



THE DATASHEET OF SN74ALS642AN



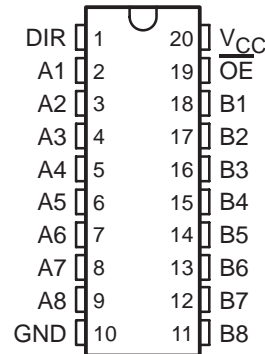
SN74ALS641A, SN74ALS642A, SN74AS641 OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS

SDAS300 – MARCH 1995

- Bidirectional Bus Transceivers in High-Density 20-Pin Packages
- Choice of True or Inverting Logic
- Package Options Include Plastic Small-Outline (DW) Packages and Standard Plastic (N) 300-mil DIPs

| DEVICE | LOGIC |
|------------------------|-----------|
| SN74ALS641A, SN74AS641 | True |
| SN74ALS642A | Inverting |

DW OR N PACKAGE
(TOP VIEW)



description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. These devices transmit data from the A bus to the B bus or from the B bus to the A bus, depending upon the level at the direction-control (DIR) input. The output-enable (\overline{OE}) input disables the device so that the buses are effectively isolated.

The -1 versions of the SN74ALS641A and SN74ALS642A are identical to the standard versions, except that the recommended maximum I_{OL} is increased to 48 mA in the -1 versions.

The SN74ALS641A, SN74ALS642A, and SN74AS641 are characterized for operation from 0°C to 70°C.

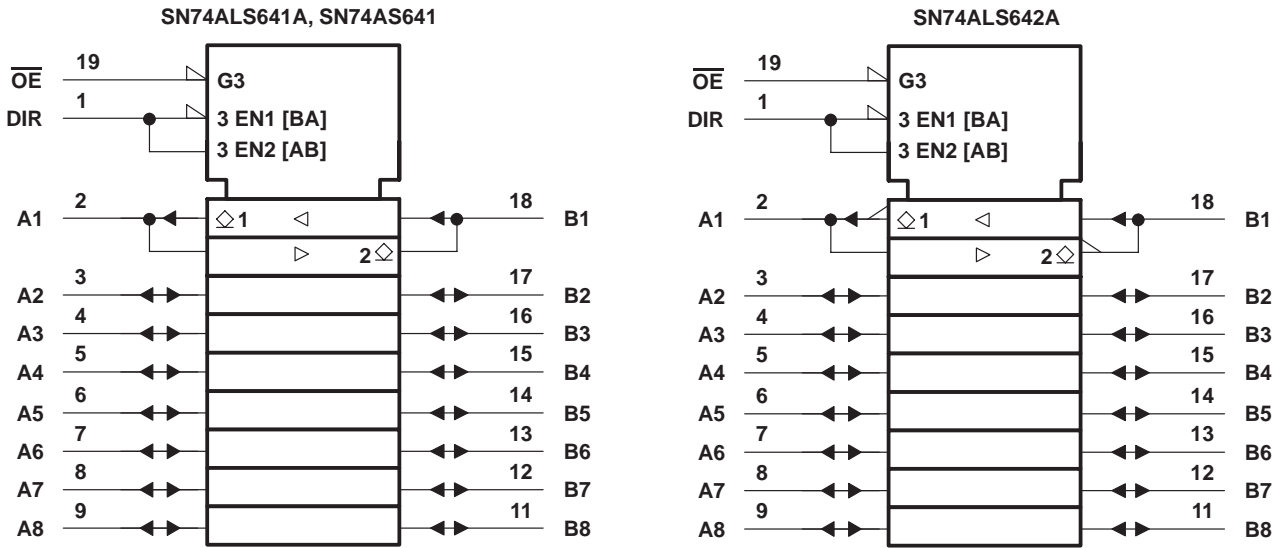
FUNCTION TABLE

| INPUTS | | OPERATION | |
|-----------------|-----|--------------------------|------------------------------|
| \overline{OE} | DIR | SN74ALS641A SN74AS641 | SN74ALS642A |
| L | L | B data to A bus | \overline{B} data to A bus |
| L | H | A data to B bus | \overline{A} data to B bus |
| H | X | Isolation | Isolation |

SN74ALS641A, SN74ALS642A, SN74AS641 OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS

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logic symbols†

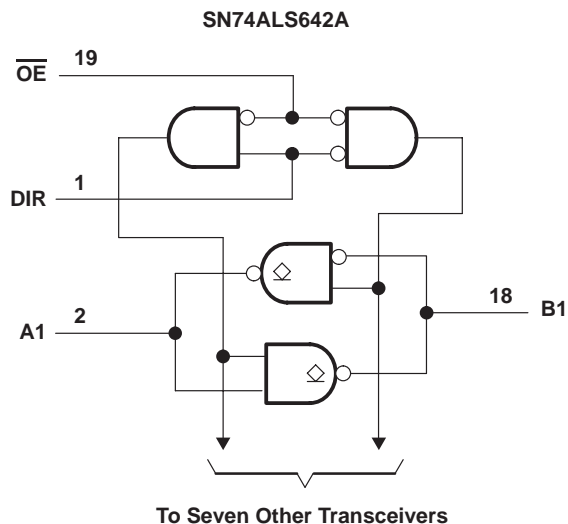
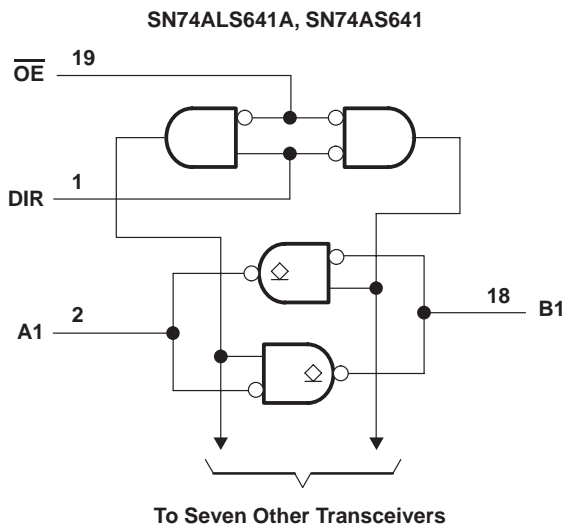


† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

SN74ALS641A, SN74ALS642A, SN74AS641 OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS

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logic diagrams (positive logic)



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

| | |
|--|----------------|
| Supply voltage, V_{CC} | 7 V |
| Input voltage, V_I : All inputs and I/O ports | 7 V |
| Operating free-air temperature range, T_A : SN74ALS641A, SN74ALS642A | 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.

recommended operating conditions

| | | SN74ALS641A SN74ALS642A | | | UNIT |
|----------|--------------------------------|----------------------------|-----|-----|------|
| | | MIN | NOM | MAX | |
| V_{CC} | Supply voltage | 4.5 | 5 | 5.5 | V |
| V_{IH} | High-level input voltage | 2 | | | V |
| V_{IL} | Low-level input voltage | | | 0.8 | V |
| V_{OH} | High-level output voltage | | | 5.5 | V |
| I_{OL} | Low-level output current | | | 24 | mA |
| | | | | 48‡ | |
| T_A | Operating free-air temperature | 0 | | 70 | °C |

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



SN74ALS641A, SN74ALS642A, SN74AS641

OCTAL BUS TRANSCEIVERS

WITH OPEN-COLLECTOR OUTPUTS

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

| PARAMETER | | TEST CONDITIONS | | SN74ALS641A SN74ALS642A | | | UNIT |
|-----------|----------------|---------------------------|----------------------------------|----------------------------|------|------|---------------|
| | | | | MIN | TYP† | MAX | |
| V_{IK} | | $V_{CC} = 4.5\text{ V}$, | $I_I = -18\text{ mA}$ | | | -1.5 | V |
| I_{OH} | | $V_{CC} = 4.5\text{ V}$, | $V_{OH} = 5.5\text{ V}$ | | | 0.1 | mA |
| V_{OL} | | $V_{CC} = 4.5\text{ V}$ | $I_{OL} = 12\text{ mA}$ | | 0.25 | 0.4 | V |
| | | | $I_{OL} = 24\text{ mA}$ | | 0.35 | 0.5 | |
| | | | $I_{OL} = 48\text{ mA}^\ddagger$ | | 0.35 | 0.5 | |
| I_I | Control inputs | $V_{CC} = 5.5\text{ V}$, | $V_I = 7\text{ V}$ | | | 0.1 | mA |
| I_{IH} | Control inputs | $V_{CC} = 5.5\text{ V}$, | $V_I = 2.7\text{ V}$ | | | 20 | μA |
| | A or B ports§ | | | | | 20 | |
| I_{IL} | Control inputs | $V_{CC} = 5.5\text{ V}$, | $V_I = 0.4\text{ V}$ | | | -0.1 | mA |
| | A or B ports§ | | | | | -0.1 | |
| I_{CC} | SN74ALS641A | $V_{CC} = 5.5\text{ V}$ | Outputs high | | 25 | 37 | mA |
| | | | Outputs low | | 33 | 47 | |
| | SN74ALS642A | $V_{CC} = 5.5\text{ V}$ | Outputs high | | 8 | 15 | |
| | | | Outputs low | | 18 | 28 | |

† All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

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

§ For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.

switching characteristics (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$, $C_L = 50\text{ pF}$, $R_L = 680\ \Omega$, $T_A = \text{MIN to MAX}^\parallel$ | | | | UNIT |
|-----------|-----------------|----------------|---|-----|-------------|-----|------|
| | | | SN74ALS641A | | SN74ALS642A | | |
| | | | MIN | MAX | MIN | MAX | |
| t_{PLH} | A or B | B or A | 5 | 25 | 10 | 30 | ns |
| t_{PHL} | | | 3 | 18 | 5 | 22 | |
| t_{PLH} | \overline{OE} | A or B | 8 | 30 | 10 | 30 | ns |
| t_{PHL} | | | 8 | 30 | 15 | 38 | |
| t_{PLH} | DIR | A or B | 8 | 32 | 10 | 30 | ns |
| t_{PHL} | | | 8 | 32 | 15 | 38 | |

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



SN74ALS641A, SN74ALS642A, SN74AS641 OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS

SDAS300 – MARCH 1995

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

| | |
|---|----------------|
| Supply voltage, V_{CC} | 7 V |
| Input voltage, V_I : All inputs and I/O ports | 7 V |
| Operating free-air temperature range, T_A : SN74AS641 | 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.

recommended operating conditions

| | | SN74AS641 | | | UNIT |
|----------|--------------------------------|-----------|-----|-----|------|
| | | MIN | NOM | MAX | |
| V_{CC} | Supply voltage | 4.5 | 5 | 5.5 | V |
| V_{IH} | High-level input voltage | 2 | | | V |
| V_{IL} | Low-level input voltage | | | 0.8 | V |
| V_{OH} | High-level output voltage | | | 5.5 | V |
| I_{OL} | Low-level output current | | | 64 | mA |
| T_A | Operating free-air temperature | 0 | | 70 | °C |

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

| PARAMETER | | TEST CONDITIONS | | SN74AS641 | | UNIT |
|-----------|----------------|---------------------------|-------------------------|-----------|-------|------|
| | | | | MIN | TYP‡ | |
| V_{IK} | | $V_{CC} = 4.5\text{ V}$, | $I_I = -18\text{ mA}$ | | –1.2 | V |
| I_{OH} | | $V_{CC} = 4.5\text{ V}$, | $V_{OH} = 5.5\text{ V}$ | | 0.1 | mA |
| V_{OL} | | $V_{CC} = 4.5\text{ V}$, | $I_{OL} = 64\text{ mA}$ | 0.35 | 0.55 | V |
| I_I | Control inputs | $V_{CC} = 5.5\text{ V}$ | $V_I = 7\text{ V}$ | | 0.1 | mA |
| | A or B ports | | $V_I = 5.5\text{ V}$ | | 0.1 | |
| I_{IH} | Control inputs | $V_{CC} = 5.5\text{ V}$, | $V_I = 2.7\text{ V}$ | | 20 | µA |
| | A or B ports§ | | | | 70 | |
| I_{IL} | Control inputs | $V_{CC} = 5.5\text{ V}$, | $V_I = 0.4\text{ V}$ | | –0.5 | mA |
| | A or B ports§ | | | | –0.75 | |
| I_{CC} | | $V_{CC} = 5.5\text{ V}$ | Outputs high | 50 | 82 | mA |
| | | | Outputs low | 84 | 136 | |

‡ All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

§ For I/O ports, the parameters I_{IH} and I_{IL} include the off-state output current.



SN74ALS641A, SN74ALS642A, SN74AS641
OCTAL BUS TRANSCEIVERS
WITH OPEN-COLLECTOR OUTPUTS

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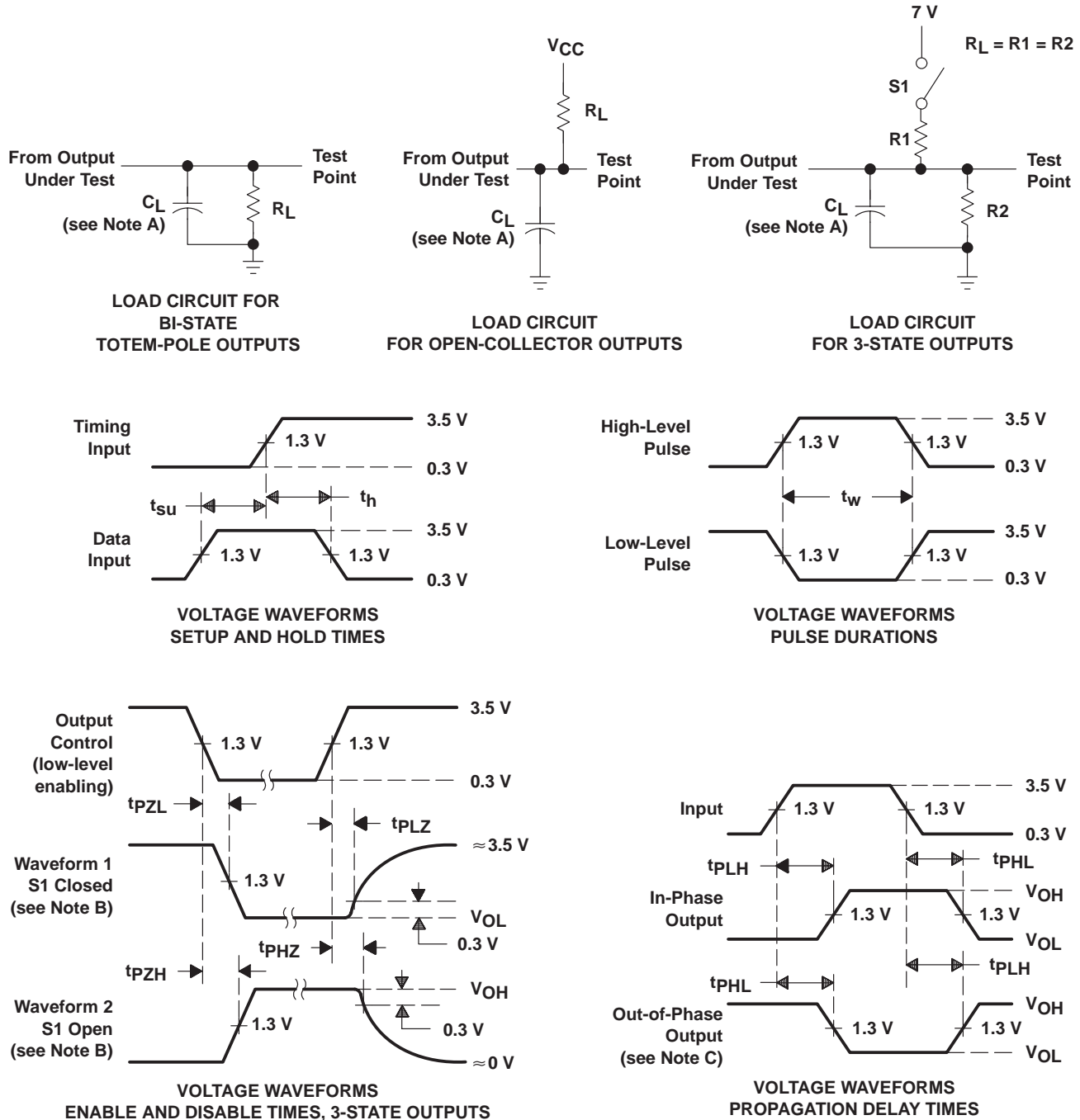
switching characteristics (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V _{CC} = 4.5 V to 5.5 V, C _L = 50 pF, R _L = 680 Ω, T _A = MIN to MAX† | | UNIT |
|------------------|-----------------|----------------|---|-----|------|
| | | | SN74AS641 | | |
| | | | MIN | MAX | |
| t _{PLH} | A or B | B or A | 5 | 21 | ns |
| t _{PHL} | | | 1 | 7.5 | |
| t _{PLH} | \overline{OE} | A or B | 5 | 21 | ns |
| t _{PHL} | | | 1 | 9 | |
| t _{PLH} | DIR | A or B | 5 | 22 | ns |
| t _{PHL} | | | 1 | 10 | |

† 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 finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74ALS641A-1DWR | ACTIVE | SOIC | DW | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | ALS641A-1 | Samples |
| SN74ALS641A-1N | ACTIVE | PDIP | N | 20 | 20 | RoHS & Non-Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74ALS641A-1N | Samples |
| SN74ALS641A-1NSR | ACTIVE | SO | NS | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | ALS641A-1 | Samples |
| SN74ALS641ADWR | ACTIVE | SOIC | DW | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | ALS641A | Samples |
| SN74ALS641AN | ACTIVE | PDIP | N | 20 | 20 | RoHS & Non-Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74ALS641AN | Samples |
| SN74ALS641ANSR | ACTIVE | SO | NS | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | ALS641A | Samples |
| SN74ALS642A-1DW | ACTIVE | SOIC | DW | 20 | 25 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | ALS642A-1 | Samples |
| SN74ALS642A-1N | ACTIVE | PDIP | N | 20 | 20 | RoHS & Non-Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74ALS642A-1N | Samples |
| SN74ALS642A-1NSR | ACTIVE | SO | NS | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | ALS642A-1 | Samples |
| SN74AS641DW | ACTIVE | SOIC | DW | 20 | 25 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | AS641 | Samples |
| SN74AS641N | ACTIVE | PDIP | N | 20 | 20 | RoHS & Non-Green | NIPDAU | N / A for Pkg Type | 0 to 70 | SN74AS641N | Samples |

(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.

OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

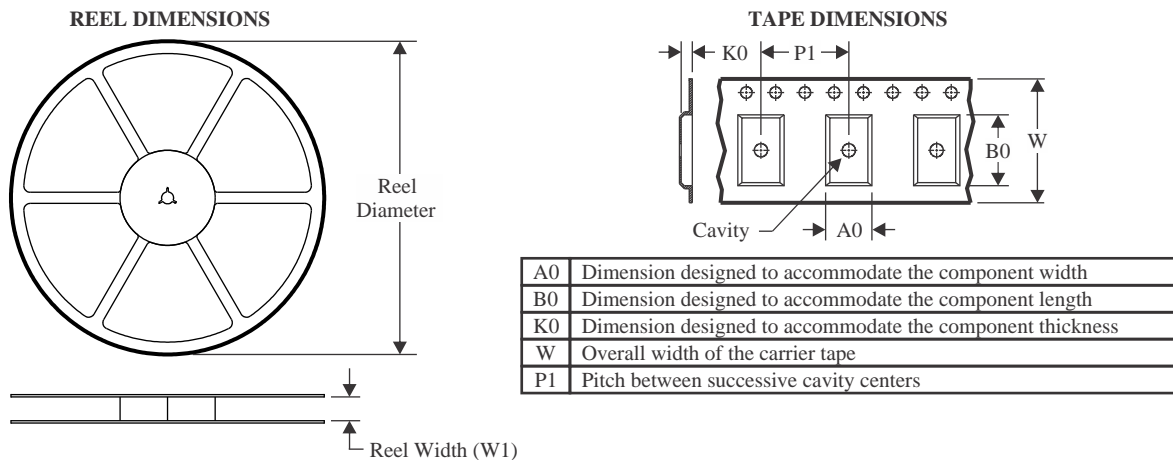
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

- (3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*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 |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74ALS641A-1DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.3 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74ALS641A-1NSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.4 | 13.0 | 2.5 | 12.0 | 24.0 | Q1 |
| SN74ALS641ADWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.3 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74ALS641ANSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.4 | 13.0 | 2.5 | 12.0 | 24.0 | Q1 |
| SN74ALS642A-1NSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.4 | 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) |
|------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74ALS641A-1DWR | SOIC | DW | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ALS641A-1NSR | SO | NS | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ALS641ADWR | SOIC | DW | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ALS641ANSR | SO | NS | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74ALS642A-1NSR | SO | NS | 20 | 2000 | 367.0 | 367.0 | 45.0 |

TUBE


*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|-----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74ALS641A-1N | N | PDIP | 20 | 20 | 506 | 13.97 | 11230 | 4.32 |
| SN74ALS641AN | N | PDIP | 20 | 20 | 506 | 13.97 | 11230 | 4.32 |
| SN74ALS642A-1DW | DW | SOIC | 20 | 25 | 507 | 12.83 | 5080 | 6.6 |
| SN74ALS642A-1N | N | PDIP | 20 | 20 | 506 | 13.97 | 11230 | 4.32 |
| SN74AS641DW | DW | SOIC | 20 | 25 | 507 | 12.83 | 5080 | 6.6 |
| SN74AS641N | N | PDIP | 20 | 20 | 506 | 13.97 | 11230 | 4.32 |

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.

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.
 - $\triangle C$ Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - $\triangle D$ The 20 pin end lead shoulder width is a vendor option, either half or full width.

DW0020A



PACKAGE OUTLINE

SOIC - 2.65 mm max height

SOIC



4220724/A 05/2016

NOTES:

1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm per side.
5. Reference JEDEC registration MS-013.

EXAMPLE BOARD LAYOUT

DW0020A

SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE
SCALE:6X



SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

4220724/A 05/2016

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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