

Product Specifications

Customer	
Description	7" TFT LCD Module
Model Name	LS700AT9001
Date	2008/10/31
Doc. No.	
Revision	03

Customer Approval	
Date	
The above signature represents that the product specifications, testing regulation, and warranty in the specifications are accepted	

Engineering			
Check	Date	Prepared	Date

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Preliminary

CONTENTS

No.	ITEM	PAGE
0	RECORD OF REVISION	3
1	SUMMARY	4
2	FEATURES	4
3	GENERAL SPECIFICATIONS	4
4	ABSOLUTE MAXIMUM RATINGS	4
5	ELECTRICAL CHARACTERISTICS	5
6	DC CHARATERISTICS	6
7	AC CHARACTERISTICS	6-7
8	OPTICAL CHARATERISTIC	7-9
9	INTERFACE	10-11
10	BLOCK DIAGRAM	12
11	QUALITY ASSURANCE	12
12	OUTLINE DRAWING	13
13	PACKAGE INFORMATION	15
14	PRECAUTIONS	16-17

Preliminary

Preliminary

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1. SUMMARY

LS700AT9001 is a transmissive type color active matrix liquid crystal display (LCD), which uses amorphous thin film transistor (TFT) as switching devices. This panel has a 7.0 inches diagonally measured active display area with SVGA (800 RGB x 600) resolution. The following describes the features of this product.

2. FEATURES

- 7" (diagonal) inch configuration
- SVGA (800×600 pixels) resolution

3. GENERAL SPECIFICATIONS

Parameter		Specifications	Unit
LCD size		7(Diagonal)	Inch
Display mode		Normally white, Transmissive type	
Number of Pixel		800 RGB x 600	Dot
Display Color		262k	color
Active area		141.60(H) x 106.20(V)	mm
Pixel Pitch		59 (H) x 177 (V)	um
Pixel Configuration		RGB-Stripe	
NTSC		45	%
Interface		Digital 18bit RGB	
View Angle L/R/U/D (CR>10)		70,70,50,70	Degree
View Angle direction		6 o'clock	
Outline Dimension		154 (H) x 119.2 (V) x 5.1 (D)	mm
Weight		(135)	g
Temperature Range	Operation	-10~70	°C
	Storage	-20~80	°C

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4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power Voltage	V _{CC}	GND=0	-0.3	6	V	-
	AVDD,	GND=0	-0.3	13.5	V	-
	V _{GH}	GND=0	-0.3	+42	V	-
	V _{GL}	GND=0	V _{GH} -42	+0.3	V	-

Note : 1. All of the voltages listed above are with respect to GND=VSSA=0V

2. Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

5. ELECTRICAL CHARACTERISTICS

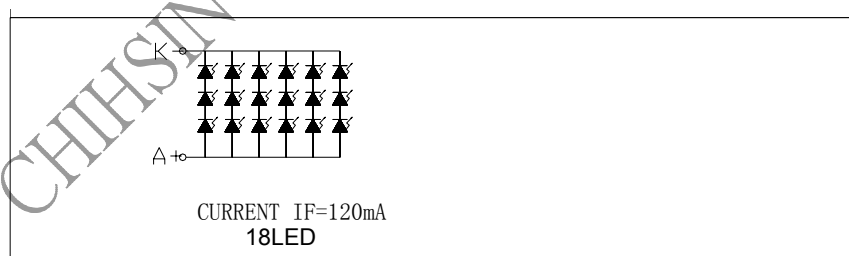
5.1. Operating conditions:

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Digital Power Supply Voltages	VCC	3.0	3.3	3.6	V	
Digital Supply Current Consumption	IVCC	12.3	12.7	13.1	mA	Black Pattern
Analog Power Supply Voltage	AVDD	10.5	12	13.5	V	
Analog Supply Current Consumption	IAVDD	21.7	22.4	23.1	mA	Black Pattern
Gate Driver Positive Supply Voltage	VGH	13	16	17	V	
Gate Driver Positive Supply Current	IVGH	0.14	0.15	0.16	mA	Black Pattern
Gate Driver Negative Supply Voltage	VGL	-8	-7	-6	V	
Gate Driver Negative Supply Current	IVGL	0.15	0.16	0.17	mA	Black Pattern
Common Electrode Driving Voltage	VCOM	-	4.3	-	V	Black Pattern
Input Logic Signal High Threshold	VIH	0.8Vcc	-	Vcc	V	
Input Logic Signal Low Threshold	VIL	0	-	0.2Vcc	V	
Input level V1~V5	Vref1	0.4AVDD	-	AVDD-0.1	V	Gamma correction voltage input
Input level V6~V10	Vref2	0.1	-	0.6AVDD	V	Gamma correction voltage input

5.2. Backlight Driving for Power Consumption

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I_{LED}	-	120	-	mA	Note 1
LED voltage	V_{LED}	9.0	9.9	-	V	
LED Life Time	-	10000	-	-	Hr	Note 2

Note 1 : There are 6 Groups LED shown as below , $V_{LED}=9.9V$.



Note 2 : Brightness to be decreased to 50% of the initial value.

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6. DC CHARACTERISTICS

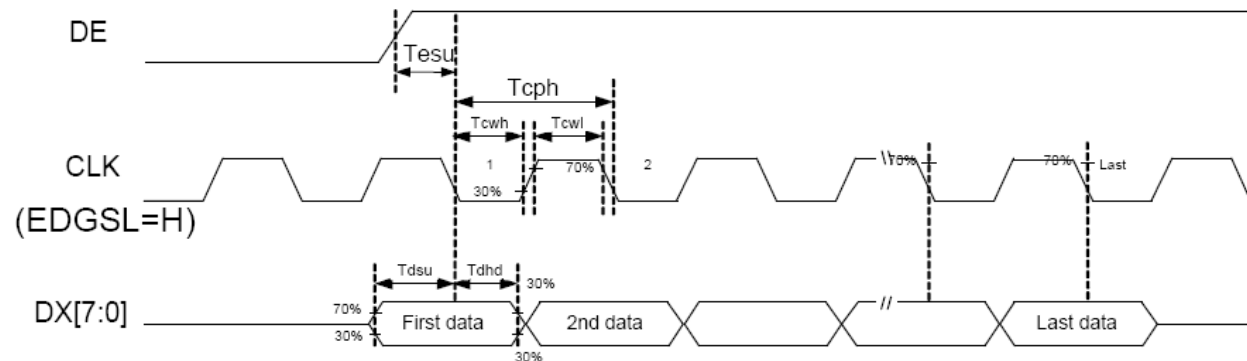
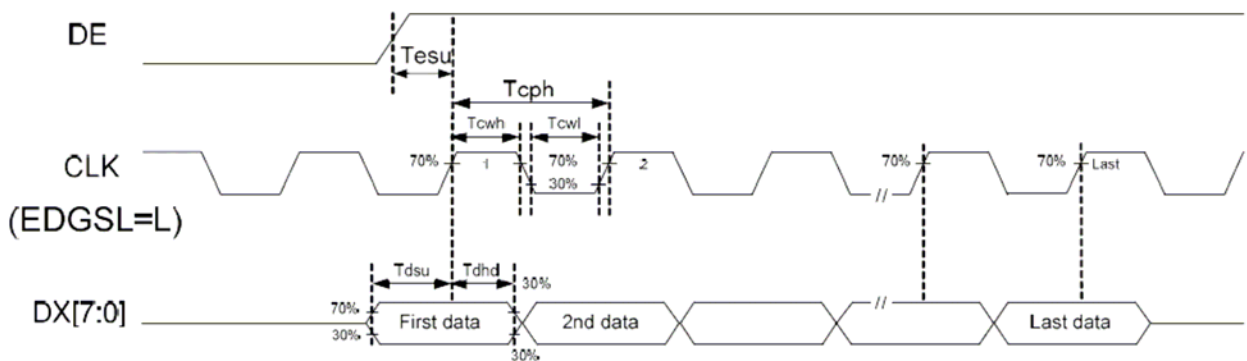
Parameter	Symbol	Rating			Unit	Condition
		Min.	Typ.	Max.		
Low level input voltage	V_{IL}	0	-	0.2VCC	V	
High level input voltage	V_{IH}	0.8VCC	-	VCC	V	

7. AC CHARACTERISTICS

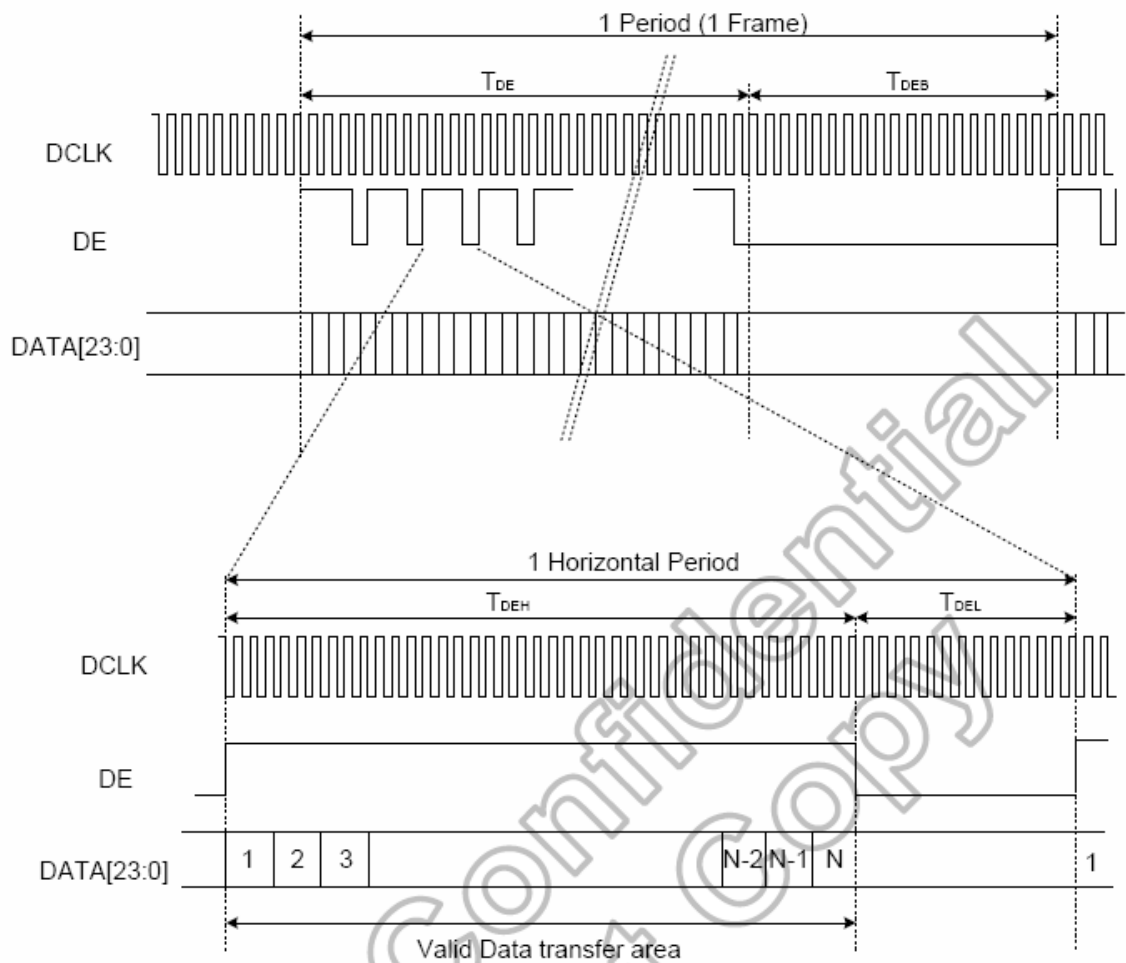
7.1 AC Timing Characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLK Frequency	Fcph	-	33.79	-	MHz
CLK Period	Tcph	-	25.13	-	ns
CLK Pulse Duty	Tcwh	40	50	60	%
DE Period	T _{DEH} +T _{DEL}	1000	1056	1200	Tcph
DE Pulse Width	T _{DH}	-	800	-	Tcph
DE Frame Blanking	T _{HS}	10	28	110	T _{DEH} +T _{DEL}
DE Frame Width	T _{EP}	-	600	-	T _{DEH} +T _{DEL}
Data Setup Time	T _{dsu}	6	-	-	ns
Data Hold Time	T _{dhd}	6	-	-	ns
DEN Setup Time	T _{esu}	6	-	-	ns

7.2 AC Timing Diagrams



7.3 Data input format



8. OPTICAL CHARATERISTIC

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Response time		TR	$\Theta=0$	-	5	10	ms	(2)
		TF		-	15	20	ms	
Contrast ratio		CR	At optimized viewing angle	300	400	-	-	(3)
Color Chromaticity	White	Wx	$\Theta=0$	0.27	0.32	0.37		(4)
		Wy		0.27	0.32	0.37		
Viewing Angle	Hor.	ΘR	$CR \geq 10$	-	70	-	Degree	(5)
		ΘL		-	70	-		
	Ver.	ϕH		-	50	-		
		ϕL		-	70	-		
Brightness		-	-	(200)	250	-	cd/m ²	Center of Display

Ta=25±2℃, ILED=120mA

Note 1: Definition of viewing angle range

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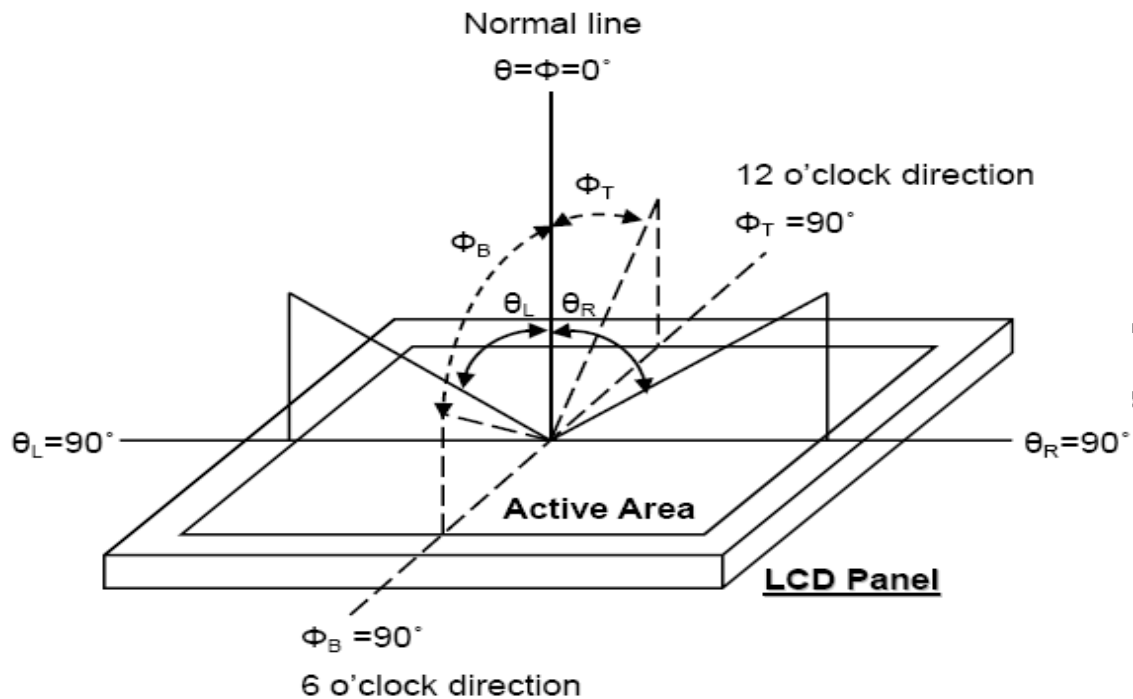


Fig. 8-1 Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

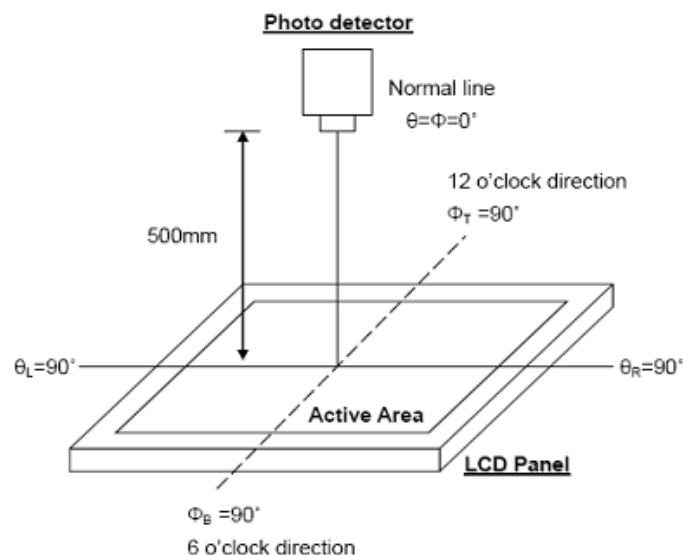


Fig. 8-2 Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between "White" state

and "Black" state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%.

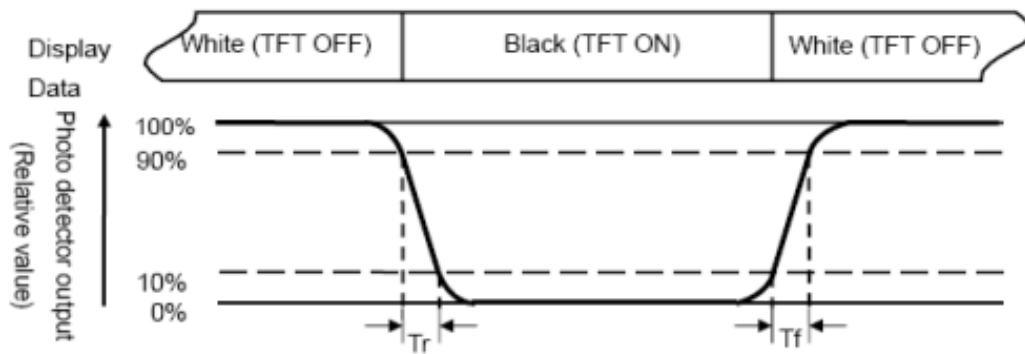


Fig. 3-3 Definition of response time

Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

"±" means that the analog input signal swings in phase with VCOM signal.

"±" means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)

Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

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9. INTERFACE

9.1. LCM PIN Definition

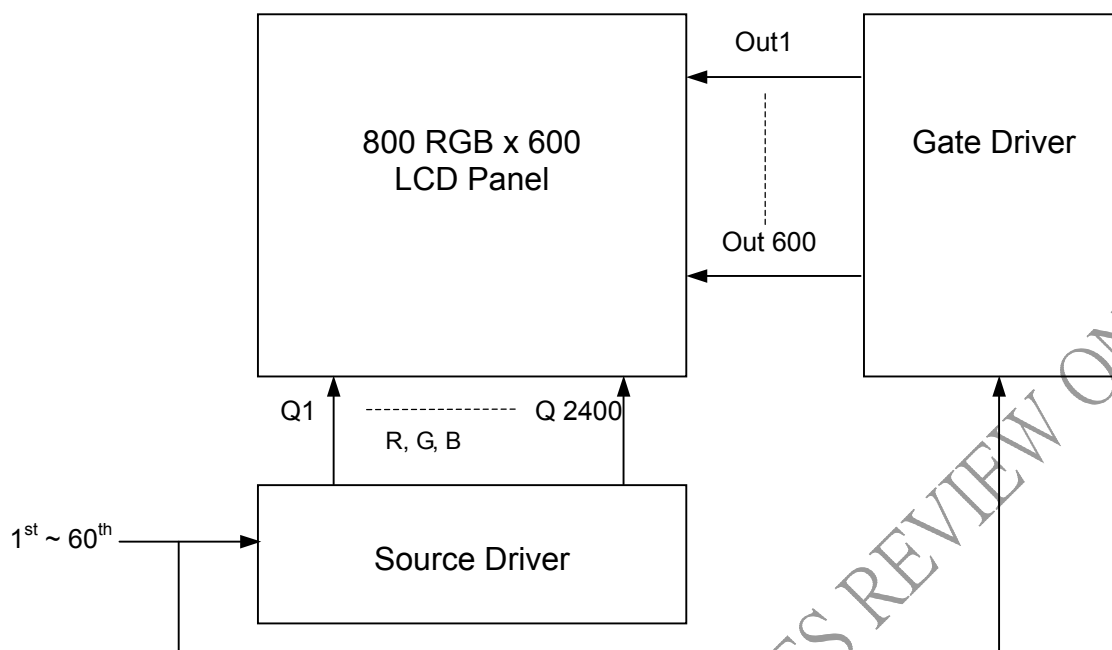
Pin	Symbol	I/O	Function	Remark
1	NC	-	NC	
2	NC	-	NC	
3	NC	-	NC	
4	NC	-	NC	
5	NC	-	NC	
6	GND	I	Power Ground	
7	EDGSL	I	Define Input Clock Polarity. When EDGSL=L, Latch Data By Rising Edge of CLK. (Default Pull Low) When EDGSL=H, CLK Polarity is Inverted, Latch Data by Falling Edge of CLK.	
8	VCC	I	Digital Power Supply (+3.3V)	
9	V9	I	Gamma voltage level 9	
10	VGL	I	Gate OFF power supply voltage	
11	V2	I	Gamma voltage level 2	
12	VGH	I	Gate ON power supply voltage	
13	V6	I	Gamma voltage level 6	
14	RESETB	I	Hardware Global Reset. Low Active. (Default Pull high)	
15	VCOM	I	Common electrode voltage input	
16	GND	I	Power Ground	
17	AVDD	I	Analog Power Supply	
18	NC	-	NC	
19	NC	-	NC	
20	V8	I	Gamma voltage level 8	
21	V5	I	Gamma voltage level 5	
22	V3	I	Gamma voltage level 3	
23	GND	I	Power ground	
24	R5	I	Red data (MSB)	
25	R4	I	Red data	
26	R3	I	Red data	
27	R2	I	Red data	
28	R1	I	Red data	
29	R0	I	Red data (LSB)	

Preliminary

30	GND	I	Power ground	
31	GND	I	Power ground	
32	G5	I	Green data (MSB)	
33	G4	I	Green data	
34	G3	I	Green data	
35	G2	I	Green data	
36	G1	I	Green data	
37	G0	I	Green data (LSB)	
38	DE	I	Input Data Enable Control. When DE Mode. Active High To Enable Data Input. (Default Pull Low)	
39	NC	-	NC	
40	GND	I	Power ground	
41	DCLK	I	Clock Signal Input. When CLK=H, User Can Input Different Polarity CLK By EDGSL Setting. When CLK=L, User Can Select CLK Rising Or Dual Edge To Latch By EDGSL Setting.	
42	VCC	I	Digital Power Supply (+3.3V)	
43	NC	-	NC	
44	NC	-	NC	
45	B5	I	Blue data (MSB)	
46	B4	I	Blue data	
47	B3	I	Blue data	
48	B2	I	Blue data	
49	B1	I	Blue data	
50	B0	I	Blue data (LSB)	
51	NC	I	NC	
52	V1	I	Gamma voltage level 1	
53	V4	I	Gamma voltage level 4	
54	V7	I	Gamma voltage level 7	
55	V10	I	Gamma voltage level 10	
56	NC	-	NC	
57	NC	-	NC	
58	AVDD	I	Analog Power Supply	
59	GND	I	Power ground	
60	VCOM	I	Common electrode voltage input	

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10. BLOCK DIAGRAM



11. QUALITY ASSURANCE

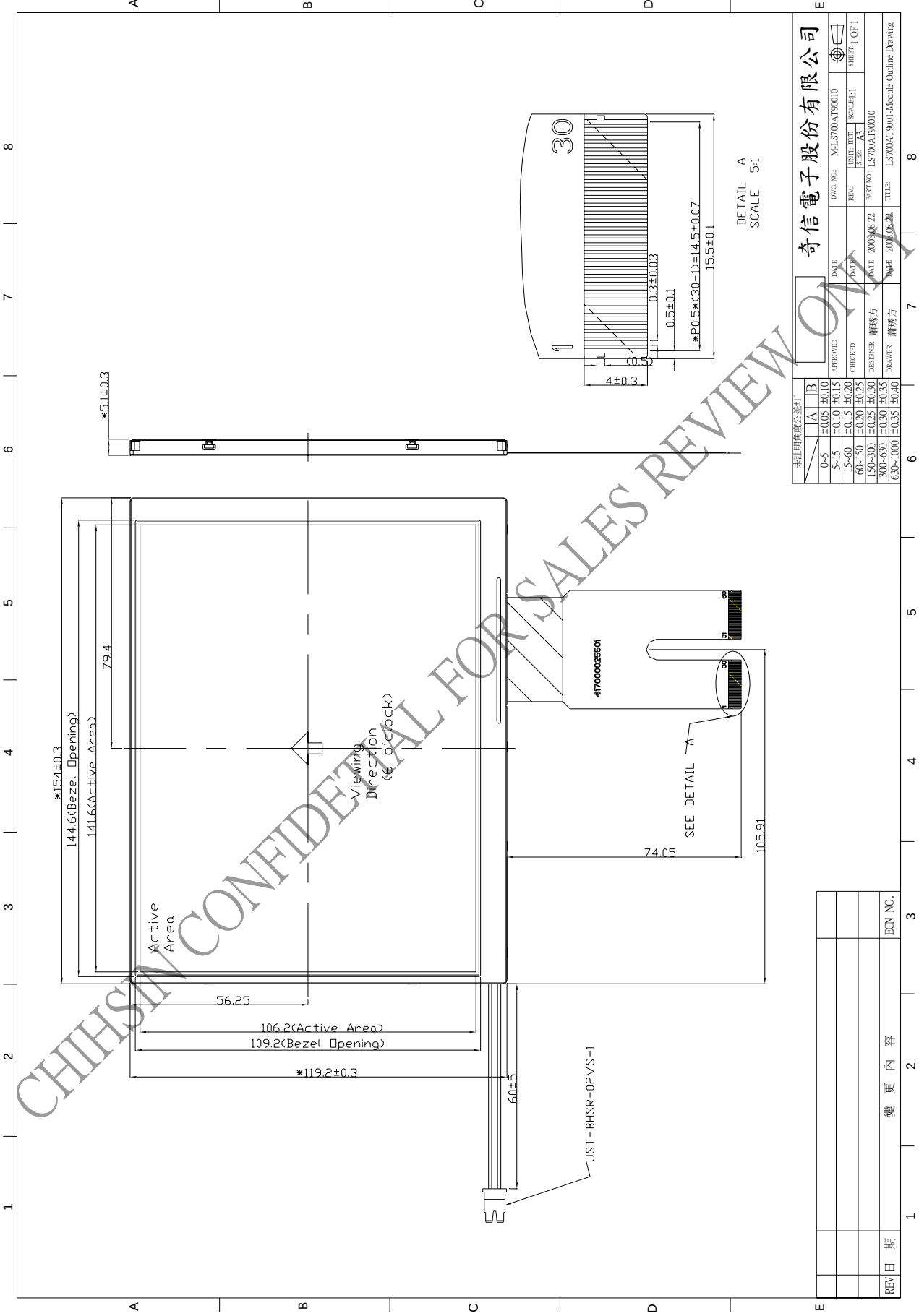
No.	Test Items	Test Condition	REMARK
1	High Temperature Storage Test	Ta=80℃ Dry 240h	
2	Low Temperature Storage Test	Ta=-20℃ Dry 240h	
3	High Temperature Operation Test	Ta=70℃ Dry 240h	
4	Low Temperature Operation Test	Ta=-10℃ Dry 240h	
5	High Temperature and High Humidity Operation Test	Ta=60℃ 90%RH 240h	
6	Electro Static Discharge Test	150pF, 330Ω, ±8KV(Contact)/±15KV(Air), 5 points/panel, 5 times/point	Non-operation
7	Thermal Shock Test	-10℃(0.5h) ~ 70℃(0.5h) / 100 cycles(Dry)	
8	Vibration Test	Sine wave, 10 ~ 500 ~ 10Hz, 1.5G, 0.37oct/min, 3 axis, 1hour/axis	Non-operation
9	Mechanical Shock Test	Half sine wave, 180G, 2ms one shock of each six faces (I.e. run 180G 2ms for all six faces)	Non-operation

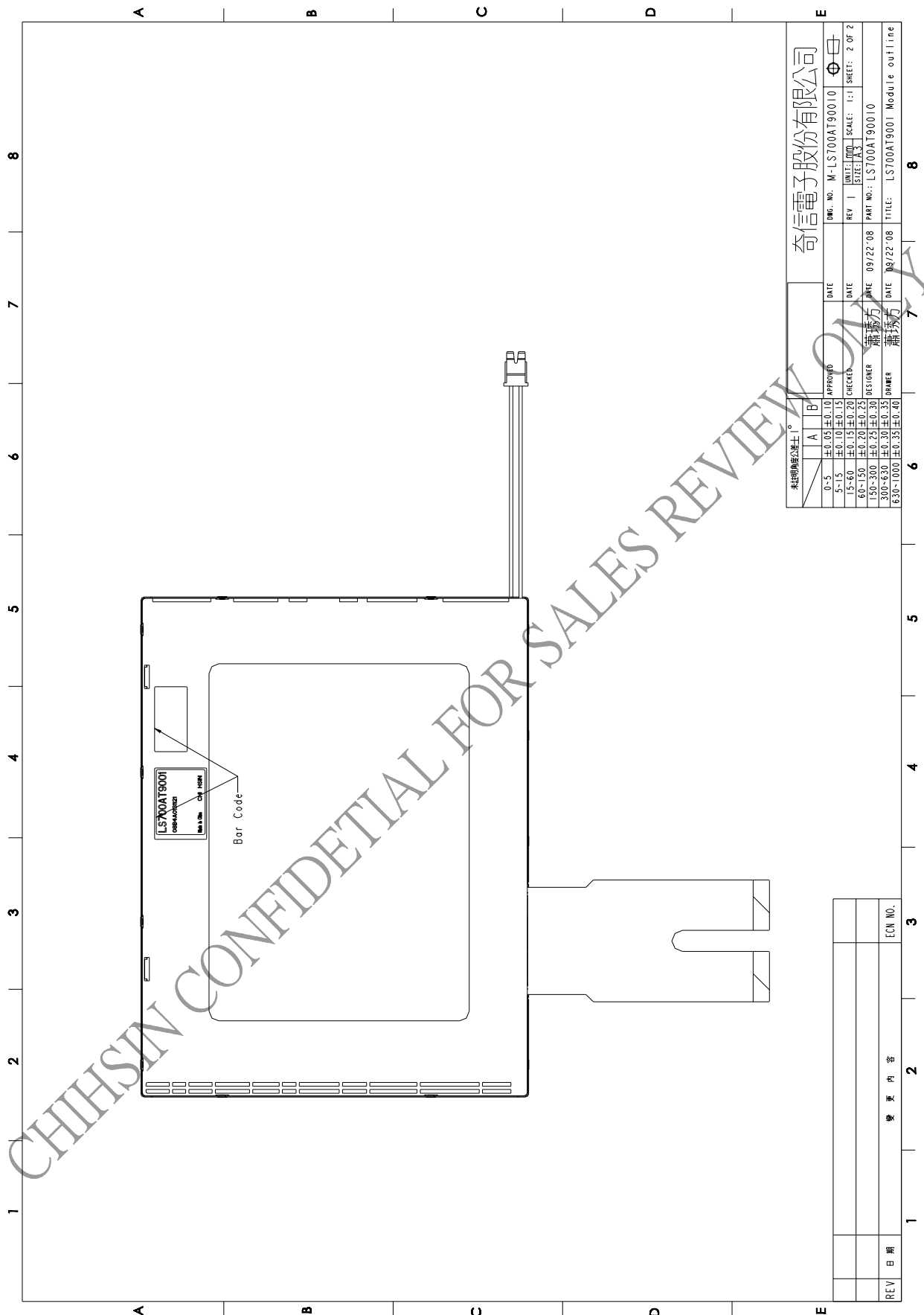
***** Ta= Ambient Temperature

Note1: The test samples have recovery time for 2 hours at room temperature before the function check. In the standard conditions, there is no display function NG issue occurred.

Note2: All the cosmetic specifications are judged before the reliability stress.

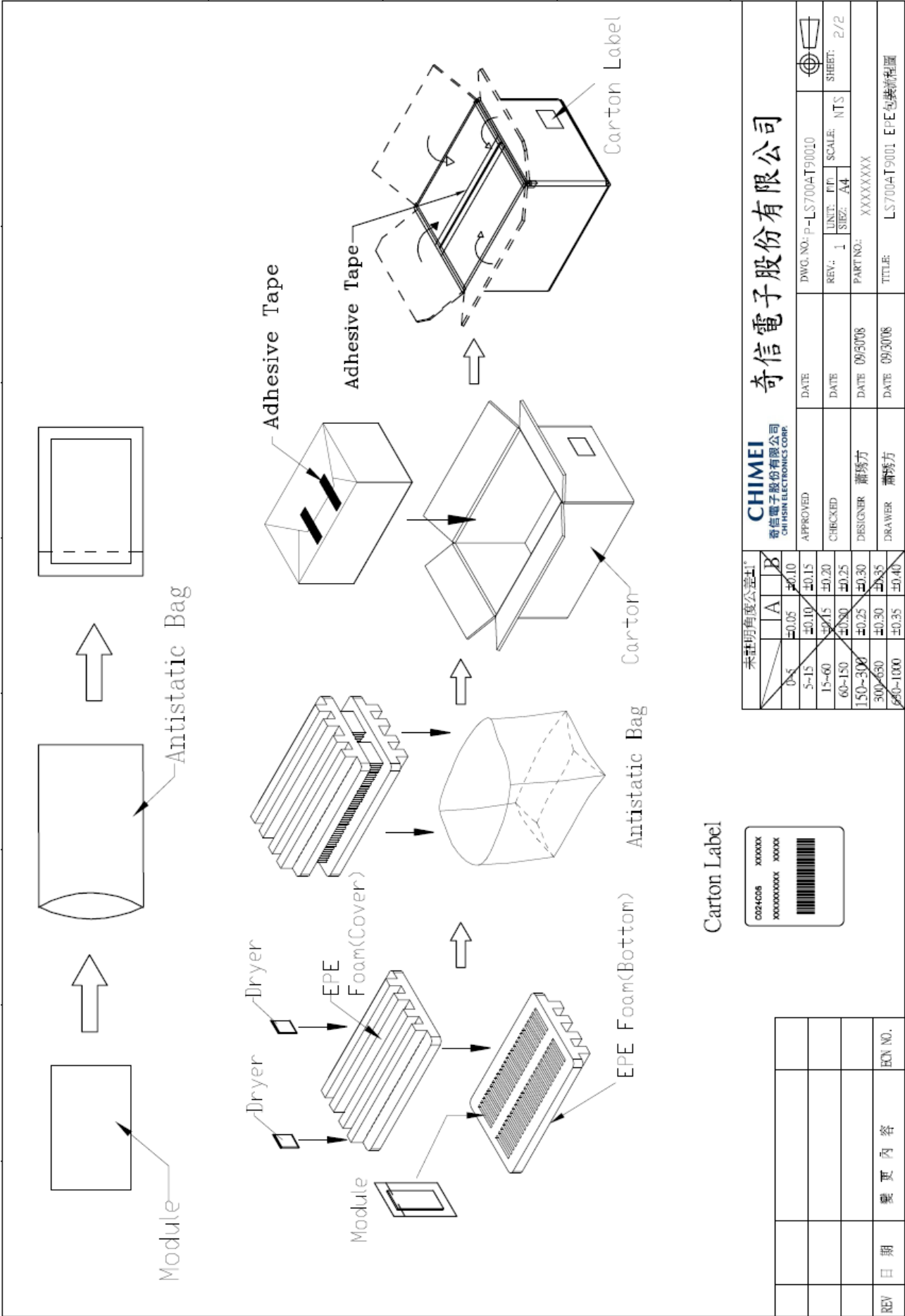
12. OUTLINE DRAWING





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13. PACKAGE INFORMATION



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14. PRECAUTIONS

Please pay attention to the following when you use this TFT LCD panel with IC and FPC

14.1 MOUNTING PRECAUTIONS

- (1) You must mount a module using 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 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 adsorbent 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.

14.2 OPERATING PRECAUTIONS

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage : $V=\pm 200\text{mV}$ (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 minimize the interference.

14.3 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 wristband etc. And don't touch interface pin directly.

14.4 PRECAUTIONS FOR STRONG LIGHT EXPOSURE

Strong light exposure causes degradation of polarizer and color filter.

14.5 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.

14.6 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. 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.

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