



DM-COG12864-708
12864 COG GRAPHIC LCD WITH 8080
OR 6800 MPU INTERFACE

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1 Revision History

Date	Changes
2015-03-13	First release

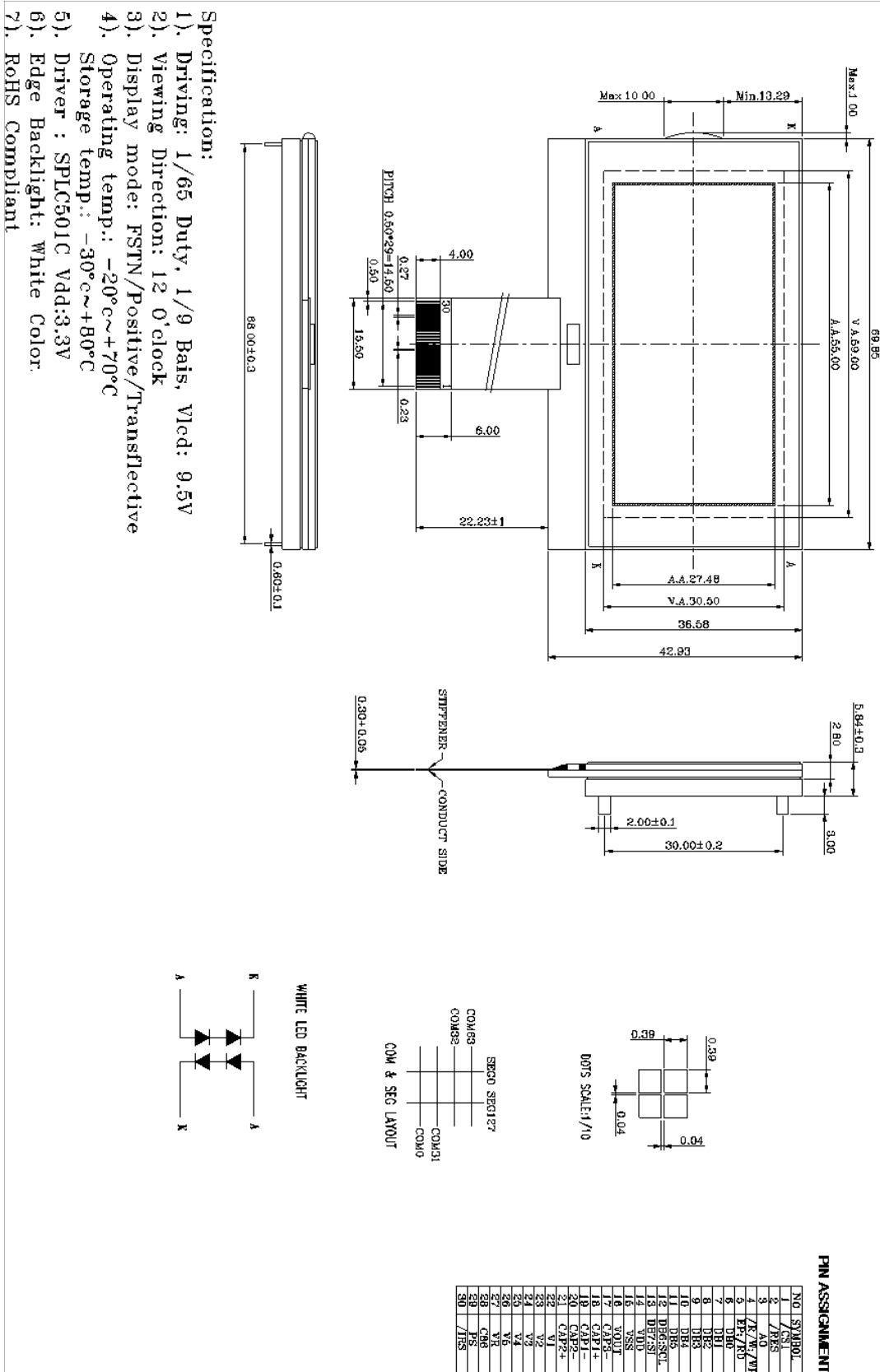
2 Main Features

Item	Specification	Unit
Resolution	128 x 64	pixel
Display Mode	FSTN, Transflective	-
Controller IC	ST7565R	-
Interface	8080 or 6800 MPU Interface	
Power Supply	3.3V	V
View Direction	12:00	-
Duty	1/65 duty, 1/9 bias	
Backlight	Edge White LED	-
Weight	25.5	g

3 Pin Description

Pin No.	Symbol	Function Description
1	/CS	Used to enter chip select signal
2	/RESET	Controller reset (module reset)
3	A0	Register select signal
4	R/W	Read/write select signal
5	E	Operation (data read/write) enable signal
6~10	DB0~DB3	Four low order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCM. These four are not used during 4-bit operation.
11~13	DB4~DB7	Four high order bi-directional three-state data bus lines. Used for data transfer between the MPU
14	VDD	Power supply for logic (+5V) for LCM
15	VSS	Signal ground for LCM (GND)
16	VOUT	DC/DC voltage converter.
17	CAP3-	
18	CAP1+	
19	CAP1-	
20	CAP2-	
21	CAP+	
22~26	V1~V5	A multi-level power supply for the liquid crystal drive.
27	VR	Output voltage regulator terminal.
28	C86	This is the MPU interface switch terminal.
29	PS	This is the parallel input/serial data input switch terminal.
30	/IRS	This terminal selects the resistors for the V5 voltage level adjustment.

4 Mechanical Drawing



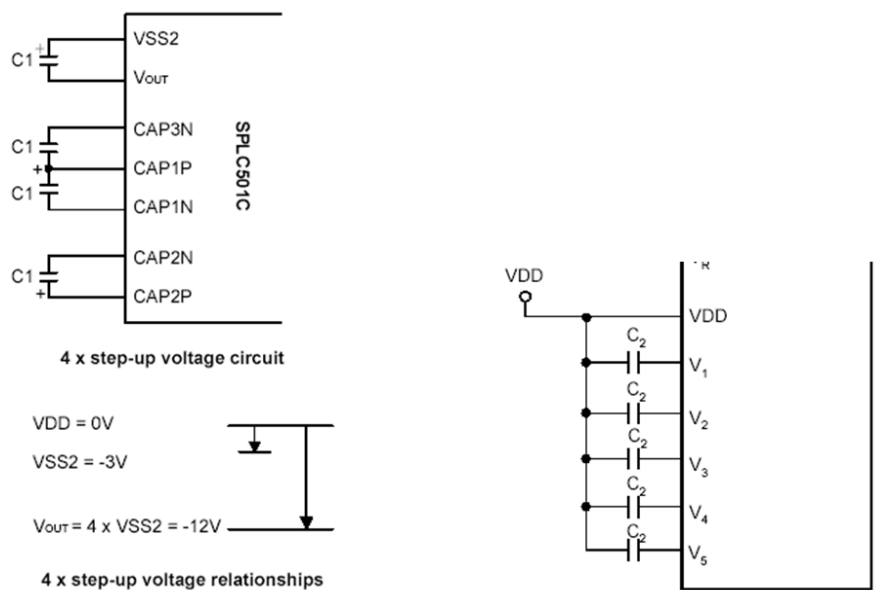
5 Electrical Characteristics

Item	Symbol	Condition	Min	Typ.	Max	Unit
Supply Voltage For Logic	VDD		3.0	3.3	3.5	V
Digital Operation Current	IDD	-	-	0.35	0.45	mA
Low Level Input Voltage	V _{IL}		0	-	0.6	V
High Level Input Voltage	V _{IH}		2.2	-	VDD	V
Low Level Output Voltage	V _{OL}		-		0.4	V
High Level Output Voltage	V _{OH}		2.4		-	V
Backlight Forward Voltage	V _{LED}			6.0		V
Backlight Forward Current	I _{LED}			30		mA
Operating Temperature	TOP	Absolute Max	-20		70	°C
Storage Temperature	TST	Absolute Max	-30		80	°C

6 Optical Characteristics

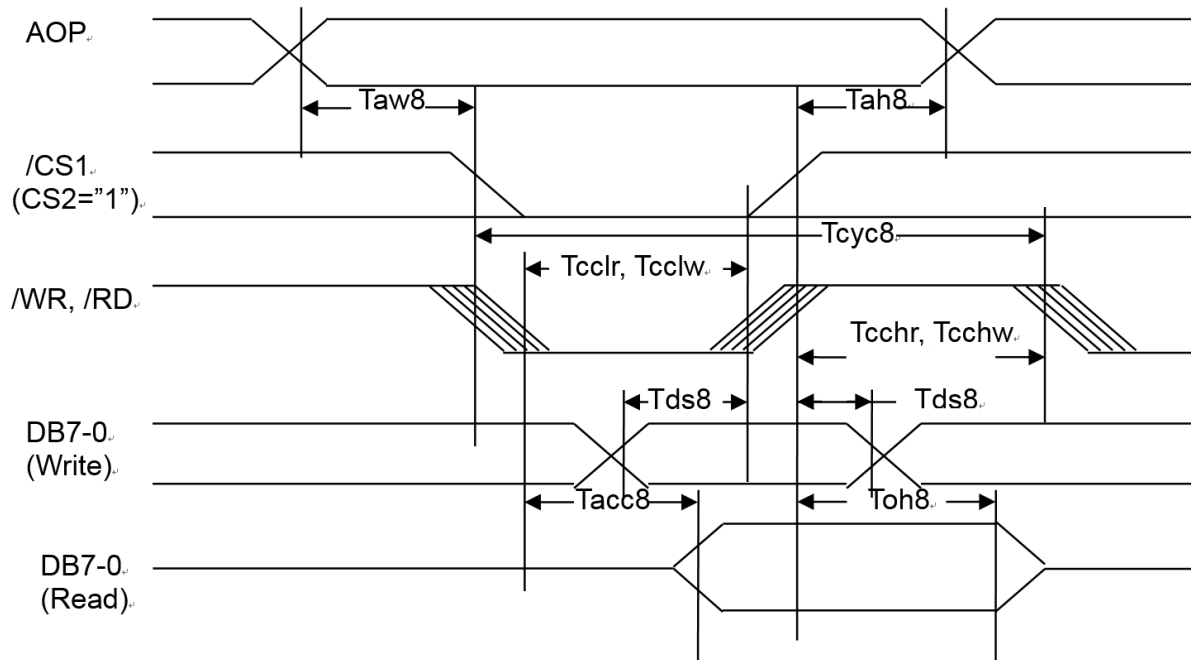
Item	Symbol	Min	Typ	Max	Unit
View Angle-Top -- Bottom	AV	-25		35	°
View Angle-Left -- Right	AH	-40		40	°
Response Time (25°C)	Tr + Tf		300	500	us
Contrast Ratio	CR		6		
Luminance	Ly				cd/m ²

7 Block diagram



8 Timing Characteristics

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



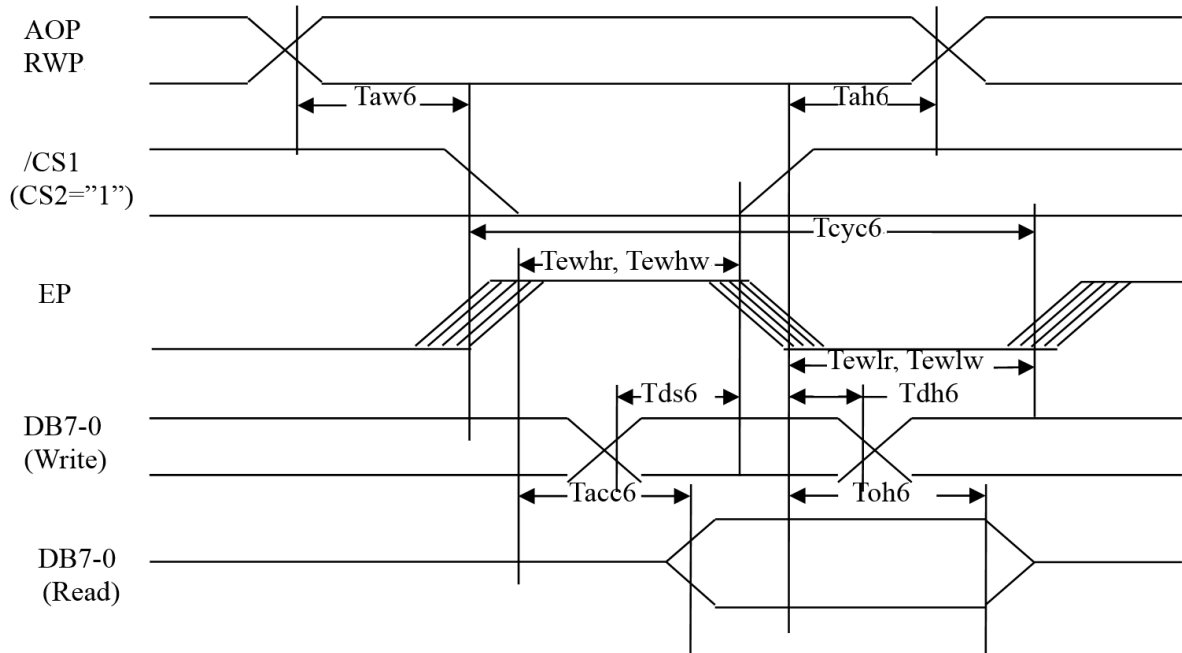
$V_{DD}=4.5V$ to $5.5V$, $T_a=25C$

Symbol	Item	Min	Typ	Max	Unit
t_{AH8}	Address hold time	0	-	-	ns
t_{AW8}	Address setup time	0	-	-	ns
t_{CYC8}	System cycle time	166	-	-	ns
t_{CCLW}	Control Low pulse width (/WR)	30	-	-	ns
t_{CCLR}	Control Low pulse width (/RD)	70	-	-	ns
t_{CCHW}	Control High pulse width (/WR)	30	-	-	ns
t_{CCHR}	Control High pulse width (/RD)	30	-	-	ns
t_{DS8}	Data setup time	30	-	-	ns
t_{DH8}	Address hold time	10	-	-	ns
t_{ACC8}	/RD access time	-	-	70	ns
t_{QH8}	Output disable time	5	-	50	ns

$V_{DD}=2.7V$ to $4.5V$, $T_a=25C$

Symbol	Item	Min	Typ	Max	Unit
t_{AH8}	Address hold time	0	-	-	ns
t_{AW8}	Address setup time	0	-	-	ns
t_{CYC8}	System cycle time	300	-	-	ns
t_{CCLW}	Control Low pulse width (/WR)	60	-	-	ns
t_{CCLR}	Control Low pulse width (/RD)	120	-	-	ns
t_{CCHW}	Control High pulse width (/WR)	60	-	-	ns
t_{CCHR}	Control High pulse width (/RD)	60	-	-	ns
t_{DS8}	Data setup time	40	-	-	ns
t_{DH8}	Address hold time	15	-	-	ns
t_{ACC8}	/RD access time	-	-	140	ns
t_{QH8}	Output disable time	10	-	100	ns

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



$V_{DD}=4.5V$ to $5.5V$, $T_a=25C$

Symbol	Item	Min	Typ	Max	Unit
t_{AH6}	Address hold time	0	-	-	ns
t_{AW6}	Address setup time	0	-	-	ns
t_{CYC6}	System cycle time	166	-	-	ns
t_{EWLW}	Enable Low pulse width (WRITE)	30	-	-	ns
t_{EWHW}	Enable High pulse width (WRITE)	30	-	-	ns
t_{EWLR}	Enable Low pulse width (READ)	30	-	-	ns
t_{EWHR}	Enable High pulse width (READ)	70	-	-	ns
t_{DS6}	WRITE Data setup time	30	-	-	ns
t_{DH6}	WRITE Address hold time	10	-	-	ns
t_{ACC6}	READ Access time	-	-	70	ns
t_{OH6}	READ Output disable time	10	-	50	ns

$V_{DD}=2.7V$ to $4.5V$, $T_a=25C$

Symbol	Item	Min	Typ	Max	Unit
t_{AH6}	Address hold time	0	-	-	ns
t_{AW6}	Address setup time	0	-	-	ns
t_{CYC6}	System cycle time	300	-	-	ns
t_{EWLW}	Enable Low pulse width (WRITE)	60	-	-	ns
t_{EWHW}	Enable High pulse width (WRITE)	60	-	-	ns
t_{EWLR}	Enable Low pulse width (READ)	60	-	-	ns
t_{EWHR}	Enable High pulse width (READ)	120	-	-	ns
t_{DS6}	WRITE Data setup time	40	-	-	ns
t_{DH6}	WRITE Address hold time	15	-	-	ns
t_{ACC6}	READ Access time	-	-	140	ns
t_{OH6}	READ Output disable time	10	-	100	ns

9 Table of Commands

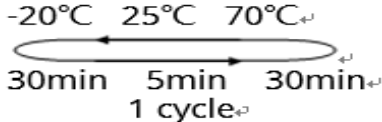
Command	Command Code								Function				
	AOP /WR	/RD	DB7 DB0	DB6	DB5	DB4	DB3	DB2		DB1			
1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	1	LCD display ON/OFF 0: OFF, 1: ON
2) Display start line set	0	1	0	0	1	Display start address					Set the display RAM display start line address		
3) Page address set	0	1	0	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	
Column address set Lower bit	0	1	0	0	0	0	0	Least significant column address				Sets the least significant 4 bits of the display RAM column address	
5) Status read	0	0	1	Status				0	0	0	0	0	Reads the status data
6) Display data write	1	1	0	Write data								Writes the status 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	0	1	0	Sets the LCD driver voltage bias ratio SPLC501C.....0: 1/9, 1: 1/7
12) Read/modify/write	0	1	0	1	1	1	0	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	1	0	Clear read/modify/write
14) Reset	0	1	0	1	1	1	0	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) V5 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	0	1	0	1	0	0	0	0	0	0	0	1	Set the V5 output voltage electronic volume register
Electronic volume register set	0	1	0	* * Electronic volume value									
19) Static indicator ON/OFF				1	0	1	0	1	1	0	0	1	0: OFF, 1: ON
Static indicator Register set				* * * * *	* * *	Mode				Set the flashing mode			
20) Page Blink Page selection	0	1	0	1	1	0	1	0	1	0	1	0	P7-0: 1 – blinking page 0 – no blinking, normal display
	0	1	0	P7	P6	P5	P4	P3	P2	P1	P0		
21) Driving Mode set	0	1	0	1	1	0	1	0	0	1	0	0	Set the driving mode register Driving capability (D1, D0): (1,1)>(0,0)>(0,1)>(1,0)
Mode selection	0	1	0	D1	D0	0	0	0	0	0	0	0	
22) Power saver													Display OFF and display all points ON compound command

10 Driver/Controller Information

Built-in ST7565R Controller

<https://drive.google.com/file/d/0Bxu0OURUiyL5TUVKSnIURXRUBFE/view?usp=sharing>

11 Reliability

Test Item	Content of Test	Test Condition	Note
High Temperature Storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature Storage	Endurance test applying the high storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	-
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20 °C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max, for 96hrs under no-load condition excluding the polarizer. Then taking it out and drying it at normal temperature.	60°C,90%RH 96hrs	1,2
Thermal Shock Resistance	The sample should be allowed stand the following 10 cycles of operation 	-20°C/70°C 10 cycles	-
Vibration Test	Endurance test applying the vibration during transportation and using	Total fixed amplitude: 15mm; Vibration: 10~55Hz; One cycle 60 seconds to 3 directions of X, Y, Z, for each 16 minutes.	3
Static Electricity Test	Endurance test apply the electric stress to the terminal.	VS=800V, RS=1.5kΩ, CS=100pF, 1 time.	-

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal. Temperature and humidity after remove from the rest chamber.

Note3: Test performed on product itself, not inside a container.

12 Warranty and Conditions

<http://www.displaymodule.com/pages/faq>