

MM54C910/MM74C910 256 Bit TRI-STATE® Random Access Read/Write Memory

General Description

The MM54C910/MM74C910 is a 64 word by 4-bit random access memory. Inputs consist of six address lines, four data input lines, a \overline{WE} , and a \overline{ME} line. The six address lines are internally decoded to select one of the 64 word locations. An internal address register latches the address information on the positive to negative transition of \overline{ME} . The TRI-STATE outputs allow for easy memory expansion.

Address Operation: Address inputs must be stable (t_{SA}) prior to the positive to negative transition of \overline{ME} , and (t_{HA}) after the positive to negative transition of \overline{ME} . The address register holds the information and stable address inputs are not needed at any other time.

Write Operation: Data is written into memory at the selected address if \overline{WE} goes low while \overline{ME} is low. \overline{WE} must be held low for $t_{\overline{WE}}$ and data must remain stable t_{HD} after \overline{WE} returns high.

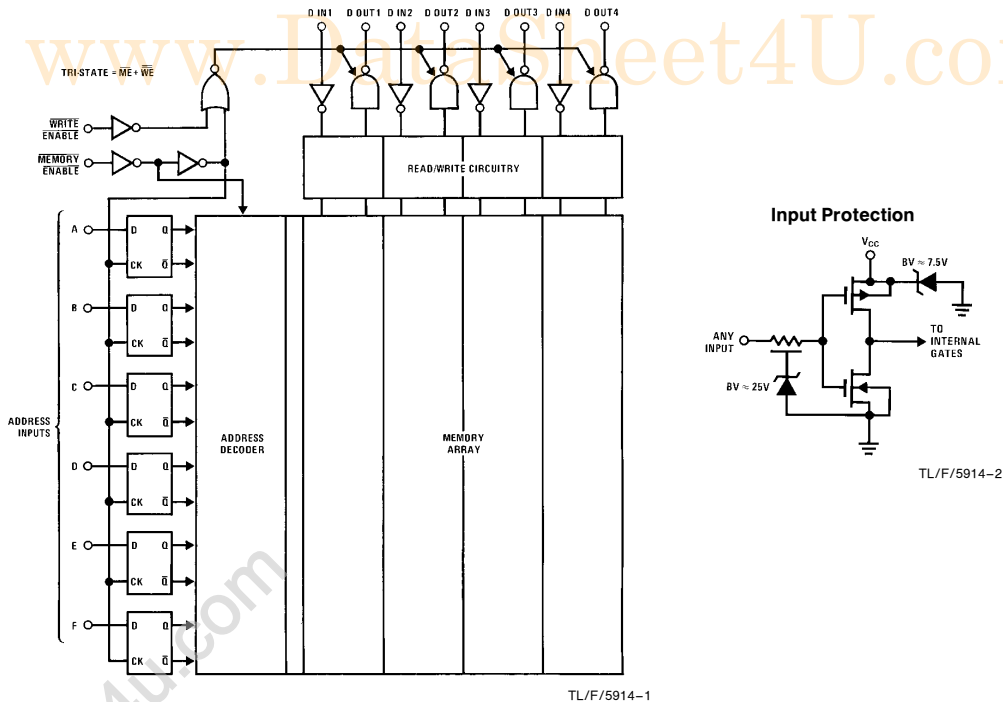
Read Operation: Data is nondestructively read from a memory location by an address operation with \overline{WE} held high.

Outputs are in the TRI-STATE (Hi-Z) condition when the device is writing or disabled.

Features

- Supply voltage range 3.0V to 5.5V
- High noise immunity 0.45V_{CC} (typ.)
- TTL compatible fan out 1 TTL load
- Input address register
- Low power consumption 250 nW/package (typ.) (chip enabled or disabled)
- Fast access time 250 ns (typ.) at 5.0V
- TRI-STATE outputs
- High voltage inputs

Logic Diagrams



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 Output Pin	-0.3V to $V_{CC} + 0.3V$
Voltage at Any Input Pin	-0.3V to +15V
Power Dissipation	
Dual-In-Line	700 mW
Small Outline	500 mW
Operating V_{CC} Range	3.0V to 5.5V
Standby V_{CC} Range	1.5V to 5.5V
Absolute Maximum (V_{CC})	6.0V
Lead Temperature (T_L)	
(Soldering, 10 sec.)	260°C

Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})			
MM54C910	4.5	5.5	V
MM74C910	4.75	5.25	V
Temperature (T_A)			
MM54C910	-55	+125	°C
MM74C910	-40	+85	°C

DC Electrical Characteristics

Min/Max limits apply across the temperature and power supply range indicated

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$V_{IN(1)}$	Logical "1" Input Voltage	Full Range	$V_{CC} - 1.5$			V
$V_{IN(0)}$	Logical "0" Input Voltage	Full Range			0.8	V
$I_{IN(1)}$	Logical "1" Input Current	$V_{IN} = 15V$ $V_{IN} = 5V$		0.005 0.005	2.0 1.0	μA μA
$I_{IN(0)}$	Logical "0" Input Current	$V_{IN} = 0V$	-1.0	-0.005		μA
$V_{OUT(1)}$	Logical "1" Output Voltage	$I_O = -150 \mu A$ $I_O = -400 \mu A$	$V_{CC} - 0.5$ 2.4			V V
$V_{OUT(0)}$	Logical "0" Output Voltage	$I_O = 1.6 mA$			0.4	V
I_{OZ}	Output Current in High Impedance State	$V_O = 5V$ $V_O = 0V$	-1.0	0.005 -0.005	1.0	μA μA
I_{CC}	Supply Current	$V_{CC} = 5V$		5.0	300	μA

AC Electrical Characteristics* $T_A = 25^\circ C, V_{CC} = 5.0V, C_L = 50 pF$

Symbol	Parameter	Min	Typ	Max	Units
t_{ACC}	Access Time from Address		250	500	ns
t_{pd}	Propagation Delay from \overline{ME}		180	360	ns
t_{SA}	Address Input Set-Up Time	140	70		ns
t_{HA}	Address Input Hold Time	20	10		ns
$t_{\overline{ME}}$	$\overline{Memory Enable}$ Pulse Width	200	100		ns
$t_{\overline{ME}}$	$\overline{Memory Enable}$ Pulse Width	400	200		ns
t_{SD}	Data Input Set-Up Time	0			ns
t_{HD}	Data Input Hold Time	30	15		ns
$t_{\overline{WE}}$	$\overline{Write Enable}$ Pulse Width	140	70		ns
t_{1H}, t_{0H}	Delay to TRI-STATE (Note 4)		100	200	ns

CAPACITANCE

Symbol	Parameter	Min	Typ	Max	Units
C_{IN}	Input Capacity Any Input (Note 2)		5.0		pF
C_{OUT}	Output Capacity Any Output (Note 2)		9.0		pF
C_{PD}	Power Dissipation Capacity (Note 3)		350		pF

AC Electrical Characteristics* (Continued) $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$, $C_L = 50\text{ pF}$

Symbol	Parameter	MM54C910 $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = 4.5\text{V to } 5.5\text{V}$		MM74C910 $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ $V_{CC} = 4.75\text{V to } 5.25\text{V}$		Units
		Min	Max	Min	Max	
		t_{ACC}	Access Time from Address		860	
t_{pd1} , t_{pd0}	Propagation Delay from \overline{ME}		660		540	ns
t_{SA}	Address Input Set-Up Time	200		160		ns
t_{HA}	Address Input Hold Time	20		20		ns
t_{ME}	$\overline{Memory\ Enable}$ Pulse Width	280		260		ns
$t_{\overline{ME}}$	$\overline{Memory\ Enable}$ Pulse Width	750		600		ns
t_{SD}	Data Input Set-Up Time	0		0		ns
t_{HD}	Data Input Hold Time	50		50		ns
t_{WE}	$\overline{Write\ Enable}$ Pulse Width	200		180		ns
t_{1H} , t_{0H}	Delay to TRI-STATE (Note 4)		200		200	ns

*AC Parameters are guaranteed by DC correlated testing.

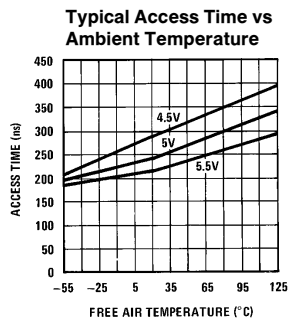
Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual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

Note 2: Capacitance is guaranteed by periodic testing.

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

Note 4: See AC test circuits for t_{1H} , t_{0H} .

Typical Performance Characteristics

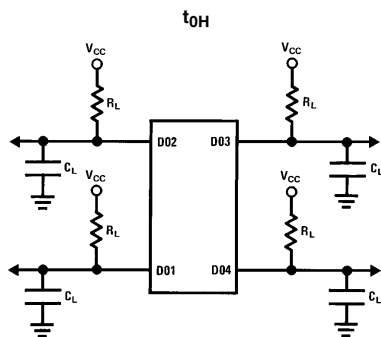


TL/F/5914-4

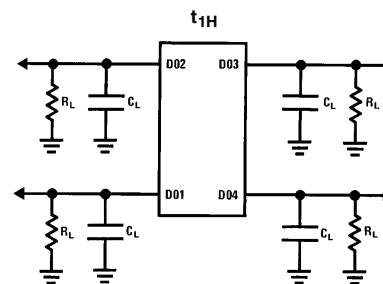
Truth Table

\overline{ME}	\overline{WE}	Operation	Outputs
L	L	Write	TRI-STATE
L	H	Read	Data
H	L	Inhibit, Store	TRI-STATE
H	H	Inhibit, Store	TRI-STATE

AC Test Circuits



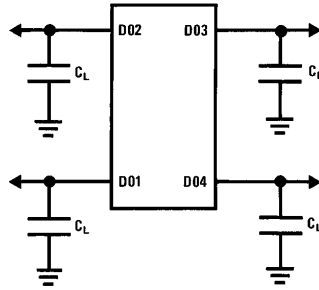
TL/F/5914-5



TL/F/5914-6

AC Test Circuits (Continued)

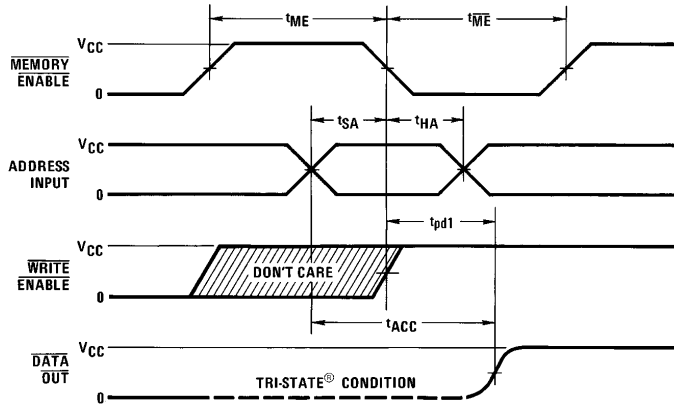
All Other AC Tests



TL/F/5914-7

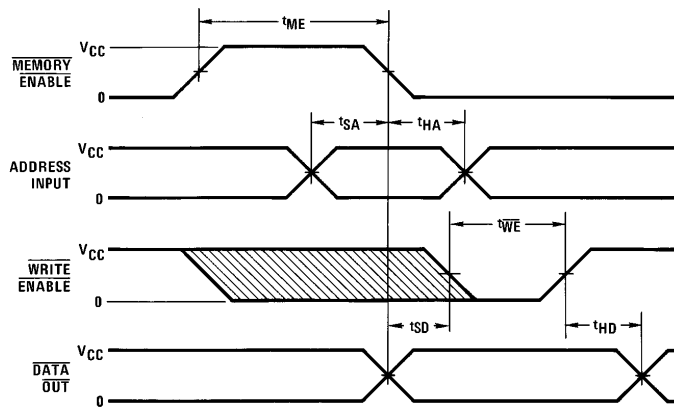
Switching Time Waveforms

Read Cycle
(See Note 1)



TL/F/5914-8

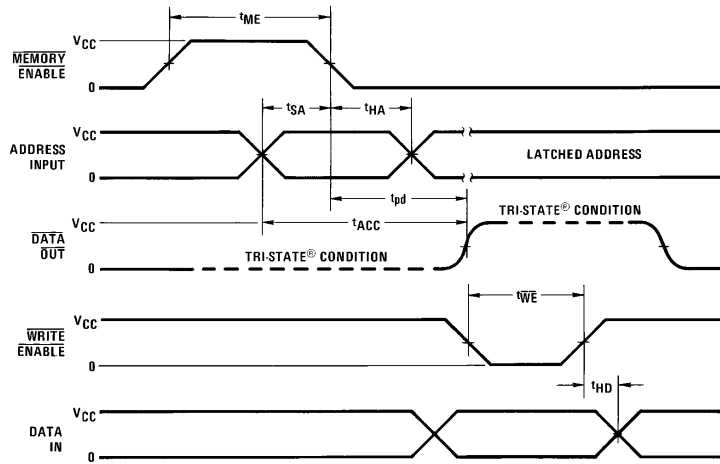
Write Cycle
(See Note 1)



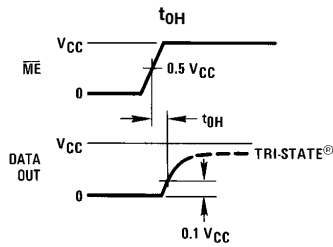
TL/F/5914-9

Switching Time Waveforms (Continued)

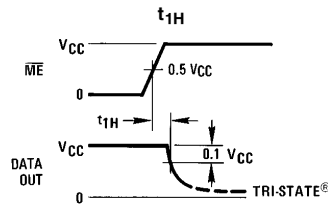
Read Modify Write Cycle (See Note 1)



TL/F/5914-10



TL/F/5914-11



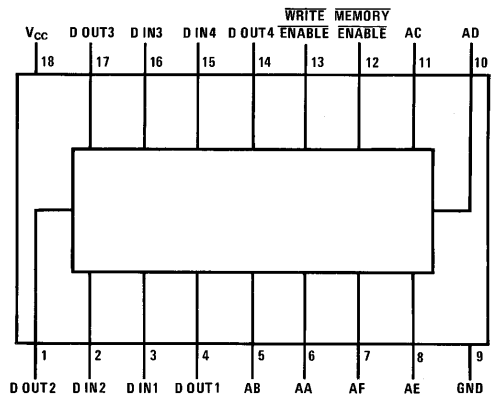
TL/F/5914-12

Note 1: $\overline{MEMORY\ ENABLE}$ must be brought high for t_{ME} nanoseconds between every address change.

Note 2: $t_r = t_f = 20$ ns for all inputs.

Connection Diagram

Dual-In-Line Package

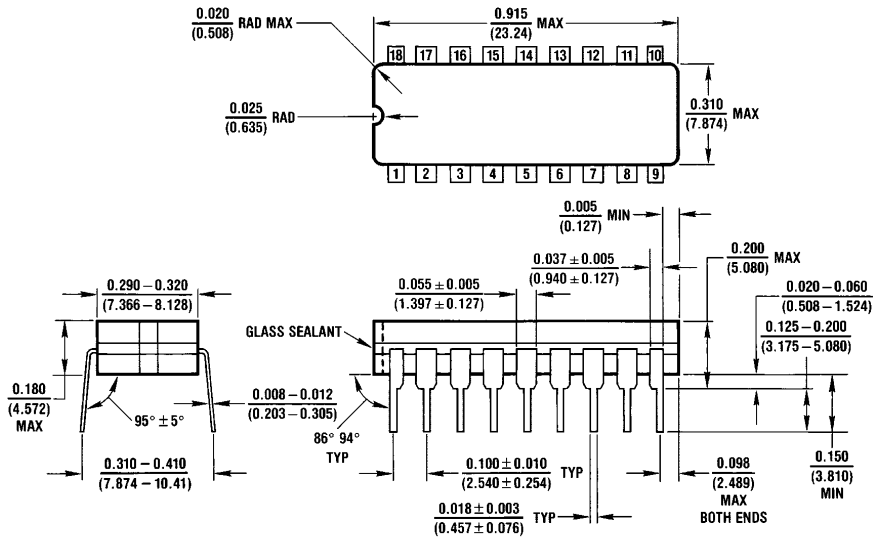


TL/F/5914-3

Order Number MM54C910 or MM74C910

Top View

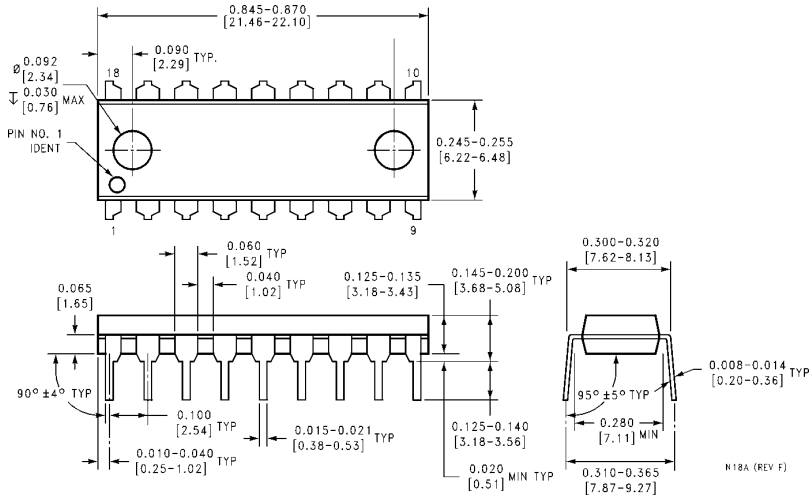
Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number MM54C910J or MM74C910J
NS Package Number J18A

J18A (REV L)

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
Order Number MM54C910N or MM74C910N
NS Package Number N18A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



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

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.