

# SN5404, SN54LS04, SN54S04, SN7404, SN74LS04, SN74S04 HEX INVERTERS

SDLS029C – DECEMBER 1983 – REVISED JANUARY 2004

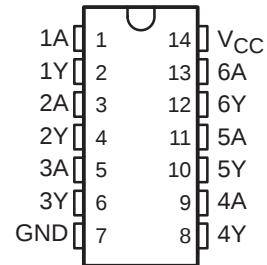
- Dependable Texas Instruments Quality and Reliability

## description/ordering information

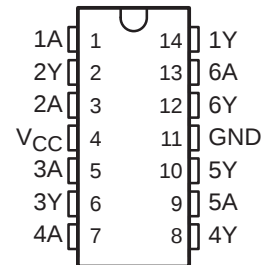
These devices contain six independent inverters.

SN5404 . . . J PACKAGE  
SN54LS04, SN54S04 . . . J OR W PACKAGE  
SN7404, SN74S04 . . . D, N, OR NS PACKAGE  
SN74LS04 . . . D, DB, N, OR NS PACKAGE

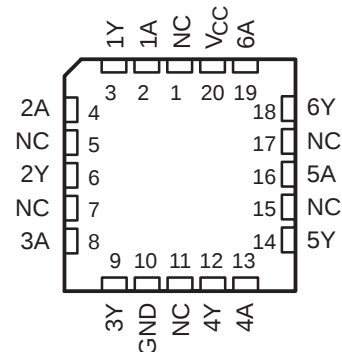
(TOP VIEW)



SN5404 . . . W PACKAGE  
(TOP VIEW)



SN54LS04, SN54S04 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection



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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.

# SN5404, SN54LS04, SN54S04, SN7404, SN74LS04, SN74S04 HEX INVERTERS

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## ORDERING INFORMATION

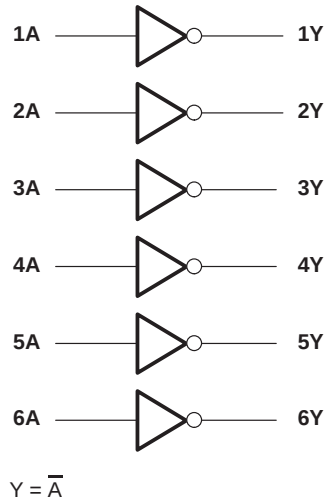
| T <sub>A</sub> | PACKAGE†  |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-----------|---------------|-----------------------|------------------|
| 0°C to 70°C    | PDIP – N  | Tube          | SN7404N               | SN7404N          |
|                |           | Tube          | SN74LS04N             | SN74LS04N        |
|                |           | Tube          | SN74S04N              | SN74S04N         |
|                | SOIC – D  | Tube          | SN7404D               | 7404             |
|                |           | Tape and reel | SN7404DR              |                  |
|                |           | Tube          | SN74LS04D             | LS04             |
|                |           | Tape and reel | SN74LS04DR            |                  |
|                |           | Tube          | SN74S04D              | S04              |
|                |           | Tape and reel | SN74S04DR             |                  |
|                | SOP – NS  | Tape and reel | SN7404NSR             | SN7404           |
|                |           | Tape and reel | SN74LS04NSR           | 74LS04           |
|                |           | Tape and reel | SN74S04NSR            | 74S04            |
|                | SSOP – DB | Tape and reel | SN74LS04DBR           | LS04             |
| –55°C to 125°C | CDIP – J  | Tube          | SN5404J               | SN5404J          |
|                |           | Tube          | SNJ5404J              | SNJ5404J         |
|                |           | Tube          | SN54LS04J             | SN54LS04J        |
|                |           | Tube          | SN54S04J              | SN54S04J         |
|                |           | Tube          | SNJ54LS04J            | SNJ54LS04J       |
|                |           | Tube          | SNJ54S04J             | SNJ54S04J        |
|                | CFP – W   | Tube          | SNJ5404W              | SNJ5404W         |
|                |           | Tube          | SNJ54LS04W            | SNJ54LS04W       |
|                |           | Tube          | SNJ54S04W             | SNJ54S04W        |
|                | LCCC – FK | Tube          | SNJ54LS04FK           | SNJ54LS04FK      |
|                |           | Tube          | SNJ54S04FK            | SNJ54S04FK       |

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

**FUNCTION TABLE**  
(each inverter)

| INPUT<br>A | OUTPUT<br>Y |
|------------|-------------|
| H          | L           |
| L          | H           |

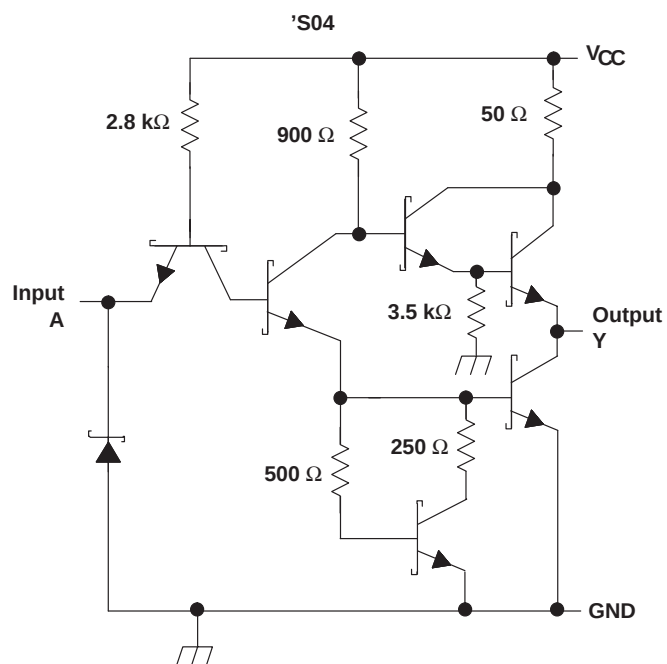
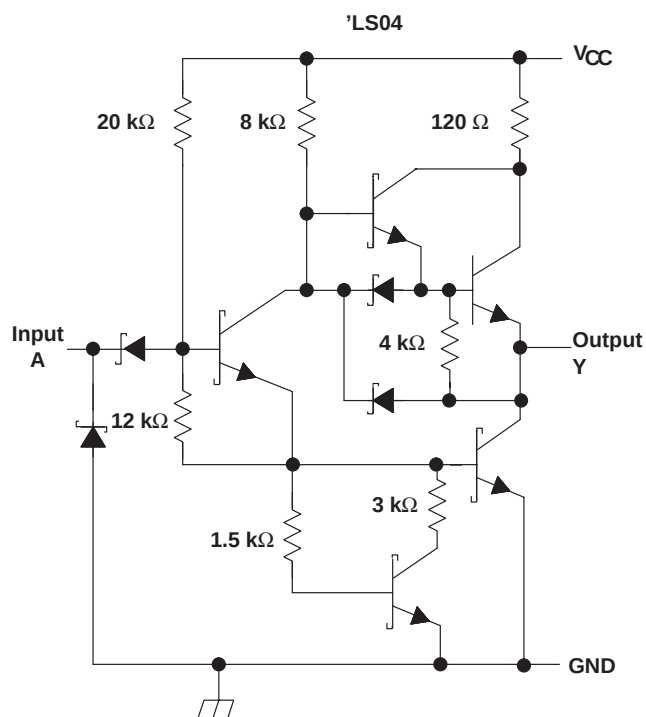
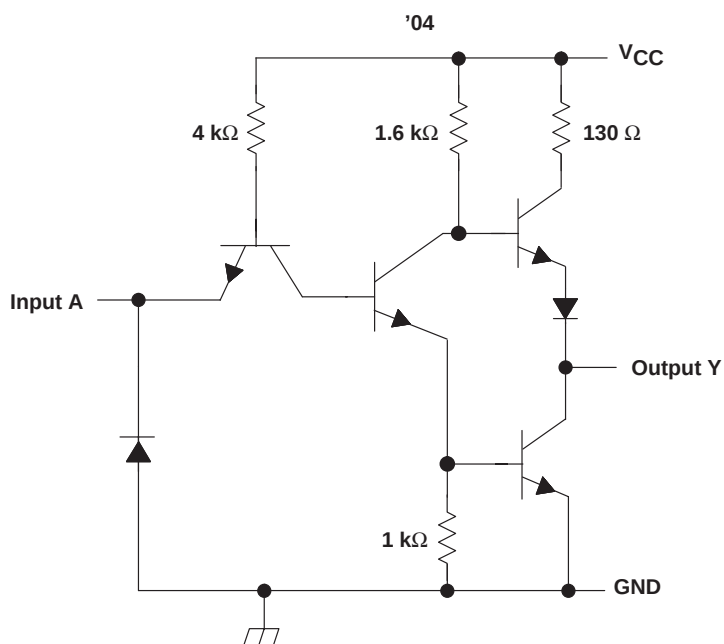
**logic diagram (positive logic)**



# SN5404, SN54LS04, SN54S04, SN7404, SN74LS04, SN74S04 HEX INVERTERS

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## schematics (each gate)



Resistor values shown are nominal.

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

|                                                                  |                |
|------------------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)                            | 7 V            |
| Input voltage, $V_I$ : '04, 'S04                                 | 5.5 V          |
| 'LS04                                                            | 7 V            |
| Package thermal impedance, $\theta_{JA}$ (see Note 2): D package | 86°C/W         |
| DB package                                                       | 96°C/W         |
| N package                                                        | 80°C/W         |
| NS package                                                       | 76°C/W         |
| Storage temperature range, $T_{stg}$                             | –65°C to 150°C |

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

- NOTES: 1. Voltage values are with respect to network ground terminal.  
2. The package thermal impedance is calculated in accordance with JESD 51-7.

**recommended operating conditions (see Note 3)**

|          |                                | SN5404 |     |      | SN7404 |     |      | 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        |        |     | 0.8  |        |     | 0.8  | V    |
| $I_{OH}$ | High-level output current      |        |     | –0.4 |        |     | –0.4 | mA   |
| $I_{OL}$ | Low-level output current       |        |     | 16   |        |     | 16   | mA   |
| $T_A$    | Operating free-air temperature | –55    |     | 125  | 0      |     | 70   | °C   |

NOTE 3: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

| PARAMETER            | TEST CONDITIONS <sup>‡</sup>                                                  | SN5404 |                  |      | SN7404 |                  |      | UNIT |
|----------------------|-------------------------------------------------------------------------------|--------|------------------|------|--------|------------------|------|------|
|                      |                                                                               | MIN    | TYP <sup>§</sup> | MAX  | MIN    | TYP <sup>§</sup> | MAX  |      |
| $V_{IK}$             | $V_{CC} = \text{MIN}$ , $I_I = -12 \text{ mA}$                                |        |                  | –1.5 |        |                  | –1.5 | V    |
| $V_{OH}$             | $V_{CC} = \text{MIN}$ , $V_{IL} = 0.8 \text{ V}$ , $I_{OH} = -0.4 \text{ mA}$ | 2.4    | 3.4              |      | 2.4    | 3.4              |      | V    |
| $V_{OL}$             | $V_{CC} = \text{MIN}$ , $V_{IH} = 2 \text{ V}$ , $I_{OL} = 16 \text{ mA}$     |        | 0.2              | 0.4  |        | 0.2              | 0.4  | V    |
| $I_I$                | $V_{CC} = \text{MAX}$ , $V_I = 5.5 \text{ V}$                                 |        |                  | 1    |        |                  | 1    | mA   |
| $I_{IH}$             | $V_{CC} = \text{MAX}$ , $V_I = 2.4 \text{ V}$                                 |        |                  | 40   |        |                  | 40   | µA   |
| $I_{IL}$             | $V_{CC} = \text{MAX}$ , $V_I = 0.4 \text{ V}$                                 |        |                  | –1.6 |        |                  | –1.6 | mA   |
| $I_{OS}^{\parallel}$ | $V_{CC} = \text{MAX}$                                                         | –20    |                  | –55  | –18    |                  | –55  | mA   |
| $I_{CCH}$            | $V_{CC} = \text{MAX}$ , $V_I = 0 \text{ V}$                                   |        | 6                | 12   |        | 6                | 12   | mA   |
| $I_{CCL}$            | $V_{CC} = \text{MAX}$ , $V_I = 4.5 \text{ V}$                                 |        | 18               | 33   |        | 18               | 33   | mA   |

<sup>‡</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

<sup>§</sup> All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

<sup>¶</sup> Not more than one output should be shorted at a time.

# SN5404, SN54LS04, SN54S04, SN7404, SN74LS04, SN74S04 HEX INVERTERS

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## switching characteristics, $V_{CC} = 5\text{ V}$ , $T_A = 25^\circ\text{C}$ (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST CONDITIONS                            | SN5404<br>SN7404 |     |     | UNIT |
|-----------|-----------------|----------------|--------------------------------------------|------------------|-----|-----|------|
|           |                 |                |                                            | MIN              | TYP | MAX |      |
| $t_{PLH}$ | A               | Y              | $R_L = 400\ \Omega$ , $C_L = 15\text{ pF}$ |                  | 12  | 22  | ns   |
| $t_{PHL}$ |                 |                |                                            |                  | 8   | 15  |      |

## recommended operating conditions (see Note 3)

|          |                                | SN54LS04 |     |      | SN74LS04 |     |      | 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        |          |     | 0.7  |          |     | 0.8  | V                |
| $I_{OH}$ | High-level output current      |          |     | -0.4 |          |     | -0.4 | mA               |
| $I_{OL}$ | Low-level output current       |          |     | 4    |          |     | 8    | mA               |
| $T_A$    | Operating free-air temperature | -55      |     | 125  | 0        |     | 70   | $^\circ\text{C}$ |

NOTE 3: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

| PARAMETER     | TEST CONDITIONS†                                                          |                        |  | SN54LS04 |      |      | SN74LS04 |      |      | UNIT          |
|---------------|---------------------------------------------------------------------------|------------------------|--|----------|------|------|----------|------|------|---------------|
|               |                                                                           |                        |  | MIN      | TYP‡ | MAX  | MIN      | TYP‡ | MAX  |               |
| $V_{IK}$      | $V_{CC} = \text{MIN}$ , $I_I = -18\text{ mA}$                             |                        |  |          |      | -1.5 |          |      | -1.5 | V             |
| $V_{OH}$      | $V_{CC} = \text{MIN}$ , $V_{IL} = \text{MAX}$ , $I_{OH} = -0.4\text{ mA}$ |                        |  | 2.5      | 3.4  |      | 2.7      | 3.4  |      | V             |
| $V_{OL}$      | $V_{CC} = \text{MIN}$ , $V_{IH} = 2\text{ V}$                             | $I_{OL} = 4\text{ mA}$ |  | 0.25     | 0.4  |      |          |      | 0.4  | V             |
|               |                                                                           | $I_{OL} = 8\text{ mA}$ |  |          |      |      |          |      | 0.25 |               |
| $I_I$         | $V_{CC} = \text{MAX}$ , $V_I = 7\text{ V}$                                |                        |  |          | 0.1  |      |          | 0.1  |      | mA            |
| $I_{IH}$      | $V_{CC} = \text{MAX}$ , $V_I = 2.7\text{ V}$                              |                        |  |          | 20   |      |          | 20   |      | $\mu\text{A}$ |
| $I_{IL}$      | $V_{CC} = \text{MAX}$ , $V_I = 0.4\text{ V}$                              |                        |  |          | -0.4 |      |          | -0.4 |      | mA            |
| $I_{OS}^{\S}$ | $V_{CC} = \text{MAX}$                                                     |                        |  | -20      |      | -100 | -20      |      | -100 | mA            |
| $I_{CCH}$     | $V_{CC} = \text{MAX}$ , $V_I = 0\text{ V}$                                |                        |  |          | 1.2  | 2.4  |          | 1.2  | 2.4  | mA            |
| $I_{CCL}$     | $V_{CC} = \text{MAX}$ , $V_I = 4.5\text{ V}$                              |                        |  |          | 3.6  | 6.6  |          | 3.6  | 6.6  | mA            |

† 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 the duration of the short-circuit should not exceed one second.

## switching characteristics, $V_{CC} = 5\text{ V}$ , $T_A = 25^\circ\text{C}$ (see Figure 2)

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST CONDITIONS                                 | SN54LS04<br>SN74LS04 |     |     | UNIT |
|-----------|-----------------|----------------|-------------------------------------------------|----------------------|-----|-----|------|
|           |                 |                |                                                 | MIN                  | TYP | MAX |      |
| $t_{PLH}$ | A               | Y              | $R_L = 2\text{ k}\Omega$ , $C_L = 15\text{ pF}$ |                      | 9   | 15  | ns   |
| $t_{PHL}$ |                 |                |                                                 |                      | 10  | 15  |      |



# SN5404, SN54LS04, SN54S04, SN7404, SN74LS04, SN74S04 HEX INVERTERS

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## recommended operating conditions (see Note 3)

|                 |                                | SN54S04 |     |     | SN74S04 |     |      | 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        |         |     | 0.8 |         |     | 0.8  | V    |
| I <sub>OH</sub> | High-level output current      |         |     | –1  |         |     | –1   | mA   |
| I <sub>OL</sub> | Low-level output current       |         |     | 20  |         |     | 20   | mA   |
| T <sub>A</sub>  | Operating free-air temperature | –55     |     | 125 | 0       |     | 70   | °C   |

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

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

| PARAMETER                    | TEST CONDITIONS <sup>†</sup>                                            | SN54S04 |                  |      | SN74S04 |                  |      | UNIT |
|------------------------------|-------------------------------------------------------------------------|---------|------------------|------|---------|------------------|------|------|
|                              |                                                                         | MIN     | TYP <sup>‡</sup> | MAX  | MIN     | TYP <sup>‡</sup> | MAX  |      |
| V <sub>IK</sub>              | V <sub>CC</sub> = MIN, I <sub>I</sub> = –18 mA                          |         |                  | –1.2 |         |                  | –1.2 | V    |
| V <sub>OH</sub>              | V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = –1 mA | 2.5     | 3.4              |      | 2.7     | 3.4              |      | V    |
| V <sub>OL</sub>              | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 20 mA   |         |                  | 0.5  |         |                  | 0.5  | V    |
| I <sub>I</sub>               | V <sub>CC</sub> = MAX, V <sub>I</sub> = 5.5 V                           |         |                  | 1    |         |                  | 1    | mA   |
| I <sub>IH</sub>              | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V                           |         |                  | 50   |         |                  | 50   | μA   |
| I <sub>IL</sub>              | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5 V                           |         |                  | –2   |         |                  | –2   | mA   |
| I <sub>OS</sub> <sup>§</sup> | V <sub>CC</sub> = MAX                                                   | –40     |                  | –100 | –40     |                  | –100 | mA   |
| I <sub>CCH</sub>             | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V                             |         | 15               | 24   |         | 15               | 24   | mA   |
| I <sub>CCL</sub>             | V <sub>CC</sub> = MAX, V <sub>I</sub> = 4.5 V                           |         | 30               | 54   |         | 30               | 54   | mA   |

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

<sup>‡</sup> All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C.

<sup>§</sup> Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

## switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see Figure 1)

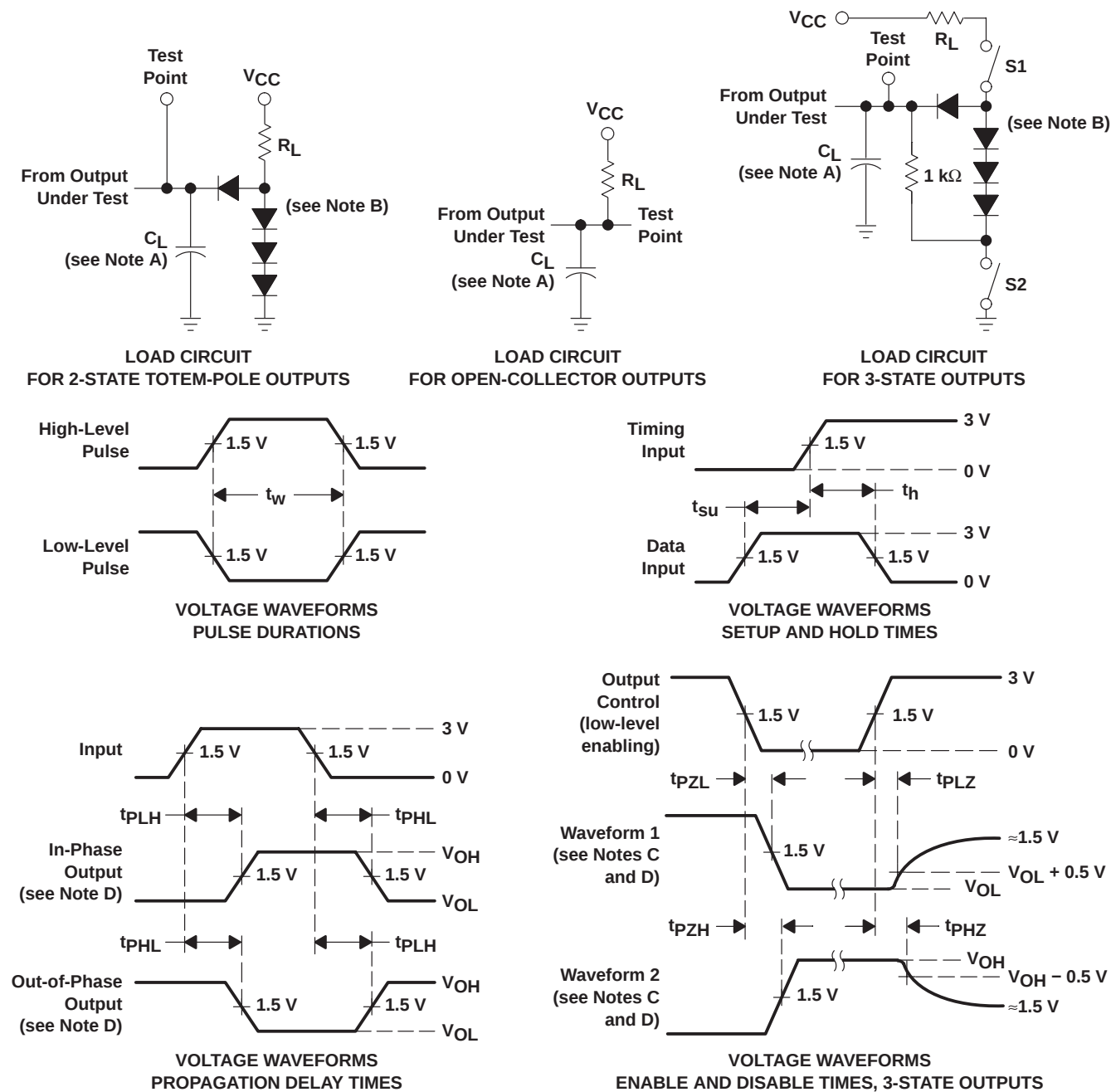
| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST CONDITIONS                                | SN54S04<br>SN74S04 |     |     | UNIT |
|------------------|-----------------|----------------|------------------------------------------------|--------------------|-----|-----|------|
|                  |                 |                |                                                | MIN                | TYP | MAX |      |
| t <sub>PLH</sub> | A               | Y              | R <sub>L</sub> = 280 Ω, C <sub>L</sub> = 15 pF |                    | 3   | 4.5 | ns   |
| t <sub>PHL</sub> |                 |                |                                                |                    | 3   | 5   |      |
| t <sub>PLH</sub> | A               | Y              | R <sub>L</sub> = 280 Ω, C <sub>L</sub> = 50 pF |                    | 4.5 |     | ns   |
| t <sub>PHL</sub> |                 |                |                                                |                    | 5   |     |      |



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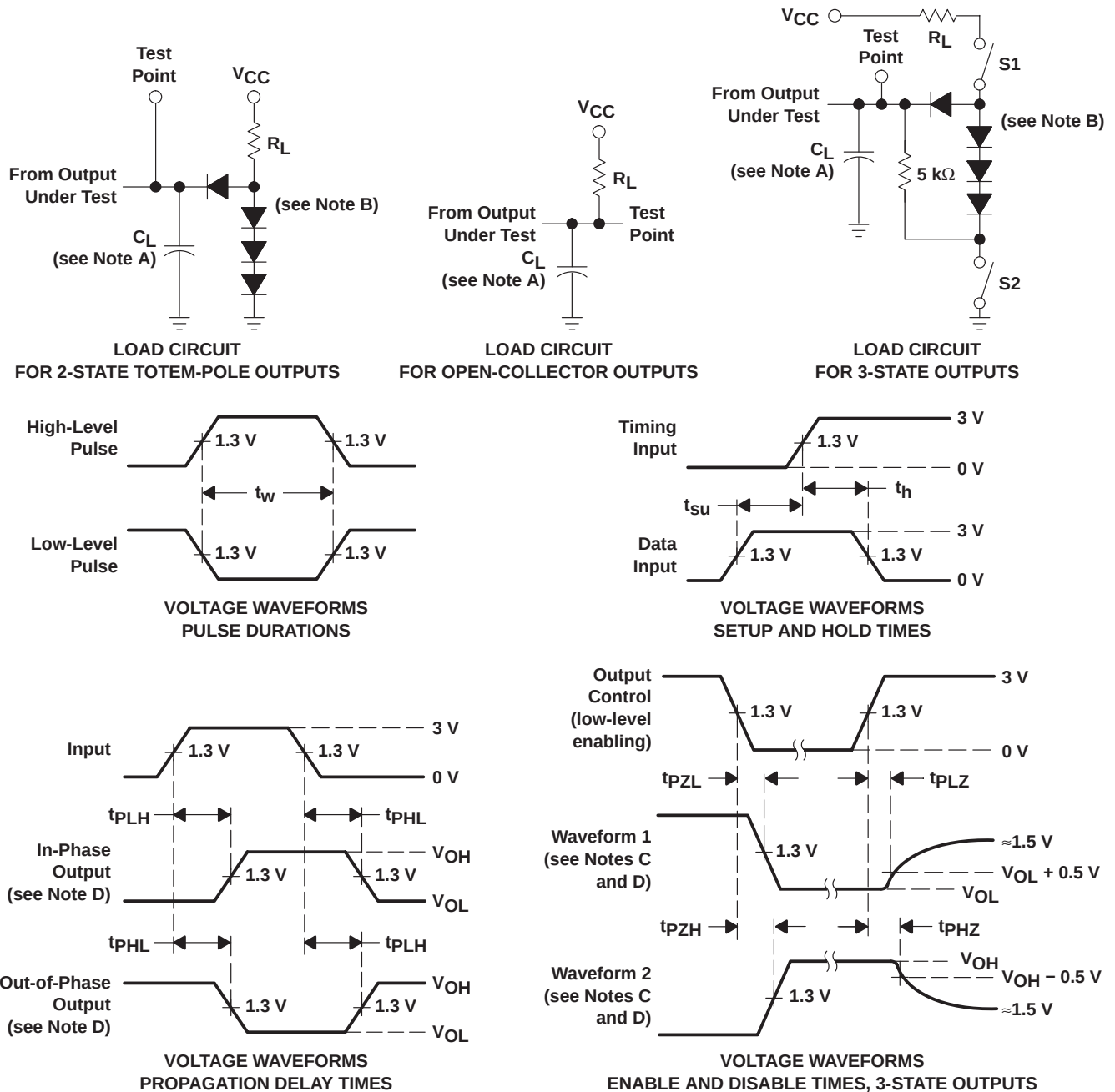
## PARAMETER MEASUREMENT INFORMATION SERIES 54/74 AND 54S/74S DEVICES



- NOTES:
- $C_L$  includes probe and jig capacitance.
  - All diodes are 1N3064 or equivalent.
  - 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.
  - S1 and S2 are closed for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PHZ}$ , and  $t_{PLZ}$ ; S1 is open and S2 is closed for  $t_{PZH}$ ; S1 is closed and S2 is open for  $t_{PZL}$ .
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O \approx 50 \Omega$ ;  $t_r$  and  $t_f \leq 7$  ns for Series 54/74 devices and  $t_r$  and  $t_f \leq 2.5$  ns for Series 54S/74S devices.
  - The outputs are measured one at a time, with one input transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION  
SERIES 54LS/74LS DEVICES



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. All diodes are 1N3064 or equivalent.  
C. 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.  
D. S1 and S2 are closed for  $t_{PLH}$ ,  $t_{PHL}$ ,  $t_{PHZ}$ , and  $t_{PLZ}$ ; S1 is open and S2 is closed for  $t_{PZH}$ ; S1 is closed and S2 is open for  $t_{PZL}$ .  
E. Phase relationships between inputs and outputs have been chosen arbitrarily for these examples.  
F. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 1$  MHz,  $Z_O \approx 50 \Omega$ ,  $t_r \leq 1.5$  ns,  $t_f \leq 2.6$  ns.  
G. The outputs are measured one at a time, with one input transition per measurement.

Figure 2. Load Circuits and Voltage Waveforms

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| Interface          | <a href="http://interface.ti.com">interface.ti.com</a>             |
| Logic              | <a href="http://logic.ti.com">logic.ti.com</a>                     |
| Power Mgmt         | <a href="http://power.ti.com">power.ti.com</a>                     |
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**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| JM38510/00105BCA | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| JM38510/00105BDA | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| JM38510/07003BCA | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| JM38510/30003B2A | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| JM38510/30003BCA | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| JM38510/30003BDA | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| JM38510/30003SCA | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| JM38510/30003SDA | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| SN5404J          | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SN54LS04J        | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SN54S04J         | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SN7404D          | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN7404DE4        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN7404DG4        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN7404DR         | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN7404DRE4       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN7404DRG4       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN7404N          | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN7404N3         | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN7404NE4        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN7404NSR        | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN7404NSRE4      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS04D        | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS04DE4      | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS04DG4      | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS04DR       | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS04DRE4     | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS04DRG4     | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS04J        | OBSOLETE              | CDIP         | J               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS04N        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74LS04N3       | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74LS04NE4      | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74LS04NSR      | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LS04NSRG4    | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S04D         | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S04DE4       | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S04DG4       | ACTIVE                | SOIC         | D               | 14   | 50          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S04DR        | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S04DRE4      | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S04DRG4      | ACTIVE                | SOIC         | D               | 14   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S04N         | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74S04N3        | OBSOLETE              | PDIP         | N               | 14   |             | TBD                     | Call TI          | Call TI                      |
| SN74S04NE4       | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74S04NSR       | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74S04NSRE4     | ACTIVE                | SO           | NS              | 14   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SNJ5404J         | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SNJ5404W         | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| SNJ54LS04FK      | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| SNJ54LS04J       | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SNJ54LS04W       | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |
| SNJ54S04FK       | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | POST-PLATE       | N / A for Pkg Type           |
| SNJ54S04J        | ACTIVE                | CDIP         | J               | 14   | 1           | TBD                     | A42 SNPB         | N / A for Pkg Type           |
| SNJ54S04W        | ACTIVE                | CFP          | W               | 14   | 1           | TBD                     | A42              | N / A for Pkg Type           |

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

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

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

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

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

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

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

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

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

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and

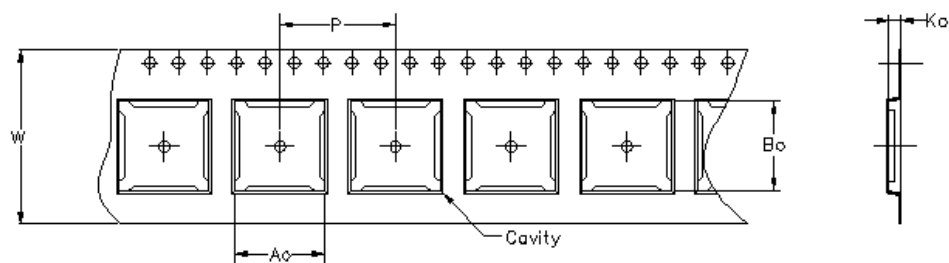
package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

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

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

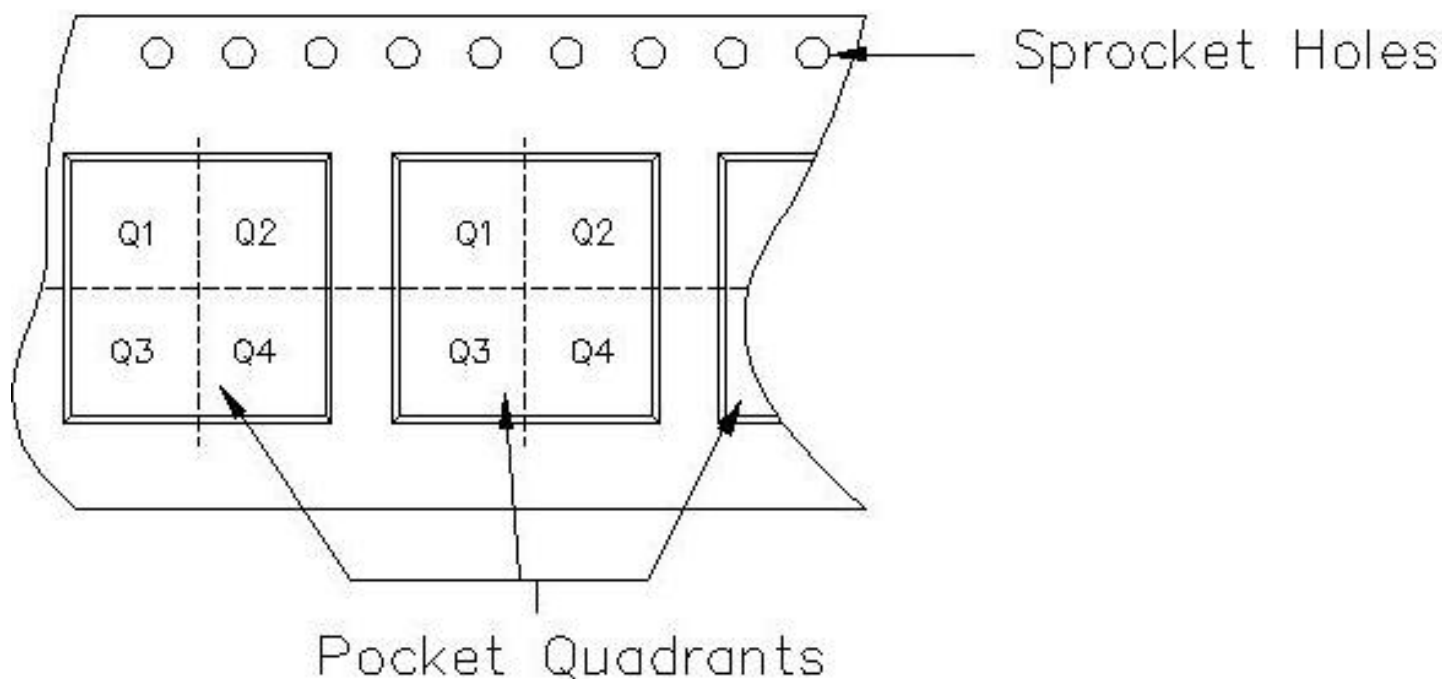
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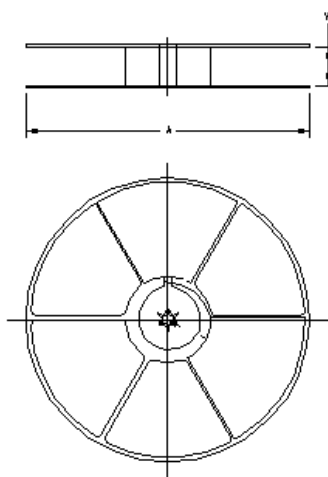
Carrier tape design is defined largely by the component length, width, and thickness.

|                                                                    |
|--------------------------------------------------------------------|
| $A_0$ = Dimension designed to accommodate the component width.     |
| $B_0$ = Dimension designed to accommodate the component length.    |
| $K_0$ = Dimension designed to accommodate the component thickness. |
| $W$ = Overall width of the carrier tape.                           |
| $P$ = Pitch between successive cavity centers.                     |



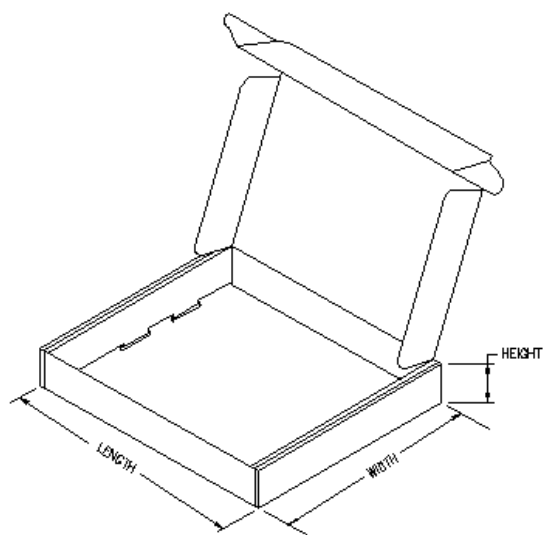
## TAPE AND REEL INFORMATION

| Device      | Package | Pins | Site | Reel<br>Diameter<br>(mm) | Reel<br>Width<br>(mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1<br>(mm) | W<br>(mm) | Pin1<br>Quadrant |
|-------------|---------|------|------|--------------------------|-----------------------|---------|---------|---------|------------|-----------|------------------|
| SN7404DR    | D       | 14   | MLA  | 330                      | 16                    | 6.5     | 9.0     | 2.1     | 8          | 16        | Q1               |
| SN7404NSR   | NS      | 14   | MLA  | 330                      | 16                    | 8.2     | 10.5    | 2.5     | 12         | 16        | Q1               |
| SN74LS04DR  | D       | 14   | MLA  | 330                      | 16                    | 6.5     | 9.0     | 2.1     | 8          | 16        | Q1               |
| SN74LS04NSR | NS      | 14   | MLA  | 330                      | 16                    | 8.2     | 10.5    | 2.5     | 12         | 16        | Q1               |
| SN74S04DR   | D       | 14   | MLA  | 330                      | 16                    | 6.5     | 9.0     | 2.1     | 8          | 16        | Q1               |
| SN74S04NSR  | NS      | 14   | MLA  | 330                      | 16                    | 8.2     | 10.5    | 2.5     | 12         | 16        | Q1               |



## TAPE AND REEL BOX INFORMATION

| Device      | Package | Pins | Site | Length (mm) | Width (mm) | Height (mm) |
|-------------|---------|------|------|-------------|------------|-------------|
| SN7404DR    | D       | 14   | MLA  | 333.2       | 333.2      | 28.58       |
| SN7404NSR   | NS      | 14   | MLA  | 333.2       | 333.2      | 28.58       |
| SN74LS04DR  | D       | 14   | MLA  | 333.2       | 333.2      | 28.58       |
| SN74LS04NSR | NS      | 14   | MLA  | 333.2       | 333.2      | 28.58       |
| SN74S04DR   | D       | 14   | MLA  | 333.2       | 333.2      | 28.58       |
| SN74S04NSR  | NS      | 14   | MLA  | 333.2       | 333.2      | 28.58       |



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)        |

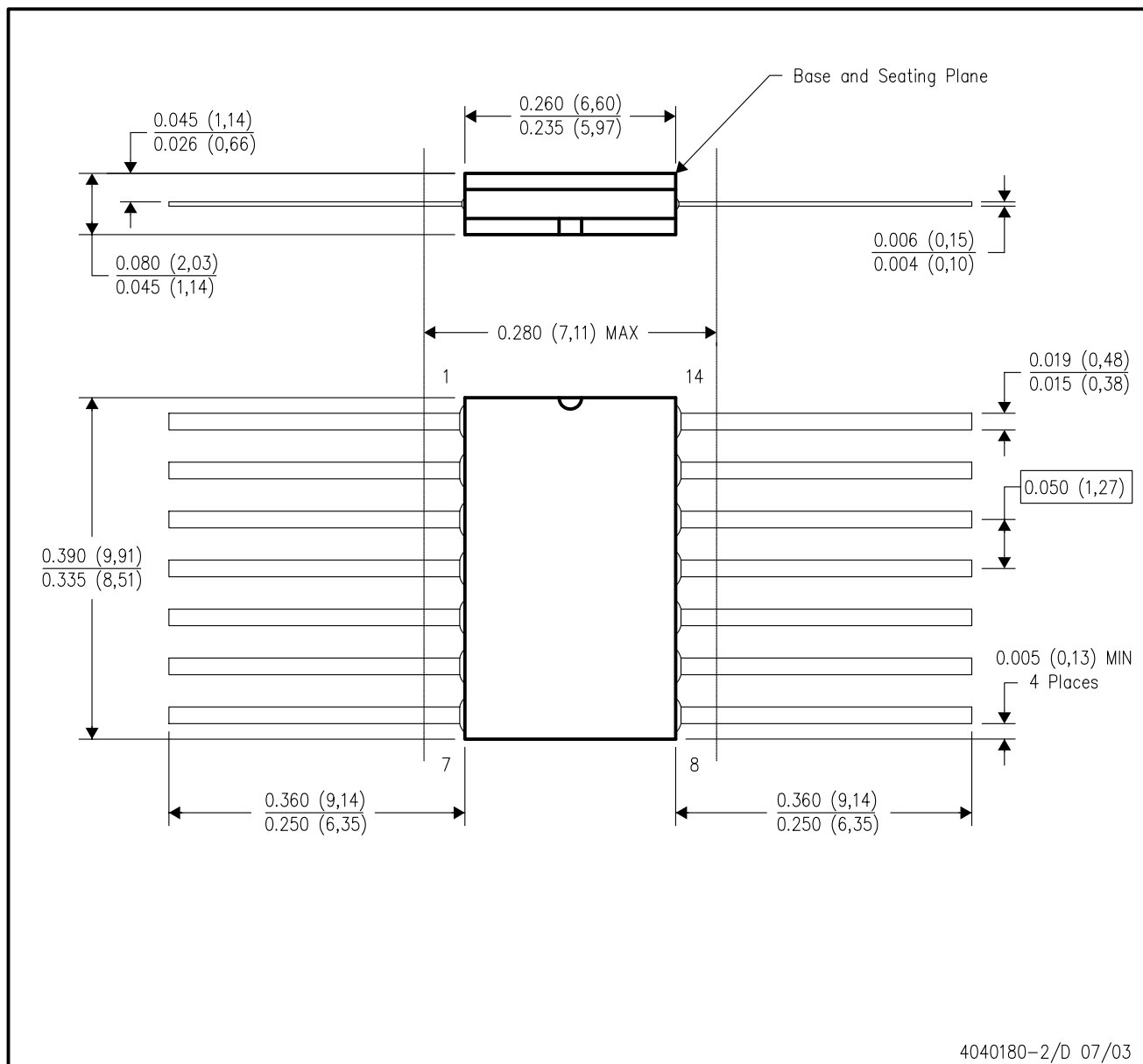


4040083/F 03/03

- 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-F14)

CERAMIC DUAL FLATPACK

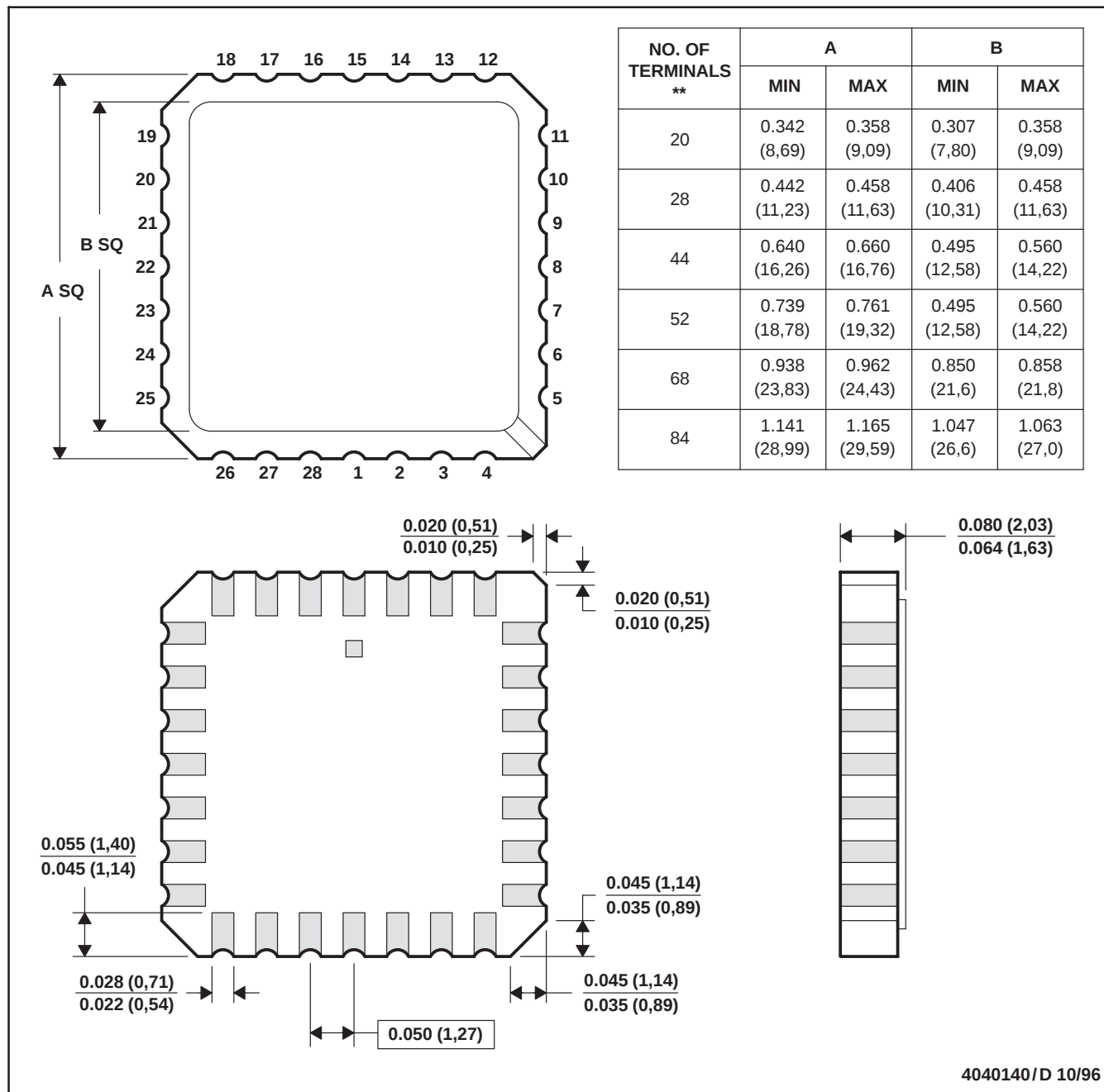


- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only.
  - Falls within MIL STD 1835 GDFP1-F14 and JEDEC MO-092AB

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

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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

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

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



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



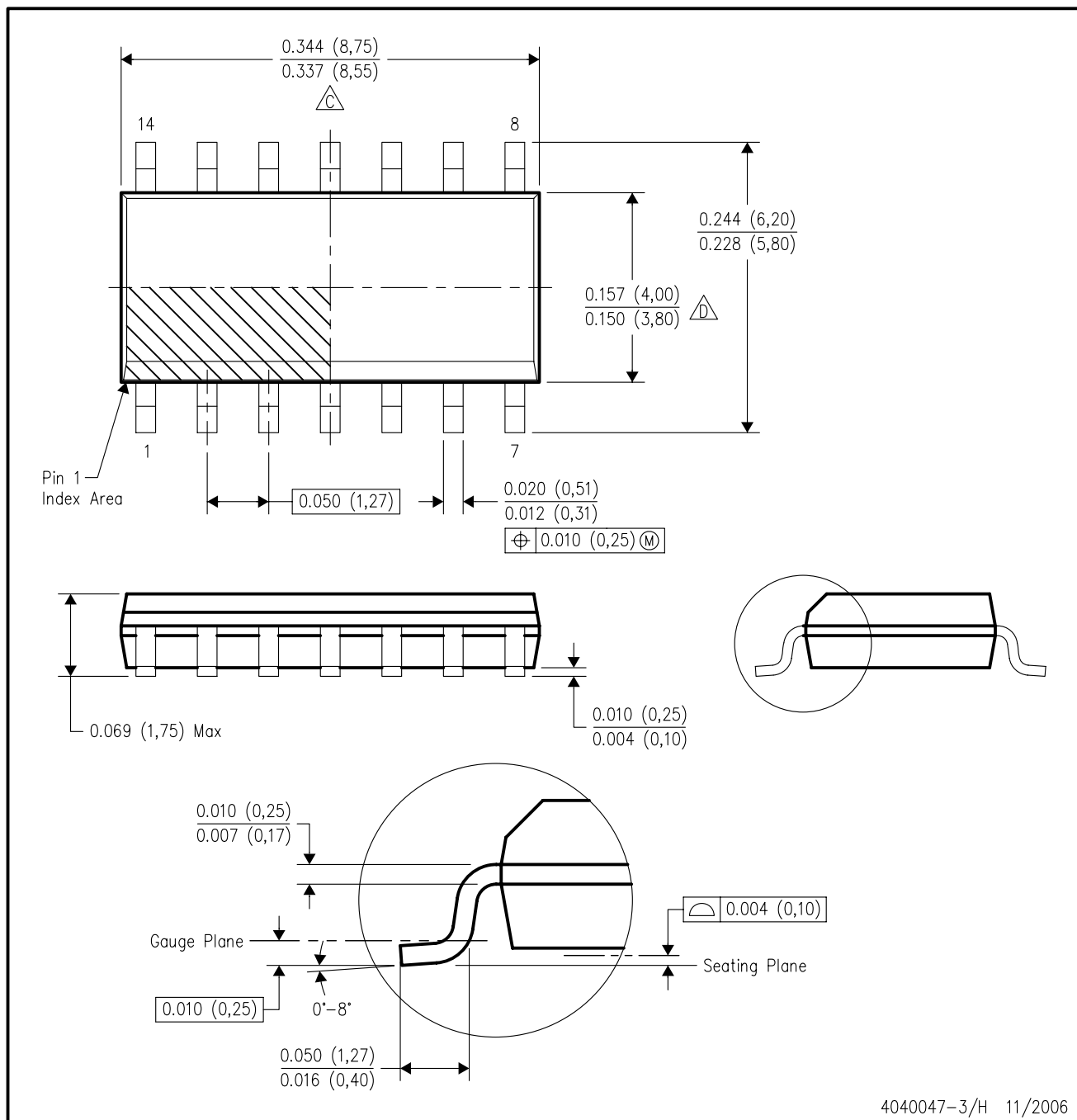
4040049/E 12/2002

NOTES:

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

## D (R-PDSO-G14)

## PLASTIC SMALL-OUTLINE PACKAGE



4040047-3/H 11/2006

## NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
- D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AB.

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



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

4040062/C 03/03

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

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### Applications

|                    |                                                                          |
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