SPECIFICATION
FOR
APPROVAL

(●) Preliminary Specification
( ) Final Specification

Title	20.1” WSXGA+ TFT LCD

BUYER	NDS
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LM201WE2
SUFFIX	SLB1

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

APPROVED BY	SIGNATURE / DATE
/	
/	
/	

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

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MNT Products Engineering Dept.
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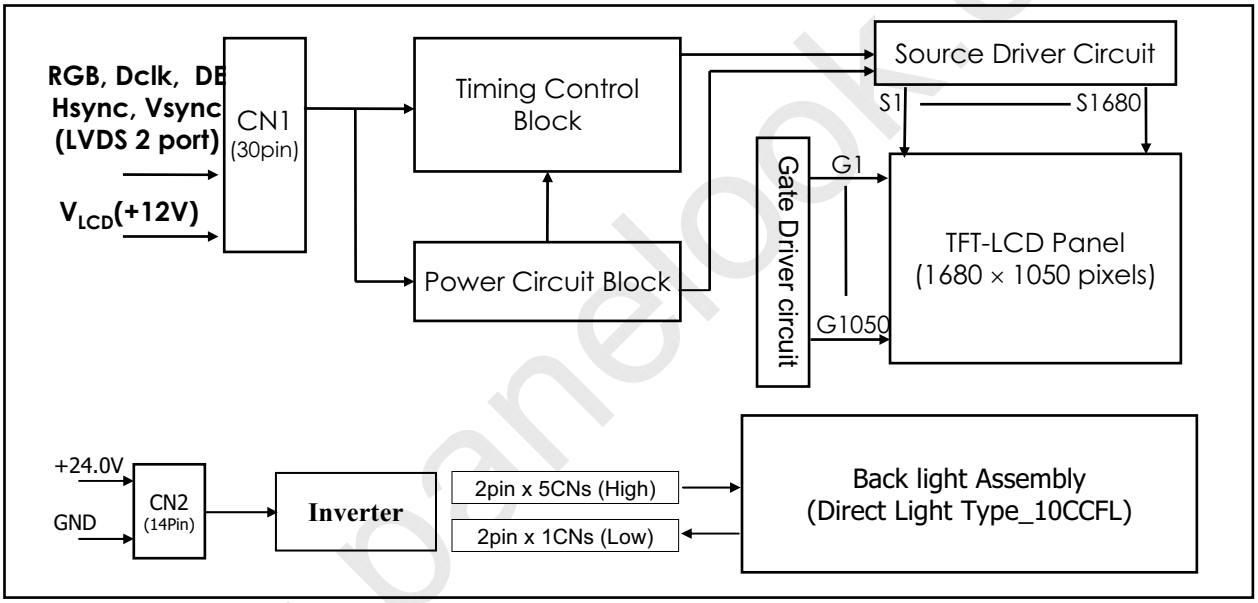
Contents

RECORD OF REVISIONS

Revision No	Revision Date	Page	DESCRIPTION
0.0	August, 29, 2005	-	First Draft, Preliminary Specifications
0.1	Sep 12,2005	17	Added the contrast ratio without DCR
0.2	Sep.22.2005	8	Update DIM out Voltage.
		22	Adjustment surface treatment.
		25	Update the Reliability
		26	Added the ROHS specification

1. General Description

LM201WE2 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. It has a 20.1 inch diagonally measured active display area with WSXGA+ resolution (1050 vertical by 1680 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 16,7M(True) colors.
It has been designed to apply the 8Bit 2 port LVDS interface.
It is intended to support displays where high brightness, super wide viewing angle, high color saturation, and high color are important.



General Features

Active Screen Size	20.1 inches(511.133mm) diagonal (Aspect ratio 16:10)
Outline Dimension	461.4(H) x 296.8 (V) x 36.9(D) mm (Typ.)
Pixel Pitch	0.258mm x 0.258mm
Pixel Format	1680 horiz. By 1050 vert. Pixels RGB strip arrangement
Color Depth	8bit, 16,7 M colors
Luminance, White	470 cd/m^2 (Center 1 point, Typ.)
Viewing Angle (CR>10)	Viewing Angle Free (R/L 178(Typ.), U/D 178(Typ))
Power Consumption	Total 54.81 Watt(Typ.) (5.81 Watt@VLCD, 49 Watt@470cd)
Weight	2680 g (Typ.)
Display Operating Mode	Transmissive mode, normally black
Surface Treatment	Hard coating (3H), Anti-glare treatment of the front polarizer

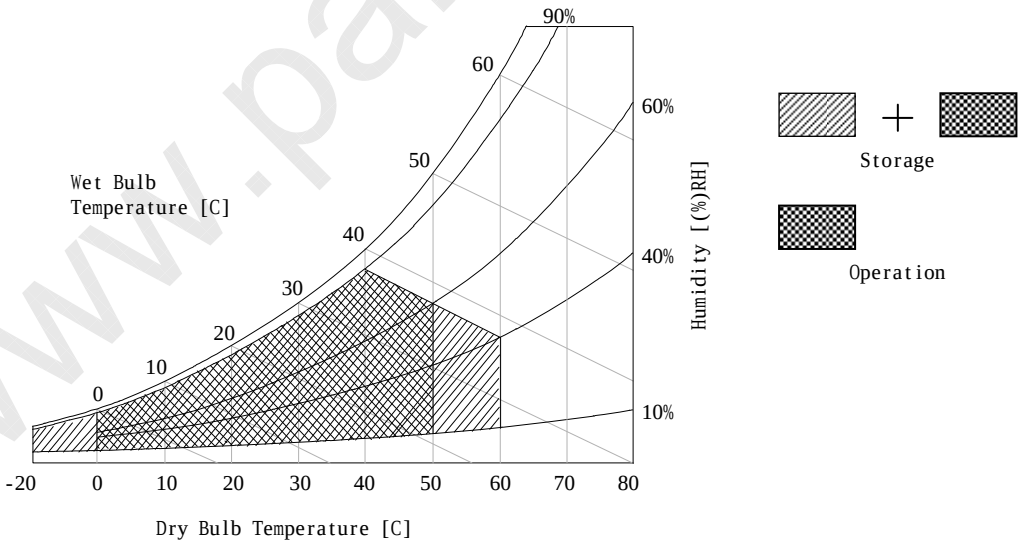
2. Absolute Maximum Ratings

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	VLCD	-0.3	14.0	Vdc	at 25 ± 2 °C
Operating Temperature	TOP	0	50	°C	1
Storage Temperature	TST	-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.



3. Electrical Specifications

3-1. Electrical Characteristics

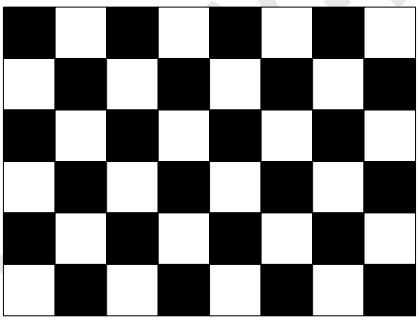
It requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The second input power for the CCFL, is typically generated by an inverter. The inverter is an external unit to the LCDs.

Table 2_1. ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
MODULE :						
Power Supply Input Voltage	V_{LCD}	11.4	12.0	12.6	Vdc	
Power Supply Input Current	I_{LCD}	-	466	560	mA	1
		-	572	686	mA	2
Power Consumption	P_{LCD}	-	5.59	6.72	Watt	1
Rush current	I_{RUSH}	-	-	3	A	3

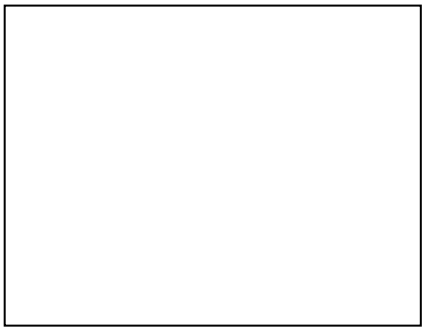
Note :
1. The specified current and power consumption are under the V_{LCD}=12.0V, 25 ± 2°C,f_V=60Hz condition whereas mosaic pattern(8 x 6) is displayed and f_V is the frame frequency.
2. The current is specified at the maximum current pattern.
3. The duration of rush current is about 2ms and rising time of power Input is 1ms(min.).

White : 255Gray
Black : 0Gray



Mosaic Pattern(8 x 6)

Maximum current pattern



White Pattern

Table 2_2. INVERTERELECTRICAL CHARACTERISTICS

Parameter	Symbol	Condition	Values			Unit	Notes
			Min.	Typ.	Max.		
Inverter :							
Input Voltage	V_{DDB}		22	24	26	V	1
Input Current	I_{DDB}	V_{BR} = 3.3V		1.92	2.28	A	2
Input Power	PB	V_{BR} = 3.3V	41.5	46.1	50.7	Watt	2
B/L on/off control	VON/OFF	Lamp ON = High	2.0	-	5.0	V	
		Lamp OFF =Low	0.0	-	0.8	V	
Brightness Adj	VBR		0.0	-	3.3	V	
LAMP :							
Life time			50,000			Hrs	3

Notes :

1. The input voltage ripple is limited below 400mVp-p.
2. The specified current and power consumption are under the typical supply Input voltage, 24V.
3. The life is determined as the time at which luminance 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.
4. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 30min in a dark environment at 25 °C± 2°C.

3-2. Interface Connections

This LCD employs Two interface connections, a 30 pin connector is used for the module electronics and a 14Pin Connector is used for the integral backlight system.

3-2-1. Interface Connections

- LCD Connector(CN1) : IS100-L30B-C23 (Manufactured by UJU) or Equivalent
- Mating Connector : FI-XC30C2L (Manufactured by JAE) or Equivalent

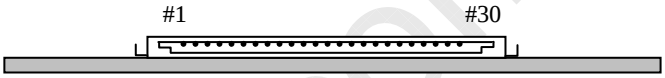
Table 3. MODULE CONNECTOR(CN1) PIN CONFIGURATION

Pin No	Symbol	Description	
1	FR0M	Minus signal of odd channel 0 (LVDS)	First data
2	FR0P	Plus signal of odd channel 0 (LVDS)	
3	FR1M	Minus signal of odd channel 1 (LVDS)	
4	FR1P	Plus signal of odd channel 1 (LVDS)	
5	FR2M	Minus signal of odd channel 2 (LVDS)	
6	FR2P	Plus signal of odd channel 2 (LVDS)	
7	GND	Ground	
8	FCLKINM	Minus signal of odd clock channel (LVDS)	
9	FCLKINP	Plus signal of odd clock channel (LVDS)	
10	FR3M	Minus signal of odd channel 3 (LVDS)	
11	FR3P	Plus signal of odd channel 3 (LVDS)	
12	SR0M	Minus signal of even channel 0 (LVDS)	Second data
13	SR0P	Plus signal of even channel 0 (LVDS)	
14	GND	Ground	
15	SR1M	Minus signal of even channel 1 (LVDS)	
16	SR1P	Plus signal of even channel 1 (LVDS)	
17	GND	Ground	
18	SR2M	Minus signal of even channel 2 (LVDS)	
19	SR2P	Plus signal of even channel 2 (LVDS)	
20	SCLKINM	Minus signal of even clock channel (LVDS)	
21	SCLKINP	Plus signal of even clock channel (LVDS)	
22	SR3M	Minus signal of even channel 3 (LVDS)	
23	SR3P	Plus signal of even channel 3 (LVDS)	
24	GND	Ground	
25	GND	Ground	
26	AI	AI-Enable ON 2.5~3.3, OFF 0~0.8V	
27	DIM	DIM-Out 0.5V ~ 3.3V	
28	V_{LCD}	Power Supply +12.0V	
29	V_{LCD}	Power Supply +12.0V	
30	V_{LCD}	Power Supply +12.0V	

Note: 1. All GND(ground) pins should be connected together and to Vss which should also be connected to the LCD's metal frame.
2. All V_{LCD} (power input) pins should be connected together.
3. Input Level of LVDS signal is based on the IEA 664 Standard.

User Connector Diagram

IS-100-L30B-C23 (UJU)



Rear view of LCM

Table 4. REQUIRED SIGNAL ASSIGNMENT FOR Flat Link (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.

3-2-2. Backlight Interface

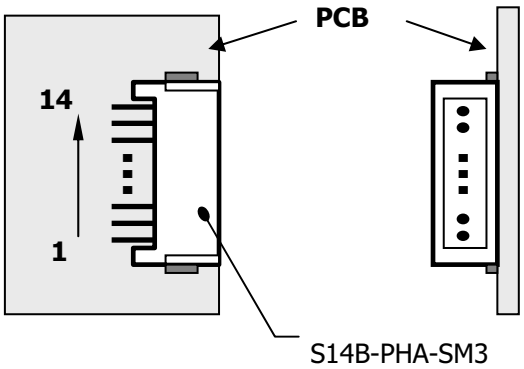
- Inverter Connector : S14B-PHA-SM3 Side entry type (Manufactured by JST) or Equivalent
- Mating Connector : PHR-14(Manufactured by JST) or Equivalent

Table 5. INVERTER CONNECTOR PIN CONFIGULATION

Pin No	Symbol	Description	Remarks
1	VDDB	Power Supply +24.0V (Back light)	
2	VDDB	Power Supply +24.0V (Back light)	
3	VDDB	Power Supply +24.0V (Back light)	
4	VDDB	Power Supply +24.0V (Back light)	
5	VDDB	Power Supply +24.0V (Back light)	
6	GND	Power Ground (Back light)	Note 1
7	GND	Power Ground (Back light)	
8	GND	Power Ground (Back light)	
9	GND	Power Ground (Back light)	
10	GND	Power Ground (Back light)	
11	OPEN	NC	
12	VON/OFF	Backlight On/off Signal	ON : 2.0V~5.0V OFF : 0.0~0.8V
13	VBR	Brightness Adjustable Voltage	Max3.3V/Min0.0V
14	OPEN	NC (DON'T USE)	

Notes : 1. GND is connected to the LCD's metal frame.

Rear view of LCM



S14B-PHA-SM3
(JST : Japan Solderless Terminal Co.,Ltd.)

3-3. Signal Timing Specifications

This is the signal timing required at the input of the User connector. All of the interface signal timing should be satisfied with the following specifications for it's proper operation.

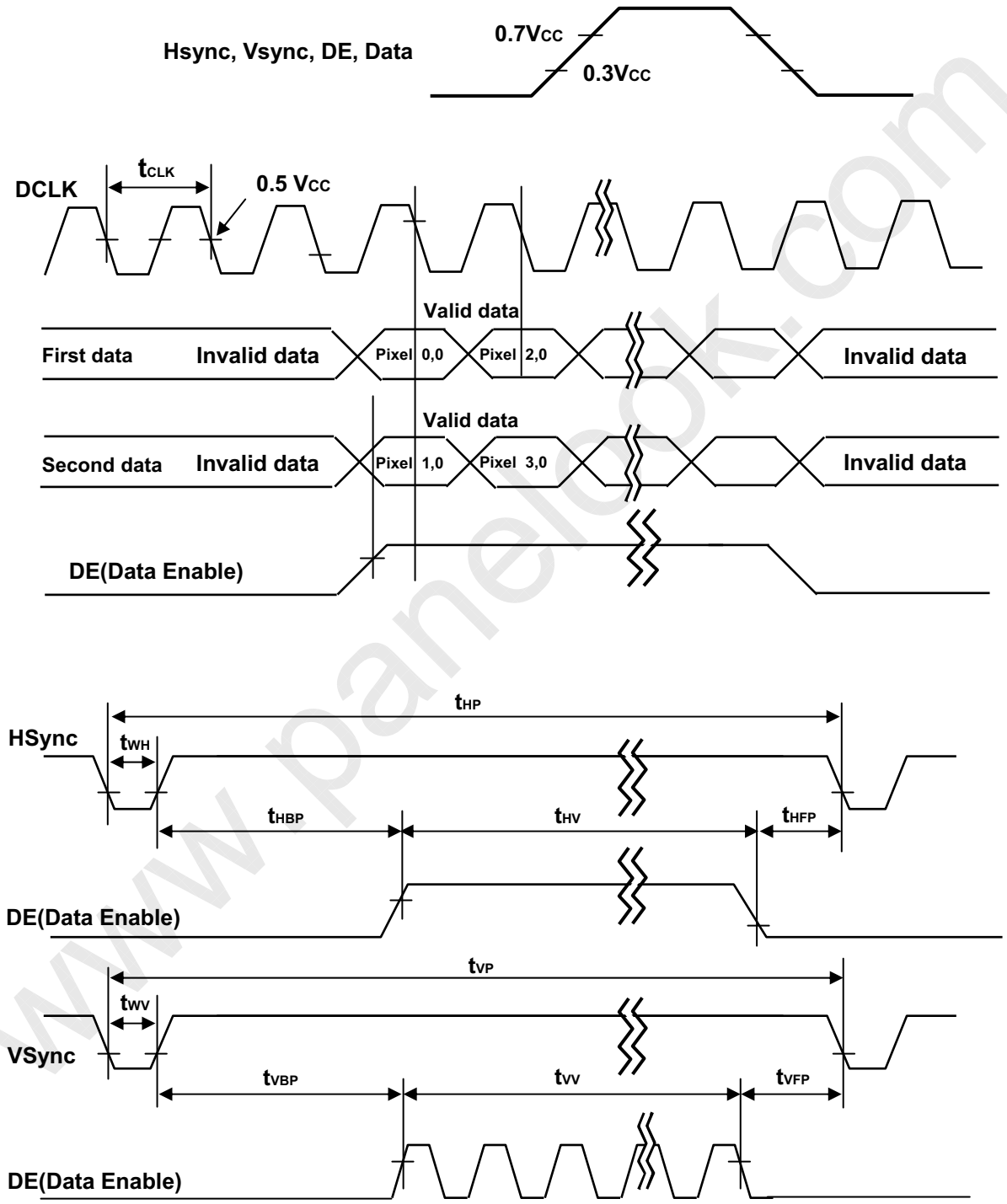
Table 6. Timing Table

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Period	t_{CLK}	8.55	8.40	8.26	ns	
	Frequency	-	117	119	121	MHz	
Hsync	Period	t_{HP}	1816	1840	1840	t_{CLK}	
	Frequency	f_H	59.696	64.674	64.674	KHz	
	Width	t_{WH}	32	32	32	t_{CLK}	
Vsync	Period	t_{VP}	1066	1080	1080	t_{HP}	
	Frequency	f_V	56	59.883	64	Hz	
	Width	t_{WV}	6	6	6	t_{HP}	
DE (Data Enable)	Horizontal Valid	t_{HV}	1680	1680	1680	t_{CLK}	
	Horizontal Back Porch	t_{HBP}	80	80	80		
	Horizontal Front Porch	t_{HFP}	24	48	48		
	Horizontal Blank	-	136	160	160		
	Vertical Valid	t_{VV}	1050	1050	1050	t_{HP}	
	Vertical Back Porch	t_{VBP}	9	21	21		
	Vertical Front Porch	t_{VFP}	1	3	3		
	Vertical Blank	-	16	30	30		

Notes: Hsync period and Hsync width-active should be even number times of t_{CLK}. If the value is odd number times of t_{CLK}, display control signal can be asynchronous. In order to operate this LCM a Hsync, Vsyn, and DE(data enable) signals should be used.

1. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rates.
2. Vsync and Hsync should be keep the above specification.
3. Hsync Period, Hsync Width, and Horizontal Back Porch should be any times of of character number(8).
4. The polarity of Hsync, Vsync is not restricted.

3-4. Signal Timing Waveforms



3-5. Color Data Reference

The Brightness of each primary color(red,green,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 MSB							LSB	GREEN MSB							LSB	BLUE 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 (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 (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 (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 (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 (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

3-6. Power Sequence

Power Supply, V_{LCD}

Interface Signal, Vi (Digital RGB signal, SCDT ,Vsync, Hsync, DE, Clock to LVDS Transmitter)

Power Supply for Backlight Inverter

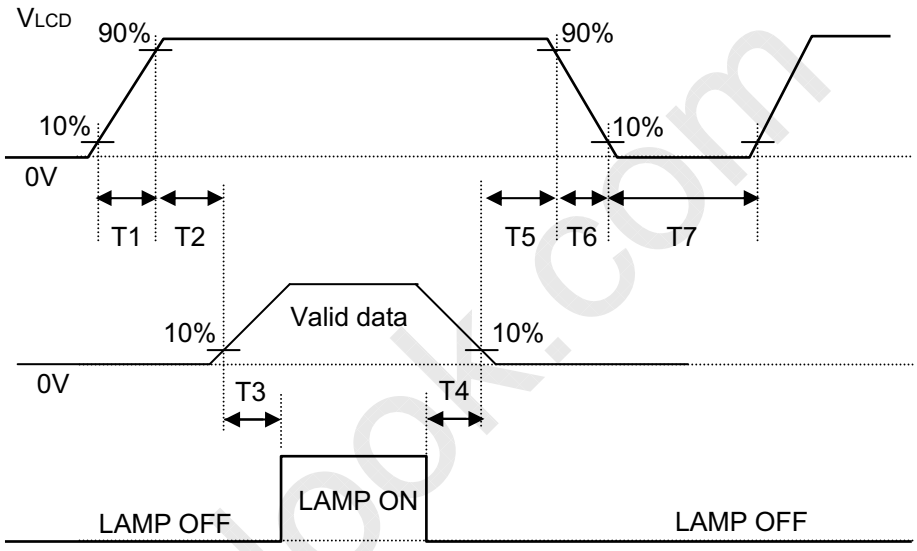


Table 8. POWER SEQUENCE

Parameter	Values			Units
	Min	Typ	Max	
T1	-	-	10	ms
T2	0.01	-	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0.01	-	50	ms
T6	0.01	-	10	ms
T7	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_{LCD} to 0V.
3. Lamp power must be turn on after power supply for LCD an interface signal are valid.

3-6-2 Power Sequence for Inverter

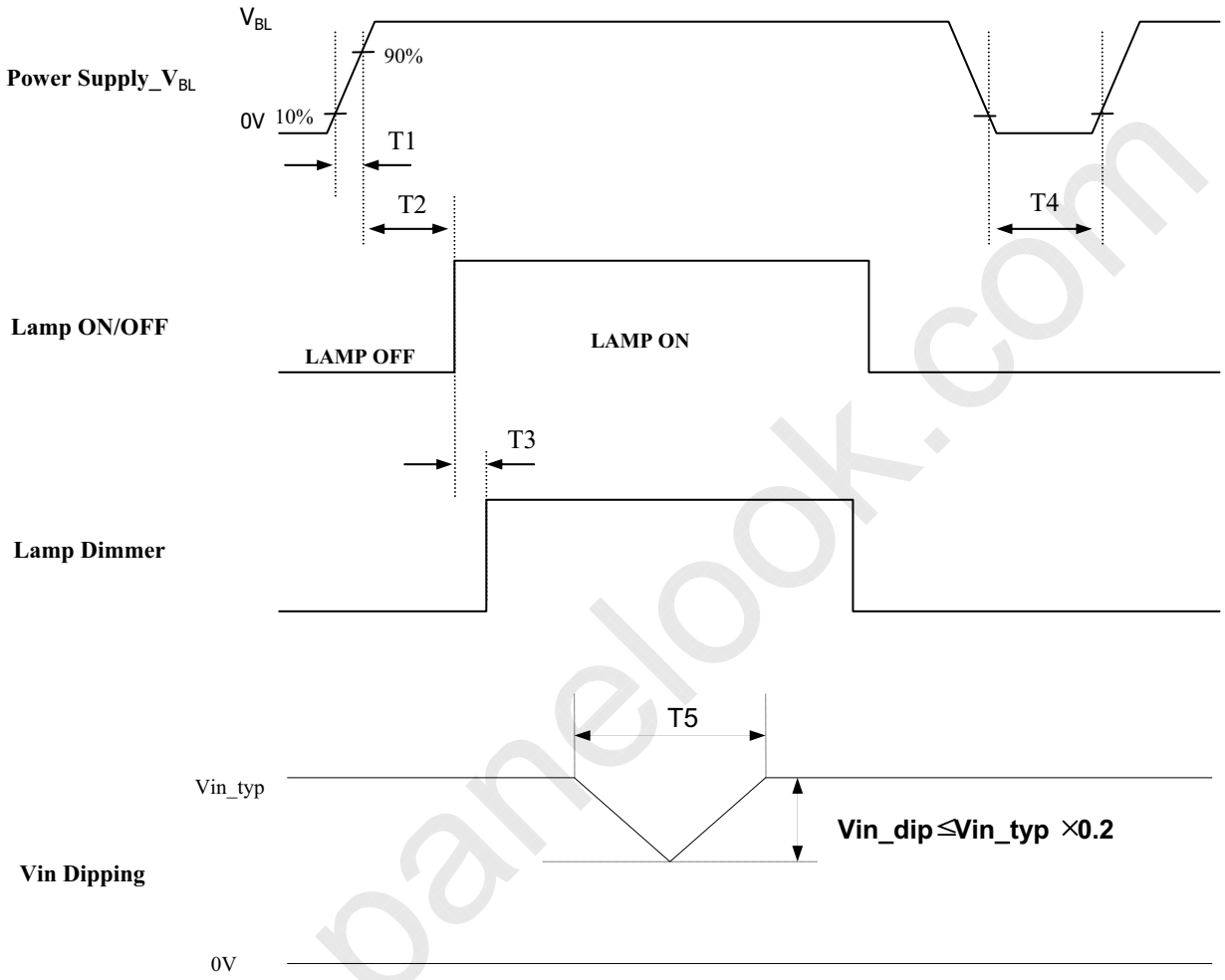


Table 11. Power Sequence

Parameter	Values			Units	Notes
	Min.	Typ.	Max.		
T1	1	-	30	ms	
T2	200	-	-	ms	
T3	-	-	50	ms	
T4	500	-	-	ms	
T5	-	-	10	ms	

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±2°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.

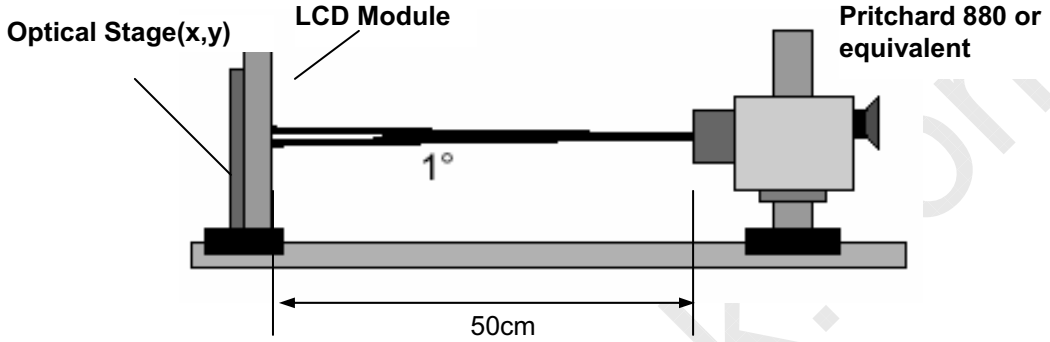


FIG. 1 Optical Characteristic Measurement Equipment and Method

Table 9. OPTICAL CHARACTERISTICS Ta=25°C, V_{LCD}=12.0V, f_V=60Hz Dclk=119MHz, I_{BL}=5.5mA

Parameter		Symbol	Values			Units	Notes
			Min	Typ	Max		
Contrast Ratio		CR	450	700	-		1
		CR(With DCR)	1000	1600	-		
Surface Luminance, 1pts		L_{WH}	400	470	-	cd/m²	2
Luminance Variation		δ_{WHITE}	-	-	1.45		3
Response Time	Rise Time	Tr_R	-	5	10	ms	4
	Decay Time	Tr_D	-	7	24	ms	4
	Gray To Gray	T_{GTG_AVR}	-	6	-	ms	5
		T_{GTG_MAX}	-	10	-	ms	5
Color Coordinates [CIE1931]	RED	Rx	Typ -0.03	0.640	Typ +0.03		
		Ry		0.340			
	GREEN	Gx		0.290			
		Gy		0.615			
	BLUE	Bx		0.145			
		By		0.070			
	WHITE	Wx		0.313			
		Wy		0.329			
Color shift							6
	Horizontal	θ_{CST_H}	-	178	-	degree	
	Vertical	θ_{CST_V}	-	178	-		
Viewing Angle (CR>10)							
General	Horizontal	θ_H	170	178	-	degree	7
	Vertical	θ_V	170	178	-		
Effective	Horizontal	θ_{GMA_H}	-	178	-	degree	8
	Vertical	θ_{GMA_V}		178			
Gray Scale				2.2			9

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

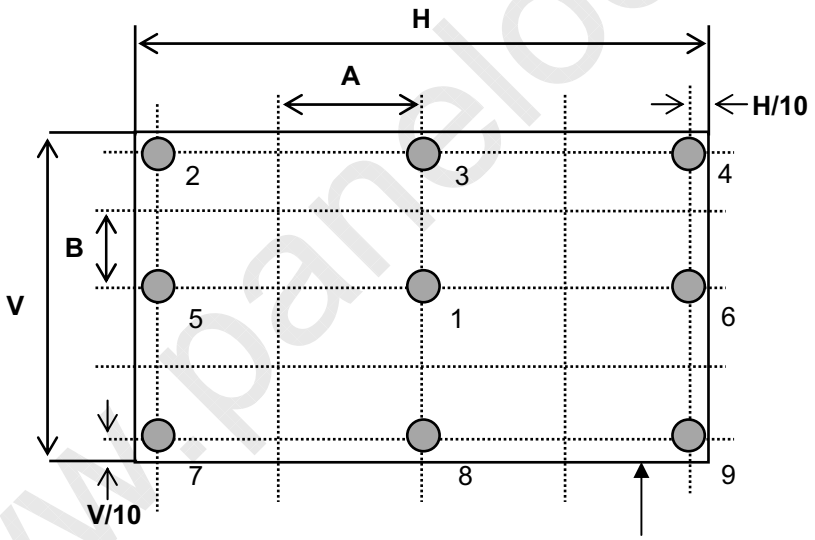
$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is luminance value at No.1 point across the LCD surface 50cm from the surface with all pixels displaying white. For more information see FIG 2.

3. The variation in surface luminance , δ WHITE is defined as :

$$\delta_{WHITE} = \frac{\text{Minimum}(L_{on1}, L_{on2}, \ldots L_{on9})}{\text{Maximum}(L_{on1}, L_{on2}, \ldots L_{on9})} \times 100(\%)$$

Measuring point for surface luminance & measuring point for luminance variation



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

FIG. 2 Measure Point for Luminance

4. **The response time** is defined as the following figure and shall be measured by switching the input signal for "black" and "white".
Response time is the time required for the display to transition from black to white (Rise Time, T_{rR}) and from white to black (Decay Time, T_{rD}).
- Measure Condition : DCR Off

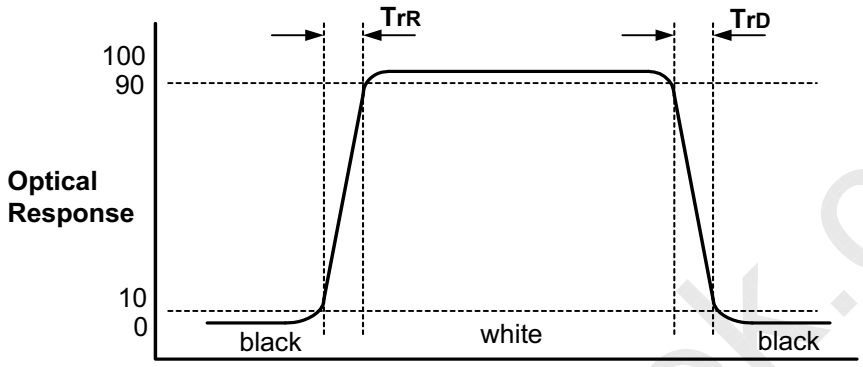


FIG. 3 Response Time

5. **The Gray to Gray response time** is defined as the following figure and shall be measured by switching the input signal for "Gray To Gray ".
- Measure Condition : DCR Off
- Gray step : 5 Step
- T_{GTG_AVR} is the total average time at rising time and falling time for "Gray To Gray ".
- T_{GTG_MAX} is the max time at rising time or falling time for "Gray To Gray ".

Gray to Gray		Rising Time				
		G255	G191	G127	G63	G0
Falling Time	G255					
	G191					
	G127					
	G63					
	G0					

6. **Color shift** is the angle at which the color difference is lower than 0.04.

- Color difference(Δu'v')

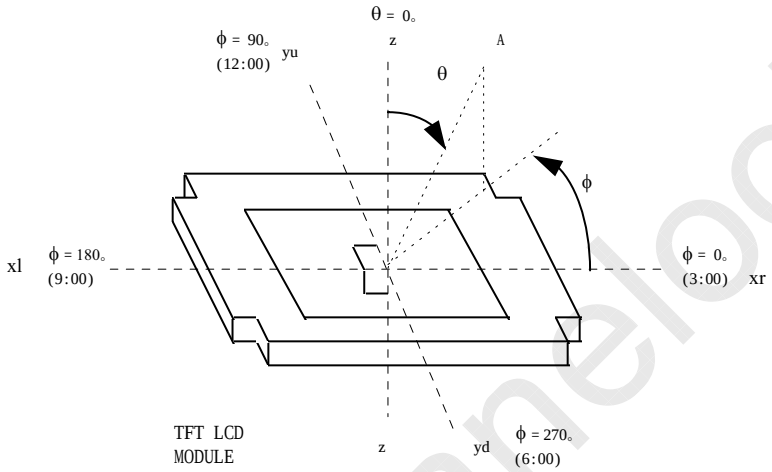
$$u' = \frac{4x}{-2x + 12y + 3} \qquad v' = \frac{9y}{-2x + 12y + 3}$$

$$\Delta u'v' = \sqrt{(u'_1-u'_2)^2+(v'_1-v'_2)^2}$$

u'1, v'1 : u'v' value at viewing angle direction
u'2, v'2 : u'v' value at front (θ=0)

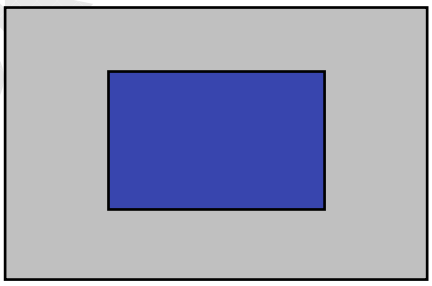
- Pattern size : 25% Box size

- Viewing angle direction of color shift : Horizontal, Vertical



Viewing angle direction

25% Box size



Average RGB values in Bruce RGB for Macbeth Chart

	Dark skin	Light skin	Blue sky	Foliage	Blue flower	Bluish green
R	98	206	85	77	129	114
G	56	142	112	102	118	199
B	45	123	161	46	185	178
	Orange	Purplish blue	Moderate red	Purple	Yellow green	Orange yellow
R	219	56	211	76	160	230
G	104	69	67	39	193	162
B	24	174	87	86	58	29
	Blue	Green	Red	Yellow	Magenta	cyan
R	26	72	197	241	207	35
G	32	148	27	212	62	126
B	145	65	37	36	151	172
	White	Neutral 8	Neutral 6.5	Neutral 5	Neutral 3.5	black
R	240	206	155	110	63	22
G	240	206	155	110	63	22
B	240	206	155	110	63	22

7. **Viewing angle(general)** is the angle at which the contrast ratio is greater than 10.

8. **Effective viewing angle** is the angle at which the gamma shift of gray scale is lower than 0.3.

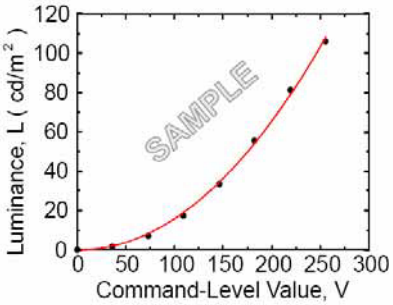


Fig. 1. Sample Luminance vs. gray scale (using a 256 bit gray scale).

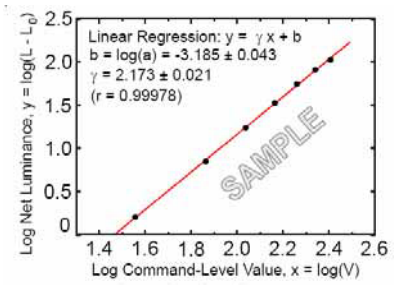


Fig. 2. Sample Log-log plot of luminance vs. gray scale.

$$L = aV^{r} + L_b$$

$$\log(L - L_b) = r\log(V) + \log(a)$$

Here the Parameter $\alpha$and γrelate the signal level V to the luminance L.
The GAMMA we calculate from the log-log representation (Fig. 2)

9. Gray scale specification
Gamma Value is approximately 2.2. For more information see Table 10.
- Measure Condition : DCR Off

Table 10. Gray Scale Specification

Gray Level	Relative Luminance [%] (Typ.)
0	0.3
31	1.1
63	4.57
95	11.3
127	21.4
159	35.2
191	52.8
223	74.4
255	100

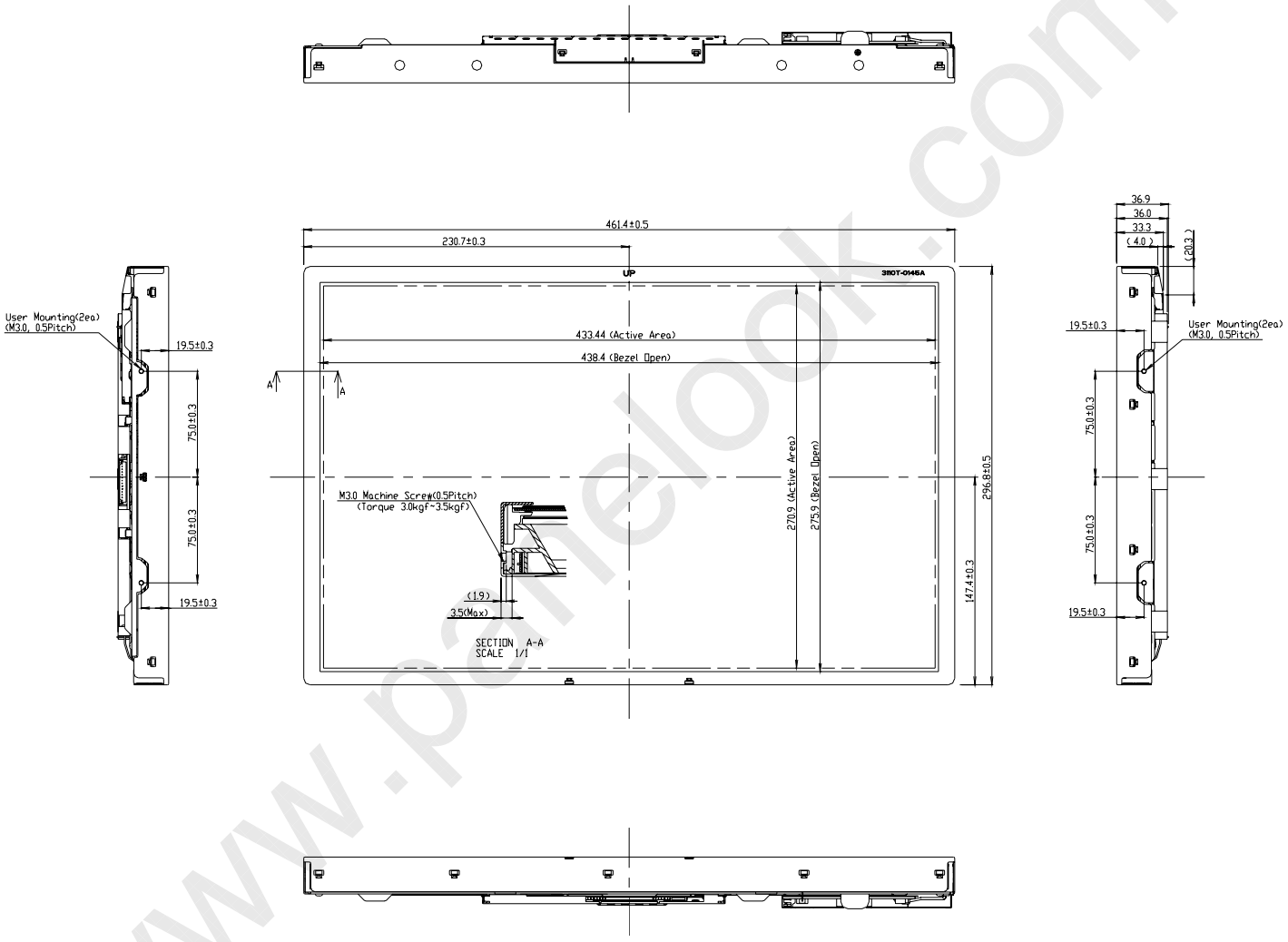
5. Mechanical Characteristics

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

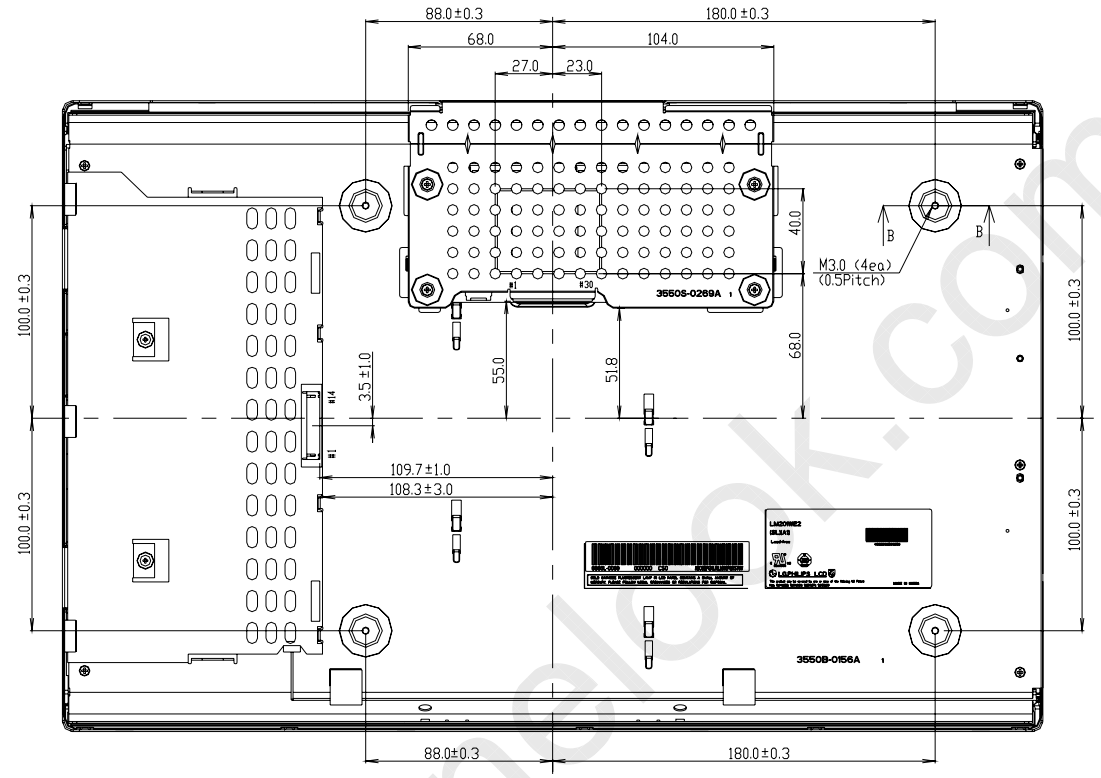
Outline Dimension	Horizontal	461.4mm
	Vertical	296.8mm
	Depth	36.9mm
Bezel Area	Horizontal	438.4mm
	Vertical	275.9mm
Active Display Area	Horizontal	433.44mm
	Vertical	270.90mm
Weight	2680g (Typ.), 2810g (Max.)	
Surface Treatment	Hard coating (3H) Anti-glare treatment of the front polarizer Haze (25%)	

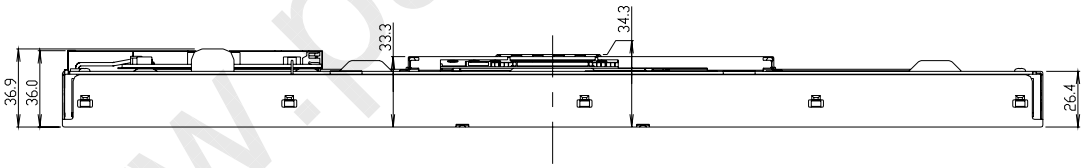
Notes : Please refer to a mechanic drawing in terms of tolerance at the next page.

<FRONT VIEW>

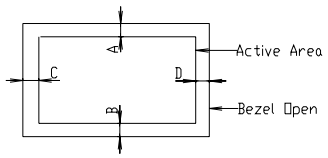


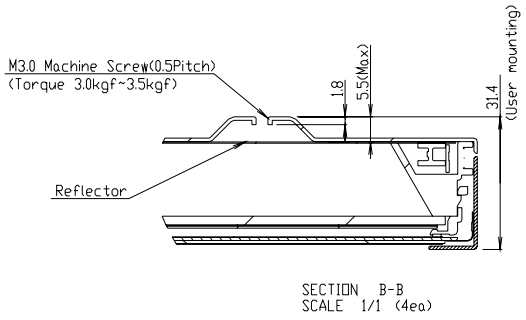
<REAR VIEW>





Notes
1. Unspecified tolerances are to be ±0.5mm.
2. Gap Between Top case and Glass is 0.3 +0.5 -0.3
3. Both backlight wires and contraction tubes are excluded from outline dimensions.
4. Tilt and partial disposition tolerance of display area are as following.
   (1) Y-direction : |A-B| < 1.4mm
   (2) X-direction : |A-B| < 1.4mm





SECTION B-B
SCALE 1/1 (4ea)

6. Reliability

Environment test condition

No	Test Item	Conditions
1	High temperature storage test	Ta= 60˚C 240hr
2	Low temperature storage test	Ta= -20˚C 240hr
3	High temperature operation test	Ta= 50˚C 60%RH 240hr
4	Low temperature operation test	Ta= 0˚C 240hr
5	Humidity condition operation	10%RH ~ 90%RH
6	Humidity condition storage	10%RH ~ 90%RH
7	Vibration test (non-operating)	1.Sinusoidal Vibration 1.0 G zero to peak. 10 to 500 Hz, 0.5 oct / min sweep rate. 10 to 500, 10 Hz, one sweep along each axis. 2.Random Vibration 0.002 G2/Hz, 10 to 500 Hz, nominal 1 GRMS. One hour for each of the three axes. or 5-200Hz:14.406m /s²rms 33min for each of the three axes..
8	Shock test (non-operating)	Shock level : 100G Waveform: half sine wave, 2ms Direction : ±X, ±Y, ±Z One time each direction
9	Altitude storage / shipment operation	0 – 40,000 feet (12,192m) 0 – 12,000 feet (3,048m)
10	ESD test (Non-operation)	Condition : 150pF, 330Ω Terminal : 200V Chassis : 10KV

{ 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.

Notes : Please refer to page 5 an Environment test 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)

Notes : The LM201WE2-SLB1 is applied ROHS items

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	97	98	99	2000	2001	2002	2003	2004	2005	2006	2007
Mark	7	8	9	0	1	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 : 6EA

b) Box Size : 409 X 489 X 543

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.
(7) Please do not give any mechanical and/or acoustical impact to LCM. Otherwise, LCM can not be operated its full characteristics perfectly.
(8) A screw which is fastened up the steels should be a machine screw (if not, it causes metallic foreign material and deal LCM a fatal blow)
(9) Please do not set LCD on its edge.

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.