SPECIFICATION FOR LCD MODULE

CUSTOMER	
MODEL	**MS12864GD01**
REVISION	**1.0**

PREPARED	CHECKED	APPROVED

ADD:4th fl, C1 Building,Huafeng No.2 Industrial Area, Gushu Xixiang Town, Bao'an District, Shenzhen City,China 518000
web:www.qc-lcd.com email:ajel_zeng@163.com/maoshengeletronics@gmail.com contact number:+86 18575525695

REVISION RECORD

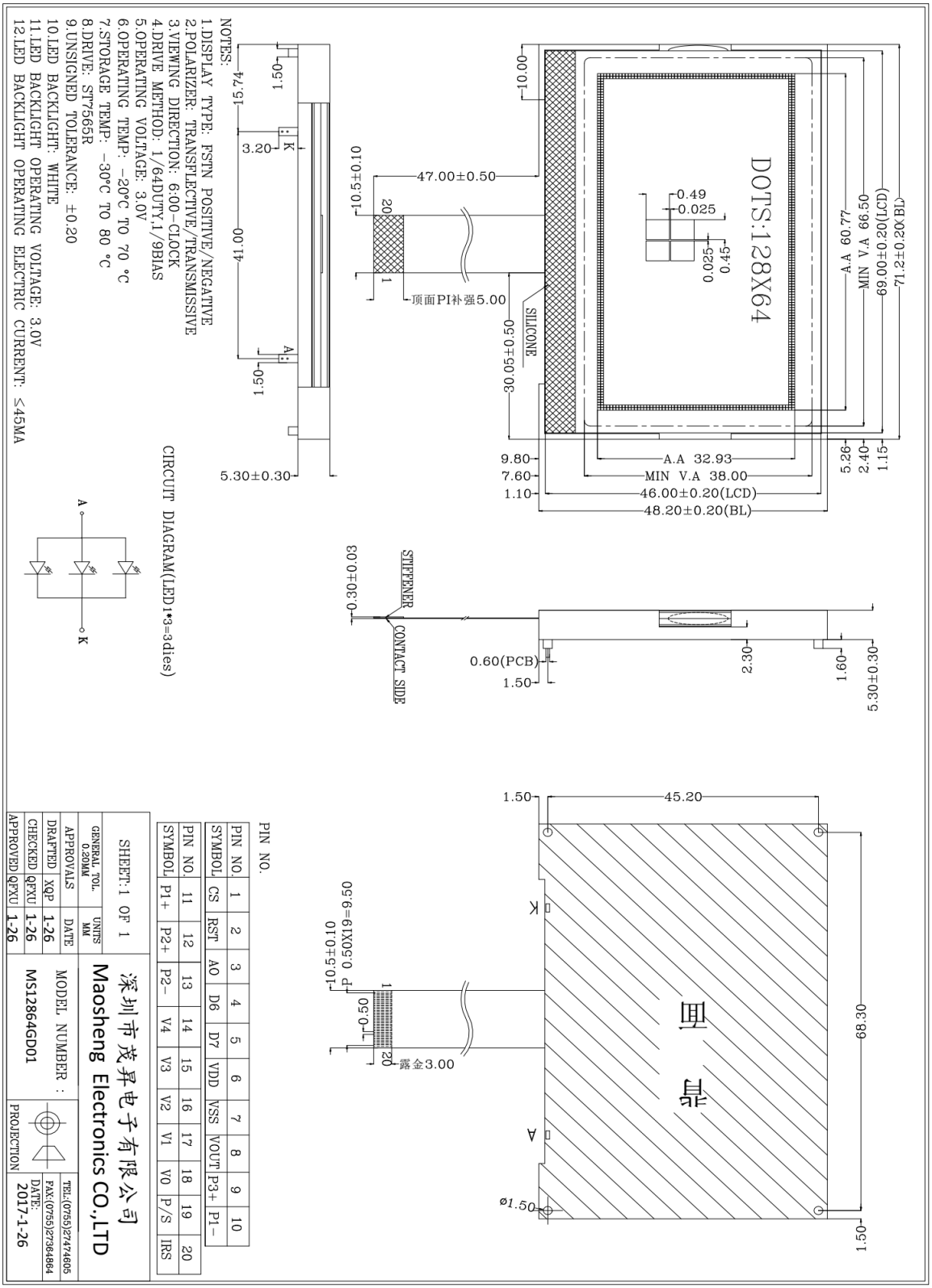
REV NO	REV DATE	CONTENTS	REMARKS
1.0	2017-1-26	First Release	

TABLE OF CONTENT

1. General Specifications

Item	Contents	Unit
LCD type	FSTN POSITIVE/NEGATIVE	-
Viewing direction	6:00	O'Clock
Module size (HxWxT)	71.20x48.20x5.30 (excluded FPC length)	mm
Viewing area (HxW)	66.50x38.00	mm
Driver IC	ST7565R	-
Number of dots	128X64	-
Backlight type	3 LEDS White 3.0V 45mA	-
Interface type	Serial interface	-
Operating temperature	-20 ~ 70	oC
Storage temperature	-30 ~ 80	oC

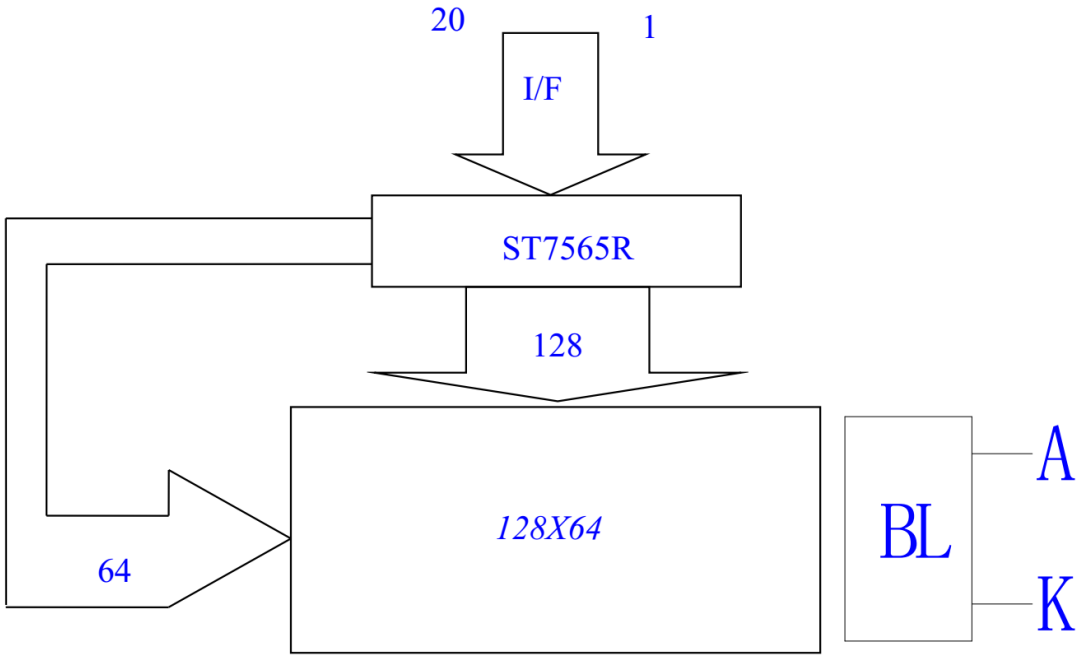
2. Dimensional Drawing

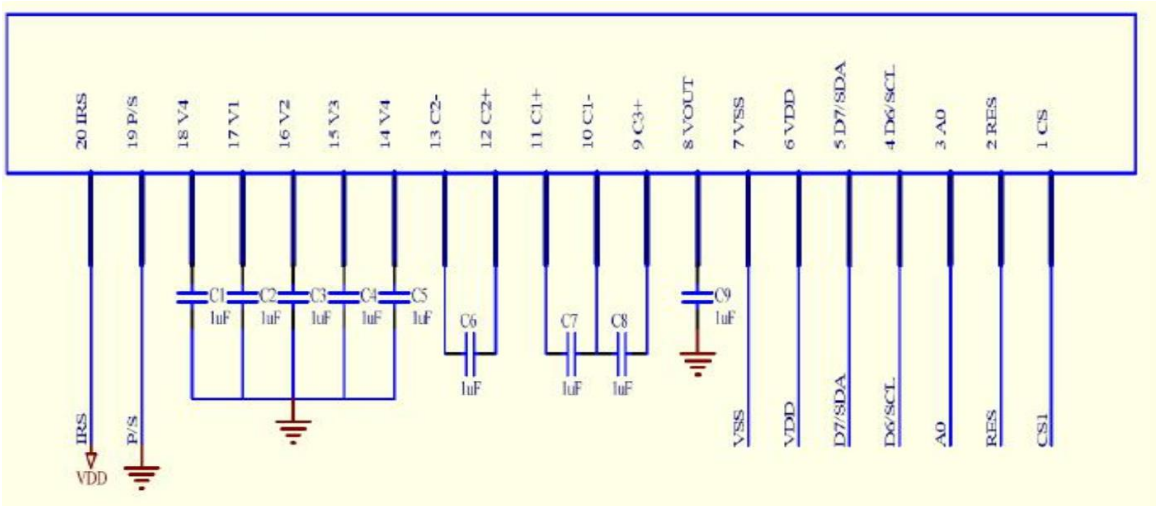


3. Interface Pin Connections

Pin No.	Symbol	Pin Description
1	CS	This is the chip select signal.
2	RST	When RES is set to "L", the settings are initialized
3	A0	This is connect to the least significant bit of the normal MPU address bus, and it determines whether the data bits are data or command.
4	D6/SCL	Serial clolk input
5	D7/SDA	Serial data input
6	VDD	Power supply
7	VSS	Groud
8	VOUT	DC/DC voltage converter output.
9	C3+	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
10	C1-	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1P terminal.
11	C1+	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal.
12	C2+	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2N terminal.
13	C2-	DC/DC voltage converter. Connect a capacitor between this terminal and the CAP2P terminal.
14	V4	This is a multi-level power supply for the liquid crystal drive.
15	V3	
16	V2	
17	V1	
18	V0	
19	P/S	This pin configures the interface to be parallel mode or serial mode.
20	IRS	This terminal selects the resistors for the V0 voltage level ， IRS="H" use the internal resistor IRS="L" not use the internal

4.Block Diagram





5. OPERATING PRINCIPLE & DRIVING METHOD

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	-	Do NOT use. Reserved for testing.

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

6.ABSOLUTE MAXIMUM RATINGS

Unless otherwise noted, V_{SS} = 0V

Table 17

Parameter		Symbol	Conditions	Unit
Power Supply Voltage		V_{DD}	-0.3 ~ 3.6	V
Power supply voltage (V_{DD} standard)		V_{DD2}	-0.3 ~ 3.6	V
Power supply voltage (V_{DD} standard)		V_0, V_{OUT}	-0.3 ~ 13.5	V
Power supply voltage (V_{DD} 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

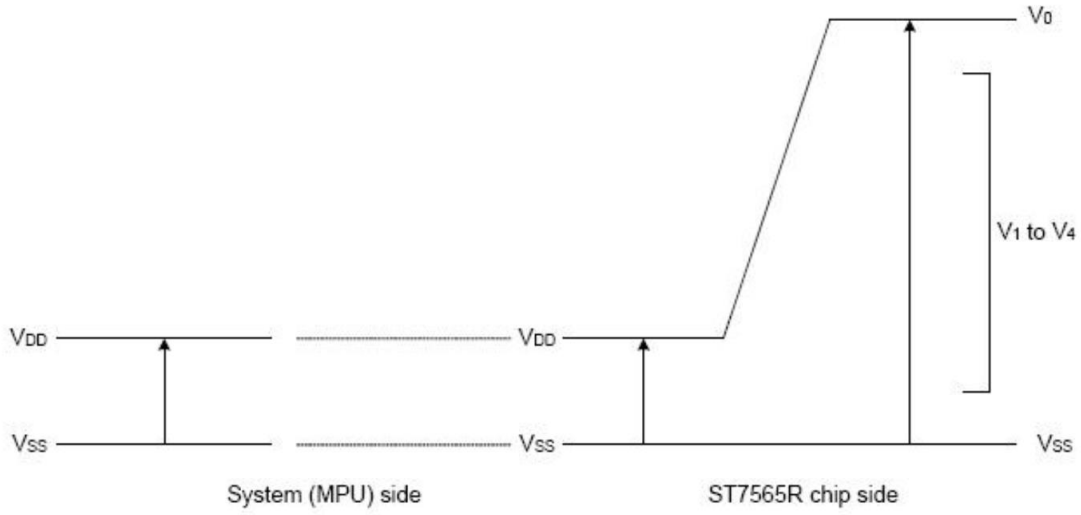


Figure 30

Notes and Cautions

1. The V_{DD2}, V_0 to V_4 and V_{OUT} are relative to the V_{SS} = 0V reference.
2. Insure that the voltage levels of V_1, V_2, V_3, and V_4 are always such that $V_{OUT} \geq V_0 \geq V_1 \geq V_2 \geq V_3 \geq V_4$.
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.

7. ELECTRICAL CHARACTERISTICS

VSS=0V; Tamb = -30°C to +85°C; unless otherwise specified.

Item	Symbol	Condition		Rating			Unit	Applicable Pin
				Min.	Typ.	Max.		
Operating Voltage (1)	VDD1			1.7	—	3.3	V	VDD1
Operating Voltage (2)	VDD2			2.4	—	3.3	V	VDD2
Operating Voltage (3)	VDD3			2.4	—	3.3	V	VDD3
Input High-level Voltage	V_{IHC}			0.7 x VDD1	—	VDD1	V	MPU Interface
Input Low-level Voltage	V_{ILC}			VSS1	—	0.3 x VDD1	V	MPU Interface
Output High-level Voltage	V_{OHC}	I_{OUT}=1mA, VDD1=1.8V		0.8 x VDD1	—	VDD1	V	D[7:0]
Output Low-level Voltage	V_{OLC}	I_{OUT}=-1mA, VDD1=1.8V		VSS1	—	0.2 x VDD1	V	D[7:0]
Input Leakage Current	I_{LI}			-1.0	—	1.0	μA	MPU Interface
Output Leakage Current	I_{LO}			-3.0	—	3.0	μA	MPU Interface
Liquid Crystal Driver ON Resistance	R_{ON}	Ta=25°C	Vop=8.5V, ΔV=0.85V	—	0.6	0.8	KΩ	COMx
			VG=1.9V, ΔV=0.19V	—	1.3	1.5	KΩ	SEGx
Frame Frequency	FR	Duty=1/65, Vop=8.5V Ta = 25℃		70	75	80	Hz	

Current consumption: During Display, with internal power system, current consumed by whole IC (bare die).

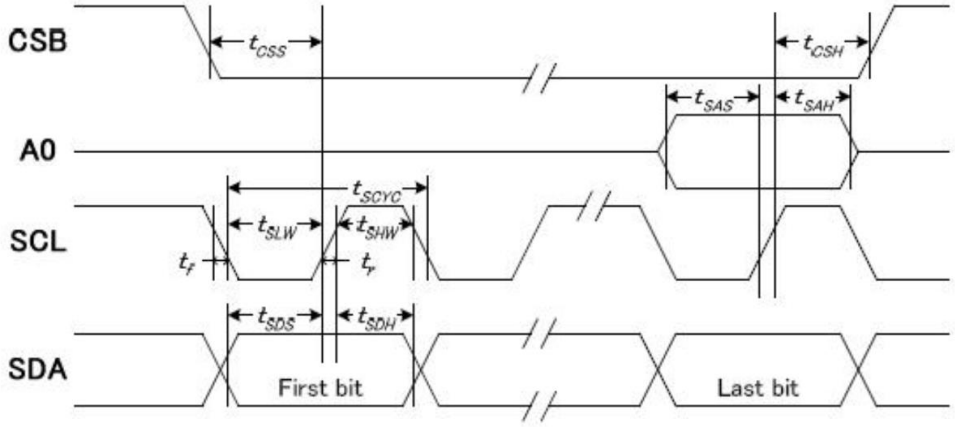
Test Pattern	Symbol	Condition	Rating			Unit	Note
			Min.	Typ.	Max.		
Display Pattern: SNOW (Static)	ISS	VDD1=VDD2=VDD3=3.0V, Booster X5 V_{OP} = 8.5 V, Bias=1/9 Ta=25°C	—	150	300	μA	
Display OFF	ISS	VDD1=VDD2=VDD3=3.0V, Booster X5 V_{OP} = 8.5 V, Bias=1/9 Ta=25°C	—	95	190	uA	
Power Down	ISS	VDD1=VDD2=VDD3=3.0V, Ta=25°C	—	8	16	μA	

Note:

- *The Current Consumption is DC characteristics*

8. ELECTRO-OPTICAL CHARACTERISTICS

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	—	

Current consumption: During Display, with internal power system, current consumed by whole IC (bare die).

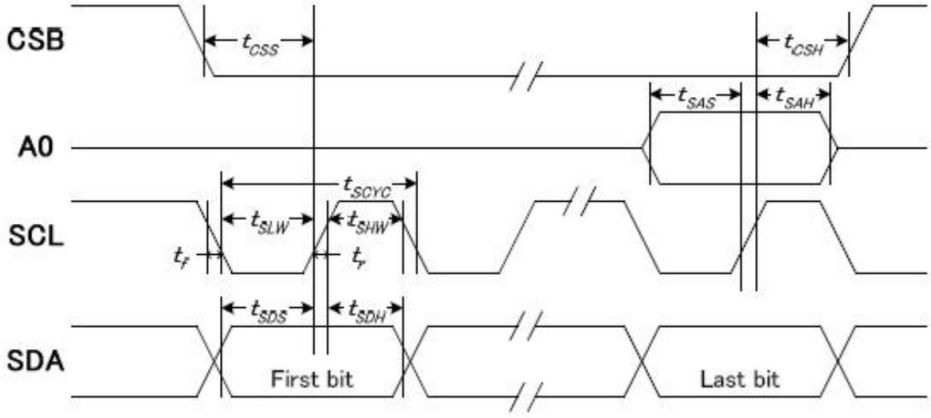
Test Pattern	Symbol	Condition	Rating			Unit	Note
			Min.	Typ.	Max.		
Display Pattern: SNOW (Static)	ISS	VDD1=VDD2=VDD3=3.0V, Booster X5 V_{OP} = 8.5 V, Bias=1/9 Ta=25˚C	—	150	300	μA	
Display OFF	ISS	VDD1=VDD2=VDD3=3.0V, Booster X5 V_{OP} = 8.5 V, Bias=1/9 Ta=25˚C	—	95	190	uA	
Power Down	ISS	VDD1=VDD2=VDD3=3.0V, Ta=25˚C	—	8	16	μA	

Note:

- *The Current Consumption is DC characteristics*

8.1 ELECTRO-OPTICAL CHARACTERISTICS

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)

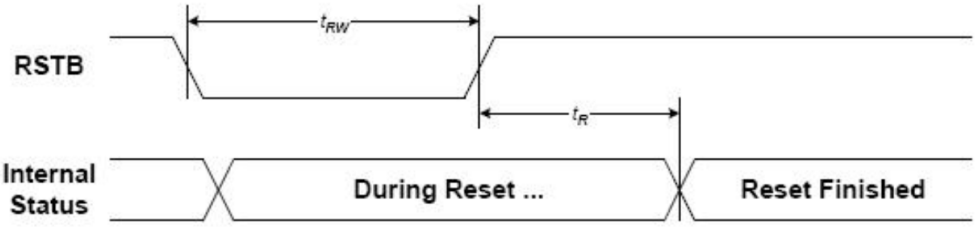
Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		100	—	ns
SCLK "H" pulse width		tSHW		50	—	
SCLK "L" pulse width		tSLW		50	—	
Address setup time	A0	tSAS		30	—	
Address hold time		tSAH		20	—	
Data setup time	SDA	tSDS		30	—	
Data hold time		tSDH		20	—	
CSB-SCLK time	CSB	tCSS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

(VDD1 = 1.8V , Ta =25°C)

Item	Signal	Symbol	Condition	Min.	Max.	Unit
Serial clock period	SCLK	tSCYC		200	—	ns
SCLK "H" pulse width		tSHW		80	—	
SCLK "L" pulse width		tSLW		80	—	
Address setup time	A0	tSAS		60	—	
Address hold time		tSAH		30	—	
Data setup time	SDA	tSDS		60	—	
Data hold time		tSDH		30	—	
CSB-SCLK time	CSB	tCSS		40	—	
CSB-SCLK time		tCSH		100	—	

*1 The input signal rise and fall time (tr, tf) are specified at 15 ns or less.
*2 All timing is specified using 20% and 80% of VDD1 as the standard.

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	—	

9. Reliability

9.1. MTBF

The LCD module shall be designed to meet a minimum MTBF value of 50000 hours with normal. (25°C in the room without sunlight)

9.2. TESTS

NO.	Test Item	Test condition	Criterion
1	High Temperature Storage	80℃±2℃ 96H Restore 2H at 25℃ Power off	Aftertesting,cosmetic and electrical defects should not happen.
2	Low Temperature Storage	-30℃±2℃ 96H Restore 2H at 25℃ Power off	
3	High Temperature Operation	70℃±2℃ 96H Restore 2H at 25℃ Power on	
4	Low Temperature Operation	-20℃±2℃ 96H Restore 2H at 25℃ Power on	
5	High Temperature & Humidity Operation	60℃±2℃ 90%RH 96H Power on	
6	Temperature Cycle	--30℃←→25℃←→80℃ 30min 5min 30min after 10cycle, Restore 2H at 25℃ Power off	
7	Vibration Test	10Hz~150Hz, 100m/s2, 120min	
8	Shock Test	Half-sinewave,300m/s2,11ms	
9	Drop Test(package state)	800mm, concrete floor,1corner, 3edges, 6 sides each time	1.After testing, cosmetic and electrical defects should not happen. 2.the product should remain at initial place 3.Product uncovered or package broken is not permitted.

10.Precautions for Using LCD Module

10.1 handing precautions

(1) The display panel is made of glass. Do not subject it to a mechanical shock or impact by dropping it.
(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten a cloth with one of the following solvents:
- Isopropyl alcohol
- Ethyl alcohol
(6) Solvents other than those above mentioned may damage the polarizer.
Especially, do not use the following:
- Water
- Ketone
- Aromatic solvents

(7) Extra care to minimize corrosion of the electrode. Water droplets, moisture condensation or a current flow in a high-humidity environment accelerates corrosion of the electrode.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD Module, make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD Module.
(10) NC terminal should be open. Do not connect anything.
(11) If the logic circuit power is off, do not apply the input signals.
(12) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Be sure to ground the body when handling he LCD Module.
- Tools required for assembling, such as soldering irons, must be properly grounded.
-To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions

-The LCD Module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

10.2 storage precautions

When storing The LCD Module, avoid exposure to direct sunlight of fluorescent lamps. Keep the modules in bags (avoid high temperature/ high humidity and low temperatures below 0℃). Whenever possible, the LCD Module should be stored in the same conditions in which they were shipped from our company.

10.3 others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD Module 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 recovered by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD Module 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

-END-