

74F139 Dual 1-of-4 Decoder/Demultiplexer

General Description

The F139 is a high-speed, dual 1-of-4 decoder/demultiplexer. The device has two independent decoders, each accepting two inputs and providing four mutually exclusive active LOW outputs. Each decoder has an active LOW Enable input which can be used as a data input for a 4-output demultiplexer. Each half of the F139 can be used as a function generator providing all four minterms of two variables.

Features

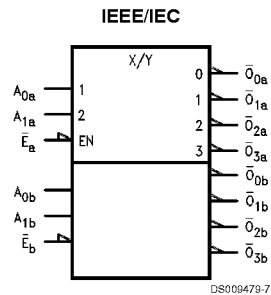
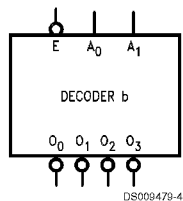
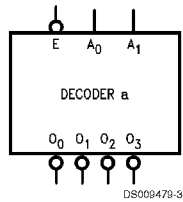
- Multifunction capability
- Two completely independent 1-of-4 decoders
- Active LOW mutually exclusive outputs
- Guaranteed 4000V minimum ESD protection

Ordering Code:

| Commercial | Package Number | Package Description |
|-------------------|----------------|---|
| 74F139PC | N16E | 16-Lead (0.300" Wide) Molded Dual-In-Line |
| 74F139SC (Note 1) | M16A | 16-Lead (0.150" Wide) Molded Small Outline, JEDEC |
| 74F139SJ (Note 1) | M16D | 16-Lead (0.300" Wide) Molded Small Outline, EIAJ |

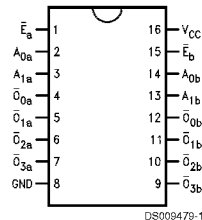
Note 1: Devices also available in 13" reel. Use suffix = SCX and SJX.

Logic Symbols



Connection Diagram

Pin Assignment DIP and SOIC



Unit Loading/Fan Out

| Pin Names | Description | U.L. HIGH/LOW | Input I_{IH}/I_{IL} Output I_{OH}/I_{OL} |
|-----------------------|----------------------------|------------------|---|
| A_0, A_1 | Address Inputs | 1.0/1.0 | 20 μ A/-0.6 mA |
| \bar{E} | Enable Inputs (Active LOW) | 1.0/1.0 | 20 μ A/-0.6 mA |
| $\bar{O}_0-\bar{O}_3$ | Outputs (Active LOW) | 50/33.3 | -1 mA/20 mA |

Functional Description

The F139 is a high-speed dual 1-of-4 decoder/demultiplexer. The device has two independent decoders, each of which accepts two binary weighted inputs (A_0-A_1) and provides four mutually exclusive active LOW Outputs ($\bar{O}_0-\bar{O}_3$). Each decoder has an active LOW enable (\bar{E}). When \bar{E} is HIGH all outputs are forced HIGH. The enable can be used as the data input for a 4-output demultiplexer application. Each half of the F139 generates all four minterms of two variables. These four minterms are useful in some applications, replacing multiple gate functions as shown in *Figure 1*, and thereby reducing the number of packages required in a logic network.

Truth Table

| Inputs | | | Outputs | | | |
|-----------|-------|-------|-------------|-------------|-------------|-------------|
| \bar{E} | A_0 | A_1 | \bar{O}_0 | \bar{O}_1 | \bar{O}_2 | \bar{O}_3 |
| H | X | X | H | H | H | H |
| L | L | L | L | H | H | H |
| L | H | L | H | L | H | H |
| L | L | H | H | H | L | H |
| L | H | H | H | H | H | L |

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

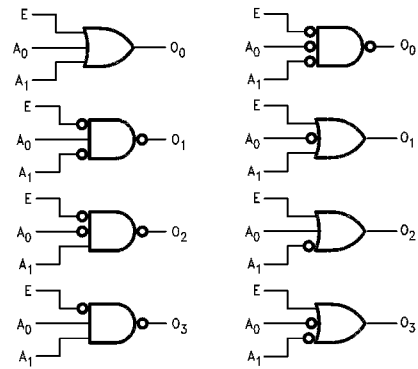
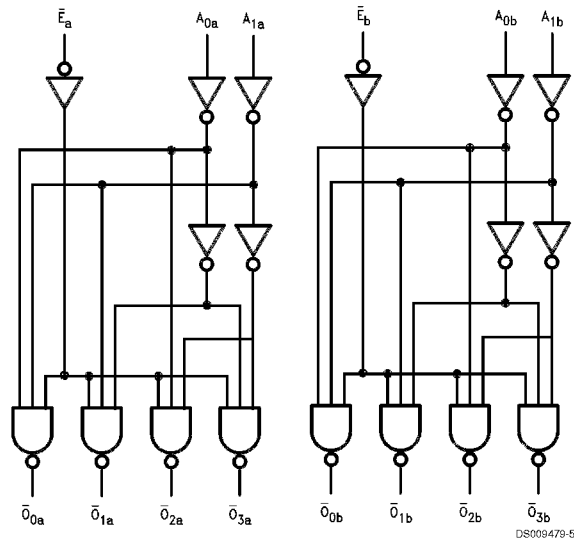


FIGURE 1. Gate Functions (each half)

Logic Diagram



Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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 |
| Plastic | -55°C to +150°C |
| V _{CC} Pin Potential to Ground Pin | -0.5V to +7.0V |
| Input Voltage (Note 3) | -0.5V to +7.0V |
| Input Current (Note 3) | -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) twice the rated I_{OL} (mA)
ESD Last Passing Voltage (Min) 4000V

Recommended Operating Conditions

| | |
|------------------------------|----------------|
| Free Air Ambient Temperature | |
| Commercial | 0°C to +70°C |
| Supply Voltage | |
| Commercial | +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.

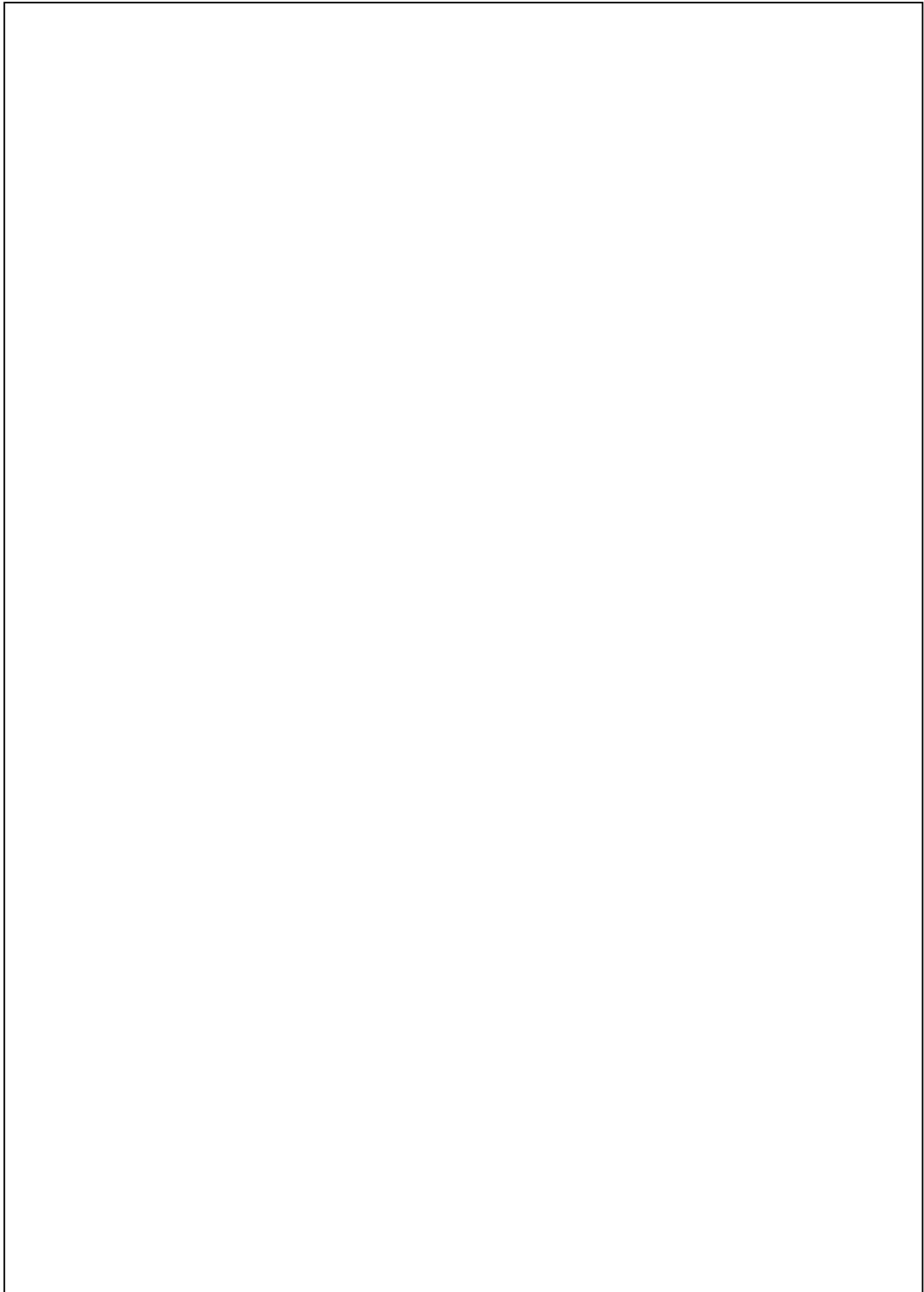
Note 3: Either voltage limit or current limit is sufficient to protect inputs.

DC Electrical Characteristics

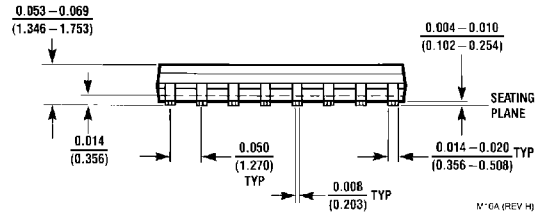
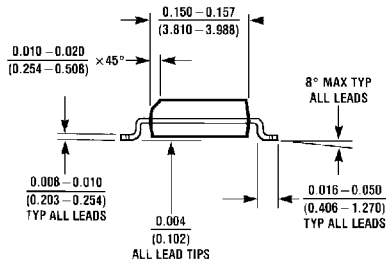
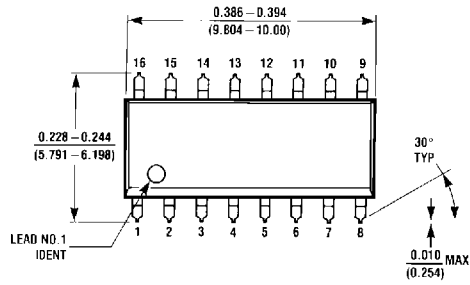
| Symbol | Parameter | Min | Typ | Max | Units | V _{CC} | Conditions |
|------------------|-----------------------------------|---------------------|-----|------|-------|-----------------|--|
| V _{IH} | Input HIGH Voltage | 2.0 | | | V | | Recognized as a HIGH Signal |
| V _{IL} | Input LOW Voltage | | | 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 |
| | | 5% V _{CC} | 2.7 | | | | I _{OH} = -1 mA |
| V _{OL} | Output LOW Voltage | | | 0.5 | V | Min | I _{OL} = 20 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 | mA | Max | V _{IN} = 0.5V |
| I _{OS} | Output Short-Circuit Current | -60 | | -150 | mA | Max | V _{OUT} = 0V |
| I _{CC} | Power Supply Current | | 13 | 20 | mA | Max | |

AC Electrical Characteristics

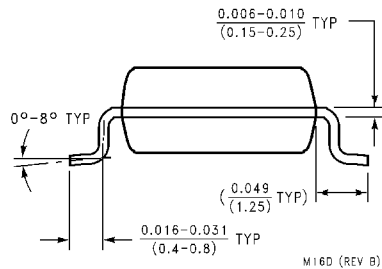
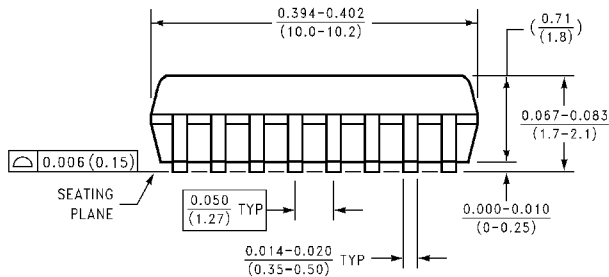
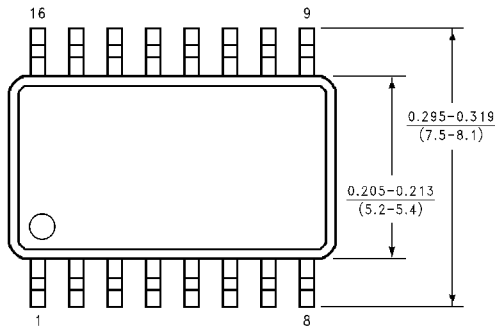
| Symbol | Parameter | 74F | | | | | Units |
|------------------|--|---|-----|-----|--|-----|-------|
| | | T _A = +25°C V _{CC} = +5.0V C _L = 50 pF | | | T _A , V _{CC} = Com C _L = 50 pF | | |
| | | Min | Typ | Max | Min | Max | |
| t _{PLH} | Propagation Delay | 3.5 | 5.3 | 7.5 | 3.0 | 8.5 | ns |
| t _{PHL} | A ₀ or A ₁ to \overline{O}_n | 4.0 | 6.1 | 8.0 | 4.0 | 9.0 | |
| t _{PLH} | Propagation Delay | 3.5 | 5.4 | 7.0 | 3.5 | 8.0 | ns |
| t _{PHL} | \overline{E}_1 to \overline{O}_n | 3.0 | 4.7 | 6.5 | 3.0 | 7.5 | |



Physical Dimensions inches (millimeters) unless otherwise noted

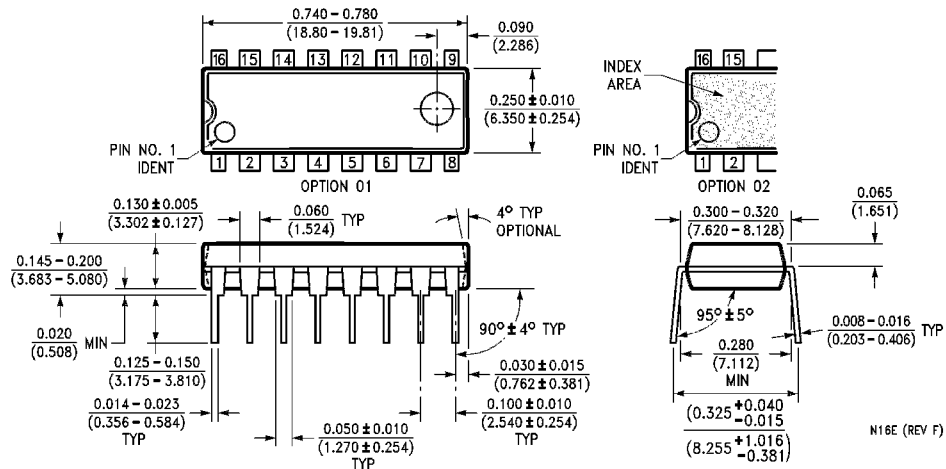


16-Lead (0.150" Wide) Molded Small Outline Integrated Circuit (S)
Package Number M16A



16-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)
Package Number M16D

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



**16-Lead (0.300" Wide) Molded Dual In-Line Package (P)
Package Number N16E**

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