

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

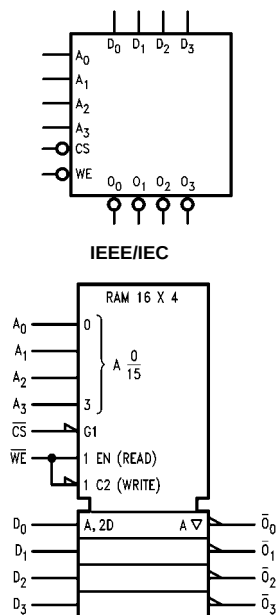
Ordering Code:

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

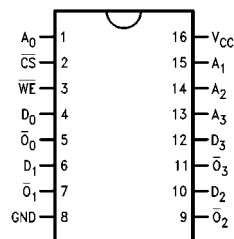
Devices also available in Tape and Reel. Specify by appending suffix "X" to the ordering code.

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

Logic Symbols



Connection Diagram



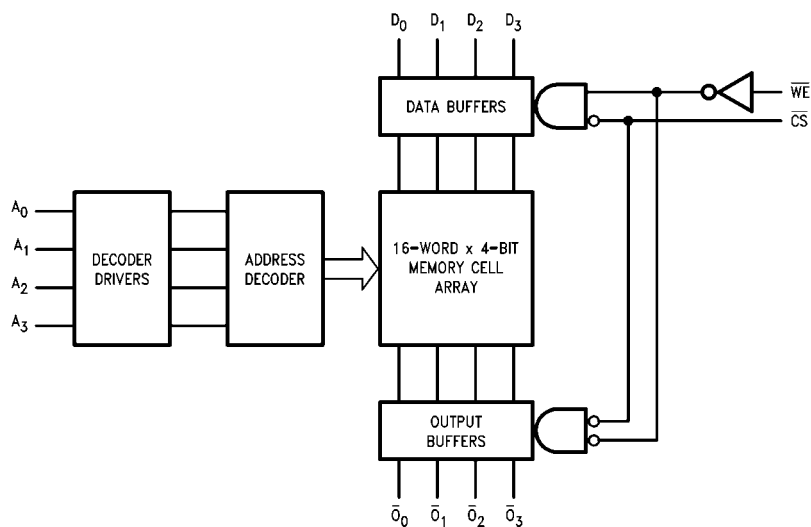
Pin Names	Description	U.L. HIGH/LOW	Input I _{IH} /I _{IL} Output I _{OH} /I _{OL}
A ₀ –A ₃	Address Inputs	1.0/1.0	20 μA/–0.6 mA
$\overline{\text{CS}}$	Chip Select Input (Active LOW)	1.0/1.0	20 μA/–1.2 mA
$\overline{\text{WE}}$	Write Enable Input (Active LOW)	1.0/1.0	20 μA/–0.6 mA
D ₀ –D ₃	Data Inputs	1.0/1.0	20 μA/–0.6 mA
$\overline{\text{O}}_0$ – $\overline{\text{O}}_3$	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 _{CC} 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 _{CC} = 0V)	
Standard Output	−0.5V to V _{CC}
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

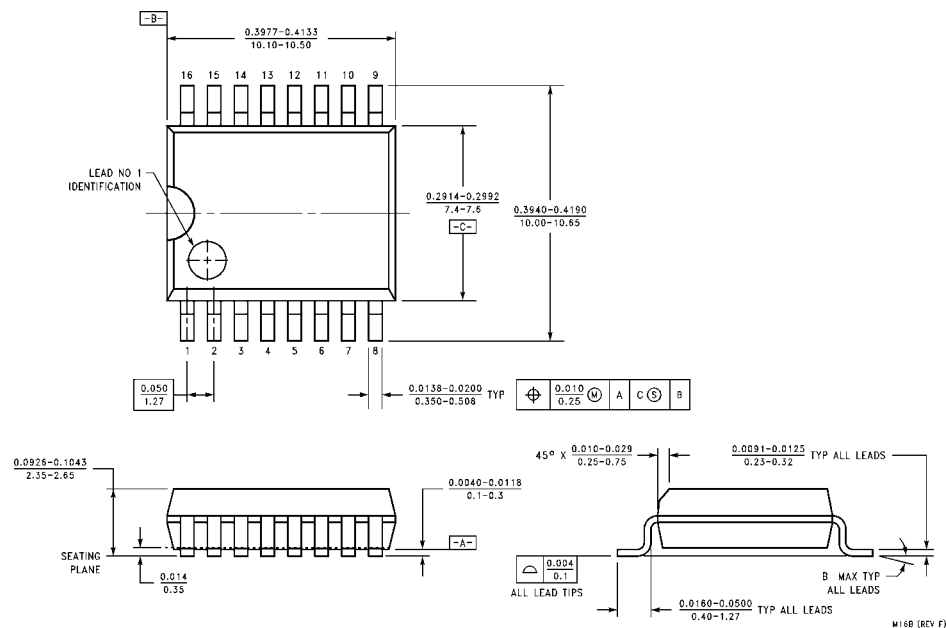
Symbol	Parameter	Min	Typ	Max	Units	V _{CC}	Conditions
V _{IH}	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V _{IL}	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V _{CD}	Input Clamp Diode Voltage			−1.2	V	Min	I _{IN} = −18 mA
V _{OH}	Output HIGH Voltage	10% V _{CC}	2.5		V	Min	I _{OH}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

AC Electrical Characteristics

Symbol	Parameter	T _A = +25°C V _{CC} = +5.0V C _L = 50 pF			T _A = -55°C to +125°C V _{CC} = +5.0V C _L = 50 pF		T _A = 0°C to +70°C V _{CC} = +5.0V C _L = 50 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	

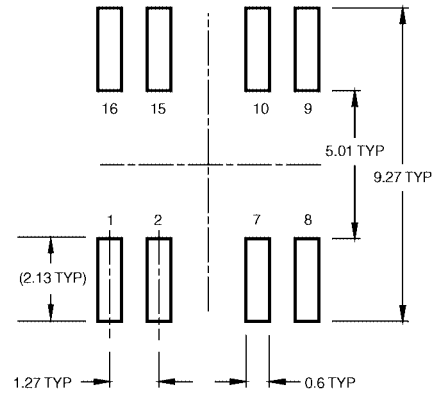
AC Operating Requirements

Symbol	Parameter	T _A = +25°C V _{CC} = +5.0V		T _A = -55°C to +125°C V _{CC} = +5.0V		T _A = 0°C to +70°C V _{CC} = +5.0V		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		ns
t _S (H)	Setup Time, HIGH or LOW	10.0		11.0		10.0		
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		ns
t _S (L)	Setup Time, LOW $\overline{CS}$ to $\overline{WE}$	0		0		0		
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		ns



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

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



LAND PATTERN RECOMMENDATION

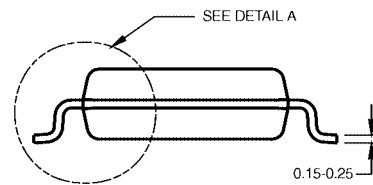


DIMENSIONS ARE IN MILLIMETERS

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.

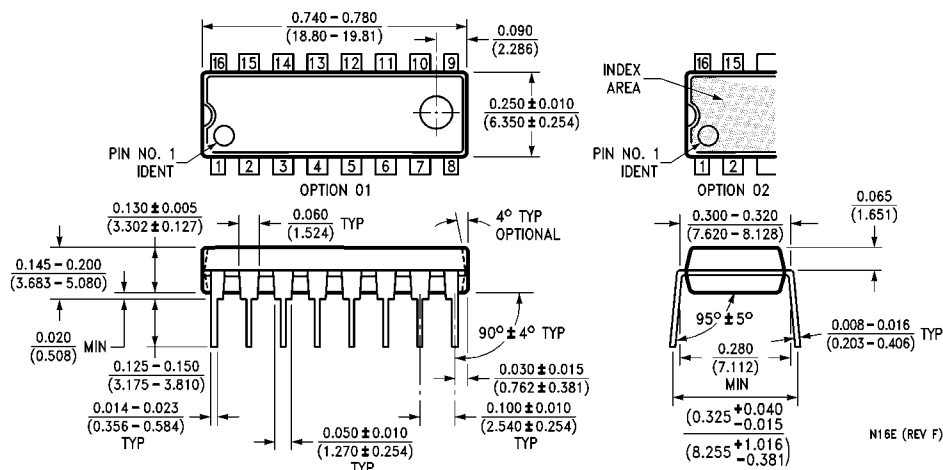
M16DRevB1



DETAIL A

**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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