Version No.:	02

SPECIFICATIONS

PRODUCT ：LCD MODULE

MODEL NO.：S69510A-DF025MB

CUSTOMER NO.: DS11005197

SUCCESS			CUSTOMER
PREPARED	CHECKED	APPROVED	APPROVED
XiangGS	ZengZP	WangYF	FOR APPROVAL Mc'TRONIC

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□APPROVAL FOR SPECIFICATIONS ONLY

■APPROVAL FOR SPECIFICATIONS AND SAMPLE

深圳市宇顺电子股份有限公司

SUCCESS ELECTRONICS LTD

" Not to use the substances and their applications of SUCCESS Management Standard for Environment-related Substances to be Controlled "

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RECORDS OF REVISION

DATE	REVISED NO.	REVISED DESCRIPTIONS	PREPARED	CHECKED	APPROVED
2021-12-9	01	New release	Xianggs	Zengzhaopeng	WangYF
2022-2-14	02	Item 8.0:Update initial code	Xianggs	Zengzhaopeng	WangYF

CONTENTS

1. GENERAL SPECIFICATIONS

1-1.DESCRIPTION:

The S69510A-DF025MB is a dot matrix mono Liquid Crystal Display Module(LCM).

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

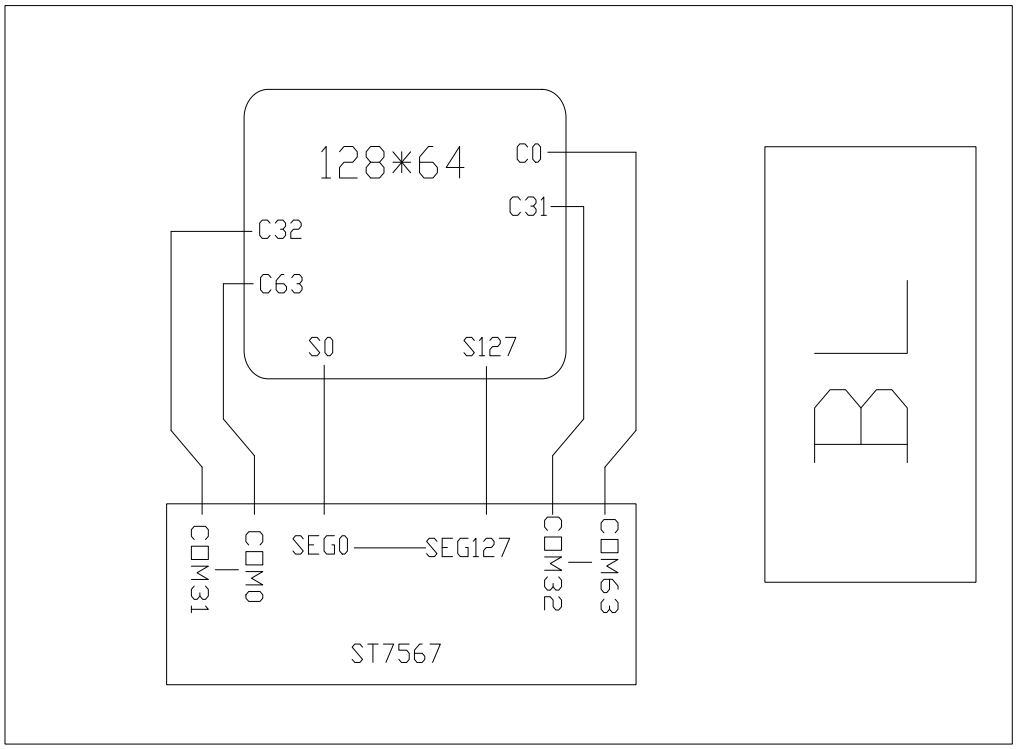
1-2. FEATURES

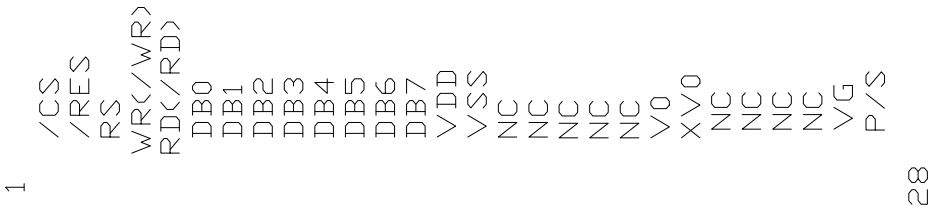
(1) Display Type: FSTN , Positive, Transflective, 6 O'clock
(2) Driving Method: VDD=3.3V, 1/65 duty, 1/9 bias
(3) Built-in controller: ST7567
(4) With White Backlight

1-3.GENERAL SPECIFICATION

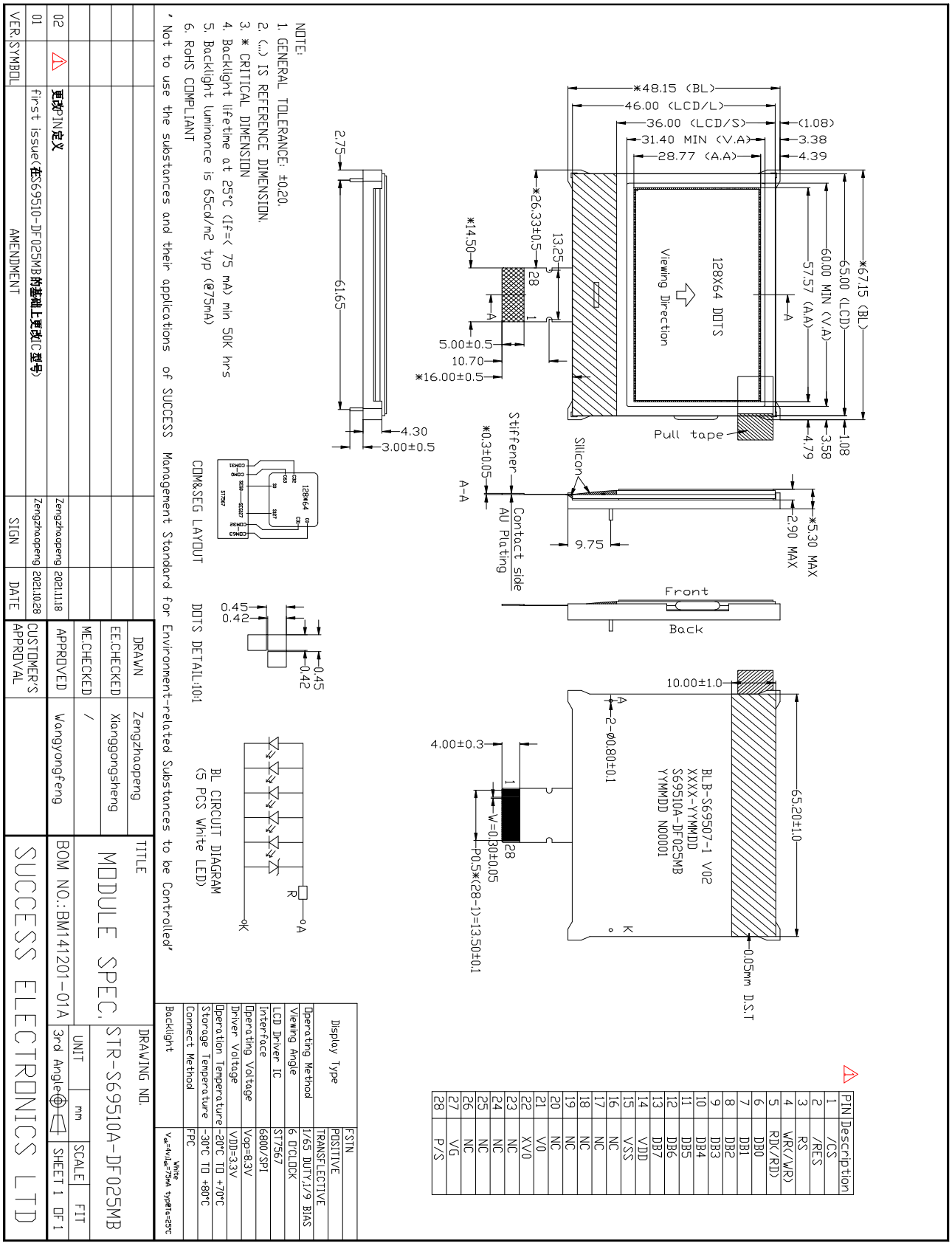
ITEM	SPECIFICATIONS	UNIT
DISP.CONSTRUCTION	128*64 Dots	--
OUTLINE DIMEMSIONS	67.15(W)*48.15(H)*5.30(T)(Not Included FPC)	mm
VIEWING AREA	60.00(W) x31.40(H)	mm
ACTIVE AREA	57.57(W) x 28.77(H)	mm
DOT SIZE	0.42(W) x 0.42(H)	mm
DOT PITCH	0.45(W) x 0.45(H)	mm
ASSY.TYPE	COG+FPC+BL	--
INTERFACE	6800/SPI	--
BACKLIGHT	White	--

2. BLOCK DIAGRAM





3.OUTLINE DRAWING



PIN	Description
1	/CS
2	/RES
3	RS
4	WR(/WR)
5	RD(/RD)
6	DB0
7	DB1
8	DB2
9	DB3
10	DB4
11	DB5
12	DB6
13	DB7
14	VDD
15	VSS
16	NC
17	NC
18	NC
19	NC
20	NC
21	V0
22	XV0
23	NC
24	NC
25	NC
26	NC
27	VG
28	P/S

Display Type	FSTN
Operating Method	POSITIVE
Viewing Angle	TRANSFLECTIVE
LCD Driver IC	1/65 DUTY,1/9 BIAS
Interface	6 'CLOCK
Operating Voltage	ST7567
Driver Voltage	6800/SPI
Operation Temperature	Vop=8.3V
Storage Temperature	VDD=3.3V
Connect Method	-20°C TO +70°C
Backlight	-30°C TO +80°C
	FPC
	White V_{ak}=4V I_{ak}=75mA typ@Ta=25°C

VER.|SYMBOL	AMENDMENT	SIGN	DATE
02	更改PIN定义	Zengzhaopeng	2021.11.18
01	first issue(在S69510-DF025MB的基础上更改IC型号)	Zengzhaopeng	2021.10.28

DRAWN	Zengzhaopeng		
EE.CHECKED	Xianggongsheng		
ME.CHECKED	/		
APPROVED	Wangyongfeng		
CUSTOMER'S APPROVAL			

TITLE: MODULE SPEC.
BOM NO.:BM141201-01A
DRAWING NO.: STR-S69510A-DF025MB
UNIT: mm | SCALE: FIT | SHEET 1 OF 1
3rd Angle

SUCCESS ELECTRONICS LTD

4.INTERFACE ASSIGNMENT

1	Chip select input pin	/CS
2	Reset input pin	/RES
3	Data/instruction selection pin	RS
4	Read/Write signal select When R/W = “H”: Read When R/W = “L”: Write	WR(/WR)
5	Enable signal, start data read/write	RD(/RD)
6~13	8 bit data Bus Line	DB0~DB7
14	Logic power supply, +3.3V	VDD
15	Ground, 0V	VSS
16~20	NO CONNECT	NC
21	V0 is the LCD driving voltage for common circuits at negative frame	V0
22	XV0 is the LCD driving voltage for common circuits at positive frame.	XV0
23~26	NO CONNECT	NC
27	VG is the LCD driving voltage for segment circuits	VG
28	This pin configures the interface to parallel mode or serial mode.	P/S

5.APPLICATION CIRCUIT

The recommended external power components need only 2 capacitors. The detailed values of these two capacitors are determined by the panel size and loading.

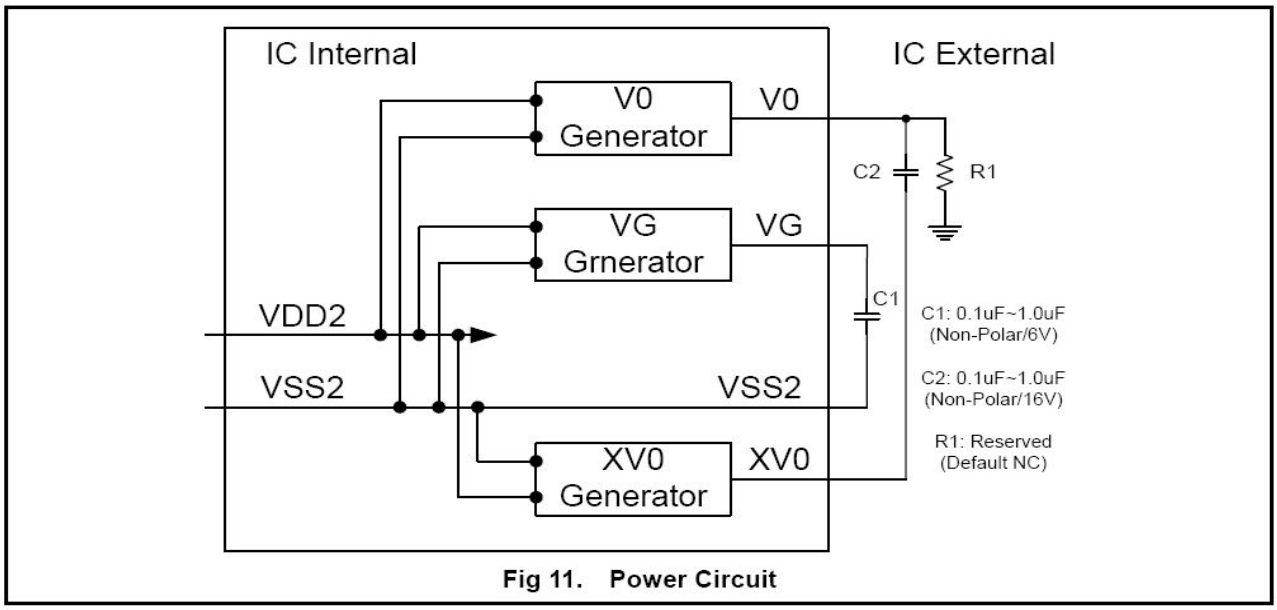


Fig 11. Power Circuit

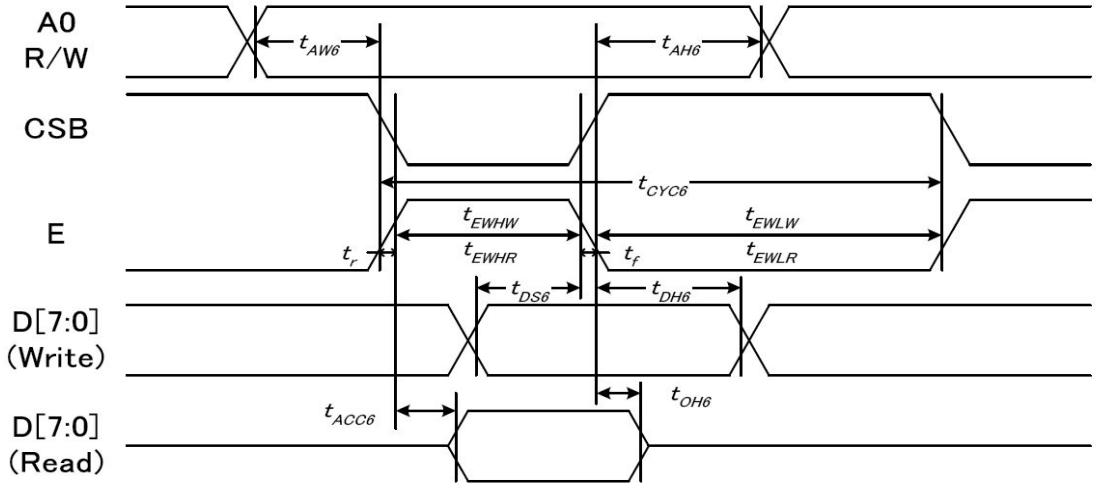
Regulator Circuit

The built-in high accuracy regulation circuit has 8 regulation ratios and each one has 64 EV-levels for voltage adjustment. Without additional external component, the output voltage can be changed by instructions such as “Regulation Ratio” and “Set EV”. The detailed setting method can be found in the INSTRUCTION DESCRIPTION section.

6. TIMING CHARACTERISTICS

6-1 For the 6800 series MPU(Default Mode)

System Bus Timing for 6800 Series MPU



(VDD1 = 3.3V , Ta =25°C)

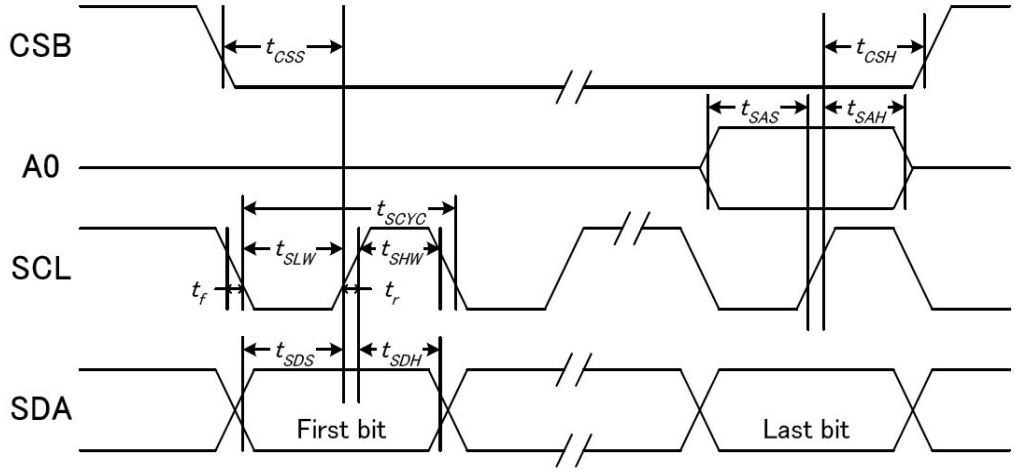
Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW6		0	—	ns
Address hold time		tAH6		10	—	
System cycle time	E	tCYC6		240	—	
Enable L pulse width (WRITE)		tEWLW		80	—	
Enable H pulse width (WRITE)		tEWHW		80	—	
Enable L pulse width (READ)		tEWLR		80	—	
Enable H pulse width (READ)		tEWHR		140		
Write data setup time	D[7:0]	tDS6		40	—	
Write data hold time		tDH6		10	—	
Read data access time		tACC6	CL = 16 pF	—	70	
Read data output disable time		tOH6	CL = 16 pF	5	50	

(VDD1 = 2.8V , Ta =25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	tAW6		0	—	ns
Address hold time		tAH6		0	—	
System cycle time	E	tCYC6		400	—	
Enable L pulse width (WRITE)		tEWLW		220	—	
Enable H pulse width (WRITE)		tEWHW		180	—	
Enable L pulse width (READ)		tEWLR		220	—	
Enable H pulse width (READ)		tEWHR		180	—	
Write data setup time	D[7:0]	tDS6		40	—	
Write data hold time		tDH6		20	—	
Read data access time		tACC6	CL = 16 pF	—	140	
Read data output disable time		tOH6	CL = 16 pF	10	100	

6-2 For 4-Line Serial Interface

System Bus Timing for 4-Line Serial Interface



(VDD1 = 3.3V , Ta =25˚C)

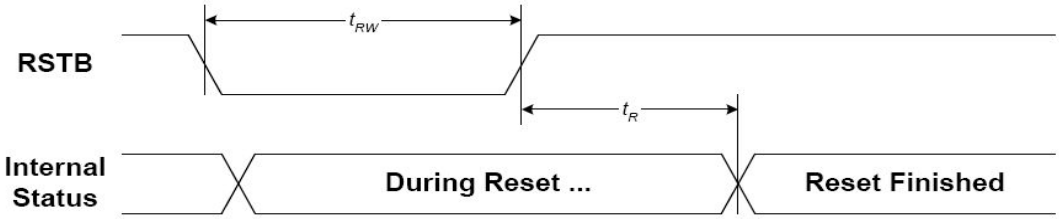
Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		50	—	ns
SCLK “H” pulse width		tSHW		25	—	
SCLK “L” pulse width		tSLW		25	—	
Address setup time	A0	tSAS		20	—	
Address hold time		tSAH		10	—	
Data setup time	SDA	tSDS		20	—	
Data hold time		tSDH		10	—	
CSB-SCLK time	CSB	tCSS		20	—	
CSB-SCLK time		tCSH		40	—	

(VDD1 = 2.8V , Ta =25˚C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		100	—	ns
SCLK “H” pulse width		tSHW		50	—	
SCLK “L” pulse width		tSLW		50	—	
Address setup time	A0	tSAS		30	—	
Address hold time		tSAH		20	—	
Data setup time	SDA	tSDS		30	—	
Data hold time		tSDH		20	—	
CSB-SCLK time	CSB	tCSS		30	—	
CSB-SCLK time		tCSH		60	—	

6-3 RESET INPUT TIMING

Hardware Reset Timing



(VDD1 = 3.3V , Ta =25˚C)

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	1.0	us
Reset "L" pulse width	tRW		1.0	—	

(VDD1 = 2.8V , Ta =25˚C)

Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	2.0	us
Reset "L" pulse width	tRW		2.0	—	

(VDD1 = 1.8V , Ta =25˚C)

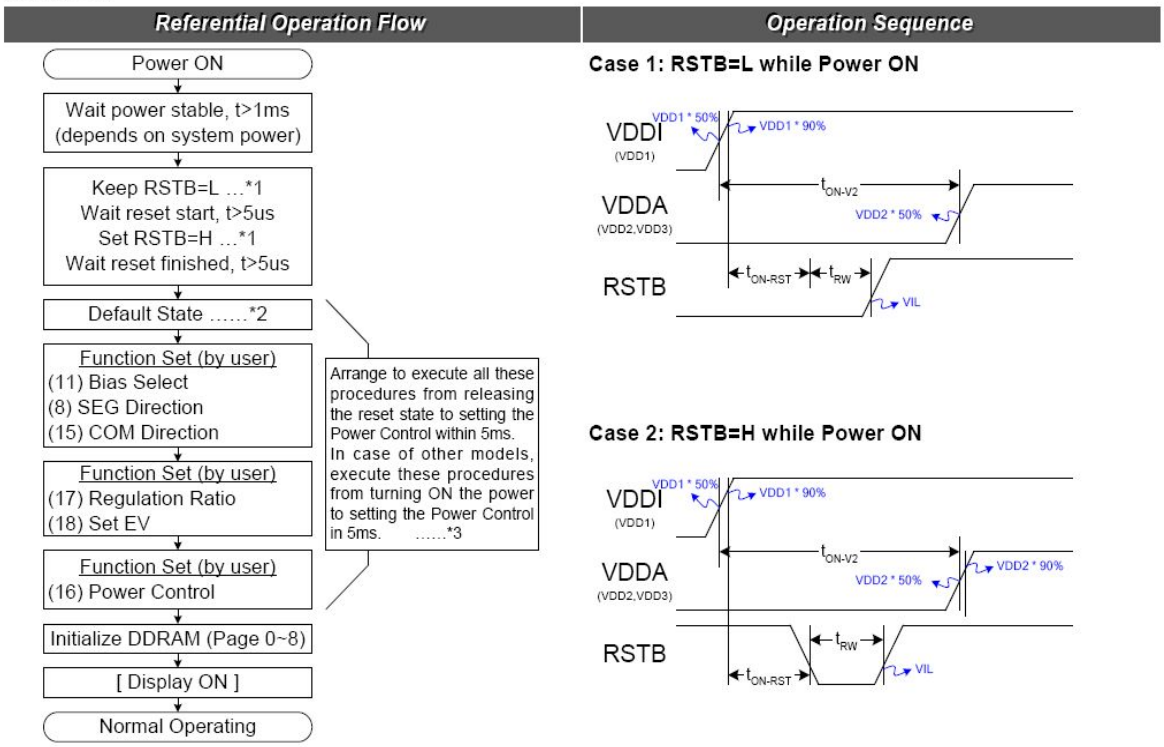
Item	Symbol	Condition	Min.	Max.	Unit
Reset time	tR		—	3.0	us
Reset "L" pulse width	tRW		3.0	—	

7. POWER ON/OFF SEQUENCE

(1)POWER ON:

This section introduces some reference operation flows.

Power ON



Note: The detailed description can be found in the respective sections listed below.

1. Please refer to the timing specification of t_{RW} and t_R.
2. Refer to Section RESET CIRCUIT.
3. The 5ms requirement depends on the characteristics of LCD panel and the external component of the power circuit. It is recommended to check with the real products with external component.
4. The detailed instruction functionality is described in Section 9. INSTRUCTION DESCRIPTION;
5. Power stable is defined as the time that the later power (VDDI or VDDA) reaches 90% of its rated voltage.

Timing Requirement:

Item	Symbol	Requirement	Note
VDDA power delay	t_{ON-V2}	$0 \le t_{ON-V2}$	● Applying VDDI and VDDA in any order will not damage IC.
RSTB input time	t_{ON-RST}	No Limitation	● If RSTB is Low, High or unstable during power ON, a successful hardware reset by RSTB is required after VDDI is stable. ● RSTB=L can be input at any time after power is stable. ● t_{RW} & t_R should match the timing specification of RSTB. ● To prevent abnormal display, the recommended timing is: $0 \le t_{ON-RST} \le 30$ ms.

- The requirement listed here is to prevent abnormal display on LCD module.

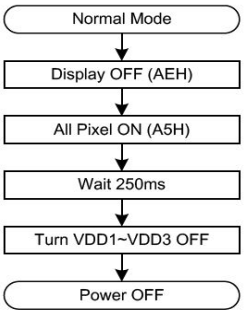
(2)POWER OFF:

Power OFF Flow and Sequence

In power save mode, LCD outputs are fixed to VSS and all analog outputs are discharged. The power can be turned OFF after ST7567 is in the power save mode. The power save mode can be triggered by the following two methods.

Referential Power OFF Flow	*Operation Sequence*

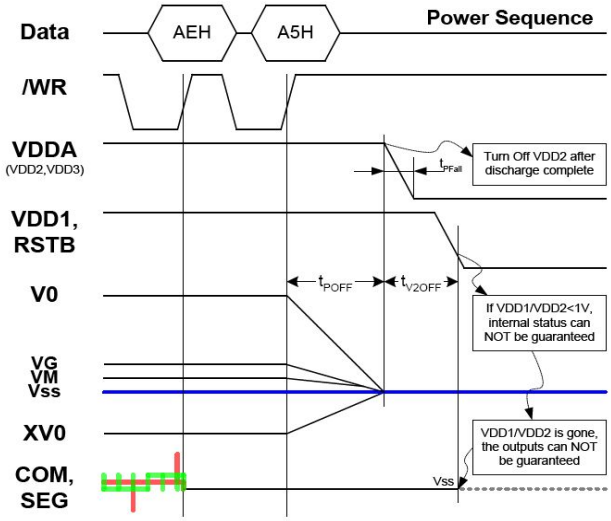
CASE 1: Use Power Save Instruction



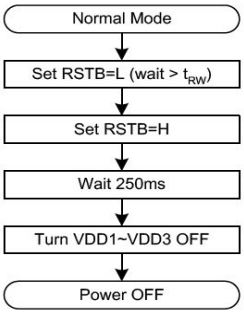
Power OFF Flow

Instruction Flow

After the built-in power circuits are OFF and completely discharged, the power (VDDI, VDDA) can be removed.



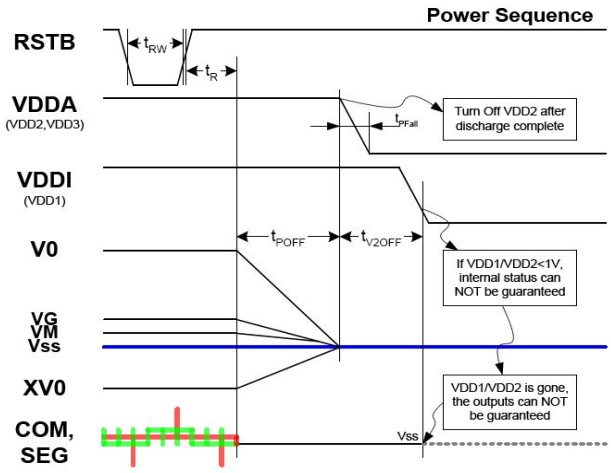
CASE 2: Use Hardware Reset Function



Power OFF Flow

Instruction Flow

After the built-in power circuits are OFF and completely discharged, the power (VDDI, VDDA) can be removed.



Note:

1. t_{POFF}: Internal Power discharge time. => 250ms (max).
2. t_{V2OFF}: Period between VDDI and VDDA OFF time. => 0 ms (min).
3. It is NOT recommended to turn VDDI OFF before VDDA. Without VDDI, the internal status cannot be guaranteed and internal discharge-process maybe stopped. The un-discharged power maybe flows into COM/SEG output(s) and the liquid crystal in panel maybe polarized.
4. IC will NOT be damaged if either VDDI or VDDA is OFF while another is ON.
5. The timing is dependent on panel loading and the external capacitor(s).
6. The timing in these figures is base on the condition that: LCD Panel Size = 1.4" with C1=1uF, C2=1uF.
7. When turning VDDA OFF, the falling time should follow the specification:
   20ms ≤ t_{Pfall} ≤ 0.2sec

8. RECOMMENDED INITIAL CODES

```
void Initial(void)
{
   CS=0;
   RES=1;   DelayuS(5000);
   RES=0;   DelayuS(5000);
   RES=1;   DelayuS(5000);

   writec(0xe2);   DelayuS(3);   // RESET
   writec(0xa2);   DelayuS(3);   // 1/9 bias
   writec(0xa0);   DelayuS(3);   //ADC select , Normal
   writec(0xc8);   DelayuS(3);   //Common output reverse
   writec(0xf8);   DelayuS(3);   //4 booster
   writec(0x00);   DelayuS(3);

   writec(0x24);   DelayuS(3);   // internal resistor ratio
   writec(0x81);   DelayuS(3);   //electronic volume mode set
   writec(28);     DelayuS(3);   // electronic volume

   writec(0x2c);   DelayuS(1000); //Power Control1
   writec(0x2e);   DelayuS(1000); //Power Control2
   writec(0x2f);   DelayuS(1000); //Power Control3

   writec(0x40);   DelayuS(3);     //Set Start Line
   writec(0xaf);   DelayuS(3);      // display ON
}
```

9.INSTRUCTION TABLE

INSTRUCTION	A0	R/W (RWR)	COMMAND BYTE								DESCRIPTION
			D7	D6	D5	D4	D3	D2	D1	D0	
(1) Display ON/OFF	0	0	1	0	1	0	1	1	1	D	D=1, display ON D=0, display OFF
(2) Set Start Line	0	0	0	1	S5	S4	S3	S2	S1	S0	Set display start line
(3) Set Page Address	0	0	1	0	1	1	Y3	Y2	Y1	Y0	Set page address
(4) Set Column Address	0	0	0	0	0	1	X7	X6	X5	X4	Set column address (MSB)
	0	0	0	0	0	0	X3	X2	X1	X0	Set column address (LSB)
(5) Read Status	0	1	0	MX	D	RST	0	0	0	0	Read IC Status
(6) Write Data	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write display data to RAM
(7) Read Data	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read display data from RAM
(8) SEG Direction	0	0	1	0	1	0	0	0	0	MX	Set scan direction of SEG MX=1, reverse direction MX=0, normal direction
(9) Inverse Display	0	0	1	0	1	0	0	1	1	INV	INV =1, inverse display INV =0, normal display
(10) All Pixel ON	0	0	1	0	1	0	0	1	0	AP	AP=1, set all pixel ON AP=0, normal display
(11) Bias Select	0	0	1	0	1	0	0	0	1	BS	Select bias setting 0=1/9; 1=1/7 (at 1/65 duty)
(12) Read-modify-Write	0	0	1	1	1	0	0	0	0	0	Column address increment: Read:+0 , Write:+1
(13) END	0	0	1	1	1	0	1	1	1	0	Exit Read-modify-Write mode
(14) RESET	0	0	1	1	1	0	0	0	1	0	Software reset
(15) COM Direction	0	0	1	1	0	0	MY	-	-	-	Set output direction of COM MY=1, reverse direction MY=0, normal direction
(16) Power Control	0	0	0	0	1	0	1	VB	VR	VF	Control built-in power circuit ON/OFF
(17) Regulation Ratio	0	0	0	0	1	0	0	RR2	RR1	RR0	Select regulation resistor ratio
(18) Set EV	0	0	1	0	0	0	0	0	0	1	Double command!! Set electronic volume (EV) level
	0	0	0	0	EV5	EV4	EV3	EV2	EV1	EV0	
(19) Set Booster	0	0	1	1	1	1	1	0	0	0	Double command Set booster level: BL=0: 4X BL=1: 5X
	0	0	0	0	0	0	0	0	0	BL	
(20) Power Save	0	0	Compound Command								Display OFF + All Pixel ON
(21) NOP	0	0	1	1	1	0	0	0	1	1	No operation
(22) Test	0	0	1	1	1	1	1	1	1	TE	Test Command Moe TE=0: releasing test command mode TE=1: entering test command mode

Note: Symbol "-" means this bit can be "H" or "L".

10.ELECTRICAL CHARACTERISTICS

10-1 Absolute maximum ratings

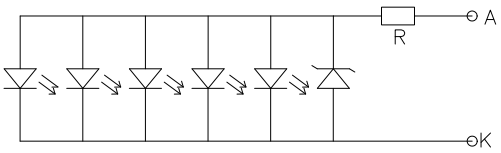
ITEM	SYMBOL	STANDARD VALUE			UNIT
		MIN	TYP	MAX	
SUPPLY VOLTAGE FOR LOGIC	VDD	-0.3	--	4	V
LCD POWER SUPPLY VOLTAGE	V0-XV0	-0.3	--	16	V
OPERATING TEMPERATURE	T_{OP}	-20	--	70	℃
STORAGE TEMPERATURE	T_{STG}	-30	--	80	℃

10-2 Electrical characteristics

ITEM	SYMBOL	CONDITIONS	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
SUPPLY VOLTAGE FOR LOGIC	VDD	Ta= 25℃	3.2	3.3	3.4	V
SUPPLY VOLTAGE FOR LCD	V0-XV0		8.1	8.3	8.5	V
INPUT VOLTAGE “H” LEVEL	VIH		0.7VDD	-	VDD	V
INPUT VOLTAGE “L” LEVEL	VIL		VSS	-	0.3VDD	V
OUTPUT VOLTAGE “H” LEVEL	VOH		0.8VDD	-	VDD	V
OUTPUT VOLTAGE “L” LEVEL	VOL		VSS	-	0.2VDD	V
CURRENT CONSUMPTION (CHECKER)	IDD		-	0.5	1.0	mA
POWER CONSUMPTION (CHECKER)	PC		-	1.65	3.3	mW

11. LED BACKLIGHT

11-1 LED CIRCUIT:



11-2.ABSOLUTE MAXIMUN RATING

PARAMETER	SYMBOL	SPECIFICATIONS	UNIT
POWER DISSIPATION	PD	400	mW
FORWARD CURRENT	Ifm	100	mA
PEAK FORWARD CURRENT	Ifp	300	mA
REVERSE VOLTAGE	Vr	5	V
OPERATION TEMPERATURE	TOPR	-20℃~+70℃	℃
STORAGE TEMPERATURE	TSTG	-30℃~+80℃	℃

11-3. ELECTRICAL CHARACTERISTICS (Ta=25℃)

PARAMETER	SYMBOL	LIGHT SOURCE	CONDITIONS	STANDARD VALUE			UNIT
				MIN	TYP	MAX	
FORWARD CURRENT	If	White	Vak=4.0V	-	75	100	mA
REVERSE CURRENT	IR		Vr= 5V/LED	-	-	10	uA
BL BRIGHTNESS	Lv		Vak=4.0V	800	1000	-	cd/m^2
CIE Color Coordinate(without LCD)	X		Vak=4.0V	0.24	0.27	0.30	-
	Y		Vak=4.0V	0.24	0.27	0.30	-
LUMINOUS UNIFORMITY	Δ		Vak=4.0V	75%	-	-	%.

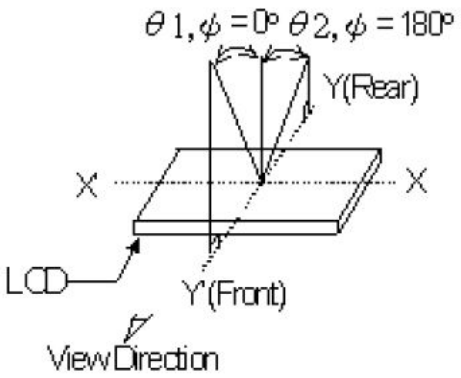
Note: Uniformity Δ=(minmum LV/maximum LV)*100%.

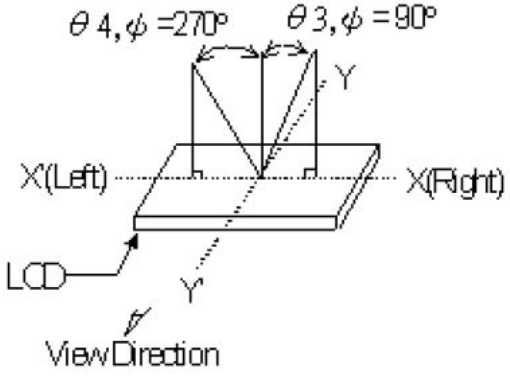
For operation above 25℃, The Ifm、Ifp & PD must be derated ,the Current derating is -0.36mA/℃for Dc drive and-0.9mA/℃ for pulsr drive,the power dissipation is -1.08 mW/℃, The product working current must not more than the 60 % of the Ifp according to the working temperature.

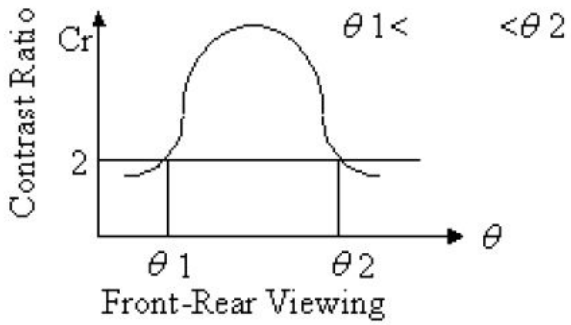
12. OPTICAL CHARACTERISTICS

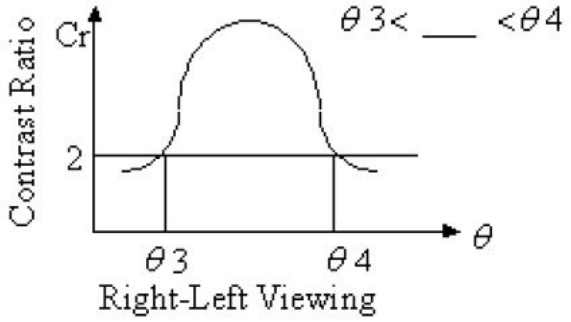
Item		Symbol	Temp.	Condition	Min.	Typ.	Max.	Unit.	Note
Response Time	Rise time	tr	-20℃	θ=0° φ=0°	-	2100	2500	mS	-
			25℃		-	120	250		
			60℃		-	38	45		
	fall time	tf	-20℃		-	4400	5300		
			25℃		-	200	240		
			60℃		-	65	80		
Viewing Angle		θ	25℃ Cr≥2	Φ=0°	-	30	-	deg.	-
				Φ=90°	-	30	-		
				Φ=180°	-	30	-		
				Φ=270°	-	40	-		
Contrast Ratio		Cr	25℃	θ=φ=0°	3	5	-	-	-

(1) DEFINITION OF VIEWING ANGLE



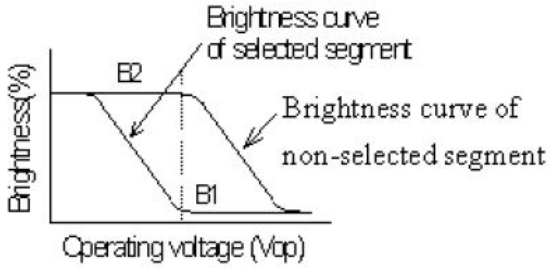




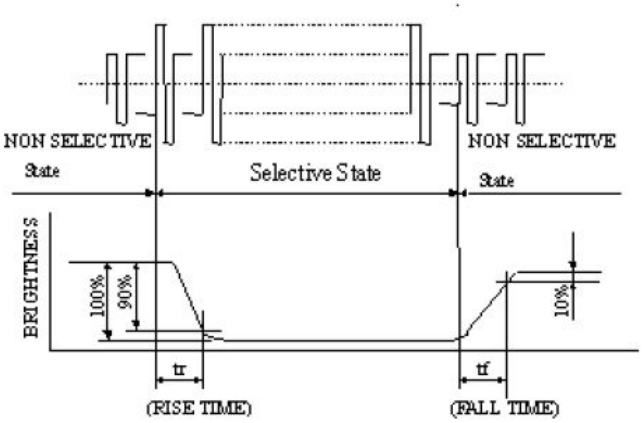


(2) DEFINITION OF CONTRAST

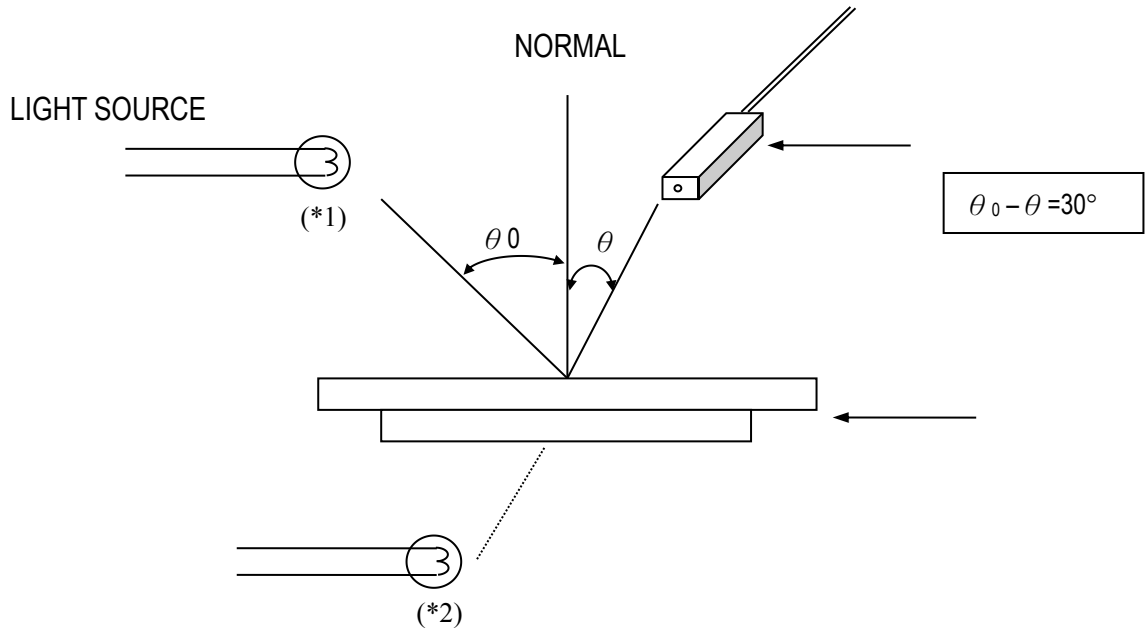
$$CR = \frac{\text{Brightness of non-selected segment (B2)}}{\text{Brightness of selected segment (B1)}}$$



(3) DEFINITION OF RESPONSE



(4) MEASURING INSTRUMENTS FOR ELECTRO-OPTICAL CHARACTERISTICS



*1.Light source position for measuring the reflective type of LCD panel

*2.Light source position for measuring the transflective / transmissive types of LCD panel

13. ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

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

Note: Test condition:

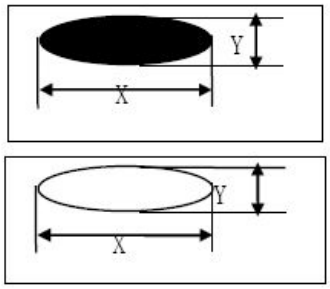
1) Temperature and humidity: if no specification, temperature set at 25+/-2℃, and humidity set at 60+/-5% RH.

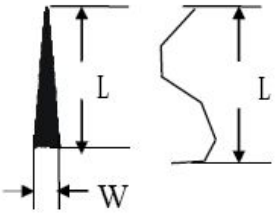
2)Operating state:all the tests to which the samples subject should be in operating condition.

14. RELIABILITY TEST

ITEM	CONDITIONS	CRITERION
Operating Temperature	HIGH TEMPERTURE 70℃ 120HRS	No defect in displaying and operational function
	LOW TEMPERTURE -20℃ 120HRS	
Storage Tempereature	HIGH TEMPERTURE +80℃ 120HRS	No defect in displaying and operational function
	LOW TEMPERTURE -30℃ 120HRS	
High Humidity & high Temp	40℃* 90%RH 120HRS	No defect in displaying and operational function
Vibration	• Operating Time: 30 minutes exposure for each direction (X,Y,Z) • Sweep Frequency: 10～55Hz (1 min) • Amplitude: 1.5mm	No defect in displaying and operational function
Thermal Shock	-20℃(30mins) ←→+70℃(30mins) 50 cycles	No defect in displaying and operational function

15. THE STANDARD OF INSPECTION





15-1 SAMPLING PLAN

Unless there is other agreement , sampling plan for incoming inspection should follow GB2828-2003.

15-1-1 Lot size: Quantity per shipment as one lot (different model as different lot .)

15-1-2 Sampling type: Normal inspection, single sampling.

15-1-3 Sampling level: Level II.

15-1-4 Acceptable Quality Level

Major defect: AQL=0.40

Minor defect: AQL=0.65

Total defect : AQL=0.65

15-2 PANEL INSPECTION CONDITION

15-2-1 Environment:Room Temperature: 25±5℃.Humidity: 55±5% RH.Illumination:800~1200Lux.

15-2-2 Inspection Distance：25±5 cm from the inspector to the module.

15-2-3 Inspection Angle:The vision of inspector should be perpendicular to the surface of the module.

16-3 MODULE INSPECTION STANDARDS

16-3-1 Defect definition

MAJOR:display or functional defects, serious deviation from the specifications, customers can not work properly; Severe skin defects, serious deviation from the specifications, the client does not work properly.

MINOR: slightly deviate from the specifications, does not affect the product function, but the appearance of an impact on product

Note: The following standard if no entities are specified, with mm meter.

15-3-2 Product area and size code definition

A area: said display active area(characters display)

B area: says visual area (except A area)

C area: the unvisual areas.

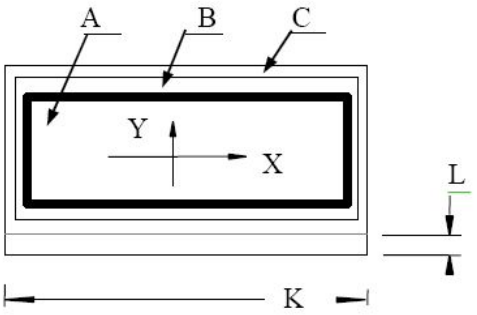
T: it saysthe thickness of the single glass

L: said glass pin lengths

K: said product length

X :said glass long side direction or glass edge direction along the length of the gap

Y :said glass short side direction or gap with glass edge along the vertical length



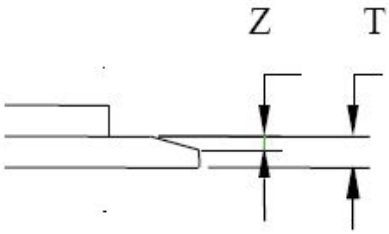
Z: the thickness of crack or gap

15-3-2 Point, line definition

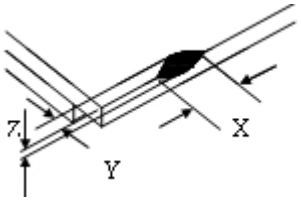
point: Φ = (X + Y) / 2

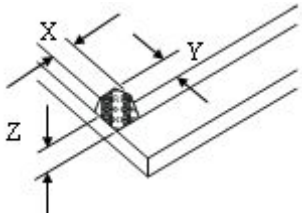
The length of the X says point length; Y says point width

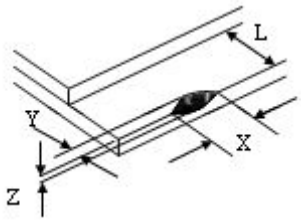
Line:L says the length of the line; W says line width

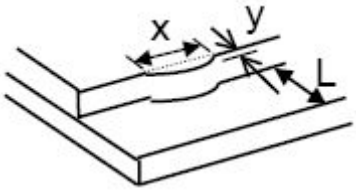


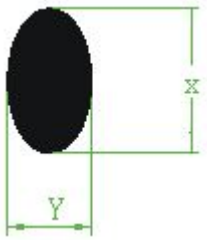
15-3-3 Inspection items and specification for appearance(power off)

<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
 

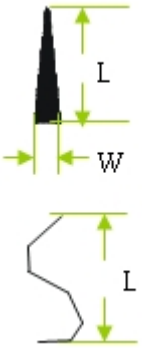
<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≥ K/8</td><td>Not over A area</td><td>≤T</td></tr></table>
2、corner
 

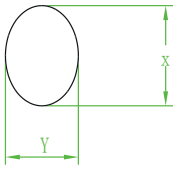
<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≥ K 8</td><td>Not over A area</td><td>No check</td></tr></table>
3、contact pad crack
 

<table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≥ K/8</td><td>≥ L/3</td><td>No check</td></tr></table>
4、Substrate protuberance and internal crack
 

<table><tr><td>X</td><td>Y</td></tr><tr><td>≥ K/8</td><td>≥ L/3</td></tr></table>
Transfer position crack: ≤L/5</td><td>2.50</td></tr>
<tr><td>3</td><td>Black dot \
White dot</td><td> 

<table><tr><td rowspan="2">D</td><td colspan="2">Acceptable of defect</td></tr><tr><td>A/B Area</td><td>C Area</td></tr><tr><td>D＜0.2</td><td>No check</td><td rowspan="4">No check</td></tr><tr><td>0.2≤D＜0.3</td><td>2</td></tr><tr><td>0.3≤D≤0.5</td><td>1</td></tr><tr><td>D>0.5</td><td>0</td></tr></table>
X: long diameter
Y: shot diameter
D: average of diameter D=(X+Y)/2</td><td>2.50</td></tr>
</table>

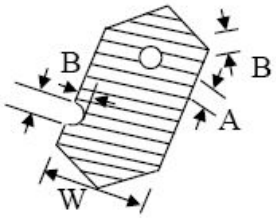
<table>
<tr>
<td>4</td>
<td>Line defect</td>
<td>


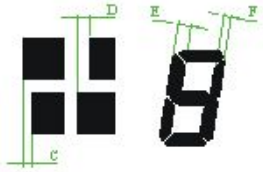
<table>
<tr><td rowspan="2">Length</td><td rowspan="2">hidth</td><td colspan="2">Acceptable of defect</td></tr>
<tr><td>A/B Area</td><td>C Area</td></tr>
<tr><td>accept</td><td>W≤0.02</td><td>No check</td><td rowspan="3">No check</td></tr>
<tr><td>L≤3</td><td>W≤0.05</td><td>2</td></tr>
<tr><td rowspan="2">L≤2.5</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>


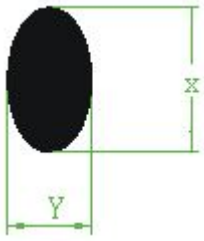
<table>
<tr><td rowspan="2">D</td><td colspan="2">Acce
table of defect</td></tr>
<tr><td>A/B Area</td><td>C Area</td></tr>
<tr><td>D≤0.2</td><td>No check</td><td rowspan="4">No check</td></tr>
<tr><td>0.2≤D≤0.5</td><td>3</td></tr>
<tr><td>0.5≤D≤1.0</td><td>2</td></tr>
<tr><td>D＞1.0</td><td>0</td></tr>
</table>
</td>
<td>2.50</td>
</tr>
<tr>
<td>6</td>
<td>External print of panel</td>
<td>Transfigure、pin hole：same as segment transfinguer
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>The char 、wrong edition、bresking off circuit、crack and air-logged orifice are unreceivable for PCB.
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>deflexion of component≤1/3width of component
Trying to keep dot of soldering tin orbicular
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>Break and distortion are unreceivable for frame.
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>

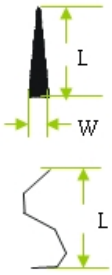
15-3-4Inspection items and specification for display defect(power on)

1	Electrical Defect		Segment missing	Not allow	1.0
			Segment s ort	Not allow	
			Non-display	Not allow	

<table>
<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> 

X: long diameter
Y: shot diameter
D: average diameter　　D=(X+Y)/2
<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></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>

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 polarizer 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 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.

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 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.

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.

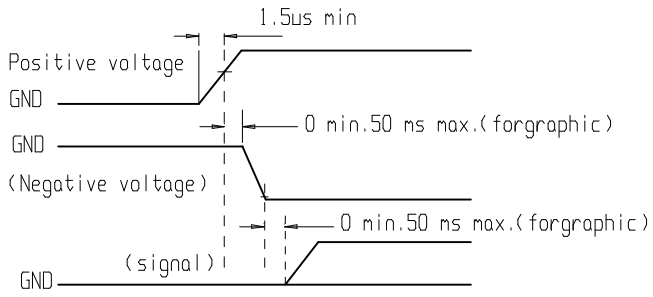
(3) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted 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 180hrs. 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 leakes out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

14-7 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.

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.