

## 74F540 • 74F541

### Octal Buffer/Line Driver with 3-STATE Outputs

#### General Description

The 74F540 and 74F541 are similar in function to the 74F240 and 74F244 respectively, except that the inputs and outputs are on opposite sides of the package (see Connection Diagrams). This pinout arrangement makes these devices especially useful as output ports for microprocessors, allowing ease of layout and greater PC board density.

#### Features

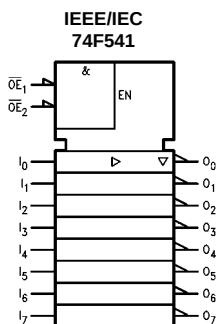
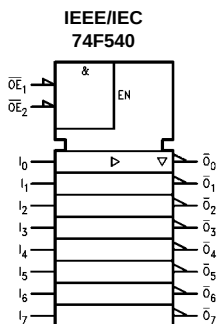
- 3-STATE outputs drive bus lines
- Inputs and outputs opposite side of package, allowing easier interface to microprocessors

#### Ordering Code:

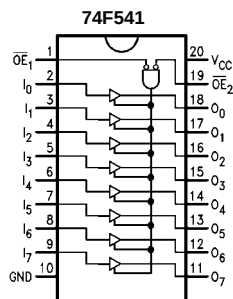
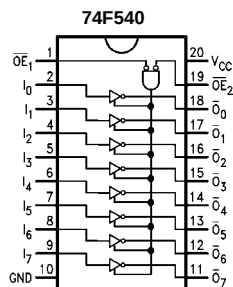
| Order Number | Package Number | Package Description                                                       |
|--------------|----------------|---------------------------------------------------------------------------|
| 74F540SC     | M20B           | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| 74F540SJ     | M20D           | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide             |
| 74F540PC     | N20A           | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide     |
| 74F541SC     | M20B           | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| 74F541SJ     | M20D           | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide             |
| 74F541PC     | N20A           | 20-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 Symbols



#### Connection Diagrams



## Unit Loading/Fan Out

| Pin Names                          | Description                              | U.L.<br>HIGH/LOW | Input $I_{IH}/I_{IL}$<br>Output $I_{OH}/I_{OL}$ |
|------------------------------------|------------------------------------------|------------------|-------------------------------------------------|
| $\overline{OE}_1, \overline{OE}_2$ | 3-STATE Output Enable Input (Active LOW) | 1.0/1.0          | 20 $\mu$ A/–0.6 mA                              |
| $I_n$                              | Inputs                                   | 1.0/1.0          | 20 $\mu$ A/–0.6 mA                              |
| $O_n, \overline{O}_n$              | Outputs                                  | 600/106.6 (80)   | –12 mA/64 mA (48 mA)                            |

## Truth Table

| Inputs            |                   |   | Outputs |        |
|-------------------|-------------------|---|---------|--------|
| $\overline{OE}_1$ | $\overline{OE}_2$ | I | 74F540  | 74F541 |
| L                 | L                 | H | L       | H      |
| H                 | X                 | X | Z       | Z      |
| X                 | H                 | X | Z       | Z      |
| L                 | L                 | L | H       | L      |

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial  
 Z = High Impedance

**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<br>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<br>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> | 2.4<br>2.0<br>2.7 |      | V     | Min             | I <sub>OH</sub> = –3 mA<br>I <sub>OH</sub> = –15 mA<br>I <sub>OH</sub> = –3 mA |
| V <sub>OL</sub>  | Output LOW Voltage                | 10% V <sub>CC</sub>                                              |                   | 0.55 | V     | Min             | I <sub>OL</sub> = 64 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 | mA    | Max             | V <sub>IN</sub> = 0.5V                                                         |
| 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      | –100                                                             |                   | –225 | 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>CCH</sub> | Power Supply Current (74F540)     |                                                                  | 11                | 20   | mA    | Max             | V <sub>O</sub> = HIGH                                                          |
| I <sub>CCL</sub> | Power Supply Current (74F540)     |                                                                  | 53                | 75   | mA    | Max             | V <sub>O</sub> = LOW                                                           |
| I <sub>CCZ</sub> | Power Supply Current (74F540)     |                                                                  | 31                | 45   | mA    | Max             | V <sub>O</sub> = HIGH Z                                                        |
| I <sub>CCH</sub> | Power Supply Current (74F541)     |                                                                  | 26                | 35   | mA    | Max             | V <sub>O</sub> = HIGH                                                          |
| I <sub>CCL</sub> | Power Supply Current (74F541)     |                                                                  | 55                | 75   | mA    | Max             | V <sub>O</sub> = LOW                                                           |
| I <sub>CCZ</sub> | Power Supply Current (74F541)     |                                                                  | 31                | 55   | mA    | Max             | V <sub>O</sub> = HIGH Z                                                        |

## AC Electrical Characteristics

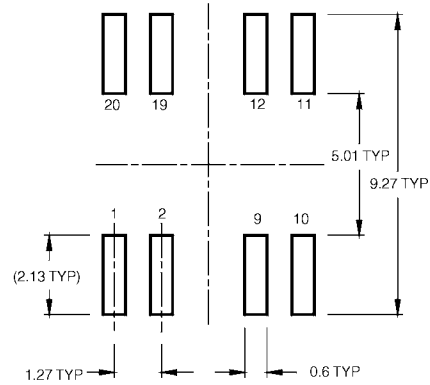
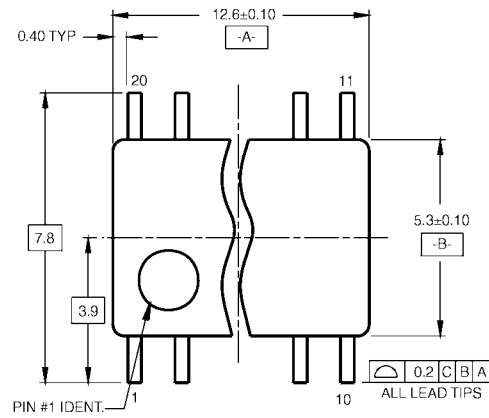
| Symbol           | Parameter                    | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |     |      | T <sub>A</sub> = -55°C to +125°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |      | T <sub>A</sub> = 0°C to +70°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |      | Units |
|------------------|------------------------------|-----------------------------------------------------------------------------|-----|------|---------------------------------------------------------------------------------------|------|------------------------------------------------------------------------------------|------|-------|
|                  |                              | Min                                                                         | Typ | Max  | Min                                                                                   | Max  | Min                                                                                | Max  |       |
| t <sub>PLH</sub> | Propagation Delay            | 1.5                                                                         | 3.0 | 5.0  | 1.0                                                                                   | 6.0  | 1.0                                                                                | 5.5  | ns    |
| t <sub>PHL</sub> | Data to Output (74F540)      | 1.0                                                                         | 2.0 | 4.0  | 1.0                                                                                   | 4.5  | 1.0                                                                                | 4.0  |       |
| t <sub>PZH</sub> | Output Enable Time (74F540)  | 2.5                                                                         | 4.9 | 8.0  | 2.5                                                                                   | 9.0  | 2.5                                                                                | 8.5  | ns    |
| t <sub>PZL</sub> |                              | 3.5                                                                         | 5.8 | 10.0 | 3.5                                                                                   | 11.0 | 3.5                                                                                | 10.5 |       |
| t <sub>PHZ</sub> | Output Disable Time (74F540) | 1.5                                                                         | 3.4 | 6.0  | 1.5                                                                                   | 7.0  | 1.5                                                                                | 6.5  |       |
| t <sub>PLZ</sub> |                              | 1.0                                                                         | 2.5 | 5.5  | 1.0                                                                                   | 7.5  | 1.0                                                                                | 6.0  | ns    |
| t <sub>PLH</sub> | Propagation Delay            | 1.5                                                                         | 3.3 | 5.5  |                                                                                       |      | 1.5                                                                                | 6.0  |       |
| t <sub>PHL</sub> | Data to Output (74F541)      | 1.5                                                                         | 2.7 | 5.5  |                                                                                       |      | 1.5                                                                                | 6.0  | ns    |
| t <sub>PZH</sub> | Output Enable Time (74F541)  | 3.0                                                                         | 5.8 | 8.0  |                                                                                       |      | 2.5                                                                                | 9.5  |       |
| t <sub>PZL</sub> |                              | 3.5                                                                         | 6.1 | 8.5  |                                                                                       |      | 3.0                                                                                | 9.5  | ns    |
| t <sub>PHZ</sub> | Output Disable Time (74F541) | 1.5                                                                         | 3.4 | 6.0  |                                                                                       |      | 1.5                                                                                | 6.5  |       |
| t <sub>PLZ</sub> |                              | 1.5                                                                         | 2.9 | 5.5  |                                                                                       |      | 1.5                                                                                | 6.0  |       |

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

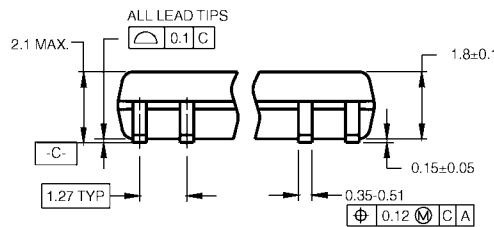


**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide  
Package Number M20B**

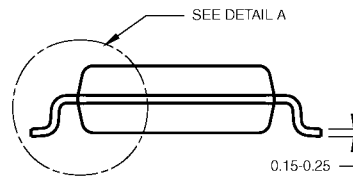
# Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



LAND PATTERN RECOMMENDATION



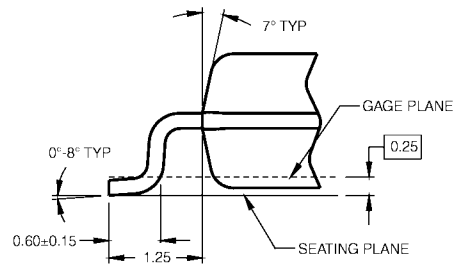
DIMENSIONS ARE IN MILLIMETERS



## NOTES:

- A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

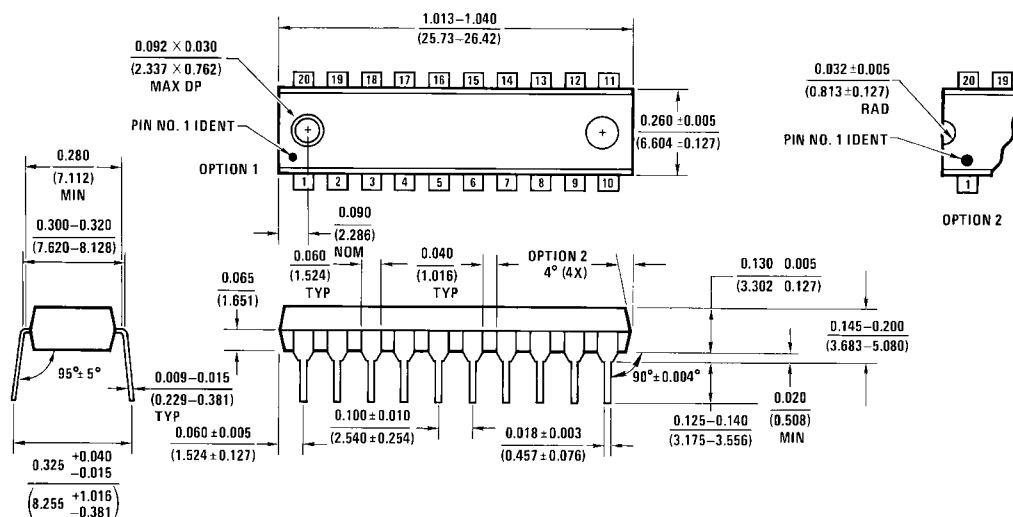
M20DRevB1



DETAIL A

20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M20D

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



20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide  
Package Number N20A

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