

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.

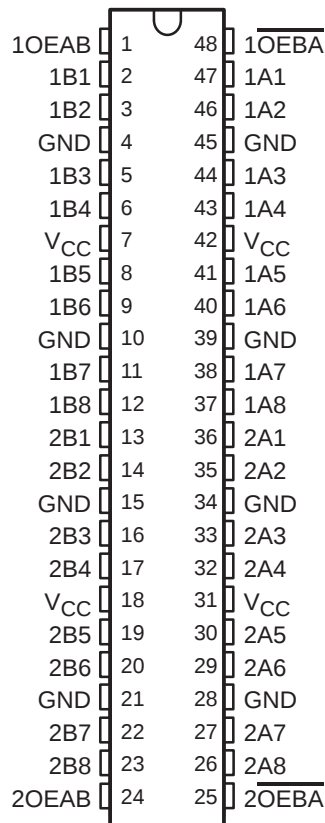
These devices can be used as two 8-bit transceivers or one 16-bit transceiver. They allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the output-enable (OEBA and OEAB) inputs. The output-enable inputs can be used to disable the device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

The dual-enable configuration gives the bus transceiver the capability to store data by simultaneously enabling 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
75ACT16623 . . . DL PACKAGE
(TOP VIEW)



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**TEXAS
INSTRUMENTS**

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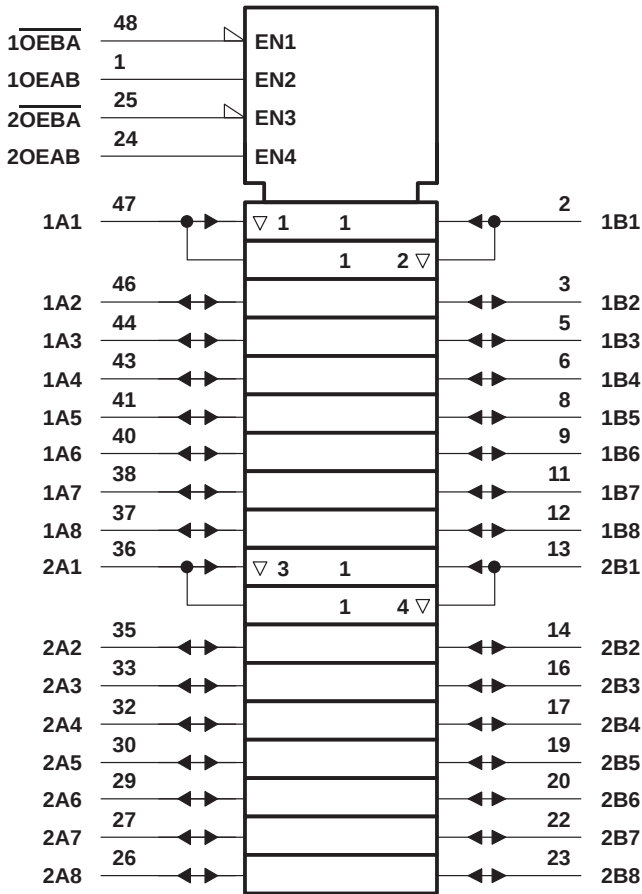
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FUNCTION TABLE

(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[†]

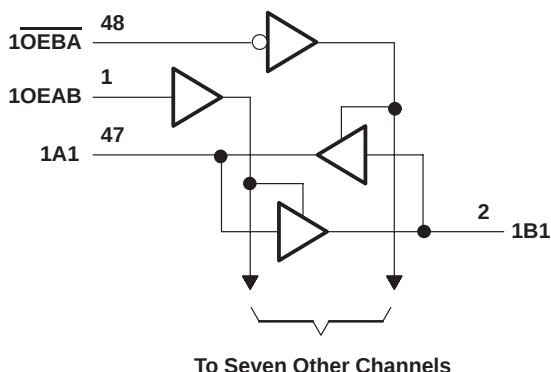


[†] This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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logic diagram (positive logic)



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	°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.

54ACT16623, 74ACT16623

16-BIT BUS TRANSCEIVERS

WITH 3-STATE OUTPUTS

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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		
			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	Control inputs	V _I = V _{CC} or GND	5.5 V			±0.1		±1		±1	µA
I _{OZ}	A or B ports	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
ΔI _{CC} ‡		One input at 3.4 V, Other inputs at V _{CC} or GND	5.5 V			0.9		1		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}	$\overline{\text{OEBA}}$	A	2.7	6.8	8.8	2.7	9.5	2.7	9.5	ns
t _{PZL}			3.5	8.2	10.2	3.5	11.1	3.5	11.1	
t _{PHZ}	$\overline{\text{OEBA}}$	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

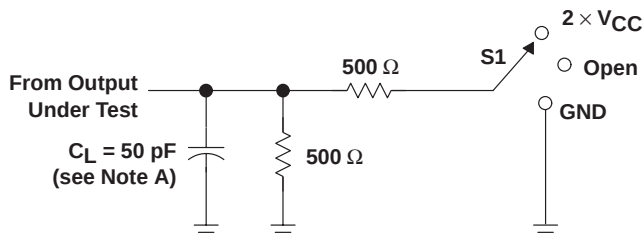
PARAMETER			TEST CONDITIONS		TYP	UNIT
C _{pd}	Power dissipation capacitance per transceiver	Outputs enabled	C _L = 50 pF, f = 1 MHz		56	pF
		Outputs disabled			11	

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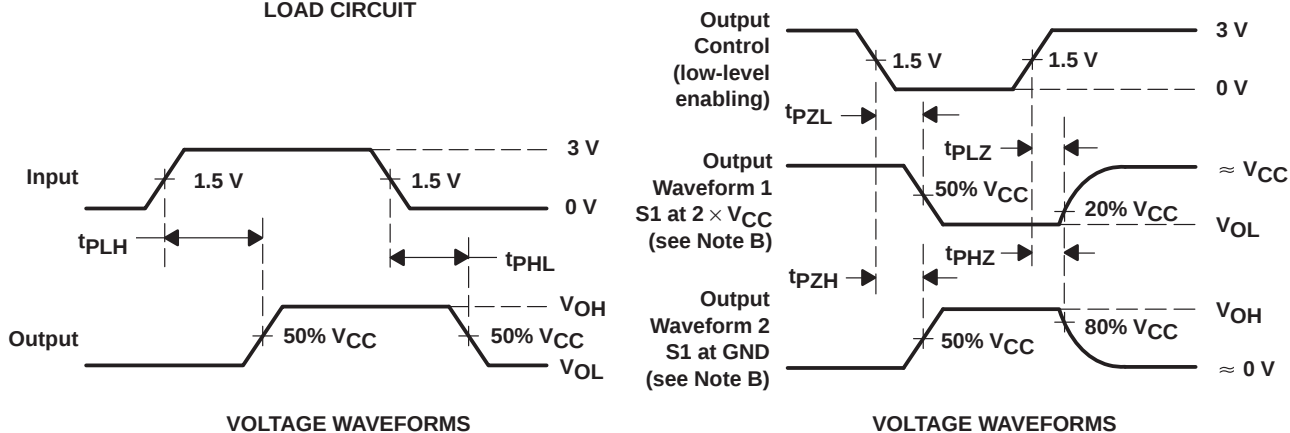
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PARAMETER MEASUREMENT INFORMATION



LOAD CIRCUIT

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

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
74ACT16623DL	Obsolete	Production	SSOP (DL) 48	-	-	Call TI	Call TI	-40 to 85	ACT16623
74ACT16623DLR	Active	Production	SSOP (DL) 48	1000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ACT16623
74ACT16623DLR.A	Active	Production	SSOP (DL) 48	1000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ACT16623

⁽¹⁾ **Status:** For more details on status, see our [product life cycle](#).

⁽²⁾ **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

⁽³⁾ **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

⁽⁴⁾ **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

⁽⁵⁾ **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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TAPE AND REEL INFORMATION



*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
74ACT16623DLR	SSOP	DL	48	1000	330.0	32.4	11.35	16.2	3.1	16.0	32.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
74ACT16623DLR	SSOP	DL	48	1000	356.0	356.0	53.0

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