

## 74F219

### 64-Bit Random Access Memory with 3-STATE Outputs

#### General Description

The 74F219 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. This device is similar to the 74F189 but features non-inverting, rather than inverting, data outputs.

#### Features

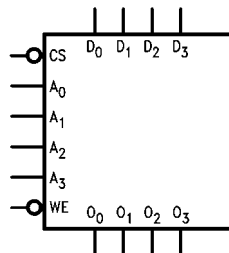
- 3-STATE outputs for data bus applications
- Buffered inputs minimize loading
- Address decoding on-chip
- Diode clamped inputs minimize ringing
- Available in SOIC (300 mil only)

#### Ordering Code:

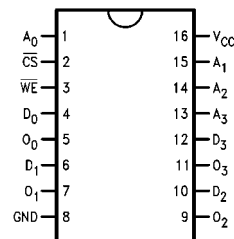
| Order Number | Package Number | Package Description                                                        |
|--------------|----------------|----------------------------------------------------------------------------|
| 74F219SC     | M16B           | 16-Lead Small Outline Intergrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| 74F219SJ     | M16D           | 16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide              |
| 74F219PC     | 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 the suffix letter "X" to the ordering code.

#### Logic Symbol



#### Connection Diagram



74F219 64-Bit Random Access Memory with 3-STATE Outputs

Unit Loading/Fan Out

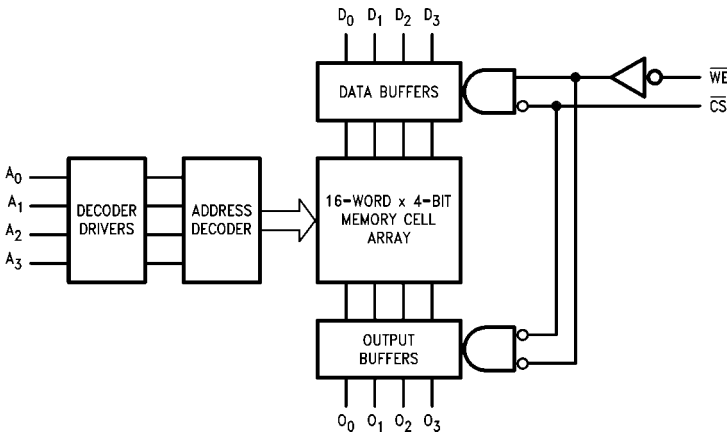
| Pin Names                      | Description                     | U.L.<br>HIGH/LOW | Input I <sub>IH</sub> /I <sub>IL</sub><br>Output I <sub>OH</sub> /I <sub>OL</sub> |
|--------------------------------|---------------------------------|------------------|-----------------------------------------------------------------------------------|
| A <sub>0</sub> –A <sub>3</sub> | Address Inputs                  | 1.0/1.0          | 20 μA/–0.6 mA                                                                     |
| $\overline{\text{CS}}$         | Chip Select Input (Active LOW)  | 1.0/2.0          | 20 μA/–1.2 mA                                                                     |
| $\overline{\text{WE}}$         | Write Enable Input (Active LOW) | 1.0/1.0          | 20 μA/–0.6 mA                                                                     |
| D <sub>0</sub> –D <sub>3</sub> | Data Inputs                     | 1.0/1.0          | 20 μA/–0.6 mA                                                                     |
| O <sub>0</sub> –O <sub>3</sub> | 3-STATE Data Outputs            | 150/40 (33.3)    | –3 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      | True 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 +150°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) twice the rated I<sub>OL</sub> (mA)**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><br>10% V <sub>CC</sub><br>5% V <sub>CC</sub><br>5% V <sub>CC</sub> | 2.5<br>2.4<br>2.7<br>2.7 |              | V     | Min             | I <sub>OH</sub> = –1 mA<br>I <sub>OH</sub> = –3 mA<br>I <sub>OH</sub> = –1 mA<br>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<br>All Other Pins Grounded                                                      |
| I <sub>OD</sub>  | Output Leakage Circuit Current    |                                                                                        |                          | 3.75         | μA    | 0.0             | V <sub>IOD</sub> = 150 mV<br>All Other Pins Grounded                                                     |
| I <sub>IL</sub>  | Input LOW Current                 |                                                                                        |                          | –0.6<br>–1.2 | mA    | Max             | V <sub>IN</sub> = 0.5V (A <sub>n</sub> , WE, D <sub>n</sub> )<br>V <sub>IN</sub> = 0.5V (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>CC</sub>  | Power Supply Current              |                                                                                        | 37                       | 55           | mA    | Max             |                                                                                                          |

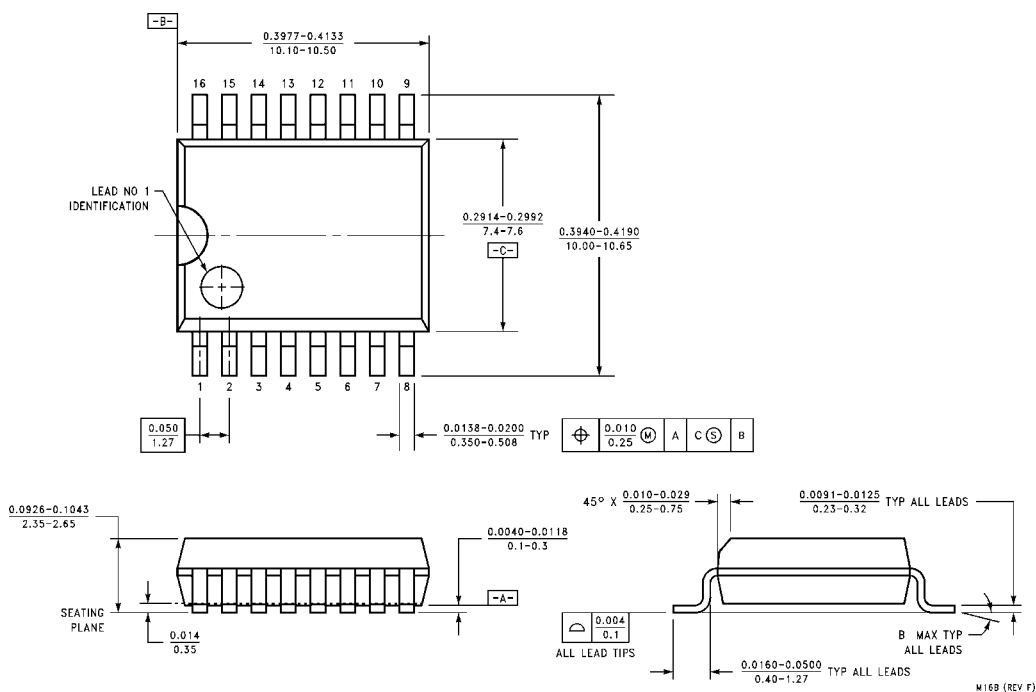
## AC Electrical Characteristics

| Symbol           | Parameter                                             | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |      |      | T <sub>A</sub> = -55°C to +125°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |      | T <sub>A</sub> = 0°C to +70°C<br>V <sub>CC</sub> = +5.0V<br>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 O <sub>n</sub>                      | 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> | $\overline{\text{CS}}$ to O <sub>n</sub>              | 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  |       |
| t <sub>PLZ</sub> | $\overline{\text{CS}}$ to O <sub>n</sub>              | 3.0                                                                         | 5.5  | 8.0  | 2.5                                                                                   | 10.0 | 3.0                                                                                | 9.0  | ns    |
| t <sub>PZH</sub> | Write Recovery Time                                   | 6.5                                                                         | 20.0 | 28.0 | 6.5                                                                                   | 37.5 | 6.5                                                                                | 29.0 |       |
| t <sub>PZL</sub> | HIGH or LOW, $\overline{\text{WE}}$ to O <sub>n</sub> | 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 |       |
| t <sub>PLZ</sub> | $\overline{\text{WE}}$ to O <sub>n</sub>              | 5.0                                                                         | 9.0  | 13.0 | 5.0                                                                                   | 15.0 | 5.0                                                                                | 14.0 |       |

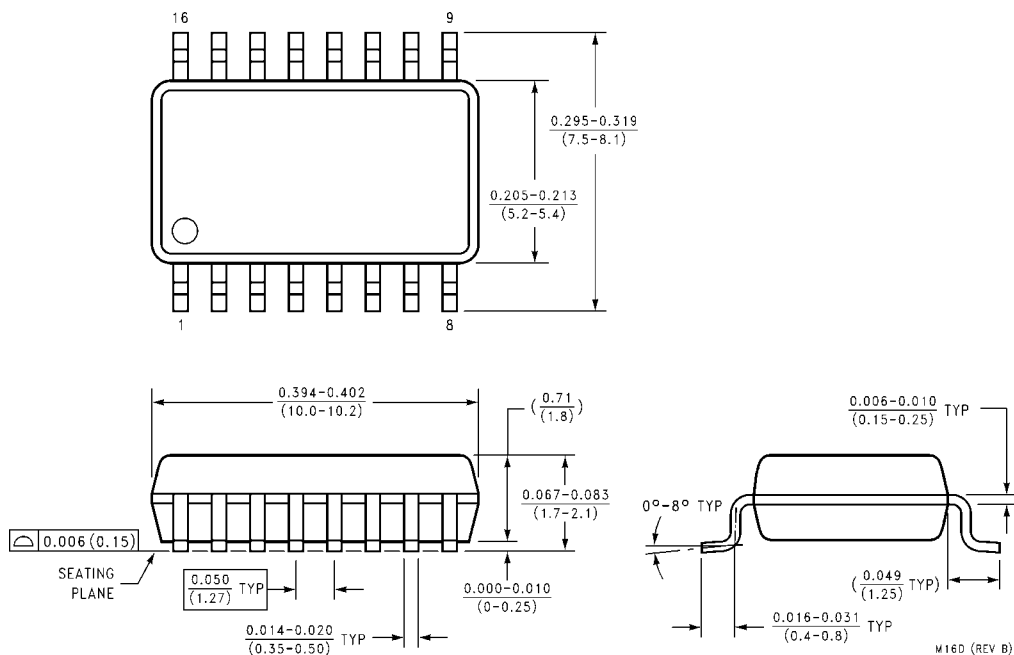
## AC Operating Requirements

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



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

The figure shows three mechanical drawings of the N16E package:

- Top View (Left):** Shows the package with pins 1-16. Dimensions include:
  - Pin pitch:  $0.740 - 0.780$  (18.80 - 19.81)
  - Pin 16 to Pin 15 distance:  $0.090$  (2.286)
  - Pin 15 to Pin 14 distance:  $0.250 \pm 0.010$  (6.350  $\pm$  0.254)
  - Pin 1 to Pin 8 distance:  $0.130 \pm 0.005$  (3.302  $\pm$  0.127)
  - Pin 8 to Pin 7 distance:  $0.060$  (1.524) TYP
  - Pin 7 to Pin 6 distance:  $4^\circ$  TYP OPTIONAL
  - Pin 6 to Pin 5 distance:  $90^\circ \pm 4^\circ$  TYP
  - Pin 5 to Pin 4 distance:  $0.030 \pm 0.015$  (0.762  $\pm$  0.381) TYP
  - Pin 4 to Pin 3 distance:  $0.100 \pm 0.010$  (2.540  $\pm$  0.254) TYP
  - Pin 3 to Pin 2 distance:  $0.050 \pm 0.010$  (1.270  $\pm$  0.254) TYP
  - Pin 2 to Pin 1 distance:  $0.014 - 0.023$  (0.356 - 0.584) TYP
  - Pin 1 to Pin 16 distance:  $0.125 - 0.150$  (3.175 - 3.810)
  - Pin 16 to Pin 15 distance:  $0.020$  (0.508) MIN
  - Pin 15 to Pin 14 distance:  $0.145 - 0.200$  (3.683 - 5.080)
- Top View (Right):** Shows the package with pins 1-16. Dimensions include:
  - Pin pitch:  $0.300 - 0.320$  (7.620 - 8.128)
  - Pin 16 to Pin 15 distance:  $0.065$  (1.651)
  - Pin 15 to Pin 14 distance:  $0.008 - 0.016$  (0.203 - 0.406) TYP
  - Pin 1 to Pin 8 distance:  $0.325 + 0.040 - 0.015$  (8.255 + 1.016 - 0.381)
  - Pin 8 to Pin 7 distance:  $0.280$  (7.112) MIN
  - Pin 7 to Pin 6 distance:  $95^\circ \pm 5^\circ$
  - Pin 6 to Pin 5 distance:  $0.030 \pm 0.015$  (0.762  $\pm$  0.381) TYP
  - Pin 5 to Pin 4 distance:  $0.100 \pm 0.010$  (2.540  $\pm$  0.254) TYP
  - Pin 4 to Pin 3 distance:  $0.050 \pm 0.010$  (1.270  $\pm$  0.254) TYP
  - Pin 3 to Pin 2 distance:  $0.014 - 0.023$  (0.356 - 0.584) TYP
  - Pin 2 to Pin 1 distance:  $0.125 - 0.150$  (3.175 - 3.810)
  - Pin 1 to Pin 16 distance:  $0.020$  (0.508) MIN
  - Pin 16 to Pin 15 distance:  $0.145 - 0.200$  (3.683 - 5.080)
- Index Area (Bottom):** Shows the package with pins 1-16. Dimensions include:
  - Pin pitch:  $0.300 - 0.320$  (7.620 - 8.128)
  - Pin 16 to Pin 15 distance:  $0.065$  (1.651)
  - Pin 15 to Pin 14 distance:  $0.008 - 0.016$  (0.203 - 0.406) TYP
  - Pin 1 to Pin 8 distance:  $0.325 + 0.040 - 0.015$  (8.255 + 1.016 - 0.381)
  - Pin 8 to Pin 7 distance:  $0.280$  (7.112) MIN
  - Pin 7 to Pin 6 distance:  $95^\circ \pm 5^\circ$
  - Pin 6 to Pin 5 distance:  $0.030 \pm 0.015$  (0.762  $\pm$  0.381) TYP
  - Pin 5 to Pin 4 distance:  $0.100 \pm 0.010$  (2.540  $\pm$  0.254) TYP
  - Pin 4 to Pin 3 distance:  $0.050 \pm 0.010$  (1.270  $\pm$  0.254) TYP
  - Pin 3 to Pin 2 distance:  $0.014 - 0.023$  (0.356 - 0.584) TYP
  - Pin 2 to Pin 1 distance:  $0.125 - 0.150$  (3.175 - 3.810)
  - Pin 1 to Pin 16 distance:  $0.020$  (0.508) MIN
  - Pin 16 to Pin 15 distance:  $0.145 - 0.200$  (3.683 - 5.080)

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