

SN54ABT241, SN74ABT241A OCTAL BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

SCBS184D – JANUARY 1991 – REVISED JANUARY 1997

- State-of-the-Art **EPIC-IIB™** BiCMOS Design Significantly Reduces Power Dissipation
- Latch-Up Performance Exceeds 500 mA Per JEDEC Standard JESD-17
- 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), Plastic (N) and Ceramic (J) DIPs, and Ceramic Flat (W) Package

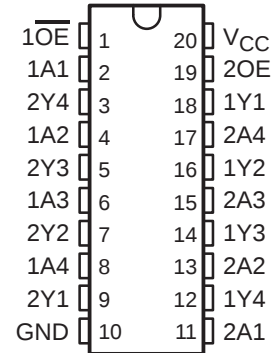
description

These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. Together with the SN54ABT240, SN74ABT240A, and 'ABT244A, these devices provide the choice of selected combinations of inverting and noninverting outputs, symmetrical active-low output-enable ($\overline{OE}$) inputs, and complementary OE and $\overline{OE}$ inputs.

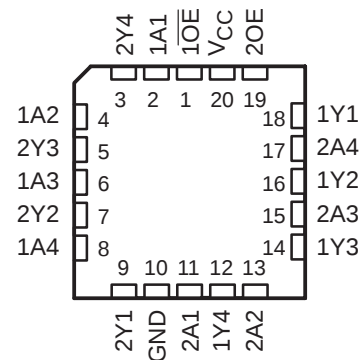
To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver. OE should be tied to GND through a pulldown resistor; the minimum value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

The SN54ABT241 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT241A is characterized for operation from -40°C to 85°C .

SN54ABT241 . . . J OR W PACKAGE
SN74ABT241A . . . DB, DW, N, OR PW PACKAGE
(TOP VIEW)



SN54ABT241 . . . FK PACKAGE
(TOP VIEW)



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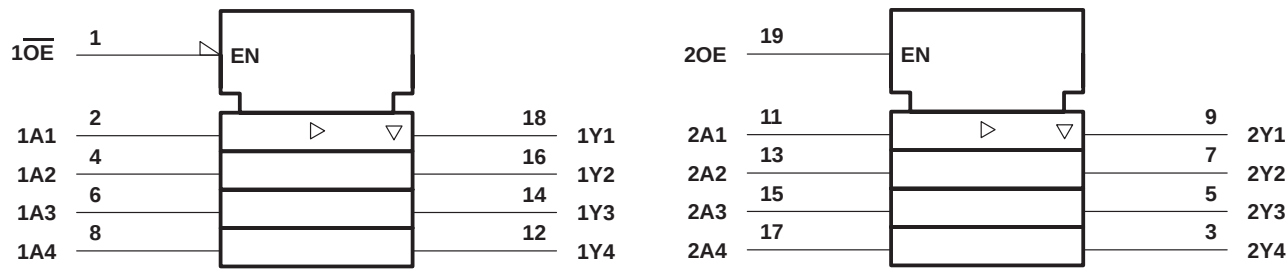
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FUNCTION TABLES

INPUTS		OUTPUT 1Y
1OE	1A	
L	H	H
L	L	L
H	X	Z

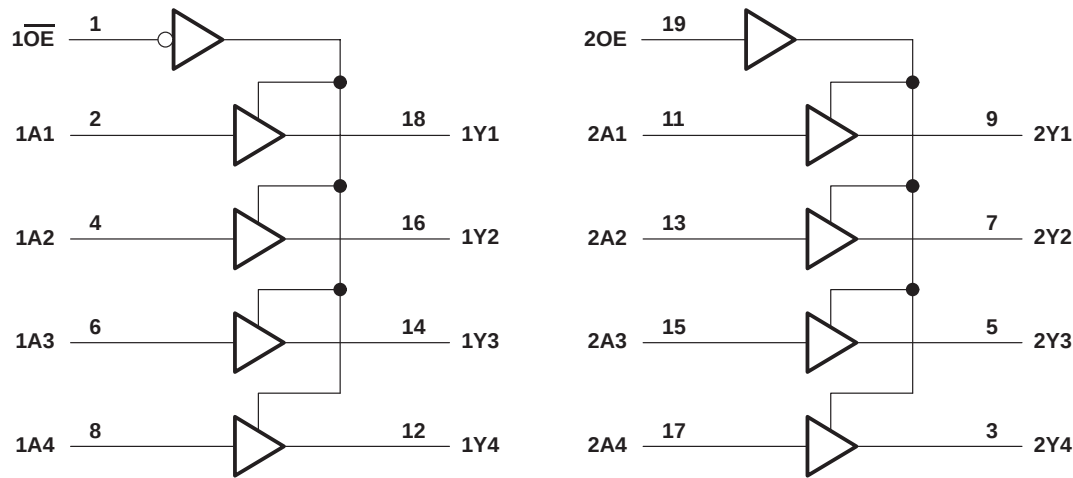
INPUTS		OUTPUT 2Y
2OE	2A	
H	H	H
H	L	L
L	X	Z

logic symbol†



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

logic diagram (positive logic)



SN54ABT241, SN74ABT241A

OCTAL BUFFERS/DRIVERS

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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 (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 : SN54ABT241	96 mA
SN74ABT241A	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	115°C/W
DW package	97°C/W
N package	67°C/W
PW package	128°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.

recommended operating conditions (see Note 3)

		SN54ABT241		SN74ABT241A		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 inputs 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			SN54ABT241		SN74ABT241A		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					
			I _{OH} = –32 mA	2*					2			
V _{OL}		V _{CC} = 4.5 V	I _{OL} = 48 mA	0.55			0.55		V			
			I _{OL} = 64 mA	0.55*			0.55					
V _{hys}					100					mV		
I _I		V _{CC} = 5.5 V, V _I = V _{CC} or GND	±1			±1		±1		μA		
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		μA	
I _O ‡		V _{CC} = 5.5 V, V _O = 2.5 V	–50	–100	–180	–50	–180	–50	–180	mA		
I _{CC}		V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND	Outputs high			1		250		250		μA
			Outputs low			24		30		30		mA
			Outputs disabled			0.5		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			0.05		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		V _I = 2.5 V or 0.5 V			4					pF		
C _O		V _O = 2.5 V or 0.5 V			5.5					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.

§ 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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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)	SN54ABT241					UNIT
			V _{CC} = 5 V, T _A = 25°C			MIN	MAX	
			MIN	TYP	MAX			
t _{PLH}	A	Y	1	2.6	4.1	0.8	5.3	ns
t _{PHL}			1	2.9	4.2	0.8	5	
t _{PZH}	$\overline{OE}$ or OE	Y	1.1	4.8	6.3	1	7	ns
t _{PZL}			1.3	4.3	5.8	1	7	
t _{PHZ}	$\overline{OE}$ or OE	Y	1.1	4.6	6.1	0.8	7.9	ns
t _{PLZ}			1	3.9	5.4	0.8	6.2	

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)	SN74ABT241A					UNIT
			V _{CC} = 5 V, T _A = 25°C			MIN	MAX	
			MIN	TYP	MAX			
t _{PLH}	A	Y	1	2.6	4.1	1	4.6	ns
t _{PHL}			1	2.9	4.4	1	4.6	
t _{PZH}	OE or OE	Y	1.1	4.8	6.3	1.1	6.8	ns
t _{PZL}			1.3	4.3	5.8	1.3	6.8	
t _{PHZ}	OE or OE	Y	1.6	4.6	6.1	1.6	7.1	ns
t _{PLZ}			1	3.9	5.4	1	5.9	

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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



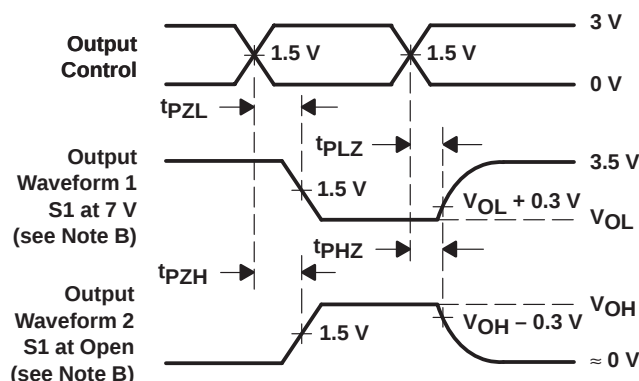
VOLTAGE WAVEFORMS
PULSE DURATION



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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