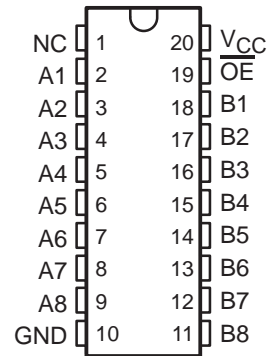


# SN74CBTLV3245A LOW-VOLTAGE OCTAL FET BUS SWITCH

SCDS034I – JULY 1997 – REVISED MAY 2000

- Standard '245-Type Pinout
- 5-Ω Switch Connection Between Two Ports
- Isolation Under Power-Off Conditions
- 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 250 mA Per JESD 17
- Package Options Include Shrink Small-Outline (DB, DBQ), Thin Very Small-Outline (DGV), Small-Outline (DW), and Thin Shrink Small-Outline (PW) Packages

DB, DBQ, DGV, DW, OR PW PACKAGE  
(TOP VIEW)



NC – No internal connection

## description

The SN74CBTLV3245A provides eight bits of high-speed bus switching in a standard '245 device pinout. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

The device is organized as one 8-bit switch. When output enable ( $\overline{OE}$ ) is low, the 8-bit bus switch is on, and port A is connected to port B. When  $\overline{OE}$  is high, the switch is open, and the high-impedance state exists between the two ports.

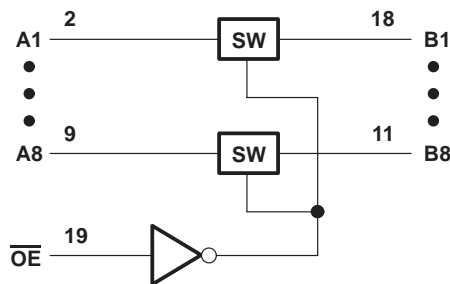
To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The SN74CBTLV3245A is characterized for operation from  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ .

FUNCTION TABLE

INPUT $\overline{OE}$	FUNCTION
L	A port = B port
H	Disconnect

## logic diagram (positive logic)



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 **TEXAS  
INSTRUMENTS**

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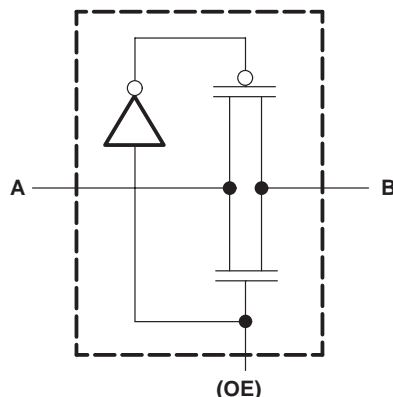
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# SN74CBTLV3245A

## LOW-VOLTAGE OCTAL FET BUS SWITCH

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### simplified schematic, each FET switch



### 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 4.6 V
Continuous channel current	.....	128 mA
Input clamp current, $I_{IK}$ ( $V_{I/O} < 0$ )	.....	-50 mA
Package thermal impedance, $\theta_{JA}$ (see Note 2):		
DB package	.....	70°C/W
DBQ package	.....	68°C/W
DGV package	.....	92°C/W
DW package	.....	58°C/W
PW package	.....	83°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 JESD 51.

### recommended operating conditions (see Note 3)

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	2.3	3.6	V
$V_{IH}$	High-level control input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	2	
$V_{IL}$	Low-level control input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	0.7	V
		$V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$	0.8	
$T_A$	Operating free-air temperature	-40	85	°C

NOTE 3: All unused control inputs of the device must be held 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.

# SN74CBTLV3245A LOW-VOLTAGE OCTAL FET BUS SWITCH

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT	
V <sub>IK</sub>	Control inputs	V <sub>CC</sub> = 3 V,	I <sub>I</sub> = -18 mA			-1.2	V	
	Data inputs					-0.8		
I <sub>I</sub>		V <sub>CC</sub> = 3.6 V,	V <sub>I</sub> = V <sub>CC</sub> or GND			±60	μA	
I <sub>off</sub>		V <sub>CC</sub> = 0,	V <sub>I</sub> or V <sub>O</sub> = 0 to 3.6 V			40	μA	
I <sub>CC</sub>		V <sub>CC</sub> = 3.6 V,	I <sub>O</sub> = 0, V <sub>I</sub> = V <sub>CC</sub> or GND			20	μA	
ΔI <sub>CC</sub> ‡	Control inputs	V <sub>CC</sub> = 3.6 V,	One input at 3 V, Other inputs at V <sub>CC</sub> or GND			300	μA	
C <sub>i</sub>	Control inputs	V <sub>I</sub> = 3 V or 0				4	pF	
C <sub>io(OFF)</sub>		V <sub>O</sub> = 3 V or 0,	$\overline{OE}$ = V <sub>CC</sub>			9	pF	
r <sub>on</sub> §	V <sub>CC</sub> = 2.3 V, TYP at V <sub>CC</sub> = 2.5 V	V <sub>I</sub> = 0	I <sub>O</sub> = 64 mA			5	8	Ω
			I <sub>O</sub> = 24 mA			5	8	
		V <sub>I</sub> = 1.7 V,	I <sub>O</sub> = 15 mA			27	40	
	V <sub>CC</sub> = 3 V	V <sub>I</sub> = 0	I <sub>O</sub> = 64 mA			5	7	
			I <sub>O</sub> = 24 mA			5	7	
		V <sub>I</sub> = 2.4 V,	I <sub>O</sub> = 15 mA			10	15	

† All typical values are at V<sub>CC</sub> = 3.3 V (unless otherwise noted), T<sub>A</sub> = 25°C.

‡ This is the increase in supply current for each input that is at the specified voltage level rather than V<sub>CC</sub> or GND.

§ Measured by the voltage drop between the A and B terminals at the indicated current through the switch. On-state resistance is determined by the lower of the voltages of the two (A or B) terminals.

## switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figures 1 and 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub> = 2.5 V ± 0.2 V		V <sub>CC</sub> = 3.3 V ± 0.3 V		UNIT
			MIN	MAX	MIN	MAX	
t <sub>pd</sub> ¶	A or B	B or A		0.15		0.25	ns
t <sub>en</sub>	$\overline{OE}$	A or B	1	6	1	4.7	ns
t <sub>dis</sub>	$\overline{OE}$	A or B	1	6.1	1	6.4	ns

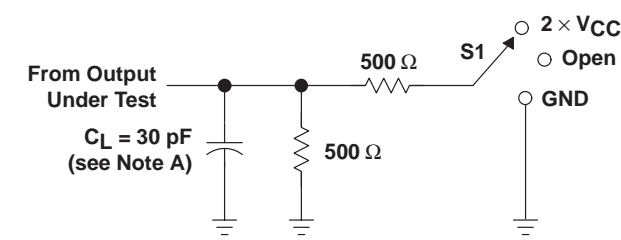
¶ The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance when driven by an ideal voltage source (zero output impedance).

# SN74CBTLV3245A LOW-VOLTAGE OCTAL FET BUS SWITCH

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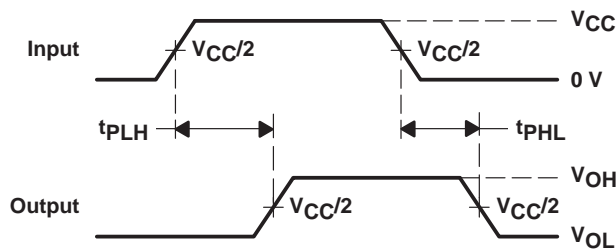
## PARAMETER MEASUREMENT INFORMATION

$$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$$

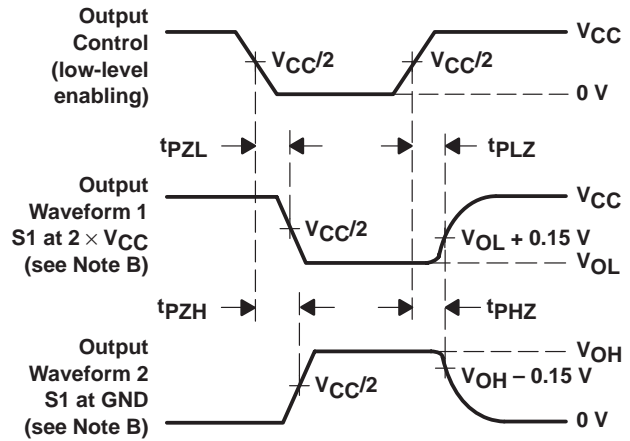


LOAD CIRCUIT

TEST	S1
$t_{pd}$	Open
$t_{PLZ}/t_{PZL}$	2 $\times$ $V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES



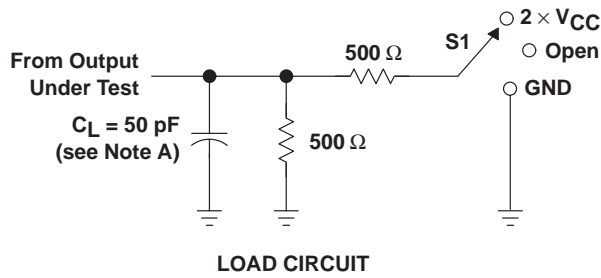
VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES

- 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:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2 \text{ ns}$ ,  $t_f \leq 2 \text{ ns}$ .
  - D. The outputs are measured one at a time with one transition per measurement.
  - E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

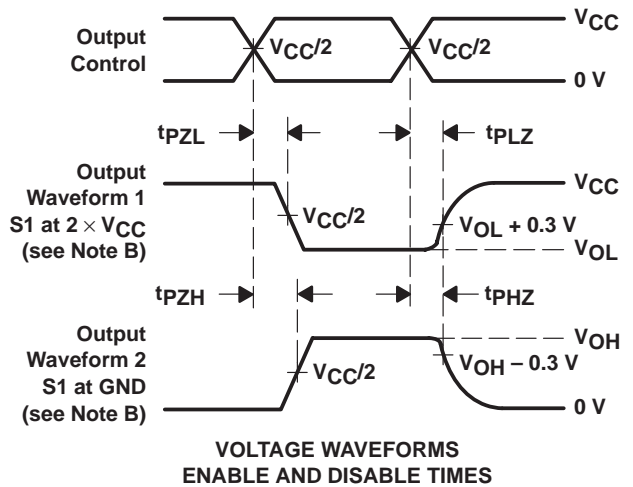
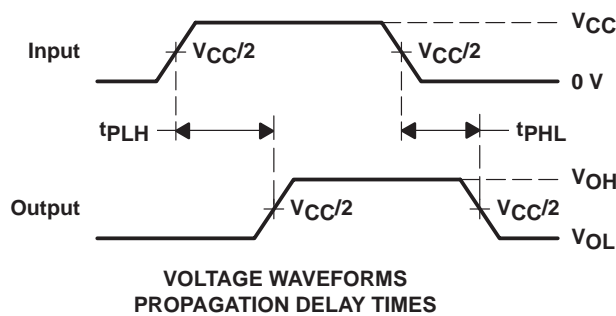
Figure 1. Load Circuit and Voltage Waveforms

PARAMETER MEASUREMENT INFORMATION

$V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$



TEST	S1
$t_{pd}$	Open
$t_{PLZ}/t_{PZL}$	$2 \times V_{CC}$
$t_{PHZ}/t_{PZH}$	GND



- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
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Figure 2. Load Circuit and Voltage Waveforms

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## SN74CBTLV3245A, Low-Voltage Octal FET Bus Switch

DEVICE STATUS: **ACTIVE**

PARAMETER NAME	SN74CBTLV3245A
Voltage Nodes (V)	3.3, 2.5
Vcc range (V)	2.3 to 3.6
No. of Bits	8
ron(max) (ohms)	7
tpd(max) (ns)	0.25

### FEATURES

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- Standard '245-Type Pinout
- 5-  $\Omega$  Switch Connection Between Two Ports
- Isolation Under Power -Off Conditions
- ESD Protection Exceeds 2000 V Per MIL-STD-883, Method 3015; Exceeds 200 V Using Machine Model (C = 200 pF, R = 0)
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### DESCRIPTION

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The SN74CBTLV3245A provides eight bits of high-speed bus switching in a standard '245 device pinout. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

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sinking capability of the driver.

The SN74CBTLV3245A is characterized for operation from -40°C to 85°C.

#### TECHNICAL DOCUMENTS

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- [5-V To 3.3-V Translation With The SN74CBTD3384](#) (SCDA003B - Updated: 03/01/1997)
- [Low-Voltage Bus-Switch Technology And Applications](#) (SCDA005 - Updated: 12/01/1997)
- [SN74CBTS3384 Bus Switches Provide Fast Connection And Ensure Isolation](#) (SCDA002A - Updated: 08/01/1996)
- [TI Logic Solutions for Memory Interleaving With the Intel440BX Chipset](#) (SCCA001 - Updated: 04/08/1999)
- [Texas Instruments Crossbar Switches](#) (SCDA001A - Updated: 06/01/1995)
- [Texas Instruments Solution for Undershoot Protection for Bus Switches](#) (SCDA007 - Updated: 04/13/2000)

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- [Documentation Rules \(SAP\) And Ordering Information](#) (SZZU001B, 4 KB - Updated: 05/06/1999)
- [Logic Selection Guide Second Half 2000](#) (SDYU001N, 5035 KB - Updated: 04/17/2000)
- [MicroStar Junior BGA Design Summary](#) (SCET004, 167 KB - Updated: 07/28/2000)
- [More Power In Less Space - Technical Article](#) (SCAU001A, 850 KB - Updated: 03/01/1996)

#### SAMPLES

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<u>ORDERABLE DEVICE</u>	<u>PACKAGE</u>	<u>PINS</u>	<u>TEMP (°C)</u>	<u>STATUS</u>	<u>SAMPLES</u>
SN74CBTLV3245ADBQR	<a href="#">DBQ</a>	20	-40 TO 85	ACTIVE	<a href="#">Request Samples</a>
SN74CBTLV3245ADWR	<a href="#">DW</a>	20	-40 TO 85	ACTIVE	<a href="#">Request Samples</a>
SN74CBTLV3245APWR	<a href="#">PW</a>	20	-40 TO 85	ACTIVE	<a href="#">Request Samples</a>

#### PRICING/AVAILABILITY

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<u>ORDERABLE DEVICE</u>	<u>PACKAGE</u>	<u>PINS</u>	<u>TEMP (°C)</u>	<u>STATUS</u>	<u>BUDGETARY PRICE US\$/UNIT QTY=1000+</u>	<u>PACK QTY</u>	<u>PRICING/AVAILABILITY</u>
SN74CBTLV3245ADBQR	<a href="#">DBQ</a>	20	-40 TO 85	ACTIVE	1.17	2500	<a href="#">Check stock or order</a>
SN74CBTLV3245ADGVR	<a href="#">DGV</a>	20	-40 TO 85	ACTIVE	1.17	2000	<a href="#">Check stock or order</a>
			-40 TO				



SN74CBTLV3245ADW	<u>DW</u>	20	85	ACTIVE	1.00	25	<u>Check stock or order</u>
SN74CBTLV3245ADWR	<u>DW</u>	20	-40 TO 85	ACTIVE	1.00	2000	<u>Check stock or order</u>
SN74CBTLV3245APWR	<u>PW</u>	20	-40 TO 85	ACTIVE	1.00	2000	<u>Check stock or order</u>

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