SPECIFICATION
FOR
APPROVAL

( ) Preliminary Specification
(●) Final Specification

Title	6.0”W (720 X RGB X 272) TFT- LCD

BUYER	
MODEL	

SUPPLIER	LG Display Co., Ltd.
MODEL	LA060N01
SUFFIX	SD01

SIGNATURE	DATE
/	
/	
/	

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

APPROVED BY	DATE
J. D. Kim / Chief Engineer	Feb. 06. 2012
REVIEWED BY	
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PREPARED BY	
I. S. Hwang / Engineer	Feb. 06. 2012

Product Engineering Dept.
LG Display Co., Ltd

Contents

RECORD OF REVISIONS

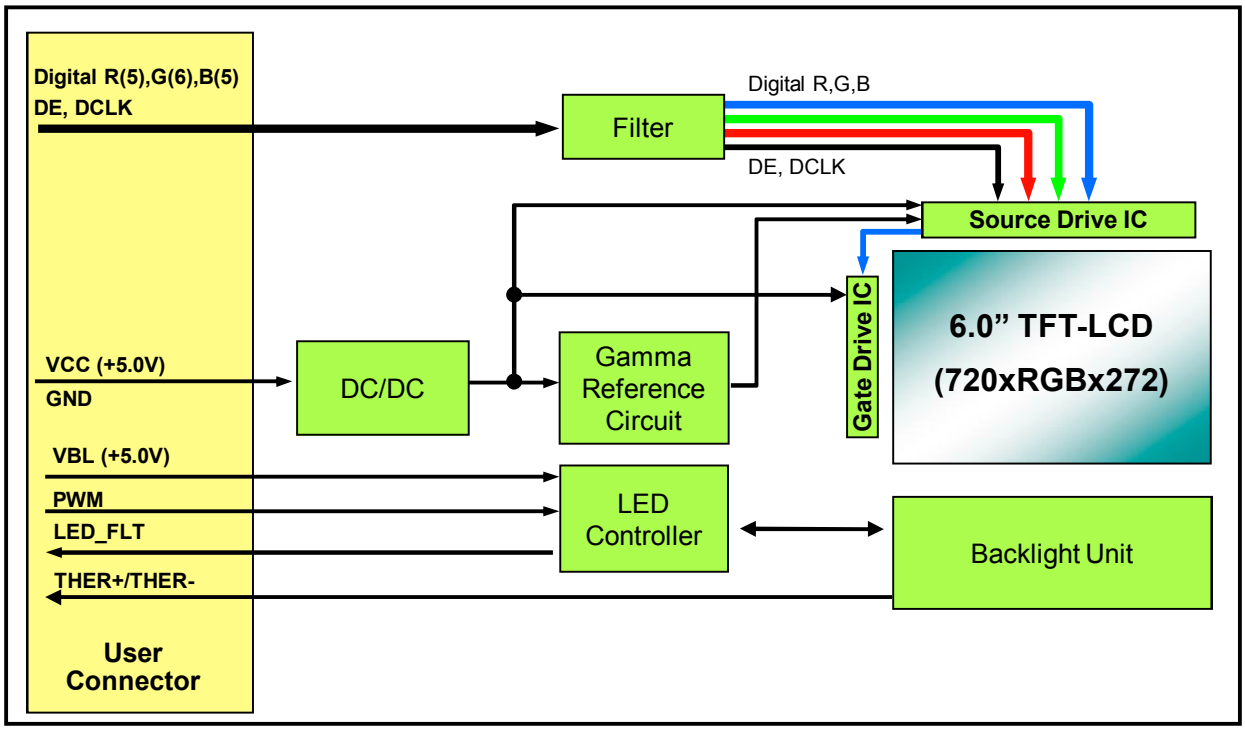
Revision No.	Revision Date	Page	Description	Note
0.0	Jun.16.2011	-	First Draft (Preliminary)	
1.0	Feb.06.2012	5	Update Total Power consumption 3.57 → 2.97W. - V_{CC}: 0.93 → 0.77W - V_{BL}: 2.64 → 2.20W Update detail surface treatment specification.	Change
		6	Update notes.1 and 2	Change
		7	Correct missing pin(6) name and description. - Name: GND → TP - Description: Ground → It should be connected GND	Correct
		7,8	Add notes about VBL, TP, GND, VCC, NC. Update Equivalent Circuits.	Add
		9	Update Power supply current. (Min, Typ, Max value) - I_{CC}: 185 → 153mA, I_{BL}: 528 → 440mA Correct ICC_RUSH spec. according to VCC rising time 0.5ms. - IRUSH: 0.9 → 1.5A Add Min PWM duty.	Change, Add
		10	Change Interface timing spec due to customer only setting 18Mhz of DCLK frequency. Add Note about DE Mode operation.	Change, Add
		11	Update digital RGB timing. - Latched at the rising edge of DCLK	Change
		12	Update RGB565 color input data reference	Change
		13	Update Power sequence Notes.	Add
		15	Add Min Contrast Ratio Value.	Change
		16	Correct notes.7 criteria of Life time about LED Backlight.	Change
		20, 21	Update LCM drawing due to improve ESD. - Change shape of FPC cover shield tape - Change system screw torque spec.: 4kgf → 6kgf	Change
		25	Correct 6" LCM picture and add detail packing method.	Change
		26	Correct 11-1.(7) about cleaning method & precautions for polarizer.	Change
		27	Correct 11-6.(1) about handling precautions for protection film.	Change
		-	Final specification	

1. Summary

This module utilizes amorphous silicon thin film transistors and a 2.65:1 aspect ratio. The 6.0” active matrix liquid crystal display allows 65,536 colors to be displayed by Digital RGB interface is available. The applications are Car Information display and Instrument Cluster for a vehicle.

2. Features

- Utilizes a panel with a 2.65:1 aspect ratio.
- The 6.0” screen produces a high resolution image that is composed of 195,840 pixel elements in a stripe arrangement.
- By adopting In Plane Switching (IPS) technology, provide a wide viewing angle.
- By adopting an active matrix drive, a picture with high contrast is realized.
- By using of COG mounting technology, the module became thin, light and compact.
- By adopting a high aperture panel, high transmittance color filter and high transmission polarizing plates, transmittance ratio is realized.
- Gray scale or the brightness of the sub-pixel color is determined with a RGB565 gray scale signal.



3. General Specification

@T_a=25℃, Aging time: Over 10 minutes

CHARACTERISTIC ITEMS		SPECIFICATION
Input Signals	Power	DC +5.0V for logic power supply DC +5.0V for backlight
	Video	Digital RGB (RGB 565)
	Control	PWM
Active Screen Size (Diagonal)		6.0" (15.24㎝), 142.56mm (H) X 53.856mm (V)
Pixel Format		720(H) X 3(R,G,B) X 272(V), RGB vertical stripes
Display Technology		a-Si TFT active matrix
		Normally Black, Transmitting mode
Outline Dimension		164.0mm (H) X 70.0mm (V) X 14.9mm (T) (Typ.)
Main Viewing Direction		Free
Pixel Pitch		0.066mm × 0.198mm
Display Modes		2.65:1
Luminance, white		400 cd/m^2 (Min.)
Power Consumption		V_{CC}: 0.77 W (Typ.) @ V_{CC} 5.0V & 25℃ V_{BL}: 2.20 W (Typ.) @ V_{BL} 5.0V & 25℃
Weight		155g (Max.)
Backlight		LED
Surface Treatment		Hard coating(3H), Anti-Glare treatment of the front polarizer (Haze 44%)

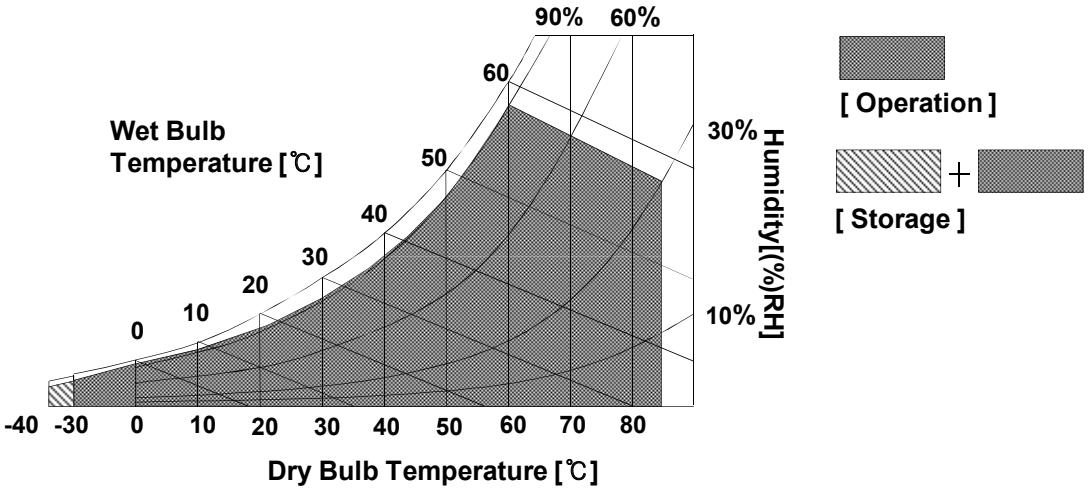
4. Absolute Maximum Rating

The followings are maximum values which, if exceeded, may cause malfunction or damage to the Module.

Parameter		Symbol	Condition	Min.	Max.	Unit	Note
Power Supply Voltage		V_{CC}	T_a = 25℃	-0.3	8.0	Vdc	
		V_{BL}		-0.3	15.0	Vdc	
Power Supply Voltage		I_{CC}	V_{CC} = 5V	0.3	-	A	1
		I_{BL}	V_{BL} = 5V	0.8	-	A	
Input Signal	BLU Dimming	PWM	-	-0.3	6.0	Vdc	
	Digital RGB	R0~R4 G0~G5 B0~B4 DE, CLK	-	-0.3	3.6	Vdc	
Storage Temperature		T_{ST}	-	-40	85	℃	2
Operating Temperature		T_{OP}	-	-30	85	℃	2,3,4

Notes:

1. The system should supply enough current for TFT LCD module's stable operation at -30~+85℃.
2. Temperature and relative humidity range are shown in the figure below.
   Wet bulb temperature should be Max. 58℃. Condensation of dew must be avoided,
   because it may cause electrical current leakage, and deterioration of performance and quality.
3. The operating temperature means that LCD Module guarantees operation of the circuit.
   All the contents of Electro-optical specifications are guaranteed under the room temperature condition.
4. This temperature is ambient temperature with regard to the heat which is generated under operation of circuit and backlight on. (reference value)



5. Electrical Specifications

5-1. Connector pin assignment

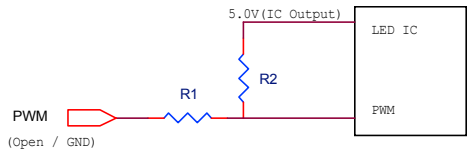
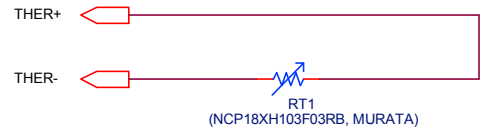
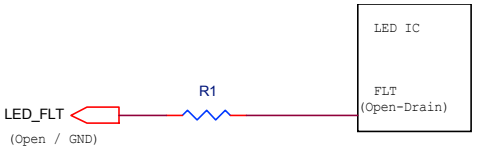
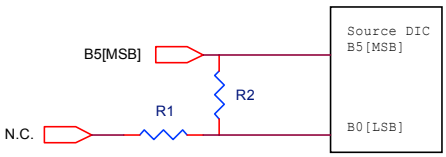
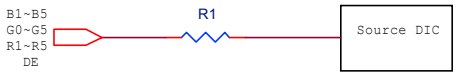
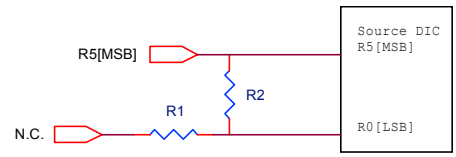
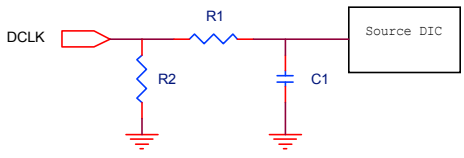
5-1-1. User Connector: CN1

The LCD module uses a 40pin connector for an interface connection.
The model name is 9617S-40Y922 manufactured by IRISO Electronics.

Pin No.	Pin Name	I/O	Description	Notes
1	VBL	I	Power Supply For Back Light Unit	1
2	VBL	I	Power Supply For Back Light Unit	1
3	VBL	I	Power Supply For Back Light Unit	1
4	GND	I	Ground	2
5	PWM	I	LED Backlight Dimming Control Signal	
6	TP	I	Test Pin. It should be connected GND	2, 3
7	TEMP -	O	Thermal sensor output (-)	
8	TEMP +	O	Thermal sensor output (+)	
9	LED_FLT	O	LED Controller IC Fault Indicator Signal	
10	VCC	I	Power Supply For Logic	4
11	VCC	I	Power Supply For Logic	4
12	GND	I	Ground	2
13	NC	-	No Connection	5
14	B1	I	Blue Data 1 [LSB]	
15	B2	I	Blue Data 2	
16	B3	I	Blue Data 3	
17	B4	I	Blue Data 4	
18	B5	I	Blue Data 5 [MSB]	
19	GND	I	Ground	2
20	G0	I	Green Data 0 [LSB]	
21	G1	I	Green Data 1	
22	G2	I	Green Data 2	
23	G3	I	Green Data 3	
24	G4	I	Green Data 4	
25	G5	I	Green Data 5 [MSB]	
26	GND	I	Ground	2
27	NC	-	No Connection	5
28	R1	I	Red Data 1 [LSB]	
29	R2	I	Red Data 2	
30	R3	I	Red Data 3	
31	R4	I	Red Data 4	
32	R5	I	Red Data 5 [MSB]	
33	GND	I	Ground	2
34	DE	I	Digital RGB Data Enable	
35	GND	I	Ground	2
36	DCLK	I	Digital RGB Clock	
37	GND	I	Ground	2
38	NC	-	No connection	6
39	NC	-	No connection	6
40	GND	I	Ground	2

Notes: 1. All VBL pins should be connected together.
2. All GND pins should be connected together.
3. This pin should be connected to GND for a normal operation.
4. All VCC pins should be connected together.
5. Each NC pins are connected internally with MSB data line.
6. Make sure that NC pins should be floated.

5-1-1-1. Equivalent Circuits (User Connector: CN1)

Pin No.	Pin Name	I/O	Equivalent Circuit	Value	Notes
5	PWM	I		R1: 47[Ω] R2: 10[kΩ]	
7,8	TEMP+ TEMP-	O O		RT1: 10[kΩ]	
9	LED_FLT	O		R1: 47[Ω]	1
13	NC	-		R1: open R2: 0[Ω]	
14~18 20~25 28~32 34	B1~B5 G0~G5 R1~R5 DE	I		R1: 47[Ω]	
27	NC	-		R1: open R2: 0[Ω]	
36	DCLK	I		R1: 820[Ω] R2: 47[Ω] C1: 10[pF]	

Notes:
1. LED_FLT pin will be low (GND) when LED circuit failures occurred. (short, open, thermal shutdown).

5-2. Electrical Characteristics

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply	Video Circuit	V_{CC}	4.8	5.0	5.2	Vdc	
		I_{CC}	107	153	199	mA	1
		I_{RUSH}	-	-	1.5	Apeak	2
	Backlight Circuit	V_{BL}	4.8	5.0	5.2	Vdc	3
		I_{BL}	310	440	570	mA	4 PWM duty = 100%
		I_{RUSH}	-	-	1.2	Apeak	5 V_{BL} = 5V PWM duty = 100%
Video Input Signal Voltage	Digital RGB	V_H	2.7	-	3.3	V	
		V_L	0	-	0.3	V	
Control Signal	PWM	f_{DIM}	16	-	20	kHz	6,7
		V_{PWM_HIGH}	2.7	-	3.3	-	8
		V_{PWM_LOW}	0	-	0.3	V	
		Duty	10	-	100	%	On Duty Ratio
Output Signal	LED_FLT	V_H	Open Drain			-	
		V_L	0	-	0.7	V	

Note 1. The specified current and power consumption are under the V_{CC}=5.0V, Ta=25°C, f_{VP}=60Hz condition whereas white pattern is displayed and f_{VP} is the frame frequency.

Full White Pattern

2. The duration of rush current is about 2ms and rising time of power input is 0.5ms (min.). (V_{CC}=5.0V, Ta=25°C, f_{VP}=60Hz)
3. Electrical characteristics are determined after the unit has been 'ON' and stable for approximately 10 minutes at 25°C.
4. The permissible forward current of LED vary with environmental temperature.
5. The duration of rush current is about 10ms and rising time of power input is 0.5ms (min.). (V_{BL}=5.0V, Ta=25°C, PWM_duty=100%)
6. The PWM is internally pulled up to High.
7. DC current dimming is recommended for LED control. If PWM dimming is needed, PWM frequency should be optimized for minimal wavy and audible noise.
8. The PWM is internally pulled up to High.
9. The recommended operating conditions show the ranges in which the device can operate normally. Operation beyond the limit of the recommended operation conditions is not assured, even though operating conditions are within the limit of the maximum ratings.

5-3. Interface Timing Specification (Digital RGB)

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 its proper operation.

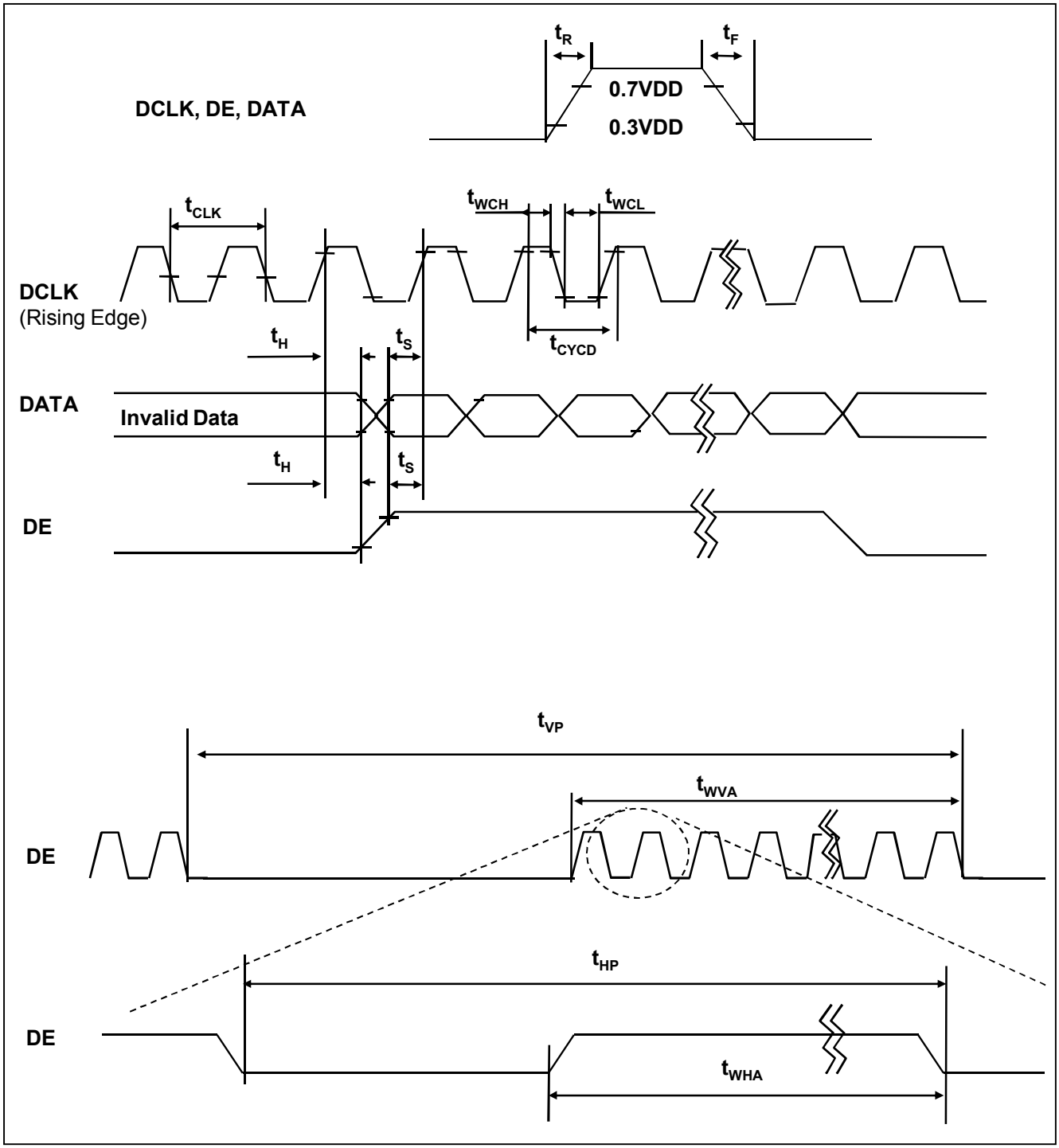
Table 5-1. SIGNAL TIMING CHARACTERISTICS (f_{VP}=60Hz)

Parameter		Symbol	Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	17.5	18.0	18.5	MHz	Fig.1
	Width_High	t_{WCH}	10	–	–	ns	
	Width_Low	t_{WCL}	10	–	–		
	cycle time	t_{CTCD}	23	–	–		
Vertical	Frequency	f_{VP}	60	60	60	Hz	
DE	Horizontal Valid	t_{WHA}	720	720	720	t_{CLK}	
	Horizontal Period	t_{HP}	995	1020	1045		
	Vertical Valid	t_{WVA}	272	272	272	t_{Hp}	
	Vertical Period	t_{VP}	293	294	295		
DE, DATA	Setup Time	t_S	10	–	–	ns	
	Hold Time	t_H	5	–	–		
DCLK, DE, DATA	Rise/Fall Time	t_R, t_F	–	–	3	ns	

Note 1. DE only mode operation.

2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rates.

Fig. 1 Digital RGB Timing Diagram



Notes: VDD means logic power voltage. (typ. 3.3V)

5-3-2. Color Input Data Reference(Digital RGB)

The brightness of each primary color(red,green and blue) is based on the 16bit(RGB 565) data input for the color ; the higher the binary input, the brighter the color.
The following table provides a reference for color versus data input.

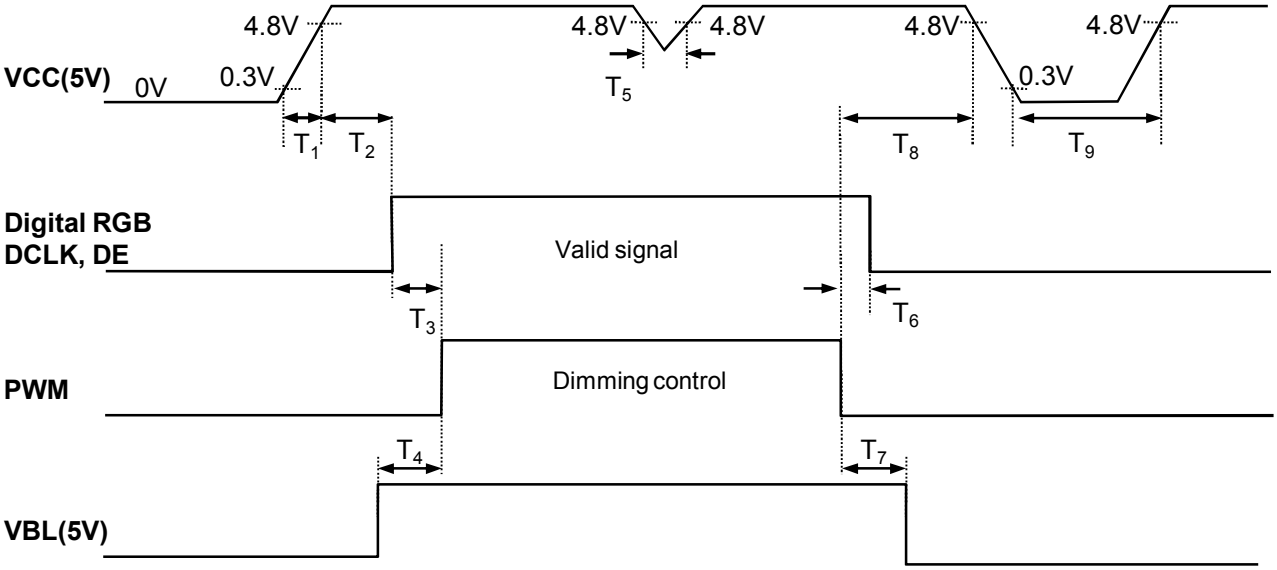
COLOR DATA REFERENCE

Color		Input Color Data																	
		Red						Green						Blue					
		MSB					LSB	MSB					LSB	MSB					LSB
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black(00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan(63)	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta(63)	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow(63)	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White(63)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Red(00) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(02)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63) Bright	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(00)Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(01)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(02)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)Bright	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Blue(00) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(02)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Blue(63) Bright	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note: Each Red and Blue LSB data lines are connected internally with MSB data line.

5-4. Power Supply Sequence

For LCD's normal operation, it should be kept below power supply sequence.



Parameter	Value			Units	Note
	Min.	Typ.	Max.		
T_1	0	-	10	(ms)	
T_2	100	-	1000	(ms)	
T_3	800	-	-	(ms)	
T_4	500	-	-	(ms)	
T_5	0	-	100	(us)	1
T_6	0	-	-	(ms)	
T_7	0	-	-	(ms)	
T_8	0	-	100	(ms)	
T_8	1500	-	-	(ms)	

Note 1. Power deep time. If it is longer than the T_5 maximum value, LCD would be abnormal state.
In this case, you must re-initialize the LCD in accordance with "Power Supply Sequence".
2. Please avoid floating state of interface signal at invalid period.
3. When the interface signal is invalid, be sure to pull down the power supply for LCD VCC to 0V.
4. Backlight must be turn on after power supply for LCD and interface signal are valid.
PWM must be kept GND before dimming control to avoid abnormal display,
because PWM is internally pulled-up to high.
5. We recommend that Logic Power (VCC) and Backlight Power (VBL) are supplied simultaneously.
If it is difficult to perform as our recommendation, customers are asked to confirm the Power sequence with LG Display prior to their use.

5-5. Thermistor Characteristics

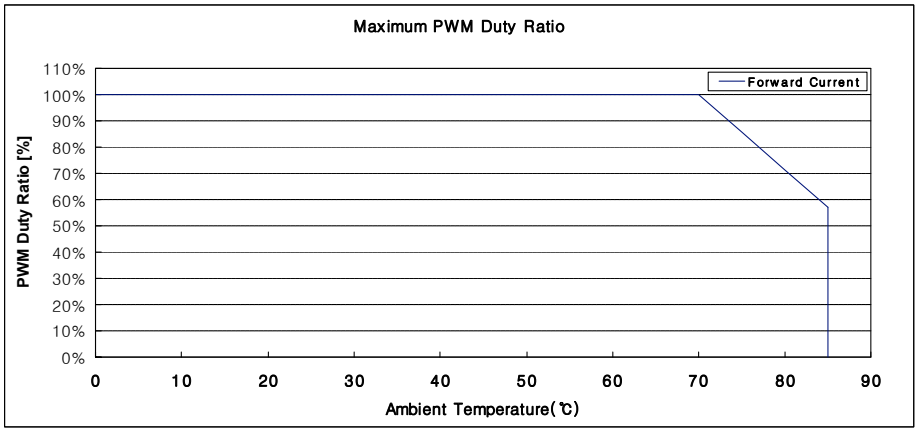
The display module shall incorporate a NTC thermistor surface mounted to LCM
The user of LCD module can utilize this thermistor for some special purpose.
For example, the user can measure display temperature from the thermistor and then turn off backlight when LCD module temperature exceeds maximum rating.

@PWM=100%

℃ (Ta)	$R_{thermistor}$ [kΩ] (Thermistor)	R_{THER} [kΩ] (LCM)
-30	113.35	(71.88) ± 5%
-25	87.56	(56.67) ± 5%
-20	68.23	(44.70) ± 5%
-15	53.65	(35.58) ± 5%
-10	42.51	(28.51) ± 5%
-5	33.89	(23.14) ± 5%
0	27.22	(18.75) ± 5%
5	22.02	(15.34) ± 5%
10	17.93	(12.57) ± 5%
15	14.67	(10.40) ± 5%
20	12.08	(8.62) ± 5%
25	10 ± 1%	(7.21) ± 5%
30	8.32	(6.05) ± 5%
35	6.95	(5.09) ± 5%
40	5.83	(4.30) ± 5%
45	4.92	(3.71) ± 5%
50	4.16	(3.12) ± 5%
55	3.54	(2.68) ± 5%
60	3.01	(2.30) ± 5%
65	2.59	(1.99) ± 5%
70	2.23	(1.73) ± 5%
75	1.93	(1.51) ± 5%
80	1.67	(1.32) ± 5%
85	1.45	(1.16) ± 5%

NCP18XH103F0SRB characteristics

* $R_{thermistor}$ in the table is the feature of the thermistor by itself, and R_{THER} is measured value in the LCM.
Customers should refer to the value of R_{THER} for LED derating.
Maximum PWM duty ratio needs to be controlled following below graph for backlight life time.



6. Electro-optical Characteristics

@T_a=25℃, Aging time: Over 10 minutes

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Contrast Ratio		CR	560	800	-	-	1
Surface Luminance, white		L_{WH}	400	-	-	cd/m2	2
Luminance Non Uniformity		LNU_W	-	-	15	%	3
Response Time	Rise Time	Tr_R	-	15	17	ms	4
	Decay Time	Tr_D	-	10	13	ms	
Color Coordinates	Red	R_X	0.605	0.635	0.665	-	2 (Reference Value)
		R_Y	0.320	0.350	0.380		
	Green	G_X	0.306	0.336	0.366		
		G_Y	0.573	0.603	0.633		
	Blue	B_X	0.118	0.148	0.178		
		B_Y	0.71	0.101	0.131		
	White	W_X	0.281	0.311	0.341	-	2
		W_Y	0.308	0.338	0.368		
Color Gamut			-	60	-	%	5
Viewing Angle	x axis, right(φ=0°)	Θr	-	89	-	degree	6
	x axis, left (φ=180°)	Θl	-	89	-		
	y axis, up (φ=90°)	Θu	-	89	-		
	y axis, down (φ=270°)	Θd	-	89	-		
Life Time		-	20,000	-	-	Hours	7

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 measured at the center point(L1) of the LCD with all pixels displaying white at the distance of 50cm by PR-880. Color Coordinates are measured at the center point(L1) of the LCD with all pixels displaying red, green, blue and white at the distance of 50cm by PR-650. For more information, refer to the Fig. 2 and Fig. 3.
3. The variation in surface luminance. The panel total variation (LNU_W) is determined by measuring LN at each test position 1 through 9. For more information see Fig. 3.

$$\delta_{WHITE} = [\text{Maximum}(L1,L2,\ldots\ L9) - \text{Minimum}(L1,L2,\ldots L9)] / \text{Average}(L1,L2,\ldots L9) \times 100$$

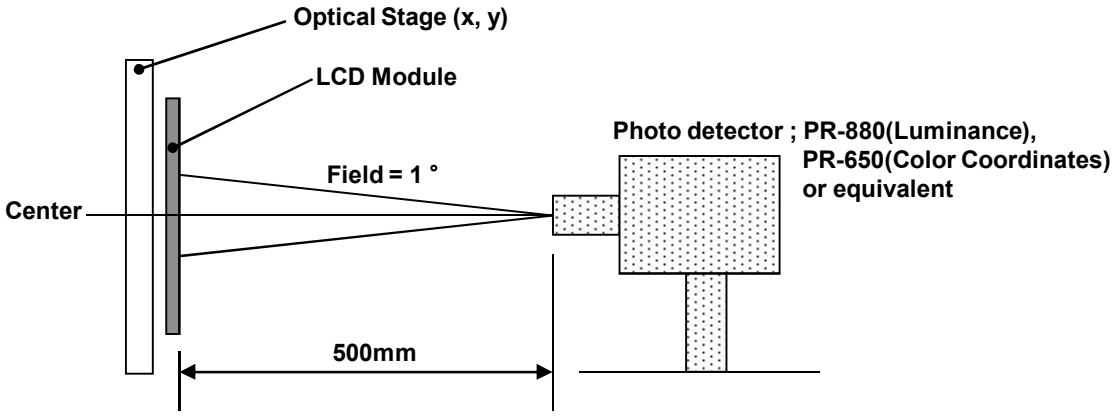
Notes :

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. 4.
5. Color Gamut is measured at the center point(L1) of the LCD with all pixels displaying R,G,B at the distance of 50cm by PR-650. Color Coordinates are measured at the center point(L1) of the LCD with all pixels displaying R,G,B and white at the distance of 50cm by PR-650. For more information, refer to the Fig. 2 and Fig. 6.

$$\text{Color Gamut} = \frac{\text{Color Area with R,G,B Color Coordinates}}{\text{NTSC Standard Area at CIE 1931 Color Coordinator}}$$

6. 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. 5.
7. The life time is determined as the time at which brightness of LED is 50% compare to that of initial value at the typical LED current.

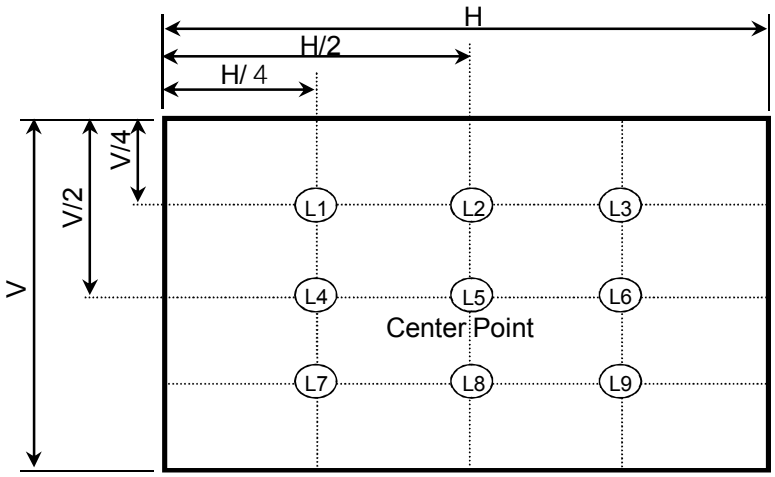
Fig. 2 Optical Characteristic Measurement Equipment and Method



Measuring Conditions ;
-Surroundings : Dark Room
-Temperature : Ta=25℃
-Input Video Signal : Digital RGB (RGB 565)
-Electrical parameters set typical values.
-Measured value at the center point of LCD panel after more than 10 minutes while backlight turning on.

Fig. 3 Non-Uniformity

<measuring point for surface luminance & measuring point for luminance variation >



H,V : ACTIVE AREA

Fig. 4 Response Time

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

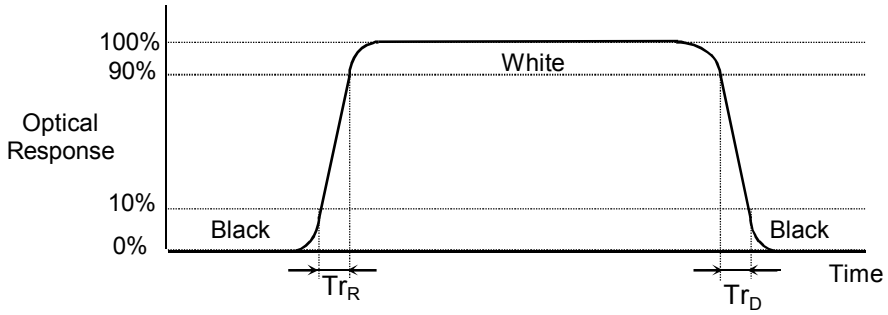


Fig. 5 Viewing angle

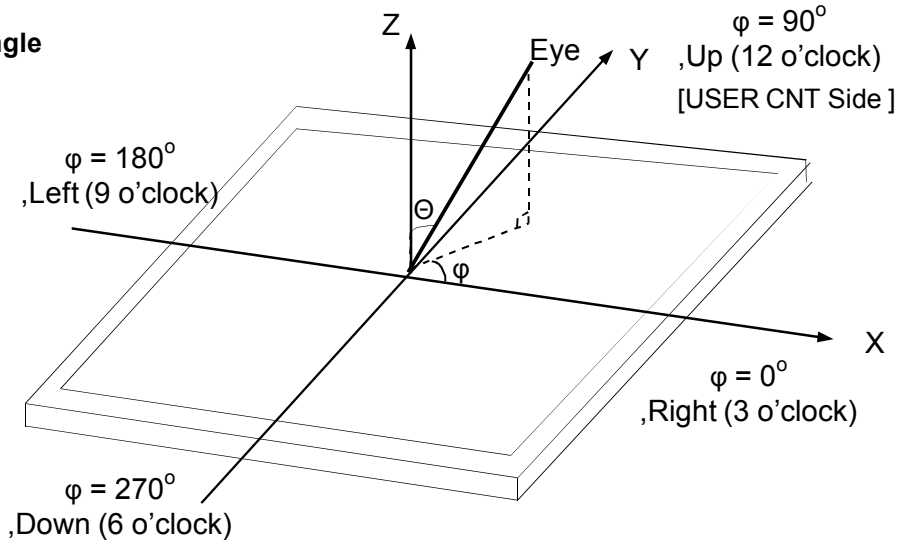
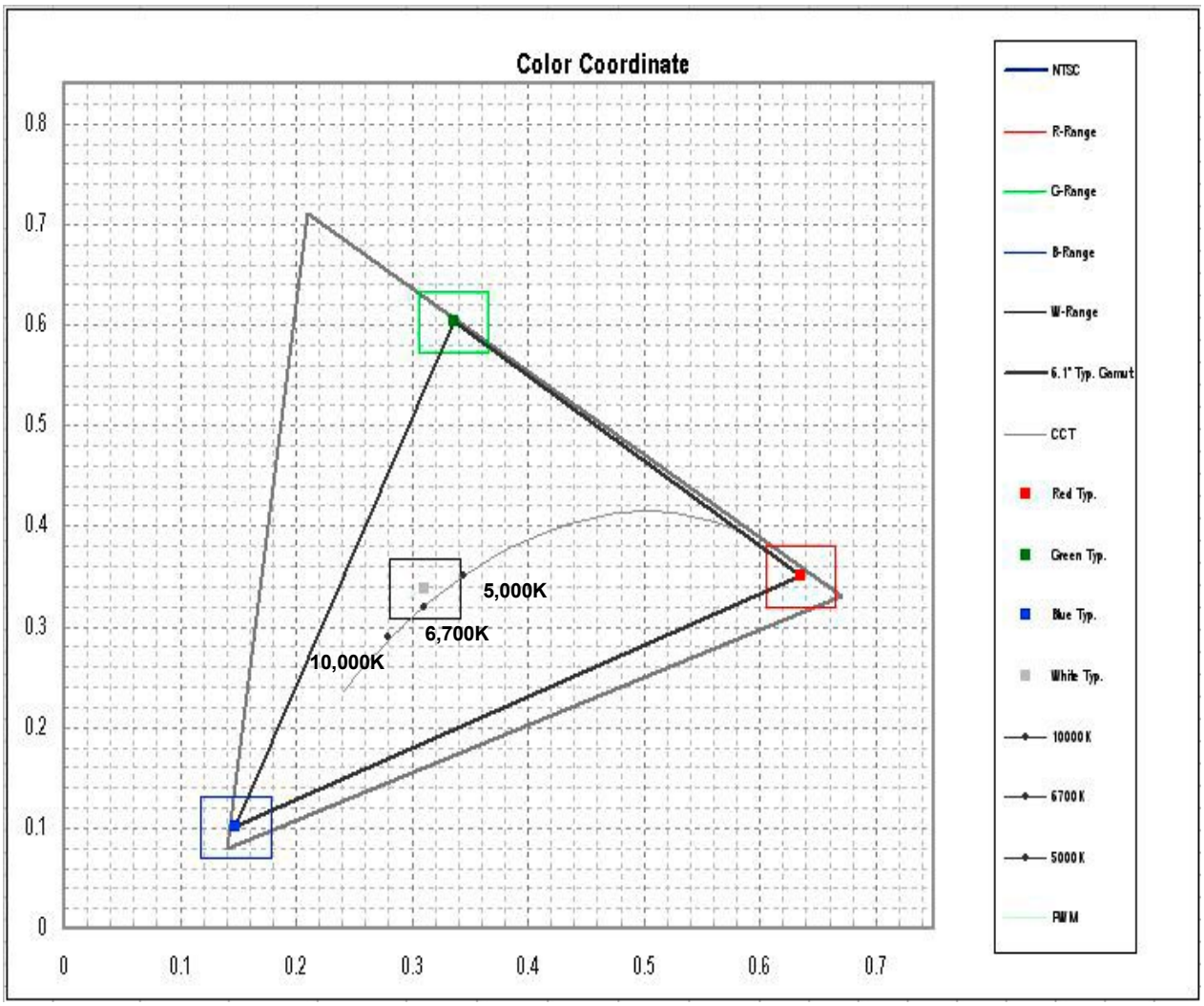


Fig. 6 Color Coordinator



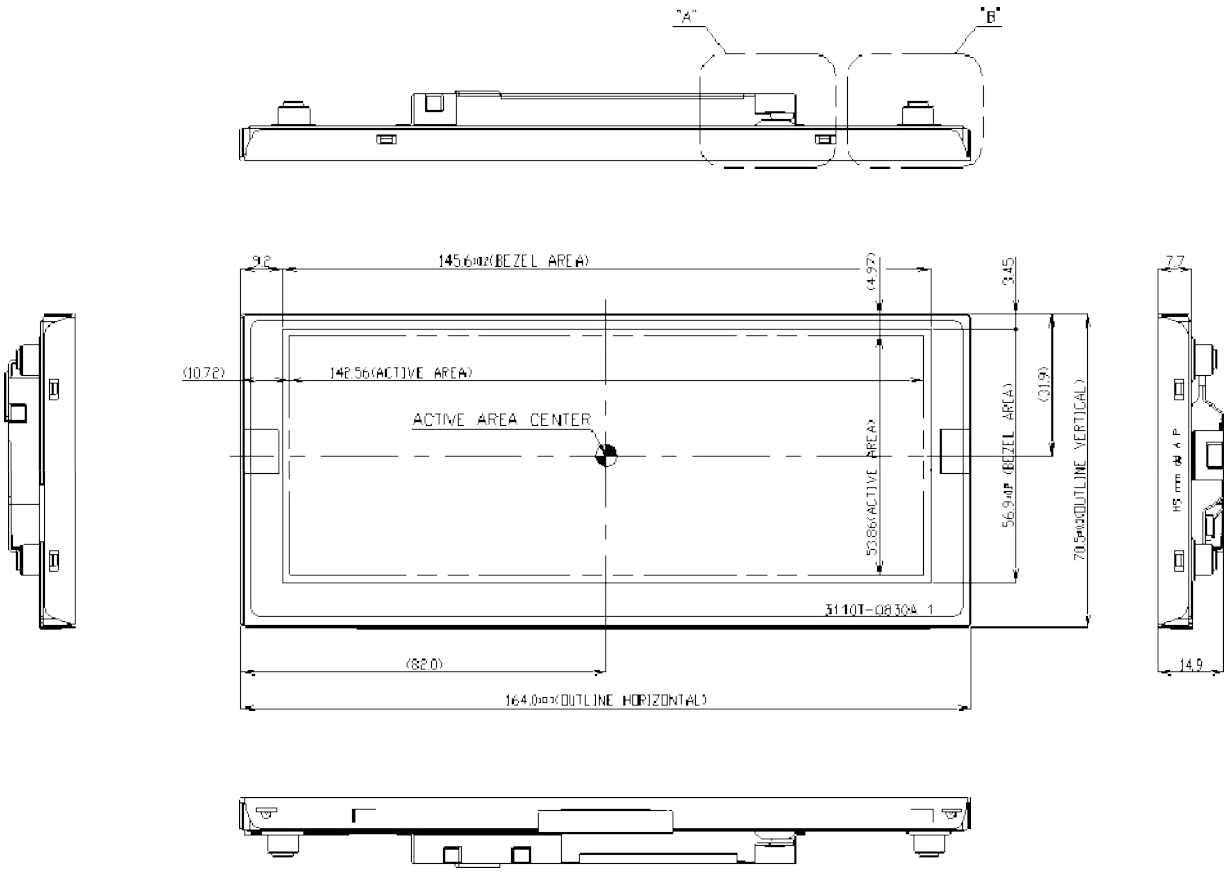
7. Mechanical Characteristics

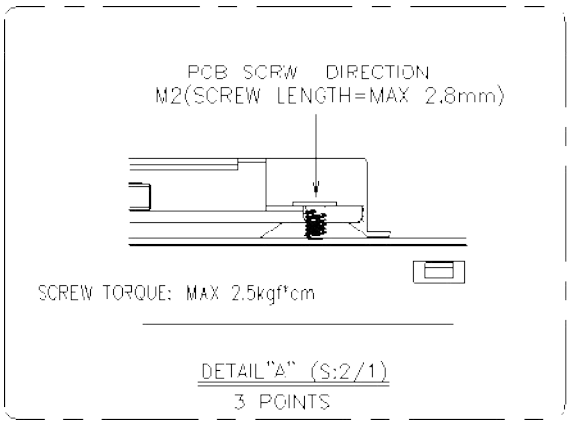
The contents provide general mechanical characteristics for this module. In addition the figures in the next page are detailed mechanical drawing of the LCD.

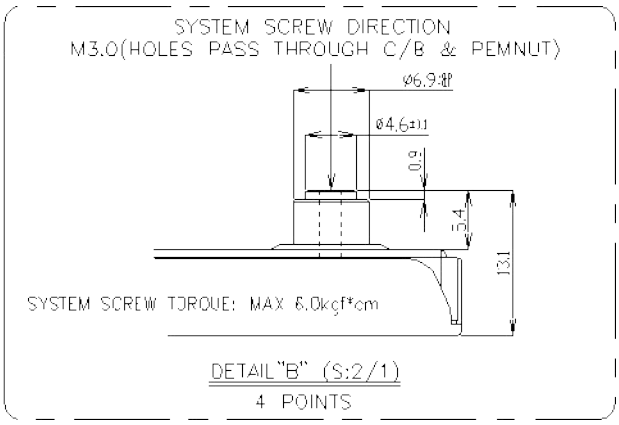
Outline Dimension	Horizontal	164.0 (±0.3)mm
	Vertical	70.5 (±0.3)mm
	Thickness	14.9 (±0.3)mm
Bezel Area	Horizontal	145.6 (±0.2)mm
	Vertical	56.9(±0.2)mm
Active Display Area	Horizontal	142.56 mm
	Vertical	53.86 mm
Weight	155g (Max.)	

<FRONT VIEW>

Note) Unit:[mm], General tolerance: ± 0.3mm



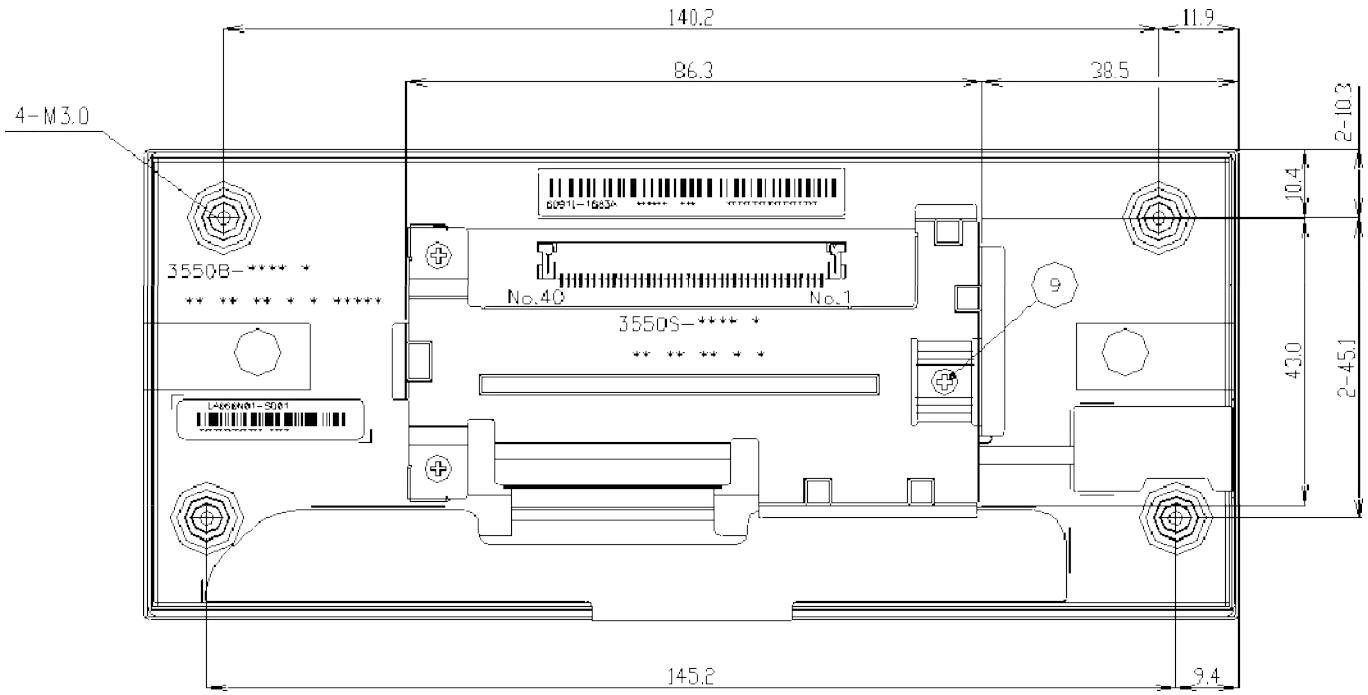




Product Specifications

<REAR VIEW>

Note) Unit:[mm], General tolerance: ± 0.3mm



8. Reliability Test

• Ta ; Ambient Temperature

No.	Test Item	Test Condition	Note
1	High Temperature Storage Test	Ta=85℃ 240h	
2	Low Temperature Storage Test	Ta=-40℃ 240h	
3	High Temperature Operation Test	Ta=85℃ 240h	
4	Low Temperature Operation Test	Ta=-30℃ 240h	
5	High Humidity Operation Test	Ta=65℃/90%RH 240h	
6	Humid Heat Cyclic Test	Ta=-10℃~65℃/80~96%RH 240h	
7	Thermal Shock Test	- 1cycle : Ta=-40℃(0.5h) ~ 85℃(0.5h) - 240Cycles	
8	Electro Static Discharge Test	- Panel Surface : ±15kV, Air, Power On - Case Top, Cover Bottom : ±10kV, Direct, Power Off (Air : 330㎊,2㏀ / Direct : 150㎊,2㏀ / 10 times)	
9	Shock Test (non-operating)	Half sine wave, 50G, 11ms, three times One in each opposite direction of each perpendicular axis	
10	Vibration Test (non-operating)	- 5Hz to 200Hz logarithm sweep for 20min/cycle. - 5Hz to 12.2Hz:The amplitude is 10mm p-p. - 12.2Hz to 100Hz:The acceleration is 3.0G 0-pk. - 101Hz to 200Hz:The acceleration is 1.5G 0-pk. - 3 axes, 18 sweeps per axis	
11	Vibration Test Temperature Cycle	-10Hz to 1000Hz, 20.9G, -40℃~70℃ - 8H×3Cycle	

Notes:

1. In the Reliability Test, Confirm performance after leaving in room temp(25℃)
2. In the standard condition, there shall be no practical problems that may affect the display function 24 hours later after reliability test.

9. International Standards

9-1. Safety

a) UL 60950-1, Second Edition, Underwriters Laboratories Inc.
Information Technology Equipment - Safety - Part 1 : General Requirements.

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

c) EN 60950-1:2006 + A11:2009, European Committee for Electrotechnical Standardization (CENELEC).
Information Technology Equipment - Safety - Part 1 : General Requirements.

9-2. Environment

a) RoHS, Directive 2002/95/EC of the European Parliament and of the council of 27 January 2003

10. Packing

10-1. 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

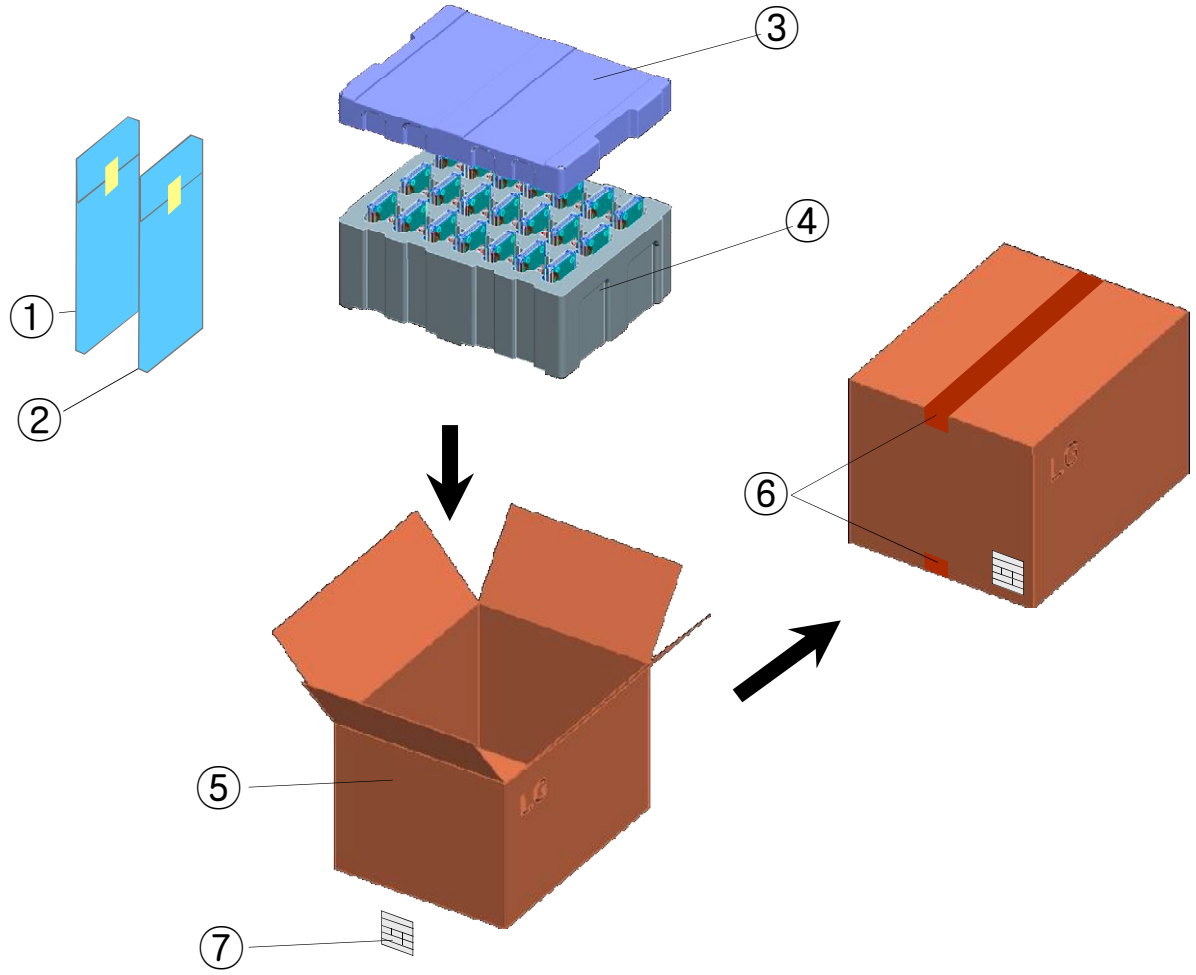
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	1	2	3	4	5	6	7	8	9	A	B	C

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.

10-2. Packing Form

a) Package quantity in one box : 42 pcs
b) Box Size : 478 x 365 x 244 (mm)



NO.	Description	Material
1	Module	42pcs/1 Box
2	Bag	PE, 100x210
3	Packing, Top	EPS
4	Packing, Bottom	EPS
5	Box	SWR4, 478X365X244
6	Tape	OPP 70MMx300m
7	Label	YUPO Paper 100x70

11. PRECAUTIONS

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

11-1. MOUNTING PRECAUTIONS

(1) You must mount a module using specified mounting holes.(Details refer to the drawings)
(2) You should consider the mounting structure so that uneven force(ex. Twisted stress) is not applied to the module.
And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach a transparent protective plate to the surface in order to protect the polarizer.
Transparent protective plate should have sufficient strength in order to 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 deteriorate the polarizer.)
(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. 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.
(10) The metal case of a module should be contacted to electrical ground of your system.

11-2. OPERATING PRECAUTIONS

(1) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(2) Brightness depends on the temperature. (In higher temperature, it becomes lower.)
(3) 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.
(4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(5) 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 minimize the interference.

11-3. 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.

11-4. PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

11-5. 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.

11-6. HANDLING PRECAUTIONS FOR PROTECTION FILM

(1) The protection film is attached to the bezel with a small masking tape or a double side 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.