

# MM54C200/MM74C200 256-Bit TRI-STATE® Random Access Read/Write Memory

## General Description

The MM54C200/MM74C200 is a 256-bit random access read/write memory. Inputs consist of eight address lines and three chip enables. The eight binary address inputs are decoded internally to select each of the 256 locations. The internal address register, latches, and address information are on the positive to negative edge of  $\overline{CE}_3$ . The TRI-STATE data output line, working in conjunction with  $\overline{CE}_1$  or  $\overline{CE}_2$  inputs, provides for easy memory expansion.

**Address Operation:** Address inputs must be stable  $t_{SA}$  prior to the positive to negative transition of  $\overline{CE}_3$ . It is therefore unnecessary to hold address information stable for more than  $t_{HA}$  after the memory is enabled (positive to negative transition).

**Note:** The timing is different from the DM74200 in that a positive to negative transition of the  $\overline{CE}_3$  must occur for the memory to be selected.

**Read Operation:** The data is read out by selecting the proper address and bringing  $\overline{\text{CE}}_3$  low and  $\overline{\text{WE}}$  high.

Holding either  $\overline{CE}_1$ ,  $\overline{CE}_2$ , or  $\overline{CE}_3$  at a high level forces the output into TRI-STATE. When used in bus-organized systems,  $\overline{CE}_1$ , or  $\overline{CE}_2$ , a TRI-STATE control provides for fast access times by not totally disabling the chip.

**Write Operation:** Data is written into the memory with  $\overline{CE}_3$  low and  $\overline{WE}$  low. The state of  $\overline{CE}_1$  or  $\overline{CE}_2$  has no effect on the write cycle. The output assumes TRI-STATE with  $\overline{WE}$  low.

## Features

- Wide supply voltage range
- Guaranteed noise margin
- High noise immunity
- TTL compatibility

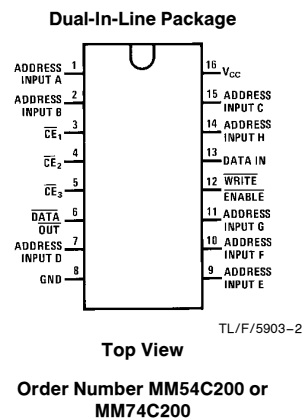
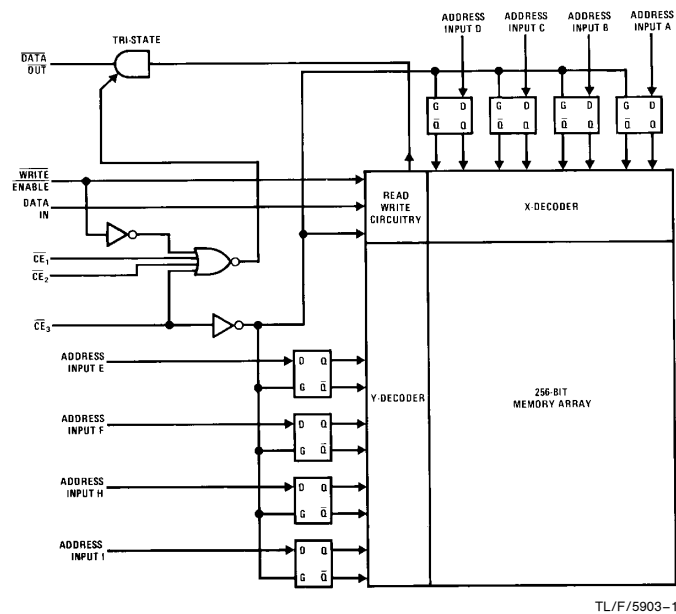
- Low power
- Internal address register

3V to 15V  
1V

 $0.45 V_{CC}$  (typ.)

Fan out of 1  
driving standard TTL  
500 nW (typ.)

## Logic and Connection Diagrams



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## Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Voltage at Any Pin	−0.3V to $V_{CC} + 0.3V$
Operating Temperature Range ( $T_A$ )	−55°C to +125°C MM54C200 −40°C to +85°C MM74C200
Storage Temperature Range ( $T_S$ )	−65°C to +150°C

Power Dissipation ( $P_D$ )	
Dual-In-Line	700 mW
Small Outline	500 mW
Operating $V_{CC}$ Range	3V to 15V
Absolute Maximum $V_{CC}$	18V
Lead Temperature ( $T_L$ ) (Soldering, 10 seconds)	260°C

## DC Electrical Characteristics Min/Max limits apply across temperature range unless otherwise noted

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>CMOS TO CMOS</b>						
$V_{IN(1)}$	Logical “1” Input Voltage	$V_{CC} = 5V$ $V_{CC} = 10V$	3.5 8			V V
$V_{IN(0)}$	Logical “0” Input Voltage	$V_{CC} = 5V$ $V_{CC} = 10V$			1.5 2	V V
$V_{OUT(1)}$	Logical “1” Output Voltage	$V_{CC}=5V, I_O = -10 \mu A$ $V_{CC}=10V, I_O = -10 \mu A$	4.5 9			V V
$V_{OUT(0)}$	Logical “0” Output Voltage	$V_{CC}=5V, I_O = +10 \mu A$ $V_{CC}=10V, I_O = +10 \mu A$			0.5 1	V V
$I_{IN(1)}$	Logical “1” Input Current	$V_{CC} = 15V, V_{IN} = 15V$		0.005	1	$\mu A$
$I_{IN(0)}$	Logical “0” Input Current	$V_{CC} = 15V, V_{IN} = 0V$	−1	−0.005		$\mu A$
$I_{CC}$	Supply Current	$V_{CC} = 15V$		0.1	600	$\mu A$
<b>CMOS/TTL INTERFACE</b>						
$V_{IN(1)}$	Logical “1” Input Voltage	54C $V_{CC} = 4.5V$ 74C $V_{CC} = 4.75V$	$V_{CC} - 1.5$ $V_{CC} - 1.5$			V V
$V_{IN(0)}$	Logical “0” Input Voltage	54C $V_{CC} = 4.5V$ 74C $V_{CC} = 4.75V$			0.8 0.8	V V
$V_{OUT(1)}$	Logical “1” Output Voltage	54C $V_{CC} = 4.5V, I_O = -1.6 mA$ 74C $V_{CC} = 4.75V, I_O = -1.6 mA$	2.4 2.4			V V
$V_{OUT(0)}$	Logical “0” Output Voltage	54C $V_{CC} = 4.5V, I_O = 1.6 mA$ 74C $V_{CC} = 4.75V, I_O = 1.6 mA$			0.4	V
<b>OUTPUT DRIVE (See 54C/74C Family Characteristics Data Sheet) (Short Circuit Current)</b>						
$I_{SOURCE}$	Output Source Current (P-Channel)	$V_{CC} = 5V, V_{OUT} = 0V$ $T_A = 25^\circ C$	−4 −1.8	−6		mA mA
$I_{SOURCE}$	Output Source Current (P-Channel)	$V_{CC} = 10V, V_{OUT} = 0V$ $T_A = 25^\circ C$	−16 −1.5	−25		mA mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 5V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$	5	8		mA
$I_{SINK}$	Output Sink Current (N-Channel)	$V_{CC} = 10V, V_{OUT} = V_{CC}$ $T_A = 25^\circ C$	20	30		mA

**Note 1:** “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. Except for “Operating Temperature Range” they are not meant to imply that the devices should be operated at these limits. The table of “Electrical Characteristics” provides conditions for actual device operation.

### AC Electrical Characteristics\* $T_A = 25^\circ\text{C}$ , $C_L = 50\text{ pF}$ , unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{\text{ACC}}$	Access Time from Address	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$		450 200	900 400	ns ns
$t_{\text{pd}}$	Propagation Delay from $\overline{\text{CE}}_3$	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$		360 120	700 300	ns ns
$t_{\text{pCE1}}$	Propagation Delay from $\overline{\text{CE}}_1$ or $\overline{\text{CE}}_2$	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$		250 85	700 200	ns ns
$t_{\text{SA}}$	Address Setup Time	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$	200 100	80 30		ns ns
$t_{\text{HA}}$	Address Hold Time	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$	50 25	15 5.0		ns ns
$t_{\text{WE}}$	Write Enable Pulse Width	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$	300 150	160 70		ns ns
$t_{\text{CE}}$	$\overline{\text{CE}}_3$ Pulse Widths	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$	400 160	200 80		ns ns
$C_{\text{IN}}$	Input Capacity	Any Input (Note 2)		5.0		pF
$C_{\text{OUT}}$	Output Capacity in TRI-STATE	(Note 2)		9.0		pF
$C_{\text{PD}}$	Power Dissipation Capacity	(Note 3)		400		pF

### AC Electrical Characteristics\* $C_L = 50\text{ pF}$

Symbol	Parameter	Conditions	MM54C200 $T_A = -55^\circ\text{C to } +125^\circ\text{C}$		MM74C200 $T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units
			Min	Max	Min	Max	
$t_{\text{ACC}}$	Access Time from Address	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$		1200 520		1100 480	ns ns
$t_{\text{pd}}$	Propagation Delay from $\overline{\text{CE}}_3$	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$		950 400		850 360	ns ns
$t_{\text{pdCE1}}$	Propagation Delay from $\overline{\text{CE}}_1$ or $\overline{\text{CE}}_2$	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$		650 300		600 275	ns ns
$t_{\text{SA}}$	Address Setup Time	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$	250 120		250 120		ns ns
$t_{\text{HA}}$	Address Hold Time	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$	100 50		100 50		ns ns
$t_{\text{WE}}$	Write Enable Pulse Width	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$	450 225		400 200		ns ns
$t_{\text{CE}}$	Disable Pulse Width	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$	500 250		460 230		ns ns
$t_{\text{HD}}$	Data Hold Time	$V_{\text{CC}} = 5\text{V}$ $V_{\text{CC}} = 10\text{V}$	50 25		50 25		ns ns

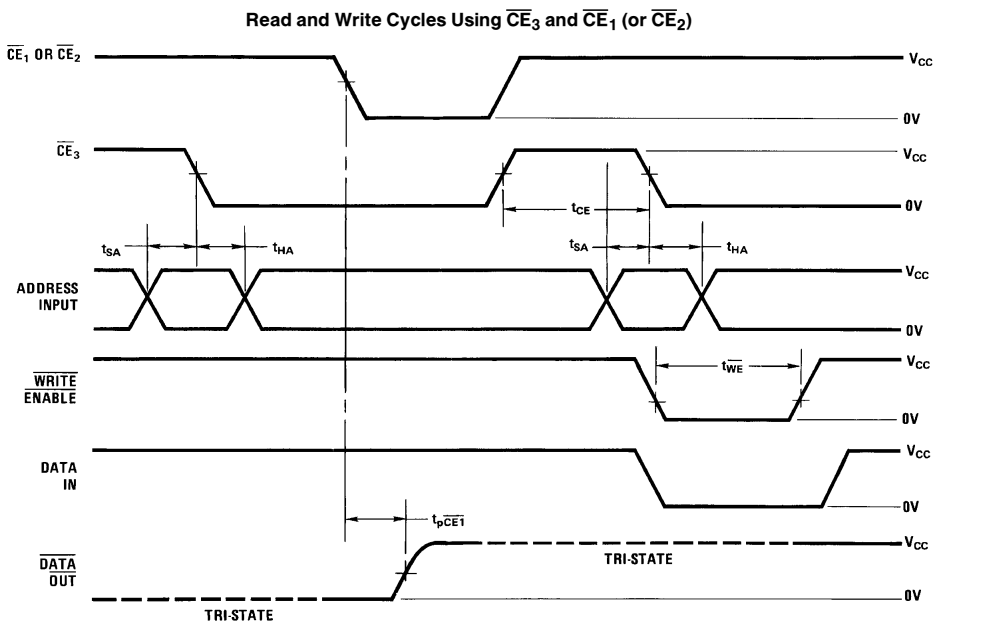
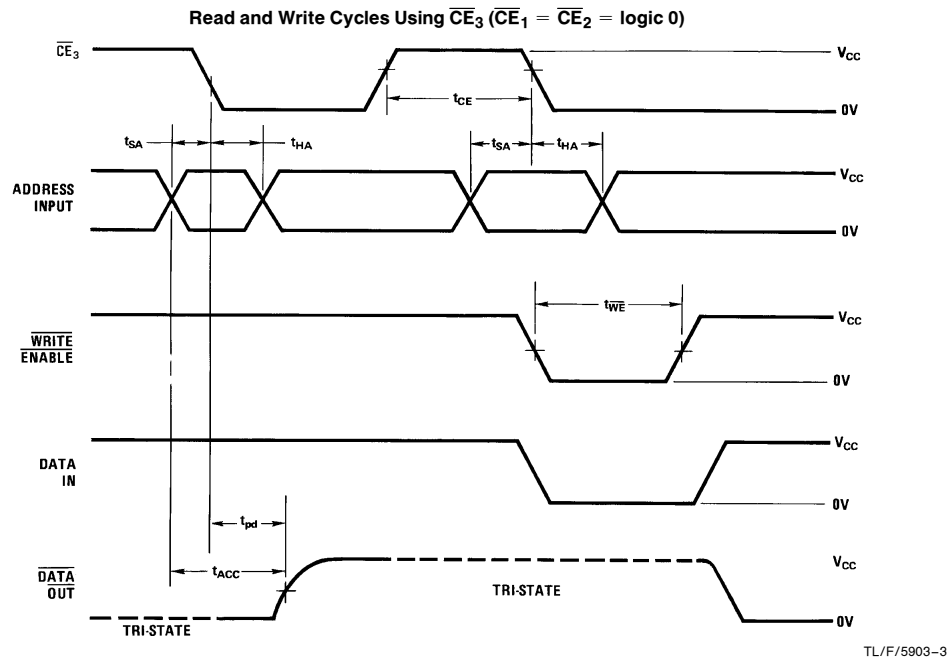
\*AC Parameters are guaranteed by DC correlated testing.

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

**Note 2:** Capacitance is guaranteed by periodic testing.

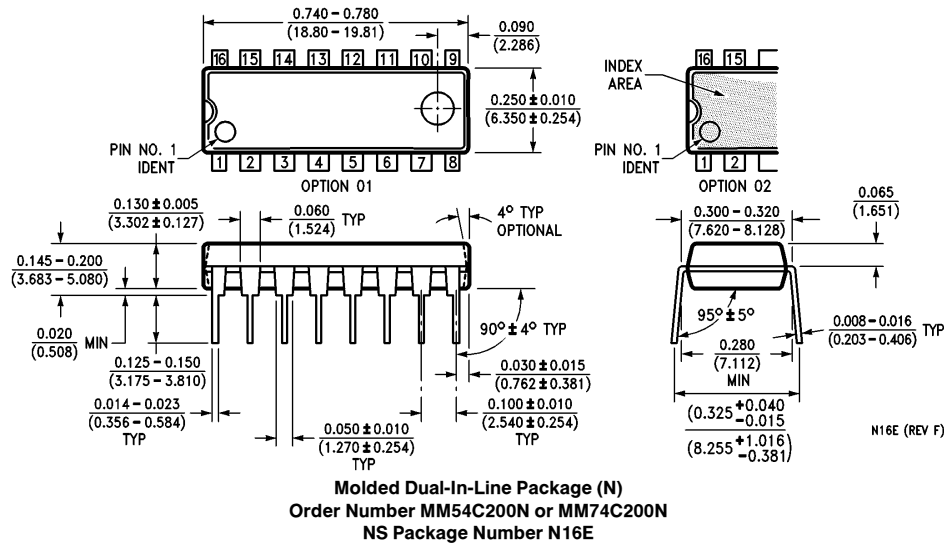
**Note 3:**  $C_{\text{PD}}$  determines the no load AC power consumption of any CMOS device. For complete explanation see 54C/74C Family Characteristics application note, AN-90.

## Switching Time Waveforms



**Note:** Used for fast access time in bused systems.

J16A (REV L)

**Physical Dimensions** inches (millimeters) (Continued)**LIFE SUPPORT POLICY**

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**National Semiconductor Corporation**  
 1111 West Bardin Road  
 Arlington, TX 76017  
 Tel: 1(800) 272-9959  
 Fax: 1(800) 737-7018

**National Semiconductor Europe**  
 Fax: (+49) 0-180-530 85 86  
 Email: cnjwge@tevm2.nsc.com  
 Deutsch Tel: (+49) 0-180-530 85 85  
 English Tel: (+49) 0-180-532 78 32  
 Français Tel: (+49) 0-180-532 93 58  
 Italiano Tel: (+49) 0-180-534 16 80

**National Semiconductor Hong Kong Ltd.**  
 19th Floor, Straight Block,  
 Ocean Centre, 5 Canton Rd.  
 Tsimshatsui, Kowloon  
 Hong Kong  
 Tel: (852) 2737-1600  
 Fax: (852) 2736-9960

**National Semiconductor Japan Ltd.**  
 Tel: 81-043-299-2309  
 Fax: 81-043-299-2408

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