OKI semiconductor

MSM2128RS

2 KW x 8 BIT STATIC RAM

GENERAL DESCRIPTION

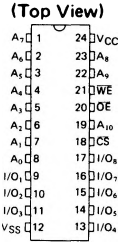
The OKI MSM2128 is a 16384 bits static Random Access Memory organized as 2048 words by 8 bits using Advanced N-channel Silicon Gate MOS technology. It uses fully static circuitry throughout and no clocks or refresh are required. The reduced standby power dissipation is automatically performed by CS control. Single +5 V Power supply. All inputs and outputs are directly TTL compatible. Common data I/O using three-state outputs. The 24 pin package is pin compatible with standard 16 K UV Erasable Programmable ROM.

FEATURES

- Single power supply
- External clock and refresh operation not required
- Access time
  - MSM2128-12RS . . . 120ns (max)
  - MSM2128-15RS . . . 150ns (max)
  - MSM2128-20RS . . . 200ns (max)
- Low power dissipation
  - during operation . . . MSM2128-15RS/20RS . . . 550 mW (max)
  - . . . MSM2128-12RS . . . 660 mW (max)
  - during standby . . . 110 mW (max)
- TTL compatible I/O
- Three-state I/O
- Common data I/O capability
- Power down mode using chip select signal
- Convertibility of pins used in 16KEPROM MSM2716

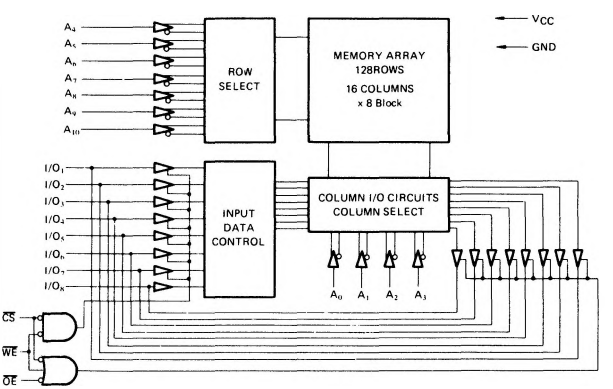
PIN CONFIGURATION

(Top View)



$A_0 \sim A_{10}$: Address Inputs
$I/O_1 \sim I/O_8$: Data Input/Output
V_{CC}: Power (5V)
V_{SS}: Ground
$\overline{WE}$: Write Enable
$\overline{CS}$: Chip Select
$\overline{OE}$: Output Enable

FUNCTIONAL BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Rating	Symbol	Value	Unit	Conditions
Supply Voltage	V_{CC}	−0.5 to 7	V	Respect to V_{SS}
Input Voltage	V_{IN}	−0.5 to 7	V	
Operating Temperature	Topr	0 to 70	°C	
Storage Temperature	T_{stg}	−55 to 150	°C	
Power Dissipation	P_D	1.0	W	

DC AND OPERATING CHARACTERISTICS

(T_a = 0°C to + 70°C, V_{CC} = 5V ±10%, unless otherwise notes.)

Parameter	Symbol	2128-12RS			2128-15/20RS			Unit	Conditions
		Min.	Typ.	Max.	Min.	Typ.	Max.		
Input Load Current	I_{LI}	−10		10	−10		10	μA	V_{CC} = Max. V_{IN} = GND to V_{CC}
Output Leakage Current	I_{LO}	−10		10	−10		10	μA	$\overline{CS}$ = $\overline{OE}$ = V_{IH}, V_{CC} = Max. V_{out} = GND to V_{CC}
Operating Current	I_{CC}			120			100	mA	V_{CC} = Max. $\overline{CS}$ = V_{IL} I I/O = 0 mA t_{cyc} = Min.
Standby Current	I_{SB}			15			15	mA	V_{CC} = Min. to Max. $\overline{CS}$ = V_{IH}
Peak Power-on Current	I_{SBP}			20			20	mA	V_{CC} = GND to V_{CC} = Min. $\overline{CS}$ = Lower of V_{CC} or V_{IH}
Input Voltage	V_{IH}	2	5	6	2	5	6	V	Respect to V_{SS}
	V_{IL}	−0.5	0	0.8	−0.5	0	0.8	V	
Output Voltage	V_{OH}	2.4		V_{CC}	2.4		V_{CC}	V	I_{OH} = −1.0 mA
	V_{OL}			0.4			0.4	V	I_{OL} = 2.1 mA

Notes 1. Typical limits are at V_{CC} = 5V, T_a = 25°C, and specified loading.

AC CHARACTERISTICS

(T_a = 0°C to + 70°C, V_{CC} = 5V ± 10%, unless otherwise noted.)

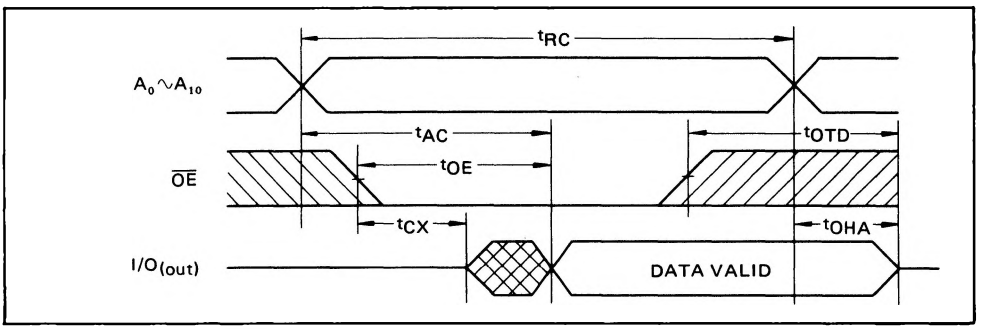
AC TEST CONDITIONS

Parameter	Conditions
Input High Level	2.0V
Input Low Level	0.8V
Input Rise and Fall Times	10 ns
Input and Output Timing Levels	1.5V
Output Load	C_L = 100 pF, 1TTL Gate

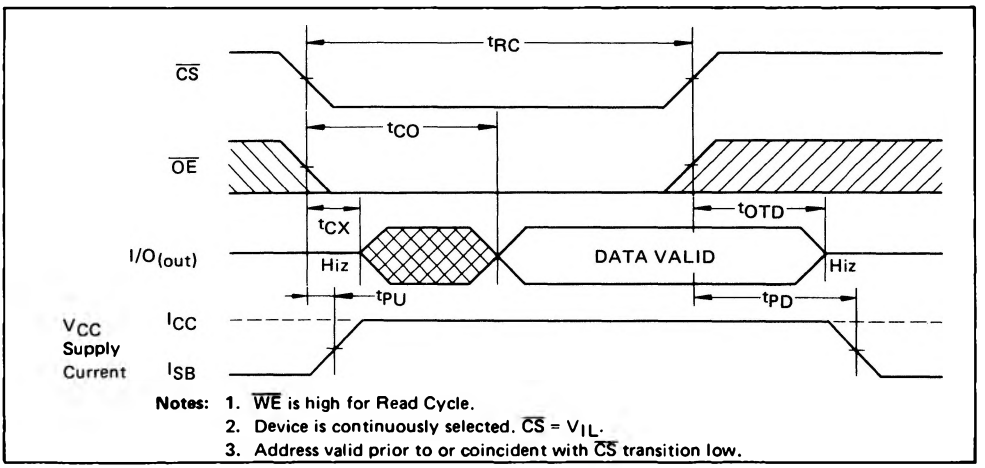
READ CYCLE [1]

Parameter	Symbol	2128-12RS		2128-15RS		2128-20RS		Unit	Conditions
		Min.	Max.	Min.	Max.	Min.	Max.		
Read Cycle Time	t_{RC}	120		150		200		ns	
Address Access Time	t_{AC}		120		150		200	ns	
Output Enable to Output Delay	t_{OE}		50		60		70	ns	
Chip Select Access Time	t_{CO}		120		150		200	ns	
Chip Selection to Output in Low Z	t_{CX}[2]	10		10		10		ns	
Chip Selection to Output in High Z	t_{OTD}[3]	0	40	0	50	0	60	ns	
Output Hold from Address Time	t_{OHA}	10		10		10		ns	
Chip Select to Power Up Time	t_{PU}	0		0		0		ns	
Chip Select to Power Down Time	t_{PD}		50		60		80	ns	

READ CYCLE NO. 1 [8] [9]



READ CYCLE NO. 2 [8] [10]



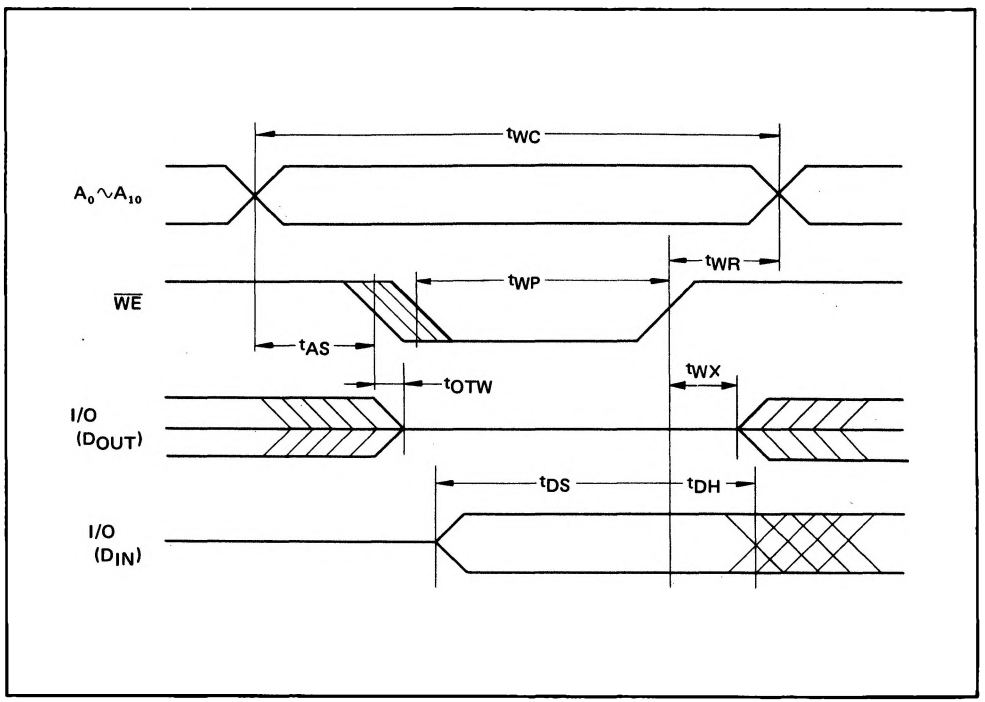
Notes: 1. $\overline{WE}$ is high for Read Cycle.
2. Device is continuously selected. $\overline{CS}$ = V_{IL}.
3. Address valid prior to or coincident with $\overline{CS}$ transition low.

WRITE CYCLE (4)(5)

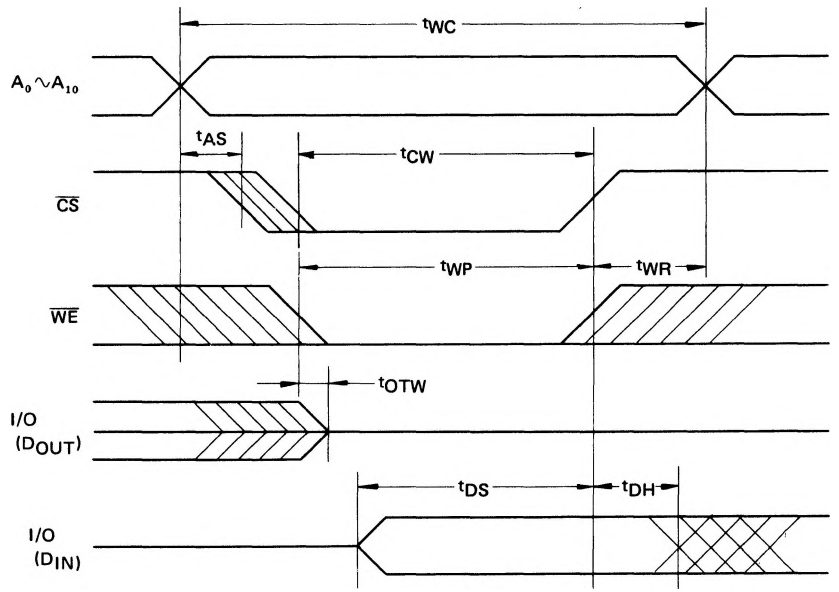
Parameter	Symbol	2128-12RS		2128-15RS		2128-20RS		Unit	Conditions
		Min.	Max.	Min.	Max.	Min.	Max.		
Write Cycle Time	t_{WC}	120		150		200		ns	
Chip Selection to End of Write	t_{CW}	90		120		150		ns	
Address Setup Time	t_{AS}	20		20		20		ns	
Write Pulse Width	t_{WP}	60		80		100		ns	
Write Recovery Time	t_{WR}(6)	10		10		10		ns	
Data Valid to End of Write	t_{DS}(6)	50		70		90		ns	
Data Hold Time	t_{DH}(6)	10		15		15		ns	
Write Enabled to Output in High Z	t_{OTW}(7)	0	40	0	50	0	60	ns	
Output Active from End of White	t_{WX}	5		5		5		ns	

Notes
1. A read occurs during the overlap of a low $\overline{CS}$, a low $\overline{OE}$ and a high $\overline{WE}$.
2. t_{CX} is specified from $\overline{CS}$ or $\overline{OE}$, whichever occurs last.
3. t_{OTD} is specified from $\overline{CS}$ or $\overline{OE}$, whichever occurs first.
4. A write occurs during the overlap of a low $\overline{CS}$ and a low $\overline{WE}$.
5. $\overline{OE}$ may be allowed in a Write Cycle both high and low.
6. t_{WR}, t_{DS}, and t_{DH} are specified from $\overline{CS}$ or $\overline{WE}$, whichever occurs first.
7. t_{OTW} is specified by the time when DATA OUT is floating, not defined by output level.

WRITE CYCLE NO. 1(11)(13)



WRITE CYCLE NO. 2[12][13]



Notes 1. $\overline{WE}$ control mode
2. $\overline{CS}$ control mode
3. When I/O pins are Data output mode, don't force inverse signal to these pins.

FUNCTION TRUTH TABLE

$\overline{CS}$	$\overline{WE}$	$\overline{OE}$	Mode	Output	Power
H	X	X	Not Selected	High Z	Standby
L	L	X	Write	High Z	Active
L	H	L	Read	D_{OUT}	Active
L	H	H	Not Selected	High Z	Active

CAPACITANCE

(T_a = 25°C, f = 1 MHz)

Parameter	Symbol	Min.	Max.	Unit	Conditions
Input/Output Capacitance	$C_{I/O}$		8	pF	$V_{I/O}$ = 0V
Input Capacitance	C_{IN}		6	pF	V_{IN} = 0V

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