

54ACT16623, 74ACT16623 16-BIT BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCAS152A - JANUARY 1991 - REVISED APRIL 1996

- Members of the Texas Instruments *Widebus™* Family
- Inputs are TTL-Voltage Compatible
- Flow-Through Architecture Optimizes PCB Layout
- Distributed V_{CC} and GND Pin Configuration Minimizes High-Speed Switching Noise
- *EPIC™* (Enhanced-Performance Implanted CMOS) 1- μ m Process
- 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

description

The 'ACT16623 are 16-bit transceivers designed for asynchronous two-way communication between data buses. The control-function implementation allows for maximum flexibility in timing.

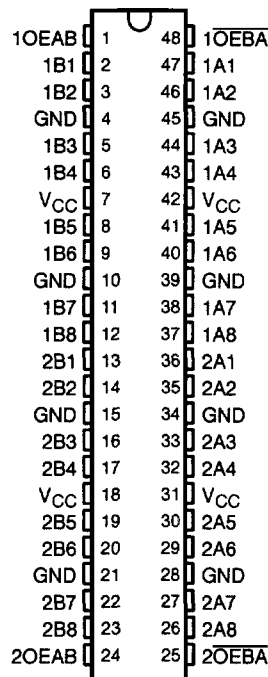
These devices can be used as two 8-bit transceivers or one 16-bit transceiver. They allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the output-enable (\overline{OEBA} and OEAB) inputs. The output-enable inputs can be used to disable the device so that the buses are effectively isolated.

The dual-enable configuration gives the bus transceiver the capability to store data by simultaneously enabling \overline{OEBA} and OEAB. Each output reinforces its input in this transceiver configuration. When both control inputs are enabled and all other data sources to the two sets of bus lines are at high impedance, the bus lines remain at their last states.

The 74ACT16623 is packaged in TI's shrink small-outline package, which provides twice the functionality of standard small-outline packages in the same printed-circuit-board area.

The 54ACT16623 is characterized for operation over the full military temperature range of -55°C to 125°C . The 74ACT16623 is characterized for operation from -40°C to 85°C .

54ACT16623 . . . WD PACKAGE
74ACT16623 . . . DL PACKAGE
(TOP VIEW)



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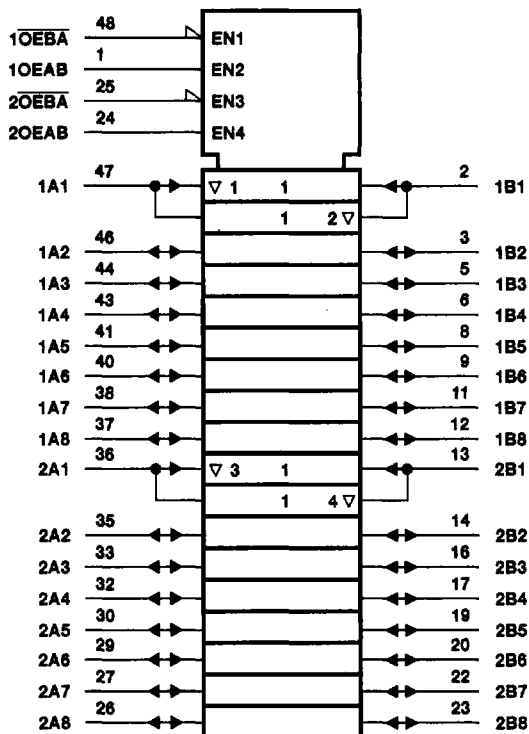
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FUNCTION TABLE
 (each 8-bit section)

| INPUTS | | OPERATION |
|--------|------|-------------------------------------|
| OEBA | OEAB | |
| L | L | B data to A bus |
| H | H | A data to B bus |
| H | L | Isolation |
| L | H | B data to A bus, A data to B bus |

logic symbol†

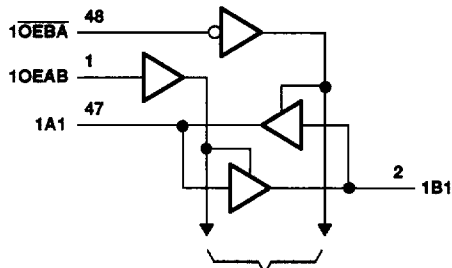


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

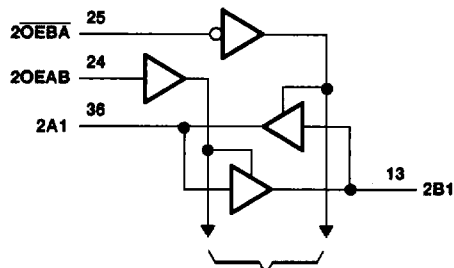
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logic diagram (positive logic)



To Seven Other Channels



To Seven Other Channels

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 $V_{CC} + 0.5$ 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 | ± 400 mA |
| Maximum power package dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2): DL package | 1.2 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)

| | 54ACT16623 | | | 74ACT16623 | | | UNIT |
|--|------------|-----|----------|------------|-----|----------|------------------|
| | MIN | NOM | MAX | MIN | NOM | MAX | |
| V_{CC} Supply voltage (see Note 4) | 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 | $^\circ\text{C}$ |

- NOTES: 3. Unused inputs should be connected to V_{CC} through a pullup resistor of approximately 5 k Ω or greater.
4. All V_{CC} and GND pins must be connected to the proper power supply.

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

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | 54ACT16623 | | 74ACT16623 | | 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 | V | |
| | | 5.5 V | | | 0.1 | | | 0.1 | | |
| | I _{OL} = 24 mA | 4.5 V | | | 0.36 | | | 0.44 | | |
| | | 5.5 V | | | 0.36 | | | 0.44 | | |
| | I _{OL} = 75 mA† | 5.5 V | | | | | | 1.65 | | |
| I _I | Control inputs | V _I = V _{CC} or GND | 5.5 V | | | ±0.1 | | ±1 | μA | |
| I _{OZ} | A or B ports | V _O = V _{CC} or GND | 5.5 V | | | ±0.5 | | ±5 | μA | |
| I _{CC} | | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | | | 8 | | 80 | μA | |
| ΔI _{CC} ‡ | | One input at 3.4 V, Other inputs at V _{CC} or GND | 5.5 V | | | 0.9 | | 1 | mA | |
| C _i | Control inputs | V _I = V _{CC} or GND | 5 V | | | 4.5 | | | pF | |
| C _{io} | A or B ports | 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.

‡ For I/O ports, the parameter I_{OZ} includes the input leakage current.

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 | | | 54ACT16623 | | 74ACT16623 | | UNIT |
|------------------|--------------|-------------|-----------------------|-----|------|------------|------|------------|------|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t _{PLH} | A or B | B or A | 4.2 | 7.3 | 9.5 | 4.2 | 10.4 | 4.2 | 10.4 | ns |
| t _{PHL} | | | 3.1 | 7.3 | 9.5 | 3.1 | 10.3 | 3.1 | 10.3 | |
| t _{PZH} | OEBA | A | 2.7 | 6.8 | 8.8 | 2.7 | 10.5 | 2.7 | 9.5 | ns |
| t _{PZL} | | | 3.5 | 8.2 | 10.2 | 3.5 | 11.1 | 3.5 | 11.1 | |
| t _{PHZ} | OEBA | A | 6 | 9.6 | 11.3 | 6 | 12 | 6 | 12 | ns |
| t _{PLZ} | | | 5.3 | 8.6 | 10.3 | 5.3 | 10.7 | 5.3 | 10.7 | |
| t _{PZH} | OEAB | B | 4.1 | 6.9 | 8.7 | 4.1 | 9.3 | 4.1 | 9.3 | ns |
| t _{PZL} | | | 5.1 | 7.9 | 9.7 | 5.1 | 10.6 | 5.1 | 10.6 | |
| t _{PHZ} | OEAB | B | 5.1 | 8.2 | 10.2 | 5.1 | 10.4 | 5.1 | 10.4 | ns |
| t _{PLZ} | | | 4.4 | 7.4 | 9.3 | 4.4 | 9.5 | 4.4 | 9.5 | |

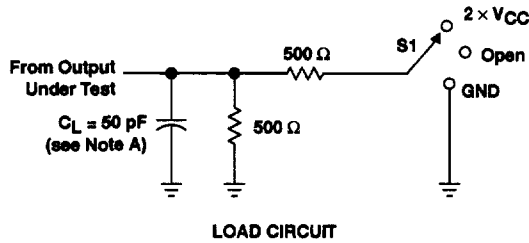
operating characteristics, V_{CC} = 5 V, T_A = 25°C

| PARAMETER | | TEST CONDITIONS | TYP | UNIT |
|-----------------|---|-----------------------------------|-----|------|
| C _{pd} | Power dissipation capacitance per transceiver | C _L = 50 pF, f = 1 MHz | 56 | pF |
| | | | 11 | |

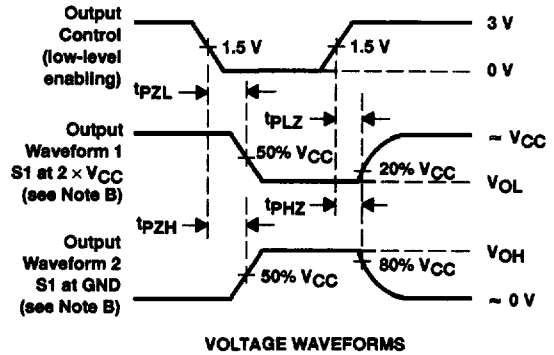
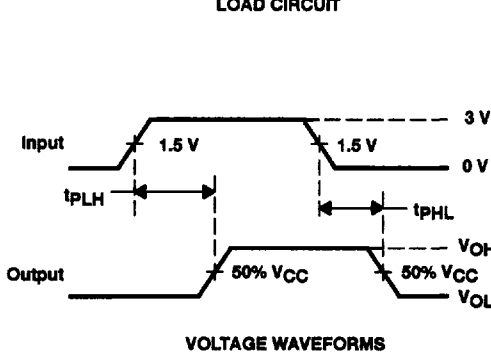
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PARAMETER MEASUREMENT INFORMATION



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



- 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: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r = 3 \text{ ns}$, $t_f = 3 \text{ ns}$.
 D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms