

SN54ALS541, SN74ALS540, SN74ALS541 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

SDAS025D – APRIL 1982 – REVISED MARCH 2002

- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- pnp Inputs Reduce dc Loading
- Data Flowthrough Pinout (All Inputs on Opposite Side From Outputs)

description

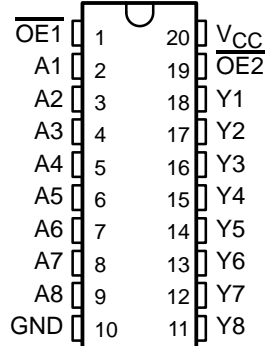
These octal buffers and line drivers are designed to have the performance of the popular SN54ALS240A/SN74ALS240A series and, at the same time, offer a pinout with inputs and outputs on opposite sides of the package. This arrangement greatly facilitates printed circuit board layout.

The 3-state control gate is a 2-input NOR gate such that, if either output-enable ($\overline{OE1}$ or $\overline{OE2}$) input is high, all eight outputs are in the high-impedance state.

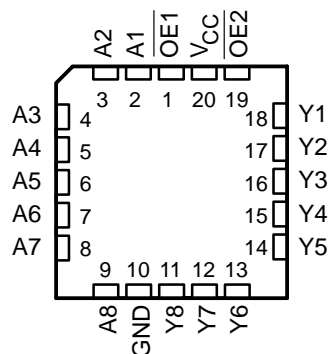
The SN74ALS540 provides inverted data. The 'ALS541 provide true data at the outputs.

The -1 versions of SN74ALS540 and SN74ALS541 are identical to the standard versions, except that the recommended maximum I_{OL} is increased to 48 mA. There is no -1 version of the SN54ALS541.

SN54ALS541 . . . J PACKAGE
SN74ALS540 . . . DW, N, OR NS PACKAGE
SN74ALS541 . . . DB, DW, N, OR NS PACKAGE
(TOP VIEW)



SN54ALS541 . . . FK PACKAGE
(TOP VIEW)



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

SN54ALS541, SN74ALS540, SN74ALS541 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

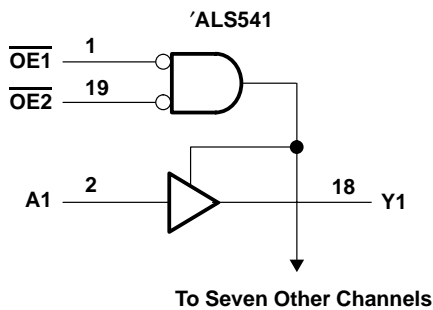
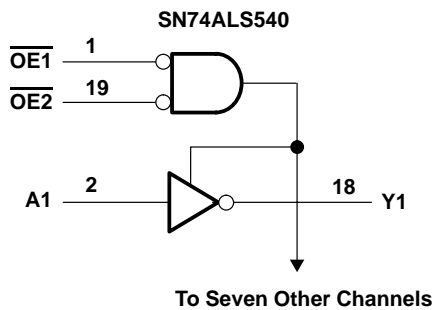
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ORDERING INFORMATION

| T _A | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|---------------|-----------------|-----------------------|------------------|
| 0°C to 70°C | PDIP – N | Tube | SN74ALS540N | SN74ALS540N |
| | | | SN74ALS540-1N | SN74ALS540-1N |
| | | | SN74ALS541N | SN74ALS541N |
| | | | SN74ALS541-1N | SN74ALS541-1N |
| | SOIC – DW | Tube | SN74ALS540DW | ALS540 |
| | | Tape and reel | SN74ALS540DWR | |
| | | Tube | SN74ALS540-1DW | ALS540-1 |
| | | Tube | SN74ALS541DW | |
| | | Tape and reel | SN74ALS541DWR | ALS541 |
| | | Tube | SN74ALS541-1DW | |
| | SOP – NS | Tape and reel | SN74ALS540NSR | ALS540 |
| | | | SN74ALS540-1NSR | ALS540-1 |
| SN74ALS541NSR | | | ALS541 | |
| SSOP – DB | Tape and reel | SN74ALS541DBR | G541 | |
| | | SN74ALS541-1DBR | G541-1 | |
| –55°C to 125°C | CDIP – J | Tube | SNJ54ALS541J | SNJ54ALS541J |
| | LCCC – FK | Tube | SNJ54ALS541FK | SNJ54ALS541FK |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

logic diagrams (positive logic)



SN54ALS541, SN74ALS540, SN74ALS541 OCTAL BUFFERS AND LINE DRIVERS WITH 3-STATE OUTPUTS

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absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

| | |
|---|----------------|
| Supply voltage, V_{CC} | 7 V |
| Input voltage, V_I | 7 V |
| Voltage applied to a disabled 3-state output | 5.5 V |
| Package thermal impedance, θ_{JA} (see Note 1): DB package | 70°C/W |
| DW package | 58°C/W |
| N package | 69°C/W |
| NS package | 60°C/W |
| Storage temperature range, T_{stg} | –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 package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

| | | SN54ALS541 | | | SN74ALS540 SN74ALS541 | | | 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 | | | 0.7 | | | 0.8 | V |
| I_{OH} | High-level output current | | | –12 | | | –15 | mA |
| I_{OL} | Low-level output current | | | 12 | | | 24 | mA |
| | | | | | | | 48† | |
| T_A | Operating free-air temperature | –55 | | 125 | 0 | | 70 | °C |

† Applies only to the -1 version and only if V_{CC} is between 4.75 V and 5.25 V



SN54ALS541, SN74ALS540, SN74ALS541

OCTAL BUFFERS AND LINE DRIVERS

WITH 3-STATE OUTPUTS

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

| PARAMETER | TEST CONDITIONS | | SN54ALS541 | | | SN74ALS540 SN74ALS541 | | | 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 to 5.5 V, I _{OH} = -0.4 mA | | V _{CC} - 2 | | | V _{CC} - 2 | | | V |
| | V _{CC} = 4.5 V | I _{OH} = -3 mA | 2.4 | 3.2 | 2.4 | 3.2 | | | |
| | | I _{OH} = -12 mA | 2 | | 2 | | | | |
| V _{OL} | V _{CC} = 4.5 V | I _{OL} = 12 mA | 0.25 | 0.4 | 0.25 | 0.4 | | | |
| | | I _{OL} = 24 mA | | | 0.35 | 0.5 | | | |
| | | I _{OL} = 48 mA [†] | | | 0.35 | 0.5 | | | |
| I _{OZH} | V _{CC} = 5.5 V, V _O = 2.7 V | 20 | | | 20 | | | μA | |
| I _{OZL} | V _{CC} = 5.5 V, V _O = 0.4 V | -20 | | | -20 | | | 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 = 0.4 V | -0.2 | | | -0.1 | | | mA | |
| I _O [§] | V _{CC} = 5.5 V, V _O = 2.25 V | -20 | | -112 | -30 | | -112 | mA | |
| I _{CC} | SN74ALS540 | V _{CC} = 5.5 V | Outputs high | | 5 | | 10 | | mA |
| | | | Outputs low | | 13 | | 22 | | |
| | | | Outputs disabled | | 11 | | 19 | | |
| | 'ALS541 | V _{CC} = 5.5 V | Outputs high | | 6 | 14 | 6 | 14 | |
| | | | Outputs low | | 15 | 25 | 15 | 25 | |
| | | | Outputs disabled | | 13.5 | 32 | 13.5 | 22 | |

[†] Applies only to the -1 version and only if V_{CC} is between 4.75 V and 5.25 V

[‡] All typical values are at V_{CC} = 5 V, T_A = 25°C.

[§] The output conditions have been chosen to produce a current that closely approximates one-half of the true short-circuit output current, I_{OS}.

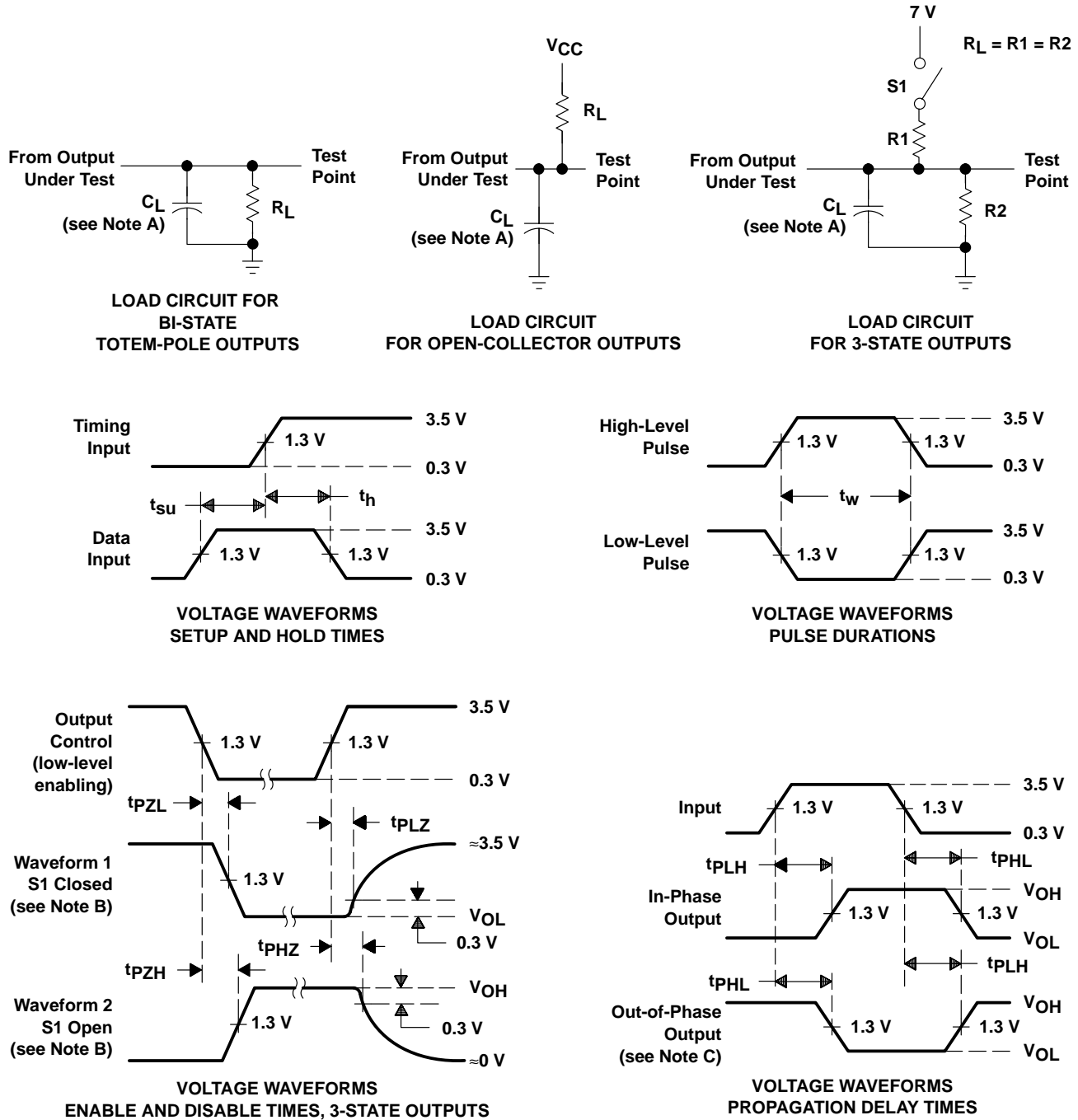
switching characteristics (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R ₁ = 500 Ω, R ₂ = 500 Ω, T _A = MIN to MAX [†] | | | | | | UNIT |
|------------------|-----------------|----------------|--|-----|------------|-----|------------|-----|------|
| | | | SN54ALS541 | | SN74ALS540 | | SN74ALS541 | | |
| | | | MIN | MAX | MIN | MAX | MIN | MAX | |
| t _{PLH} | A | Y | 4 | 17 | 2 | 12 | 4 | 14 | ns |
| t _{PHL} | | | 2 | 14 | 2 | 9 | 2 | 10 | |
| t _{PZH} | \overline{OE} | Y | 5 | 18 | 5 | 15 | 5 | 15 | ns |
| t _{PZL} | | | 8 | 28 | 8 | 20 | 8 | 20 | |
| t _{PHZ} | \overline{OE} | Y | 1 | 12 | 1 | 10 | 1 | 10 | ns |
| t _{PLZ} | | | 2 | 14 | 2 | 12 | 2 | 12 | |

[†] For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.



PARAMETER MEASUREMENT INFORMATION
 SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- NOTES: A. C_L includes probe and jig 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. When measuring propagation delay items of 3-state outputs, switch S1 is open.
 D. All input pulses have the following characteristics: $PRR \leq 1$ MHz, $t_r = t_f = 2$ ns, duty cycle = 50%.
 E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/ Ball Finish | MSL Peak Temp ⁽³⁾ | Samples (Requires Login) |
|-------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| 5962-89602012A | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Call TI | |
| 5962-8960201RA | ACTIVE | CDIP | J | 20 | 1 | TBD | Call TI | Call TI | |
| 5962-8960201SA | OBSOLETE | CFP | W | 20 | | TBD | Call TI | Call TI | |
| SN54ALS541J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 | N / A for Pkg Type | |
| SN74ALS540-1DWR | OBSOLETE | SOIC | DW | 20 | | TBD | Call TI | Call TI | |
| SN74ALS540-1N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | |
| SN74ALS540-1NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | |
| SN74ALS540-1NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS540-1NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS540-1NSRG4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS540DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS540DWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS540DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS540DWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS540N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | |
| SN74ALS540N3 | OBSOLETE | PDIP | N | 20 | | TBD | Call TI | Call TI | |
| SN74ALS540NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | |
| SN74ALS540NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS540NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS540NSRG4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541-1DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/ Ball Finish | MSL Peak Temp ⁽³⁾ | Samples (Requires Login) |
|-------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|----------------------|------------------------------|-----------------------------|
| SN74ALS541-1DWE4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541-1DWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541-1N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | |
| SN74ALS541-1NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | |
| SN74ALS541-1NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541-1NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541-1NSRG4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541DBR | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541DBRE4 | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541DBRG4 | ACTIVE | SSOP | DB | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541DWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541DWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | |
| SN74ALS541N3 | OBSOLETE | PDIP | N | 20 | | TBD | Call TI | Call TI | |
| SN74ALS541NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | |
| SN74ALS541NSR | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ALS541NSRE4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/ Ball Finish | MSL Peak Temp ⁽³⁾ | Samples (Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|----------------------|------------------------------|-----------------------------|
| SN74ALS541NSRG4 | ACTIVE | SO | NS | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SNJ54ALS541FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | POST-PLATE | N / A for Pkg Type | |
| SNJ54ALS541J | ACTIVE | CDIP | J | 20 | 1 | TBD | A42 | N / A for Pkg Type | |

⁽¹⁾ 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.

OBSELETE: TI has discontinued the production of the device.

⁽²⁾ 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)

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

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OTHER QUALIFIED VERSIONS OF SN54ALS541, SN74ALS541 :

● Catalog: [SN74ALS541](#)

● Military: [SN54ALS541](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION
REEL DIMENSIONS

TAPE DIMENSIONS


| | |
|----|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74ALS540-1NSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.2 | 13.0 | 2.5 | 12.0 | 24.0 | Q1 |
| SN74ALS540DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.0 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74ALS540NSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.2 | 13.0 | 2.5 | 12.0 | 24.0 | Q1 |
| SN74ALS541-1NSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.2 | 13.0 | 2.5 | 12.0 | 24.0 | Q1 |
| SN74ALS541DBR | SSOP | DB | 20 | 2000 | 330.0 | 16.4 | 8.2 | 7.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74ALS541DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.0 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74ALS541NSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.2 | 13.0 | 2.5 | 12.0 | 24.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74ALS540-1NSR | SO | NS | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ALS540DWR | SOIC | DW | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ALS540NSR | SO | NS | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ALS541-1NSR | SO | NS | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ALS541DBR | SSOP | DB | 20 | 2000 | 367.0 | 367.0 | 38.0 |
| SN74ALS541DWR | SOIC | DW | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ALS541NSR | SO | NS | 20 | 2000 | 367.0 | 367.0 | 45.0 |

J (R-GDIP-T**)

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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

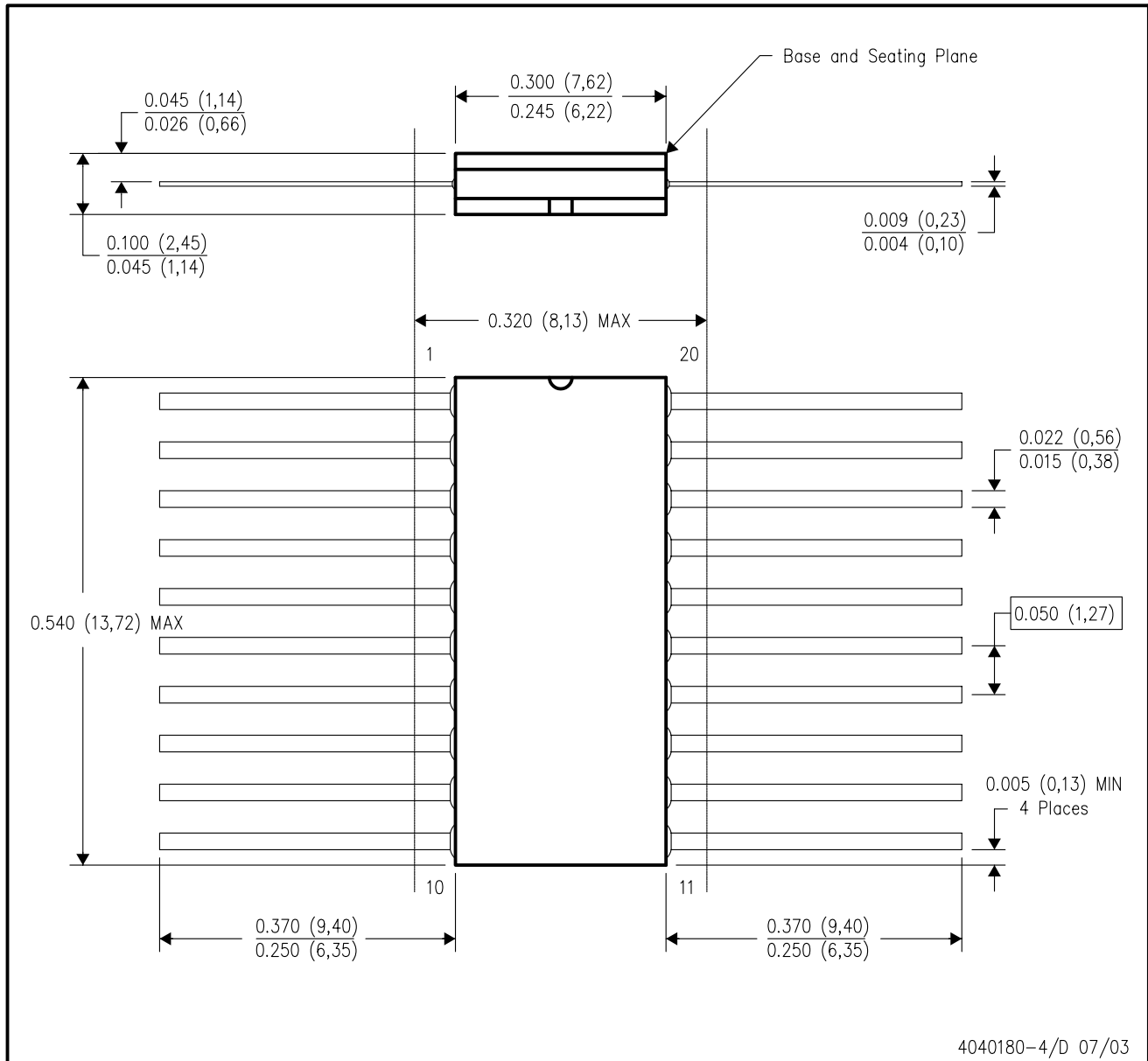


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- NOTES:
- All linear dimensions are in inches (millimeters).
 - This drawing is subject to change without notice.
 - This package is hermetically sealed with a ceramic lid using glass frit.
 - Index point is provided on cap for terminal identification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

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within Mil-Std 1835 GDFP2-F20

FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



| NO. OF TERMINALS ** | A | | B | |
|---------------------|------------------|------------------|------------------|------------------|
| | MIN | MAX | MIN | MAX |
| 20 | 0.342 (8,69) | 0.358 (9,09) | 0.307 (7,80) | 0.358 (9,09) |
| 28 | 0.442 (11,23) | 0.458 (11,63) | 0.406 (10,31) | 0.458 (11,63) |
| 44 | 0.640 (16,26) | 0.660 (16,76) | 0.495 (12,58) | 0.560 (14,22) |
| 52 | 0.740 (18,78) | 0.761 (19,32) | 0.495 (12,58) | 0.560 (14,22) |
| 68 | 0.938 (23,83) | 0.962 (24,43) | 0.850 (21,6) | 0.858 (21,8) |
| 84 | 1.141 (28,99) | 1.165 (29,59) | 1.047 (26,6) | 1.063 (27,0) |



4040140/D 01/11

- 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.
 - Falls within JEDEC MS-004

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- 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.

DW (R-PDSO-G20)

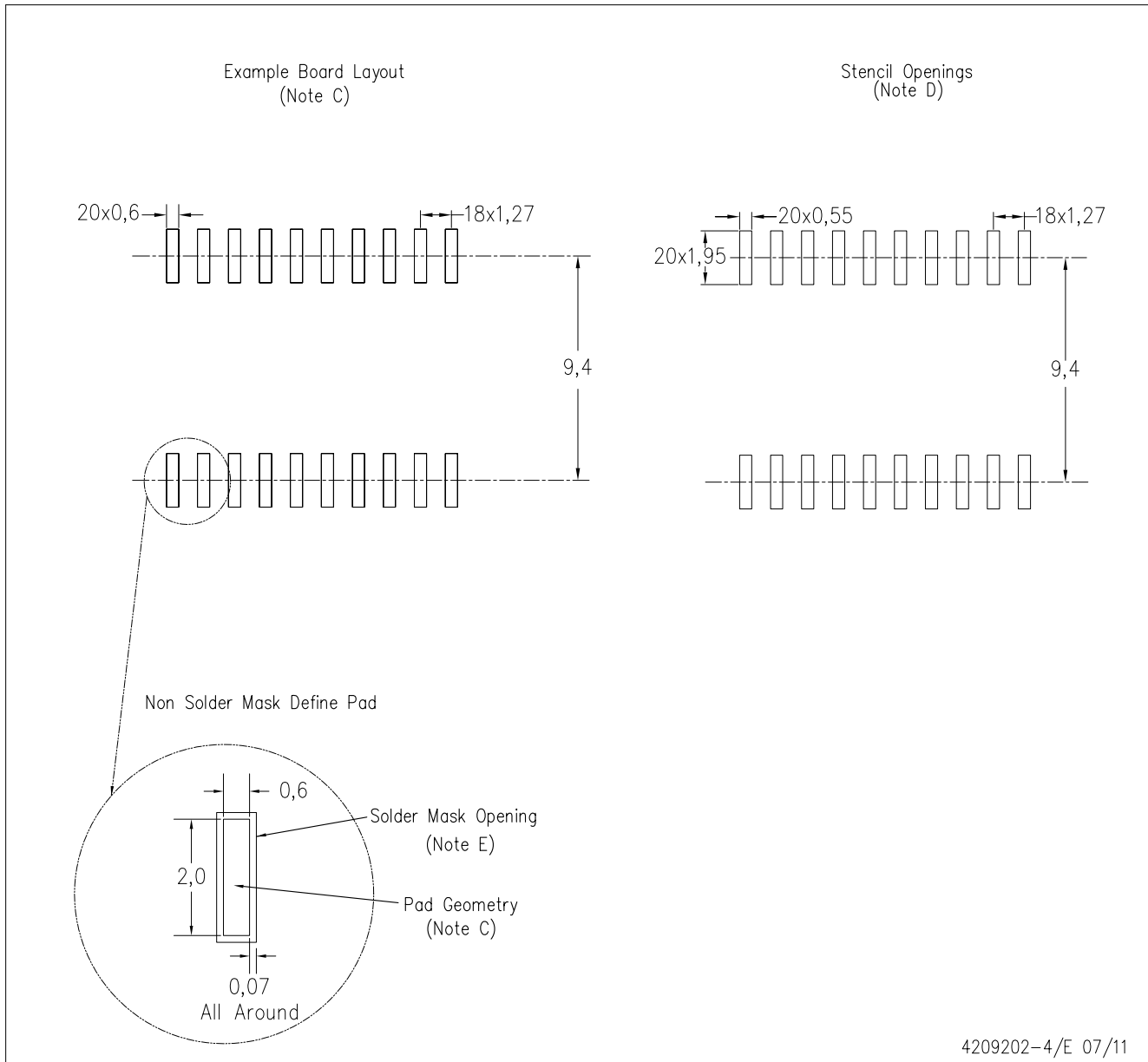
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
 - D. Falls within JEDEC MS-013 variation AC.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



4209202-4/E 07/11

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Refer to IPC7351 for alternate board design.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

MECHANICAL DATA

NS (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.

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