

SN54ABT2240, SN74ABT2240 OCTAL BUFFERS AND LINE/MOS DRIVERS WITH 3-STATE OUTPUTS

SCBS232A - JANUARY 1991 - REVISED JULY 1994

- Output Ports Have Equivalent 25-Ω Series Resistors, So No External Resistors Are Required
- State-of-the-Art EPIC-IIB™ BICMOS Design Significantly Reduces Power Dissipation
- Typical V_{OLP} (Output Ground Bounce) < 1 V at $V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$
- Package Options Include Plastic Small-Outline (DW) and Shrink Small-Outline (DB) Packages, Ceramic Chip Carriers (FK), and Plastic (N) and Ceramic (J) DIPs

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. Taken together with the 'ABT2241 and 'ABT2244, 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 'ABT2240 is organized as two 4-bit line drivers with separate \overline{OE} inputs. When \overline{OE} is low, the device passes data from the A inputs to the Y outputs. When \overline{OE} is high, the outputs are in the high-impedance state.

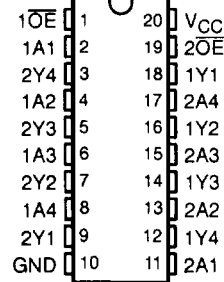
The outputs, which are designed to sink up to 12 mA, include 25-Ω series resistors to reduce overshoot and undershoot.

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.

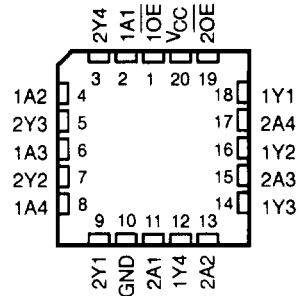
The SN74ABT2240 is available in TI's shrink small-outline package (DB), which provides the same I/O pin count and functionality of standard small-outline packages in less than half the printed-circuit-board area.

The SN54ABT2240 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT2240 is characterized for operation from -40°C to 85°C .

SN54ABT2240 . . . J PACKAGE
SN74ABT2240 . . . DB, DW, OR N PACKAGE
(TOP VIEW)



SN54ABT2240 . . . FK PACKAGE
(TOP VIEW)



FUNCTION TABLE
(each buffer)

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

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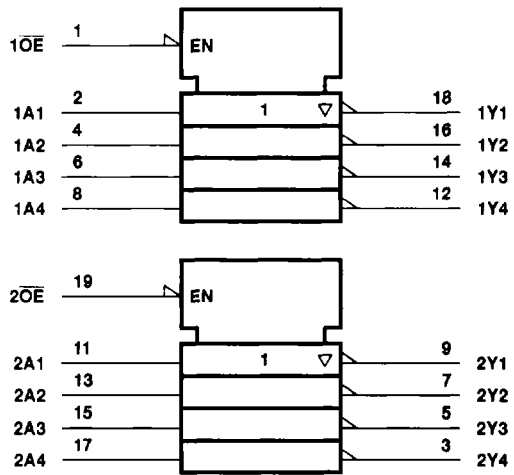
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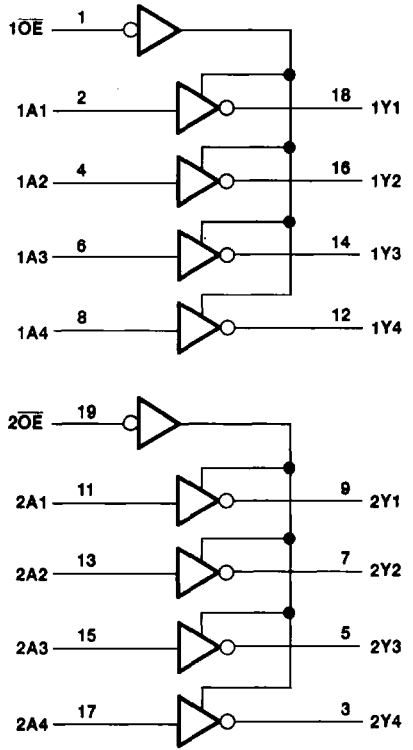
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logic symbol†

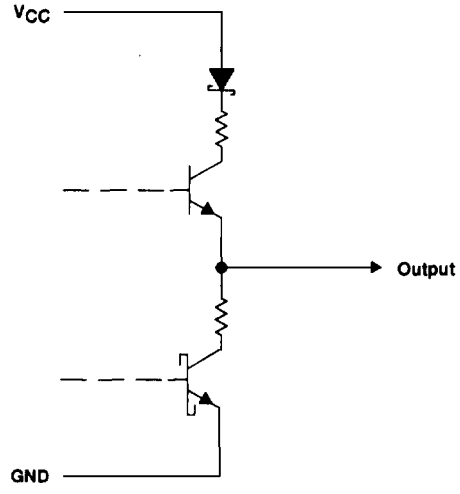


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



schematic of Y outputs



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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 state 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	
Maximum power dissipation at $T_A = 55^\circ\text{C}$ (in still air) (see Note 2):	DB package	0.6 W
	DW package	1.6 W
	N package	1.3 W
Storage temperature range	-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 maximum package power dissipation is calculated using a junction temperature of 150°C and a board trace length of 750 mils, except for the N package, which has a trace length of zero. For more information, refer to the *Package Thermal Considerations* application note in the 1994 *ABT Advanced BiCMOS Technology Data Book*, literature number SCBD002B.

recommended operating conditions (see Note 3)

		SN54ABT2240		SN74ABT2240		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
T_A	Operating free-air temperature	-55	125	-40	85	°C

NOTE 3: Unused or floating inputs must be held high or low.

PRODUCT PREVIEW Information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



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

PARAMETER	TEST CONDITIONS		T _A = 25°C			SN54ABT2240		SN74ABT2240		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
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		50			10		50		μA
I _{OZL}	V _{CC} = 5.5 V, V _O = 0.5 V		-50			-10		-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	-180	-50	-180	-50	-180	mA
I _{CC}	V _{CC} = 5.5 V, V _I = V _{CC} or GND	I _O = 0,	Outputs high		1	250	250		250	μA
			Outputs low		24	30	30		30	mA
			Outputs disabled		0.5	250	250		250	μA
ΔI _{CC} §	V _{CC} = 5.5 V, One input at 3.4 V, Other inputs at V _{CC} or GND	Data inputs	Outputs enabled		1.5		1.5		1.5	
			Outputs disabled		0.05		0.05		0.05	
		Control inputs			1.5		1.5		1.5	
C _I	V _I = 2.5 V or 0.5 V		3							pF
C _O	V _O = 2.5 V or 0.5 V		8.5							pF

* On products compliant to MIL-STD-883, Class B, 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.

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)	V _{CC} = 5 V, T _A = 25°C			SN54ABT2240		SN74ABT2240		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	1	3	4	1	5	1	4.9	ns
t _{PHL}			3	4.8	5.8	3	6.3	3	6	
t _{PZH}	OE	Y	1.5	3.7	4.7	1.5	6.1	1.5	5.8	ns
t _{PZL}			4.2	6.5	7.6	4.2	8.8	4.2	8.4	
t _{PHZ}	OE	Y	1.9	3.8	5	1.9	6.2	1.9	5.6	ns
t _{PLZ}			2.5	4.7	5.8	2.5	6.9	2.5	6.4	

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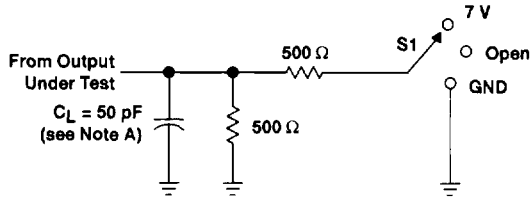
 **TEXAS
INSTRUMENTS**

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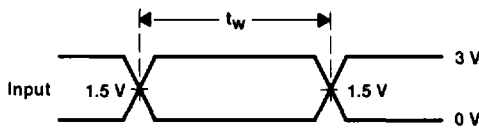
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PARAMETER MEASUREMENT INFORMATION

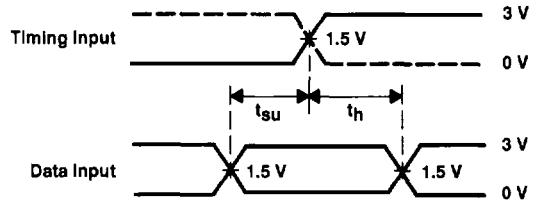


LOAD CIRCUIT FOR OUTPUTS

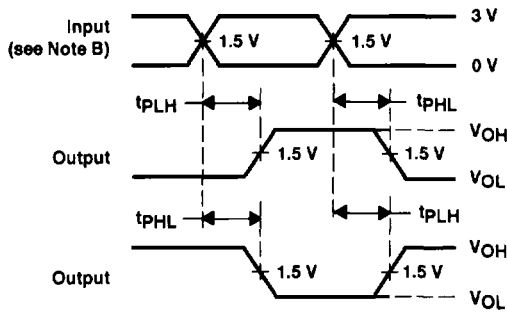
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



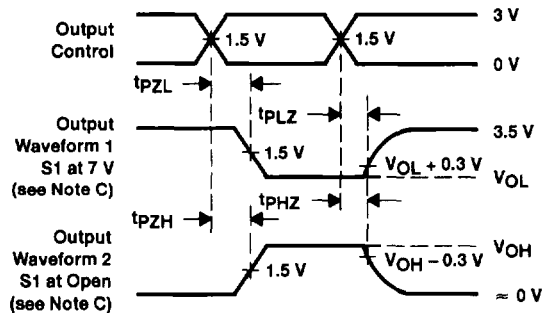
VOLTAGE WAVEFORMS
 PULSE DURATION



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. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r \leq 2.5$ ns, $t_f \leq 2.5$ ns.
 C. 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.
 D. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

