

SPECIFICATION

Customer	
Customer Part NO.	
Sucmax Part NO.	S95461 - AAA
Remarks	<input type="checkbox"/> APPROVAL FOR SPECIFICATION ONLY <input checked="" type="checkbox"/> APPROVAL FOR SPECIFICATION AND SAMPLE

CUSTOMER			SUCMAX		
APPROVED	CHECKED	CHECKED	APPROVED	CHECKED	PREPARED
					Windy/09-11-24

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SHSHENZHEN SUCMAX ELECTRONIC CO.,.LTD

RECORDS OF REVISION

DATE	REVISED NO.	REVISED DESCRIPTIONS	PREPARED	CHECKED	APPROVED
09-11-24	A0	FIRST ISSUE			

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1. GENERAL SPECIFICATIONS
1-1 SCOPE:

This specification covers the delivery requirements for the liquid crystal display delivered by SUCMAX ELECTRONIC to Customer .

1-2 PRODUCTS:

Liquid Crystal Display Module (LCM)

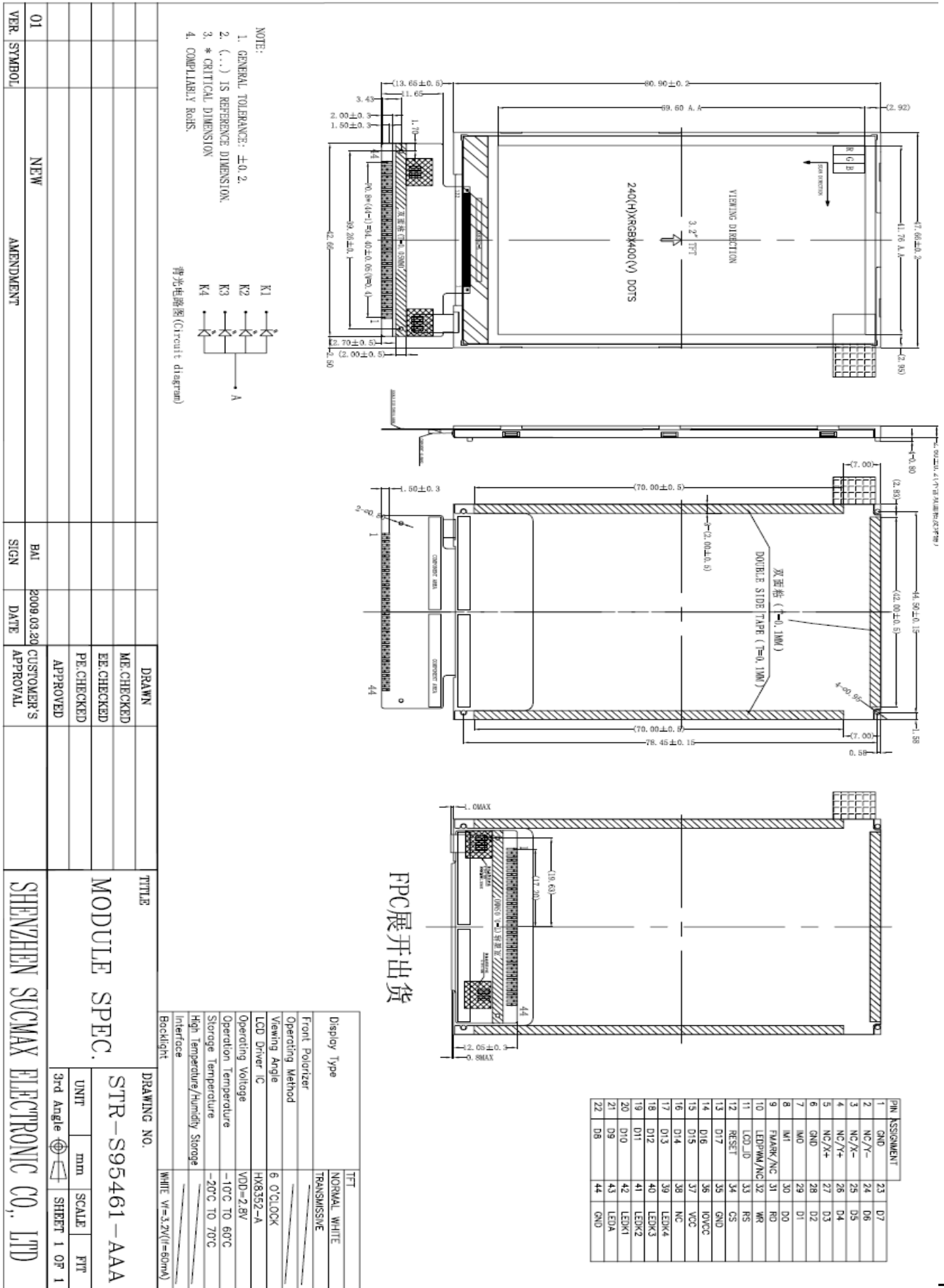
2. FEATURES

ITEM	SPECIFICATIONS
Part No.	S95461-AAA
SIZE	3.2 “TFT
Display Type	262k TFT, Transmissive
Viewing Direction	6 0’ clock
Driving IC	HX8352-A
Backlight	4-Chip WHITE LED
Operating Temperature	-20℃ ~+70℃
Storage Temperature	-30℃ ~+80℃

3. MECHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
OUTLINE DIMENSIONS	47.66(W) x 80.90 (H) x 2.60(T)	mm
ACTIVE AREA	41.76(W) x 69.60(H)	mm
NUMBER OF DOTS	240 RGB x 400 Dots	---
ASSY .TYPE	COG+FPC+BL	---
WEIGHT	TBD	g

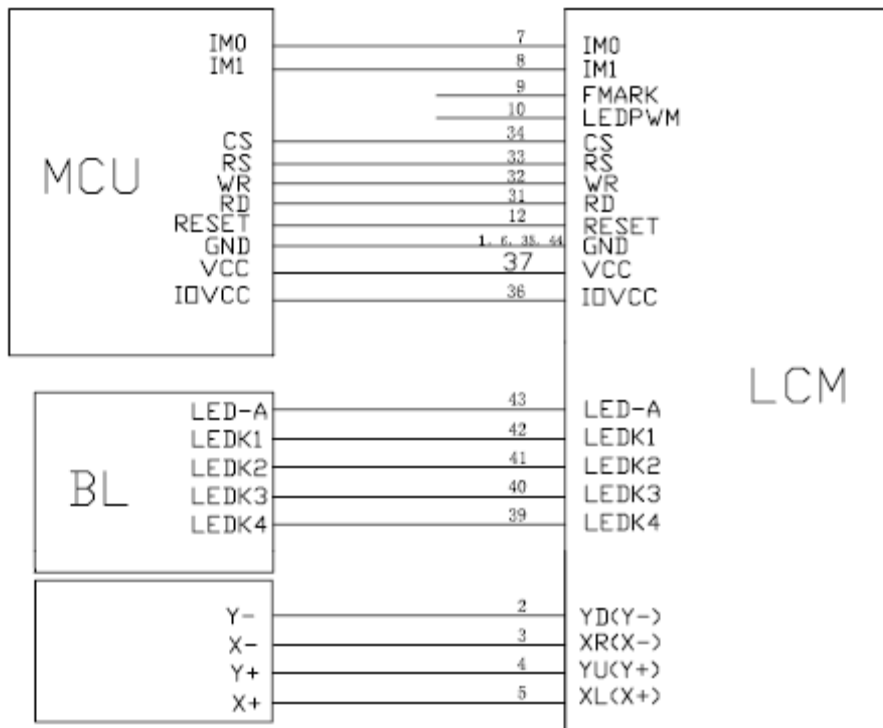
4. OUTLINE DIMENSIONS



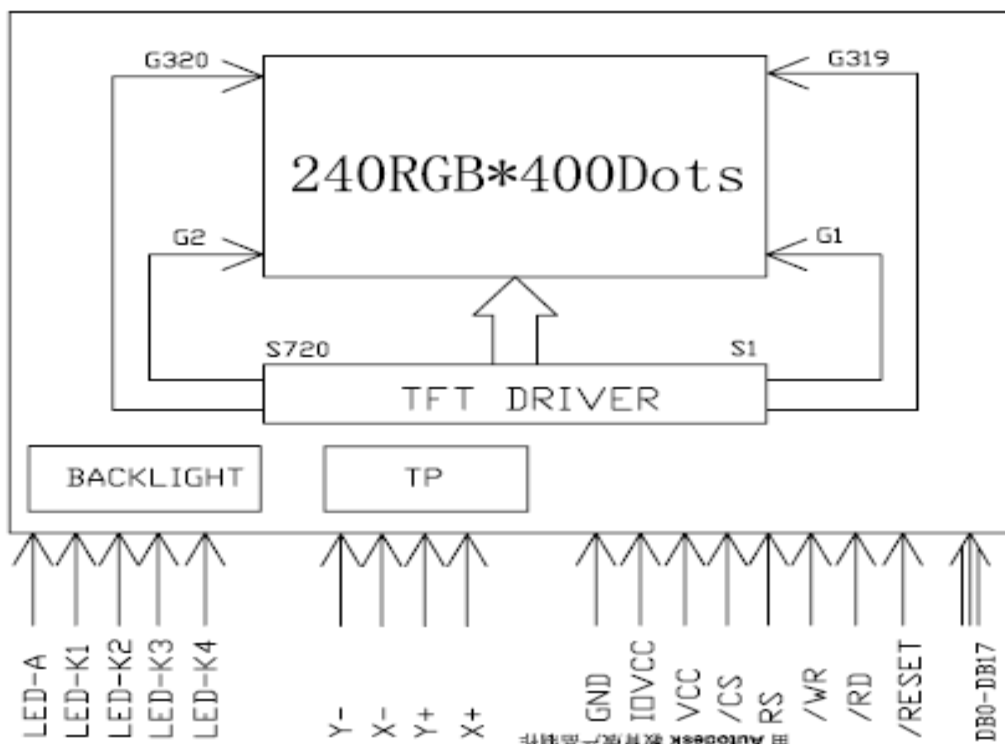
5. INTERFACE ASSIGNMENT

PIN NO.	FUNCTION DESCRIPTIONS	SYMBOL
1	GROUND.	GND
2	Y-	NC(Y-)
3	X-	NC(X-)
4	Y+	NC(Y+)
5	X+	NC(X+)
6	GROUND.	GND
7	IM0=0 IM1=0 16-bit bus interface,80-system, 65K-Color D15-D0: Data	IM0
8	IM0=1 IM1=0 18-bit bus interface,80-system, 262K-color D17-D0: Data	IM1
	IM0=1 IM1=1 8-bit bus interface,80-system, 262K-color D7-D0: Data	
9	NC	FMARK/NC
10	NC	LEDPWM/NC
11	LCD Identify PIN	LCD_ID
12	Reset pin.	RESET
13-30	Data bus 17-10.	D17-D0
31	Read strobe signal in 80-system bus interface operation and enables read operation when RD is low.	RD
32	Write strobe signal in 80-system bus interface operation and enables write operation when WR is low.	WR
33	Register select signal.	RS
34	Chip select signal.	CS
35	GROUND.	GND
36	Power supply for I/O interface.	IOVCC
37	Power supply.	VCC
38	NC	NC
39	Backlight cathode.	LEDK4
40	Backlight cathode.	LEDK3
41	Backlight cathode.	LEDK2
42	Backlight cathode.	LEDK1
43	Backlight anode.	LEDA
44	GROUND.	GND

6. APPLICATION CIRCUIT

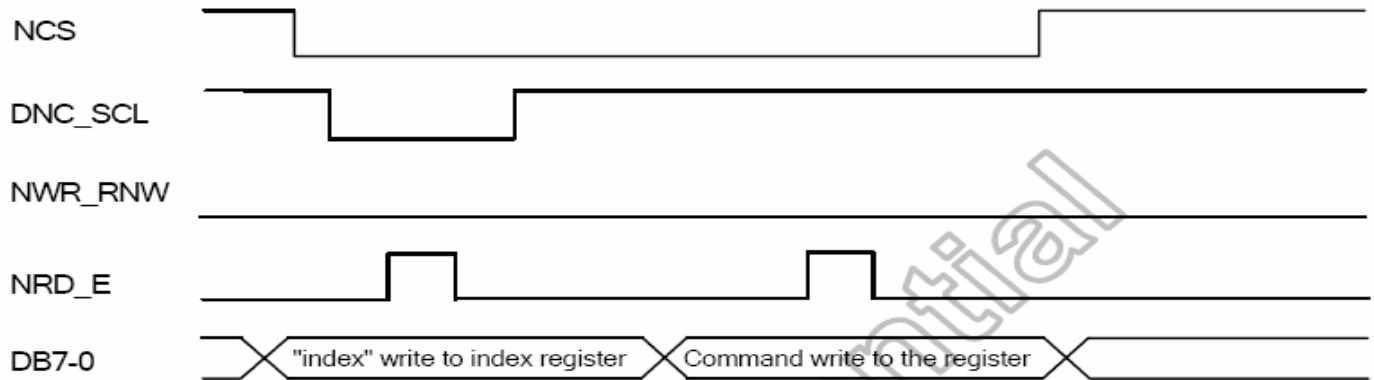


7. BLOCK DIAGRAM



8. TIMING CHARACTERISTICS

Write to the register



Read the register

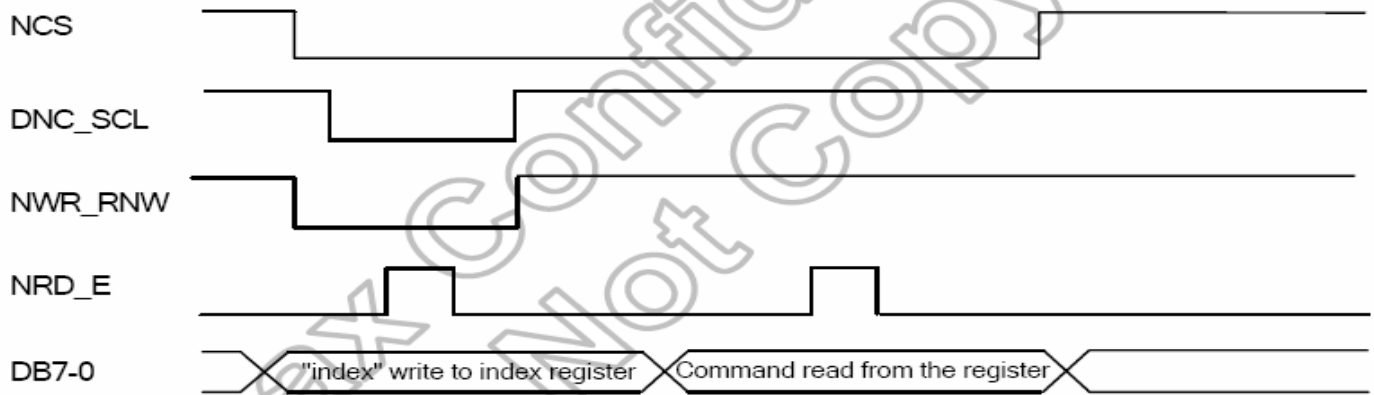


Figure 5. 4 Register Read/Write Timing in Parallel Bus System Interface (for M68 Series MPU)

8-1 RESET SIGNAL

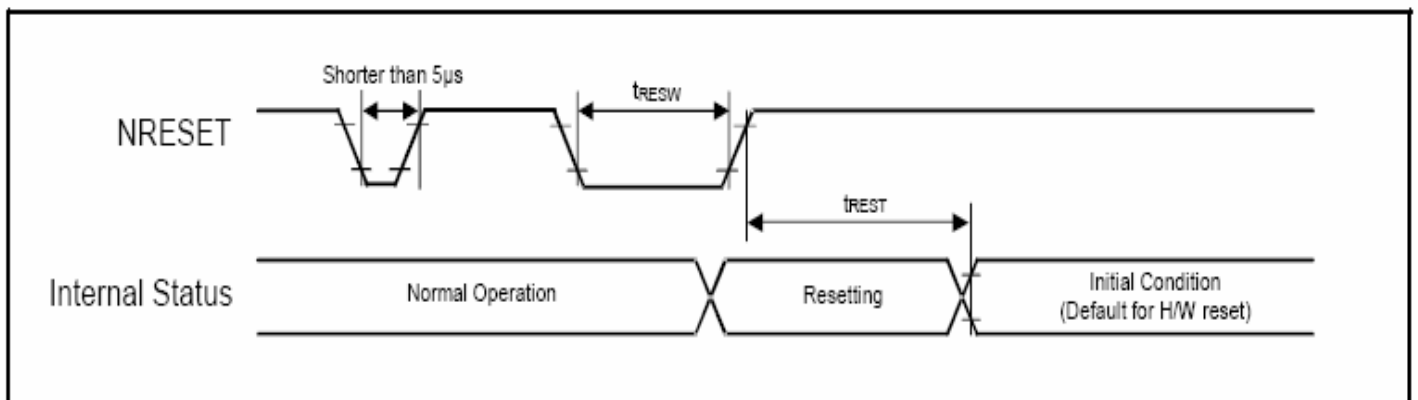
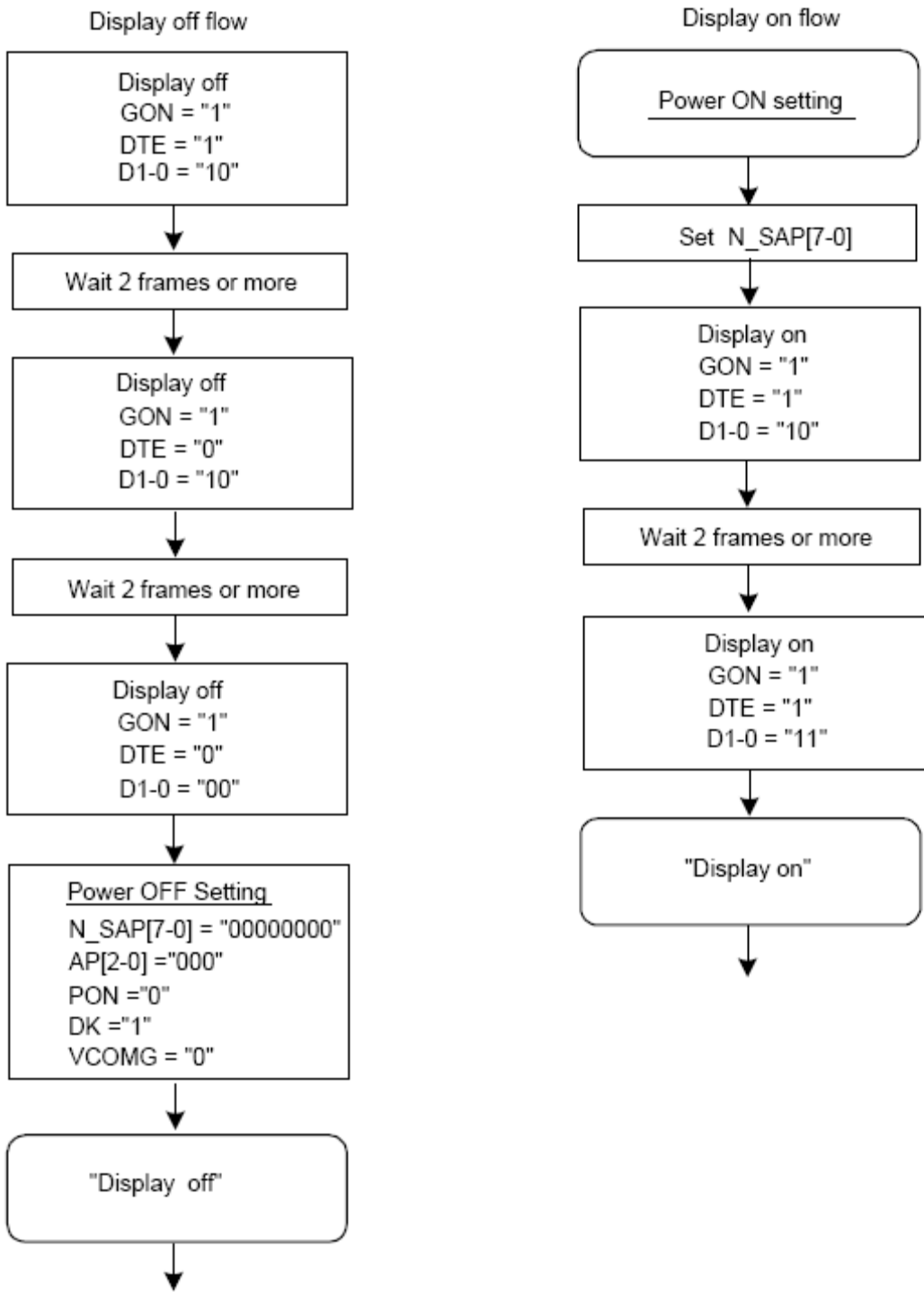


Figure 7. 7 Reset Input Timing

9. POWER ON SEQUENCE

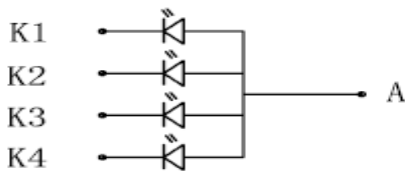


10. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITIONS	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY VOLTAGE	VDD	Ta= +25°C	2.6	2.8	3.4	V
INPUT VOLTAGE LEVEL	VIN	Ta=25°C	1.65	2.8	3.3	V
POWER SUPPLY FOR LCD DRIVING	AVDD	Ta= +25°C	2.3	2.8	3.3	V
INPUT VOLTAGE "H" LEVEL	VIH	—	0.8VDD	—	VDD	V
INPUT VOLTAGE "L" LEVEL	VIL	—	VSS	—	0.2VDD	V
OUTPUT VOLTAGE "H" LEVEL	VOH	IOH=-100uA	0.9VDD	—	VDD	V
OUTPUT VOLTAGE "L" LEVEL	VOL	IOH=100uA	VSS	—	0.1VDD	V

11. LED BACKLIGHT

11-1 POWER SUPPLY FOR LED BACKLIGHT



背光电路图 (Circuit diagram)

11-2 ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	SPECIFICATIONS	UNIT
POWER DISSIPATION	PD	320	mW
OPERATION TEMPERATURE	TOPR	-10°C ~+50°C	°C
STORAGE TEMPERATURE	TSTG	-20°C ~+70°C	°C

11-3 ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	lamp	REMARK	STANDARD VALUE		
				MIN	TYP	MAX
FORWARD VOLTAGE	Vf	WHITE	If =60 MA	----	3.2	----
LUMINOUS INTENSITY (complete module)	Iv	WHITE		TBD	TBD	TBD
LUMINOUS TOLERANCE	Iv-m	WHITE	(min/max)/100	80	----	----

12. OPTICAL CHARACTERISTICS

Item	Symbol	Conditions	Specifications			Unit	Note
			Min.	Typ.	Max.		
Transmittance	T%	Viewing normal angle $\theta_x = \theta_y = 0^\circ$	-	5.9	-	%	All left side data are based on CMO's following condition - 1.CG : NTSC 60% 2.LC : TN 3.Light Source : CMO LED BLU 4.Film : Nitto Linear Polarizer 5.Machine : DMS 803
Contrast Ratio	CR		-	300	-		
Response Time (by Quick)	T_R		-	10	20	ms	
	T_F	-	20	30	ms		
Viewing Angle	Hor.	θ_{x+}	-	45	-	deg.	
		θ_x	-	45	-		
	Ver.	θ_{y+}	-	35	-		
		θ_y	-	15	-		
CF only Chromaticity	Red	X_R	0.616	0.646	0.676	Under C light Simulation	
		Y_R	0.291	0.321	0.351		
	Green	X_G	0.268	0.298	0.328		
		Y_G	0.543	0.573	0.603		
	Blue	X_B	0.104	0.134	0.164		
		Y_B	0.103	0.133	0.163		
	White	X_W	0.270	0.300	0.330		
		Y_W	0.304	0.334	0.364		

*Note (1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

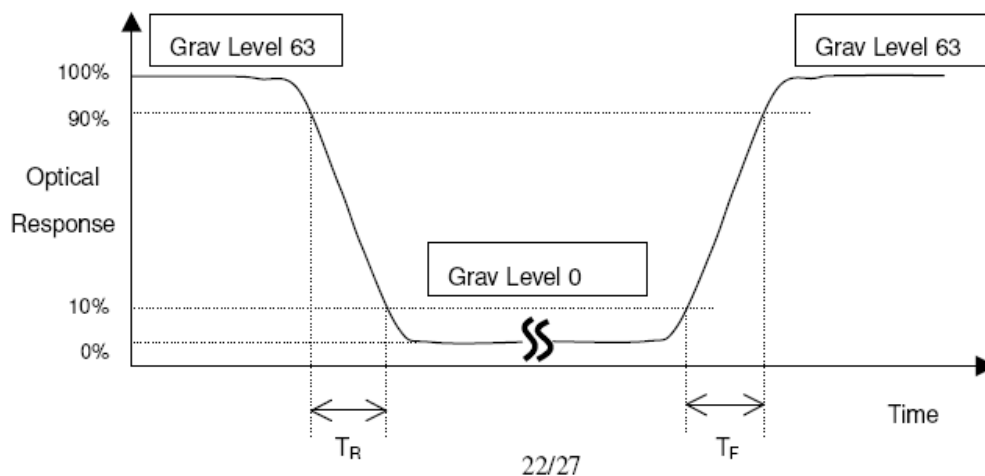
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

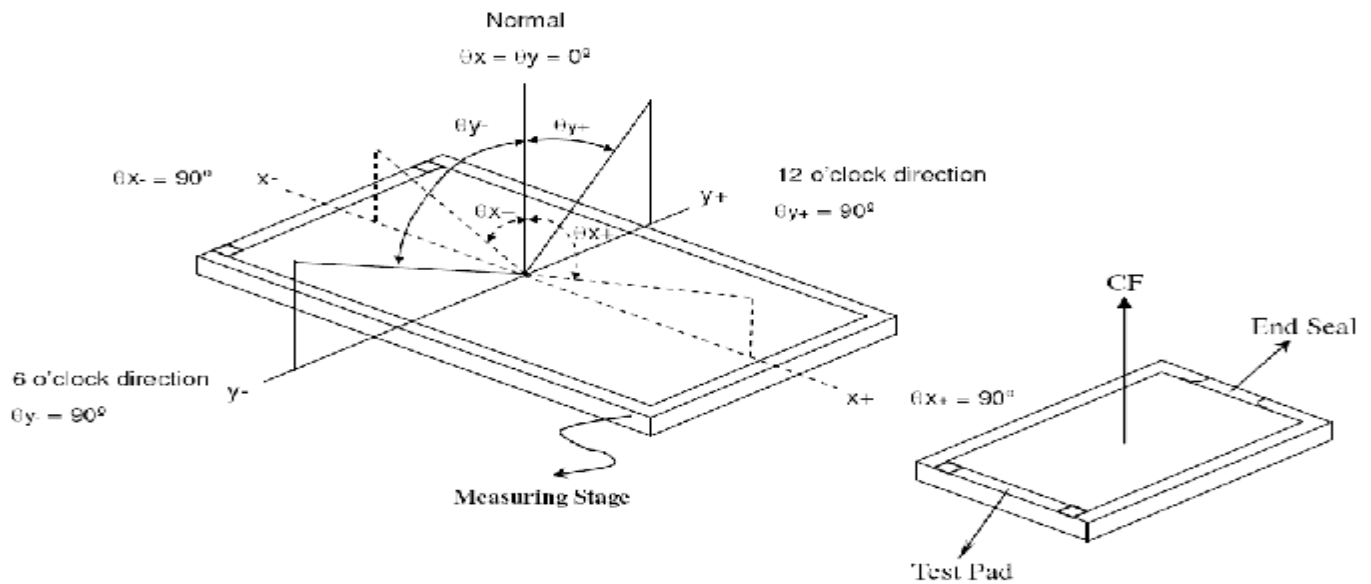
$$CR = CR (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

*Note (2) Definition of Response Time (T_R , T_F):

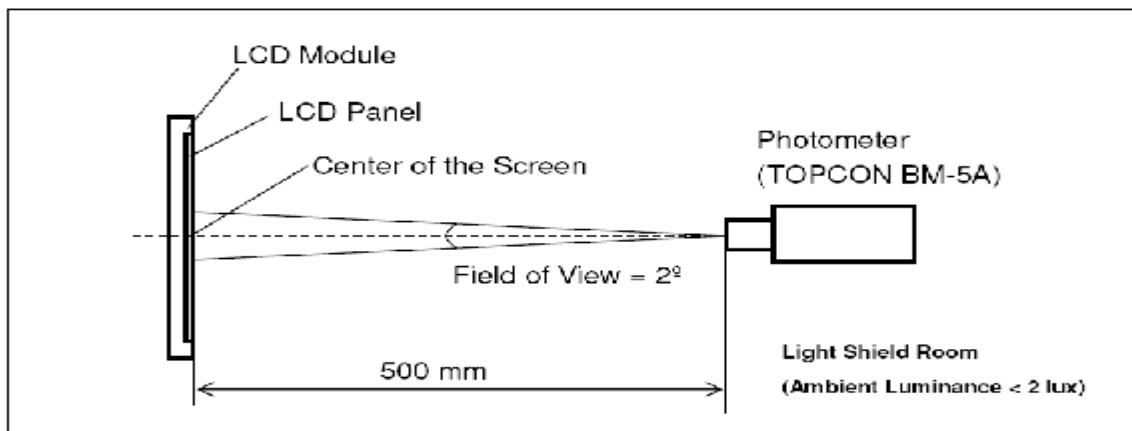


*Note(3) Definition of Viewing Angle

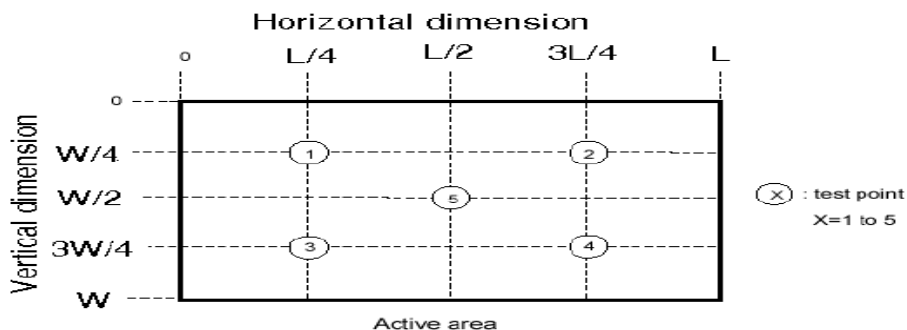


*Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



*Note (5)



13. ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITIONS	CRITERION
OPERATING TEMPERATURE	TOPR	-20°C ~+70°C	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
STORAGE TEMPERATURE	TSTG	-30°C ~+80°C	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
HUMIDITY	—	See Note	WITHOUT CONDENSATION

NOTE: TEST CONDITION

- (1) Temperature and humidity: If no specification, temp .set at 25±2°C .humidity
- (2) Operating state: Samples subject to the test shall be in “operating” condition

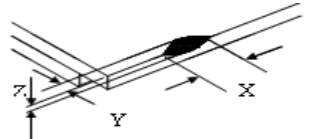
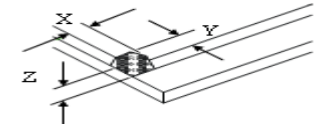
14. RELIABILITY TEST

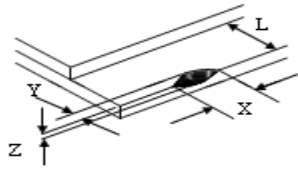
ITEM	CONDITIONS	CRITERION
OPERATING TEMPERATURE	HIGH TEMPERATURE +50°C 72HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERATURE -10°C 72HRS	
STORAGE TEMPERATURE	HIGH TEMPERATURE +70°C 120HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	LOW TEMPERATURE - 20°C 120HRS	
HUMIDITY	40°C 90%RH 72HRS	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
VIBRATION	• Operating Time: thirty minutes exposure for	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
	• each direction (X,Y,Z)	
	• Sweep Frequency: 10~55Hz (1 min)	
	• Amplitude: 1.5mm	
THERMAL SHOCK	-10°C (30mins) → 35°C (5mins) → +50°C (30mins) 10 cycles	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION

NOTE: The samples must be free from defect before test, must be restore at room condition at least for 2 hour after reliability test before any inspection.

15. THE STANDARD OF INSPECTION

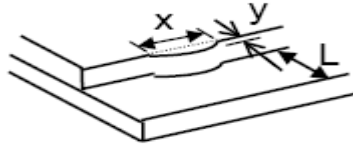
15-1 Inspection items and specification for appearance (power off)

No.	Item	Criterion	AQL						
1	Dimension	Dimension out of the specification	1.0						
2	Glass crack	1、 General crack	2.50						
		 <table border="1" style="margin-left: 20px;"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>≥ K/8</td> <td>Not over A area</td> <td>≤ T</td> </tr> </table>		X	Y	Z	≥ K/8	Not over A area	≤ T
		X		Y	Z				
≥ K/8	Not over A area	≤ T							
2、 corner	 <table border="1" style="margin-left: 20px;"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td>≥ K/8</td> <td>Not over A area</td> <td>No check</td> </tr> </table>	X	Y	Z	≥ K/8	Not over A area	No check		
X	Y	Z							
≥ K/8	Not over A area	No check							
3、 contact pad crack									



X	Y	Z
$\geq K/8$	$\geq L/3$	No check

4、Substrate protuberance and internal crack

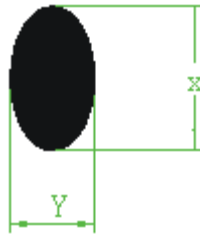


X	Y
$\geq K/8$	$\geq L/3$

Transfer position crack: $\leq L/5$

3

Black dot \ White dot



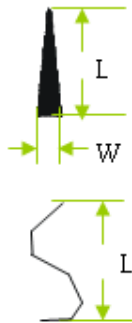
D	Acceptable of defect	
	A/B Area	C Area
$D < 0.2$	No check	
$0.2 \leq D < 0.3$	2	No check
$0.3 \leq D \leq 0.5$	1	
$D > 0.5$	0	

2.50

X: long diameter Y: short diameter
D: average of diameter $D = (X+Y)/2$

4

Line defect



Length	Whidth	Acceptable of defect	
		A/B Area	C Area
accept	$W \leq 0.02$	No check	No check
$L \leq 3$	$W \leq 0.05$	2	

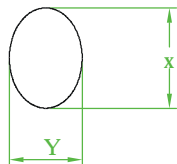
2.50

L: Length W: Width
Defect of polarizer (Scratches、Spot) : According to the limit specimen

$L \leq 2.5$	$W \leq 0.05$	2	
	$W > 0.05$	As round type	

5

Polarizer Bubble



D	Acceptable of defect	
	A/B Area	C Area
$D \leq 0.2$	No check	
$0.2 \leq D \leq 0.5$	3	No check
$0.5 \leq D \leq 1.0$	2	
$D > 1.0$	0	

2.50

6

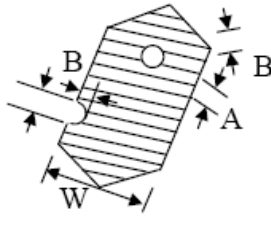
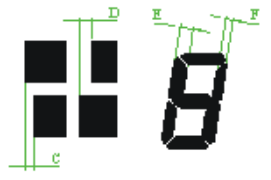
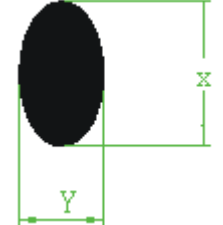
External print of panel

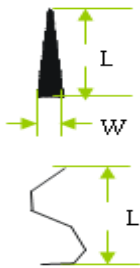
1、Transfigure、pin hole: same as segment transfiguer
2、Print width: print width $\geq 1/2$ standard width is acceptable

2.50

7	Silicon glue	The area of painting silicon glue must cover the ITO circuit.	2.50
8	Defect of PCB	1、 The char 、 wrong edition、 bresking off circuit、 crack and air-logged orifice are unreceivable for PCB. 2、 gold finger of PCB can not be oxidative、 smudgy and broken..	2.50
9	SMT organ	1、 deflexion of component $\leq 1/3$ width of component 2、 Trying to keep dot of soldering tin orbicular 3、 Damage 、 break、 wrong assembly and unseal are unreceivable for component.	2.50
10	Steel Frame	1、 Break and distortion are unreceivable for frame. 2、 If there is one nick which can not lead to cast or hole of painting, we allow that following: Length ≤ 5 mm; Width ≤ 0.3 mm	2.50

15-2 Inspection items and specification for display defect (power on)

1	Electrical Defect	Segment missing	Not allow	1.0													
		Segment short	Not allow														
		Non-display	Not allow														
2	Pin hole	<p>1、 Pin hole</p>  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>width</th> <th>Acceptable of defect</th> </tr> </thead> <tbody> <tr> <td>$W < 0.4$</td> <td>$D \leq 0.2$ & $D \leq 1/2W$</td> </tr> <tr> <td>$W \geq 0.4$</td> <td>$D \leq 0.25$ & $D \leq 1/3W$</td> </tr> </tbody> </table> <p>* $D = (A+B)/2$ $D \leq 0.1$ acceptable</p>	width	Acceptable of defect	$W < 0.4$	$D \leq 0.2$ & $D \leq 1/2W$	$W \geq 0.4$	$D \leq 0.25$ & $D \leq 1/3W$	2.50								
width	Acceptable of defect																
$W < 0.4$	$D \leq 0.2$ & $D \leq 1/2W$																
$W \geq 0.4$	$D \leq 0.25$ & $D \leq 1/3W$																
3	Display pattern	 <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Width</th> <th>Acceptable of defect</th> </tr> </thead> <tbody> <tr> <td>$W < 0.4$</td> <td>$C、D、G \leq 1/2W$</td> </tr> <tr> <td>$W \geq 0.4$</td> <td>$C、D、G \leq 0.2$</td> </tr> </tbody> </table> <p>W: Design dimension C、D: discrepant dimension $G = E-F$</p>	Width	Acceptable of defect	$W < 0.4$	$C、D、G \leq 1/2W$	$W \geq 0.4$	$C、D、G \leq 0.2$	1.0								
Width	Acceptable of defect																
$W < 0.4$	$C、D、G \leq 1/2W$																
$W \geq 0.4$	$C、D、G \leq 0.2$																
4	Black/white dot	 <table border="1" style="margin-left: 20px;"> <thead> <tr> <th rowspan="2">D</th> <th colspan="2">Acceptable QTY</th> </tr> <tr> <th>A/B Area</th> <th>C Area</th> </tr> </thead> <tbody> <tr> <td>$D < 0.1$</td> <td>No check</td> <td rowspan="4">No check</td> </tr> <tr> <td>$0.1 \leq D < 0.2$</td> <td>2</td> </tr> <tr> <td>$0.2 \leq D \leq 0.25$</td> <td>1</td> </tr> <tr> <td>$D > 0.25$</td> <td>0</td> </tr> </tbody> </table> <p>X: long diameter Y: shot diameter D: average diameter $D = (X+Y)/2$</p>	D	Acceptable QTY		A/B Area	C Area	$D < 0.1$	No check	No check	$0.1 \leq D < 0.2$	2	$0.2 \leq D \leq 0.25$	1	$D > 0.25$	0	2.50
D	Acceptable QTY																
	A/B Area	C Area															
$D < 0.1$	No check	No check															
$0.1 \leq D < 0.2$	2																
$0.2 \leq D \leq 0.25$	1																
$D > 0.25$	0																

5	Line defect	 <p>L: length W: width</p>	Length	Width	Acceptable QTY		2.50
					A/B Area	C Area	
			不计	$W \leq 0.02$	No check	No check	
			$L \leq 3$	$W \leq 0.03$	2		
$L \leq 2.5$	$0.03 < W \leq 0.05$	2	Sa round type				
	$W > 0.05$						

16.USING LCD MODULES

16-1 LIQUID CRYSTAL DISPLAY MODULES

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

- (1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
- (2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).
- (3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.
- (4) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, wipe gently with absorbent cotton or other soft material like chamois soaked in Isopropyl alcohol or Ethyl alcohol. Do not scrub hard to avoid damaging the display surface.
- (5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.
- (6) Avoid contacting oil and fats.
- (7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
- (8) Do not put or attach anything on the display area to avoid leaving marks on.
- (9) Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).
- (10) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- (11) As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

16-2 PRECAUTION FOR HANDING LCD MODULES

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- (1) Do not alter, modify or change the the shape of the tab on the metal frame.
- (2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be

attached.

- (3) Do not damage or modify the pattern writing on the printed circuit board.
- (4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- (5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- (6) Do not drop, bend or twist LCM. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
- (7) In order to avoid the cracking of the FPC, you should pay attention to the area of FPC where the FPC was bent, the edge of coverlay; the area of surface of Ni-Au plating, the area of soldering land, the area of through hole.

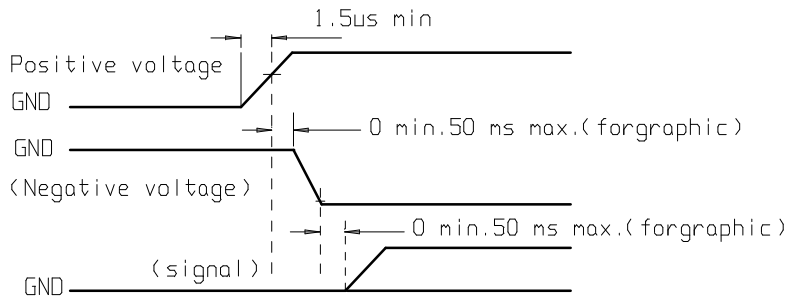
16-3 ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

- (1) Make certain that you are grounded when handling LCM. To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.
 - Exposed area of the printed circuit board.
 - Terminal electrode sections.
- (2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
- (3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
- (4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potential to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- (5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
- (6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

16-4 PRECAUTIONS FOR OPERATION

- (1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.
- (2) Driving the LCD in the voltage above the limit shortens its life.
- (3) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
- (4) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- (5) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
- (6) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C, 50% RH.
- (7) When turning the power on, input each signal after the positive/negative voltage becomes stable.



16-5 STORAGE

When storing LCDs as spares for some years, the following precaution are necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.
- (2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
- 3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)
- (4) Environmental conditions :
 - Do not leave them for more than 160hrs. at 70°C.
 - Should not be left for more than 48hrs. at -20°C.

16-6 SAFETY

- (1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
- (2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

16-7 LIMITED WARRANTY

Unless agreed between SUCMAX and customer, SUCMAX will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with SUCMAX LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to SUCMAX within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of SUCMAX limited to repair and/or replacement on the terms set forth above. SUCMAX will not be responsible for any subsequent or consequential events.

16-8 RETURN LCM UNDER WARRANTY

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- Circuit modified in any way, including addition of components.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB's eyelet, conductors and terminals.