

# SN54HCT541, SN74HCT541 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SCLS306C – JANUARY 1996 – REVISED AUGUST 2003

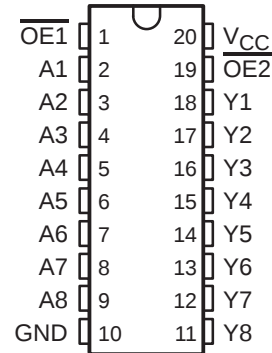
- Operating Voltage Range of 4.5 V to 5.5 V
- High-Current 3-State Outputs Interface Directly With System Bus or Can Drive Up To 15 LSTTL Loads
- Low Power Consumption, 80- $\mu$ A Max  $I_{CC}$
- Typical  $t_{pd} = 12$  ns
- $\pm 6$ -mA Output Drive at 5 V
- Low Input Current of 1  $\mu$ A Max
- Inputs Are TTL-Voltage Compatible
- Data Flow-Through Pinout (All Inputs on Opposite Side From Outputs)

## description/ordering information

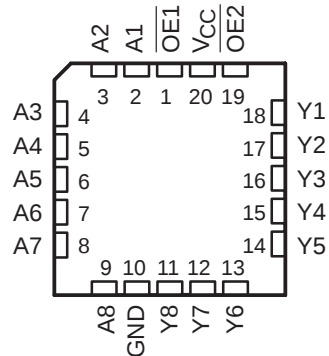
These octal buffers and line drivers are designed to have the performance of the popular 'HC240 series devices and to offer a pinout with inputs and outputs on opposite sides of the package. This arrangement greatly facilitates printed circuit board layout.

The 3-state control gate is a 2-input NOR. If either output-enable ( $\overline{OE1}$  or  $\overline{OE2}$ ) input is high, all eight outputs are in the high-impedance state. The 'HCT541 devices provide true data at the outputs.

SN54HCT541 . . . J OR W PACKAGE  
SN74HCT541 . . . DB, DW, N, NS, OR PW PACKAGE  
(TOP VIEW)



SN54HCT541 . . . FK PACKAGE  
(TOP VIEW)



## ORDERING INFORMATION

| T <sub>A</sub> | PACKAGE†   |               | ORDERABLE<br>PART NUMBER | TOP-SIDE<br>MARKING |
|----------------|------------|---------------|--------------------------|---------------------|
| –40°C to 85°C  | PDIP – N   | Tube of 20    | SN74HCT541N              | SN74HCT541N         |
|                | SOIC – DW  | Tube of 25    | SN74HCT541DW             | HCT541              |
|                |            | Reel of 2000  | SN74HCT541DWR            |                     |
|                | SOP – NS   | Reel of 2000  | SN74HCT541NSR            | HCT541              |
|                | SSOP – DB  | Reel of 2000  | SN74HCT541DBR            | HT541               |
|                | TSSOP – PW | Tube of 70    | SN74HCT541PW             | HT541               |
|                |            | Reel of 2000  | SN74HCT541PWR            |                     |
| Reel of 250    |            | SN74HCT541PWT |                          |                     |
| –55°C to 125°C | CDIP – J   | Tube of 20    | SNJ54HCT541J             | SNJ54HCT541J        |
|                | CFP – W    | Tube of 85    | SNJ54HCT541W             | SNJ54HCT541W        |
|                | LCCC – FK  | Tube of 55    | SNJ54HCT541FK            | SNJ54HCT541FK       |

<sup>†</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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**TEXAS  
INSTRUMENTS**

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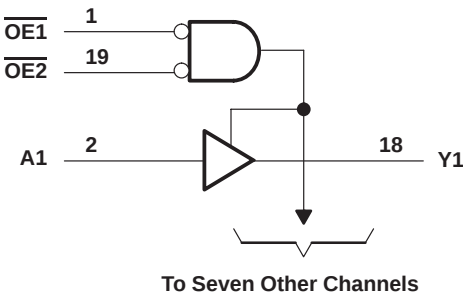
# SN54HCT541, SN74HCT541 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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FUNCTION TABLE  
(each buffer/driver)

| INPUTS |     |   | OUTPUT<br>Y |
|--------|-----|---|-------------|
| OE1    | OE2 | A |             |
| L      | L   | L | L           |
| L      | L   | H | H           |
| H      | X   | X | Z           |
| X      | H   | X | Z           |

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

|                                                                             |            |                |
|-----------------------------------------------------------------------------|------------|----------------|
| Supply voltage range, $V_{CC}$                                              | .....      | –0.5 V to 7 V  |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see Note 1)  | .....      | ±20 mA         |
| Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1) | .....      | ±20 mA         |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )                  | .....      | ±35 mA         |
| Continuous current through $V_{CC}$ or GND                                  | .....      | ±70 mA         |
| Package thermal impedance, $\theta_{JA}$ (see Note 2):                      | DB package | 70°C/W         |
|                                                                             | DW package | 58°C/W         |
|                                                                             | N package  | 69°C/W         |
|                                                                             | NS package | 60°C/W         |
|                                                                             | PW package | 83°C/W         |
| Storage temperature range, $T_{stg}$                                        | .....      | –65°C to 150°C |

<sup>†</sup> 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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
2. The package thermal impedance is calculated in accordance with JESD 51-7.

# SN54HCT541, SN74HCT541 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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## recommended operating conditions (see Note 3)

|                 |                                 |                                  | SN54HCT541 |     |                 | SN74HCT541 |     |                 | UNIT |
|-----------------|---------------------------------|----------------------------------|------------|-----|-----------------|------------|-----|-----------------|------|
|                 |                                 |                                  | MIN        | NOM | MAX             | MIN        | NOM | MAX             |      |
| V <sub>CC</sub> | Supply voltage                  |                                  | 4.5        | 5   | 5.5             | 4.5        | 5   | 5.5             | V    |
| V <sub>IH</sub> | High-level input voltage        | V <sub>CC</sub> = 4.5 V to 5.5 V | 2          |     |                 | 2          |     |                 | V    |
| V <sub>IL</sub> | Low-level input voltage         | V <sub>CC</sub> = 4.5 V to 5.5 V |            |     | 0.8             |            |     | 0.8             | V    |
| V <sub>I</sub>  | Input voltage                   |                                  | 0          |     | V <sub>CC</sub> | 0          |     | V <sub>CC</sub> | V    |
| V <sub>O</sub>  | Output voltage                  |                                  | 0          |     | V <sub>CC</sub> | 0          |     | V <sub>CC</sub> | V    |
| Δt/Δv           | Input transition rise/fall time |                                  |            |     | 500             |            |     | 500             | ns   |
| T <sub>A</sub>  | Operating free-air temperature  |                                  | –55        |     | 125             | –40        |     | 85              | °C   |

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

| PARAMETER                     | TEST CONDITIONS                                                                            |                          | V <sub>CC</sub> | T <sub>A</sub> = 25°C |       |      | SN54HCT541 |       | SN74HCT541 |       | UNIT |
|-------------------------------|--------------------------------------------------------------------------------------------|--------------------------|-----------------|-----------------------|-------|------|------------|-------|------------|-------|------|
|                               |                                                                                            |                          |                 | MIN                   | TYP   | MAX  | MIN        | MAX   | MIN        | MAX   |      |
| V <sub>OH</sub>               | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                        | I <sub>OH</sub> = –20 μA | 4.5 V           | 4.4                   | 4.499 |      | 4.4        |       | 4.4        |       | V    |
|                               |                                                                                            | I <sub>OH</sub> = –6 mA  |                 | 3.98                  | 4.3   |      | 3.7        |       | 3.84       |       |      |
| V <sub>OL</sub>               | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                        | I <sub>OL</sub> = 20 μA  | 4.5 V           |                       | 0.001 | 0.1  |            | 0.1   |            | 0.1   | V    |
|                               |                                                                                            | I <sub>OL</sub> = 6 mA   |                 |                       | 0.17  | 0.26 |            | 0.4   |            | 0.33  |      |
| I <sub>I</sub>                | V <sub>I</sub> = V <sub>CC</sub> or 0                                                      |                          | 5.5 V           |                       | ±0.1  | ±100 |            | ±1000 |            | ±1000 | nA   |
| I <sub>OZ</sub>               | V <sub>O</sub> = V <sub>CC</sub> or 0, V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> |                          | 5.5 V           |                       | ±0.01 | ±0.5 |            | ±10   |            | ±5    | μA   |
| I <sub>CC</sub>               | V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0                                  |                          | 5.5 V           |                       |       | 8    |            | 160   |            | 80    | μA   |
| ΔI <sub>CC</sub> <sup>†</sup> | One input at 0.5 V or 2.4 V, Other inputs at 0 or V <sub>CC</sub>                          |                          | 5.5 V           |                       | 1.4   | 2.4  |            | 3     |            | 2.9   | mA   |
| C <sub>i</sub>                |                                                                                            |                          | 4.5 V to 5.5 V  |                       | 3     | 10   |            | 10    |            | 10    | pF   |

<sup>†</sup> This is the increase in supply current for each input that is at one of the specified TTL voltage levels, rather than 0 V or V<sub>CC</sub>.

## switching characteristics over recommended operating free-air temperature range, C<sub>L</sub> = 50 pF (unless otherwise noted) (see Figure 1)

| PARAMETER        | FROM (INPUT)           | TO (OUTPUT) | V <sub>CC</sub> | T <sub>A</sub> = 25°C |     |     | SN54HCT541 |     | SN74HCT541 |     | UNIT |
|------------------|------------------------|-------------|-----------------|-----------------------|-----|-----|------------|-----|------------|-----|------|
|                  |                        |             |                 | MIN                   | TYP | MAX | MIN        | MAX | MIN        | MAX |      |
| t <sub>pd</sub>  | A                      | Y           | 4.5 V           |                       | 13  | 23  |            | 34  |            | 29  | ns   |
|                  |                        |             | 5.5 V           |                       | 12  | 21  |            | 31  |            | 26  |      |
| t <sub>en</sub>  | $\overline{\text{OE}}$ | Y           | 4.5 V           |                       | 21  | 30  |            | 45  |            | 38  | ns   |
|                  |                        |             | 5.5 V           |                       | 19  | 27  |            | 41  |            | 34  |      |
| t <sub>dis</sub> | $\overline{\text{OE}}$ | Y           | 4.5 V           |                       | 19  | 30  |            | 45  |            | 38  | ns   |
|                  |                        |             | 5.5 V           |                       | 18  | 27  |            | 41  |            | 34  |      |
| t <sub>t</sub>   |                        | Y           | 4.5 V           |                       | 8   | 12  |            | 18  |            | 15  | ns   |
|                  |                        |             | 5.5 V           |                       | 7   | 11  |            | 16  |            | 14  |      |



# SN54HCT541, SN74HCT541

## OCTAL BUFFERS AND LINE DRIVERS

### WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range,  $C_L = 150 \text{ pF}$  (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC}$ | $T_A = 25^\circ\text{C}$ |     |     | SN54HCT541 |     | SN74HCT541 |     | UNIT |
|-----------|-----------------|----------------|----------|--------------------------|-----|-----|------------|-----|------------|-----|------|
|           |                 |                |          | MIN                      | TYP | MAX | MIN        | MAX | MIN        | MAX |      |
| $t_{pd}$  | A               | Y              | 4.5 V    |                          | 20  | 33  |            | 49  |            | 42  | ns   |
|           |                 |                | 5.5 V    |                          | 19  | 30  |            | 45  |            | 38  |      |
| $t_{en}$  | $\overline{OE}$ | Y              | 4.5 V    |                          | 26  | 40  |            | 60  |            | 50  | ns   |
|           |                 |                | 5.5 V    |                          | 25  | 36  |            | 54  |            | 45  |      |
| $t_t$     |                 | Y              | 4.5 V    |                          | 17  | 42  |            | 63  |            | 53  | ns   |
|           |                 |                | 5.5 V    |                          | 14  | 38  |            | 57  |            | 48  |      |

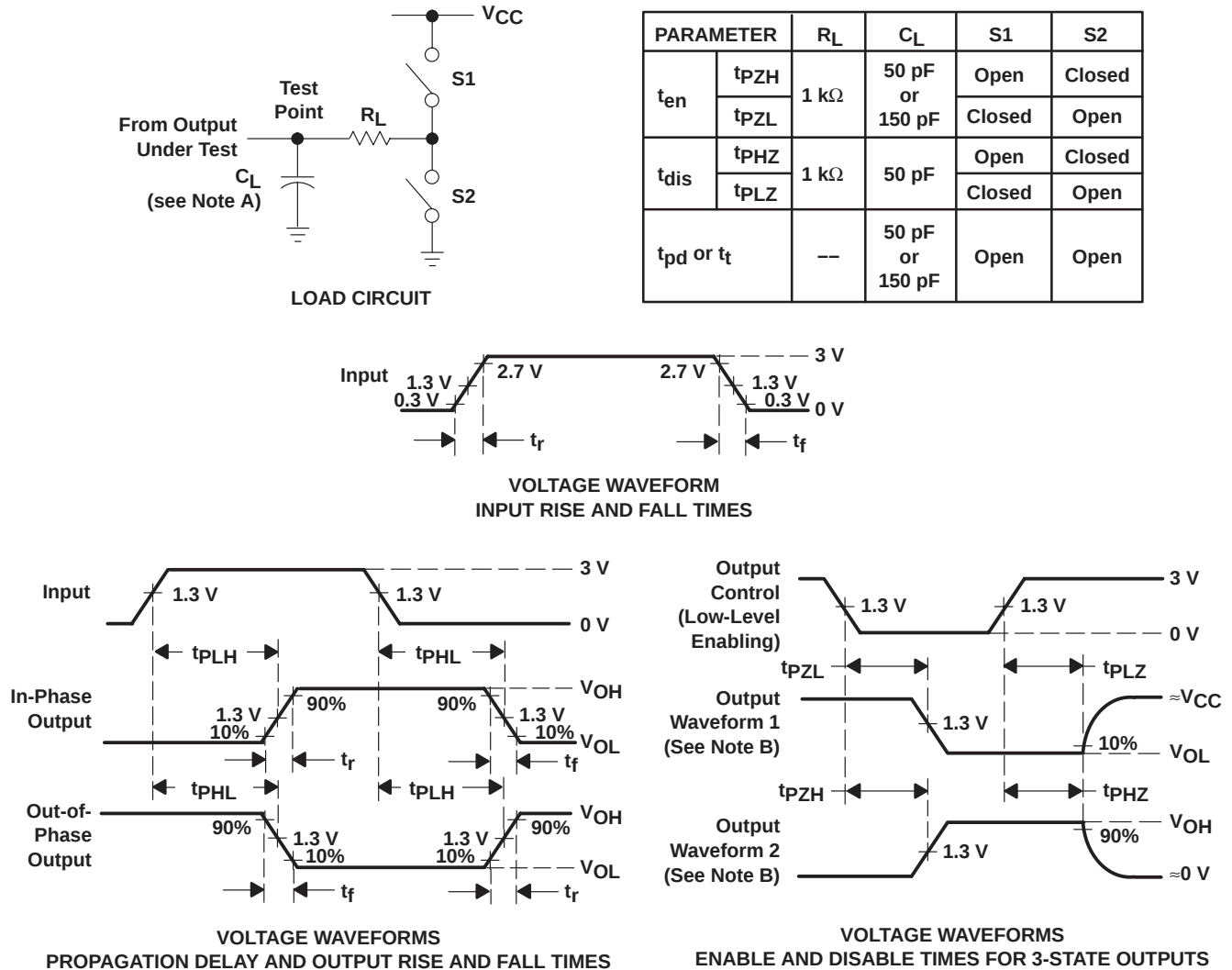
operating characteristics,  $T_A = 25^\circ\text{C}$

| PARAMETER |                                                 | TEST CONDITIONS | TYP | UNIT |
|-----------|-------------------------------------------------|-----------------|-----|------|
| $C_{pd}$  | Power dissipation capacitance per buffer/driver | No load         | 35  | pF   |

# SN54HCT541, SN74HCT541 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and test-fixture capacitance.  
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
 C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.  
 D. The outputs are measured one at a time with one input transition per measurement.  
 E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .  
 F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .  
 G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| JM38510/65761BRA | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SN54HCT541J      | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SN74HCT541DBR    | ACTIVE                | SSOP         | DB              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541DBRE4  | ACTIVE                | SSOP         | DB              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541DBRG4  | ACTIVE                | SSOP         | DB              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541DW     | ACTIVE                | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541DWE4   | ACTIVE                | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541DWG4   | ACTIVE                | SOIC         | DW              | 20   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541DWR    | ACTIVE                | SOIC         | DW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541DWRE4  | ACTIVE                | SOIC         | DW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541DWRG4  | ACTIVE                | SOIC         | DW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541N      | ACTIVE                | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74HCT541N3     | OBSOLETE              | PDIP         | N               | 20   |             | TBD                     | Call TI          | Call TI                      |
| SN74HCT541NE4    | ACTIVE                | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74HCT541NSR    | ACTIVE                | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541NSRE4  | ACTIVE                | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541NSRG4  | ACTIVE                | SO           | NS              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541PW     | ACTIVE                | TSSOP        | PW              | 20   | 70          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541PWE4   | ACTIVE                | TSSOP        | PW              | 20   | 70          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541PWG4   | ACTIVE                | TSSOP        | PW              | 20   | 70          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541PWR    | ACTIVE                | TSSOP        | PW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541PWRE4  | ACTIVE                | TSSOP        | PW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541PWRG4  | ACTIVE                | TSSOP        | PW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541PWT    | ACTIVE                | TSSOP        | PW              | 20   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541PWTE4  | ACTIVE                | TSSOP        | PW              | 20   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74HCT541PWTG4  | ACTIVE                | TSSOP        | PW              | 20   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SNJ54HCT541FK    | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| SNJ54HCT541J     | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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**TAPE AND REEL INFORMATION**



\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74HCT541DBR | SSOP         | DB              | 20   | 2000 | 330.0              | 16.4               | 8.2     | 7.5     | 2.5     | 12.0    | 16.0   | Q1            |
| SN74HCT541DWR | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 2.7     | 12.0    | 24.0   | Q1            |
| SN74HCT541PWR | TSSOP        | PW              | 20   | 2000 | 330.0              | 16.4               | 6.95    | 7.1     | 1.6     | 8.0     | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device        | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74HCT541DBR | SSOP         | DB              | 20   | 2000 | 346.0       | 346.0      | 33.0        |
| SN74HCT541DWR | SOIC         | DW              | 20   | 2000 | 346.0       | 346.0      | 41.0        |
| SN74HCT541PWR | TSSOP        | PW              | 20   | 2000 | 346.0       | 346.0      | 33.0        |

## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - The terminals are gold plated.
  - Falls within JEDEC MS-004

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



| DIM \ PINS ** | 14    | 16    | 20    | 24    |
|---------------|-------|-------|-------|-------|
| A MAX         | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN         | 9,90  | 9,90  | 12,30 | 14,70 |

4040062/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| PINS **<br>DIM | 14                     | 16                     | 18                     | 20                     |
|----------------|------------------------|------------------------|------------------------|------------------------|
| A              | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX          | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN          | —                      | —                      | —                      | —                      |
| C MAX          | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN          | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |



4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

## PW (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

## DW (R-PDSO-G20)

## PLASTIC SMALL-OUTLINE PACKAGE



4040000-4/F 06/2004

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - Falls within JEDEC MS-013 variation AC.

## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



14/18 Pin Only  
20 Pin vendor option

4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

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