

MWS5101 MWS5101A

256-Word x 4-Bit
LSI Static RAM

February 1992

Features

- Industry Standard Pinout
- Very Low Operating Current 8mA at $V_{DD} = 5V$ and Cycle Time = $1\mu s$
- Two Chip Select Inputs Simple Memory Expansion
- Memory Retention for Standby 2V (Min) Battery Voltage
- Output Disable for Common I/O Systems
- 3-State Data Output for Bus Oriented Systems
- Separate Data Inputs and Outputs
- TTL Compatible (MWS5101A)

Description

The MWS5101 and MWS5101A are 256 word by 4 bit static random access memories designed for use in memory systems where high speed, very low operating current, and simplicity in use are desirable. They have separate data inputs and outputs and utilize a single power supply of 4 to 6.5 volts. The MWS5101 and MWS5101A differ in input voltage characteristics (MWS5101A is TTL compatible).

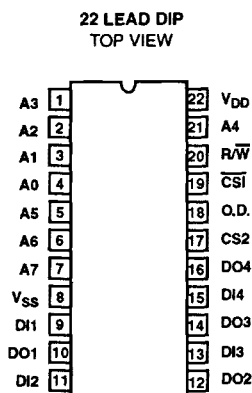
Two Chip Select inputs are provided to simplify system expansion. An Output Disable control provides Wire-OR capability and is also useful in common Input/Output systems by forcing the output into a high impedance state during a write operation independent of the Chip Select input condition. The output assumes a high impedance state when the Output Disable is at high level or when the chip is deselected by $\overline{CS1}$ and/or $\overline{CS2}$.

The high noise immunity of the CMOS technology is preserved in this design. For TTL interfacing at 5V operation, excellent system noise margin is preserved by using an external pull-up resistor at each input.

For applications requiring wider temperature and operating voltage ranges, the mechanically and functionally equivalent static RAM, CDP1822 may be used.

The MWS5101 and MWS5101A types are supplied in 22 lead hermetic dual-in-line, sidebraced ceramic packages (D suffix), in 22 lead dual-in-line plastic packages (E suffix), and in chip form (H suffix).

Pinout



Ordering Information

PACKAGE	TEMPERATURE RANGE	MWS5101		MWS5101A	
		250ns	350ns	250ns	350ns
Plastic DIP Burn-In	0°C to +70°C	MWS5101EL2 MWS5101EL2X	MWS5101EL3 MWS5101EL3X	MWS5101AEL2 MWS5101AEL2X	MWS5101AEL3 MWS5101AEL3X
Ceramic DIP Burn-In	0°C to +70°C	- -	MWS5101DL3 MWS5101DL3X	- -	MWS5101ADL3 MWS5101ADL3X

6
CMOS MEMORY

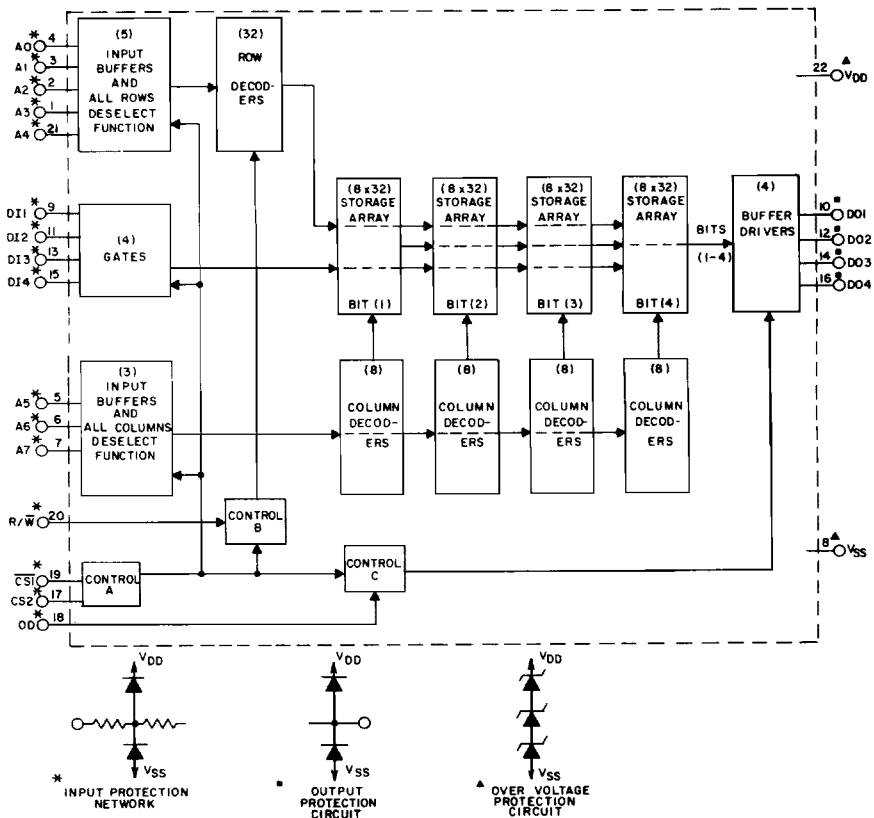
MWS5101, MWS5101A

OPERATIONAL MODES

MODE	INPUTS				OUTPUT
	CHIP SELECT 1 CS ₁	CHIP SELECT 2 CS ₂	OUTPUT DISABLE OD	READ/WRITE R/W	
Read	0	1	0	1	Read
Write	0	1	0	0	Data In
Write	0	1	1	0	High Impedance
Standby	1	X	X	X	High Impedance
Standby	X	0	X	X	High Impedance
Output Disable	X	X	1	X	High Impedance

Logic 1 = High, Logic 0 = Low, X = Don't Care

Functional Block Diagram



Specifications MWS5101, MWS5101A

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 $\pm 10mA$

Power Dissipation Per Package (P_D)

$T_A = -40^\circ C$ to $+60^\circ C$ (Package Type E) 500mW

$T_A = +60^\circ C$ to $+85^\circ C$ (Package Type E) Derate Linearly at
12mW/ $^\circ C$ to 200mW

$T_A = -55^\circ C$ to $+100^\circ C$ (Package Type D) 500mW

$T_A = +100^\circ C$ to $+125^\circ C$ (Package Type D) Derate Linearly at
12mW/ $^\circ C$ to 200mW

Device Dissipation Per Output Transistor

$T_A =$ Full Package Temperature Range

(All Package Types) 100mW

Operating Temperature Range (T_A):

Package Type D $-55^\circ C$ to $+125^\circ C$

Package Type E $-40^\circ C$ to $+85^\circ C$

Storage Temperature Range (T_{stg}) $-65^\circ C$ to $+150^\circ C$

Lead Temperature (During Soldering):

At distance 1/16 \pm 1/32 In. ($1.59 \pm 0.79mm$)

from case for 10s max $+265^\circ C$

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:

CHARACTERISTIC	LIMITS		UNITS
	ALL TYPES		
	MIN	MAX	
DC Operating Voltage Range	4	6.5	V
Input Voltage Range	V_{SS}	V_{DD}	V

Static Electrical Characteristics

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

CHARACTERISTIC	SYMBOL	CONDITIONS		LIMITS						UNITS
		V_O (V)	V_{IH} (V)	MWS5101			MWS5101A			
				MIN	(Note 1) TYP	MAX	MIN	(Note 1) TYP	MAX	
Quiescent Device Current	L2 Types	-	0, 5	-	25	50	-	25	50	μA
	L3 Types	-	0, 10	-	100	200	-	100	200	μA
Output Low (Sink) Current	I_{OL}	0.4	0, 5	2	4	-	2	4	-	mA
Output High (Source) Current	I_{OH}	4.6	0, 5	-1	-2	-	-1	-2	-	mA
Output Voltage Low-Level	V_{OL}	-	0, 5	-	0	0.1	-	0	0.1	V
Output Voltage High-Level	V_{OH}	-	0, 5	4.9	5	-	4.9	5	-	V
Input Low Voltage	V_{IL}	-	-	-	-	1.5	-	-	0.65	V
Input High Voltage	V_{IH}	-	-	3.5	-	-	2.2	-	-	V
Input Leakage Current	I_{IN}	-	0, 5	-	-	± 5	-	-	± 5	μA
Operating Current (Note 2)	I_{DD1}	-	0, 5	-	4	8	-	4	8	mA
3-State Output Leakage Current	L2 Types	0, 5	0, 5	-	-	± 5	-	-	± 5	μA
	L3 Types	0, 5	0, 5	-	-	± 5	-	-	± 5	μA
Input Capacitance	C_{IN}	-	-	-	5	7.5	-	5	7.5	pF
Output Capacitance	C_{OUT}	-	-	-	10	15	-	10	15	pF

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

2. Outputs open circuited; Cycle time = $1\mu s$.

Specifications MWS5101, MWS5101A

Dynamic Electrical Characteristics at $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$, $V_{DD} = 5V \pm 5\%$

CHARACTERISTIC	SYMBOL	LIMITS (NOTE 1)						UNITS
		L2 TYPES			L3 TYPES			
		(NOTE 2) MIN	(NOTE 3) TYP	MAX	(NOTE 2) MIN	(NOTE 3) TYP	MAX	
READ CYCLE TIMES (FIGURE 1)								
Read Cycle	t_{RC}	250	-	-	350	-	-	ns
Access from Address	t_{AA}	-	150	250	-	200	350	ns
Output Valid from Chip Select 1	t_{DOA1}	-	150	250	-	200	350	ns
Output Valid from Chip Select 2	t_{DOA2}	-	150	250	-	200	350	ns
Output Valid from Output Disable	t_{DOA3}	-	-	110	-	-	150	ns
Output Hold from Chip Select 1	t_{DOH1}	20	-	-	20	-	-	ns
Output Hold from Chip Select 2	t_{DOH2}	20	-	-	20	-	-	ns
Output Hold from Output Disable	t_{DOH3}	20	-	-	20	-	-	ns
WRITE CYCLE TIMES (FIGURE 2)								
Write Cycle	t_{WC}	300	-	-	400	-	-	ns
Address Setup	t_{AS}	110	-	-	150	-	-	ns
Write Recovery	t_{WR}	40	-	-	50	-	-	ns
Write Width	t_{WRW}	150	-	-	200	-	-	ns
Input Data Setup Time	t_{DS}	150	-	-	200	-	-	ns
Data in Hold	t_{DH}	40	-	-	50	-	-	ns
Chip Select 1 Setup	t_{CS1S}	110	-	-	150	-	-	ns
Chip Select 2 Setup	t_{CS2S}	110	-	-	150	-	-	ns
Chip Select 1 Hold	t_{CS1H}	0	-	-	0	-	-	ns
Chip Select 2 Hold	t_{CS2H}	0	-	-	0	-	-	ns
Output Disable Setup	t_{ODS}	110	-	-	150	-	-	ns

NOTES:

1. MWS5101: $t_r, t_f = 20\text{ns}$, $V_{IH} = 0.7V_{DD}$, $V_{IL} = 3V_{DD}$; $C_L = 100\text{pF}$ and MWS5101A: $t_r, t_f = 20\text{ns}$, $V_{IH} = 2.2V$, $V_{IL} = 0.65V$; $C_L = 50\text{pF}$ and 1 TTL Load.
2. Time required by a limit device to allow for the indicated function
3. Typical values are for $T_A = 25^\circ\text{C}$ and nominal V_{DD}

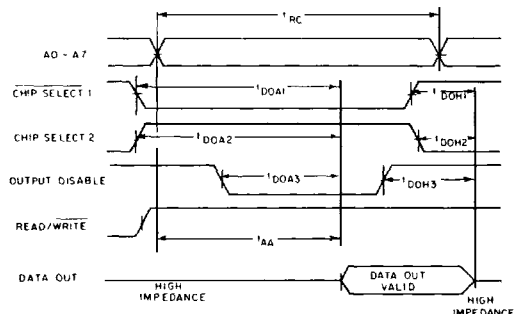
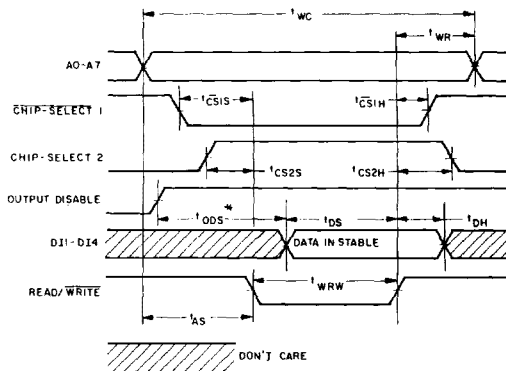


FIGURE 1. READ CYCLE TIMING WAVEFORMS



* t_{ODS} is required for common I/O operation only; for separate I/O operations, output disable is "don't care"

FIGURE 2. WRITE CYCLE TIMING WAVEFORMS

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS		LIMITS			UNITS	
		V_{DR} (V)	V_{DD} (V)	ALL TYPES				
				MIN	(NOTE 1) TYP	MAX		
Minimum Data Retention Voltage	V_{DR}	-	-	-	1.5	2	V	
Data Retention Quiescent Current	L2 Types	I_{DD}	2	-	-	2	10	μA
	L3 Types							5
Chip Deselect to Data Retention Time	t_{CDR}	-	5	600	-	-	ns	
Recovery to Normal Operation Time	t_{RC}	-	5	600	-	-	ns	
V_{DD} to V_{DR} Rise and Fall Time	t_r, t_f	2	5	1	-	-	μs	

NOTE:

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

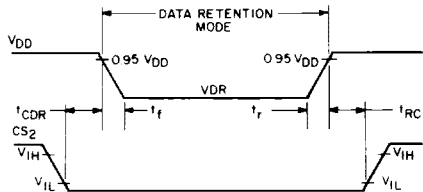


FIGURE 3. LOW V_{DD} DATA RETENTION TIMING WAVEFORMS

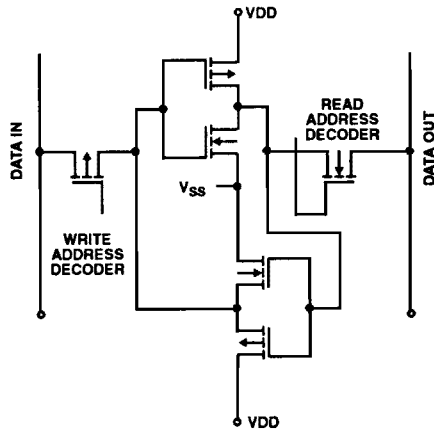


FIGURE 4. MEMORY CELL CONFIGURATION

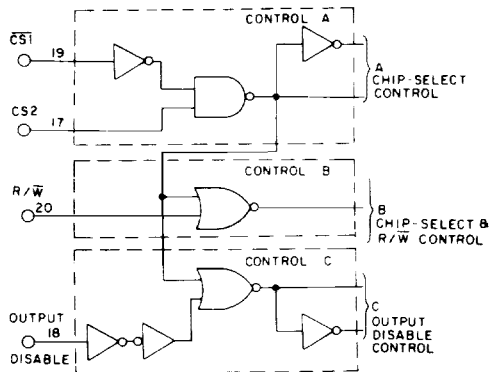


FIGURE 5. LOGIC DIAGRAM OF CONTROLS FOR MWS5101, MWS5101A