

SN54ABT16623, SN74ABT16623 16-BIT BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCBS211B – FEBRUARY 1991 – REVISED JANUARY 1997

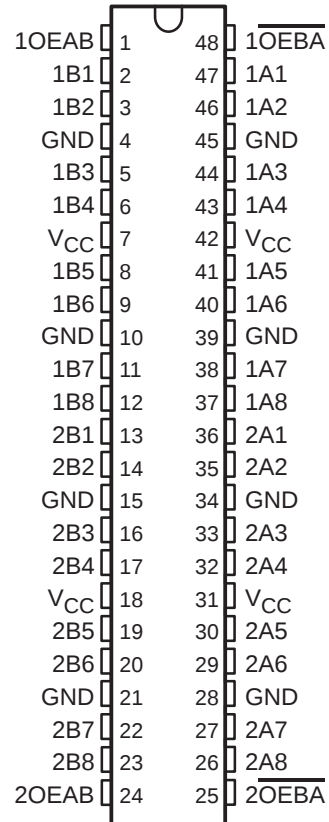
- Members of the Texas Instruments *Widebus™* Family
- State-of-the-Art *EPIC-II B™* BiCMOS Design Significantly Reduces Power Dissipation
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Typical V_{OLP} (Output Ground Bounce) < 1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- Distributed V_{CC} and GND Pin Configuration Minimizes High-Speed Switching Noise
- Flow-Through Architecture Optimizes PCB Layout
- High-Drive Outputs ($-32\text{-mA } I_{OH}$, $64\text{-mA } I_{OL}$)
- Package Options Include Plastic 300-mil Shrink Small-Outline (DL) and Thin Shrink Small-Outline (DGG) Packages and 380-mil Fine-Pitch Ceramic Flat (WD) Package Using 25-mil Center-to-Center Spacings

description

The 'ABT16623 are 16-bit transceivers designed for asynchronous communication between data buses. The control-function implementation allows for maximum flexibility in timing. The 'ABT16623 provide true data at the outputs.

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 levels at the output-enable (OEAB and OEBA) 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 transceivers the capability of storing data by simultaneously enabling OEAB and OEBA. Each output reinforces its input in this configuration. When both OEAB and OEBA are enabled and all other data sources to the two sets of bus lines are at high impedance, both sets of bus lines (32 total) remain at their last states.

SN54ABT16623 . . . WD PACKAGE
SN74ABT16623 . . . DGG OR DL PACKAGE
(TOP VIEW)



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description (continued)

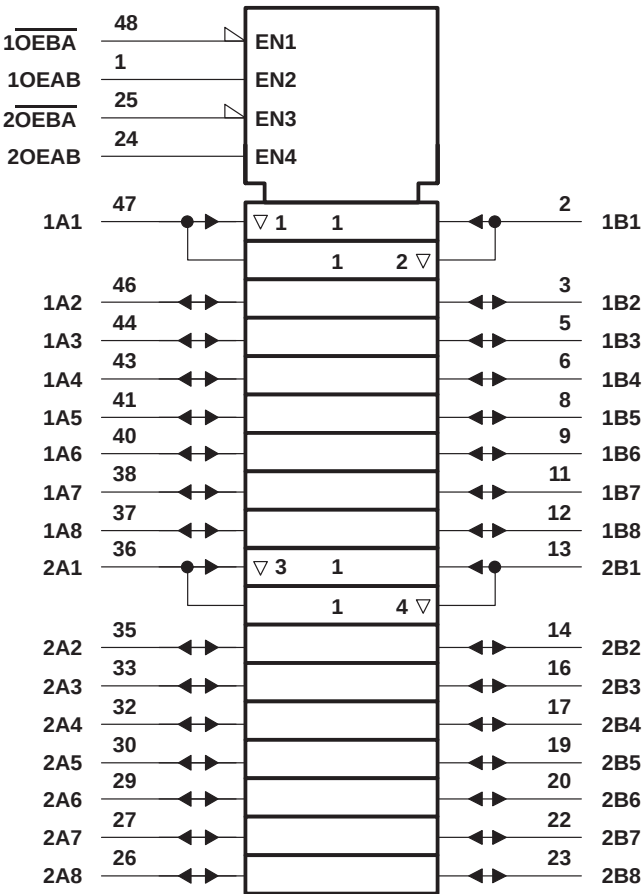
To ensure the high-impedance state during power up or power down, $\overline{OEBA}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver. OEAB should be tied to GND through a pulldown resistor; the minimum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

The SN54ABT16623 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT16623 is characterized for operation from -40°C to 85°C .

FUNCTION TABLE
(each 8-bit section)

INPUTS		OPERATION
$\overline{OEBA}$	OEAB	
L	L	B data to A bus
L	H	B data to A bus, A data to B bus
H	L	Isolation
H	H	A data to B bus

logic symbol†

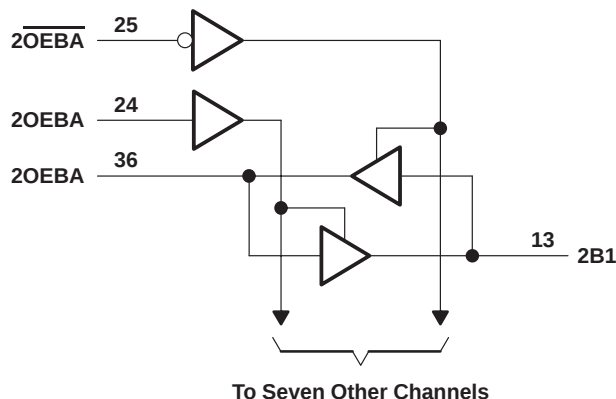
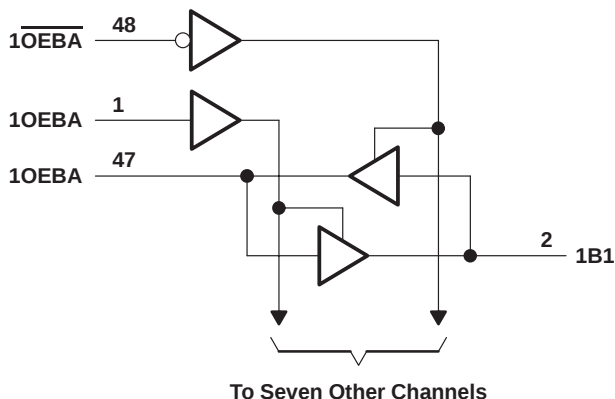


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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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 (except I/O ports) (see Note 1)	–0.5 V to 7 V
Voltage range applied to any output in the high or power-off state, V_O	–0.5 V to 5.5 V
Current into any output in the low state, I_O : SN54ABT16623	96 mA
SN74ABT16623	128 mA
Input clamp current, I_{IK} ($V_I < 0$)	–18 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Package thermal impedance, θ_{JA} (see Note 2): DGG package	89°C/W
DL package	94°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 negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. The package thermal impedance is calculated in accordance with EIA/JEDEC Std JESD51.

recommended operating conditions (see Note 3)

		SN54ABT16623		SN74ABT16623		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
I_{OH}	High-level output current		–24		–32	mA
I_{OL}	Low-level output current		48		64	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled				
		5		5		ns/V
T_A	Operating free-air temperature	–55	125	–40	85	°C

NOTE 3: Unused pins (input or I/O) must be held high or low to prevent them from floating.

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

PARAMETER		TEST CONDITIONS		T _A = 25°C			SN54ABT16623		SN74ABT16623		UNIT
				MIN	TYP [†]	MAX	MIN	MAX	MIN	MAX	
V _{IK}		V _{CC} = 4.5 V, I _I = –18 mA		–1.2			–1.2		–1.2		V
V _{OH}		V _{CC} = 4.5 V, I _{OH} = –3 mA		2.5			2.5		2.5		V
		V _{CC} = 5 V, I _{OH} = –3 mA		3			3		3		
		V _{CC} = 4.5 V		I _{OH} = –24 mA			2				
				I _{OH} = –32 mA			2*		2		
V _{OL}		V _{CC} = 4.5 V		I _{OL} = 48 mA			0.55				V
				I _{OL} = 64 mA			0.55*		0.55		
V _{hys}				100							mV
I _I	Control inputs	V _{CC} = 5.5 V, V _I = V _{CC} or GND		±1			±1		±1		μA
	A or B ports			±100			±100		±100		
I _{OZH} [‡]		V _{CC} = 5.5 V, V _O = 2.7 V		50			50		50		μA
I _{OZL} [‡]		V _{CC} = 5.5 V, V _O = 0.5 V		–50			–50		–50		μA
I _{off}		V _{CC} = 0, V _I or V _O ≤ 4.5 V		±100					±100		μA
I _{CEX}		V _{CC} = 5.5 V, V _O = 5.5 V		50			50		50		μA
I _O [§]		V _{CC} = 5.5 V, V _O = 2.5 V		–50	–100	–180	–50	–180	–50	–180	mA
I _{CC}	A or B ports	V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND		Outputs high			2		2		mA
				Outputs low			35		35		
				Outputs disabled			2		2		
ΔI _{CC} [¶]	Data inputs	V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND		Outputs enabled			1		1.5		mA
				Outputs disabled			0.05		0.05		
	Control inputs	V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND		1.5			1.5		1.5		
C _i	Control inputs	V _I = 2.5 V or 0.5 V		3							pF
C _{iO}	A or B ports	V _O = 2.5 V or 0.5 V		8							pF

* On products compliant to MIL-PRF-38535, this parameter does not apply.

[†] All typical values are at V_{CC} = 5 V.

[‡] The parameters I_{OZH} and I_{OZL} include the input leakage current.

[§] Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

[¶] This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

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16-BIT BUS TRANSCEIVERS
WITH 3-STATE OUTPUTS

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switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

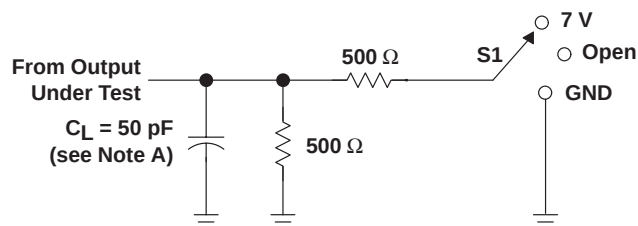
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$			SN54ABT16623		SN74ABT16623		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	1	2	3.2	1	3.7	1	3.6	ns
t_{PHL}			1	2.2	3.4	1	4.4	1	4.3	
t_{PZH}	$\overline{\text{OEBA}}$ or OEAB	A or B	1.1	3	4	1.1	5	1.1	4.9	ns
t_{PZL}			1.4	3.3	4.9	1.4	6.2	1.4	6	
t_{PHZ}	$\overline{\text{OEBA}}$ or OEAB	A or B	1	3.5	4.9	1	6.2	1	6	ns
t_{PLZ}			1.4	2.8	4.7	1.4	5.6	1.4	5.4	

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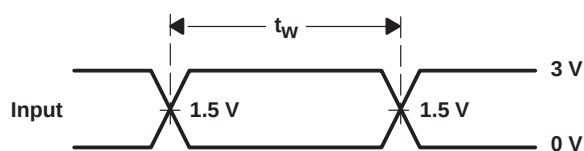
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PARAMETER MEASUREMENT INFORMATION

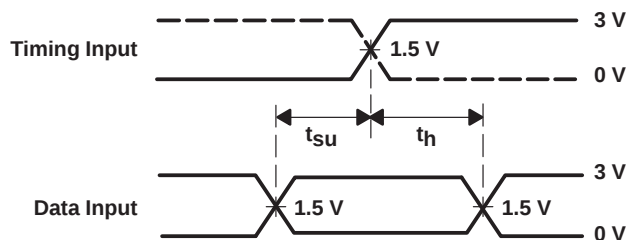


LOAD CIRCUIT

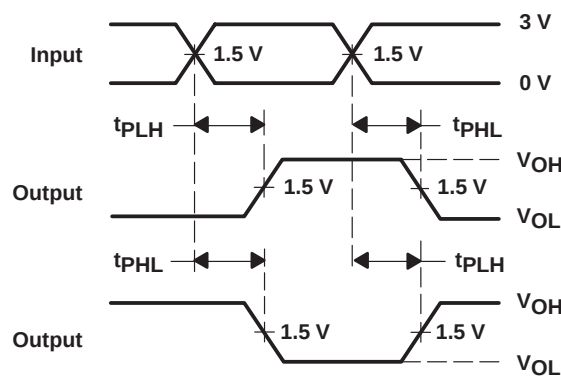
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



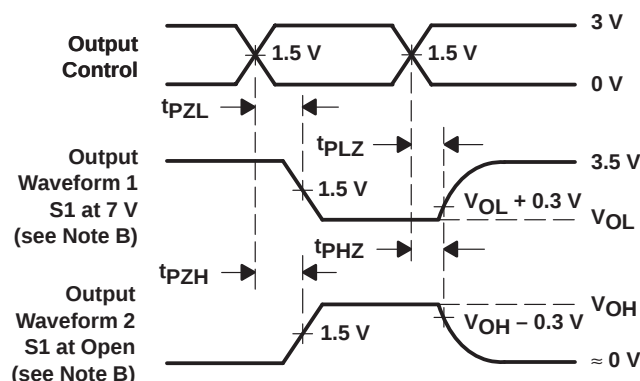
VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS
ENABLE AND DISABLE TIMES
LOW- AND HIGH-LEVEL ENABLING

- 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: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
 D. The outputs are measured one at a time with one 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)
SN74ABT16623DL	Active	Production	SSOP (DL) 48	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16623
SN74ABT16623DL.B	Active	Production	SSOP (DL) 48	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16623
SN74ABT16623DLR	Active	Production	SSOP (DL) 48	1000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16623
SN74ABT16623DLR.B	Active	Production	SSOP (DL) 48	1000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT16623

⁽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.

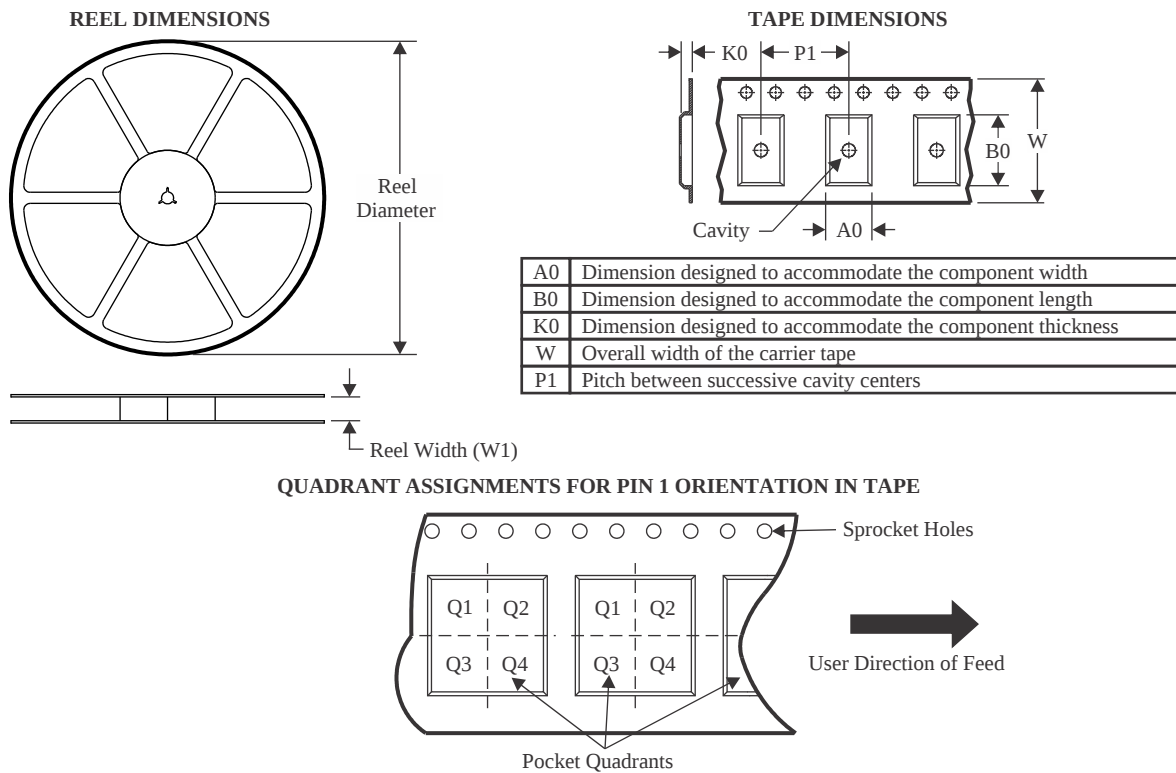
⁽⁶⁾ **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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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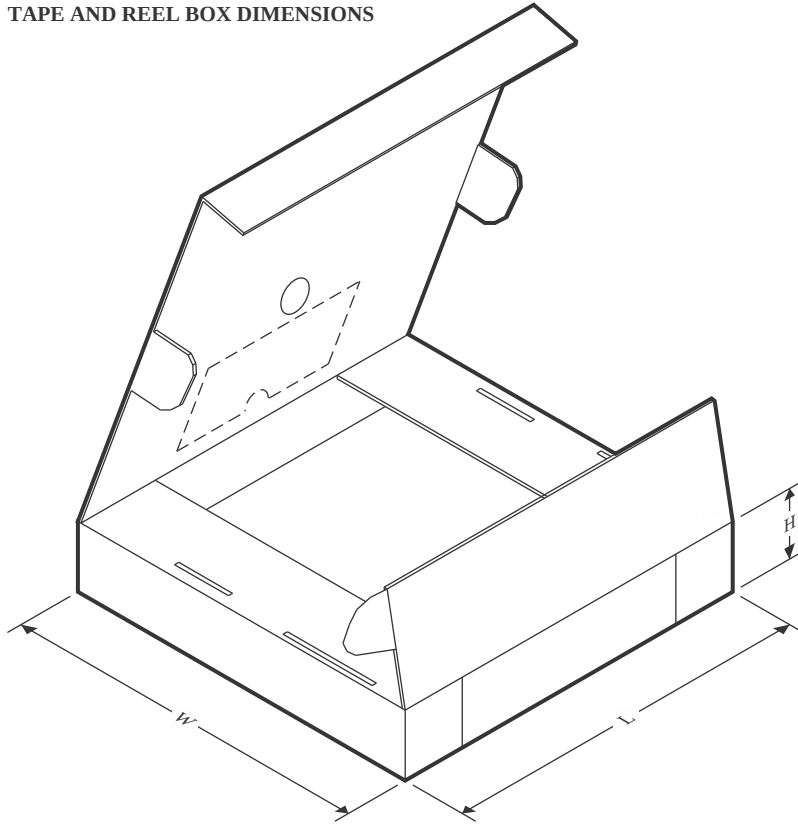
TAPE AND REEL INFORMATION



*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
SN74ABT16623DLR	SSOP	DL	48	1000	330.0	32.4	11.35	16.2	3.1	16.0	32.0	Q1

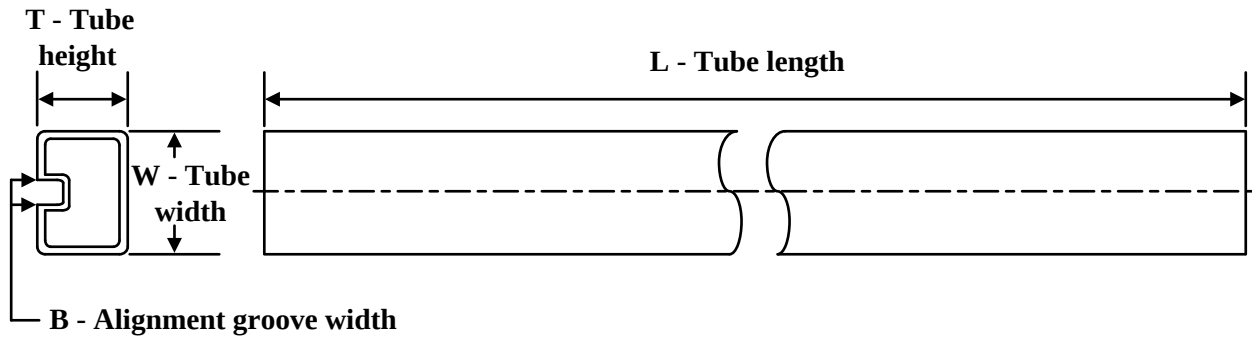
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74ABT16623DLR	SSOP	DL	48	1000	356.0	356.0	53.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74ABT16623DL	DL	SSOP	48	25	473.7	14.24	5110	7.87
SN74ABT16623DL.B	DL	SSOP	48	25	473.7	14.24	5110	7.87

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