



# NMOS RAMs

## MM2102A, MM2102AL Family 1024-Bit (1024 × 1) Static RAMs

### General Description

The MM2102A family of high speed 1024 × 1-bit static random access read/write memories is manufactured using N-channel depletion-mode silicon gate technology. Static storage cells eliminate the need for clocks or refresh circuitry and the resultant cost associated with them.

Low threshold silicon gate N-channel technology allows complete DTL/TTL compatibility of all inputs and outputs as well as a single 5V supply. The separate chip enable input ( $\overline{CE}$ ) controlling the TRI-STATE<sup>®</sup> output allows easy memory expansion by OR-tying individual devices to a data bus. Data in and data out have the same polarity.

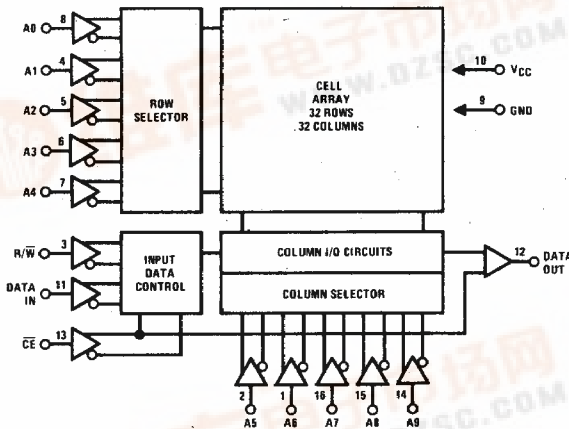
In addition to the MM2102A, a low power version, the MM2102AL, is also available. This selection offers

a maximum operating current of 33 mA and a guaranteed standby mode down to a power supply voltage of 1.5V.

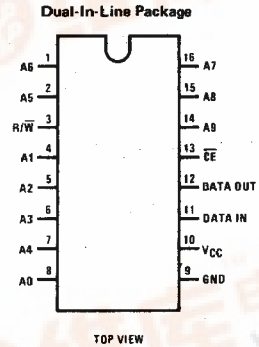
### Features

- Single 5V supply
- All inputs and outputs directly DTL/TTL compatible
- Static operation—no clocks or refresh
- TRI-STATE output for bus interface
- All inputs protected against static charge
- Access time down to 250 ns

### Block Diagram



### Connection Diagram

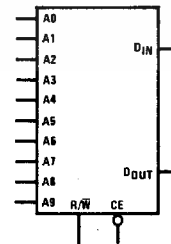


- |  |  |
|--|--|
| Order Number:<br>MM2102AJ-2L<br>MM2102AJ-2<br>MM2102AJ-L<br>MM2102AJ<br>MM2102AJ-4L<br>MM2102AJ-4<br>MM2102AJ-6L<br>MM2102AJ-6 | Order Number:<br>MM2102AN-2L<br>MM2102AN-2<br>MM2102AN-L<br>MM2102AN<br>MM2102AN-4L<br>MM2102AN-4<br>MM2102AN-6L<br>MM2102AN-6 |
|--|--|
- See NS Package J16A      See NS Package N16A

### Truth Table

$\overline{CE}$	R/W	D <sub>IN</sub>	D <sub>OUT</sub>	MODE
H	X	X	Hi-Z	Not selected
L	L	L	L	Write "0"
L	L	H	H	Write "1"
L	H	X	D <sub>OUT</sub>	Read

### Logic Symbol



MM2102A, MM2102AL Family

1



### Absolute Maximum Ratings (Note 1)

Voltage at Any Pin	-0.5V to +7V
Storage Temperature	-65°C to +150°C
Power Dissipation	1W
Lead Temperature (Soldering, 10 seconds)	300°C

### Operating Conditions

	MIN	MAX	UNITS
Supply Voltage (V <sub>CC</sub> )	4.75	5.25	V
Ambient Temperature (T <sub>A</sub> )	0	+70	°C
Input Low Voltage	-0.5	0.8	V
Input High Voltage	2.0	V <sub>CC</sub>	V

### DC Electrical Characteristics

T<sub>A</sub> = 0°C to +70°C, V<sub>CC</sub> = ±5%, unless otherwise specified.

SYMBOL	PARAMETER	CONDITION	MM2102A, MM2102A-2, MM2102A-4, MM2102A-6		MM2102A-L, MM2102A-2L, MM2102A-4L, MM2102A-6L		UNITS
			MIN	MAX	MIN	MAX	
I <sub>LI</sub>	Input Load Current	V <sub>IN</sub> = 0 to 5.25V		10		10	μA
I <sub>LOH</sub>	Output Leakage Current	ĈE = 2V, V <sub>OUT</sub> = 2.4V		5		5	μA
I <sub>LOL</sub>	Output Leakage Current	ĈE = 2V, V <sub>OUT</sub> = 0.4V		-10		-10	μA
I <sub>CC</sub>	Power Supply Current	All Inputs = 5.25V, Data Output Open, T <sub>A</sub> = 25°C		45		31	mA
I <sub>CC</sub>	Power Supply Current	All Inputs = 5.25V, Data Output Open, T <sub>A</sub> = 0°C		50		33	mA
V <sub>OL</sub>	Output Low Voltage	I <sub>OL</sub> = 3.2 mA		0.4		0.4	V
V <sub>OH</sub>	Output High Voltage	I <sub>OH</sub> = -200 μA	2.4		2.4		V

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the device may be permanently damaged. They do not mean the device may be operated at these values.

### AC Electrical Characteristics

(With standard load) T<sub>A</sub> = 0°C to +70°C, V<sub>CC</sub> = 5V ±5% unless otherwise specified.

SYMBOL	PARAMETER	MM2102A-2, MM2102A-2L		MM2102A, MM2102A-L		MM2102A-4, MM2102A-4L		MM2102A-6, MM2102A-6L		UNITS
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
<b>READ CYCLE (Figure 1)</b>										
t <sub>RC</sub>	Read Cycle	250		350		450		650		ns
t <sub>A</sub>	Access Time		250		350		450		650	ns
t <sub>CO</sub>	Chip Enable to Output Time		100		150		200		200	ns
t <sub>OH1</sub>	Previous Read Data Valid with Respect to Address	40		40		40		50		ns
t <sub>OH2</sub>	Previous Read Data Valid with Respect to Chip Enable	0		0		0		0		ns

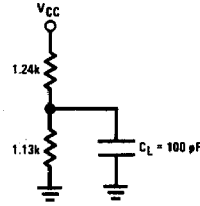
### WRITE CYCLE (Figure 2)

t <sub>WC</sub>	Write Cycle	250		350		450		650		ns
t <sub>AW</sub>	Address to Write Set-Up	20		20		20		20		ns
t <sub>WP</sub>	Write Pulse Width	100		150		200		200		ns
t <sub>WR</sub>	Write Recovery Time	0		0		0		0		ns
t <sub>DW</sub>	Date Set-Up Time	85		125		175		175		ns
t <sub>DH</sub>	Data Hold Time	0		0		0		0		ns
t <sub>CW</sub>	Chip Enable To Write Set-Up	100		150		200		200		ns

**AC Electrical Characteristics**  $T_A = 25^\circ\text{C}$ ,  $f = 1\text{ MHz}$

**AC Test Circuit**

SYMBOL	PARAMETER	LIMIT (pF)	
		TYP	MAX
<b>CAPACITANCE <sup>2</sup></b>			
C <sub>IN</sub>	Input Capacitance (All Inputs V <sub>IN</sub> = 0V)	3	5
C <sub>OUT</sub>	Output Capacitance, V <sub>O</sub> = 0V	4	6



**Note 2:** This parameter is guaranteed by periodic testing

**Switching Time Waveforms**

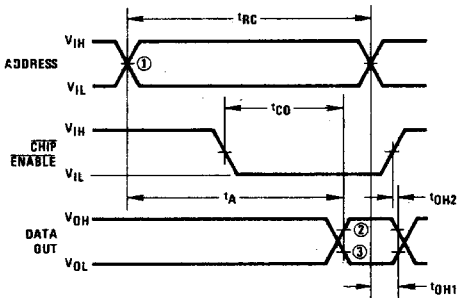


FIGURE 1. Read Cycle

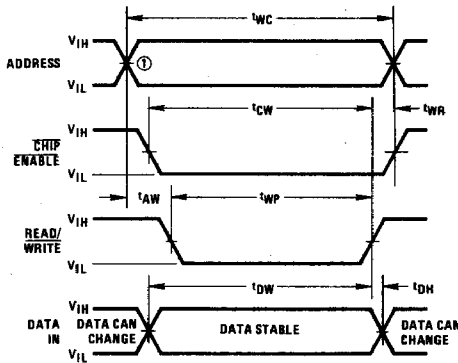


FIGURE 2. Write Cycle

- Note ①:** Input reference level for timing is 1.5V.
- Note ②:** V<sub>OH</sub> = 2V is reference level for output high.
- Note ③:** V<sub>OL</sub> = 0.8V is reference level for output low.
- Note ④:** Input rise and fall times are 10 ns.

**Standby Characteristics**  $T_A = 0^\circ\text{C}$  to  $+70^\circ\text{C}$

SYMBOL	PARAMETER	CONDITIONS	MM2102A, MM2102A-2, MM2102A-4, MM2102-6			MM2102A-L, MM2102A-2L, MM2102A-4L, MM2102A-6L			UNITS
			MIN	TYP(3)	MAX	MIN	TYP(3)	MAX	
V <sub>PD</sub>	V <sub>CC</sub> in Standby		1.5			1.5			V
V <sub>CES</sub>	$\overline{\text{CE}}$ Bias in Standby	$2 \leq V_{PD} \leq V_{CCMAX}$	2.0			2.0			V
V <sub>CES</sub>	$\overline{\text{CE}}$ Bias in Stand-by	$1.5 \leq V_{PD} \leq 2$	V <sub>PD</sub>			V <sub>PD</sub>			V
I <sub>PD1</sub>	Standby Current	All Inputs = V <sub>PD</sub> = 1.5V			28			23	mA
I <sub>PD2</sub>	Standby Current	All Inputs = V <sub>PD</sub> = 2V			38			28	mA
t <sub>CP</sub>	Chip Deselect to Standby Time		0			0			ns
t <sub>R</sub>	Recovery Time (Note 4)		t <sub>RC</sub>			t <sub>RC</sub>			ns

**Note 3:** Typical values at  $T_A = 25^\circ\text{C}$ .

**Note 4:**  $t_R = t_{RC}$  = read cycle time.

**Standby Waveforms**

