HARRIS
SEMICONDUCTOR

1024-Word x 4-Bit
LSI Static RAM

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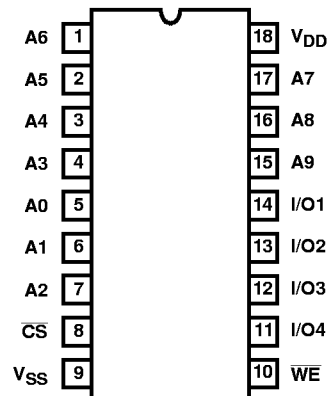
The MWS5114 is supplied in 18 lead, hermetic, dual-in-line sidebrazed ceramic packages (D suffix) and in 18 lead dual-in-line plastic packages (E suffix).

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**

```
        A6 [1       18] V_DD
        A5 [2       17] A7
        A4 [3       16] A8
        A3 [4       15] A9
        A0 [5       14] I/O1
        A1 [6       13] I/O2
        A2 [7       12] I/O3
        CS [8       11] I/O4
       Vss [9       10] WE
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OPERATIONAL MODES

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

CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper IC Handling Procedures.

File Number **1325.2**

Functional Block Diagram
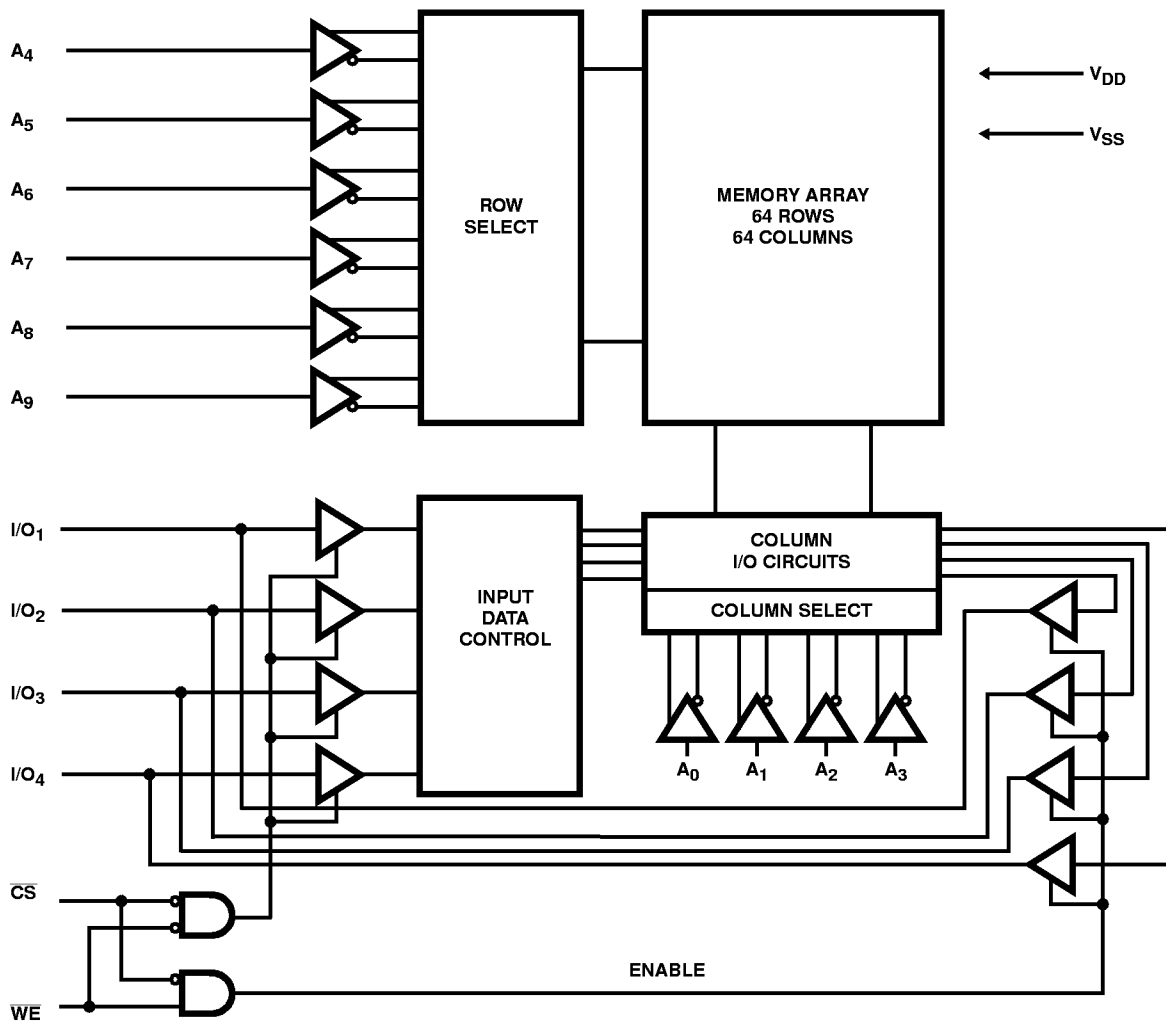
Absolute Maximum Ratings

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......................... ±10mA

Thermal Information

Thermal Resistance (Typical)	θ_{JA} (^{o}C/W)	θ_{JC} (^{o}C/W)
Plastic DIP Package	75	N/A
SBDIP Package..................	75	20

Operating Temperature Range (T_A)
   Package Type D.......................... -55^{o}C to +125^{o}C
   Package Type E........................... -40^{o}C to +85^{o}C
Maximum Storage Temperature Range (T_{STG}) ... -65^{o}C to +150^{o}C
Maximum Junction Temperature
   Ceramic Package .... +175^{o}C
   Plastic Package.................................. +150^{o}C
Maximum Lead Temperature......................... +265^{o}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:

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

Static Electrical Specifications

At T_A = 0^{o}C to +70^{o}C, V_{DD} = ±5%, Except as Noted

PARAMETER	SYMBOL	CONDITIONS V_O (V)	V_{IN} (V)	V_{DD} (V)	MWS5114-3 MIN	(NOTE 1) TYP	MAX	MWS5114-2 MIN	(NOTE 1) TYP	MAX	MWS5114-1 MIN	(NOTE 1) TYP	MAX	UNITS
Quiescent Device Current	IDD	-	0, 5	5	-	75	100	-	75	100	-	75	250	µA
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	-	±0.1	±5	-	±0.1	±5	-	±0.1	±5	µA
Operating Current (Note 3)	IDD1	-	0, 5	5	-	4	8	-	4	8	-	4	8	mA

Static Electrical Specifications   At T_A = 0°C to +70°C, V_{DD} = ±5%, Except as Noted **(Continued)**

| | | CONDITIONS | | | LIMITS | | | | | | | | | |
| | | | | | MWS5114-3 | | | MWS5114-2 | | | MWS5114-1 | | | |
PARAMETER	SYMBOL	V_O (V)	V_{IN} (V)	V_{DD} (V)	MIN	(NOTE 1) TYP	MAX	MIN	(NOTE 1) TYP	MAX	MIN	(NOTE 1) TYP	MAX	UNITS
Three-State Output Leakage Current (Note 4)	I_{OUT}	0, 5	0, 5	5	-	±0.5	±5	-	±0.5	±5	–	±0.5	±5	µA
Input Capacitance	CI_N	-	-	-	-	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°C and nominal V_{DD}.

2. All inputs in parallel.

3. Outputs open circuited; cycle time = 1µs.

4. All outputs in parallel.

MWS5114

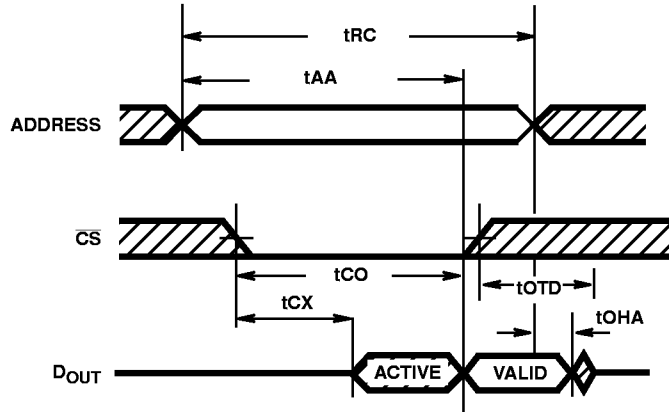## Dynamic Electrical Specifications at $T_A = 0^o$C to $+70^o$C, V_{DD} = 5V ±5%, Input t_R, t_F = 10ns; C_L = 50pF and 1 TTL Load

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	
READ CYCLE TIMES (FIGURE 1)											
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
WRITE CYCLE TIMES (FIGURE 2)											
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	t$\overline{ACS}$	0	0	-	0	0	-	0	0	-	ns
Address to Write Setup Time	t$\overline{AW}$	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.

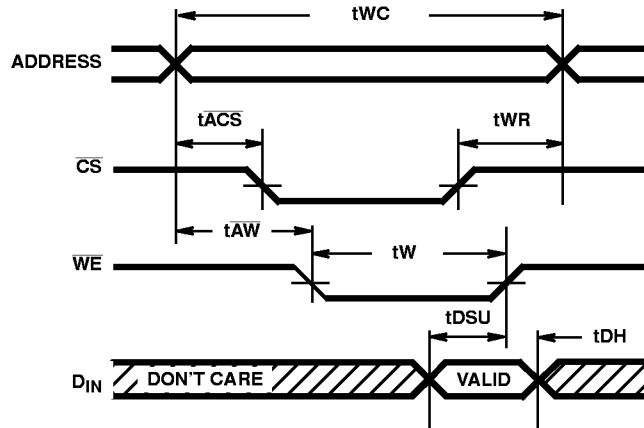2. Typical values are for $T_A = 25^o$C and nominal V_{DD}.

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 $T_A = 0^oC$ to $+70^oC$; See Figure 3

| PARAMETER		SYMBOL	TEST CONDITIONS		LIMITS			UNITS
					ALL TYPES			
			V_{DR} (V)	V_{DD} (V)	MIN	(NOTE 1) TYP	MAX	
Minimum Data Retention Voltage		VDR	-	-	2	-	-	V
Data Retention Quiescent Current	MWS5114-3	IDD	2	-	-	25	50	μA
	MWS5114-2		2	-	-	25	50	μA
	MWS5114-1		2	-	-	60	125	μA
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	-	-	μs

NOTE:

1. Typical Values are for $T_A = 25^oC$ and nominal V_{DD}.
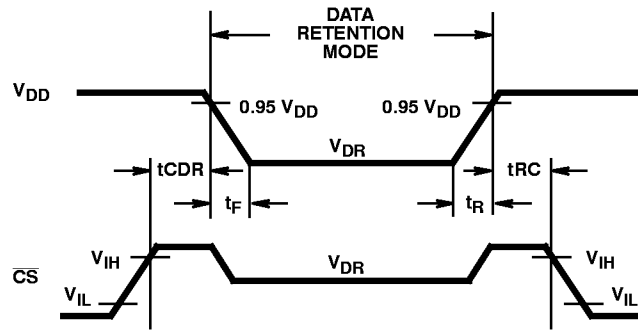
FIGURE 3. LOW V_{DD} DATA RETENTION TIMING WAVEFORMS