LG Display

Product Specification

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	LB070WV1
Suffix	TJ01

SIGNATURE	DATE
/	
/	
/	

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

SIGNATURE	DATE
S.D. JUNG / G. Manager	
REVIEWED BY	
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O. J. KWON / Engineer	

Products Engineering Dept.
LG Display Co., Ltd

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RECORD OF REVISIONS

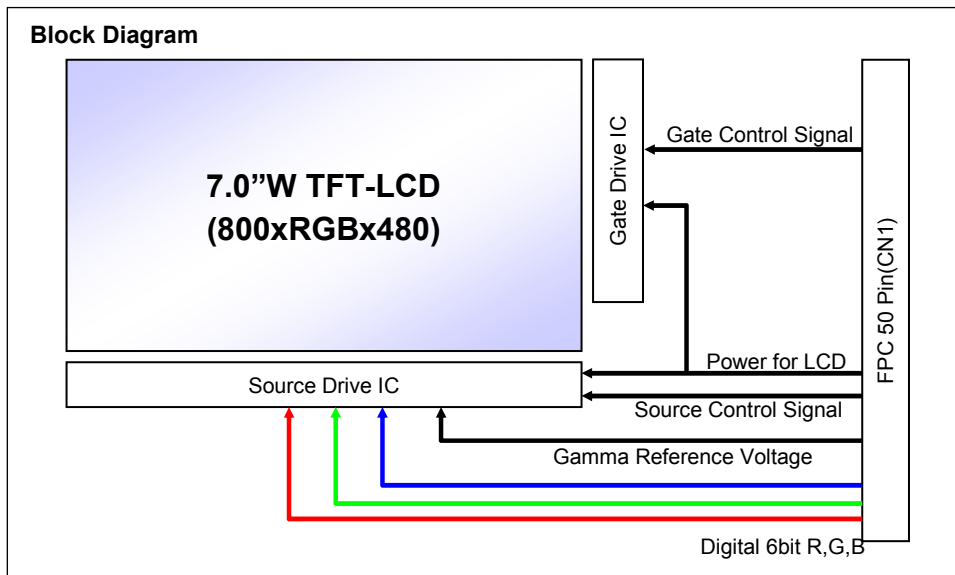| Revision No	Revision Date	Page	Description
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1. General Description

The LB070WV1-**TJ01** is a **Board Assembly Product** of TFT LCD without any extra system.
This Board Assembly utilizes amorphous silicon thin film transistors and a 16:9 aspect ratio. A 7.0" active matrix liquid crystal display allows full color to be displayed.
The applications are Portable DVD, Multimedia applications and others AV system.
•Utilizes a panel with a 16:9 aspect ratio, which makes the module suitable for use in wide-screen systems.
•The 7.0" screen produces a high resolution image that is composed of 384,000 pixel elements in a stripe arrangement.
•Wide viewing angle technology is employed.
[The most suitable viewing direction is in the 6 o'clock direction.]
•By adopting an active matrix drive, a picture with high contrast is realized.
•This Board Assembly is accomplished through the use of COG mounting technology.
•By adopting a high aperture panel, high transmittance color filter and high transmission polarizing plates, transmittance ratio is realized.

Block Diagram

7.0"W TFT-LCD
(800xRGBx480)

Gate Drive IC

Gate Control Signal

Source Drive IC

Power for LCD

Source Control Signal

Gamma Reference Voltage

Digital 6bit R,G,B

FPC 50 Pin(CN1)

General Features

Video Signal Interface	TTL Interface
Active Screen Size	7.0 inches diagonal
Outline Dimension	161.8x171.25x1.69mm
Pixel Pitch	0.1905 mm × 0.1905 mm
Pixel Format	800 horiz. by 480 vert. Pixels RGB strip arrangement
Color Depth	6-bit, 262,144 colors
Transmittance	5.94% (Typ.)
Number of Dots	800(H)× 3(R, G, B)× 480(V)
Weight	59.5g(Typ.)
Display Operating Mode	TN Type, Transmitting type, normally white
Surface Treatment	Anti-glare treatment of the front polarizer

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2. Absolute Maximum Ratings

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

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Min	Max	Unit	Remark
Logic Voltage	VCC	T_a=25℃	-0.5	4.0	V	
Source Driver Voltage	VDD	T_a=25℃	-0.3	14.5	V	
Digital Input Signals	V_{I1}	T_a=25℃	-0.5	VCC+0.5	V	[Note 2-1]
Analog Input Signals	V_{I2}	T_a=25℃	-0.5	VDD+0.5	V	[Note 2-2]
Gate Driver Voltage	VGH	T_a=25℃	-0.3	40	V	
	VGL	T_a=25℃	-20	0.3	V	
	VGH-VGL	T_a=25℃	-0.3	40	V	
	GVCC	T_a=25℃	-0.3	4	V	
Operating Temperature (Ambient Temperature)	T_{op}	-	-10	60	℃	[Note 2-3,4,5,6]
Storage Temperature	T_{st}	-	-20	70	℃	[Note 2-3,4]

[Note 2-1] U_D,GSP1/2,GSC,GOE, SSP1/2, SOE, SSC, POL, REV, L_R, R0-5/G0-5/B0-5
[Note 2-2] VCOM,VREF0/1/2/3/4/5
[Note 2-3] This rating applies to all parts of the module and should not be exceeded.
[Note 2-4] Maximum wet-bulb temperature is 46℃. Condensation of dew must be avoided as electrical current leaks will occur, causing a degradation of performance specifications.
[Note 2-5] The operating temperature only guarantees operation of the circuit and doesn't guarantee all the contents of Electro-optical specification.
[Note 2-6] Ambient temperature when the backlight is lit (reference value).

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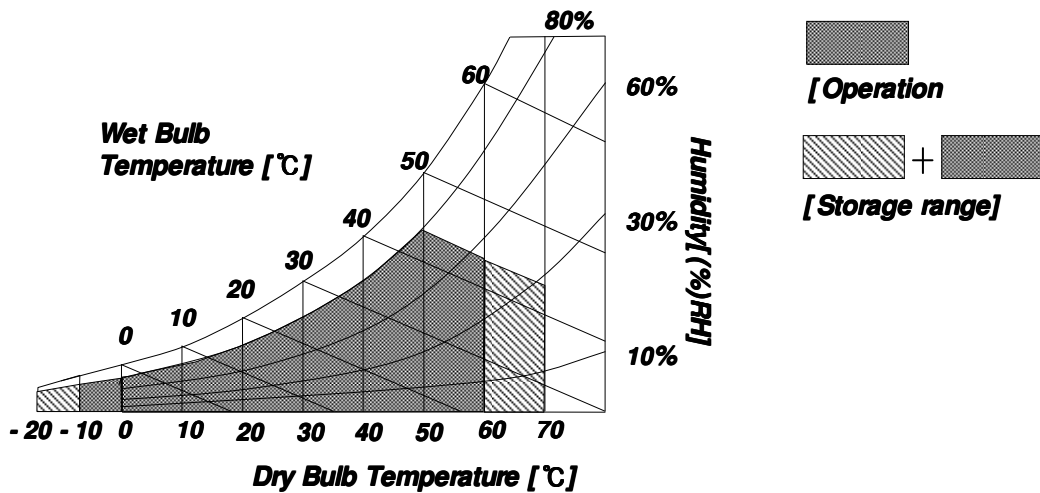
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3. Electrical Specifications

3-1. Electrical Characteristics

Table 3. ELECTRICAL CHARACTERISTICS(TFT-LCD PANEL DRIVING SECTION) $T_a=25℃$

Parameter			Symbol	Min	Typ	Max	Unit	Remark
Logic Supply Voltage			VCC	3.0	3.3	3.6	V	
Digital Input Signal	High Level		V_{IH}	0.7VCC	-	VCC	V	
	Low Level		V_{IL}	0	-	0.3VCC	V	
Source Driver Supply Voltage			VDD	11.0	12.0	13.0	V	
Gate Driver	TFT	Hi	VGH	18.5	19.5	20.5	V	
		Lo	VGL	-10	(-4.5)	-4	V	
	Logic Supply Voltage		GVCC	3.0	3.3	3.6	V	
Gamma Correction Voltage	DC		VREF0~2	0.4VDD	-	VDD-0.2	V	
			VREF3~5	GND+0.2	-	0.6VDD		
Color Filter Substrate Voltage	DC		VCOM	4.8	5.0	5.2	V	
Source Driver Supply Current			IDD	-	36	50	mA	VDD = 12V
Logic Supply Current			ICC	-	11	30	mA	VCC = 3.3V
Gate Driver Logic Supply Current			GICC	-	0.02	0.1	mA	GVCC = 3.3V
Gate Driver High Supply Current			IGH	-	0.15	0.75	mA	VGH = 19.5V
Gate Driver Low Supply Current			IGL	-	0.45	2	mA	VGL = -4.5V

***** Cautionary Matter : When applying or disconnecting power, please be sure that such action is sequentially carried out for all power supplies. In addition, apply input signals only after power has been turned on.

[Power Sequence]
 -Source Driver :
    Power on sequence : Case.1) VCC > Logic input > VDD > VREF0 to VREF5.
                           Case.2) VCC > VDD > VREF0 to VREF5 > Logic input.
    Power off sequence is reverse turn of this.
 -Gate Driver :
    Power on sequence : GVCC > VGL > Input signal > VGH.
    Power off sequence is reverse turn of this.

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3-2. Interface (Input Terminal)

This LCD employs two interface connections, a 50 pin connector is used for the module electronics interface and the other connector is used for the integral backlight system.

Table 4. TFT-LCD Panel Driving Part

Pin No.	Symbol	Description	Pin No.	Symbol	Description
1	VGH	Gate Driver Positive Voltage	26	GND	Ground
2	VGL	Gate Driver Negative Voltage	27	R0	Red Data 0 [LSB]
3	GVCC	Power Line For Gate Driver IC Logic	28	R1	Red Data 1
			29	R2	Red Data 2
4	GSP1	Gate Scanning Start Signal 1	30	R3	Red Data 3
5	GSP2	Gate Scanning Start Signal 2	31	R4	Red Data 4
6	GSC	Gate Driver Scanning Clock Pulse	32	R5	Red Data 5 [MSB]
7	U_D	Up/Down Scanning Change	33	GND	Ground
8	GOE	Gate Driver Output Enable Control	34	G0	Green Data 0 [LSB]
			35	G1	Green Data 1
9	VCOM	Voltage Applied To Color Filter Substrate	36	G2	Green Data 2
10	VCOM		37	G3	Green Data 3
11	VDD	Source Driver Supply Voltage	38	G4	Green Data 4
12	VREF5	Voltage For Gamma Correction	39	G5	Green Data 5 [MSB]
13	VREF4		40	GND	Ground
14	VREF3		41	B0	Blue Data 0 [LSB]
15	VREF2		42	B1	Blue Data 1
16	VREF1		43	B2	Blue Data 2
17	VREF0		44	B3	Blue Data 3
18	GND	Ground	45	B4	Blue Data 4
19	VCC	Power Line For Logic	46	B5	Blue Data 5 [MSB]
20	VCC	Power Line For Logic	47	GND	Ground
21	SSP2	Source Scanning Right Start Signal	48	REV	Reverse of Input R,G,B Data Code
22	SSP1	Source Scanning Left Start Signal	49	L_R	Left/Right Scanning Change
23	SOE	Source Driver Output Enable Control	50	VCOM	Voltage Applied To Color Filter Substrate
24	SSC	Source Driver Clock Input			
25	POL	Polarity Reversal Signal			

**The matching connector part number is FH19SC-50S-0.5SH(Bottom Contact Type, 0.5mm-Pitch) manufactured by Hirose or equivalent.

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3-3. Signal Timing Specifications

Table 6. Timing Characteristics of input signals

	Parameter	Symbol	Min	Typ	Max	Unit	Remark
S	SSC Frequency	fclk	26	33.26	40	MHz	SSC
	High level SSC pulse width duration	twh	4	-	-	ns	
	Low level SSC pulse width duration	twl	4	-	-	ns	
O	DATA/REV Setup Time	ts1	2	-	-	ns	DATA,REV
U	DATA/REV Hold Time	th1	2			ns	
R	Start Pulse Setup Time	ts2	3	-	-	ns	SSP1/2
	Start Pulse Hold Time	th2	3	-	-	ns	
C	SOE Signal Setup Time	ts3	3	-	-	SSC cycle	SOE
E	SOE Low Hold Time from final data SSC	th3	2	-	-	SSC cycle	
	High level SOE signal pulse width duration	twtp1	1	2.5	4	us	
	POL Signal SOE Setup Time	ts4	6	-	-	ns	SOE,POL
	POL Signal SOE Hold Time	th4	6	-	-	ns	
G	GSC Frequency	fclk	-	-	200	KHz	[Note 3-2]
A	GSC Rise Time	trck	-	-	100	ns	
	GSC Falling Time	tfck	-	-	100	ns	
T	GSC Pulse Width	pwclk	500	-	-	ns	
	GSP1/2 Setup Time	tsu	200	-	-	ns	
E	GSP1/2 Hold Time	thd	300	-	-	ns	
	GOE Pulse Width	twcl	1	-	-	us	

[Note 3-2] At least input one cycle of GSC during "L" period of GSP1.

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3-4. Timing Diagram

① Source D-IC Timing Diagram

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② Gate D-IC Timing Diagram
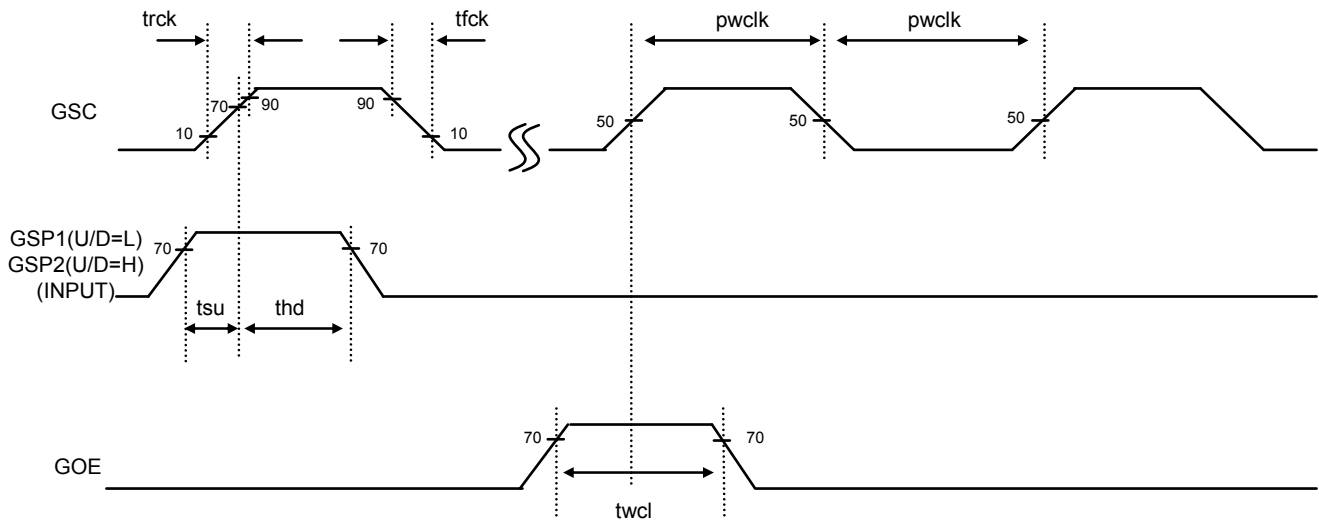
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3-5. Detail Description of Pin Functions

1. U_D is used as input pin for selecting the shifting direction of bi-directional shift register.

U_D	Output Shift	GSP Input Pin
H	Up to Down	GSP2
L	Down to Up	GSP1

2. L_R is is used as input pin for the horizontal scanning direction. If L_R is H, SSP1 is the Input Pin for the Source Start Pulse(SSP). Otherwise(If L_R is L), SSP2 is the Input Pin for the Source Start Pulse.

L_R	Scanning Direction	SSP Input Pin
H	Form Left to Right	SSP1
L	From Right to Left	SSP2

3-6. Recommended Gamma Correction Voltage [VREF0 to VREF5]

VDD=12V

Symbol	Values(Typ)	Unit	Remark
VREF0	(9.16)		
VREF1	(7.51)		
VREF2	(6.23)	V	[Note 3-3]
VREF3	(5.06)		
VREF4	(3.59)		
VREF5	(1.54)		

[Note 3-3] Be sure to maintain the voltage relationships of
VDD > VREF0 > VREF1 > VREF2 > VREF3 > VREF4 > VREF5 > GND

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4. Electro-optical Characteristics

Ta=25°C, VCC=3.3V, fv=60Hz, f_{CLK}= 33.26MHz

PARAMETER		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
Transmittance		T	-	5.35	5.94	-	%	
Contrast Ratio		CR	Optimal	(280)	(400)	-	-	[Note 4-2]
White Color Chromaticity		W_x	-	0.283	0.313	0.343	-	[Note 4-1]
		W_y		0.299	0.329	0.359	-	
Viewing Angle	φ=180°	Θl	CR≥10	60	70	-	°	[Note 4-2] [Note 4-3]
	φ=0°	Θr		60	70	-	°	
	φ=90°	Θu		40	50	-	°	
	φ=270°	Θd		50	60	-	°	
Response Time	Rise	τ_r	Θ=0°	-	8	20	ms	[Note 4-4]
	Fall	τ_d		-	17	30	ms	

** All transmissive mode optical characteristics are measured under back light condition.
   but, following conditions are just "Internal Conditions for Quality Test" of LG Display.

< Reference Backlight Unit >

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Luminance	B_1	-	3700	-	cd/m²	Center Point
White Color Chromaticity	X	-	0.290	-	-	Center Point
	Y	-	0.283	-		Center Point

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Measuring Condition ;
-Measuring surroundings : Dark Room
-Measuring temperature : T_a=25℃
-Adjust operating voltage to get optimum contrast at the center of the display.
-Measured value at the center point of LCD panel after more than 30 minutes while backlight turning on.

[Note 4-1] Measured on the center area of the panel by PHOTO RESEARCH photometer PR-880.

[Note 4-2] Contrast ratio is defined as follows ;

$$\text{Contrast Ratio(CR)} = \frac{\text{Photo detector output with LCD being "white"}}{\text{Photo detector output with LCD being "black"}}$$

[Note 4-3] Viewing angle range is defined as follows;

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[Note 4-4]

Response time is obtained by measuring the transition time of photo detector output, when input signals are applied so as to make the area "black" to and from "white".
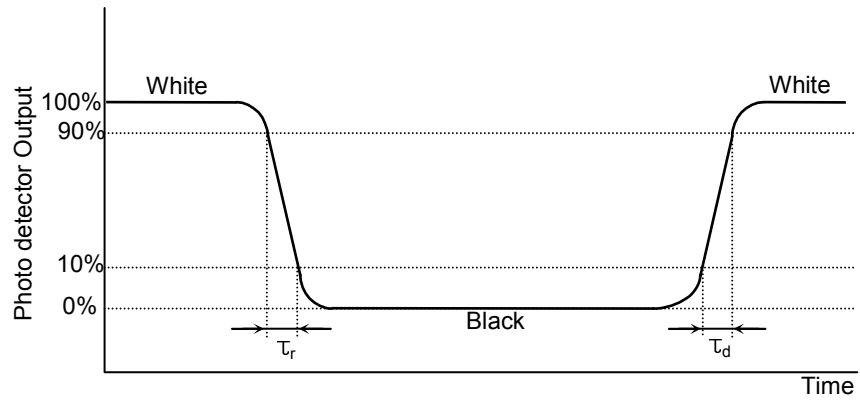
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5. Mechanical Characteristics

The contents provide general mechanical characteristics for the model LB070WV1. In addition the figures in the next page are detailed mechanical drawing of the LCD.

Outline Dimension	Horizontal	161.8 mm(Typ)
	Vertical	171.25 mm(Typ)
	Depth	1.69 mm (Typ.)
Active Display Area	Horizontal	152.40 mm (Typ.)
	Vertical	91.44 mm (Typ.)
Weight	59.5g(Typ.) / 64.5g (Max.)	
Surface Treatment	Anti-glare treatment of the front polarizer	

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<FRONT VIEW>   Unit:[mm], General tolerance: ± 0.3mm

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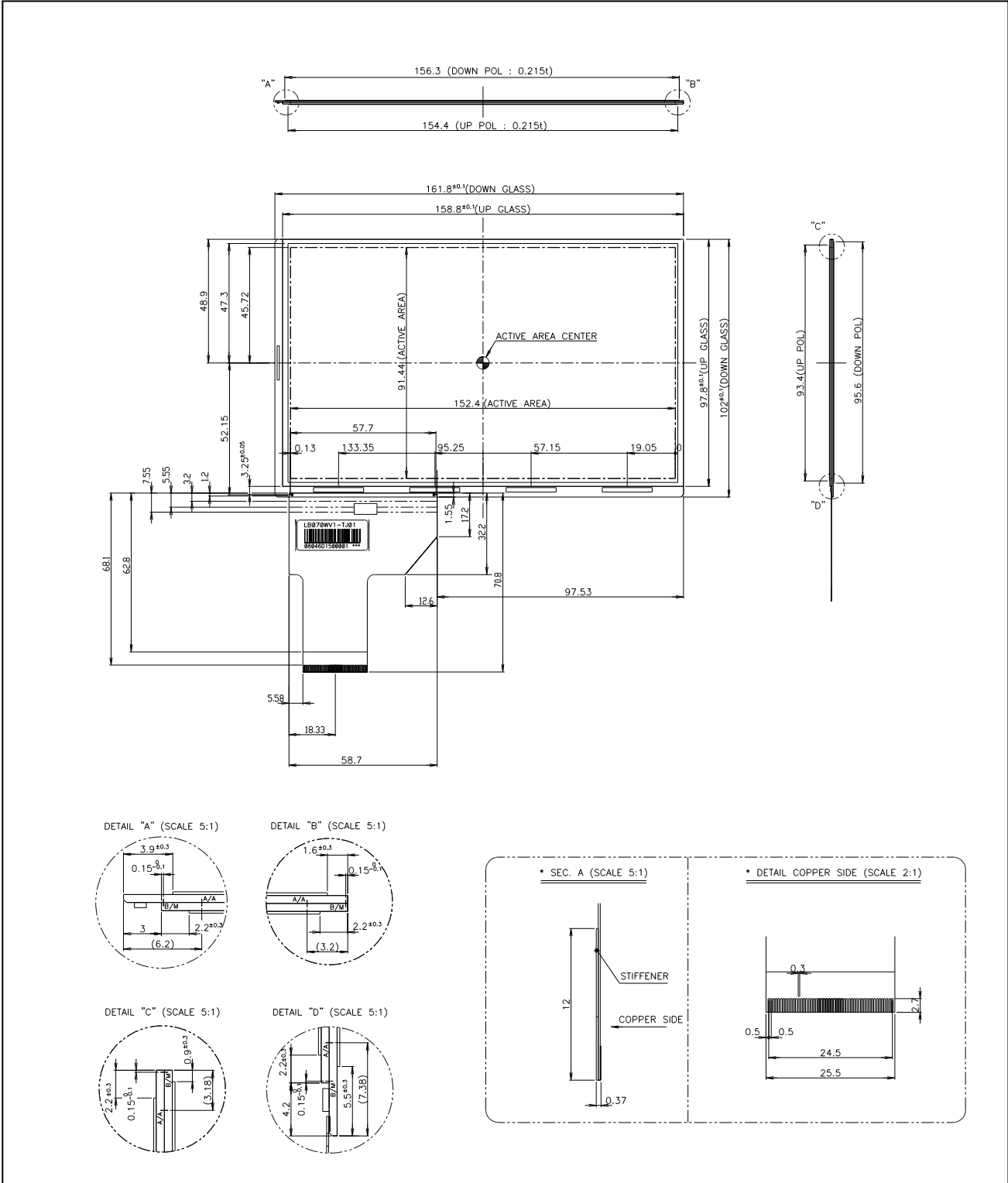
6. Reliability

No.	Test Items	Test Condition	Remark
1	High Temperature Storage Test	Ta=70℃ 240h	[Note 6-1,2,3]
2	Low Temperature Storage Test	Ta=-20℃ 240h	[Note 6-1,2,3]
3	High Temperature Operation Test	Ta=60℃ 240h	[Note 6-1,2,3]
4	Low Temperature Operation Test	Ta =-10℃ 240h	[Note 6-1,2,3]
5	High Temperature and High Humidity Operation Test	Ta=50℃ 80%RH 240h	[Note 6-1,2,3]
6	Thermal Shock Test	-10℃(0.5h) ~ 60℃(0.5h) / 100 cycles	

[Note 6-1] T_a = Ambient Temperature
[Note 6-2] In the Reliability Test, Confirm performance after leaving in room temp.
[Note 6-3] In the standard condition, there shall be no practical problems that may affect the display function.

※ Ta= Ambient Temperature

{ 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.

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7. International Standards

7-1. 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.

7-2. EMC

a) ANSI C63.4 – 2003 "American National Standard for Methods of Measurement of Radio-Noise
   Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."
   American National Standards Institute (ANSI), 2003.

b) C.I.S.P.R. Pub. 22. Limits and methods of measurement of radio interference characteristics of
   information technology equipment." International Special Committee on Radio Interference
   (C.I.S.P.R.), 2005.

c) EN 55022 "Limits and methods of measurement of radio interference characteristics of information
   technology equipment." European Committee for Electrotechnical Standardization (CENELEC), 2006.

7-3. Environment

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

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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	2001 2011	2002 2012	2003 2013	2004 2014	2005 2015	2006 2016	2007 2017	2008 2018	2009 2019	2010 2020
Mark	1	2	3	4	5	6	7	8	9	0

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 : 52 pcs

b) Box Size(mm) : 475(L)× 348(W)× 150(H)

9. PRECAUTIONS

Please pay attention to the following when you use this TFT LCD COG Assembly(Board Ass'y).

9-1. MOUNTING PRECAUTIONS

(1) You must mount a Board Ass'y using packing trays arranged.
And do not hold on to the FPC while carrying.
(2) You should consider the mounting structure so that uneven force(ex. Twisted stress) is not applied to the Board Ass'y.
And the case on which a Board Ass'y is mounted should have sufficient strength so that external force is not transmitted directly to the Board Ass'y.
(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 describe 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 determined 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) 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) Sufficient suppression to the electromagnetic interference shall be done by system manufacturers.
Grounding and shielding methods may be important to minimize 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.