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Datasheet of SN74ABT16833DLR - IC 8-9BT DUAL PARITY TXRX 56SSOP

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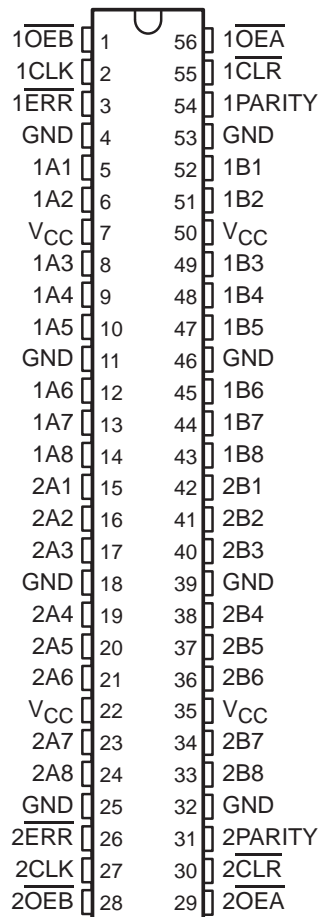
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SN54ABT16833, SN74ABT16833 DUAL 8-BIT TO 9-BIT PARITY BUS TRANSCEIVERS

SCBS097D – FEBRUARY 1991 – REVISED JANUARY 1997

- **Members of the Texas Instruments *Widebus*™ Family**
- **State-of-the-Art *EPIC-II*™ 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 $V_{CC} = 5 V, T_A = 25^\circ C$**
- **Distributed V_{CC} and GND Pin Configuration Minimizes High-Speed Switching Noise**
- **Flow-Through Architecture Optimizes PCB Layout**
- **High-Drive Outputs ($-32\text{-mA } I_{OH}, 64\text{-mA } I_{OL}$)**
- **Parity-Error Flag With Parity Generator/Checker**
- **Register for Storage of Parity-Error Flag**
- **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**

SN54ABT16833 . . . WD PACKAGE
SN74ABT16833 . . . DGG OR DL PACKAGE
(TOP VIEW)



description

The 'ABT16833 consist of two noninverting 8-bit to 9-bit parity bus transceivers and are designed for communication between data buses. For each transceiver, when data is transmitted from the A bus to the B bus, an odd-parity bit is generated and output on the parity I/O pin (1PARITY or 2PARITY). When data is transmitted from the B bus to the A bus, 1PARITY (or 2PARITY) is configured as an input and combined with the B-input data to generate an active-low error flag if odd parity is not detected.

The error ($1\overline{ERR}$ or $2\overline{ERR}$) output is configured as an open-collector output. The B-to-A parity-error flag is clocked into $1\overline{ERR}$ (or $2\overline{ERR}$) on the low-to-high transition of the clock ($1CLK$ or $2CLK$) input. $1\overline{ERR}$ (or $2\overline{ERR}$) is cleared (set high) by taking the clear ($1\overline{CLR}$ or $2\overline{CLR}$) input low.

The output-enable ($1\overline{OEA}$ and $1\overline{OEB}$) inputs can be used to disable the device so that the buses are effectively isolated. When both $1\overline{OEA}$ and $1\overline{OEB}$ are low, data is transferred from the A bus to the B bus and inverted parity is generated. Inverted parity is a forced error condition that gives the designer more system diagnostic capability.

To ensure the high-impedance state during power up or power down, $1\overline{OE}$ 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.



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description (continued)

The SN54ABT16833 is characterized for operation over the full military temperature range of -55°C to 125°C .
 The SN74ABT16833 is characterized for operation from -40°C to 85°C .

FUNCTION TABLE

INPUTS						OUTPUT AND I/O				FUNCTION
$\overline{\text{OEB}}$	$\overline{\text{OEA}}$	$\overline{\text{CLR}}$	CLK	Ai Σ OF H	Bi† Σ OF H	A	B	PARITY	$\overline{\text{ERR}}\ddagger$	
L	H	X	X	Odd Even	NA	NA	A	L H	NA	A data to B bus and generate parity
H	L	H	\uparrow	NA	Odd Even	B	NA	NA	H L	B data to A bus and check parity
X	X	L	X	X	X	X	NA	NA	H	Check error-flag register
H	H	H	No \uparrow	X	X	Z	Z	Z	NC	Isolation§
		L	No \uparrow	X					H	
		H	\uparrow	Odd					H	
L	L	X	X	Odd	NA	NA	A	H	NA	A data to B bus and generate inverted parity
				Even				L		

NA = not applicable, NC = no change, X = don't care

† Summation of high-level inputs includes PARITY along with Bi inputs.

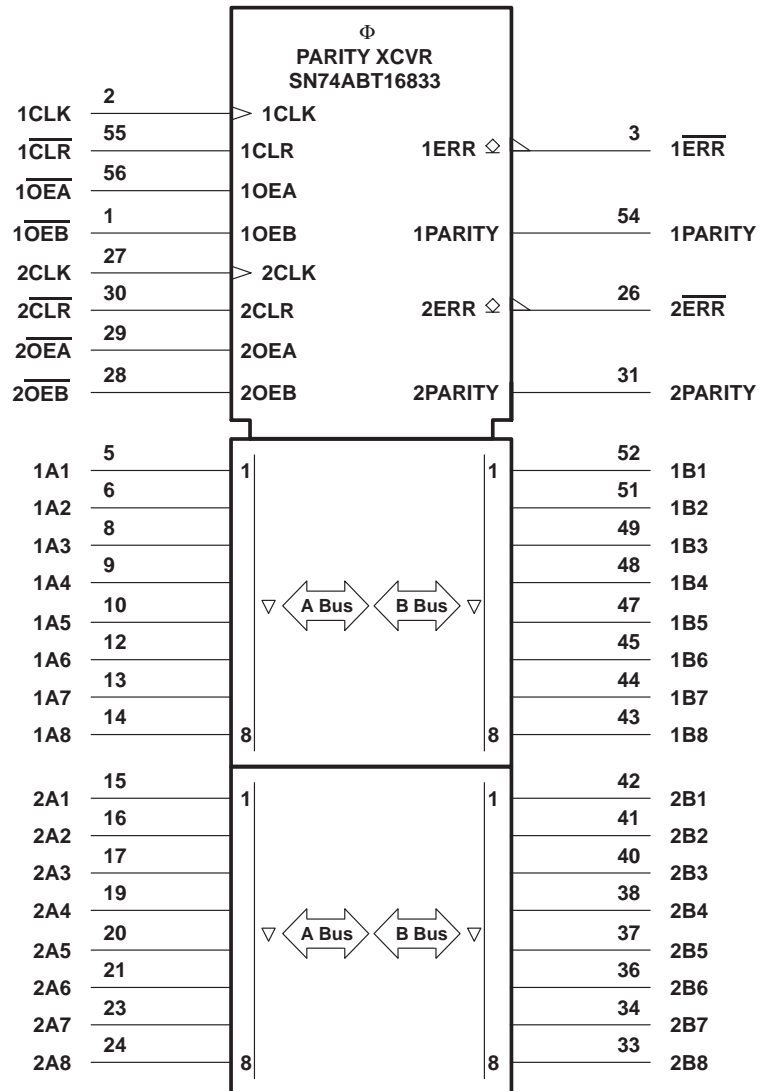
‡ Output states shown assume $\overline{\text{ERR}}$ was previously high.

§ In this mode, $\overline{\text{ERR}}$ (when clocked) shows inverted parity of the A bus.

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logic symbol†

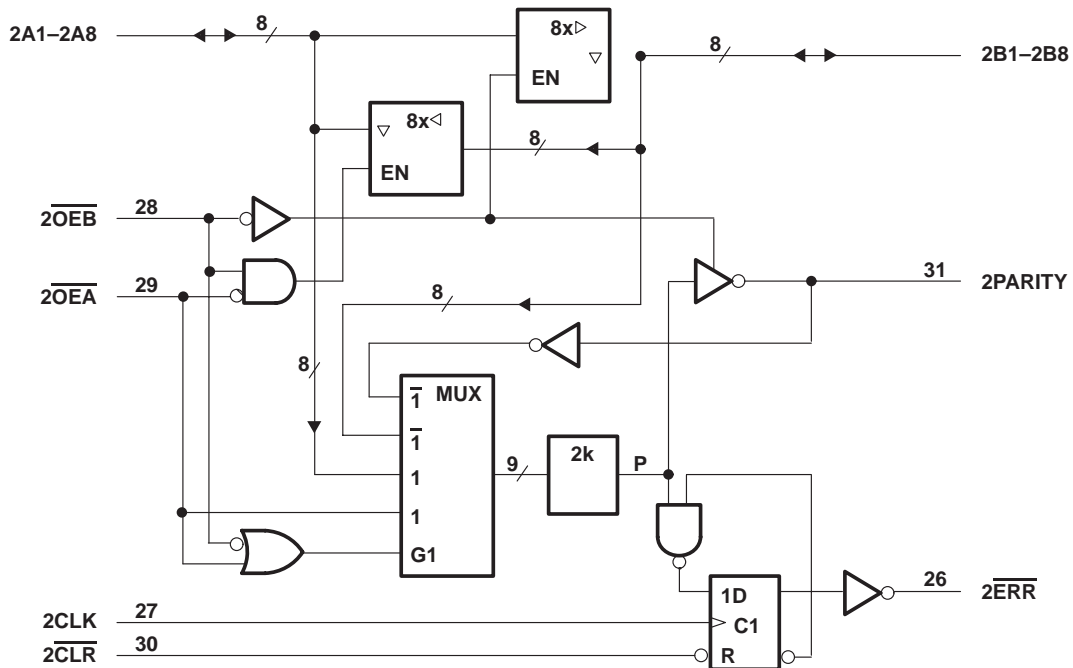
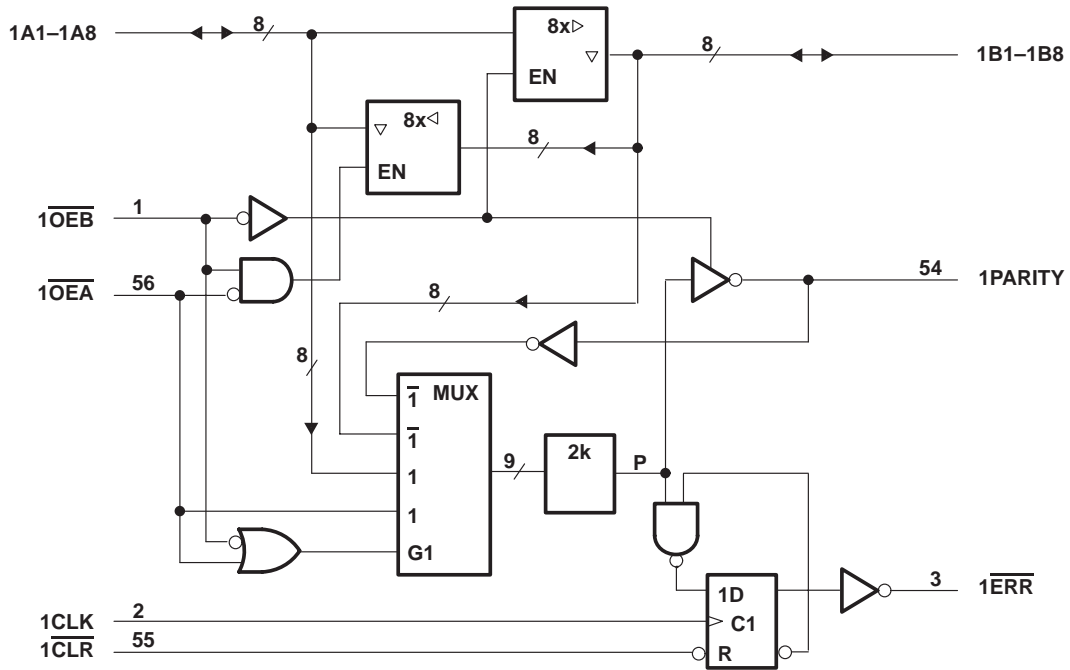


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

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logic diagram (positive logic)



SN54ABT16833, SN74ABT16833
DUAL 8-BIT TO 9-BIT PARITY BUS TRANSCEIVERS

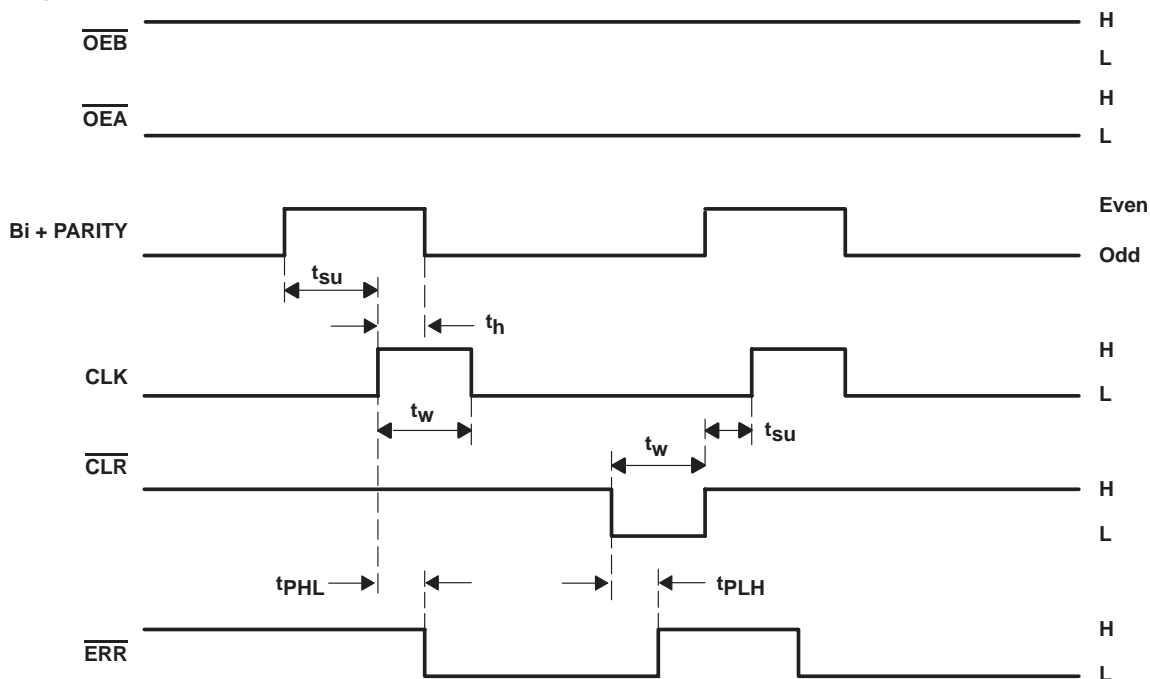
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ERROR-FLAG FUNCTION TABLE

INPUTS		INTERNAL TO DEVICE	OUTPUT PRE-STATE	OUTPUT ERR	FUNCTION
CLR	CLK	POINT P	ERR _{n-1} †	ERR	
H	↑	H	H	H	Sample
H	↑	X	L	L	
H	↑	L	X	L	
L	X	X	X	H	Clear

† State of ERR before changes at CLR, CLK, or point P

error-flag waveforms



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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 : SN54ABT16833	96 mA
SN74ABT16833	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	81°C/W
DL package	74°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)

		SN54ABT16833		SN74ABT16833		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_{OH}	High-level output voltage		\overline{ERR}		5.5	V
I_{OH}	High-level output current		Except \overline{ERR}		-24	mA
I_{OL}	Low-level output current				48	mA
$\Delta t/\Delta v$	Input transition rise or fall rate		Outputs enabled		10	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			SN54ABT16833		SN74ABT16833		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}	All outputs except ERR	V _{CC} = 4.5 V, I _{OH} = -3 mA		2.5	3	2.5			V	
		V _{CC} = 5 V, I _{OH} = -3 mA		3	3.4	3		3		
		V _{CC} = 4.5 V, I _{OH} = -24 mA						2		
V _{OL}	V _{CC} = 4.5 V	I _{OL} = -32 mA		2*	2.7			2	V	
		I _{OL} = 24 mA		0.25	0.55			0.55		
V _{OL}	V _{CC} = 4.5 V	I _{OL} = 64 mA		0.3	0.55*			0.55	V	
V _{hys}				100					mV	
I _{OH}	ERR	V _{CC} = 4.5 V, V _{OH} = 5.5 V				20		20	μA	
I _{off}		V _{CC} = 0, V _I or V _O ≤ 4.5 V				±100		±100	μA	
I _{CEX}	Outputs high	V _{CC} = 5.5 V, V _O = 5.5 V				50		50	μA	
I _I	Control inputs	V _{CC} = 5.5 V, V _I = V _{CC} or GND				±1		±1	μA	
	A or B ports					±100		±100		
I _{IL}	A or B ports	V _{CC} = 0, V _I = GND				-50		-50	μA	
I _O ‡		V _{CC} = 5.5 V, V _O = 2.5 V		-50	-100	-180		-50	-180	mA
I _{OZH} §		V _{CC} = 5.5 V, V _O = 2.7 V				50		50	μA	
I _{OZL} §		V _{CC} = 5.5 V, V _O = 0.5 V				-50		-50	μA	
I _{CC}	A or B ports	V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND		Outputs high		1.5	2	2	2	mA
				Outputs low		28	36	36	36	
				Outputs disabled		1	2	2	2	
ΔI _{CC} ¶		V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND				50		50	μA	
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				9			pF	

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

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

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

§ The parameters I_{OZH} and I_{OZL} include the input leakage current.

¶ 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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timing requirements over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

		V _{CC} = 5 V, T _A = 25°C		SN54ABT16833		SN74ABT16833		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t _w	Pulse duration, CLK high or low	3		3		3		ns
t _{su}	Setup time before CLK↑	A port	4.5	4.5		4.5		ns
		$\overline{\text{CLR}}$	1		1			
		$\overline{\text{OEA}}$	5		5			
t _h	Hold time after CLK↑	0		0		0		ns

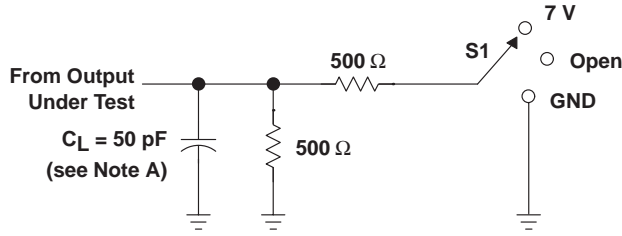
switching characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 5 V, T _A = 25°C			SN54ABT16833		SN74ABT16833		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	A or B	B or A	1.5	2.5	3.3	1.5	4.2	1.5	4.1	ns
t _{PHL}			2	3.1	3.9	2	4.5	2	4.3	
t _{PZH}	$\overline{\text{OE}}$	A or B	2	3.9	4.9	2	5.8	2	5.6	ns
t _{PZL}			2.5	4.3	5.1	2.5	6.2	2.5	6	
t _{PHZ}	$\overline{\text{OE}}$	A or B	2	3.6	4.5	2	5.5	2	5.4	ns
t _{PLZ}			1.5	3	3.8	1.5	4.7	1.5	4.3	
t _{PLH}	A or $\overline{\text{OE}}$	PARITY	2	4.6	5.4	2	7	2	6.7	ns
t _{PHL}			2	4.3	5.1	2	6.5	2	6.1	
t _{PZH}	$\overline{\text{OE}}$	PARITY	2	3.6	5	2	5.8	2	5.7	ns
t _{PZL}			2.5	4.4	5.8	2.5	6.7	2.5	6.5	
t _{PHZ}	$\overline{\text{OE}}$	PARITY	1.5	3.2	4	1.5	4.8	1.5	4.7	ns
t _{PLZ}			1.5	2.9	3.7	1.5	4.2	1.5	4.1	
t _{PLH}	CLK, $\overline{\text{CLR}}$	$\overline{\text{ERR}}$	2	3.4	4.2	2	4.8	2	4.6	ns
t _{PHL}	CLK		2	2.8	3.6	2	4.1	2	3.9	

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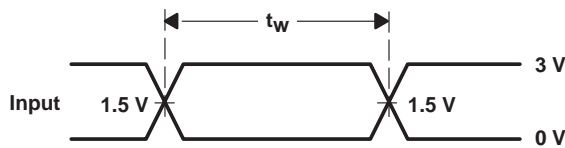
PARAMETER MEASUREMENT INFORMATION



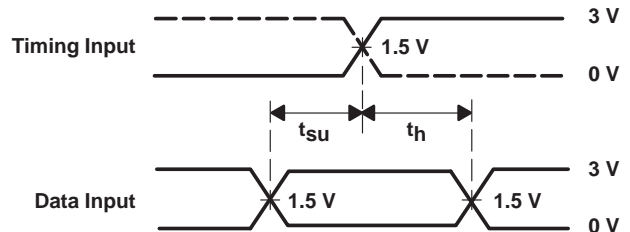
LOAD CIRCUIT

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

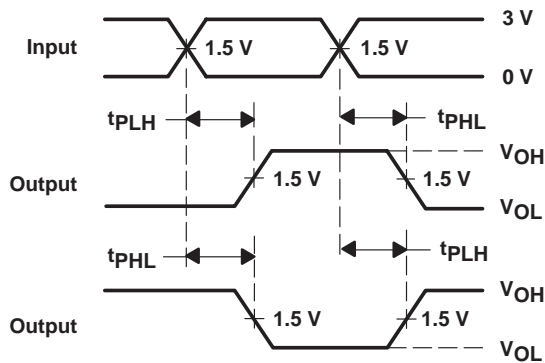
ERR	S1
t_{PHL} (see Note E)	7 V
t_{PLH} (see Note F)	7 V



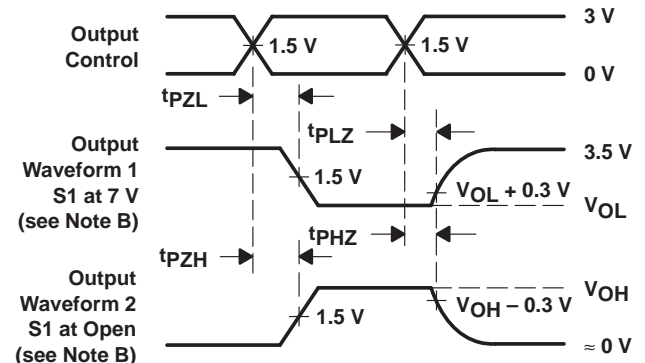
**VOLTAGE WAVEFORMS
 PULSE DURATION**



**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.
 E. t_{PHL} is measured at 1.5 V.
 F. t_{PLH} is measured at $V_{OL} + 0.3 \text{ V}$.

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⁾
SN74ABT16833DL	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT16833DLG4	ACTIVE	SSOP	DL	56	20	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT16833DLR	ACTIVE	SSOP	DL	56	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74ABT16833DLRG4	ACTIVE	SSOP	DL	56	1000	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.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

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.

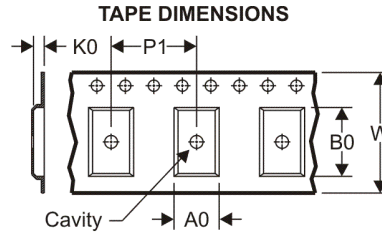
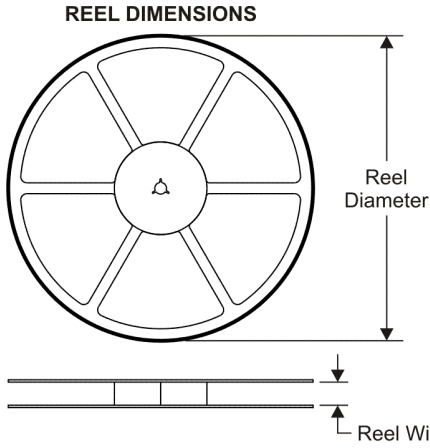
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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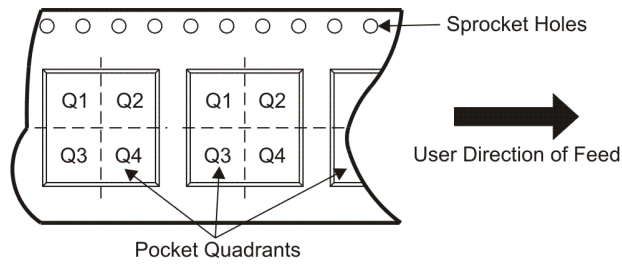
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TAPE AND REEL INFORMATION



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

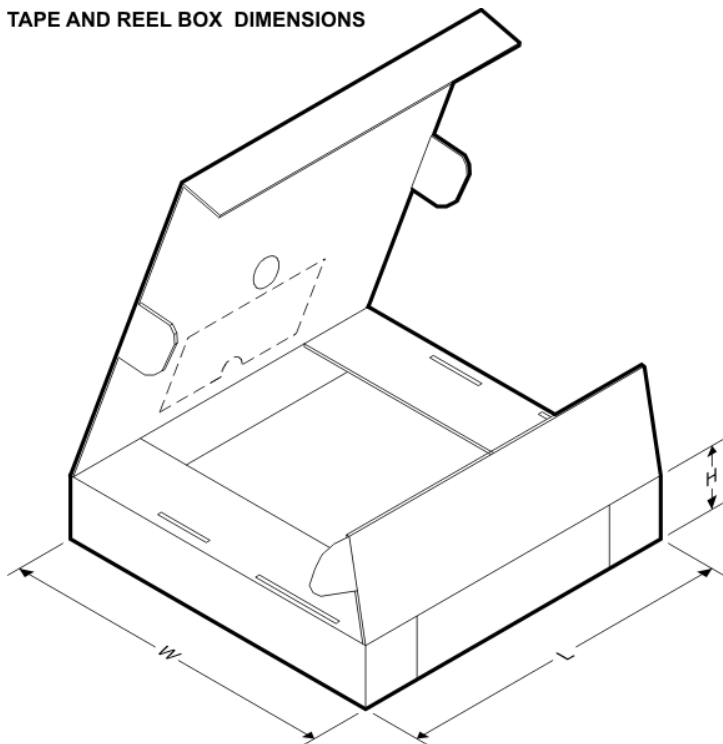
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
SN74ABT16833DLR	SSOP	DL	56	1000	330.0	32.4	11.35	18.67	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)
SN74ABT16833DLR	SSOP	DL	56	1000	346.0	346.0	49.0

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Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DLP® Products	www.dlp.com
DSP	dsp.ti.com
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Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
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