- Members of the Texas Instruments *Widebus*™ Family
- Inputs Are TTL-Voltage Compatible
- 3-State Outputs Drive Bus Lines Directly
- Flow-Through Architecture Optimizes PCB Layout
- Distributed $V_{CC}$ and GND Pin Configuration Minimizes High-Speed Switching Noise
- *EPIC*™ (Enhanced-Performance Implanted CMOS) 1-$\mu$m Process
- 500-mA Typical Latch-Up Immunity at 125°C
- Package Options Include Plastic 300-mil Shrink Small-Outline (DL) Packages Using 25-mil Center-to-Center Pin Spacings and 380-mil Fine-Pitch Ceramic Flat (WD) Packages Using 25-mil Center-to-Center Pin Spacings

**54ACT16827 . . . WD PACKAGE**
**74ACT16827 . . . DL PACKAGE**
**(TOP VIEW)**

| | | | | |
|---|---|---|---|---|
| 1OE1 | 1 | | 56 | 1OE2 |
| 1Y1 | 2 | | 55 | 1A1 |
| 1Y2 | 3 | | 54 | 1A2 |
| GND | 4 | | 53 | GND |
| 1Y3 | 5 | | 52 | 1A3 |
| 1Y4 | 6 | | 51 | A14 |
| $V_{CC}$ | 7 | | 50 | $V_{CC}$ |
| 1Y5 | 8 | | 49 | 1A5 |
| 1Y6 | 9 | | 48 | 1A6 |
| 1Y7 | 10 | | 47 | 1A7 |
| GND | 11 | | 46 | GND |
| 1Y8 | 12 | | 45 | 1A8 |
| 1Y9 | 13 | | 44 | 1A9 |
| 1Y10 | 14 | | 43 | 1A10 |
| 2Y1 | 15 | | 42 | 2A1 |
| 2Y2 | 16 | | 41 | 2A2 |
| 2Y3 | 17 | | 40 | 2A3 |
| GND | 18 | | 39 | GND |
| 2Y4 | 19 | | 38 | 2A4 |
| 2Y5 | 20 | | 37 | 2A5 |
| 2Y6 | 21 | | 36 | 2A6 |
| $V_{CC}$ | 22 | | 35 | $V_{CC}$ |
| 2Y7 | 23 | | 34 | 2A7 |
| 2Y8 | 24 | | 33 | 2A8 |
| GND | 25 | | 32 | GND |
| 2Y9 | 26 | | 31 | 2A9 |
| 2Y10 | 27 | | 30 | 2A10 |
| 2OE1 | 28 | | 29 | 2OE2 |
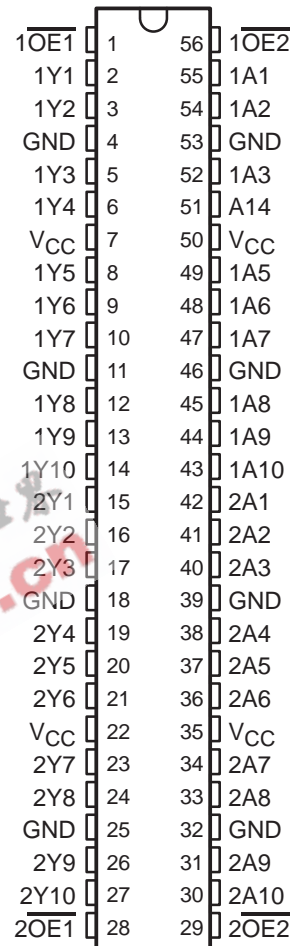
### description

The 'ACT16827 are noninverting 20-bit buffers composed of two 10-bit sections with separate output-enable signals. For either 10-bit buffer section, the two output-enable (1OE1 and 1OE2 or 2OE1 and 2OE2) inputs must both be low for the corresponding Y outputs to be active. If either output-enable input is high, the outputs of that 10-bit buffer section are in the high-impedance state.

The 74ACT16827 is packaged in TI's shrink small-outline package, which provides twice the I/O pin count and functionality of standard small-outline packages in the same printed-circuit-board area.

The 54ACT16827 is characterized for operation over the full military temperature range of –55°C to 125°C. The 74ACT16827 is characterized for operation from –40°C to 85°C.

**FUNCTION TABLE**
**(each 8-bit section)**

| INPUTS | | | OUTPUT |
|---|---|---|---|
| OE1 | OE2 | A | Y |
| L | L | L | L |
| L | L | H | H |
| H | X | X | Z |
| X | H | X | Z |

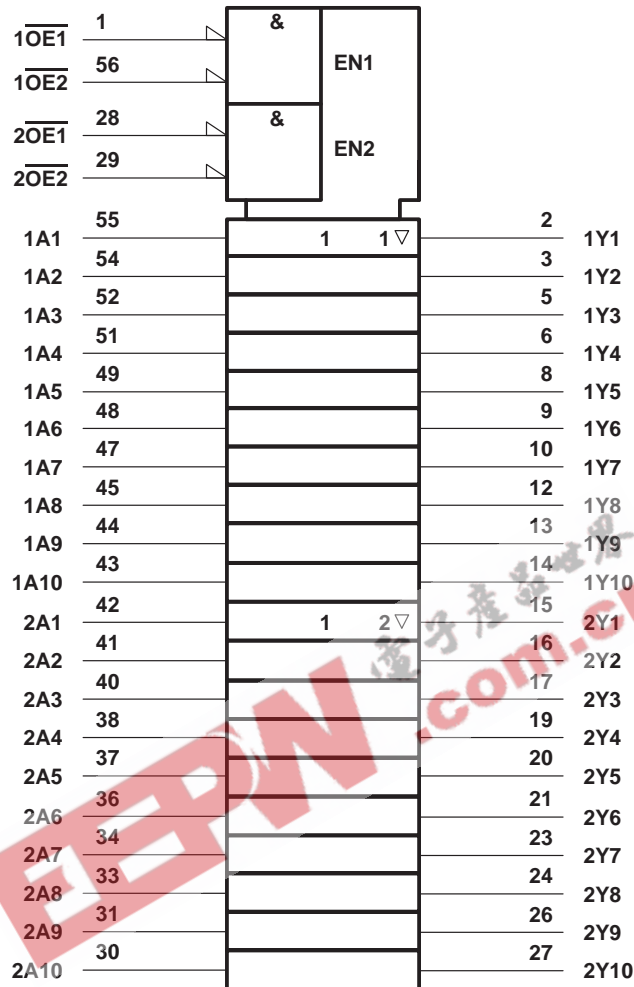EPIC and Widebus are trademarks of Texas Instruments Incorporated.

## TEXAS INSTRUMENTS

# 54ACT16827, 74ACT16827
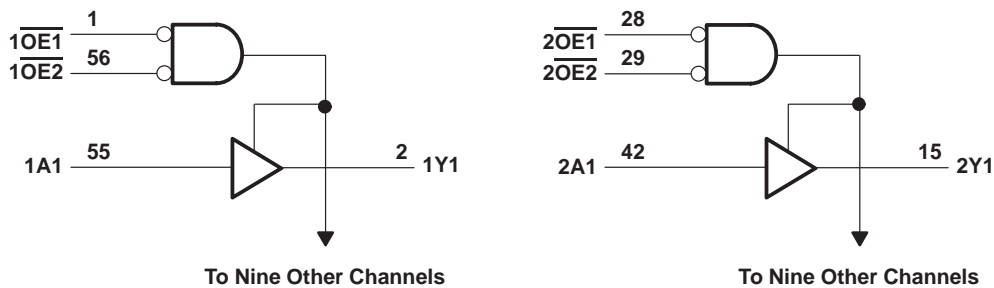# 20-BIT BUFFERS/DRIVERS
# WITH 3-STATE OUTPUTS
SCAS163A – JUNE 1990 – REVISED APRIL 1996

## logic symbol†



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

## logic diagram (positive logic)



**To Nine Other Channels**          **To Nine Other Channels**

## absolute maximum ratings over operating free-air temperature (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 $V_{CC}$ + 0.5 V
Output voltage range, $V_O$ (see Note 1) ....................................... −0.5 V to $V_{CC}$ + 0.5 V
Input clamp current, $I_{IK}$ ($V_I$ < 0 or $V_I$ > $V_{CC}$) .............................................. ±20 mA
Output clamp current, $I_{OK}$ ($V_O$ < 0 or $V_O$ > $V_{CC}$) .......................................... ±50 mA
Continuous output current, $I_O$ ($V_O$ = 0 to $V_{CC}$) ............................................ 50 mA
Continuous current through $V_{CC}$ or GND ..................................................... ±500 mA
Maximum package power dissipation at $T_A$ = 55°C (in still air) (see Note 2): DL package .......... 1.4 W
Storage temperature range, $T_{stg}$ ........................................................ −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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. The maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils.

## recommended operating conditions (see Note 3)

| | | 54ACT16827 | | | 54ACT16827 | | | 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 |
| $V_I$ | Input voltage | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $V_O$ | Output voltage | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $I_{OH}$ | High-level output current | | | −24 | | | −24 | mA |
| $I_{OL}$ | Low-level output current | | | 24 | | | 24 | mA |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | 0 | | 10 | 0 | | 10 | ns/V |
| $T_A$ | Operating free-air temperature | −55 | | 125 | −40 | | 85 | °C |

NOTE 3: Unused inputs must be held high or low to prevent them from floating.

![Texas Instruments logo] **TEXAS INSTRUMENTS**

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

| PARAMETER | TEST CONDITIONS | $V_{CC}$ | $T_A = 25°C$ | | | 54ACT16827 | | 74ACT16827 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $V_{OH}$ | $I_{OH} = -50$ μA | 4.5 V | 4.4 | | | 4.4 | | 4.4 | | V |
| | | 5.5 V | 5.4 | | | 5.4 | | 5.4 | | |
| | $I_{OH} = -24$ mA | 4.5 V | 3.94 | | | 3.8 | | 3.8 | | |
| | | 5.5 V | 4.94 | | | 4.8 | | 4.8 | | |
| | $I_{OH} = -75$ mA† | 5.5 V | | | | 3.85 | | 3.85 | | |
| $V_{OL}$ | $I_{OL} = 50$ μA | 4.5 V | | | 0.1 | | 0.1 | | 0.1 | V |
| | | 5.5 V | | | 0.1 | | 0.1 | | 0.1 | |
| | $I_{OL} = 24$ mA | 4.5 V | | | 0.36 | | 0.44 | | 0.44 | |
| | | 5.5 V | | | 0.36 | | 0.44 | | 0.44 | |
| | $I_{OL} = 75$ mA† | 5.5 V | | | | | 1.65 | | 1.65 | |
| $I_I$ | $V_I = V_{CC}$ or GND | 5.5 V | | ±0.1 | | | ±1 | | ±1 | μA |
| $I_{OZ}$ | $V_O = V_{CC}$ or GND | 5.5 V | | ±0.5 | | | ±5 | | ±5 | μA |
| $I_{CC}$ | $V_I = V_{CC}$ or GND,   $I_O = 0$ | 5.5 V | | 8 | | | 80 | | 80 | μA |
| $\Delta I_{CC}$‡ | One input at 3.4 V, Other inputs at $V_{CC}$ or GND | 5.5 V | | 0.9 | | | 1 | | 1 | mA |
| $C_i$ | $V_I = V_{CC}$ or GND | 5 V | | 4.5 | | | | | | pF |
| $C_o$ | $V_O = V_{CC}$ or GND | 5 V | | 16 | | | | | | pF |

† Not more than one output should be tested at a time, and the duration of the test should not exceed 10 ms.
‡ This is the increase in supply current for each input that is at one of the specified TTL voltage levels rather than 0 V or $V_{CC}$.

## switching characteristics over recommended operating free-air temperature range, $V_{CC}$ = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A = 25°C$ | | | 54ACT16827 | | 74ACT16827 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{PLH}$ | A | Y | 3.6 | 7.4 | 9.8 | 3.6 | 11 | 3.6 | 11 | ns |
| $t_{PHL}$ | | | 2.8 | 7.4 | 9.8 | 2.8 | 10.8 | 2.8 | 10.8 | |
| $t_{PZH}$ | $\overline{OE}$ | Y | 3 | 7.9 | 10.4 | 3 | 11.7 | 3 | 11.7 | ns |
| $t_{PZL}$ | | | 4 | 9.6 | 12.4 | 4 | 14 | 4 | 14 | |
| $t_{PHZ}$ | $\overline{OE}$ | Y | 5.8 | 9.1 | 11.3 | 5.8 | 12.4 | 5.8 | 12.4 | ns |
| $t_{PLZ}$ | | | 5.3 | 8.5 | 10.5 | 5.3 | 11.5 | 5.3 | 11.5 | |

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

| PARAMETER | | TEST CONDITIONS | TYP | UNIT |
|---|---|---|---|---|
| $C_{pd}$ Power dissipation capacitance | Outputs enabled | $C_L = 50$ pF,     f = 1 MHz | 41 | pF |
| | Outputs disabled | | 10 | |

![Texas Instruments logo]

## PARAMETER MEASUREMENT INFORMATION

| TEST | S1 |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | $2 \times V_{CC}$ |
| $t_{PHZ}/t_{PZH}$ | GND |



**LOAD CIRCUIT**



**VOLTAGE WAVEFORMS**



**VOLTAGE WAVEFORMS**

NOTES: A. $C_L$ includes probe and jig capacitance.
 B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
  Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, $Z_O$ = 50 Ω, $t_r$ = 3 ns, $t_f$ = 3 ns.
 D. The outputs are measured one at a time with one input transition per measurement.

**Figure 1. Load Circuit and Voltage Waveforms**

![TEXAS INSTRUMENTS logo]
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## PACKAGING INFORMATION

| Orderable Device | Status [1] | Package Type | Package Drawing | Pins | Package Qty | Eco Plan [2] | Lead/Ball Finish | MSL Peak Temp [3] |
|---|---|---|---|---|---|---|---|---|
| 74ACT16827DL | ACTIVE | SSOP | DL | 56 | 20 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |
| 74ACT16827DLR | ACTIVE | SSOP | DL | 56 | 1000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM |

**[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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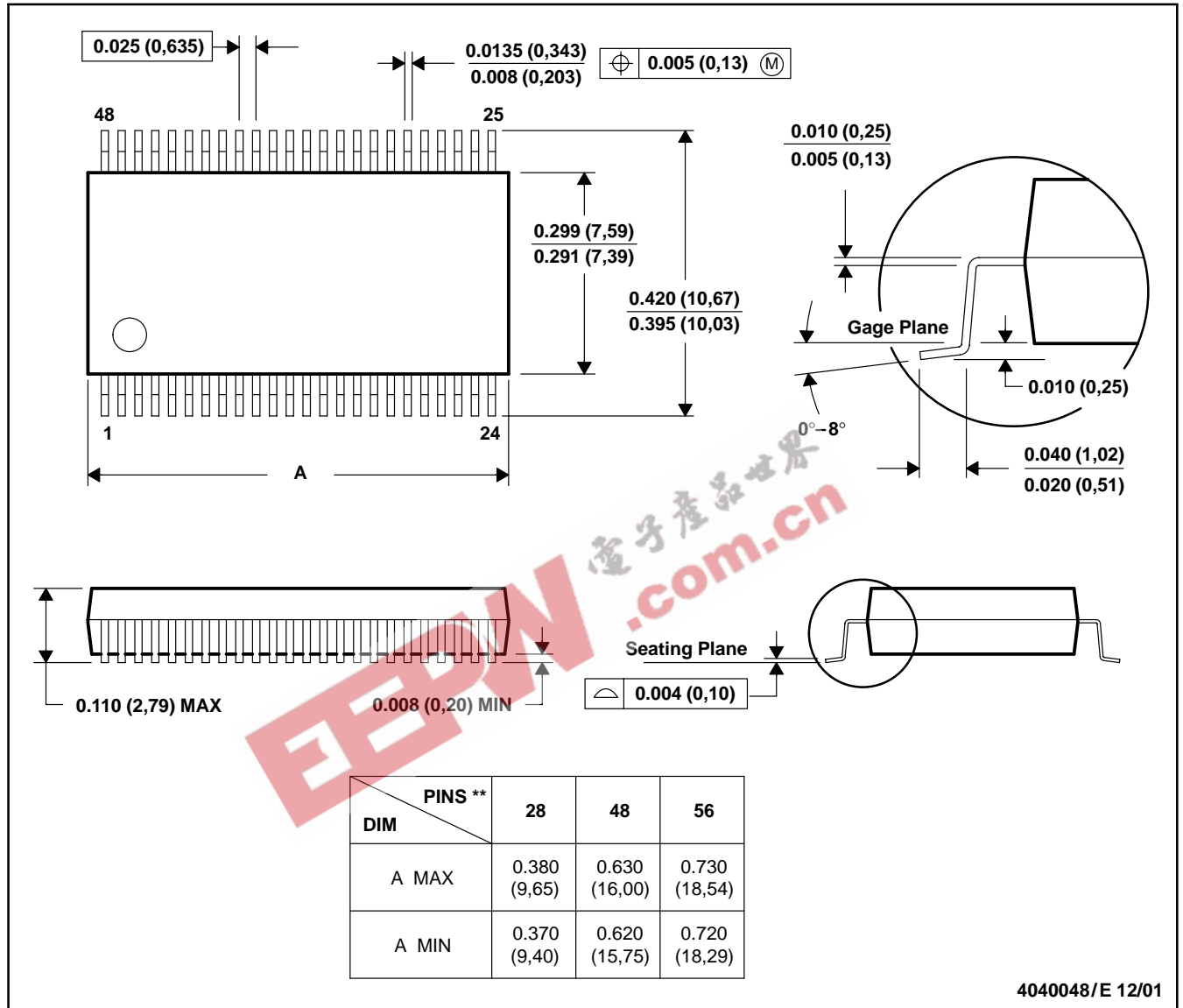
# MECHANICAL DATA

**DL (R-PDSO-G\*\*)**                                    **PLASTIC SMALL-OUTLINE PACKAGE**

**48 PINS SHOWN**



| PINS \*\* DIM | 28 | 48 | 56 |
|---|---|---|---|
| A MAX | 0.380 (9,65) | 0.630 (16,00) | 0.730 (18,54) |
| A MIN | 0.370 (9,40) | 0.620 (15,75) | 0.720 (18,29) |

4040048 / E 12/01

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 MO-118

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