

OKI semiconductor

MSM5115RS

4096-BIT (1024 x 4) CMOS STATIC RAM

GENERAL DESCRIPTION

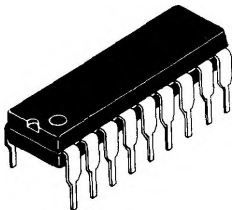
The Oki MSM5115 is a 4096-bit static Random Access Memory organized as 1024 words by 4 bits using Oki's reliable Silicon Gate CMOS technology. Microwatt power dissipation typical of all CMOS is exhibited in all static states. Directly TTL compatible inputs, outputs, operation from a single +5 V supply and on-chip address registers simplify system designs. Common data input/output pins using three-state outputs are provided.

The MSM5115 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 4 V to 6 V power supply range.

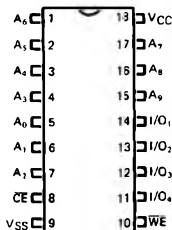
FEATURES

- Low Power Dissipation
 - 40μW Max. Standby Power
 - 33mW/MHz Max. Operating Power
- Data Retention to $V_{CC} = 22V$
- Single 4 ~ 6V Power Supply
- High Density 300-mil 18-Pin Package
- On-Chip Address Register
- Common I/O Capability using Three-State Outputs
- Directly TTL/CMOS Compatible
- Silicon Gate CMOS Technology
- Pin-compatible with Intel 2114, Interchangeable with Harris 6514

	5114-2	5115-3
Max. Access Time (NS)	200	300
Max. Operating Power (MW/MHz)	33	33
Max. Standby Power (μW)	40	40

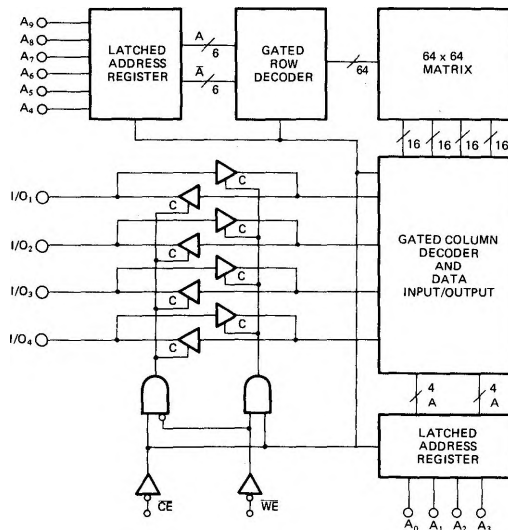


PIN CONFIGURATION



A₀ To A₉: Address Inputs
 WE: Write Enable
 CE: Chip Enable
 I/O₁ ~ I/O₄: Data Input/Output
 V_{CC}: +5V Supply
 V_{SS}: Ground

FUNCTIONAL BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Supply Voltage	V_{CC}	-0.3 to 7.0	V
Input Voltage	V_{IN}	-0.3 to $V_{CC} + 0.3$	V
Data I/O Voltage	V_D	-0.3 to $V_{CC} + 0.3$	V
Storage Temperature	T_{stg}	-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 operation 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_{CC}	4	5	6	V	$5V \pm 20\%$
Input Signal Level	V_{IH}	2.4	5	V_{CC}	V	Respect to V_{SS}
	V_{IL}	-0.3	0	0.8	V	
Operating Temperature	T_{opr}	0		70	°C	

DC CHARACTERISTICS

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Input Load Current	I_{LI}	-1		1	μA	$V_{IN} = 0$ to V_{CC}
Data I/O Leakage Current	I_{LO}	-1		1	μA	$V_{I/O} = 0$ to V_{CC}
Output High Voltage	V_{OH}	4.2			V	$I_{OUT} = -40\mu A$
Output Low Voltage	V_{OL}			0.4	V	$I_{OUT} = 1.6mA$
Output High Current	I_{OH}	-1.0			mA	$V_{OUT} = 2.4V$
Standby Supply Current	I_{CCS}		0.2	50	μA	$V_{IN} = 0$ or V_{CC}
Operating Supply Current	I_{CC}			6	mA	$V_{IN} = 0$ or V_{CC} , $t_{RC} = 1\mu s$

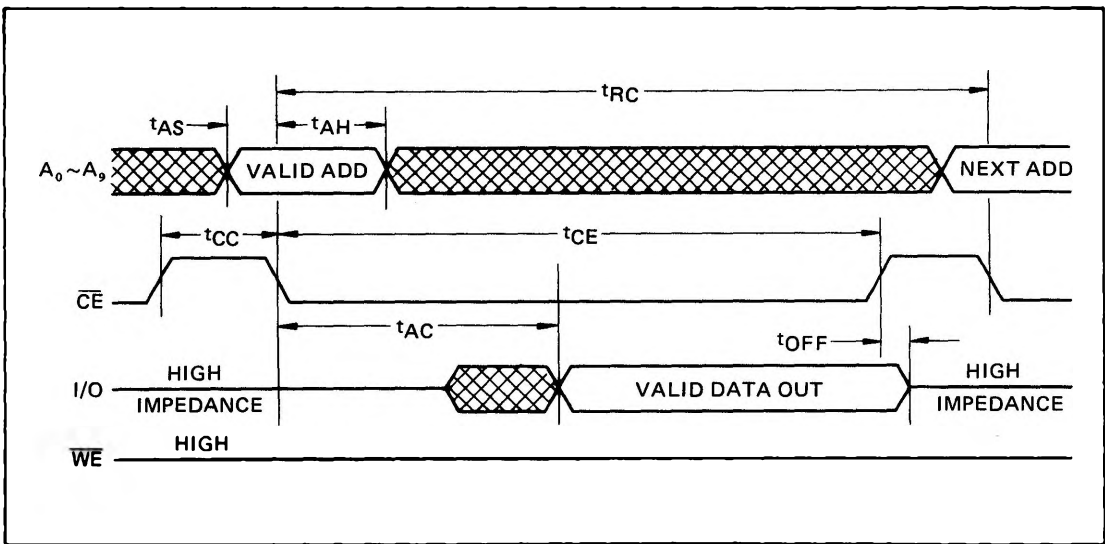
AC CHARACTERISTICS

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

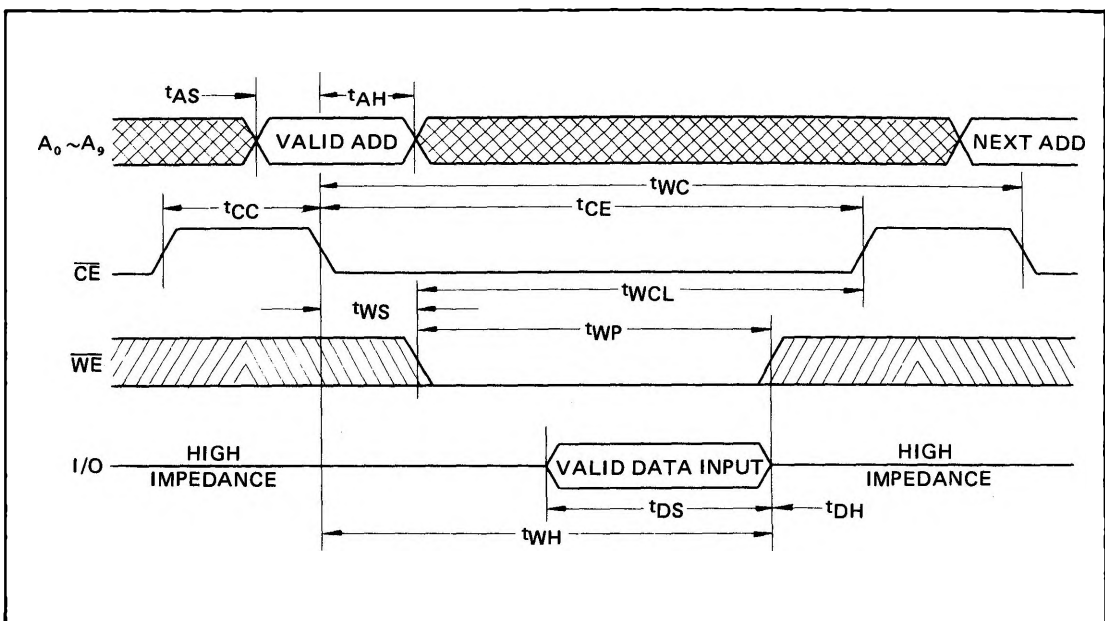
Parameter	Symbol	5115-2		5115-3		Unit
		Min.	Max.	Min.	Max.	
Read/Write Cycle Time	t_{RC}, t_{WC}	300		420		ns
Chip Enable Access Time	t_{AC}		200		300	ns
Chip Enable Pulse Width	t_{CE}	200		300		ns
Chip Enable Off Time	t_{CC}	100		120		ns
Address Hold Time	t_{AH}	40		50		ns
Address Setup Time	t_{AS}	0		0		ns
Output Disable Time	t_{OFF}	0	70	0	100	ns
Write Enable Pulse Width	t_{WP}	100		130		ns
Write Enable Setup Time	t_{WS}	0		0		ns

Parameter	Symbol	5115-2		5115-3		Unit
		Min.	Max.	Min.	Max.	
Write Enable Hold	t_{WH}	170		250		ns
Data Setup Time	t_{DS}	100		130		ns
Data Hold Time	t_{DH}	0		0		ns
Data Valid Time to Write Pulse	t_{DV}	0		0		ns
Write Enable Read Time	t_{WCL}	150		200		ns

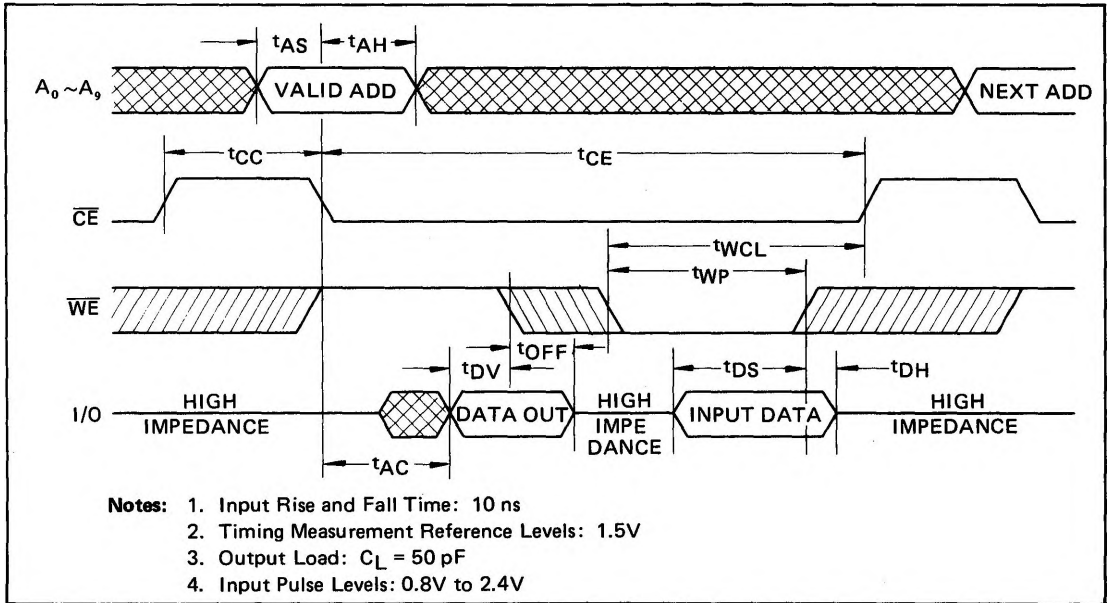
READ CYCLE



WRITE CYCLE



READ MODIFY WRITE CYCLE

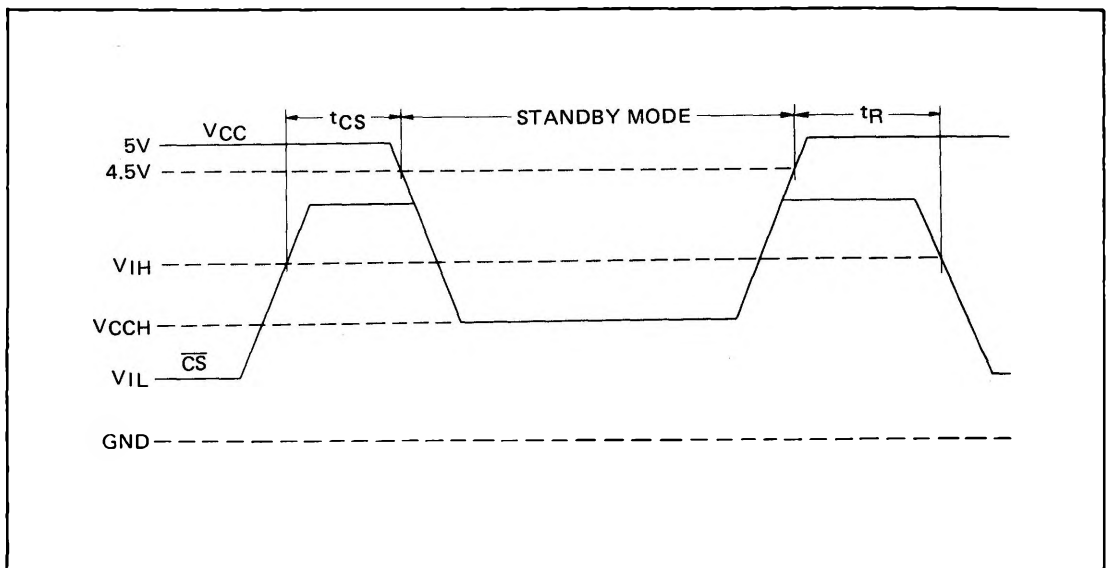


LOW V_{CC} DATA RETENTION CHARACTERISTICS

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
V_{CC} for Data Retention	V_{CCH}	2			V	$V_{IN} = 0\text{V}$ or V_{CC}
Data Retention Current	I_{CCH}		0.1	20	μA	$V_{CC} = 2\text{V}$ $\sqrt{CE} = V_{CC}$ $V_{IN} = 0\text{V}$ or V_{CC}
\overline{CE} 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.