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April 1988
Revised January 2004

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.

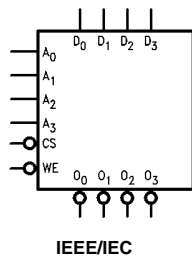
Features

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

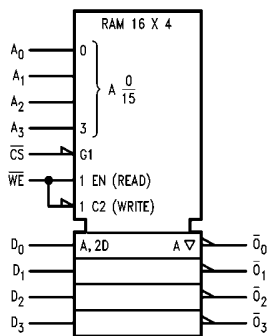
Ordering Code:

Order Number	Package Number	Package Description
74F189PC	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

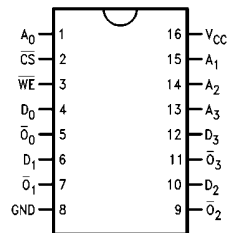
Logic Symbols



IEEE/IEC



Connection Diagram



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Unit Loading/Fan Out

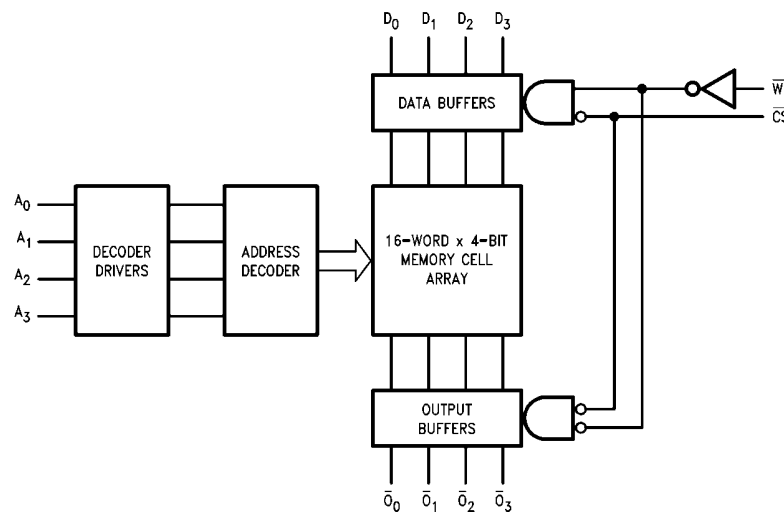
Pin Names	Description	U.L.	
		HIGH/LOW	Input I _{IH} /I _{IL} Output I _{OH} /I _{OL}
A ₀ -A ₃	Address Inputs	1.0/1.0	20 μA/-0.6 mA
$\overline{\text{CS}}$	Chip Select Input (Active LOW)	1.0/1.0	20 μA/-1.2 mA
$\overline{\text{WE}}$	Write Enable Input (Active LOW)	1.0/1.0	20 μA/-0.6 mA
D ₀ -D ₃	Data Inputs	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
$\overline{\text{CS}}$	$\overline{\text{WE}}$		
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 1)		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 _{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)			

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

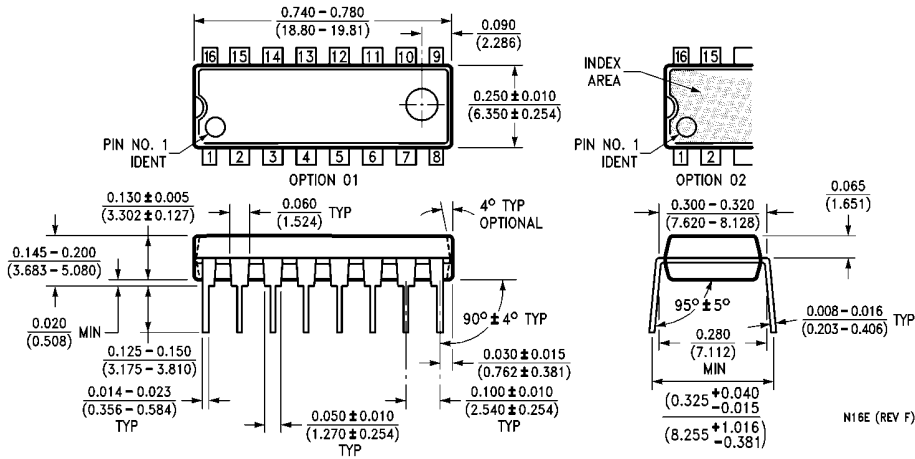
Symbol	Parameter	Min	Typ	Max	Units	V _{CC}	Conditions
V _{IH}	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V _{IL}	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V _{CD}	Input Clamp Diode Voltage			-1.2	V	Min	I _{IN} = -18 mA
V _{OH}	Output HIGH Voltage	10% V _{CC}	2.5		V	Min	I _{OH} = -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			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 CS) V _{IN} = 0.5V (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

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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		ns
t _H (L)	D _n to \overline{WE}	0		2.0		0		
t _S (L)	Setup Time, LOW	0		0		0		
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 Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
 Package Number N16E**

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