

S12232A

LCD MODULE USER MANUAL

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1. FUNCTIONS & FEATURES

Features

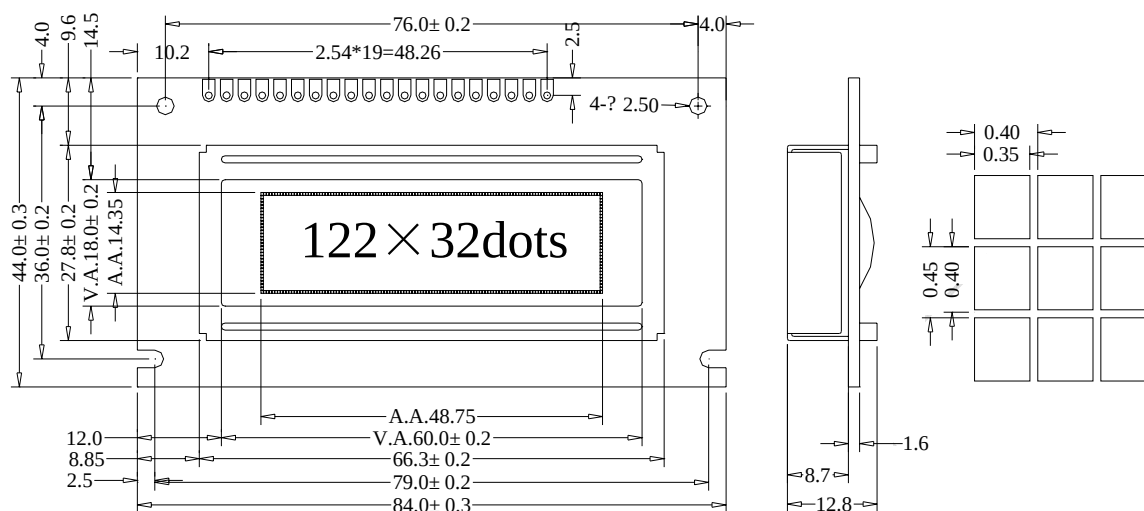
- Dot Matrix: 122×32 Dots
- LCD Mode: STN
- Controller IC: SED1520 or Equivalent
- Driving Method: 1/32 Duty; 1/9 Bias
- Viewing Angle: 6 O'clock direction
- 6800 serial 8-Bit MPU Interface
- Backlight: LED
- Operating Temperature Range: -20 to 70°C ;
- Storage Temperature Range : -30 to 80°C ;

Note: Color tone is slightly changed by temperature and driving voltage.

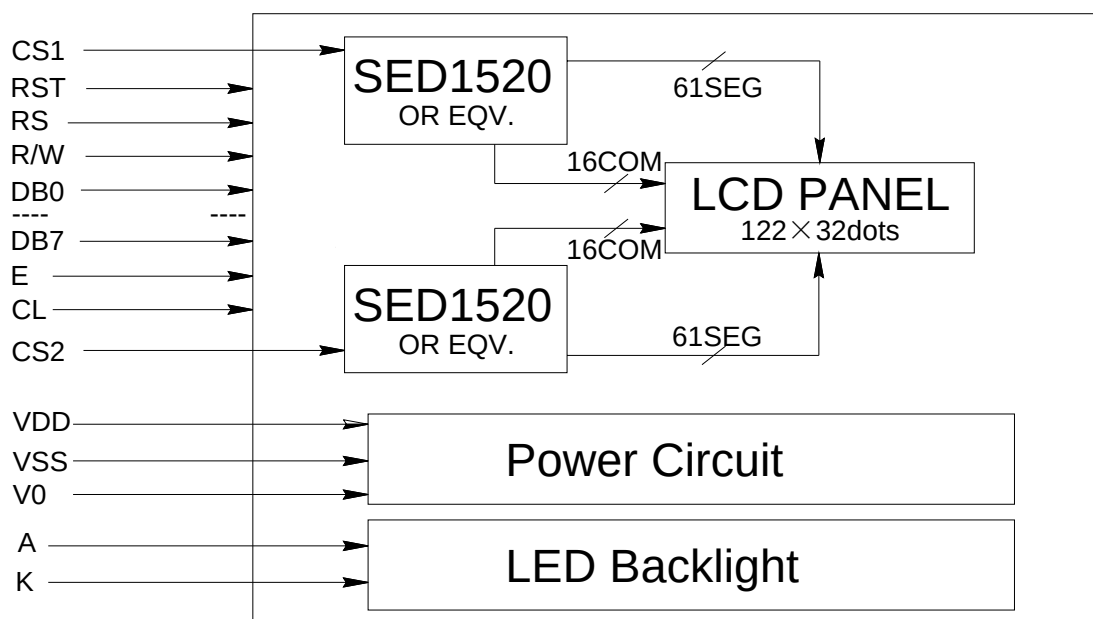
2. MECHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
Module Size	$84.0\text{L} \times 44.0\text{W} \times 12.8 \text{ max) H}$	mm
View Area	60.0×18.0	mm
Effective Area	122×32	dots
Dot Size	0.35×0.40	mm
Dot Pitch	0.40×0.45	mm

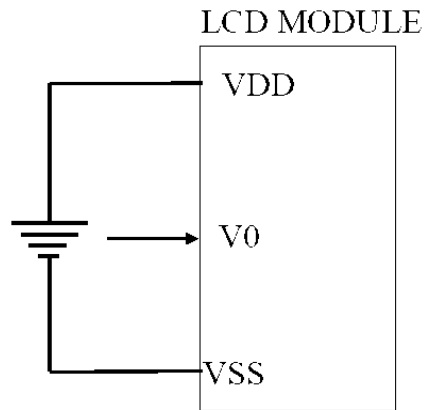
3. EXTERNAL DIMENSIONS



4. BLOCK DIAGRAM



5. POWER SUPPLY





6. PIN DESCRIPTION

ITEM	SYMBOL	I/O	FUNCTION
1	VDD	5.0V	Power Supply For Logic
2	VSS	0V	Power Ground
3	V0	Input	Contrast Adjust
4	RS	Input	H: DB0-DB7=Data L: DB0-DB7=Command
5	CS1	Input	Chip selection signal for IC1,
6	CS2	Input	Chip selection signal for IC2
7	CL	Input	System clock input
8	E*	Input	Enable signal for 6800 family interface
9	R/W*	Input	Write Read/Write signal for 6800 family interface H: Read L: Write
10 ~ 17	DB0 ~ DB7	I/O	Data Bus
18	RST	Input	Reset Signal
19	LEDA	5.0V	Power Supply For LED Backlight
20	LEDK	0V	

Note: E signal should be used as /RD signal for 8080 family interface, ; R/W should be used as /WR signal for 8080 family interface.

7. MAXIMUM ABSOLUTE LIMIT (T=25°C)

Items	Symbol	Standard Value	Unit
Supply Voltage	Vdd	-0.3~7.0	V
Input Voltage	Vin	Vss~Vdd	V
Operating Temperature	Top	-20~70	°C
Storage Temperature	Tst	-30~80	°C

Note: Voltage greater than above may damage the module
All voltages are specified relative to Vss=0V



8. ELECTRICAL CHARACTERISTICS

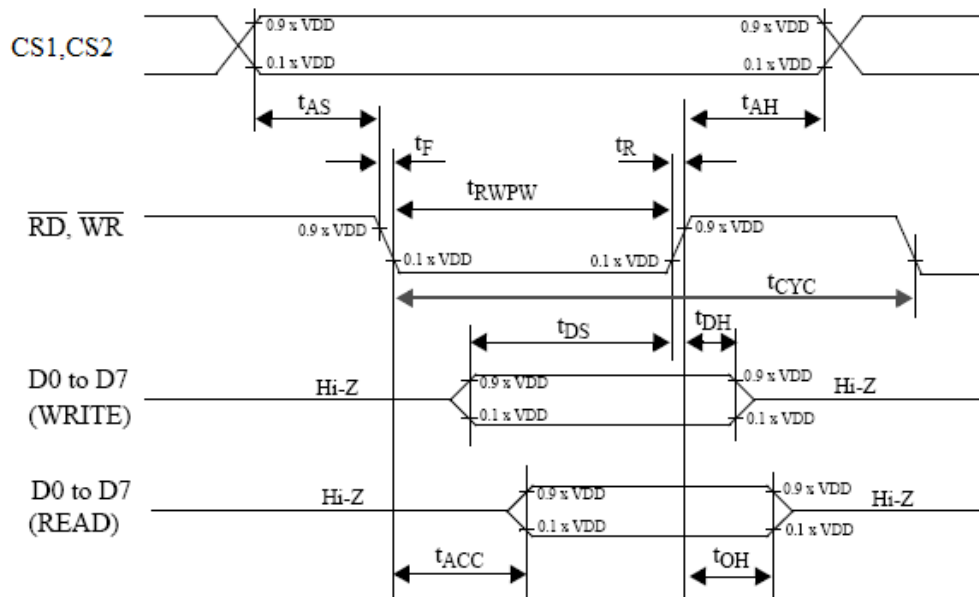
8.1 DC Characteristics (VDD=+5V, VSS=0V, Ta=-0~+50° C)

Items	Symbol	Min	TYP	Max	Unit	Condition
Operating Voltage	Vdd	4.8	5.0	5.2	V	Vdd
Supply Current	Idd	—	5	10	mA	except LED backlight
Input High Voltage	Vin	Vdd-2.2	—	Vdd	V	RS,RW,E,DB0-DB7
Input Low Voltage	Vil	0	—	0.8	V	
Output High Voltage	Voh	Vdd-0.3	—	Vdd	V	Ioh=-0.1mA,DB0-DB7
Output Low Voltage	Vol	0	—	0.3	V	Iol=0.1mA,DB0-DB7
LCD Driving Voltage	Vlcd	4.7	4.8	5.0	V	Vdd-V0

8.2a AC Characteristics for 8080 family interface (VDD=+5V, VSS=0V, Ta=-20~75° C)

Items	Symbol	Min	Max	Unit
Address set-up time	t _{AS}	20	—	nS
Address hold time	t _{AH}	10	—	nS
Read / Write pulse falling/rising time	t _F , t _R	—	15	nS
Read / Write pulse width	t _{RWPW}	200		
System cycle time	t _{CYC}	1000	—	nS
Data setup time	t _{DS}	80	—	nS
Data hold time	t _{DH}	10	—	nS
Data access time	t _{ACC}	—	90	nS
Data output hold time	t _{OH}	10	60	nS

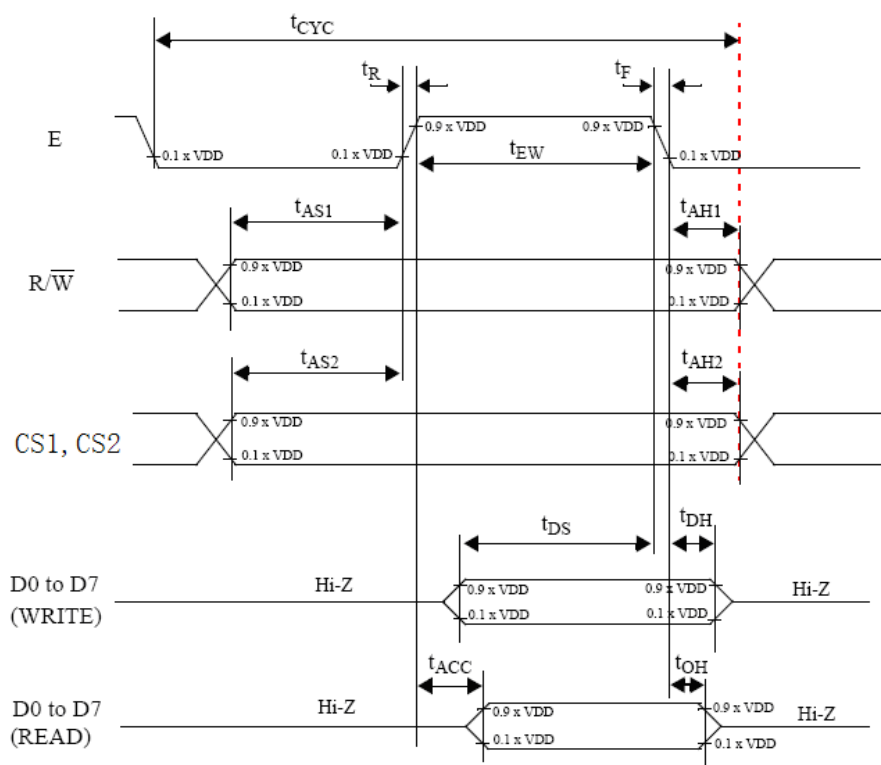
MPU write timing for 8080 family interface



8.2b AC Characteristics for 6800 family interface (VDD=+5V, VSS=0V, TTa=-20~75°)

Items	Symbol	Min	Max	Unit
Address set-up time with respect to R/W	t_{AS1}	20	—	nS
Address set-up time with respect to RS	t_{AS2}	20	—	nS
Address hold time with respect to R/W	t_{AH1}	10	—	nS
Address hold time with respect to RS	t_{AH2}	10	—	nS
Enable pulse falling/rising time	t_F, t_R	—	15	nS
System cycle time	t_{CYC}	1000	—	nS
Enable pulse width for READ	t_{EWR}	100	—	nS
Enable pulse width for WRITE	t_{EWW}	80	—	nS
Data setup time	t_{DS}	80	—	nS
Data hold time	t_{DH}	10	—	nS
Data access time	t_{ACC}	—	90	nS
Data output hold time	t_{OH}	10	60	nS

MPU write timing for 6800 family interface



9. FUNCTION SPECIFICATIONS

9.1. Basic Setting

To drive the LCD module correctly and provide normally display, please use the following setting:

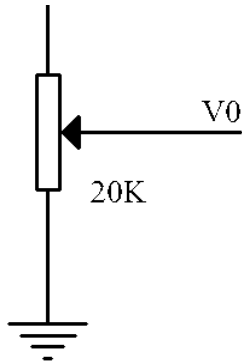
- Select duty=1/32;
- ADC=0;
- Display start line=0;
- LCD display=ON;
- READ-MODIFY-WRITE=OFF.

Note:

- These setting/commands should issue to both controllers while start up;
- See the Display control instructions section for details.

9.2. Adjusting The LCD Display Contrast

A Variable-Resistor must be connected to the LCD module for providing a reference to V0. The recommended value of the Variable-Resistor is 20K to 50K.



9.3. Resetting Signal

The LCD module can be reset or initialized by setting /RST to low level(if it is interfaced with a 6800 MPU) or high level(if it is interfaced with a 8080 family MPU). This reset operation occurs when an edge of the /RST signal is sensed. The level input selects the type of interface with the 6800 family or 8080 family MPU.

High level: Interface with 6800 family MPU

Low level: Interface with 8080 family MPU

9.4. Display Memory Map

Page address	Data	LCD Display (font view)															
0	DB7 DB0																
1	DB7 DB0																
2	DB7 DB0																
3	DB7																

	 DB0										
Column driver		Y1	Y2	...	Y60	Y61	Y1	Y2	...	Y60	Y61
Column address		00h—3Ch					00h—3Ch				
Total		61×32dots					61×32dots				
Drive(accessed by)		E1					E2				

- Note:
- Display start line=0;
 - ADC=0.

9.5. Display Control Instructions

Instructions	Code										Function	Note
	R/W	A0	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Display ON/OFF	0	0	1	0	1	0	1	1	1	0/1	0 = OFF 1 = ON (Display Data RAM is not affected)	*1
Set Display Start Line	0	0	1	1	0	Display Start Line (0 ~ 31)					Specifies RAM line corresponding to the top line of display	*1
Set Page Address	0	0	1	0	1	1	1	0	Page (0 ~ 3)		Set Page Address Register	*1
Set Column Address	0	0	0	Column Address (0 ~ 79)							Set Column Address Counter	*1
Read Status	1	0	Busy	ADC	ON/OFF	Reset	0	0	0	0	Busy=1, Busy Busy=0, Ready ADC=1, CW output ADC=0, CCW output ON/OFF=1, Display off ON/OFF=0, Display on Reset=1, Being reset Reset=0, Normal	*3
Write Display Data	0	1	Display Data								Write Display Data to display data RAM	*1
Read Display Data	1	1	Display Data								Read Display Data from display data RAM	*3
Select ADC	0	0	1	0	1	0	0	0	0	0/1	0 = CW output 1 = CCW output	*1
Static Drive ON/OFF	0	0	1	0	1	0	0	1	0	0/1	0 = normal drive 1 = static drive	*1
Select duty	0	0	1	0	1	0	1	0	0	0/1	0 = 1/16 duty 1 = 1/32 duty	*1
Read-Modify-Write	0	0	1	1	1	0	0	0	0	0	Read-modify-write = ON	*1
End	0	0	1	1	1	0	1	1	1	0	Read-modify-write = OFF	*1
Reset	0	0	1	1	1	0	0	0	1	0	Software Reset	*1

Note:

1*. Only one section(driver) could be read at the same time.

2*. For the details of the display control instructions, please refer to SBN1661G datasheet.

10.DESIGN AND HANDING PRECAUTION

- 10.1.The LCD panel is made by glass. Any mechanical shock (eg. Dropping form high place) will damage the LCD module. Do not add excessive force on the surface of the display, which may cause the Display color change abnormally.
- 10.2.The polarizer on the LCD is easily get scratched. If possible, do not remove the LCD protective film until the last step of installation.
- 10.3.Never attempt to disassemble or rework the LCD module.
- 10.4.Only Clean the LCD with Isopropyl Alcohol or Ethyl Alcohol. Other solvents (eg. water) may damage the LCD.
- 10.5.When mounting the LCD module, make sure that it is free form twisting, warping and

distortion.

- 10.6. Ensure to provide enough space (with cushion) between case and LCD panel to prevent external force adding on it, or it may cause damage to the LCD or degrade the display result
- 10.7. Only hold the LCD module by its side. Never hold LCD module by add force on the heat seal or TAB.
- 10.8. Never add force to component of the LCD module. It may cause invisible damage or degrade of the reliability.
- 10.9. LCD module could be easily damaged by static electricity. Be careful to maintain an optimum anti-static work environment to protect the LCD module.
- 10.10. When peeling of the protective film from LCD, static charge may cause abnormal display pattern. It is normal and will resume to normal in a short while.
- 10.11. Take care and prevent get hurt by the LCD panel edge.
- 10.12. Never operate the LCD module exceed the absolute maximum ratings.
- 10.13. Keep the signal line as short as possible to prevent noisy signal applying to LCD module.
- 10.14. Never apply signal to the LCD module without power supply.
- 10.15. IC chip (eg. TAB or COG) is sensitive to the light. Strong lighting environment could possibly cause malfunction. Light sealing structure casing is recommend.
- 10.16. LCD module reliability may be reduced by temperature shock.
- 10.17. When storing the LCD module, avoid exposure to the direct sunlight, high humidity, high temperature or low temperature. They may damage or degrade the LCD module