

# AZ DISPLAYS, INC.

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*COMPLETE LCD SOLUTIONS*

## **SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY**

PART NUMBER:

AGM1264P SERIES

DATE:

August 17, 2006

# AGM1264P SERIES LCD MODULE

## GENERAL SPECIFICATION

Interface With Parallel MPU

Driving IC:S1D15605

Display Specification

Display Dot Matrix :128\*64

Viewing Angle :6:00 Clock

Display Duty:1/65 Driving bias:1/9 Driving voltage:8.9V

Mechanical Characteristics(Unit:mm)

Extenal Dimension:89.7\*49.8\*6.0

View Area:66.8\*35.5

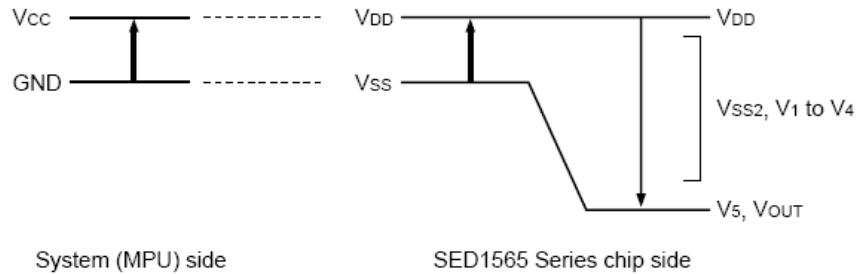
Dots Size:0.48\*0.48

Dots Pitch:0.50\*0.50

# AGM1264P SERIES LCD MODULE

## Absolute Maximun Ratings

Parameter		Symbol	Conditions	Unit
Power Supply Voltage		VDD	-0.3 to +7.0	V
Power supply voltage (2) (VDD standard)	With Triple step-up With Quad step-up	VSS2	-7.0 to +0.3	V
			-6.0 to +0.3	
			-4.5 to +0.3	
Power supply voltage (3) (VDD standard)		V5, VOUT	-18.0 to +0.3	V
Power supply voltage (4) (VDD standard)		V1, V2, V3, V4	V5 to +0.3	V
Input voltage		VIN	-0.3 to VDD + 0.3	V
Output voltage		VO	-0.3 to VDD + 0.3	V
Operating temperature		TOPR	-40 to +85	°C
Storage temperature	TCP	TSTR	-55 to +100	°C
	Bare chip		-55 to +125	



### Notes and Cautions

1. The VSS2, V1 to V5 and VOUT are relative to the VDD = 0V reference.
2. Insure that the voltage levels of V1, V2, V3, and V4 are always such that  $VDD \geq V1 \geq V2 \geq V3 \geq V4 \geq V5$ .
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.

## Electrical Characteristics

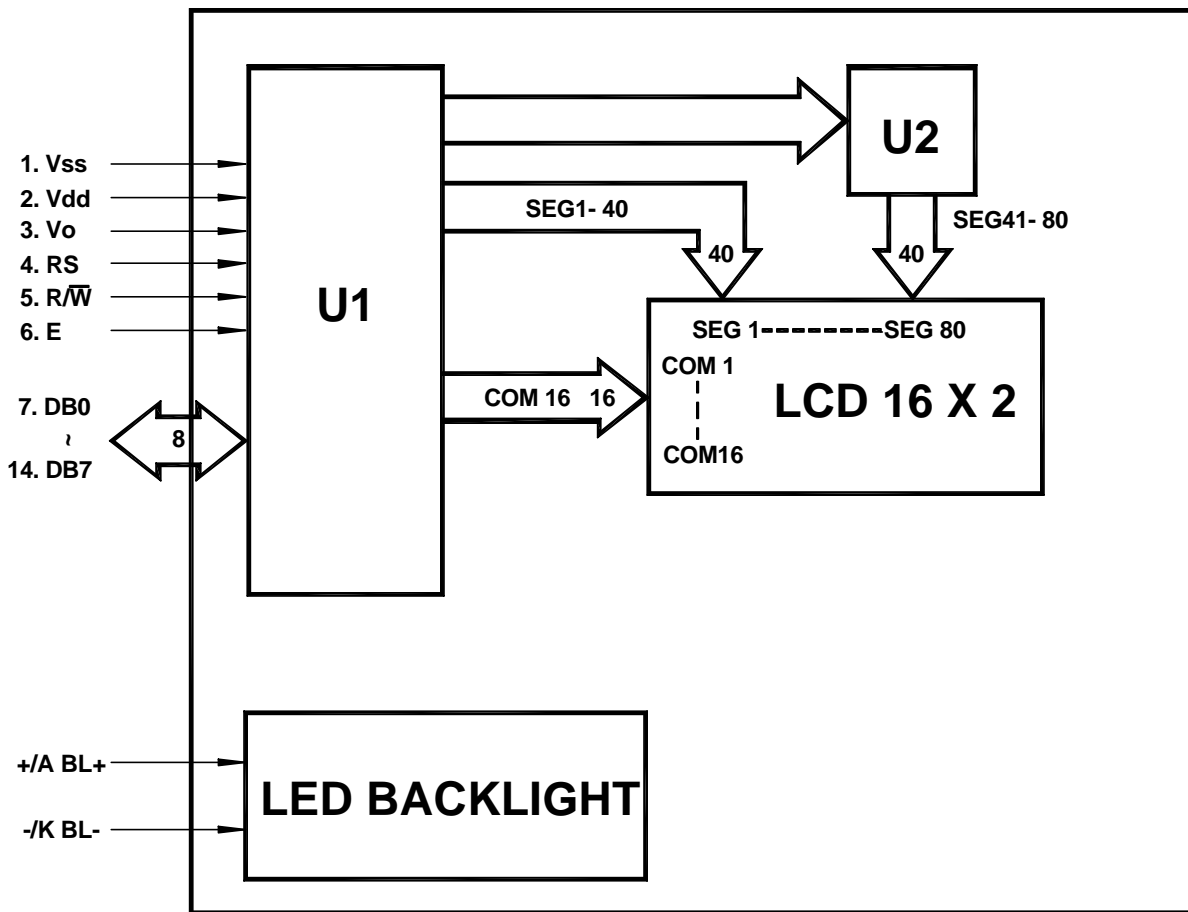
Item	Symbol	Condition	Standard Value			Unit
			Min	Type	Max	
Supply Voltage For logic	Vdd-Vss	-	1.8	-	5.5	V
Supply Current For logic	Idd	-	-	-	1000	uA
Driving Current For LCD	Iee		-	-	80	uA
Driving Voltage For LCD	V0-Vss		-	-	-	V
Input Voltage H level	Vih		0.7Vdd	-	Vdd	V
Input Voltage L level	Vil		Vss	-	0.3Vdd	V

# AGM1264P SERIES LCD MODULE

## 4.1 OPTICAL CHARACTERISTICS (Ta=25°C, Vdd= 5.0V±0.25V, STN LC fluid)

Item	Symbol	Condition	Min	Typ	Max	Unit
Viewing angle (horizontal)	$\theta$	$Cr \geq 2.0$	-60	-	35	deg
Viewing angle (vertical)	$\phi$	$Cr \geq 2.0$	-40	-	40	deg
Contrast Ratio	Cr	$\phi=0^\circ, \theta=0^\circ$	-	6	-	
Response time (rise)	Tr	$\phi=0^\circ, \theta=0^\circ$	-	150	250	ms
Response time (fall)	Tf	$\phi=0^\circ, \theta=0^\circ$	-	150	250	ms

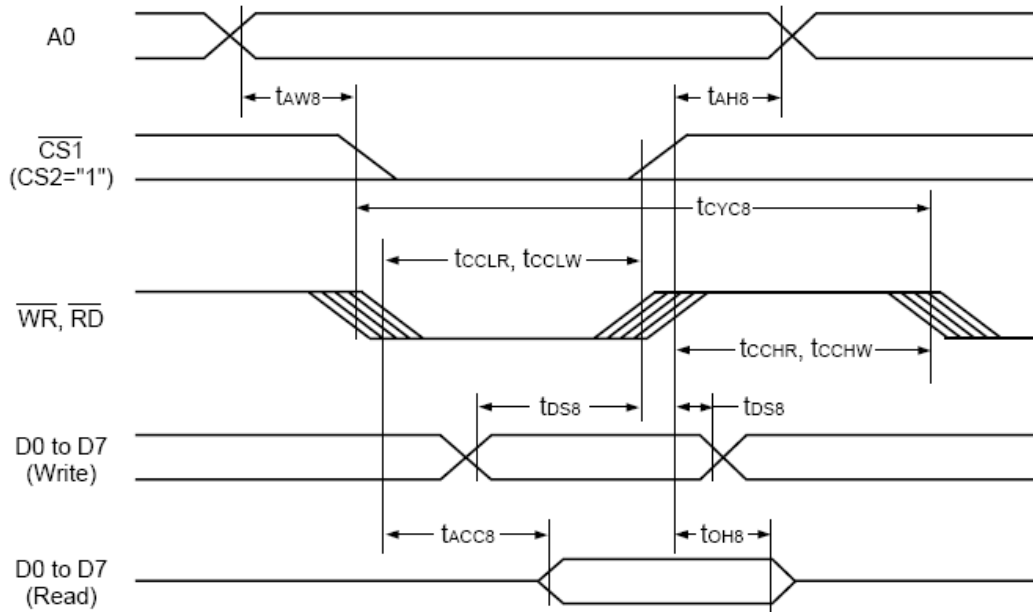
## 5.0 BLOCK DIAGRAM



# AGM1264P SERIES LCD MODULE

## TIMING CHARACTERISTICS

### System Bus Read/Write Characteristics 1 (For the 8080 Series MPU)



(VDD = 4.5 V to 5.5 V, Ta = -40 to 85°C )

Item	Signal	Symbol	Condition	Rating		Units
				Min	Max	
Address hold time	A0	tAH8		0	—	ns
Address setup time	A0	tAW8		0	—	ns
System cycle time	A0	tCYC8		166	—	ns
Control L pulse width ( $\overline{WR}$ )	$\overline{WR}$	tcCLW		30	—	ns
Control L pulse width ( $\overline{RD}$ )	$\overline{RD}$	tcCLR		70	—	ns
Control H pulse width ( $\overline{WR}$ )	$\overline{WR}$	tcCHW		30	—	ns
Control H pulse width ( $\overline{RD}$ )	$\overline{RD}$	tcCHR		30	—	ns
Data setup time	D0 to D7	tDS8		30	—	ns
Address hold time		tDH8		10	—	ns
$\overline{RD}$ access time		tACC8	CL = 100 pF	—	70	ns
Output disable time		toH8		5	50	ns

(VDD = 2.7 V to 4.5 V, Ta = -40 to 85°C )

Item	Signal	Symbol	Condition	Rating		Units
				Min	Max	
Address hold time	A0	tAH8		0	—	ns
Address setup time	A0	tAW8		0	—	ns
System cycle time	A0	tCYC8		300	—	ns
Control L pulse width ( $\overline{WR}$ )	$\overline{WR}$	tcCLW		60	—	ns
Control L pulse width ( $\overline{RD}$ )	$\overline{RD}$	tcCLR		120	—	ns
Control H pulse width ( $\overline{WR}$ )	$\overline{WR}$	tcCHW		60	—	ns
Control H pulse width ( $\overline{RD}$ )	$\overline{RD}$	tcCHR		60	—	ns
Data setup time	D0 to D7	tDS8		40	—	ns
Address hold time		tDH8		15	—	ns
$\overline{RD}$ access time		tACC8	CL = 100 pF	—	140	ns
Output disable time		toH8		10	100	ns

# AGM1264P SERIES LCD MODULE

(VDD = 1.8 V to 2.7 V, Ta = -40 to 85°C)

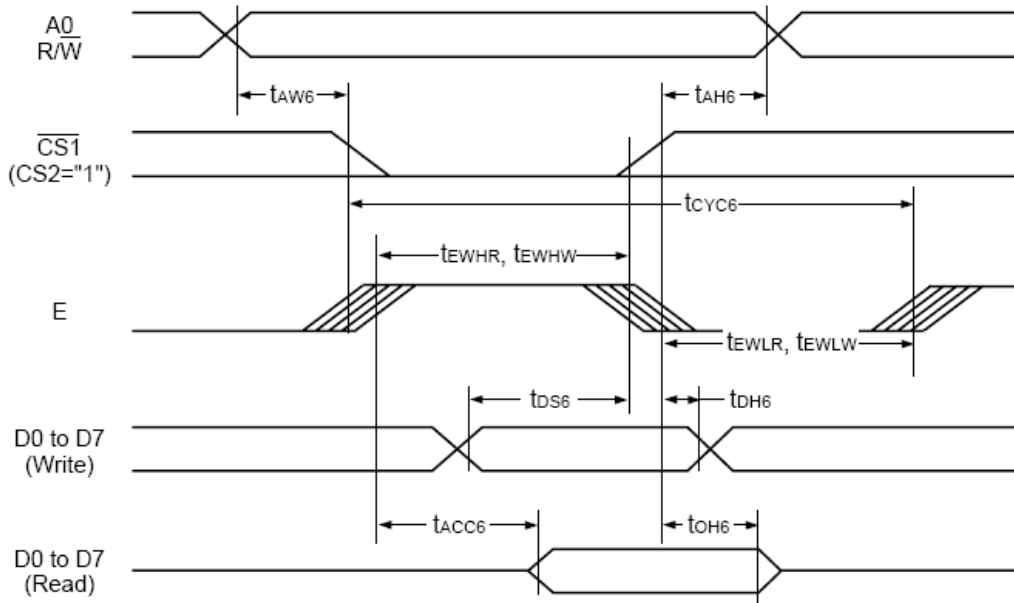
Item	Signal	Symbol	Condition	Rating		Units
				Min	Max	
Address hold time	A0	t <sub>AH8</sub>		0	—	ns
Address setup time	A0	t <sub>AW8</sub>		0	—	ns
System cycle time	A0	t <sub>CYC8</sub>		1000	—	ns
Control L pulse width ( $\overline{WR}$ )	$\overline{WR}$	t <sub>CCLW</sub>		120	—	ns
Control L pulse width ( $\overline{RD}$ )	$\overline{RD}$	t <sub>CCLR</sub>		240	—	ns
Control H pulse width ( $\overline{WR}$ )	$\overline{WR}$	t <sub>CCHW</sub>		120	—	ns
Control H pulse width ( $\overline{RD}$ )	$\overline{RD}$	t <sub>CCHR</sub>		120	—	ns
Data setup time	D0 to D7	t <sub>DS8</sub>		80	—	ns
Address hold time		t <sub>DH8</sub>		30	—	ns
$\overline{RD}$ access time	D0 to D7	t <sub>ACC8</sub>	CL = 100 pF	—	280	ns
Output disable time		t <sub>OH8</sub>		10	200	ns

\*1 The input signal rise time and fall time (t<sub>r</sub>, t<sub>f</sub>) is specified at 15 ns or less. When the system cycle time is extremely fast, (t<sub>r</sub> + t<sub>f</sub>) ≤ (t<sub>CYC8</sub> - t<sub>CCLW</sub> - t<sub>CCHW</sub>) for (t<sub>r</sub> + t<sub>f</sub>) ≤ (t<sub>CYC8</sub> - t<sub>CCLR</sub> - t<sub>CCHR</sub>) are specified.

\*2 All timing is specified using 20% and 80% of VDD as the reference.

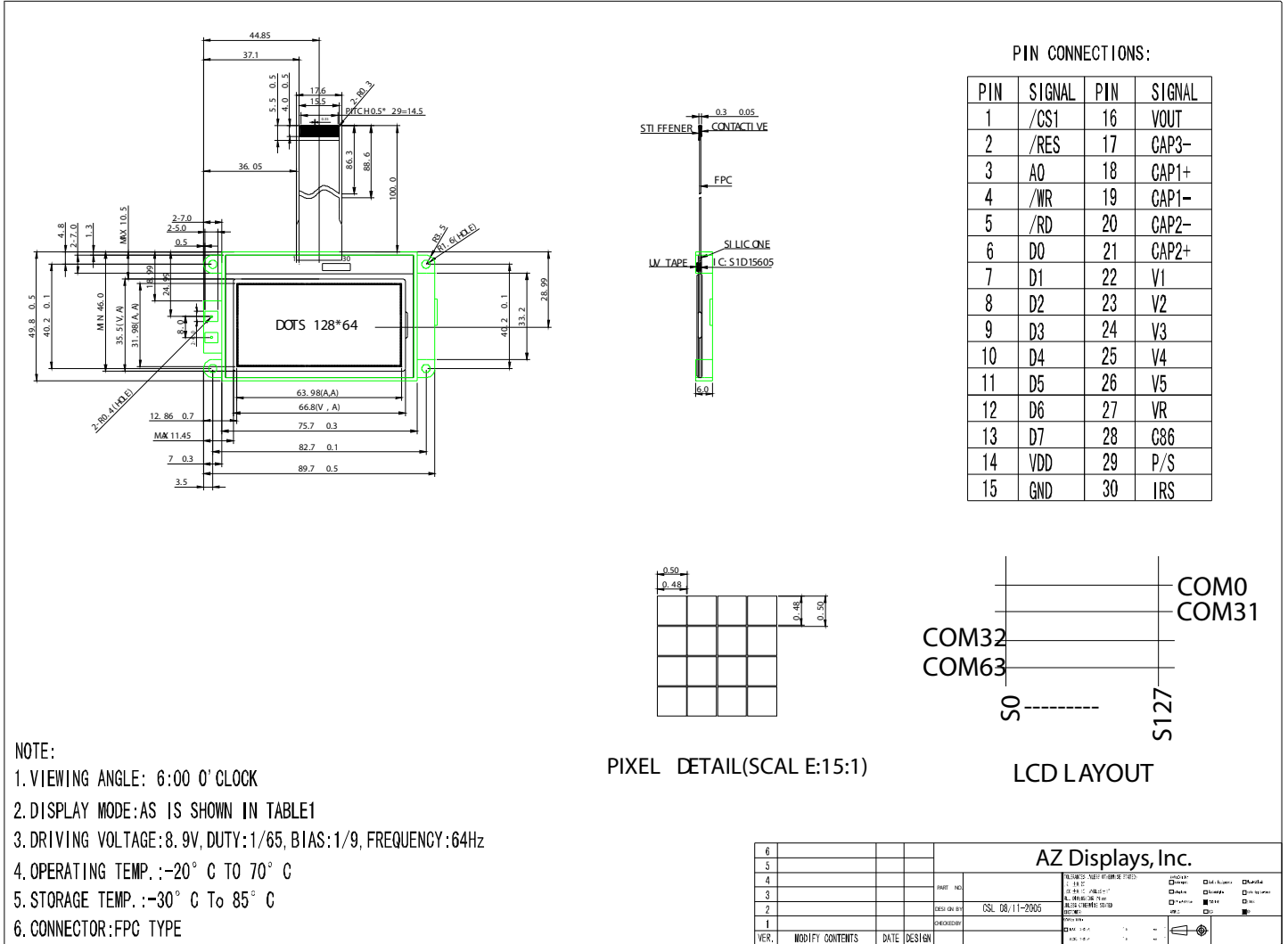
\*3 t<sub>CCLW</sub> and t<sub>CCLR</sub> are specified as the overlap between  $\overline{CS1}$  being "L" (CS2 = "H") and  $\overline{WR}$  and  $\overline{RD}$  being at the "L" level.

## System Bus Read/Write Characteristics 2 (6800 Series MPU)



# AGM1264P SERIES LCD MODULE

## 9.0 MECHANICAL DIAGRAM



# AGM1264P SERIES LCD MODULE

(VDD = 4.5 V to 5.5 V, Ta = -40 to 85°C )

Item	Signal	Symbol	Condition	Rating		Units	
				Min	Max		
Address hold time	A0	tAH6		0	—	ns	
Address setup time		tAW6		0	—	ns	
System cycle time	A0	tCYC6		166	—	ns	
Data setup time	D0 to D7	tDS6		30	—	ns	
Data hold time		tDH6		10	—	ns	
Access time		tACC6		CL = 100 pF	—	70	ns
Output disable time		tOH6			10	50	ns
Enable H pulse time	Read Write	E		tEWHR	70	—	ns
				tEWHW	30	—	ns
Enable L pulse time	Read Write	E		tEWLR	30	—	ns
				tEWLW	30	—	ns

(VDD = 2.7 V to 4.5 V, Ta = -40 to 85°C )

Item	Signal	Symbol	Condition	Rating		Units	
				Min	Max		
Address hold time	A0	tAH6		0	—	ns	
Address setup time		tAW6		0	—	ns	
System cycle time	A0	tCYC6		300	—	ns	
Data setup time	D0 to D7	tDS6		40	—	ns	
Data hold time		tDH6		15	—	ns	
Access time		tACC6		CL = 100 pF	—	140	ns
Output disable time		tOH6			10	100	ns
Enable H pulse time	Read Write	E		tEWHR	120	—	ns
				tEWHW	60	—	ns
Enable L pulse time	Read Write	E		tEWLR	60	—	ns
				tEWLW	60	—	ns

(VDD = 1.8 V to 2.7 V, Ta = -40 to 85°C )

Item	Signal	Symbol	Condition	Rating		Units	
				Min	Max		
Address hold time	A0	tAH6		0	—	ns	
Address setup time		tAW6		0	—	ns	
System cycle time	A0	tCYC6		1000	—	ns	
Data setup time	D0 to D7	tDS6		80	—	ns	
Data hold time		tDH6		30	—	ns	
Access time		tACC6		CL = 100 pF	—	280	ns
Output disable time		tOH6			10	200	ns
Enable H pulse time	Read Write	E		tEWHR	240	—	ns
				tEWHW	120	—	ns
Enable L pulse time	Read Write	E		tEWLR	120	—	ns
				tEWLW	120	—	ns

\*1 The input signal rise time and fall time (tr, tf) is specified at 15 ns or less. When the system cycle time is extremely fast, (tr + tf) ≤ (tCYC6 - tEWLW - tEWHW) for (tr + tf) ≤ (tCYC6 - tEWLR - tEWHR) are specified.

\*2 All timing is specified using 20% and 80% of VDD as the reference.

\*3 tEWLW and tEWLR are specified as the overlap between CS1 being "L" (CS2 = "H") and E.

## IC Specification

See The Reference of EPSON Data Book----S1D15605



# AGM1264P SERIES LCD MODULE

## Instruction Table

Command	Command Code											Function		
	A0	$\overline{RD}$	$\overline{WR}$	D7	D6	D5	D4	D3	D2	D1	D0			
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	0 1	LCD display ON/OFF 0: OFF, 1: ON	
(2) Display start line set	0	1	0	0	1	Display start address						0	Sets the display RAM display start line address	
(3) Page address set	0	1	0	1	0	1	1	Page address					0	Sets the display RAM page address
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				0	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				0	Sets the least significant 4 bits of the display RAM column address.	
(5) Status read	0	0	1	Status				0	0	0	0	0	0	Reads the status data
(6) Display data write	1	1	0	Write data								0	Writes to the display RAM	
(7) Display data read	1	0	1	Read data								0	Reads from the display RAM	
(8) ADC select	0	1	0	1	0	1	0	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	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	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 1	Sets the LCD drive voltage bias ratio SED1565*** ..... 0: 1/9, 1: 1/7 SED1566*** /SED1568*** /SED1569*** ..... 0: 1/8, 1: 1/6 SED1567*** ..... 0: 1/6, 1: 1/5	
(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	0	0	Clear read/modify/write	
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	0	Internal reset	
(15) Common output mode select	0	1	0	1	1	0	0	0	*	*	*	1	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			0	Select internal power supply operating mode	
(17) Vs voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			0	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 Vs output voltage electronic volume register	
Electronic volume register set	0	1	0	*	*	Electronic volume value						0		
(19) Static indicator ON/OFF	0	1	0	1	0	1	0	1	1	0	0	0 1	0: OFF, 1: ON	
Static indicator register set	0	1	0	*	*	*	*	*	*	*	Mode	0	Set the flashing mode	
(20) Power saver													Display OFF and display all points ON compound command	
(21) NOP	0	1	0	1	1	1	0	0	0	0	1	1	Command for non-operation	
(22) Test	0	1	0	1	1	1	1	*	*	*	*	*	Command for IC test. Do not use this command	

(Note) \*: disabled data

# AGM1264P SERIES LCD MODULE

## Instruction Description

### 1. Display On/Off

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	<b>D0</b>
0	1	0	1	0	1	0	1	1	1	-

**D0=1** Display On

**D0=0** Display Off

### 2. Set Display Start Line

A0	E	RW	D7	D6	<b>D5</b>	<b>D4</b>	<b>D3</b>	<b>D2</b>	<b>D1</b>	<b>D0</b>
0	1	0	0	1	<b>ST5</b>	<b>ST4</b>	<b>ST3</b>	<b>ST2</b>	<b>ST1</b>	<b>ST0</b>

<b>ST5</b>	<b>ST4</b>	<b>ST3</b>	<b>ST2</b>	<b>ST1</b>	<b>ST0</b>	Line Address
0	0	0	0	0	0	0
0	0	0	0	0	1	1
.	.	.	.	.	.	.
1	1	1	1	1	0	62
1	1	1	1	1	1	63

### 3. Set Page Address

A0	E	RW	D7	D6	D5	D4	<b>D3</b>	<b>D2</b>	<b>D1</b>	<b>D0</b>
0	1	0	1	0	1	1	<b>P3</b>	<b>P2</b>	<b>P1</b>	<b>P0</b>

<b>P3</b>	<b>P2</b>	<b>P1</b>	<b>P0</b>	Page
0	0	0	0	0
0	0	0	1	1
.	.	.	.	.
0	1	1	1	7
1	0	0	0	8

### 4. Set Column Address

A0	E	RW	D7	D6	D5	D4	<b>D3</b>	<b>D2</b>	<b>D1</b>	<b>D0</b>
0	1	0	0	0	0	0	<b>Y7</b>	<b>Y6</b>	<b>Y5</b>	<b>Y4</b>
0	1	0	0	0	0	0	<b>Y3</b>	<b>Y2</b>	<b>Y1</b>	<b>Y0</b>

**Y4-Y7** :Higter Bits

**Y0-Y3** :Lower Bits

# AGM1264P SERIES LCD MODULE

Y7	Y6	Y5	Y4	Y3	Y2	Y1	Y0	Column Address
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	1	1
.	.	.	.	.	.	.	.	.
1	0	0	0	0	0	1	0	130
1	0	0	0	0	0	1	1	131

## 5. Read Status

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	0	1	Status				0	0	0	0

## 6. Write Display Data

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
1	1	0	Write Data							

## 7. Read Display Data

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
1	0	1	Read Data							

## 8. ADC Select

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	0	1	0	0	0	0	-

D0=1 Display Reverse

D0=0 Display Normal

## 9. Normal/Reverse Display

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	0	1	0	0	1	1	D

When **D**=1 Reverse Display

**D**=0 Normal Display

## 10. Entire Display On/Off

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	0	1	0	0	1	0	D

When D=0 Normal Display      D=1 Reverse Display

## 11. Set LCD Bias

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	0	1	0	0	0	1	D

When **D**=0 Bias=1/9

**D**=1 Bias=1/7

# AGM1264P SERIES LCD MODULE

## Read-Modify-Write

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	1	1	0	0	0	0	0

### 13. End

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	1	1	0	1	1	1	0

### 14. Reset

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	1	1	0	0	0	1	0

### 15. Command Output Mode Select

A0	E	RW	D7	D6	D5	D4	<b>D3</b>	D2	D1	D0
0	1	0	1	1	0	0	<b>D</b>	*	*	*

### 16. Set Power Control

A0	E	RW	D7	D6	D5	D4	D3	<b>D2</b>	<b>D1</b>	<b>D0</b>
0	1	0	0	0	1	0	1	<b>A2</b>	<b>A1</b>	<b>A0</b>

When **A0**=1 Follower Circuit Is Turn On

**A1**=1 Regulator Circuit Is Turn On

**A2**=1 Booster Circuit Is Turn On

### 17. V0 Voltage Regulator Internal Resistor Ratio Set

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	0	0	1	0	0	R2	R1	R0

### 18. The Electronic Volume Mode Set

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	0	0	0	0	0	0	1

### 19. Electronic Volume Register Set

A0	E	RW	D7	D6	<b>D5</b>	<b>D4</b>	<b>D3</b>	<b>D2</b>	<b>D1</b>	<b>D0</b>
0	1	0	0	0	<b>SV5</b>	<b>SV4</b>	<b>SV3</b>	<b>SV2</b>	<b>SV1</b>	<b>SV0</b>

### 20. Static Indicator On/Off

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	<b>D0</b>
0	1	0	1	0	1	0	1	1	0	<b>D</b>

# AGM1264P SERIES LCD MODULE

21.Nop

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	1	1	0	0	0	1	1

**22.Booster Ratio Select Mode Set**

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	1	1	1	1	1	0	0	0

**23.Booster Ratio Register Set**

A0	E	RW	D7	D6	D5	D4	D3	D2	D1	D0
0	1	0	0	0	0	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	1
0	1	0	0	0	0	0	0	0	1	1

D1、D0=00,2x,3x,4x

D1、D0=01,5x

D1、D0=11,6x

**Application Example**

**Application Circuit**

