

**SPECIFICATION
FOR
LCM MODULE**

**MODULE NO.: GC0801A0-A202
DOC.REVISION 00**

Customer Approval:

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	SIGNATURE	DATE
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1. FUNCTIONS & FEATURES

1.1. Format	: 8x1characters
1.2. LCD mode	: STN /Transmissive / Positive / Y-G Mode
1.3. Viewing direction	: 6 o'clock
1.4. Driving scheme	: 1/8 Duty , 1/4Bias
1.5. Power supply voltage (V _{DD})	: 5.0V
1.6. LCD driving voltage(V _{op})	: 3.8V(adjustable for best contrast)
1.7. Operation temp	: -20~70°C
1.8. Storage temp	: -30~80°C
1.9. Backlight color	: Bottom Yellow-Green

2. MECHANICAL SPECIFICATIO8NS

2.1. Module size	: 60.0mm(L)*33.0mm(W)*12.0 mm(H)max
2.2. Viewing area	: 44.0mm(L)*13.0mm(W)
2.3. Character pitch	: 5.21mm(L)*7.88mm(W)
2.4. Character size	: 4.41mm(L)x7.88mm(W)
2.5. Dot pitch	: 0.89mm(L)* 0.99mm(W)
2.6. Dot size	: 0.85mm(L)*0.95mm(W)
2.7. Weight	: Approx.

3. BLOCK DIAGRAM

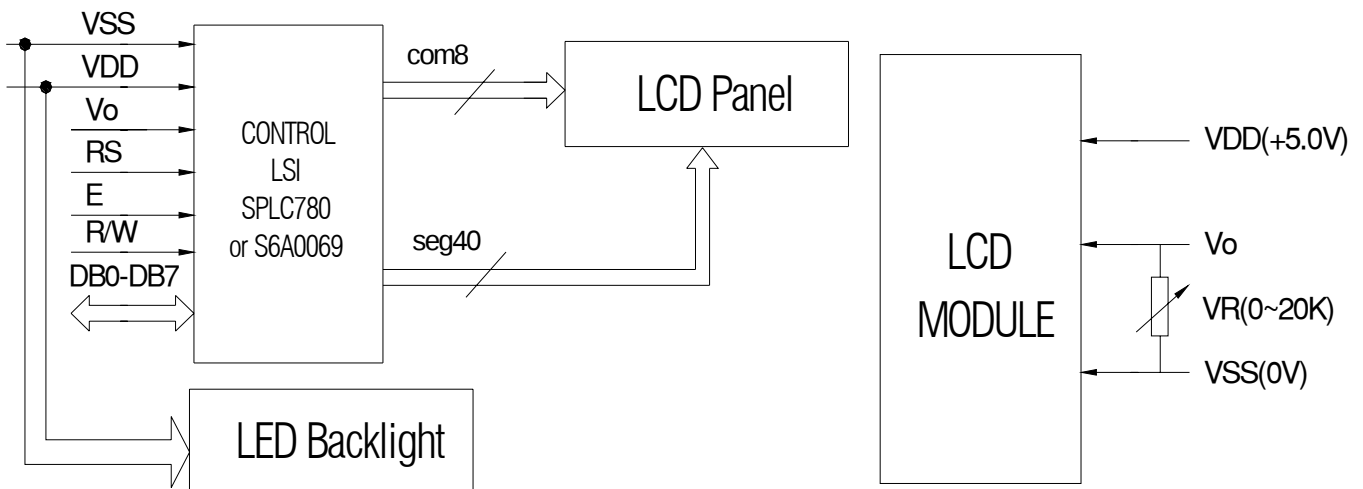


Figure 1. Block diagram

5. PIN DESCRIPTION

No.	Symbol	Function
1	VSS	GND(0V)
2	VDD	Power supply for Logic(+5.0V)
3	V0	Power supply for LCD drive
4	RS	Register selection (H: Data register , L :Instruction register)
5	R/W	Read/write selection (H: Read , L: Write)
6	E	Enable signal for LCM
7-14	DB0~DB7	Data Bus lines
15	VDD	Power supply for Logic(+5.0V)
16	VSS	GND(0V)

6. MAXIMUM ABSOLUTE LIMIT

Maximum Absolute Power Ratings

Characteristic	Symbol	Unit	Value
Power Supply Voltage(1)	V_{DD}	V	-0.3 ~ +7.0
Power Supply Voltage(2)	V_{LCD}	V	$V_{DD}-15.0 \sim V_{DD}+0.3$
Input Voltage	V_{IN}	V	-0.3 ~ $V_{DD}+0.3$

NOTE: Voltage greater than above may damage the circuit.
 $V_{DD} > V_1 > V_2 > V_3 > V_4 > V_5$

7. ELECTRICAL CHARACTERISTICS

1.DC CHARACTERISTICS

(VDD = 4.5V ~ 5.5V, Ta = 25°C)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
Operating Current	I _{OD}	-	0.55	0.8	mA	External clock (Note)
Input High Voltage	V _{IH1}	2.2	-	VDD	V	Pins:(E, RS, R/W, DB0 - DB7)
Input Low Voltage	V _{IL1}	-0.3	-	0.6	V	
Input High Voltage	V _{IH2}	VDD-1	-	VDD	V	Pin OSC1
Input Low Voltage	V _{IL2}	-0.2	-	1.0	V	Pin OSC1
Input High Current	I _{IH}	-2.0	-	2.0	μA	Pins: (RS, R/W, DB0 - DB7) VDD = 5.0V
Input Low Current	I _{IL}	-20	-50	-100	μA	
Output High Voltage (TTL)	V _{OH1}	2.4	-	VDD	V	I _{OH} = - 0.1mA Pins: DB0 - DB7
Output Low Voltage (TTL)	V _{OL1}	-	-	0.4	V	I _{OL} = 0.1mA Pins: DB0 - DB7
Output High Voltage (CMOS)	V _{OH2}	0.9VDD	-	VDD	V	I _{OH} = - 40μA, Pins: CL1, CL2, M, D
Output Low Voltage (CMOS)	V _{OL2}	-	-	0.1VDD	V	I _{OL} = 40μA, Pins: CL1, CL2, M, D
Driver ON Resistance (COM)	R _{COM}	-	-	20	KΩ	I _O = ±50μA, V _{LCD} = 4.0V Pins: COM1 - COM16
Driver ON Resistance (SEG)	R _{SEG}	-	-	30	KΩ	I _O = ±50μA, V _{LCD} = 4.0V Pins: SEG1 - SEG40
LCD Voltage	V _{LCD}	3.0	-	11	V	VDD-V5, 1/4 bias or 1/5 bias

Note: F_{OSC} = 250KHz, VDD = 5.0V, pin E = "L", RS, R/W, DB0 - DB7 are open, all outputs are no loads.

2.AC Characteristics

(VDD = 4.5V ~ 5.5V, Ta = -30 °C ~ +85°C)

Mode	Characteristic	Symbol	Min.	Typ.	Max.	Unit
Write Mode (Refer to Fig-6)	E Cycle Time	tc	500	-	-	ns
	E Rise / Fall Time	t _R ,t _F	-	-	20	
	E Pulse Width (High, Low)	tw	230	-	-	
	R/W and RS Setup Time	tsu1	40	-	-	
	R/W and RS Hold Time	t _{H1}	10	-	-	
	Data Setup Time	tsu2	80	-	-	
	Data Hold Time	t _{H2}	10	-	-	
Read Mode (Refer to Fig-7)	E Cycle Time	tc	500	-	-	ns
	E Rise / Fall Time	t _R ,t _F	-	-	20	
	E Pulse Width (High, Low)	tw	230	-	-	
	R/W and RS Setup Time	tsu	40	-	-	
	R/W and RS Hold Time	t _H	10	-	-	
	Data Output Delay Time	t _D	-	-	120	
	Data Hold Time	t _{DH}	5	-	-	

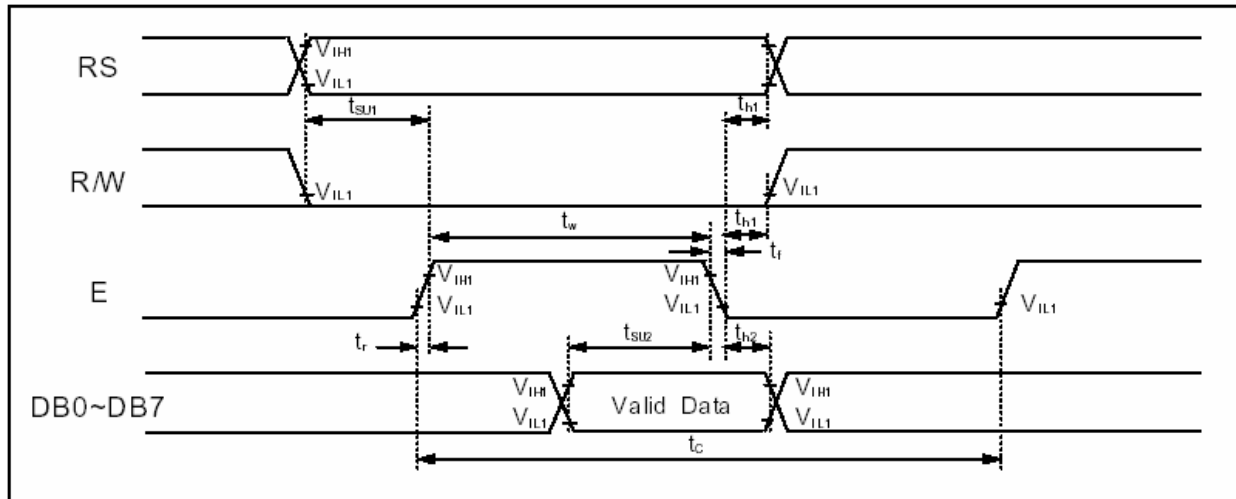


Figure 6 . Write Mode Timing Diagram

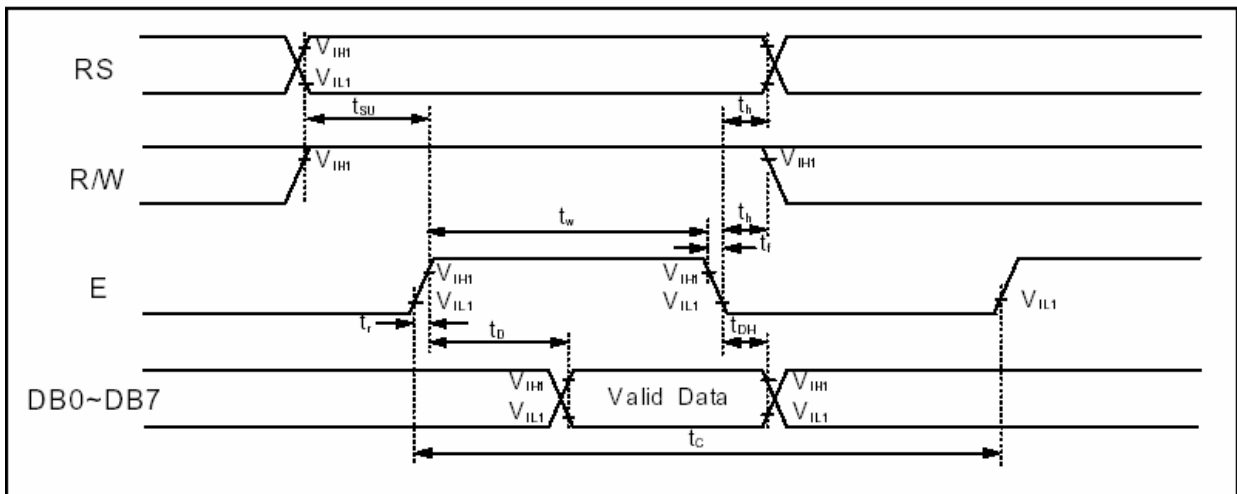


Figure 7 . Read Mode Timing Diagram

8. CONTROL AND DISPLAY INSTRUCTION

Instruction	Instruction Code										Description	Execution time (fosc=270KHz)
	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM and set DDRAM address to "00H" from AC	1.52ms
Return Home	0	0	0	0	0	0	0	0	1	-	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.52ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Assign cursor moving direction and enable the shift of entire display	38μs
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Set display(D), cursor(C), and blinking of cursor(B) on/off control bit.	38μs
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	-	-	Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.	38μs
Function Set	0	0	0	0	1	DL	N	F	-	-	Set interface data length (DL: 8-bit/4-bit), numbers of display line (N: 2-line/1-line) and, display font type (F:5x10 dots/5x8 dots)	38μs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	38μs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in counter	38μs
Read Busy Flag and Address Counter	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	38μs
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	38μs

Note: "-": don't care

9. BACK LIGHT CHARACTERISTICS

Bottom LED Backlight
ELECTRICAL RATINGS

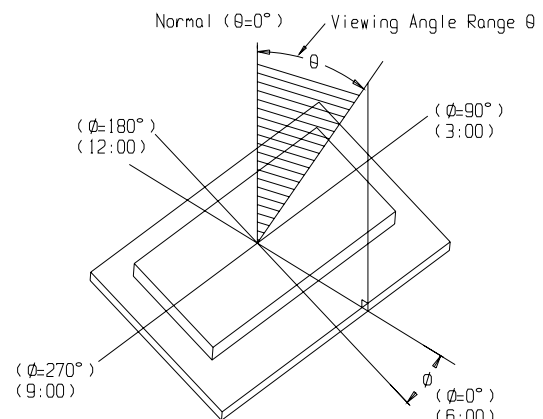
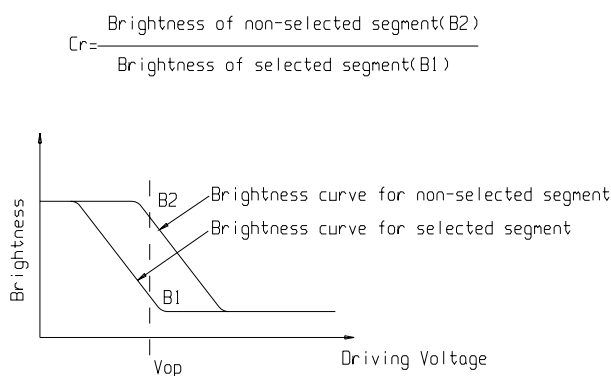
$T_a = 25^{\circ}\text{C}$

Item	Symbol	Condition	Min	TY	Max	Unit
Forward Voltage	VF	IF=100mA	--	4.2	--	V
Reverse Current	IR	VR=10V	---	100	--	uA
Operation temperature	Topr	IF=100mA	-20~+70			°C
Wave length	λ_p	IF=100mA	--	570	---	nm
Color	Yellow-Green					

10. ELECTRO-OPTICAL CHARACTERISTICS

($V_{OP} = 4.3\text{V}$, $T_a = 25^{\circ}\text{C}$)

Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	Vop	$T_a = -20^{\circ}\text{C}$	4.6	4.8	5.0	V
		$T_a = 25^{\circ}\text{C}$	4.1	4.3	4.5	
		$T_a = 70^{\circ}\text{C}$	3.6	3.8	4.0	
Response time	Tr	$T_a = 25^{\circ}\text{C}$	---	185	---	ms
	Tf		---	200	---	ms
Contrast	Cr	$T_a = 25^{\circ}\text{C}$	---	4	---	---
Viewing angle range	θ	$Cr \geq 2$	-40	---	+40	deg
	Φ		-40	---	+40	deg



11.FONT CHARACTERISTICS

Upper 4 bit Lower 4 bit	LLLL	LLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLL	HHLH	HHHL	HHHH
LLLL				00P`P								一	夕	ミ	α	p
LLH			!	1	0	a	9				。	ア	チ	△	△	q
LLHL			"	2	B	R	b	r			「	イ	ウ	×	β	θ
LLHH			#	3	C	S	c	≡			」	ウ	テ	モ	ε	∞
LHLH			\$	4	D	T	d	t			√	エ	ト	ト	μ	Ω
LHLL			%	5	E	U	e	u			・	オ	ナ	ユ	ε	ü
LHHL			&	6	F	U	f	v			ヲ	カ	ニ	ヨ	p	Σ
LHHH			'	7	G	W	g	w			ヲ	キ	ヌ	ヲ	g	π
HLLL			(	8	H	X	h	x			イ	ウ	ネ	リ	フ	Σ
HLLH			)	9	I	Y	i	y			ウ	ケ	ル	ル	フ	g
HLHL			*	:	J	Z	j	z			エ	コ	△	レ	j	チ
HLHH			+	:	K	L	k	{			オ	サ	ヒ	ロ	*	万
HHLL			,	<	L	¥	1	!			ホ	シ	フ	ワ	*	円
HHLH			-	=	M	J	m	}			ユ	ヌ	△	ン	モ	÷
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