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**SPECIFICATION
FOR
LCM MODULE**

**MODULE NO.: GGG12864A05-A01
DOC.REVISION: 00**

Customer Approval:

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	SIGNATURE	DATE
PREPARED BY (RD ENGINEER)		
PREPARED BY (QA ENGINEER)		
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CONTENTS

1. Functions & Features	2
2. Mechanical specifications	2
3. Block diagram	2
4. Dimensional outline	3
5. LCD driving voltage generator and bias reference circuit	4
6. Pin description	4-5
7. Maximum absolute limit	6
8. Electrical characteristics	7-8
9. Timing characteristics	8-11
10. Control and display command	12
11. Electro-Optical characteristics	13
12. Backlight characteristics	13
13. Precaution for using LCD/LCM	14-15
14. LCM test criteria	16-25

1. FUNCTIONS & FEATURES

- | | |
|--|------------------------------|
| 1.1. Format | : 128x64 Dots |
| 1.2. LCD mode | : STN/Positive/Transflective |
| 1.3. Viewing direction | : 6 o'clock |
| 1.4. Driving scheme | : 1/65 Duty cycle, 1/9 Bias |
| 1.5. Power supply voltage (V _{DD}) | : 3.3V |
| 1.6. LCD driving voltage (VLCD) | : 9.8V |
| 1.7. Operation temp | : -20~70°C |
| 1.8. Storage temp | : -30~80°C |
| 1.9. Back light | : Yellow-Green |
| 1.10. RoHS compliant. | |

2. MECHANICAL SPECIFICATIONS

- | | |
|-------------------|--|
| 2.1. Module size | : 80.0mm(L)*54.0mm(Excluding FPC length 46.0mm) (W)*9.7mm(H) |
| 2.2. Viewing area | : 70.7mm(L)*38.8mm(W) |
| 2.3. Dot pitch | : 0.52mm(L)*0.52mm(W) |
| 2.4. Dot size | : 0.48mm(L)*0.48mm(W) |
| 2.5. Weight | : Approx. |

3. BLOCK DIAGRAM

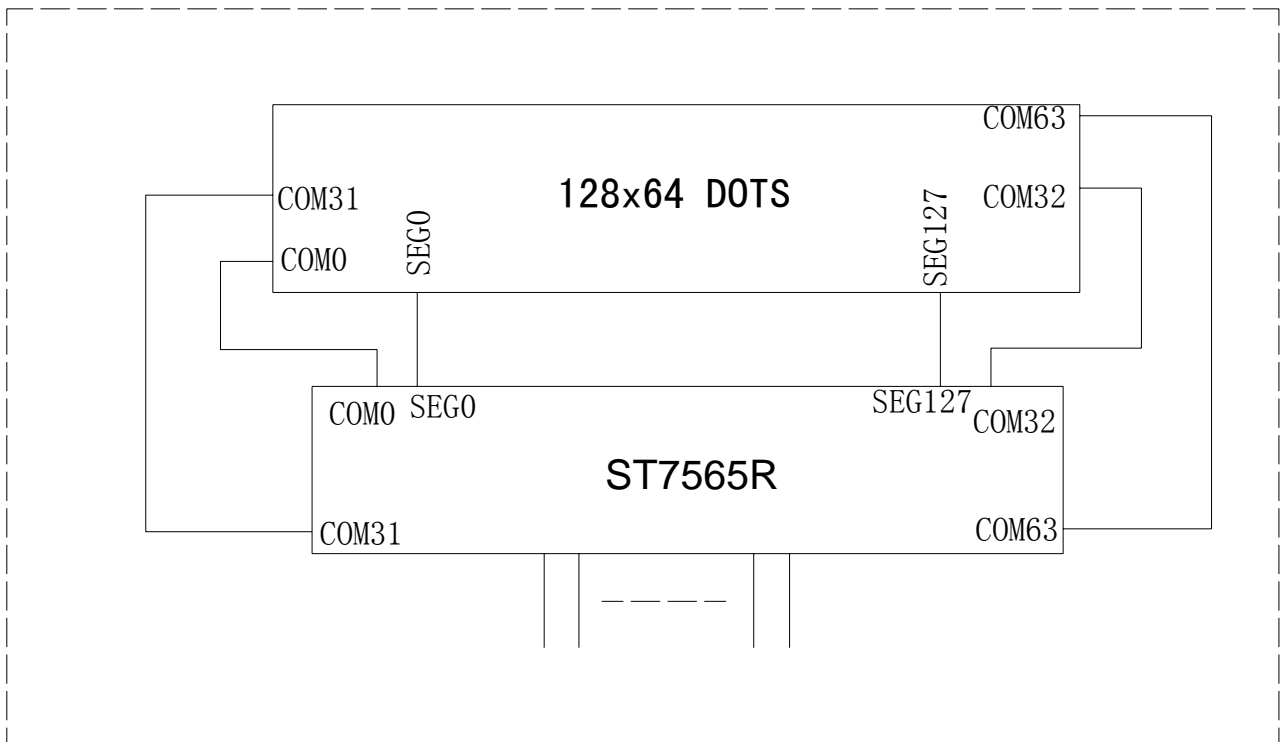


Figure 1. Block diagram

4. DIMENSIONAL OUTLINE

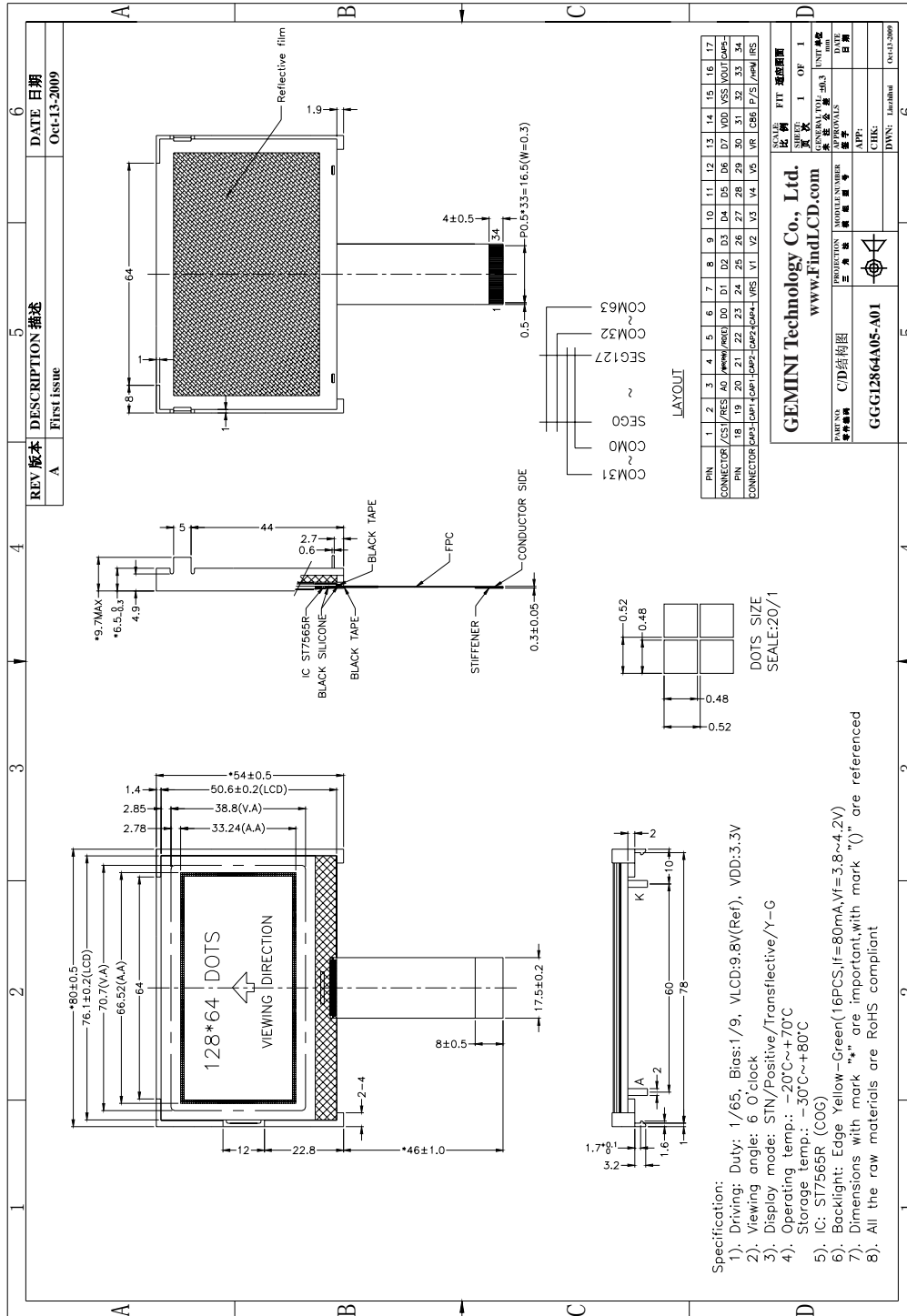


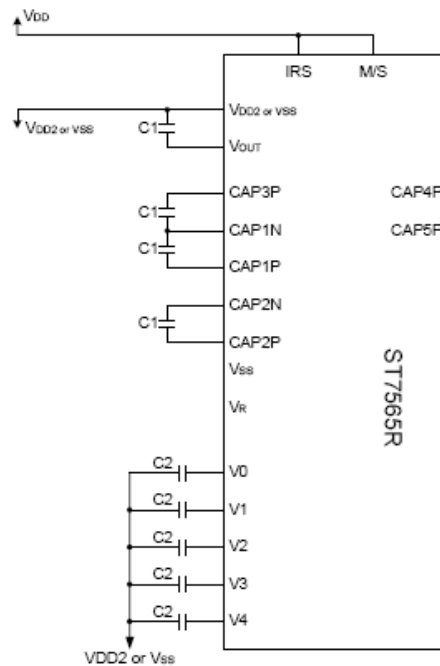
Figure2. Dimensional outline

5. LCD DRIVING VOLTAGE GENERATOR AND BIAS REFERENCE

CIRCUIT

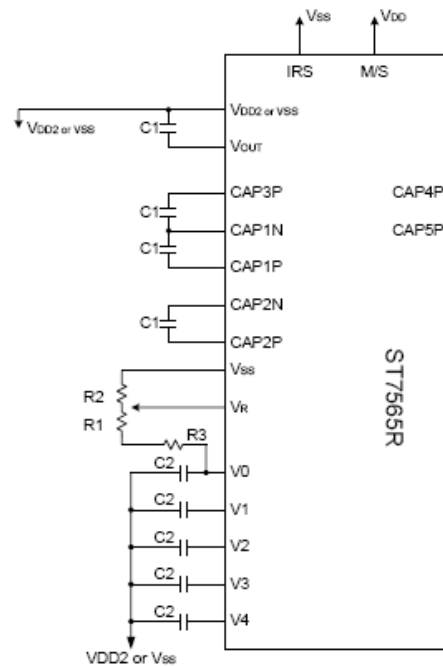
(1) When the voltage regulator internal resistor is used.

(Example where $V_{DD2} = V_{DD}$, with 4x step-up)



(2) When the voltage regulator internal resistor is not used.

(Example where $V_{DD2} = V_{DD}$, with 4x step-up)



NOTE: Reference circuit used 4 times booster circuit (Have been designed in the PCB).

- Recommended component values: C1: 1.0 to 4.7uF; C2: 0.47~1.0uF
- C1, C2 is determined by the size of the LCD being driven. Select a value that will stabilize the liquid crystal drive voltage.
- Ra and Rb maybe changed in mass productions to keep the consistency of display contrast.

6. PIN DESCRIPTION

No.	Symbol	Function
1	/CS1	Chip select signal.
2	/RES	Reset signal.
3	A0	This is connected 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.
4	/WR(RW)	8080 Series: this is the write control signal. 6800 Series: this is the read/write control signal input terminal. When R/W = "H": Read. When R/W = "L": Write.
5	/RD(E)	8080 Series: this is the read control signal. 6800 Series: this is the enable clock input terminal.



6~13	D0~D7	This is an 8-bit bi-directional data bus that connects to an 8-bit standard MPU data bus. When the serial interface is selected (P/S = "L") : D7 : serial data input (SI) ; D6 : the serial clock input (SCL). D0 to D5 are set to high impedance.
14	VDD	Power Supply (+3.3V).
15	VSS	Power GND.
16	VOUT	DC/DC voltage converter. Connect a capacitor between this terminal and VSS.
17	CAP5-	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1+ terminal.
18	CAP3-	
19	CAP1+	
20	CAP1-	
21	CAP2-	
22	CAP2+	
23	CAP4-	
24	VRS	This is the internal-output VREG power supply for the LCD power supply voltage regulator.
25~29	V1~V5	This is a multi-level power supply for the liquid crystal drive.
30	VR	Output voltage regulator terminal. Provides the voltage between VDD and V5 through a resistive voltage divider.
31	C86	This is the MPU interface switch terminal. C86 = "H": 6800 Series MPU interface. C86 = "L": 8080 MPU interface.
32	P/S	This is the parallel data input/serial data input switch terminal. P/S = "H": Parallel data input. P/S = "L": Serial data input.
33	HPM	This is the power control terminal for the power supply circuit for liquid crystal drive. /HPM = "H": Normal mode /HPM = "L": High power mode
34	IRS	This terminal selects the resistors for the V5 voltage level adjustment. IRS = "H": Use the internal resistors IRS = "L": Do not use the internal resistors. The V5 voltage level is regulated by an external resistive voltage divider attached to the VR terminal

7. MAXIMUM ABSOLUTE LIMIT

Maximum Ratings (Voltage Reference to VSS)(for IC)

Parameter		Symbol	Conditions	Unit
Power Supply Voltage		VDD	-0.3 ~ 3.6	V
Power supply voltage (VDD standard)		VDD2	-0.3 ~ 3.6	V
Power supply voltage (VDD standard)		V ₀ , V _{OUT}	-0.3 ~ 13.5	V
Power supply voltage (VDD standard)		V ₁ , V ₂ , V ₃ , V ₄	-0.3 to V ₀	V
Operating temperature		T _{OPR}	-30 to +85	°C
Storage temperature	Bare chip	T _{STR}	-65 to +150	°C

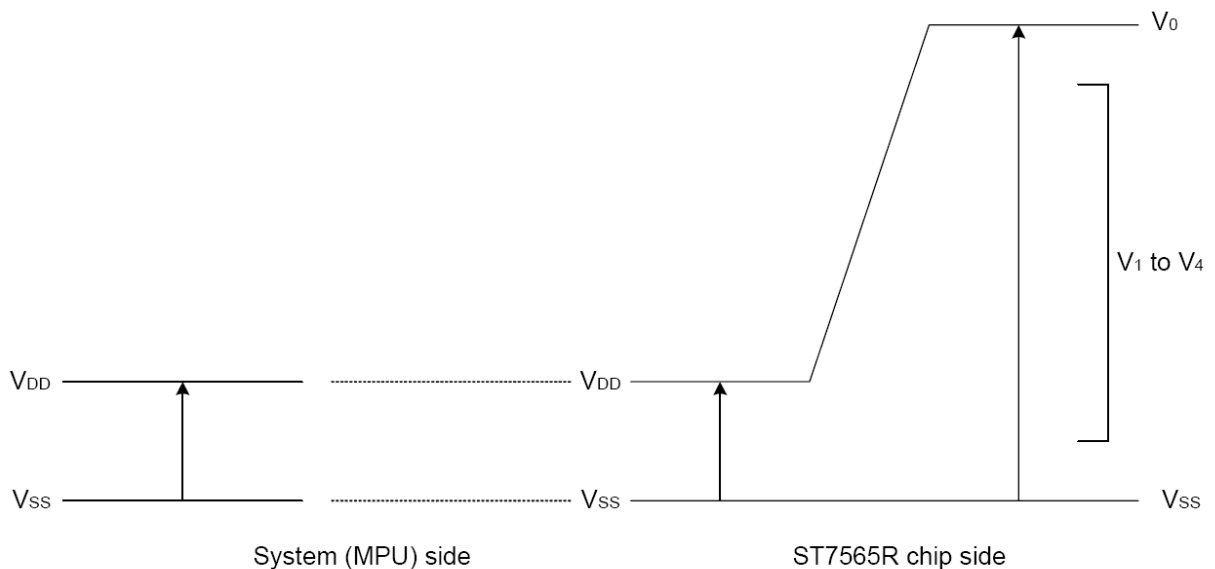


Figure 30

Notes and Cautions

1. The VDD2, V₀ to V₄ and V_{OUT} are relative to the VSS = 0V reference.
2. Insure that the voltage levels of V₁, V₂, V₃, and V₄ are always such that V_{OUT} ≥ V₀ ≥ V₁ ≥ V₂ ≥ V₃ ≥ V₄.
3. Permanent damage to the LSI may result if the LSI is used outside of the absolute maximum ratings. Moreover, it is recommended that in normal operation the chip be used at the electrical characteristic conditions, and use of the LSI outside of these conditions may not only result in malfunctions of the LSI, but may have a negative impact on the LSI reliability as well.



8. ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

Item	Symbol	Condition	Rating			Units	Applicable Pin		
			Min.	Typ.	Max.				
Operating Voltage (1)	V _{DD}		2.7	—	3.3	V	V _{DD} *1		
Operating Voltage (2)	V _{DD2}	(Relative to V _{SS})	2.7	—	3.3	V	V _{DD}		
High-level Input Voltage	V _{IHC}		0.8 x V _{DD}	—	V _{DD}	V	*3		
Low-level Input Voltage	V _{ILC}		V _{SS}	—	0.2 x V _{DD}	V	*3		
High-level Output Voltage	V _{OHC}	I _{OH} = -0.5 mA	0.8 x V _{DD}	—	V _{DD}	V	*4		
Low-level Output Voltage	V _{OLC}	I _{OL} = 0.5 mA	V _{SS}	—	0.2 x V _{DD}	V	*4		
Input leakage current	I _{LI}	V _{IN} = V _{DD} or V _{SS}	-1.0	—	1.0	μA	*5		
Output leakage current	I _{LO}	V _{IN} = V _{DD} or V _{SS}	-3.0	—	3.0	μA	*6		
Liquid Crystal Driver ON Resistance	R _{ON}	Ta = 25°C (Relative to V _{SS})	V ₀ = 13.0 V	—	2.0	3.5	KΩ	SEn COMn *7	
			V ₀ = 8.0 V	—	3.2	5.4			
Static Consumption Current	I _{SSQ}	V ₀ = 13.0 V (Relative To V _{SS})	—	0.01	2	μA	V _{DD} , V _{DD2}		
Output Leakage Current	I _{OQ}		—	0.01	10	μA	V ₀		
Input Terminal Capacitance	C _{IN}	Ta = 25°C, f = 1 MHz	—	5.0	8.0	pF			
Oscillator Frequency	Internal Oscillator	f _{OSC}	1/65 duty 1/33 duty	Ta = 25°C	17	20	24	kHz	*8
	External Input	f _{CL}			17	20	24	kHz	CL
	Internal Oscillator	f _{OSC}	1/49 duty 1/53 duty 1/55 duty	Ta = 25°C	25	30	35	kHz	*8
	External Input	f _{CL}			25	30	35	kHz	CL

Table 19

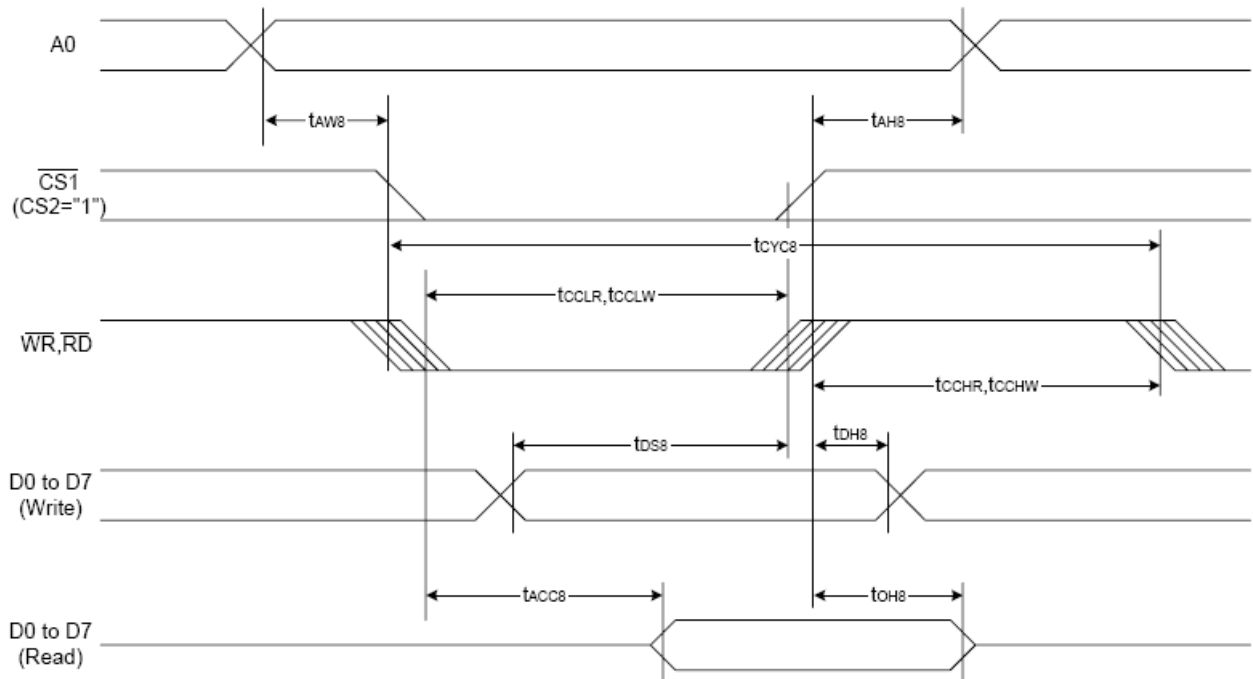
Item	Symbol	Condition	Rating			Units	Applicable Pin	
			Min.	Typ.	Max.			
Internal Power	Input voltage	V _{DD2}	(Relative To V _{SS})	2.7	—	3.3	V	V _{DD}
	Supply Step-up output voltage Circuit	V _{OUT}	(Relative To V _{SS})	—	—	13.5	V	V _{OUT}
	Voltage regulator Circuit Operating Voltage	V _{OUT}	(Relative To V _{SS})	6.0	—	13.5	V	V _{OUT}
	Voltage Follower Circuit Operating Voltage	V ₀	(Relative To V _{SS})	4.0	—	13.5	V	V ₀ *9
	Base Voltage	V _{RS}	Ta = 25°C, (Relative To V _{SS}) -0.05%/°C	2.07	2.10	2.13	V	*10

References for items market with *

- *1 While a broad range of operating voltages is guaranteed, performance cannot be guaranteed if there are sudden fluctuations to the voltage while the MPU is being accessed.
- *2 The operating voltage range for the V_{SS} system and the V₀ system is. This applies when the external power supply is being used.
- *3 The A0, D0 to D5, D6 (SCL), D7 (SI), /RD (E), /WR (R/W), /CS1, CS2, CLS, CL, FR, C86, P/S, /DOF, /RES, IRS, and /HPM terminals.
- *4 The D0 to D7, FR, /DOF, and CL terminals.
- *5 The A0, /RD (E), /WR (R/W), /CS1, CS2, CLS, C86, P/S, /RES, IRS, and /HPM terminals.
- *6 Applies when the D0 to D5, D6 (SCL), D7 (SI), CL, FR, and /DOF terminals are in a high impedance state.
- *7 These are the resistance values for when a 0.1 V voltage is applied between the output terminal SEG_n or COM_n and the various power supply terminals (V₁, V₂, V₃, and V₄). These are specified for the operating voltage (3) range.
 $R_{ON} = 0.1 \text{ V} / \Delta I$ (Where ΔI is the current that flows when 0.1 V is applied while the power supply is ON.)
- *8 See Table 23 for the relationship between the oscillator frequency and the frame rate frequency.
- *9 The V₀ voltage regulator circuit regulates within the operating voltage range of the voltage follower.
- *10 This is the internal voltage reference supply for the V₀ voltage regulator circuit. In the ST7565R, the temperature range approximately $-0.05\%/^{\circ}\text{C}$.

9. TIMING CHARACTERISTICS

System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)

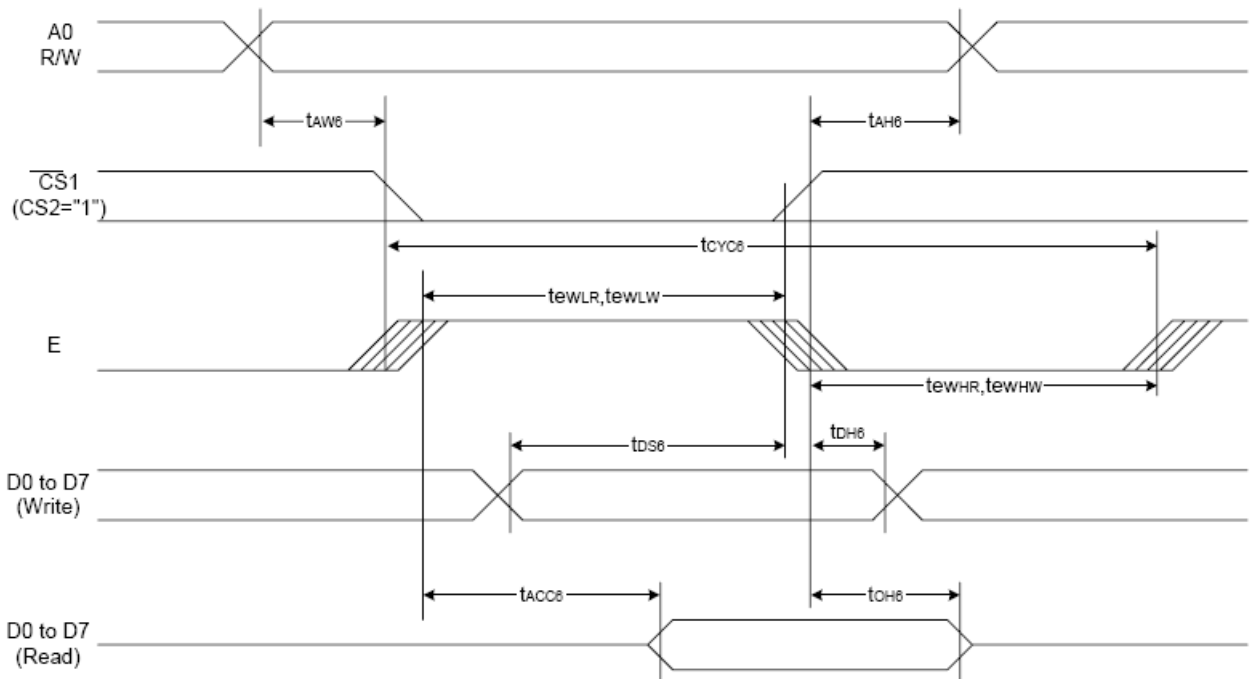




(VDD = 3.3V, Ta = -30 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	t _{AH8}		0	—	Ns
Address setup time		t _{AW8}		0	—	
System cycle time		t _{CYC8}		240	—	
Enable L pulse width (WRITE)	WR	t _{CCLW}		80	—	
Enable H pulse width (WRITE)		t _{CCHW}		80	—	
Enable L pulse width (READ)	RD	t _{CCLR}		140	—	
Enable H pulse width (READ)		t _{CCHR}		80	—	
WRITE Data setup time	D0 to D7	t _{DS8}		40	—	
WRITE Address hold time		t _{DH8}		0	—	
READ access time		t _{ACC8}	CL = 100 pF	—	70	
READ Output disable time		t _{OH8}	CL = 100 pF	5	50	

System Bus Read/Write Characteristics 2 (For the 6800 Series MPU)

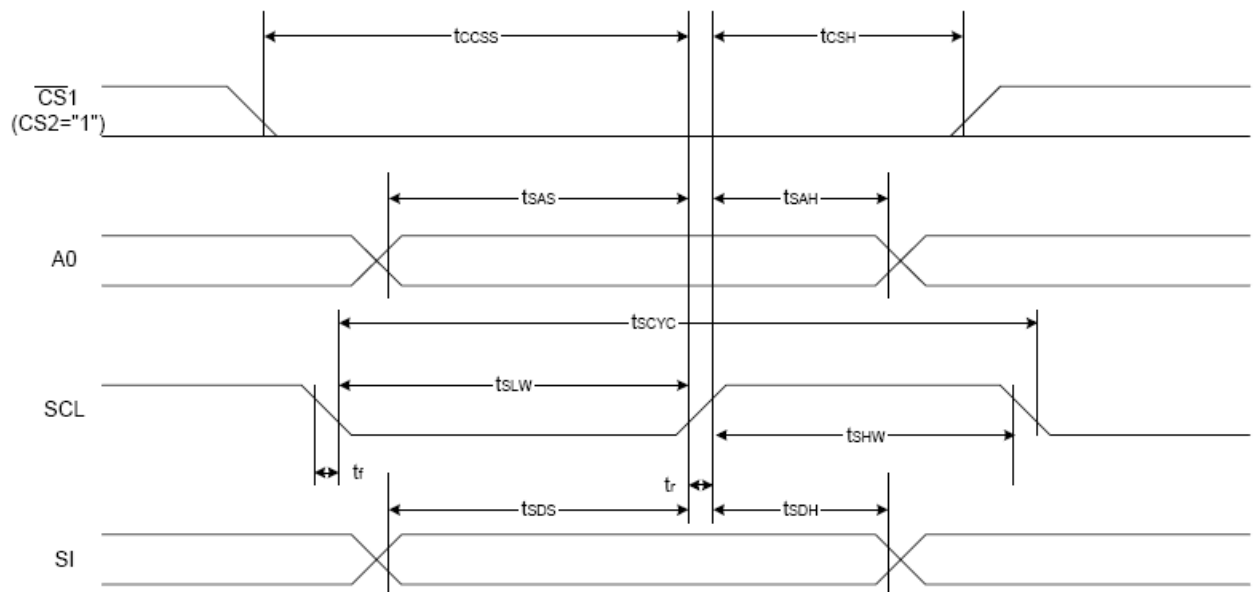




(VDD = 3.3V, Ta = -30 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
Address hold time	A0	t _{AH6}		0	—	ns
Address setup time		t _{AW6}		0	—	
System cycle time		t _{CYC6}		240	—	
Enable L pulse width (WRITE)	WR	t _{EWLW}		80	—	
Enable H pulse width (WRITE)		t _{EWHW}		80	—	
Enable L pulse width (READ)	RD	t _{EWLR}		80	—	
Enable H pulse width (READ)		t _{EWHR}		140	—	
WRITE Data setup time	D0 to D7	t _{DS6}		40	—	
WRITE Address hold time		t _{DH6}		0	—	
READ access time		t _{ACC6}	CL = 100 pF	—	70	
READ Output disable time		t _{OH6}	CL = 100 pF	5	50	

The 4-line SPI Interface

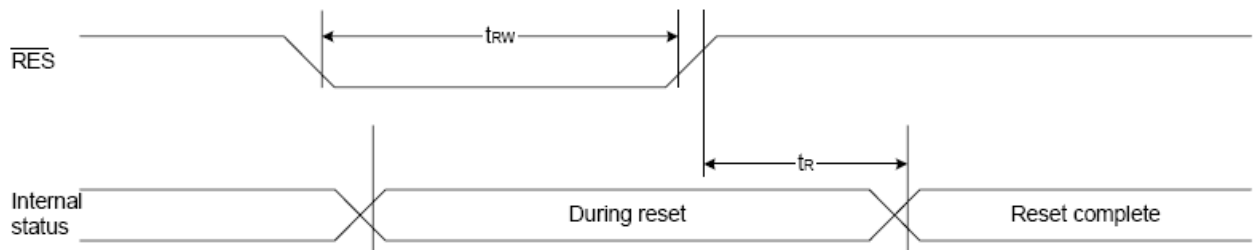




(VDD = 3.3V, Ta = -30 to 85°C)

Item	Signal	Symbol	Condition	Rating		Units
				Min.	Max.	
4-line SPI Clock Period	SCL	T_{scyc}		50	—	ns
SCL "H" pulse width		T_{shw}		25	—	
SCL "L" pulse width		T_{slw}		25	—	
Address setup time	A0	T_{sas}		20	—	
Address hold time		T_{sah}		10	—	
Data setup time	SI	T_{sds}		20	—	
Data hold time		T_{sdh}		10	—	
CS-SCL time	CS	T_{css}		20	—	
CS-SCL time		T_{csh}		40	—	

RESET TIMING



(VDD = 3.3V, Ta = -30 to 85°C)

Item	Signal	Symbol	Condition	Rating			Units
				Min.	Typ.	Max.	
Reset time		t_r		—	—	1.0	us
Reset "L" pulse width	/RES	t_{rw}		1.0	—	—	us



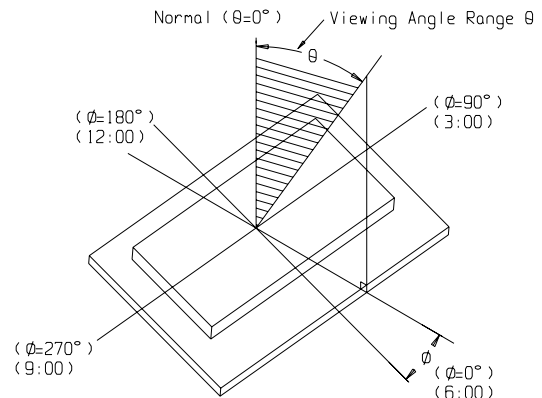
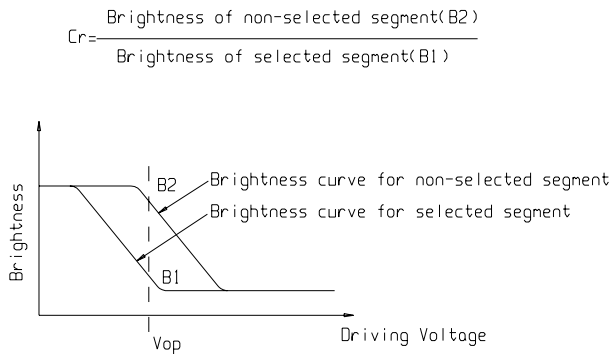
10. CONTROL AND DISPLAY COMMAND

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	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	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.
Column address set lower bit				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	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	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	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	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	*	*	*	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) Sleep mode set	0	1	0	1	0	1	0	1	1	0	0	0: Sleep mode, 1: Normal 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
(21) NOP	0	1	0	1	1	1	0	0	0	1	1	Command for non-operation
(22) Test	0	1	0	1	1	1	1	*	*	*	*	Command for IC test. Do not use this command

11. ELECTRO-OPTICAL CHARACTERISTICS

(V_{DD} = 3.3V, Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage for LCD	V _{op}	Ta = -20°C	10.1	10.3	10.5	V
		Ta = 25°C	9.5	9.8	10.1	
		Ta = 70°C	9.1	9.3	9.5	
Response time	T _r	Ta = 25°C	---	250	500	ms
	T _f		---	300	600	ms
Contrast	Cr	Ta = 25°C	2	4	---	---
Viewing angle range	θ	Cr ≥ 2	-35	---	+35	deg
	Φ		-35	---	+40	deg



12. BACK LIGHT CHARACTERISTICS

LCD Module with edge LED Backlight. Electrical ratings. Ta = 25°C

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=80mA	3.8	4.0	4.2	V
Reverse Current	IR	VR=8V	---	80	--	uA
Luminous Intensity (With LCD dots off)	IV	IF=80mA	70	80	---	Cd/m ²
Wave length	λ _p	IF=80mA	570---575			nm
Color	yellow-green					

13. PRECAUTION FOR USING LCD/LCM

After reliability test, recovery time should be 24 hours minimum. Moreover, functions, performance and appearance shall be free from remarkable deterioration within 50,000 hours(average) under ordinary operating and storage conditions room temperature ($20\pm 8^{\circ}\text{C}$), normal humidity (below 65% RH), and in the area not exposed to direct sun light. Using LCM beyond these conditions will shorten the life time.

Precaution for using LCD/LCM

LCD/LCM is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification. The followings should be noted.

General Precautions:

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isopropyl alcohol, ethyl alcohol or trichlorotrifluoroethane, do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not make any modification on the PCB without consulting Gemini.
5. When mounting a LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.
7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

Static Electricity Precautions:

1. CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.
2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.



5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

Soldering Precautions:

1. Soldering should be performed only on the I/O terminals.
2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature: $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

Operation Precautions:

1. The viewing angle can be adjusted by varying the LCD driving voltage V_o .
2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage over 40°C is required, the relative humidity should be kept below 60%, and avoid direct sunlight.

Limited Warranty

Gemini LCDs and modules are not consumer products, but may be incorporated by Gemini customers into consumer products or components thereof, Gemini does not warrant that its LCDs and components are fit for any such particular purpose.

1. The liability of Gemini is limited to repair or replacement on the terms set forth below. Gemini will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between Gemini and the customer, Gemini will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with Gemini general LCD inspection standard . (Copies available on request)
2. No warranty can be granted if any of the precautions state in handling liquid crystal display above has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.
3. In returning the LCD/LCM, they must be properly packaged; there should be detailed description of the failures or defect.

14. LCM TEST CRITERIA

1. Objective

The criteria is made for customer and company to check on delivery LCM end product, guarantee the production quality to meet with customer's demand.

2. Range

2.1 Suit for our company's LCD end production.

3. Testing equipment

Function tester、sliding calipers、microscope、visual magnifying glass、ESD arm protector、finger cover、label、high-low temperature experiment case、refrigerator、fixed-voltage power supply (DC) , table lamp and so on.

4. Sampling plan and quote superscript

4.1.1 According to GB/T 2828.1---2003/ISO2859-1:1999, normal check of one sampling plan, general level of inspection II.

Testing item	Sample quantity	AQL judgment
cosmetic	II one time sample	MA=0.4 MI=1.5
scale	N=3	C=0
function	II one time sample	MA=0.4 MI=1.5

4. 1. 2 GB/T 2828.1---2003/ISO2859-1:1999 check and count the sampling procedure and table one by one.

4. 1. 3 GB/T 1619.96 Test method of twisting out LCD device.

4. 1. 4 GB/T 12848.91 General standard of super-out LCD device.

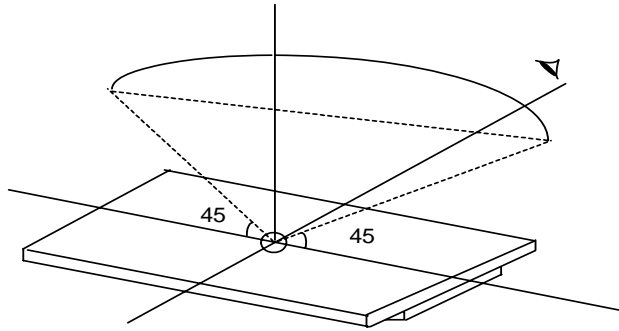
4. 1. 5 GB2421-89 Basic experience environment of electrical and electronic products

4. 1. 6 IPC-A-610C Check condition of electrical assemblies.

5. Test condition and basis

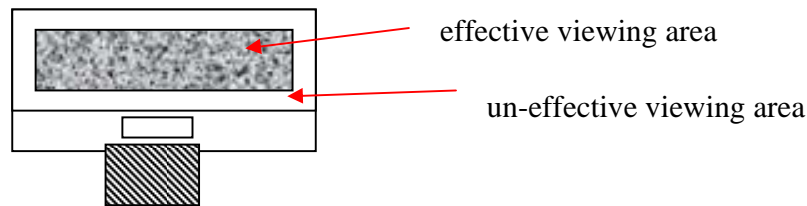
5. 1 visual: General under the condition of $25\pm 5^{\circ}\text{C}$, $45\pm 20\% \text{RH}$, with enough light ($>300\text{cd}/\text{cm}^2$) , the distance between operator and LCD is 30cm, use the method of reflective to test is normal, the backlight products, must test under the condition of luminance smaller than $100\text{cd}/\text{cm}^2$, and lit up the backlight.

5.2 The test left and right direction is 45° , up and down view angle is $0-45^\circ$



(STN depends on $-20-55^\circ$) to have a test, as follows:

5.3 Viewing area definition



5.4 Naked eye examination (except with assistant of magnifying glass to do defect test) .

5.5 Electricity property

Testing use self-made/professional LCM test installation: contrast with the products file and designed drawing, ask for the display content and parameters accord with the document, and the result in line with the pattern



5.5.1 Testing voltage (V) : Refer to the requirement of test device, customer have no special statement, think the external circuit adjustable, effect controlled in agreed voltage fluctuation (without special agreement, accord to LCD driving voltage at 9V or bellowed control in $\pm 0.3V$, above 9V, at least is LCD driving voltage $\pm 3\%$) , to the products with special voltage demand, assurance display effect through circuit adjust, when necessary made the maximum and minimum receivable samples.


5.5.2 Power consumption of electric current (I) : refer to product document or designed blueprint identify.

6. Defective item and testing criteria

6.1 Scale: To the whole cosmetic scale and which could influence the assemble position , should accord to the drawing, main defect.

6.2 capacity test:

order	item	description	MAJ	MIN	Accept standard
6.2.1	Segment missing	SEG/COM showed line or spot missing caused by line break/bad connection, inner short 	✓		reject
6.2.3	No display/no action	Normal connection, no display	✓		reject
6.2.4	mistake/abnormal	Accord to common scanner procedure, picture and order inconsistent with requirement	✓		reject
6.2.5	Viewing angle mistake	The clearest direction inconsistent with requirement	✓		reject
6.2.6	Display dark/light	Normal display the whole ratio too light or dark	✓		Over voltage standard ,reject
6.2.7	Slow reflect	Reflection of lit or off on part dose not uniform with others.	✓		reject
6.2.8	Show more symbol, more lines and rows	due to lack of matching unrighteousness or etched caused alignment or logo when lit display of symbols, row or line.		✓	refer to spot/line standard
6.2.9	light/dim segment	On the condition of normal voltage, the display contrast is not uniformed		✓	Reject or refer to samples
6.2.10	PI black/white spot	Poor connect in LCD lead to black/white spot in word change procedure		✓	Suspend ed screen , refer to spot/line , others OK
6.2.11	pinhole/white spot	ITO missing lead to picture incomplete when lit up  $d = (X+Y)/2$		✓	refer to spot/line standard


6.2.12	word deformed	Mistaken match caused the display width dose not conform to standard, then lead to convex or air leakage: $ a-Ib \leq 1/4W$ (W is the normal width)		√	accept $ a-Ib > 1/4W$, reject
6.2.13	High current	LCM current exceed requirement		√	reject

6.3 LCD visual defect

6.3.1 spot defect (controlled in viewing area, in un-viewing area, OK)

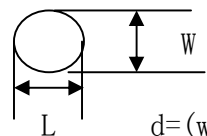
Defective item	average diameter (d)	Accept number	MAJ	MIN
Spot defect (black spot, impurity, pinhole,, contain LC defect)	$d \leq 0.2$	3		√
	$0.2 < d \leq 0.25$	2		
	$0.25 < d \leq 0.30$	1		

6.3.2 Line defect (controlled in viewing area, in un-viewing area, OK)

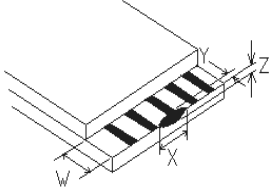
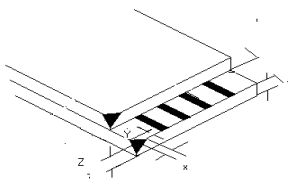
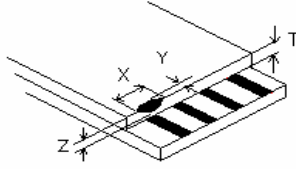
Defective item	length(L)	width(W)	Accept number	MAJ	MIN
line defect (segment, impurity) 	≤ 5.0	≤ 0.02	3		√
	≤ 3.0	≤ 0.03	3		
	≤ 3.0	≤ 0.05	1		

note: 1.when width is bigger than 0.1, it needs to handle as line defect.

6.3.3 polarizer air bubble (controlled in viewing area, in un-viewing area, OK)

Defective item	average diameter (d)	Accept number	MAJ	MIN
polarizer air bubble、convex point 	$d \leq 0.3$	3		√
	$0.3 < d \leq 0.5$	2		
	$0.5 < d \leq 0.8$	1		

6.3.4 Damaged (LCD edge reveal without mental frame, contain COG, H/S, deduct BL directly)

order	item	Permit standard		MAJ	MIN
6.3.4.1	Conductor chips 		(mm)		√
		X	$\leq 1/8L$		
		Y	$\leq 1/3W$		
		Z	$\leq 1/2t$		
		Accept number	2		
When $Y \leq 0.2\text{mm}$, neglect the length of X, un-conductor chips, depend on $X \leq 1/10L$, $Y \leq 1/2W$.					
6.3.4.2	chips(ITO lead position) 		(mm)	MAJ	MIN
		X	Not enter into frit or do not attach the conductor		√
		Y			
		Z	$\leq t$		
		Accept number	2		
Seal position refer to 6.3.4.3, do not enter into frame black edge. Chips damage the conducting, refer to 6.3.4.1					
6.3.4.3	interface seal rubber crack (outer crack) 		(mm)	MAJ	MIN
		X	$\leq 1/8 L$		√
		Y	$\leq 1/2H$		
		z	$\leq 1/2t$		
		Accept number	2		
Seal edge rubber inner crack conform to the standard of outer. when the back of stage cracked refer to 6.3.4.1.					
note: t---glass thickness, L---length, H---distance. W—glass stage width					

6.3.5 others

order	item	description	MAJ	MIN	Accept standard
6.3.5.1	coloration/background	One product, different color		√	Reject or refer to limited sample
6.3.5.2	Leak ink(LC)	/	√		reject



6.3.5.3	Without protect film	/		√	reject
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6.4 backlight components

order	item	description	MAJ	MIN	Accept standard
6.4.1	Backlight unlit, wrong color	/	√		reject
6.4.2	Color deviation	Lit up, color differ from the sample, or do not match the drawing after testing		√	Refer to sample and drawing
6.4.3	Brightness deviation	Lit up, lightness differ from the sample, or do not match the drawing after testing, or over the sample range of±30%.		√	Refer to sample and drawing
6.4.4	LED uneven	Lit up, brightness uneven, exceed the drawing specification.		√	Refer to sample and drawing
6.4.5	Spot/line segment	There are tainted, segment when lit up.		√	Refer to 6.3.1/6.3.2

6.5 Mental frame

order	item	description	MAJ	MIN	Accept standard
6.5.1	material/surface	Mental frame/surface approach inconsistent with specification.	√		reject
6.5.2	Twist un-quality/without twisting	Twist method/direction default,	√		reject
6.5.3	oxidation, paint stripping, discoloration, dent ,segment	The surface of the mental frame dose not appear oxidation, front surface paint stripping and segment to bottom≤0.8mm, exceed 3 point, length≤5.0mm, width≤0.05mm line defect exceed 2 point, positive dent, bubble and side surface have paint stripping and segment to bottom≤1.0mm exceed 3 point, width≤0.05mm line defect exceed 3 point.		√	reject
6.5.4	prick	Prick is too long, enter into viewing area		√	reject

6.6 PCB/COB part

order	item	description	MAJ	MIN	Accept standard
6.6.1	Seal rubber defect	<ol style="list-style-type: none"> 1. COB inner round white remark line have PAD out reveal.. 2. height exceed the document/drawing specification. 3. COB seal rubber should in white remark, the largest out scale can not exceed remark radius 2MM 4. COB surface has clear lien assemble mark, some even through the pinhole. 5. COB surface pinhole diameter over 0.25mm or have tainted.. 		√	reject
6.6.2	PCB cosmetic defect	<ol style="list-style-type: none"> 1. PCB golden figure surface can not have oxidation, dirt. 2. PCB can not appear bubble caused by reflow. 3. PCB green oil drop /segment lead to leak copper. Use mending, circuit diameterψ can not over 1.3mm, other diameterψ can not over 2.6mm, total less than 10 point. otherwise reject. 		√	reject
6.6.3	Components mistake	<ol style="list-style-type: none"> 1. PCB components inconsistent with drawing. Find wrong pitch, more or less pitch, polar reverse (LCD voltage side circuit/BL current limit resistance modify, only if customer have special require, otherwise do not control) 2. The JUMP of PCB shot need refer to the structure picture, appear more or less soldering. 3. customer have special require on the component, mode specification and supplier should conform to technique demand. Otherwise reject. 	√	√	reject

6.7 SMT part (vague parts refer to IPC-A-610C)

Order	Item	Description	MAJ	MIN	Accept standard
6.7.1	Soldering	Cold solder, fake solder, missing solder,		√	reject



	defect	crack, tin un-dissolved			
6.7.2	Solder ball/bridge	Solder ball/bridge drop lead to spot short.		√	reject
6.7.3	DIP parts	DIP parts, keypad, connection appear flowing and tilted.		√	reject
6.7.4	Spot shape	Inner dent, can not form to cover solder or less solder, otherwise reject		√	reject
6.7.5	Component out reveal	After cutting, just left 0.5mm~2mm,can not damage solder surface and covered the component foot. Otherwise reject.		√	reject
6.7.6	Cosmetic defect	Solder residues appear tawny or coke black. PCB solder spot remained white mist residues after clean.		√	reject

6.8 Thermal press part (contain H/S, FPC)

Order	item	description	MAJ	MIN	Accept standard
6.8.1	Model specifications do not match		√		reject
6.8.2	Scale/position	Material scale must in the drawing specification range, the contact area of dielectric material and the body (ITO, PDA) should be above 1/2, and the dislocation must control in specification		√	Accept
6.8.3	Thermal press dirt	Thermal area tainted can not lead to short, OK, in through position, dirt area is smaller than 50%, OK.		√	accept
6.8.4	creases			√	Refer to limited sample

6.9 connection and other parts

order	item	description	MAJ	MIN	Accept standard
6.9.1	Specification un-matched	Connection and other components do not conform to drawing requirement	√		reject
6.9.2	Position and order	Solder position should consistent with the drawing .		√	reject



6.9.3	cosmetic	1. the body of our connect component and the PIN foot have solder-helping. 2. PIN connection PIN deformation bigger than PIN width 1/2.		√	reject
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6.10 General visual

order	item	description	MAJ	MIN	Accept standard
6.10.1	Connect material	FPC golden figure or H/S,FFC out part of PIN leak copper or material, have damaged. FPC,FFC,COF,H/S connected material curved (except for original) . FPC、PCB golden figure bigger than 1PIN width. FPC/FFC material segment, crease exceed the specification.		√	reject
6.10.2	Protect defect	Protect film do not cover circuit totally (如 H/S, FFC, FPC) or not contact with interface, or add on PIN outer part.		√	reject
6.10.3	Visual dirty	The surface of end products have dirt, rubber, PCB/COB un-welding area has solder ball. The defective remark or label do not clean.		√	reject
6.10.4	Assembly black spot	Add backlight, taint and black spot		√	Refer to 6.3.1
6.10.5	Product remark	Model defer from approved remark and technique requirement、 position, vague and leak.		√	reject
6.10.6	Inner product packing	Packing inconsistent with requirement, segment short, wrong amount. And inconsistent with shipment remark/ order demand.		√	reject

7. Reality test

Note: If customer have requirement, please put forward on the item development. (high/low temperature storage and experiment, the temperature refer to specific requirement) , ±5°C deviation could be accept.



Test item	Condition	Time(hrs)	Accept standard
high temp storage	80°C	120	
high temperature operating	70°C	120	
low temperature storage	-30°C	120	Before and after test,
low temperature operating	-20°C	120	function and cosmetic is
temperature& humidity test	40°C/ 90%RH	120	qualified.
temperature shock	-20°C ← 25°C → +70°C (30 min ← 5 min → 30min)	10 cycles	

8. Packing

- 8.1 Product design must meet the requirement of packing design and check on delivery. Besides the product name, specification, model, quantity and date on the label, the quality chapter is necessary after checked by QA. Incomplete or mistake, is not qualified.
- 8.2 When the safety of the packing (earthquake, moisture-proof, anti-static, anti-squeezed) exist problem, not qualified.
- 8.3 When customer' s special requirement is confirmed and accepted by interior, carry it out and check on delivery.
- 8.4 Environment protected and unprotected products must have obvious distinguished remark. The present remark adopts "RoHS". If customer have special requirement, use the appointed remark or label.

9. Others

- 9.1 No-provision or compromised item, depend on two side agreement and limited prototype.