Product Specification

SPECIFICATION
FOR
APPROVAL

(◆) **Preliminary Specification**

(   ) **Final Specification**

Title	10.1" HD TFT LCD

Customer	DELL
MODEL	CV6P7

SUPPLIER	LG Display Co., Ltd.
*MODEL	LP101WH4
Suffix	SLA1

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

APPROVED BY	SIGNATURE
/	
/	
/	

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

APPROVED BY	SIGNATURE
Mighty Peang / S.Manager	
REVIEWED BY	
M. H. Kim / Manager	
PREPARED BY	
K.M. Lee/ Engineer	

**Product Engineering Dept.
LG Display Co., Ltd**

Contents

RECORD OF REVISIONS

| Revision No	Revision Date	Page	Description	EDID ver.
0.0	2012.08.15		First Draft	CE
0.1	2012.08.31	6	Update Touch Supply Input Current	CD
		15	Update Power Sequence for Touch	
		19-23	Update Mechanical Characteristics	
		29-31	Update EDID Data	
0.2	2012.10.18	4	Update Weight Data	62
		6	Update Electrical Characteristics	
		10	Update LVDS Signal Timing Specifications	
		14	Update Power Sequence for LCM	
		19-22	Update Mechanical Characteristics	
		29-31	Update EDID Data	
1.0	2012.11.15		Final Version Release	62
		21	2D Drawing Update	

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1. General Description

The LP101WH4 is a Color Active Matrix Liquid Crystal Display with an integral LED 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 10.1inches diagonally measured active display area with HD resolution(1366 horizontal by 768 vertical 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 LP101WH4 has been designed to apply the interface method that enables low power, high speed, low EMI.

The LP101WH4 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 LP101WH4 characteristics provide an excellent flat display
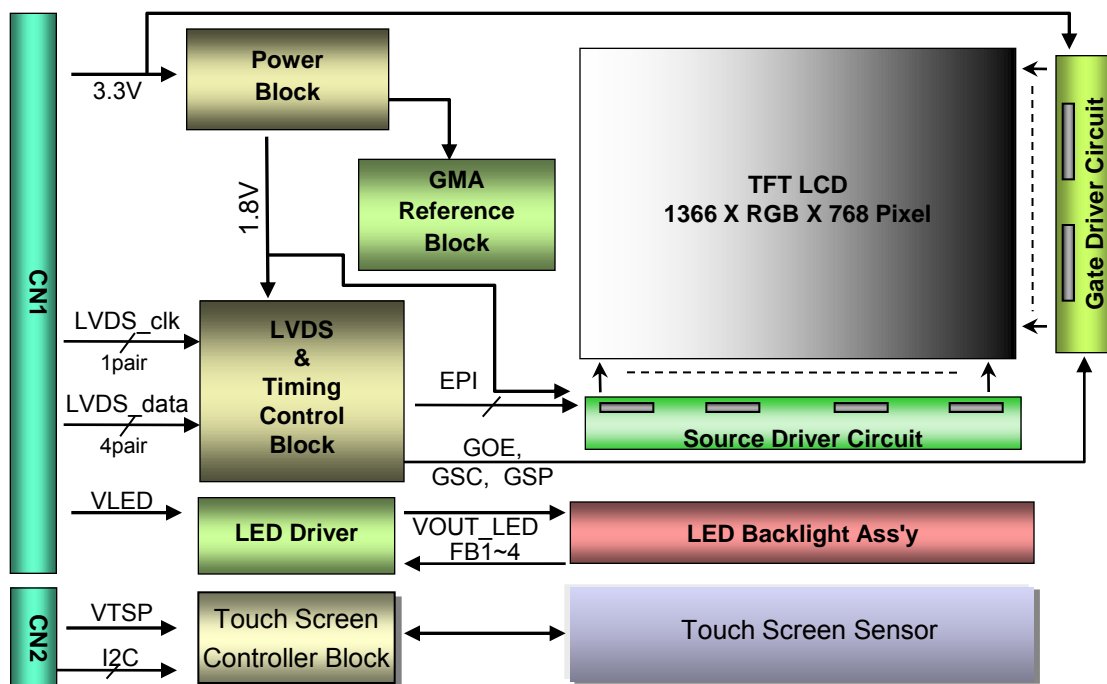
General Features

|	
Active Screen Size	10.1 inches diagonal
Outline Dimension	232.8±0.3 (H) × 138.15±0.3 (V) × 2.40 mm (max.) LCD + Touch : 268.70(H) × 171.30(V) × 3.85 (max.)
Pixel Pitch	0.05430 mm × 0.16290 mm
Pixel Format	1366 horiz. by 768 vert. Pixels RGB strip arrangement
Color Depth	8-bit, 16,777,216 colors
Luminance, White	360 cd/m^2(Typ., @I$_{LED}$=17.5mA)
Power Consumption	Logic : 0.55 W (typ.@Mosaic), Back Light : 2.1W (typ.@ I$_{LED}$= 17.5mA) TSP: 0.29W (typ. @ VTSP=3.3V))
Weight	160g (Max., LCM only) 275g(Max. with Touch)
Display Operating Mode	Transmissive mode, normally Black
Surface Treatment	Glare, low reflective treatment of the front polarizer, 2H, Touch: AF Coating (8H)

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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	VCC	-0.3	4.0	V_{DC}	at 25 $\pm$ 5°C
Operating Temperature	TOP	0	50	°C	1
Storage Temperature	HST	-20	60	°C	1
Operating Ambient Humidity	HOP	10	90	%RH	1
Storage Humidity	HST	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.

Dry Bulb Temperature [℃]
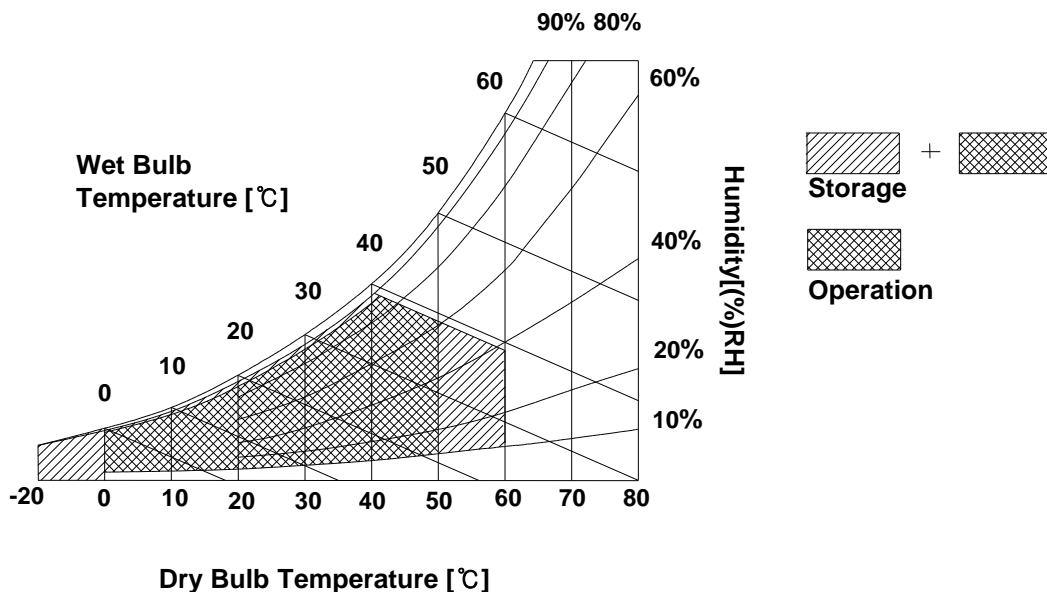
3. Electrical Specifications

3-1. Electrical Characteristics

The LP101WH4 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 LED BL.

Table 2. ELECTRICAL CHARACTERISTICS

| Parameter	Symbol		Values			Unit	Notes
			Min	Typ	Max		
LOGIC :							
Power Supply Input Voltage	VCC		3.0	3.3	3.6	V_{DC}	1
Power Consumption	Pcc	White		0.55	0.64	W	
		Black		0.55	0.64	W	
		Mosaic		0.55	0.64	W	2
		R/G/B	-	0.73	0.84	W	
Power Supply Inrush Current	I_{CC_P}		-	-	2000	mA	3, 4
LVDS Impedance	Z_{LVDS}		90	100	110	Ω	5
EDID Input Voltage	V_{EDID}		3.0	3.3	3.6	V	
EDID Input Current	I_{EDID}				10	mA	6
BACKLIGHT : (with LED Driver)							
LED Power input Voltage	VLED		6.0	8.4	12.0	V	7
LED Power Input Current	I_{LED}		-	250	256	mA	8
LED Power Consumption	P_{LED}		-	2.1	2.15	W	8
LED Power Inrush Current	I_{LED_P}		-	-	1500	mA	9
PWM Duty Ratio			5	-	100	%	10
PWM Jitter			0	-	0.3	%	11
PWM Frequency	F_{PWM}		200		10,000	Hz	12
PWM High Level Voltage	V_{PWM_H}		2.1			V	
PWM Low Level Voltage	V_{PWM_L}				0.8	V	
LED_EN High Voltage	V_{EN_H}		2.1			V	
Life Time			12,000	-	-	Hrs	13
Touch Panel							
Power Supply Input Voltage	V_{TSP}		3.15	3.3	3.45	V	
Power Supply Input Current	ITSP	Active	75	88.5	102	mA	
		Stand by		33	-	mA	
Power Consumption	P_{TSP}			0.29	0.33	W	14

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Note)

1. The measuring position is the connector of LCM and the test conditions are under 25℃, fv = 60Hz, Mosaic pattern.
2. The specified Icc current and power consumption are under the Vcc = 3.3V , 25℃, fv = 60Hz condition whereas Mosaic pattern is displayed and fv is the frame frequency.
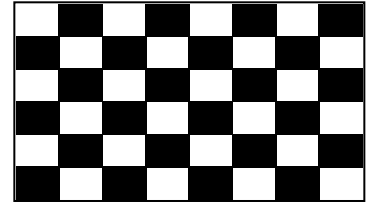
3. This Spec. is the max load condition for the cable impedance designing.
4. The below figures are the measuring Vcc condition and the Vcc control block LGD used.
   The Vcc condition is same the minimum of T1 at Power on sequence.

Rising time
Vcc

3.3V

90%

0V   10%

0.5ms
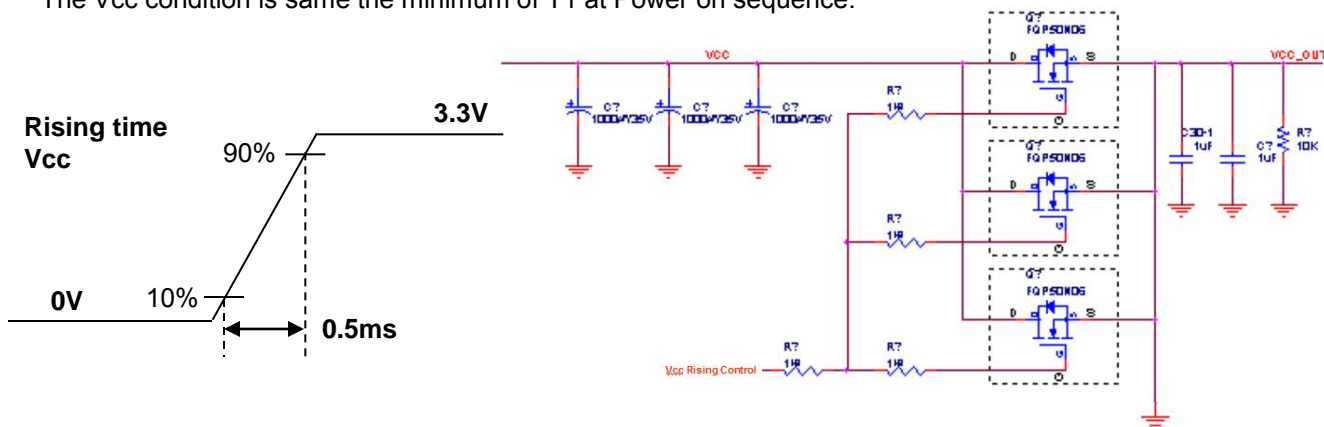
5. This impedance value is needed to proper display and measured form LVDS Tx to the mating connector.
6. The specified IEDID current are under the Vcc = 3.3V @ frequency = 330Khz condition.
7. The measuring position is the connector of LCM and the test conditions are under 25℃.
8. The current and power consumption with LED Driver are under the Vled = 8.4V , 25℃, Dimming of Max luminance whereas White pattern is displayed and fv is the frame frequency.
9. The below figures are the measuring Vled condition and the Vled control block LGD used.
   VLED control block is same with Vcc control block.

Rising time
VLED

8.4V

90%

0V   10%

0.5ms
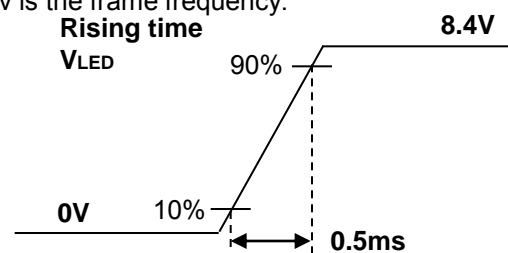
10. The operation of LED Driver below minimum dimming ratio may cause F.O.S or reliability issue.
11. If Jitter of PWM is bigger than maximum. It may cause flickering.
12. This Spec. is not effective at 100% dimming ratio as an exception because it has DC level equivalent to 0Hz. In spite of acceptable range as defined, the PWM Frequency should be fixed and stable for more consistent brightness control at any specific level desired.
13. The life time is determined as the time at which the typical brightness of LCD is 50% compare to that of initial value at the typical LED current.
14. The specified ITSP current and power consumption (PTSP) are under the VTSP = 3.3V , 25℃, 100Hz at 1-finger and Active mode.
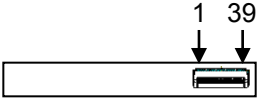
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3-2. Interface Connections

3-2-1. LCD Control Board Connection

This LCD employs two interface connections, a 39pin connector is used for the module electronics interface and the other connector is used for the integral backlight system.
The electronics interface connector is a model FH35C-39S-0.3SHW manufactured by HIROSE.

Table 3. MODULE CONNECTOR PIN CONFIGURATION (CN1)

Pin	Symbol	Description	Notes
1	NC	Reserved (diag-loop)	
2	GND	Ground	**[Connector]** FH35C-39S-0.3SHW(Hirose), 39pin
3	GND	Ground	
4	LVDS0_A3_P	Positive LVDS differential data input	**[Connector pin arrangement]**
5	NC	No Connection	
6	LVDS0_A3_N	Negative LVDS differential data input	
7	GND	Ground	
8	LVDS0_ACLK_P	Positive LVDS differential clock input	
9	NC	No Connection	
10	LVDS0_ACLK_N	Negative LVDS differential clock input	
11	GND	Ground	[LCD Module Rear View]
12	LVDS0_A2_P	Positive LVDS differential data input	
13	NC	No Connection	
14	LVDS0_A2_N	Negative LVDS differential data input	
15	GND	Ground	
16	LVDS0_A1_P	Positive LVDS differential data input	Rear View
17	NC	No Connection	
18	LVDS0_A1_N	Negative LVDS differential data input	
19	GND	Ground	1 39
20	LVDS0_A0_P	Positive LVDS differential data input	
21	NC	No Connection	
22	LVDS0_A0_N	Negative LVDS differential data input	
23	GND	Ground	
24	DBC	Dynamic Backlight Control (0 :Off, 1 : On, Floating - off)	
25	BLIM	PWM for Luminance Control	
26	BL_ON	Backlight On/Off Control	
27	VDD_EDID	DDC 3.3V Power	
28	VCC	Power Supply, 3.3V typ.	
29	VCC	Power Supply, 3.3V typ.	
30	LCD_I2C_DATA	DDC Data	
31	VLED_GND	LED Ground	
32	LCD_I2C_CLK	DDC Clock	
33	VLED_GND	LED Ground	
34	NC	Reserved (diag-loop)	
35	BIST	LCD panel self test enable (0 :Off, 1 : On, Floating - off)	
36	NC	Reserved	
37	VLED	LED Power Supply (System Input is 6V min.)	
38	VLED	LED Power Supply (System Input is 6V min.)	
39	VLED	LED Power Supply (System Input is 6V min.)	
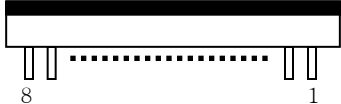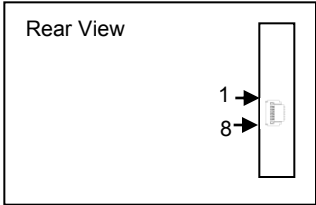
3-2-2. Touch Control Board Connection(for I2C)

This TSP employs a 8 pin connector used for the Touch I2C interface.

Table 4. Touch Control Board Connection

Pin	Symbol	Description	Notes
1	NC	–	**[Connector]** **AYF530835**(Panasonic), 8pin
2	AVDD_EN	AVDD/XVDD Power Control (for Sleep mode)	**[Connector pin arrangement]**
3	RESET	Reset Signal (from System)	
4	GND	Ground	**[LCD Module Rear View]**
5	CHG	State change interrupt	
6	SDA	I2C Serial Interface Data	
7	SCL	I2C Serial Interface Clock	
8	VBUS	Supply Voltage_3.3V	

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3-3. LVDS Signal Timing Specifications

3-3-1. DC Specification

$$\# |V_{ID}| = |(LVDS+) - (LVDS-)|$$
$$\# V_{CM} = \{(LVDS+) + (LVDS-)\}/2$$
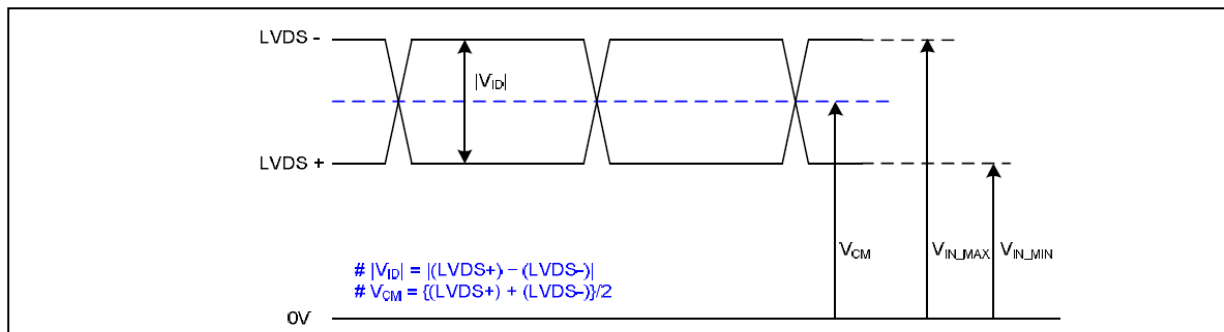
Description	Symbol	Min	Max	Unit	Notes
LVDS Differential Voltage	$|V_{ID}|$	100	600	mV	-
LVDS Common mode Voltage	V_{CM}	0.6	1.5	V	-
LVDS Input Voltage Range	V_{IN}	0.3	1.8	V	-

3-3-2. AC Specification

$t_{SKEW} (F_{clk} = 1/T_{clk})$
1) 85MHz > Fclk ≥ 65MHz : -400 ~ +400
2) 65MHz > Fclk ≥ 25MHz : -600 ~ +600
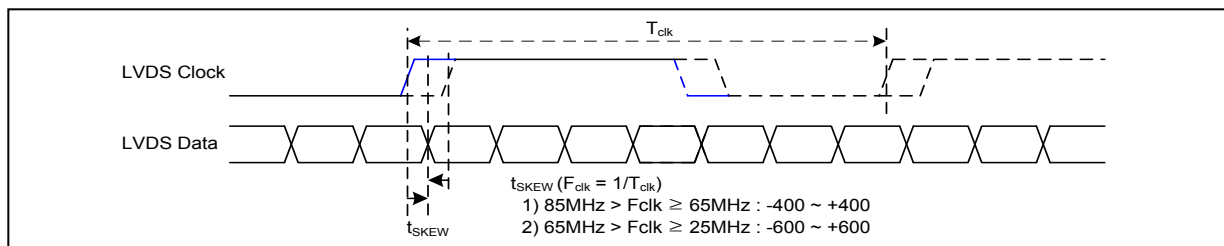
Description	Symbol	Min	Max	Unit	Notes
LVDS Clock to Data Skew Margin	t_{SKEW}	- 400	+ 400	ps	85MHz > Fclk ≥ 65MHz
	t_{SKEW}	- 600	+ 600	ps	65MHz > Fclk ≥ 25MHz
LVDS Clock to Clock Skew Margin (Even to Odd)	t_{SKEW_EO}	- 1/7	+ 1/7	T_{clk}	-
Maximum deviation of input clock frequency during SSC	F_{DEV}	-	± 3	%	-
Maximum modulation frequency of input clock during SSC	F_{MOD}	-	200	KHz	-

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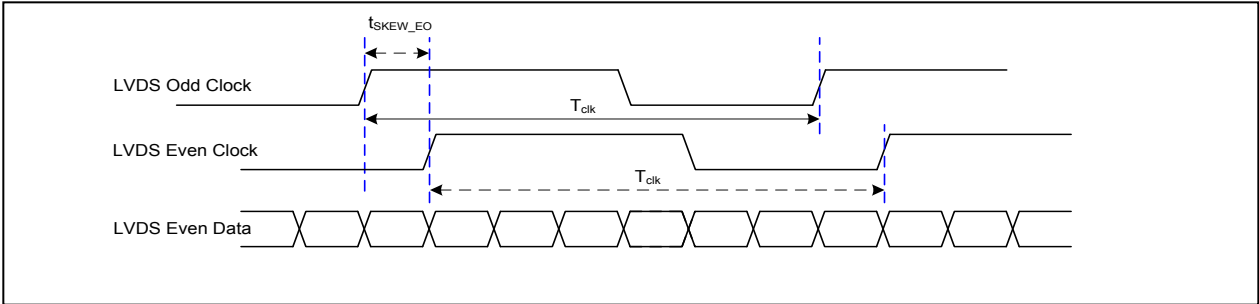
< Clock skew margin between channel >
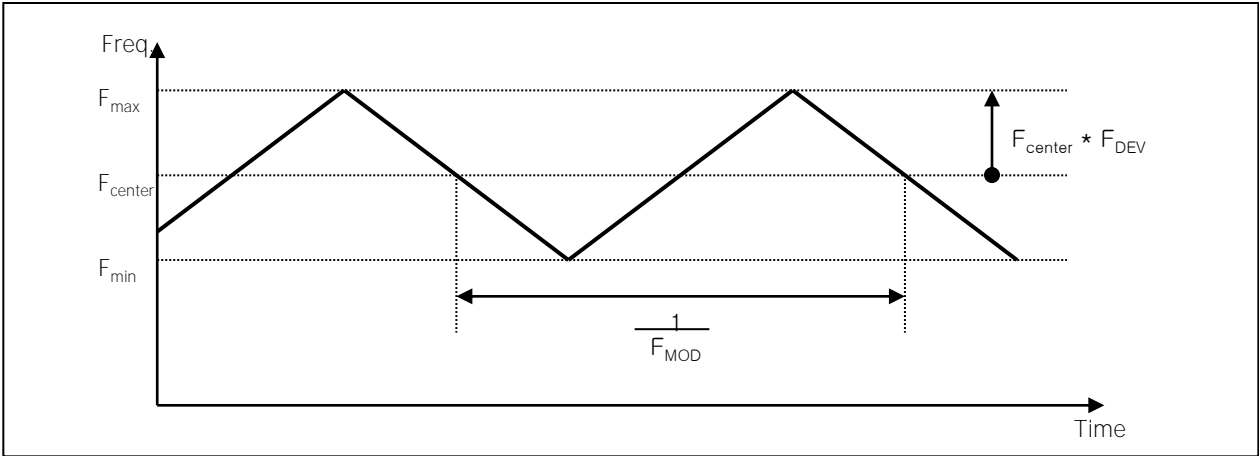
< Spread Spectrum >

3-3-3. Data Format

- LVDS 1 Port

< LVDS Data Format >

Product Specification
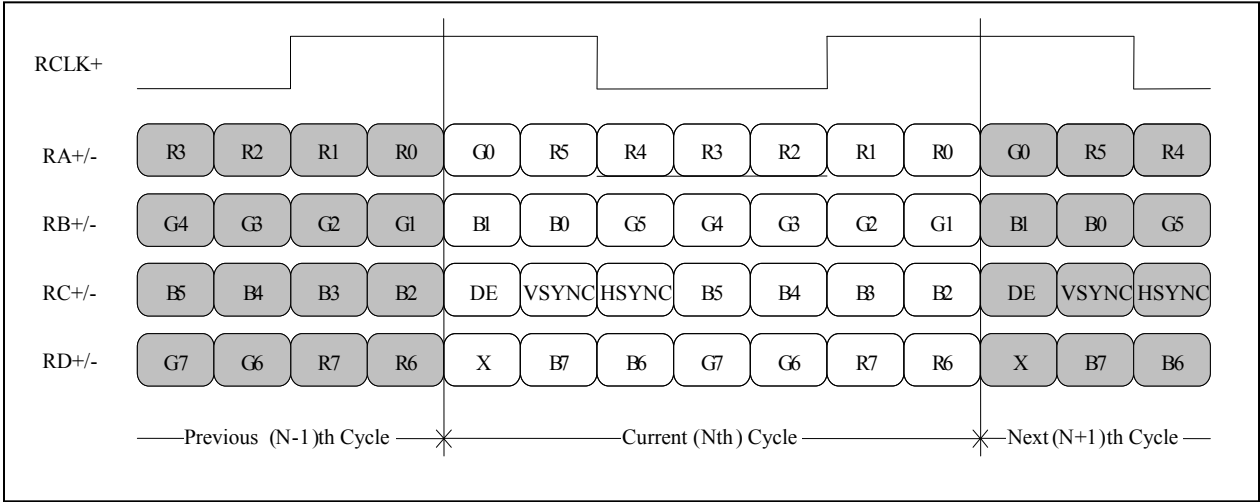
3-4. Signal Timing Specifications

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/Rx for its proper operation.

Table 5. TIMING TABLE

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	68.0	69.8	74.0	MHz	1port
Hsync	Period	t_{HP}	1462	1472	1532	Tclk	
	Width	t_{WH}	30	32	40		
	Width-Active	t_{WHA}	-	1366	-		
Vsync	Period	t_{VP}	775	790	805	t_{HP}	
	Width	t_{VW}	3	5	7		
	Width-Active	t_{VWA}	-	768	-		
Data Enable	Horizontal back porch	t_{HBP}	44	48	78	tCLK	
	Horizontal front porch	t_{HFP}	22	26	48		
	Vertical back porch	t_{VBP}	2	11	20	t_{HP}	
	Vertical front porch	t_{VFP}	2	6	10		

3-5. Signal Timing Waveforms

Condition : VCC =3.3V

Data Enable, Hsync, Vsync
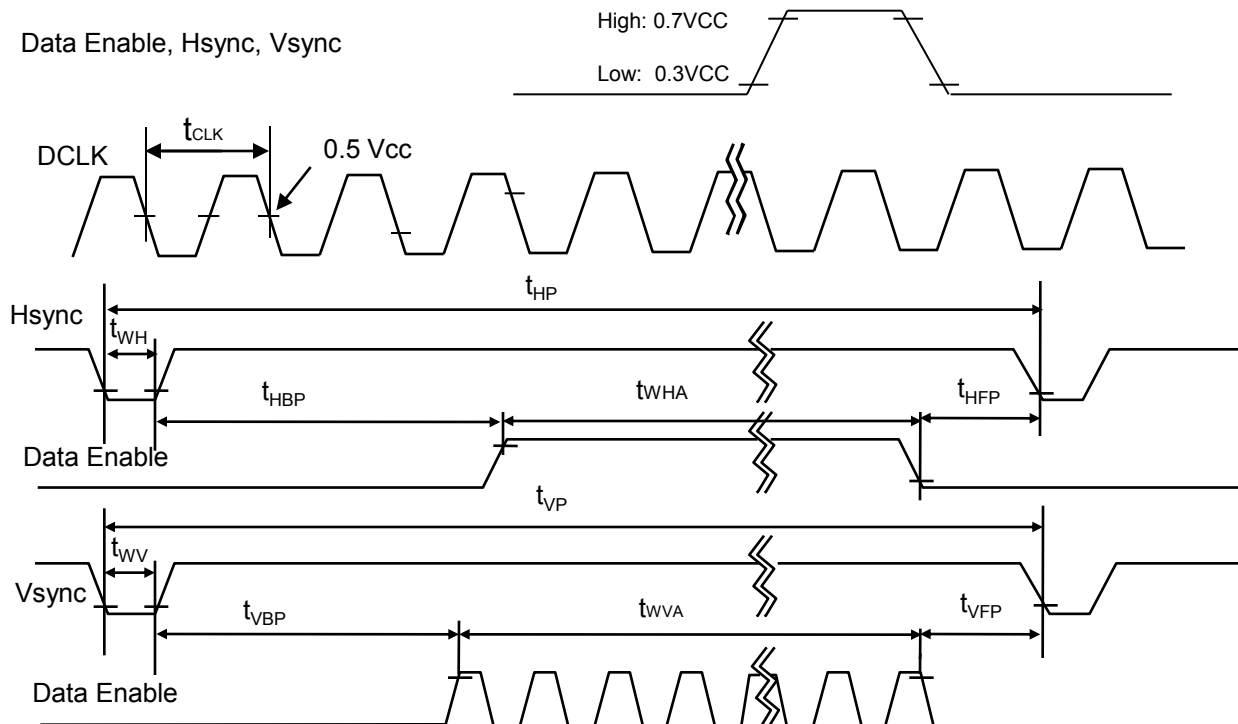
3-6. Color Input Data Reference

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	R7	R6	R5	R4	R3	R2	R1	R0	R7	R6	R5	R4	R3	R2	R1	R0
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 (00)	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 (01)	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 (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)	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 (00)	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 (01)	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 (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)	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 (00)	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 (01)	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

3-7. Power Sequence

3-7-1. Power Sequence for LCM
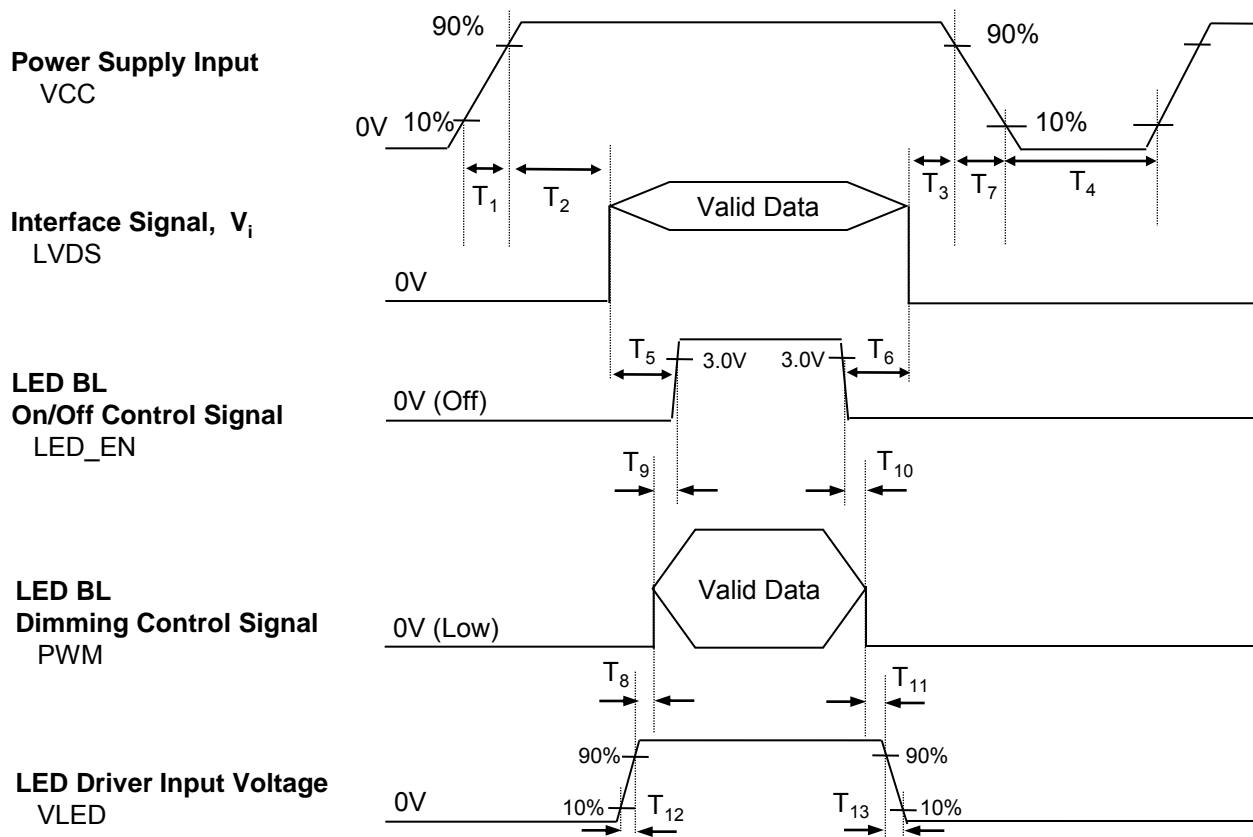
Table 8. POWER SEQUENCE TABLE

Logic Parameter	Value			Units	LED Parameter	Value			Units
	Min.	Typ.	Max.			Min.	Typ.	Max.	
T_1	0.5	-	10	ms	T_8	10	-	-	ms
T_2	0	-	50	ms	T_9	0	-	-	ms
T_3	0	-	50	ms	T_{10}	0	-	-	ms
T_4	400	-	-	ms	T_{11}	10	-	-	ms
T_5	200	-	-	ms	T_{12}	0.5	-	-	ms
T_6	200	-	-	ms	T_{13}	0	-	5000	ms
T_7	3	-	10	ms					

Note)

1. Do not insert the mating cable when system turn on.

2. Valid Data is Data to meet "3-3. Signal Timing Specifications"

3. LVDS, LED_EN and PWM need to be on pull-down condition on invalid status.

4. LGD recommend the rising sequence of VLED after the Vcc and valid status of LVDS turn on

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3-7-2. Power Sequence for Touch

Power Supply Input
VTSP 3.3V

RESET
Reset Active low

CHG
State change Interrupt

Interface Signal
I2C
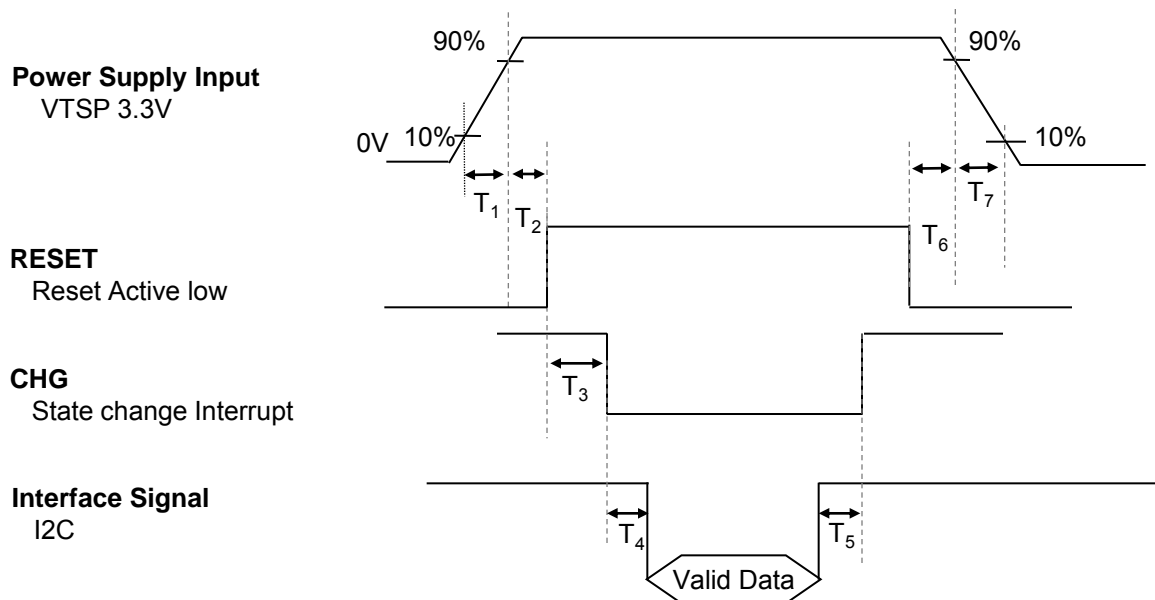
Table 9. POWER SEQUENCE TABLE

Parameter	Value			Units
	Min.	Typ.	Max.	
T_1	0.5	–	10	ms
T_2	90	–	–	ns
T_3	–	65	–	ms
T_4	0.1	–	–	ms
T_5	–	–	0.5	ms
T_6	0	–	–	ns
T_7	–	–	10	ms

Transferring Data Bits
  Each data bit transferred on the bus is accompanied by a pulse on the clock line. The level of the data line must
be stable when the clock line is high ; the only exception to this rule is for generating START and STOP conditions.

START and STOP conditions
 START and STOP conditions are signaled by changing the level of the SDA line when the SCL line is high.
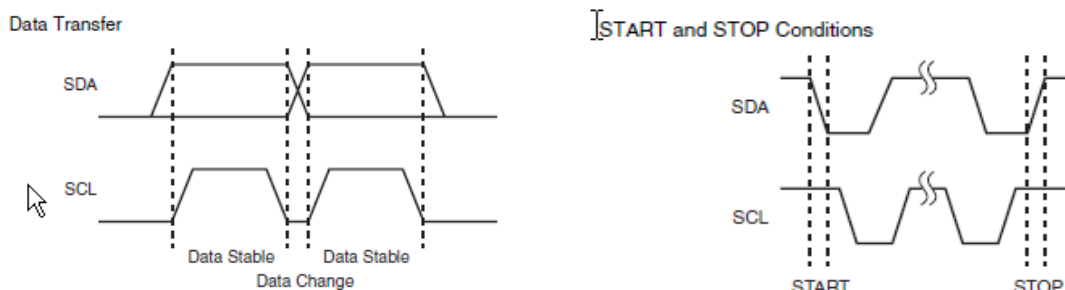
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4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 20 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. 1 Optical Characteristic Measurement Equipment and Method
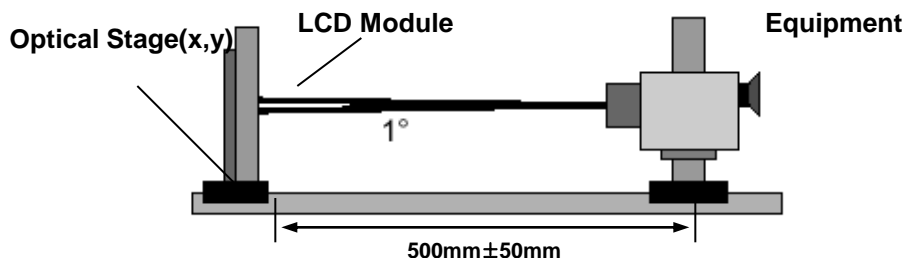
Table 9. OPTICAL CHARACTERISTICS   Ta=25°C, VCC=3.3V, fv=60Hz, f_{CLK}= 69.8MHz, ILED = 17.5mA

Parameter		Symbol	Condition	Min	Typ	Max	Units	Notes
Average Luminance (with Touch)		LAVE	5 Points (ILED= 17.5mA)	306	360	-	cd/㎡	2
Luminance variation		δ WHITE	5points	-	1.20	1.40		
			13 point	-	1.40	1.60		3
C/R		-	Center 1 Point	500	800	-	-	1
Response time			-	-	25	-	ms	4
Viewing angle	Horizontal	Θ	φx(Left,Right)	±80	±85	-	°	5
	Vertical	Θ	φyu(Up)	80	85	-		
		Θ	φyd(Down)	80	85	-		
Color Coordinates		RED	RX	0.567	0.597	0.627		
			RY	0.324	0.354	0.384		
		GREEN	GX	0.305	0.335	0.365		
			GY	0.537	0.567	0.597		
		BLUE	BX	0.121	0.151	0.181		
			BY	0.089	0.119	0.149		
		WHITE	WX	0.283	0.313	0.343		
			WY	0.299	0.329	0.359		
Gray Scale		-	-	Gamma 2.2				6

Product Specification

Note)
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 average of 5 point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see FIG 1.

$$L_{WH} = \text{Average}(L_1, L_2, \ldots L_5)$$

3. The variation in surface luminance , The panel total variation (δ_{WHITE}) is determined by measuring L_N at each test position 1 through 17 and then defined as followed numerical formula. For more information see FIG 2.

$$\delta_{WHITE} = \frac{\text{Maximum}(L_1, L_2, \ldots L_{13})}{\text{Minimum}(L_1, L_2, \ldots L_{13})}$$

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 3.

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 4.

6. Gray scale specification   * f_V = 60Hz

Gray Level	Luminance [%] (Typ)
L0	0.13
L15	0.30
L31	0.90
L47	2.20
L63	4.35
L79	7.50
L95	11.70
L111	16.80
L127	22.80
L143	28.80
L159	35.50
L175	42.90
L191	51.10
L207	60.20
L223	71.45
L239	85.30
L255	100.00

Product Specification

FIG. 2 Luminance

<Measuring point for Average Luminance & measuring point for Luminance variation>

H,V : ACTIVE AREA
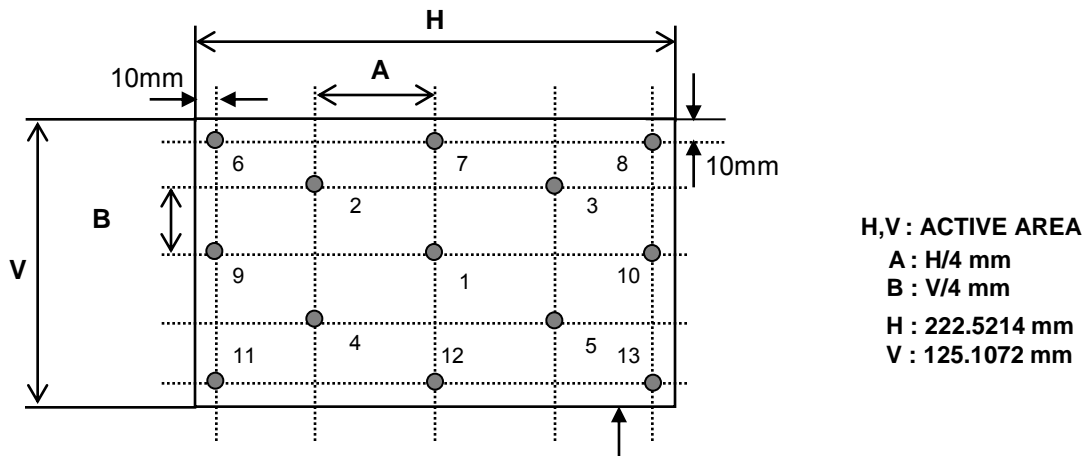**A : H/4 mm**
B : V/4 mm
H : 222.5214 mm
V : 125.1072 mm

FIG. 3 Response Time

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

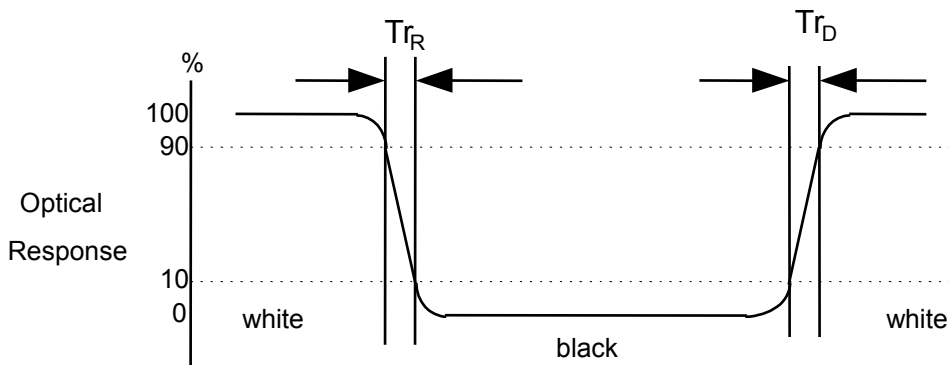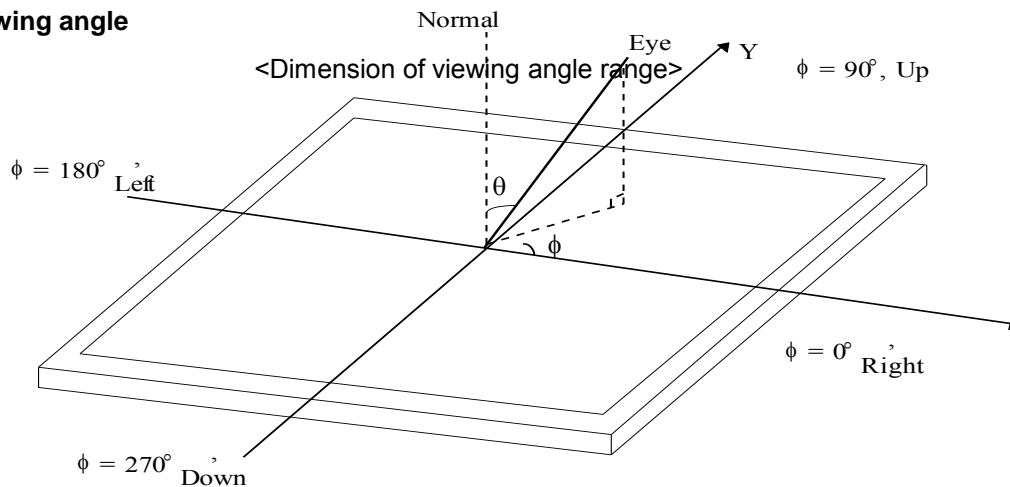### FIG. 4 Viewing angle

<Dimension of viewing angle range>

$\phi = 90°$, Up
$\phi = 180°$ Left
$\phi = 0°$ Right
$\phi = 270°$ Down

Product Specification

5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LP101WH4. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	232.8 ± 0.3mm (without Touch)
	Vertical	138.15 ± 0.3mm (without Touch)
	Thickness	2.40mm (max.)
Active Display Area	Horizontal	222.5214mm
	Vertical	125.1072mm
Touch Screen Panel	Horizontal	268.70mm
	Vertical	171.30mm
	Thickness	1.45 Max
Weight	160g (Max.) w/o Touch, 275g (Max) w/ Touch	
Surface Treatment	LCD : Glare, low reflective treatment of the front polarizer, 2H Touch : AF Coating, 8H	
Viewing Angle	Viewing Angle(When Active area can be seen) ≤ 30°	

Product Specification

<FRONT VIEW>

TOP
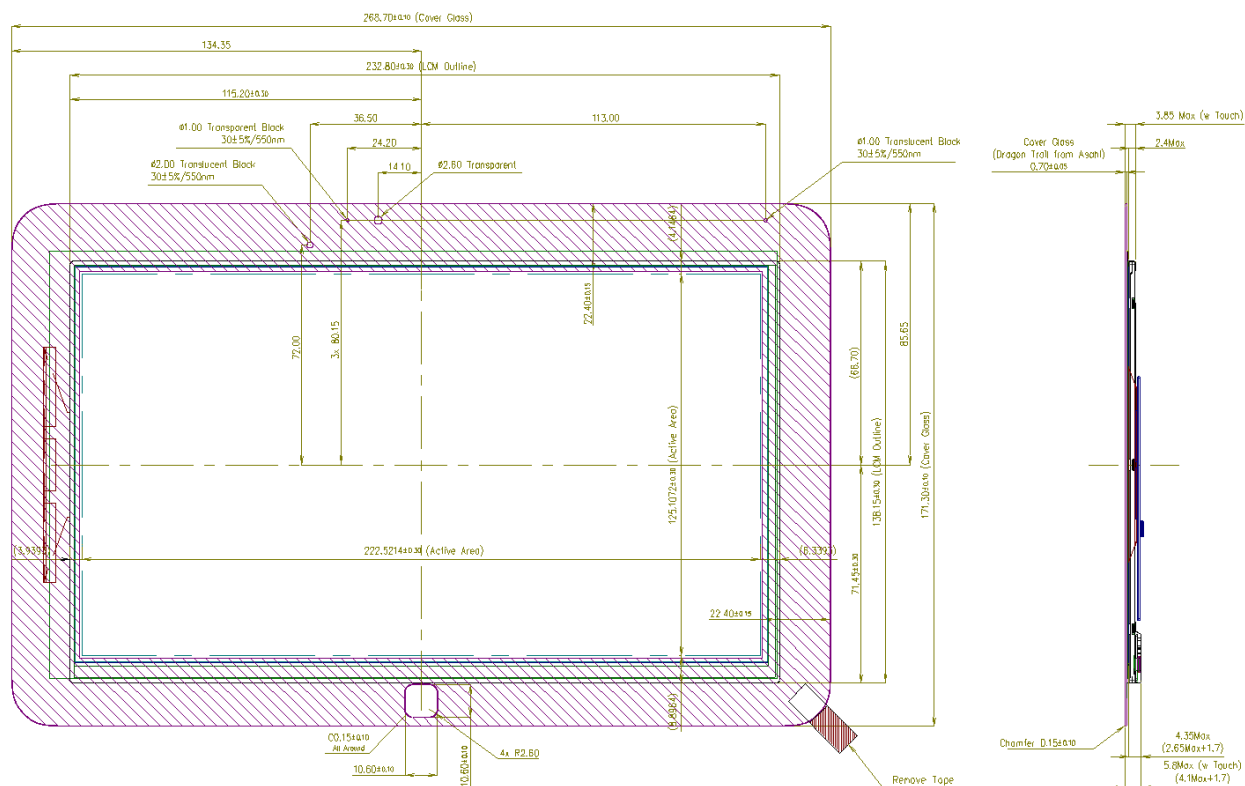
	Layer	Tolerance
G/F2 TYPE TOUCH STACK UP	AF coating (200~300 Angstrom)	Neglect able value
	Cover Glass (700um)	+/- 50um
	OCA (100um)	+/- 30um
	Sensor Film (200um) Rx 150 +/- 30Ω/Sq Tx 150 +/- 30Ω/Sq	+/- 50um
	Resin (300um)	+/- 120um

BOTTOM

LG Display

Product Specification

<REAR VIEW>

Product Specification

Thickness   Weight
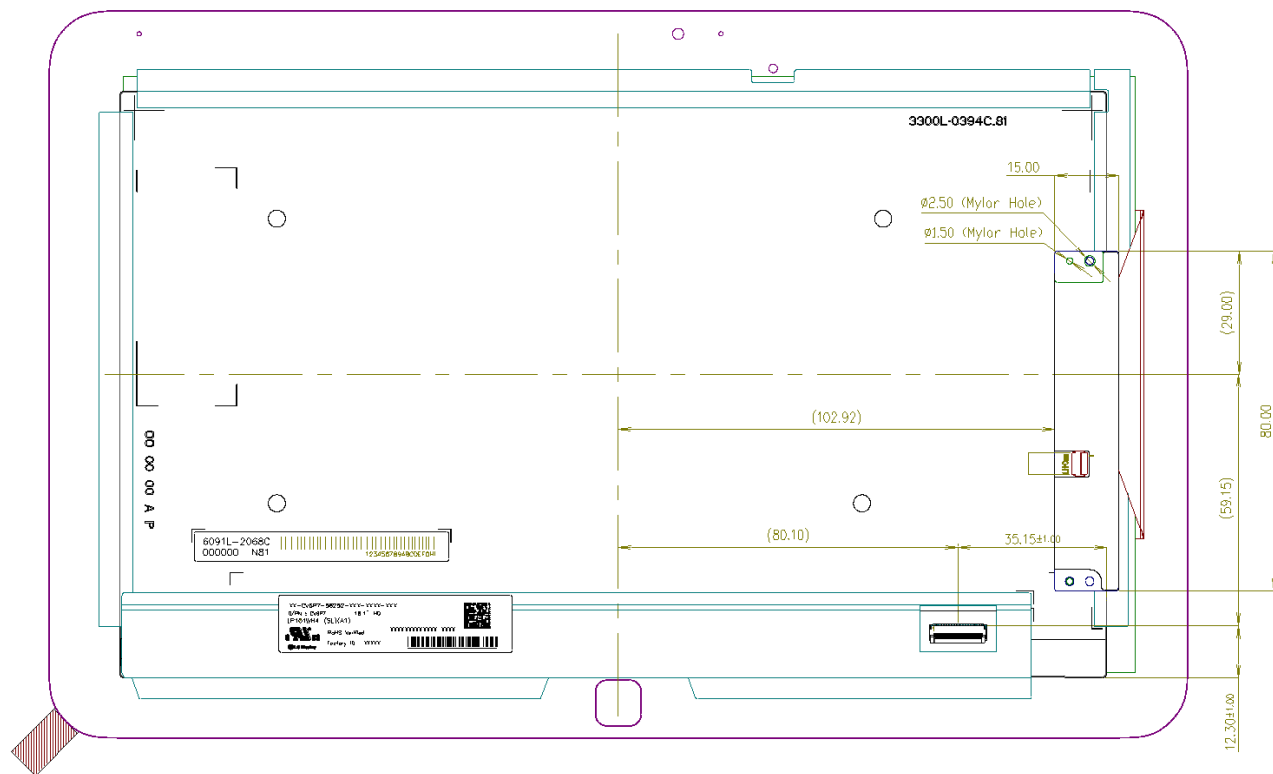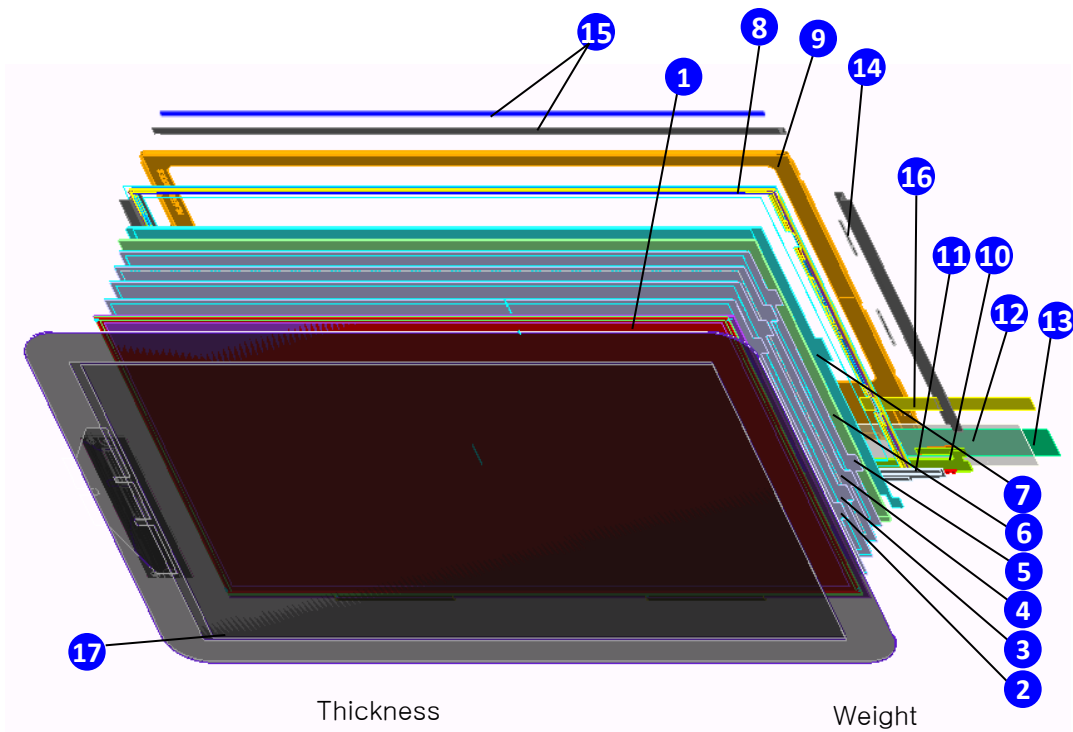
	Component	EA
1	Board Assembly	1
2	Diffuser up sheet	1
3	Prism up sheet	1
4	Prism down sheet	1
5	Diffuser down sheet	1
6	Light Guide Panel	1
7	Reflector sheet	1
8	Supporter Main	1
9	Plate Bottom	1
10	LED Array Assembly	1
11	LED Housing	1
12	Source Cover Shield	1
13	LCM Label	1
14	Sheet fixing pad	3
15	Double side tape	9
16	BL Label	1
17	Touch Screen Panel	1
	total	27

[DETAIL INFORMATION OF PPID LABEL AND REVISION CODE]

* *** Country of Origin**

* PPID Label Revision

* PPID Label Revision :
  It is subject to change with Dell event. Please refer to the below table for detail.

Classification	No Change	1st Revision	2nd Revision	…	9th Revision	…
SST(WS)	X00	X01	X02	…	A09	…
PT(ES)	X10	X11	X12	…	A19	…
ST(CS)	X20	X21	X22	…	A29	…
XB(MP)	A00	A01	A02	…	A09	…

Country of Origin	Factory ID
CN: China	LGDNJ
KR: Korea	-

6. Reliability

Environment test condition

No.	Test Item	Conditions
1	High temperature storage test	Ta= 60°C, 240h
2	Low temperature storage test	Ta= -20°C, 240h
3	High temperature operation test	Ta= 50°C, 50%RH, 240h
4	Low temperature operation test	Ta= 0°C, 240h
5	Vibration test (non-operating)	Sine wave, 10 ~ 500 ~ 10Hz, 1.5G, 0.37oct/min 3 axis, 1hour/axis
6	Shock test (non-operating)	Half sine wave, 180G, 2ms one shock of each six faces(I.e. run 180G 6ms for all six faces)
7	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, Underwriters Laboratories Inc.
   Information Technology Equipment - Safety - Part 1 : General Requirements.

b) CAN/CSA C22.2 No.60950-1-07, Canadian Standards Association.
   Information Technology Equipment - Safety - Part 1 : General Requirements.

c) EN 60950-1, European Committee for Electrotechnical Standardization (CENELEC).
   Information Technology Equipment - Safety - Part 1 : General Requirements.

d) IEC 60950-1, The International Electrotechnical Commission (IEC).
   Information Technology Equipment - Safety - Part 1 : General Requirements.

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)

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	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Mark	A	B	C	D	E	F	G	H	J	K

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 : 40 pcs

b) Box Size : 355 X 468 X 310

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=± 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.

Product Specification

EDID Data for *Dell* _ ver. 1.0

2012.10.18

	Byte (Dec)	Byte (Hex)	Field Name and Comments	Value (Hex)	Value (Bin)
Header	0	00	Header	00	00000000
	1	01	Header	FF	11111111
	2	02	Header	FF	11111111
	3	03	Header	FF	11111111
	4	04	Header	FF	11111111
	5	05	Header	FF	11111111
	6	06	Header	FF	11111111
	7	07	Header	00	00000000
Vendor / Product EDID Version	8	08	ID Manufacture Name LGD	30	00110000
	9	09	ID Manufacture Name	E4	11100100
	10	0A	ID Product Code 0377h	77	01110111
	11	0B	(Hex. LSB first)	03	00000011
	12	0C	ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)	00	00000000
	13	0D	ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)	00	00000000
	14	0E	ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)	00	00000000
	15	0F	ID Serial No. - Optional ("00h" If not used, Number Only and LSB First)	00	00000000
	16	10	Week of Manufacture - Optinal 00 weeks	00	00000000
	17	11	Year of Manufacture 2012 years	16	00010110
	18	12	EDID structure version # = 1	01	00000001
	19	13	EDID revision # = 4	04	00000100
Display Parameters	20	14	Video input Definition = Input is a Digital Video signal Interface , Colo Bit Depth : 8 Bits per Primary Color , Digital Video Interface Standard Supported: Digital Interface is not defined	A0	10100000
	21	15	Horizontal Screen Size (Rounded cm) = 22 cm	16	00010110
	22	16	Vertical Screen Size (Rounded cm) = 13 cm	0D	00001101
	23	17	Display Transfer Characteristic (Gamma) = (gamma*100)-100 = Example:(2.2*100)-100=120	78	01111000
	24	18	Feature Support [Display Power Management(DPM) : Standby Mode is not supported, Suspend Mode is not supported, Active Off = Very Low Power is not supported ,Supportted Color Encoding Formats : RGB 4:4:4 ,Other Feature Support Flags : No_sRGB, Preferred Timing Mode, No_Display is continuous frequency (Multi-mode Base EDID and Extension Block).]	02	00000010
Panel Color Coordinates	25	19	Red/Green Low Bits (RxRy/GxGy)	ED	11101101
	26	1A	Blue/White Low Bits (BxBy/WxWy)	E5	11100101
	27	1B	Red X Rx = 0.597	98	10011000
	28	1C	Red Y Ry = 0.354	5A	01011010
	29	1D	Green X Gx = 0.335	55	01010101
	30	1E	Green Y Gy = 0.567	91	10010001
	31	1F	Blue X Bx = 0.151	26	00100110
	32	20	Blue Y By = 0.119	1E	00011110
	33	21	White X Wx = 0.313	50	01010000
	34	22	White Y Wy = 0.329	54	01010100
Established Timings	35	23	Established timing 1 (Optional_00h if not used)	00	00000000
	36	24	Established timing 2 (Optional_00h if not used)	00	00000000
	37	25	Manufacturer's timings (Optional_00h if not used)	00	00000000
Standard Timing ID	38	26	Standard timing ID1 (Optional_01h if not used)	01	00000001
	39	27	Standard timing ID1 (Optional_01h if not used)	01	00000001
	40	28	Standard timing ID2 (Optional_01h if not used)	01	00000001
	41	29	Standard timing ID2 (Optional_01h if not used)	01	00000001
	42	2A	Standard timing ID3 (Optional_01h if not used)	01	00000001
	43	2B	Standard timing ID3 (Optional_01h if not used)	01	00000001
	44	2C	Standard timing ID4 (Optional_01h if not used)	01	00000001
	45	2D	Standard timing ID4 (Optional_01h if not used)	01	00000001
	46	2E	Standard timing ID5 (Optional_01h if not used)	01	00000001
	47	2F	Standard timing ID5 (Optional_01h if not used)	01	00000001
	48	30	Standard timing ID6 (Optional_01h if not used)	01	00000001
	49	31	Standard timing ID6 (Optional_01h if not used)	01	00000001
	50	32	Standard timing ID7 (Optional_01h if not used)	01	00000001
	51	33	Standard timing ID7 (Optional_01h if not used)	01	00000001
	52	34	Standard timing ID8 (Optional_01h if not used)	01	00000001
	53	35	Standard timing ID8 (Optional_01h if not used)	01	00000001

LG Display

Byte (Dec)	Byte (Hex)	Field Name and Comments		Value (Hex)	Value (Bin)
		Timing Descriptor #1			
54	36	Pixel Clock/10,000 (LSB)	69.8 MHz @ 60 Hz	44	01000100
55	37	Pixel Clock/10,000 (MSB)		1B	00011011
56	38	Horizontal Active (HA) (lower 8 bits)	1366 pixels	56	01010110
57	39	Horizontal Blanking (HB) (lower 8 bits)	106 pixels	6A	01101010
58	3A	Horizontal Active (HA) / Horizontal Blanking (HB) (upper 4:4bits)		50	01010000
59	3B	Vertical Avtive (VA)	768 lines	00	00000000
60	3C	Vertical Blanking (VB) (DE Blanking typ.for DE only panels)	22 lines	16	00010110
61	3D	Vertical Active (VA) / Vertical Blanking (VB) (upper 4:4bits)		30	00110000
62	3E	Horizontal Front Porch in pixels (HF) (lower 8 bits)	26 pixels	1A	00011010
63	3F	Horizontal Sync Pulse Width in pixels (HS) (lower 8 bits)	32 pixels	20	00100000
64	40	Vertical Front Porch in lines (VF) : Vertical Sync Pluse Width in lines (VS) (lower 4 bits)	6 lines : 5 lines	65	01100101
65	41	Horizontal Front Porch/ Sync Pulse Width/ Vertical Front Porch/ Sync Pulse Width (upper 2bits)		00	00000000
66	42	Horizontal Vedio Image Size (mm) (lower 8 bits)	223 mm	DF	11011111
67	43	Vertical Vedio Image Size (mm) (lower 8 bits)	125 mm	7D	01111101
68	44	Horizontal Image Size / Vertical Image Size (upper 4 bits)		00	00000000
69	45	Horizontal Border = 0 (Zero for Notebook LCD)		00	00000000
70	46	Vertical Border = 0 (Zero for Notebook LCD)		00	00000000
71	47	Non-Interlace, Normal display, no stereo, Digital Separate [Vsync_NEG, Hsync_POS (outside of V-sync)]		1A	00011010
		Timing Descriptor #2			
72	48	Pixel Clock/10,000 (LSB)	46.5 MHz @ 40 Hz	2D	00101101
73	49	Pixel Clock/10,000 (MSB)		12	00010010
74	4A	Horizontal Active (HA) (lower 8 bits)	1366 pixels	56	01010110
75	4B	Horizontal Blanking (HB) (lower 8 bits)	106 pixels	6A	01101010
76	4C	Horizontal Active (HA) / Horizontal Blanking (HB) (upper 4:4bits)		50	01010000
77	4D	Vertical Avtive (VA)	768 lines	00	00000000
78	4E	Vertical Blanking (VB) (DE Blanking typ.for DE only panels)	22 lines	16	00010110
79	4F	Vertical Active (VA) / Vertical Blanking (VB) (upper 4:4bits)		30	00110000
80	50	Horizontal Front Porch in pixels (HF) (lower 8 bits)	26 pixels	1A	00011010
81	51	Horizontal Sync Pulse Width in pixels (HS) (lower 8 bits)	32 pixels	20	00100000
82	52	Vertical Front Porch in lines (VF) : Vertical Sync Pluse Width in lines (VS) (lower 4 bits)	6 lines : 5 lines	65	01100101
83	53	Horizontal Front Porch/ Sync Pulse Width/ Vertical Front Porch/ Sync Pulse Width (upper 2bits)		00	00000000
84	54	Horizontal Vedio Image Size (mm) (lower 8 bits)	223 mm	DF	11011111
85	55	Vertical Vedio Image Size (mm) (lower 8 bits)	125 mm	7D	01111101
86	56	Horizontal Image Size / Vertical Image Size (upper 4 bits)		00	00000000
87	57	Horizontal Border = 0 (Zero for Notebook LCD)		00	00000000
88	58	Vertical Border = 0 (Zero for Notebook LCD)		00	00000000
89	59	Non-Interlace, Normal display, no stereo, Digital Separate [Vsync_NEG, Hsync_POS (outside of V-sync)]		1A	00011010
		Timing Descriptor #3			
90	5A	Flag		00	00000000
91	5B	Flag		00	00000000
92	5C	Flag		00	00000000
93	5D	Data Type Tag : Alphanumeric Data String (ASCII String)		FE	11111110
94	5E	Flag		00	00000000
95	5F	Dell P/N 1st Character =	C	43	01000011
96	60	Dell P/N 2nd Character =	V	56	01010110
97	61	Dell P/N 3rd Character =	6	36	00110110
98	62	Dell P/N 4th Character =	P	50	01010000
99	63	Dell P/N 5th Character =	7	37	00110111
100	64	EDID Revision Build Name = MP(X-Build) , Revision # = A00		80	10000000
101	65	Manufacturer P/N =	1	31	00110001
102	66	Manufacturer P/N =	0	30	00110000
103	67	Manufacturer P/N =	1	31	00110001
104	68	Manufacturer P/N =	W	57	01010111
105	69	Manufacturer P/N =	H	48	01001000
106	6A	Manufacturer P/N =	4	34	00110100
107	6B	Manufacturer P/N (If < 13 char, then terminate with ASC II code 0Ah,set remaining char = 20h)		0A	00001010

Product Specification

	Byte (Dec)	Byte (Hex)	Field Name and Comments	Value (Hex)	Value (Bin)
Timing Descriptor #4	108	6C	Flag	00	00000000
	109	6D	Flag	00	00000000
	110	6E	Flag	00	00000000
	111	6F	Data Type Tag : Descriptor Defined by manufacturer	00	00000000
	112	70	Flag	00	00000000
	113	71	Color Management [No +2 FRC Support, True Color Depth : 8 bit]	02	00000010
	114	72	Panel Type [WLED] , Configuration [Single light bar], Number Lamp or LED Light Bar [one]	41	01000001
	115	73	Frame Rate Details [Minimum Frame Rate : 40Hz, Maximum Frame Rate : 65Hz , Tcon provides native Intel DRRS / sDRRS support]	31	00110001
	116	74	Controller Interface and Maximum Luminance [PWM type, 360 nit]	A4	10100100
	117	75	Front Surface / Polarizer [Glossy/True-life, No Transflective] , Pixel Structure [RGB v-stripe]	01	00000001
	118	76	Multi-Media Features [Color Management : NTSC, Dynamic Backlight Control : No]	00	00000000
	119	77	Multi-Media Features [Motion Blur : No support , Active Gamma Control : No support]	00	00000000
	120	78	Special Features [Wireless Enhancement Hardware : No support , In-Cell Scanner : No support]	00	00000000
	121	79	Special Features [Number of LVDS channels or eDP lanes : one , Overdrive : No ,Interface : LVDS , In-Cell Touch Support : No]	01	00000001
	122	7A	Special Features [BIST Support : yes , Electronic Privacy : No electronic privacy hardware support , 3-D Support : No]	01	00000001
	123	7B	(If<13 char--> 0Ah, then terminate with ASC II code 0Ah,set remaining char = 20h)	0A	00001010
	124	7C	(If<13 char--> 0Ah, then terminate with ASC II code 0Ah,set remaining char = 20h)	20	00100000
	125	7D	(If<13 char--> 0Ah, then terminate with ASC II code 0Ah,set remaining char = 20h)	20	00100000
Checksum	126	7E	Extension flag (# of optional 128 panel ID extension block to follow, Typ = 0)	00	00000000
	127	7F	Check Sum (The 1-byte sum of all 128 bytes in this panel ID block shall = 0)	62	01100010