

## 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.

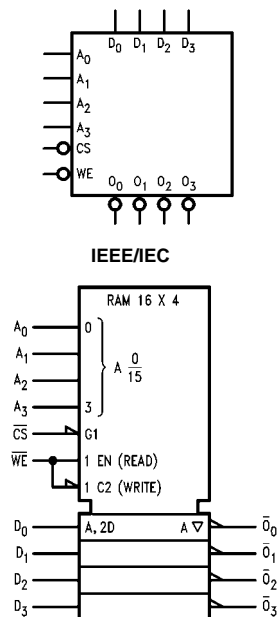
### Features

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

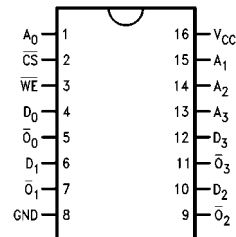
### Ordering Code:

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

### Logic Symbols



### Connection Diagram



## Unit Loading/Fan Out

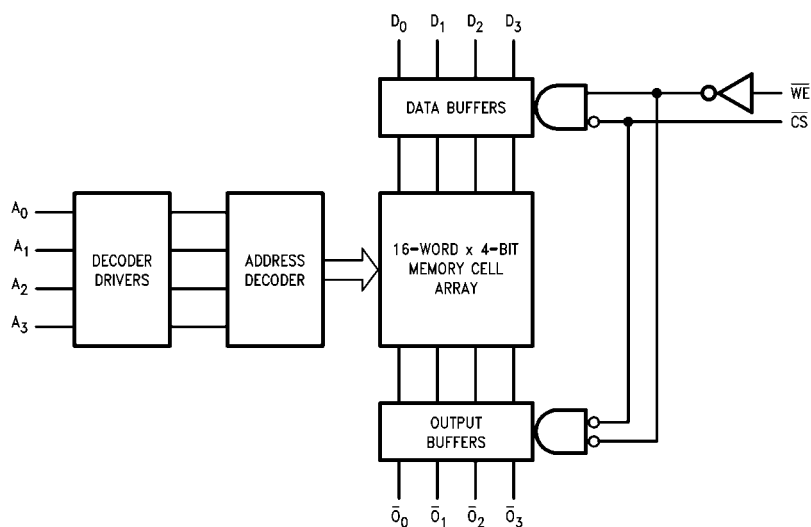
Pin Names	Description	U.L. HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
$A_0$ – $A_3$	Address Inputs	1.0/1.0	20 $\mu$ A/–0.6 mA
$\overline{CS}$	Chip Select Input (Active LOW)	1.0/1.0	20 $\mu$ A/–1.2 mA
$\overline{WE}$	Write Enable Input (Active LOW)	1.0/1.0	20 $\mu$ A/–0.6 mA
$D_0$ – $D_3$	Data 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**(Note 1)

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 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		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	10% V <sub>CC</sub>		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

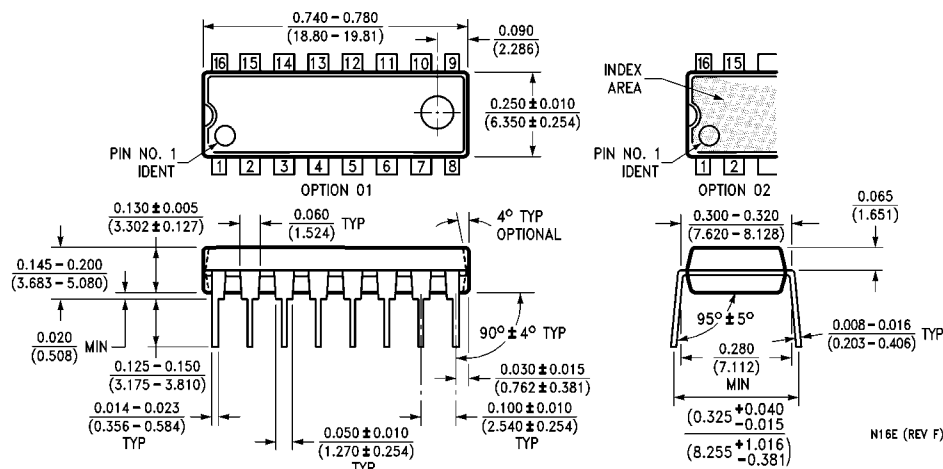
## AC Electrical Characteristics

Symbol	Parameter	T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> = -55°C to +125°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF		T <sub>A</sub> = 0°C to +70°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF		Units
		Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub>	Access Time, HIGH or LOW	10.0	18.5	26.0	9.0	32.0	10.0	27.0	ns
t <sub>PHL</sub>	A <sub>n</sub> to $\overline{O_n}$	8.0	13.5	19.0	8.0	23.0	8.0	20.0	
t <sub>PZH</sub>	Access Time, HIGH or LOW	3.5	6.0	8.5	3.5	10.5	3.5	9.5	ns
t <sub>PZL</sub>	$\overline{CS}$ to $\overline{O_n}$	5.0	9.0	13.0	5.0	15.0	5.0	14.0	
t <sub>PHZ</sub>	Disable Time, HIGH or LOW	2.0	4.0	6.0	2.0	8.0	2.0	7.0	ns
t <sub>PLZ</sub>	$\overline{CS}$ to $\overline{O_n}$	3.0	5.5	8.0	2.5	10.0	3.0	9.0	
t <sub>PZH</sub>	Write Recovery Time,	6.5	15.0	28.0	6.5	37.5	6.5	29.0	ns
t <sub>PZL</sub>	HIGH or LOW $\overline{WE}$ to $\overline{O_n}$	6.5	11.0	15.5	6.5	17.5	6.5	16.5	
t <sub>PHZ</sub>	Disable Time, HIGH or LOW	4.0	7.0	10.0	3.5	12.0	4.0	11.0	ns
t <sub>PLZ</sub>	$\overline{WE}$ to $\overline{O_n}$	5.0	9.0	13.0	5.0	15.0	5.0	14.0	

## AC Operating Requirements

Symbol	Parameter	T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V		T <sub>A</sub> = -55°C to +125°C V <sub>CC</sub> = +5.0V		T <sub>A</sub> = 0°C to +70°C V <sub>CC</sub> = +5.0V		Units
		Min	Max	Min	Max	Min	Max	
t <sub>S</sub> (H)	Setup Time, HIGH or LOW	0		0		0		ns
t <sub>S</sub> (L)	A <sub>n</sub> to $\overline{WE}$	0		0		0		
t <sub>H</sub> (H)	Hold Time, HIGH or LOW	2.0		2.0		2.0		
t <sub>H</sub> (L)	A <sub>n</sub> to $\overline{WE}$	2.0		2.0		2.0		
t <sub>S</sub> (H)	Setup Time, HIGH or LOW	10.0		11.0		10.0		ns
t <sub>S</sub> (L)	D <sub>n</sub> to $\overline{WE}$	10.0		11.0		10.0		
t <sub>H</sub> (H)	Hold Time, HIGH or LOW	0		2.0		0		
t <sub>H</sub> (L)	D <sub>n</sub> to $\overline{WE}$	0		2.0		0		
t <sub>S</sub> (L)	Setup Time, LOW $\overline{CS}$ to $\overline{WE}$	0		0		0		ns
t <sub>H</sub> (L)	Hold Time, LOW $\overline{CS}$ to $\overline{WE}$	6.0		7.5		6.0		
t <sub>W</sub> (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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