

✓ 54S/74S189 011745  
 ✓ 54LS/74LS189 011750

**64-BIT RANDOM ACCESS MEMORY**  
 (With 3-State Outputs)

**DESCRIPTION** — The '189 is a high speed 64-bit RAM organized as a 16-word by 4-bit array. Address inputs are buffered to minimize loading and are fully decoded on-chip. The outputs are 3-state and are in the high impedance state whenever the Chip Select ( $\overline{CS}$ ) input is HIGH. The outputs are active only in the Read mode and the output data is the complement of the stored data.

- 3-STATE OUTPUTS FOR DATA BUS APPLICATIONS
- BUFFERED INPUTS MINIMIZE LOADING
- ADDRESS DECODING ON-CHIP
- DIODE CLAMPED INPUTS MINIMIZE RINGING

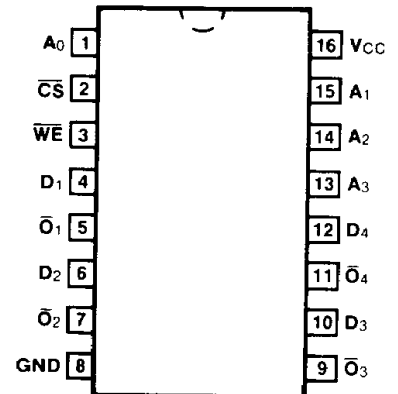
**ORDERING CODE:** See Section 9

PKGS	PIN OUT	COMMERCIAL GRADE	MILITARY GRADE	PKG TYPE
		$V_{CC} = +5.0\text{ V} \pm 5\%$ , $T_A = 0^\circ\text{C to } +70^\circ\text{C}$	$V_{CC} = +5.0\text{ V} \pm 10\%$ , $T_A = -55^\circ\text{C to } +125^\circ\text{C}$	
Plastic DIP (P)	A	74S189PC, 74LS189PC		9B
Ceramic DIP (D)	A	74S189DC, 74LS189DC	54S189DM, 54LS189DM	6B
Flatpak (F)	A	74S189FC, 74LS189FC	54S189FM, 54LS189FM	4L

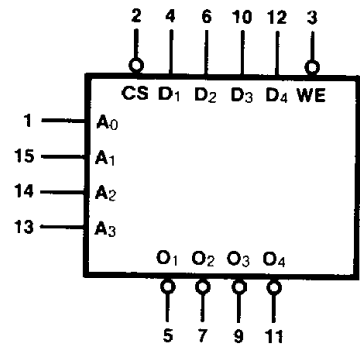
**INPUT LOADING/FAN-OUT:** See Section 3 for U.L. definitions

PIN NAMES	DESCRIPTION	54/74S (U.L.) HIGH/LOW	54/74LS (U.L.) HIGH/LOW
$A_0 - A_3$	Address Inputs	0.63/0.16	0.5/0.013
$\overline{CS}$	Chip Select Input (Active LOW)	0.63/0.16	0.5/0.013
$\overline{WE}$	Write Enable Input (Active LOW)	0.63/0.16	0.5/0.013
$D_1 - D_4$	Data Inputs	0.63/0.16	0.5/0.013
$\overline{O}_1 - \overline{O}_4$	Inverted Data Outputs	162/10 (50)	10/10 (5.0)

**CONNECTION DIAGRAM**  
 PINOUT A



**LOGIC SYMBOL**



$V_{CC} = \text{Pin } 16$   
 $GND = \text{Pin } 8$

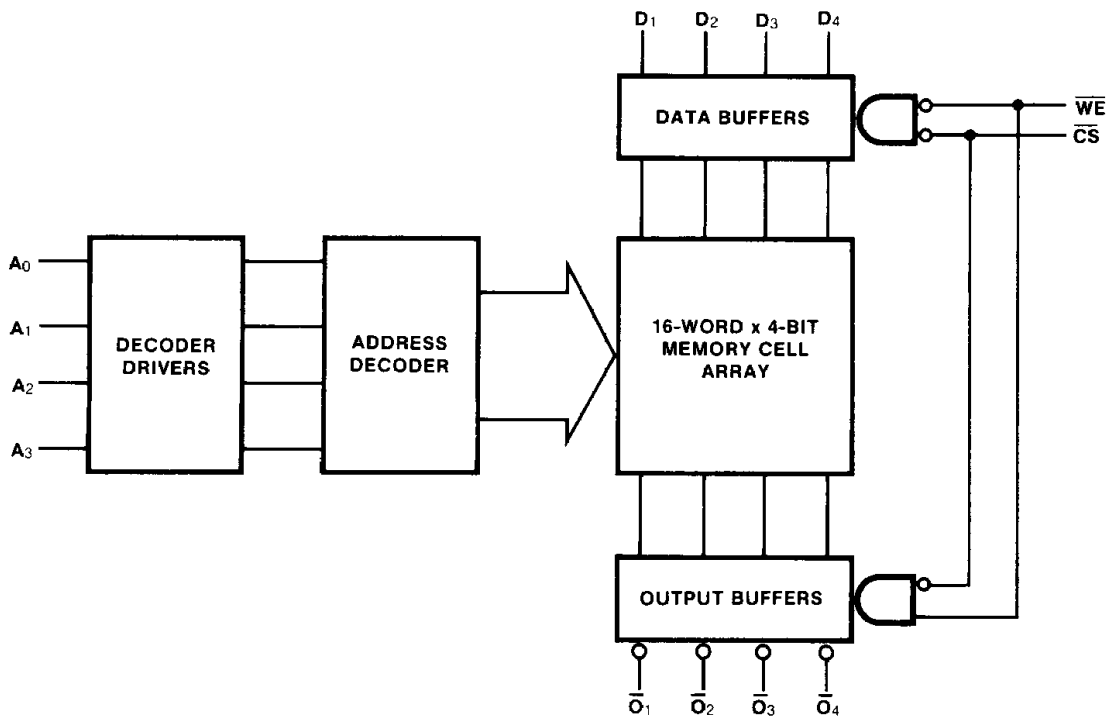
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FUNCTION TABLE

INPUTS		OPERATION	CONDITION OF OUTPUTS
$\overline{CS}$	$\overline{WE}$		
L	L	Write	High Impedance
L	H	Read	Complement of Stored Data
H	X	Inhibit	High Impedance

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial

LOGIC DIAGRAM



DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

SYMBOL	PARAMETER	54/74S		54/74LS		UNITS	CONDITIONS
		Min	Max	Min	Max		
V <sub>OL</sub>	Output LOW Voltage	XM	0.5	0.4	V	V <sub>CC</sub> = Min I <sub>OL</sub> = 16 mA ('S189) I <sub>OL</sub> = 8.0 mA (54LS189) I <sub>OL</sub> = 16 mA (74LS189)	
		XC	0.45	0.5			
V <sub>OH</sub>	Output HIGH Voltage	XM	2.4	2.8	V	V <sub>CC</sub> = Min I <sub>OH</sub> = 2.0 mA (54S189) I <sub>OH</sub> = 6.5 mA (74S189) I <sub>OH</sub> = 0.4 mA ('LS189)	
		XC	2.4	2.8			
I <sub>OS</sub>	Output Short Circuit Current	-30	-100	-80*	mA	V <sub>CC</sub> = Max	
I <sub>CC</sub>	Power Supply Current	110		40	mA	V <sub>CC</sub> = Max; $\overline{WE}$ , $\overline{CS}$ , Gnd	

\*Typical Value

**AC CHARACTERISTICS OVER RECOMMENDED  $V_{CC}$  AND  $T_A$  RANGE** (unless otherwise specified)

SYMBOL	PARAMETER	54/74S		54/74LS		UNITS	CONDITIONS
		$C_L = 30 \text{ pF}$ $R_L = 300 \Omega$		$C_L = 15 \text{ pF}$			
		Min	Max	Min	Max		
t <sub>PLH</sub> t <sub>PHL</sub>	Access Time, HIGH or LOW, $A_n$ to $\overline{O}_n$	XM XC	50 35	37* 37*	ns	Figs. 3-1, 3-20	
t <sub>PZH</sub> t <sub>PZL</sub>	Access Time, HIGH or LOW, $\overline{CS}$ to $\overline{O}_n$	XM XC	32 22	10* 10*	ns	Figs. 3-3, 3-11, 3-12 $R_L = 2 \text{ k}\Omega$ ('LS189)	
t <sub>PHZ</sub> t <sub>PLZ</sub>	Disable Time $\overline{CS}$ to $\overline{O}_n$	XM XC	25 25		ns	Figs. 3-3, 3-11, 3-12 $R_L = 2 \text{ k}\Omega$ ('LS189) $C_L = 5 \text{ pF}$	
t <sub>PZH</sub> t <sub>PZL</sub>	Access Time, HIGH or LOW, $\overline{WE}$ to $\overline{O}_n$	XM XC	40 30				ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Disable Time $\overline{WE}$ to $\overline{O}_n$	XM XC	30 20		ns	Figs. 3-3, 3-11, 3-12 $R_L = 2 \text{ k}\Omega$ ('LS189) $C_L = 5 \text{ pF}$	
t <sub>PZH</sub> t <sub>PZL</sub>	Access Time, HIGH or LOW, $\overline{WE}$ to $\overline{O}_n$	XM XC	32 20				

**AC OPERATING REQUIREMENTS OVER RECOMMENDED  $V_{CC}$  AND  $T_A$  RANGE** (unless otherwise specified)

SYMBOL	PARAMETER	54/74S		54/74LS		UNITS	CONDITIONS
		Min	Max	Min	Max		
t <sub>s</sub> (H) t <sub>s</sub> (L)	Setup Time HIGH or LOW $A_n$ to $\overline{WE}$	0		10*		ns	Fig. 3-21
t <sub>h</sub> (H) t <sub>h</sub> (L)	Hold Time HIGH or LOW $A_n$ to $\overline{WE}$	0		0*			
t <sub>s</sub> (H) t <sub>s</sub> (L)	Setup Time HIGH or LOW $D_n$ to $\overline{WE}$	20		25*		ns	Fig. 3-13
t <sub>h</sub> (H) t <sub>h</sub> (L)	Hold Time HIGH or LOW $D_n$ to $\overline{WE}$	0		0*			
t <sub>s</sub> (L)	Setup Time LOW $\overline{CS}$ to $\overline{WE}$	0				ns	Fig. 3-14
t <sub>h</sub> (L)	Hold Time LOW $\overline{CS}$ to $\overline{WE}$	0				ns	Fig. 3-13
t <sub>w</sub> (L)	$\overline{WE}$ Pulse Width LOW	20		25*		ns	Fig. 3-14

\*Typical Value