

# SN54BCT29827B, SN74BCT29827B 10-BIT BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCBS008C – APRIL 1987 – REVISED NOVEMBER 1993

- State-of-the-Art BiCMOS Design Significantly Reduces  $I_{CCZ}$
- ESD Protection Exceeds 2000 V Per MIL-STD-883C, Method 3015; Exceeds 200 V Using Machine Model ( $C = 200$  pF,  $R = 0$ )
- 3-State Outputs Drive Bus Lines or Buffer Memory Address Registers
- P-N-P Inputs Reduce DC Loading
- Flow-Through Architecture Optimizes PCB Layout
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK) and Flatpacks (W), and Standard Plastic and Ceramic 300-mil DIPs (JT, NT)

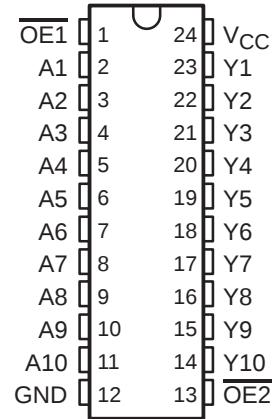
## description

These 10-bit buffers and bus drivers provide high-performance bus interface for wide data paths or buses carrying parity.

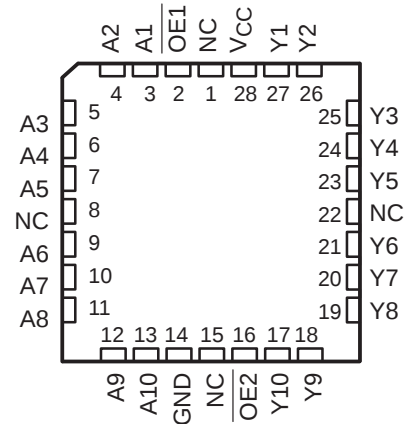
The 3-state control gate is a 2-input AND gate with active-low inputs so that if either output-enable ( $\overline{OE1}$  or  $\overline{OE2}$ ) input is high, all ten outputs are in the high-impedance state. The outputs are also in the high-impedance state during power-up and power-down conditions. The outputs remain in the high-impedance state while the device is powered down.

The SN54BCT29827B is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74BCT29827B is characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54BCT29827B . . . JT OR W PACKAGE  
SN74BCT29827B . . . DW OR NT PACKAGE  
(TOP VIEW)



SN54BCT29827B . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

FUNCTION TABLE

| INPUTS           |                  |   | OUTPUT<br>Y |
|------------------|------------------|---|-------------|
| $\overline{OE1}$ | $\overline{OE2}$ | A |             |
| L                | L                | L | L           |
| L                | L                | H | H           |
| H                | X                | X | Z           |
| X                | H                | X | Z           |

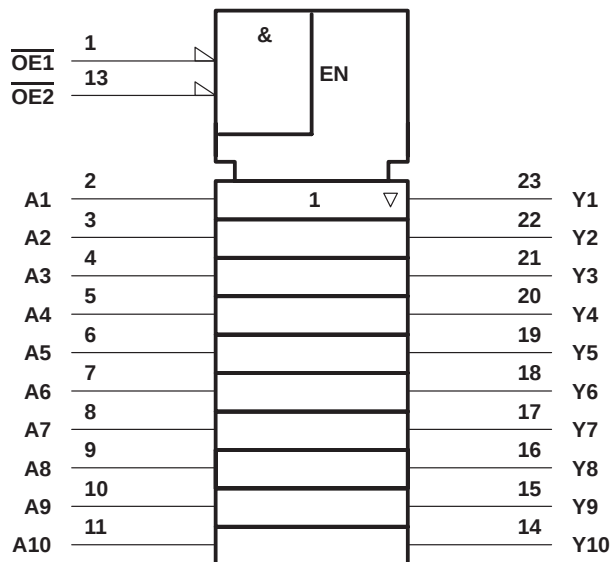
# SN54BCT29827B, SN74BCT29827B

## 10-BIT BUFFERS/DRIVERS

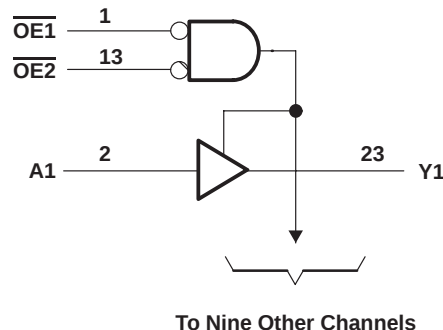
### WITH 3-STATE OUTPUTS

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#### logic symbol†



#### logic diagram (positive logic)



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

Pin numbers shown are for the DW, JT, NT, and W packages.

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

|                                                                               |                    |
|-------------------------------------------------------------------------------|--------------------|
| Supply voltage range, $V_{CC}$                                                | –0.5 V to 7 V      |
| Input voltage range, $V_I$ (see Note 1)                                       | –0.5 V to 7 V      |
| Voltage range applied to any output in the disabled or power-off state, $V_O$ | –0.5 V to 5.5 V    |
| Voltage range applied to any output in the high state, $V_{OH}$               | –0.5 V to $V_{CC}$ |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ )                                   | –30 mA             |
| Current into any output in the low state, $I_{OL}$ : SN54BCT29827B            | 48 mA              |
| SN74BCT29827B                                                                 | 96 mA              |
| Operating free-air temperature range: SN54BCT29827B                           | –55°C to 125°C     |
| SN74BCT29827B                                                                 | 0°C to 70°C        |
| Storage temperature range                                                     | –65°C to 150°C     |

‡ 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.

NOTE 1: The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

#### recommended operating conditions

|          |                                | SN54BCT29827B |     |     | SN74BCT29827B |     |     | UNIT |
|----------|--------------------------------|---------------|-----|-----|---------------|-----|-----|------|
|          |                                | MIN           | NOM | MAX | MIN           | NOM | MAX |      |
| $V_{CC}$ | Supply voltage                 | 4.5           | 5   | 5.5 | 4.5           | 5   | 5.5 | V    |
| $V_{IH}$ | High-level input voltage       | 2             |     |     | 2             |     |     | V    |
| $V_{IL}$ | Low-level input voltage        |               |     | 0.8 |               |     | 0.8 | V    |
| $I_{IK}$ | Input clamp current            |               |     | –18 |               |     | –18 | mA   |
| $I_{OH}$ | High-level output current      |               |     | –15 |               |     | –24 | mA   |
| $I_{OL}$ | Low-level output current       |               |     | 24  |               |     | 48  | mA   |
| $T_A$    | Operating free-air temperature | –55           |     | 125 | 0             |     | 70  | °C   |



**SN54BCT29827B, SN74BCT29827B**  
**10-BIT BUFFERS/DRIVERS**  
**WITH 3-STATE OUTPUTS**

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

| PARAMETER         | TEST CONDITIONS                                    |                                        | SN54BCT29827B |      |      | SN74BCT29827B |      |      | UNIT          |
|-------------------|----------------------------------------------------|----------------------------------------|---------------|------|------|---------------|------|------|---------------|
|                   |                                                    |                                        | MIN           | TYP† | MAX  | MIN           | TYP† | MAX  |               |
| $V_{IK}$          | $V_{CC} = 4.5\text{ V}$ ,<br>$I_I = -18\text{ mA}$ |                                        |               |      | -1.2 |               |      | -1.2 | V             |
| $V_{OH}$          | $V_{CC} = 4.5\text{ V}$                            | $I_{OH} = -15\text{ mA}$               | 2             | 3.2  |      | 2.4           | 3.3  |      | V             |
|                   |                                                    | $I_{OH} = -24\text{ mA}$               |               |      |      | 2             | 3.1  |      |               |
|                   | $V_{CC} = 4.75\text{ V}$ ,                         | $I_{OH} = -3\text{ mA}$                |               |      |      | 2.7           |      |      |               |
| $V_{OL}$          | $V_{CC} = 4.5\text{ V}$                            | $I_{OL} = 24\text{ mA}$                |               | 0.38 | 0.55 |               |      |      | V             |
|                   |                                                    | $I_{OL} = 48\text{ mA}$                |               |      |      |               | 0.42 | 0.5  |               |
| $I_I$             | $V_{CC} = 5.5\text{ V}$ ,                          | $V_I = 7\text{ V}$                     |               |      | 0.1  |               |      | 0.1  | mA            |
| $I_{IH}$          | $V_{CC} = 5.5\text{ V}$ ,                          | $V_I = 2.7\text{ V}$                   |               |      | 20   |               |      | 20   | $\mu\text{A}$ |
| $I_{IL}$          | $V_{CC} = 5.5\text{ V}$ ,                          | $V_I = 0.5\text{ V}$                   |               |      | -0.2 |               |      | -0.2 | mA            |
| $I_{OS}^\ddagger$ | $V_{CC} = 5.5\text{ V}$ ,                          | $V_O = 0$                              | -75           |      | -250 | -75           |      | -250 | mA            |
| $I_{OZH}$         | $V_{CC} = 5.5\text{ V}$ ,                          | $V_O = 2.7\text{ V}$                   |               |      | 20   |               |      | 20   | $\mu\text{A}$ |
| $I_{OZL}$         | $V_{CC} = 5.5\text{ V}$ ,                          | $V_O = 0.5\text{ V}$                   |               |      | -20  |               |      | -20  | $\mu\text{A}$ |
| $I_{CCL}$         | $V_{CC} = 5.5\text{ V}$ ,                          | Outputs open                           |               | 28   |      |               | 28   | 40   | mA            |
| $I_{CCH}$         | $V_{CC} = 5.5\text{ V}$ ,                          | Outputs open                           |               | 15   |      |               | 15   | 25   | mA            |
| $I_{CCZ}$         | $V_{CC} = 5.5\text{ V}$ ,                          | Outputs open                           |               | 3.5  |      |               | 3.5  | 6    | mA            |
| $C_i$             | $V_{CC} = 5\text{ V}$ ,                            | $V_I = 2.5\text{ V}$ or $0.5\text{ V}$ |               | 6    |      |               | 6    |      | pF            |
| $C_o$             | $V_{CC} = 5\text{ V}$ ,                            | $V_O = 2.5\text{ V}$ or $0.5\text{ V}$ |               | 8    |      |               | 8    |      | pF            |

† All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

**switching characteristics over recommended ranges of supply voltage and operating free-air temperature,  $C_L = 50\text{ pF}$  (unless otherwise noted) (see Note 2)**

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC} = 5\text{ V}$ ,<br>$T_A = 25^\circ\text{C}$ |     |      | SN54BCT29827B |      | SN74BCT29827B |      | UNIT |
|-----------|-----------------|----------------|-----------------------------------------------------|-----|------|---------------|------|---------------|------|------|
|           |                 |                | MIN                                                 | TYP | MAX  | MIN           | MAX  | MIN           | MAX  |      |
| $t_{PLH}$ | A               | Y              | 1.6                                                 | 3.3 | 5.3  | 1.6           | 5.5  | 1.6           | 5.5  | ns   |
| $t_{PHL}$ |                 |                | 2.7                                                 | 5.1 | 7.3  | 2.7           | 7.7  | 2.7           | 7.5  |      |
| $t_{PZH}$ | $\overline{OE}$ | Y              | 2.7                                                 | 5.3 | 7.9  | 2.7           | 10.6 | 2.7           | 9.1  | ns   |
| $t_{PZL}$ |                 |                | 5.3                                                 | 8.5 | 12.1 | 5.3           | 13.5 | 5.3           | 12.8 |      |
| $t_{PHZ}$ | $\overline{OE}$ | Y              | 2.8                                                 | 5.4 | 8.2  | 2.8           | 9.4  | 2.8           | 8.8  | ns   |
| $t_{PLZ}$ |                 |                | 2.3                                                 | 5.1 | 7.6  | 2.3           | 9.1  | 2.3           | 8.4  |      |

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> |
|-------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74BCT29827BDW   | ACTIVE                | SOIC         | DW              | 24   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74BCT29827BDWE4 | ACTIVE                | SOIC         | DW              | 24   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74BCT29827BDWG4 | ACTIVE                | SOIC         | DW              | 24   | 25          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74BCT29827BNT   | ACTIVE                | PDIP         | NT              | 24   | 15          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN74BCT29827BNTE4 | ACTIVE                | PDIP         | NT              | 24   | 15          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |

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

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

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

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

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

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

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

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

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

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

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

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

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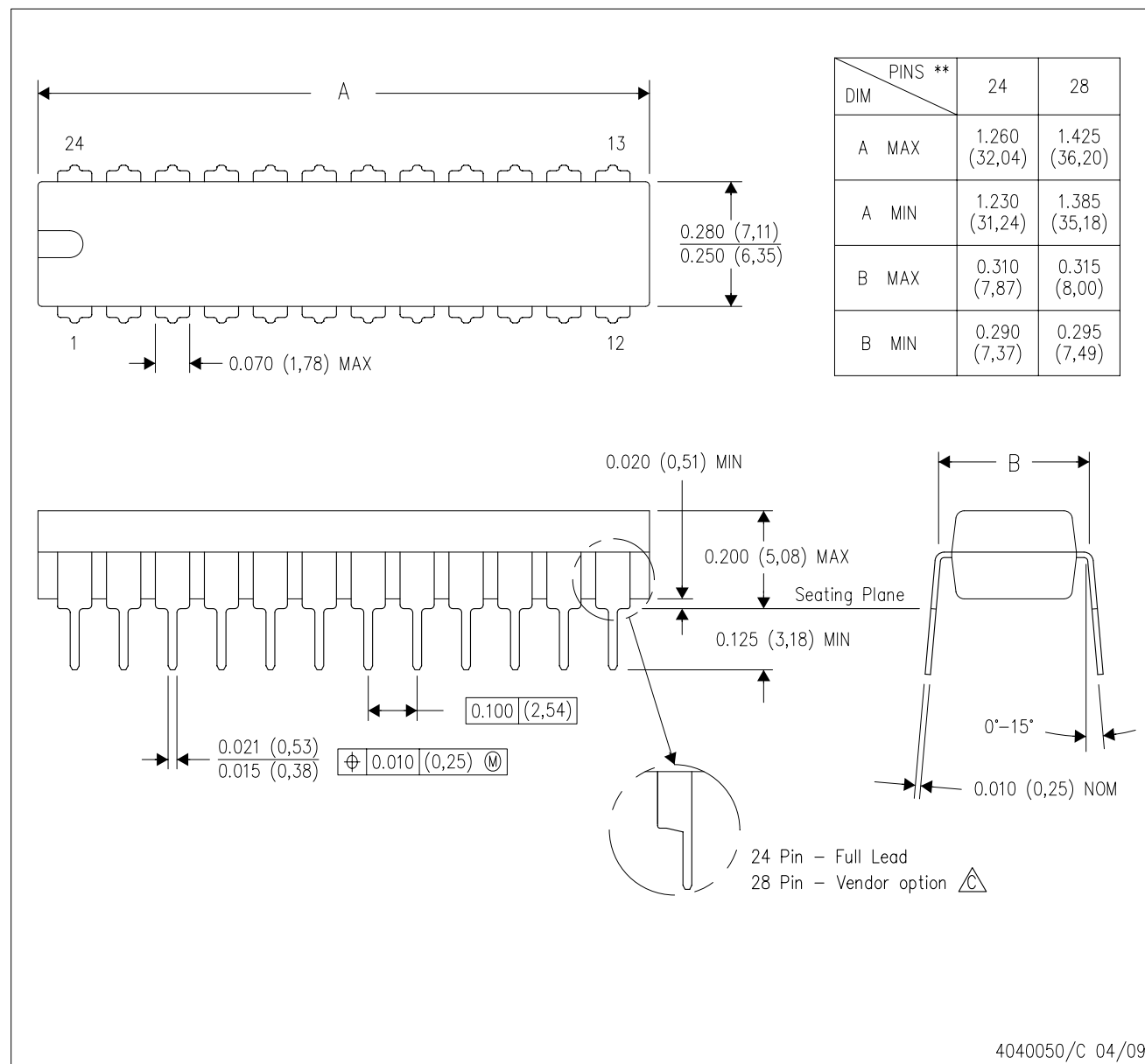
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# MECHANICAL DATA

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

24 PINS SHOWN

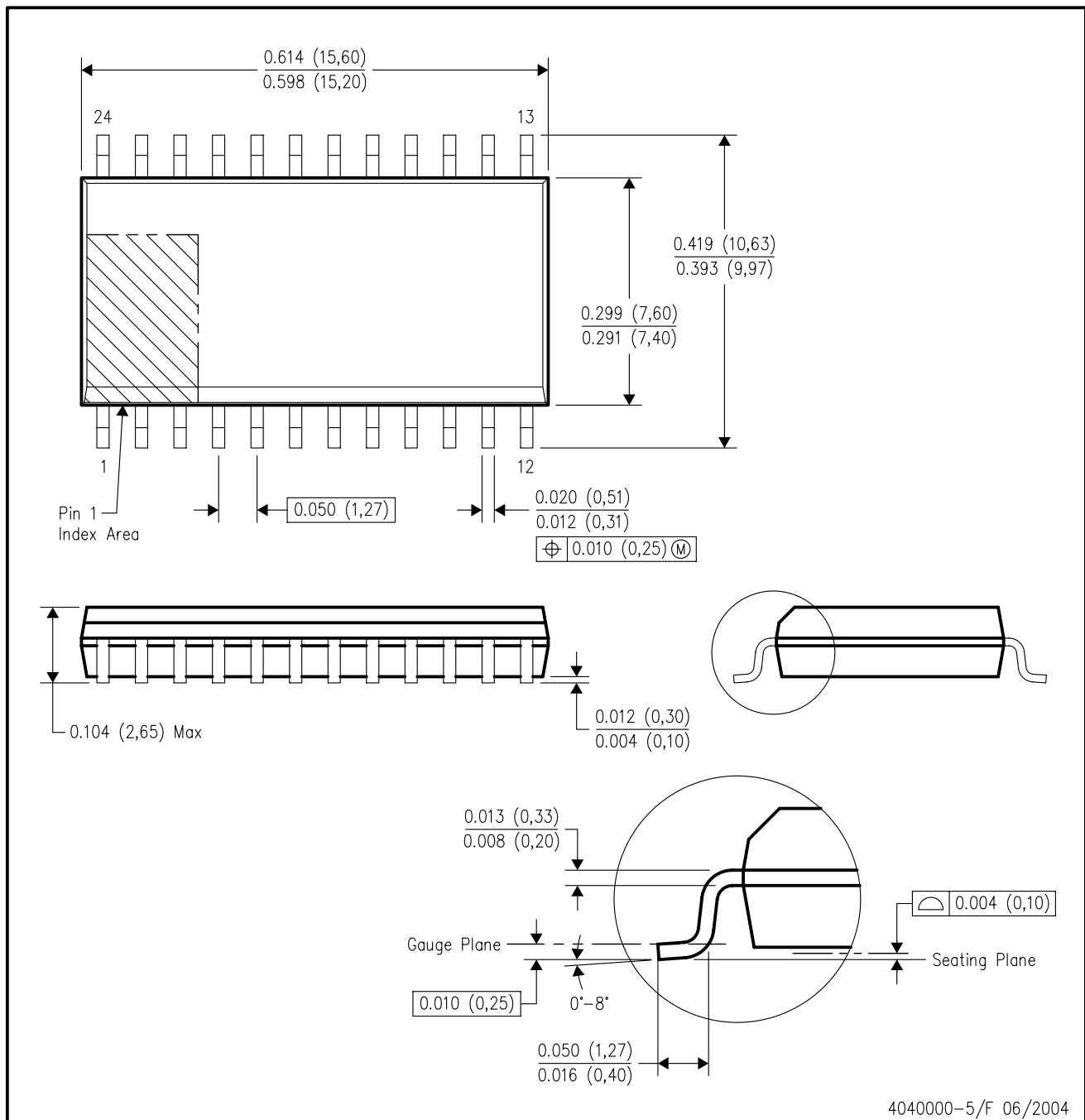
PLASTIC DUAL-IN-LINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - $\triangle C$  The 28 pin end lead shoulder width is a vendor option, either half or full width.

DW (R-PDSO-G24)

# 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-013 variation AD.

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