

SN54ABT2244A, SN74ABT2244A OCTAL BUFFERS AND LINE/MOS DRIVERS WITH 3-STATE OUTPUTS

SCBS106E – JANUARY 1991 – REVISED MAY 1997

- Output Ports Have Equivalent 25- Ω Series Resistors, So No External Resistors Are Required
- 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
- State-of-the-Art *EPIC-II B*[™] BiCMOS Design Significantly Reduces Power Dissipation
- Typical V_{OLP} (Output Ground Bounce) < 1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- High-Impedance State During Power Up and Power Down
- 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) Packages

description

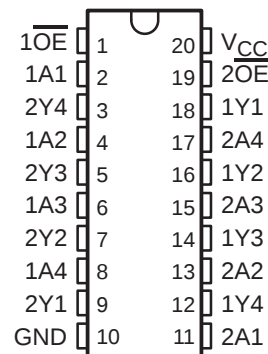
These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. Together with the SN54ABT2240, SN74ABT2240A, and 'ABT2241, these devices provide the choice of selected combinations of inverting and noninverting outputs, symmetrical active-low output-enable ($\overline{OE}$) inputs, and complementary OE and $\overline{OE}$ inputs. These devices feature high fan-out and improved fan-in.

The outputs, which are designed to sink up to 12 mA, include equivalent 25- Ω series resistors to reduce overshoot and undershoot.

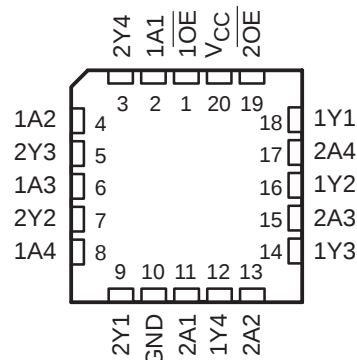
When V_{CC} is between 0 and 2.1 V, the device is in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 2.1 V, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN54ABT2244A is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT2244A is characterized for operation from -40°C to 85°C .

SN54ABT2244A . . . J OR W PACKAGE
SN74ABT2244A . . . DB, DW, N, OR PW PACKAGE
(TOP VIEW)



SN54ABT2244A . . . FK PACKAGE
(TOP VIEW)



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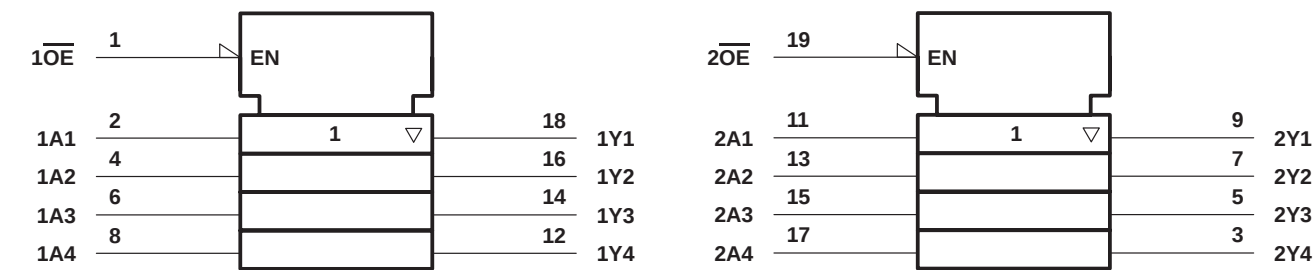
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FUNCTION TABLE
(each buffer)

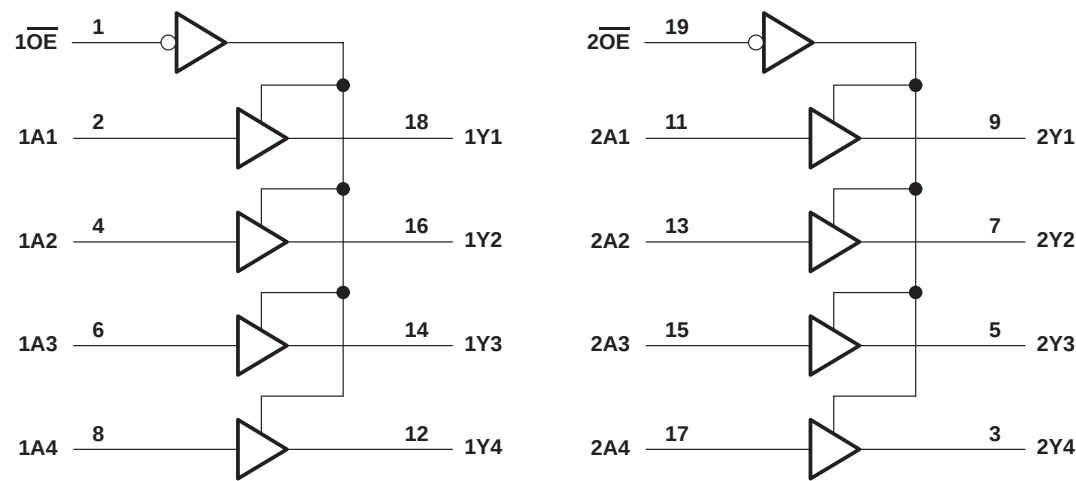
INPUTS		OUTPUT Y
$\overline{\text{OE}}$	A	
L	H	H
L	L	L
H	X	Z

logic symbol†



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

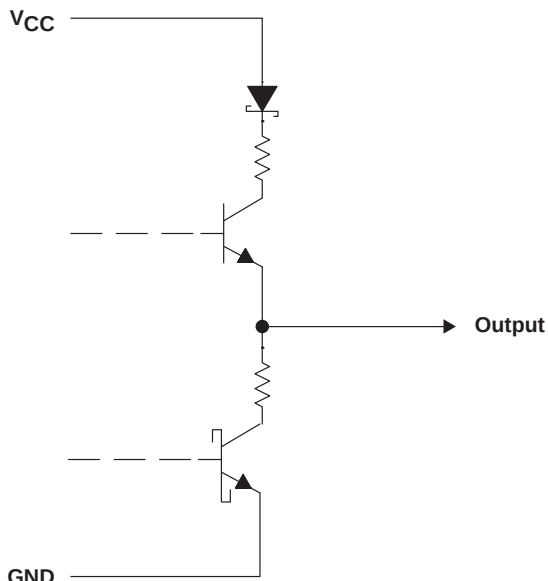
logic diagram (positive logic)



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schematic of Y outputs



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	30 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.

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recommended operating conditions (see Note 3)

		SN54ABT2244A		SN74ABT2244A		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		12		12	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	Outputs enabled		5	5	ns/V
$\Delta t/\Delta V_{CC}$	Power-up ramp rate	200		200		$\mu s/V$
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			SN54ABT2244A		SN74ABT2244A		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} = 12 mA	0.8			0.8		0.8		V	
V _{hys}			100							mV	
I _I		V _{CC} = 5.5 V, V _I = V _{CC} or GND	±1			±1		±1		μA	
I _{OZPU} [‡]		V _{CC} = 0 to 2.1 V, V _O = 0.5 V to 2.7 V, $\overline{OE}$ = X	±50			±50		±50		μA	
I _{OZPD} [‡]		V _{CC} = 2.1 V to 0, V _O = 0.5 V to 2.7 V, $\overline{OE}$ = X	±50			±50		±50		μA	
I _{OZH}		V _{CC} = 2.1 V to 5.5 V, V _O = 2.7 V, $\overline{OE} \geq 2$ V	10			50		10		μA	
I _{OZL}		V _{CC} = 2.1 V to 5.5 V, V _O = 0.5 V, $\overline{OE} \geq 2$ V	–10			–50		–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	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}		V _{CC} = 5.5 V, I _O = 0, V _I = V _{CC} or GND	Outputs high		1	250	250		250	μA	
			Outputs low		24	30	30		30	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		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.

[‡] This parameter is characterized, but not production tested.

[§] 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)	SN54ABT2244A					UNIT
			V _{CC} = 5 V, T _A = 25°C			MIN	MAX	
			MIN	TYP	MAX			
t _{PLH}	A	Y	1	3.4	4.4	1	5.3	ns
t _{PHL}			1	4.5	6.3	1	6.8	
t _{PZH}	$\overline{OE}$	Y	1.1	3.8	5.5	1.1	6.5	ns
t _{PZL}			2.1	6.3	9	2.1	10.2	
t _{PHZ}	$\overline{OE}$	Y	2.1	4.5	6.9	2.1	7	ns
t _{PLZ}			1.7	4.3	6.9	1.7	7.4	

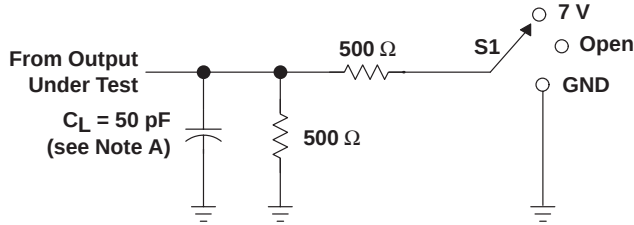
switching characteristics over recommended ranges of supply voltage and operating free-air temperature, $C_L = 50$ pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN74ABT2244A					UNIT
			V _{CC} = 5 V, T _A = 25°C			MIN	MAX	
			MIN	TYP	MAX			
t _{PLH}	A	Y	1	3.4	4.3	1	4.7	ns
t _{PHL}			1	4.5	5.3	1	5.6	
t _{PZH}	OE	Y	1.1	3.8	4.8	1.1	5.5	ns
t _{PZL}			2.1	6.3	7.3	2.1	8.3	
t _{PHZ}	OE	Y	2.1	4.5	5.6	2.1	6.6	ns
t _{PLZ}			1.7	4.3	5.3	1.7	5.8	

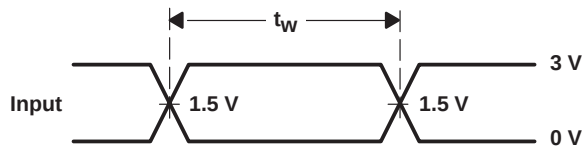
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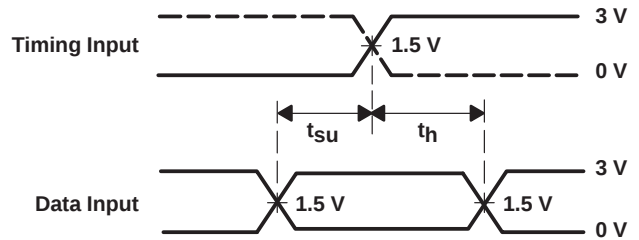
PARAMETER MEASUREMENT INFORMATION



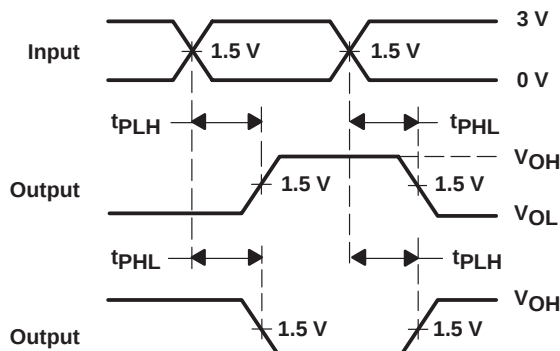
LOAD CIRCUIT



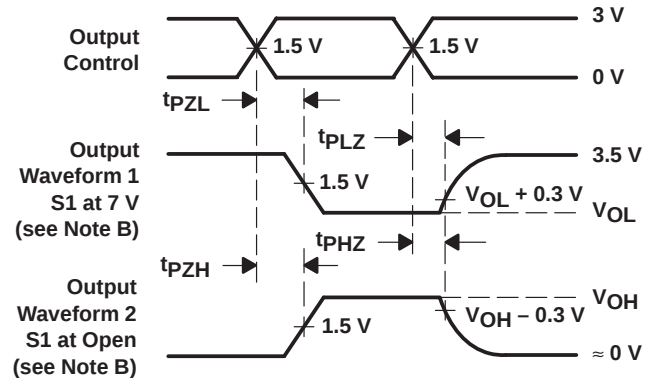
VOLTAGE WAVEFORMS
PULSE DURATION



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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