

# SN54LS640 THRU SN54LS642, SN54LS644, SN54LS645 SN74LS640 THRU SN74LS642, SN74LS644, SN74LS645 OCTAL BUS TRANSCEIVERS

SDLS189 – APRIL 1979 – REVISED MARCH 1988

- **SN74LS64X-1 Versions Rated at  $I_{OL}$  of 48 mA**
- **Bi-directional Bus Transceivers in High-Density 20-Pin Packages**
- **Hysteresis at Bus Inputs Improves Noise Margins**
- **Choice of True or Inverting Logic**
- **Choice of 3-State or Open-Collector Outputs**

| DEVICE | OUTPUT         | LOGIC              |
|--------|----------------|--------------------|
| 'LS640 | 3-State        | Inverting          |
| 'LS641 | Open-Collector | True               |
| 'LS642 | Open-Collector | Inverting          |
| 'LS644 | Open-Collector | True and inverting |
| 'LS645 | 3-State        | True               |

## description

These octal bus transceivers are designed for asynchronous two-way communication between data buses. The 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 enable input ( $\bar{G}$ ) can be used to disable the device so the buses are effectively isolated.

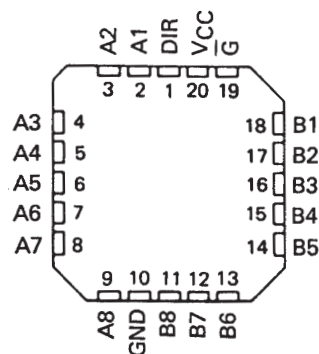
The -1 versions of the SN74LS640 thru SN74LS642, SN74LS644, and SN74LS645 are identical to the standard versions except that the recommended maximum  $I_{OL}$  is increased to 48 milliamperes. There are no -1 versions of the SN54LS640 thru SN54LS642, SN54LS644, and SN54LS645.

The SN54LS640 thru SN54LS642, SN54LS644, and SN54LS645 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74LS640 thru SN74LS642, SN74LS644, and SN74LS645 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54LS' . . . J PACKAGE  
SN74LS' . . . DW OR N PACKAGE  
(TOP VIEW)



SN54LS' . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE

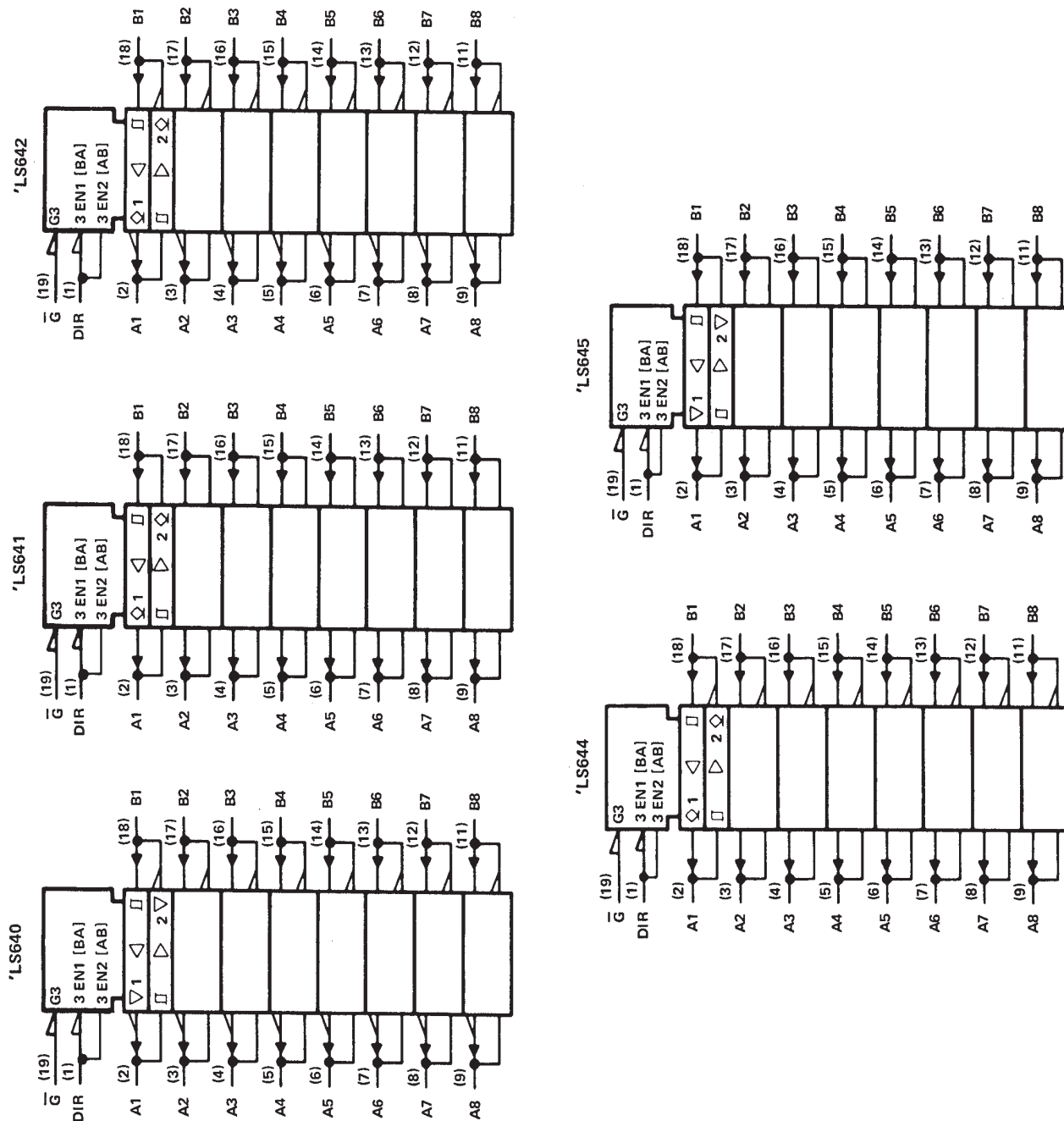
| CONTROL INPUTS |     | OPERATION        |                  |                         |
|----------------|-----|------------------|------------------|-------------------------|
| $\bar{G}$      | DIR | 'LS640<br>'LS642 | 'LS641<br>'LS645 | 'LS644                  |
| L              | L   | B data to A bus  | B data to A bus  | B data to A bus         |
| L              | H   | A data to B bus  | A data to B bus  | $\bar{A}$ data to B bus |
| H              | X   | Isolation        | Isolation        | Isolation               |

H = high level, L = low level, X = irrelevant

# SN54LS640 THRU SN54LS642, SN54LS644, SN54LS645 SN74LS640 THRU SN74LS642, SN74LS644, SN74LS645 OCTAL BUS TRANSCEIVERS

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logic symbols†

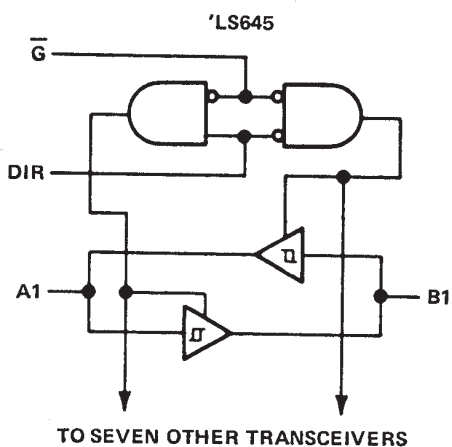
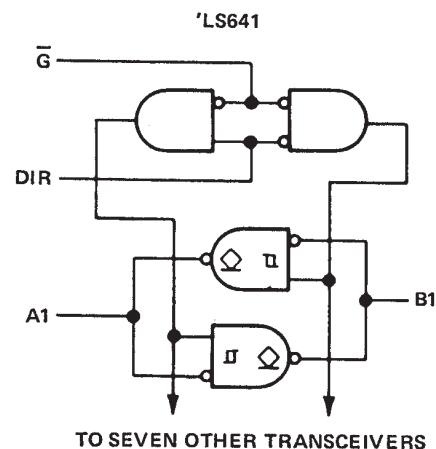
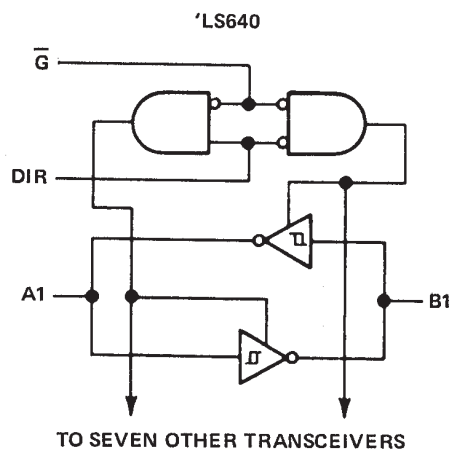


† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for DW, J, and N packages.

SN54LS640 THRU SN54LS642, SN54LS644, SN54LS645  
 SN74LS640 THRU SN74LS642, SN74LS644, SN74LS645  
 OCTAL BUS TRANSCEIVERS

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logic diagrams (positive logic)



**SN54LS640, SN54LS645**  
**SN74LS640, SN74LS645**  
**OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS**

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

|                                                                      |                   |
|----------------------------------------------------------------------|-------------------|
| Supply voltage, $V_{CC}$ (see Note 1) . . . . .                      | 7 V               |
| Input voltage: All inputs . . . . .                                  | 7 V               |
| I/O ports . . . . .                                                  | 5.5 V             |
| Operating free-air temperature range: SN54LS640, SN54LS645 . . . . . | – 55 °C to 125 °C |
| SN74LS640, SN74LS645 . . . . .                                       | 0 °C to 70 °C     |
| Storage temperature range . . . . .                                  | – 65 °C to 150 °C |

NOTE 1: Voltage values are with respect to network ground terminal.

**recommended operating conditions**

| PARAMETER                            | SN54LS640<br>SN54LS645 |     |      | SN74LS640<br>SN74LS645 |     |      | UNIT |
|--------------------------------------|------------------------|-----|------|------------------------|-----|------|------|
|                                      | MIN                    | NOM | MAX  | MIN                    | NOM | MAX  |      |
| $V_{CC}$ Supply voltage              | 4.5                    | 5   | 5.5  | 4.75                   | 5   | 5.25 | V    |
| $V_{IH}$ High-level input voltage    | 2                      |     |      | 2                      |     |      | V    |
| $V_{IL}$ Low-level input voltage     |                        |     | 0.5  |                        |     | 0.6  | 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   |

†The 48-mA limit applies for the SN74LS640-1 and SN74LS645-1 only.

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

| PARAMETER                                          |                  | TEST CONDITIONS†                                                       |                           | SN54LS640<br>SN54LS645 |       | SN74LS640<br>SN74LS645 |       | UNIT |
|----------------------------------------------------|------------------|------------------------------------------------------------------------|---------------------------|------------------------|-------|------------------------|-------|------|
|                                                    |                  |                                                                        |                           | MIN                    | TYP‡  | MAX                    | MIN   |      |
| V <sub>IK</sub>                                    |                  | V <sub>CC</sub> = MIN, I <sub>I</sub> = − 18 mA                        |                           | − 1.5                  |       | − 1.5                  |       | V    |
| Hysteresis<br>(V <sub>T+</sub> − V <sub>T−</sub> ) |                  | V <sub>CC</sub> = MIN,                                                 | A or B input              | 0.1                    | 0.4   | 0.2                    | 0.4   | V    |
| V <sub>OH</sub>                                    |                  | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = MAX | I <sub>OH</sub> = − 3 mA  | 2.4                    | 3.4   | 2.4                    | 3.4   | V    |
|                                                    |                  |                                                                        | I <sub>OH</sub> = MAX     | 2                      |       | 2                      |       |      |
| V <sub>OL</sub>                                    |                  | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V,<br>V <sub>IL</sub> = MAX | I <sub>OL</sub> = 12 mA   | 0.25                   | 0.4   | 0.25                   | 0.4   |      |
|                                                    |                  |                                                                        | I <sub>OL</sub> = 24 mA   |                        |       | 0.35                   | 0.5   |      |
|                                                    |                  |                                                                        | I <sub>OL</sub> = 48 mA # |                        |       | 0.4                    | 0.5   |      |
| I <sub>OZH</sub>                                   |                  | V <sub>CC</sub> = MAX, $\bar{G}$ at 2 V,                               | V <sub>O</sub> = 2.7 V    | 20                     |       | 20                     |       | μA   |
| I <sub>OZL</sub>                                   |                  | V <sub>CC</sub> = MAX, $\bar{G}$ at 2 V,                               | V <sub>O</sub> = 0.4 V    | − 0.4                  |       | − 0.4                  |       | mA   |
| I <sub>I</sub>                                     | A or B           | V <sub>CC</sub> = MAX                                                  | V <sub>I</sub> = 5.5 V    | 0.1                    |       | 0.1                    |       | mA   |
|                                                    | DIR or $\bar{G}$ |                                                                        | V <sub>I</sub> = 7 V      | 0.1                    |       | 0.1                    |       |      |
| I <sub>IH</sub>                                    |                  | V <sub>CC</sub> = MAX, V <sub>IH</sub> = 2.7 V                         |                           | 20                     |       | 20                     |       | μA   |
| I <sub>IL</sub>                                    |                  | V <sub>CC</sub> = MAX, V <sub>IL</sub> = 0.4 V                         |                           | − 0.4                  |       | − 0.4                  |       | mA   |
| I <sub>OS</sub> †                                  |                  | V <sub>CC</sub> = MAX                                                  |                           | − 40                   | − 225 | − 40                   | − 225 | mA   |
| I <sub>CC</sub>                                    | Outputs high     | V <sub>CC</sub> = MAX, Outputs open                                    |                           | 48                     | 70    | 48                     | 70    | mA   |
|                                                    | Outputs low      |                                                                        |                           | 62                     | 90    | 62                     | 90    |      |
|                                                    | Outputs at Hi-Z  |                                                                        |                           | 64                     | 95    | 64                     | 95    |      |

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

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

†Not more than one output should be shorted at a time, and duration of the short-circuit should not exceed one second.

#The 48-mA condition applies for the SN74LS640-1 and SN74LS645-1 only.

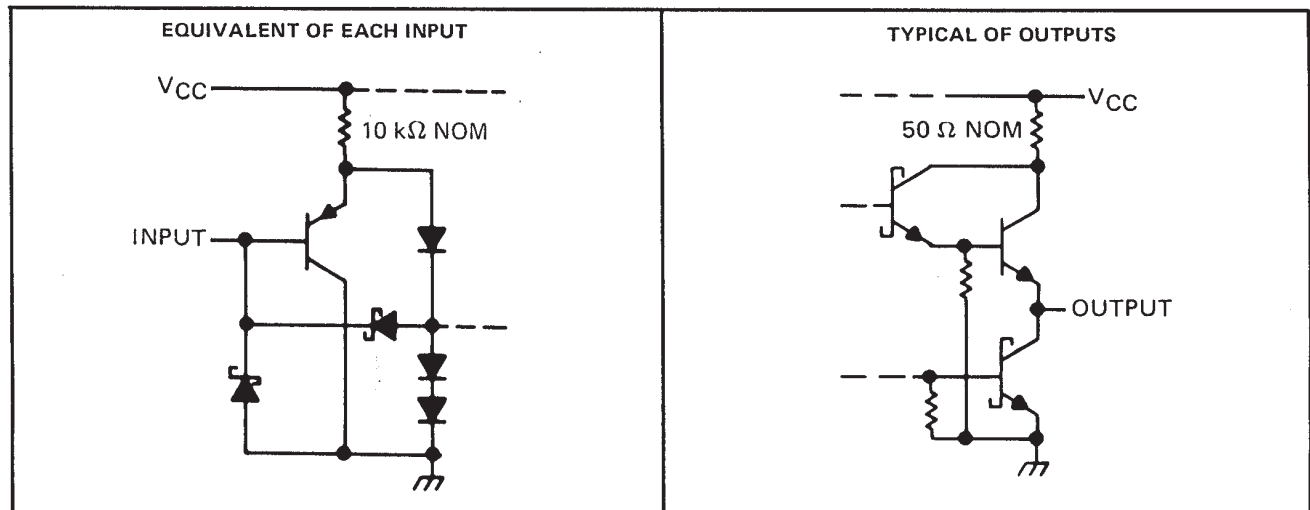


switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

| PARAMETER                                                     | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST<br>CONDITIONS                                            | 'LS640, 'LS640-1 |     |     | 'LS645, 'LS645-1 |     |     | UNIT |
|---------------------------------------------------------------|-----------------|----------------|---------------------------------------------------------------|------------------|-----|-----|------------------|-----|-----|------|
|                                                               |                 |                |                                                               | MIN              | TYP | MAX | MIN              | TYP | MAX |      |
| $t_{PLH}$ Propagation delay time,<br>low-to-high-level output | A               | B              | $C_L = 45\text{ pF}$ ,<br>$R_L = 667\ \Omega$ ,<br>See Note 2 |                  | 6   | 10  |                  | 8   | 15  | ns   |
|                                                               | B               | A              |                                                               |                  | 6   | 10  |                  | 8   | 15  |      |
| $t_{PHL}$ Propagation delay time,<br>high-to-low-level output | A               | B              |                                                               |                  | 8   | 15  |                  | 11  | 15  | ns   |
|                                                               | B               | A              |                                                               |                  | 8   | 15  |                  | 11  | 15  |      |
| $t_{PZL}$ Output enable time to<br>low level                  | $\overline{G}$  | A              |                                                               |                  | 31  | 40  |                  | 31  | 40  | ns   |
|                                                               | $\overline{G}$  | B              |                                                               |                  | 31  | 40  |                  | 31  | 40  |      |
| $t_{PZH}$ Output enable time to<br>high level                 | $\overline{G}$  | A              |                                                               |                  | 23  | 40  |                  | 26  | 40  | ns   |
|                                                               | $\overline{G}$  | B              |                                                               |                  | 23  | 40  |                  | 26  | 40  |      |
| $t_{PLZ}$ Output disable time<br>from low level               | $\overline{G}$  | A              | $C_L = 5\text{ pF}$ ,<br>$R_L = 667\ \Omega$ ,<br>See Note 2  |                  | 15  | 25  |                  | 15  | 25  | ns   |
|                                                               | $\overline{G}$  | B              |                                                               |                  | 15  | 25  |                  | 15  | 25  |      |
| $t_{PHZ}$ Output disable time<br>from high level              | $\overline{G}$  | A              |                                                               |                  | 15  | 25  |                  | 15  | 25  | ns   |
|                                                               | $\overline{G}$  | B              |                                                               |                  | 15  | 25  |                  | 15  | 25  |      |

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

#### schematics of inputs and outputs

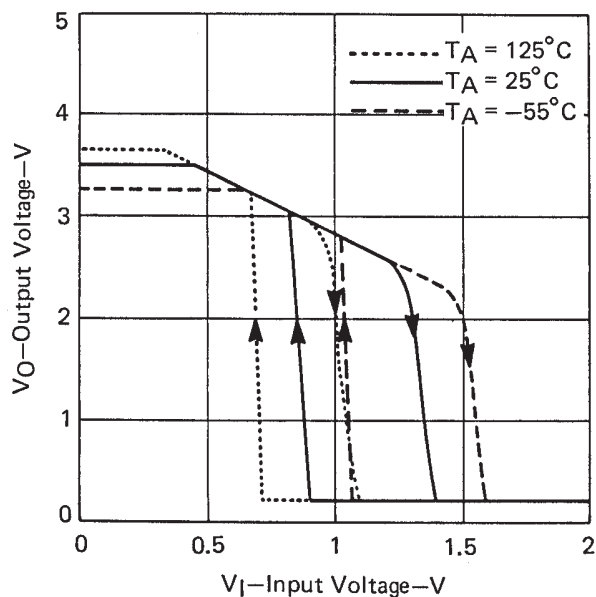


**SN54LS640, SN54LS645**  
**SN74LS640, SN74LS645**  
**OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS**

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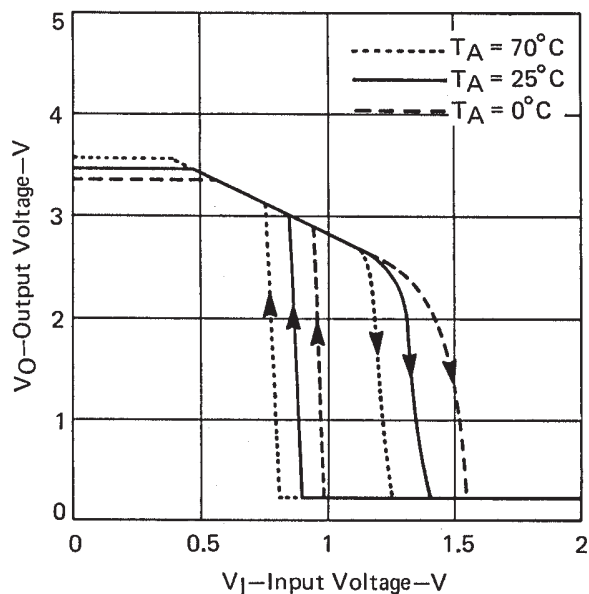
**TYPICAL CHARACTERISTICS**

**SN54LS'**  
**INVERTING OUTPUT VOLTAGE**  
 vs  
**INPUT VOLTAGE**



**FIGURE 1**

**SN74LS'**  
**INVERTING OUTPUT VOLTAGE**  
 vs  
**INPUT VOLTAGE**



**FIGURE 2**

**SN54LS'**  
**NONINVERTING OUTPUT VOLTAGE**  
 vs  
**INPUT VOLTAGE**



**FIGURE 3**

**SN74LS'**  
**NONINVERTING OUTPUT VOLTAGE**  
 vs  
**INPUT VOLTAGE**



**FIGURE 4**

|                                                                       |                 |
|-----------------------------------------------------------------------|-----------------|
| Supply voltage, V <sub>CC</sub> (see Note 1)                          | 7 V             |
| Input voltage: All inputs and I/O ports                               | 7 V             |
| Operating free-air temperature range: SN54LS641, SN54LS642, SN54LS644 | – 55°C to 125°C |
| SN74LS641, SN74LS642, SN74LS644                                       | 0°C to 70°C     |
| Storage temperature range                                             | – 65°C to 150°C |

| PARAMETER                                     | SN54LS641<br>SN54LS642<br>SN54LS644 |     |     | SN74LS641<br>SN74LS642<br>SN74LS644 |     |      | UNIT |
|-----------------------------------------------|-------------------------------------|-----|-----|-------------------------------------|-----|------|------|
|                                               | MIN                                 | NOM | MAX | MIN                                 | NOM | MAX  |      |
| V <sub>CC</sub> Supply voltage                | 4.5                                 | 5   | 5.5 | 4.75                                | 5   | 5.25 | V    |
| V <sub>IH</sub> High-level input voltage      | 2                                   |     |     | 2                                   |     |      | V    |
| V <sub>IL</sub> Low-level input voltage       |                                     |     | 0.5 |                                     |     | 0.6  | V    |
| V <sub>OH</sub> High-level output voltage     |                                     |     | 5.5 |                                     |     | 5.5  | V    |
| I <sub>OL</sub> Low-level output current      |                                     |     | 12  |                                     |     | 24   | mA   |
|                                               |                                     |     |     |                                     |     | 48 § |      |
| T <sub>A</sub> Operating free-air temperature | − 55                                |     | 125 | 0                                   |     | 70   | °C   |

| PARAMETER                           |                  | TEST CONDITIONS†       | SN54LS641<br>SN54LS642<br>SN54LS644                                          |                                                     | SN74LS641<br>SN74LS642<br>SN74LS644 |      | UNIT |      |               |    |
|-------------------------------------|------------------|------------------------|------------------------------------------------------------------------------|-----------------------------------------------------|-------------------------------------|------|------|------|---------------|----|
|                                     |                  |                        | MIN                                                                          | TYP‡                                                | MAX                                 | MIN  | TYP‡ | MAX  |               |    |
| $V_{IK}$                            |                  |                        | $V_{CC} = \text{MIN},$                                                       | $I_I = -18 \text{ mA}$                              |                                     | -1.5 |      | -1.5 |               | V  |
| Hysteresis<br>( $V_{T+} - V_{T-}$ ) |                  |                        | $V_{CC} = \text{MIN},$                                                       | A or B input                                        |                                     | 0.1  | 0.4  | 0.2  | 0.4           | V  |
| $I_{OH}$                            |                  |                        | $V_{CC} = \text{MIN},$<br>$V_{IH} = \text{MAX},$<br>$V_{OH} = 5.5 \text{ V}$ | $V_{IH} = 2 \text{ V},$<br>$V_{OH} = 5.5 \text{ V}$ |                                     | 0.1  |      | 0.1  |               | mA |
| $V_{OL}$                            |                  |                        | $V_{CC} = \text{MIN},$<br>$V_{IH} = 2 \text{ V},$<br>$V_{IL} = \text{MAX}$   | $I_{OL} = 12 \text{ mA}$                            |                                     | 0.25 | 0.4  | 0.25 | 0.4           | V  |
|                                     |                  |                        |                                                                              | $I_{OL} = 24 \text{ mA}$                            |                                     |      |      | 0.35 | 0.5           |    |
|                                     |                  |                        |                                                                              | $I_{OL} = 48 \text{ mA}§$                           |                                     |      |      | 0.4  | 0.5           |    |
| $I_I$                               | A or B           | $V_{CC} = \text{MAX}$  | $V_I = 5.5 \text{ V}$                                                        |                                                     | 0.1                                 |      | 0.1  |      | mA            |    |
|                                     | D1R or $\bar{G}$ |                        | $V_I = 7 \text{ V}$                                                          |                                                     | 0.1                                 |      | 0.1  |      |               |    |
| $I_{IH}$                            |                  | $V_{CC} = \text{MAX},$ | $V_I = 2.7 \text{ V}$                                                        |                                                     | 20                                  |      | 20   |      | $\mu\text{A}$ |    |
| $I_{IL}$                            |                  | $V_{CC} = \text{MAX},$ | $V_I = 0.4 \text{ V}$                                                        |                                                     | -0.4                                |      | -0.4 |      | mA            |    |
| $I_{CC}$                            | Outputs high     | $V_{CC} = \text{MAX},$ | Outputs open                                                                 |                                                     | 48                                  | 70   | 48   | 70   | mA            |    |
|                                     | Outputs low      |                        |                                                                              |                                                     | 62                                  | 90   | 62   | 90   |               |    |
|                                     | Outputs at Hi-Z  |                        |                                                                              |                                                     | 64                                  | 95   | 64   | 95   |               |    |

§The 48 mA condition applies for the SN74LS641-1, SN74LS642-1, and SN74LS644-1 only.

SN54LS641, SN54LS642, SN54LS644  
 SN74LS641, SN74LS642, SN74LS644  
 OCTAL BUS TRANSCEIVERS WITH OPEN-COLLECTOR OUTPUTS

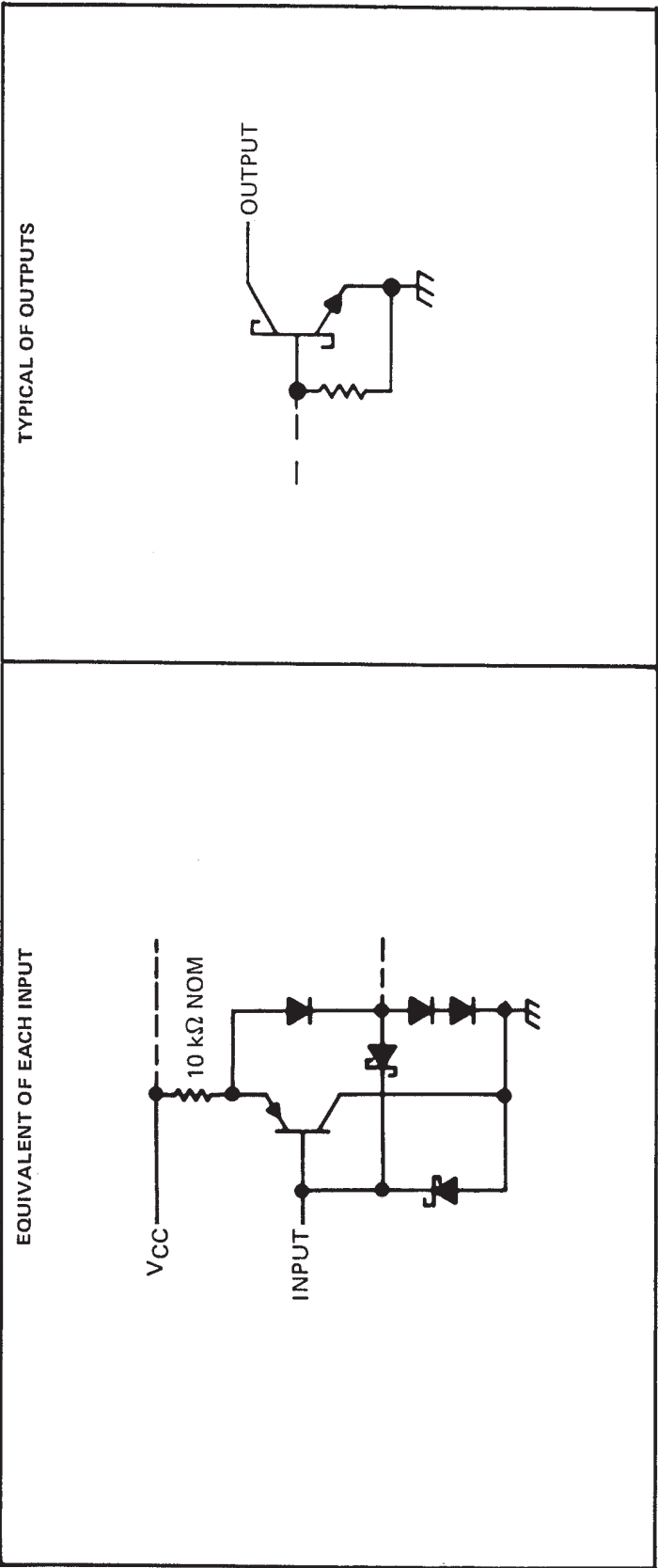
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switching characteristics at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

| PARAMETER                                    | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST CONDITIONS                                                  | 'LS641, 'LS641-1 |     | 'LS642, 'LS642-1 |     | 'LS644, 'LS644-1 |     | UNIT |
|----------------------------------------------|-----------------|----------------|------------------------------------------------------------------|------------------|-----|------------------|-----|------------------|-----|------|
|                                              |                 |                |                                                                  | MIN              | TYP | MAX              | MIN | TYP              | MAX |      |
| t <sub>PLH</sub><br>low-to-high-level output | A               | B              | C <sub>L</sub> = 45 pF,<br>R <sub>L</sub> = 667 Ω,<br>See Note 2 | 17               | 25  | 25               | 19  | 25               | 25  | ns   |
|                                              | B               | A              |                                                                  | 17               | 25  | 25               | 19  | 25               | 25  |      |
| t <sub>PHL</sub><br>high-to-low-level output | A               | B              |                                                                  | 16               | 25  | 25               | 14  | 25               | 25  | ns   |
|                                              | B               | A              |                                                                  | 16               | 25  | 25               | 14  | 25               | 25  |      |
| Output disable time<br>from low level        | $\bar{G}$ , DIR | A              |                                                                  | 23               | 40  | 40               | 26  | 40               | 40  | ns   |
|                                              | $\bar{G}$ , DIR | B              |                                                                  | 25               | 40  | 40               | 28  | 40               | 40  |      |
| Output enable time<br>from high level        | $\bar{G}$ , DIR | A              |                                                                  | 34               | 50  | 50               | 43  | 60               | 60  | ns   |
|                                              | $\bar{G}$ , DIR | B              |                                                                  | 37               | 50  | 50               | 39  | 60               | 60  |      |

NOTE 2: Load circuits and voltage waveforms are shown in Section 1.

schematics of inputs and outputs



**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Top-Side Markings<br>(4)           | Samples                 |
|------------------|---------------|--------------|--------------------|------|-------------|----------------------------|------------------|----------------------|--------------|------------------------------------|-------------------------|
| 5962-8416101VRA  | ACTIVE        | CDIP         | J                  | 20   | 20          | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 5962-8416101VR<br>A<br>SNV54LS640J | <a href="#">Samples</a> |
| 5962-8416101VSA  | ACTIVE        | CFP          | W                  | 20   | 25          | TBD                        | Call TI          | N / A for Pkg Type   | -55 to 125   | 5962-8416101VS<br>A<br>SNV54LS640W | <a href="#">Samples</a> |
| 84161012A        | ACTIVE        | LCCC         | FK                 | 20   | 1           | TBD                        | Call TI          | Call TI              | -55 to 125   | 84161012A<br>SNJ54LS<br>640FK      | <a href="#">Samples</a> |
| 8416101RA        | ACTIVE        | CDIP         | J                  | 20   | 1           | TBD                        | Call TI          | Call TI              | -55 to 125   | 8416101RA<br>SNJ54LS640J           | <a href="#">Samples</a> |
| 8416101SA        | ACTIVE        | CFP          | W                  | 20   | 1           | TBD                        | Call TI          | Call TI              | -55 to 125   | 8416101SA<br>SNJ54LS640W           | <a href="#">Samples</a> |
| SN54LS640J       | ACTIVE        | CDIP         | J                  | 20   | 1           | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | SN54LS640J                         | <a href="#">Samples</a> |
| SN54LS645J       | ACTIVE        | CDIP         | J                  | 20   | 1           | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | SN54LS645J                         | <a href="#">Samples</a> |
| SN74LS640-1DW    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS640-1                            | <a href="#">Samples</a> |
| SN74LS640-1DWE4  | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS640-1                            | <a href="#">Samples</a> |
| SN74LS640-1DWG4  | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS640-1                            | <a href="#">Samples</a> |
| SN74LS640-1DWR   | OBSOLETE      | SOIC         | DW                 | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                                    |                         |
| SN74LS640-1N     | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS640-1N                       | <a href="#">Samples</a> |
| SN74LS640-1NE4   | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS640-1N                       | <a href="#">Samples</a> |
| SN74LS640-1NSR   | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS640-1                          | <a href="#">Samples</a> |
| SN74LS640-1NSRE4 | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS640-1                          | <a href="#">Samples</a> |
| SN74LS640-1NSRG4 | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS640-1                          | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Top-Side Markings<br>(4) | Samples                 |
|------------------|---------------|--------------|--------------------|------|-------------|----------------------------|------------------|----------------------|--------------|--------------------------|-------------------------|
| SN74LS640DW      | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS640                    | <a href="#">Samples</a> |
| SN74LS640DWE4    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS640                    | <a href="#">Samples</a> |
| SN74LS640DWG4    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS640                    | <a href="#">Samples</a> |
| SN74LS640DWR     | ACTIVE        | SOIC         | DW                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS640                    | <a href="#">Samples</a> |
| SN74LS640DWRE4   | ACTIVE        | SOIC         | DW                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS640                    | <a href="#">Samples</a> |
| SN74LS640DWRG4   | ACTIVE        | SOIC         | DW                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS640                    | <a href="#">Samples</a> |
| SN74LS640N       | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS640N               | <a href="#">Samples</a> |
| SN74LS640N3      | OBSOLETE      | PDIP         | N                  | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                          |                         |
| SN74LS640NE4     | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS640N               | <a href="#">Samples</a> |
| SN74LS640NSR     | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS640                  | <a href="#">Samples</a> |
| SN74LS640NSRE4   | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS640                  | <a href="#">Samples</a> |
| SN74LS640NSRG4   | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS640                  | <a href="#">Samples</a> |
| SN74LS641-1DW    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS641-1                  | <a href="#">Samples</a> |
| SN74LS641-1DWE4  | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS641-1                  | <a href="#">Samples</a> |
| SN74LS641-1DWG4  | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS641-1                  | <a href="#">Samples</a> |
| SN74LS641-1DWR   | ACTIVE        | SOIC         | DW                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS641-1                  | <a href="#">Samples</a> |
| SN74LS641-1DWRE4 | ACTIVE        | SOIC         | DW                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS641-1                  | <a href="#">Samples</a> |
| SN74LS641-1DWRG4 | ACTIVE        | SOIC         | DW                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS641-1                  | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Top-Side Markings<br>(4) | Samples                 |
|------------------|---------------|--------------|--------------------|------|-------------|----------------------------|------------------|----------------------|--------------|--------------------------|-------------------------|
| SN74LS641-1N     | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS641-1N             | <a href="#">Samples</a> |
| SN74LS641-1N3    | OBSOLETE      | PDIP         | N                  | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                          |                         |
| SN74LS641-1NE4   | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS641-1N             | <a href="#">Samples</a> |
| SN74LS641DW      | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS641                    | <a href="#">Samples</a> |
| SN74LS641DWE4    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS641                    | <a href="#">Samples</a> |
| SN74LS641DWG4    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS641                    | <a href="#">Samples</a> |
| SN74LS641DWR     | OBSOLETE      | SOIC         | DW                 | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      | LS641                    |                         |
| SN74LS641DWRE4   | OBSOLETE      | SOIC         | DW                 | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                          |                         |
| SN74LS641DWRG4   | OBSOLETE      | SOIC         | DW                 | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                          |                         |
| SN74LS641N       | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS641N               | <a href="#">Samples</a> |
| SN74LS641N3      | OBSOLETE      | PDIP         | N                  | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                          |                         |
| SN74LS641NE4     | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS641N               | <a href="#">Samples</a> |
| SN74LS641NSR     | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS641                  | <a href="#">Samples</a> |
| SN74LS641NSRE4   | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS641                  | <a href="#">Samples</a> |
| SN74LS641NSRG4   | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS641                  | <a href="#">Samples</a> |
| SN74LS642-1DW    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS642-1                  | <a href="#">Samples</a> |
| SN74LS642-1DWE4  | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS642-1                  | <a href="#">Samples</a> |
| SN74LS642-1DWG4  | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS642-1                  | <a href="#">Samples</a> |
| SN74LS642-1N     | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS642-1N             | <a href="#">Samples</a> |
| SN74LS642-1NE4   | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS642-1N             | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Top-Side Markings<br>(4) | Samples                 |
|------------------|---------------|--------------|--------------------|------|-------------|----------------------------|------------------|----------------------|--------------|--------------------------|-------------------------|
| SN74LS642DW      | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS642                    | <a href="#">Samples</a> |
| SN74LS642DWE4    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS642                    | <a href="#">Samples</a> |
| SN74LS642DWG4    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS642                    | <a href="#">Samples</a> |
| SN74LS642N       | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS642N               | <a href="#">Samples</a> |
| SN74LS642NE4     | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS642N               | <a href="#">Samples</a> |
| SN74LS642NSR     | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS642                  | <a href="#">Samples</a> |
| SN74LS642NSRE4   | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS642                  | <a href="#">Samples</a> |
| SN74LS642NSRG4   | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS642                  | <a href="#">Samples</a> |
| SN74LS644-1N     | OBSOLETE      | PDIP         | N                  | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                          |                         |
| SN74LS644N       | OBSOLETE      | PDIP         | N                  | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                          |                         |
| SN74LS645-1DW    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS645-1                  | <a href="#">Samples</a> |
| SN74LS645-1DWE4  | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS645-1                  | <a href="#">Samples</a> |
| SN74LS645-1DWG4  | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS645-1                  | <a href="#">Samples</a> |
| SN74LS645-1DWR   | ACTIVE        | SOIC         | DW                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS645-1                  | <a href="#">Samples</a> |
| SN74LS645-1DWRE4 | ACTIVE        | SOIC         | DW                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS645-1                  | <a href="#">Samples</a> |
| SN74LS645-1DWRG4 | ACTIVE        | SOIC         | DW                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS645-1                  | <a href="#">Samples</a> |
| SN74LS645-1N     | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS645-1N             | <a href="#">Samples</a> |
| SN74LS645-1N3    | OBSOLETE      | PDIP         | N                  | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                          |                         |
| SN74LS645-1NE4   | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS645-1N             | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Top-Side Markings<br>(4)      | Samples                 |
|------------------|---------------|--------------|--------------------|------|-------------|----------------------------|------------------|----------------------|--------------|-------------------------------|-------------------------|
| SN74LS645-1NSR   | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS645-1                     | <a href="#">Samples</a> |
| SN74LS645-1NSRE4 | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS645-1                     | <a href="#">Samples</a> |
| SN74LS645-1NSRG4 | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS645-1                     | <a href="#">Samples</a> |
| SN74LS645DW      | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS645                         | <a href="#">Samples</a> |
| SN74LS645DWE4    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS645                         | <a href="#">Samples</a> |
| SN74LS645DWG4    | ACTIVE        | SOIC         | DW                 | 20   | 25          | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | LS645                         | <a href="#">Samples</a> |
| SN74LS645DWR     | OBSOLETE      | SOIC         | DW                 | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                               |                         |
| SN74LS645N       | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS645N                    | <a href="#">Samples</a> |
| SN74LS645N3      | OBSOLETE      | PDIP         | N                  | 20   |             | TBD                        | Call TI          | Call TI              | 0 to 70      |                               |                         |
| SN74LS645NE4     | ACTIVE        | PDIP         | N                  | 20   | 20          | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | 0 to 70      | SN74LS645N                    | <a href="#">Samples</a> |
| SN74LS645NSR     | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS645                       | <a href="#">Samples</a> |
| SN74LS645NSRE4   | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS645                       | <a href="#">Samples</a> |
| SN74LS645NSRG4   | ACTIVE        | SO           | NS                 | 20   | 2000        | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | 0 to 70      | 74LS645                       | <a href="#">Samples</a> |
| SNJ54LS640FK     | ACTIVE        | LCCC         | FK                 | 20   | 1           | TBD                        | POST-PLATE       | N / A for Pkg Type   | -55 to 125   | 84161012A<br>SNJ54LS<br>640FK | <a href="#">Samples</a> |
| SNJ54LS640J      | ACTIVE        | CDIP         | J                  | 20   | 1           | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 8416101RA<br>SNJ54LS640J      | <a href="#">Samples</a> |
| SNJ54LS640W      | ACTIVE        | CFP          | W                  | 20   | 1           | TBD                        | Call TI          | N / A for Pkg Type   | -55 to 125   | 8416101SA<br>SNJ54LS640W      | <a href="#">Samples</a> |
| SNJ54LS645FK     | NRND          | LCCC         | FK                 | 20   | 1           | TBD                        | POST-PLATE       | N / A for Pkg Type   | -55 to 125   | SNJ54LS<br>645FK              |                         |
| SNJ54LS645J      | ACTIVE        | CDIP         | J                  | 20   | 1           | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | SNJ54LS645J                   | <a href="#">Samples</a> |
| SNJ54LS645W      | OBSOLETE      | CFP          | W                  | 20   |             | TBD                        | Call TI          | Call TI              | -55 to 125   |                               |                         |

<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.

<sup>(4)</sup> Only one of markings shown within the brackets will appear on the physical device.

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**OTHER QUALIFIED VERSIONS OF SN54LS640, SN54LS640-SP, SN54LS645, SN74LS640, SN74LS645 :**

- Catalog: [SN74LS640](#), [SN54LS640](#), [SN74LS645](#)
- Military: [SN54LS640](#), [SN54LS645](#)
- Space: [SN54LS640-SP](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

- 
- Military - QML certified for Military and Defense Applications
  - Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

**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 |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LS640-1NSR | SO           | NS              | 20   | 2000 | 330.0              | 24.4               | 8.2     | 13.0    | 2.5     | 12.0    | 24.0   | Q1            |
| SN74LS640DWR   | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 2.7     | 12.0    | 24.0   | Q1            |
| SN74LS640NSR   | SO           | NS              | 20   | 2000 | 330.0              | 24.4               | 8.2     | 13.0    | 2.5     | 12.0    | 24.0   | Q1            |
| SN74LS641-1DWR | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 2.7     | 12.0    | 24.0   | Q1            |
| SN74LS641NSR   | SO           | NS              | 20   | 2000 | 330.0              | 24.4               | 8.2     | 13.0    | 2.5     | 12.0    | 24.0   | Q1            |
| SN74LS642NSR   | SO           | NS              | 20   | 2000 | 330.0              | 24.4               | 8.2     | 13.0    | 2.5     | 12.0    | 24.0   | Q1            |
| SN74LS645-1DWR | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.0    | 2.7     | 12.0    | 24.0   | Q1            |
| SN74LS645-1NSR | SO           | NS              | 20   | 2000 | 330.0              | 24.4               | 8.2     | 13.0    | 2.5     | 12.0    | 24.0   | Q1            |
| SN74LS645NSR   | 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) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LS640-1NSR | SO           | NS              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| SN74LS640DWR   | SOIC         | DW              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| SN74LS640NSR   | SO           | NS              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| SN74LS641-1DWR | SOIC         | DW              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| SN74LS641NSR   | SO           | NS              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| SN74LS642NSR   | SO           | NS              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| SN74LS645-1DWR | SOIC         | DW              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| SN74LS645-1NSR | SO           | NS              | 20   | 2000 | 367.0       | 367.0      | 45.0        |
| SN74LS645NSR   | SO           | NS              | 20   | 2000 | 367.0       | 367.0      | 45.0        |

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)        |

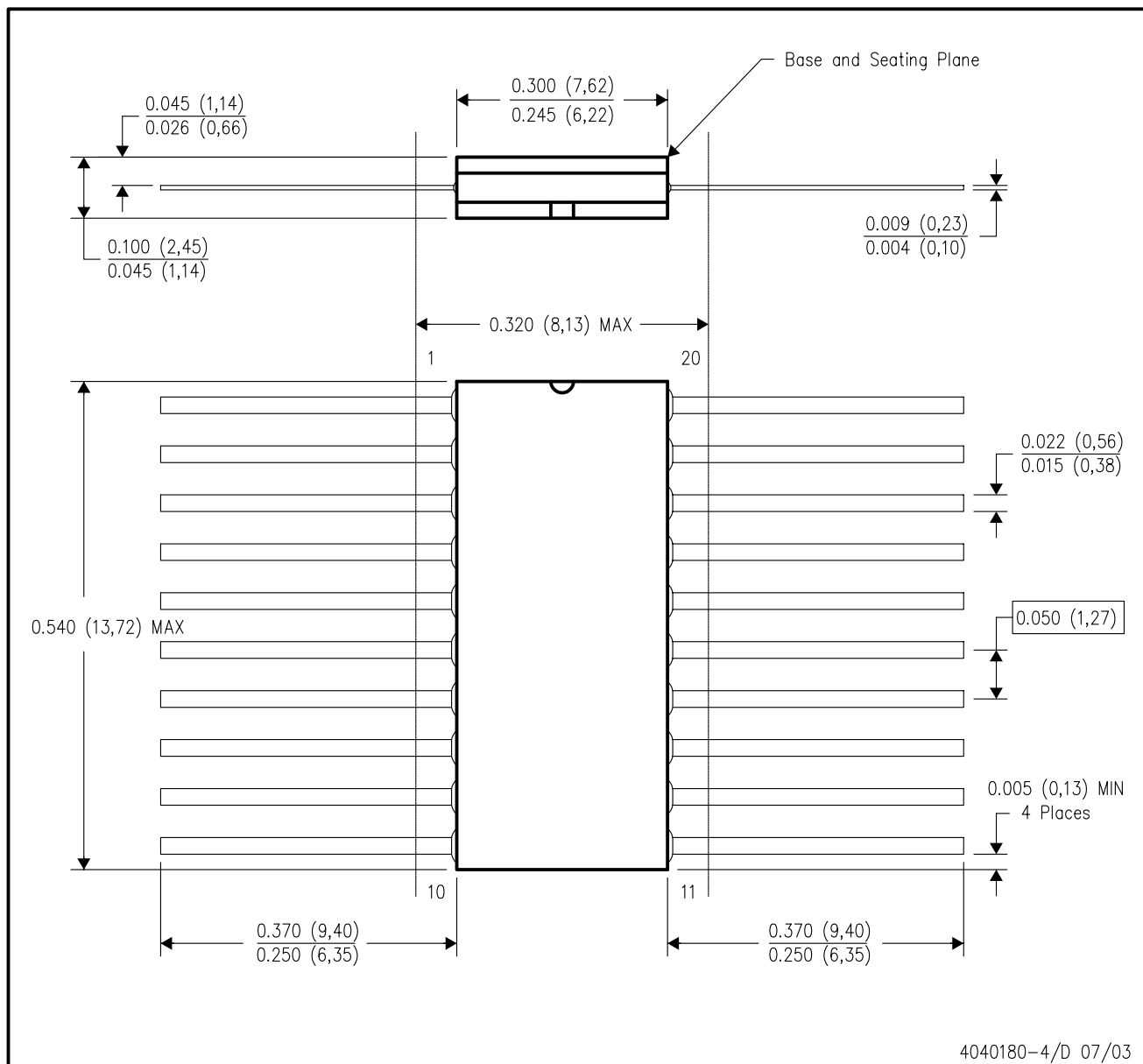


4040083/F 03/03

- 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.

W (R-GDFP-F20)

CERAMIC DUAL FLATPACK

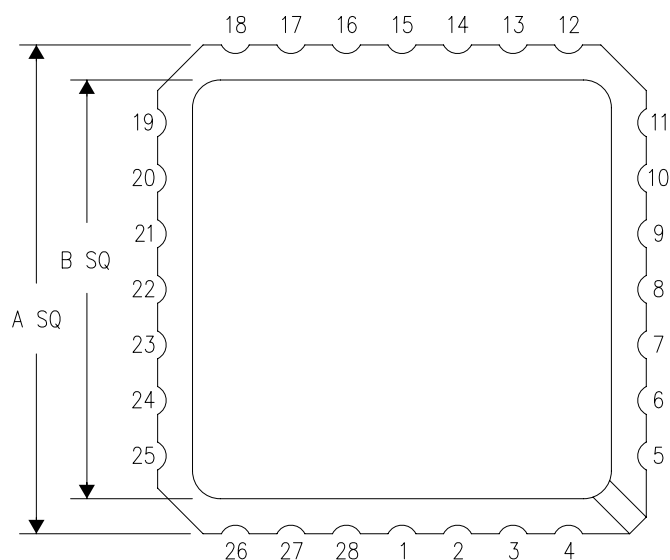


- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only.
  - Falls within Mil-Std 1835 GDFP2-F20

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

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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

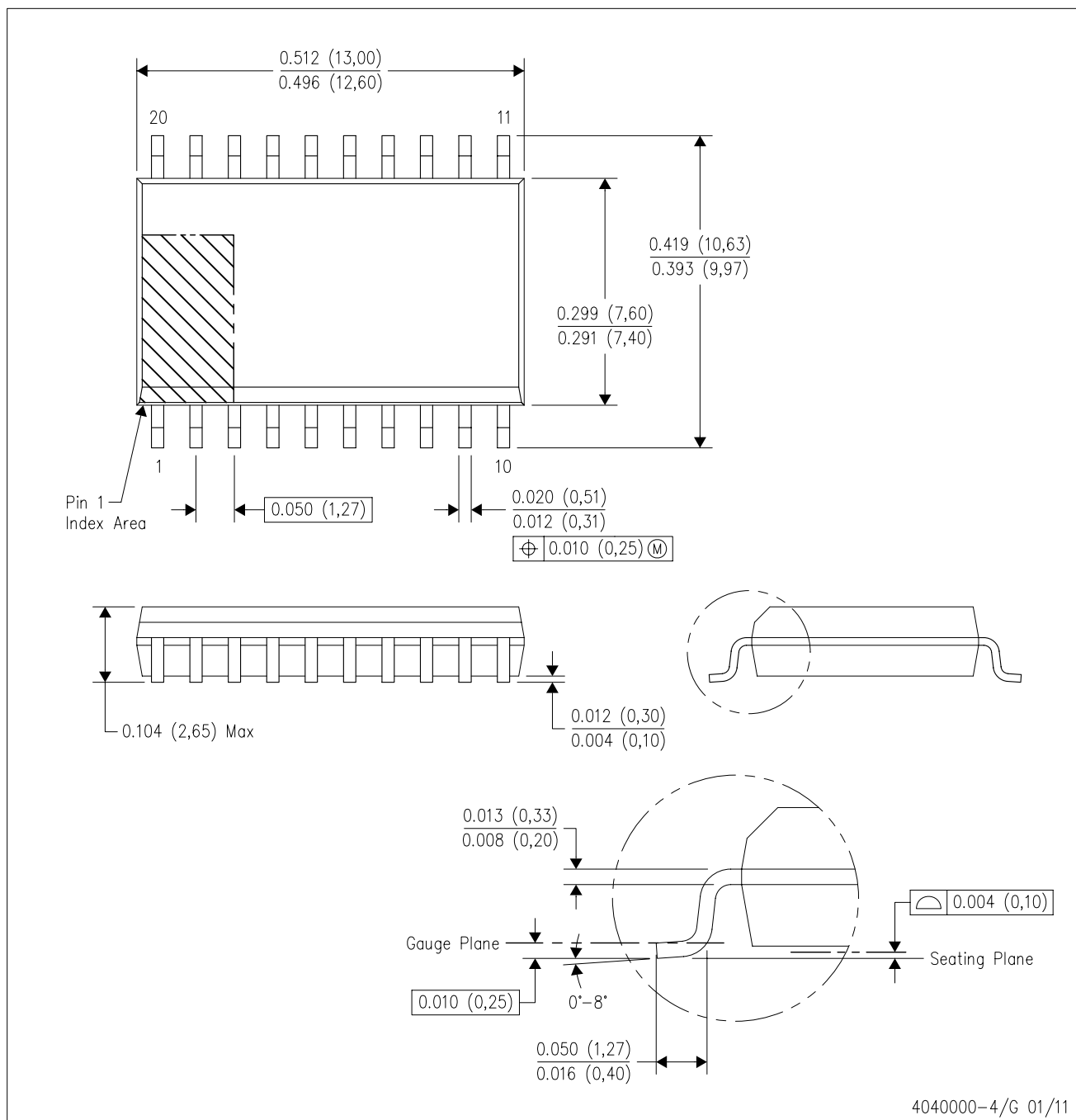


4040140/D 01/11

- 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

DW (R-PDSO-G20)

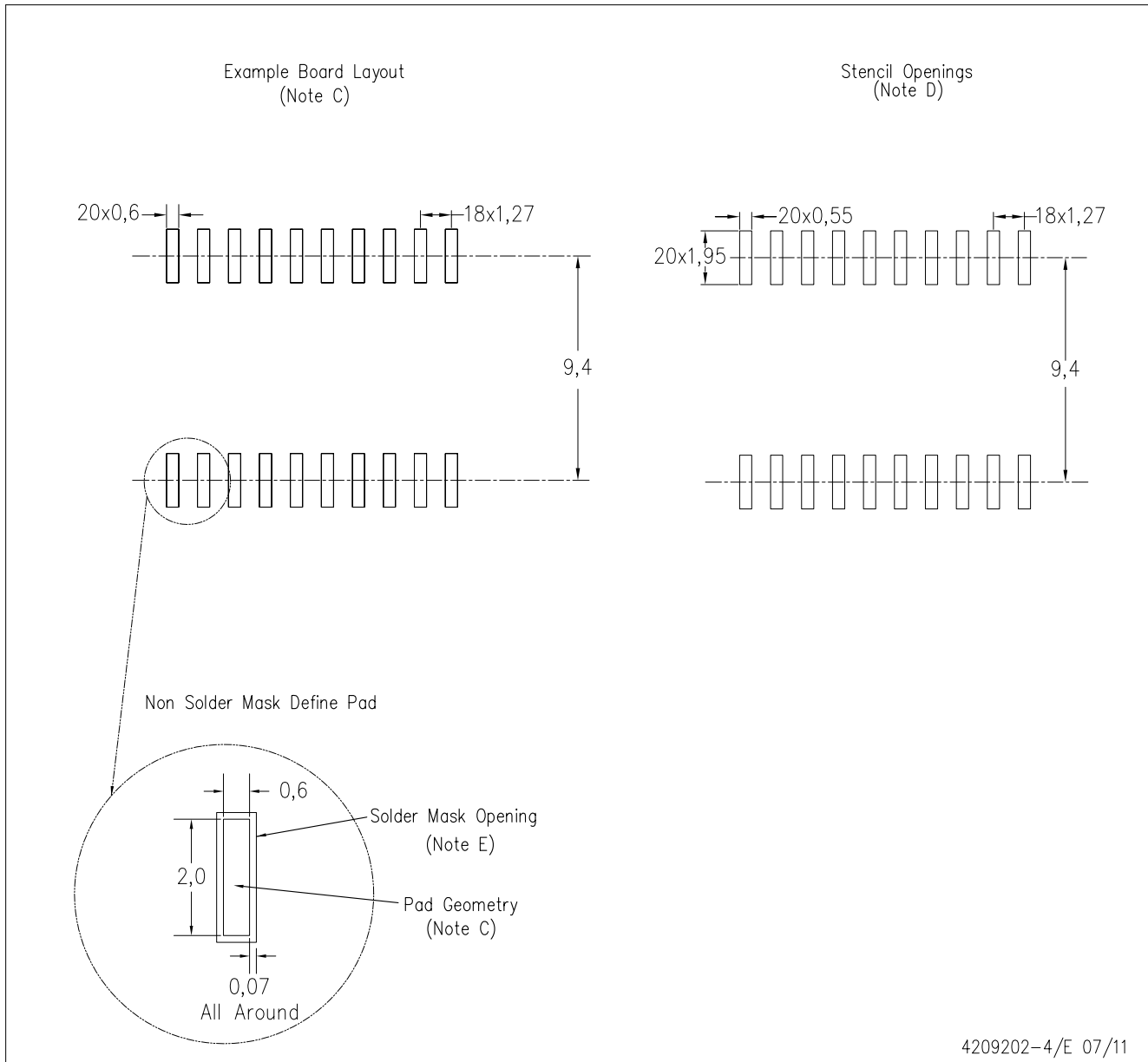
PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - 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.

DW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



- 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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|                               |                                                                                          |
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