

March 1997

**Features**

- Fully Static Operation
- Industry Standard 1024 x 4 Pinout (Same as Pinouts for 6514, 2114, 9114, and 4045 Types)
- Common Data Input and Output
- Memory Retention for Standby Battery Voltage as Low as 2V Min
- All Inputs and Outputs Directly TTL Compatible
- Three-State Outputs
- Low Standby and Operating Power

**Description**

The MWS5114 is a 1024 word by 4-bit static random access memory that uses the ion-implanted silicon gate complementary MOS (CMOS) technology. It is designed for use in memory systems where low power and simplicity in use are desirable. This type has common data input and data output and utilizes a single power supply of 4.5V to 6.5V.

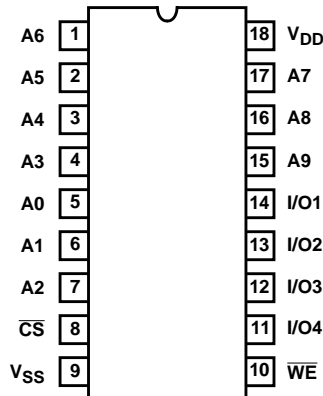
The MWS5114 is supplied in 18 lead, hermetic, dual-in-line sidebraced ceramic packages (D suffix) and in 18 lead dual-in-line plastic packages (E suffix).

**Ordering Information**

200ns	250ns	300ns	TEMPERATURE RANGE	PACKAGE	PKG. NO.
MWS5114E3	MWS5114E2 MWS5114E2X	MWS5114E1	0°C to +70°C	PDIP Burn-In	E18.3 E18.3
MWS5114D3 MWS5114D3X	MWS5114D2	MWS5114D1	0°C to +70°C	SBDIP Burn-In	D18.3 D18.3

**Pinout**

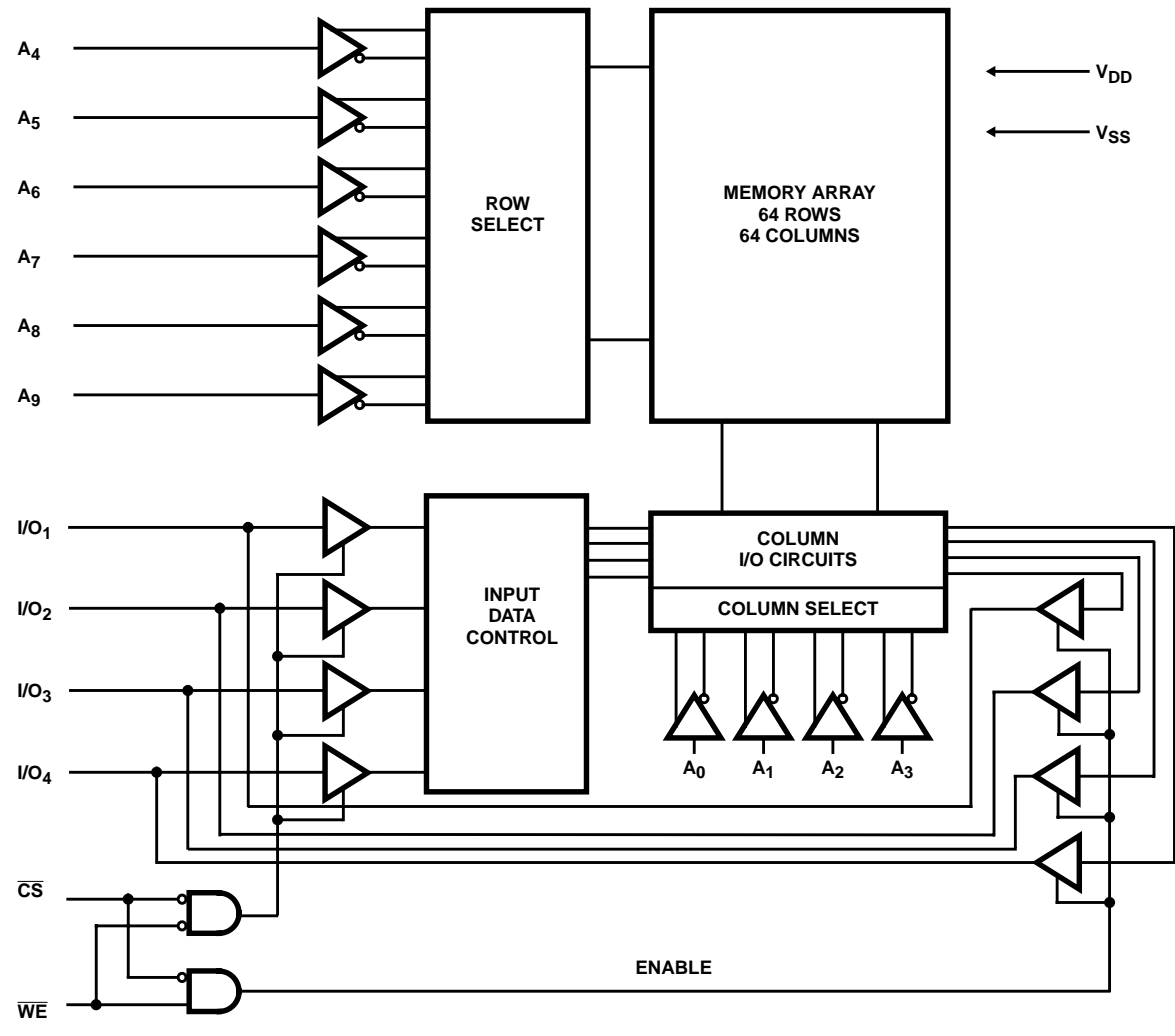
**MWS5114  
(PDIP, SBDIP)  
TOP VIEW**



**OPERATIONAL MODES**

FUNCTION	CS	WE	DATA PINS
Read	0	1	Output: Dependent on data
Write	0	0	Input
Not Selected	1	X	High Impedance

**Functional Block Diagram**



# MWS5114

## Absolute Maximum Ratings

DC Supply Voltage Range, ( $V_{DD}$ )  
 (All Voltages Referenced to  $V_{SS}$  Terminal) . . . . . -0.5V to +7V  
 Input Voltage Range, All Inputs . . . . . -0.5V to  $V_{DD} + 0.5V$   
 DC Input Current, Any One Input. . . . .  $\pm 10mA$

## Thermal Information

Thermal Resistance (Typical)  $\theta_{JA}$  ( $^{\circ}C/W$ )  $\theta_{JC}$  ( $^{\circ}C/W$ )  
 Plastic DIP Package . . . . . 75 N/A  
 SBDIP Package . . . . . 75 20  
 Operating Temperature Range ( $T_A$ )  
 Package Type D . . . . .  $-55^{\circ}C$  to  $+125^{\circ}C$   
 Package Type E . . . . .  $-40^{\circ}C$  to  $+85^{\circ}C$   
 Maximum Storage Temperature Range ( $T_{STG}$ ) . . . . .  $-65^{\circ}C$  to  $+150^{\circ}C$   
 Maximum Junction Temperature  
 Ceramic Package . . . . .  $+175^{\circ}C$   
 Plastic Package . . . . .  $+150^{\circ}C$   
 Maximum Lead Temperature. . . . .  $+265^{\circ}C$

## Recommended Operating Conditions

At  $T_A$  = Full Package Temperature Range. For maximum reliability, operating conditions should be selected so that operation is always within the following ranges:

PARAMETER	LIMITS		UNITS
	ALL TYPES		
	MIN	MAX	
DC Operating Voltage Range	4.5	6.5	V
Input Voltage Range	$V_{SS}$	$V_{DD}$	V

## Static Electrical Specifications

At  $T_A = 0^{\circ}C$  to  $+70^{\circ}C$ ,  $V_{DD} = \pm 5\%$ , Except as Noted

PARAMETER	SYMBOL	CONDITIONS			LIMITS									UNITS
		$V_O$ (V)	$V_{IN}$ (V)	$V_{DD}$ (V)	MWS5114-3			MWS5114-2			MWS5114-1			
					MIN	(NOTE 1) TYP	MAX	MIN	(NOTE 1) TYP	MAX	MIN	(NOTE 1) TYP	MAX	
Quiescent Device Current	IDD	-	0, 5	5	-	75	100	-	75	100	-	75	250	$\mu A$
Output Low (Sink) Current	$I_{OL}$	0.4	0, 5	5	2	4	-	2	4	-	2	4	-	mA
Output High (Source) Current	$I_{OH}$	4.6	0, 5	5	-0.4	-1	-	-0.4	-1	-	-0.4	-1	-	mA
Output Voltage Low-Level	VOL	-	0, 5	5	-	0	0.1	-	0	0.1	-	0	0.1	V
Output Voltage High-Level	VOH	-	0, 5	5	4.9	5	-	4.9	5	-	4.9	5	-	V
Input Low Voltage	$V_{IL}$	0.5, 4.5	-	5	-	1.2	0.8	-	1.2	0.8	-	1.2	0.8	V
Input High Voltage	$V_{IH}$	0.5, 4.5	-	5	2.4	-	-	2.4	-	-	2.4	-	-	V
Input Leakage Current (Note 2)	IIN	-	0, 5	5	-	$\pm 0.1$	$\pm 5$	-	$\pm 0.1$	$\pm 5$	-	$\pm 0.1$	$\pm 5$	$\mu A$
Operating Current (Note 3)	IDD1	-	0, 5	5	-	4	8	-	4	8	-	4	8	mA

## MWS5114

### Static Electrical Specifications At $T_A = 0^{\circ}\text{C}$ to $+70^{\circ}\text{C}$ , $V_{DD} = \pm 5\%$ , Except as Noted (Continued)

PARAMETER	SYMBOL	CONDITIONS			LIMITS									UNITS
		$V_O$ (V)	$V_{IN}$ (V)	$V_{DD}$ (V)	MWS5114-3			MWS5114-2			MWS5114-1			
					MIN	(NOTE 1) TYP	MAX	MIN	(NOTE 1) TYP	MAX	MIN	(NOTE 1) TYP	MAX	
Three-State Output Leakage Current (Note 4)	$I_{OUT}$	0, 5	0, 5	5	-	$\pm 0.5$	$\pm 5$	-	$\pm 0.5$	$\pm 5$	-	$\pm 0.5$	$\pm 5$	$\mu\text{A}$
Input Capacitance	$C_{IN}$	-	-	-	-	5	7.5	-	5	7.5	-	5	7.5	pF
Output Capacitance	$C_{OUT}$	-	-	-	-	10	15	-	10	15	-	10	15	pF

**NOTES:**

1. Typical values are for  $T_A = 25^{\circ}\text{C}$  and nominal  $V_{DD}$ .
2. All inputs in parallel.
3. Outputs open circuited; cycle time =  $1\mu\text{s}$ .
4. All outputs in parallel.

## MWS5114

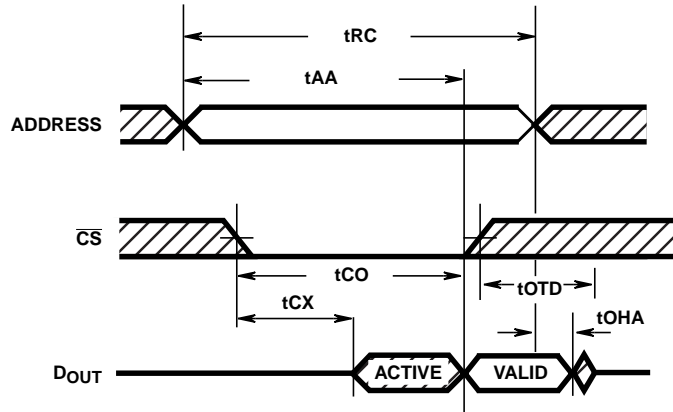
**Dynamic Electrical Specifications** at  $T_A = 0^\circ\text{C}$  to  $+70^\circ\text{C}$ ,  $V_{DD} = 5V \pm 5\%$ , Input  $t_R, t_F = 10\text{ns}$ ;  $C_L = 50\text{pF}$  and 1 TTL Load

PARAMETER	SYMBOL	LIMITS									UNITS
		MWS5114-3			MWS5114-2			MWS5114-1			
		(NOTE 1) MIN	(NOTE 2) TYP	MAX	(NOTE 1) MIN	(NOTE 2) TYP	MAX	(NOTE 1) MIN	(NOTE 2) TYP	MAX	
<b>READ CYCLE TIMES (FIGURE 1)</b>											
Read Cycle	tRC	200	160	-	250	200	-	300	250	-	ns
Access from Address	tAA	-	160	200	-	200	250	-	250	300	ns
Chip Selection to Output Valid	tCO	-	110	150	-	150	200	-	200	250	ns
Chip Selection to Output Active	tCX	20	100	-	20	100	-	20	100	-	ns
Output Three-State from Deselection	tOTD	-	75	125	-	75	125	-	75	125	ns
Output Hold from Address Change	tOHA	50	100	-	50	100	-	50	100	-	ns
<b>WRITE CYCLE TIMES (FIGURE 2)</b>											
Write Cycle	tWC	200	160	-	250	200	-	300	220	-	ns
Write	tW	125	100	-	150	120	-	200	140	-	ns
Write Release	tWR	50	40	-	50	40	-	50	40	-	ns
Address to Chip Select Setup Time	tACS	0	0	-	0	0	-	0	0	-	ns
Address to Write Setup Time	tAW	25	20	-	50	40	-	50	40	-	ns
Data to Write Setup Time	tDSU	75	50	-	75	50	-	75	50	-	ns
Data Hold from Write	tDH	30	10	-	30	10	-	30	10	-	ns

**NOTES:**

1. Time required by a limit device to allow for the indicated function.
2. Typical values are for  $T_A = 25^\circ\text{C}$  and nominal  $V_{DD}$ .

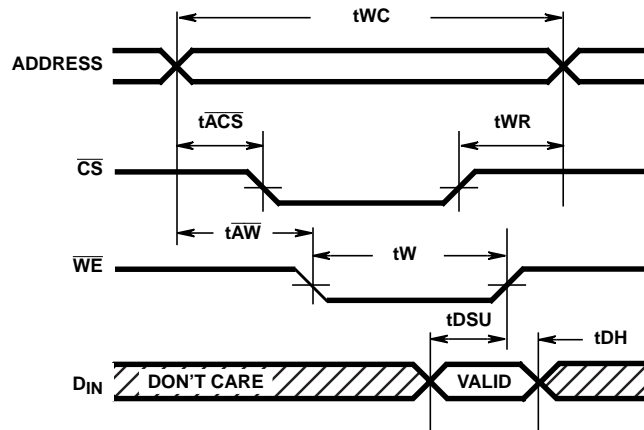
# MWS5114



NOTE:

1.  $\overline{WE}$  is high during the Read Cycle. Timing measurement reference level is 1.5V.

FIGURE 1. READ CYCLE TIMING WAVEFORMS



NOTE:

1.  $\overline{WE}$  is low during the Write Cycle. Timing measurement reference level is 1.5V.

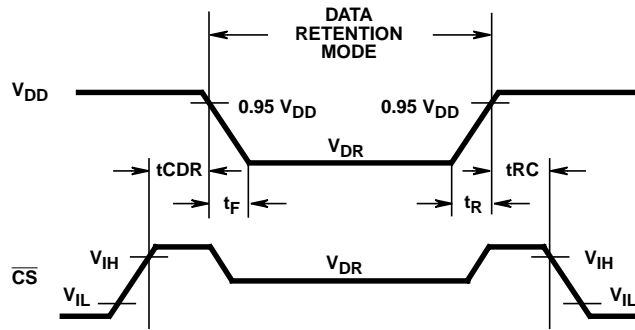
FIGURE 2. WRITE CYCLE TIMING WAVEFORMS

## Data Retention Specifications at $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ ; See Figure 3

PARAMETER	SYMBOL	TEST CONDITIONS		LIMITS			UNITS	
		$V_{DR}$ (V)	$V_{DD}$ (V)	ALL TYPES				
				MIN	(NOTE 1) TYP	MAX		
Minimum Data Retention Voltage	VDR	-	-	2	-	-	V	
Data Retention Quiescent Current	IDD	MWS5114-3	2	-	-	25	50	$\mu\text{A}$
		MWS5114-2	2	-	-	25	50	$\mu\text{A}$
		MWS5114-1	2	-	-	60	125	$\mu\text{A}$
Chip Deselect to Data Retention Time	tCDR	-	5	300	-	-	ns	
Recovery to Normal Operation Time	tRC	-	5	300	-	-	ns	
$V_{DD}$ to $V_{DR}$ Rise and Fall Time	$t_R, t_F$	2	5	1	-	-	$\mu\text{s}$	

NOTE:

1. Typical Values are for  $T_A = 25^\circ\text{C}$  and nominal  $V_{DD}$ .

FIGURE 3. LOW  $V_{DD}$  DATA RETENTION TIMING WAVEFORMS

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