SPECIFICATION
FOR
APPROVAL

( ) **Preliminary Specification**
(●) **Final Specification**

Title	7.0" WVGA (800 x RGB x 480) TFT LCD

BUYER	
MODEL	

SUPPLIER	LG Display Co., Ltd.
*MODEL	LA070WV4
Suffix	SD01

SIGNATURE	DATE
/	
/	
/	

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

SIGNATURE	DATE
J.D. KIM / Research Fellow	
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Products Engineering Dept.
LG Display Co., Ltd

Contents

RECORD OF REVISIONS

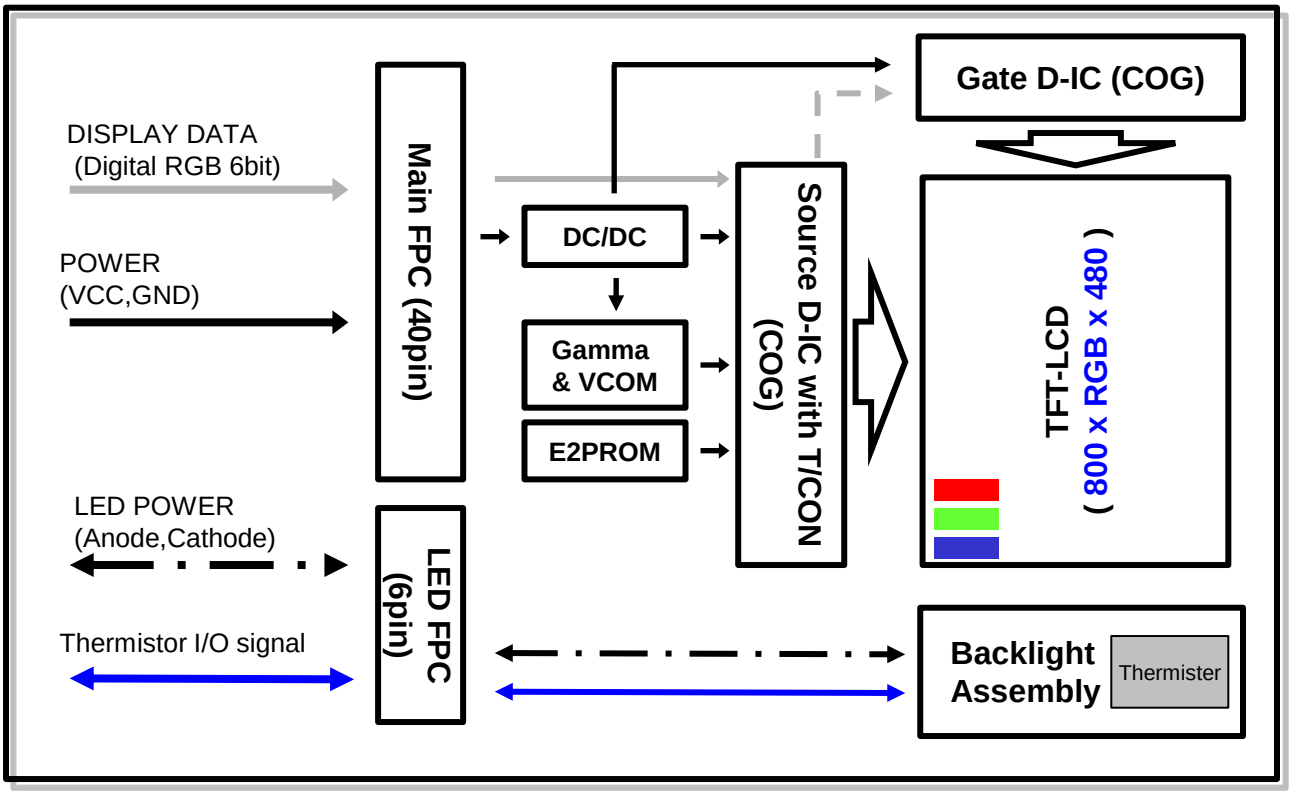
Revision No	Revision Date	Page	Description
1.0	Jan. 10. 2013	-	Final Version

1. Summary

This module utilizes amorphous silicon thin film transistors and a 15:9 aspect ratio. The 7.0" active matrix liquid crystal display allows 262,144 colors to be displayed by digital RGB interface is available.
The applications are CNS(Car Navigation System) for a vehicle

2. Features

- Applying a panel with a 15:9 aspect ratio
- The 7.0" screen produces a high resolution image that is composed of 384,000 RGB 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 6-bit gray scale signal.



3. General Specification

Active Screen Size	7.0 inches diagonal
Outline Dimension	170.0 (H) × 109.6 (V) × 9.2(D) mm (Typ.)
Pixel Pitch	0.1905 mm × 0.1905 mm
Pixel Format	800 horiz. by 480 vert. Pixels RGB strip arrangement
Color Depth	6-bit(D), 262,144 colors
Luminance, White	470 cd/m^2(Min.) [with LCF, Enhanced Single-Peak]
Viewing Angle (CR>100:1)	Viewing angle free (R/L 65 (Min.), U/D 25 (Min.))
Power Consumption	Total 4.28W(Typ.) [LCM = 0.86W + B/L = 3.42W(I_{BL}=80mA)]
Weight	256g(Typ.) / 261g(Max.)
Display Mode	Transmissive mode, Normally black
Surface Treatment	Anti-glare/Anti-reflection treatment of the front polarizer (Haze 11%)

4. Absolute Maximum Ratings

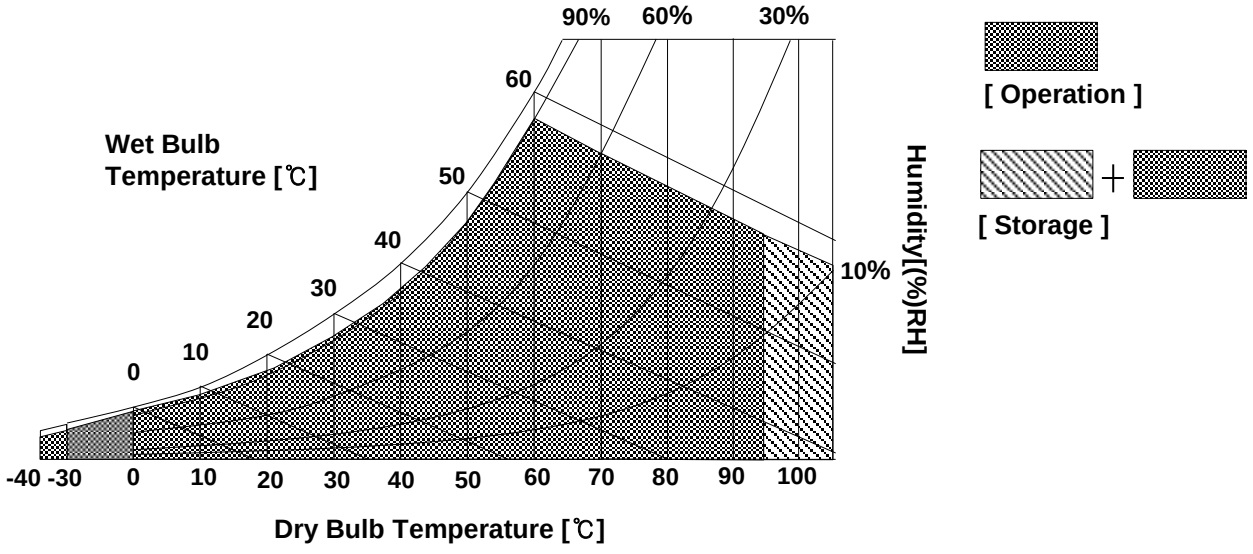
The following are maximum values which, if exceeded, may cause faulty operation or damage to the LCD module.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Values		Units	Notes
			Min	Max		
Power Supply Voltage		VCC	0.0	3.6	V	
Logic Input Voltage		VLOGIC	-0.2	3.6	V	1
LED Current		I_{LED}	-	85	mA	2
LED Power Consumption		P_{LED}	-	4.30	W	
Storage Temperature	Ambient	TST	-40	105	°C	3
Operating Temperature	On panel surface	T_{OP}	-40	95	°C	3,4

Notes :

1. Clock, RGB data, DE(Data Enable), HVR
2. Applies to each LED individually.
3. Temperature and relative humidity range are shown in the figure below.
   Maximum wet-bulb temperature is 58℃. Condensation of dew must be avoided, because it may cause electrical current leakage, and deterioration of performance and quality.
4. 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.



5. Electrical Specifications

5-1. Electrical Characteristics

It requires two power inputs. One is employed to power for LCD circuit. The other is used for the LED backlight.

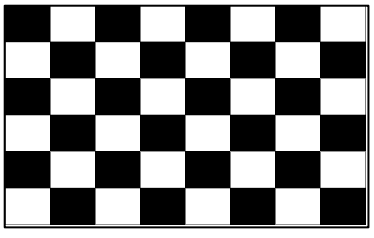
Table 2. LCD DRIVING CIRCUIT ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Power Supply Voltage	VCC	3.0	3.3	3.6	V	
Power Supply Current	ICC	150	230	310	mA	1
Power Consumption	PCC	-	0.86	1.06	W	
Rush Current	I_{RUSH}	-	-	1.5	A	2
Input Signal Voltage	V_H	0.7VCC	-	VCC	V	3
	V_L	0.0	-	0.3VCC	V	
Permissive input ripple	V_{RF}	-	-	200	mV_{PP}	4

Note 1. The specified current and power consumption are under the VCC=3.3V, Ta=25 ± 2°C, fv=60Hz condition. (fv is the frame frequency)
- Typical current : Mosaic pattern (8x6)
- Maximum current : White pattern (63 Gray)
- Minimum current : Black pattern (0 Gray)

2. The duration of rush current is about 2ms and rising time of power input is 0.5ms (min.). (VCC=3.3V, Ta=25 ± 2°C, fv=60Hz)
3. 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. (VCC=3.3V, Ta=25 ± 2°C, fV=60Hz)
4. The ranges of VCC, V_H and V_L include the Permissive input ripple.

White : 63 Gray
Black : 0 Gray



Mosaic Pattern(8 x 6)

White : 63 Gray

White Pattern

Black : 0 Gray

Black Pattern

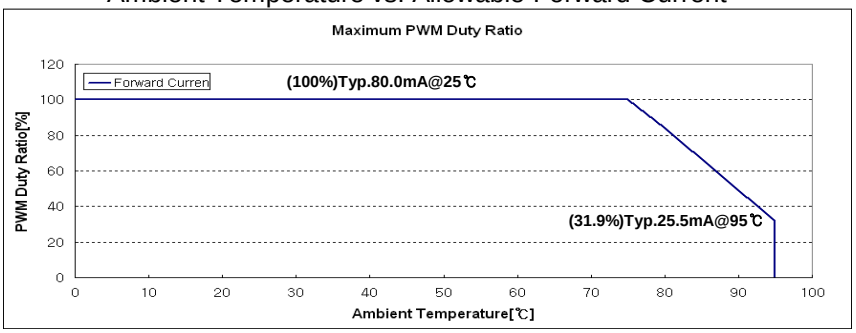
Table 3. BACKLIGHT ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
LED current	I_{LED}	-	80.0	85.0	mA	1,2
LED voltage	V_{LED} (-40℃)	21.0	23.1	25.2	V	1
	V_{LED} (25℃)	19.3	21.4	23.5		
	V_{LED} (95℃)	18.6	20.7	22.8		
LED power	P_{LED} (25℃)	-	3.42	4.00	W	3
Max. voltage difference between LED chains	$\triangle V_{LED\_chain}$ (25℃)	-	-	1	V	
LED chain			2			4
Life Time continuous		20,000	-	-	Hrs	5
Life Time intermittent		54,000	-	-	Cycles	6

Note 1. This values applies to one chain (7-LED connected in each chain)

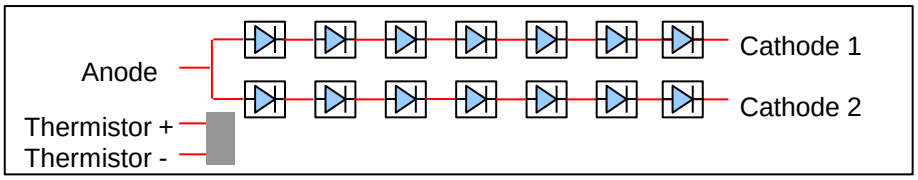
2. The permissible forward current of LED should be applied with environmental temperature.

Ambient Temperature vs. Allowable Forward Current



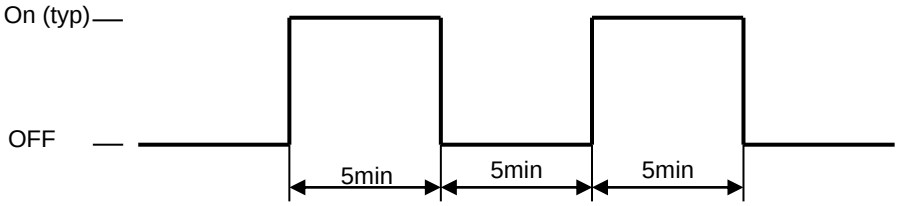
3. LED Power
   - Typ. LED Power = Typ. LED Current x +25℃ Typ. LED Voltage x LED Chain number
   - Max. LED Power = Max. LED Current x +25℃ Max. LED Voltage x LED Chain number

4. LED Chain
   The thermistor has to be thermally connected to the LED PCB to measure the temperature of it.
   Type : NCP NCP15XW223E03RC (supplier : MURATA)
   R = 22kohm ± 3%



5. 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.

6. Intermittent cycle, at V_{LED} = typ, I_{LED} = typ.



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.

5-2. FPC pin assignment

This LCD employs two interface connections, 40 pin FPC pad is used for the module electronics interface and 6 pin FPC pad is used for the integral backlight system.

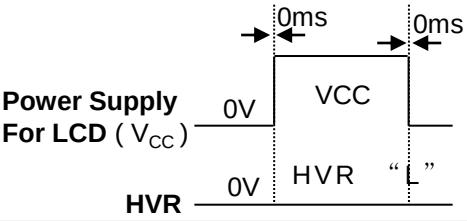
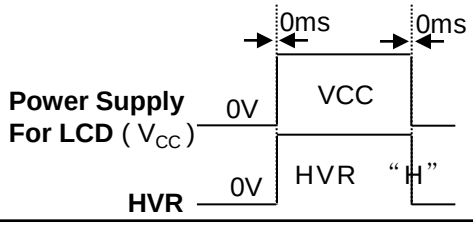
5-2-1. Panel FPC Pin Configuration

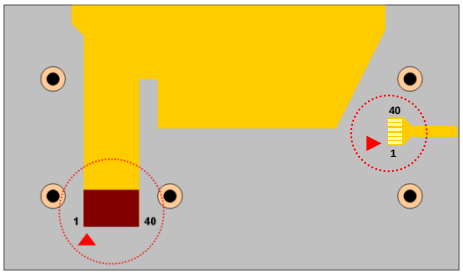
The mating connector model name is FH40-40S-0.5SV manufactured by Hirose or equivalent.

Table 4-1. PANEL FPC 40 PIN CONFIGURATION

Pin No	Name	I/O	Description	Note
1	GND	I	Ground	1
2	GND	I	Ground	
3	HVR	I	Horizontally and Vertically Inverted	4
4	NC	-	No Connection (LGD test pin)	3
5	NC	-	No Connection (LGD test pin)	
6	NC	-	No Connection (LGD test pin)	
7	NC	-	No Connection	
8	GND	I	Ground	1
9	NC	-	No Connection	3
10	NC	-	No Connection	
11	DE	I	Data Enable	
12	GND	I	Ground	1
13	GND	I	Ground	
14	CLK	I	Pixel Clock Signal	
15	GND	I	Ground	1
16	GND	I	Ground	
17	R0	I	Red Data Signal 0(LSB)	
18	R1	I	Red Data Signal 1	
19	R2	I	Red Data Signal 2	
20	R3	I	Red Data Signal 3	
21	R4	I	Red Data Signal 4	
22	R5	I	Red Data Signal 5(MSB)	
23	GND	I	Ground	1
24	G0	I	Green Data Signal 0(LSB)	
25	G1	I	Green Data Signal 1	
26	G2	I	Green Data Signal 2	
27	G3	I	Green Data Signal 3	
28	G4	I	Green Data Signal 4	
29	G5	I	Green Data Signal 5(MSB)	
30	GND	I	Ground	1
31	B0	I	Blue Data Signal 0(LSB)	
32	B1	I	Blue Data Signal 1	
33	B2	I	Blue Data Signal 2	
34	B3	I	Blue Data Signal 3	
35	B4	I	Blue Data Signal 4	
36	B5	I	Blue Data Signal 5(MSB)	
37	VCC	I	LCD Power Supply (+3.3V)	2
38	VCC	I	LCD Power Supply (+3.3V)	
39	GND	I	Ground	1
40	GND	I	Ground	

Note 1. All GND(ground) pins should be connected together.
2. All VCC pins should be connected together.
3. Make sure that NC pins should be floated.
4. Display Direction as following pictures

HVR (Static Signal)	Display Image	Sequence (VCC to HVR)
L (Regular Display)		
H (Horizontal and Vertical Inverted Display)		



5-2-2. Backlight FPC Pin Configuration

The mating connector model name is 9664S-06A-GFN1 manufactured by IRISO or equivalent.

Table 4-2. BACKLIGHT FPC 40 PIN CONFIGURATION

Pin No	Name	I/O	Description	Note
1	BL_AN	I	Backlight Anode of all chains	1
2	BL_AN	I	Backlight Anode of all chains	
3	BL_CA_1	O	Backlight Chain 1 (Cathode)	
4	BL_CA_2	O	Backlight Chain 2 (Cathode)	
5	NTC1	I	Temperature Sensor Pin1	2
6	NTC2	O	Temperature Sensor Pin2	

Note 1. All BL_AN pins should be connected together.
2. Please see the Appendix I for more information about Thermistor Characteristics.

5-3. Signal Timing Specifications

This is the signal timing required at the input of the FPC.
All of the interface signal timing should be satisfied with the following specifications for its proper operation.

Table 5-1. SIGNAL TIMING CHARACTERISTICS (fv=50Hz)

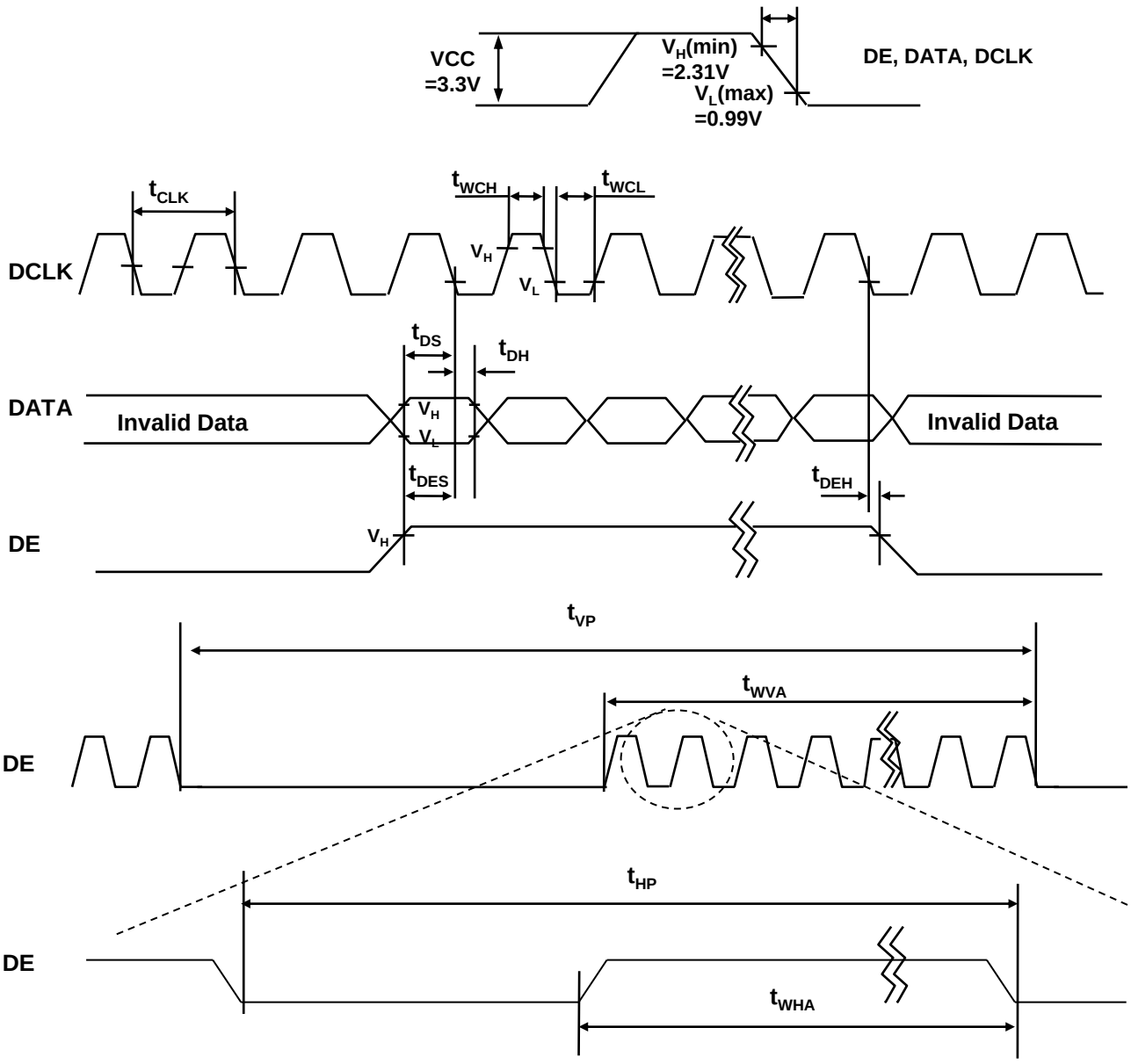
Parameter		Symbol	Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	31.50	33.00	34.54	MHz	
	Period	t_{CLK}	28.95	30.30	31.75	ns	
	High Level Width	t_{WCH}	10	-	-	ns	
	Low Level Width	t_{WCL}	10	-	-	ns	
DATA	Setup Time	t_{DS}	5	-	-	ns	
	Hold Time	t_{DH}	5	-	-	ns	
DE	Setup Time	t_{DES}	5	-	-	ns	
	Hold Time	t_{DEH}	5	-	-	ns	
	Horizontal Valid	t_{WHA}	800	800	800	t_{CLK}	1,2
	Horizontal Period	t_{HP}	1024	1056	1088		
	Vertical Valid	t_{WVA}	480	480	480	t_{Hp}	
	Vertical Period	t_{VP}	616	625	635		

Table 5-2. SIGNAL TIMING CHARACTERISTICS (fv=60Hz)

Parameter		Symbol	Min	Typ	Max	Unit	Note
DCLK	Frequency	f_{CLK}	31.95	33.26	34.60	MHz	
	Period	t_{CLK}	28.90	30.06	31.30	ns	
	High Level Width	t_{WCH}	10	-	-	ns	
	Low Level Width	t_{WCL}	10	-	-	ns	
DATA	Setup Time	t_{DS}	5	-	-	ns	
	Hold Time	t_{DH}	5	-	-	ns	
DE	Setup Time	t_{DES}	5	-	-	ns	
	Hold Time	t_{DEH}	5	-	-	ns	
	Horizontal Valid	t_{WHA}	800	800	800	t_{CLK}	1,2
	Horizontal Period	t_{HP}	1024	1056	1088		
	Vertical Valid	t_{WVA}	480	480	480	t_{Hp}	
	Vertical Period	t_{VP}	520	525	530		

Note 1. DE Only mode operation. The input of Hsync & Vsync signal does not have an effect on LCD normal operation.
2. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rates.
3. RGB data, DE signals change logic level in synchronization with DCLK(rising edge). Values are valid with the falling edge of DCLK.
4. In case of no valid data is available (missing like DCLK, DE) LCD display black screen.

FIG.1 Signal Timing Diagram



5-4. Color Data Reference

The brightness of each primary color (red,green and blue) is based on the 6-bit gray scale data input for the color ; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Table 6. 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 Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (01)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	…			…						…						…			
	RED (62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (01)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	...			…						…						…			
	GREEN (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE (00)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (01)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	…			…						…						…			
	BLUE (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

5-5. Power Sequence

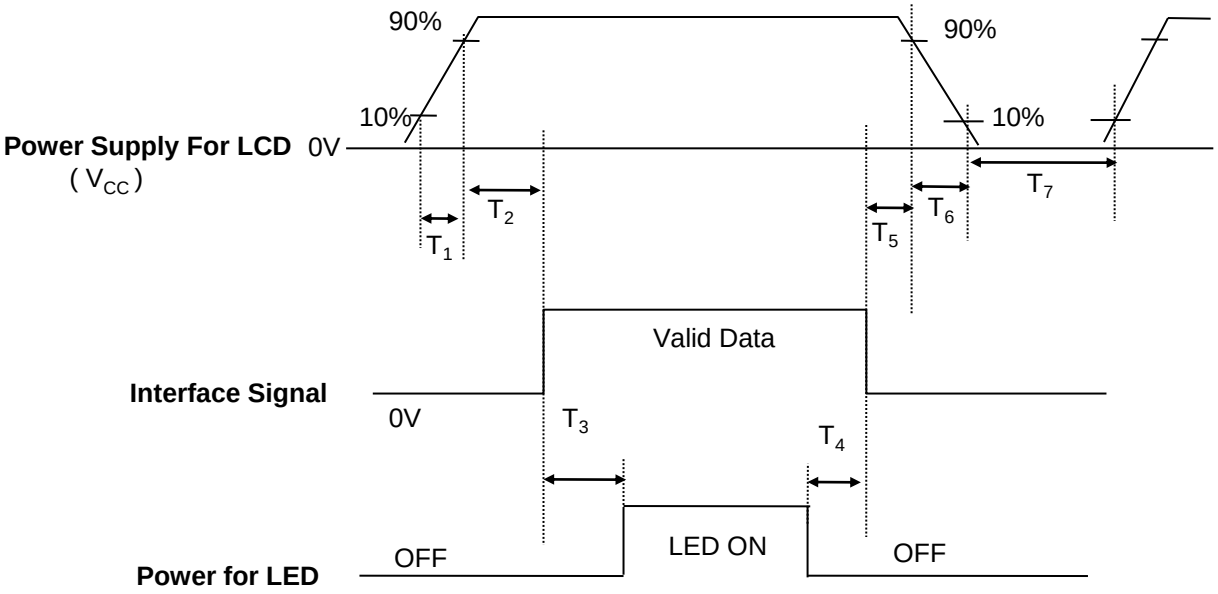


Table 7. POWER SEQUENCE TABLE

Parameter	Value			Units
	Min.	Typ.	Max.	
T_1	0.5	-	10	(ms)
T_2	50	-	-	(ms)
T_3	150	-	-	(ms)
T_4	200	-	-	(ms)
T_5	0	-	-	(ms)
T_6	0	-	10	(ms)
T_7	400	-	-	(ms)

Note)
1. Please avoid floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply for LCD VCC to 0V.
3. LED power must be turn on after power supply for LCD and interface signal are valid.

6. Electro-Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25°C. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and Θ equal to 0°.
FIG. 1 presents additional information concerning the measurement equipment and method.

FIG.2 Optical Characteristic Measurement Equipment and Method

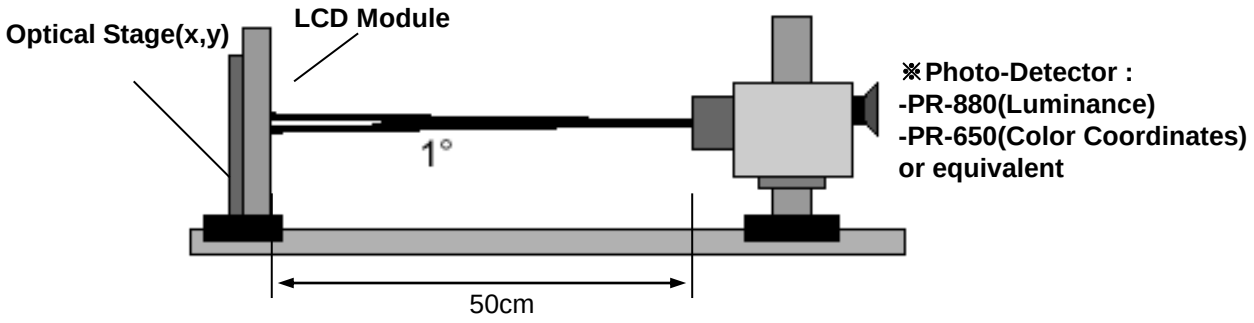


Table 8. ELECTRO-OPTICAL CHARACTERISTICS

[With LCF & Enhanced Single-Peak] Ta=25°C, VCC=3.3V, fv=60Hz, f_{CLK}= 33.26MHz, I_{LED} = 80.0mA/chain

Parameter			Symbol	Values			Units	Notes
				Min	Typ	Max		
Contrast Ratio			CR	630	900	-		1
Surface Luminance, white (Θ=0 °)			L_{WH}	470	-	-	cd/m2	2
Surface Luminance, white(Φ=180 °Θ=30 °)			L_{WH}_LEFT	410	-	-	cd/m2	
Surface Luminance, white(Φ=0 °Θ=30 °)			L_{WH}_RIGHT	310	-	-	cd/m2	
Luminance Variation			δ_{WHITE}	80	85	-	%	3
Response Time	Ta = -30℃	Rise Time	Tr_R	-	260	330	ms	4
		Decay Time	Tr_D	-	160	200	ms	
	Ta = -20℃	Rise Time	Tr_R	-	125	145	ms	
		Decay Time	Tr_D	-	65	75	ms	
	Ta = +0℃	Rise Time	Tr_R	-	35	41	ms	
		Decay Time	Tr_D	-	25	29	ms	
	Ta = +25℃	Rise Time	Tr_R	-	15	18	ms	
		Decay Time	Tr_D	-	10	12	ms	
Color Coordinates	RED		RX	0.605	0.635	0.665		2
			RY	0.319	0.349	0.379		
	GREEN		GX	0.299	0.329	0.359		
			GY	0.584	0.614	0.644		
	BLUE		BX	0.118	0.148	0.178		
			BY	0.066	0.096	0.126		
	WHITE		WX	0.282	0.312	0.342		
			WY	0.306	0.336	0.366		
Viewing Angle	x axis, right(Φ=0°)		Θr	65	70	-	degree	5
	x axis, left (Φ=180°)		Θl	65	70	-	degree	
	y axis, up (Φ=90°)		Θu	25	30	-	degree	
	y axis, down (Φ=270°)		Θd	25	30	-	degree	
Gamma				2.0	2.2	2.4		6

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 measured at the center point(L_1) of the LCD with all pixels displaying white at the distance of 50cm by PR-880. Color Coordinates are measured at the center point(L_1) 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. Luminance % uniformity is measured for 9 point For more information see FIG 3.
   δ WHITE = { Minimum(L1,L2, ….. L9) ÷ Maximum(L1,L2, ….. L9) } * 100(%)

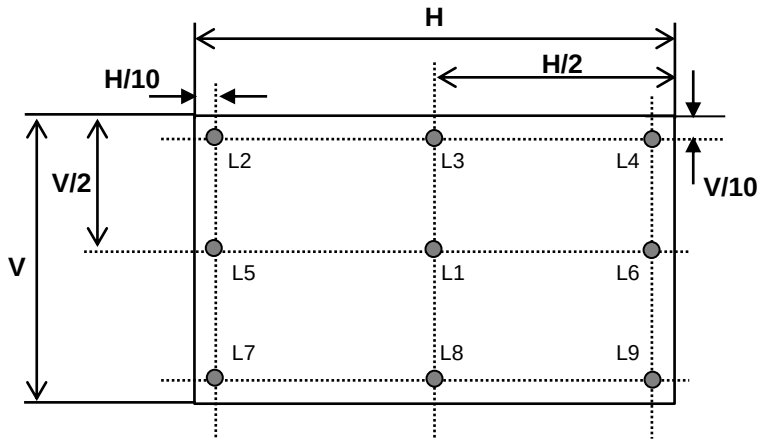
4. Response time is the time required for the display to transition from white to black (Rise Time, Tr_R) and from black to white(Decay Time, Tr_D). For additional information see FIG 4.

5. 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.

6. Gamma value calculation follow the "VESA Standard"

FIG.3 Luminance

<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".

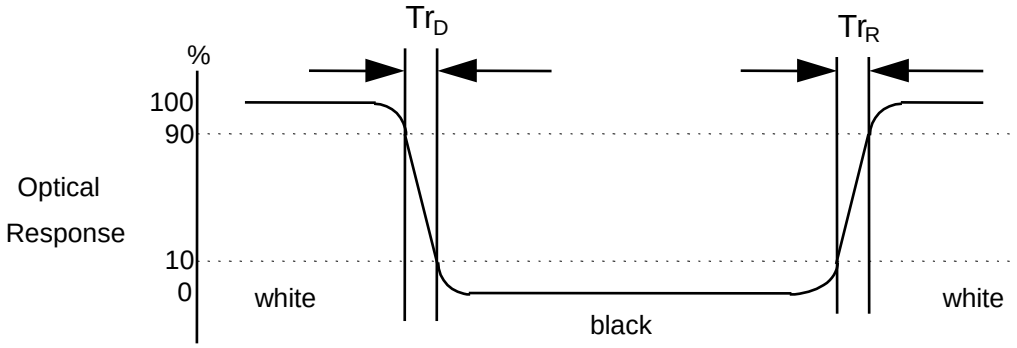
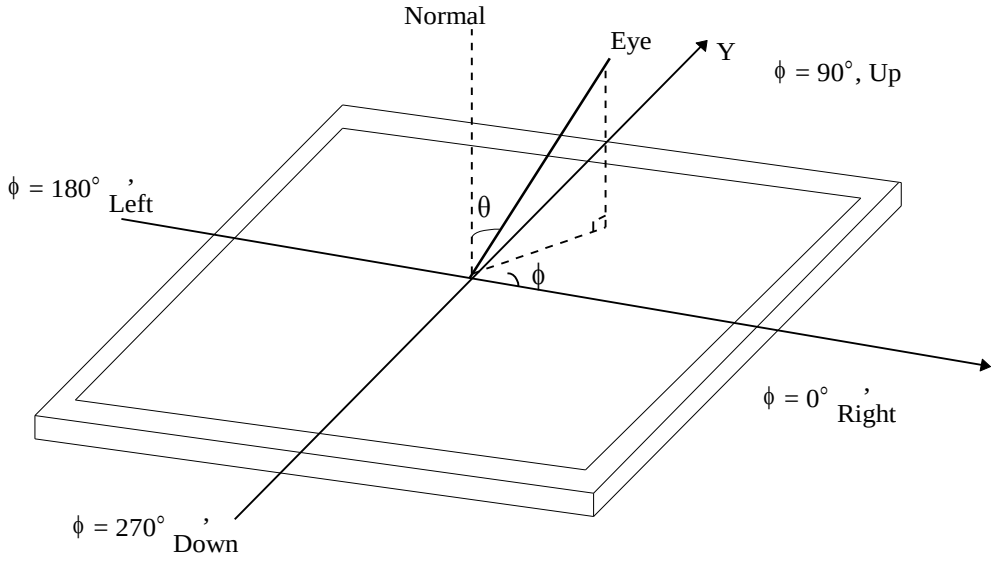


FIG.5 Viewing angle

<Dimension of viewing angle range>



7. Mechanical Characteristics

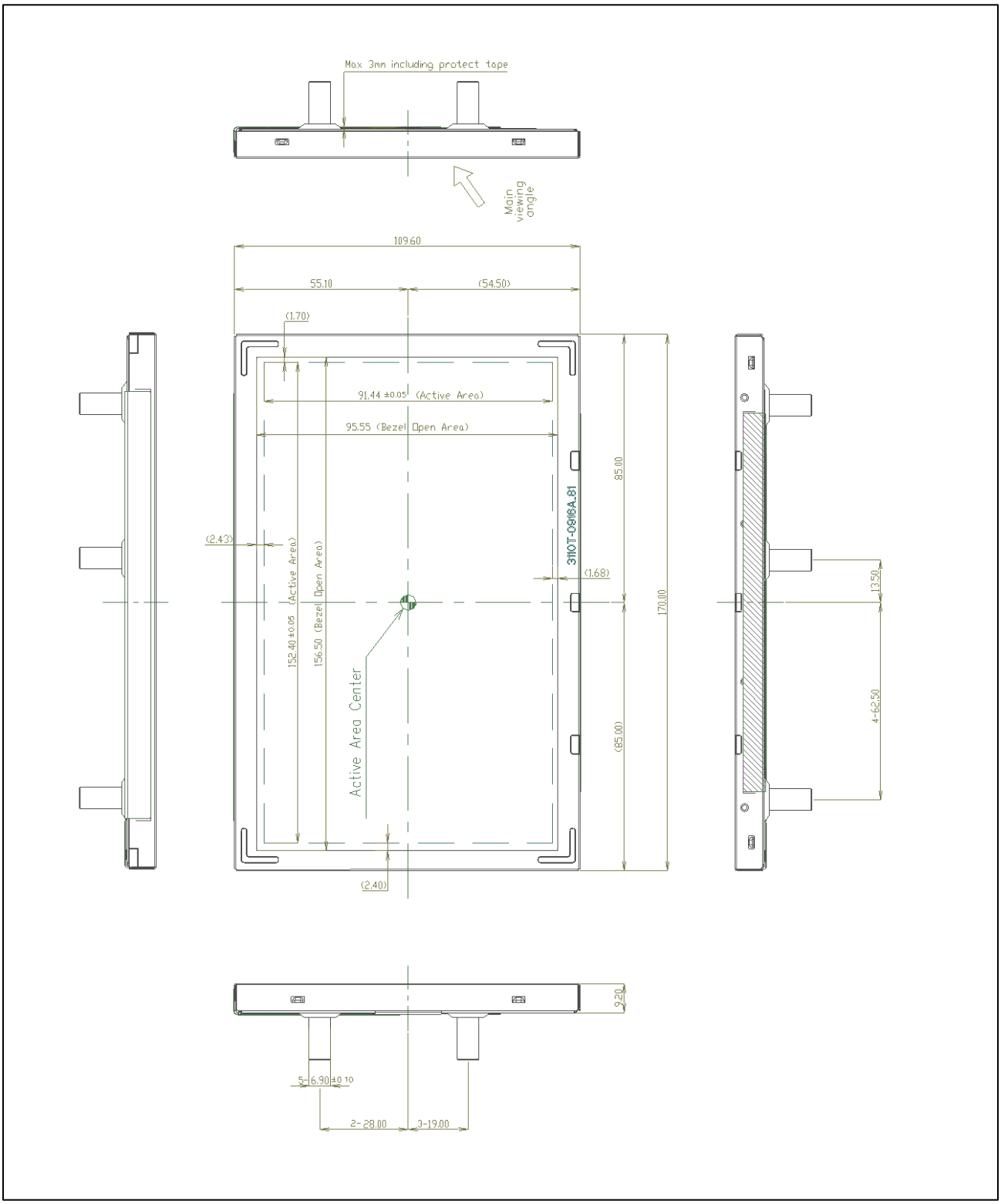
The contents provide general mechanical characteristics for the model LA070WV4. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Table 9. MECHANICAL CHARACTERISTICS

Item	Value	
Outline Dimension	Horizontal	170.0 ± 0.3 mm
	Vertical	109.6 ± 0.3 mm
	Depth	9.2 ± 0.3 mm
Bezel Area	Horizontal	156.5 ± 0.3 mm
	Vertical	95.55 ± 0.3 mm
Active Display Area	Horizontal	152.40 mm
	Vertical	91.44 mm
Weight	256g (Typ.), 261g (Max.)	

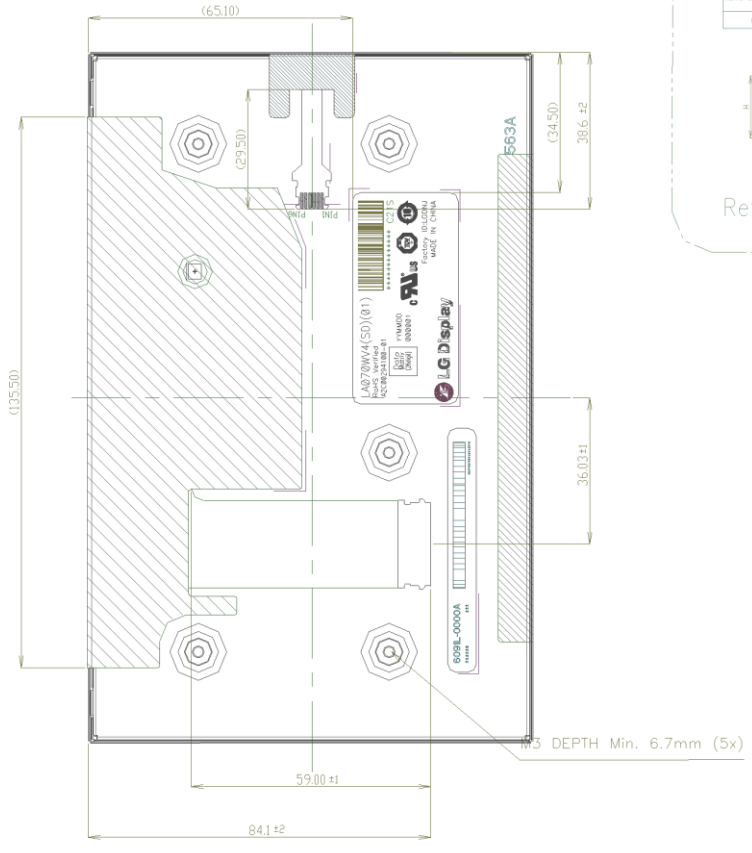
<FRONT VIEW>

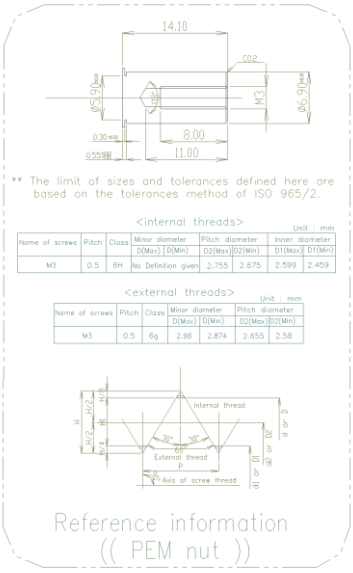
Note) Unit:[mm], General tolerance: ± 0.3mm



<REAR VIEW>

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





8. Reliability

Table 10. ENVIRONMENT TEST CONDITION

No.	Test Item	Conditions
1	High Temperature Storage Test	Ta=+105℃ 500h
2	Low Temperature Storage Test	Ta=-40℃ 100h
3	High Temperature Operation Test	Tp=+95℃ 200h
4	High Temperature and High Humidity Storage Test	Tp=+65℃ 93%RH 500h
5	Vibration test (non-operating)	10 - 30 Hz : ± 0.75mm 30 - 500 Hz : 3G 1 Oct./min Random 3Grms 3x (16h sinusoidal and 8h random) in X, Y and Z direction)
6	Shock test (non-operating)	3 shocks in each direction Peak acceleration: 981 m/s^2 Duration of nominal shock: 6ms Waveform: saw-tooth with slow rise(2.94 m/s) or half-sine
7	Thermal Shock Test (non-operating)	Ta=-40℃ ~ +95℃ 2h duration / 10 cycles
8	Electrostatic Discharge	Probe Settings: ±2kV (330Ω/150pF) ±2kV (1.5kΩ/100pF, FPC pad) Sample quantity: 3 displays 3 contact discharges on all critical positions of the display (such as all FPC pins, display viewing area, backside of driver, contact ledge).
9	Resistance to UV-radiation	Ta=+42℃, 1000W/㎡ 300h

※ Ta= Ambient Temperature, Tp= Panel Temperature

Note 1. Result Evaluation Criteria

TFT-LCD panels should take place at room temperature for 24 hours after the reliability tests finish. In the standard condition, there shall be no practical problems that may affect the display function.

Note 2. After No.1/3/4/9 tests have been done, TFT-LCD has to be satisfied with following condition.

- optical and electrical defects as specified in the test specification
- exceeding the specified “on” and “off” switching times
- reduction of the original contrast ratio perpendicular of more than 30% or the contrast ratio perpendicular has to be minimum (CR min value in CAS) x 70%
- doubling of specified max. total consumption
- reduction of the original min. brightness from LED more than 50%

9. International Standards

9-1. 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.

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

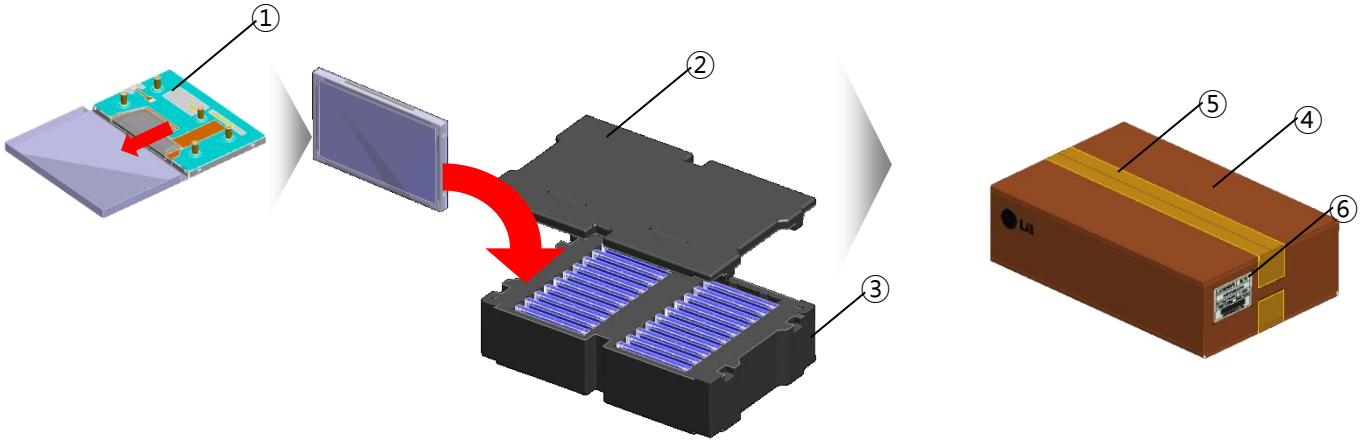
b) Location of Lot Mark

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 : 20 pcs

b) Box Size : 572 mm × 372 mm × 166 mm



NO.	Description	Material
1	Module	20 pcs
2	Packing, Bottom	EPP
3	Packing, Top	EPP
4	Box	SW
5	Tape	OPP
6	Box Label	ART Paper

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) 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 higher temperature, it becomes lower.)
(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 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.