

SN54ABT833, SN74ABT833 8-BIT TO 9-BIT PARITY BUS TRANSCEIVERS

SCBS195C – FEBRUARY 1991 – REVISED JANUARY 1997

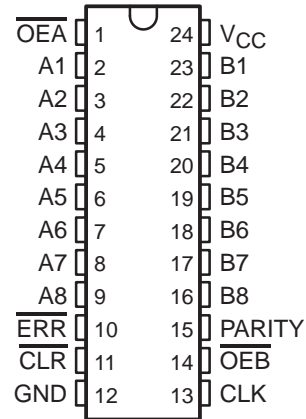
- State-of-the-Art *EPIC-IIB™* BiCMOS Design Significantly Reduces Power Dissipation
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- Typical V_{OLP} (Output Ground Bounce) < 1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- High-Drive Outputs (–32-mA I_{OH} , 64-mA I_{OL})
- Parity Error Flag With Parity Generator/Checker
- Register for Storage of the Parity Error Flag
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Plastic (NT) and Ceramic (JT) DIPs

description

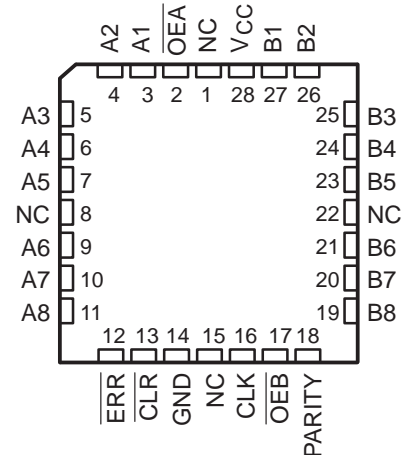
The 'ABT833 8-bit to 9-bit parity transceivers are designed for communication between data buses. When data is transmitted from the A bus to the B bus, a parity bit is generated. When data is transmitted from the B bus to the A bus with its corresponding parity bit, the open-collector parity-error (\overline{ERR}) output indicates whether or not an error in the B data has occurred. The output-enable (\overline{OEA} and \overline{OEB}) inputs can be used to disable the device so that the buses are effectively isolated. The 'ABT833 provide true data at their outputs.

A 9-bit parity generator/checker generates a parity-odd (PARITY) output and monitors the parity of the I/O ports with the \overline{ERR} flag. \overline{ERR} is clocked into the register on the rising edge of the clock (CLK) input. The error flag register is cleared with a low pulse on the clear (\overline{CLR}) input. When both \overline{OEA} and \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.

SN54ABT833 . . . JT PACKAGE
SN74ABT833 . . . DW OR NT PACKAGE
(TOP VIEW)



SN54ABT833 . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection



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EPIC-IIB is a trademark of Texas Instruments Incorporated.

UNLESS OTHERWISE NOTED this document contains PRODUCTION DATA information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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description (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.

The SN54ABT833 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT833 is characterized for operation from -40°C to 85°C .

FUNCTION TABLE

INPUTS						OUTPUT AND I/O				FUNCTION
\overline{OEB}	\overline{OEA}	\overline{CLR}	CLK	A_i Σ OF H's	B_i^{\dagger} Σ OF H's	A	B	PARITY	$\overline{ERR}^{\ddagger}$	
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 \S
		L	No \uparrow	H						
		H	\uparrow	H						
L	L	X	X	Odd	NA	NA	A	H	NA	A data to B bus and generate inverted parity
				Even				L		

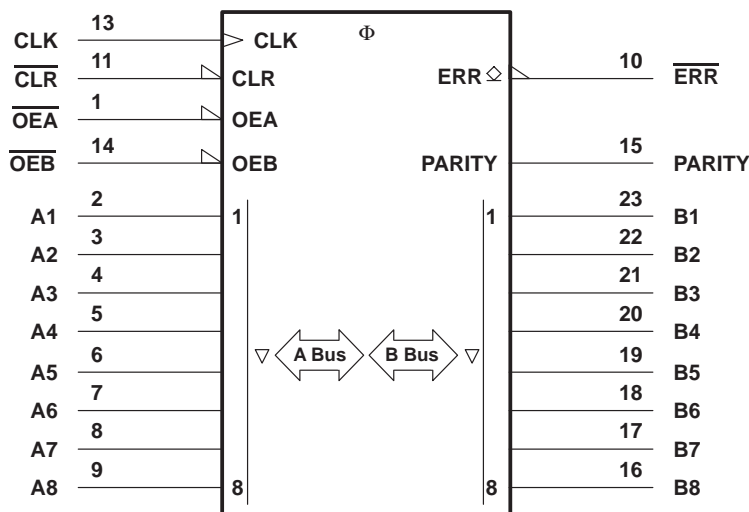
NA = not applicable, NC = no change, X = don't care

\dagger Summation of high-level inputs includes PARITY along with B_i inputs.

\ddagger Output states shown assume \overline{ERR} was previously high.

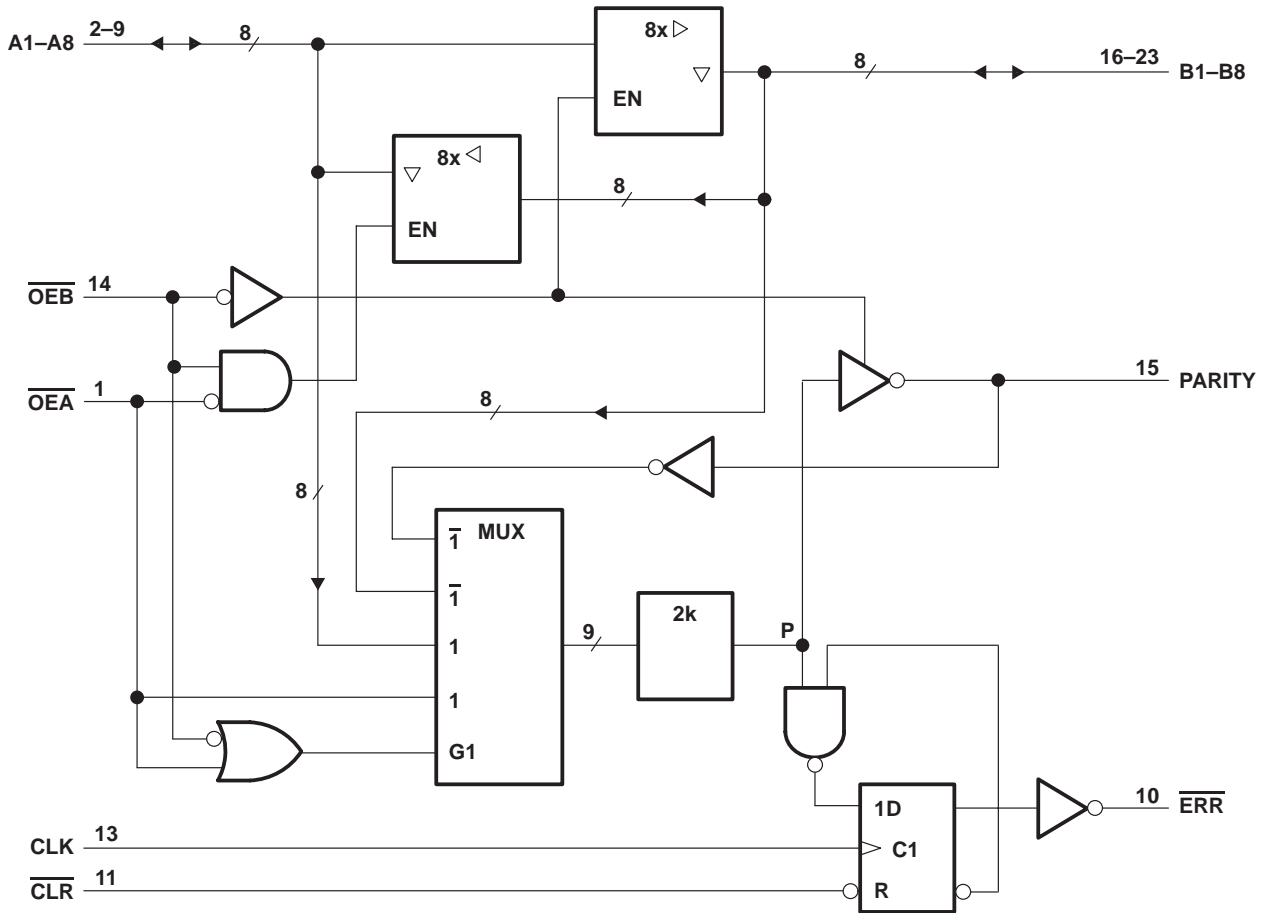
\S In this mode, \overline{ERR} (when clocked) shows inverted parity of the A bus.

logic symbol \uparrow



\uparrow This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the DW, JT, and NT packages.

logic diagram (positive logic)



Pin numbers shown are for the DW, JT, and NT packages.

ERROR-FLAG FUNCTION TABLE

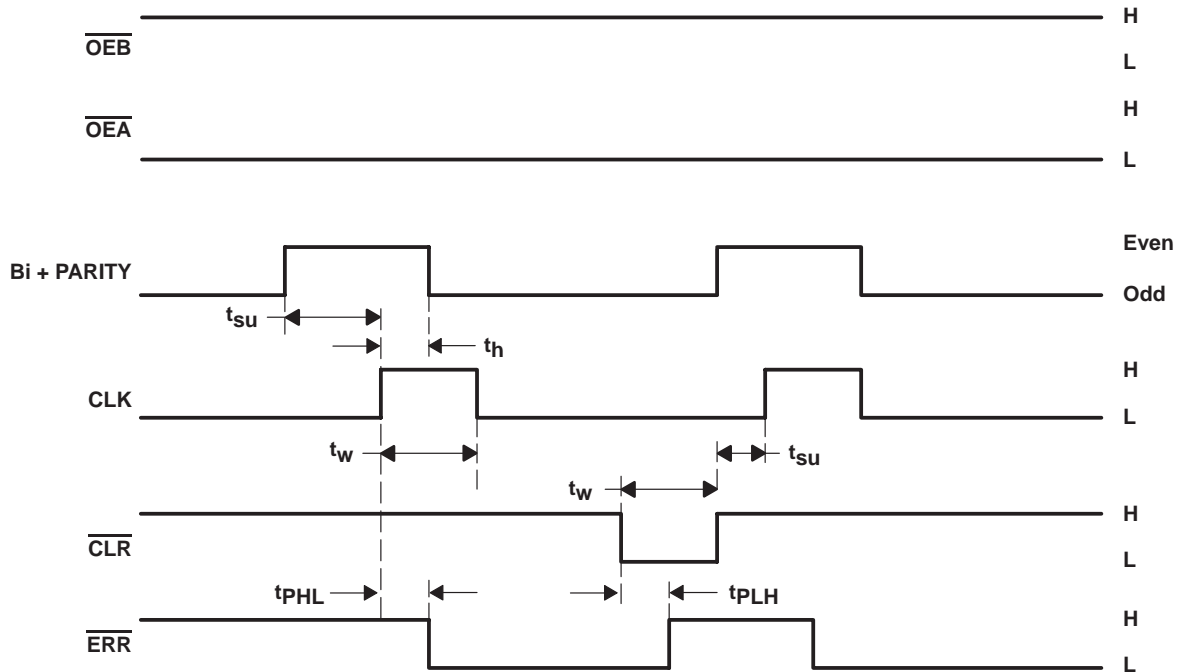
INPUTS		INTERNAL TO DEVICE	OUTPUT PRE-STATE	OUTPUT $\overline{\text{ERR}}$	FUNCTION
$\overline{\text{CLR}}$	CLK	POINT P	$\overline{\text{ERR}}_{n-1}^\dagger$		
H	\uparrow	H	H	H	Sample
H	\uparrow	X	L	L	
H	\uparrow	L	X	L	
L	X	X	X	H	Clear

† The state of $\overline{\text{ERR}}$ before any changes at $\overline{\text{CLR}}$, CLK, or point P

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error-flag waveforms



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 : SN54ABT833	96 mA
SN74ABT833	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): DW package	81°C/W
NT 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 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, except for through-hole packages, which use a trace length of zero.



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recommended operating conditions (see Note 3)

		SN54ABT833		SN74ABT833		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		$\overline{\text{ERR}}$		5.5	V
I _{OH}	High-level output current		Except $\overline{\text{ERR}}$		-24	mA
I _{OL}	Low-level output current				48	mA
$\Delta t/\Delta v$	Input transition rise or fall rate		Outputs enabled		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			SN54ABT833		SN74ABT833		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		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		2			2	
V _{OL}	V _{CC} = 4.5 V	I _{OL} = 24 mA				0.55			V		
		I _{OL} = 64 mA				0.55*		0.55			
V _{hys}				100					mV		
I _{OH}	ERR	V _{CC} = 4.5 V, V _{OH} = 5.5 V		20		20		20	μA		
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 _{IL}	A or B ports	V _{CC} = 0, V _I = GND		-50		-50		-50	μA		
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	Outputs high		50		50		μA		
I _O §		V _{CC} = 5.5 V, V _O = 2.5 V		-50	-100	-200¶	-50	-200¶	-50	-200¶	mA
I _{CC}	A or B ports	V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND	Outputs high		1	250		250		250	μA
			Outputs low		24	38¶		38¶		38¶	mA
			Outputs disabled		0.5	250		250		250	μA
ΔI _{CC} #	Data inputs	V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND	Outputs enabled		1.5		1.5		1.5	mA	
			Outputs disabled		50		50		50	μA	
	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	mA		
C _i	Control inputs	V _I = 2.5 V or 0.5 V		4.5					pF		
C _{io}	A or B ports	V _O = 2.5 V or 0.5 V		10.5					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.

¶ These limits may vary among suppliers.

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)

		$V_{CC} = 5\text{ V},$ $T_A = 25^\circ\text{C}$		SN54ABT833		SN74ABT833		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration	CLK high or low	3	3	3	3	3	ns
		CLR low	3	3	3	3		
t_{su}	Setup time before CLK \uparrow	B or PARITY high	9.8	9.8	9.8	9.8	ns	
		B or PARITY low	8.1	8.1	8.1	8.1		
		$\overline{\text{CLR}}$	2	2	2	2		
t_h	Hold time after CLK \uparrow	B or PARITY	0	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)	$V_{CC} = 5\text{ V},$ $T_A = 25^\circ\text{C}$			SN54ABT833		SN74ABT833		UNIT
			MIN	TYP \dagger	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A or B	B or A	1.2	2.8	4.8	1.2	5.4	1.2	5.3	ns
t_{PHL}			1	3	4.8 \ddagger	1	5.4	1	5.3 \ddagger	
t_{PLH}	A	PARITY	2.1	5.5	9.5	2.1	11.3	2.1	11.2	ns
t_{PHL}			2.5	5.3	9.7	2.5	11.1	2.5	11	
t_{PZH}	$\overline{\text{OE}}$	PARITY	2.6	6.2	8.5	2.6	10.6	2.6	10.5	ns
t_{PZL}			2.6 \ddagger	5.8	8.6	2.6 \ddagger	10.1	2.6 \ddagger	10	
t_{PLH}	$\overline{\text{CLR}}$	$\overline{\text{ERR}}$	1	3.2	4.8 \ddagger	1	5.3	1	5.2	ns
t_{PHL}	CLK		1.2 \ddagger	2.8	5.7	1.2 \ddagger	6.3	1.2 \ddagger	6.2	
t_{PZH}	$\overline{\text{OE}}$	A, B, or PARITY	1	3.7	5.8 \ddagger	1	6.6	1	6.5 \ddagger	ns
t_{PZL}			1.3 \ddagger	3.8	5.8	1.3 \ddagger	6.6	1.3 \ddagger	6.5 \ddagger	
t_{PHZ}	$\overline{\text{OE}}$	A, B, or PARITY	1.9 \ddagger	4.4	7.3	1.9 \ddagger	8	1.9 \ddagger	7.9	ns
t_{PLZ}			2.2 \ddagger	4.4	7.7	2.2 \ddagger	8.2	2.2 \ddagger	8.1	

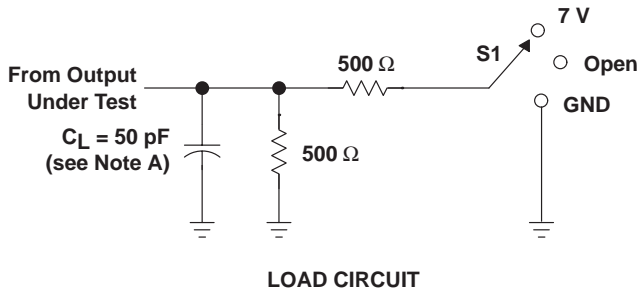
\dagger All typical values are at $V_{CC} = 5\text{ V}$.

\ddagger These limits may vary among suppliers.

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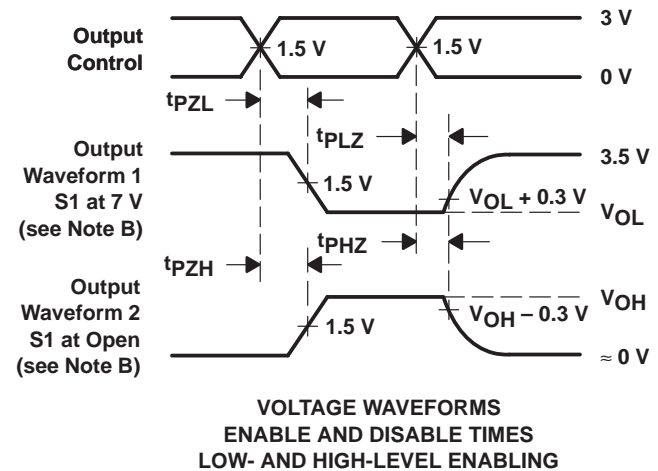
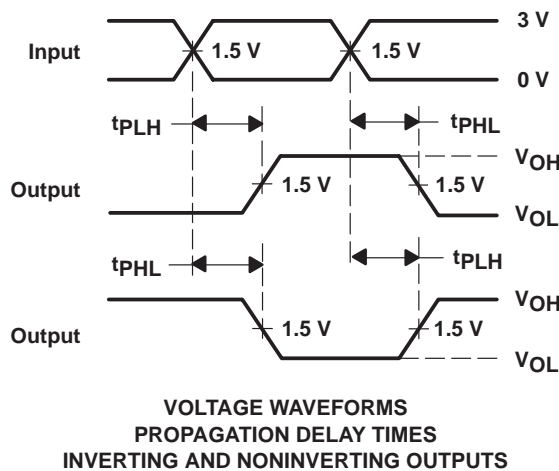
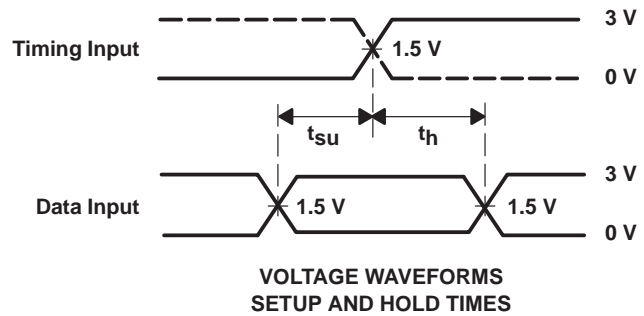
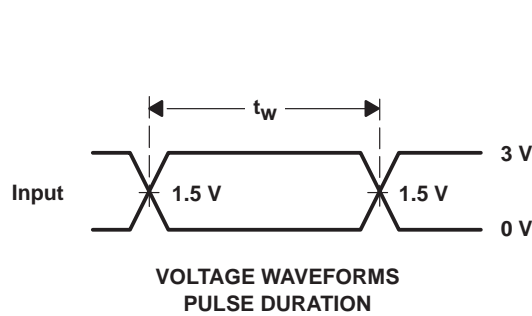
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PARAMETER MEASUREMENT INFORMATION



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

ERR	S1
t_{PHL}	7 V
t_{PLH}	7 V



- 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)
SN74ABT833DW	Active	Production	SOIC (DW) 24	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT833
SN74ABT833DW.Z	Active	Production	SOIC (DW) 24	25 TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	ABT833

(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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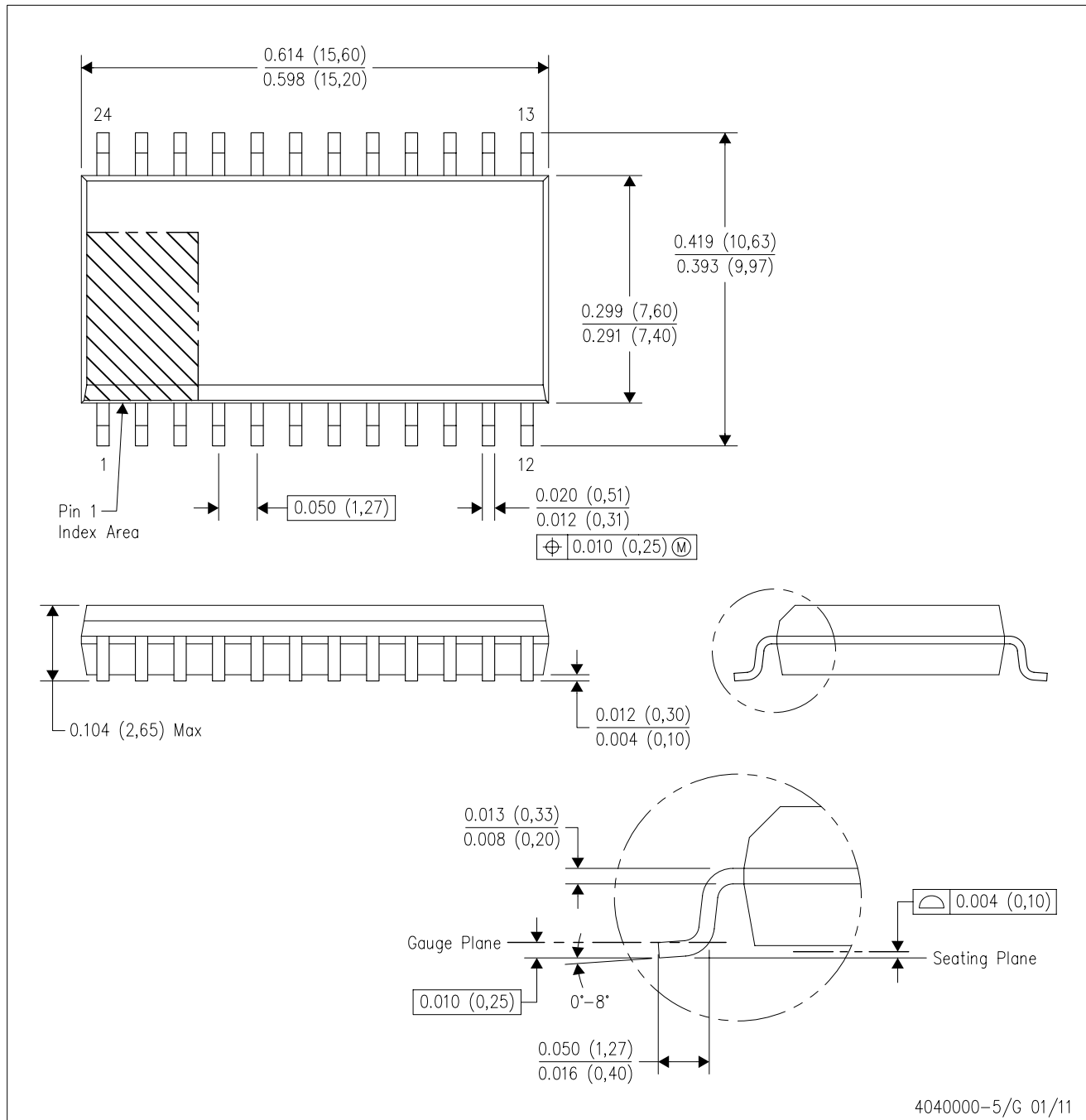
TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74ABT833DW	DW	SOIC	24	25	506.98	12.7	4826	6.6
SN74ABT833DW.Z	DW	SOIC	24	25	506.98	12.7	4826	6.6

DW (R-PDSO-G24)

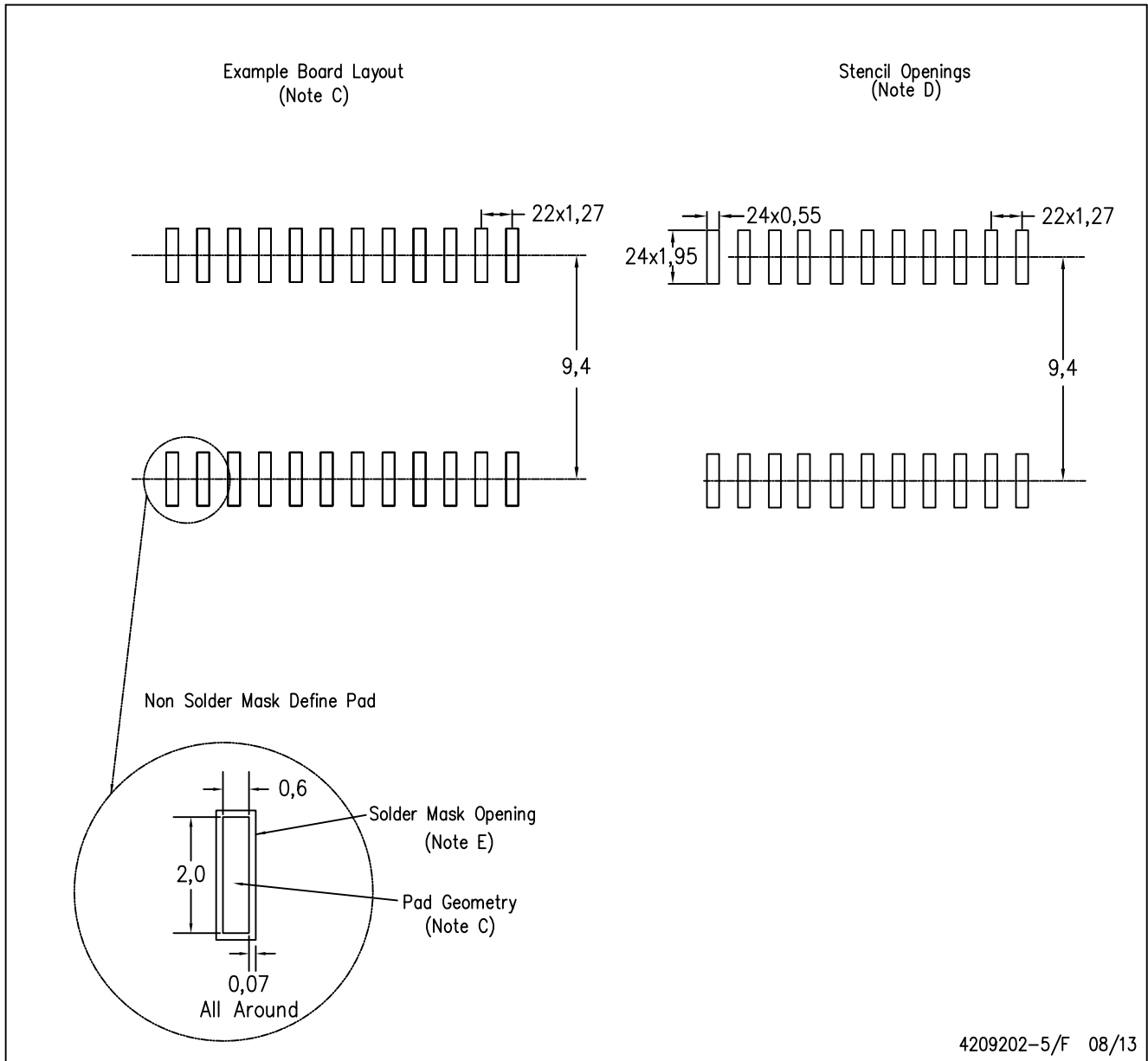
PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
 - 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 AD.

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



4209202-5/F 08/13

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Refer to IPC7351 for alternate board design.
 - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525
 - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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