

# SN5410, SN54LS10, SN54S10, SN7410, SN74LS10, SN74S10 TRIPLE 3-INPUT POSITIVE-NAND GATES

SDLS035A – DECEMBER 1983 – REVISED APRIL 2003

- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers and Flat Packages, and Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

## description

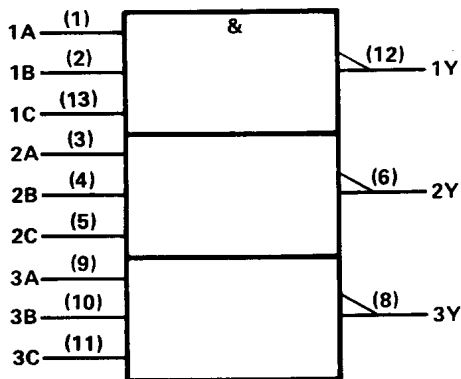
These devices contain three independent 3-input NAND gates.

The SN5410, SN54LS10, and SN54S10 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN7410, SN74LS10, and SN74S10 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

### FUNCTION TABLE (each gate)

| INPUTS |   |   | OUTPUT |
|--------|---|---|--------|
| A      | B | C | Y      |
| H      | H | H | L      |
| L      | X | X | H      |
| X      | L | X | H      |
| X      | X | L | H      |

## logic symbol†



†This symbol is in accordance with ANSI/IEEE Std. 91-1984 and IEC Publication 617-12.

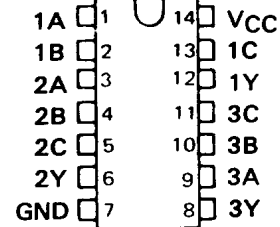
Pin numbers shown are for D, J, and N packages.

## positive logic

$$Y = \overline{A \cdot B \cdot C} \text{ or } Y = \overline{A} + \overline{B} + \overline{C}$$

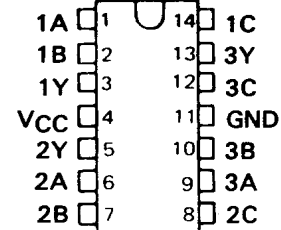
SN5410 . . . J PACKAGE  
SN54LS10, SN54S10 . . . J OR W PACKAGE  
SN7410 . . . N PACKAGE  
SN74LS10, SN74S10 . . . D OR N PACKAGE

(TOP VIEW)



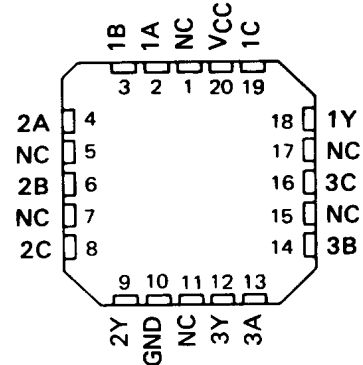
SN5410 . . . W PACKAGE

(TOP VIEW)



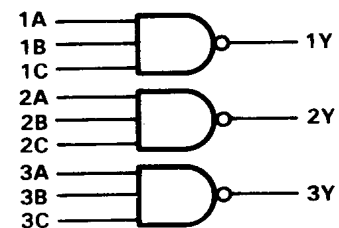
SN54LS10, SN54S10 . . . FK PACKAGE

(TOP VIEW)



NC - No internal connection

## logic diagram (positive logic)

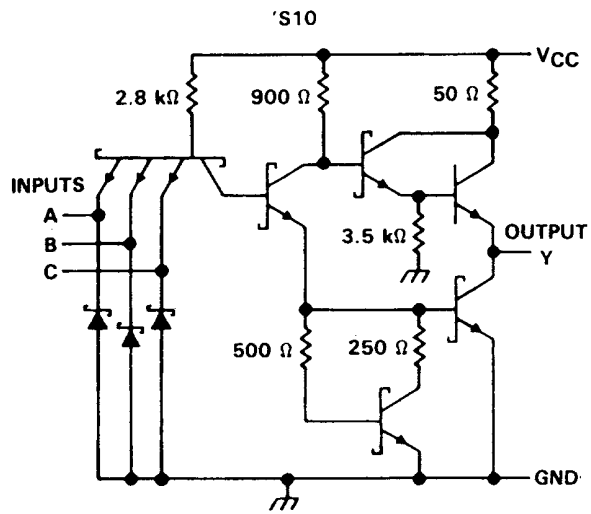
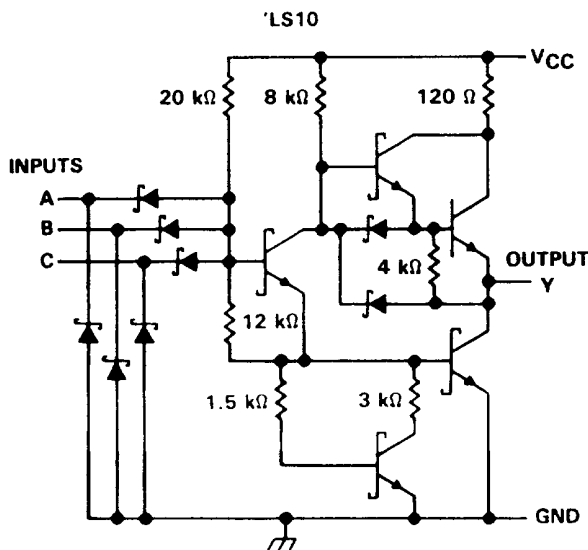
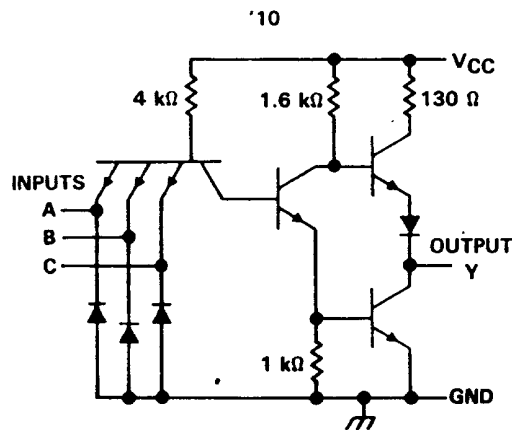


# SN5410, SN54LS10, SN54S10, SN7410, SN74LS10, SN74S10

## TRIPLE 3-INPUT POSITIVE-NAND GATES

SDL5035A – DECEMBER 1983 – REVISED APRIL 2003

schematics (each gate)



Resistor values shown are nominal.

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

|  |                |
|--|----------------|
| Supply voltage, V <sub>CC</sub> (see Note 1) | 7 V            |
| Input voltage: '10, 'S10                     | 5.5 V          |
| 'LS10  | 7 V            |
| Operating free-air temperature range: SN54'  | -55°C to 125°C |
| SN74'  | 0°C to 70°C    |
| Storage temperature range                    | -65°C to 150°C |

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



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

# SN5410, SN7410, TRIPLE 3-INPUT POSITIVE-NAND GATES

SDLS035 – DECEMBER 1983 – REVISED MARCH 1988

## recommended operating conditions

|   | SN5410 |     |      | SN7410 |     |      | 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     |        |     | -0.4 |        |     | -0.4 | mA   |
| I <sub>OL</sub> Low-level output current      |        |     | 16   |        |     | 16   | mA   |
| T <sub>A</sub> Operating free-air temperature | -55    |     | 125  | 0      |     | 70   | °C   |

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

| PARAMETER         | TEST CONDITIONS †   | SN5410 |       |      | SN7410 |       |      | UNIT |
|-------------------|---|--------|-------|------|--------|-------|------|------|
|                   |   | MIN    | TYP ‡ | MAX  | MIN    | TYP ‡ | MAX  |      |
| V <sub>IK</sub>   | V <sub>CC</sub> = MIN, I <sub>I</sub> = -12 mA                            |        |       | -1.5 |        |       | -1.5 | V    |
| V <sub>OH</sub>   | V <sub>CC</sub> = MIN, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = -0.4 mA | 2.4    | 3.4   |      | 2.4    | 3.4   |      | V    |
| V <sub>OL</sub>   | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 16 mA     |        | 0.2   | 0.4  |        | 0.2   | 0.4  | 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> = 2.4 V                             |        |       | 40   |        |       | 40   | μA   |
| I <sub>IL</sub>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V                             |        |       | -1.6 |        |       | -1.6 | mA   |
| I <sub>OS</sub> § | V <sub>CC</sub> = MAX   | -20    |       | -55  | -18    |       | -55  | mA   |
| I <sub>CCH</sub>  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V                               |        | 3     | 6    |        | 3     | 6    | mA   |
| I <sub>CCL</sub>  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 4.5 V                             |        | 9     | 16.5 |        | 9     | 16.5 | mA   |

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

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

§ Not more than one output should be shorted at a time.

## switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 2)

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST CONDITIONS                                | MIN | TYP | MAX | UNIT |
|------------------|-----------------|----------------|--|-----|-----|-----|------|
| t <sub>PLH</sub> | A, B or C       | Y              | R <sub>L</sub> = 400 Ω, C <sub>L</sub> = 15 pF |     | 11  | 22  | ns   |
| t <sub>PHL</sub> |                 |                |  |     | 7   | 15  | ns   |

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

# SN54LS10, SN74LS10, TRIPLE 3-INPUT POSITIVE-NAND GATES

SDLS035 – DECEMBER 1983 – REVISED MARCH 1988

## recommended operating conditions

|   | SN54LS10 |     |      | SN74LS10 |     |      | 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       |          |     | 0.7  |          |     | 0.8  | V    |
| I <sub>OH</sub> High-level output current     |          |     | -0.4 |          |     | -0.4 | mA   |
| I <sub>OL</sub> Low-level output current      |          |     | 4    |          |     | 8    | mA   |
| T <sub>A</sub> Operating free-air temperature | -55      |     | 125  | 0        |     | 70   | °C   |

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

| PARAMETER         | TEST CONDITIONS †   | SN54LS10 |      |      | SN74LS10 |      |      | UNIT |
|-------------------|---|----------|------|------|----------|------|------|------|
|                   |   | MIN      | TYP‡ | MAX  | MIN      | TYP‡ | MAX  |      |
| V <sub>IK</sub>   | V <sub>CC</sub> = MIN, I <sub>I</sub> = -18 mA                          |          |      | -1.5 |          |      | -1.5 | V    |
| V <sub>OH</sub>   | V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX, I <sub>OH</sub> = -0.4 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> = 4 mA    |          | 0.25 | 0.4  |          |      | 0.4  | V    |
|                   | V <sub>CC</sub> = MIN, V <sub>IH</sub> = 2 V, I <sub>OL</sub> = 8 mA    |          |      |      |          | 0.25 | 0.5  |      |
| I <sub>I</sub>    | V <sub>CC</sub> = MAX, V <sub>I</sub> = 7 V                             |          |      | 0.1  |          |      | 0.1  | mA   |
| I <sub>IH</sub>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7 V                           |          |      | 20   |          |      | 20   | μA   |
| I <sub>IL</sub>   | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.4 V                           |          |      | -0.4 |          |      | -0.4 | mA   |
| I <sub>OS</sub> § | V <sub>CC</sub> = MAX   | -20      |      | -100 | -20      |      | -100 | mA   |
| I <sub>CCH</sub>  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 0 V                             |          | 0.6  | 1.2  |          | 0.6  | 1.2  | mA   |
| I <sub>CCL</sub>  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 4.5 V                           |          | 1.8  | 3.3  |          | 1.8  | 3.3  | mA   |

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

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 2)

| PARAMETER        | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS                               | MIN | TYP | MAX | UNIT |
|------------------|--------------|-------------|---|-----|-----|-----|------|
| t <sub>PLH</sub> | A, B or C    | Y           | R <sub>L</sub> = 2 kΩ, C <sub>L</sub> = 15 pF |     | 9   | 15  | ns   |
| t <sub>PHL</sub> |              |             |   |     | 10  | 15  | ns   |

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



# SN54S10, SN74S10, TRIPLE 3-INPUT POSITIVE-NAND GATES

SDLS035 – DECEMBER 1983 – REVISED MARCH 1988

## recommended operating conditions

|   | SN54S10 |     |     | SN74S10 |     |      | 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   |

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

| PARAMETER         | TEST CONDITIONS †   | SN54S10 |       |      | SN74S10 |       |      | UNIT |
|-------------------|---|---------|-------|------|---------|-------|------|------|
|                   |   | MIN     | TYP ‡ | MAX  | MIN     | TYP ‡ | 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> § | 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                             |         | 7.5   | 12   |         | 7.5   | 12   | mA   |
| I <sub>CCL</sub>  | V <sub>CC</sub> = MAX, V <sub>I</sub> = 4.5 V                           |         | 15    | 27   |         | 15    | 27   | mA   |

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

‡ All typical values are at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°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<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 2)

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

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



**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>               |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--|
| JM38510/00103BCA | OBSOLETE              | CDIP         | J               | 14   |             | None                    | Call TI          | Call TI                                    |
| JM38510/00103BDA | OBSOLETE              | CFP          | W               | 14   |             | None                    | Call TI          | Call TI                                    |
| JM38510/07005BCA | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| JM38510/07005BDA | ACTIVE                | CFP          | W               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| JM38510/30005B2A | ACTIVE                | LCCC         | FK              | 20   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| JM38510/30005BCA | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| JM38510/30005BDA | ACTIVE                | CFP          | W               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| JM38510/30005SCA | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| JM38510/30005SDA | ACTIVE                | CFP          | W               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SN5410J          | OBSOLETE              | CDIP         | J               | 14   |             | None                    | Call TI          | Call TI                                    |
| SN54LS10J        | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SN54S10J         | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SN7410N          | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| SN7410N3         | OBSOLETE              | PDIP         | N               | 14   |             | None                    | Call TI          | Call TI                                    |
| SN74LS10D        | ACTIVE                | SOIC         | D               | 14   | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74LS10DR       | ACTIVE                | SOIC         | D               | 14   | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74LS10N        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| SN74LS10N3       | OBSOLETE              | PDIP         | N               | 14   |             | None                    | Call TI          | Call TI                                    |
| SN74LS10NSR      | ACTIVE                | SO           | NS              | 14   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74S10D         | ACTIVE                | SOIC         | D               | 14   | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74S10N         | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| SN74S10N3        | OBSOLETE              | PDIP         | N               | 14   |             | None                    | Call TI          | Call TI                                    |
| SN74S10NSR       | ACTIVE                | SO           | NS              | 14   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SNJ5410J         | OBSOLETE              | CDIP         | J               | 14   |             | None                    | Call TI          | Call TI                                    |
| SNJ5410W         | OBSOLETE              | CFP          | W               | 14   |             | None                    | Call TI          | Call TI                                    |
| SNJ5410WA        | OBSOLETE              | CFP          | WA              | 14   |             | None                    | Call TI          | Call TI                                    |
| SNJ54LS10FK      | ACTIVE                | LCCC         | FK              | 20   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SNJ54LS10J       | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SNJ54LS10W       | ACTIVE                | CFP          | W               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SNJ54S10FK       | ACTIVE                | LCCC         | FK              | 20   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SNJ54S10J        | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SNJ54S10W        | ACTIVE                | CFP          | W               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |

<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.

(2) Eco Plan - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**None:** Not yet available Lead (Pb-Free).

**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.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

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

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

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

14 LEADS SHOWN

CERAMIC DUAL IN-LINE PACKAGE



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



W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



4040180-2/D 07/03

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

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

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



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

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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN

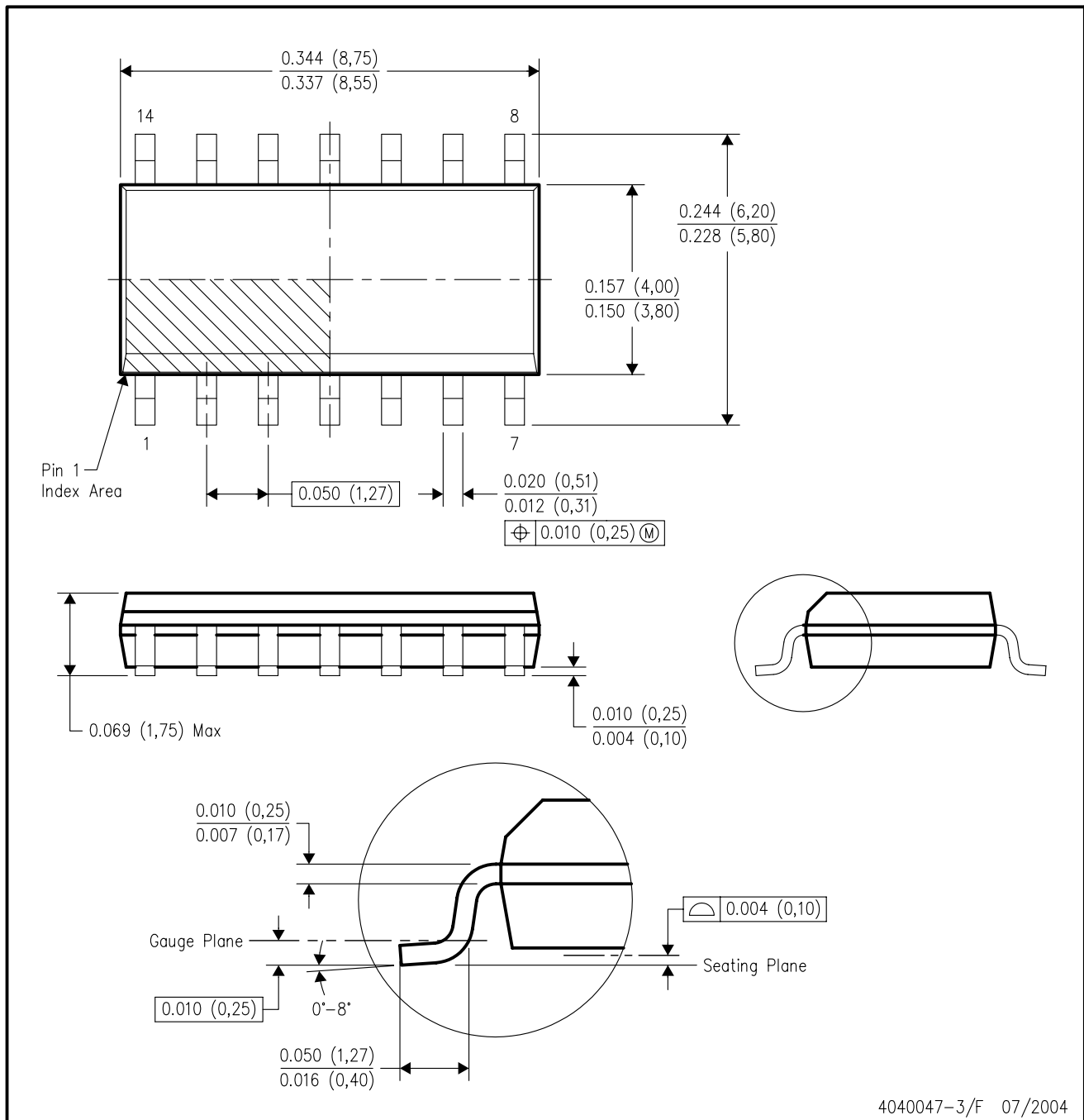


4040049/E 12/2002

- 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



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-012 variation AB.

# 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.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

| <b>Products</b>  |  | <b>Applications</b> |  |
|------------------|--|---------------------|--|
| Amplifiers       | <a href="http://amplifier.ti.com">amplifier.ti.com</a>             | Audio               | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                   |
| Data Converters  | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>     | Automotive          | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>         |
| DSP              | <a href="http://dsp.ti.com">dsp.ti.com</a>                         | Broadband           | <a href="http://www.ti.com/broadband">www.ti.com/broadband</a>           |
| Interface        | <a href="http://interface.ti.com">interface.ti.com</a>             | Digital Control     | <a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a> |
| Logic            | <a href="http://logic.ti.com">logic.ti.com</a>                     | Military            | <a href="http://www.ti.com/military">www.ti.com/military</a>             |
| Power Mgmt       | <a href="http://power.ti.com">power.ti.com</a>                     | Optical Networking  | <a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a> |
| Microcontrollers | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a> | Security            | <a href="http://www.ti.com/security">www.ti.com/security</a>             |
|                  |  | Telephony           | <a href="http://www.ti.com/telephony">www.ti.com/telephony</a>           |
|                  |  | Video & Imaging     | <a href="http://www.ti.com/video">www.ti.com/video</a>                   |
|                  |  | Wireless            | <a href="http://www.ti.com/wireless">www.ti.com/wireless</a>             |

Mailing Address: Texas Instruments  
Post Office Box 655303 Dallas, Texas 75265