MOTOROLA

MCM2114
MCM21L14

4096-BIT STATIC RANDOM ACCESS MEMORY

The MCM2114 is a 4096-bit random access memory fabricated with high density, high reliability N-channel silicon-gate technology. For ease of use, the device operates from a single power supply, is directly compatible with TTL and DTL, and requires no clocks or refreshing because of fully static operation. Data access is particularly simple, since address setup times are not required. The output data has the same polarity as the input data.

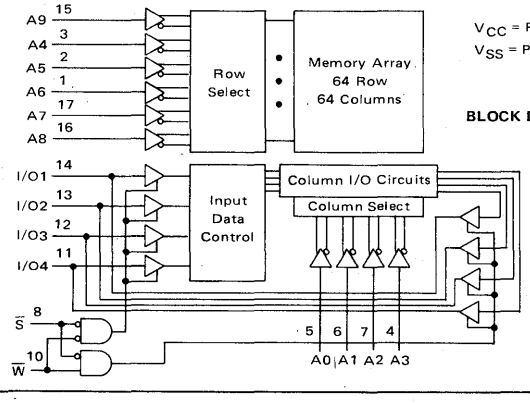
The MCM2114 is designed for memory applications where simple interfacing is the design objective. The MCM2114 is assembled in 18-pin dual-in-line packages with the industry standard pin-out. A separate chip select ($\overline{S}$) lead allows easy selection of an individual package when the three-state outputs are OR-tied.

The MCM2114 series has a maximum current of 100 mA. Low power versions (i.e., MCM21L14 series) are available with a maximum current of only 70 mA.

- 1024 Words by 4-Bit Organization
- Industry Standard 18-Pin Configuration
- Single +5 Volt Supply
- No Clock or Timing Strobe Required
- Fully Static: Cycle Time = Access Time
- Fully TTL/DTL Compatible
- Common Data Input and Output
- Three-State Outputs for OR-Ties
- Low Power Version Available

MAXIMUM ACCESS TIME/MINIMUM CYCLE TIME

MCM2114-20 MCM21L14-20	200 ns	MCM2114-30 MCM21L14-30	300 ns
MCM2114-25 MCM21L14-25	250 ns	MCM2114-45 MCM21L14-45	450 ns

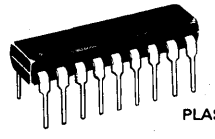


BLOCK DIAGRAM

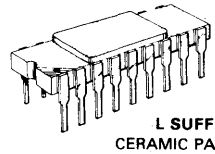
MOS

(N-CHANNEL, SILICON-GATE)

4096-BIT STATIC RANDOM ACCESS MEMORY

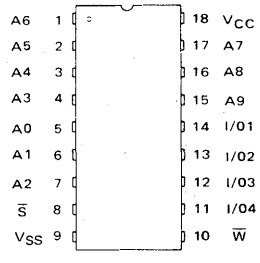


P SUFFIX
PLASTIC PACKAGE
CASE 707



L SUFFIX
CERAMIC PACKAGE
CASE 680

PIN ASSIGNMENT



PIN NAMES

A0-A9	Address Input
$\overline{W}$	Write Enable
$\overline{S}$	Chip Select
I/O1-I/O4	Data Input/Output
V_{CC}	Power (+5 V)
V_{SS}	Ground

2

ABSOLUTE MAXIMUM RATINGS (See Note 1)

Rating	Value	Unit
Temperature Under Bias	-10 to +80	°C
Voltage on Any Pin With Respect to V_{SS}	-0.5 to +7.0	Vdc
DC Output Current	5.0	mA
Power Dissipation	1.0	Watt
Operating Temperature Range	0 to +70	°C
Storage Temperature Range	-65 to +150	°C

Note: 1. Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to RECOMMENDED OPERATING CONDITIONS. Exposure to higher than recommended voltages for extended periods of time could affect device reliability.

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high-impedance circuit.

DC OPERATING CONDITIONS AND CHARACTERISTICS

(T_A = 0° to 70°C, V_{CC} = 5.0V ±5%, unless otherwise noted.)

RECOMMENDED DC OPERATING CONDITIONS

Parameter	Symbol	MCM2114			MCM21L14			Unit
		Min	Nom	Max	Min	Nom	Max	
Input Load Current (All Input Pins, V_{in} = 0 to 5.5 V)	I_{LI}	–	–	10	–	–	10	μA
I/O Leakage Current ($\overline{S}$ = 2.4 V, $V_{I/O}$ = 0.4 V to V_{CC})	$\|I_{LO}\|$	–	–	10	–	–	10	μA
Power Supply Current (V_{in} = 5.5, $I_{I/O}$ = 0 mA, T_A = 25°C)	I_{CC1}	–	80	95	–	–	65	mA
Power Supply Current (V_{in} = 5.5 V, $I_{I/O}$ = 0 mA, T_A = 0°C)	I_{CC2}	–	–	100	–	–	70	mA
Input Low Voltage	V_{IL}	-0.5	–	0.8	-0.5	–	0.8	V
Input High Voltage	V_{IH}	2.0	–	6.0	2.0	–	6.0	V
Output Low Current V_{OL} = 0.4 V	I_{OL}	2.1	6.0	–	2.1	6.0	–	mA
Output High Current V_{OH} = 2.4 V	I_{OH}	–	-1.4	-1.0	–	-1.4	-1.0	mA
Output Short Circuit Current	I_{OS} (2)	–	–	40	–	–	40	mA

Note: 2. Duration not to exceed 30 seconds.

CAPACITANCE

(f = 1.0 MHz, T_A = 25°C, periodically sampled rather than 100% tested.)

Characteristic	Symbol	Max	Unit
Input Capacitance (V_{in} = 0 V)	C_{in}	5.0	pF
Input/Output Capacitance ($V_{I/O}$ = 0 V)	$C_{I/O}$	5.0	pF

AC OPERATING CONDITIONS AND CHARACTERISTICS

(Full operating voltage and temperature unless otherwise noted.)

Input Pulse Levels . . . . . 0.8 Volt to 2.4 Volts
Input Rise and Fall Times . . . . . 10 ns
Input and Output Timing Levels . . . . . 1.5 Volts
Output Load . . . . . 1 TTL Gate and C_L = 100 pF

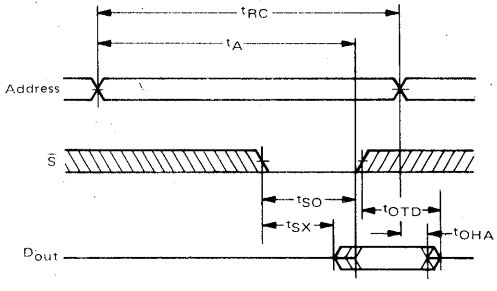
AC OPERATING CONDITIONS AND CHARACTERISTICS
Read (Note 3), Write (Note 4) Cycles

RECOMMENDED AC OPERATING CONDITIONS (T_A = 0 to 70°C, V_{CC} = 5.0 V ± 5%)

Parameter	Symbol	MCM2114-20 MCM21L14-20		MCM2114-25 MCM21L14-25		MCM2114-30 MCM21L14-30		MCM2114-45 MCM21L14-45		Units
		Min	Max	Min	Max	Min	Max	Min	Max	
Read Cycle Time	t_{RC}	200	–	250	–	300	–	450	–	ns
Access Time	t_A	–	200	–	250	–	300	–	450	ns
Chip Selection to Output Valid	t_{SO}	–	70	–	85	–	100	–	120	ns
Chip Selection to Output Active	t_{SX}	20	–	20	–	20	–	20	–	ns
Output 3-State From Deselection	t_{OTD}	–	60	–	70	–	80	–	100	ns
Output Hold From Address Change	t_{OHA}	50	–	50	–	50	–	50	–	ns
Write Cycle Time	t_{WC}	200	–	250	–	300	–	450	–	ns
Write Time	t_W	120	–	135	–	150	–	200	–	ns
Write Release Time	t_{WR}	0	–	0	–	0	–	0	–	ns
Output 3-State From Write	t_{OTW}	–	60	–	70	–	80	–	100	ns
Data to Write Time Overlap	t_{DW}	120	–	135	–	150	–	200	–	ns
Data Hold From Write Time	t_{DH}	0	–	0	–	0	–	0	–	ns

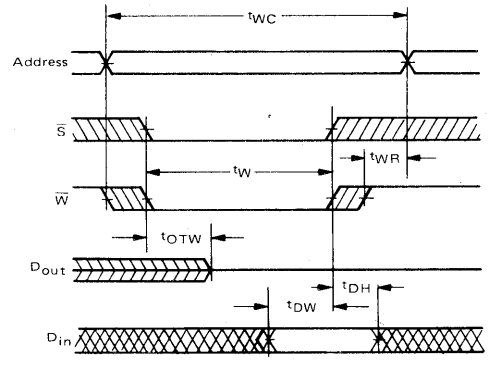
Notes: 3. A Read occurs during the overlap of a low $\overline{S}$ and a high $\overline{W}$.
4. A Write occurs during the overlap of a low $\overline{S}$ and a low $\overline{W}$.

READ CYCLE TIMING (Note 5)



Note: 5. $\overline{W}$ is high for a Read cycle.

WRITE CYCLE TIMING (Notes 6 and 7)



Notes: 6. If the $\overline{S}$ low transition occurs simultaneously with the $\overline{W}$ low transition, the output buffers remain in a high-impedance state.
7. $\overline{W}$ must be high during all address transitions.

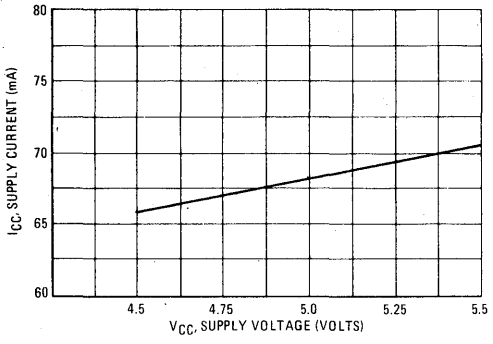
WAVEFORMS

Waveform Symbol	Input	Output
———	MUST BE VALID	WILL BE VALID
▨	CHANGE FROM H TO L	WILL CHANGE FROM H TO L
▨	CHANGE FROM L TO H	WILL CHANGE FROM L TO H
▨	DON'T CARE ANY CHANGE PERMITTED	CHANGING STATE UNKNOWN
———		HIGH IMPEDANCE

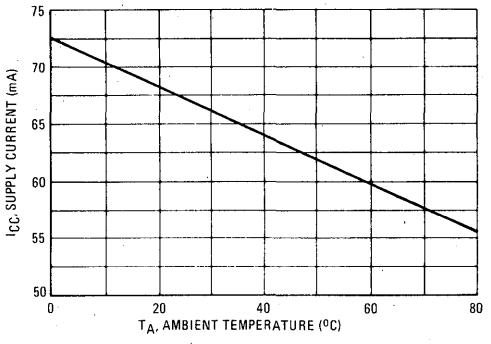
2

TYPICAL CHARACTERISTICS

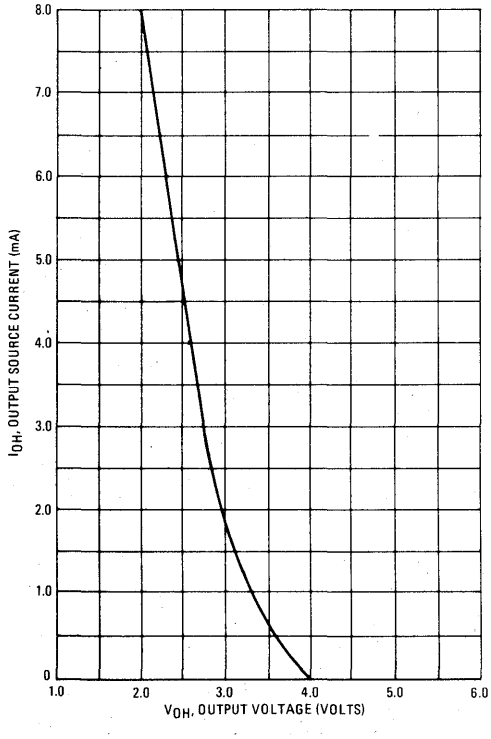
SUPPLY CURRENT versus SUPPLY VOLTAGE



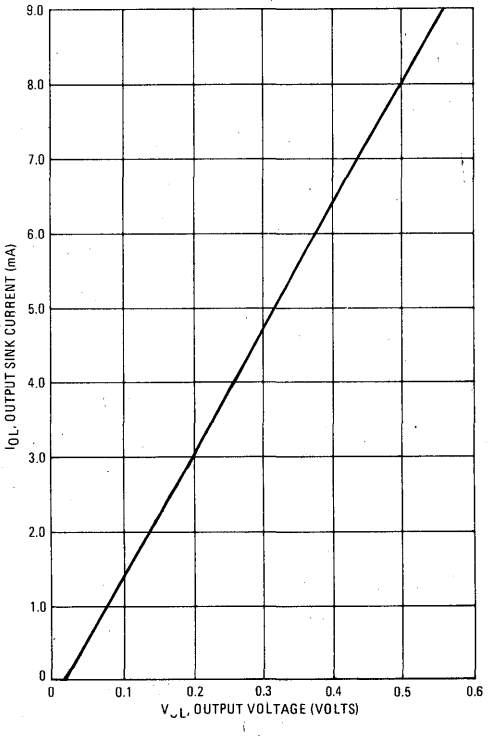
SUPPLY CURRENT versus AMBIENT TEMPERATURE



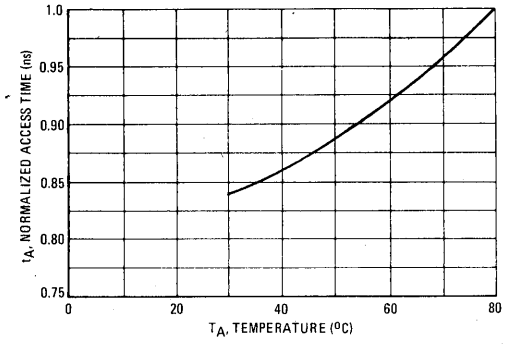
OUTPUT SOURCE CURRENT versus OUTPUT VOLTAGE



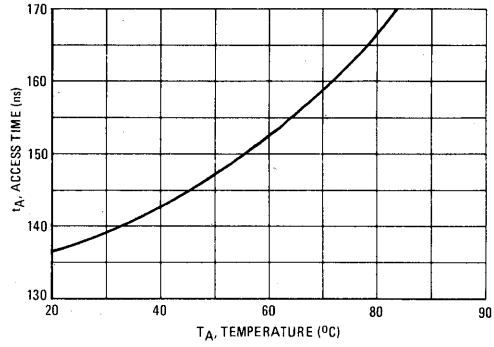
OUTPUT SINK CURRENT versus OUTPUT VOLTAGE



NORMALIZED ACCESS TIME versus TEMPERATURE

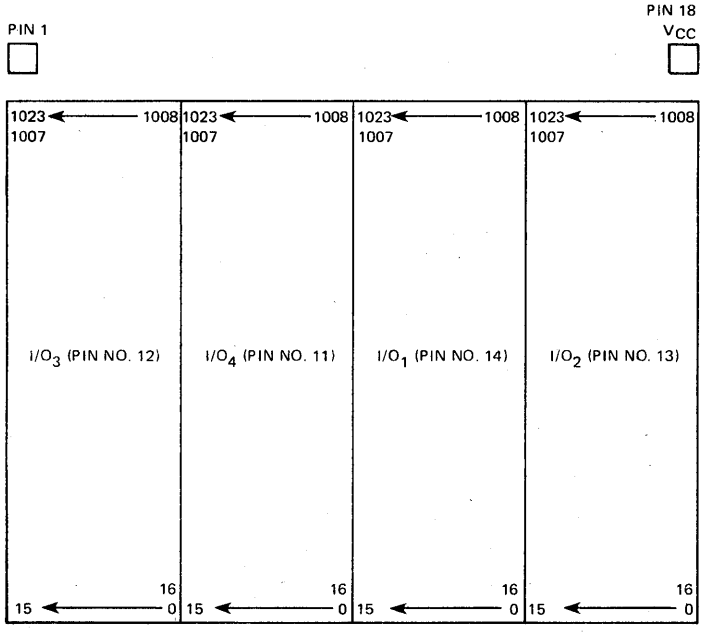


TYPICAL ACCESS TIME versus TEMPERATURE



2

MCM2114/MCM21L14 BIT MAP



To determine the precise location on the die of a word in memory, reassign address numbers to the address pins as in the table below. The bit locations can then be determined directly from the bit map.

PIN NUMBER	REASSIGNED ADDRESS NUMBER	PIN NUMBER	REASSIGNED ADDRESS NUMBER
1	A6	6	A1
2	A5	7	A2
3	A4	15	$\overline{A9}$
4	A3	16	$\overline{A8}$
5	A0	17	$\overline{A7}$