# OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SDFS021A – D3126, JANUARY 1989 – REVISED OCTOBER 1993

- **3-State Outputs Drive Bus Lines or Buffer Memory Address Registers**
- **Data Flow-Through Pinout (All Inputs on Opposite Side From Outputs)**
- **Package Options Include Plastic Small-Outline Packages, Ceramic Chip Carriers, and Plastic and Ceramic DIPs**

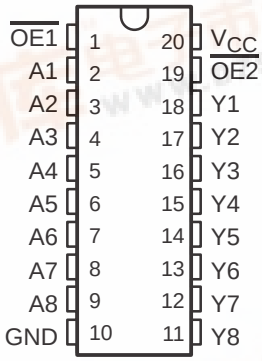
## description

The ′F541 octal buffer/line driver is ideal for driving bus lines or buffering memory address registers. The device features inputs and outputs on opposite sides of the package to facilitate printed-circuit-board layout.

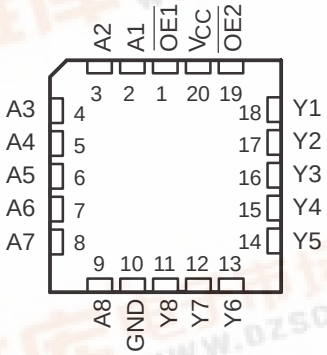
The 3-state control gate is a 2-input AND gate with active-low inputs so that if either output enable ($\overline{OE1}$ or $\overline{OE2}$) input is high, all eight outputs are in the high-impedance state.

The SN54F541 is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74F251 is characterized for operation from 0°C to 70°C.

**SN54F541 . . . J PACKAGE**
**SN74F541 . . . DW OR N PACKAGE**
**(TOP VIEW)**



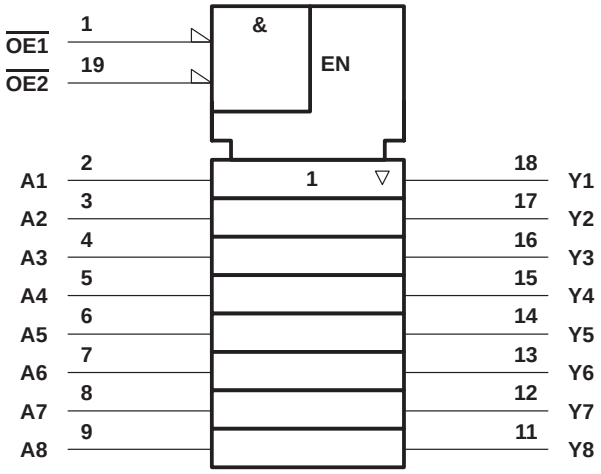

**SN54F541 . . . FK PACKAGE**
**(TOP VIEW)**




**FUNCTION TABLE**

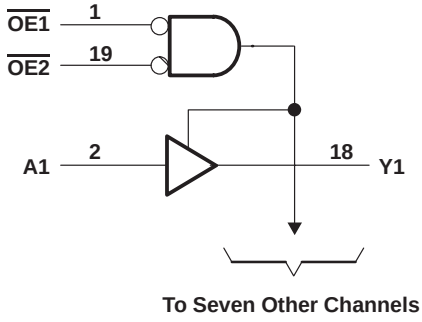
| INPUTS | | | OUTPUT |
|---|---|---|---|
| $\overline{OE1}$ | $\overline{OE2}$ | A | Y |
| L | L | L | L |
| L | L | H | H |
| H | X | X | Z |
| X | H | X | Z |

## logic symbol†




† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## logic diagram (positive logic)




## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)‡

Supply voltage range, $V_{CC}$ . . . . . –0.5 V to 7 V
Input voltage range, $V_I$ (see Note 1) . . . . . –1.2 V to 7 V
Input current range . . . . . –30 mA to 5 mA
Voltage range applied to any output in the disabled or power-off state . . . . . –0.5 V to 5.5 V
Voltage range applied to any output in the high state . . . . . –0.5 V to $V_{CC}$
Current into any output in the low state: SN54F541 . . . . . 96 mA
SN74F541 . . . . . 128 mA
Operating free-air temperature range: SN54F541 . . . . . –55°C to 125°C
SN74F541 . . . . . 0°C to 70°C
Storage temperature range . . . . . –65°C to 150°C

‡ Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTE 1: The input voltage ratings may be exceeded provided the input current ratings are observed.

## recommended operating conditions

| | | SN54F541 | | | SN74F541 | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | 4.5 | 5 | 5.5 | 4.5 | 5 | 5.5 | V |
| $V_{IH}$ | High-level input voltage | 2 | | | 2 | | | V |
| $V_{IL}$ | Low-level input voltage | | | 0.8 | | | 0.8 | V |
| $I_{IK}$ | Input clamp current | | | –18 | | | –18 | mA |
| $I_{OH}$ | High-level output current | | | –12 | | | –15 | mA |
| $I_{OL}$ | Low-level output current | | | 48 | | | 64 | mA |
| $T_A$ | Operating free-air temperature | –55 | | 125 | 0 | | 70 | °C |

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

| PARAMETER | TEST CONDITIONS | | SN54F541 | | | SN74F541 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP† | MAX | MIN | TYP† | MAX | |
| $V_{IK}$ | $V_{CC}$ = 4.5 V, | $I_I$ = –18 mA | | | –1.2 | | | –1.2 | V |
| $V_{OH}$ | $V_{CC}$ = 4.5 V | $I_{OH}$ = – 3 mA | 2.4 | 3.3 | | 2.4 | 3.3 | | V |
| | | $I_{OH}$ = – 12 mA | 2 | 3.2 | | | | | |
| | | $I_{OH}$ = – 15 mA | | | | 2 | 3.1 | | |
| | $V_{CC}$ = 4.75 V, | $I_{OH}$ = – 3 mA | | | | 2.7 | | | |
| $V_{OL}$ | $V_{CC}$ = 4.5 V | $I_{OL}$ = 48 mA | | 0.38 | 0.55 | | | | V |
| | | $I_{OL}$ = 64 mA | | | | | 0.42 | 0.55 | |
| $I_{OZH}$ | $V_{CC}$ = 5.5 V, | $V_O$ = 2.7 V | | | 50 | | | 50 | µA |
| $I_{OZL}$ | $V_{CC}$ = 5.5 V, | $V_O$ = 0.5 V | | | –50 | | | –50 | µA |
| $I_I$ | $V_{CC}$ = 5.5 V, | $V_I$ = 7 V | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 2.7 V | | | 20 | | | 20 | µA |
| $I_{IL}$ | $V_{CC}$ = 5.5 V, | $V_I$ = 0.5 V | | | – 0.6 | | | – 0.6 | mA |
| $I_{OS}$‡ | $V_{CC}$ = 5.5 V, | $V_O$ = 0 | –100 | | –225 | –100 | | –225 | mA |
| $I_{CC}$ | $V_{CC}$ = 5.5 V | Outputs high | | 28 | 35 | | 28 | 35 | mA |
| | | Outputs low | | 62 | 75 | | 62 | 75 | |
| | | Outputs disabled | | 40 | 55 | | 40 | 55 | |

† All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
‡ Not more than one output should be shorted at a time, and the duration of the short circuit should not exceed one second.

## switching characteristics (see Note 2)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ = 5 V, $C_L$ = 50 pF, $R_L$ = 500 Ω, $T_A$ = 25°C | | | $V_{CC}$ = 4.5 V to 5.5 V, $C_L$ = 50 pF, $R_L$ = 500 Ω, $T_A$ = MIN to MAX§ | | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | ′F541 | | | SN54F541 | | SN74F541 | | |
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | Any A | Y | 1.5 | 3.3 | 5.5 | 1 | 6.5 | 1.5 | 6 | ns |
| $t_{PHL}$ | | | 1.5 | 2.7 | 5.5 | 1 | 6.5 | 1.5 | 6 | |
| $t_{PZH}$ | $\overline{OE}$ | Y | 3 | 5.8 | 8 | 1.7 | 10 | 2.5 | 9.5 | ns |
| $t_{PZL}$ | | | 3.5 | 6.1 | 8.5 | 2.2 | 10 | 3 | 9.5 | |
| $t_{PHZ}$ | $\overline{OE}$ | Y | 1.5 | 3.4 | 6 | 1 | 7 | 1.5 | 6.5 | ns |
| $t_{PLZ}$ | | | 1.5 | 2.9 | 5.5 | 1 | 7.5 | 1.5 | 6 | |

§ For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
NOTE 2: Load circuits and waveforms are shown in Section 1.

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