

# DS8830, SN55183, SN75183 DUAL DIFFERENTIAL LINE DRIVERS

SLLS093D – OCTOBER 1972 – REVISED APRIL 1998

- Single 5-V Supply
- Differential Line Operation
- Dual Channels
- TTL Compatibility
- Short-Circuit Protection of Outputs
- Output Clamp Diodes to Terminate Line Transients
- High-Current Outputs
- Quad Inputs
- Single-Ended or Differential AND/NAND Outputs
- Designed for Use With Dual Differential Drivers SN55182 and SN75182
- Designed to Be Interchangeable With National Semiconductor DS7830 and DS8830

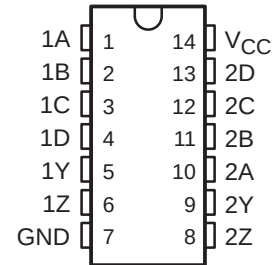
## description

The DS8830, SN55183, and SN75183 dual differential line drivers are designed to provide differential output signals with high current capability for driving balanced lines, such as twisted pair, at normal line impedances without high power dissipation. These devices can be used as TTL expander/phase splitters, because the output stages are similar to TTL totem-pole outputs.

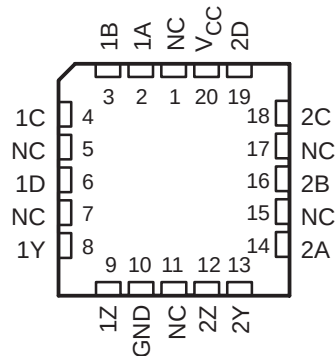
The driver is of monolithic single-chip construction, and both halves of the dual circuits use common power supply and ground terminals.

The SN55183 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The DS8830 and SN75183 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN55183 . . . J OR W PACKAGE  
SN75183 . . . D OR N PACKAGE  
DS8830 . . . N PACKAGE  
(TOP VIEW)



SN55183 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

**THE DS8830 AND SN55183 ARE  
NOT RECOMMENDED FOR NEW DESIGNS**



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

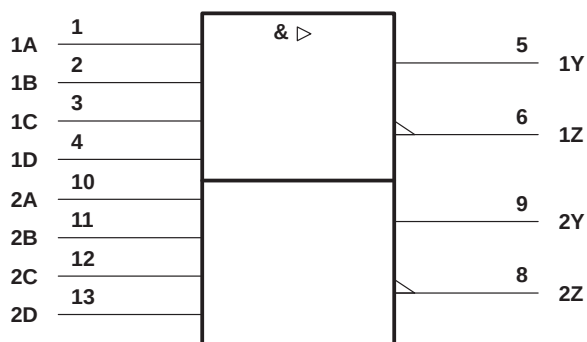
Copyright © 1998, Texas Instruments Incorporated

# DS8830, SN55183, SN75183

## DUAL DIFFERENTIAL LINE DRIVERS

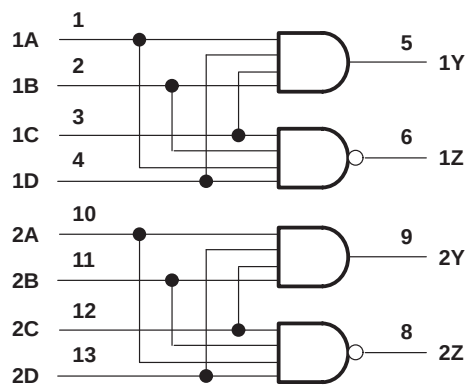
SLLS093D – OCTOBER 1972 – REVISED APRIL 1998

### logic symbol†



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for the D, J, N, and W packages.

### logic diagram (positive logic)



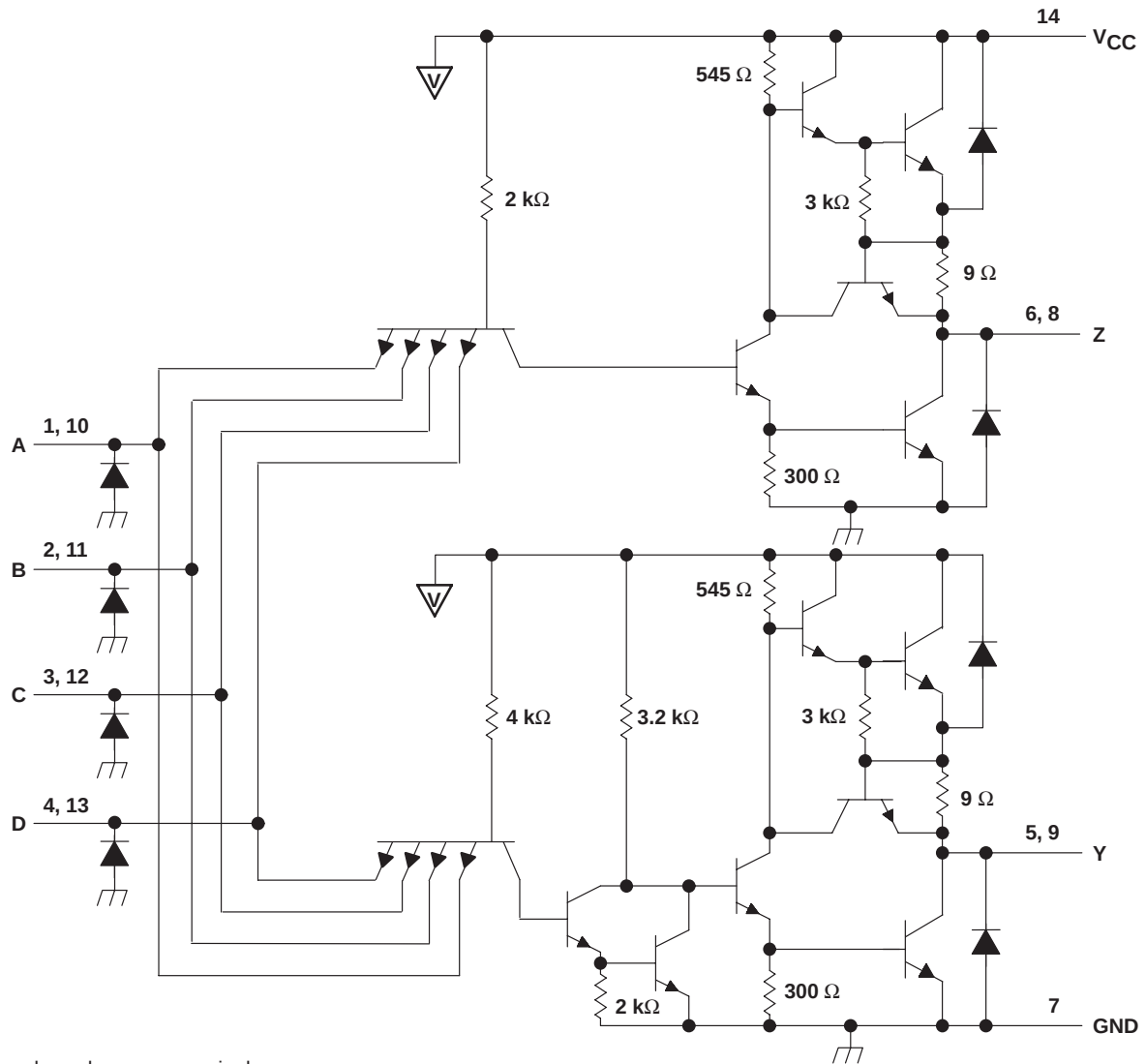
Positive logic:  $y = ABCD$ ,  $Z = \overline{ABCD}$

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

# DS8830, SN55183, SN75183 DUAL DIFFERENTIAL LINE DRIVERS

SLLS093D – OCTOBER 1972 – REVISED APRIL 1998

## schematic (each driver)



Resistor values shown are nominal.  
Pin numbers shown are for the D, J, N, and W packages.

# DS8830, SN55183, SN75183

## DUAL DIFFERENTIAL LINE DRIVERS

SLLS093D – OCTOBER 1972 – REVISED APRIL 1998

### 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, $V_I$                                                         | 5.5 V                        |
| Duration of output short circuit (see Note 2)                                | 1 s                          |
| Continuous total power dissipation                                           | See Dissipation Rating Table |
| Storage temperature range, $T_{stg}$                                         | –65°C to 150°C               |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D or N package | 260°C                        |
| Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package      | 300°C                        |
| Case temperature for 60 seconds, $T_C$ : FK package                          | 260°C                        |

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These 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. All voltage values, except differential voltages, are with respect to network ground terminal.  
2. Not more than one output should be shorted to ground at any one time.

DISSIPATION RATING TABLE

| PACKAGE         | $T_A \leq 25^\circ\text{C}$<br>POWER RATING | DERATING FACTOR<br>ABOVE $T_A = 25^\circ\text{C}$ | $T_A = 70^\circ\text{C}$<br>POWER RATING | $T_A = 125^\circ\text{C}$<br>POWER RATING |
|-----------------|---------------------------------------------|---------------------------------------------------|------------------------------------------|-------------------------------------------|
| D               | 950 mW                                      | 7.6 mW/°C                                         | 608 mW                                   | –                                         |
| FK <sup>‡</sup> | 1375 mW                                     | 11.0 mW/°C                                        | 880 mW                                   | 275 mW                                    |
| J <sup>‡</sup>  | 1375 mW                                     | 11.0 mW/°C                                        | 880 mW                                   | 275 mW                                    |
| N               | 1150 mW                                     | 9.2 mW/°C                                         | 736 mW                                   | –                                         |
| W <sup>‡</sup>  | 1000 mW                                     | 8.0 mW/°C                                         | 640 mW                                   | 200 mW                                    |

<sup>‡</sup> In the FK, J, and W packages, SN55183 chips are alloy mounted and SN75183 chips are glass mounted.

### recommended operating conditions

|                                       | SN55183 |     |     | DS8830,<br>SN75183 |     |      | UNIT |
|---------------------------------------|---------|-----|-----|--------------------|-----|------|------|
|                                       | MIN     | NOM | MAX | MIN                | NOM | MAX  |      |
| Supply voltage, $V_{CC}$              | 4.5     | 5   | 5.5 | 4.75               | 5   | 5.25 | V    |
| High-level input voltage, $V_{IH}$    | 2       |     |     | 2                  |     |      | V    |
| Low-level input voltage, $V_{IL}$     |         |     | 0.8 |                    |     | 0.8  | V    |
| High-level output current, $I_{OH}$   |         |     | –40 |                    |     | –40  | mA   |
| Low-level output current, $I_{OL}$    |         |     | 40  |                    |     | 40   | mA   |
| Operating free-air temperature, $T_A$ | –55     |     | 125 | 0                  |     | 70   | °C   |



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

electrical characteristics over recommended ranges of  $V_{CC}$  and operating free-air temperature (unless otherwise noted)

| PARAMETER |                                           |                  | TEST CONDITIONS                                                |                           | MIN | TYP <sup>†</sup> | MAX  | UNIT          |
|-----------|-------------------------------------------|------------------|----------------------------------------------------------------|---------------------------|-----|------------------|------|---------------|
| $V_{OH}$  | High-level output voltage                 | Y (AND) outputs  | $V_{IH} = 2\text{ V}$                                          | $I_{OH} = -0.8\text{ mA}$ | 2.4 |                  |      | V             |
|           |                                           |                  |                                                                | $I_{OH} = -40\text{ mA}$  | 1.8 | 3.3              |      |               |
| $V_{OL}$  | Low-level output voltage                  | Y (AND) outputs  | $V_{IL} = 0.8\text{ V}$                                        | $I_{OL} = 32\text{ mA}$   |     | 0.2              |      | V             |
|           |                                           |                  |                                                                | $I_{OL} = 40\text{ mA}$   |     | 0.22             | 0.4  |               |
| $V_{OH}$  | High-level output voltage                 | Z (NAND) outputs | $V_{IL} = 0.8\text{ V}$                                        | $I_{OH} = -0.8\text{ mA}$ | 2.4 |                  |      | V             |
|           |                                           |                  |                                                                | $I_{OH} = -40\text{ mA}$  | 1.8 | 3.3              |      |               |
| $V_{OL}$  | Low-level output voltage                  | Z (NAND) outputs | $V_{IH} = 2\text{ V}$                                          | $I_{OL} = 32\text{ mA}$   |     | 0.2              |      | V             |
|           |                                           |                  |                                                                | $I_{OL} = 40\text{ mA}$   |     | 0.22             | 0.4  |               |
| $I_{IH}$  | High-level input current                  |                  | $V_{IH} = 2.4\text{ V}$                                        |                           |     |                  | 120  | $\mu\text{A}$ |
| $I_I$     | Input current at maximum input voltage    |                  | $V_{IH} = 5.5\text{ V}$                                        |                           |     |                  | 2    | mA            |
| $I_{IL}$  | Low-level input current                   |                  | $V_{IL} = 0.4\text{ V}$                                        |                           |     |                  | -4.8 | mA            |
| $I_{OS}$  | Short-circuit output current <sup>‡</sup> |                  | $V_{CC} = 5\text{ V}$ , $T_A = 125^\circ\text{C}$ <sup>§</sup> |                           | -40 | -100             | -120 | mA            |
| $I_{CC}$  | Supply current (average per driver)       |                  | $V_{CC} = 5\text{ V}$ , All inputs at 5 V, No load             |                           |     | 10               | 18   | mA            |

<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 to ground at a time, and duration of the short circuit should not exceed one second.

<sup>§</sup>  $T_A = 125^\circ\text{C}$  is applicable to SN55183 only.

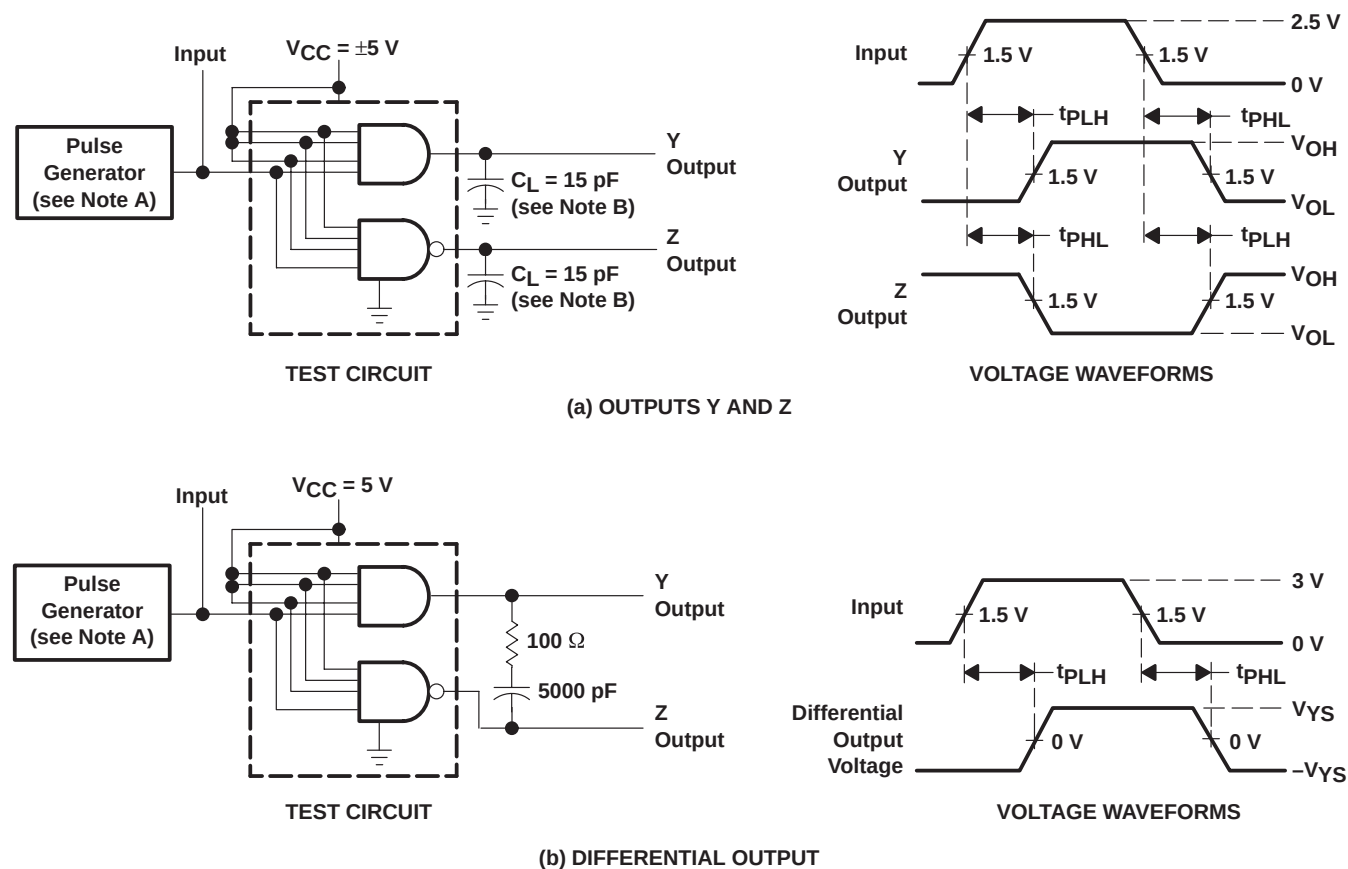
switching characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

| PARAMETER |                                                                   | TEST CONDITIONS                                                                                      |                                           | MIN | TYP | MAX | UNIT |
|-----------|-------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------|-----|-----|-----|------|
| $t_{PLH}$ | Propagation delay time, low- to high-level Y output               | AND gates                                                                                            | $C_L = 15\text{ pF}$ ,<br>See Figure 1(a) |     | 8   | 12  | ns   |
| $t_{PHL}$ | Propagation delay time, high- to low-level Y output               | AND gates                                                                                            | $C_L = 15\text{ pF}$ ,<br>See Figure 1(a) |     | 12  | 18  | ns   |
| $t_{PLH}$ | Propagation delay time, low- to high-level Z output               | NAND gates                                                                                           | $C_L = 15\text{ pF}$ ,<br>See Figure 1(a) |     | 6   | 12  | ns   |
| $t_{PHL}$ | Propagation delay time, high- to low-level Z output               | NAND gates                                                                                           | $C_L = 15\text{ pF}$ ,<br>See Figure 1(a) |     | 6   | 8   | ns   |
| $t_{PLH}$ | Propagation delay time,<br>low- to high-level differential output | Y output with respect to Z output,<br>$R_L = 100\ \Omega$ in series with 5000 pF,<br>See Figure 1(b) |                                           |     | 9   | 16  | ns   |
| $t_{PHL}$ | Propagation delay time,<br>high- to low-level differential output | Y output with respect to Z output,<br>$R_L = 100\ \Omega$ in series with 5000 pF,<br>See Figure 1(b) |                                           |     | 8   | 16  | ns   |

# DS8830, SN55183, SN75183 DUAL DIFFERENTIAL LINE DRIVERS

SLLS093D – OCTOBER 1972 – REVISED APRIL 1998

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A. The pulse generators have the following characteristics:  $Z_O = 50\ \Omega$ ,  $t_r \leq 10\text{ ns}$ ,  $t_f \leq 10\text{ ns}$ ,  $t_W = 0.5\ \mu\text{s}$ ,  $\text{PRR} \leq 1\text{ MHz}$ .  
 B.  $C_L$  includes probe and jig capacitance.  
 C. Waveforms are monitored on an oscilloscope with  $r_i \geq 1\text{ M}\Omega$ .

Figure 1. Test Circuits and Voltage Waveforms

TYPICAL CHARACTERISTICS†

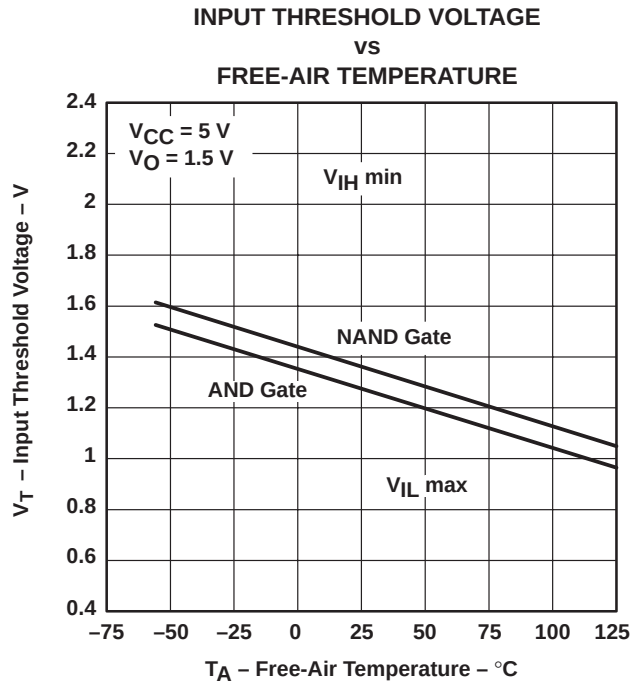


Figure 2

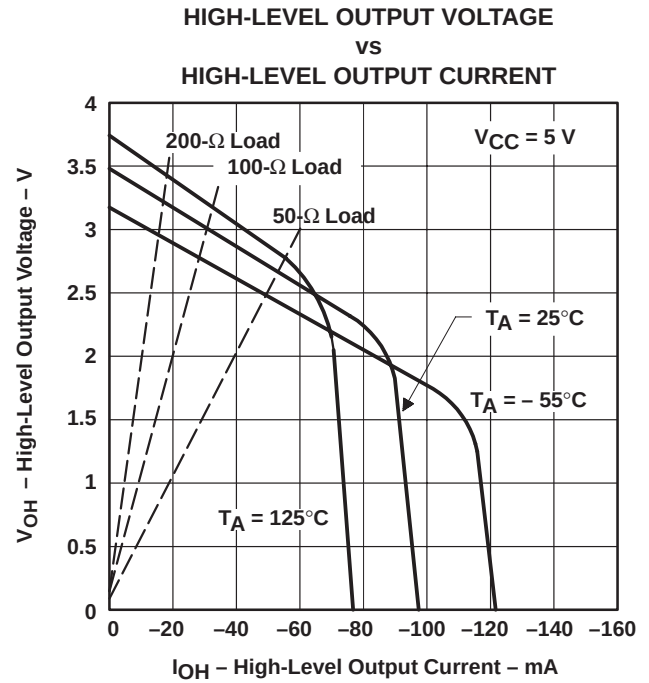


Figure 3

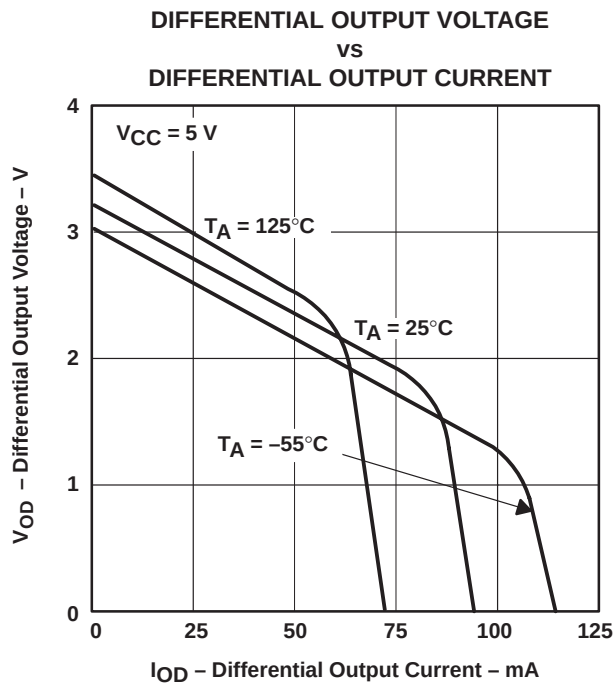


Figure 4

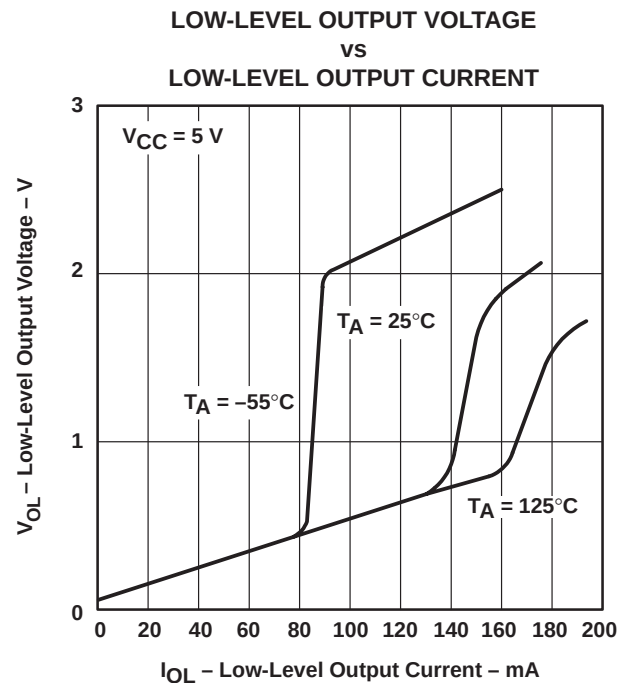


Figure 5

† Operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied.

DS8830, SN55183, SN75183  
DUAL DIFFERENTIAL LINE DRIVERS

SLLS093D – OCTOBER 1972 – REVISED APRIL 1998

TYPICAL CHARACTERISTICS†

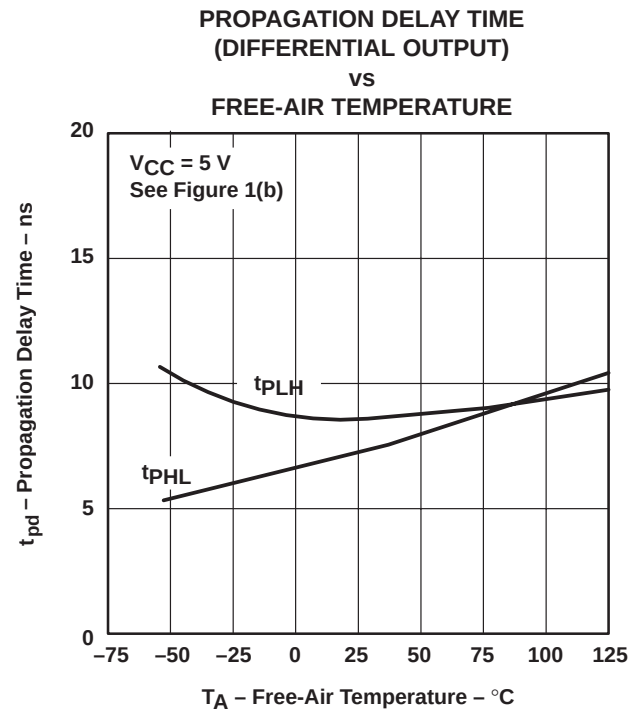


Figure 6

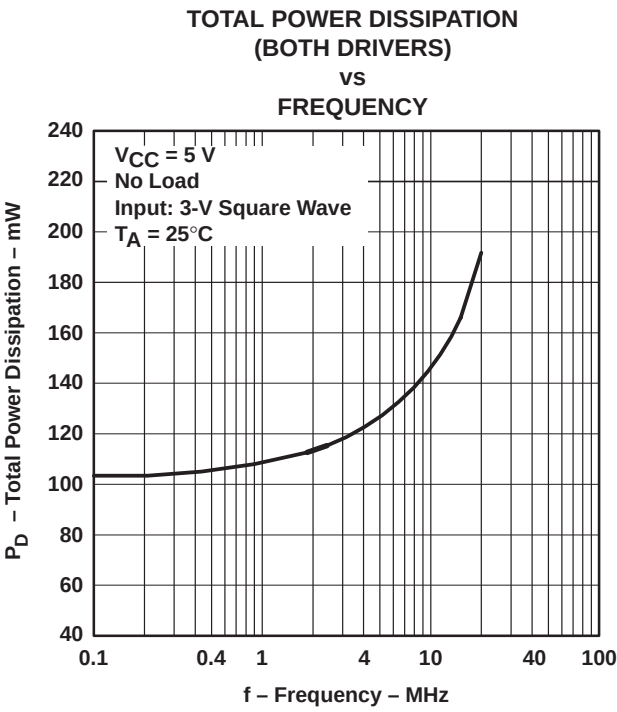
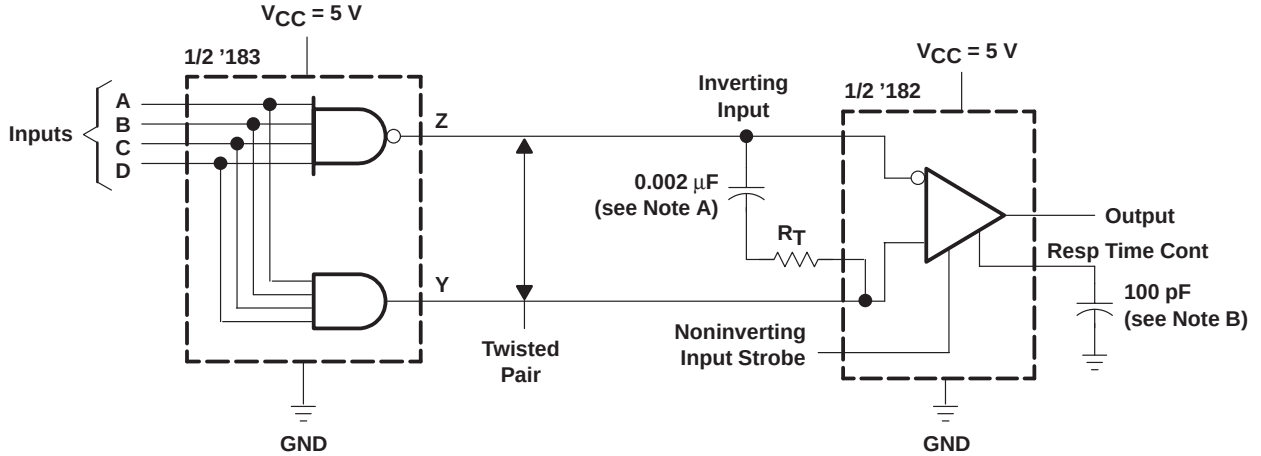


Figure 7

† Operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied.

## APPLICATION INFORMATION



NOTES: A. When the inputs are open circuited, the output is high. A capacitor may be used for dc isolation of the line-terminating resistor. At the frequency of operation, the impedance of the capacitor should be relatively small.

Example: let  $f = 5 \text{ MHz}$   
 $C = 0.002 \mu\text{F}$

$$Z_{(\text{circuit})} = \frac{1}{2\pi f C} = \frac{1}{2\pi(5 \times 10^6)(0.002 \times 10^{-6})}$$

$$Z_{(\text{circuit})} \approx 16\Omega$$

B. Use of a capacitor to control response time is optional.

**Figure 8. Transmission of Digital Data Over Twisted-Pair Line**

**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>               |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--------------------------------------------|
| 7900901CA        | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | A42 SNPB         | Level-NC-NC-NC                             |
| 7900901DA        | ACTIVE                | CFP          | W               | 14   | 1           | None                    | A42 SNPB         | Level-NC-NC-NC                             |
| DS8830N          | OBSOLETE              | PDIP         | N               | 14   |             | None                    | Call TI          | Call TI                                    |
| SN55183J         | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | A42 SNPB         | Level-NC-NC-NC                             |
| SN75183D         | ACTIVE                | SOIC         | D               | 14   | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN75183DR        | ACTIVE                | SOIC         | D               | 14   | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN75183N         | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| SN75183NSR       | ACTIVE                | SO           | NS              | 14   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SNJ55183FK       | ACTIVE                | LCCC         | FK              | 20   | 1           | None                    | POST-PLATE       | Level-NC-NC-NC                             |
| SNJ55183J        | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | A42 SNPB         | Level-NC-NC-NC                             |
| SNJ55183W        | ACTIVE                | CFP          | W               | 14   | 1           | None                    | A42 SNPB         | 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.

<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.

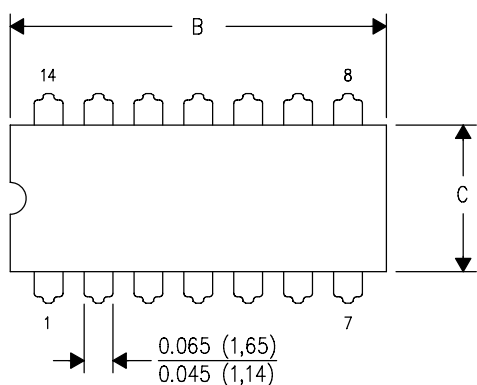
**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. 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.

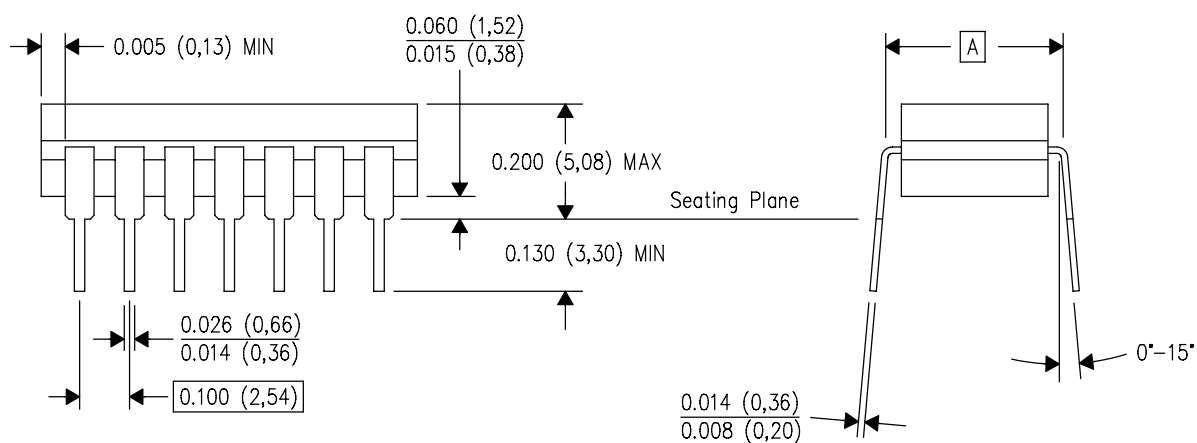
J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| 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)        |

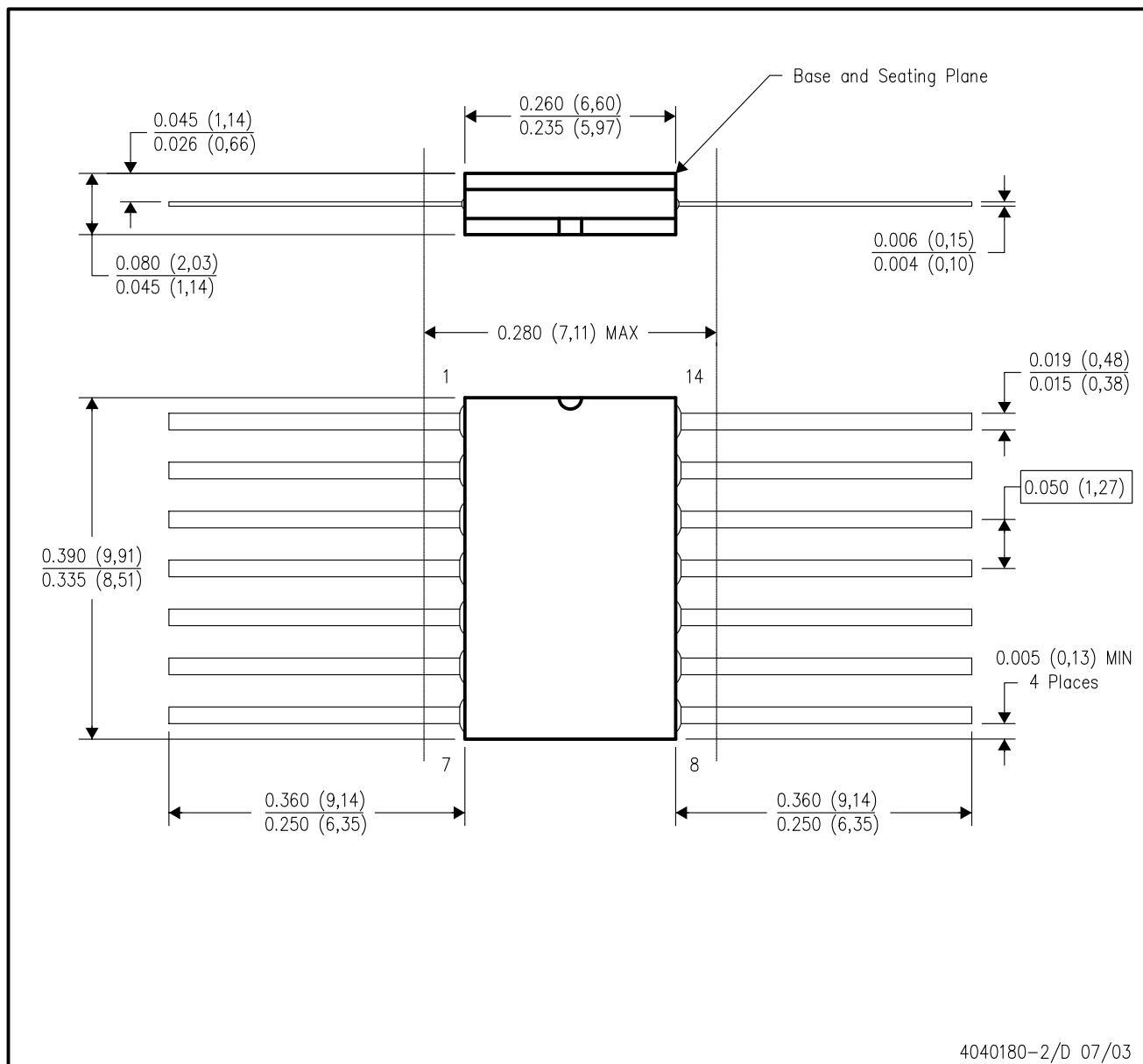


4040083/F 03/03

- 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



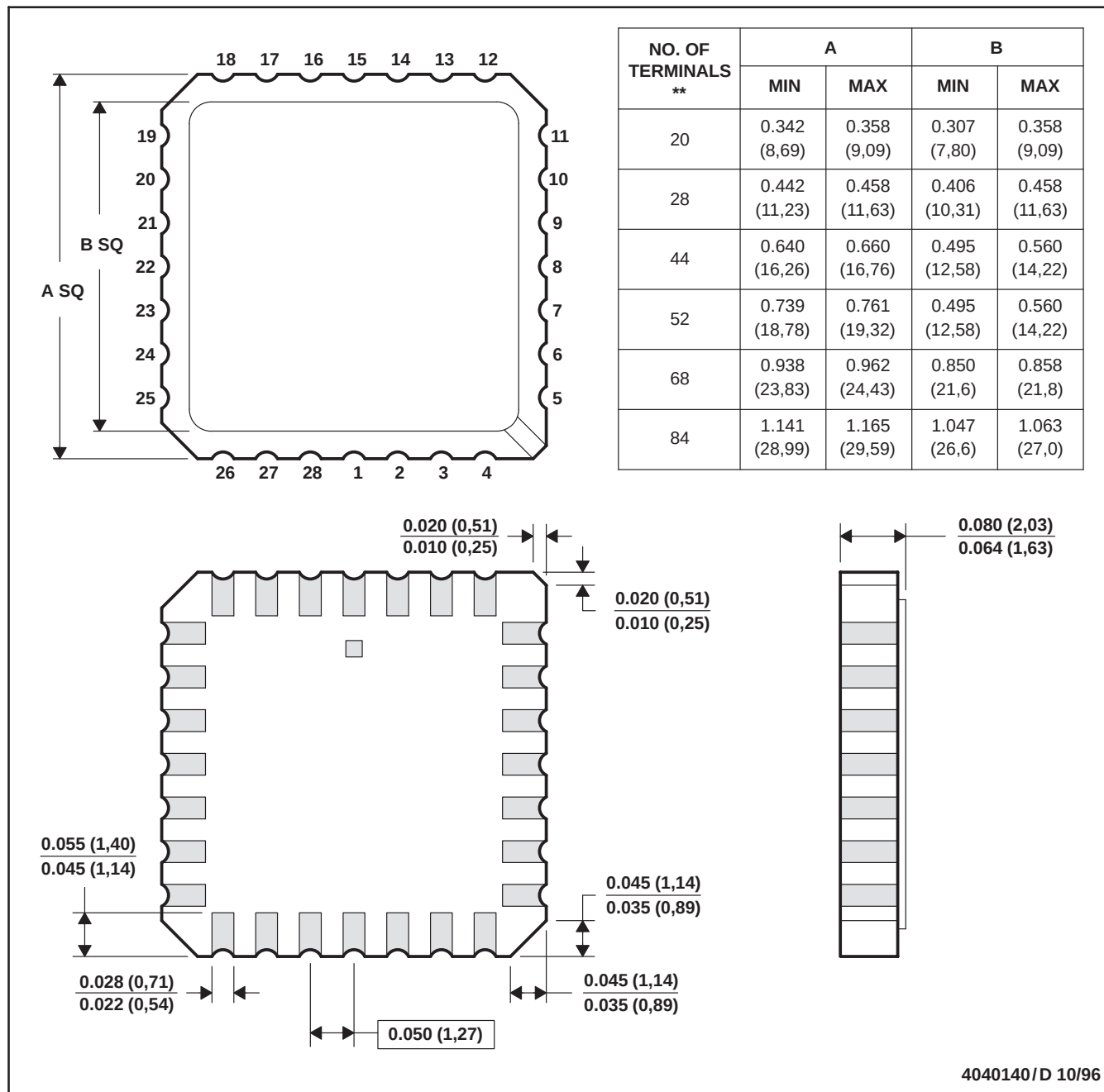
NOTES:

- 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

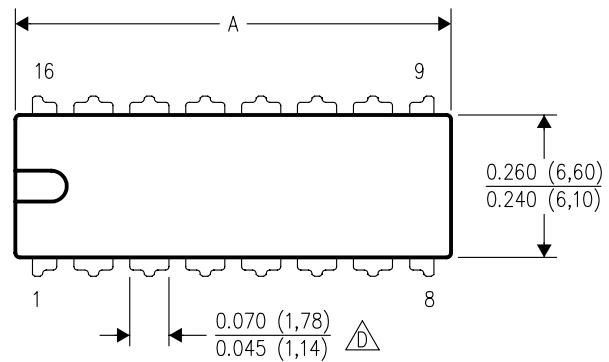


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package can be hermetically sealed with a metal lid.
  - D. The terminals are gold plated.
  - E. Falls within JEDEC MS-004

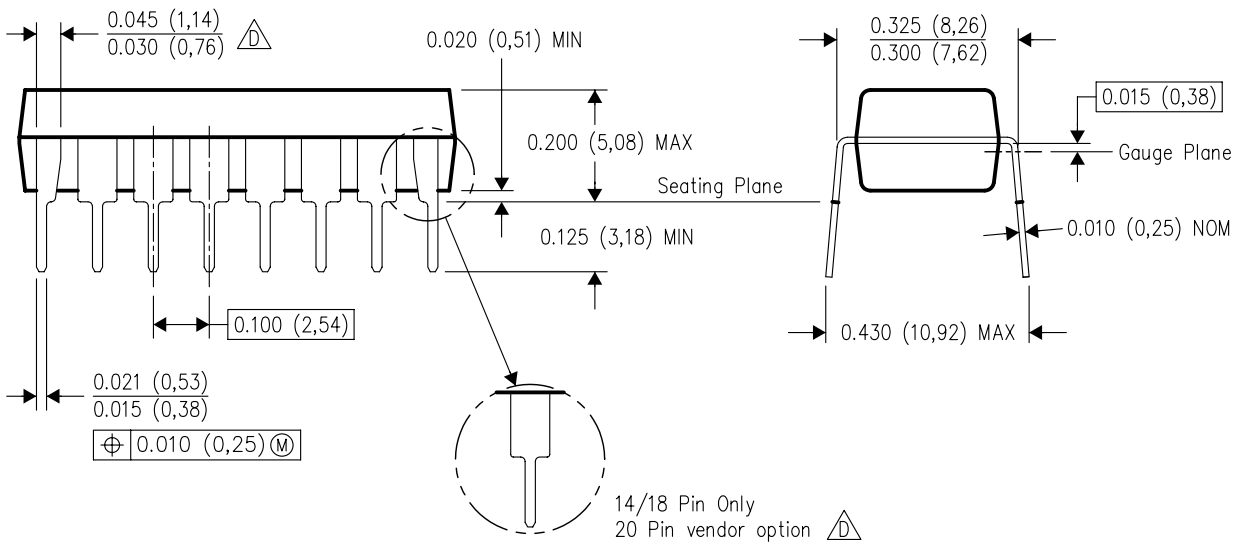
## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| 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               |



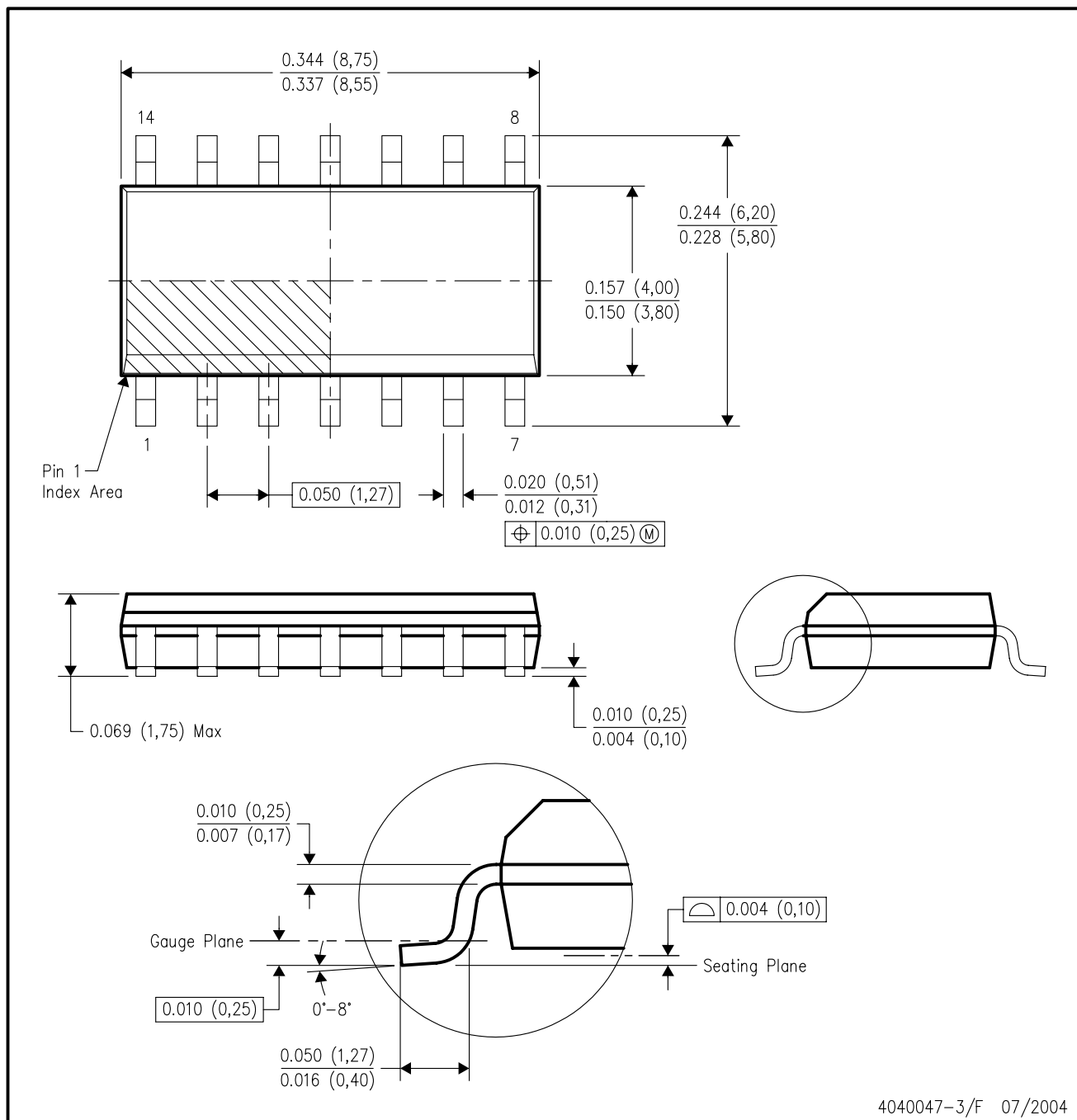
14/18 Pin Only  
20 Pin vendor option

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



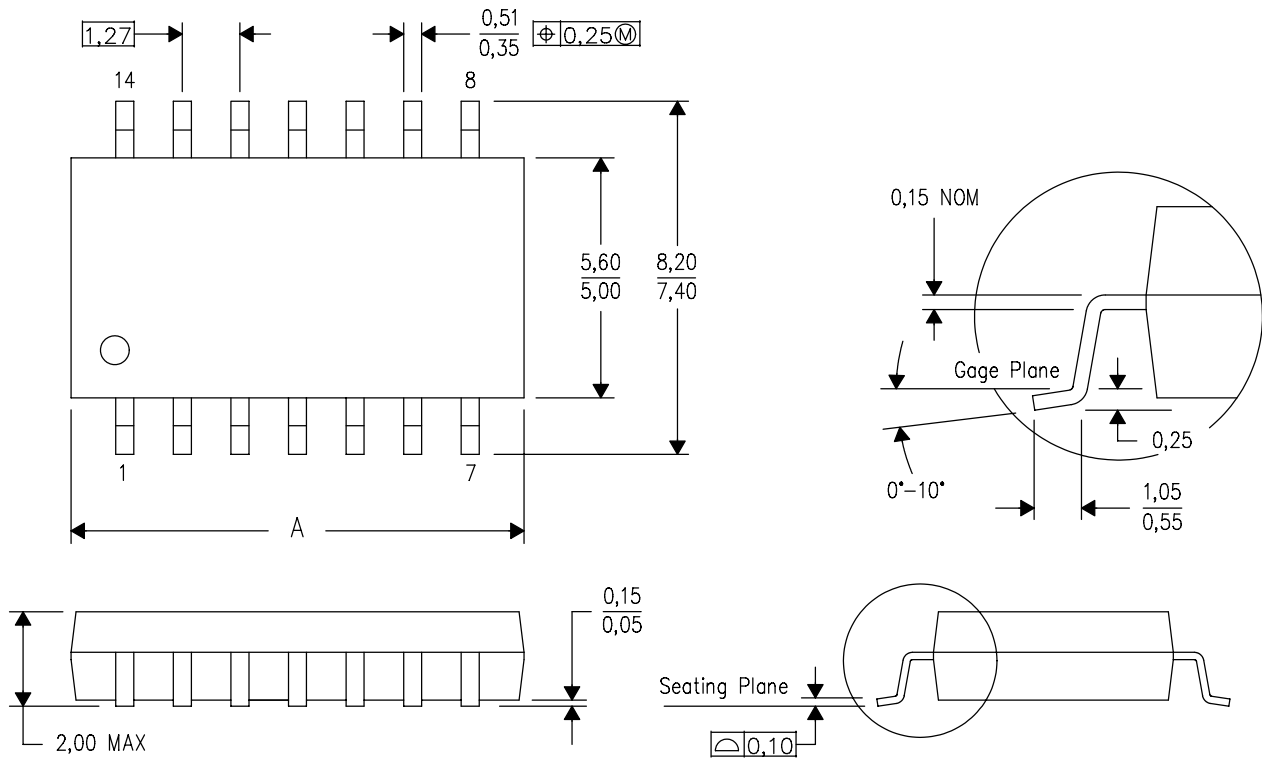
4040047-3/F 07/2004

# 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.

## 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

Copyright © 2005, Texas Instruments Incorporated