

## MSM5114RS

4096-BIT (1024 x 4) CMOS STATIC RAM

### GENERAL DESCRIPTION

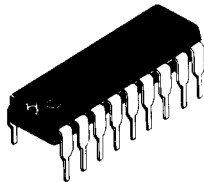
The Oki MSM5114 is a 4096-bit static Random Access Memory organized as 1024 words by 4 bits using Oki's reliable Silicon Gate CMOS technology. It uses fully static circuitry and therefore requires no clocks or refreshing to operate. Microwatt power dissipation typical of all CMOS is exhibited in all static states. Directly TTL compatible inputs, outputs and operation from a single +5V supply simplify system designs. Common data input/output pins using three-state outputs are provided.

The MSM5114 series is offered in an 18-pin plastic (RS suffix) package. The series is guaranteed for operation from 0°C to 70°C and over a 4V to 6V power supply range.

### FEATURES

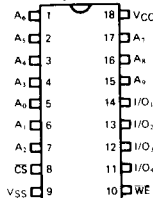
- Fully Static Operation
- Low Power Dissipation  
40μW Max. Standby Power  
192 mW/MHz Max. Operating Power
- Data Retention to V<sub>CC</sub>=2V
- Single 4 ~ 6V Power Supply
- High Density 300-mil 18-Pin Package
- Common I/O Capability using Three-State Outputs
- Directly TTL/CMOS Compatible
- Silicon Gate CMOS Technology
- Interchangeable with Intel 2114L Devices

	5114-2	5114-3	5114
Max. Access Time (NS)	200	300	450
Max. Operating Power (MW/MHz)	192	192	192
Max. Standby Power (μW)	40	40	40



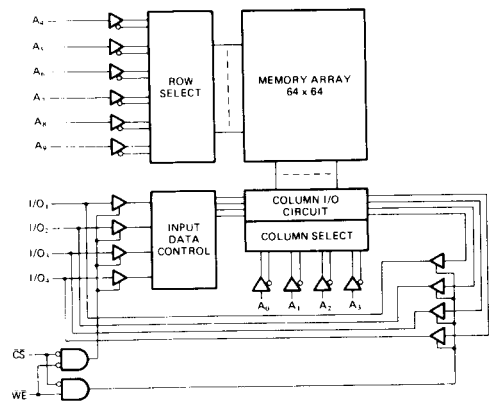
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### PIN CONFIGURATION (Top View)



A<sub>0</sub> To A<sub>3</sub>: Address Inputs  
 WE: Write Enable  
 CS: Chip Select  
 I/O<sub>0</sub>~I/O<sub>3</sub>: Data Input/Output  
 VCC: +5V Supply  
 VSS: Ground

### FUNCTIONAL BLOCK DIAGRAM



CS	WE	I/O	Mode
H	X	Hi-Z	Not Selected
L	L	H	Write 1
L	L	L	Write 0
L	H	D-out	Read

### ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit	Conditions
Supply Voltage	V <sub>CC</sub>	-0.3 to 7.0	V	Respect to V <sub>SS</sub>
Input Voltage	V <sub>IN</sub>	-0.3 to V <sub>CC</sub> + 0.3	V	
Data I/O Voltage	V <sub>D</sub>	-0.3 to V <sub>CC</sub> + 0.3	V	
Storage Temperature	T <sub>stg</sub>	-55 to 150	°C	

**Note:** Stresses above those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operations of the device at these or at any other condition above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

### OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	V <sub>CC</sub>	4	5	6	V	
Input Signal Level	V <sub>IH</sub>	2.4	5	V <sub>CC</sub>	V	5V ±10%
	V <sub>IL</sub>	-0.3	0	0.8	V	
Operating Temperature	T <sub>opr</sub>	0		70	°C	

### DC CHARACTERISTICS

(V<sub>CC</sub> = 5V ± 10%; T<sub>a</sub> = 0°C to +70°C, unless otherwise noted.)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input Load Current	I <sub>LI</sub>	-1		1	μA	V <sub>IN</sub> = 0 to V <sub>CC</sub>
Data I/O Leakage Current	I <sub>LO</sub>	-1		1	μA	V <sub>I/O</sub> = 0 to V <sub>CC</sub>
Output High Voltage	V <sub>OH</sub>	2.4			V	I <sub>OUT</sub> = -1.0 mA
Output Low Voltage	V <sub>OL</sub>			0.4	V	I <sub>OUT</sub> = 1.6 mA
Standby Supply Current	I <sub>CCS</sub>		0.2	50	μA	V <sub>IN</sub> = 0 or V <sub>CC</sub> , V <sub>CS</sub> = V <sub>CC</sub>
Operating Supply Current	I <sub>CC</sub>		19	35	mA	V <sub>IN</sub> = 0 or V <sub>CC</sub> , t <sub>RC</sub> = 1 μs

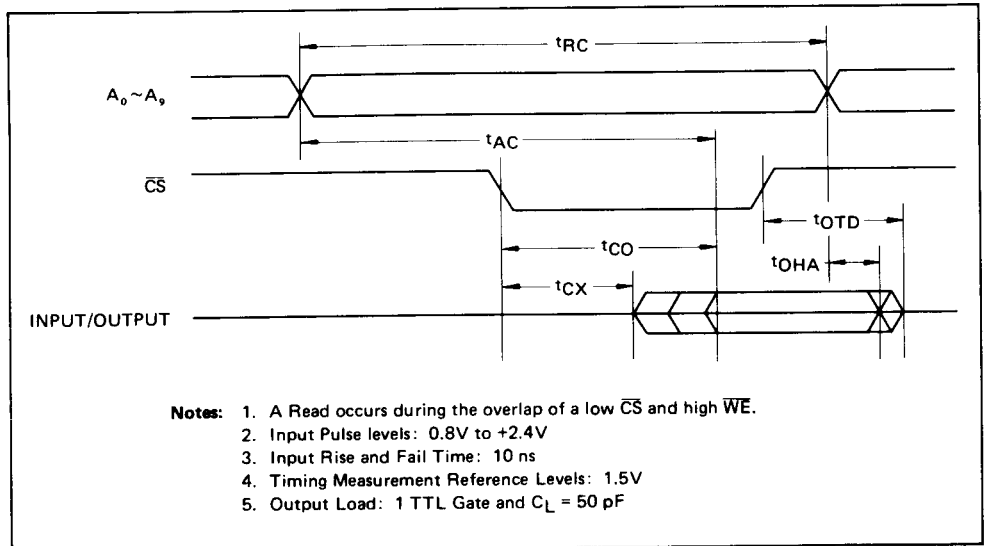
**AC CHARACTERISTICS**

**READ CYCLE**

( $V_{CC} = 5V \pm 10\%$ ,  $T_a = 0^\circ C$  to  $+70^\circ C$ )

Parameter	Symbol	5114-2		5114-3		5114		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Read Cycle Time	$t_{RC}$	200		300		450		ns
Access Time	$t_{AC}$		200		300		450	ns
Chip Selection to Output Valid	$t_{CO}$		200		300		450	ns
Chip Selection to Output Active	$t_{CX}$	20		20		20		ns
Output 3-state from Deselection	$t_{OTD}$		60		80		100	ns
Output Hold from Address Change	$t_{OHA}$	10		10		10		ns

**READ CYCLE**



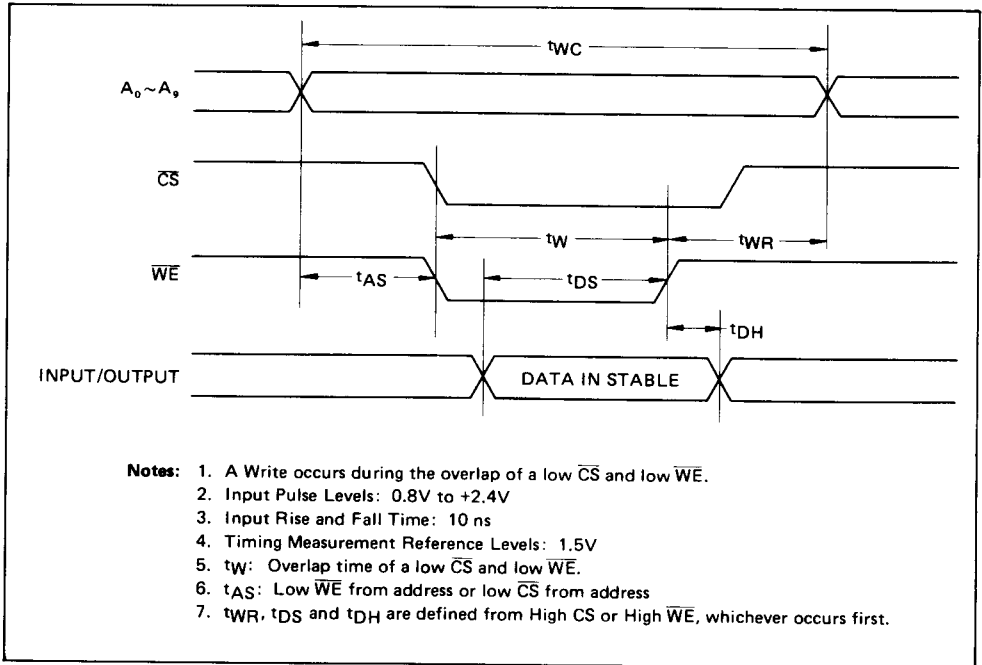
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**WRITE CYCLE**

( $V_{CC} = 5V \pm 10\%$ ,  $T_a = 0^\circ C$  to  $+70^\circ C$ )

Parameter	Symbol	5114-2		5114-3		5114		Unit
		Min.	Max.	Min.	Max.	Min.	Max.	
Write Cycle Time	$t_{WC}$	200		300		450		ns
Write Time	$t_W$	150		190		250		ns
Write Release Time	$t_{WR}$	20		30		50		ns
Address Setup Time	$t_{AS}$	20		20		20		ns
Data Setup Time	$t_{DS}$	120		150		200		ns
Data Hold From Write Time	$t_{DH}$	10		10		10		ns

### WRITE CYCLE

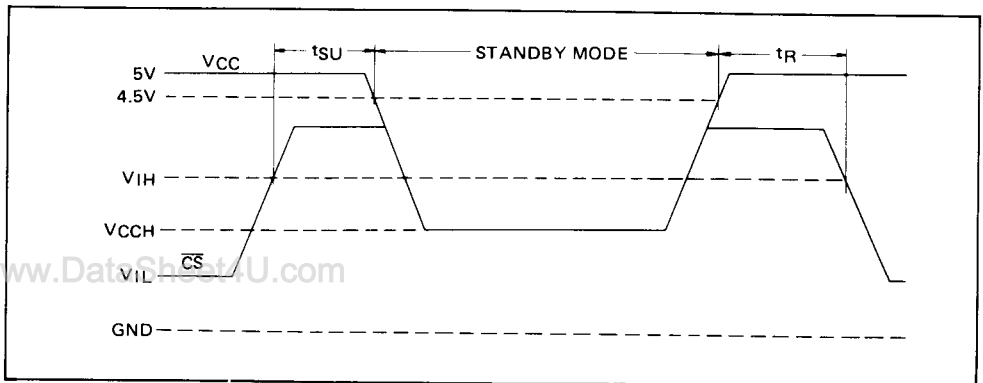


### LOW $V_{CC}$ DATA RETENTION CHARACTERISTICS

( $T_a = 0^\circ\text{C}$  to  $+70^\circ\text{C}$ , unless otherwise noted.)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
$V_{CC}$ for Data Retention	$V_{CCH}$	2			V	$V_{IN} = 0$ or $V_{CC}$ , $V_{\overline{CS}} = V_{CC}$
Data Retention Current	$I_{CCH}$		0.1	20	$\mu\text{A}$	$V_{CC} = 2\text{V}$ , $V_{\overline{CS}} = V_{CC}$ $V_{IN} = 0\text{V}$ or $V_{CC}$
$\overline{CS}$ to Data Retention Time	$t_{SU}$	0			ns	
Operation Recovery Time	$t_R$	$t_{RC}$			ns	

### LOW $V_{CC}$ DATA RETENTION WAVEFORM



### CAPACITANCE

( $T_a = 25^\circ\text{C}$ ,  $f = 1\text{ MHz}$ )

Parameter	Symbol	Min.	Typ.	Max.	Unit
Input/Output Capacitance	$C_{I/O}$			10	pF
Input Capacitance	$C_{IN}$			8	pF

**Note:** This parameter is periodically sampled and not 100% tested.

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