

# SN54HC623, SN74HC623 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCLS149B – DECEMBER 1982 – REVISED MAY 1997

- Lock Bus-Latch Capability
- True Logic
- High-Current 3-State Outputs Can Drive up to 15 LSTTL Loads
- Package Options Include Plastic Small-Outline (DW) and Ceramic Flat (W) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

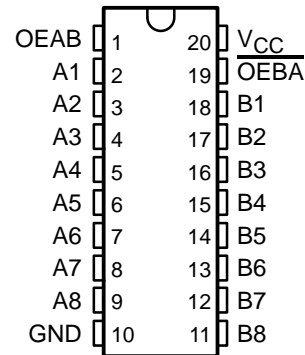
These octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation allows for maximum flexibility in timing.

The 'HC623 allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending upon the logic levels at the output-enable (OEAB and  $\overline{\text{OEBA}}$ ) inputs.

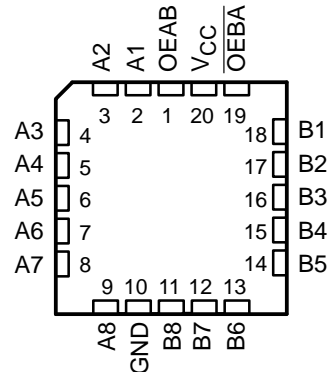
OEAB and  $\overline{\text{OEBA}}$  disable the device so that the buses are effectively isolated. The dual-enable configuration gives the transceivers the capability to store data by simultaneously enabling OEAB and  $\overline{\text{OEBA}}$ . Each output reinforces its input in this transceiver configuration. When both OEAB and  $\overline{\text{OEBA}}$  are enabled and all other data sources to the two sets of bus lines are in the high-impedance state, both sets of bus lines (16 total) remain at their last states. The 8-bit codes appearing on the two sets of buses are identical.

The SN54HC623 is characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74HC623 is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

SN54HC623 . . . J OR W PACKAGE  
SN74HC623 . . . DW OR N PACKAGE  
(TOP VIEW)



SN54HC623 . . . FK PACKAGE  
(TOP VIEW)



FUNCTION TABLE

INPUTS		OPERATION
$\overline{\text{OEBA}}$	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



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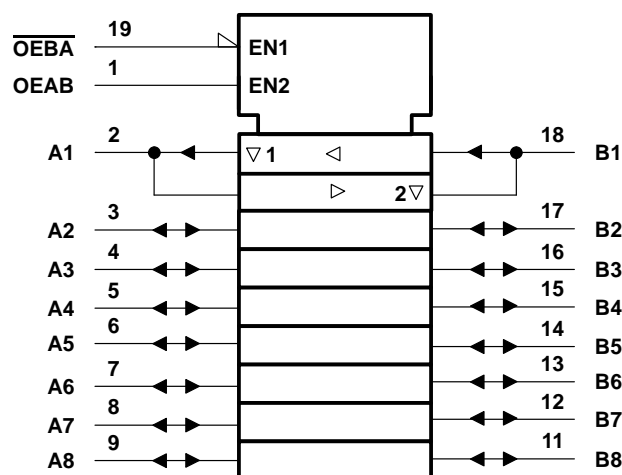
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**TEXAS  
INSTRUMENTS**

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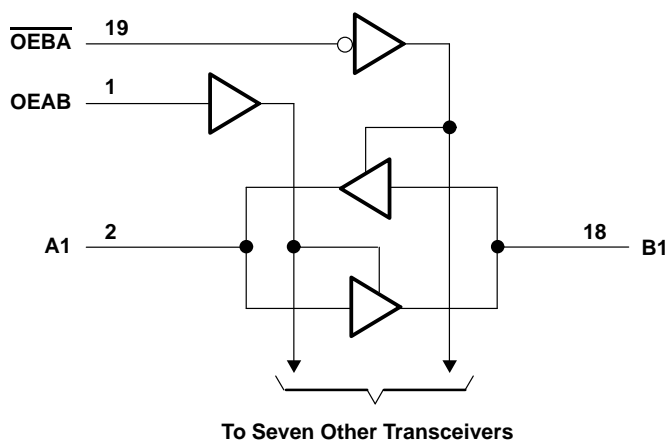
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## logic symbol†



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

## logic diagram (positive logic)



## absolute maximum ratings over operating free-air temperature range‡

Supply voltage range, $V_{CC}$	–0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ or $V_I > V_{CC}$ ) (see Note 1)	±20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) (see Note 1)	±20 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )	±35 mA
Continuous current through $V_{CC}$ or GND	±70 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2): DW package	97°C/W
N package	67°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, except for through-hole packages, which use a trace length of zero.

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## recommended operating conditions

			SN54HC623			SN74HC623			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage		2	5	6	2	5	6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V	1.5			1.5			V
		V <sub>CC</sub> = 4.5 V	3.15			3.15			
		V <sub>CC</sub> = 6 V	4.2			4.2			
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V	0		0.5	0		0.5	V
		V <sub>CC</sub> = 4.5 V	0		1.35	0		1.35	
		V <sub>CC</sub> = 6 V	0		1.8	0		1.8	
V <sub>I</sub>	Input voltage		0		V <sub>CC</sub>	0		V <sub>CC</sub>	V
V <sub>O</sub>	Output voltage		0		V <sub>CC</sub>	0		V <sub>CC</sub>	V
t <sub>t</sub>	Input transition (rise and fall) time	V <sub>CC</sub> = 2 V	0		1000	0		1000	ns
		V <sub>CC</sub> = 4.5 V	0		500	0		500	
		V <sub>CC</sub> = 6 V	0		400	0		400	
T <sub>A</sub>	Operating free-air temperature		–55		125	–40		85	°C

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

PARAMETER		TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			SN54HC623		SN74HC623		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V <sub>OH</sub>		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OH</sub> = –20 µA	2 V	1.9	1.998	1.9		1.9		V
				4.5 V	4.4	4.499	4.4		4.4		
				6 V	5.9	5.999	5.9		5.9		
		I <sub>OH</sub> = –6 mA	4.5 V	3.98	4.3		3.7		3.84		
			6 V	5.48	5.8		5.2		5.34		
V <sub>OL</sub>		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>OL</sub> = 20 µA	2 V	0.002	0.1	0.1		0.1		V
				4.5 V	0.001	0.1	0.1		0.1		
				6 V	0.001	0.1	0.1		0.1		
		I <sub>OL</sub> = 6 mA	4.5 V	0.17	0.26		0.4		0.33		
			6 V	0.15	0.26		0.4		0.33		
I <sub>I</sub>	OEAB or OEBA	V <sub>I</sub> = V <sub>CC</sub> or 0	6 V	±0.1	±100		±1000		±1000		nA
I <sub>OZ</sub>	A or B	V <sub>O</sub> = V <sub>CC</sub> or 0	6 V	±0.01	±0.5		±10		±5		µA
I <sub>CC</sub>		V <sub>I</sub> = V <sub>CC</sub> or 0, I <sub>O</sub> = 0	6 V		8		160		80		µA
C <sub>i</sub>	OEAB or OEBA		2 V to 6 V		3	10	10		10		pF

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# SN54HC623, SN74HC623

## OCTAL BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range,  $C_L = 50$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC623		SN74HC623		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A or B	B or A	2 V		29	105		160		130	ns
			4.5 V		10	21		32		26	
			6 V		8	18		27		22	
$t_{en}$	$\overline{OEBA}$	A	2 V		112	210		315		265	ns
			4.5 V		27	42		63		53	
			6 V		20	36		54		45	
$t_{dis}$	$\overline{OEBA}$	A	2 V		40	150		225		190	ns
			4.5 V		18	30		45		38	
			6 V		16	26		38		32	
$t_{en}$	OEAB	B	2 V		112	210		315		265	ns
			4.5 V		27	42		63		53	
			6 V		20	36		54		45	
$t_{dis}$	OEAB	B	2 V		40	150		225		190	ns
			4.5 V		18	30		45		38	
			6 V		16	26		38		32	
$t_t$		A or B	2 V		20	60		90		75	ns
			4.5 V		8	12		18		15	
			6 V		6	10		15		13	

switching characteristics over recommended operating free-air temperature range,  $C_L = 150$  pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			SN54HC623		SN74HC623		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	A or B	B or A	2 V		44	135		200		170	ns
			4.5 V		14	27		40		34	
			6 V		11	23		34		29	
$t_{en}$	$\overline{OEBA}$	A	2 V		130	270		405		335	ns
			4.5 V		31	54		81		67	
			6 V		23	46		69		56	
	OEAB	B	2 V		130	270		405		335	ns
			4.5 V		31	54		81		67	
			6 V		23	46		69		56	
$t_t$		A or B	2 V		45	210		315		265	ns
			4.5 V		17	42		63		53	
			6 V		13	36		53		45	

operating characteristics,  $T_A = 25^\circ\text{C}$

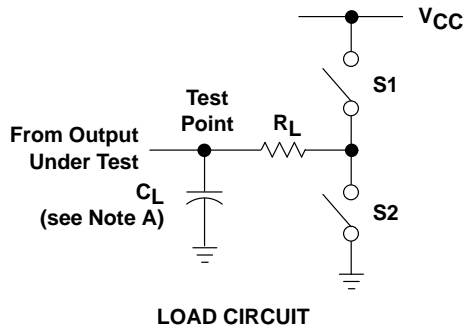
PARAMETER		TEST CONDITIONS	TYP	UNIT
$C_{pd}$	Power dissipation capacitance per transceiver	No load	40	pF

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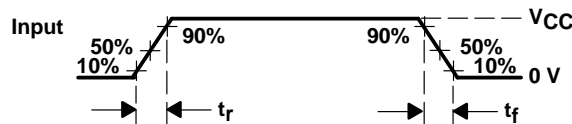


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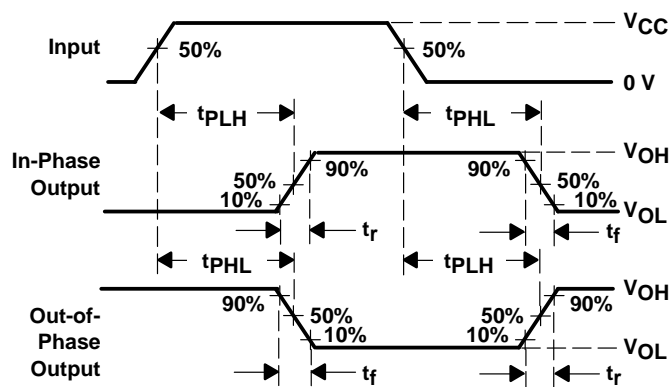
## PARAMETER MEASUREMENT INFORMATION



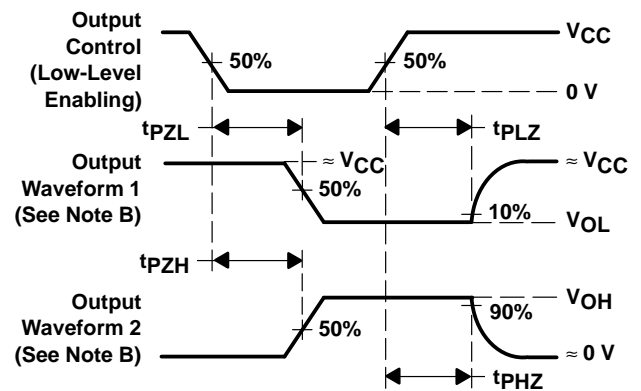
PARAMETER	$R_L$	$C_L$	S1	S2
$t_{en}$	1 k $\Omega$	50 pF or 150 pF	Open	Closed
			Closed	Open
$t_{dis}$	1 k $\Omega$	50 pF	Open	Closed
			Closed	Open
$t_{pd}$ or $t_t$	—	50 pF or 150 pF	Open	Open



VOLTAGE WAVEFORM  
INPUT RISE AND FALL TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES FOR 3-STATE OUTPUTS

- NOTES:
- $C_L$  includes probe and test-fixture capacitance.
  - 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.
  - Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1$  MHz,  $Z_O = 50 \Omega$ ,  $t_r = 6$  ns,  $t_f = 6$  ns.
  - The outputs are measured one at a time with one input transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

Figure 1. Load Circuit and Voltage Waveforms

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