

# 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 ( $\overline{CS}$ ) input is HIGH. The outputs are active only in the Read mode and the output data is the complement of the stored data.

### Features

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

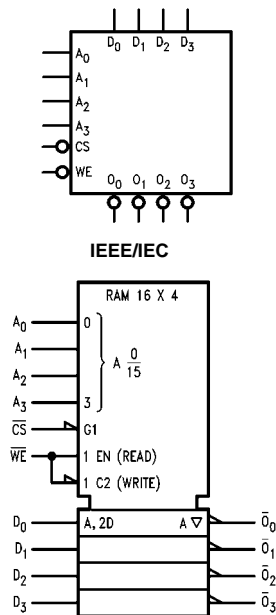
### Ordering Code:

Order Number	Package Number	Package Description
74F189SC	M16B	16-Lead Small Outline Intergrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide
74F189SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74F189PC (Note 1)	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

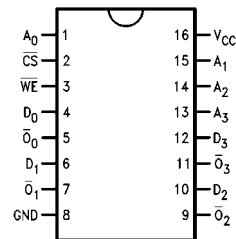
Devices also available in Tape and Reel. Specify by appending suffix "X" to the ordering code.

**Note 1:** This device not available in Tape and Reel.

### Logic Symbols



### Connection Diagram



### Unit Loading/Fan Out

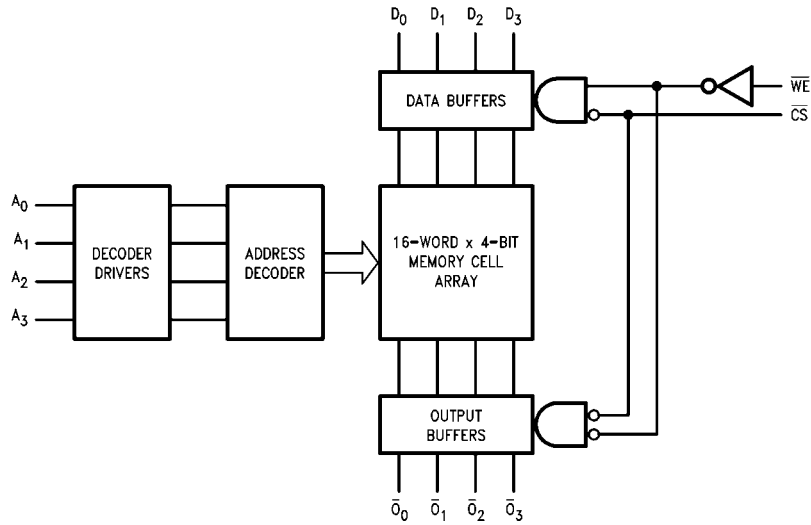
Pin Names	Description	U.L. HIGH/LOW	Input $I_H/I_{IL}$ Output $I_{OH}/I_{OL}$
$A_0$ - $A_3$	Address Inputs	1.0/1.0	20 $\mu$ A/-0.6 mA
$\overline{CS}$	Chip Select Input (Active LOW)	1.0/1.0	20 $\mu$ A/-1.2 mA
$\overline{WE}$	Write Enable Input (Active LOW)	1.0/1.0	20 $\mu$ A/-0.6 mA
$D_0$ - $D_3$	Data 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**(Note 2)

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-55°C to +125°C
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)	

**Recommended Operating Conditions**

Free Air Ambient Temperature	0°C to +70°C
Supply Voltage	+4.5V to +5.5V

**Note 2:** 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 3:** 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		V	Min	I <sub>OH</sub> = -1 mA
		10% V <sub>CC</sub>	2.4	I <sub>OH</sub> = -3 mA			
		5% V <sub>CC</sub>	2.7	I <sub>OH</sub> = -1 mA			
		5% V <sub>CC</sub>	2.7	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

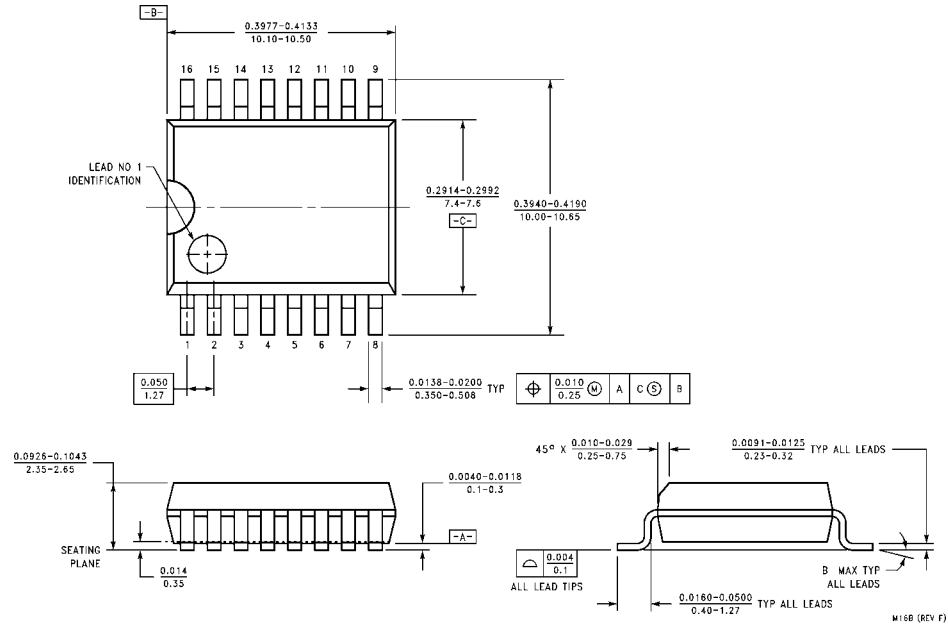
### AC Electrical Characteristics

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,	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

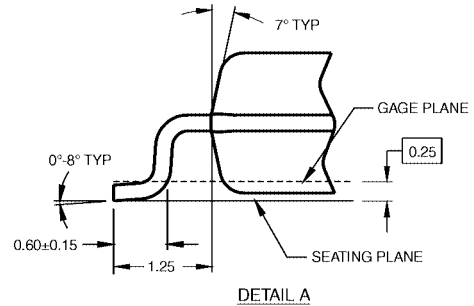
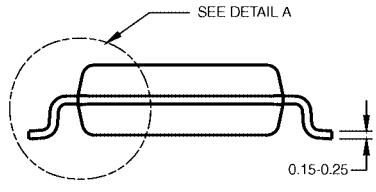
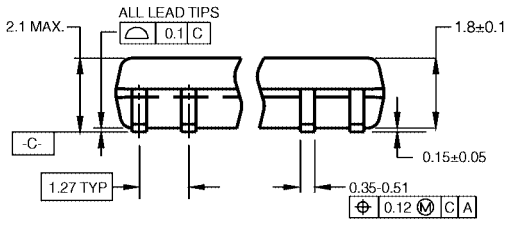
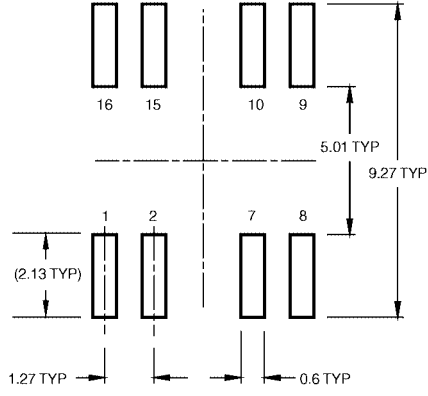
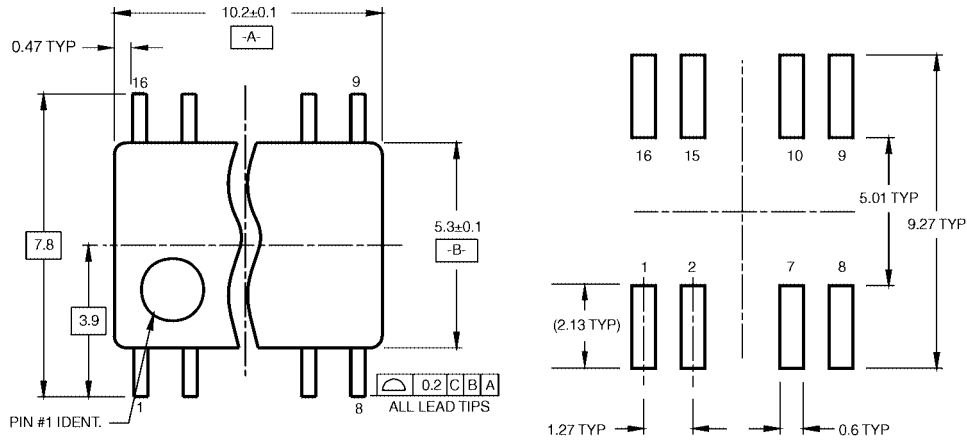
Symbol	Parameter	$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$		Units
		Min	Max	Min	Max	Min	Max	
$t_S(H)$	Setup Time, HIGH or LOW	0		0		0		ns
$t_S(L)$	$A_n$ to $\overline{WE}$	0		0		0		
$t_H(H)$	Hold Time, HIGH or LOW	2.0		2.0		2.0		ns
$t_H(L)$	$A_n$ 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		ns
$t_H(L)$	$D_n$ to $\overline{WE}$	0		2.0		0		
$t_S(L)$	Setup Time, LOW	0		0		0		ns
	$\overline{CS}$ to $\overline{WE}$							
$t_H(L)$	Hold Time, LOW	6.0		7.5		6.0		ns
	$\overline{CS}$ to $\overline{WE}$							
$t_W(L)$	$\overline{WE}$ Pulse Width, LOW	6.0		15.0		6.0		ns

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



**16-Lead Small Outline Intergrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M16B**

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

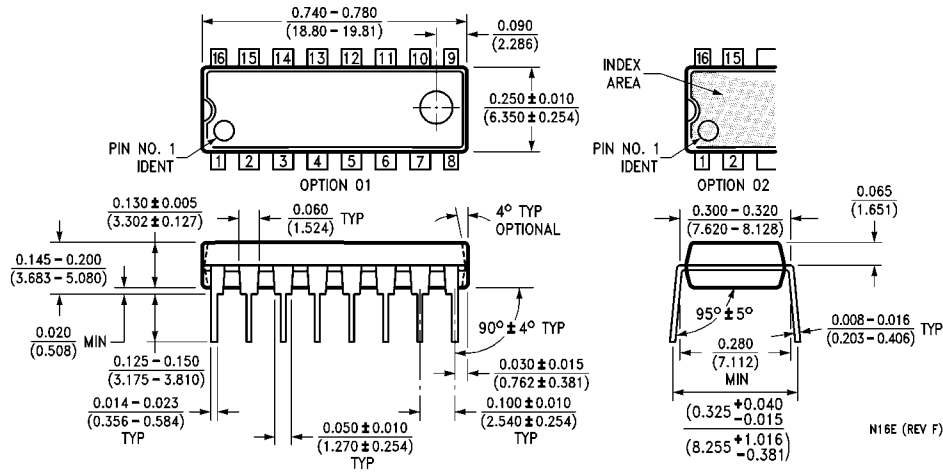


- NOTES:  
 A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.  
 B. DIMENSIONS ARE IN MILLIMETERS.  
 C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M16DRevB1

**16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide Package Number M16D**

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



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

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