

# CMOS 8-Channel Data Selector

High-Voltage Types (20-Volt Rating)

■ CD4512B is an 8-channel data selector featuring a three-state output that can interface directly with, and drive, data lines of bus-oriented systems.

The CD4512B-series types are supplied in 16-lead hermetic dual-in-line ceramic packages (F3A suffix), 16-lead dual-in-line plastic packages (E suffix), 16-lead small-outline packages (M, M96, MT, and NSR suffixes), and 16-lead thin shrink small-outline packages (PW and PWR suffixes).

### RECOMMENDED OPERATING CONDITIONS

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

| CHARACTERISTIC  | LIMITS |      | UNITS |
|---|--------|------|-------|
|   | MIN.   | MAX. |       |
| Supply-Voltage Range (For $T_A$ = Full Package Temperature Range) | 3      | 18   | V     |

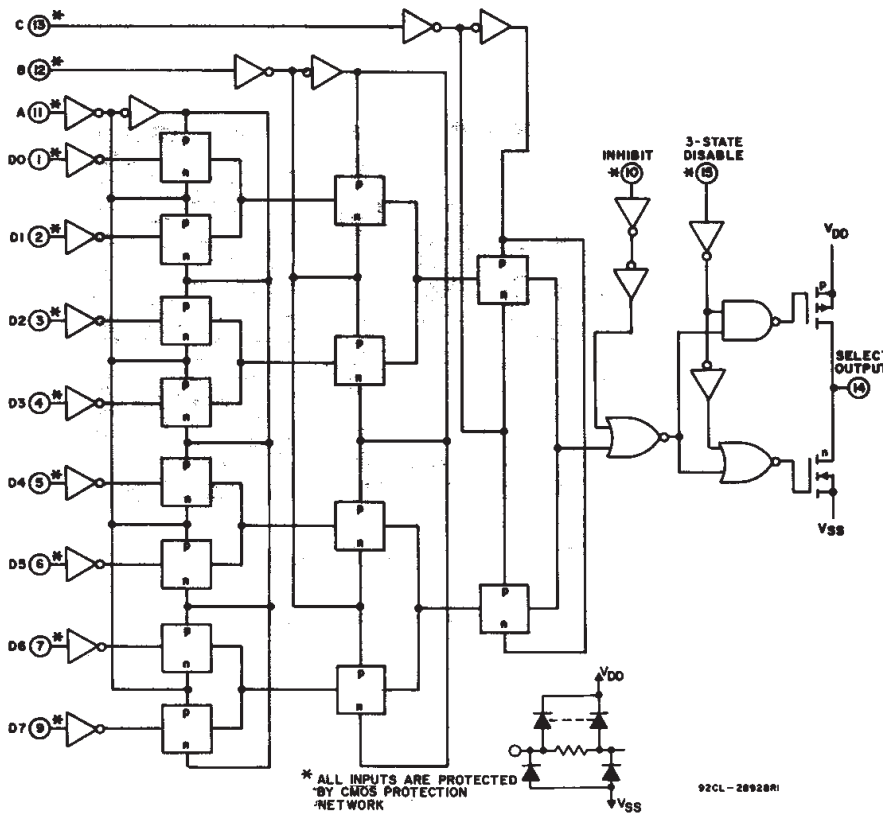


Fig. 1 - Logic diagram.

### Features:

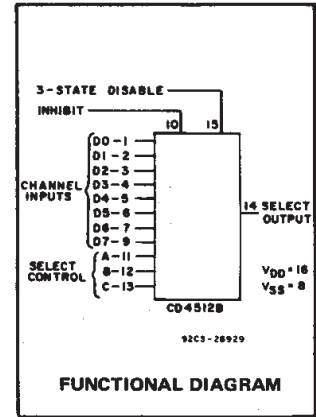
- 3-state output
- Standardized, symmetrical output characteristics
- 100% tested for quiescent current at 20 V
- 5-V, 10-V, and 15-V parametric ratings
- Maximum input current of 1  $\mu$ A at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Noise margin (over full package-temperature range):
  - 1 V at  $V_{DD} = 5$  V
  - 2 V at  $V_{DD} = 10$  V
  - 2.5 V at  $V_{DD} = 15$  V

■ Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

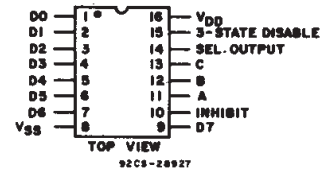
### Applications:

- Digital multiplexing
- Number-sequence generation
- Signal gating

# CD4512B Types



FUNCTIONAL DIAGRAM



TERMINAL ASSIGNMENT

### TRUTH TABLE

| SEL. CONT. |   |   | INH | 3-STATE DISABLE | SEL OUTPUT |
|------------|---|---|-----|-----------------|------------|
| A          | B | C |     |                 |            |
| 0          | 0 | 0 | 0   | 0               | D0         |
| 1          | 0 | 0 | 0   | 0               | D1         |
| 0          | 1 | 0 | 0   | 0               | D2         |
| 1          | 1 | 0 | 0   | 0               | D3         |
| 0          | 0 | 1 | 0   | 0               | D4         |
| 1          | 0 | 1 | 0   | 0               | D5         |
| 0          | 1 | 1 | 0   | 0               | D6         |
| 1          | 1 | 1 | 0   | 0               | D7         |
| X          | X | X | 1   | 0               | 0          |
| X          | X | X | X   | 1               | High Z     |

1 = High Level    0 = Low Level  
X = Don't Care

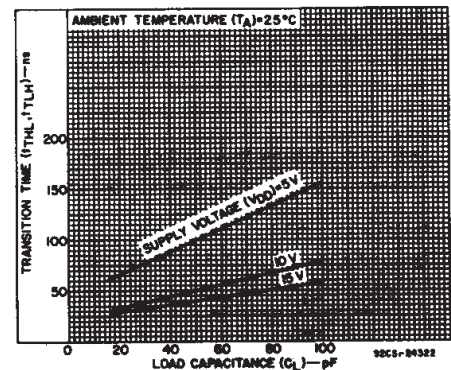


Fig. 2 - Typical transition time as a function of load capacitance.

# CD4512B Types

## MAXIMUM RATINGS, Absolute-Maximum Values:

### DC SUPPLY-VOLTAGE RANGE, (V<sub>DD</sub>)

Voltages referenced to V<sub>SS</sub> Terminal ..... -0.5V to +20V

INPUT VOLTAGE RANGE, ALL INPUTS ..... -0.5V to V<sub>DD</sub> +0.5V

DC INPUT CURRENT, ANY ONE INPUT ..... ±10mA

### POWER DISSIPATION PER PACKAGE (P<sub>D</sub>):

For T<sub>A</sub> = -55°C to +100°C ..... 500mW

For T<sub>A</sub> = +100°C to +125°C ..... Derate Linearly at 12mW/°C to 200mW

### DEVICE DISSIPATION PER OUTPUT TRANSISTOR

FOR T<sub>A</sub> = FULL PACKAGE-TEMPERATURE RANGE (All Package Types) ..... 100mW

OPERATING-TEMPERATURE RANGE (T<sub>A</sub>) ..... -55°C to +125°C

STORAGE TEMPERATURE RANGE (T<sub>stg</sub>) ..... -65°C to +150°C

### LEAD TEMPERATURE (DURING SOLDERING):

At distance 1/16 ± 1/32 inch (1.59 ± 0.79mm) from case for 10s max ..... +265°C

## STATIC ELECTRICAL CHARACTERISTICS

| CHARACTERISTIC                                       | CONDITIONS            |                        |                        | LIMITS AT INDICATED TEMPERATURES (°C) |       |       |       |       |                   |      | UNITS |
|--|-----------------------|------------------------|------------------------|---------------------------------------|-------|-------|-------|-------|-------------------|------|-------|
|  | V <sub>O</sub><br>(V) | V <sub>IN</sub><br>(V) | V <sub>DD</sub><br>(V) | -55                                   | -40   | +85   | +125  | +25   |                   |      |       |
|  |                       |                        |                        |                                       |       |       |       | Min.  | Typ.              | Max. |       |
| Quiescent Device Current, I <sub>DD</sub> Max.       | -                     | 0.5                    | 5                      | 5                                     | 5     | 150   | 150   | -     | 0.04              | 5    | μA    |
|  | -                     | 0.10                   | 10                     | 10                                    | 10    | 300   | 300   | -     | 0.04              | 10   |       |
|  | -                     | 0.15                   | 15                     | 20                                    | 20    | 600   | 600   | -     | 0.04              | 20   |       |
|  | -                     | 0.20                   | 20                     | 100                                   | 100   | 3000  | 3000  | -     | 0.08              | 100  |       |
| Output Low (Sink) Current I <sub>OL</sub> Min.       | 0.4                   | 0.5                    | 5                      | 0.64                                  | 0.61  | 0.42  | 0.36  | 0.51  | 1                 | -    | mA    |
|  | 0.5                   | 0.10                   | 10                     | 1.6                                   | 1.5   | 1.1   | 0.9   | 1.3   | 2.6               | -    |       |
|  | 1.5                   | 0.15                   | 15                     | 4.2                                   | 4     | 2.8   | 2.4   | 3.4   | 6.8               | -    |       |
| Output High (Source) Current, I <sub>OH</sub> Min.   | 4.6                   | 0.5                    | 5                      | -0.64                                 | -0.61 | -0.42 | -0.36 | -0.51 | -1                | -    | mA    |
|  | 2.5                   | 0.5                    | 5                      | -2                                    | -1.8  | -1.3  | -1.15 | -1.6  | -3.2              | -    |       |
|  | 9.5                   | 0.10                   | 10                     | -1.6                                  | -1.5  | -1.1  | -0.9  | -1.3  | -2.6              | -    |       |
|  | 13.5                  | 0.15                   | 15                     | -4.2                                  | -4    | -2.8  | -2.4  | -3.4  | -6.8              | -    |       |
| Output Voltage: Low-Level, V <sub>OL</sub> Max.      | -                     | 0.5                    | 5                      | 0.05                                  |       |       |       | -     | 0                 | 0.05 | V     |
|  | -                     | 0.10                   | 10                     | 0.05                                  |       |       |       | -     | 0                 | 0.05 |       |
|  | -                     | 0.15                   | 15                     | 0.05                                  |       |       |       | -     | 0                 | 0.05 |       |
| Output Voltage: High-Level, V <sub>OH</sub> Min.     | -                     | 0.5                    | 5                      | 4.95                                  |       |       |       | 4.95  | 5                 | -    | V     |
|  | -                     | 0.10                   | 10                     | 9.95                                  |       |       |       | 9.95  | 10                | -    |       |
|  | -                     | 0.15                   | 15                     | 14.95                                 |       |       |       | 14.95 | 15                | -    |       |
| Input Low Voltage V <sub>IL</sub> Max.               | 0.5, 4.5              | -                      | 5                      | 1.5                                   |       |       |       | -     | -                 | 1.5  | V     |
|  | 1.9                   | -                      | 10                     | 3                                     |       |       |       | -     | -                 | 3    |       |
|  | 1.5, 13.5             | -                      | 15                     | 4                                     |       |       |       | -     | -                 | 4    |       |
| Input High Voltage, V <sub>IH</sub> Min.             | 0.5, 4.5              | -                      | 5                      | 3.5                                   |       |       |       | 3.5   | -                 | -    | V     |
|  | 1.9                   | -                      | 10                     | 7                                     |       |       |       | 7     | -                 | -    |       |
|  | 1.5, 13.5             | -                      | 15                     | 11                                    |       |       |       | 11    | -                 | -    |       |
| Input Current I <sub>IN</sub> Max.                   | -                     | 0.18                   | 18                     | ±0.1                                  | ±0.1  | ±1    | ±1    | -     | ±10 <sup>-5</sup> | ±0.1 | μA    |
| 3-State Output Leakage Current I <sub>OUT</sub> Max. | 0.18                  | 0.18                   | 18                     | ±0.4                                  | ±0.4  | ±12   | ±12   | -     | ±10 <sup>-4</sup> | ±0.4 | μA    |

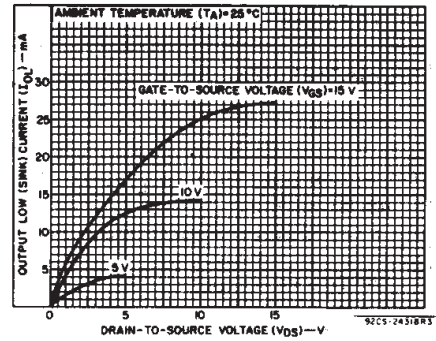


Fig. 3 - Typical output low (sink) current characteristics.

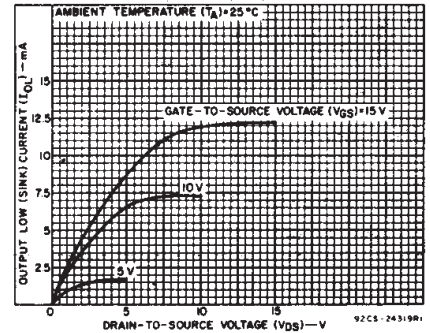


Fig. 4 - Minimum output low (sink) current characteristics.

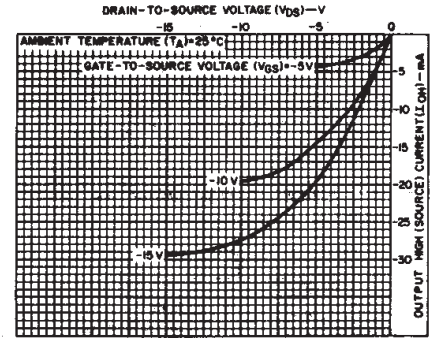


Fig. 5 - Typical output high (source) current characteristics.

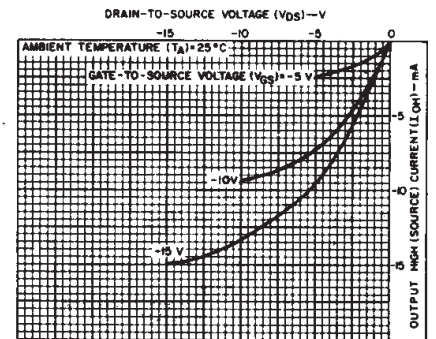


Fig. 6 - Minimum output high (source) current characteristics.

3  
COMMERCIAL CMOS  
HIGH VOLTAGE ICs

# CD4512B Types

DYNAMIC ELECTRICAL CHARACTERISTICS at  $T_A = 25^\circ\text{C}$ , Input  $t_r, t_f = 20\text{ ns}$ ,  $C_L = 50\text{ pF}$ ,  $R_L = 200\text{ k}\Omega$

| CHARACTERISTIC   | TEST CONDITIONS<br>$V_{DD}$<br>(V) | LIMITS |      | UNITS |
|--|------------------------------------|--------|------|-------|
|  |                                    | Typ.   | Max. |       |
| Propagation Delay Time, $t_{PHL}$ , $t_{PLH}$<br>Inhibit to Output           | 5                                  | 140    | 280  | ns    |
|  | 10                                 | 70     | 140  |       |
|  | 15                                 | 50     | 100  |       |
| "A" Select to Output   | 5                                  | 200    | 400  |       |
|  | 10                                 | 85     | 170  |       |
|  | 15                                 | 60     | 120  |       |
| Data to Output   | 5                                  | 180    | 360  |       |
|  | 10                                 | 75     | 150  |       |
|  | 15                                 | 55     | 110  |       |
| 3-State Disable Delay Time:<br>$t_{PZL}$ , $t_{PLZ}$ , $t_{PHZ}$ , $t_{PZH}$ | 5                                  | 60     | 120  | ns    |
|  | 10                                 | 30     | 60   |       |
|  | 15                                 | 20     | 40   |       |
| Transition Time, $t_{THL}$ , $t_{TLH}$                                       | 5                                  | 100    | 200  | ns    |
|  | 10                                 | 50     | 100  |       |
|  | 15                                 | 40     | 80   |       |
| Input Capacitance, $C_{iN}$<br>(Any Input)                                   |                                    | 5      | 7.5  | pF    |
|  |                                    |        |      |       |

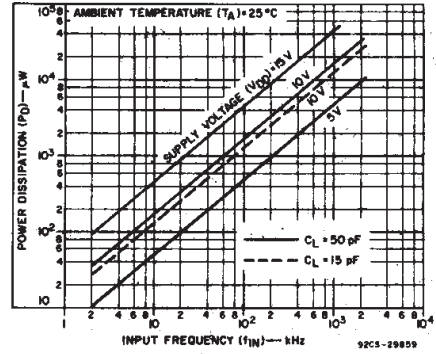


Fig. 7 - Typical dynamic power dissipation as a function of frequency.

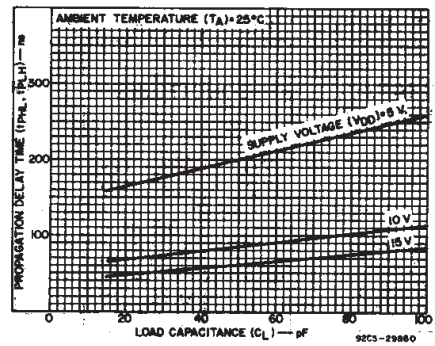
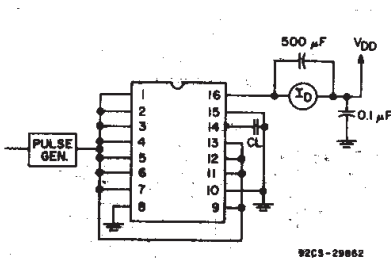
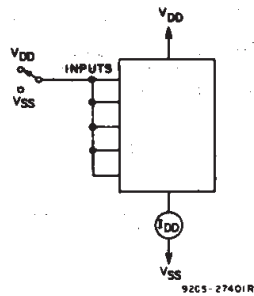


Fig. 8 - Typical propagation delay time as a function of load capacitance ("A" select to output).



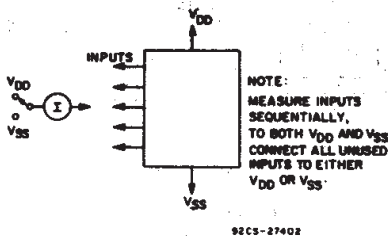
92CS-2986Z

Fig. 9 - Dynamic power dissipation test circuit.



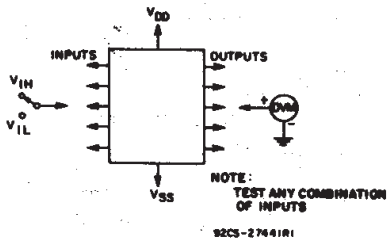
92CS-27401R1

Fig. 10 - Quiescent device current test circuit.



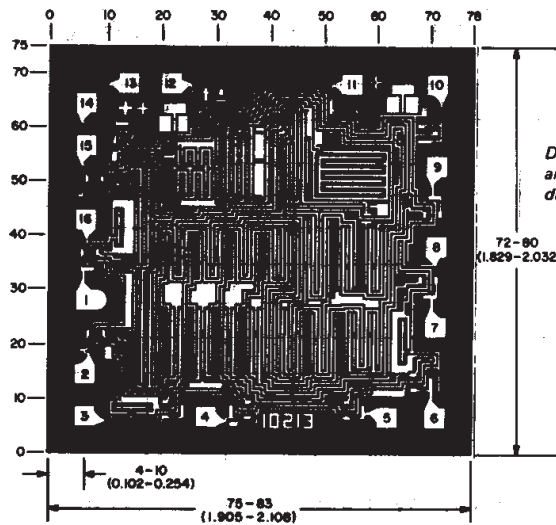
92CS-27402

Fig. 11 - Input current test circuit.



92CS-27441R1

Fig. 12 - Input voltage test circuit.



Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils ( $10^{-3}$  inch).

Dimensions and pad layout for CD4512BH

92CS-29861

**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>               |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--|
| CD4512BE         | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| CD4512BF         | ACTIVE                | CDIP         | J               | 16   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| CD4512BF3A       | ACTIVE                | CDIP         | J               | 16   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| CD4512BM         | ACTIVE                | SOIC         | D               | 16   | 40          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD4512BM96       | ACTIVE                | SOIC         | D               | 16   | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD4512BMT        | ACTIVE                | SOIC         | D               | 16   | 250         | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD4512BNSR       | ACTIVE                | SO           | NS              | 16   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| CD4512BPW        | ACTIVE                | TSSOP        | PW              | 16   | 90          | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| CD4512BPWR       | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |

<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 - 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.

<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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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.

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

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - 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-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



- 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.



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

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- 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.  
 D. Falls within JEDEC MO-153

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| 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>             |

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