Version No.:	01

SPECIFICATIONS

PRODUCT : LCD MODULE

MODEL NO.: S60779

CUSTOMER			SUCCESS		
APPROVED	CHECKED	CHECKED	APPROVED	CHECKED	PREPARED

□APPROVED FOR SPECIFICATIONS PRELIMINARY

■APPROVED FOR SPECIFICATIONS AND SAMPLE

深圳市宇顺电子有限公司

SUCCESS ELECTRONIC CO.,LTD.

RECORDS OF REVISION

DATE	REVISED NO.	REVISED DESCRIPTIONS	PREPARED	CHECKED	APPROVED
2008-4-8	01	FIRST ISSUE	CWF		

CONTENTS

1. GENERAL SPECIFICATIONS

1-1 SCOPE:

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

1-2 PRODUCTS:

Liquid Crystal Display Module (LCM)

1-3 MODULE NAME:

S60779

2. FEATURES

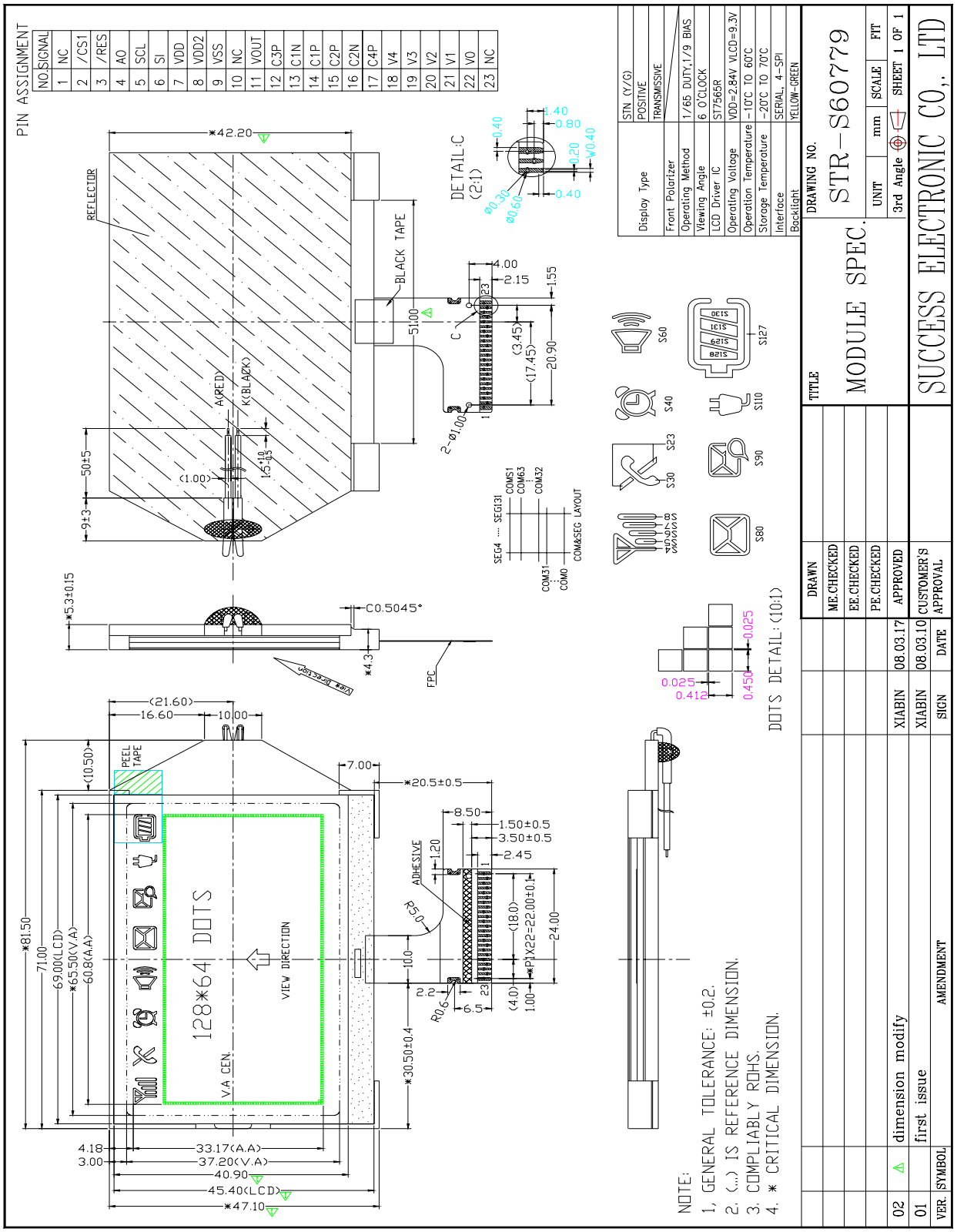
2-1 MAIN LCD (LARGE)

(1) Display Type: STN(Y/G), Positive, Transmissive, 6 o'clock
(2) Driving Method: 1/65duty, 1/9 bias
(3) Built-in controller: ST7565R
(4) With Y/G LED Backlight

3. MACHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
OUTLINE DIMEMSIONS	81.5(W) × 47.1(H) ×5.3 (T)	mm
VIEWING AREA	65.5(W) ×37.2(H)	mm
ACTIVE AREA	60.8(W) ×33.17(H)	mm
DISP.CONSTRUCTION	128× 64 Dots + ICONS	---
NUMBER OF DOTS	128× 64	Dots
DOT SIZE	0.45(W) ×0.412(H)	mm
DOT PITCH	0.475(W) × 0.437(H)	mm
ASSY.TYPE	COG+B/L	---
BACKLIGHT	Yellow-Green	—
WEIGHT	TBD	g

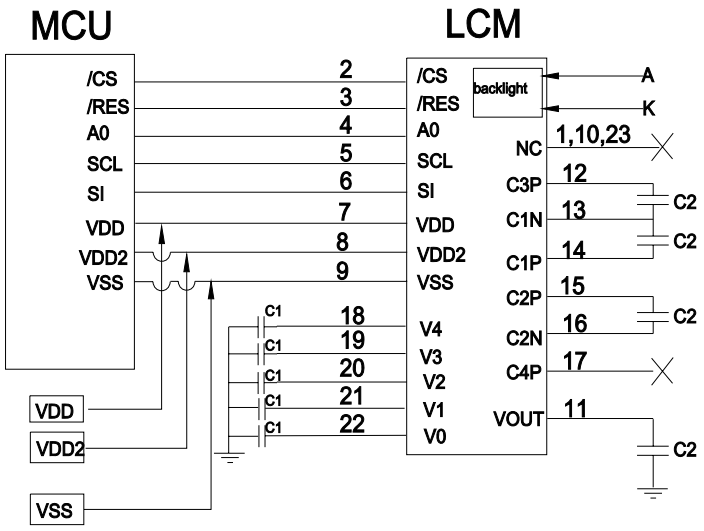
4.OUTLINE DIMENSIONS



5. INTERFACE ASSIGNMENT

PIN NO.	FUNCTION DESCRIPTIONS	SYMBOL
1	NC	NC
2	This is the chip select signal.	/CS1
3	When /RES is set to “L,” the settings are initialized. The reset operation is performed by the /RES signal level.	/RES
4	This is connect to the least significant bit of the normal MPU address bus, and it determines whether the data bits are data or a command. A0 = “H”: Indicates that D0 to D7 are display data. A0 = “L”: Indicates that D0 to D7 are control data.	A0
5	When the 4-line SPI interface is selected (P/S = “L”) :	SCL
6	SI: 4-line SPI data input; SCL: the 4-line SPI clock input .	SI
7	Power supply for logic	VDD
8	These are the power supply pads for the step-up voltage circuit for the LCD.	VDD2
9	Ground	VSS
10	NC	NC
11	DC/DC voltage converter. Connect a capacitor between this terminal and VSS or VDD	VOUT
12	DC/DC voltage converter.	C3P
13	DC/DC voltage converter.	C1N
14	DC/DC voltage converter.	C1P
15	DC/DC voltage converter.	C2P
16	DC/DC voltage converter.	C2N
17	DC/DC voltage converter.	C4P
18	This is a multi-level power supply for the liquid crystal drive. The voltage Supply applied is determined by the liquid crystal cell, and is changed through the use of a resistive voltage divided or through changing the impedance using an op. amp. Voltage levels are determined based on Vss, and must maintain the relative magnitudes shown below. V0 ≧V1 ≧V2 ≧V3 ≧V4 ≧Vss	V4
19		V3
20		V2
21		V1
22		V0
23	NC	NC

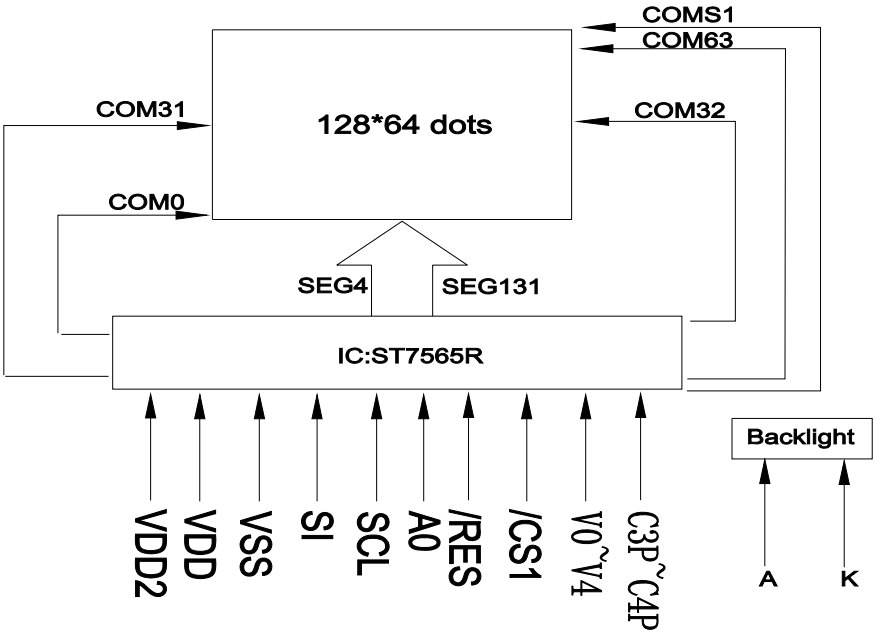
6.APPLICATION CIRCUIT



Remark:

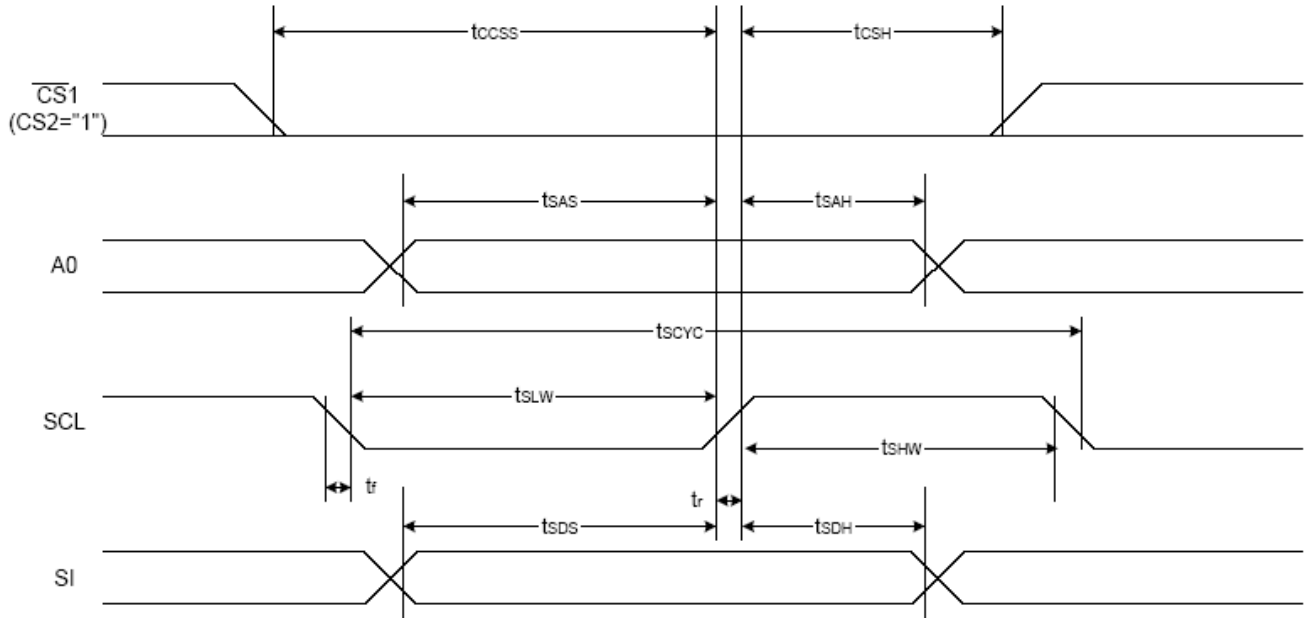
1. Reference value: C1: 0.1~4.7UF /16V ; C2 :1.0~4.7 UF / 16V

7. BLOCK DIAGRA



8.TIMING CHARACTERISTICS

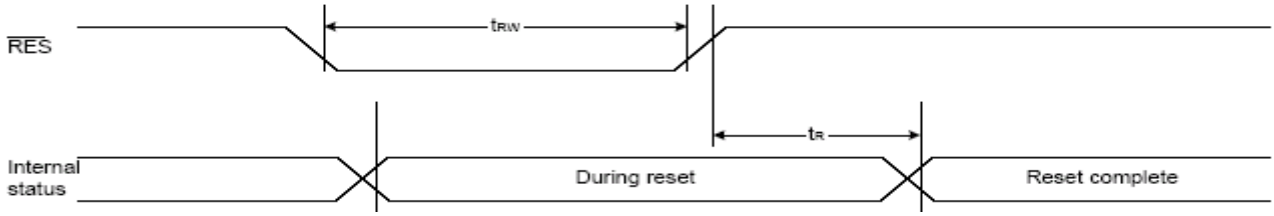
The 4-line SPI Interface



(VDD = 2.7V,Ta = –30 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
4-line SPI Clock Period	SCL	T_{scyc}		100	—	ns
SCL "H" pulse width		T_{SHW}		50	—	
SCL "L" pulse width		T_{SLW}		50	—	
Address setup time	A0	T_{SAS}		30	—	
Address hold time		T_{SAH}		20	—	
Data setup time	SI	T_{SDS}		30	—	
Data hold time		T_{SDH}		20	—	
CS-SCL time	CS	T_{CSS}		30	—	
CS-SCL time		T_{CSH}		60	—	

9.RESET TIMING CHARACTERISTICS

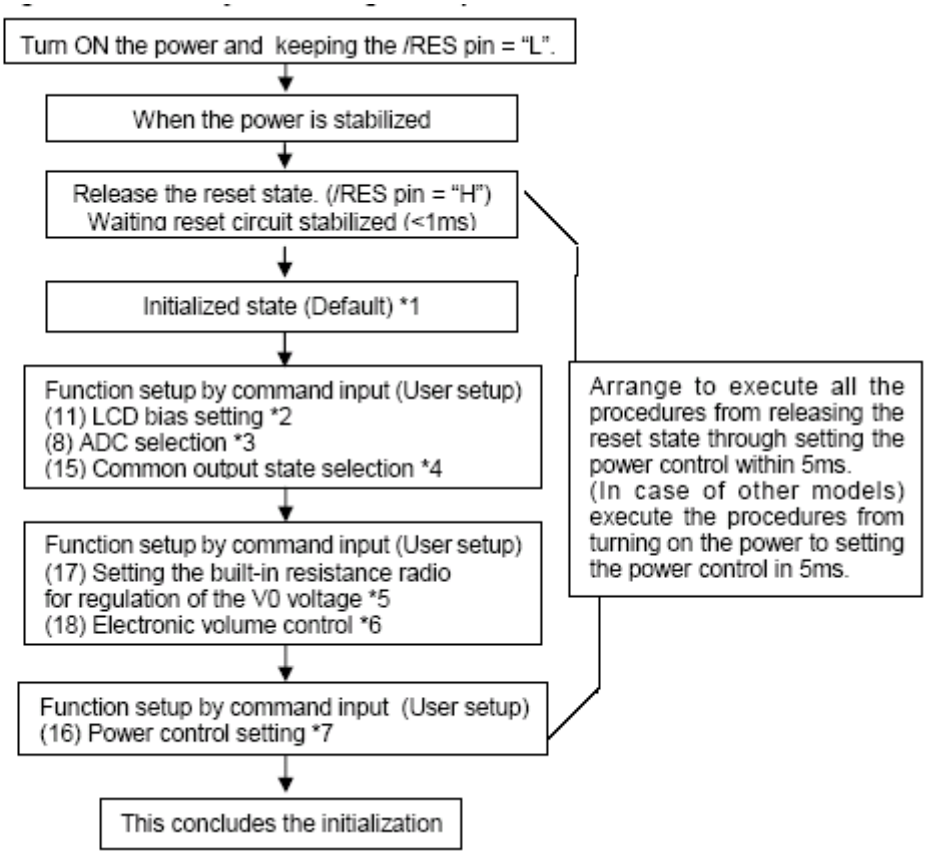


(V_{DD} = 2.7V,Ta = –30 to 85°C)

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		t_R		—	—	2.0	us
Reset "L" pulse width	/RES	t_{RW}		2.0	—	—	us

10. POWER ON/OFF SEQUENCE

(1)POWER ON:

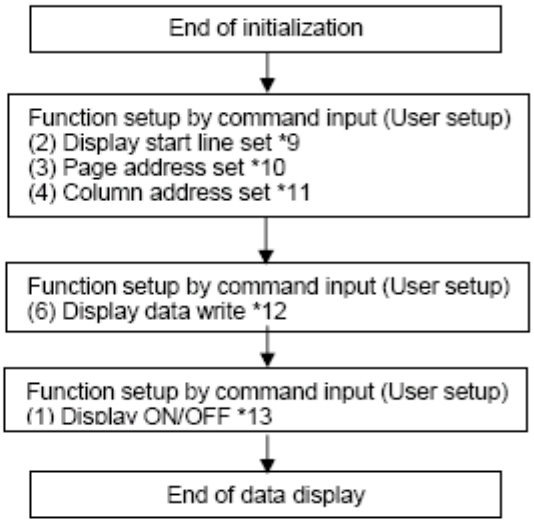


* The target time of 5ms will result to vary depending on the panel characteristics and the capacitance of the smoothing capacitor. Therefore, we suggest you to conduct an operation check using the actual equipment.

Notes: Refer to respective sections or paragraphs listed below.

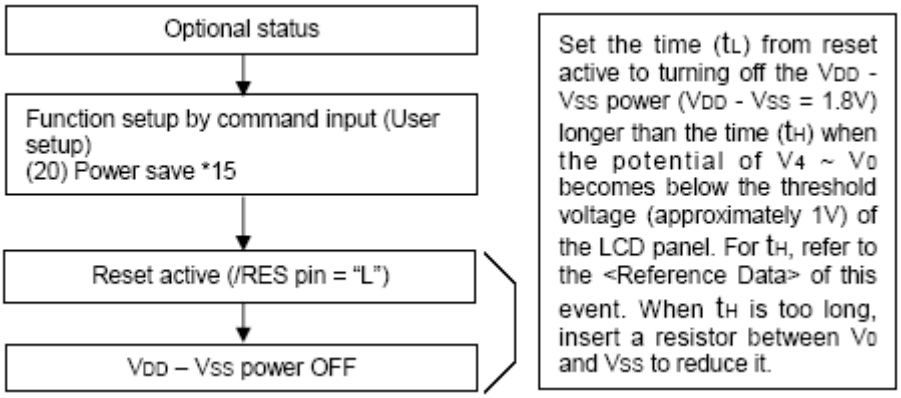
*1: Description of functions; Resetting circuit
*2: Command description; LCD bias setting
*3: Command description; ADC selection
*4: Command description; Common output state selection
*5: Description of functions; Power circuit & Command description; Setting the built-in resistance radio for regulation of the V0 voltage
*6: Description of functions; Power circuit & Command description; Electronic volume control
*7: Description of functions; Power circuit & Command description; Power control setting

(2) Data Display



Notes: Reference items
*9: Command Description; Display start line set
*10: Command Description; Page address set
*11: Command Description; Column address set
*12: Command Description; Display data write
*13: Command Description; Display ON/OFF
Avoid displaying all the data at the data display start (when the display is ON) in white.

(3)POWER OFF:



Notes: Reference items
*14: The logic circuit of this IC's power supply VDD - VSS controls the driver of the LCD power supply VSS – V0. So, if the power supply VDD - VSS is cut off when the LCD power supply VSS – V0 has still any residual voltage, the driver (COM. SEG) may output any uncontrolled voltage. When turning off the power, observe the following basic procedures:
• After turning off the internal power supply, make sure that the potential V0 ~ V4 has become below the threshold voltage of the LCD panel, and then turn off this IC's power supply (VDD - VSS). 6. Description of Function, 6.7 Power Circuit
*15: After inputting the power save command, be sure to reset the function using the /RES terminal until the power supply VDD - VSS is turned off. 7. Command Description (20) Power Save
*16: After inputting the power save command, do not reset the function using the /RES terminal until the power supply VDD - VSS is turned off. 7. Command Description (20) Power Save

11. INITIALIZED CODE

```
void main(void)
{
  P2=0xff;
  vopcode=52;//VOP
  Ra_Rb=0x23;
  LCMSEG=128;
  LCMCOM=64;
  interface=1;
  writec(0xa2);                    /* 1/9 bias */
  writec(0xD1);                    /* icon on */
  writec(0xa0);                    /* ADC select , Normal */
  writec(0xc8);                    /* Common output reverse */
  writec(0xa6);                    /* normal display 1=on */
  writec(0x2f);                    /* V/C off, V/R off, V/F on */


  writec(Ra_Rb);                    /* internal resistor ratio */
  writec(0x81);                    /* electronic volume mode set */
  writec(vopcode);                    /* electronic volume */
  writec(0x40);                    /* display start first line */
  writec(0xaf);                    /* display on */
}

void address(unsigned char page)
{ writec(0x40);                    /* display start first line */
  writec(0xb0+page);               /* Page adress set */
  writec(0x10);                    /* column address 0 ( High Byte ) */
  writec(0x04);                    /* column address 0 ( Low Byte ) */
}
```

12. INSTRUCTION TABLE

Command	Command Code										Function
	A0	/RD	/WR	D7	D6	D5	D4	D3	D2	D1	D0	
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0 1	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	Display start address						Sets the display RAM display start line address
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address
(4) Column address set upper bit Column address set lower bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address. Sets the least significant 4 bits of the display RAM column address.
				0	0	0	0	Least significant column address				
(5) Status read	0	0	1	Status				0	0	0	0	Reads the status data
(6) Display data write	1	1	0	Write data								Writes to the display RAM
(7) Display data read	1	0	1	Read data								Reads from the display RAM
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0 1	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/ reverse	0	1	0	1	0	1	0	0	1	1	0 1	Sets the LCD display normal/ reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0 1	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0 1	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565R)
(12) Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0 1	*	*	*	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode
(17) V_0 voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio(Rb/Ra) mode
(18) Electronic volume mode set Electronic volume register set	0	1	0	1	0	0	0	0	0	0	1	Set the V_0 output voltage electronic volume register
				0	0	Electronic volume value						
(19) Static indicator ON/OFF Static indicator register set	0	1	0	1	0	1	0	1	1	0	0 1	0: OFF, 1: ON Set the flashing mode
				0	0	0	0	0	0	0	Mode	
(20) Booster ratio set	0	1	0	1	1	1	1	1	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
				0	0	0	0	0	0	step-up value		
(21) Power save	0	1	0									Display OFF and display all points ON compound command
(22) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(23) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

13. DDRAM ARRANGEMENT

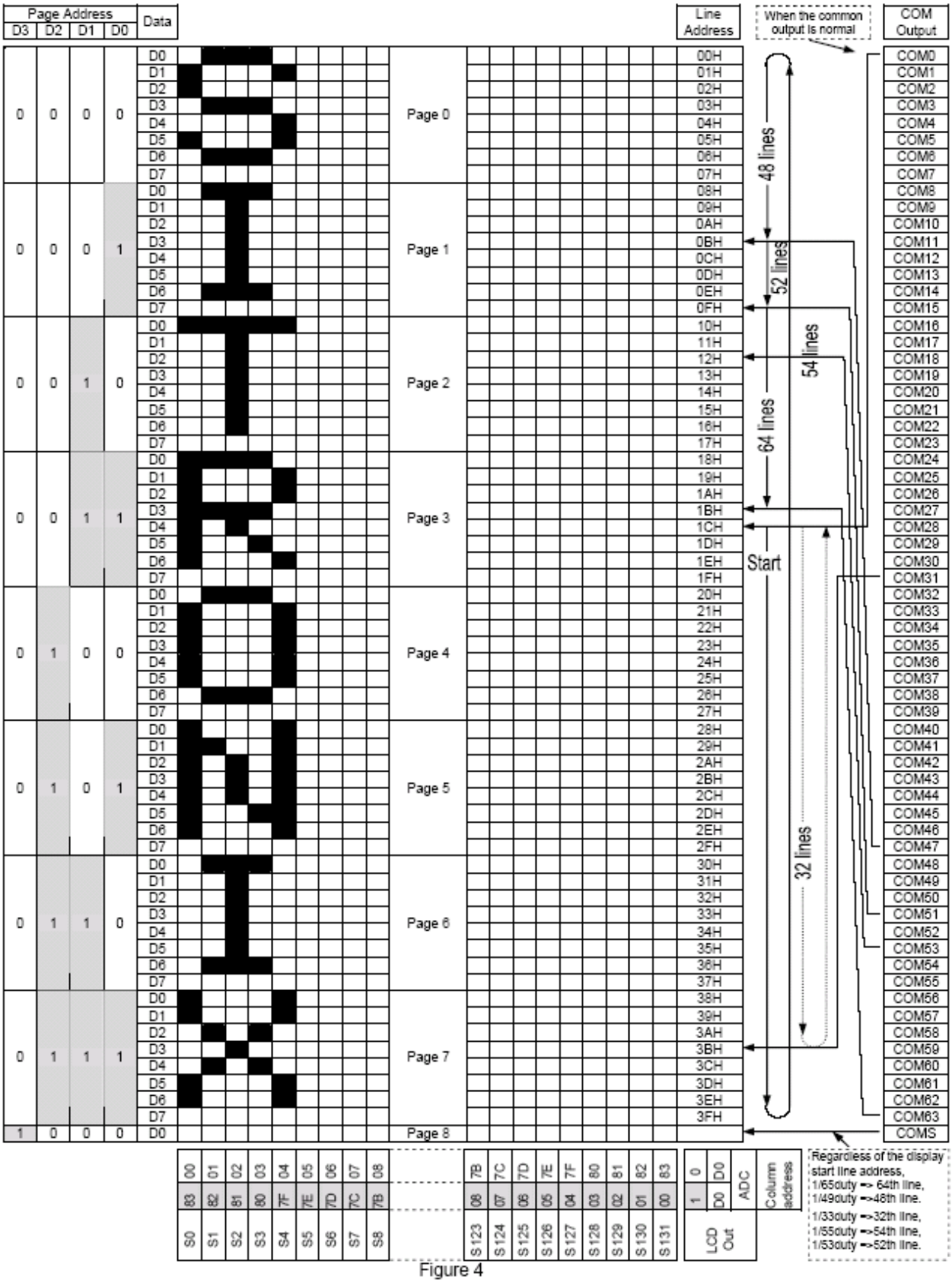


Figure 4

14. ABSOLUTE MAXIMUM RATING

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY FOR LOGIC	VDD－VSS	Ta=25℃	0.3	—	3.6	V
POWER SUPPLY FOR LCD DRIVING	V0－VSS	Ta=25℃	0.3	—	13.5	V
INPUT VOLTAGE	V1~V4	Ta=25℃	-0.3	—	V0	V
OPERATION TEMPERATURE	TOPR	---	-10	–	60	℃
STORAGE TEMPERATURE	TSTG	---	- 20	–	70	℃

NOTES:

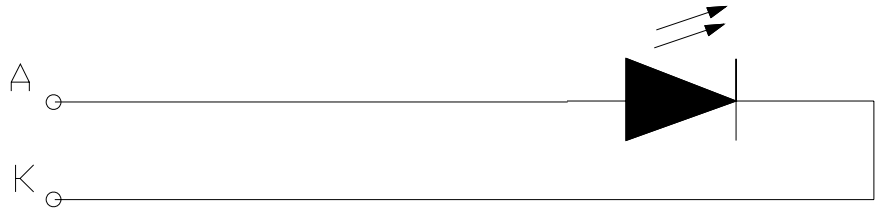
(1) LCM should be grounded during handling LCM.

15. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITIONS	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
POWER SUPPLY VOLTAGE	VDD－VSS	Ta= +25℃	---	2.84	--	V
POWER SUPPLY FOR LCD DRIVING	V0－VSS	Ta= +25℃	8.70	8.90	9.10	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=-0.5uA	0.8VDD	—	VDD	V
OUTPUT VOLTAGE “L” LEVEL	VOL	IOL=-0.5uA	VSS	—	0.2VDD	V

16. LED BACKLIGHT

16-1 POWER SUPPLY FOR LED BACKLIGHT



16-2 ABSOLUTE MAXIMUN RATING

PARAMETER	SYMBOL	SPECIFICATIONS	UNIT
POWER DISSIPATION	PD	75	mW
FORWARD CURRENT	IFm	15	mA
REVERSE VOLTAGE	VR	5	V
OPERATION TEMPERATURE	TOPR	-10℃ ~ 60℃	℃
STORAGE TEMPERATURE	TSTG	-20℃ ~ +70℃	℃

16-3 ELECTRICAL CHARACTERISTICS

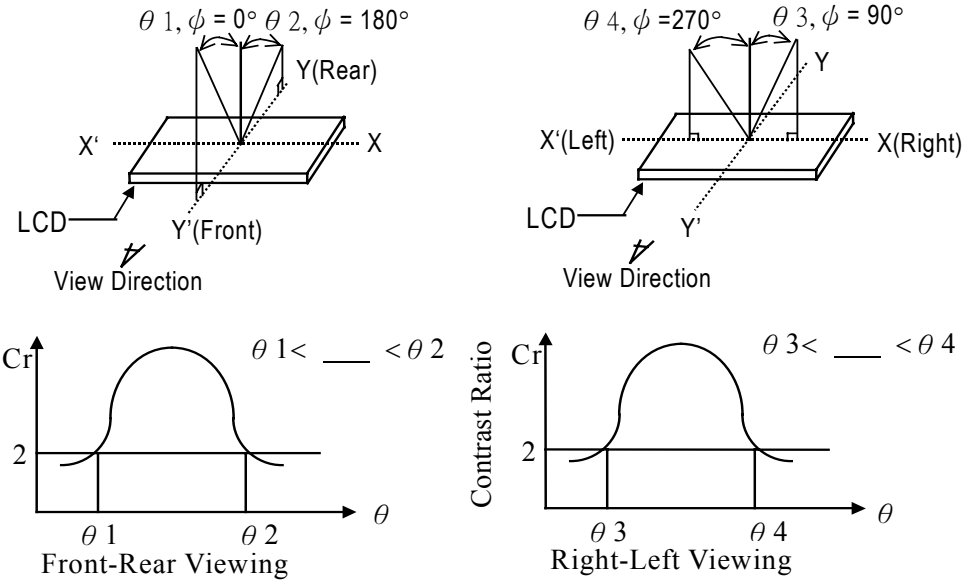
PARAMETER	SYMBOL	LIGHT SOURCE	CONDITIONS	STANDARD VALUE			UNIT
				MIN	TYP	MAX	
PARAMETER VOLTAGE	VAK	Y/G	IF=12.5mA	1.95	2.05	2.15	V
LUMINOUS INTENSITY	Iv	Y/G	IF=12.5mA	1.0	2.5	4.0	cd/m2
PEAK EMISSION WAVELENGTH	- -	Y/G		569	--	575	nm

17. OPTICAL CHARACTERISTICS

for LCD 1/65 Duty, 1/9 Bias

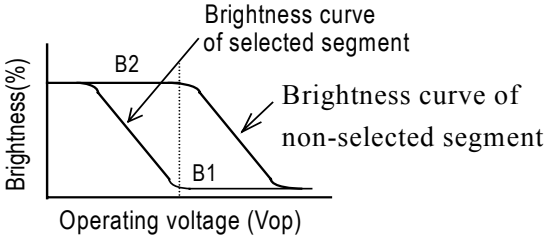
Item		Symbol	Temp.	Condition	Min.	Typ.	Max.	Unit.	Note
Response Time	Rise time	tr	-20℃	θ=0° φ=0°		1130		mS	
			25℃			280			
	Decay time	td	-20℃			1080			
			25℃			220			
Viewing Angle (6:00 H)		θ	25℃ K≥2	Φ=0°		35		deg.	
				Φ=90°		35			
				Φ=180°		30			
				Φ=270°		35			
Uniformity		ΔBn	25℃	θ=φ=0°	70%				
Contrast Ratio		K	25℃	θ=φ=0°		8			
Color of CIE(1931) coordinate	White	X	25℃	θ=φ=0°				-	
		Y						-	
	Red	X						-	
		Y						-	
	Green	X						-	
		Y						-	
	Blue	X						-	
		Y						-	
NTSC Ratio	S				-		-	-	

(1) DEFINITION OF VIEWING ANGLE

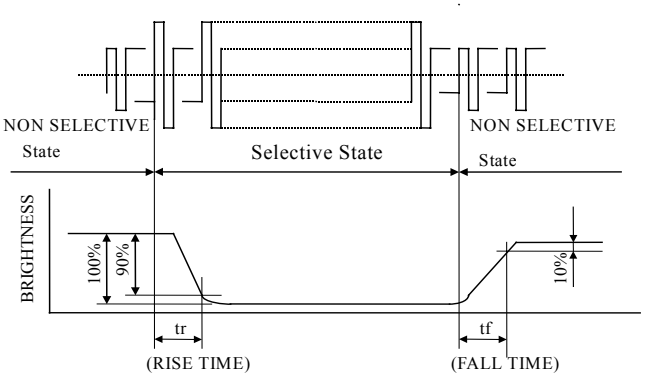


(2) DEFINITION OF CONTRAST

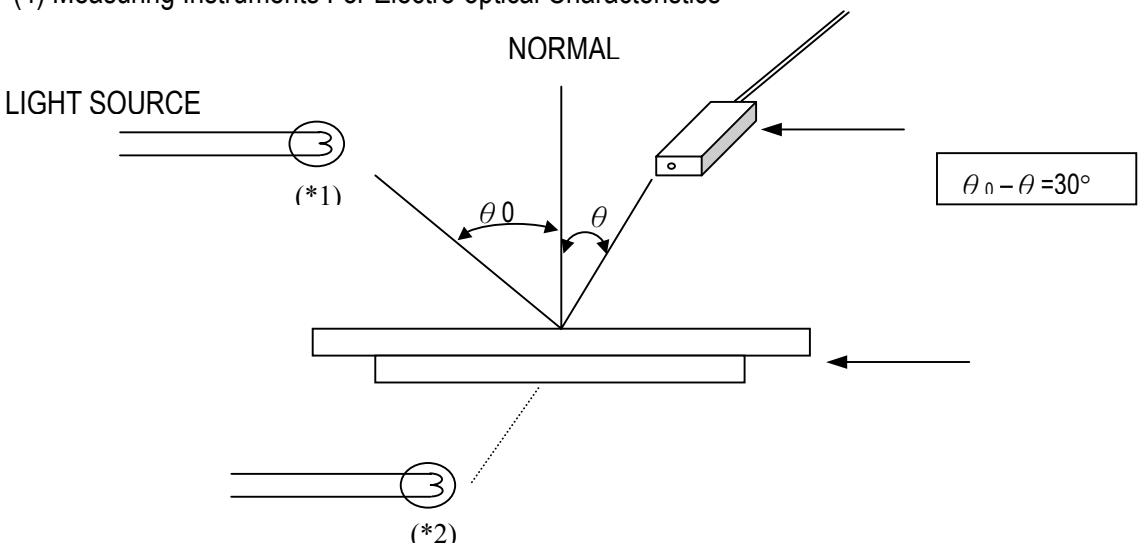
$$C.R = \frac{\text{Brightness of non-selected segment (B2)}}{\text{Brightness of selected segment (B1)}}$$



(3) DEFINITION OF RESPONSE



(4) Measuring Instruments For Electro-optical Characteristics



18. ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITIONS	CRITERION
OPERATING TEMPERATURE	TOPR	-10℃～+60℃	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
STORAGE TEMPERATURE	TSTG	-20℃～+70℃	NO DEFECT IN DISPLAYING AND OPERATIONAL FUNCTION
HUMIDITY	—		WITHOUT CONDENSATION

19. RELIABILITY

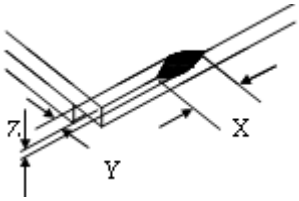
19-1 RELIABILITY TEST

Test item	**Test condition**	**Number of failures/number of examinations**
高温储存 High temperature storage	70 ℃ 240hrs	0/8
低温储存 Low temperature storage	-20 ˚C 240hrs	0/8
高温高湿储存 High temperature/humidity storage	55 ˚C,95% 240hrs（极限条件）	0/8
高温工作 High temperature operation	60 ˚C 240hrs	0/10
低温工作 Low temperature operation	-10 ˚C 240hrs	0/10
高温高湿工作 High temperature/humidity operation	55 ˚C,95% 168hrs（极限条件）	0/10
热冲击 Thermal shock	-20~70 ˚C(30min/30min) 10 cycle	0/8
Electostatic discharge test	Air and Contact 330 ohm 150pF +/-8000V 10 times	0/3
振动 Vibration test	Amplitude 1.5mm,f=10 to 55 Hz, 2 hours each in the X,Y and Z direction	0/3
冲击 Impact test	Apply 1g for operation time 6ms, 3 times each in X,Y and Z direction	0/3
Packing vibration-proof test	2g, f=10->55->10Hz apply in each of X, Y, and Z direction for 30 min	0/3
Packing drop test	Drop the packing from 75cm height, 3 times for 6-faces, 3-edges and 1-corner	

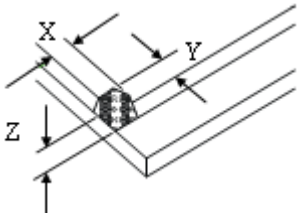
20. THE STANDARD OF INSPECTION

20-1 Inspection items and specification for appearance（power off）

<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>1</td><td>Dimension</td><td>Dimension out of the specification</td><td>1.0</td></tr>
<tr><td>2</td><td>Glass crack</td><td>1、General crack
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≥ K/8</td><td>Not over A area</td><td>≤T</td></tr>
</table></td><td>2.50</td></tr>
</table>

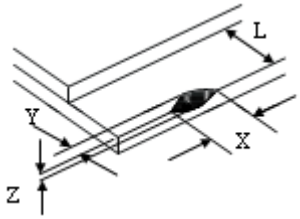


2、corner



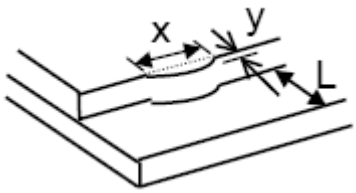
X	Y	Z
≥ K/8	Not over A area	No check

3、contact pad crack



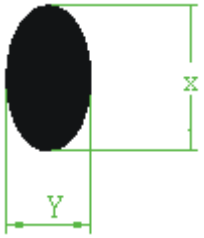
X	Y	Z
≥ K/8	≥ L/3	No check

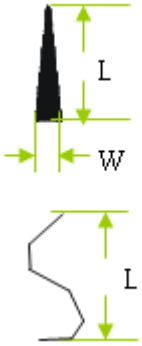
4、Substrate protuberance and internal crack

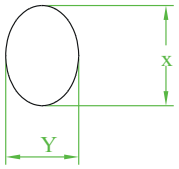


X	Y
≥ K/8	≥ L/3

Transfer position crack: ≤L/5

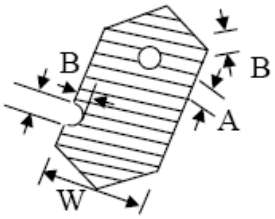
3	Black dot \ White dot		D	Acceptable of defect: A/B Area / C Area
			D<0.2	No check / No check
			0.2≤D<0.3	2 / No check
			0.3≤D≤0.5	1 / No check
			D>0.5	0 / No check
		X: long diameter Y: shot diameter D: average of diameter D=(X+Y)/2		

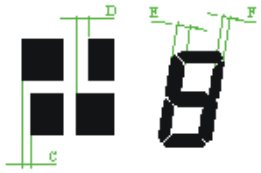
<table>
<tr><td>4</td><td>Line defect</td><td>


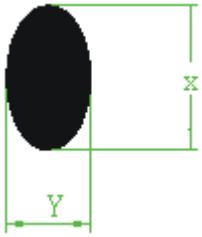
<table>
<tr><th rowspan="2">Length</th><th rowspan="2">Whidth</th><th colspan="2">Acceptable of defect</th></tr>
<tr><th>A/B Area</th><th>C Area</th></tr>
<tr><td>accept</td><td>W≤0.02</td><td>No check</td><td rowspan="3">No check</td></tr>
<tr><td>L≤3</td><td>W≤0.05</td><td>2</td></tr>
<tr><td rowspan="2">L≤2.5</td><td>W≤0.05</td><td>2</td></tr>
<tr><td>W>0.05</td><td colspan="2">As round type</td></tr>
</table>
L: Length W: Width
Defect of polarizer (Scratches、Spot) : According to the limit specimen
</td><td>2.50</td></tr>
<tr><td>5</td><td>Polarizer Bubble</td><td>


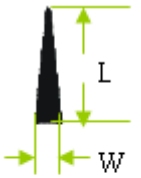
<table>
<tr><th rowspan="2">D</th><th colspan="2">Acceptable of defect</th></tr>
<tr><th>A/B Area</th><th>C Area</th></tr>
<tr><td>D≤0.2</td><td>No check</td><td rowspan="4">No check</td></tr>
<tr><td>0.2≤D≤0.5</td><td>3</td></tr>
<tr><td>0.5≤D≤1.0</td><td>2</td></tr>
<tr><td>D>1.0</td><td>0</td></tr>
</table>
</td><td>2.50</td></tr>
<tr><td>6</td><td>External print of panel</td><td>1、 Transfigure、pin hole：same as segment transfinguer
2、 Print width: print width ≥1/2 standard width is acceptable</td><td>2.50</td></tr>
<tr><td>7</td><td>Silicon glue</td><td>The area of painting silicon glue must cover the ITO circuit.</td><td>2.50</td></tr>
<tr><td>8</td><td>Defect of PCB</td><td>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..</td><td>2.50</td></tr>
<tr><td>9</td><td>SMT organ</td><td>1、 deflexion of component≤1/3width of component
2、 Trying to keep dot of soldering tin orbicular
3、 Damage 、break、wrong assembly and unseal are unreceivable for component.</td><td>2.50</td></tr>
<tr><td>10</td><td>Steel Frame</td><td>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≤5mm;Width≤0.3mm</td><td>2.50</td></tr>
</table>

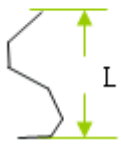
20-2 Inspection items and specification for display defect（power on）

<table>
<tr><td>1</td><td>Electrical Defect</td><td><table><tr><td>Segment missing</td><td>Not allow</td></tr><tr><td>Segment short</td><td>Not allow</td></tr><tr><td>Non-display</td><td>Not allow</td></tr></table></td><td>1.0</td></tr>
<tr><td>2</td><td>Pin hole</td><td>1、Pin hole
 

<table><tr><td>width</td><td>Acceptable of defect</td></tr><tr><td>W＜0.4</td><td>D≤0.2 & D≤1/2W</td></tr><tr><td>W≥0.4</td><td>D≤0.25 & D≤1/3W</td></tr></table>
* D=(A+B)/2　　D≤0.1 acceptable</td><td>2.50</td></tr>
<tr><td>3</td><td>Display pattern</td><td> 

<table><tr><td>Width</td><td>Acceptable of defect</td></tr><tr><td>W＜0.4</td><td>C、D、G≤1/2W</td></tr><tr><td>W≥0.4</td><td>C、D、G≤0.2</td></tr></table>
W: Design dimension　　C、D: discrepant dimension　G=|E-F|</td><td>1.0</td></tr>
<tr><td>4</td><td>Black/white dot</td><td> 

<table><tr><td rowspan="2">D</td><td colspan="2">Acceptable QTY</td></tr><tr><td>A/B Area</td><td>C Area</td></tr><tr><td>D＜0.1</td><td>No check</td><td rowspan="4">No check</td></tr><tr><td>0.1≤D＜0.2</td><td>2</td></tr><tr><td>0.2≤D≤0.25</td><td>1</td></tr><tr><td>D＞0.25</td><td>0</td></tr></table>
X: long diameter
Y: shot diameter
D: average diameter　　D=(X+Y)/2</td><td>2.50</td></tr>
<tr><td>5</td><td>Line defect</td><td> 



<table><tr><td rowspan="2">Length</td><td rowspan="2">Width</td><td colspan="2">Acceptable QTY</td></tr><tr><td>A/B Area</td><td>C Area</td></tr><tr><td>不计</td><td>W≤0.02</td><td>No check</td><td rowspan="3">No check</td></tr><tr><td>L≤3</td><td>W≤0.03</td><td>2</td></tr><tr><td rowspan="2">L≤2.5</td><td>0.03＜W≤0.05</td><td>2</td></tr><tr><td>W＞0.05</td><td colspan="2">Sa round type</td></tr></table>
L: length　W: width</td><td>2.50</td></tr>
</table>

21. USING LCD MODULES

21-1 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.

21-2 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 to 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.

21-3 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 handing 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 potentiality 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.

21-4 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.

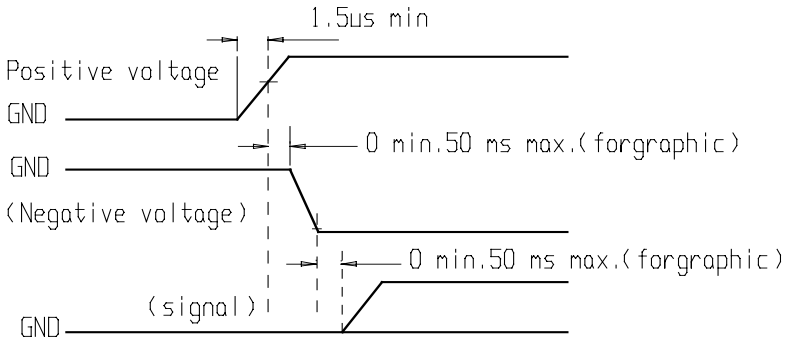
(3) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted 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.



21-5 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.

21-6 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 leakes out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

21-7 LIMITED WARRANTY

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

21-8 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.