

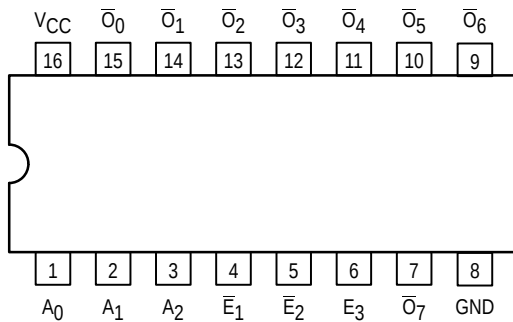


# 1-OF-8 DECODER/ DEMULTIPLEXER

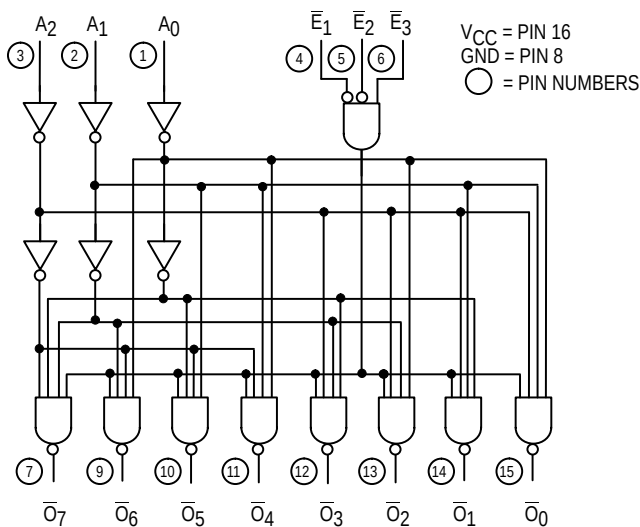
The MC54/74F138 is a high speed 1-of-8 Decoder/Demultiplexer. This device is ideally suited for high speed bipolar memory chip select address decoding. The multiple input enables allow parallel expansion to a 1-of-24 decoder using just three F138 devices or to a 1-of-32 decoder using four F138s and one inverter.

- Demultiplexing Capability
- Multiple Input Enable for Easy Expansion
- Active Low Mutually Exclusive Outputs
- Input Clamp Diodes Limit High-Speed Termination Effects

CONNECTION DIAGRAM DIP (TOP VIEW)



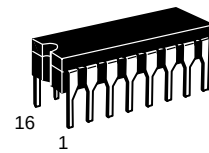
LOGIC DIAGRAM



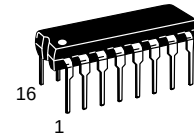
## MC54/74F138

### 1-OF-8 DECODER/ DEMULTIPLEXER

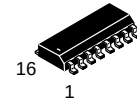
FAST™ SHOTTKY TTL



**J SUFFIX**  
CERAMIC  
CASE 620-09



**N SUFFIX**  
PLASTIC  
CASE 648-08

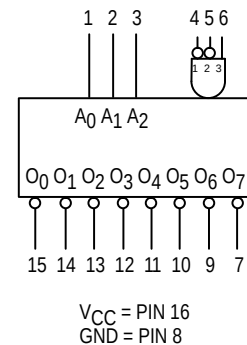


**D SUFFIX**  
SOIC  
CASE 751B-03

### ORDERING INFORMATION

|           |         |
|-----------|---------|
| MC54FXXXJ | Ceramic |
| MC74FXXXN | Plastic |
| MC74FXXXD | SOIC    |

### LOGIC SYMBOL



# MC54/74F138

## GUARANTEED OPERATING RANGES

| Symbol          | Parameter                           |        | Min | Typ | Max  | Unit |
|-----------------|-------------------------------------|--------|-----|-----|------|------|
| V <sub>CC</sub> | Supply Voltage                      | 54, 74 | 4.5 | 5.0 | 5.5  | V    |
| T <sub>A</sub>  | Operating Ambient Temperature Range | 54     | −55 | 25  | 125  | °C   |
|                 |                                     | 74     | 0   | 25  | 70   |      |
| I <sub>OH</sub> | Output Current — High               | 54, 74 |     |     | −1.0 | mA   |
| I <sub>OL</sub> | Output Current — Low                | 54, 74 |     |     | 20   | mA   |

## DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

| Symbol          | Parameter                             | Limits |     |      | Unit | Test Conditions                                     |
|-----------------|---------------------------------------|--------|-----|------|------|-----------------------------------------------------|
|                 |                                       | Min    | Typ | Max  |      |                                                     |
| V <sub>IH</sub> | Input HIGH Voltage                    | 2.0    |     |      | V    | Guaranteed Input HIGH Voltage                       |
| V <sub>IL</sub> | Input LOW Voltage                     |        |     | 0.8  | V    | Guaranteed Input LOW Voltage                        |
| V <sub>IK</sub> | Input Clamp Diode Voltage             |        |     | −1.2 | V    | V <sub>CC</sub> = MIN, I <sub>IN</sub> = −18 mA     |
| V <sub>OH</sub> | Output HIGH Voltage                   | 54, 74 | 2.5 |      | V    | I <sub>OH</sub> = −1.0 mA, V <sub>CC</sub> = 4.50 V |
|                 |                                       | 74     | 2.7 |      | V    | I <sub>OH</sub> = −1.0 mA, V <sub>CC</sub> = 4.75 V |
| V <sub>OL</sub> | Output LOW Voltage                    |        |     | 0.5  | V    | I <sub>OL</sub> = 20 mA, V <sub>CC</sub> = MIN      |
| I <sub>IH</sub> | Input HIGH Current                    |        |     | 20   | μA   | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 2.7 V      |
|                 |                                       |        |     | 0.1  | mA   | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 7.0 V      |
| I <sub>IL</sub> | Input LOW Current                     |        |     | −0.6 | mA   | V <sub>CC</sub> = MAX, V <sub>IN</sub> = 0.5 V      |
| I <sub>OS</sub> | Output Short Circuit Current (Note 2) | −60    |     | −150 | mA   | V <sub>CC</sub> = MAX, V <sub>OUT</sub> = 0 V       |
| I <sub>CC</sub> | Power Supply Current                  |        |     | 20   | mA   | V <sub>CC</sub> = MAX                               |

### NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable device type.
- Not more than one output should be shorted at a time, nor for more than 1 second.

## AC CHARACTERISTICS

| Symbol           | Parameter                               | Levels<br>of<br>Delay | 54/74F                                                                        |     | 54F                                                                                        |      | 74F                                                                                    |     | Unit |
|------------------|-----------------------------------------|-----------------------|-------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------|-----|------|
|                  |                                         |                       | T <sub>A</sub> = +25 °C<br>V <sub>CC</sub> = +5.0 V<br>C <sub>L</sub> = 50 pF |     | T <sub>A</sub> = +25°C to +125°C<br>V <sub>CC</sub> = 5.0 V ±10%<br>C <sub>L</sub> = 50 pF |      | T <sub>A</sub> = 0°C to 70°C<br>V <sub>CC</sub> = 5.0 V ±10%<br>C <sub>L</sub> = 50 pF |     |      |
|                  |                                         |                       | Min                                                                           | Max | Min                                                                                        | Max  | Min                                                                                    | Max |      |
| t <sub>PLH</sub> | Propagation Delay,<br>Address to Output | 3                     | 3.0                                                                           | 7.5 | 3.0                                                                                        | 12   | 3.0                                                                                    | 8.5 | ns   |
| t <sub>PHL</sub> |                                         |                       | 3.0                                                                           | 8.0 | 3.0                                                                                        | 9.5  | 3.0                                                                                    | 9.0 |      |
| t <sub>PLH</sub> | Enable to Output                        | 2                     | 3.5                                                                           | 7.0 | 3.5                                                                                        | 11   | 3.5                                                                                    | 8.0 | ns   |
| t <sub>PHL</sub> | $\bar{E}_1$ or $\bar{E}_2$              |                       | 3.0                                                                           | 7.0 | 3.0                                                                                        | 8.0  | 3.0                                                                                    | 7.5 |      |
| t <sub>PLH</sub> | Enable to Output                        | 3                     | 4.0                                                                           | 8.0 | 4.0                                                                                        | 12.5 | 4.0                                                                                    | 9.0 | ns   |
| t <sub>PHL</sub> | E3                                      |                       | 3.5                                                                           | 7.5 | 3.5                                                                                        | 8.5  | 3.5                                                                                    | 8.5 |      |

## FUNCTIONAL DESCRIPTION

The decoder accepts three binary weighted inputs (A<sub>0</sub>, A<sub>1</sub>, A<sub>2</sub>) and when enabled provides eight mutually exclusive active LOW outputs ( $\bar{O}_0$ – $\bar{O}_7$ ). The F138 features three Enable inputs, two active LOW ( $\bar{E}_1$ ,  $\bar{E}_2$ ) and one active HIGH (E<sub>3</sub>). All outputs will be HIGH unless  $\bar{E}_1$  and  $\bar{E}_2$  are LOW and E<sub>3</sub> is HIGH. This multiple enable function allows easy parallel

expansion of the device to a 1-of-32 (5 lines to 32 lines) decoder with just four F138s and one inverter.

The F138 can be used as an 8-output demultiplexer by using one of the active LOW Enable inputs as the data input and the other Enable inputs as strobes. The Enable inputs which are not used must be permanently tied to their appropriate active HIGH or active LOW states.

MC54/74F138

FUNCTION TABLE

| Inputs           |                  |       |       |       |       | Outputs          |                  |                  |                  |                  |                  |                  |                  |
|------------------|------------------|-------|-------|-------|-------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| $\overline{E}_1$ | $\overline{E}_2$ | $E_3$ | $A_0$ | $A_1$ | $A_2$ | $\overline{O}_0$ | $\overline{O}_1$ | $\overline{O}_2$ | $\overline{O}_3$ | $\overline{O}_4$ | $\overline{O}_5$ | $\overline{O}_6$ | $\overline{O}_7$ |
| H                | X                | X     | X     | X     | X     | H                | H                | H                | H                | H                | H                | H                | H                |
| X                | H                | X     | X     | X     | X     | H                | H                | H                | H                | H                | H                | H                | H                |
| X                | X                | L     | X     | X     | X     | H                | H                | H                | H                | H                | H                | H                | H                |
| L                | L                | H     | L     | L     | L     | L                | H                | H                | H                | H                | H                | H                | H                |
| L                | L                | H     | H     | L     | L     | H                | L                | H                | H                | H                | H                | H                | H                |
| L                | L                | H     | L     | H     | L     | H                | H                | L                | H                | H                | H                | H                | H                |
| L                | L                | H     | H     | H     | L     | H                | H                | H                | L                | H                | H                | H                | H                |
| L                | L                | H     | L     | L     | H     | H                | H                | H                | H                | L                | H                | H                | H                |
| L                | L                | H     | H     | L     | H     | H                | H                | H                | H                | H                | L                | H                | H                |
| L                | L                | H     | L     | H     | H     | H                | H                | H                | H                | H                | H                | L                | H                |
| L                | L                | H     | H     | H     | H     | H                | H                | H                | H                | H                | H                | H                | L                |

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Don't Care

