

# 54FCT540

*54FCT540 Octal Buffer/Line Driver with -TRISTATE Outputs*



Literature Number: SNOS431

# 54FCT540

## Octal Buffer/Line Driver with TRI-STATE® Outputs

### General Description

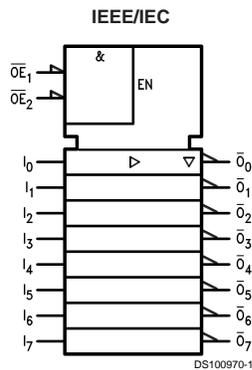
The 'FCT540 is an octal buffer/line drivers designed to be employed as memory and address drivers, clock drivers and bus oriented transmitter/receivers.

These devices are similar in function to the 'FCT240 while providing flow-through architecture (inputs on opposite side from outputs). This pinout arrangement makes these devices especially useful as output ports for microprocessors, allowing ease of layout and greater PC board density.

### Features

- TRI-STATE inverting outputs
- Inputs and outputs opposite side of package, allowing easier interface to microprocessors
- TTL input and output level compatible
- CMOS power consumption
- Output sink capability of 48mA, source capability of 12 mA
- Standard Microcircuit Drawing (SMD) 5962-8976701

### Logic Symbol

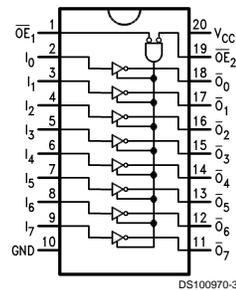


| Inputs            |                   |   | Outputs |
|-------------------|-------------------|---|---------|
| $\overline{OE}_1$ | $\overline{OE}_2$ | I |         |
| L                 | L                 | H | L       |
| H                 | X                 | X | Z       |
| X                 |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

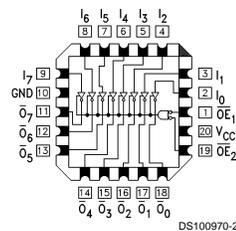
H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial  
 Z = High Impedance

### Connection Diagrams

#### Pin Assignment for DIP and Flatpak



#### Pin Assignment for LCC



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**Absolute Maximum Ratings** (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

|                                          |                          |
|------------------------------------------|--------------------------|
| Supply Voltage ( $V_{CC}$ )              | -0.5V to +7.0V           |
| DC Input Diode Current ( $I_{IK}$ )      |                          |
| $V_I = -0.5V$                            | -20 mA                   |
| $V_I = V_{CC} + 0.5V$                    | +20 mA                   |
| DC Input Voltage ( $V_I$ )               | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Diode Current ( $I_{OK}$ )     |                          |
| $V_O = -0.5V$                            | -20 mA                   |
| $V_O = V_{CC} + 0.5V$                    | +20 mA                   |
| DC Output Voltage ( $V_O$ )              | -0.5V to $V_{CC} + 0.5V$ |
| DC Output Source                         |                          |
| or Sink Current ( $I_O$ )                | $\pm 50$ mA              |
| DC $V_{CC}$ or Ground Current            |                          |
| per Output Pin ( $I_{CC}$ or $I_{GND}$ ) | $\pm 50$ mA              |

|                                   |                 |
|-----------------------------------|-----------------|
| Storage Temperature ( $T_{STG}$ ) | -65°C to +150°C |
| Junction Temperature ( $T_J$ )    |                 |
| CDIP                              | 175°C           |

**Recommended Operating Conditions**

|                                 |                 |
|---------------------------------|-----------------|
| Supply Voltage ( $V_{CC}$ )     |                 |
| 'FCT                            | 2.0V to 6.0V    |
| Input Voltage ( $V_I$ )         | 0V to $V_{CC}$  |
| Output Voltage ( $V_O$ )        | 0V to $V_{CC}$  |
| Operating Temperature ( $T_A$ ) |                 |
| 54FCT                           | -55°C to +125°C |

**Note 1:** Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT® circuits outside databook specifications.

**DC Characteristics for 'FCT Family Devices**

| Symbol          | Parameter                      | FCT540 |      | Units      | $V_{CC}$ | Conditions                                                                                                 |
|-----------------|--------------------------------|--------|------|------------|----------|------------------------------------------------------------------------------------------------------------|
|                 |                                | Min    | Max  |            |          |                                                                                                            |
| $V_{IH}$        | Input HIGH Voltage             | 2.0    |      | V          |          | Recognized HIGH Signal                                                                                     |
| $V_{IL}$        | Input LOW Voltage              |        | 0.8  | V          |          | Recognized LOW Signal                                                                                      |
| $V_{CD}$        | Input Clamp Diode Voltage      |        | -1.2 | V          | Min      | $I_{IN} = -18$ mA                                                                                          |
| $V_{OH}$        | Output HIGH Voltage            | 54FCT  | 4.3  | V          | Min      | $I_{OH} = -300$ $\mu$ A                                                                                    |
|                 |                                | 54FCT  | 2.4  | V          | Min      | $I_{OH} = -12$ mA                                                                                          |
| $V_{OL}$        | Output LOW Voltage             | 54FCT  | 0.2  | V          | Min      | $I_{OL} = 300$ $\mu$ A                                                                                     |
|                 |                                | 54FCT  | 0.55 | V          | Min      | $I_{OL} = 48$ mA                                                                                           |
| $I_{IH}$        | Input HIGH Current             |        | 5    | $\mu$ A    | Max      | $V_{IN} = V_{CC}$                                                                                          |
| $I_{IL}$        | Input LOW Current              |        | -5   | $\mu$ A    | Max      | $V_{IN} = 0.0V$                                                                                            |
| $I_{OZH}$       | Output Leakage Current         |        | 10   | $\mu$ A    | Max      | $V_{OUT} = 5.5V$ ; $\overline{OE}_n = 2.0V$                                                                |
| $I_{OZL}$       | Output Leakage Current         |        | -10  | $\mu$ A    | Max      | $V_{OUT} = 0.0V$ ; $\overline{OE}_n = 2.0V$                                                                |
| $I_{OS}$        | Output Short-Circuit Current   |        | -60  | mA         | Max      | $V_{OUT} = 0.0V$                                                                                           |
| $I_{CCQ}$       | Quiescent Power Supply Current |        | 1.5  | mA         | Max      | $V_{IN} < 0.2V$ or $V_{IN} 5.3V$ , $V_{CC} = 5.5V$                                                         |
| $\Delta I_{CC}$ | Quiescent Power Supply Current |        | 2.0  | mA         | Max      | $V_I = V_{CC} - 2.1V$                                                                                      |
| $I_{CCD}$       | Dynamic $I_{CC}$               |        | 0.4  | mA/<br>MHz | Max      | $V_{CC} = 5.5V$ , Outputs Open, One Bit Toggling, 50% Duty Cycle, $\overline{OE}_n = GND$                  |
| $I_{CC}$        | Total Power Supply Current     |        | 6.0  | mA         | Max      | $V_{CC} = 5.5V$ , Outputs Open, $f_l = 10MHz$ , $\overline{OE}_n = GND$ , One Bit Toggling, 50% Duty Cycle |

**Note 2:** All outputs loaded; thresholds on input associated with output under test.

**Note 3:** Maximum test duration 2.0 ms, one output loaded at a time.

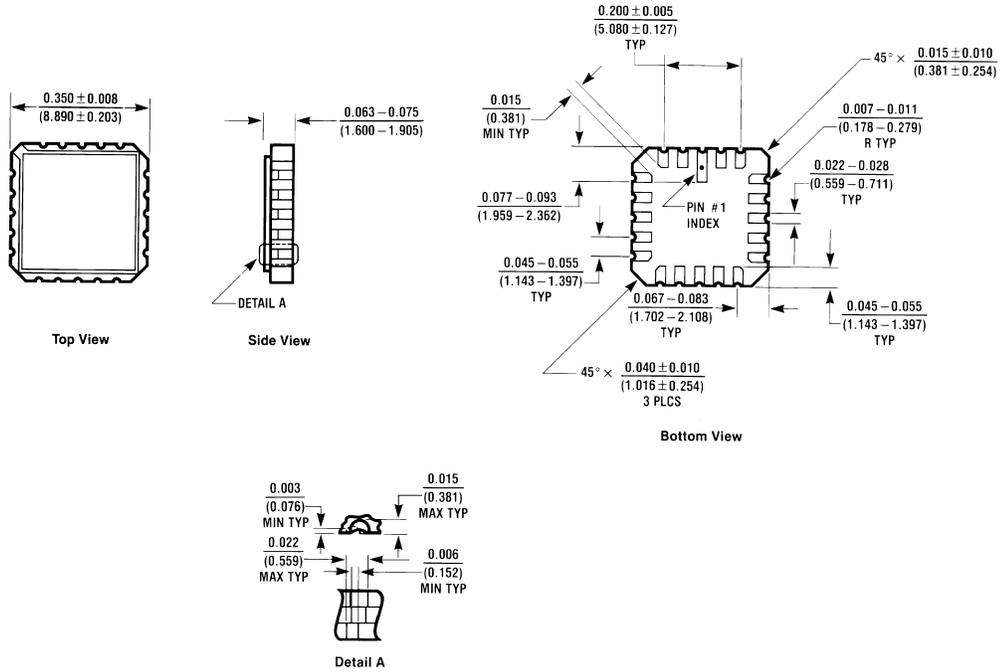
## AC Electrical Characteristics

| Symbol    | Parameter           | 54FCT                                                                                                            |      | Units |
|-----------|---------------------|------------------------------------------------------------------------------------------------------------------|------|-------|
|           |                     | $T_A = -55^\circ\text{C to } +125^\circ\text{C}$<br>$V_{CC} = 4.5\text{V} - 5.5\text{V}$<br>$C_L = 50\text{ pF}$ |      |       |
|           |                     | Min                                                                                                              | Max  |       |
| $t_{PLH}$ | Propagation Delay   | 2.0                                                                                                              | 9.5  | ns    |
| $t_{PHL}$ | Data to Outputs     | 2.0                                                                                                              | 9.5  |       |
| $t_{PZH}$ | Output Enable Time  | 2.0                                                                                                              | 12.5 | ns    |
| $t_{PZL}$ |                     | 2.0                                                                                                              | 12.5 |       |
| $t_{PHZ}$ | Output Disable Time | 2.0                                                                                                              | 12.5 | ns    |
| $t_{PLZ}$ |                     | 2.0                                                                                                              | 12.5 |       |

## Capacitance

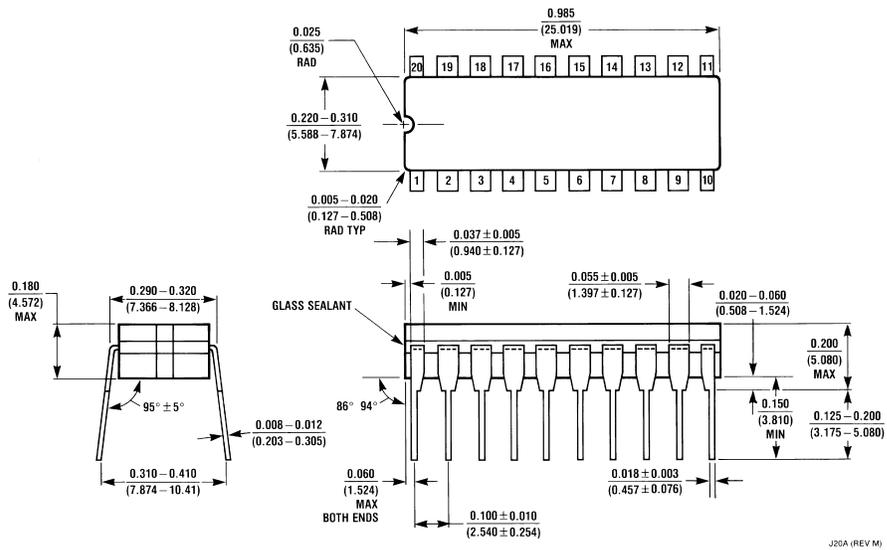
| Symbol   | Parameter                     | Typ  | Units | Conditions             |
|----------|-------------------------------|------|-------|------------------------|
| $C_{IN}$ | Input Capacitance             | 4.5  | pF    | $V_{CC} = \text{OPEN}$ |
| $C_{PD}$ | Power Dissipation Capacitance | 30.0 | pF    | $V_{CC} = 5.0\text{V}$ |

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



E20A (REV 01)

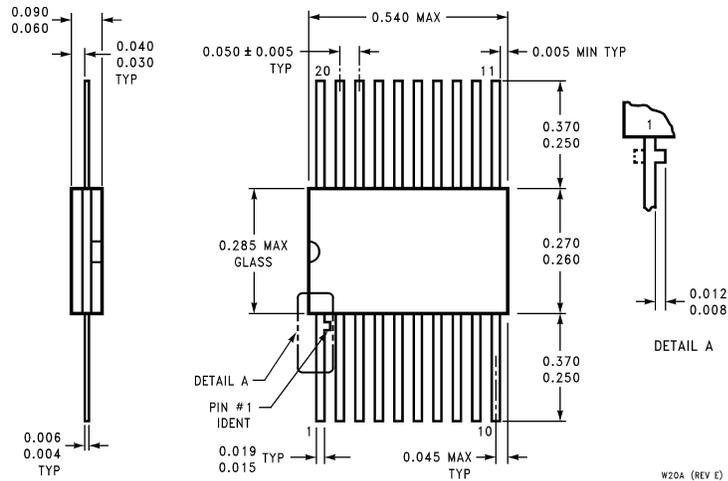
**20-Terminal Ceramic Leadless Chip Carrier (L)**  
**NS Package Number E20A**



J20A (REV M)

**20-Lead Ceramic Dual-In-Line Package (D)**  
**NS Package Number J20A**

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



**20-Lead Ceramic Flatpak (F)  
NS Package Number W20A**

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