

SN54AC563, SN74AC563 OCTAL D-TYPE TRANSPARENT LATCHES WITH 3-STATE OUTPUTS

SCAS552C – NOVEMBER 1995 – REVISED OCTOBER 2003

- 2-V to 6-V V_{CC} Operation
- Inputs Accept Voltages to 6 V
- Max t_{pd} of 9 ns at 5 V
- 3-State Inverting Outputs Drive Bus Lines Directly
- Full Parallel Access for Loading
- Flow-Through Architecture to Optimize PCB Layout

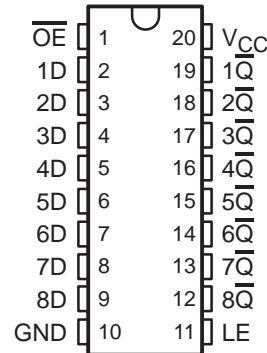
description/ordering information

The 'AC563 devices are octal D-type transparent latches with 3-state outputs. When the latch-enable (LE) input is high, the \bar{Q} outputs follow 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.

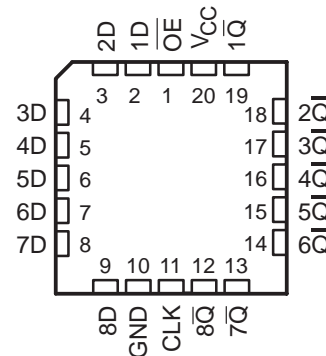
A buffered output-enable (\overline{OE}) input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or the high-impedance state. In the high-impedance state, the outputs neither load nor drive the bus lines significantly. The high-impedance state and increased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

SN54AC563 . . . J OR W PACKAGE
SN74AC563 . . . DB, DW, N, NS, OR PW PACKAGE
(TOP VIEW)



SN54AC563 . . . FK PACKAGE
(TOP VIEW)



ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	PDIP – N	Tube	SN74AC563N	SN74AC563N
	SOIC – DW	Tube	SN74AC563DW	AC563
		Tape and reel	SN74AC563DWR	
	SOP – NS	Tape and reel	SN74AC563NSR	AC563
	SSOP – DB	Tape and reel	SN74AC563DBR	AC563
	TSSOP – PW	Tube	SN74AC563PW	AC563
Tape and reel		SN74AC563PWR		
-55°C to 125°C	CDIP – J	Tube	SNJ54AC563J	SNJ54AC563J
	CFP – W	Tube	SNJ54AC563W	SNJ54AC563W
	LCCC – FK	Tube	SNJ54AC563FK	SNJ54AC563FK

† 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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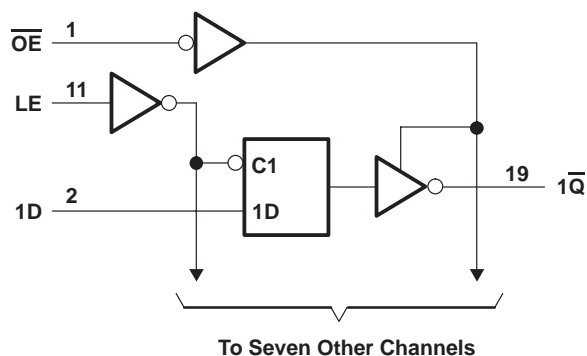
description/ordering information (continued)

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.

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)

		SN54AC563		SN74AC563		UNIT
		MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage	2	6	2	6	V
V_{IH}	High-level input voltage	$V_{CC} = 3\text{ V}$		2.1		V
		$V_{CC} = 4.5\text{ V}$		3.15		
		$V_{CC} = 5.5\text{ V}$		3.85		
V_{IL}	Low-level input voltage	$V_{CC} = 3\text{ V}$		0.9		V
		$V_{CC} = 4.5\text{ V}$		1.35		
		$V_{CC} = 5.5\text{ V}$		1.65		
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	$V_{CC} = 3\text{ V}$		-12		mA
		$V_{CC} = 4.5\text{ V}$		-24		
		$V_{CC} = 5.5\text{ V}$		-24		
I_{OL}	Low-level output current	$V_{CC} = 3\text{ V}$		12		mA
		$V_{CC} = 4.5\text{ V}$		24		
		$V_{CC} = 5.5\text{ V}$		24		
$\Delta t/\Delta v$	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}	$T_A = 25^\circ\text{C}$			SN54AC563		SN74AC563		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$I_{OH} = -50\ \mu\text{A}$	3 V	2.99			2.9		2.9		V
		4.5 V	4.49			4.4		4.4		
		5.5 V	5.49			5.4		5.4		
	$I_{OH} = -12\ \text{mA}$	3 V	2.56			2.48		2.46		
		4.5 V	3.86			3.8		3.76		
		5.5 V	4.86			4.8		4.76		
$I_{OH} = -75\ \text{mA}^\dagger$	5.5 V				3.85		3.85			
V_{OL}	$I_{OL} = 50\ \mu\text{A}$	3 V	0.002			0.1		0.1		V
		4.5 V	0.001			0.1		0.1		
		5.5 V	0.001			0.1		0.1		
	$I_{OL} = 12\ \text{mA}$	3 V				0.36		0.5		
		4.5 V				0.36		0.5		
		5.5 V				0.36		0.5		
$I_{OL} = 75\ \text{mA}^\dagger$	5.5 V				1.65		1.65			
I_I	$V_I = V_{CC}$ or GND	5.5 V				± 0.1		± 1		μA
I_{OZ}	$V_O = V_{CC}$ 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
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 10 ms.

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timing requirements over recommended operating free-air temperature range, $V_{CC} = 3.3 V \pm 0.3 V$ (unless otherwise noted) (see Figure 1)

		$T_A = 25^\circ C$		SN54AC563		SN74AC563		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration, LE high	6		8		7		ns
t_{su}	Setup time, data before LE \downarrow	2.5		5		3		ns
t_h	Hold time, data after LE \downarrow	2		3		2		ns

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

		$T_A = 25^\circ C$		SN54AC563		SN74AC563		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration, LE high	4		6		5		ns
t_{su}	Setup time, data before LE \downarrow	2		4.5		2.5		ns
t_h	Hold time, data after LE \downarrow	2		3		2		ns

switching characteristics over recommended operating free-air temperature range, $V_{CC} = 3.3 V \pm 0.3 V$ (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ C$			SN54AC563		SN74AC563		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	D	\bar{Q}	3.5	5.3	13	1.5	16.5	3.5	15	ns
t_{PHL}			3.5	5.6	12	1.5	15.5	3.5	14	
t_{PLH}	LE	\bar{Q}	3.5	4.6	13	1.5	16.5	3.5	15	ns
t_{PHL}			3.5	4.8	12	1.5	15.5	3.5	14	
t_{PZH}	\overline{OE}	\bar{Q}	2.5	5.3	11	1.5	13.5	2.5	12	ns
t_{PZL}			3	5.4	11	1.5	14	3.5	12.5	
t_{PHZ}	\overline{OE}	\bar{Q}	4	6	12.5	1.5	15	4.5	13.5	ns
t_{PLZ}			2	5.1	9.5	1.5	12	2.5	10.5	

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ C$			SN54AC563		SN74AC563		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	D	\bar{Q}	2	5.3	10	1.5	13	2	11.5	ns
t_{PHL}			2	5.6	9.5	1.5	12.5	2	11	
t_{PLH}	LE	\bar{Q}	2	4.6	9.5	1.5	12.5	2	11	ns
t_{PHL}			2	4.8	8.5	1.5	11.5	2	9.5	
t_{PZH}	\overline{OE}	\bar{Q}	2	5.3	9	1.5	11.5	2	10	ns
t_{PZL}			1.5	5.4	8.5	1.5	11	2	9.5	
t_{PHZ}	\overline{OE}	\bar{Q}	2	6	11	1.5	13.5	2	12	ns
t_{PLZ}			1.5	5.1	8	1.5	10.5	1.5	9	

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

PARAMETER	TEST CONDITIONS	TYP	UNIT
C_{pd} Power dissipation capacitance	$C_L = 50 pF, f = 1 MHz$	25	pF

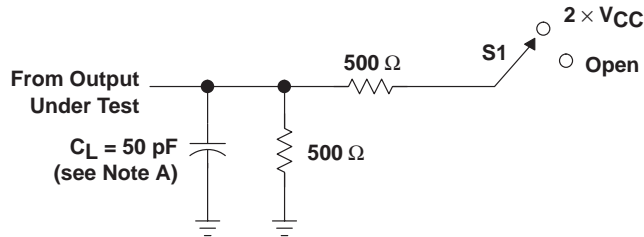
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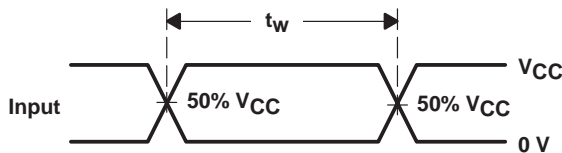
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PARAMETER MEASUREMENT INFORMATION

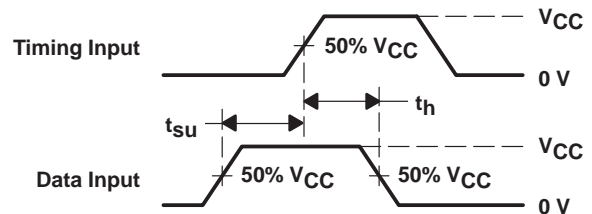


LOAD CIRCUIT

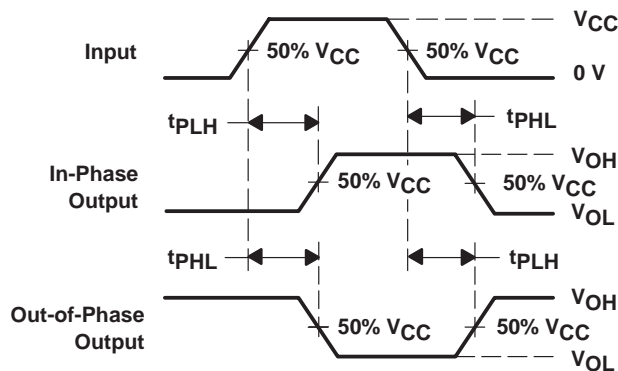
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	$2 \times V_{CC}$
t_{PHZ}/t_{PZH}	Open



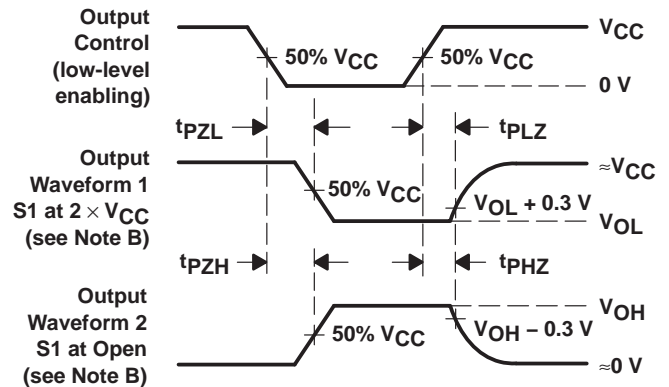
VOLTAGE WAVEFORMS



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⁾
SN74AC563DBLE	OBSOLETE	SSOP	DB	20		TBD	Call TI	Call TI
SN74AC563DBR	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563DBRE4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563DBRG4	ACTIVE	SSOP	DB	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563DW	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563DWE4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563DWG4	ACTIVE	SOIC	DW	20	25	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563N	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74AC563NE4	ACTIVE	PDIP	N	20	20	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
SN74AC563PW	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563PWE4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563PWG4	ACTIVE	TSSOP	PW	20	70	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563PWLE	OBSOLETE	TSSOP	PW	20		TBD	Call TI	Call TI
SN74AC563PWR	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563PWRE4	ACTIVE	TSSOP	PW	20	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74AC563PWRG4	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
SN74AC563DBR	SSOP	DB	20	2000	330.0	16.4	8.2	7.5	2.5	12.0	16.0	Q1
SN74AC563PWR	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)
SN74AC563DBR	SSOP	DB	20	2000	346.0	346.0	33.0
SN74AC563PWR	TSSOP	PW	20	2000	346.0	346.0	33.0

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- 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.
 D. Falls within JEDEC MO-150

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- 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.
 D. Falls within JEDEC MO-153

DW (R-PDSO-G20)

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 AC.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - $\triangle C$ Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - $\triangle D$ The 20 pin end lead shoulder width is a vendor option, either half or full width.

4040049/E 12/2002

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