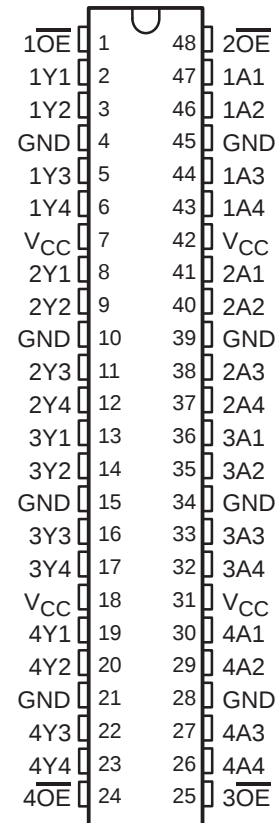


SN54LVT16244B, SN74LVT16244B 3.3-V ABT 16-BIT BUFFERS/DRIVERS WITH 3-STATE OUTPUTS

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- Members of the Texas Instruments *Widebus™* Family
- State-of-the-Art Advanced BiCMOS Technology (ABT) Design for 3.3-V Operation and Low Static-Power Dissipation
- Support Mixed-Mode Signal Operation (5-V Input and Output Voltages With 3.3-V V_{CC})
- I_{off} and Power-Up 3-State Support Hot Insertion
- Support Unregulated Battery Operation Down to 2.7 V
- Typical V_{OLP} (Output Ground Bounce) <0.8 V at $V_{CC} = 3.3$ V, $T_A = 25^\circ\text{C}$
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
 - 2000-V Human-Body Model (A114-A)
 - 200-V Machine Model (A115-A)
 - 1000-V Charged-Device Model (C101)
- Package Options Include Plastic Shrink Small-Outline (DL), Thin Shrink Small-Outline (DGG), and Thin Very Small-Outline (DGV) Packages and 380-mil Fine-Pitch Ceramic Flat (WD) Package Using 25-mil Center-to-Center Spacings

SN54LVT16244B . . . WD PACKAGE
SN74LVT16244B . . . DGG, DGV, OR DL PACKAGE
(TOP VIEW)



description

The 'LVT16244B devices are 16-bit buffers and line drivers designed for low-voltage (3.3-V) V_{CC} operation, but with the capability to provide a TTL interface to a 5-V system environment. These devices can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer. These devices provide true outputs and symmetrical active-low output-enable ($\overline{OE}$) inputs.

When V_{CC} is between 0 and 1.5-V, the devices are in the high-impedance state during power up or power down. However, to ensure the high-impedance state above 1.5-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.

These devices are fully specified for hot-insertion applications using I_{off} and power-up 3-state. The I_{off} circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down. The power-up 3-state circuitry places the outputs in the high-impedance state during power up and power down, which prevents driver conflict.

The SN54LVT16244B is characterized for operation over the full military temperature range of -55°C to 125°C . The SN74LVT16244B is characterized for operation from -40°C to 85°C .



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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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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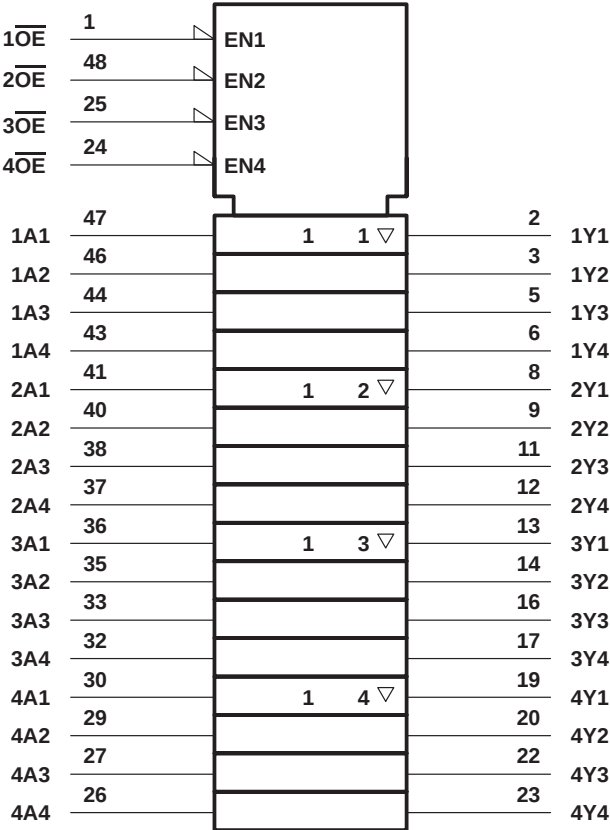
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FUNCTION TABLE
(each 4-bit buffer)

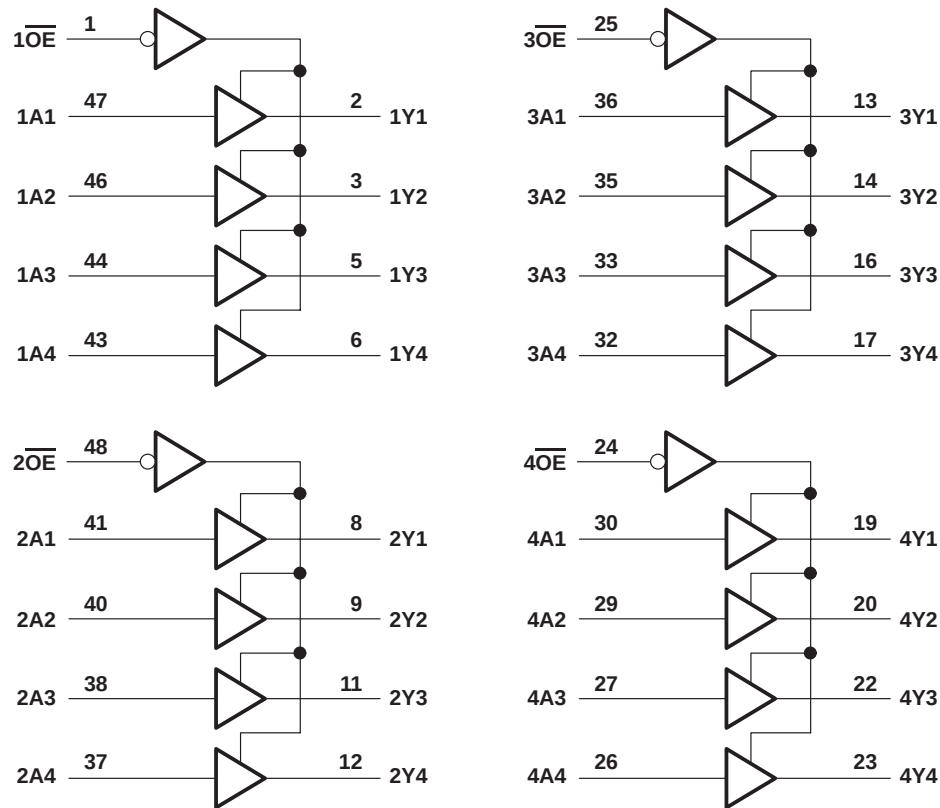
INPUTS		OUTPUT Y
$\overline{OE}$	A	
L	H	H
L	L	L
H	X	Z

logic symbol†



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

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage range, V_{CC}	–0.5 V to 4.6 V
Input voltage range, V_I (see Note 1)	–0.5 V to 7 V
Voltage range applied to any output in the high-impedance or power-off state, V_O (see Note 1)	–0.5 V to 7 V
Voltage range applied to any output in the high state, V_O (see Note 1)	–0.5 V to $V_{CC} + 0.5$ V
Current into any output in the low state, I_{OL} : SN54LVT16244B	96 mA
SN74LVT16244B	128 mA
Current into any output in the high state, I_{OH} (see Note 2): SN54LVT16244B	48 mA
SN74LVT16244B	64 mA
Input clamp current, I_{IK} ($V_I < 0$)	–50 mA
Output clamp current, I_{OK} ($V_O < 0$)	–50 mA
Package thermal impedance, θ_{JA} (see Note 3): DGG package	70°C/W
DGV package	58°C/W
DL package	63°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. This current flows only when the output is in the high state and $V_O > V_{CC}$.
3. The package thermal impedance is calculated in accordance with JESD 51.

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recommended operating conditions (see Note 4)

			SN54LVT16244B		SN74LVT16244B		UNIT
			MIN	MAX	MIN	MAX	
V _{CC}	Supply voltage		2.7	3.6	2.7	3.6	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			5.5		5.5	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		10		10	ns/V
Δt/ΔV _{CC}	Power-up ramp rate		200		200		μs/V
T _A	Operating free-air temperature		–55	125	–40	85	°C

NOTE 4: All unused inputs of the device must at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

PARAMETER		TEST CONDITIONS	SN54LVT16244B			SN74LVT16244B			UNIT
			MIN	TYP†	MAX	MIN	TYP†	MAX	
V_{IK}		$V_{CC} = 2.7\text{ V}$, $I_I = -18\text{ mA}$			-1.2			-1.2	V
V_{OH}		$V_{CC} = 2.7\text{ V to } 3.6\text{ V}$, $I_{OH} = -100\text{ }\mu\text{A}$	$V_{CC}-0.2$			$V_{CC}-0.2$			V
		$V_{CC} = 2.7\text{ V}$, $I_{OH} = -8\text{ mA}$	2.4			2.4			
		$V_{CC} = 3\text{ V}$	2			2			
V_{OL}		$V_{CC} = 2.7\text{ V}$		$I_{OL} = 100\text{ }\mu\text{A}$	0.2		$I_{OL} = 100\text{ }\mu\text{A}$	0.2	V
				$I_{OL} = 24\text{ mA}$	0.5		$I_{OL} = 24\text{ mA}$	0.5	
		$V_{CC} = 3\text{ V}$		$I_{OL} = 16\text{ mA}$	0.4		$I_{OL} = 16\text{ mA}$	0.4	
				$I_{OL} = 32\text{ mA}$	0.5		$I_{OL} = 32\text{ mA}$	0.5	
				$I_{OL} = 48\text{ mA}$	0.55		$I_{OL} = 48\text{ mA}$	0.55	
				$I_{OL} = 64\text{ mA}$			$I_{OL} = 64\text{ mA}$	0.55	
I_I		$V_{CC} = 0\text{ or } 3.6\text{ V}$, Control inputs		$V_I = 5.5\text{ V}$	50		$V_I = 5.5\text{ V}$	10	μA
		$V_{CC} = 3.6\text{ V}$, Data inputs		$V_I = V_{CC}\text{ or GND}$	± 1		$V_I = V_{CC}\text{ or GND}$	± 1	
		$V_{CC} = 3.6\text{ V}$		$V_I = V_{CC}$	1		$V_I = V_{CC}$	1	
				$V_I = 0$	-5		$V_I = 0$	-5	
I_{off}		$V_{CC} = 0$, V_I or $V_O = 0\text{ to } 4.5\text{ V}$						± 100	μA
I_{OZH}		$V_{CC} = 3.6\text{ V}$, $V_O = 3\text{ V}$			5			5	μA
I_{OZL}		$V_{CC} = 3.6\text{ V}$, $V_O = 0.5\text{ V}$			-5			-5	μA
I_{OZPU}		$V_{CC} = 0\text{ to } 1.5\text{ V}$, $V_O = 0.5\text{ V to } 3\text{ V}$, $\overline{OE} = \text{don't care}$			$\pm 100^*$			± 100	μA
I_{OZPD}		$V_{CC} = 1.5\text{ V to } 0$, $V_O = 0.5\text{ V to } 3\text{ V}$, $\overline{OE} = \text{don't care}$			$\pm 100^*$			± 100	μA
I_{CC}		$V_{CC} = 3.6\text{ V}$, $I_O = 0$, $V_I = V_{CC}\text{ or GND}$		Outputs high	0.19		0.19		mA
				Outputs low	5		5		
				Outputs disabled	0.19		0.19		
$\Delta I_{CC}^\ddagger$		$V_{CC} = 3\text{ V to } 3.6\text{ V}$, One input at $V_{CC} - 0.6\text{ V}$, Other inputs at $V_{CC}\text{ or GND}$			0.2			0.2	mA
C_i		$V_I = 3\text{ V or } 0$			4			4	pF
C_o		$V_O = 3\text{ V or } 0$			9			9	pF

*On products compliant to MIL-PRF-38535, this parameter is not production tested.

† All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

‡ 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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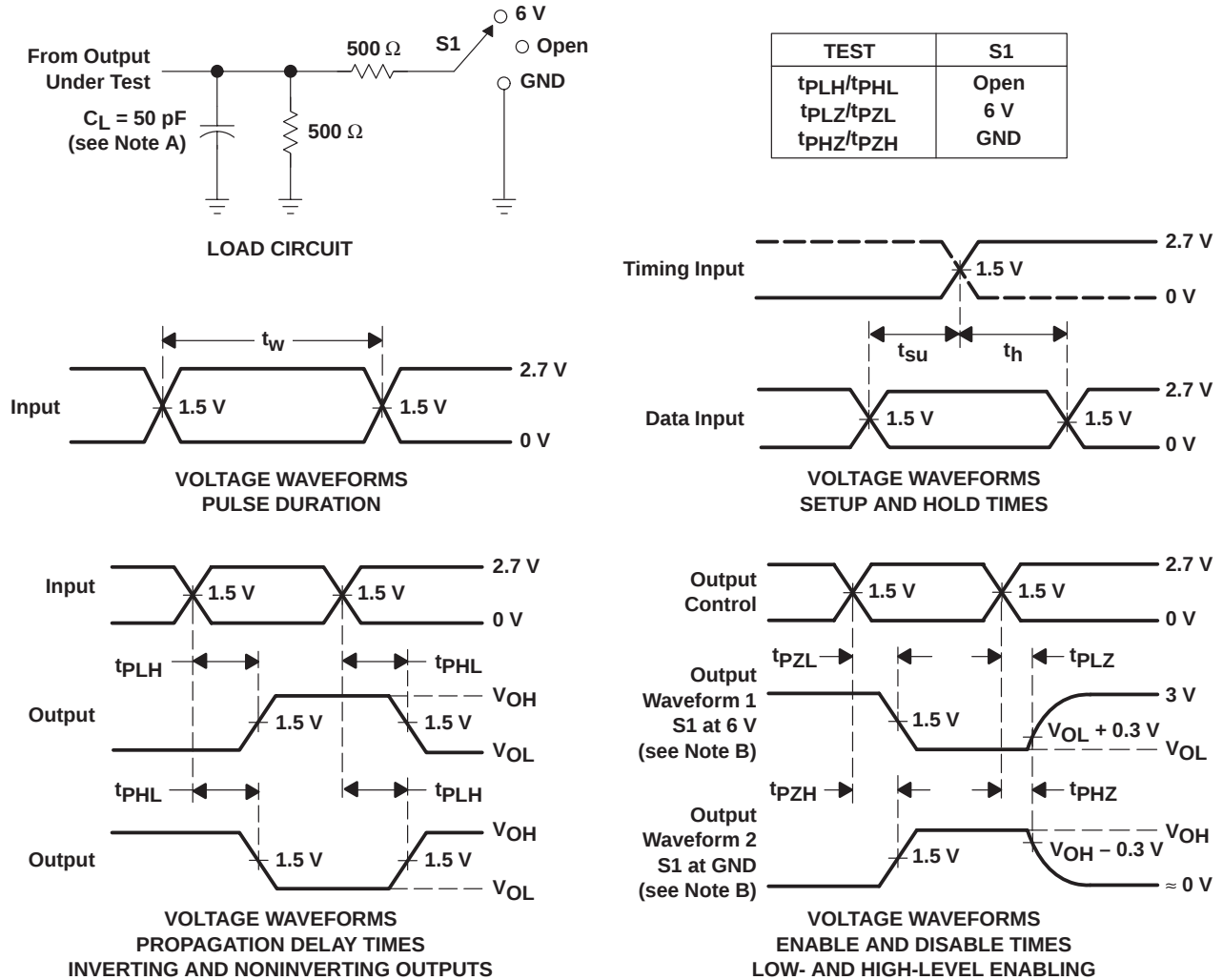
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switching characteristics over recommended operating free-air temperature range, $C_L = 50$ pF
(unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	SN54LVT16244B				SN74LVT16244B				UNIT	
			V _{CC} = 3.3 V ± 0.3 V		V _{CC} = 2.7 V		V _{CC} = 3.3 V ± 0.3 V			V _{CC} = 2.7 V		
			MIN	MAX	MIN	MAX	MIN	TYP†	MAX	MIN		MAX
t _{PLH}	A	Y	1.1	4.4		4.6	1.2	2.3	3.2		3.7	ns
t _{PHL}			1.1	3.6		3.9	1.2	2	3.2		3.7	
t _{PZH}	OE	Y	1.1	4.6		5.4	1.2	2.6	4		5	ns
t _{PZL}			1.1	5.4		6.2	1.2	2.7	4		5	
t _{PHZ}	OE	Y	1.6	5.7		6.2	2.2	3.3	4.5		5	ns
t _{PLZ}			1.2	5		4.7	2	3.1	4.2		4.4	
t _{sk(o)}									0.5			ns

[†] All typical values are at $V_{CC} = 3.3\text{ V}$, $T_A = 25^\circ\text{C}$.

PARAMETER MEASUREMENT INFORMATION



- 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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