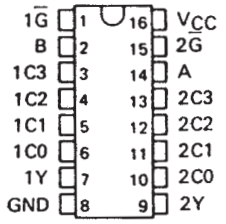
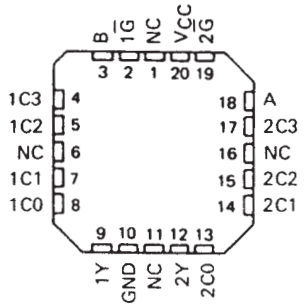
- **Three-State Version of SN54/74LS153, SN54/74S153**
- **Schottky-Diode-Clamped Transistors**
- **Permits Multiplexing from N Lines to 1 Line**
- **Performs Parallel-to Serial Conversion**
- **Fully Compatible with Most TTL Circuits**
- **Low Power Dissipation**
  **'LS253 . . . 35 mW Typical**
  **'S253 . . . 225 mW Typical**

**SN54LS253, SN54S253 . . . J OR W PACKAGE**
**SN74LS253, SN74S253 . . . D OR N PACKAGE**
**(TOP VIEW)**




**SN54LS253, SN54S253 . . . FK PACKAGE**
**(TOP VIEW)**




NC-No internal connection

## description

Each of these Schottky-clamped data selectors/multiplexers contains inverters and drivers to supply fully complementary, on-chip, binary decoding data selection to the AND-OR gates. Separate output control inputs are provided for each of the two four-line sections.

The three-state outputs can interface with and drive data lines of bus-organized systems. With all but one of the common outputs disabled (at a high-impedance state) the low-impedance of the single enabled output will drive the bus line to a high or low logic level.

**FUNCTION TABLE**

| SELECT INPUTS | | DATA INPUTS | | | | OUTPUT CONTROL | OUTPUT |
|---|---|---|---|---|---|---|---|
| B | A | C0 | C1 | C2 | C3 | $\overline{G}$ | Y |
| X | X | X | X | X | X | H | Z |
| L | L | L | X | X | X | L | L |
| L | L | H | X | X | X | L | H |
| L | H | X | L | X | X | L | L |
| L | H | X | H | X | X | L | H |
| H | L | X | X | L | X | L | L |
| H | L | X | X | H | X | L | H |
| H | H | X | X | X | L | L | L |
| H | H | X | X | X | H | L | H |

Address inputs A and B are common to both sections.
H = high level, L = low level, X = irrelevant, Z = high impedance (off)

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

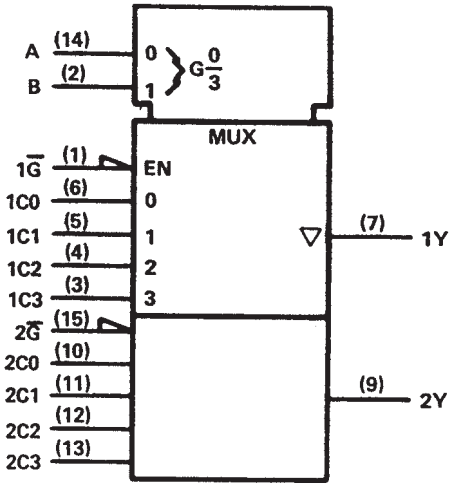
Supply voltage, $V_{CC}$ (see Note 1) . . . . . 7 V
Input voltage: 'LS253 . . . . . 7 V
'S253 . . . . . 5.5 V
Off-state output voltage . . . . . 5.5 V
Operating free-air temperature range: SN54LS253, SN54S253 . . . . . $-55^{\circ}C$ to $125^{\circ}C$
SN74LS253, SN74S253 . . . . . $0^{\circ}C$ to $70^{\circ}C$
Storage temperature range . . . . . $-65^{\circ}C$ to $150^{\circ}C$

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

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.

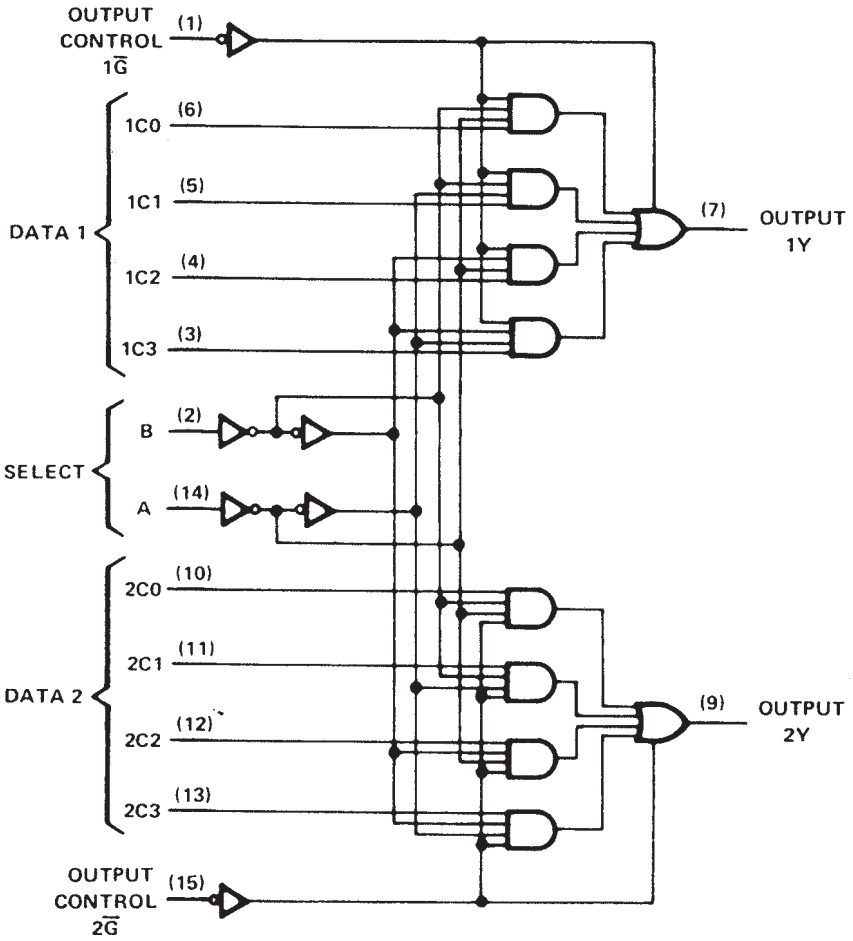
Copyright © 1988, Texas Instruments Incorporated

### logic symbol†



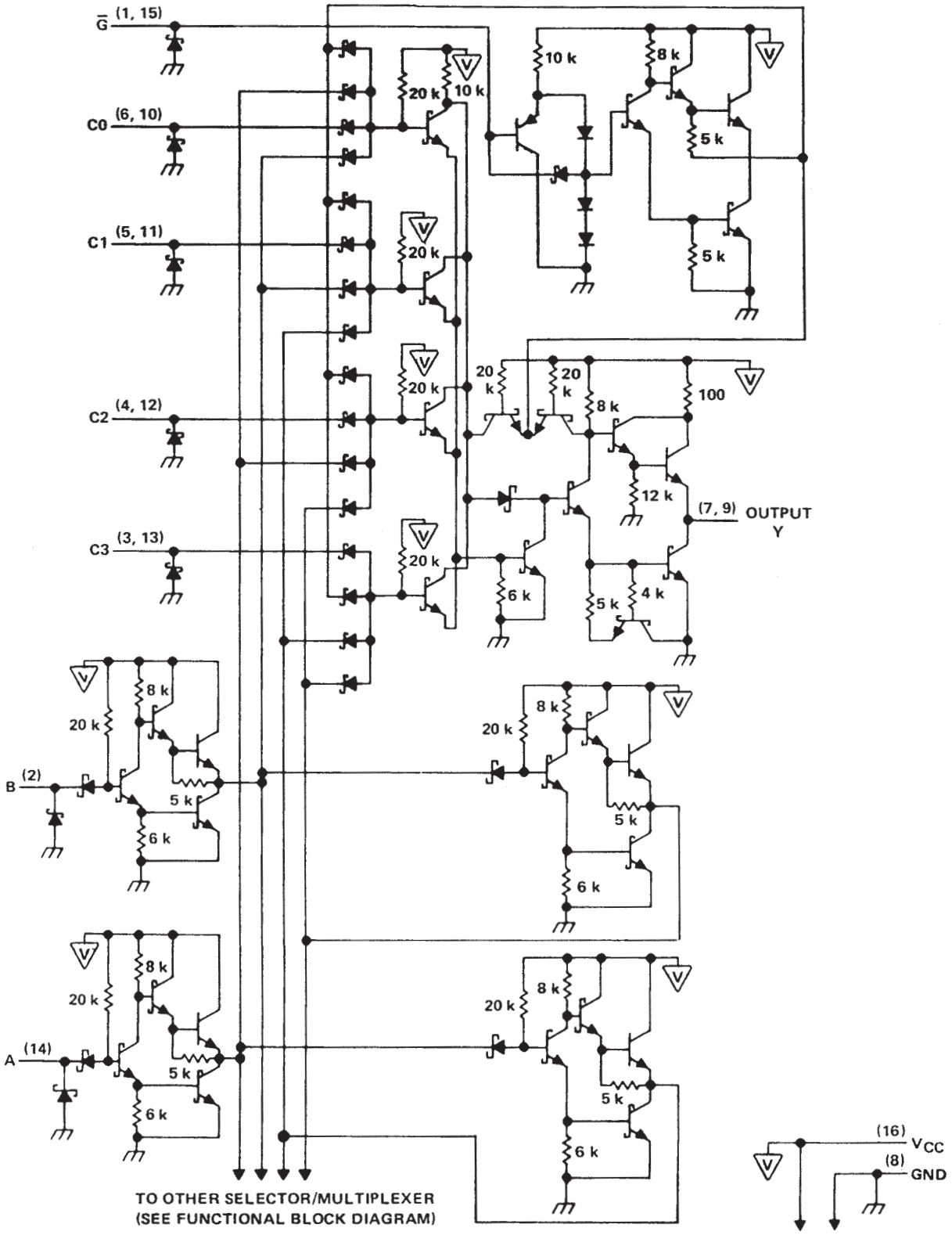

† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

### logic diagram (positive logic)




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

schematic (each selector/multiplexer, and the common select section)




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

## recommended operating conditions

| | | SN54LS253 | | | SN74LS253 | | | 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 | | | −1 | | | −2.6 | mA |
| $I_{OL}$ | Low-level output current | | | 4 | | | 8 | mA |
| $T_A$ | Operating free-air temperature | −55 | | 125 | 0 | | 70 | °C |

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

| PARAMETER | TEST CONDITIONS† | | | SN54LS253 | | | SN74LS253 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP‡ | MAX | MIN | TYP‡ | MAX | |
| $V_{IK}$ | $V_{CC}$ = MIN, $I_I$ = −18 mA | | | | | −1.5 | | | −1.5 | V |
| $V_{OH}$ | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = MAX, | | $I_{OH}$ = MAX | 2.4 | 3.4 | | 2.4 | 3.1 | | V |
| $V_{OL}$ | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = MAX | | $I_{OL}$ = 4 mA | | 0.25 | 0.4 | | 0.25 | 0.4 | V |
| | | | $I_{OL}$ = 8 mA | | | | | 0.25 | 0.5 | |
| $I_{OZ}$ | $V_{CC}$ = MAX, $V_{IH}$ = 2 V | | $V_O$ = 2.7 V | | | 20 | | | 20 | μA |
| | | | $V_O$ = 0.4 V | | | −20 | | | −20 | |
| $I_I$ | $V_{CC}$ = MAX, $V_I$ = 7 V | | | | | 0.1 | | | 0.1 | mA |
| $I_{IH}$ | $V_{CC}$ = MAX, $V_I$ = 2.7 V | | | | | 20 | | | 20 | μA |
| $I_{IL}$ | $V_{CC}$ = MAX, $V_I$ = 0.4 V | | $\overline{G}$ | | | −0.2 | | | −0.2 | mA |
| | | | All other | | | −0.4 | | | −0.4 | |
| $I_{OS}$§ | $V_{CC}$ = MAX | | | −30 | | −130 | −30 | | −130 | mA |
| $I_{CC}$ | $V_{CC}$ = MAX, See Note 2 | | Condition A | | 7 | 12 | | 7 | 12 | mA |
| | | | Condition B | | 8.5 | 14 | | 8.5 | 14 | |

† For conditions shown as MIN or MAX, use the appropriate value spcified under recommended operating conditions.
‡ All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
§ Not more than one output should be shorted at a time, and duration for the short-circuit should exceed one second.
NOTE 2: $I_{CC}$ is measured with the outputs open under the following conditions:
A. All inputs grounded.
B. Output control at 4.5 V, all inputs grounded.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $t_{PLH}$ | Data | Y | $C_L$ = 15 pF, $R_L$ = 2 kΩ, See Note 3 | | 17 | 25 | ns |
| $t_{PHL}$ | | | | | 13 | 20 | |
| $t_{PLH}$ | Select | Y | | | 30 | 45 | ns |
| $t_{PHL}$ | | | | | 21 | 32 | |
| $t_{PZH}$ | Output Control | Y | | | 15 | 28 | ns |
| $t_{PZL}$ | | | | | 15 | 23 | |
| $t_{PHZ}$ | Output Control | Y | $C_L$ = 5 pF, $R_L$ = 2 kΩ, See Note 3 | | 27 | 41 | ns |
| $t_{PLZ}$ | | | | | 18 | 27 | |

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

## recommended operating conditions

| | | SN54S253 | | | SN74S253 | | | 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 | | | −2 | | | −6.5 | mA |
| $I_{OL}$ | Low-level output current | | | 20 | | | 20 | mA |
| $T_A$ | Operating free-air temperature | −55 | | 125 | 0 | | 70 | °C |

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

| PARAMETER | TEST CONDITIONS† | | MIN | TYP‡ | MAX | UNIT |
|---|---|---|---|---|---|---|
| $V_{IK}$ | $V_{CC}$ = MIN, $I_I$ = −18 mA | | | | −1.2 | V |
| $V_{OH}$ | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V, $I_{OH}$ = MAX | Series 54S | 2.5 | 3.4 | | V |
| | | Series 74S | 2.7 | 3.4 | | |
| $V_{OL}$ | $V_{CC}$ = MIN, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V, $I_{OL}$ = 20 mA | | | | 0.5 | V |
| $I_{OZ}$ | $V_{CC}$ = MAX, $V_{IH}$ = 2 V | $V_O$ = 2.4 V | | | 50 | μA |
| | | $V_O$ = 0.5 V | | | −50 | |
| $I_I$ | $V_{CC}$ = MAX, $V_I$ = 5.5 V | | | | 1 | mA |
| $I_{IH}$ | $V_{CC}$ = MAX, $V_I$ = 2.7 V | | | | 50 | μA |
| $I_{IL}$ | $V_{CC}$ = MAX, $V_I$ = 0.5 V | $\overline{G}$ = 0.8 V | | | −2 | mA |
| | | $\overline{G}$ = 2 V | | | −0.25 | |
| $I_{OS}$§ | $V_{CC}$ = MAX | | −40 | | −100 | mA |
| $I_{CC}$ | $V_{CC}$ = MAX, See Note 2 | Condition A | | 45 | 70 | mA |
| | | Condition B | | 65 | 85 | |

† For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
‡ All typical values are at $V_{CC}$ = 5 V, $T_A$ = 25°C.
§ Not more than one output should be shorted at a time and duration of short-circuit should not exceed one second.
NOTE 2: $I_{CC}$ is measured with the outputs open under the following conditions:
A. All inputs grounded.
B. Output control at 4.5 V, all inputs grounded.

## switching characteristics, $V_{CC}$ = 5 V, $T_A$ = 25°C

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $t_{PLH}$ | Data | Y | $R_L$ = 280 Ω, $C_L$ = 15 pF, See Note 3 | | 6 | 9 | ns |
| $t_{PHL}$ | | | | | 6 | 9 | |
| $t_{PLH}$ | Select | Y | | | 11.5 | 18 | ns |
| $t_{PHL}$ | | | | | 12 | 18 | |
| $t_{PZH}$ | Output Control | Y | | | 11 | 16.5 | ns |
| $t_{PZL}$ | | | | | 12 | 18 | |
| $t_{PHZ}$ | Output Control | Y | $R_L$ = 280 Ω, $C_L$ = 5 pF, See Note 3 | | 6.5 | 9.5 | ns |
| $t_{PLZ}$ | | | | | 10 | 15 | |

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL Peak Temp (3) |
|---|---|---|---|---|---|---|---|---|
| 76017012A | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| 7601701EA | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| 7601701EA | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| 7601701FA | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| 7601701FA | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/30908B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/30908B2A | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/30908BEA | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/30908BEA | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/30908BFA | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| JM38510/30908BFA | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN54LS253J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN54LS253J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SN74LS253D | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS253D | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS253DE4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS253DE4 | ACTIVE | SOIC | D | 16 | 40 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS253DR | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS253DR | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS253DRE4 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS253DRE4 | ACTIVE | SOIC | D | 16 | 2500 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS253J | OBSOLETE | CDIP | J | 16 | | TBD | Call TI | Call TI |
| SN74LS253J | OBSOLETE | CDIP | J | 16 | | TBD | Call TI | Call TI |
| SN74LS253N | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74LS253N | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74LS253N3 | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI |
| SN74LS253N3 | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI |
| SN74LS253NE4 | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74LS253NE4 | ACTIVE | PDIP | N | 16 | 25 | Pb-Free (RoHS) | CU NIPDAU | Level-NC-NC-NC |
| SN74LS253NSR | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS253NSR | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74LS253NSRE4 | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & | CU NIPDAU | Level-1-260C-UNLIM |

| Orderable Device | Status [1] | Package Type | Package Drawing | Pins | Package Qty | Eco Plan [2] | Lead/Ball Finish | MSL Peak Temp [3] |
|---|---|---|---|---|---|---|---|---|
| | | | | | | no Sb/Br) | | |
| SN74LS253NSRE4 | ACTIVE | SO | NS | 16 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| SN74S253N | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI |
| SN74S253N | OBSOLETE | PDIP | N | 16 | | TBD | Call TI | Call TI |
| SNJ54LS253FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS253FK | ACTIVE | LCCC | FK | 20 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS253J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS253J | ACTIVE | CDIP | J | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS253W | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |
| SNJ54LS253W | ACTIVE | CFP | W | 16 | 1 | TBD | Call TI | Level-NC-NC-NC |

**(1)** The marketing status values are defined as follows:
**ACTIVE:** Product device recommended for new designs.
**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.
**OBSOLETE:** TI has discontinued the production of the device.

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

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

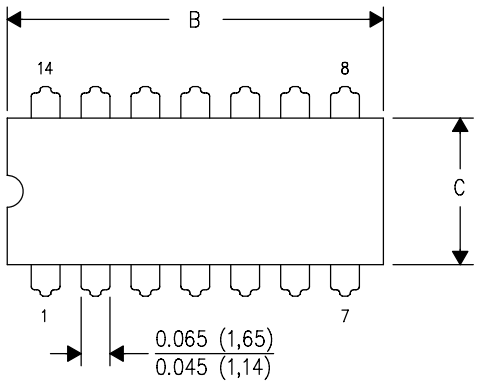
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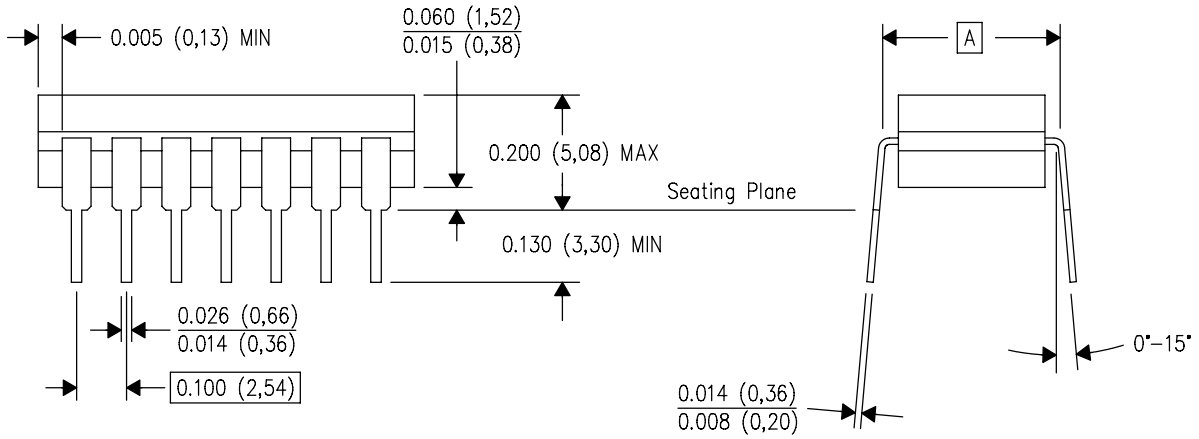
J (R–GDIP–T**)

14 LEADS SHOWN

# CERAMIC DUAL IN–LINE PACKAGE



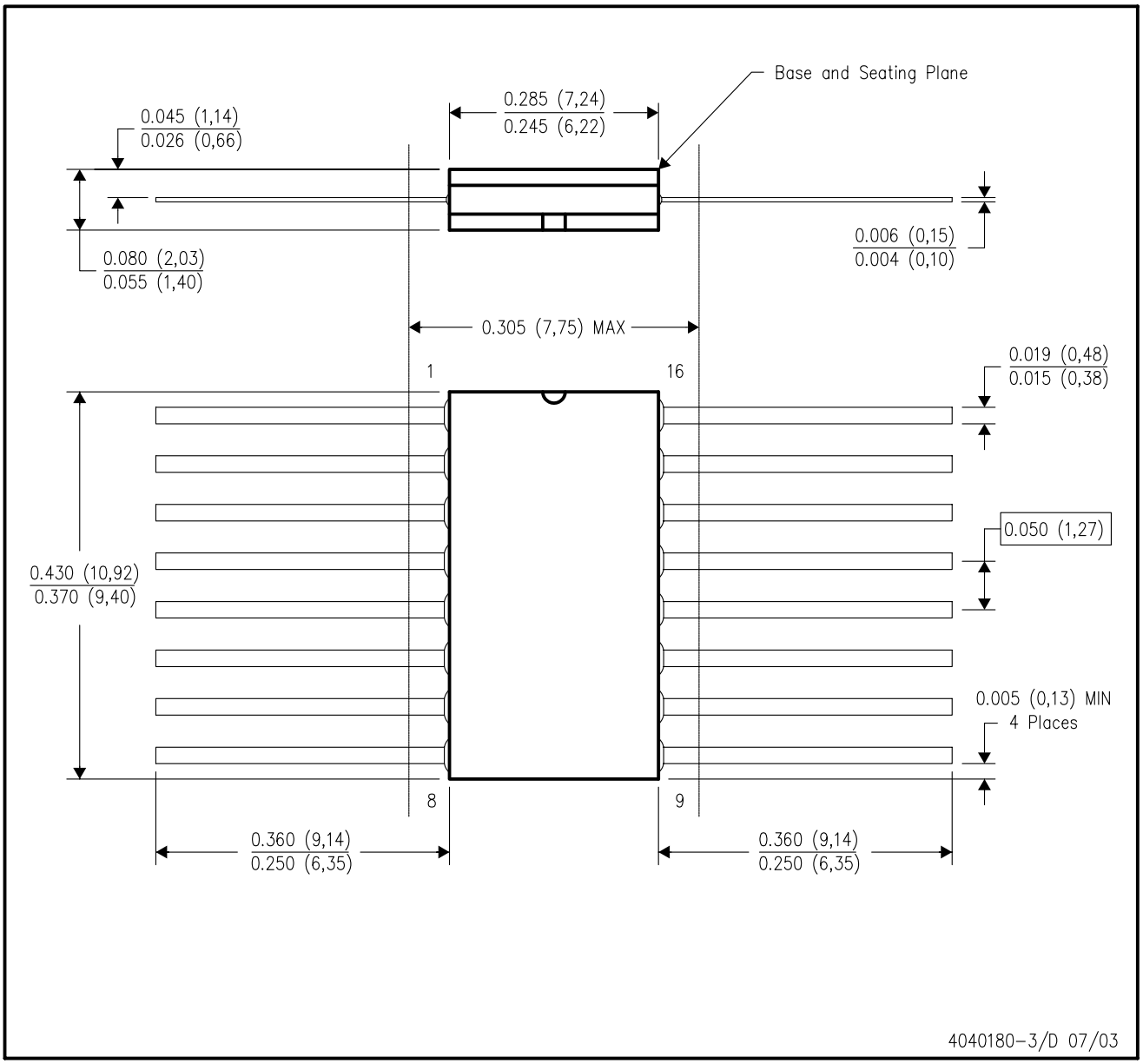

| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B MIN | — | — | — | — |
| C MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87) | 0.300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




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.

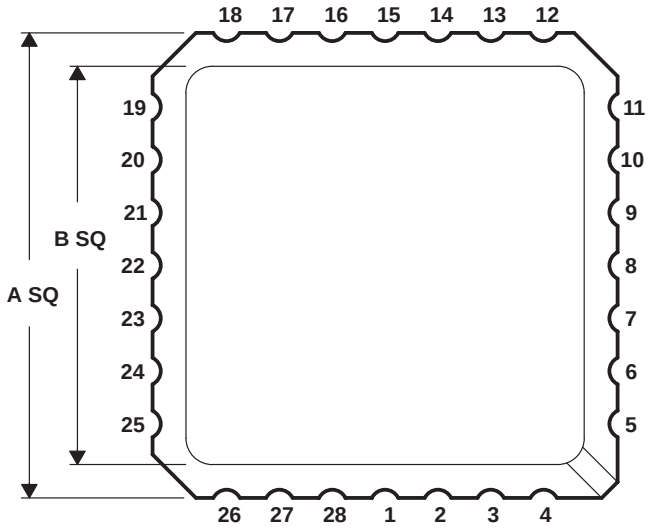
## W (R–GDFP–F16) CERAMIC DUAL FLATPACK



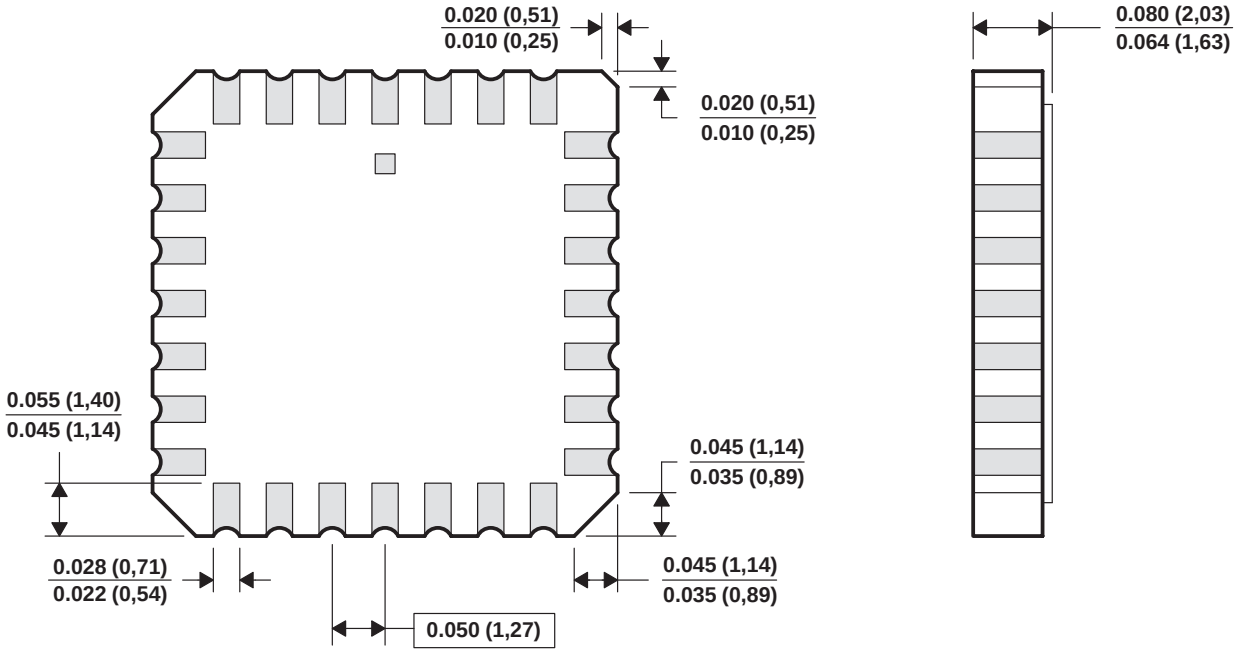

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package can be hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only.
E. Falls within MIL STD 1835 GDFP1–F16 and JEDEC MO–092AC

**FK (S-CQCC-N**)** **LEADLESS CERAMIC CHIP CARRIER**

**28 TERMINAL SHOWN**




| NO. OF TERMINALS ** | A | | B | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| 20 | 0.342 (8,69) | 0.358 (9,09) | 0.307 (7,80) | 0.358 (9,09) |
| 28 | 0.442 (11,23) | 0.458 (11,63) | 0.406 (10,31) | 0.458 (11,63) |
| 44 | 0.640 (16,26) | 0.660 (16,76) | 0.495 (12,58) | 0.560 (14,22) |
| 52 | 0.739 (18,78) | 0.761 (19,32) | 0.495 (12,58) | 0.560 (14,22) |
| 68 | 0.938 (23,83) | 0.962 (24,43) | 0.850 (21,6) | 0.858 (21,8) |
| 84 | 1.141 (28,99) | 1.165 (29,59) | 1.047 (26,6) | 1.063 (27,0) |



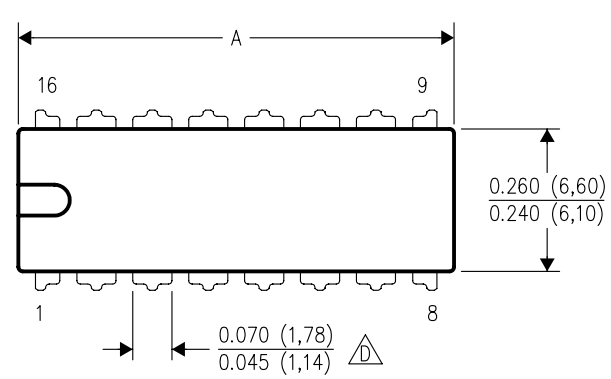

**4040140/D 10/96**

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

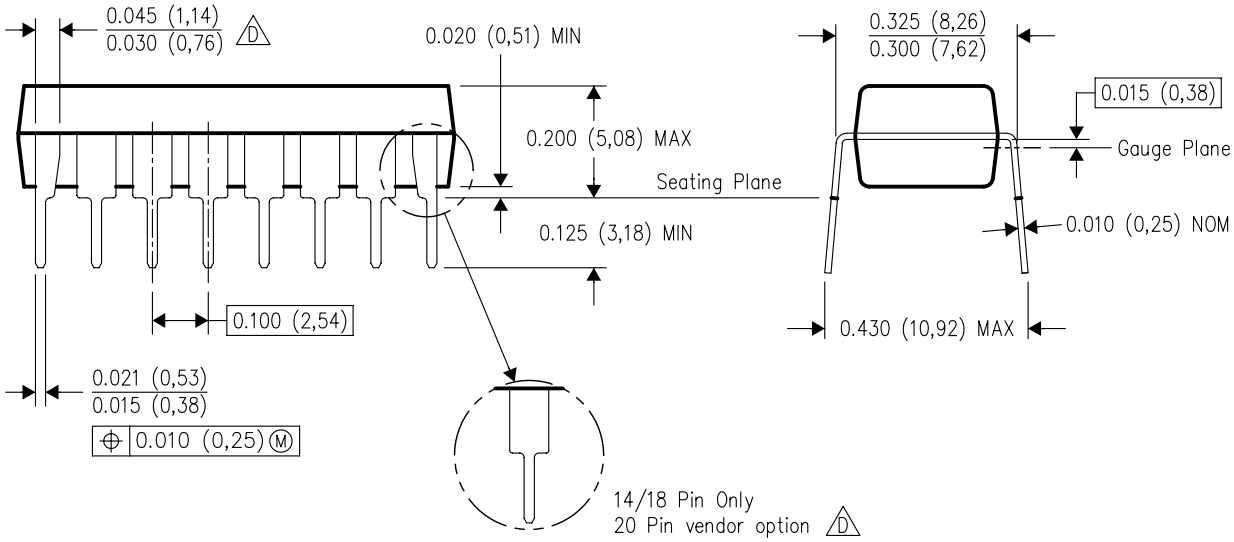
## N (R–PDIP–T**)

## PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



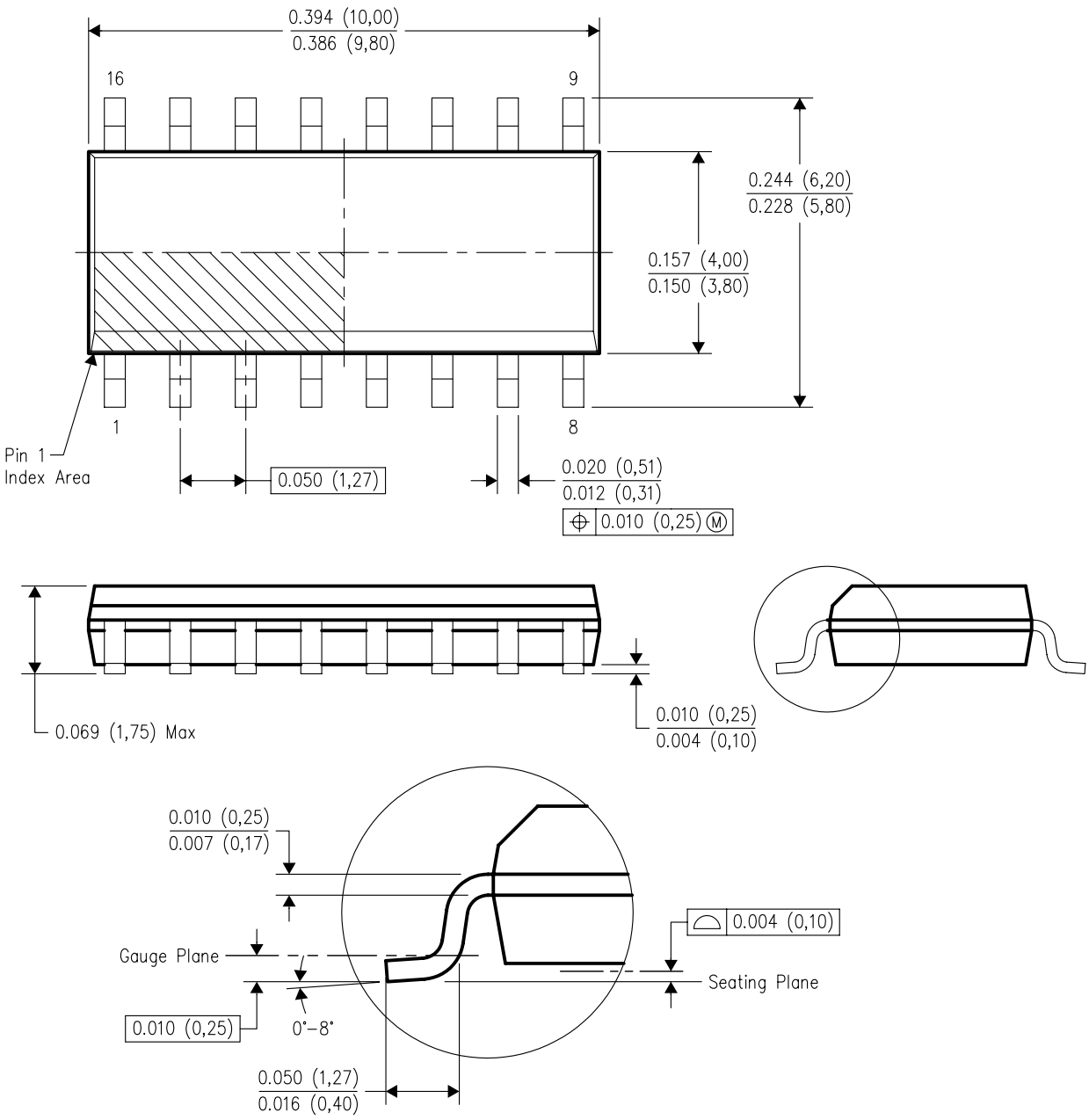

| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23,37) | 1.060 (26,92) |
| A MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21,59) | 0.940 (23,88) |
| MS–001 VARIATION (C) | AA | BB | AC | AD |




4040049/E 12/2002

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

## D (R–PDSO–G16) PLASTIC SMALL–OUTLINE PACKAGE

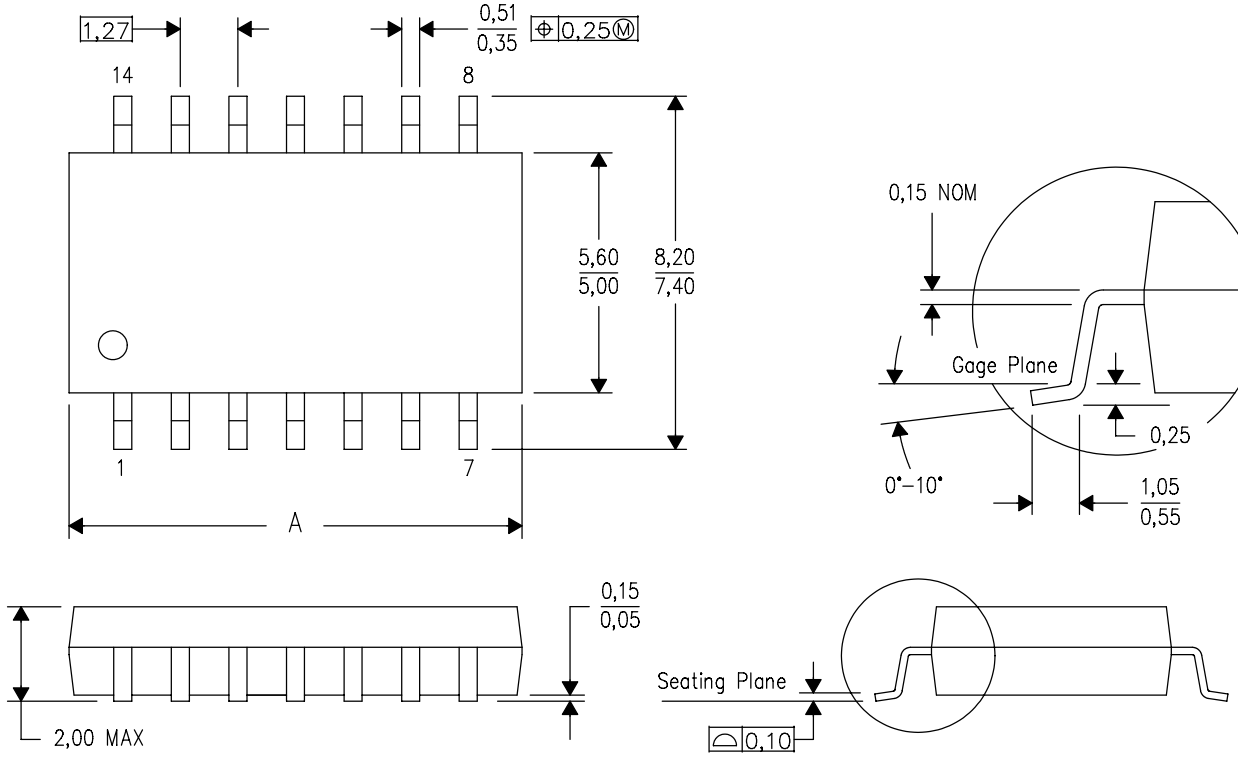



NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
D. Falls within JEDEC MS–012 variation AC.

## 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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