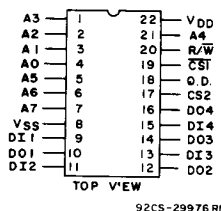


MWS5101



TERMINAL ASSIGNMENT

256-Word by 4-Bit LSI Static Random-Access Memory

Features:

- Industry standard pinout
- Very low operating current—8 mA at $V_{DD} = 5 V$ and cycle time = $1 \mu s$
- Two Chip-Select inputs—simple memory expansion
- Memory retention for standby battery voltage of 2 V min.
- Output-Disable for common I/O systems
- 3-state data output for bus-oriented systems
- Separate data inputs and outputs

The RCA-MWS5101 is a 256-word by 4-bit static random-access memory designed for use in memory systems where high speed, very low operating current, and simplicity in use are desirable. It has separate data inputs and outputs and utilizes a single power supply of 4 to 6.5 volts.

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 CS1 and/or CS2.

The high noise immunity of the CMOS technology is preserved in this design. For TTL interfacing at 5-V 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, RCA-CDP1822, may be used.

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

OPERATIONAL MODES

MODE	INPUTS				OUTPUT
	Chip Select 1 CS1	Chip Select 2 CS2	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

MAXIMUM RATINGS, Absolute-Maximum Values:

DC SUPPLY-VOLTAGE RANGE (V_{DD})
 (All voltage referenced to V_{SS} terminal) -0.5 to -7 V
 INPUT VOLTAGE RANGE, ALL INPUTS -0.5 to $V_{DD} + 0.5$ V
 DC INPUT CURRENT, ANY ONE INPUT ± 10 mA
 POWER DISSIPATION PER PACKAGE (P_D):
 For $T_A = -40$ to $+60^\circ\text{C}$ (PACKAGE TYPE E) 500 mW
 For $T_A = +60$ to $+85^\circ\text{C}$ (PACKAGE TYPE E) Derate Linearly at 12 mW/ $^\circ\text{C}$ to 200 mW
 For $T_A = -55$ to $+100^\circ\text{C}$ (PACKAGE TYPE D) 500 mW
 For $T_A = +100$ to $+125^\circ\text{C}$ (PACKAGE TYPE D) Derate Linearly at 12 mW/ $^\circ\text{C}$ to 200 mW
 DEVICE DISSIPATION PER OUTPUT TRANSISTOR
 FOR $T_A =$ FULL PACKAGE-TEMPERATURE RANGE (All Package Types) 100 mW
 OPERATING-TEMPERATURE RANGE (T_A):
 PACKAGE TYPE D -55 to $+125^\circ\text{C}$
 PACKAGE TYPE E -40 to $+85^\circ\text{C}$
 STORAGE TEMPERATURE RANGE (T_{stg}) -65 to $+150^\circ\text{C}$
 LEAD TEMPERATURE (DURING SOLDERING):
 At distance $1/16 \pm 1/32$ inch (1.59 ± 0.79 mm) from case for 10 s max. $+265^\circ\text{C}$

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}	

5

STATIC ELECTRICAL CHARACTERISTICS at $T_A = 0$ to 70°C , $V_{DD} = 5$ V $\pm 5\%$.

CHARACTERISTIC	TEST CONDITIONS		LIMITS			UNITS	
	V_O (V)	V_{IN} (V)	MWS5101D MWS5101E				
			Min.	Typ. [●]	Max.		
Quiescent Device Current, I_{DD}	L2 Types	—	0.5	—	25	50	μA
	L3 Types	—	0.5	—	100	200	
Output Voltage:	Low-Level, V_{OL}	—	0.5	—	0	0.1	V
	High-Level, V_{OH}	—	0.5	4.9	5	—	
Input Low Voltage, V_{IL}	—	—	—	—	—	1.5	
Input High Voltage, V_{IH}	—	—	—	3.5	—	—	
Output Low (Sink) Current, I_{OL}	—	0.4	0.5	2	4	—	mA
Output High (Source) Current, I_{OH}	—	4.6	0.5	-1	-2	—	
Input Current, I_{IN}	—	—	0.5	—	—	± 5	
3-State Output Leakage Current, I_{OUT}	L2 Types	0.5	0.5	—	—	± 5	μA
	L3 Types	0.5	0.5	—	—	± 5	
Operating Current, I_{DD1} [#]	—	—	0.5	—	4	8	mA
Input Capacitance, C_{IN}	—	—	—	—	5	7.5	pF
Output Capacitance, C_{OUT}	—	—	—	—	10	15	

[●] Typical values are for $T_A = 25^\circ\text{C}$ and nominal V_{DD} .

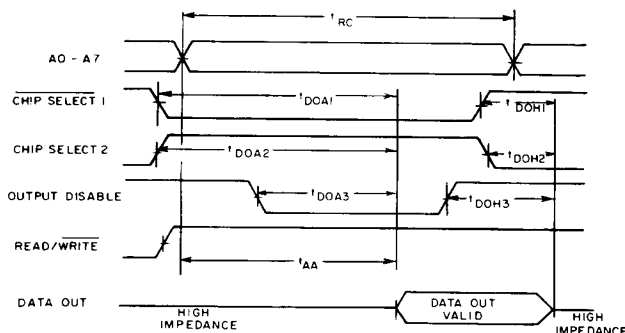
[#] Outputs open-circuited; cycle time = 1 μs .

MWS5101

DYNAMIC ELECTRICAL CHARACTERISTICS at $T_A = 0$ to 70°C , $V_{DD} = 5\text{ V} \pm 5\%$,
 $t_r, t_f = 20\text{ ns}$, $V_{IH} = 0.7 V_{DD}$, $V_{IL} = 0.3 V_{DD}$, $C_L = 100\text{ pF}$

CHARACTERISTIC	LIMITS						UNITS	
	MWS5101D, MWS5101E							
	L2 Types			L3 Types				
	Min.†	Typ.●	Max.	Min.†	Typ.●	Max.		
Read Cycle Times (Fig. 1)								
Read Cycle	t_{RC}	250	—	—	350	—	—	ns
Access from Address	t_{AA}	—	150	250	—	200	350	
Output Valid from Chip-Select 1	t_{DOA1}	—	150	250	—	200	350	
Output Valid from Chip-Select 2	t_{DOA2}	—	150	250	—	200	350	
Output Valid from Output Disable	t_{DOA3}	—	—	110	—	—	150	
Output Hold from Chip-Select 1	t_{DOH1}	20	—	—	20	—	—	
Output Hold from Chip-Select 2	t_{DOH2}	20	—	—	20	—	—	
Output Hold from Output Disable	t_{DOH3}	20	—	—	20	—	—	

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



92CM-30244R4

Fig. 1 - Read cycle timing waveforms.

MWS5101

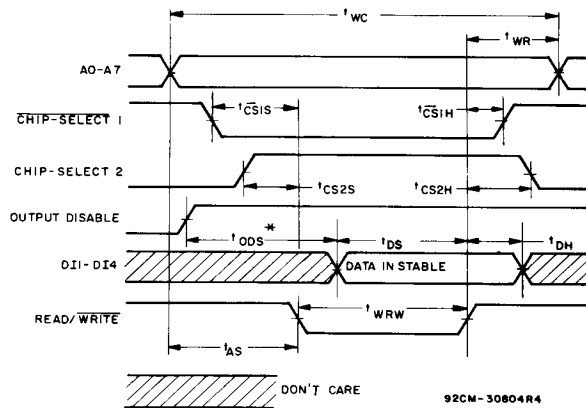
DYNAMIC ELECTRICAL CHARACTERISTICS at $T_A = 0$ to 70°C , $V_{DD} = 5\text{ V} \pm 5\%$,
 $t_r, t_f = 20\text{ ns}$, $V_{IH} = 0.7 V_{DD}$, $V_{IL} = 0.3 V_{DD}$, $C_L = 100\text{ pF}$

CHARACTERISTIC	LIMITS						U N I T S	
	MWS5101D, MWS5101E							
	L2 Types			L3 Types				
	Min.†	Typ.●	Max.	Min.†	Typ.●	Max.		
Write Cycle Times (Fig. 2)								
Write Cycle	t_{WC}	300	-	-	400	-	-	ns
Address Setup	t_{AS}	110	-	-	150	-	-	
Write Recovery	t_{WR}	40	-	-	50	-	-	
Write Width	t_{WRW}	150	-	-	200	-	-	
Input Data Setup Time	t_{DS}	150	-	-	200	-	-	
Data In Hold	t_{DH}	40	-	-	50	-	-	
Chip-Select 1 Setup	$t_{\overline{CS}1S}$	110	-	-	150	-	-	
Chip-Select 2 Setup	t_{CS2S}	110	-	-	150	-	-	
Chip-Select 1 Hold	$t_{\overline{CS}1H}$	0	-	-	0	-	-	
Chip-Select 2 Hold	t_{CS2H}	0	-	-	0	-	-	
Output Disable Setup	t_{ODS}	110	-	-	150	-	-	

† Time required by a limit device to allow for the indicated function.

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

5



* t_{ODS} IS REQUIRED FOR COMMON I/O OPERATION ONLY. FOR SEPARATE I/O OPERATIONS, OUTPUT DISABLE IS 'DON'T CARE'

Fig. 2 - Write cycle timing waveforms.

MWS5101

DATA RETENTION CHARACTERISTICS at $T_A = 0$ to 70°C ; See Fig. 3

CHARACTERISTIC	TEST CONDITIONS		LIMITS			UNITS
	VDR (V)	VDD (V)	All Types			
			Min.	Typ.*	Max.	
Minimum Data Retention Voltage, V_{DR}	—	—	—	1.5	2	V
Data Retention Quiescent Current, I_{DD}	L2 Types	—	—	2	10	μA
	L3 Types		—	5	50	
Chip Deselect to Data Retention Time, t_{CDR}	—	5	600	—	—	ns
Recovery to Normal Operation Time, t_{RC}	—	5	600	—	—	
VDD to VDR Rise and Fall Time t_r, t_f	2	5	1	—	—	μs

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

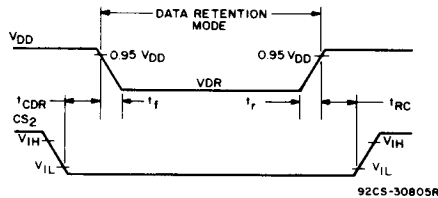


Fig. 3 - Low V_{DD} data retention timing waveforms.

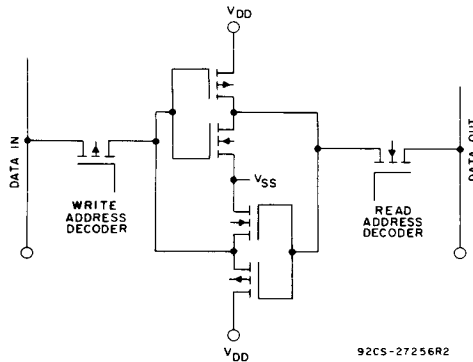


Fig. 4 - Memory cell configuration.

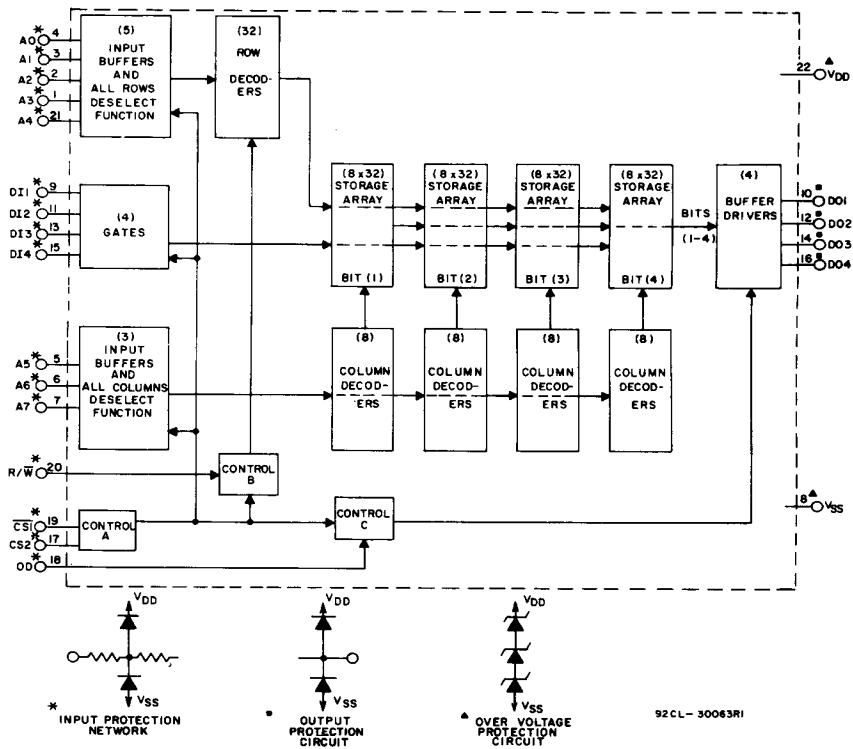


Fig. 5 - Functional block diagram for MWS5101.

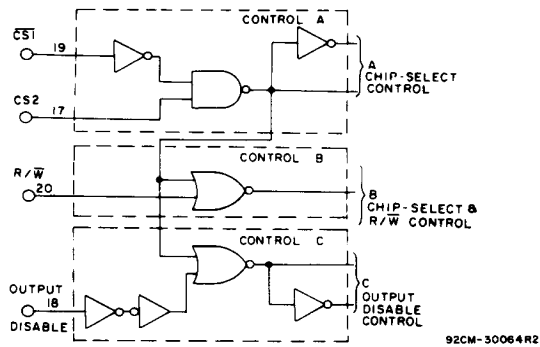


Fig. 6 - Logic diagram of controls for MWS5101.