

## 74F189 64-Bit Random Access Memory with 3-STATE Outputs

### General Description

The F189 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 (CS) input is HIGH. The outputs are active only in the Read mode and the output data is the complement of the stored data.

### Features

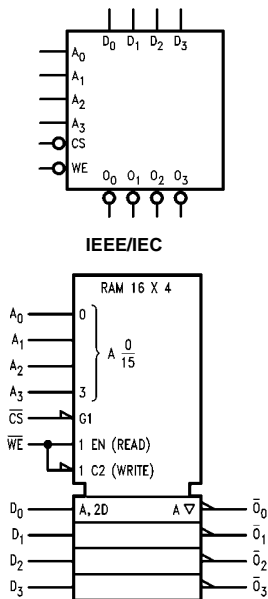
- 3-STATE outputs for data bus applications
- Buffered inputs minimize loading
- Address decoding on-chip
- Diode clamped inputs minimize ringing

### Ordering Code:

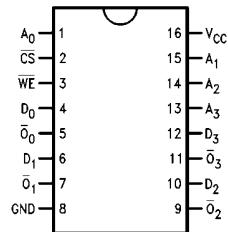
Order Number	Package Number	Package Description
74F189SC	M16B	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74F189SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74F189PC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Devices also available in Tape and Reel. Specify by appending suffix "X" to the ordering code.

### Logic Symbols



### Connection Diagram



## Unit Loading/Fan Out

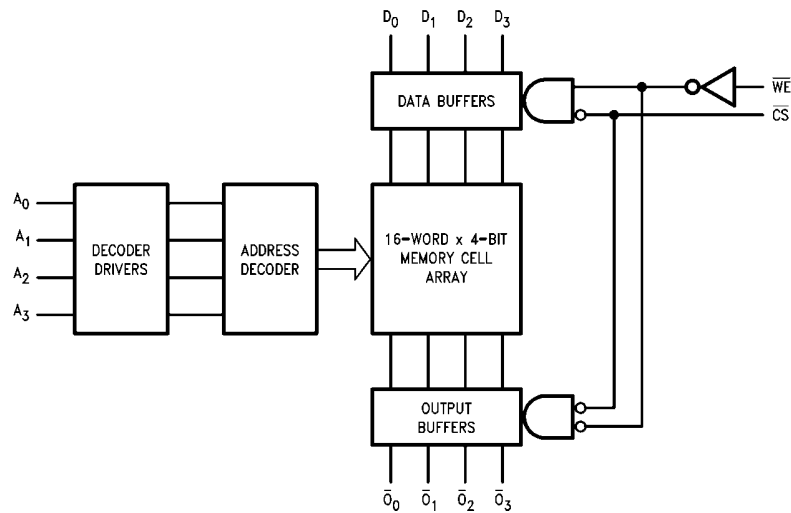
Pin Names	Description	U.L.	
		HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
$A_0-A_3$	Address Inputs	1.0/1.0	20 $\mu$ A/-0.6 mA
$\overline{CS}$	Chip Select Input (Active LOW)	1.0/1.0	20 $\mu$ A/-1.2 mA
$\overline{WE}$	Write Enable Input (Active LOW)	1.0/1.0	20 $\mu$ A/-0.6 mA
$D_0-D_3$	Data Inputs	1.0/1.0	20 $\mu$ A/-0.6 mA
$\overline{O}_0-\overline{O}_3$	Inverted Data Outputs	150/40 (33.3)	-3.0 mA/24 mA (20 mA)

## 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

## Block Diagram



Absolute Maximum Ratings <sup>(Note 1)</sup>		Recommended Operating Conditions	
Storage Temperature	-65°C to +150°C	Free Air Ambient Temperature	0°C to +70°C
Ambient Temperature under Bias	-55°C to +125°C	Supply Voltage	+4.5V to +5.5V
Junction Temperature under Bias	-55°C to +175°C		
V <sub>CC</sub> Pin Potential to Ground Pin	-0.5V to +7.0V		
Input Voltage (Note 2)	-0.5V to +7.0V		
Input Current (Note 2)	-30 mA to +5.0 mA		
Voltage Applied to Output in HIGH State (with V <sub>CC</sub> = 0V)			
Standard Output	-0.5V to V <sub>CC</sub>		
3-STATE Output	-0.5V to +5.5V		
Current Applied to Output in LOW State (Max)			

**Note 1:** Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

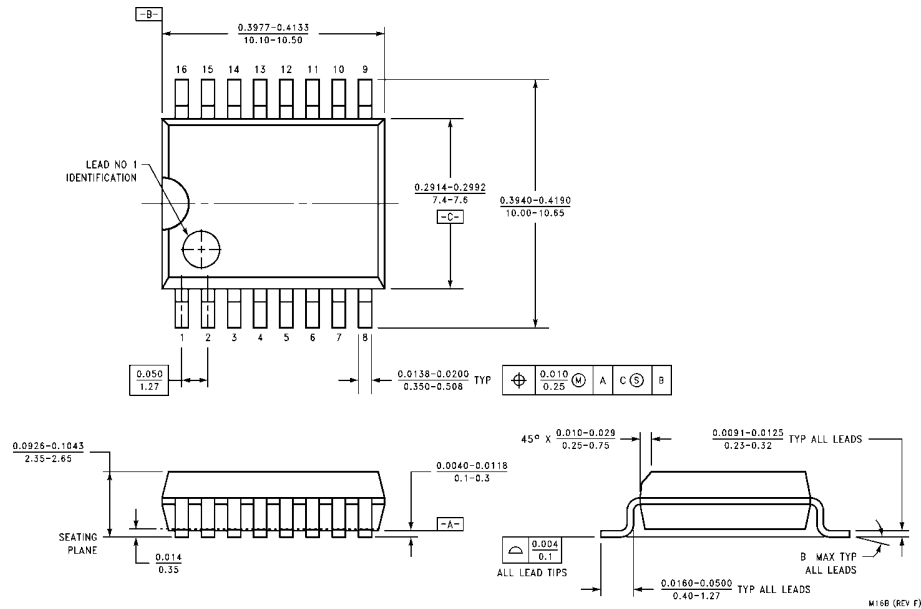
**Note 2:** Either voltage limit or current limit is sufficient to protect inputs.

### DC Electrical Characteristics

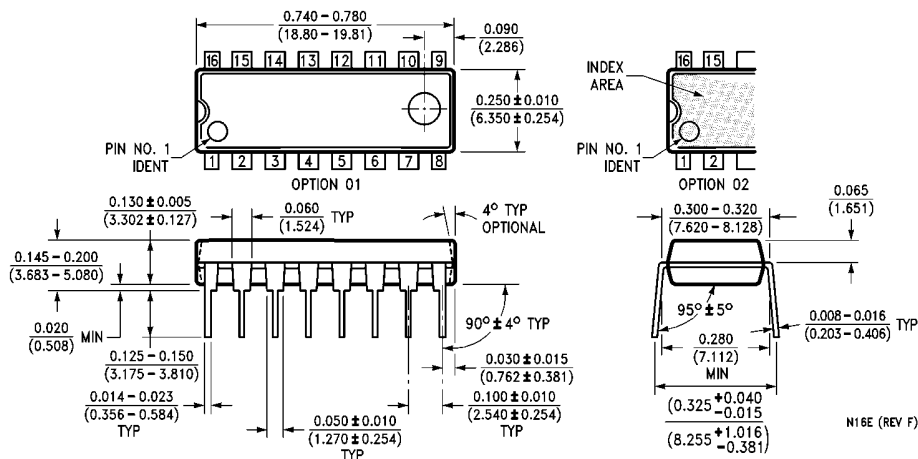
Symbol	Parameter	Min	Typ	Max	Units	V <sub>CC</sub>	Conditions
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage			-1.2	V	Min	I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	10% V <sub>CC</sub> 2.5 10% V <sub>CC</sub> 2.4 5% V <sub>CC</sub> 2.7 5% V <sub>CC</sub> 2.7			V	Min	I <sub>OH</sub> = -1 mA I <sub>OH</sub> = -3 mA I <sub>OH</sub> = -1 mA I <sub>OH</sub> = -3 mA
V <sub>OL</sub>	Output LOW Voltage			0.5	V	Min	I <sub>OL</sub> = 24 mA
I <sub>IH</sub>	Input HIGH Current			5.0	μA	Max	V <sub>IN</sub> = 2.7V
I <sub>BVI</sub>	Input HIGH Current Breakdown Test			7.0	μA	Max	V <sub>IN</sub> = 7.0V
I <sub>CEX</sub>	Output HIGH Leakage Current			50	μA	Max	V <sub>OUT</sub> = V <sub>CC</sub>
V <sub>ID</sub>	Input Leakage Test	4.75			V	0.0	I <sub>ID</sub> = 1.9 μA All Other Pins Grounded
I <sub>OD</sub>	Output Leakage Circuit Current			3.75	μA	0.0	V <sub>IOD</sub> = 150 mV All Other Pins Grounded
I <sub>IL</sub>	Input LOW Current			-0.6 -1.2	mA	Max	V <sub>IN</sub> = 0.5V (except $\overline{CS}$ ) V <sub>IN</sub> = 0.5V ( $\overline{CS}$ )
I <sub>OZH</sub>	Output Leakage Current			50	μA	Max	V <sub>OUT</sub> = 2.7V
I <sub>OZL</sub>	Output Leakage Current			-50	μA	Max	V <sub>OUT</sub> = 0.5V
I <sub>OS</sub>	Output Short-Circuit Current	-60		-150	mA	Max	V <sub>OUT</sub> = 0V
I <sub>ZZ</sub>	Bus Drainage Test			500	μA	0.0V	V <sub>OUT</sub> = 5.25V
I <sub>CCZ</sub>	Power Supply Current		37	55	mA	Max	V <sub>O</sub> = HIGH Z

AC Electrical Characteristics									
Symbol	Parameter	$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$			$T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$		Units
		Min	Typ	Max	Min	Max	Min	Max	
$t_{PLH}$	Access Time, HIGH or LOW	10.0	18.5	26.0	9.0	32.0	10.0	27.0	ns
$t_{PHL}$	$A_n$ to $\overline{O}_n$	8.0	13.5	19.0	8.0	23.0	8.0	20.0	
$t_{PZH}$	Access Time, HIGH or LOW	3.5	6.0	8.5	3.5	10.5	3.5	9.5	ns
$t_{PZL}$	$\overline{CS}$ to $\overline{O}_n$	5.0	9.0	13.0	5.0	15.0	5.0	14.0	
$t_{PHZ}$	Disable Time, HIGH or LOW	2.0	4.0	6.0	2.0	8.0	2.0	7.0	ns
$t_{PLZ}$	$\overline{CS}$ to $\overline{O}_n$	3.0	5.5	8.0	2.5	10.0	3.0	9.0	
$t_{PZH}$	Write Recovery Time, HIGH or LOW $\overline{WE}$ to $\overline{O}_n$	6.5	15.0	28.0	6.5	37.5	6.5	29.0	ns
$t_{PZL}$	HIGH or LOW $\overline{WE}$ to $\overline{O}_n$	6.5	11.0	15.5	6.5	17.5	6.5	16.5	
$t_{PHZ}$	Disable Time, HIGH or LOW	4.0	7.0	10.0	3.5	12.0	4.0	11.0	ns
$t_{PLZ}$	$\overline{WE}$ to $\overline{O}_n$	5.0	9.0	13.0	5.0	15.0	5.0	14.0	
AC Operating Requirements									
Symbol	Parameter	$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		Units	
		Min	Max	Min	Max	Min	Max		
$t_S(H)$	Setup Time, HIGH or LOW	0		0		0		ns	
$t_S(L)$	$A_n$ to $\overline{WE}$	0		0		0			
$t_H(H)$	Hold Time, HIGH or LOW	2.0		2.0		2.0			
$t_H(L)$	$A_n$ to $\overline{WE}$	2.0		2.0		2.0			
$t_S(H)$	Setup Time, HIGH or LOW	10.0		11.0		10.0		ns	
$t_S(L)$	$D_n$ to $\overline{WE}$	10.0		11.0		10.0			
$t_H(H)$	Hold Time, HIGH or LOW	0		2.0		0			
$t_H(L)$	$D_n$ to $\overline{WE}$	0		2.0		0			
$t_S(L)$	Setup Time, LOW $\overline{CS}$ to $\overline{WE}$	0		0		0		ns	
$t_H(L)$	Hold Time, LOW $\overline{CS}$ to $\overline{WE}$	6.0		7.5		6.0			
$t_W(L)$	$\overline{WE}$ Pulse Width, LOW	6.0		15.0		6.0			

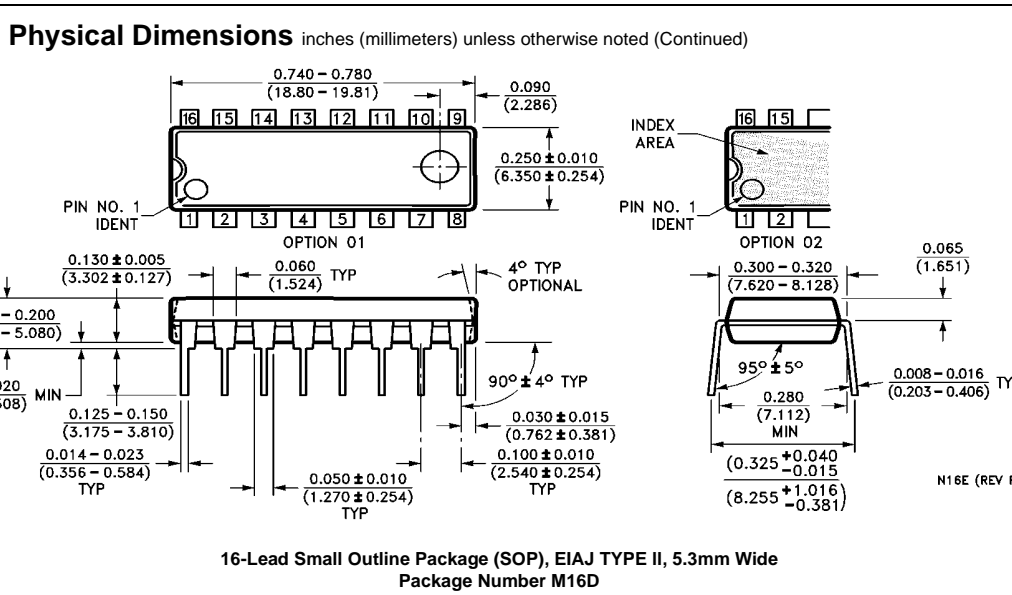
**Physical Dimensions** inches (millimeters) unless otherwise noted



**16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS013, 0.300" Wide Body Package Number M16B**



**16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide Package Number N16E**



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