LG.PHILIPS LCD

Liquid Crystal Display

Product Specification

배포
LM181E06
2003. 10. 27
DID설계실
접수NO.

	회로	기구	규격	EMI
검토	송성호			
승인			차성호	

SPECIFICATION FOR APPROVAL

APPROVED

Oct. 24. 2003

LG Electronics CO.,LTD.
GUMI KOREA
MONITOR ENG" G DIV.

DESC	LM181E06-D4	
PART NO	6304FP093A	
EN"GR	CHKD	APPD"
Jeong 2003/10/24		정의호 10/27

( ) Preliminary Specification
(◆) Final Specification

Title	18.1" SXGA TFT LCD

BUYER	DID (Dell)
MODEL	

SUPPLIER	LG.Philips LCD CO., Ltd.
*MODEL	LM181E06
SUFFIX	D4

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

SIGNATURE	DATE
/	
/	
/	

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

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LG. Philips LCD Co., Ltd

CONTENTS

RECORD OF REVISIONS

Revision No	Date	Page	Description
Ver1.0	Oct.24, 2003	-	Final Specification

1. General Description

The LM181E06-D4 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 black mode. This TFT-LCD has a 18.1 inch diagonally measured active display area with SXGA resolution(1024 vertical by 1280 horizontal pixel array).
Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes.
Gray scale or the brightness of the sub-pixel color is determined with a 8-bit gray scale signal for each dot, thus, presenting a palette of more than 16,777,216 colors.
The LM181E06-D4 has been designed to apply the interface method that enables low power, high speed,low EMI. FPD Link must be used as a LVDS(Low Voltage Differential Signaling) chip.
The LM181E06-D4 is intended to support applications where thin thickness, wide viewing angle, low power are critical factors and graphic displays are important. In combination with the vertical arrangement of the sub-pixels, the LM181E06-D4 characteristics provide an excellent flat panel display for office automation products such as monitors.

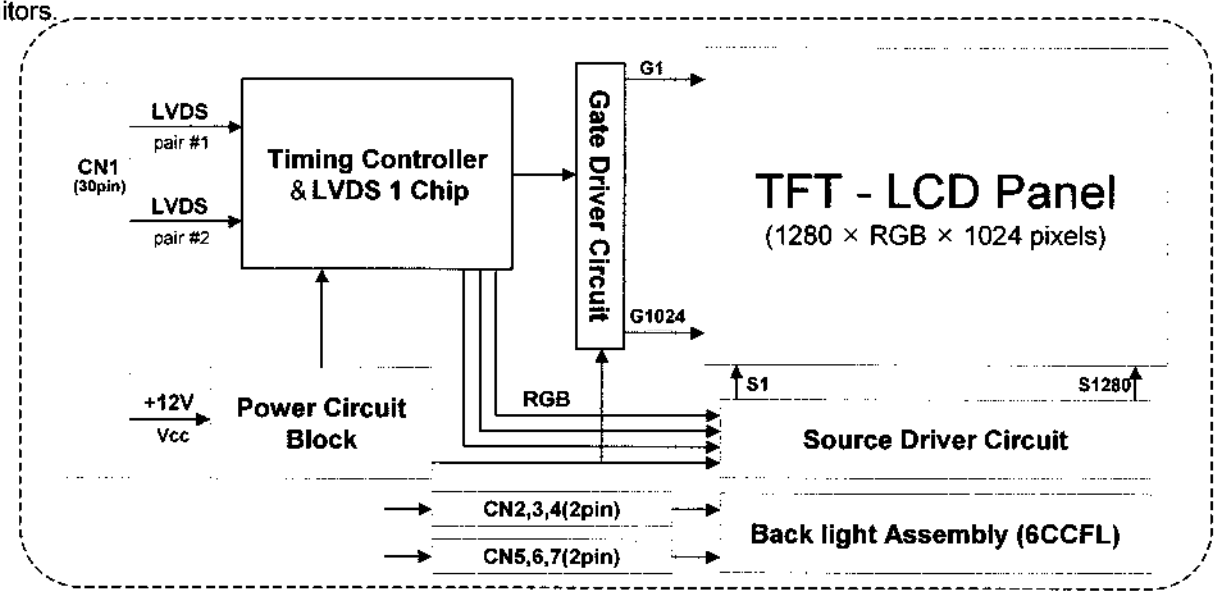


FIG.1 Block diagram

General Features

Active screen size	18.1 inches (459.74mm) diagonal
Outline Dimension	389.0(H) x 317.2(V) x 27.0(D) mm(Typ.)
Pixel Pitch	0.2805 mm x 0.2805 mm
Pixel Format	1280 horizontal By 1024 vertical Pixels RGB stripe arrangement
Color depth	8-bits, 16,777,216 colors
Luminance, white	250 cd/m^2(Typ. Center 1 point)
Power Consumption	Total 29.52 Watt(Typ.), (4.32Watt @Vcc, 25.2 Watt @250cd/㎡ [Lamp=7mA])
Weight	3100g (Typ.)
Display operating mode	Transmissive mode, normally black
Surface treatments	Hard coating (3H), Anti-glare treatment of the front polarizer

2. Absolute Maximum Ratings

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

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Values		Units	Notes
		Min.	Max.		
Power Input Voltage	V_{CC}	−0.3	+14	V_{dc}	at 25℃
Operating Temperature	T_{OP}	0	+50	℃	1
Storage Temperature	T_{ST}	−20	+60	℃	1
Operating Ambient Humidity	H_{OP}	10	+90	%RH	1
Storage Humidity	H_{ST}	10	+90	%RH	1

Note : 1. Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 °C Max, and no condensation of water.

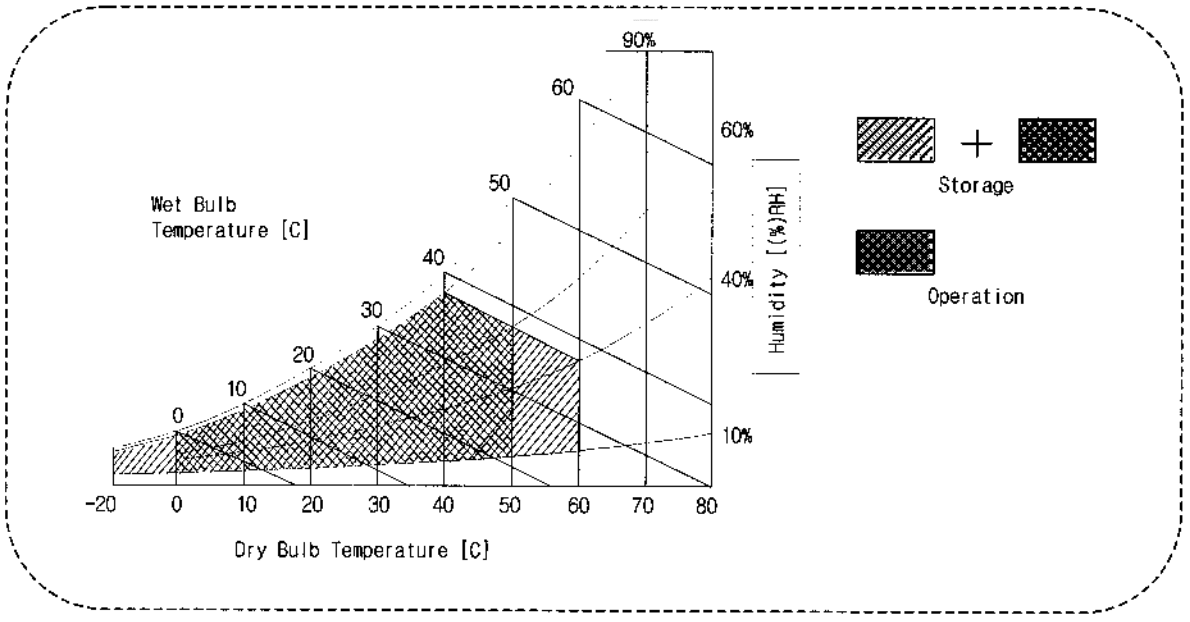


FIG. 2 Temperature and relative humidity

3. Electrical Specifications

3-1. Electrical Characteristics

The LM181E06-D4 requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input which powers the CCFL, is typically generated by an inverter. The inverter is an external unit to the LCD.

Table 2. ELECTRICAL CHARACTERISTICS

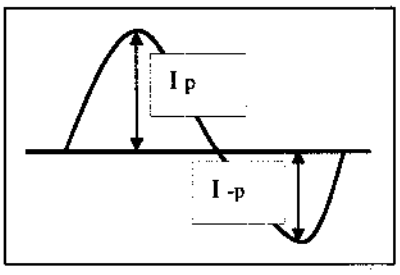
Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
MODULE :						
Power Supply Input Voltage	V_{CC}	11.4	12.0	12.6	V(DC)	
Power Supply Input Current	I_{CC}	–	0.36	0.45	A	1
Differential Impedance	Zm	90	100	110	Ohm	2
Power Consumption	P_C	–	4.32	5.4	Watts	1
Rush Current	I_{RUSH}	–	--	4	A	3
LAMP :						
Operating Voltage	V_{BL}	550(8.0)	600(7.0)	725(3.0)	V_{RMS}	4
Operating Current	I_{BL}	3.0	7.0	8.0	mA_{RMS}	
Established Starting Voltage	V_S					5
at 25℃	–	–	–	1,000	V_{RMS}	
at 0℃	–	–	–	1,300	V_{RMS}	
Operating Frequency	F_{BL}	45	55	65	KHz	6
Discharge Stabilization Time	T_S	–	–	3	Minutes	7
Power Consumption(6CCFL's)	P_{BL}	–	25.2	27.7	Watts	8
Life Time	–	40,000	–	–	Hrs	9

Note : **The design of the inverter must have specifications for the lamp in LCD Assembly.**
The performance of the Lamp in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC inverter. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.

When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter(no lighting, flicker, etc) never occurs. When you confirm it, the LCD Assembly should be operated in the same condition as installed in you instrument.

Requirements for a system inverter design, which is intended to have a better display performance, a better power efficiency and a more reliable lamp.

It shall help increase the lamp lifetime and reduce its leakage current.
a. The asymmetry rate of the inverter waveform should be 10% below;
b. The distortion rate of the waveform should be within $\sqrt{2} \pm 10\%$;
c. The ideal sine wave form shall be symmetric in positive and negative polarities.



* Asymmetry rate:

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

* Distortion rate

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

1. The specified current and power consumption are under the V_{CC}=12.0V, 25°C, f_V=60Hz condition, Typical supply current is measured at the condition of 8 X 6 chess pattern(white & black) shown in the [Figure 3] is displayed.
2. This impedance value is for impedance matching between LVDS T_X and the mating connector of the LCD.
3. The duration of rush current is about 1ms.
4. The variance of the voltage is ± 10%.
5. The voltage above V_{BS} should be applied to the lamps for more than 1 second for start-up. Otherwise, the lamps may not be turned on.
6. The output of the inverter must have symmetrical (negative and positive) voltage waveform and symmetrical current waveform.(Unsymmetrical ratio is less than 10%) Please do not use the inverter which has unsymmetrical voltage and unsymmetrical current and spike wave. Lamp frequency may produce 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. Let's define the brightness of the lamp after being lighted for 5 minutes as 100%. T_S is the time required for the brightness of the center of the lamp to be not less than 95%. The used lamp current is the lamp typical current.
8. The lamp power consumption shown above does not include loss of external inverter. The used lamp current is the lamp typical current.
9. The life time is determined as the time at which brightness of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25 ± 2°C.

Typical life time shall be defined that remained rate maintains over 50% of total amount at the life test.

◈ Do not attach a conductive 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.

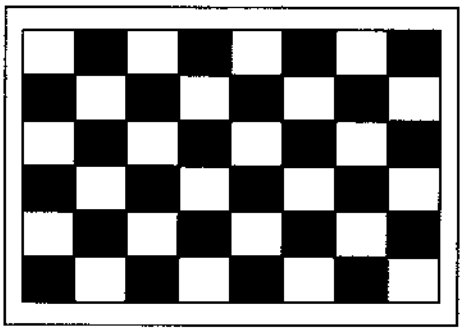


FIG. 3
Mosaic pattern
for power consumption measurement

3-2. Interface Connections

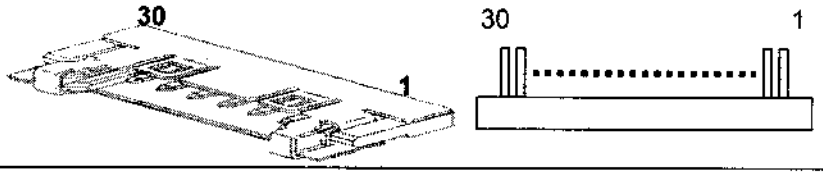
Interface chip must be used LVDS, part No. DS90CF383MTD(Transmitter) made by Nation Semiconductor.
Or used the compatible interface chips(TI:SN75LVDS83, Thine).
This LCD employs seven interface connections, a 30-pin connector is used for the module electronics interface.
Six 2-pin connectors are used for the integral back-light system.
The electronics interface connector is a model 55177-3091 manufactured by MOLEX. The pin configuration for the connector is shown in the table 3.

Table 3. MODULE CONNECTOR PIN CONFIGURATION(LVDS)

Pin	Symbol	Description	
1	Vcc	Supply voltage for LCD module	
2	Vcc	Supply voltage for LCD module	
3	Vcc	Supply voltage for LCD module	
4	Vcc	Supply voltage for LCD module	
5	GND	Ground	
6	GND	Ground	
7	SR0M	Minus signal of even channel 0 (LVDS)	Second data
8	SR0P	Plus signal of even channel 0 (LVDS)	
9	SR1M	Minus signal of even channel 1 (LVDS)	
10	SR1P	Plus signal of even channel 1 (LVDS)	
11	SR2M	Minus signal of even channel 2 (LVDS)	
12	SR2P	Plus signal of even channel 2 (LVDS)	
13	SCLKINM	Minus signal of even clock channel (LVDS)	
14	SCLKINP	Plus signal of even clock channel (LVDS)	
15	SR3M	Minus signal of even channel 3 (LVDS)	
16	SR3P	Plus signal of even channel 3 (LVDS)	
17	GND	Ground	
18	GND	Ground	
19	FR0M	Minus signal of odd channel 0 (LVDS)	First data
20	FR0P	Plus signal of odd channel 0 (LVDS)	
21	FR1M	Minus signal of odd channel 1 (LVDS)	
22	FR1P	Plus signal of odd channel 1 (LVDS)	
23	FR2M	Minus signal of odd channel 2 (LVDS)	
24	FR2P	Plus signal of odd channel 2 (LVDS)	
25	FCLKINM	Minus signal of odd clock channel (LVDS)	
26	FCLKINP	Plus signal of odd clock channel (LVDS)	
27	FR3M	Minus signal of odd channel 3 (LVDS)	
28	FR3P	Plus signal of odd channel 3 (LVDS)	
29	GND	Ground	
30	GND	Ground	

Connector pin arrangement

P/N, Maker :
55177-3091, Molex



The backlight interface connector is a model BHSR-02VS-1, manufactured by JST. The mating connector part number is SM02B-BHS-1 or equivalent.
The pin configuration for the connector is shown in the table 4.

Table 4. BACKLIGHT CONNECTOR PIN CONFIGURATION

No.	Pin	Symbol	Description	Notes
CN2,3,4,5,6,7	1	HV	Power supply for lamp (High voltage side)	1
	2	LV	Power supply for lamp (Low voltage side)	2

Note : 1. The high voltage side terminal is colored Pink & Blue & White.
2. The low voltage side terminal is all Gray

The below is block diagram for pin configuration of lamp connector.

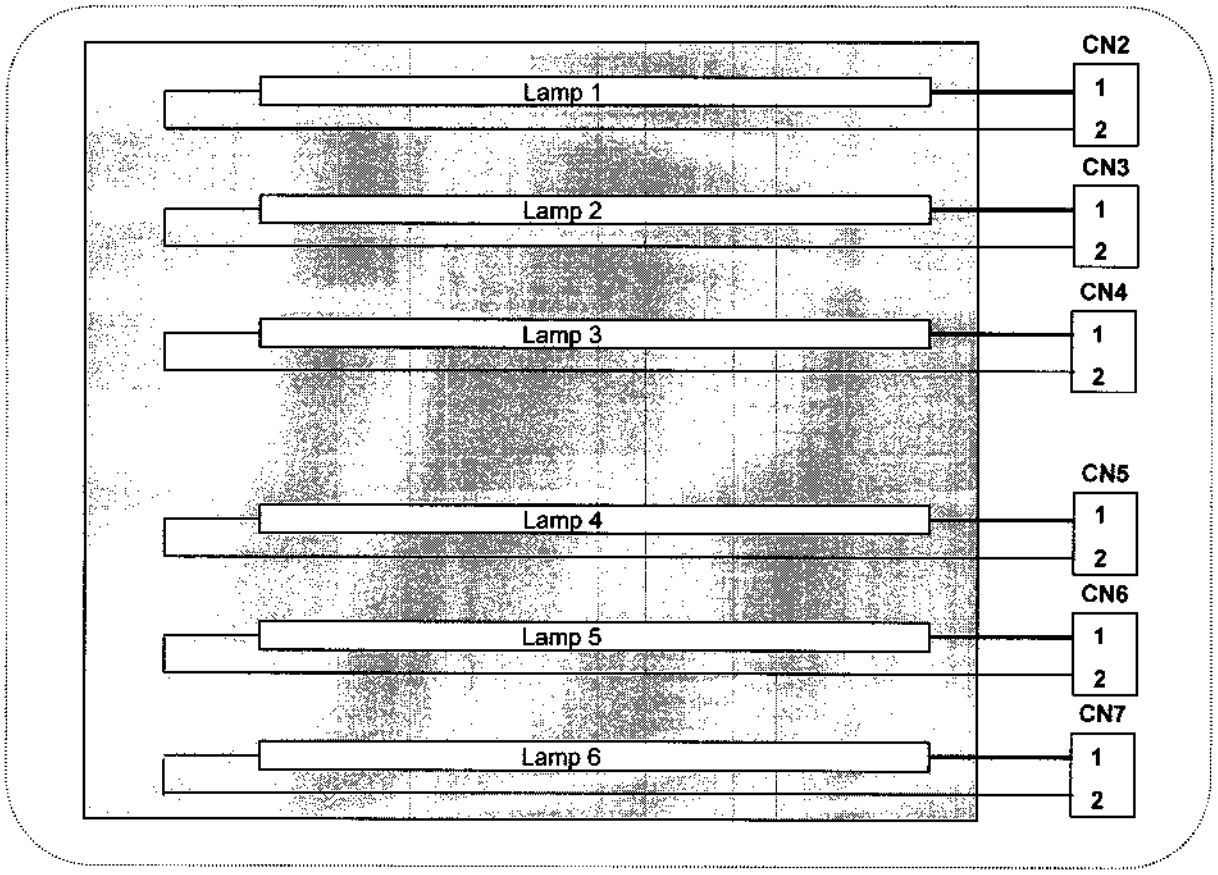


FIG. 4 Lamp Block diagram

3-3. Signal Timing Specifications

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 it's proper operation.

Table 6. TIMING TABLE

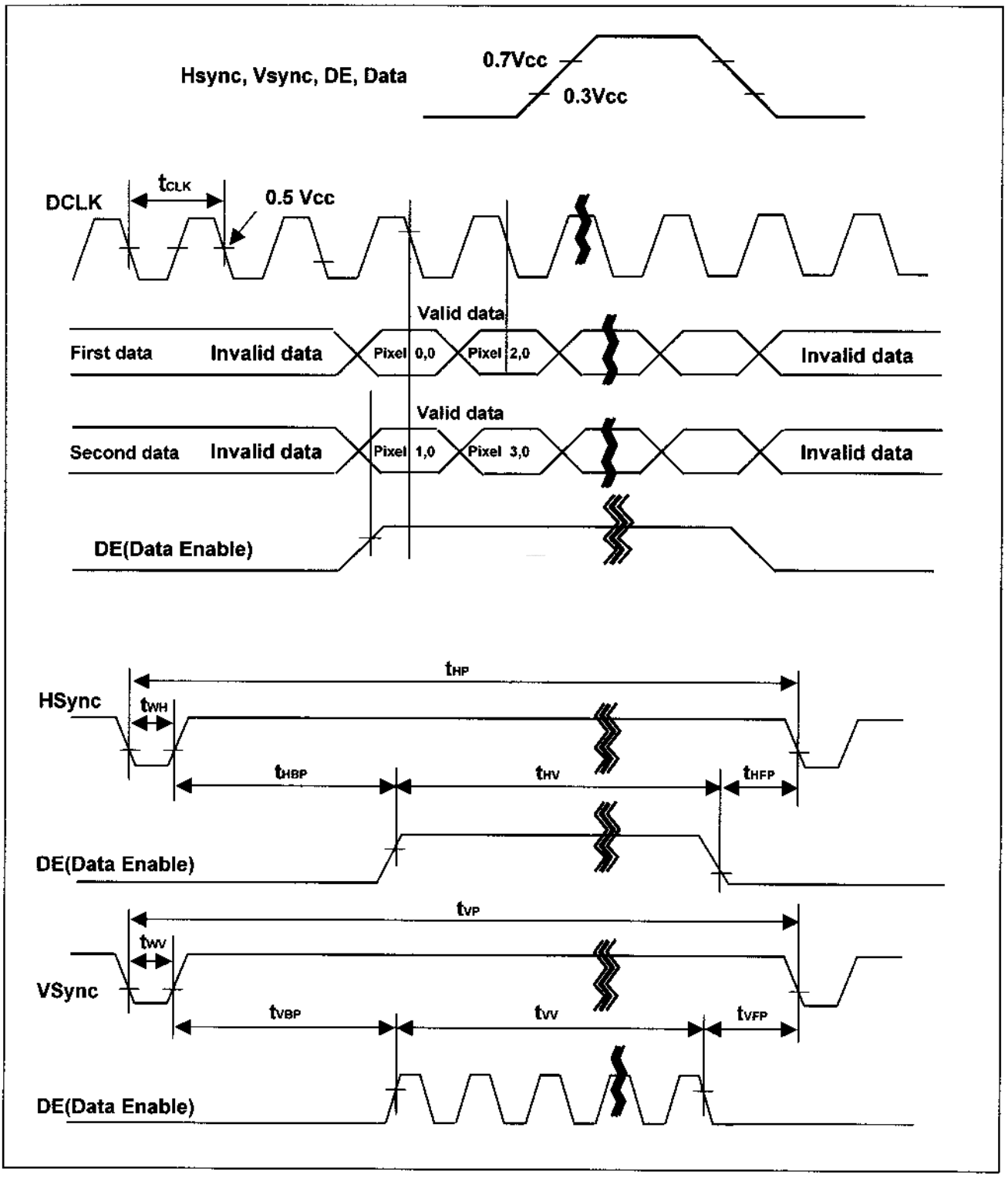
	ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Dclk	Period	t_{CLK}	23.65	18.52	14.82	ns	
	Frequency	–	42.3	54.0	67.5	MHz	Dclk: 84.6~ 135MHz
Hsync	Period	t_{HP}	664	844	1024	t_{CLK}	
	Width	t_{WH}	8	56	-		
	Frequency	f_h	50.10	63.98	79.95	KHz	Note1)
Vsync	Period	t_{VP}	1034	1066	1098	t_{HP}	
	Frequency	f_V	47	60	75	Hz	
	Width	t_{WV}	2	3	-	t_{HP}	
DE (Data Enable)	Horizontal Valid	t_{HV}	640	640	640	t_{CLK}	
	Horizontal Back Porch	t_{HBP}	8	124	-		
	Horizontal Front Porch	t_{HFP}	8	24	-		
	Horizontal Blank	–	24	–	$t_{HP} - t_{HV}$		
	Vertical Valid	t_{VV}	1024	1024	1024	t_{HP}	
	Vertical Back Porch	t_{VBP}	1	38	-		
	Vertical Front Porch	t_{VFP}	1	1	–		
	Vertical Blank	–	10	–	$t_{VP} - t_{VV}$		

Notes: " No Variation of Hsync(DE) input is required for normal operation .
"Input data shall be latched at the falling edge of DCLK.

-. Please refer transmitter data sheets for the detail timing condition (required setup, hold time and etc.) between video processor and LVDS transmitter.
-. Horizontal sync shall be active high.
-. Vertical sync shall be active high.
-. Data enable shall be active high.

Note1) : The performance of the electro-optical characteristics are may be influenced by variance of the vertical refresh rate

3-4. Signal Timing Waveforms



3-5. Color Input Data Reference

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

Table 7. COLOR DATA REFERENCE

Color		Input Color Data																							
		Red								Green								Blue							
		MSB							LSB	MSB							LSB	MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red(000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(002)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255) Bright	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255) Bright	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Blue(000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(002)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255) Bright	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

3-6. Power Sequence

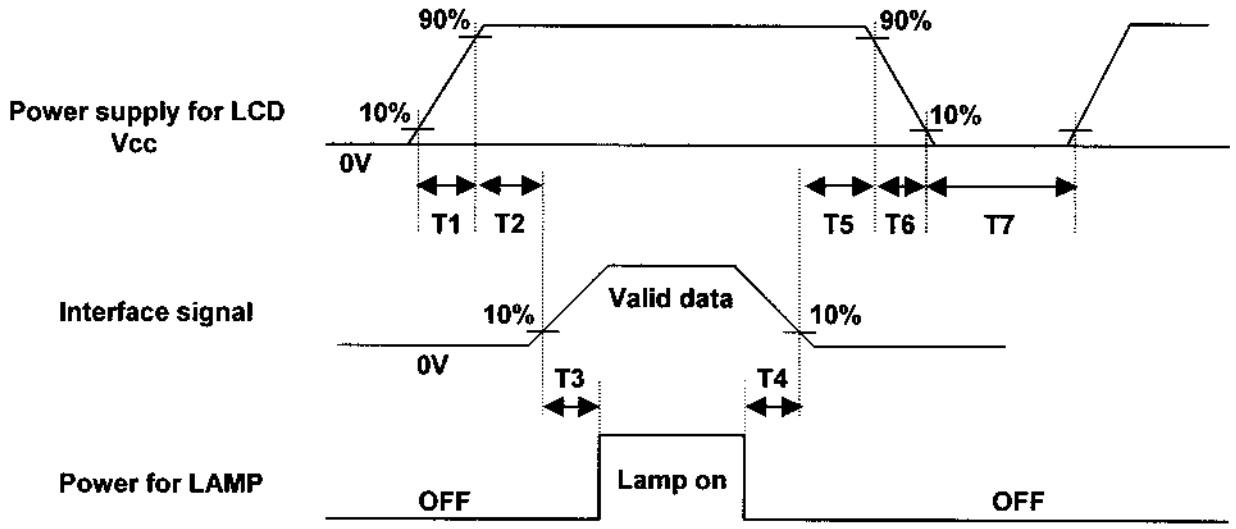


Table 8. POWER SEQUENCE

Parameter	Values			Units
	Min.	Typ.	Max.	
T 1	–	–	10	ms
T 2	0.01	–	50	ms
T 3	200	–	–	ms
T 4	200	–	–	ms
T 5	0.01	–	50	ms
T 6	-	–	10	ms
T 7	1	–	–	s

Notes : 1. Please avoid floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply for LCD V_{CC} to 0V. Invalid signal with Vcc for a long period of time, causes permanent damage to LCD panel.
3. Lamp power must be turn on after power supply for LCD and interface signals are valid.

4. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 °C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 °.

FIG. 1 presents additional information concerning the measurement equipment and method.

FIG. 5 Optical Characteristic Measurement Equipment and Method

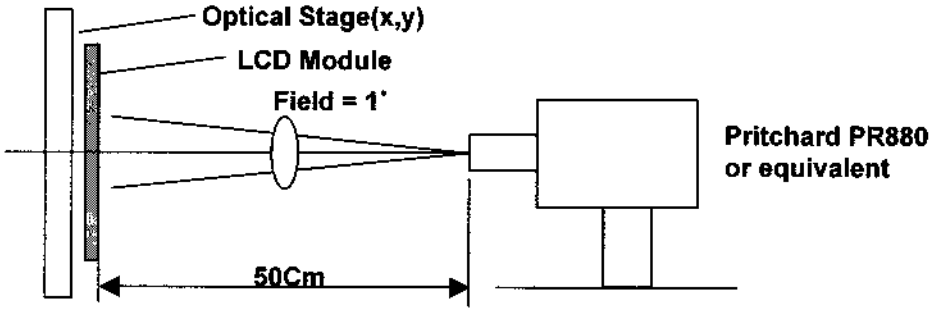


Table 9. OPTICAL CHARACTERISTICS (Ta=25 °C, V_{CC}=12.0V, f_V=60Hz, Dclk=54MHz, I_{BL}=7mArms)

Parameter	Symbol	Values			Units	Notes
		Min.	Typ.	Max.		
Contrast Ratio	CR	250	400	–		1
Surface Luminance, white	L_{WH}	200	250	–	cd/m²	2
Luminance Variation(5point)	δ_{WHITE}	–		1.3		3
Response Time Rise Time Decay Time	Tr Tr_R Tr_D	 – –	 15 15	 25 25	ms	4
CIE Color Coordinates Red Green Blue White	 x_R y_R x_G y_G x_B y_B x_W y_W	 Typ + 0.03	 0.637 0.340 0.297 0.610 0.146 0.071 0.313 0.329	 Typ + 0.03		
Viewing Angle x axis, right(ϕ=0°) x axis, left (ϕ=180°) y axis, up (ϕ=90°) y axis, down (ϕ=270°)	 θ x θ x θ y θ y	 +60 −60 +60 −60	 +85 −85 +85 −85	 – – – –	degree	5
Flicker	–	–	–	-20	dB	6

Notes :

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

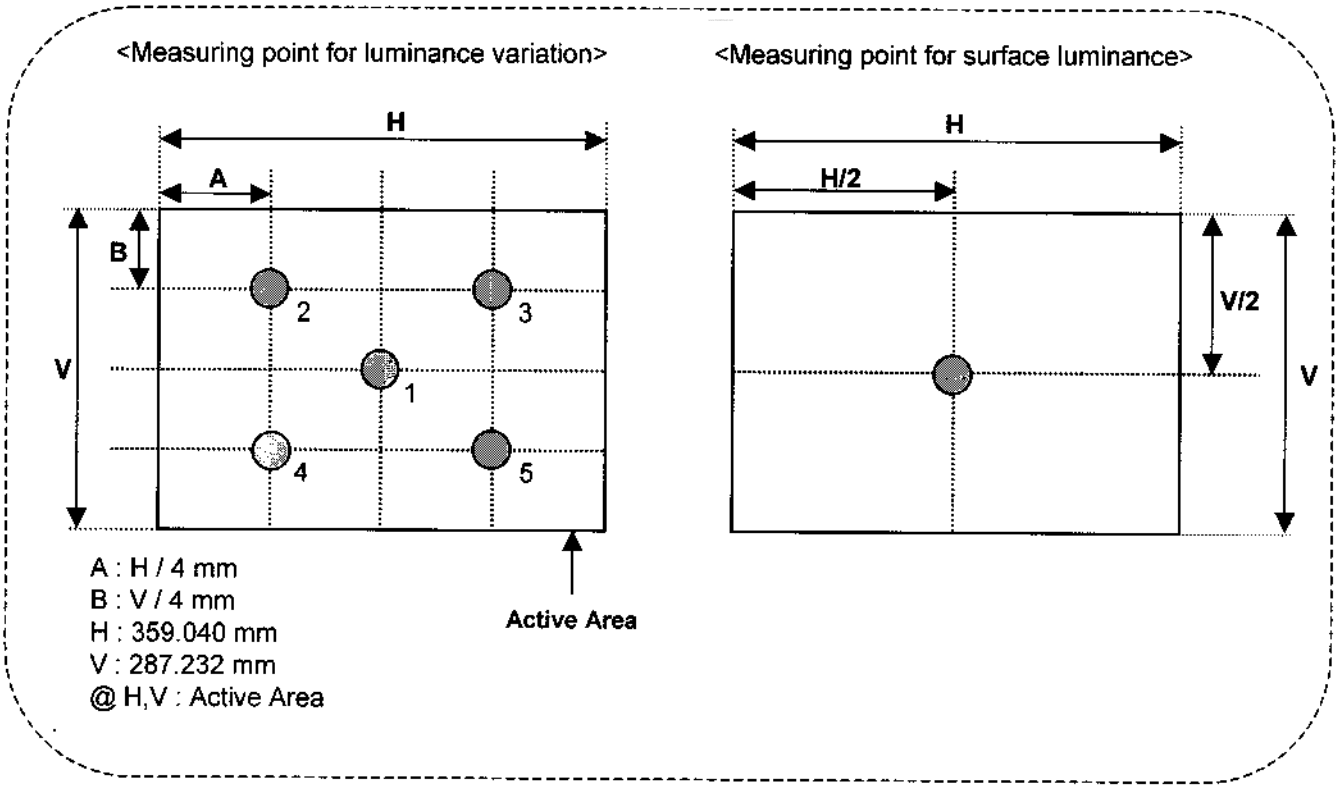
$$\text{Contrast ratio} = \frac{\text{Surface luminance with all white pixels}}{\text{Surface luminance with all black pixels}}$$

2. Surface luminance is the center point across the LCD surface 50cm from the surface with all pixels displaying white under the condition of I_{BL} = 7mArms . For more information see FIG 6.

3. The variation in surface luminance , δ_{WHITE} is determined by measuring L_{ON} at each test position 1 through 5, and then dividing the maximum L_{ON} of 5 points luminance by minimum L_{ON} of 5 points luminance. For more information see FIG 2.

$$\delta_{WHITE} = \text{Maximum}(L_{ON1}, L_{ON2}, \ldots L_{ON5}) \div \text{Minimum}(L_{ON1}, L_{ON2}, \ldots L_{ON5})$$

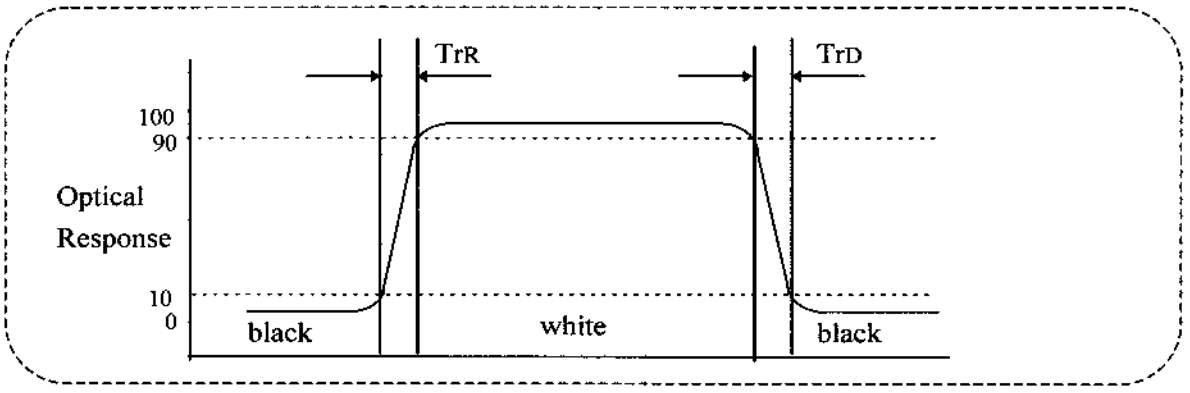
FIG. 6 Luminance



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 [Figure 9].
The sampling rate is 2,500 sample/sec.

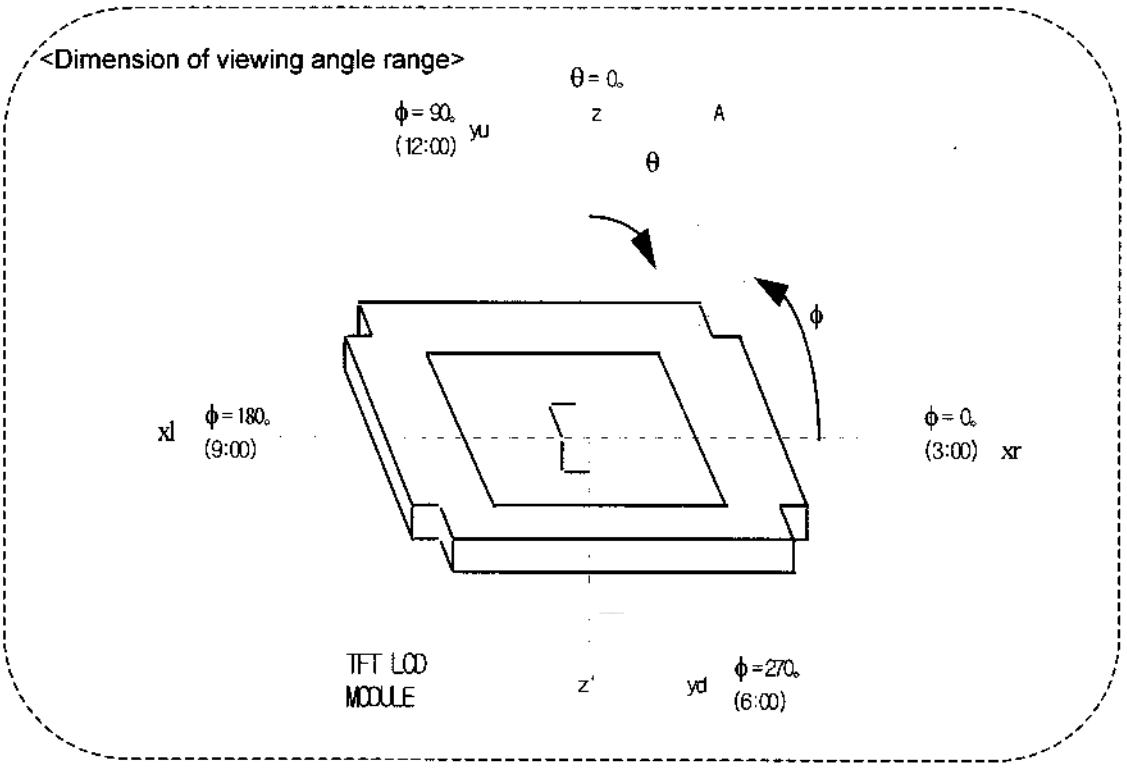
FIG. 8 Response Time

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



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 Figure 9 .

FIG. 9 Viewing angle



6. Flicker shall be measured at the center location.

Test pattern : pixel pattern
Background RGB gray (0, 0, 0)
Foreground RGB gray (127, 127, 127)

Test equation : -20 log $\frac{\text{AC(at 30Hz)}}{\text{DC level}}$

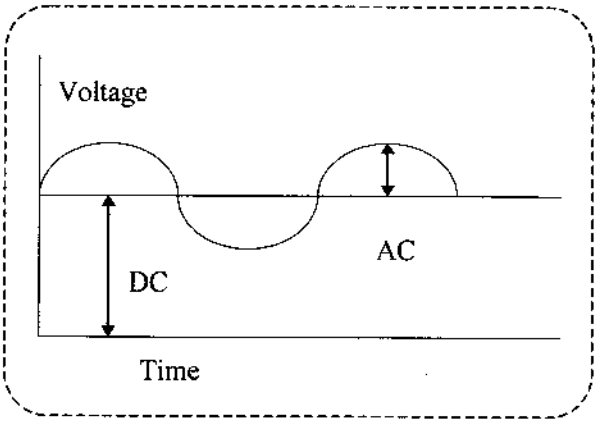


FIG. 10 Flicker

7. Gray scale specification

Gray Level	Luminance (%)		
	Min.	Typ.	Max.
L 0	–	0.25	0.57
L 31	–	0.77	1.82
L 63	1.61	4.5	7.40
L 95	5.43	11.3	17.1
L 127	10.4	20.2	30.0
L 159	18.1	32.4	46.6
L 191	30.8	49.1	67.5
L 223	50.1	69.8	89.5
L 255	–	100	–

5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LM181E06-D4 . In addition, the figures in the next page are detailed mechanical drawing of the LCD.

Outside dimensions	Horizontal	389.0, +0.4 / -0.5 mm
	Vertical	317.2, +0.4 / -0.5 mm
	Depth	27.0, ± 0.5 mm
Bezel area	Horizontal	366.0 ± 0.5 mm
	Vertical	294.2 ± 0.5 mm
Active display area	Horizontal	359.040 mm
	Vertical	287.232 mm
Weight (approximate)	3,100g (Typ.), 3,255 (Max.)	
Surface Treatment	Hard coating (3H) Anti-glare treatment of the front polarizer Haze (25%)	

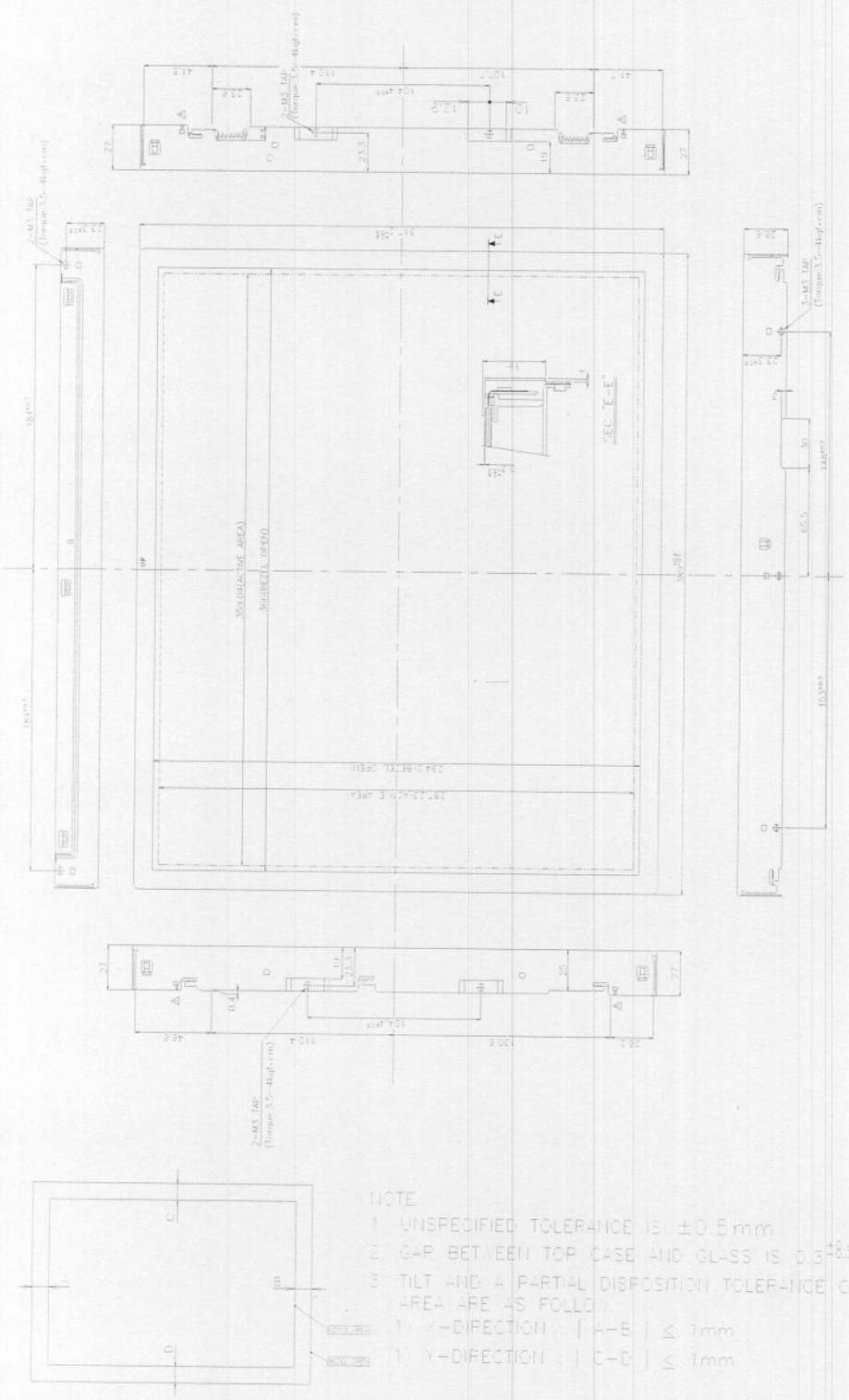
6. Reliability

Environment test condition

No.	Test Item	Conditions
1	High temperature storage test	Ta= 60°C 240hour
2	Low temperature storage test	Ta= -20°C 240hour
3	High temperature operation test	Ta= 50°C 60%RH 240hour
4	Low temperature operation test	Ta= 0°C 240hour
5	Vibration test (non-operating)	Waveform : Random Vibration level : 1.0G RMS Bandwidth : 10 ~ 500Hz Duration : X,Y,Z 20min One time each direction
6	Shock test (non-operating)	Shock level : 120G Waveform: half sine wave, 2ms Direction : ±X, ±Y, ±Z One time each direction
7	Altitude storage / shipment	0 - 40,000 feet(12,192m)

{ 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.

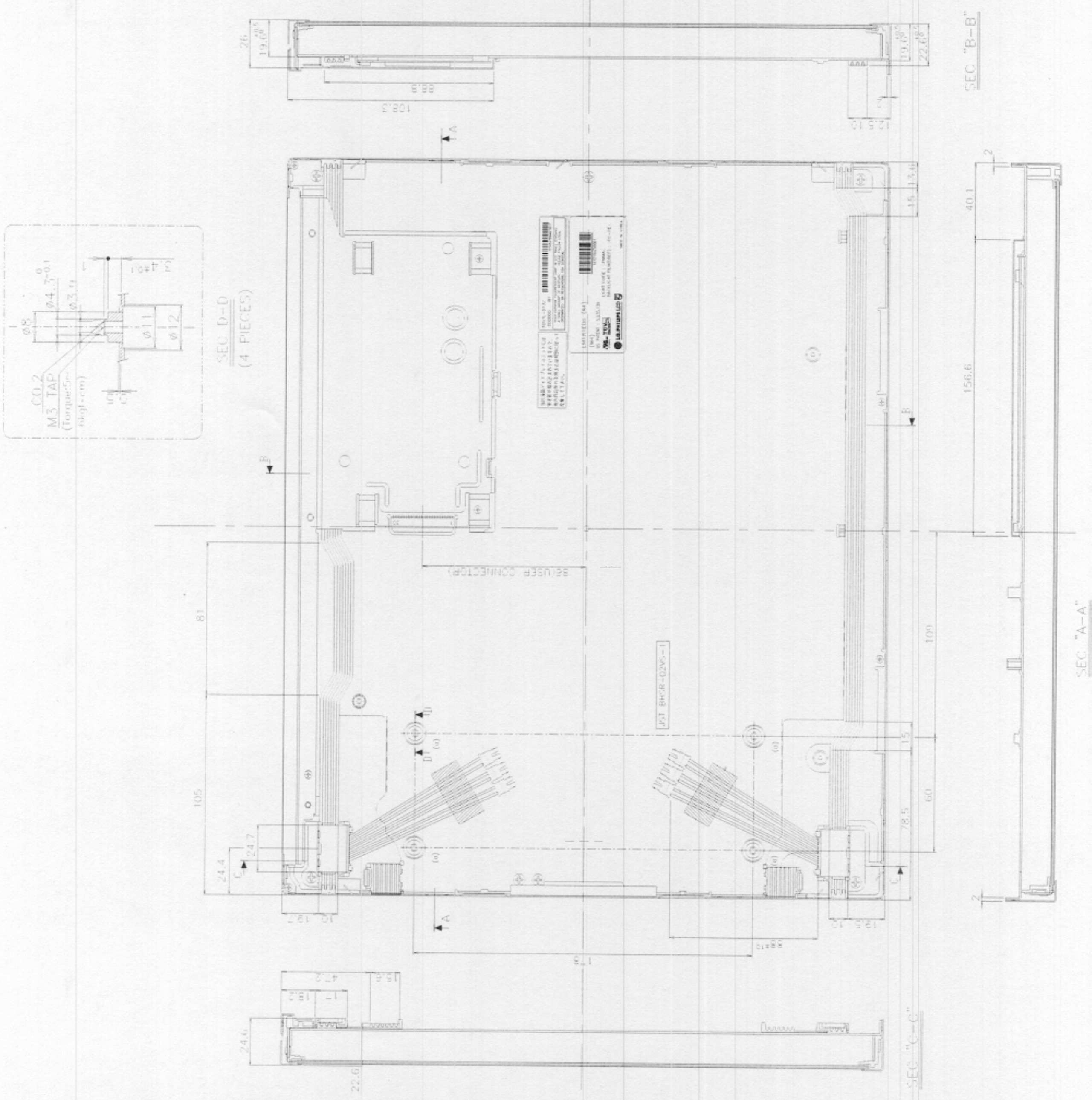
<FRONT VIEW>



NOTE
1. UNSPECIFIED TOLERANCE IS ±0.5mm
2. GAP BETWEEN TOP CASE AND GLASS IS 0.3 +0.2 -0.3
3. TILT AND A PARTIAL DISPOSITION TOLERANCE OF DISPLAY AREA ARE AS FOLLOW.
   1) X-DIRECTION : | A-B | ≤ 1mm
   1) Y-DIRECTION : | C-D | ≤ 1mm

Product Specification

<REAR VIEW>



7. International Standards

7-1. Safety

a) UL 60950, Third Edition, Underwriters Laboratories, Inc., Dated Dec. 11, 2000.
Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment.
b) CAN/CSA C22.2, No. 60950, Third Edition, Canadian Standards Association, Dec. 1, 2000.
Standard for Safety of Information Technology Equipment, Including Electrical Business Equipment.
c) EN 60950 : 2000, Third Edition
IEC 60950 : 1999, Third Edition
European Committee for Electrotechnical Standardization(CENELEC)
EUROPEAN STANDARD for Safety of Information Technology Equipment Including Electrical Business Equipment.

7-2. EMC

a) ANSI C63.4 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and 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 (Standards apply by CISPR22 class B).
c) EN 55022 "Limits and Methods of Measurement of Radio Interface Characteristics of Information Technology Equipment." European Committee for Electrotechnical Standardization (CENELEC), 1988

8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

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

A,B,C : Inch
D : Year
E : Month
F : Panel Code
G : Factory Code
H : Assembly Code
I,J,K,L,M : Serial No

Note

1. Year

Year	-	-	-	-	-	2002	2003	2004	2005	2006	2007
Mark	-	-	-	-	-	2	3	4	5	6	7

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

3. Panel Code

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

4. Factory Code

Factory Code	LPL Gumi	LPL Nanjing
Mark	K	C

5. Serial No

Serial No.	1 ~ 99,999	100,000 ~
Mark	00001 ~ 99999	A0001 ~ A9999, - - - - , Z9999

b) Location of Lot Mark

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

8-2. Packing Form

a) Package quantity in one box : 5 pcs

b) Box Size : 530mm × 307mm × 453mm

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

9-2. OPERATING PRECAUTIONS

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage : V=±200mV(Over and under shoot voltage)
(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer.
(4) Be careful for condensation at sudden temperature change. Condensation 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) The protection film is attached to the bezel with a small masking tape.
When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.
(3) You can remove the glue easily. When the glue remains on the bezel surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

APPENDIX 1. REQUIRED SIGNAL ASSIGNMENT FOR FlatLink(TI:SN75LVDS83) Transmitter

Pin #	Pin Name	Require Signal	Pin #	Pin Name	Require Signal
1	VCC	Power Supply for TTL Input	29	GND	Ground pin for TTL
2	D5	TTL Input (R7)	30	D26	TTL Input (DE)
3	D6	TTL Input (R5)	31	T_X CLKIN	TTL Level clock Input
4	D7	TTL Input (G0)	32	PWR DWN	Power Down Input
5	GND	Ground pin for TTL	33	PLL GND	Ground pin for PLL
6	D8	TTL Input (G1)	34	PLL VCC	Power Supply for PLL
7	D9	TTL Input (G2)	35	PLL GND	Ground pin for PLL
8	D10	TTL Input (G6)	36	LVDS GND	Ground pin for LVDS
9	VCC	Power Supply for TTL Input	37	TxOUT3+	Positive LVDS differential data output 3
10	D11	TTL Input (G7)	38	TxOUT3-	Negative LVDS differential data output 3
11	D12	TTL Input (G3)	39	T_X CLKOUT+	Positive LVDS differential clock output
12	D13	TTL Input (G4)	40	T_X CLKOUT-	Negative LVDS differential clock output
13	GND	Ground pin for TTL	41	T_X OUT2+	Positive LVDS differential data output 2
14	D14	TTL Input (G5)	42	T_X OUT2-	Negative LVDS differential data output 2
15	D15	TTL Input (B0)	43	LVDS GND	Ground pin for LVDS
16	D16	TTL Input (B6)	44	LVDS VCC	Power Supply for LVDS
17	VCC	Power Supply for TTL Input	45	T_X OUT1+	Positive LVDS differential data output 1
18	D17	TTL Input (B7)	46	T_X OUT1-	Negative LVDS differential data output 1
19	D18	TTL Input (B1)	47	T_X OUT0+	Positive LVDS differential data output 0
20	D19	TTL Input (B2)	48	T_X OUT0-	Negative LVDS differential data output 0
21	GND	Ground pin for TTL Input	49	LVDS GND	Ground pin for LVDS
22	D20	TTL Input (B3)	50	D27	TTL Input (R6)
23	D21	TTL Input (B4)	51	D0	TTL Input (R0)
24	D22	TTL Input (B5)	52	D1	TTL Input (R1)
25	D23	TTL Input (RSVD)	53	GND	Ground pin for TTL
26	VCC	Power Supply for TTL Input	54	D2	TTL Input (R2)
27	D24	TTL Input (HSYNC)	55	D3	TTL Input (R3)
28	D25	TTL Input (VSYNC)	56	D4	TTL Input (R4)

Notes : Refer to LVDS Transmitter Data Sheet for detail descriptions.