-		
	Ver.	θ_{up}		ϕ = 90°	15	20	-		
		θ_{Low}		ϕ = -90°	35	40	-		
13 Points White Variation		δ W	θ=0°, ϕ=0° Viewing normal angle		-	-	1.6		(7)
13 Points CR Variation		δC_R			-	-	2.0		(7)
White Variation		dL			-	-	2.0		(8)

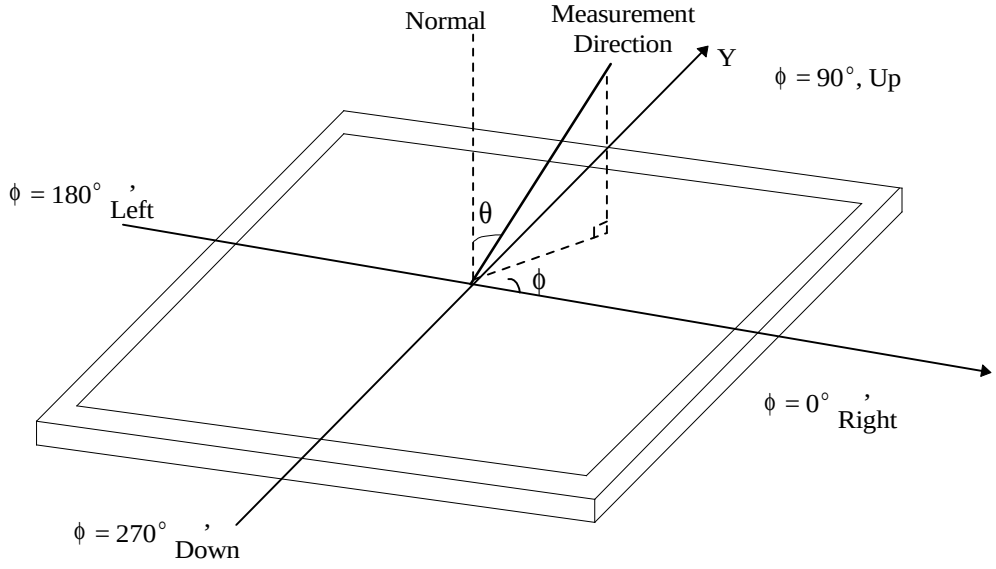
Attach the Lamp current – Luminance characteristics. The range of lamp current is shown in 3.2 (2)

A. Present CR Variation(13Point) Spec is based on PR-880 Equipment and can be changed by the measuring equipment.

Item	Gray level	Conditions	Min.	Typ.	Max.	Unit	Note
Normalized luminance at each gray level	63	θ=0°, ϕ=0° Viewing normal angle	100	100	100	%	(1), (6) (Center 1 Point)
	55		60.5	74.1	87.0		
	47		38.5	53.2	66.5		
	39		22.6	36.1	48.3		
	31		11.5	22.5	33.2		
	23		3.00	11.0	21.4		
	15		0.50	3.77	12.7		
	7		0.10	0.65	5.80		
	0		0.00	0.19	1.20		

At normal viewing direction, during displaying the L0-L63 gray scale bar, luminance intensity inversion can not be seen.

Note 1) Definition of viewing angle θ and ϕ



Note 2) LCD fixing condition for z direction.

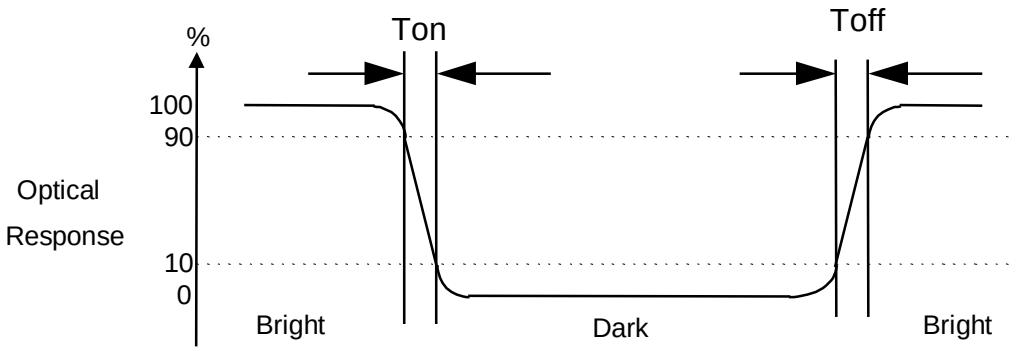
The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

L63 : Luminance on the white raster (gray scale level L63)

L 0 : Luminance on the black raster (gray scale level L0)

Note 3) Definition of response time



Note 4) Definition of surface luminance of white

Measure the luminance of white at Center point. Surface luminance of white Y_L

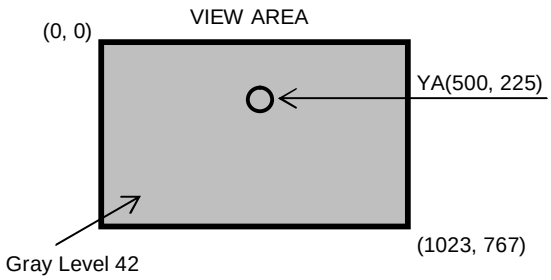
Note 5) Definition of Cross Modulation (D_{SHA})

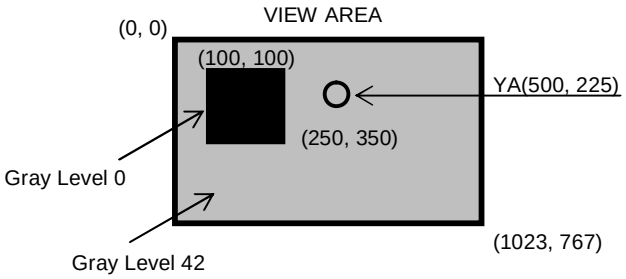
$$D_{SHA} = | Y_B - Y_A | / Y_A \times 100 \ (\%)$$

Where:

Y_A = Luminance of measured location without darkest gray pattern (cd/m^2)

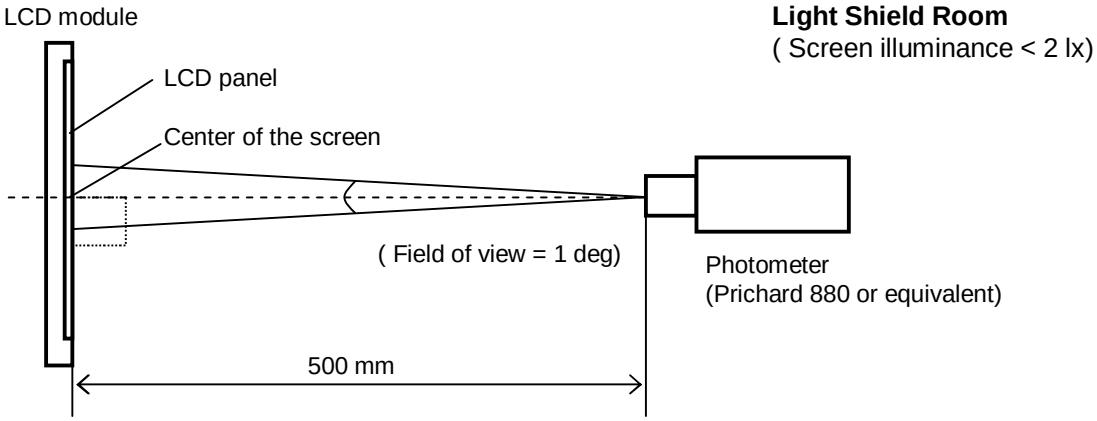
Y_B = Luminance of measured location with darkest gray pattern (cd/m^2)





Note 6) Measuring setup

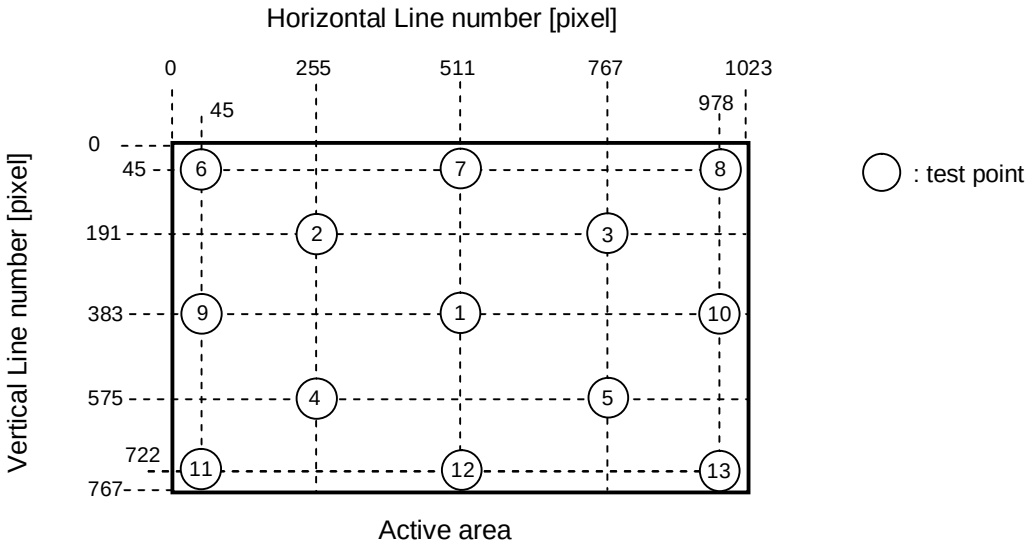
The measurement suppose to be executed after stabilized the panel at given temperature during 30 min. The measurement shall be executed 30 minutes after lighting at rating. The luminance of white should be typical luminance (Typical Condition IL=6.0mA). In order to stable the luminance, LCD s hall not be got winds.



Note 7) Definition of 13 points white variation δW, CR variation δC_R

δW = Maximum luminance of 13 points / Minimum luminance of 13 points

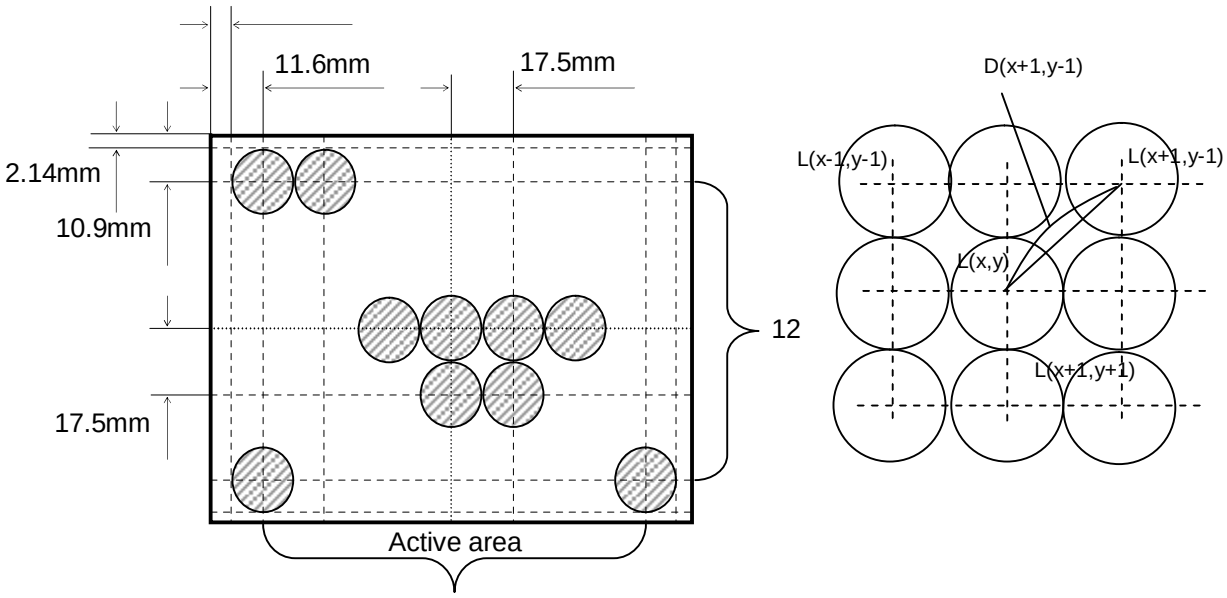
δC_R = Maximum CR 13 points / Minimum CR of 13 points



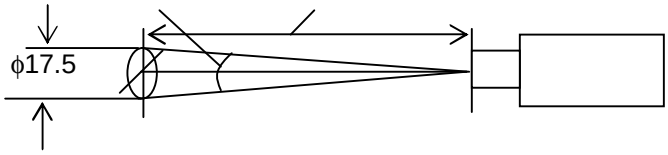
Note 8) Definition of White Variation dL : measure the luminance of white at 13 ×11 points.

$$dL = [\ |\ L(x,y) - L(x+I,\ y+j)\ |\ /\ (\ L(x,y) \times D(x+I,\ y+j)\ )\ ] \times 100 \quad (\%/mm)$$

where $2 \le x \le 15$, $2 \le y \le 11$, $I = \pm 1$, $j = \pm 1$



Measuring Spot 16
(Field of View : 2deg. Measuring Distance : 500 mm)



5. Electrical Characteristics

5.1. TFT LCD module

Item		Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage		V_{DD}	3.0	3.3	3.6	V	
Differential Input Threshold Voltage	High	Vth	+100	-	-	mV	
	Low	Vtl	-100	-	-	mV	
Rush Current		I_{RUSH}	-	-	2.0	A	(5)
Power Supply Current	White(L63)	I_{DD}	220	255	290	mA	(3), (4) (a)
	Mosaic		255	300	345		(3), (4) (b)
	Max. Pattern		335	390	445		(3), (4) (c)

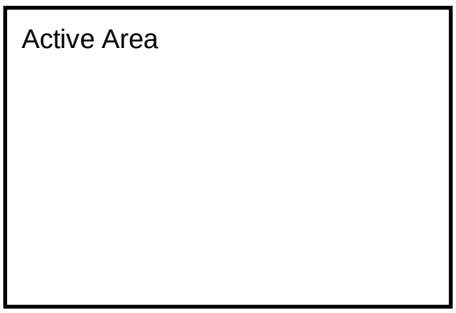
Note 1) The module should be always operated within these ranges. The "Typ." shows the recommendable value.

Note 2) Recommended LVDS transmitter : SN75LVDS84 (made by TI).
LVDS receiver included in this module is KE5M5U2455.(1 chip)

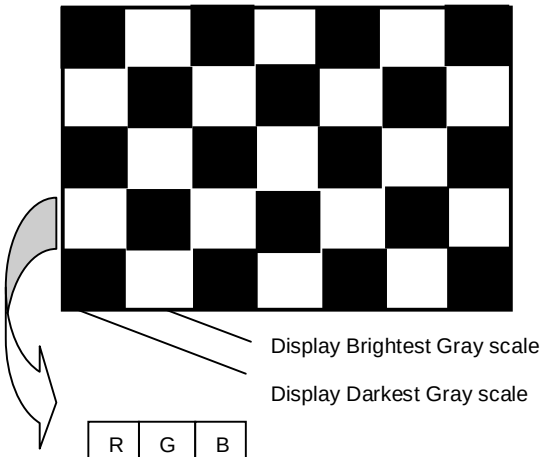
Note 3) Typical condition as follows. : fV= 60Hz, fDCLK = 68.9 MHz, V_{DD}= 3.3V, DC current.

Note 4) Power dissipation check pattern.

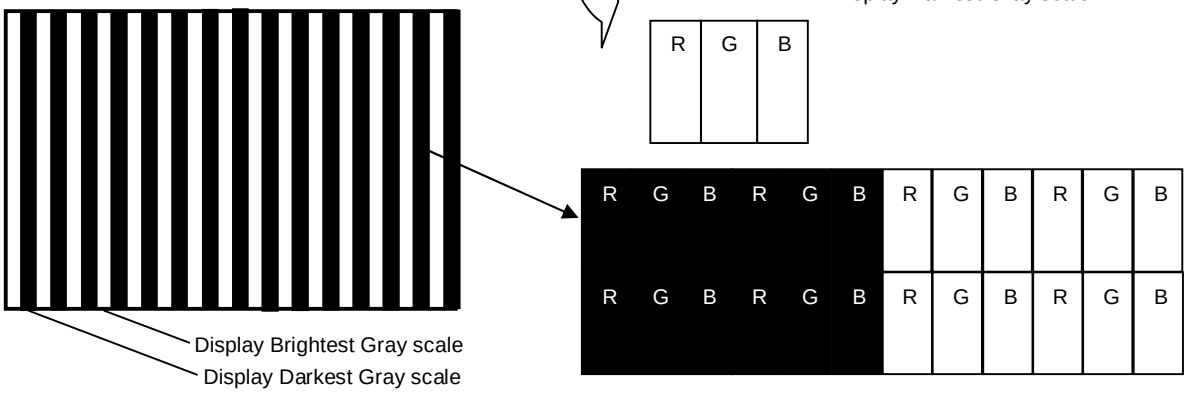
(a) White pattern



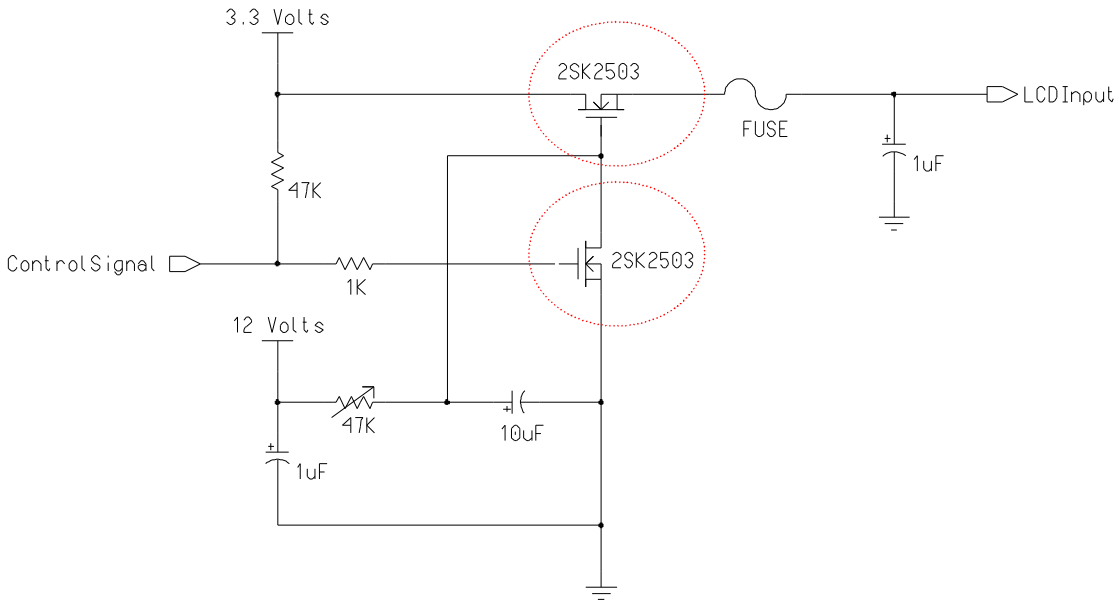
(b) Mosaic pattern



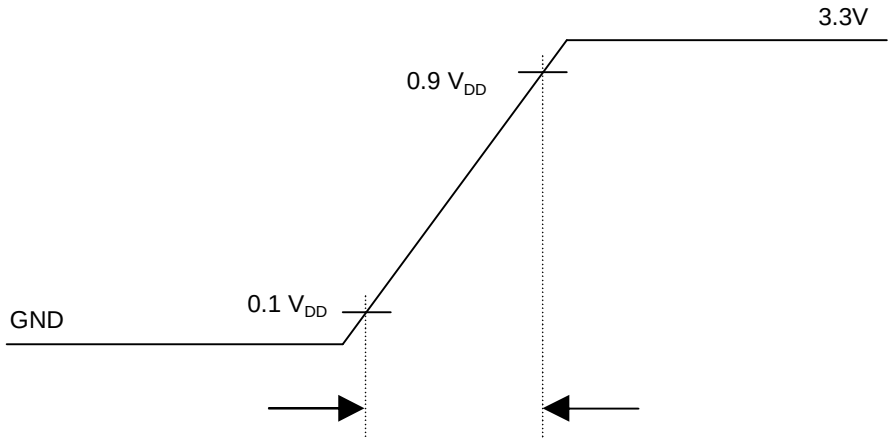
(C) Max. pattern



Note 5) Measuring condition of rush current.



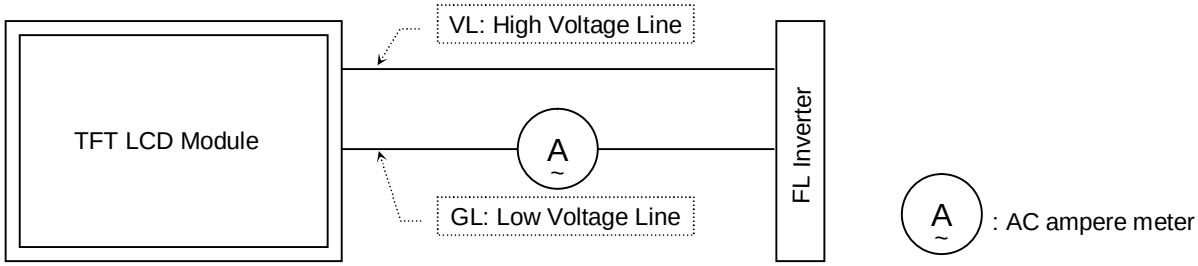
V_{DD} rising time is 470us



5.2. Backlignt Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Lamp Current	I_L	2.0	6.0	6.5	mA_{RMS}	(1)
Lamp Voltage	V_L	680	695	895	V_{RMS}	
Power Consumption	P_L	-	4.2	4.50	W	(2)
Frequency	f_{FL}	45	60	80	kHz	
Operating Life Time	Hr	10,000	-	-	Hour	(3)
Ignition Voltage at 0°C	V_{IV}	-	-	1400	V_{RMS}	(5)
		-	-	-		(4)
Ignition Voltage at 25°C	V_{IV}	-	-	1170		(5)
		-	-	-		(4)
Mercury Qt'y of CCFL	-	1.5	-	3.0	mg	

Note 1) Lamp current is measured with a high frequency current as shown below.



Note 2) Refer to I_L X V_L to calculate.

Note 3) Life time of Lamp can be defined as the time in which it continues to operate under the condition T = 25°C ± 2°C and IL= 6.0 mArms until one of the following events occurs.

1. When the brightness becomes 50% or lower than it's original.
2. When the Effective ignition length becomes 80% or lower than it's original value.

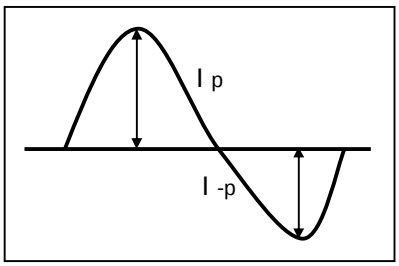
(Effective ignition length is defined as an area that has less than 70% brightness compared to the brightness in the center point.)

Note 4) The discharge shall be connected uniformly. Slide up method shall be used for voltage application. Above voltage is applied voltage to both ends of the lamp as the starting voltage. (Above value is not out put voltage of inverter.)

Note 5) The lamp shall be lighted stably. Slide up method shall be used for voltage application. Above voltage is applied voltage to both ends of the lamp as the established starting voltage. (Above value is not out put voltage of inverter)

*** Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp, are following.
It shall help increase the lamp lifetime and reduce leakage current.

a. The asymmetry rate of the inverter waveform should be less than 10%.
b. The distortion rate of the waveform should be within $\sqrt{2} \pm 10\%$.
* Inverter output waveform had better be more similar to ideal sine wave.



* Asymmetry rate:

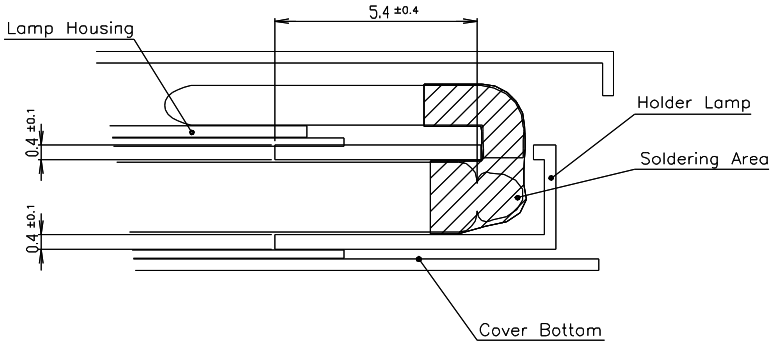
$| I_p - I_{-p} | / I_{rms} * 100\%$

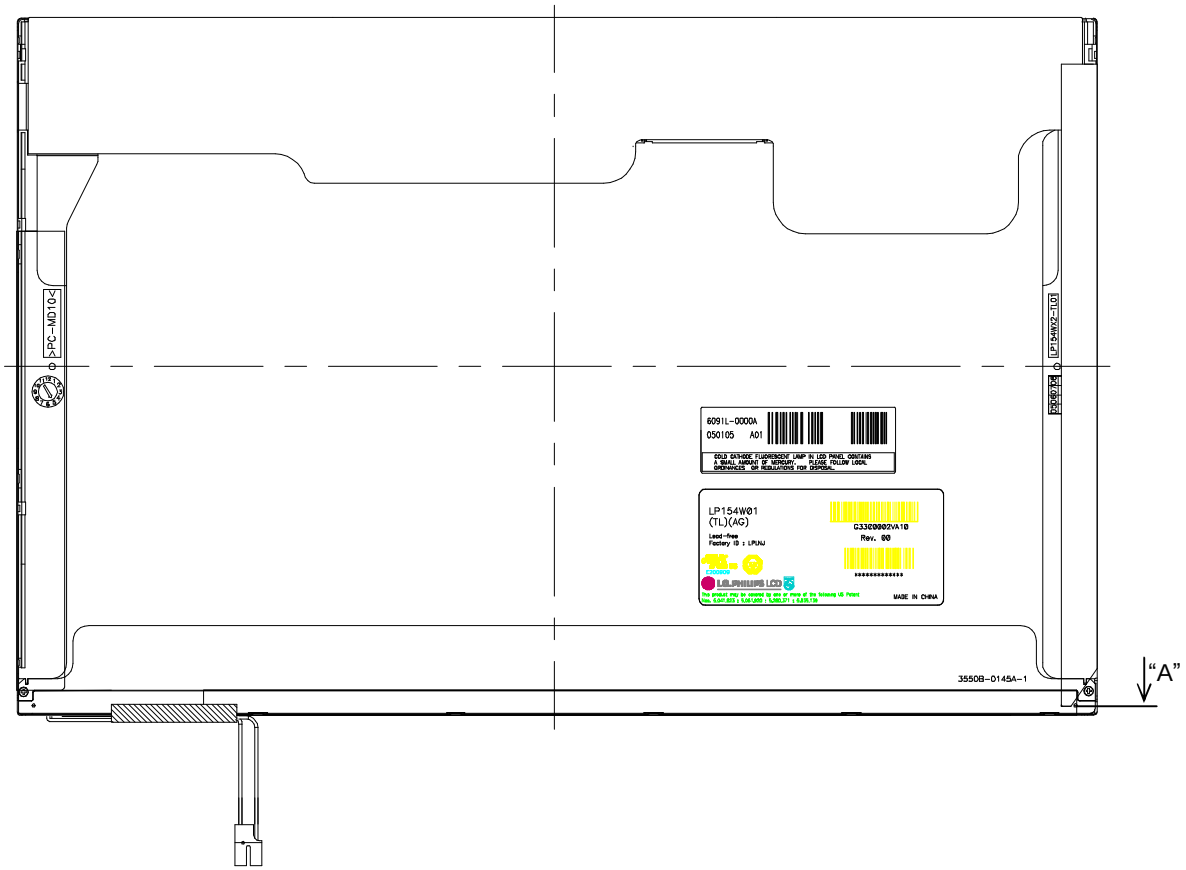
* Distortion rate

I_p (or I_{-p}) / I_{rms}

Note 6) Detail description of creepage distance

[Section 'A']





5.3. Regulation

The set (which LCD module is assembled into) should conform to the regulations below.

(1) EMI Regulations.

CISPR : Pub.22 CLASS B
FCC : PART15 CLASS B
VCCI : CLASS B

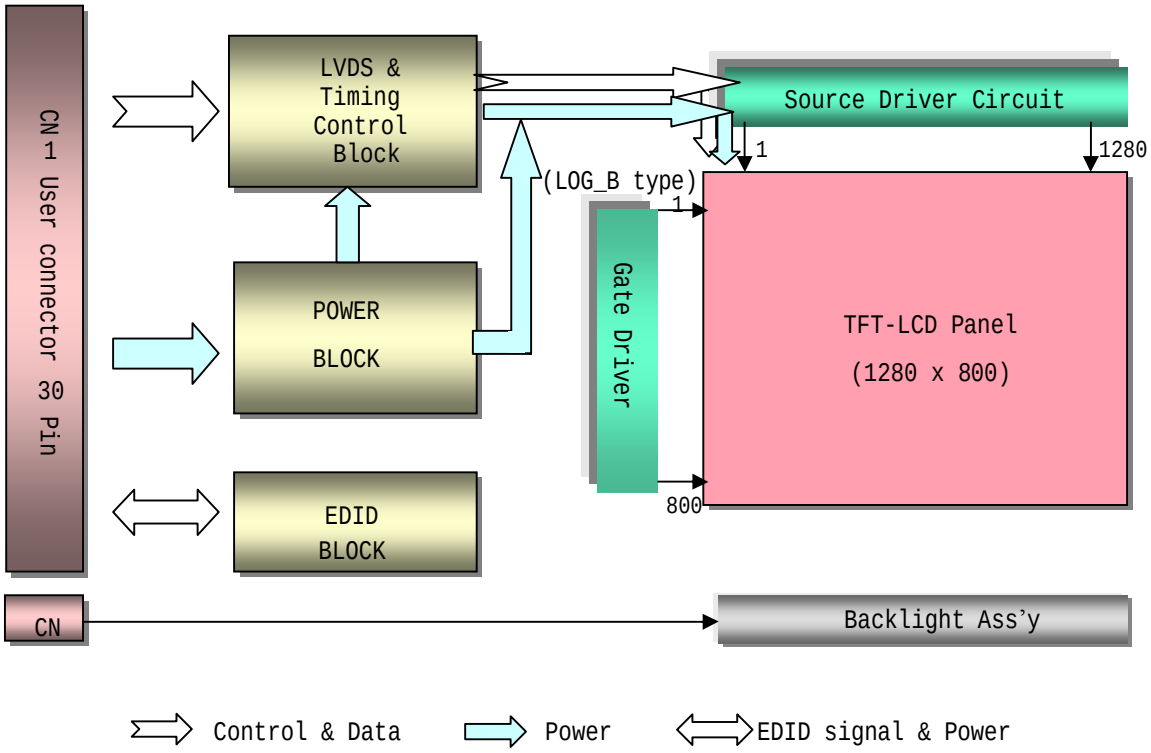
(2) Safety Regulations (Only LCD)

IEC 60950
UL 60950

(3) Material list concerning

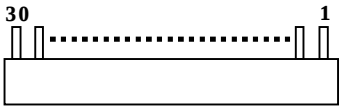
Item		Silk	Product	Rating	Maker
EMI Filter	ASIC (Data Output)	AR11,12,13,14,15,16, 17,18,19	Array Resistor	47Ω	
		AC1,2,3,4,5,6,7,8,9	Array Capacitor	open	
	ASIC (Clock Output)	FB1	BLM18BD121SN	120Ω1608	MURATA
		C61	Chip Capacitor	150pF 1608	
	Power V_{DD}(2.5V)	UC1	ASIC	LDO in ASIC	Siliconworks
DC/DC	Control IC for Power supply	U1	EL7516IYZ-T13	8 Pin, MOSP-8, R/TP, PWM (Min 1MHz/Typ 1.25MHz/1.5MHz)	ELANTEC
	Switching Diode	D2,D3,D4	BAV99		DIODES
	Zener Diode	ZD1	open	open	DIODES
	Schottky Barrier Diode	D1	BAT750	0.75A	DIODES
	Inductor	L1	PLN6012T-100MR80	10 uH±20% (Inductance) 0.24Ω±20%(DC Resistance) 0.9A Max(Rated DC Current)	TDK

6. Block Diagram



7. Input Terminal Pin Assignment

7.1. TFT LCD module

Pin	Symbol	Description	Notes
1	GND	Ground	1, Interface chips 1.1 LCD : KE5M5U2455(LCD Controller) including LVDS Receiver 1.2 System : THC63LVD63A or equivalent * Pin to Pin compatible with THINE LVDS 2. Connector 2.1 LCD : IS100-C30R-C15,UJU or GT101-30S-HR11, LS cable or FI-XB30Sx-HFxx, JAE or Equivalent 2.2 Mating : FI-X30M or equivalent. 2.3 Connector pin arrangement  [LCD Module Rear View]
2	VCC	Power Supply, 3.3V Typ.	
3	VCC	Power Supply, 3.3V Typ.	
4	V EEDID	DDC 3.3V power	
5	NC	Reserved for supplier test point	
6	Clk EEDID	DDC Clock	
7	DATA EEDID	DDC Data	
8	R_{IN} 0-	Negative LVDS differential data input	
9	R_{IN} 0+	Positive LVDS differential data input	
10	GND	Ground	
11	R_{IN} 1-	Negative LVDS differential data input	
12	R_{IN} 1+	Positive LVDS differential data input	
13	GND	Ground	
14	R_{IN} 2-	Negative LVDS differential data input	
15	R_{IN} 2+	Positive LVDS differential data input	
16	GND	Ground	
17	CLKIN-	Negative LVDS differential clock input	
18	CLKIN+	Negative LVDS differential clock input	
19	GND	Ground	
20	NC	No connect	
21	NC	No connect	
22	NC	No connect	
23	NC	No connect	
24	NC	No connect	
25	NC	No connect	
26	NC	No connect	
27	NC	No connect	
28	NC	No connect	
29	NC	No connect	
30	NC	No connect	

7.2. Backlight Unit

Using Connector : BHTR-02VS (Maker : JST)
(Contact Pin of VL : SBHT-002T-P0.5 (Maker :JST))
(Contact Pin of GL : SBHT-002T-P0.5 (Maker :JST))

Pin	Symbol	Cable Color	Function
1	VL	Pink	High Voltage
2	GL	Blue	Low Voltage

7.3. LVDS Transmitter

LVDS Transmitter : SN75LVDS84 (made by TI) or compatible.

Pin #	Pin Name	Require Signals	Pin #	Pin Name	Require Signals
1	D4	R4	48	D3	R3
2	Vcc	Vcc	47	D2	R2
3	D5	R5	46	GND	GND
4	D6	G0	45	D1	R1
5	DND	GND	44	D0	R0
6	D7	G1	43	NC	NC
7	D8	G2	42	LVDS GND	LVDS GND
8	Vcc	Vcc	41	Y0M	A0M
9	D9	G3	40	Y0P	A0P
10	D10	G4	39	Y1M	A1M
11	GND	GND	38	Y1P	A1P
12	D11	G5	37	LVDS Vcc	LVDS Vcc
13	D12	B0	36	LVDS GND	LVDS GND
14	NC	NC	35	Y2M	A2M
15	D13	B1	34	Y2P	A2P
16	D14	B2	33	CLKOUTM	CLKM
17	GND	GND	32	CLKOUTP	CLKP
18	D15	B3	31	LVDS GND	LVDS GND
19	D16	B4	30	PLL GND	PLL GND
20	D17	B5	29	PLL Vcc	PLL Vcc
21	Vcc	Vcc	28	PLL GND	PLL GND
22	D18	HSYNC	27	SHDN	SHDN
23	D19	VSYNC	26	CLKIN	Dclk
24	GND	GND	25	D20	DE(Data Enable)

7.4. Timing Diagrams of LVDS Transmission

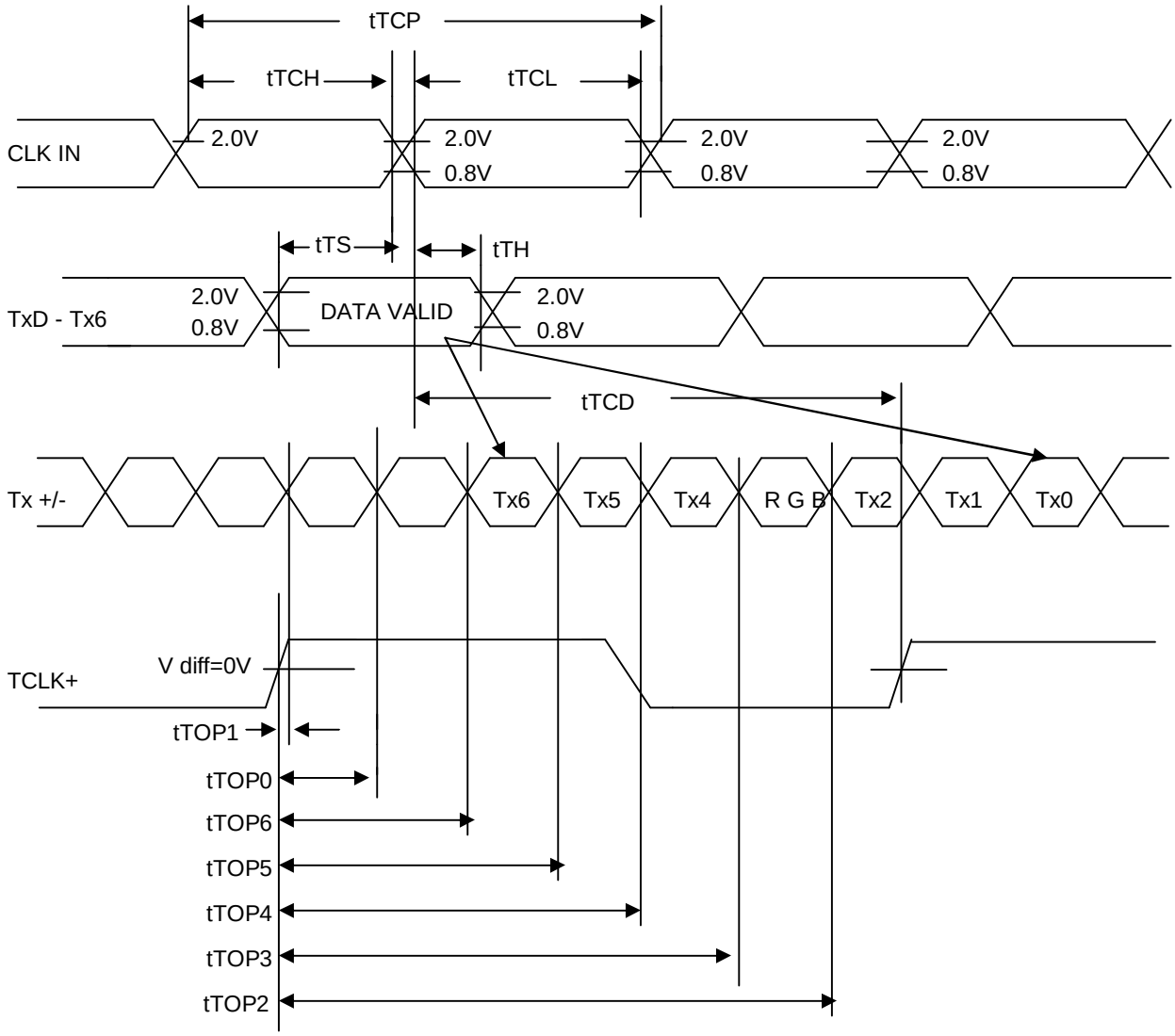
Switching Characteristic

VCC = 3.0 ~ 3.6V, Ta = -10 ~ +70℃

Transmitter

Symbol	Parameter	Min.	Typ.	Max.	Unit
tTCIT	CLK IN Transition Time	-	-	5	ns
tTCP	CLK IN Period	14.7	T	32.4	ns
tTCH	CLK IN High Time	0.4T	0.5T	0.6T	ns
tTCL	CLK IN Low Time	0.4T	0.5T	0.6T	ns
tTCD	CLK IN to TCLK +/- Delay	-	14.2	-	ns
tTS	TTL Data Setup to CLK IN	3.0	-	-	ns
tTH	TTL Data Hold from CLK IN	1.5	-	-	ns
tLVT	LVDS Transition Time	0.26	0.7	1.5	ns
tTOP1	Output Data Position 0 (T= 15.38ns)	-0.2	0	0.2	ns
tTOP0	Output Data Position 1 (T= 15.38ns)	T/7 - 0.2	T/7	T/7 + 0.2	ns
tTOP2	Output Data Position 2 (T= 15.38ns)	2T/7 - 0.2	2T/7	2T/7 + 0.2	ns
tTOP3	Output Data Position 3 (T= 15.38ns)	3T/7 - 0.2	3T/7	3T/7 + 0.2	ns
tTOP4	Output Data Position 4 (T= 15.38ns)	4T/7 - 0.2	4T/7	4T/7 + 0.2	ns
tTOP5	Output Data Position 5 (T= 15.38ns)	5T/7 - 0.2	5T/7	5T/7 + 0.2	ns
tTOP6	Output Data Position 6 (T= 15.38ns)	6T/7 - 0.2	6T/7	6T/7 + 0.2	ns
tTPLL	Phase Lock Loop Set	-	-	10	ns

AC Timing Diagrams
Transmitter Device



7.5. Input Signal, Basic Display Colors and Gray Scale of each Color

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 Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	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	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(Dark)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	…			…						…						…			
	RED(Bright)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(Dark)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	...			…						…						…			
	GREEN(Bright)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(Dark)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	…			…						…						…			
	BLUE(Bright)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note 1) 0: Low level voltage, 1: High level voltage

8. Interface Timing

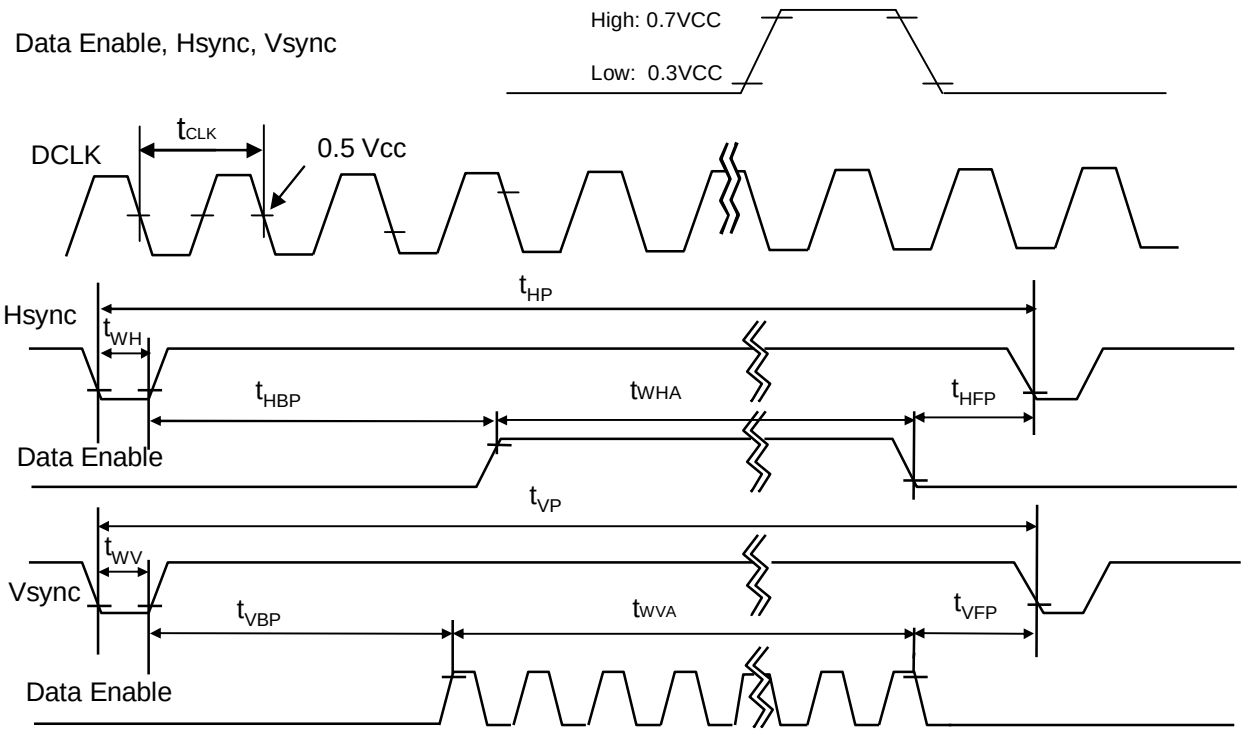
8.1. Timing Parameters

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

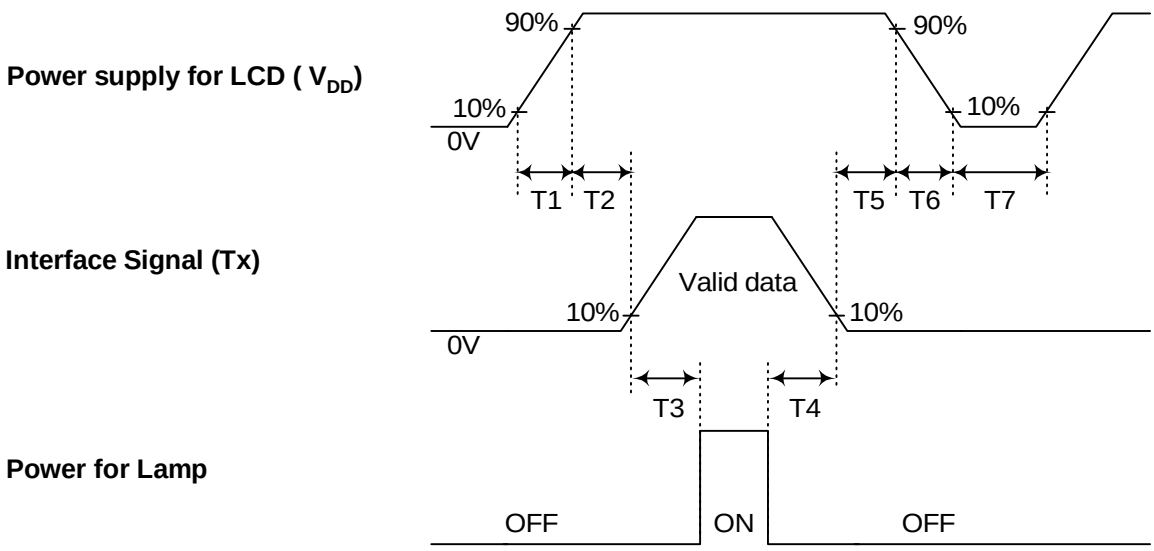
ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	66.9	68.9	75.4	MHz	
Hsync	Period	t_{HP}	1380	1408	1496	t_{CLK}	
	Width	t_{WH}	16	32	40		
	Active	t_{WHA}	1280	1280	1280		
Vsync	Period	t_{VP}	808	816	840	t_{HP}	
	Width	t_{WV}	2	4	6		
	Active	t_{WVA}	800	800	800		
Data Enable	Horizontal back porch	t_{HBP}	68	72	120	t_{CLK}	
	Horizontal front porch	t_{HFP}	16	24	56		
	Vertical back porch	t_{VBP}	5	8	28	t_{HP}	
	Vertical front porch	t_{VFP}	1	4	6		

8.2. Timing Diagrams of LVDS Transmission

Condition : VCC =3.3V



8.3. Power On/Off Sequence



Parameter	Min.	Typ.	Max.	Unit
T_1	0	-	10	(ms)
T_2	0	-	50	(ms)
T_3	200	-	-	(ms)
T_4	200	-	-	(ms)
T_5	0	-	50	(ms)
T_6	0	-	10	(ms)
T_7	200	-	-	(ms)

Note 1) Please avoid floating state of interface signal at invalid period.
Note 2) When the interface signal is invalid, be sure to pull down the power supply for LCD V_{CC} to 0V.
Note 3) Lamp power must be turn on after power supply for LCD and interface signal are valid.

9. Cosmetic Specification

9.1. Sampling

A.Q.L (Acceptable Quality Level): MIL-STD, 105E Level II,
Major: 0.65 , Minor: 1.5

9.2. Conditions of Inspections

(1) Ambient Temperature : 25±5°C
(2) Ambient Humidity : 65±20%RH
(3) Illumination : 200 – 500 Lux (nominal 350 Lux) under the fluorescent lamp
(4) Viewing Distance: Approximately 30cm by the eyes of the inspector from the module
(5) Viewing angle : The surface of the module and the inspector's line shall be at 90 ± 45 degrees.
(6) Display pattern: Pure Red, Green, Blue, Black, White, Gray level 0 - 63

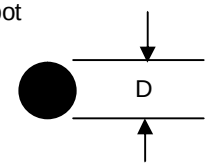
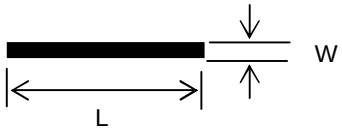
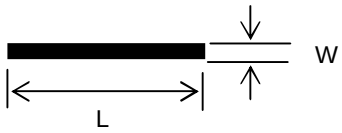
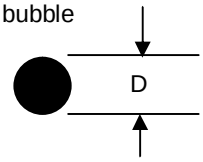
9.3. Defect modes

Defect Mode	Description
Dark / Bright spots	Points on the display which appear dark / bright and remain unchanged in size
Dark / Bright lines	Lines on the display which appear dark / bright and remain unchanged in size
Polarizer scratch	When the unit is lit a light , line is seen across a darker background; line does not vary in size
Polarizer dent	When the unit is lit a light, light (white) spots appear against a darker background, and do not vary in size
Bright / dark dot	A sub-pixel (R,G,B dot) stuck off / on
Rubbing line	Diagonal lines that appear gray with the display patterns dark and vary in size
Dim line	When the unit lights, lines in the minor (Vertical) or major (Horizontal) axis appear dim
Cross line	When the unit lights, lines in the both minor and major axis do not appear
Interference	Interference can not be seen with any bright plane display at any viewing angle
Flicker	When displaying sub-pexel checker(gray level and darkest gray), flicker can not be seen
Ripple (Pooling)	Tapping Test, Tapping area : All bezel(Metal cover) side, LCD: Full-screen gray (L32) "Ripple (Pooling)" can not be seen in Active Area

9.4. Mechanical Inspection

(1) Light leakage: No light leakage between metal chassis (bezel) and glass
(2) No sharp edge
(3) The mounting holes: No Changed (Side fixed type)
(4) PCB Appearance: No pattern peeling snapping / No electrically short
If there are repair portions, the repair portions on PCB is covered by epoxy resign
(5) Soldering: No cold solder joint, lead move when pulled
(6) Bezel, Frame, Connectors: No distinct stain, rust or scratch, no pin bending

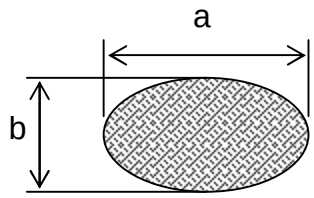
9.5. Visual Inspection

Defect type	Count (mm)	Reject (mm)
Dark / bright spot 	0.2 < D ≤ 0.5 N ≤ 3	D > 0.5
Dark / Bright lines 	0.05 < W ≤ 0.07 0.3 < L ≤ 3.0 N ≤ 3	W > 0.07 L > 3.0
Polarizer scratch 	0.01 < W ≤ 0.1 0.3 < L ≤ 0.5 N ≤ 3	W > 0.1 L > 0.5
Polarizer dent / bubble 	0.2 ≤ D ≤ 0.5 N ≤ 3	D > 0.5
Maximum allowable number of defects	N ≤ 7	N > 7
Rubbing defect	Not allowed	
Dim line	Not allowed	

[D : diameter, W : width, L : length, N : count]

Note 1) Inspection area should be within bezel opening.
Note 2) Dusts which are bigger not less than 0.10mm (0.1≤W) shall be judged by "Average Diameter".
Note 3) Scratches which are bigger not less than 0.05mm (0.05≤W) shall be judged by "Average Diameter".

Average Diameter D = (a+b)/2 (mm)

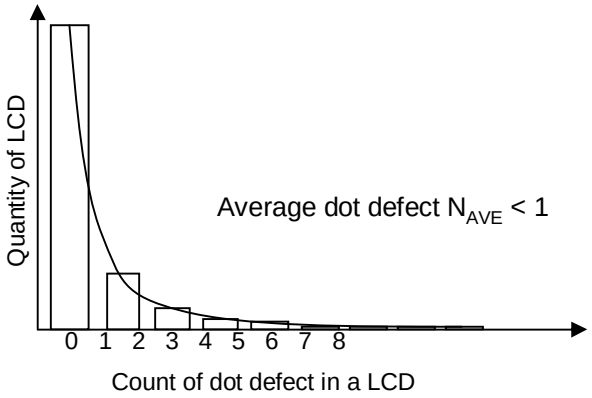


9.6. Electrical Inspection

(1) Dot defect

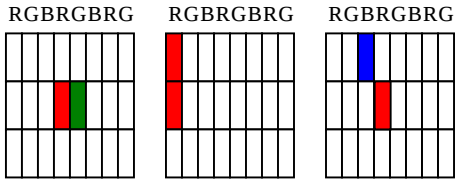
Defect type		Count	Reject
Bright dots	Random	N ≤ 5 (Green ≤ 3)	N > 5 (Green > 3)
	Two adjacent	N = 0	N > 0
	Three or more adjacent	Not allowed	
Dark dots	Random	N ≤ 5	N > 5
	Two adjacent	N = 1	N > 1
	Three or more adjacent	Not allowed	
Maximum allowable number of dot defect		N ≤ 8	N > 8
Maximum distance between defects	Bright - to - bright dot		L<15mm
	Dark - to - dark dot		L<10mm

1) Inspection patterns for dot defect are Pure Red, Green, Blue, Black, and White.
2) Adjacent two dots will be counted as two dots.
3) The distribution of dot defects should be below. Average value of dot defect s should be less than 1.



Required distribution of dot defect

4) The definition of 2 adjacent dots.

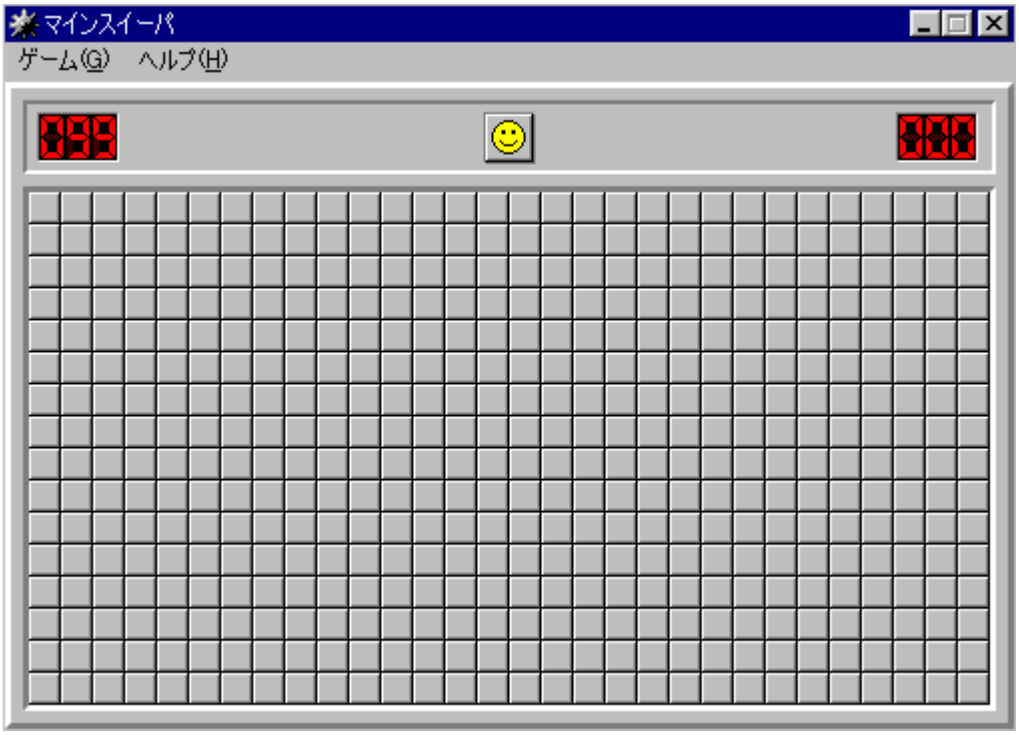


(2) Light leakage

Light leakage can not be seen between metal chassis (bezel) and glass when displaying black plane.

(3) Image sticking

Image sticking pattern shall not be to persist longer than 1second after displaying following pattern 8 hours in the room temperature condition.



(4) Glue/stain/dirt

Glue, non-removable stain and dirt which are visible in the inspection area are not acceptable.

10. Packing

10.1. Carton

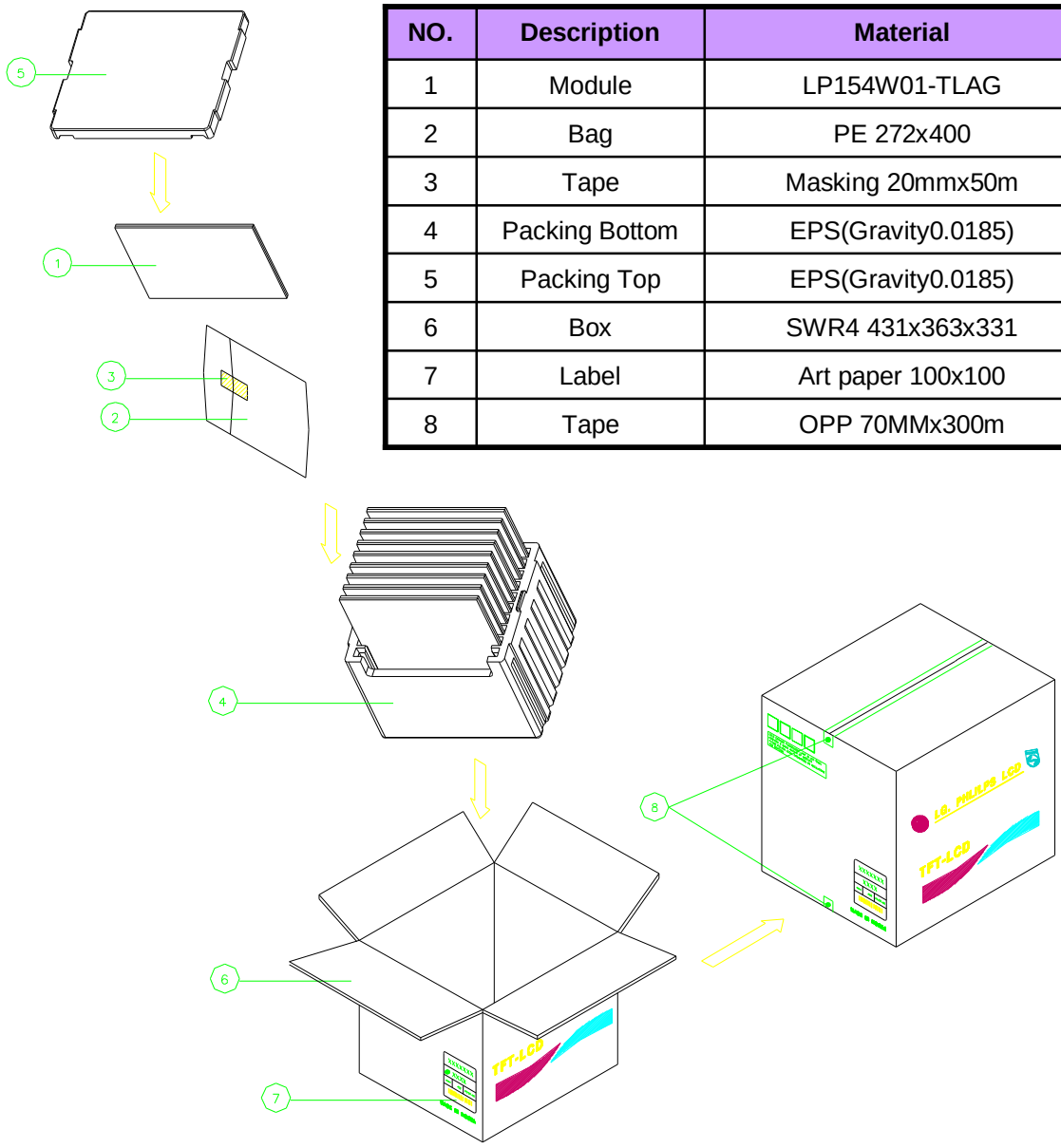
(1) Packing Form

Corrugated cardboard box and EPS Packing

(2) Packing Method

Packing Material : EPS(Gravity 0.0185)

Packing Weight: : 261g
(1BOX/20Module)
Packing weight, 20 pcs modules included :12.3kg



NO.	Description	Material
1	Module	LP154W01-TLAG
2	Bag	PE 272x400
3	Tape	Masking 20mmx50m
4	Packing Bottom	EPS(Gravity0.0185)
5	Packing Top	EPS(Gravity0.0185)
6	Box	SWR4 431x363x331
7	Label	Art paper 100x100
8	Tape	OPP 70MMx300m

(3) Packing Specification

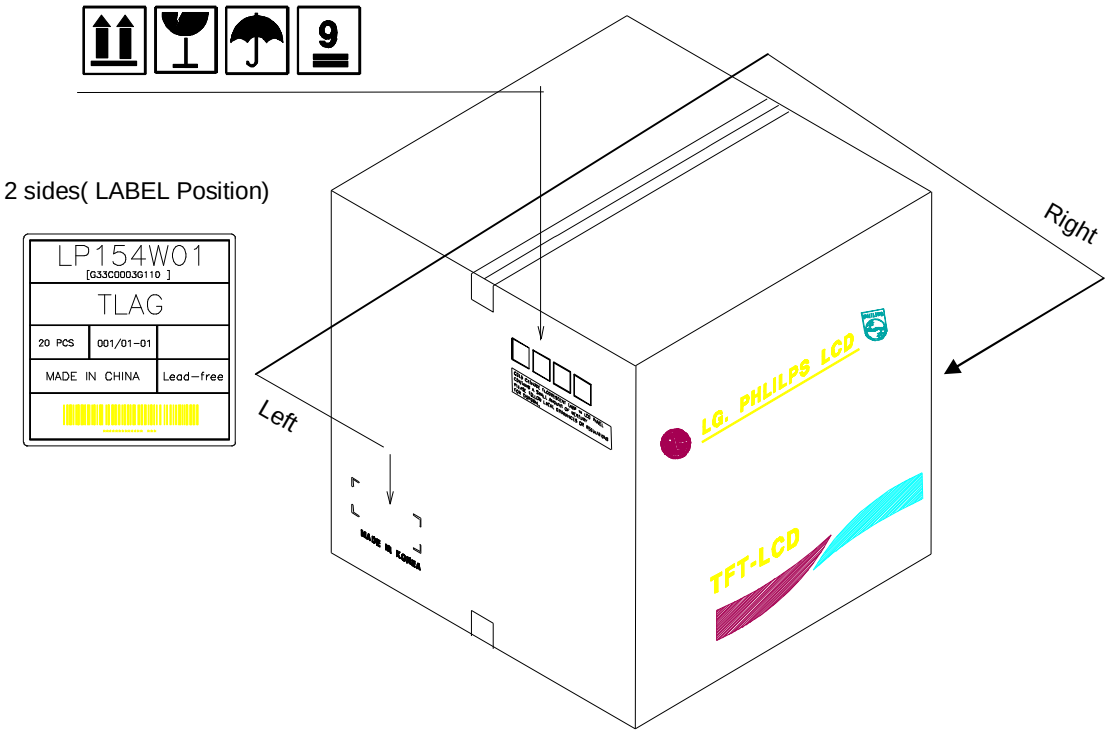
Item	Conditions
Packing Vibration	Frequency Range : 5 - 500 - 5 Hz, Degree of acceleration 1.0G(9.8m/s^2). Sweep rate 27 minutes Resonance Frequency : 1.0G(9.8m/s^2), 30minutes each Axis(X, Y, Z direction) : Non Operation Random 1.06Grms, 30minutes each Axis(X, Y, Z direction) : Non Operation
Packing Drop Test	1 Angle, 3 Edge, 6 Face, 70 cm

(4) Package Label

Package label should be at least shown the following information.

a) TOSHIBA code name(**G33C0003G110**) which will be numbered by Toshiba
b) Revision number which be numbered by LCD maker
c) Quantity
d) LCD maker
e) Model number which be numbered by LCD maker
f) Production Year / Month

(5) Location of Package label : 2 points (Side)



11. Labels and Lamp Ass'y Exchange

11.1. LCD code Label on LCD

LCD code label should be at least shown the following information.

(1) TOSHIBA code name (**G33C0003G110**) which will be numbered by Toshiba & Bar code
(Bar code : CODE-39 High-density)

(2) LGPL Serial number CODE (numbered by LCD maker , less than equal 13 digits)

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

A,B,C : SIZE(INCH)
D : YEAR
E : MONTH
F ~ M : SERIAL NO.

Note

1. YEAR

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mark	1	2	3	4	5	6	7	8	9	0

2. MONTH

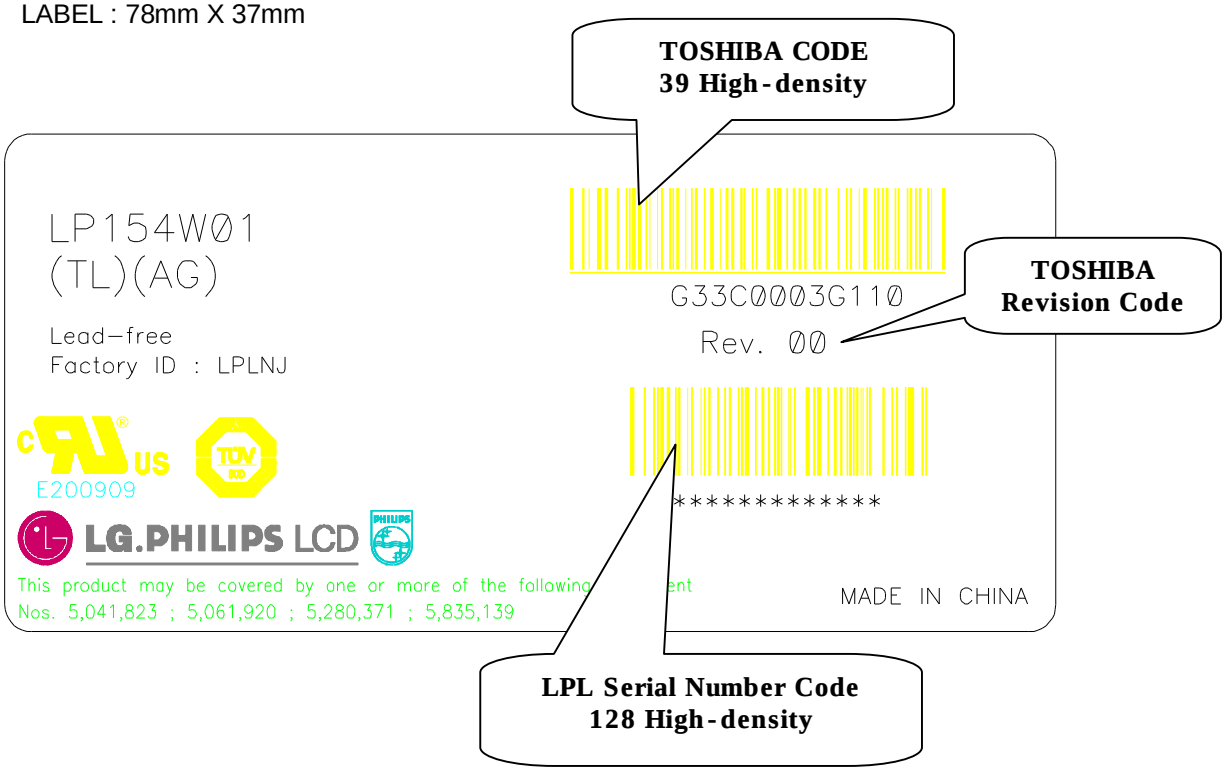
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	1	2	3	4	5	6	7	8	9	A	B	C

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.

Example >

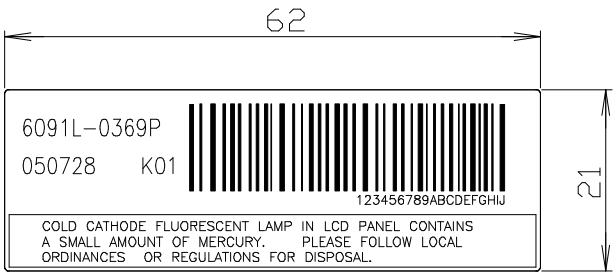
LABEL : 78mm X 37mm



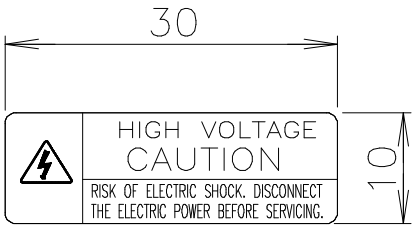
The revision code is inserted in the label by Toshiba request. If the contents of the specification need to be change under mass-production, the code can be revised after Toshiba's approval. Although there is not items in the contents of the specification, Toshiba can requests LPL to change the revision code.

11.2. Caution Texture and Labels on LCD

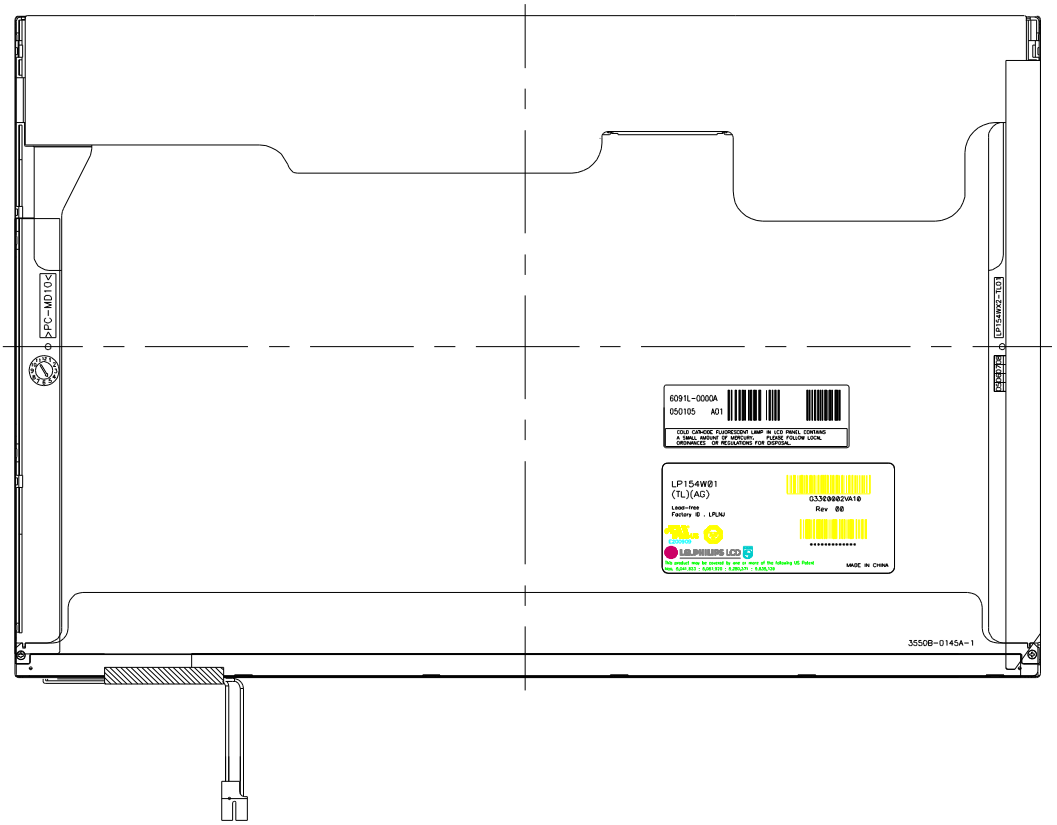
[Disposal of CCFL]



[High Voltage]



11.3. Label Locations on LCD



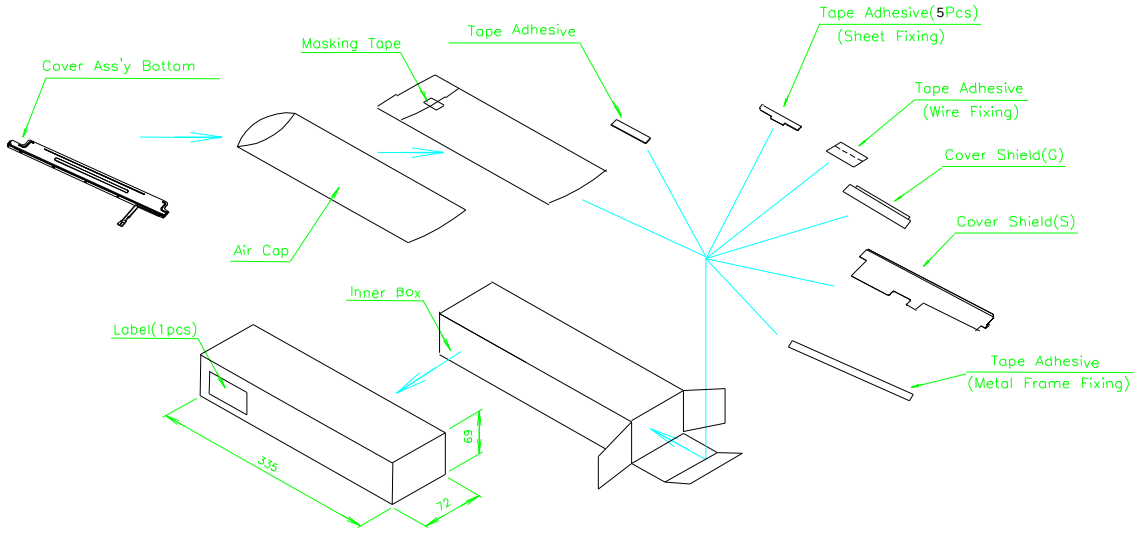
11.4. Others

(1) Backlight repair parts kit : 6913L-0275R (G33C00030110)

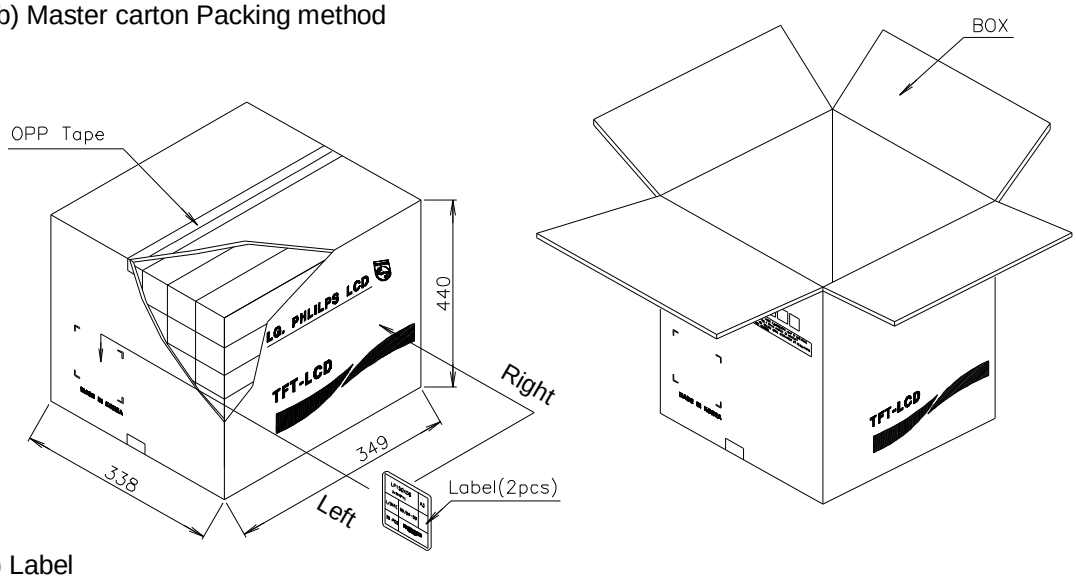
No.	Part	Product Code	Maker	Qt'y	Note
1	Cover Ass'y Bottom	3550B-0145A	Sung Ahn, han sung	1	
2	Cover Shield(S)	3550S-0213B	Geo rim	1	
3	Cover Shield(G)	3550S-0080B	Jae Hyun	1	
4	Tape Adhesive	7250L-0050K	Jae Hyun	1	
5	Tape Adhesive	7250L-0080E	Jae Hyun	1	
6	Tape Adhesive	7250L-0077A	Jae Hyun	1	
7	Tape Adhesive	7250L-0023A	Jae Hyun	2	

(2) Package specification of Backlight repair parts kit

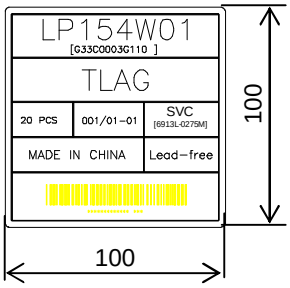
a) Individual packing



b) Master carton Packing method



c) Label



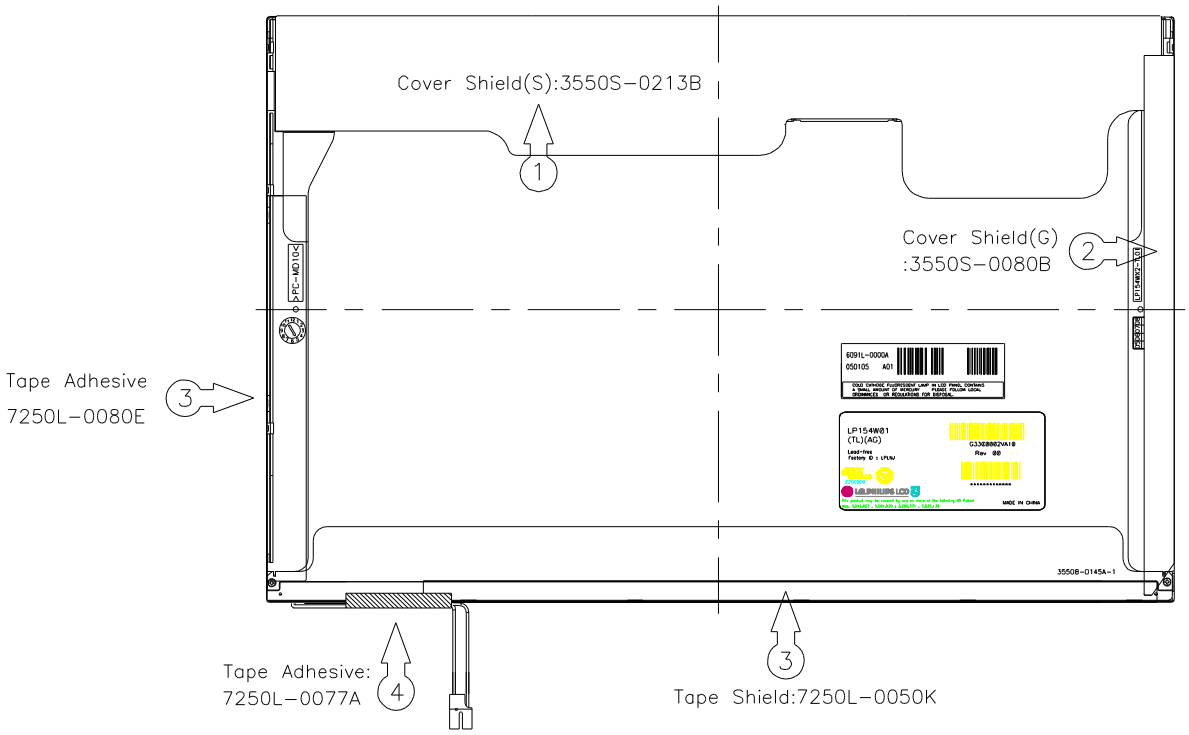
11.5. Instruction of changing the Lamp parts - Lamp Ass'y Exchange process

11.5.1. Disassembly of outside tape / Cover shield

(1) ① Disassembly of Cover shield(S)
Caution: Pressure or stress should not be given on Source PCB.
Usage of gloves with anti-electric discharge coating is recommended.
To eliminate possible damage on circuits occurred by ESC.

(2) ② Disassembly of Cover shield(G)
Caution: Pressure or stress should not be given on Gate COF.

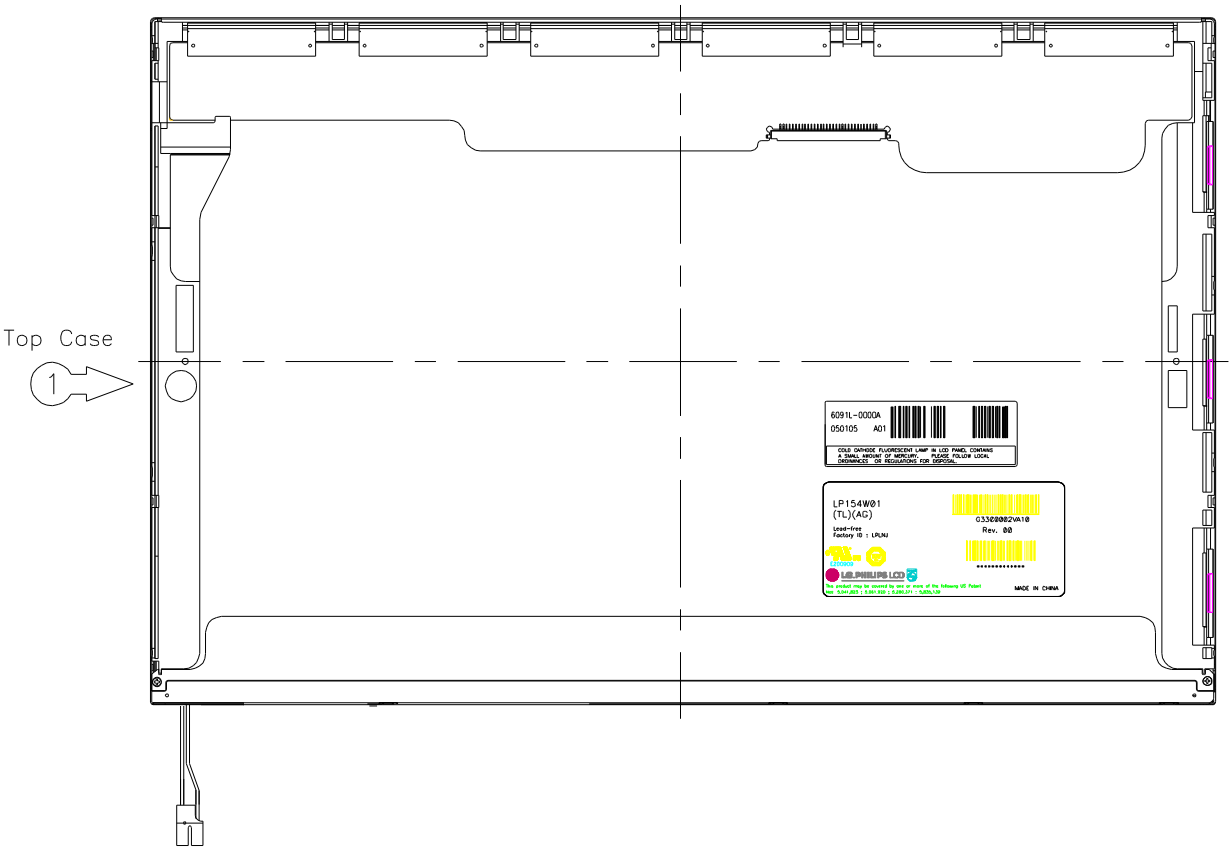
(3) ③ Disassembly of Tape Adhesive used for Top case fixing
④ Disassembly of Tape Adhesive used for B/L Wire fixing
Caution: Pressure or stress should not be given on Top case during this process



11.5.2. Disassembly of Top Case

(1) ① Disassembly of Top Case

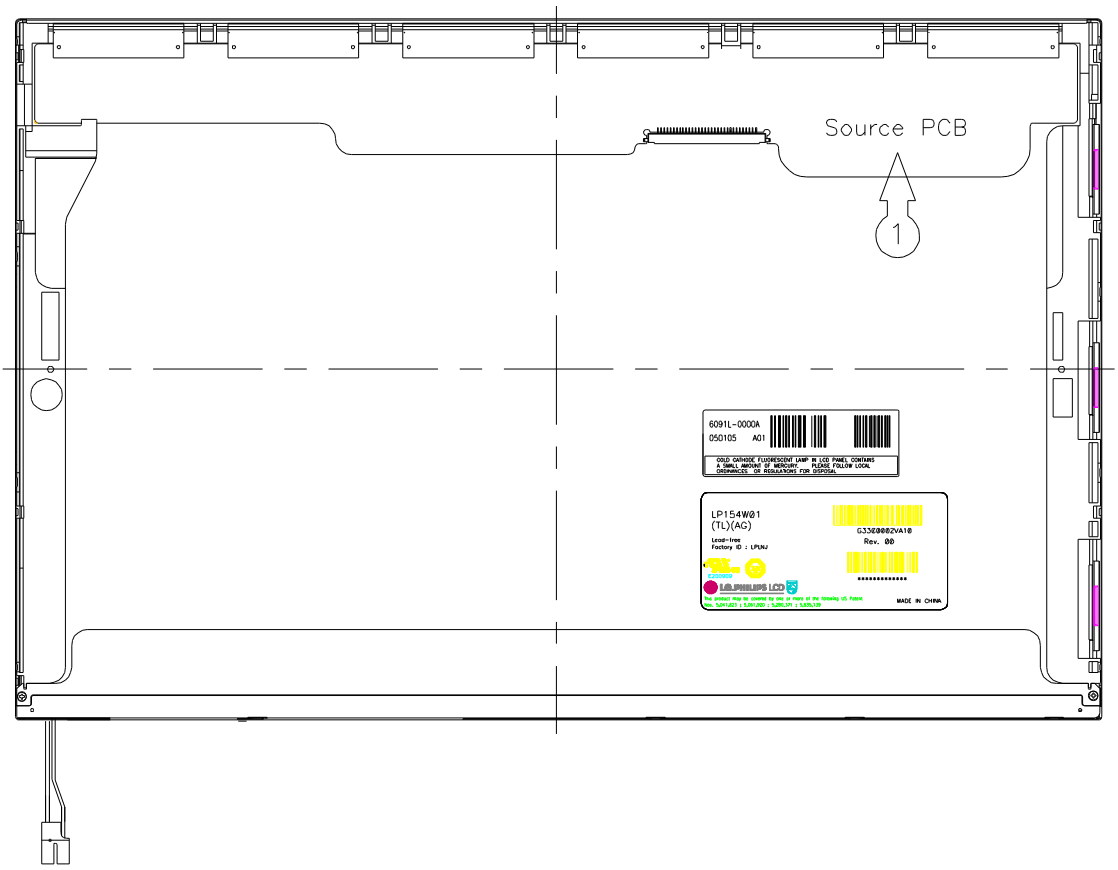
Caution: Pressure or stress should not be given on Source TCP and Gate COF.



11.5.3. Disassembly of Source PCB

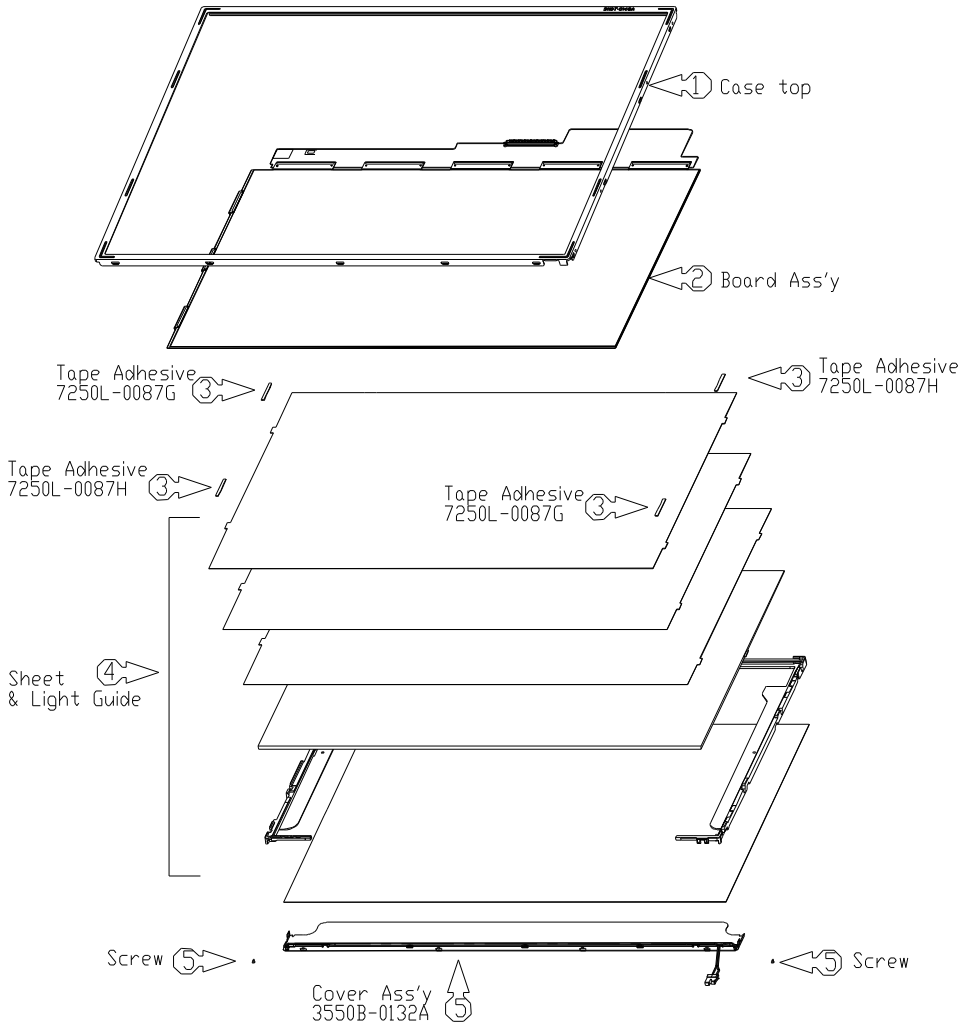
(1) ① Disassembly of Source PCB.

Caution: Pressure or stress should not be given on PCB and TCP



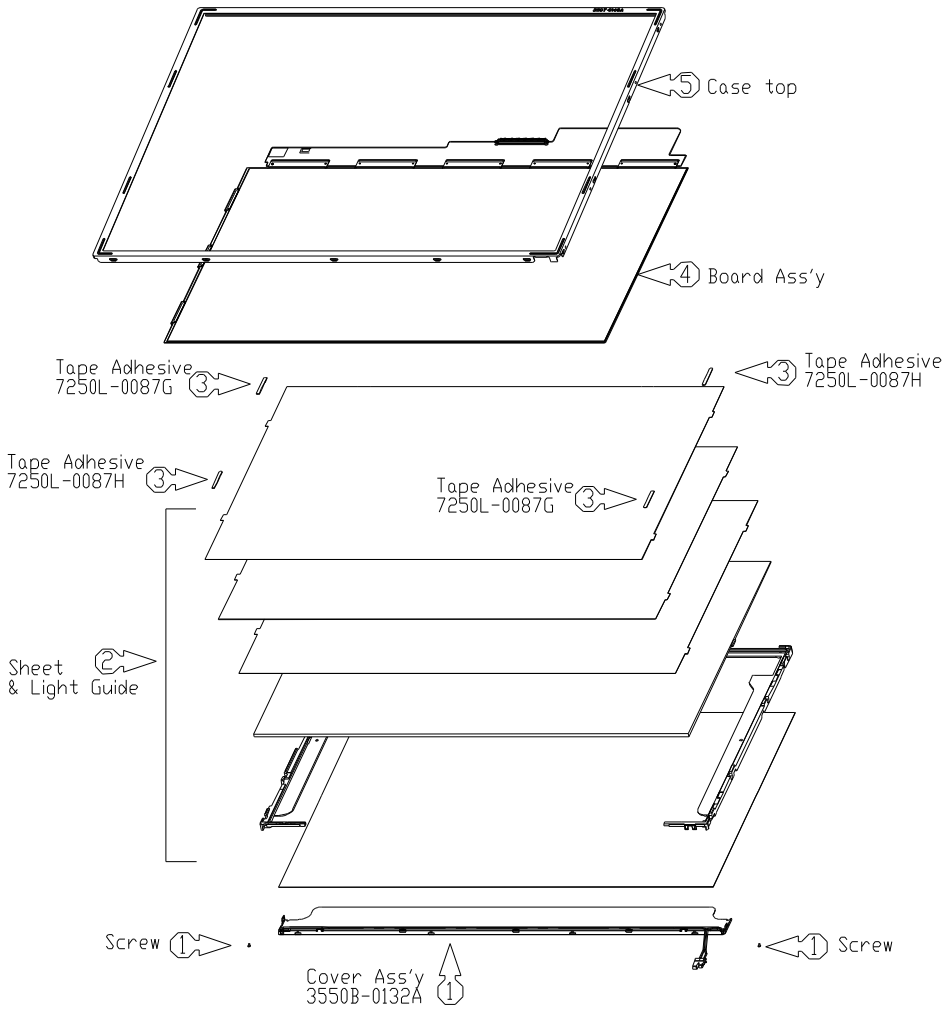
11.5.4. Disassembly of Case top, Board Ass'y, Tape Adhesive, Light guide, Cover Ass'y

(1) ① Disassembly of Case top
(2) ② Disassembly of Board Ass'y.
Caution: This process should be made in Clean room with no scratch nor particle on Polarizer and B/L Ass'y.
(3) ③ Disassembly of Tape Adhesive used for Sheets fixing (4Point).
(4) ④ Disassembly of Sheets, Light guide.
Caution: No penetration of foreign body is indispensable with no scratch on the surface of each Sheets.
(5) ⑤ Disassembly of Screw(2Point) and Cover Ass'y
Caution: Maximum value of torque with Screw should be below 1.5kg.



11.5.5. Assembly of Cover Ass'y, Sheets, Light guide, Tape Adhesive, Board Ass'y and Case top.

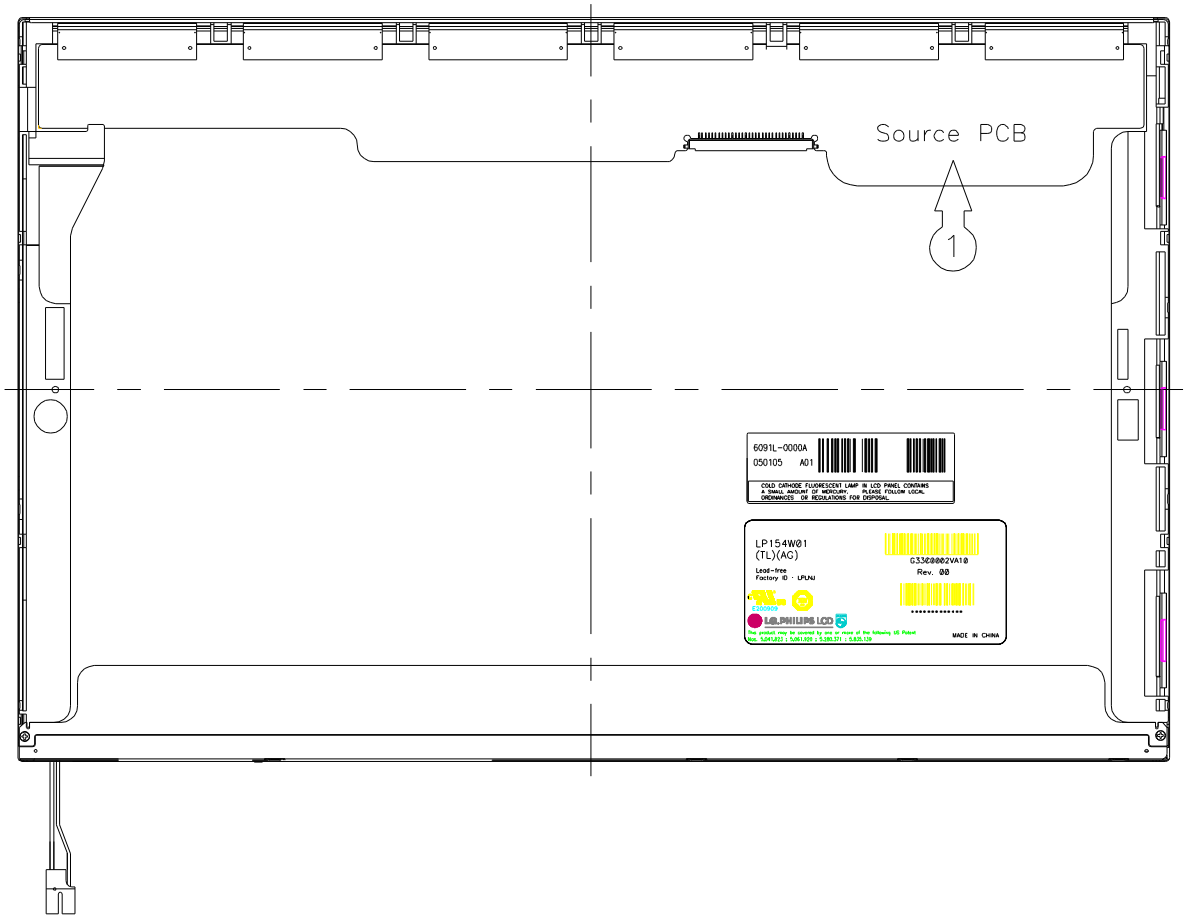
(1) ① Assembly of Cover Ass'y and Screw(2Point).
Caution: Maximum value of torque with Screw should be below 2.0kgf.cm
(2) ② Assembly of Light Guide and Sheets.(Reflector Sheet fixing with one Double Tape)
Caution: No penetration of foreign body is indispensable with no scratch on the surface of each Sheet and Light guide.
(3) ③ Assembly of Tape adhesive used for Sheets fixing(4Point)
(4) ④ Assembly of Board Ass'y.
Caution: Pressure or stress should not be given on PCB and COF.
(5) ⑤ Assembly of Case top



11.5.6. Assembly of Source PCB

(1) ① Assembly of Source PCB.

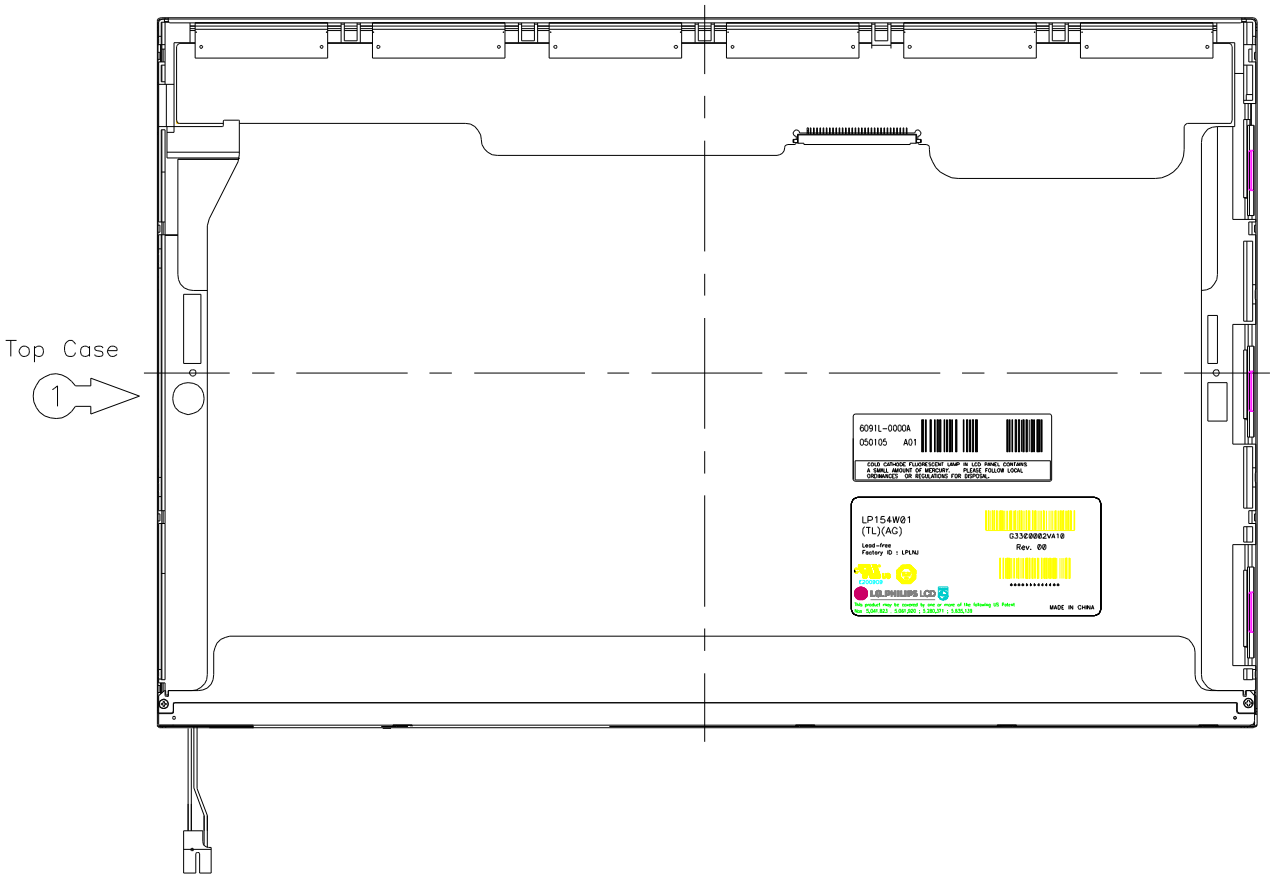
Caution: Stress should not be given on TCP



11.5.7. Assembly of Top Case

(1) ① Assembly of Top Case.

Caution: Pressure should not be given on Source TCP and Gate COF.



11.5.8. Assembly of outside Tape and Cover shield

(1) ① Assembly of Cover shield(S)

Caution: Pressure or stress should not be given on Source PCB.

Usage of gloves with anti-electric discharge coating is recommended

To eliminate possible damage on circuits occurred by ESC.

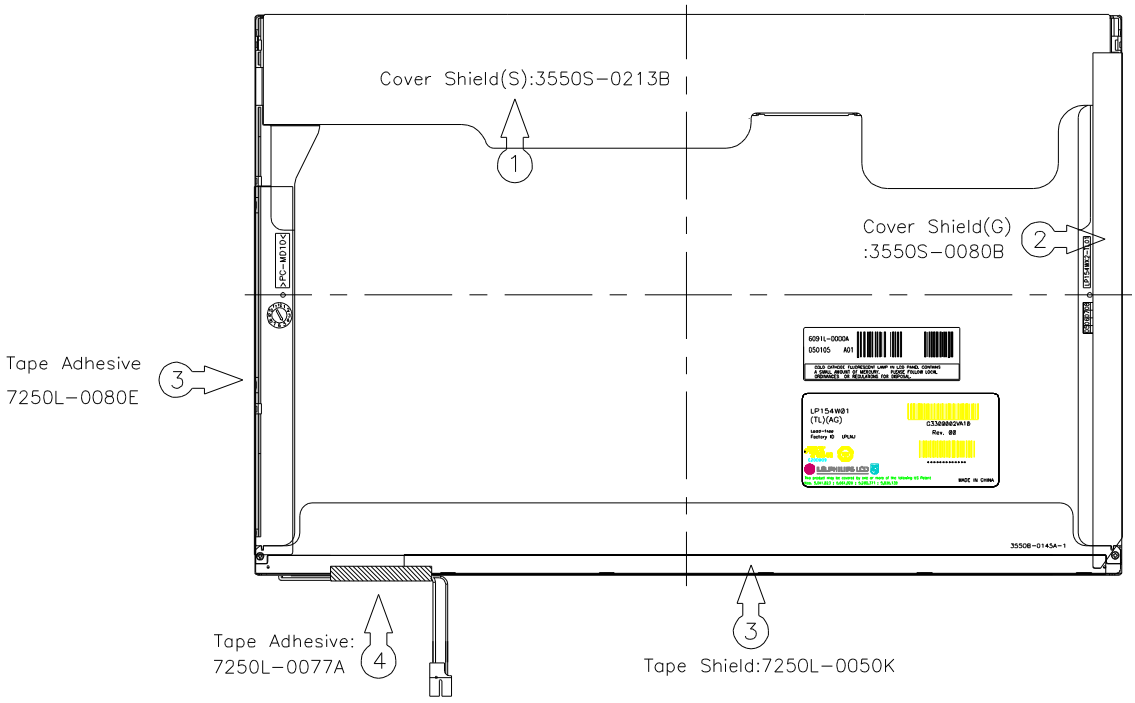
(2) ② Assembly of Cover shield(G)

Caution: Pressure or stress should not be given on Gate TCP.

(3) ③ Assembly of Tape Adhesive used for Top case fixing

④ Assembly of Tape Adhesive used for B/L Wire fixing

Caution: Pressure or stress should not be given on Top case during this process



12. General Precaution

Please pay attention to the followings when you use this TFT LCD module.

12.1. 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 aren't 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 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.

12.2. 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 co-work. When a Back-light unit is operating, it sounds. If you need to shield the noise, please co-work**.**

12.3. 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.

12.4. Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

12.5. 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.

12.6. 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.

< Appendix>

Byte# (decimal)	Byte# (HEX)	Field Name and Comments	Value (HEX)		Value (binary)	
0	00	Header	0	0	0000 0000	Header
1	01		F	F	1111 1111	
2	02		F	F	1111 1111	
3	03		F	F	1111 1111	
4	04		F	F	1111 1111	
5	05		F	F	1111 1111	
6	06		F	F	1111 1111	
7	07		0	0	0000 0000	
8	08	EISA manufacturer code = LPL	3	2	0011 0010	Vender/ Product ID
9	09	Compressed ASCII	0	C	0000 1100	
10	0A	Panel Supplier Reserved - Product code	0	0	0000 0000	
11	0B	(Hex, LSB first)	A	8	1010 1000	
12	0C	LCD Module Serial No. = 0(If not used)	0	0	0000 0000	
13	0D	LCD Module Serial No. = 0(If not used)	0	0	0000 0000	
14	0E	LCD Module Serial No. = 0(If not used)	0	0	0000 0000	
15	0F	LCD Module Serial No. = 0(If not used)	0	0	0000 0000	
16	10	Week of manufacture	0	0	0000 0000	
17	11	Year of manufacture = 2005	0	F	0000 1111	
18	12	EDID Structure version # = 1	0	1	0000 0001	EDID Version/ Revision
19	13	EDID Revision # = 2	0	2	0000 0010	
20	14	Video input definition = Digital I/p,non TMDS CRGB	8	0	1000 0000	Display Parameter
21	15	Max H image size(cm) = 33.12cm(33)	2	1	0010 0001	
22	16	Max V image size(cm) = 20.70cm(21)	1	5	0001 0101	
23	17	Display gamma = 2.2	7	8	0111 1000	
24	18	Feature support(DPMS) = Active off, RGB Color	0	A	0000 1010	
25	19	Red/Green low Bits	0	F	0000 1111	Color Characteristic
26	1A	Blue/White Low Bits	1	0	0001 0000	
27	1B	Red X Rx = 0.590	9	7	1001 0111	
28	1C	Red Y Ry = 0.344	5	8	0101 1000	
29	1D	Green X Gx = 0.324	5	2	0101 0010	
30	1E	Green Y Gy = 0.535	8	8	1000 1000	
31	1F	Blue X Bx = 0.157	2	8	0010 1000	
32	20	Blue Y By = 0.138	2	3	0010 0011	
33	21	White X Wx = 0.313	5	0	0101 0000	
34	22	White Y Wy = 0.329	5	4	0101 0100	
35	23	Established Timing I	0	0	0000 0000	Established Timings
36	24	Established Timing II	0	0	0000 0000	
37	25	Manufacturer's Timings	0	0	0000 0000	
38	26	Standard Timing Identification 1 was not used	0	1	0000 0001	Standard Timing ID
39	27	Standard Timing Identification 1 was not used	0	1	0000 0001	
40	28	Standard Timing Identification 2 was not used	0	1	0000 0001	
41	29	Standard Timing Identification 2 was not used	0	1	0000 0001	
42	2A	Standard Timing Identification 3 was not used	0	1	0000 0001	
43	2B	Standard Timing Identification 3 was not used	0	1	0000 0001	
44	2C	Standard Timing Identification 4 was not used	0	1	0000 0001	
45	2D	Standard Timing Identification 4 was not used	0	1	0000 0001	
46	2E	Standard Timing Identification 5 was not used	0	1	0000 0001	
47	2F	Standard Timing Identification 5 was not used	0	1	0000 0001	
48	30	Standard Timing Identification 6 was not used	0	1	0000 0001	
49	31	Standard Timing Identification 6 was not used	0	1	0000 0001	
50	32	Standard Timing Identification 7 was not used	0	1	0000 0001	
51	33	Standard Timing Identification 7 was not used	0	1	0000 0001	
52	34	Standard Timing Identification 8 was not used	0	1	0000 0001	
53	35	Standard Timing Identification 8 was not used	0	1	0000 0001	

< Appendix>

Byte# (decimal)	Byte# (HEX)	Field Name and Comments	Value (HEX)		Value (binary)	
54	36	Detailed Timing Descriptor #1	E	A	1110 1010	Detailed Timing Description #1
55	37	1280 X 800 @ 60㎐ mode : pixel clock = 68.9㎒	1	A	0001 1010	
56	38	Horizontal Active = 1280 pixels	0	0	0000 0000	
57	39	Horizontal Blanking = 128 pixels	8	0	1000 0000	
58	3A	Horizontal Active : Horizontal Blanking = 1280 : 128	5	0	0101 0000	
59	3B	Vertical Avtive = 800 lines	2	0	0010 0000	
60	3C	Vertical Blanking = 16 lines	1	0	0001 0000	
61	3D	Vertical Active : Vertical Blanking = 800 : 16	3	0	0011 0000	
62	3E	Horizontal Sync. Offset = 24 pixels	1	8	0001 1000	
63	3F	Horizontal Sync Pulse Width = 32 pixels	2	0	0010 0000	
64	40	Vertical Sync Offset = 4 lines, Sync Width = 4 lines	4	4	0100 0100	
65	41	Horizontal Vertical Sync Offset/Width upper 2bits = 0	0	0	0000 0000	
66	42	Horizontal Image Size = 33.12cm(331)	4	B	0100 1011	
67	43	Vertical Image Size = 207㎜(207)	C	F	1100 1111	
68	44	Horizontal & Vertical Image Size	1	0	0001 0000	
69	45	Horizontal Border = 0	0	0	0000 0000	
70	46	Vertical Border = 0	0	0	0000 0000	
71	47	Non-interlaced,Normal display,no stereo,Digital separate sync,H/V pol negatives	1	9	0001 1001	
72	48	Detailed Timing Descriptor #2	0	0	0000 0000	Detailed Timing Description #2
73	49		0	0	0000 0000	
74	4A		0	0	0000 0000	
75	4B		0	0	0000 0000	
76	4C		0	0	0000 0000	
77	4D		0	0	0000 0000	
78	4E		0	0	0000 0000	
79	4F		0	0	0000 0000	
80	50		0	0	0000 0000	
81	51		0	0	0000 0000	
82	52		0	0	0000 0000	
83	53		0	0	0000 0000	
84	55		0	0	0000 0000	
85	55		0	0	0000 0000	
86	56		0	0	0000 0000	
87	57		0	0	0000 0000	
88	58		0	0	0000 0000	
89	59		0	0	0000 0000	
90	5A	Detailed Timing Descriptor #3	0	0	0000 0000	Detailed Timing Description #3
91	5B		0	0	0000 0000	
92	5C		0	0	0000 0000	
93	5D		F	E	1111 1110	
94	5E		0	0	0000 0000	
95	5F	L	4	C	0100 1100	
96	60	G	4	7	0100 0111	
97	61	P	5	0	0101 0000	
98	62	H	6	8	0110 1000	
99	63	I	6	9	0110 1001	
100	64	L	6	C	0110 1100	
101	65	I	6	9	0110 1001	
102	66	P	7	0	0111 0000	
103	67	S	7	3	0111 0011	
104	68	L	4	C	0100 1100	
105	69	C	4	3	0100 0011	
106	6A	D	4	4	0100 0100	
107	6B	LF	0	A	0000 1010	

< Appendix>

Byte# (decimal)	Byte# (HEX)	Field Name and Comments	Value (HEX)	Value (binary)	
108	6C	Detailed Timing Descriptor #4	0 0	0000 0000	Detailed Timing Description #4
109	6D		0 0	0000 0000	
110	6E		0 0	0000 0000	
111	6F		F E	1111 1110	
112	70		0 0	0000 0000	
113	71	L	4 C	0100 1100	
114	72	P	5 0	0101 0000	
115	73	1	3 1	0011 0001	
116	74	5	3 5	0011 0101	
117	75	4	3 4	0011 0100	
118	76	W	5 7	0101 0111	
119	77	0	3 0	0011 0000	
120	78	1	3 1	0011 0001	
121	79	-	2 D	0010 1101	
122	7A	T	5 4	0101 0100	
123	7B	L	4 C	0100 1100	
124	7C	A	4 1	0100 0001	
125	7D	G	4 7	0100 0111	
126	7E	Extension flag = 00	0 0	0000 0000	Extension Flag
127	7F	Checksum	7 4	0111 0100	Checksum