

SN54ACT563, SN74ACT563 OCTAL D-TYPE TRANSPARENT LATCHES WITH 3-STATE OUTPUTS

SCAS550B – NOVEMBER 1995 – REVISED OCTOBER 2002

- 4.5-V to 5.5-V V_{CC} Operation
- Inputs Accept Voltages to 5.5 V
- Max t_{pd} of 8.5 ns at 5 V
- Inputs Are TTL-Voltage Compatible
- 3-State Inverted Outputs Drive Bus Lines Directly
- Flow-Through Architecture to Optimize PCB Layout

description/ordering information

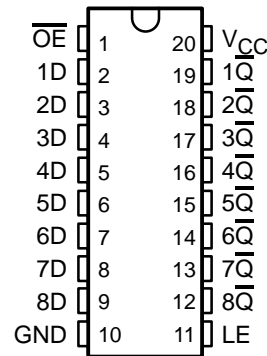
The 'ACT563 devices are octal D-type transparent latches with 3-state outputs. When the latch-enable (LE) input is high, the \bar{Q} outputs are set to the complements of the data (D) inputs. When LE is taken low, the \bar{Q} outputs are latched at the inverse logic levels set up at the D inputs.

A buffered output-enable (\overline{OE}) input places the eight outputs in either a normal logic state (high or low logic levels) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased high logic level provide the capability to drive bus lines without interface or pullup components.

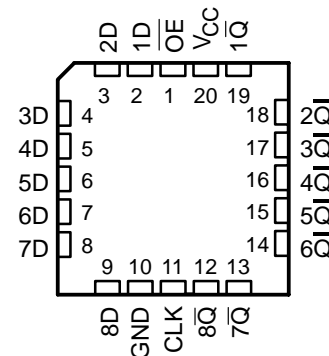
\overline{OE} does not affect internal operations of the latches. Old data can be retained or new data can be entered while the outputs are in the high-impedance state.

To ensure the high-impedance state during power up or power down, \overline{OE} should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

SN54ACT563 . . . J OR W PACKAGE
SN74ACT563 . . . DB, DW, N, NS, OR PW PACKAGE
(TOP VIEW)



SN54ACT563 . . . FK PACKAGE
(TOP VIEW)



ORDERING INFORMATION

| T_A | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|---------------|---------------|-----------------------|------------------|
| -40°C to 85°C | PDIP – N | Tube | SN74ACT563N | SN74ACT563N |
| | SOIC – DW | Tube | SN74ACT563DW | ACT563 |
| | | Tape and reel | SN74ACT563DWR | |
| | SOP – NS | Tape and reel | SN74ACT563NSR | ACT563 |
| | SSOP – DB | Tape and reel | SN74ACT563DBR | AD563 |
| TSSOP – PW | Tape and reel | SN74ACT563PWR | AD563 | |
| -55°C to 125°C | CDIP – J | Tube | SNJ54ACT5634J | SNJ54ACT563J |
| | CFP – W | Tube | SNJ54ACT563W | SNJ54ACT563W |
| | LCCC – FK | Tube | SNJ54ACT563FK | SNJ54ACT563FK |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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 **TEXAS
INSTRUMENTS**

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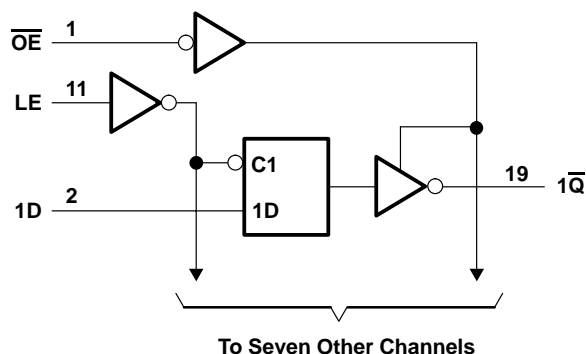
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FUNCTION TABLE
(each latch)

| INPUTS | | | OUTPUT |
|-----------------|----|---|------------------|
| \overline{OE} | LE | D | \overline{Q} |
| L | H | H | L |
| L | H | L | H |
| L | L | X | $\overline{Q_0}$ |
| H | X | X | Z |

logic diagram (positive logic)



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 $V_O > V_{CC}$) | ± 20 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ± 50 mA |
| Continuous current through V_{CC} or GND | ± 200 mA |
| Package thermal impedance, θ_{JA} (see Note 2): | |
| DB package | 70°C/W |
| DW package | 58°C/W |
| N package | 69°C/W |
| NS package | 60°C/W |
| PW package | 83°C/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 package thermal impedance is calculated in accordance with JESD 51-7.

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recommended operating conditions (see Note 3)

| | | SN54ACT563 | | SN74ACT563 | | UNIT |
|---------------------|------------------------------------|------------|----------|------------|----------|------|
| | | MIN | MAX | MIN | MAX | |
| V_{CC} | Supply voltage | 4.5 | 5.5 | 4.5 | 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 | | 8 | | 8 | ns/V |
| T_A | Operating free-air temperature | -55 | 125 | -40 | 85 | °C |

NOTE 3: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

| PARAMETER | TEST CONDITIONS | V_{CC} | $T_A = 25^\circ\text{C}$ | | | SN54ACT563 | | SN74ACT563 | | UNIT |
|-----------------------------------|---|----------|--------------------------|-------|------------|------------|-----------|---------------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V_{OH} | $I_{OH} = -50 \mu\text{A}$ | 4.5 V | 4.4 | 4.49 | 4.4 | | 4.4 | | V | |
| | | 5.5 V | 5.4 | 5.49 | 5.4 | | 5.4 | | | |
| | $I_{OH} = -24 \text{ mA}$ | 4.5 V | 3.86 | | 3.7 | | 3.76 | | | |
| | | 5.5 V | 4.86 | | 4.7 | | 4.76 | | | |
| | $I_{OH} = -50 \text{ mA}^\dagger$ | 5.5 V | | | 3.85 | | | | | |
| $I_{OH} = -75 \text{ mA}^\dagger$ | 5.5 V | | | | | 3.85 | | | | |
| V_{OL} | $I_{OL} = 50 \mu\text{A}$ | 4.5 V | | 0.001 | 0.1 | | 0.1 | 0.1 | V | |
| | | 5.5 V | | 0.001 | 0.1 | | 0.1 | 0.1 | | |
| | $I_{OL} = 24 \text{ mA}$ | 4.5 V | | | 0.36 | | 0.5 | 0.44 | | |
| | | 5.5 V | | | 0.36 | | 0.5 | 0.44 | | |
| | $I_{OL} = 50 \text{ mA}^\dagger$ | 5.5 V | | | | 1.65 | | | | |
| $I_{OL} = 75 \text{ mA}^\dagger$ | 5.5 V | | | | | 1.65 | | | | |
| I_{OZ} | $V_O = V_{CC}$ or GND | 5.5 V | | | ± 0.25 | ± 5 | ± 2.5 | μA | | |
| I_I | $V_I = V_{CC}$ or GND | 5.5 V | | | ± 0.1 | ± 1 | ± 1 | μA | | |
| I_{CC} | $V_I = V_{CC}$ or GND, $I_O = 0$ | 5.5 V | | | 4 | 80 | 40 | μA | | |
| ΔI_{CC}^\ddagger | One input at 3.4 V, Other inputs at GND or V_{CC} | 5.5 V | | 0.6 | | 1.6 | 1.5 | mA | | |
| C_i | $V_I = V_{CC}$ or GND | 5 V | | 4.5 | | | | pF | | |

† Not more than one output should be tested at a time, and the duration of the test should not exceed 2 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} .

timing requirements over recommended operating free-air temperature range, $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$ (unless otherwise noted) (see Figure 1)

| | | $T_A = 25^\circ\text{C}$ | | SN54ACT563 | | SN74ACT563 | | UNIT |
|----------|---|--------------------------|-----|------------|-----|------------|-----|------|
| | | MIN | MAX | MIN | MAX | MIN | MAX | |
| t_w | Pulse duration, LE high | 3 | | 5 | | 3 | | ns |
| t_{su} | Setup time, data before LE \downarrow | 4 | | 4.5 | | 4.5 | | ns |
| t_h | Hold time, data after LE \downarrow | 0 | | 1.5 | | 0 | | ns |

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

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $T_A = 25^\circ\text{C}$ | | | SN54ACT563 | | SN74ACT563 | | UNIT |
|-----------|-----------------|-------------|--------------------------|-----|------|------------|------|------------|------|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t_{PLH} | D | \bar{Q} | 3 | 7 | 11.5 | 1 | 14.5 | 2.5 | 12.5 | ns |
| t_{PHL} | | | 3 | 6 | 10 | 1 | 12 | 2.5 | 11 | |
| t_{PLH} | LE | \bar{Q} | 3 | 6.5 | 10.5 | 1 | 12.5 | 2.5 | 11.5 | ns |
| t_{PHL} | | | 2.5 | 5.5 | 9.5 | 1 | 11.5 | 2 | 10.5 | |
| t_{PZH} | \overline{OE} | \bar{Q} | 2.5 | 5.5 | 9 | 1 | 11.5 | 2 | 10 | ns |
| t_{PZL} | | | 2 | 5.5 | 8.5 | 1 | 11 | 2 | 9.5 | |
| t_{PHZ} | \overline{OE} | \bar{Q} | 3.5 | 6.5 | 10.5 | 1 | 12 | 2.5 | 11.5 | ns |
| t_{PLZ} | | | 2 | 4.5 | 8 | 1 | 9.5 | 1 | 8.5 | |

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

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|---|-----|------|
| C_{pd} Power dissipation capacitance | $C_L = 50\text{ pF}$, $f = 1\text{ MHz}$ | 50 | pF |

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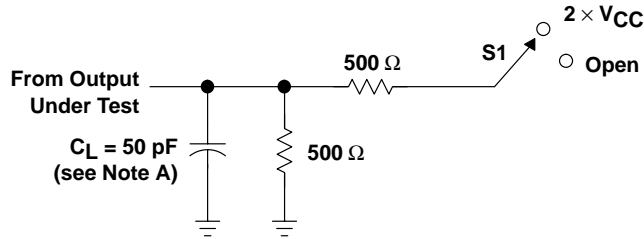


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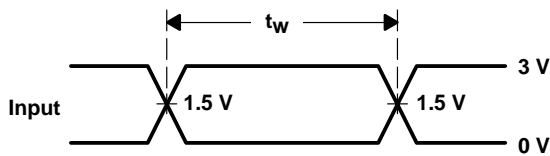
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PARAMETER MEASUREMENT INFORMATION

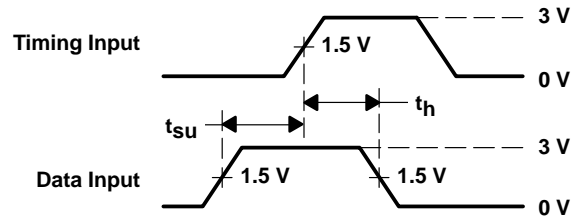


LOAD CIRCUIT

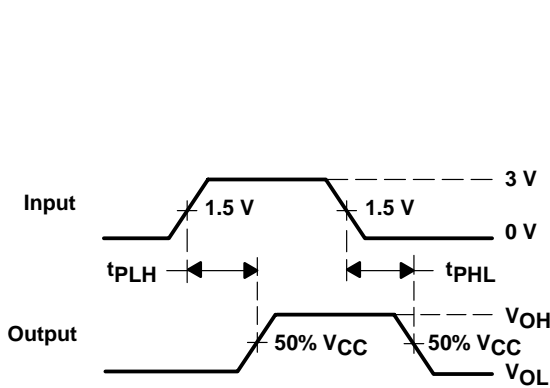
| TEST | S1 |
|-------------------|-------------------|
| t_{PLH}/t_{PHL} | Open |
| t_{PLZ}/t_{PZL} | $2 \times V_{CC}$ |
| t_{PHZ}/t_{PZH} | Open |



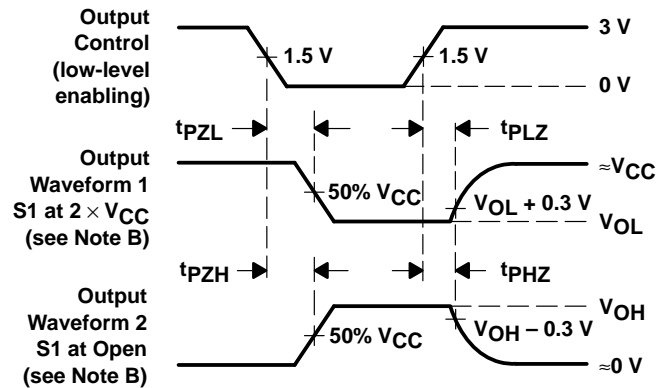
VOLTAGE WAVEFORMS



VOLTAGE WAVEFORMS



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: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.

D. The outputs are measured one at a time with one input transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/ Ball Finish | MSL Peak Temp ⁽³⁾ | Samples (Requires Login) |
|------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| SN74ACT563DBLE | OBSOLETE | SSOP | DB | 20 | | TBD | Call TI | Call TI | |
| SN74ACT563DBRE4 | ACTIVE | SSOP | DB | 20 | | TBD | Call TI | Call TI | |
| SN74ACT563DBRG4 | ACTIVE | SSOP | DB | 20 | | TBD | Call TI | Call TI | |
| SN74ACT563DW | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ACT563DWG4 | ACTIVE | SOIC | DW | 20 | 25 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ACT563DWR | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ACT563DWRE4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ACT563DWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ACT563N | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | |
| SN74ACT563NE4 | ACTIVE | PDIP | N | 20 | 20 | Pb-Free (RoHS) | CU NIPDAU | N / A for Pkg Type | |
| SN74ACT563PW | ACTIVE | TSSOP | PW | 20 | 70 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ACT563PWE4 | ACTIVE | TSSOP | PW | 20 | 70 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ACT563PWG4 | ACTIVE | TSSOP | PW | 20 | 70 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ACT563PWLE | OBSOLETE | TSSOP | PW | 20 | | TBD | Call TI | Call TI | |
| SN74ACT563PWR | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ACT563PWRE4 | ACTIVE | TSSOP | PW | 20 | 2000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74ACT563PWRG4 | ACTIVE | TSSOP | PW | 20 | 2000 | 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), 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.

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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)

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

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TAPE AND REEL INFORMATION



QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74ACT563DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.0 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74ACT563PWR | TSSOP | PW | 20 | 2000 | 330.0 | 16.4 | 6.95 | 7.1 | 1.6 | 8.0 | 16.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74ACT563DWR | SOIC | DW | 20 | 2000 | 346.0 | 346.0 | 41.0 |
| SN74ACT563PWR | TSSOP | PW | 20 | 2000 | 346.0 | 346.0 | 33.0 |

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