

SN54ABT2241, SN74ABT2241 OCTAL BUFFERS AND LINE/MOS DRIVERS WITH 3-STATE OUTPUTS

SCBS233B – JANUARY 1991 – REVISED JANUARY 1997

- Output Ports Have Equivalent 25- Ω Series Resistors, So No External Resistors Are Required
- State-of-the-Art *EPIC-II*[™] 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), Shrink Small-Outline (DB), and Thin Shrink Small-Outline (PW) Packages, Ceramic Chip Carriers (FK), and Plastic (N) and Ceramic (J) DIPs

description

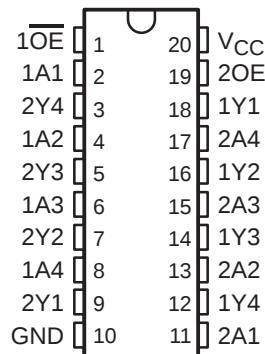
These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. Together with the SN54ABT2240, SN74ABT2240A and 'ABT2244A, these devices provide the choice of selected 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.

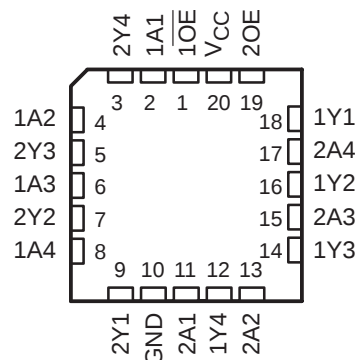
To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver. OE should be tied to GND through a pulldown resistor; the minimum value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

The SN54ABT2241 is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74ABT2241 is characterized for operation from -40°C to 85°C .

SN54ABT2241 . . . J PACKAGE
SN74ABT2241 . . . DB, DW, N, OR PW PACKAGE
(TOP VIEW)



SN54ABT2241 . . . FK PACKAGE
(TOP VIEW)



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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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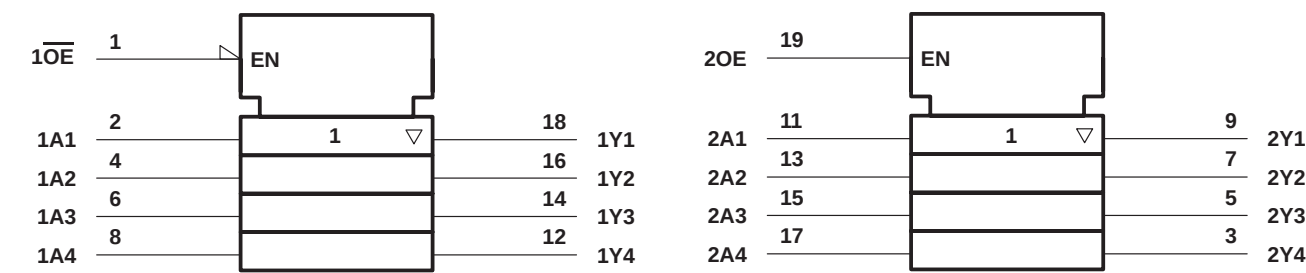
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FUNCTION TABLES

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

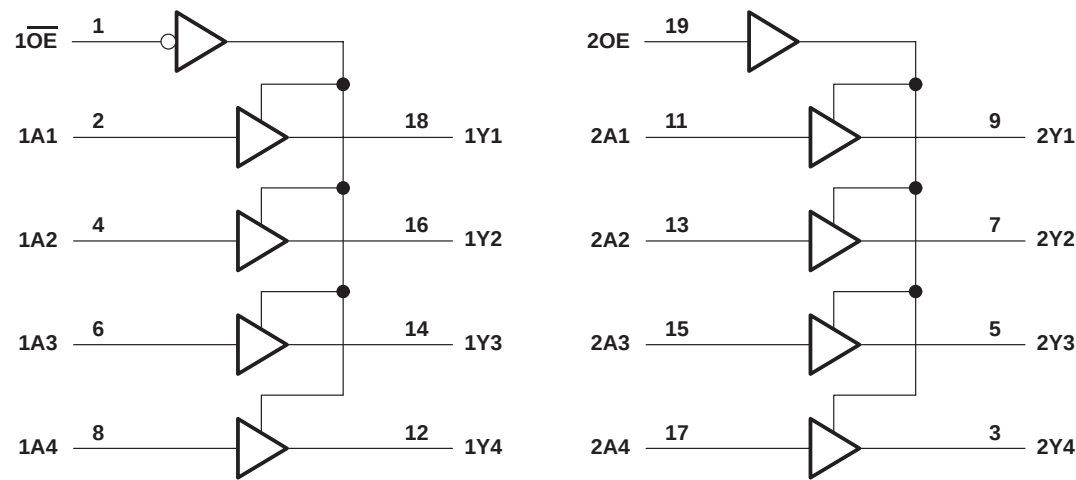
INPUTS		OUTPUT 2Y
2OE	2A	
H	H	H
H	L	L
L	X	Z

logic symbol†

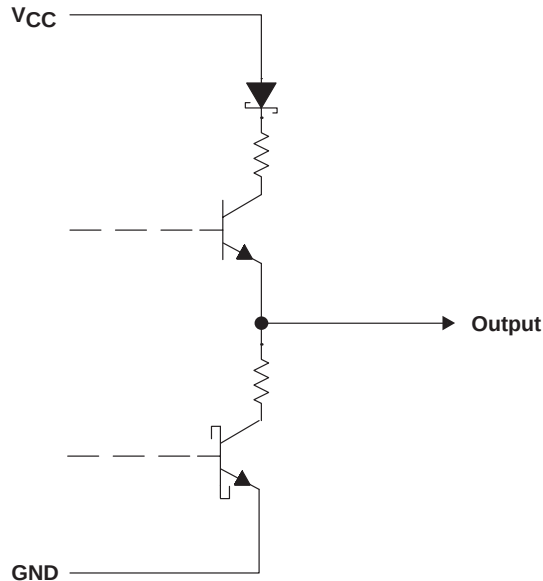


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram (positive logic)



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.

SN54ABT2241, SN74ABT2241

OCTAL BUFFERS AND LINE/MOS DRIVERS

WITH 3-STATE OUTPUTS

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recommended operating conditions (see Note 3)

			SN54ABT2241		SN74ABT2241		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 inputs 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	$T_A = 25^\circ\text{C}$			SN54ABT2241		SN74ABT2241		UNIT
			MIN	TYP [†]	MAX	MIN	MAX	MIN	MAX	
V_{IK}		$V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$			–1.2		–1.2		–1.2	V
V_{OH}		$V_{CC} = 4.5\text{ V}$, $I_{OH} = -3\text{ mA}$	2.5			2.5		2.5		V
		$V_{CC} = 5\text{ V}$, $I_{OH} = -3\text{ mA}$	3			3		3		
		$V_{CC} = 4.5\text{ V}$, $I_{OH} = -24\text{ mA}$	2			2				
		$V_{CC} = 4.5\text{ V}$, $I_{OH} = -32\text{ mA}$	2*					2		
V_{OL}		$V_{CC} = 4.5\text{ V}$, $I_{OL} = 12\text{ mA}$			0.8		0.8		0.8	V
V_{hys}				100						mV
I_I		$V_{CC} = 5.5\text{ V}$, $V_I = V_{CC}$ or GND			± 1		± 1		± 1	μA
I_{OZH}		$V_{CC} = 5.5\text{ V}$, $V_O = 2.7\text{ V}$			50		50		50	μA
I_{OZL}		$V_{CC} = 5.5\text{ V}$, $V_O = 0.5\text{ V}$			–50		–50		–50	μA
I_{off}		$V_{CC} = 0$, V_I or $V_O \leq 4.5\text{ V}$			± 100				± 100	μA
I_{CEX}		$V_{CC} = 5.5\text{ V}$, $V_O = 5.5\text{ V}$, Outputs high			50		50		50	μA
$I_O^\ddagger$		$V_{CC} = 5.5\text{ V}$, $V_O = 2.5\text{ V}$	–50	–100	–180	–50	–180	–50	–180	mA
I_{CC}		$V_{CC} = 5.5\text{ V}$, $I_O = 0$, $V_I = V_{CC}$ or GND, Outputs high		1	250		250		250	μA
		$V_{CC} = 5.5\text{ V}$, $I_O = 0$, $V_I = V_{CC}$ or GND, Outputs low		24	30		30		30	mA
		$V_{CC} = 5.5\text{ V}$, $I_O = 0$, $V_I = V_{CC}$ or GND, Outputs disabled		0.5	250		250		250	μA
$\Delta I_{CC}^\S$	Data inputs	$V_{CC} = 5.5\text{ V}$, One input at 3.4 V, Other inputs at V_{CC} or GND, Outputs enabled			1.5		1.5		1.5	mA
		$V_{CC} = 5.5\text{ V}$, One input at 3.4 V, Other inputs at V_{CC} or GND, Outputs disabled			0.05		0.05		0.05	
	Control inputs	$V_{CC} = 5.5\text{ V}$, One input at 3.4 V, Other inputs at V_{CC} or GND			1.5		1.5		1.5	
C_i	C_i	$V_I = 2.5\text{ V}$ or 0.5 V			3					pF
C_o	C_o	$V_O = 2.5\text{ V}$ or 0.5 V			8.5					pF

* On products compliant to MIL-PRF-38535, this parameter does not apply.

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

[‡] 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)	$V_{CC} = 5$ V, $T_A = 25^\circ\text{C}$			SN54ABT2241		SN74ABT2241		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A	Y	1	3	4.3	1	4.8	1	4.7	ns
t_{PHL}			1	4.3	5.3	1	5.7	1	5.6	
t_{PZH}	OE or $\overline{\text{OE}}$	Y	1.1	3.5	4.8	1.1	6.1	1.1	5.8	ns
t_{PZL}			2.1	6.2	7.6	2.1	8.6	2.1	8.4	
t_{PHZ}	OE or $\overline{\text{OE}}$	Y	1.7	4.2	5.6	1.7	6.7	1.7	6.6	ns
t_{PLZ}			1.7	3.9	5.8	1.7	6.9	1.7	6.4	

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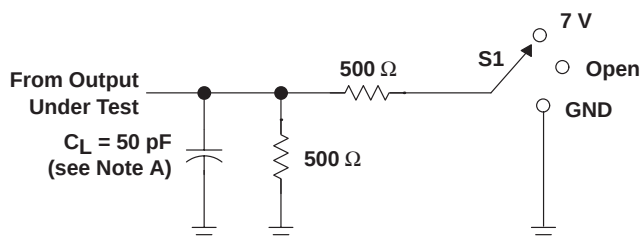
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WITH 3-STATE OUTPUTS

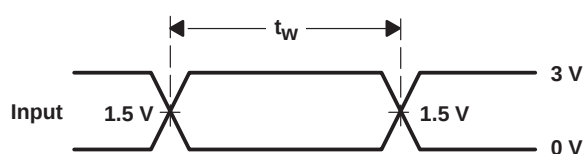
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PARAMETER MEASUREMENT INFORMATION

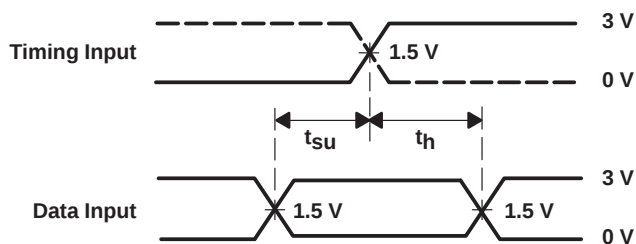


LOAD CIRCUIT

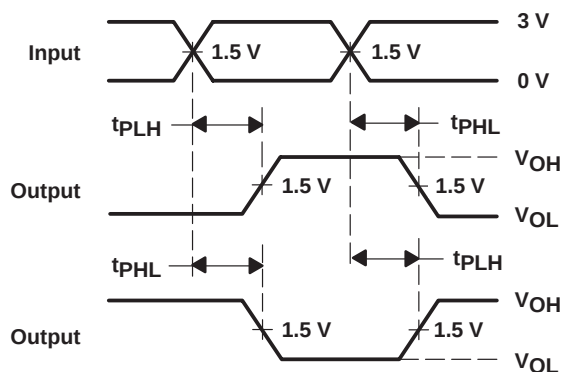
TEST	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	7 V
t_{PHZ}/t_{PZH}	Open



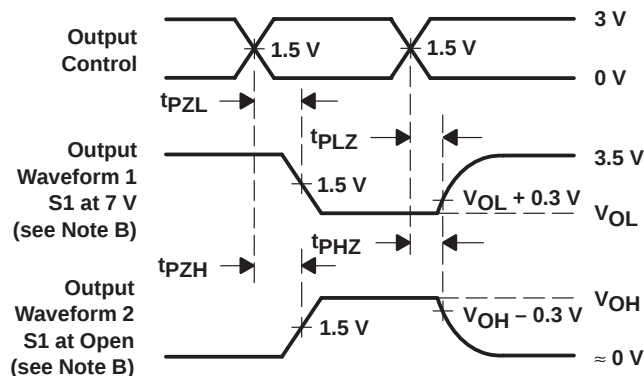
VOLTAGE WAVEFORMS
PULSE DURATION



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:
- C_L includes probe and jig capacitance.
 - 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.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2.5 \text{ ns}$, $t_f \leq 2.5 \text{ ns}$.
 - The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuit and Voltage Waveforms

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