

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.

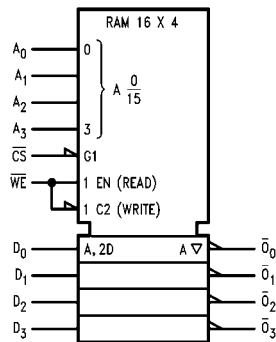
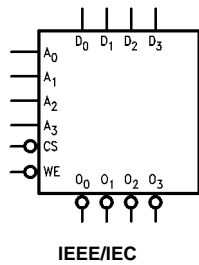
Features

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

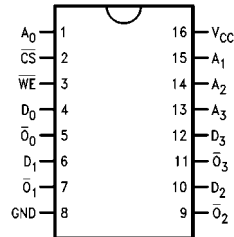
Ordering Code:

| 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

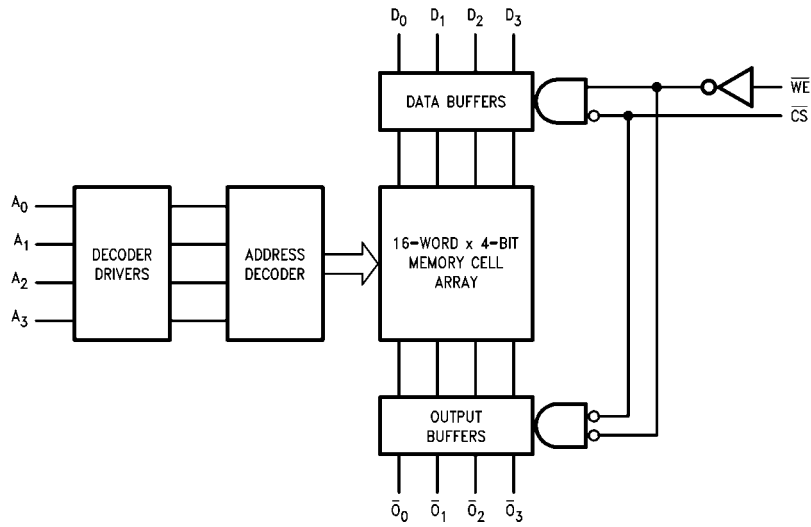
| Pin Names | Description | U.L. HIGH/LOW | Input I_H/I_L Output I_{OH}/I_{OL} |
|-------------------------------------|---------------------------------|------------------|---|
| A_0 – A_3 | Address Inputs | 1.0/1.0 | 20 μ A/–0.6 mA |
| \overline{CS} | Chip Select Input (Active LOW) | 1.0/1.0 | 20 μ A/–1.2 mA |
| \overline{WE} | Write Enable Input (Active LOW) | 1.0/1.0 | 20 μ A/–0.6 mA |
| D_0 – D_3 | Data Inputs | 1.0/1.0 | 20 μ 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 _{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 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.

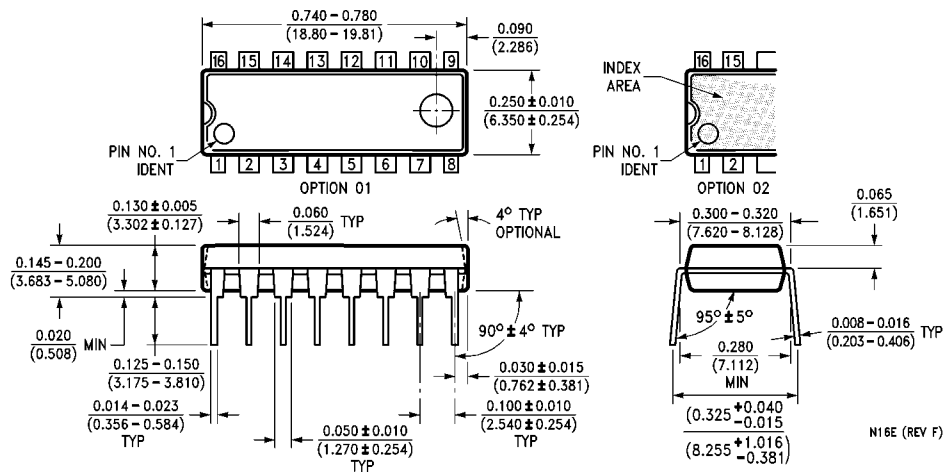
DC Electrical Characteristics

| 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 \overline{CS}) V _{IN} = 0.5V (\overline{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 | $T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$ | | | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$ | | $T_A = 0^\circ\text{C to } +70^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$ | | 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 Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N16E**

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