

SN54ABT543A, SN74ABT543A OCTAL REGISTERED TRANSCEIVERS WITH 3-STATE OUTPUTS

SCBS157F – JANUARY 1991 – REVISED MAY 1997

- State-of-the-Art *EPIC-II B*[™] 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)
- 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})
- Package Options Include Plastic Small-Outline (DW), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), Ceramic Flat (W) Package, and Plastic (NT) and Ceramic (JT) DIPs

description

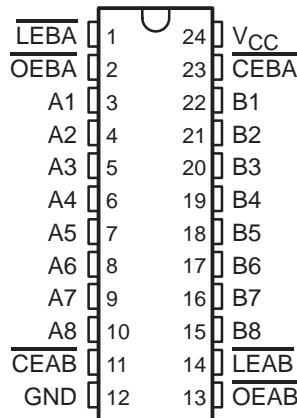
The 'ABT543A octal transceivers contain two sets of D-type latches for temporary storage of data flowing in either direction. Separate latch-enable ($\overline{\text{LEAB}}$ or $\overline{\text{LEBA}}$) and output-enable ($\overline{\text{OEAB}}$ or $\overline{\text{OEBA}}$) inputs are provided for each register to permit independent control in either direction of data flow.

The A-to-B enable ($\overline{\text{CEAB}}$) input must be low to enter data from A or to output data from B. If $\overline{\text{CEAB}}$ is low and $\overline{\text{LEAB}}$ is low, the A-to-B latches are transparent; a subsequent low-to-high transition of $\overline{\text{LEAB}}$ puts the A latches in the storage mode. With $\overline{\text{CEAB}}$ and $\overline{\text{OEAB}}$ both low, the 3-state B outputs are active and reflect the data present at the output of the A latches. Data flow from B to A is similar, but requires using the $\overline{\text{CEBA}}$, $\overline{\text{LEBA}}$, and $\overline{\text{OEBA}}$ inputs.

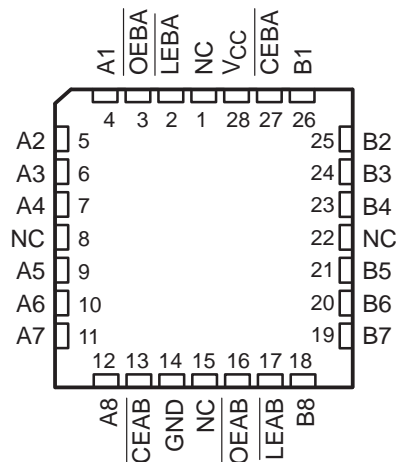
To ensure the high-impedance state during power up or power down, $\overline{\text{OE}}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54ABT543A is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT543A is characterized for operation from -40°C to 85°C .

SN54ABT543A . . . JT OR W PACKAGE
SN74ABT543A . . . DB, DW, NT, OR PW PACKAGE
(TOP VIEW)



SN54ABT543A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection



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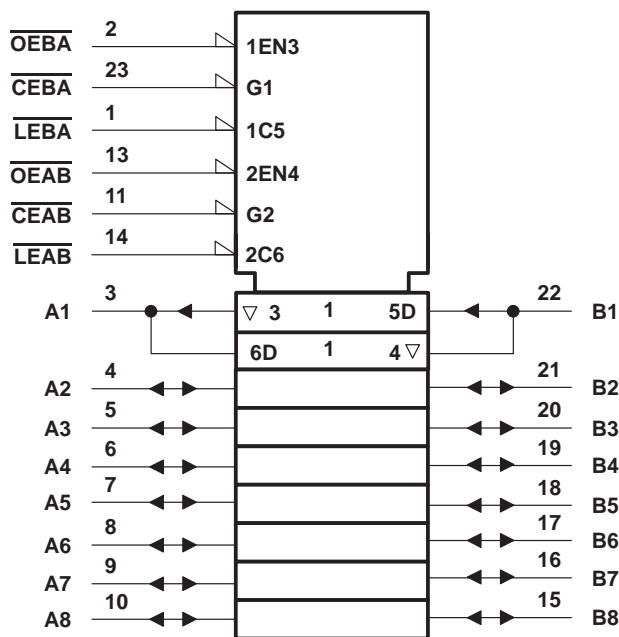
FUNCTION TABLE†

INPUTS				OUTPUT B
$\overline{\text{CEAB}}$	$\overline{\text{LEAB}}$	$\overline{\text{OEAB}}$	A	
H	X	X	X	Z
X	X	H	X	Z
L	H	L	X	B_0^\ddagger
L	L	L	L	L
L	L	L	H	H

† A-to-B data flow is shown; B-to-A flow control is the same except that it uses $\overline{\text{CEBA}}$, $\overline{\text{LEBA}}$, and $\overline{\text{OEBA}}$.

‡ Output level before the indicated steady-state input conditions were established

logic symbols§

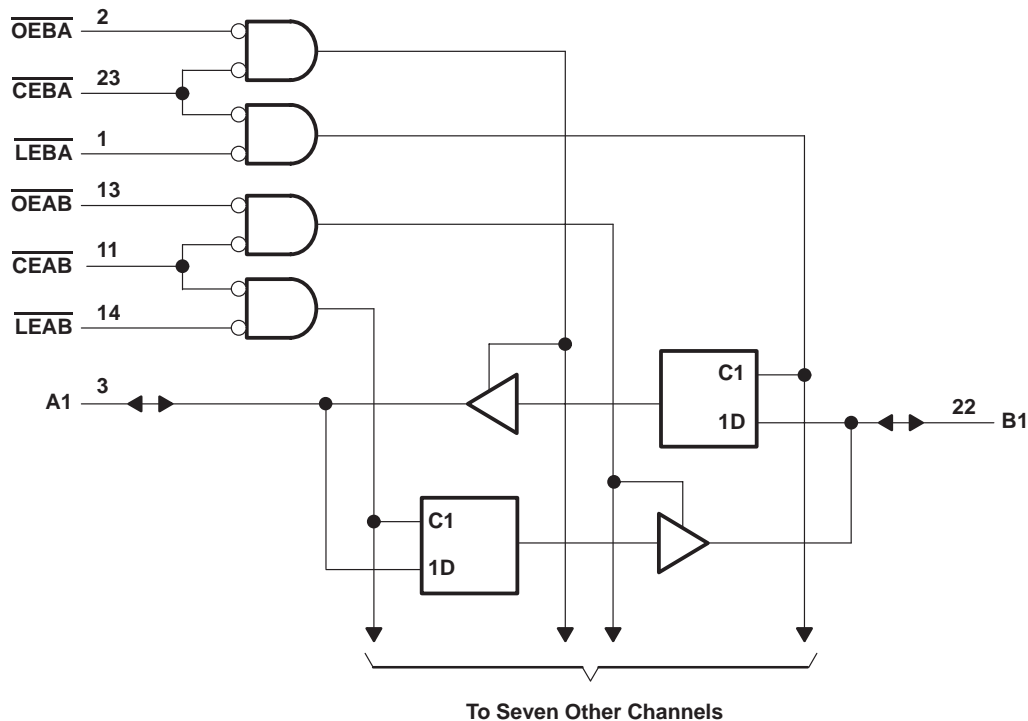


§ This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for the DB, DW, JT, NT, PW, and W packages.

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logic diagram (positive logic)



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

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 : SN54ABT543A	96 mA
SN74ABT543A	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): DB package	104°C/W
DW package	81°C/W
NT package	67°C/W
PW package	120°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)

		SN54ABT543A		SN74ABT543A		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
Δt/Δv	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.

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

PARAMETER	TEST CONDITIONS	T _A = 25°C			SN54ABT543A		SN74ABT543A		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		2					
V _{OL}	V _{CC} = 4.5 V, I _{OL} = 48 mA			0.55		0.55			V	
				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			10§		10§		10§	μA	
I _{OZL} ‡	V _{CC} = 5.5 V, V _O = 0.5 V			-10§		-10§		-10§	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		50	μA	
I _O ¶	V _{CC} = 5.5 V, V _O = 2.5 V		-50*	-100	-180*	-50	-200	-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		1	250*		350		250	μA
		Outputs low		24	30*		34		30	mA
		Outputs disabled		0.5	250*		350		250	μA
ΔI _{CC} #	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					pF	
C _{io}	A or B ports, V _O = 2.5 V or 0.5 V			7					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.

§ This data sheet limit may vary among suppliers.

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

			SN54ABT543A		UNIT		
			V _{CC} = 5 V, T _A = 25°C			MIN	MAX
			MIN	MAX			
t _w	Pulse duration, $\overline{\text{LEAB}}$ or $\overline{\text{LEBA}}$ low		3.5	3.5	ns		
t _{su}	Setup time	Data before $\overline{\text{LEAB}}$ or $\overline{\text{LEBA}}\uparrow$	High	2.5	2.5	ns	
			Low	3	3		
		Data before $\overline{\text{CEAB}}$ or $\overline{\text{CEBA}}\uparrow$	High	2.5	2.5		
			Low	3	3		
t _h	Hold time	Data after $\overline{\text{LEAB}}$ or $\overline{\text{LEBA}}\uparrow$	1	1	ns		
		Data after $\overline{\text{CEAB}}$ or $\overline{\text{CEBA}}\uparrow$	1	1			

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

			SN74ABT543A		UNIT		
			V _{CC} = 5 V, T _A = 25°C			MIN	MAX
			MIN	MAX			
t _w	Pulse duration, $\overline{\text{LEAB}}$ or $\overline{\text{LEBA}}$ low		3.5	3.5	ns		
t _{su}	Setup time	Data before $\overline{\text{LEAB}}$ or $\overline{\text{LEBA}}\uparrow$	High	3.5	3.5	ns	
			Low	3	3		
		Data before $\overline{\text{CEAB}}$ or $\overline{\text{CEBA}}\uparrow$	High	3.5	3.5		
			Low	3	3		
t _h	Hold time	Data after $\overline{\text{LEAB}}$ or $\overline{\text{LEBA}}\uparrow$	0.5	0.5	ns		
		Data after $\overline{\text{CEAB}}$ or $\overline{\text{CEBA}}\uparrow$	0.5	0.5			



SN54ABT543A, SN74ABT543A
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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)	SN54ABT543A				UNIT	
			$V_{CC} = 5$ V, $T_A = 25^\circ$ C			MIN		MAX
			MIN	TYP	MAX			
t_{PLH}	A or B	B or A	1.6†	4.4	4.4	1.6†	5.5	ns
t_{PHL}			1.6	4.4	5.1	1.6	6.2	
t_{PLH}	\overline{LEBA} or \overline{LEAB}	A or B	1.6†	4.1	5.1	1.6†	6.6	ns
t_{PHL}			1.6	4.6	5.4	1.6	6.4	
t_{PZH}	\overline{OEBA} or \overline{OEAB}	A or B	1.4	3.9	4.1	1.4	5.1	ns
t_{PZL}			2	5	4.9	2	5.8	
t_{PHZ}	\overline{OEBA} or \overline{OEAB}	A or B	2.5†	5.9	5.8	2.5†	6.9	ns
t_{PLZ}			2.5†	5.5	6.1	2.5†	7.6	
t_{PZH}	\overline{CEBA} or \overline{CEAB}	A or B	1.4	3.9	4.7	1.4	5.6	ns
t_{PZL}			2	5	5.7	2	6.2	
t_{PHZ}	CEBA or CEAB	A or B	3.2†	5.9	6.5	3.2†	7.3	ns
t_{PLZ}			2.5†	5.5	6.7	2.5†	7.8	

† This data sheet limit may vary among suppliers.

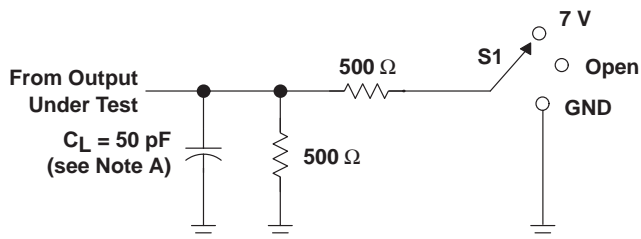
switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74ABT543A				UNIT	
			$V_{CC} = 5$ V, $T_A = 25^\circ$ C			MIN		MAX
			MIN	TYP	MAX			
t_{PLH}	A or B	B or A	1.8†	4.4	5.9	1.8†	6.9	ns
t_{PHL}			1.9	4.4	5.9	1.9	6.9	
t_{PLH}	\overline{LEBA} or \overline{LEAB}	A or B	1.5†	4.1	5.6	1.5†	6.6	ns
t_{PHL}			2.1	4.6	6.1	2.1	7.1	
t_{PZH}	\overline{OEBA} or \overline{OEAB}	A or B	1.4	3.9	5.4	1.4	6.4	ns
t_{PZL}			2.5	5	6.5	2.5	7.5	
t_{PHZ}	\overline{OEBA} or \overline{OEAB}	A or B	2.5†	5.9	7.4	2.5†	8.4	ns
t_{PLZ}			2.5†	5.5	7	2.5†	8	
t_{PZH}	\overline{CEBA} or \overline{CEAB}	A or B	1.4	3.9	5.4	1.4	6.4	ns
t_{PZL}			2.5	5	6.5	2.5	7.5	
t_{PHZ}	\overline{CEBA} or \overline{CEAB}	A or B	2.9†	5.9	7.4	2.9†	8.4	ns
t_{PLZ}			2.4†	5.5	7	2.4†	8	

† This data sheet limit may vary among suppliers.

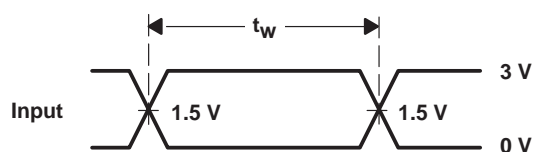


PARAMETER MEASUREMENT INFORMATION

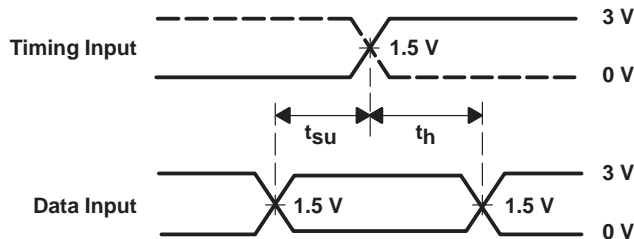


TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open

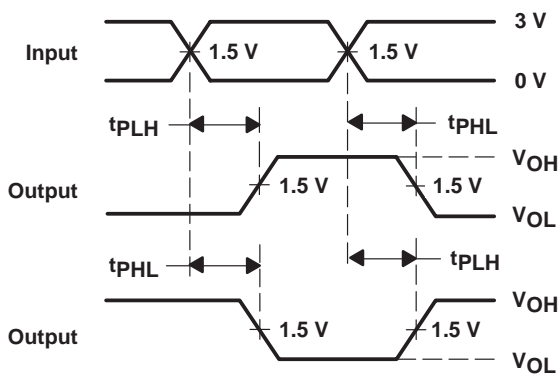
LOAD CIRCUIT



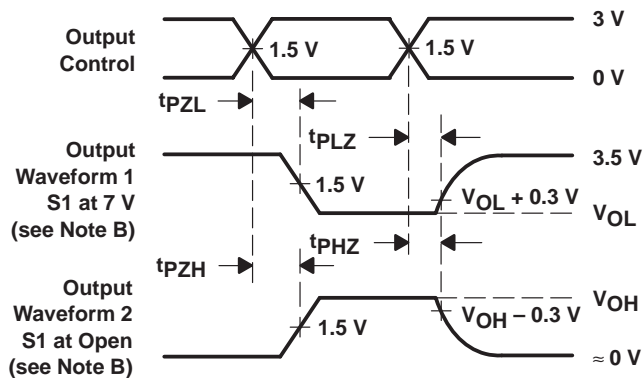
VOLTAGE WAVEFORMS
 PULSE DURATION



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

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