SPECIFICATION
FOR
APPROVAL

(   ) **Preliminary Specification**

(●) **Final Specification**
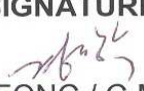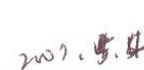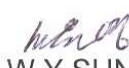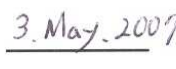
Title	8.4" SVGA TFT LCD

Customer	
Project	

SUPPLIER	LG.Philips LCD Co., Ltd.
MODEL	LB084S01
Suffix	TL01

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

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

Product Specification

Contents

RECORD OF REVISIONS

| Revision No	Revision Date	Page	Description
0.0	Dec. 06. 2006	-	First Draft
0.1	Dec. 13. 2006	4	Add main view angle
		6	Change I_{CC} ,Pc and V_{FH} . (I_{CC}:0.218→0.156,Pc: 0.72→0.51,V_{FH} Min:0.7VCC→2.6,V_{FH} Max:VCC→3.6V)
		10~12	Add "3-3.Connection between host system and LVDS receiver"
0.2	Feb. 7. 2007	4,6	Change I_{CC} and Pc. (Icc typ. : 0.156→0.184, Icc max : 0.180→0.212) (Pc typ : 0.51→0.61, Pc max : 0.59→0.70) Update Lamp electrical characteristics.
		9	Change lamp CNT model.(BHSR-02VS-1 → BHSR-02VS-2)
		25	Update weight and change tolerance.
		26~8	Update mechanical drawing.
		29	Add thermal shock test condition.
0.3	Mar. 12. 2007	6	Change operating voltage(Typ:400 V_{RMS} →390 V_{RMS}), power consumption(Typ:5.6W→5.46W) and operating frequency(Min:35→30)
		21	Change viewing angle spec.[up(typ):65→70, up(min):60→65) [down(typ):55→50, down(min):50→45]
		25,26	Change depth tolerance.(±0.5 →±0.3)
		29	Change shock test & vibration test condition
1.0	April. 23. 2007	12	Update Table 5.
		21	Update R,G,B color coordinates.
		27	Update mechanical drawing.
		-	Final specification

Product Specification

1. General Description

The LB084S01 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 8.4 inches diagonally measured active display area with SVGA resolution(600 vertical by 800 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(or 6-bit) gray scale signal for each dot, thus, presenting a palette of more than 16,777,216(or 262,144) colors.

The LB084S01 has been designed to apply the interface method that enables low power, high speed, low EMI.

The LB084S01 is intended to support applications where thin thickness, low power are critical factors and graphic displays are important. In combination with the vertical arrangement of the sub-pixels, the LB084S01 characteristics provide an excellent flat display for office automation products such as Mini-Notebook PC or Web-pad, etc.
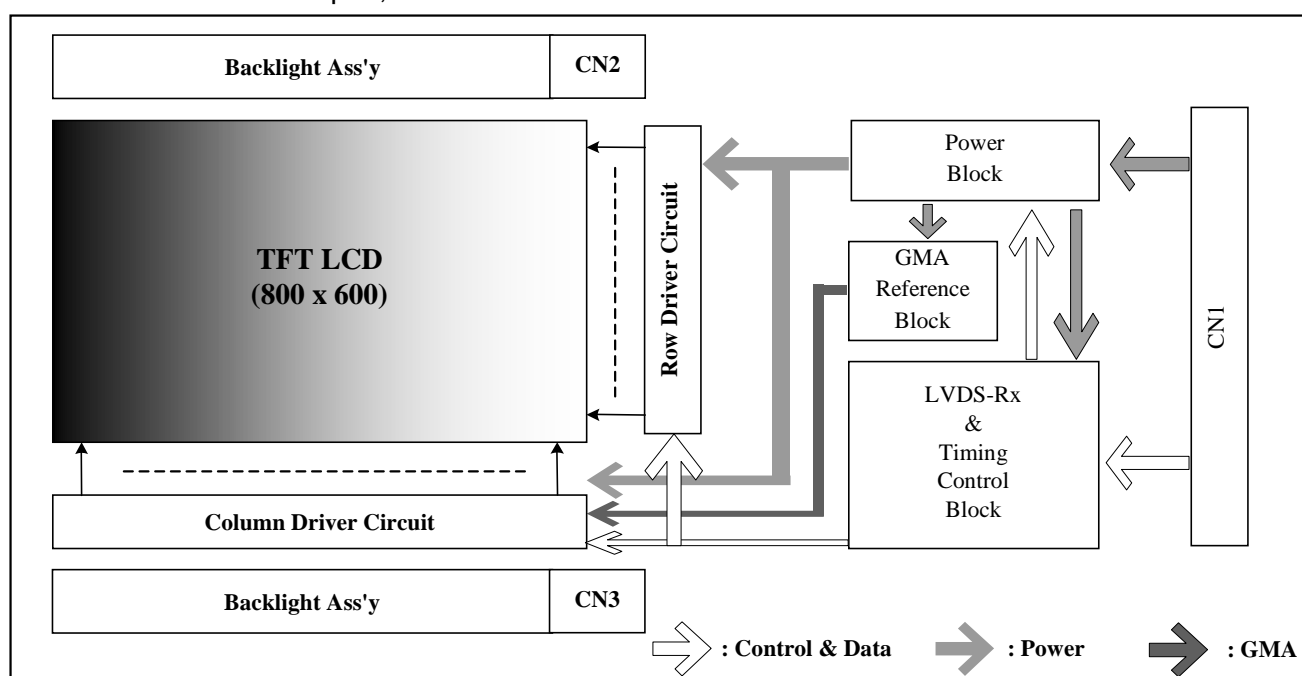
General Features

| Active Screen Size	8.4 inches (213mm) diagonal
Outline Dimension	189.5(H) x 148.6(V) x 9.1(D) mm(Typ.)
Main Viewing Angle	12 o'clock =up side (viewing direction with image reversal)
Pixel Pitch	0.2130(H) mm x 0.2130(V)mm
Pixel Format	800(H) By 600 (V) Pixels RGB stripes arrangement
Color Depth	16,777,216 colors(At 8-bit input) 262,144 colors(At 6-bit input)
Luminance, White	600 cd/m^2(Typ.)
Power Consumption	0.61Watt (Typ., Only module), Total 6.07Watt(Typ., module+2 lamp)
Weight	330. (Max.)
Display Operating Mode	Transmissive mode, normally white
Surface Treatment	Anti-glare & hard coating(3H)

LG.PHILIPS LCD

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		
Power Supply Voltage	VCC	-0.3	4.0	Vdc	at 25 ± 5°C
Input Voltage for Signal	V_{Dis}	-0.3	VCC+0.3	Vdc	2
Operating Temperature	T_{OP}	-10	70	°C	1
Storage Temperature	H_{ST}	-20	80	°C	1
Operating Ambient Humidity	H_{OP}	10	90	%RH	1
Storage Humidity	H_{ST}	10	90	%RH	1

Notes : 1. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 58°C Max, and no condensation of water.
2. D0+/-, D1+/-, D2+/-, CK+/-, D3+/-, DIR, FRC

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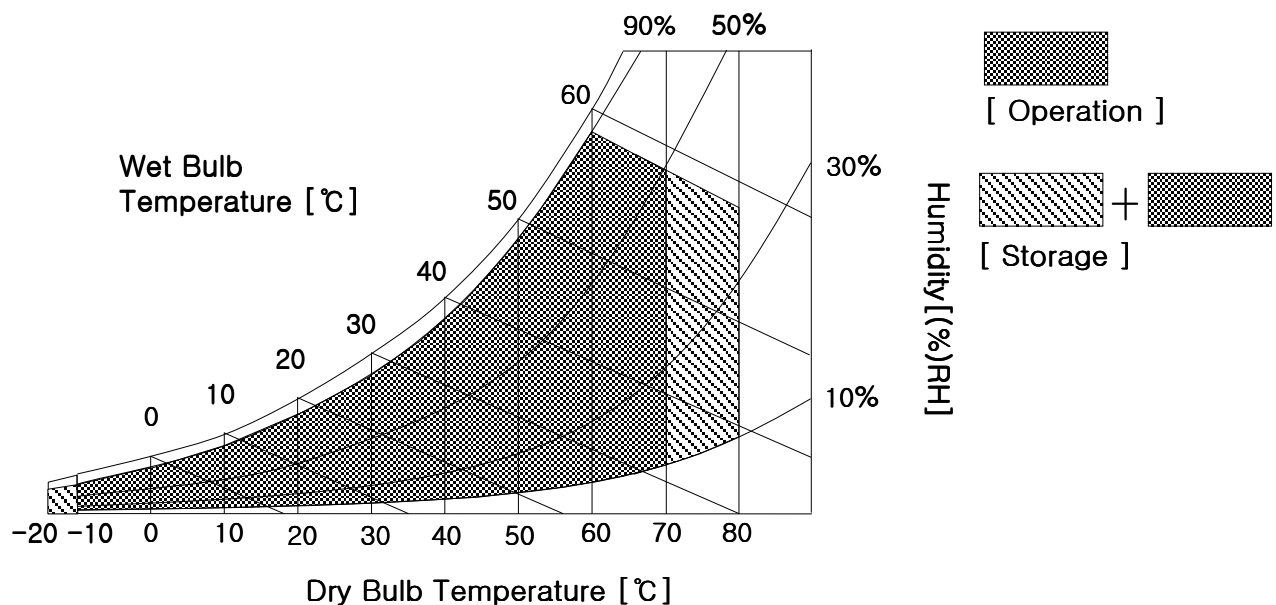
3. Electrical Specifications

3-1. Electrical Characteristics

The LB084S01 requires three power inputs. CN1 is employed to power the LCD electronics and to drive the TFT array and liquid crystal. CN2 and CN3 input which powers the CCFL, are typically generated by two inverters. The inverters are external unit to the LCD.

Table 2. ELECTRICAL CHARACTERISTICS

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
MODULE :							
Power Supply Input Voltage		VCC	3.0	3.3	3.6	V_{DC}	
DIR and FRC Input	High	V_{FH}	3.0	3.3	3.6	V	
Voltage	Low	V_{FL}	0	-	0.2	V	
Power Supply Input Current		I_{CC}	-	0.184	0.212	A	1
Power Consumption		Pc	-	0.61	0.70	Watt	1
Differential Impedance		Zm	90	100	110	Ohm	2
LAMP :							
Operating Voltage		V_{BL}	380 (8 mA_{RMS})	390 (7 mA_{RMS})	480 (3 mA_{RMS})	V_{RMS}	3
Operating Current		I_{BL}	3.0	7.0	8.0	mA_{RMS}	4
Power Consumption		P_{BL}	-	5.46	6.01	W	5
Operating Frequency		f_{BL}	30	60	80	kHz	6
Discharge Stabilization Time		Ts	-	-	3	Min	7
Life Time			20,000	30,000	-	Hrs	8
Established Starting Voltage	at 25℃	Vs	-	-	800	V_{RMS}	9
	at 0 ℃		-	-	1050	V_{RMS}	

Notes :
1. The specified current and power consumption are under the VCC = 3.3V,25℃,8bit,fv=60Hz condition whereas mosaic(8x6) pattern is displayed and fv is the frame frequency.

   ※ Mosaic pattern(8x6)
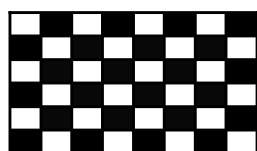
2. This impedance value is needed to proper display and measured form LVDS Tx to the mating connector.
3. The variance of the voltage is ± 10%
4. The typical operating current is 7mArms for the typical surface luminance (L_{WH}) in optical characteristics.
5. The lamp power consumption shown above does not include loss of external inverter.
   The used lamp current is the lamp typical current.($P_{BL} = V_{BL}$ x I_{BL} x N_{Lamp})

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6. The output of the inverter must have symmetrical(negative and positive) voltage waveform and symmetrical current waveform.(Asymmetrical ratio is less than 10%) Please do not use the inverter which has asymmetrical voltage and asymmetrical current and spike wave.
   Lamp frequency may produce interface with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore lamp frequency shall be as away possible from the horizontal synchronous frequency and from its harmonics in order to prevent interference.

7. Define the brightness of the lamp after being lighted for 5 minutes as 100%, Ts is the time required for the brightness of the center of the lamp to be not less than 95%.

8. The life time is determined as the time at which brightness of lamp is 50% compare to that of initial value at the typical lamp current

9. The voltage above Vs should be applied to the lamp for more than 1 second for start-up, Otherwise, the lamp may not be turned on, The used lamp current is the lamp typical current.

10. 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.
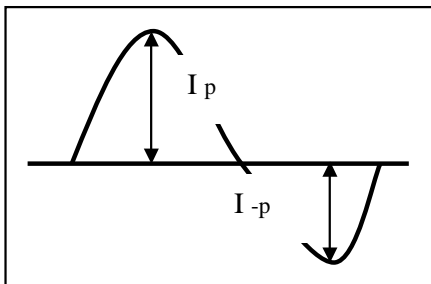
* Asymmetry rate:

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

* Distortion rate

$$I_p \ (or \ I_{-p}) / I_{RMS}$$

※ Do not attach a conducting tape to lamp connecting wire.
   If the lamp wire attach to a conducting tape, TFT-LCD Module has a low luminance and the inverter has abnormal action. Because leakage current is occurred between lamp wire and conducting tape.
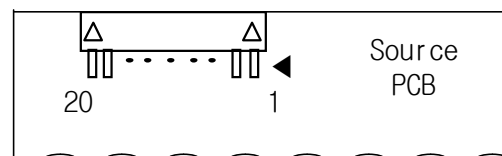
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3-2. Interface Connections

This LCD employs three interface connections, a 20 pin connector(CN1) is used for the module electronics interface and the other connectors(CN2&CN3) are used for the integral backlight system.

The electronics interface connector is a model GT100-20P-LS-SMT manufactured by LS Cable.

Table 3. MODULE CONNECTOR PIN CONFIGURATION (CN1)

Pin	Symbol	Description	Notes
1	D3+	Positive LVDS differential data input	Note 1
	GND	Ground	
2	D3-	Negative LVDS differential data input	Note 1
	GND	Ground	
3	DIR	Selection of scan direction	Note 2
4	FRC	Selection of number of color	Note 1
5	GND	Ground	
6	CK+	Positive LVDS differential clock input	Note 3
7	CK-	Negative LVDS differential clock input	Note 3
8	GND	Ground	
9	D2+	Positive LVDS differential data input	Note 3
10	D2-	Negative LVDS differential data input	Note 3
11	GND	Ground	
12	D1+	Positive LVDS differential data input	Note 3
13	D1-	Negative LVDS differential data input	Note 3
14	GND	Ground	
15	D0+	Positive LVDS differential data input	Note 3
16	D0-	Negative LVDS differential data input	Note 3
17	GND	Ground	
18	GND	Ground	
19	VCC	Power Supply, 3.3V Typ.	
20	VCC	Power Supply, 3.3V Typ.	

Notes:

■ Interface chips
- LCD : KE5M6U2730WFP (LCD Controller)
  including LVDS Receiver
- System : THC63LVDM63R / 83R
  or Equivalent
  * Pin to Pin compatible with NS LVDS

■ Connector
- LCD : GT100-20P-LS-SMT, LS Cable
  or Equivalent
- Mating
  Discrete Wire type : DF19G-20S-1C(HIROSE)
  FPC Type   : DF19G-20S-1F(HIROSE)
- Connector pin arrangement

```
       △           △
      ┌─────────────┐        Source
      ║║ ・・・・ ║║ ◄      PCB
      20            1
```

[LCD Module rear view]

Note1 : See "3-6. Display color and Input data signal"
Note2 : See "3.8. Scanning Directions"
Note3 : See "3.4. Signal Timing Specification"

Product Specification

The backlight interface connectors are model BHSR-02VS-2, manufactured by JST or Compatible.

The mating connector part number is SM02B-BHSS-1 or equivalent.

Table 4. BACKLIGHT CONNECTOR PIN CONFIGURATION (CN2 & CN3)

Pin	Symbol	Description	Wire color
1	HV	Power supply for lamp (High voltage side)	Pink
2	LV	Power supply for lamp (Low voltage side)	Black

3-3. Connection between Host system and LVDS receiver

Connection between Host system and LVDS receiver should be different by input signal condition(8bit or 6bit). Please refer to 3.3.1 and 3.3.2.

3.3.1 Input data signal : 8bit

If input data is 8bit, connect MSB 2bit of R,G,B to TD0~TD5 pin of LVDS Tx. Refer to FIG 1 and Table 5 for more detail.

FIG 1. REQUIRED SIGNAL ASSIGNMENT FOR LVDS TRANSMITTER(THC63LVDM83R)
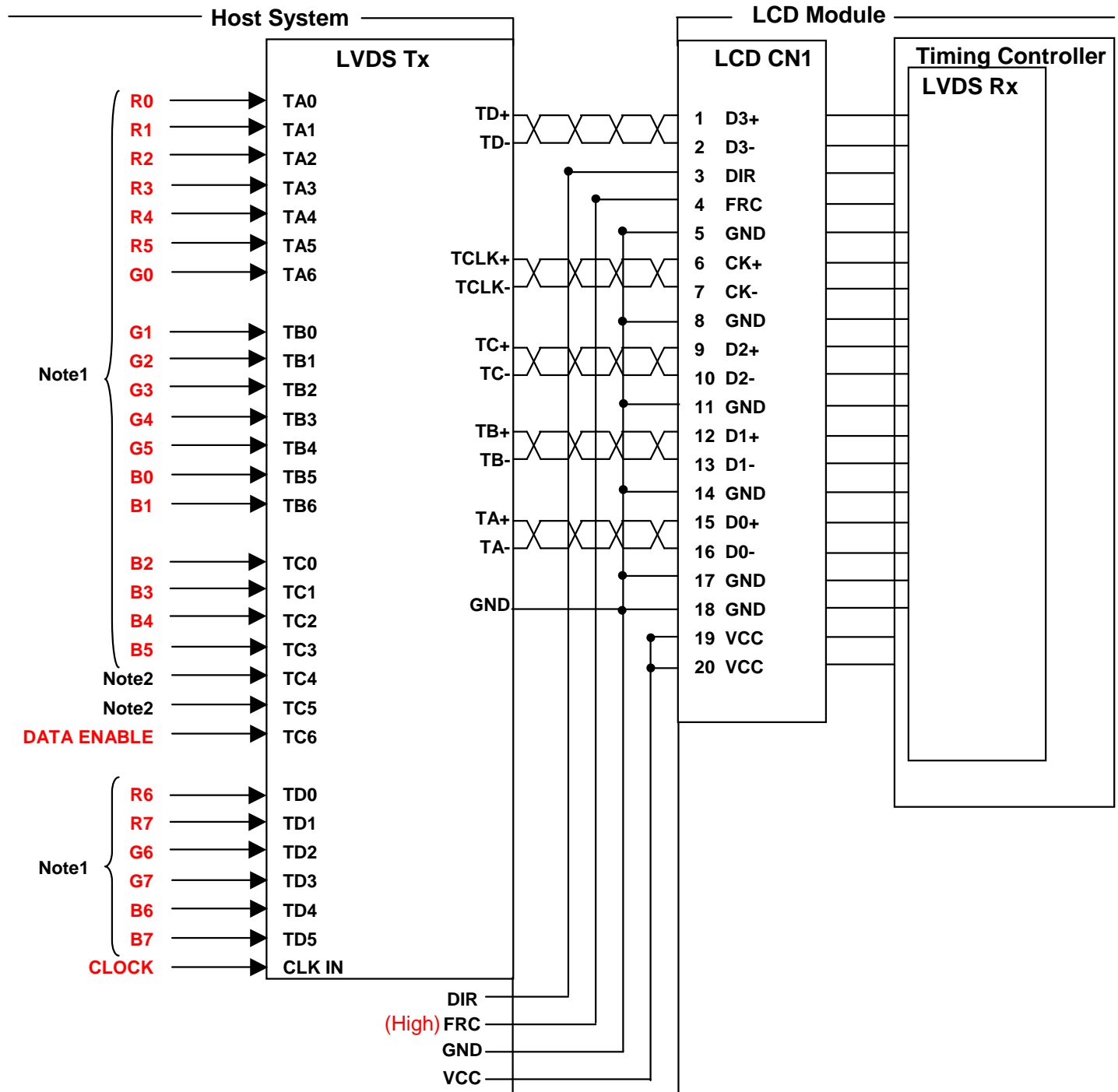
Note1 : See "Table 5. Input pin map of LVDS Tx for 8bit and 6bit"
Note2 : Connect to ground.

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3.3.2 Input data signal : 6bit

If input data is 6bit, pin map of host system should be different with 8bit. Refer to FIG 2 for more detail.

FIG 2. REQUIRED SIGNAL ASSIGNMENT FOR LVDS TRANSMITTER(THC63LVDM83R)

Host System

LVDS Tx

Signal	Pin
R0	TA0
R1	TA1
R2	TA2
R3	TA3
R4	TA4
R5	TA5
G0	TA6
G1	TB0
G2	TB1
G3	TB2
G4	TB3
G5	TB4
B0	TB5
B1	TB6
B2	TC0
B3	TC1
B4	TC2
B5	TC3
Note2	TC4
Note2	TC5
DATA ENABLE	TC6
Note2	TD0
Note2	TD1
Note2	TD2
Note2	TD3
Note2	TD4
Note2	TD5
CLOCK	CLK IN

Note1

TD+
TD-
TCLK+
TCLK-
TC+
TC-
TB+
TB-
TA+
TA-
GND

DIR
(Low) FRC
GND
VCC

LCD Module

LCD CN1

Pin	Signal
1	GND
2	GND
3	DIR
4	FRC
5	GND
6	CK+
7	CK-
8	GND
9	D2+
10	D2-
11	GND
12	D1+
13	D1-
14	GND
15	D0+
16	D0-
17	GND
18	GND
19	VCC
20	VCC

Timing Controller

LVDS Rx

Note1 : R0(6bit) is not equal to R0(8bit). See "Table 5. Input pin map of LVDS Tx for 8bit and 6bit" for more detail.
Note2 : Connect to ground.

Table 5. Input pin map of LVDS Tx for 8bit and 6bit

TTL Data		LVDS Tx input Pin (Pin #)	TTL Data		LVDS Tx input Pin (Pin #)	Note
8bit			6Bit			
LSB	R0	TA0 (51)	LSB	-	-	If input data is 6bit, don't connect LSB two data to LVDS Tx.
	R1	TA1 (52)		-	-	
	R2	TA2 (54)		R0	TA0 (51)	TTL R2(8bit)=TTL R0(6bit)
	R3	TA3 (55)		R1	TA1 (52)	TTL R3(8bit)=TTL R1(6bit)
	R4	TA4 (56)		R2	TA2 (54)	TTL R4(8bit)=TTL R2(6bit)
	R5	TA5 (3)		R3	TA3 (55)	TTL R5(8bit)=TTL R3(6bit)
	R6	TD0 (50)		R4	TA4 (56)	TTL R6(8bit)=TTL R4(6bit)
MSB	R7	TD1 (2)	MSB	R5	TA5 (3)	TTL R7(8bit)=TTL R5(6bit)
LSB	G0	TA6 (4)	LSB	-	-	If input data is 6bit, don't connect LSB two data to LVDS Tx.
	G1	TB0 (6)		-	-	
	G2	TB1 (7)		G0	TA6 (4)	TTL G2(8bit)=TTL G0(6bit)
	G3	TB2 (11)		G1	TB0 (6)	TTL G3(8bit)=TTL G1(6bit)
	G4	TB3 (12)		G2	TB1 (7)	TTL G4(8bit)=TTL G2(6bit)
	G5	TB4 (14)		G3	TB2 (11)	TTL G5(8bit)=TTL G3(6bit)
	G6	TD2 (8)		G4	TB3 (12)	TTL G6(8bit)=TTL G4(6bit)
MSB	G7	TD3 (10)	MSB	G5	TB4 (14)	TTL G7(8bit)=TTL G5(6bit)
LSB	B0	TB5 (15)	LSB	-	-	If input data is 6bit, don't connect LSB two data to LVDS Tx.
	B1	TB6 (19)		-	-	
	B2	TC0 (20)		B0	TB5 (15)	TTL B2(8bit)=TTL B0(6bit)
	B3	TC1 (22)		B1	TB6 (19)	TTL B3(8bit)=TTL B1(6bit)
	B4	TC2 (23)		B2	TC0 (20)	TTL B4(8bit)=TTL B2(6bit)
	B5	TC3 (24)		B3	TC1 (22)	TTL B5(8bit)=TTL B3(6bit)
	B6	TD4 (16)		B4	TC2 (23)	TTL B6(8bit)=TTL B4(6bit)
MSB	B7	TD5 (18)	MSB	B5	TC3 (24)	TTL B7(8bit)=TTL B5(6bit)
Data Enable		TC6 (30)	Data Enable		TC6 (30)	
CLOCK		CLKIN (31)	CLOCK		CLKIN (31)	

Note : LVDS Tx : THC63LVDM83R(Thine) or equivalent.

3-4. 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 and specifications of LVDS Tx(THC63LVDM63R or equivalent) / Rx for its proper operation.

Table 6-1. LVDS Input DC Specification

Symbol	Parameter	Min	Typ	Max	Unit
Vic	LVDS common voltage	0.6	1.2	1.8	V
Vth	LVDS differential High threshold	-	-	+100	mV
Vtl	LVDS differential Low threshold	-100	-	-	mV
| Vid |	LVDS differential Input voltage	100	-	600	mV
Iin	LVDS Input current	-	-	±10	μA

Table 6-2. LVDS Input AC Timing

Symbol	Parameter	Min	Typ	Max	Unit
tCLK	LVDS CLK Period	25	26	27	ns
tRIP1	Input Data Position 0	-0.4	0.0	0.4	ns
tRIP0	Input Data Position 1	T/7-0.4	T/7	T/7+0.4	ns
tRIP6	Input Data Position 2	2T/7-0.4	2T/7	2T/+0.4	ns
tRIP5	Input Data Position 3	3T/7-0.4	3T/7	3T/7+0.4	ns
tRIP4	Input Data Position 4	4T/7-0.4	4T/7	4T/7+0.4	ns
tRIP3	Input Data Position 5	5T/7-0.4	5T/7	5T/7+0.4	ns
tRIP2	Input Data Position 6	6T/7-0.4	6T/7	6T/7+0.4	ns

※ T = Input CLKP period time
   ex) T= 26 ns @ SVGA, 60Hz

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Table 6-3. TIMING TABLE

| ITEM	Symbol		Min	Typ	Max	Unit	Notes
DCLK	Period	tCLK	25.0	26.0	27.0	ns	
	Frequency	fCLK	37.0	38.5	40.0	MHz	
Hsync	Period	tHP	990	1024	1100	tCLK	
	Width	tWH	16	64	120		
Vsync	Period	tVP	606	625	730	tHP	
	Width	tWV	1	6	24		
	Frequency	fv	51.5	60.2	62	Hz	
Data Enable	Horizontal Addr. time	tWHA	800	800	800	tCLK	
	Horizontal back porch	tHBP	32	88	120		
	Horizontal front porch	tHFP	32	72	80		
	Horizontal blank	-	76	~	tHP- tWHA		tWH+ tHBP+ tHFP
	Vertical Addr. Time	tWVA	600	600	600	tHP	
	Vertical back porch	tVBP	2	15	22		
	Vertical front porch	tVFP	3	4	5		
	Vertical blank	-	6	~	tVP-tWVA		tWV+ tVBP+tVFP

Notes
 1. DE Only mode operation.
 2. tHFP, tWH and tHBP should be any times of a character number (8).
 3. No variation of the total number of Hsync and DE in a frame is required for normal operation.
 4. No variation of the total number of clock in a Hsync period for tVBP is required for normal operation.

3-5. Signal Timing Waveforms

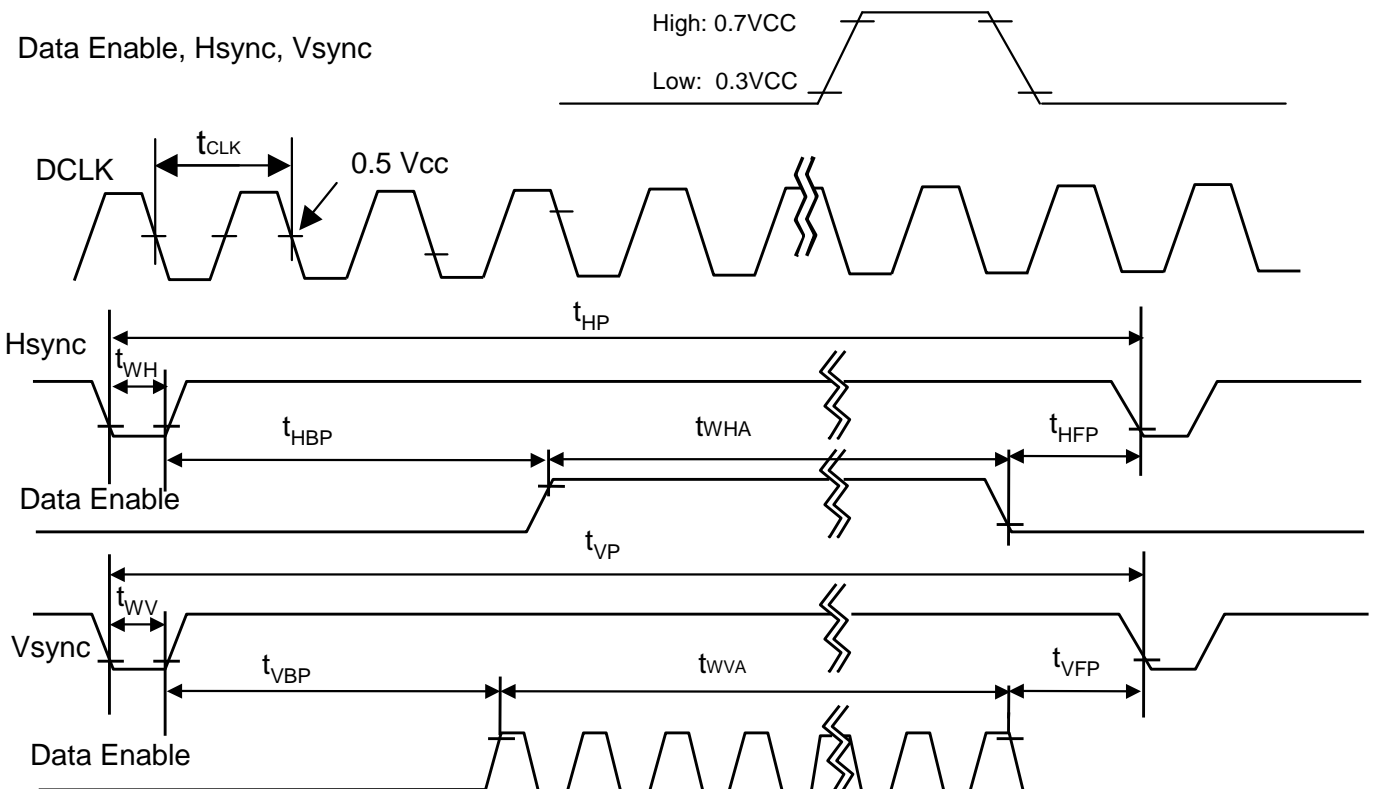### 3.5.1 LVDS Rx input wave form
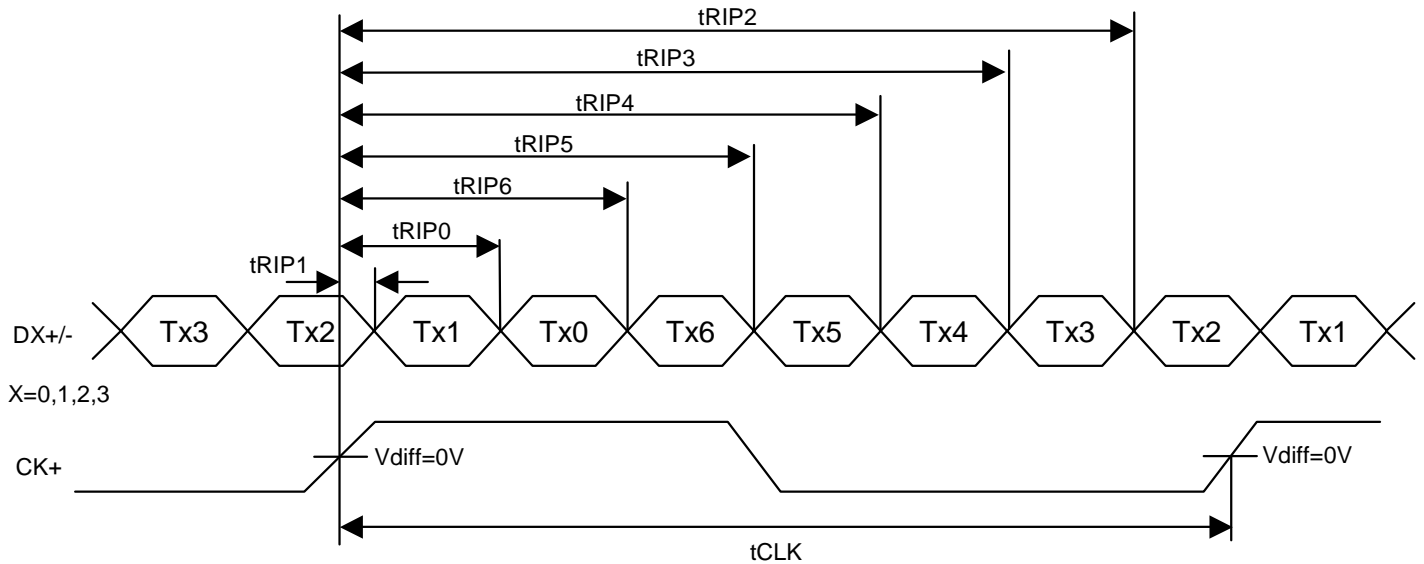
3.5.2 TTL wave form

Condition : VCC =3.3V

Data Enable, Hsync, Vsync

High: 0.7VCC
Low: 0.3VCC

Product Specification

3-6. Display Color and Input Signals

3-6-1. Input Condition of FRC signal and data signals

LB084S01 can display 16,777,216 color in 256 gray scales and 262,144 colors in 64 gray scales by input condition of FRC signal and data signals. See following table.

Table 7. FRC and Input data signal

Input data signals	FRC terminal	Input signal for Pin 1 of CN1	Input signal for Pin 2 of CN1	Display color	Notes
8-bit	High	D3+	D3-	16,777,216	1,3
6-bit	Low	GND	GND	262,144	2,4

Note 1 : See "3-6-2.Color Input Data Reference(16,777,216)"
Note 2 : See "3-6-3. Color Input Data Reference(262,144)"
Note 3 : See "3-3-1. Input data signal : 8bit"
Note 4 : See "3-3-2. Input data signal : 6bit"

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3-6-2. Color Input Data Reference(16,777,216 color)

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. Please see "3-6-1. Input Condition of FRC signal and data signals" for 16,777,216 color.
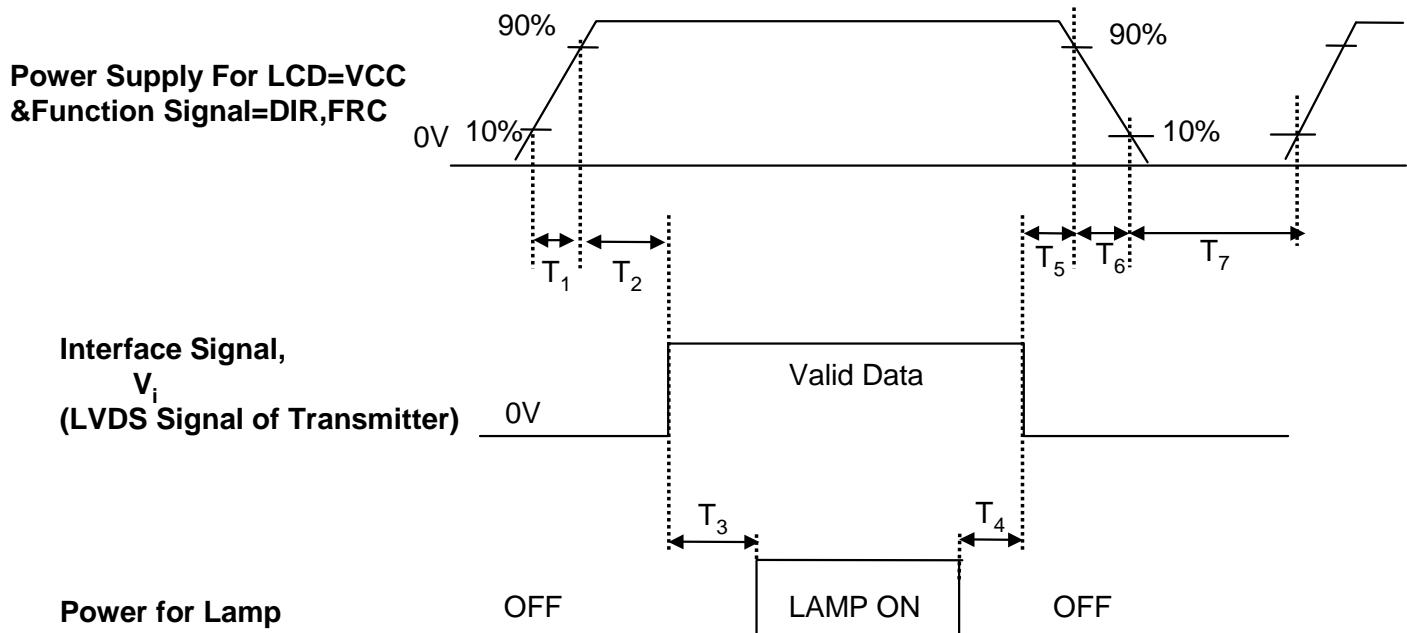
Table 8-1. COLOR DATA REFERENCE

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

Product Specification

3-6-3. Color Input Data Reference(262,144 color)

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. Please see "3-6-1. Input Condition of FRC signal and data signals" for 262,144 color.

Table 8-2. COLOR DATA REFERENCE

Color		Input Color Data																		
		RED MSB					LSB	GREEN MSB					LSB	BLUE MSB					LSB
		R 5	R 4	R 3	R 2	R 1	R 0	G 5	G 4	G 3	G 2	G 1	G 0	B 5	B 4	B 3	B 2	B 1	B 0
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	RED (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (01)	0	0	0	0	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)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (01)	0	0	0	0	0	0	0	0	0	0	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)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	…			…						…						…			
	BLUE (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Product Specification

3-7. Power Sequence

Power Supply For LCD=VCC
&Function Signal=DIR,FRC

Interface Signal,
V$_i$
(LVDS Signal of Transmitter)

Power for Lamp

Table 9. POWER SEQUENCE TABLE

Parameter	Value			Units
	Min.	Typ.	Max.	
T$_1$	-	-	10	(ms)
T$_2$	0	-	50	(ms)
T$_3$	200	-	-	(ms)
T$_4$	200	-	-	(ms)
T$_5$	0	-	50	(ms)
T$_6$	-	-	10	(ms)
T$_7$	400	-	-	(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 VCC to 0V.
  3. Lamp power must be turn on after power supply for LCD and interface signal are valid.

3-8. Scanning Directions

LB084S01 can change scanning direction by DIR input condition. See the Table 10 and FIG.3.

Table 10 . Scanning direction and DIR Input

Scanning direction	DIR input	Note
Normal	Low	-
Reverse	High	-

Normal and reverse scan direction are shown in the FIG.3. The figures are seen from a front view and the allow is the direction of scan.

FIG.3 Scanning direction
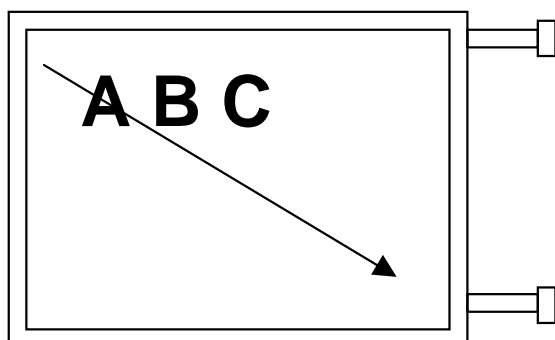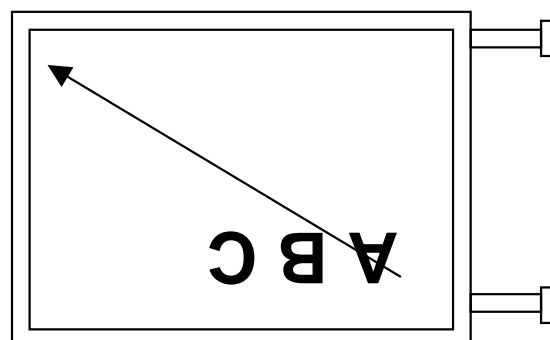
[Normal scan]   [Reverse scan]

Product Specification

4. Optical Specification

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. 4 presents additional information concerning the measurement equipment and method.

FIG. 4 Optical Characteristic Measurement Equipment and Method
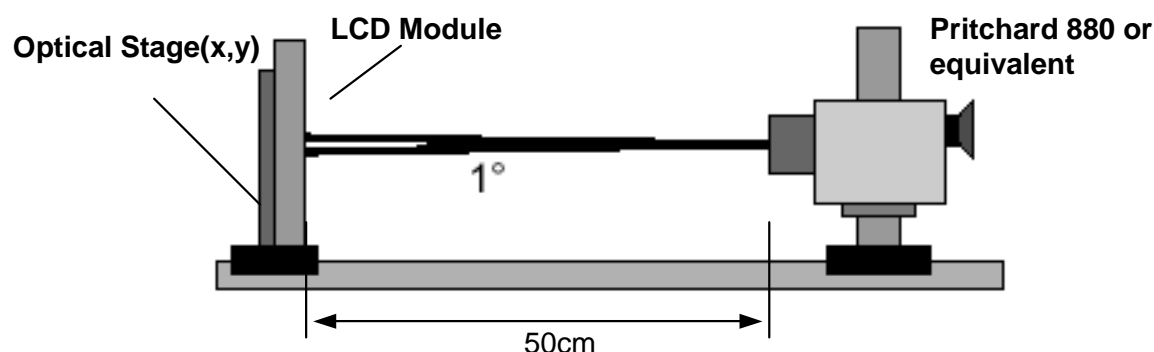
Table 11. OPTICAL CHARACTERISTICS

Measurement condition : Ta=25°C, VCC=3.3V, DIR=Low, SVGA, f_V =60Hz, f_{CLK}= 38.5MHz, I_{BL}= 7mA

Parameter		Symbol	Values			Units	Notes
			Min	Typ	Max		
Contrast Ratio		CR		600	-		1
Surface Luminance, white		L_{WH}	480	600	-	cd/m²	2
Luminance Variation		δ_{WHITE}		1.25	1.40		3
Response Time							4
	Rise Time	Tr_R	-	7	15	ms	
	Delay Time	Tr_D	-	18	30	ms	
Color Coordinates							
	RED	RX	0.571	0.601	0.631		Reference
		RY	0.316	0.346	0.376		Reference
	GREEN	GX	0.298	0.328	0.358		Reference
		GY	0.508	0.538	0.568		Reference
	BLUE	BX	0.128	0.158	0.188		Reference
		BY	0.122	0.152	0.182		Reference
	WHITE	WX	0.283	0.313	0.343		
		WY	0.299	0.329	0.359		
Viewing Angle							5
	x axis, right(Φ=0°)	Θr	70	75	-	degree	
	x axis, left (Φ=180°)	Θl	70	75	-	degree	
	y axis, up (Φ=90°)	Θu	65	70	-	degree	
	y axis, down (Φ=270°)	Θd	45	50	-	degree	

Notes : If don't satisfied measurement condition, measurement value may be out of optical specification.

Product Specification

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

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

2. Surface luminance is the center point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see FIG 5.

$$L_{WH} = L_1$$

3. The variation in surface luminance , The panel total variation (δ_{WHITE}) is determined by measuring L_N at each test position 1 through 5 and then defined as followed numerical formula. For more information see FIG 5.

$$\delta_{WHITE} = \frac{\text{Maximum } (L_1, L_2, \ldots L_5)}{\text{Minimum } (L_1, L_2, \ldots L_5)}$$

4. Response time is the time required for the display to transition from white to black (rise time, Tr_R) and from black to white(Decay Time, Tr_D). For additional information see FIG 6.

5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 7.

Product Specification

FIG. 5 Luminance

<measuring point for surface luminance>

<measuring point for luminance variation>

```
A : H/4 mm
B : V/4 mm
H : 170.4 mm
V : 127.8 mm
@ H,V : Active Area
```
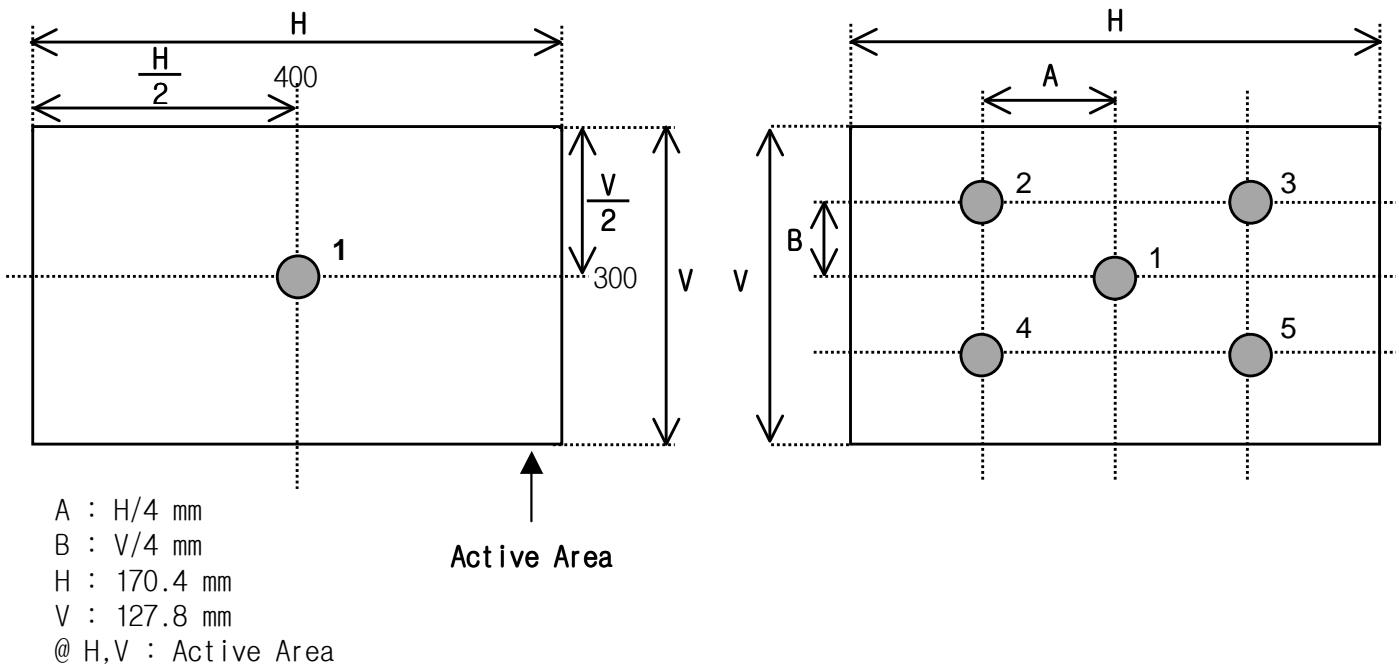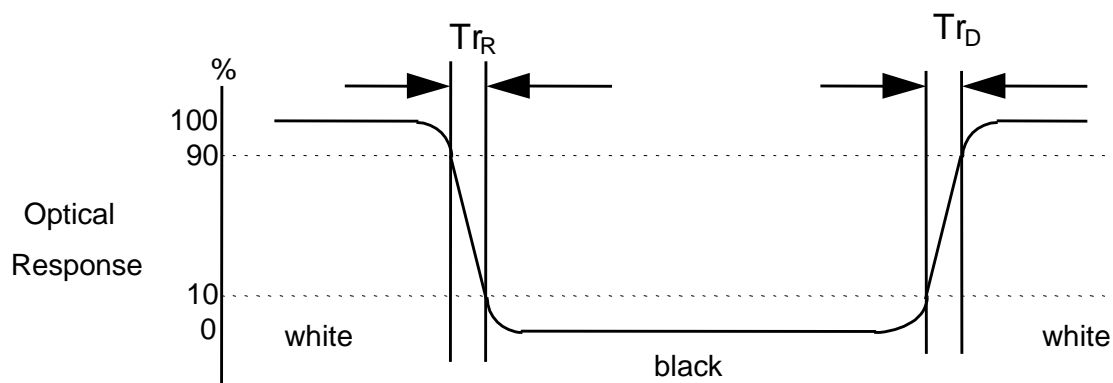
Active Area

FIG. 6 Response Time
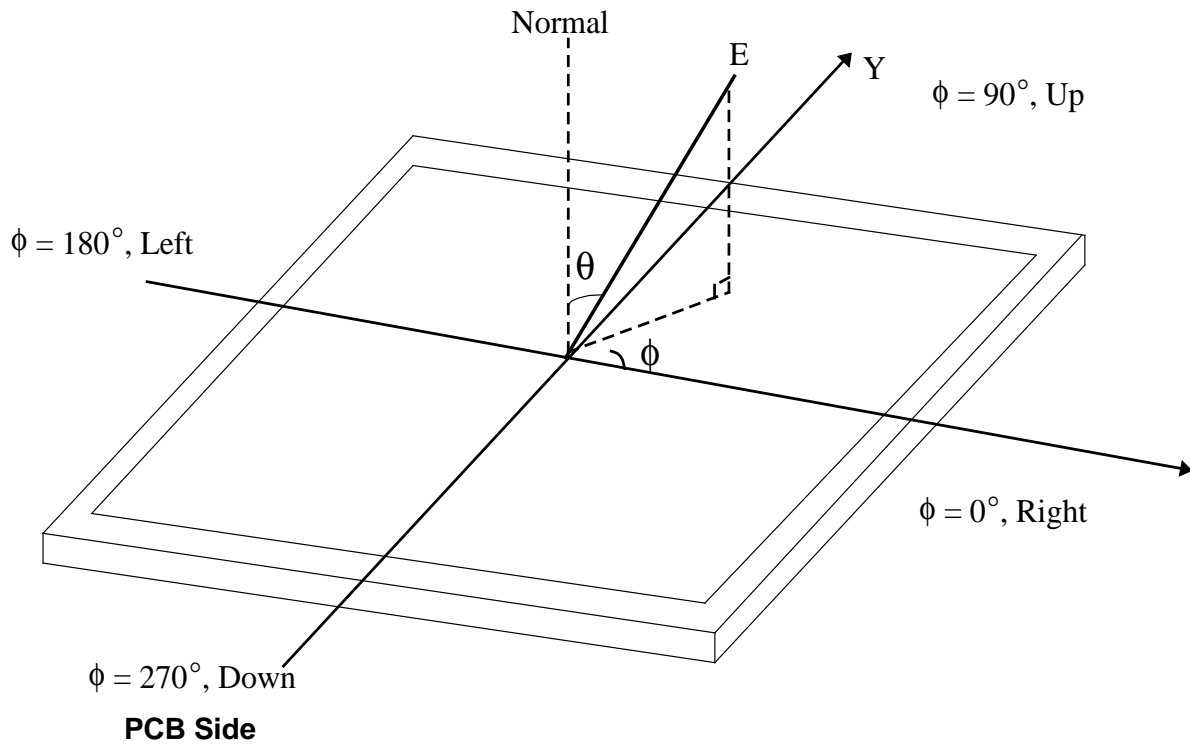
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

Tr_R

Tr_D

%

Optical

Response

100
90

10
0

white

black

white

Product Specification

FIG. 7 Viewing angle

<Dimension of viewing angle range>

Normal

E

Y

$\phi = 90°$, Up

$\phi = 180°$, Left

θ

ϕ

$\phi = 0°$, Right

$\phi = 270°$, Down
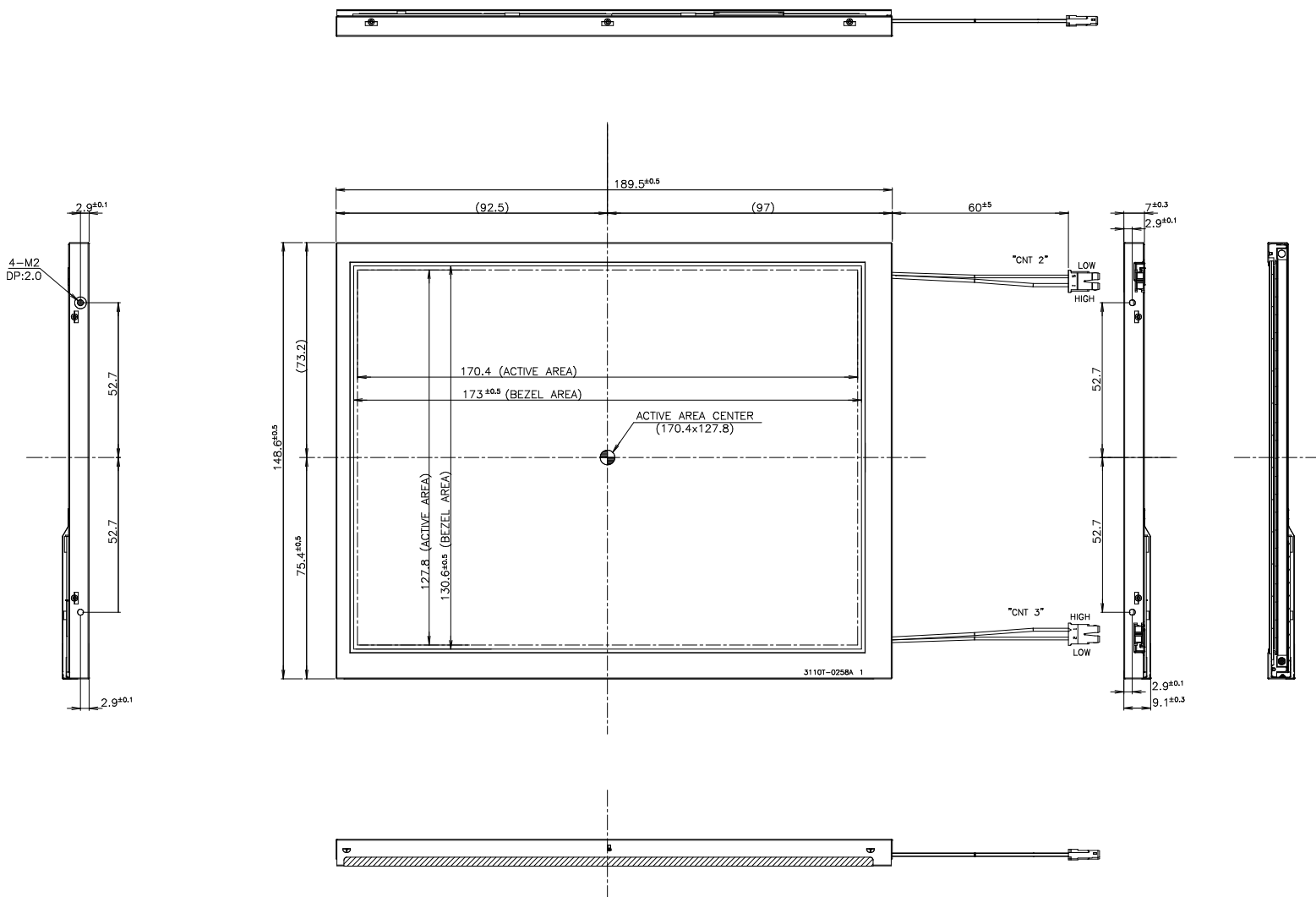
PCB Side

5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LB084S01. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	189.5 ± 0.5mm
	Vertical	148.6 ± 0.5mm
	Depth	9.1 ± 0.3mm
Bezel Area	Horizontal	173 ± 0.5mm
	Vertical	130.6 ± 0.5mm
Active Display Area	Horizontal	170.4 mm
	Vertical	127.8 mm
Weight	320 g (Typ.) 330 g (Max.)	

Product Specification

<FRONT VIEW>

Note) Unit:[mm], General tolerance: ± 0.5mm

4-M2
DP:2.0

2.9±0.1

52.7

52.7

2.9±0.1

189.5±0.5

(92.5)

(97)

60±5

7±0.3

2.9±0.1

148.6±0.5

(73.2)

75.4±0.5

170.4 (ACTIVE AREA)

173±0.5 (BEZEL AREA)

127.8 (ACTIVE AREA)

130.6±0.5 (BEZEL AREA)

ACTIVE AREA CENTER
(170.4x127.8)

"CNT 2"

LOW

HIGH

"CNT 3"

HIGH

LOW

52.7

52.7

2.9±0.1

9.1±0.3

3110T-0258A 1

Product Specification

<REAR VIEW>

Note) Unit:[mm], General tolerance: ± 0.5mm

LB084S01
(TL)(01)

08474D11Z0001 B11
RoHS Verified

LG.PHILIPS LCD
This product may be covered by one or more of the following US Patent
Nos. 5,041,823 ; 5,061,920 ; 5,280,371 ; 5,835,139

MADE IN KOREA

6091L-0525A
060420   **

123456789ABCDEFG

FLUORESCENT LAMP IN LCD PANEL CONTAINS A SMALL
AMOUNT OF MERCURY. PLEASE FOLLOW LOCAL ORDINANCES
OR REGULATIONS FOR DISPOSAL.

3550B-0265A   1

26.8

48.18

Product Specification

[DETAIL DESCRIPTION OF SIDE MOUNTING SCREW]

M2

2.3(MAX)
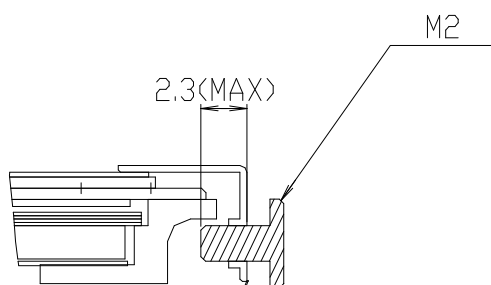
*MOUNTING SCREW DEPTH : MAX 2.3mm
*SCREW(6ea) TORQUE : Max 2.5kgf*cm

Note) Unit:[mm], General tolerance: ± 0.5mm

6. Reliability

Environment test condition

No.	Test Item	Conditions
1	High temperature storage test	Ta= 80°C, 240h
2	Low temperature storage test	Ta= -20°C, 240h
3	High temperature operation test	Ta= 70°C, 240h
4	Low temperature operation test	Ta= -10°C, 240h
5	High Temp. High Humidity	Ta= 60℃, 90%RH, 240h
6	Thermal shock	-20℃, 30minute 80℃, 30minute 100cycle, 1hour / cycle
7	Vibration test (non-operating)	Random no operation 10~300Hz, 1.0G X/Y/Z direction, Per 30min
8	Shock test (non-operating)	No operation, 180G, 2msec, Half sine ±X,±Y, ±Z Per 1time
9	Altitude operating storage / shipment	0 - 10,000 feet(3,048m) 24Hr 0 - 40,000 feet(12,192m) 24Hr

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

7-2. EMC

a) ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHZ to 40GHz. "American National Standards Institute(ANSI), 1992
b) C.I.S.P.R. "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment." International Special Committee on Radio Interference.
c) EN 55022 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment." European Committee for Electrotechnical Standardization.(CENELEC), 1998
(Including A1: 2000)

Product Specification

8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

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

A,B,C : SIZE(INCH)　　　　　　　　　　　　D : YEAR
E : MONTH　　　　　　　　　　　　　　　　F ~ 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.

8-2. Packing Form

a) Package quantity in one box : 20 pcs
b) Box Size : 331x284x474
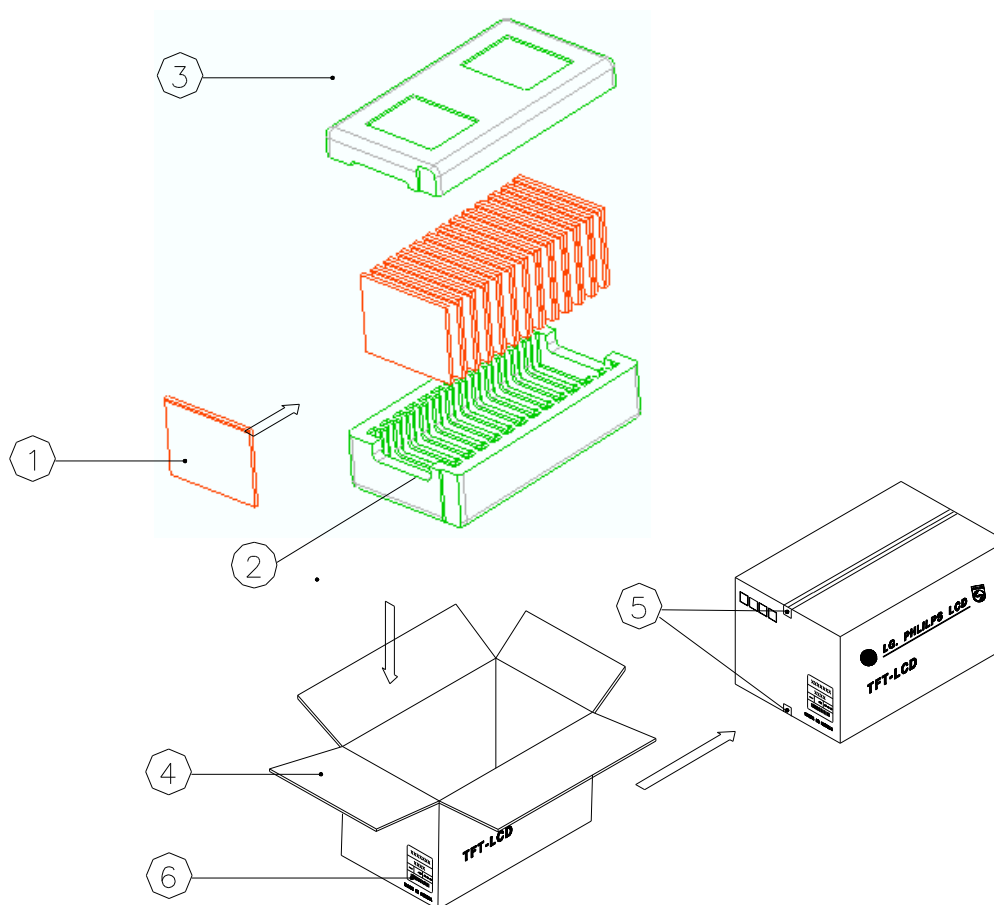
NO.	Description	Material
1	Module	
2	Packing, Bottom	EPS
3	Packing, Top	EPS
4	Carton Box	SWR4
5	Tape	OPP 70MMx300m
6	Label	YUPO Paper 100x100

Product Specification

9. PRECAUTIONS

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

9-1. MOUNTING PRECAUTIONS

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

9-2. OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
    V=$\pm$ 200mV(Over and under shoot voltage)

(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
    And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.

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.