

# **User's Guide**

## **GXM12232SL**

### **Liquid Crystal Display Module**

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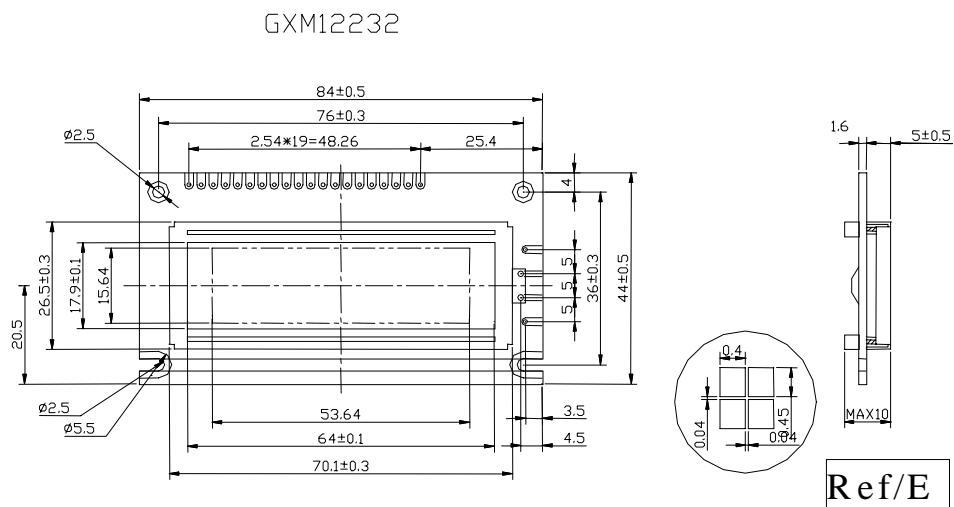
**Read/Write operation sequence (68 Type MPU)**

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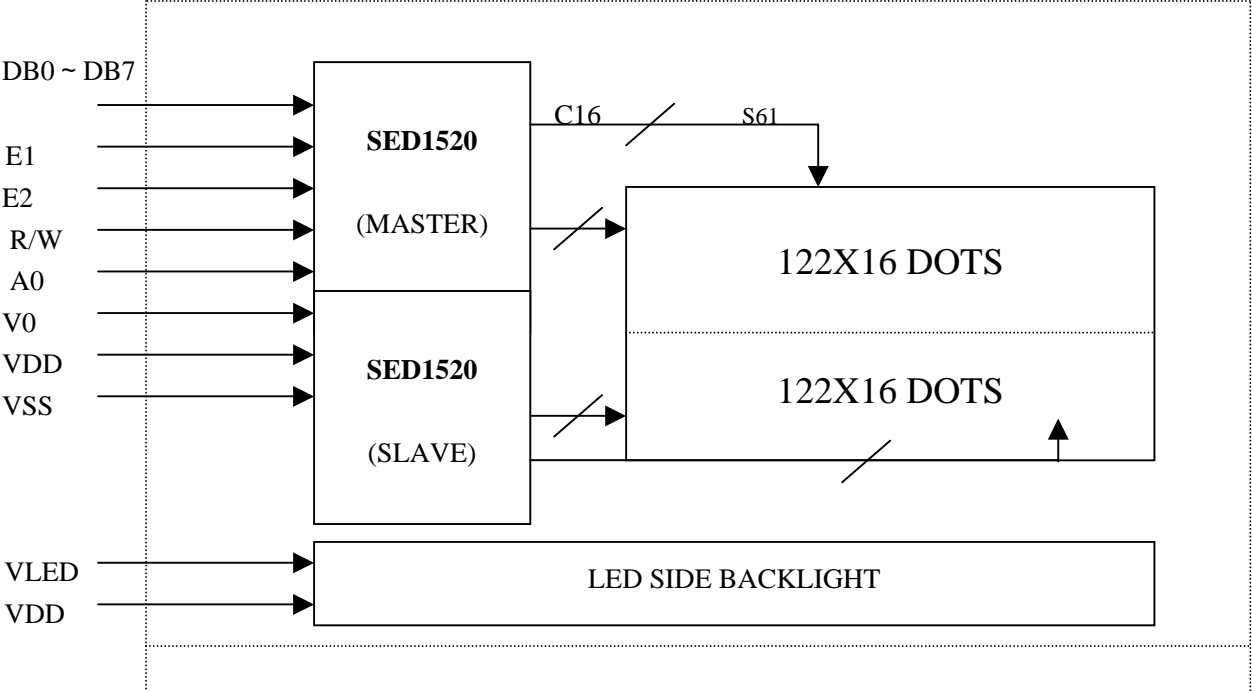
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Mechanical Diagram(GXM12232SL with LED side backlight)



BLOCK DIAGRAM



## PIN ASSIGNMENTS

Pin	Symbol	Level	Function
1	V <sub>SS</sub>	---	GND (0V)
2	V <sub>DD</sub>	---	Power Supply For Logic
3	V <sub>O</sub>	---	Power Supply For LCD Drive
4	A0	H/L	H Data L Instruction
5	NC		No connection
6	E2	H/L	Enable signal 2
7	NC		No connection
8	/RD(E1)	-H/L	/RD for 80 series, E for 68 series (Enable signal 1)
9	/WR(R/W)	---	/WD for 80 series, R/W for 68 series
10	DB0	H/L	Data Bus Line
11	DB1	H/L	
12	DB2	H/L	
13	DB3	H/L	
14	DB4	H/L	
15	DB5	H/L	
16	DB6	H/L	
17	DB7	H/L	
18	/RES	H/L	Reset Signal, H 80 Series, L 68 series
19	LEDA	---	Power Supply For LED Backlight
20	LEDK	---	

## ABSOLUTE MAXIMUM RATINGS(T<sub>a</sub>=25 )

Parameter	Symbol	Min	Max	Unit
Supply Voltage for logic	VDD	0	6.7	V
Supply Voltage for LCD	VDD-V <sub>O</sub>	0	10	V
Input voltage	V <sub>I</sub>	0	VDD	V
Operating Temp.	T <sub>OP</sub>	-10	+50	
Storage Temp.	T <sub>ST</sub>	-20	+70	

**ABSOLUTE MAXIMUM RATINGS for LED SIDE BACKLIGHT**(Ta=25 )

Item	Symbol	Conditions	Rating	Unit
Abosolute maximum forward current	Ifm		35*2	mA
Peak forward current	Ifp	1 msec plus 10% duty cycle	100*2	mA
Reverse voltage	Vr		5	V
Power dissipation	Pd		200	mW
Operating temperature range	Topr		- 40~ + 80	
Storage temperature range	Tstg		- 40~ + 80	

**ELECTRICAL CHRACTERISTICS**(VDD=+5V±10%,VSS=0V,Ta=25 )**DC Characteristics**

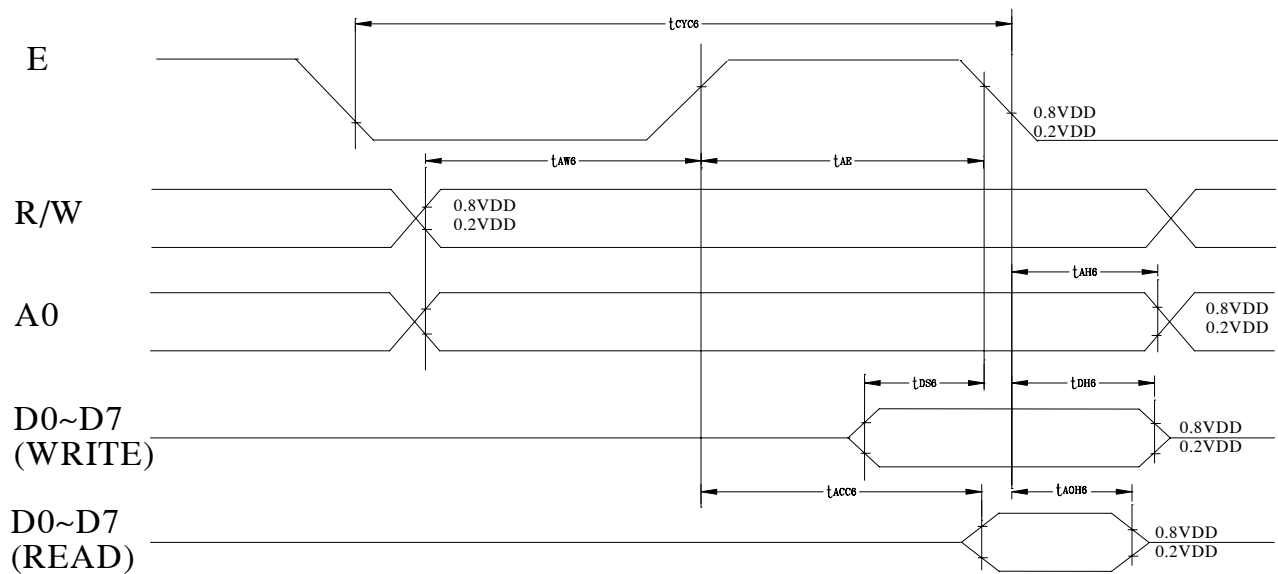
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Supply voltage for logic	VDD	----	4.5	5.0	5.5	V
Supply current for logic	IDD	----	----	0.8	1.5	mA
Operating voltage for LCD	VDD-V0	25	----	4.5	----	V
Supply voltage for LED backlight	VLED	----	----	4.2	----	V
Supply current for LED backlight	ILED	VLED=4.2V	----	110	----	mA

**ELECTRICAL CHRACTERISTICS for LED SIDE BACKLIGHT**

Item	Symbol	min.	typ.	max.	Unit	Condition
Forward Voltage	Vf		4.2	4.8	V	If = 20*2mA
Reverse Current	Ir			100*2	A	Vr=5V
Peak wave length		571	576	580	Nm	If = 20*2mA
Spectral line half width		50	55	60	nm	If = 20*2mA
Luminance	Lv	29	37		Cd/m <sup>2</sup>	If=20*2mA

AC Characteristics

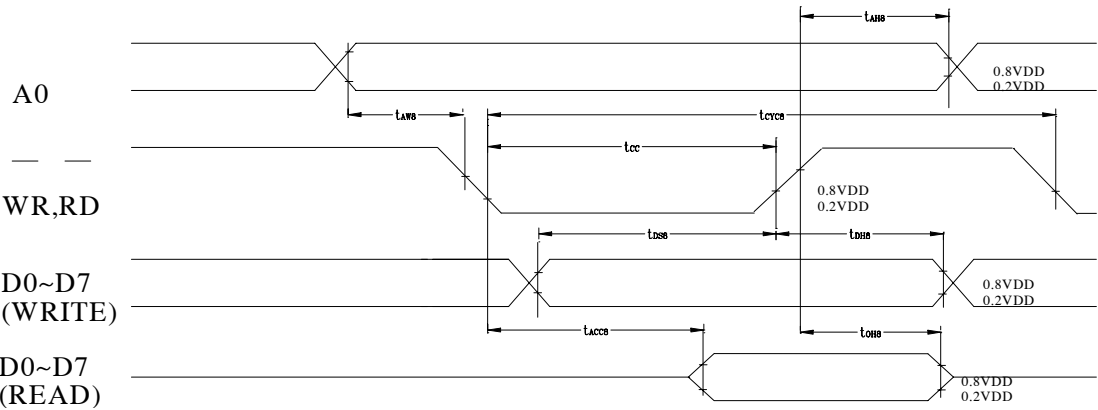
Read/Write operation sequence(68 Type MPU)



Ta=-20 to +75 ,VDD=5.0V±10%,VSS=0V

Parameter		Symbol	Min	Max	unit	Condition
System cycle time		t <sub>CYC6</sub>	1000	-----	ns	
Address setup time		t <sub>AW6</sub>	20	-----	ns	
Address hold time		T <sub>AH6</sub>	10	-----	ns	
Enable pulse width	Read	t <sub>EW</sub>	100	-----	ns	
	Write	t <sub>EW</sub>	80	-----	ns	
Data setup time		t <sub>DS6</sub>	80	-----	ns	
Data hold time		t <sub>DH6</sub>	10	-----	ns	
Access time		t <sub>ACC6</sub>	----	90	ns	CL=100Pf
Output disable time		t <sub>OH6</sub>	10	60	ns	
Input wave form rise time		t <sub>r</sub>	----	15	ns	

Read/Write operation sequence(80 Type MPU)



**Ta=-20 to +75 ,VDD=5.0V±10%,VSS=0V**

Parameter	Symbol	Min	Max	unit	Condition
System cycle time	t <sub>CYC8</sub>	1000	-----	ns	
Address setup time	t <sub>AW8</sub>	20	-----	ns	
Address hold time	t <sub>AH8</sub>	10	-----	ns	
Control pulse width	t <sub>CC</sub>	200	-----	ns	
Data setup time	t <sub>DS8</sub>	80	-----	ns	
Data hold time	t <sub>DH8</sub>	10	-----	ns	
RD access time	t <sub>ACC8</sub>	----	90	ns	CL=100Pf
Output disable time	t <sub>CH8</sub>	10	60	ns	

## OPERATING PRINCIPLES & METHODS

### Control and Display Command

command	R/W	RD	A0	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0/1	Whole display ON/OFF 1: ON , 0: OFF(Power Save mode if the static drive on)
Display start line	0	1	0	1	1	0	Display start line (0 to 31)					Determine the display line correspond to the com0.
Set page address	0	1	0	1	0	1	1	1	0	Page( 0 to 3)		Set the page of display .Data RAM to the Column Register
Set column address	0	1	0	0	Column address ( 0 to 79 )							Set the Column Address of Display data RAM to the column register
Read status	0	0	1	Bus y	ADC	On/ Off	Reset	0	0	0	0	Read the status. BUSY 1: Working 0: Ready ADC 1: Clockwise output 0: Counter clockwise ON/OFF 1: Display off 0: Display on RESET 1: Reset 0: Normal
Write display data	1	1	0	Write data								Write data from data bus into display RAM
Read display data	1	0	1	Read data								Read data from display RAM onto data bus
Select ADC	0	1	0	1	0	1	0	0	0	0	0/1	Determine the clockwise or counterclockwise reading of the display data RAM 0: Clockwise Output 1: Counterclockwise Output
Static drive ON/OFF	0	1	0	1	0	1	0	0	1	0	0/1	Select the dynamic or static driving 1: Static driving(Power save) 0: Dynamic driving

Select duty	0	1	0	1	0	1	0	1	0	0	0/1	Select the duty ratio 1: 1/32 duty                      0: 1/16 duty
Read-Modify- Write	0	1	0	1	1	1	0	0	0	0	0	Increment the column address register when writing but no-change when reading.
Reset	0	1	0	1	1	1	0	0	0	1	0	Set the display start line register to 1st line ,Column add. Counter and page add. register to "0".
End	0	1	0	1	1	1	0	1	1	1	0	Release from the Read Modify Write Mode.

**DIAPLAY DATA RAM ADDRESS MAP**

Page	Data			Com NO.	Driver
1	DB0 ..... DB7	122 × 16 Pixels		0       15	Master
2	DB0 ..... DB7				
3	DB0 ..... DB7	122 × 16 Pixels		16       31	Slave
4	DB0 ..... DB7				
	Seg NO.	0 ----- 60	0----- 60		
	Driver	Master	Slave		