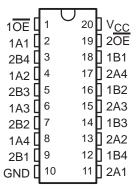
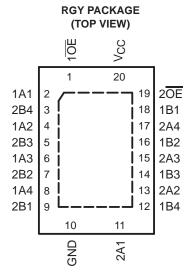
- **Undershoot Protection for Off-Isolation on** A and B Ports Up To -2 V
- **Bidirectional Data Flow, With Near-Zero Propagation Delay**
- Low ON-State Resistance (ron) Characteristics ($r_{on} = 3 \Omega$ Typical)
- **Low Input/Output Capacitance Minimizes Loading and Signal Distortion** $(C_{io(OFF)} = 5.5 pF Typical)$
- **Data and Control Inputs Provide Undershoot Clamp Diodes**
- **Low Power Consumption** $(I_{CC} = 3 \mu A Max)$
- V_{CC} Operating Range From 4 V to 5.5 V
- Data I/Os Support 0 to 5-V Signaling Levels (0.8-V, 1.2-V, 1.5-V, 1.8-V, 2.5-V, 3.3-V, 5-V)

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



- Control Inputs Can Be Driven by TTL or 5-V/3.3-V CMOS Outputs
- Ioff Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- **ESD Performance Tested Per JESD 22**
 - 2000-V Human-Body Model (A114-B, Class II)
 - 1000-V Charged-Device Model (C101)
- **Supports Both Digital and Analog** Applications: USB Interface, Memory Interleaving, Bus Isolation, Low-Distortion Signal Gating



description/ordering information

The SN74CBT3244C is a high-speed TTL-compatible FET bus switch with low ON-state resistance (ron), allowing for minimal propagation delay. Active Undershoot-Protection Circuitry on the A and B ports of the SN74CBT3244C provides protection for undershoot up to -2 V by sensing an undershoot event and ensuring that the switch remains in the proper OFF state.

The SN74CBT3244C is organized as two 4-bit bus switches with separate output-enable (1OE, 2OE) inputs. It can be used as two 4-bit bus switches or as one 8-bit bus switch. When \overline{OE} is low, the associated 4-bit bus switch is ON, and the A port is connected to the B port, allowing bidirectional data flow between ports. When OE is high, the associated 4-bit bus switch is OFF, and the high-impedance state exists between the A and B ports.



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.



description/ordering information (continued)

This device is fully specified for partial-power-down applications using I_{off} . The I_{off} feature ensures that damaging current will not backflow through the device when it is powered down. The device has isolation during power off.

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.

ORDERING INFORMATION

TA	PACKAGI	<u>=</u> †	ORDERABLE PART NUMBER	TOP-SIDE MARKING	
	QFN – RGY	Tape and reel	SN74CBT3244CRGYR	CU244C	
	0010 014	Tube	SN74CBT3244CDW	00700440	
	SOIC - DW	Tape and reel	SN74CBT3244CDWR	CBT3244C	
	0000 00	Tube SN74CBT3244CDB		0110440	
-40°C to 85°C	SSOP – DB	Tape and reel	SN74CBT3244CDBR	CU244C	
	SSOP (QSOP) – DBQ	Tape and reel	SN74CBT3244CDBQR	CBT3244C	
	TOOOD DW	Tube	SN74CBT3244CPW		
	TSSOP – PW	Tape and reel	SN74CBT3244CPWR	CU244C	
	TVSOP - DGV	Tape and reel	SN74CBT3244CDGVR	CU244C	

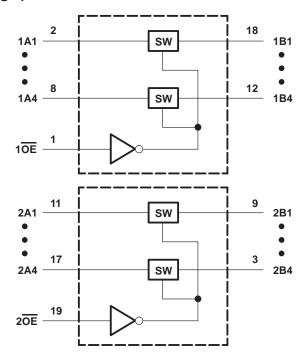
[†] Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE (each 4-bit bus switch)

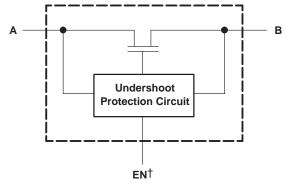
INPUT OE	INPUT/OUTPUT A	FUNCTION
L	В	A port = B port
Н	Z	Disconnect



logic diagram (positive logic)



simplified schematic, each FET switch (SW)



†EN is the internal enable signal applied to the switch.

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

Supply voltage range, V _{CC}	0.5 V to 7 V
Control input voltage range, V _{IN} (see Notes 1 and 2)	–0.5 V to 7 V
Switch I/O voltage range, V _{I/O} (see Notes 1, 2, and 3)	–0.5 V to 7 V
Control input clamp current, I _{IK} (V _{IN} < 0)	–50 mA
I/O port clamp current, $I_{I/OK}$ ($V_{I/O}$ < 0)	–50 mA
ON-state switch current, I _{I/O} (see Note 4)	
Continuous current through V _{CC} or GND terminals	±100 mA
Package thermal impedance, θ _{JA} (see Note 5): DB package	70°C/W
(see Note 5): DBQ package	68°C/W
(see Note 5): DGV package	92°C/W
(see Note 5): DW package	58°C/W
(see Note 5): PW package	83°C/W
(see Note 6): RGY package	37°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. All voltages are with respect to ground unless otherwise specified.
 - 2. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
 - 3. V_I and V_O are used to denote specific conditions for V_{I/O}.
 - 4. I_I and I_O are used to denote specific conditions for I_{I/O}.
 - 5. The package thermal impedance is calculated in accordance with JESD 51-7.
 - 6. The package thermal impedance is calculated in accordance with JESD 51-5.

recommended operating conditions (see Note 7)

		MIN	MAX	UNIT
VCC	Supply voltage	4	5.5	V
VIH	High-level control input voltage	2	5.5	V
VIL	Low-level control input voltage	0	0.8	V
V _{I/O}	Data input/output voltage	0	5.5	V
TA	Operating free-air temperature	-40	85	°C

NOTE 7: 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.



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

PAI	RAMETER		TEST CONDITIO	NS	MIN	TYP†	MAX	UNIT
VIK	Control inputs	$V_{CC} = 4.5 \text{ V},$	$I_{IN} = -18 \text{ mA}$				-1.8	V
VIKU	Data inputs	V _{CC} = 5 V,	$0 \text{ mA} > I_{I} \ge -50 \text{ mA},$ $V_{IN} = V_{CC} \text{ or GND},$	Switch OFF			-2	٧
I _{IN}	Control inputs	$V_{CC} = 5.5 \text{ V},$	$V_{IN} = V_{CC}$ or GND				±1	μΑ
loz‡		V _{CC} = 5.5 V,	$V_O = 0 \text{ to } 5.5 \text{ V},$ $V_I = 0,$	Switch OFF, V _{IN} = V _{CC} or GND			±10	μΑ
l _{off}		$V_{CC} = 0$,	$V_{O} = 0 \text{ to } 5.5 \text{ V},$	V _I = 0			10	μΑ
ICC		V _{CC} = 5.5 V,	$I_{I/O} = 0,$ $V_{IN} = V_{CC} \text{ or GND},$	Switch ON or OFF			3	μΑ
Δlcc§	Control inputs	$V_{CC} = 5.5 \text{ V},$	One input at 3.4 V,	Other inputs at V _{CC} or GND			2.5	mA
C _{in}	Control inputs	V _{IN} = 3 V or 0				4		pF
C _{io(OFF}	()	$V_{I/O} = 3 \text{ V or } 0,$	Switch OFF,	$V_{IN} = V_{CC}$ or GND		5.5		pF
C _{io(ON)}		$V_{I/O} = 3 \text{ V or } 0,$	Switch ON,	$V_{IN} = V_{CC}$ or GND		14		pF
		$V_{CC} = 4 \text{ V},$ TYP at $V_{CC} = 4 \text{ V}$	V _I = 2.4 V,	I _O = -15 mA		8	12	
$r_{on}\P$			V 0	I _O = 64 mA		3	6	Ω
		V _{CC} = 4.5 V	V _I = 0	I _O = 30 mA		3	6	
			$V_{I} = 2.4 V,$	$I_{O} = -15 \text{ mA}$		5	10	

switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 4 V	± 0.5	UNIT	
	(INPOT)	(001701)	MIN MAX	MIN	MAX	
tpd#	A or B	B or A	0.24		0.15	ns
^t en	ŌE	A or B	5.2	1.5	4.8	ns
^t dis	ŌĒ	A or B	5.1	1.5	5.7	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).

 V_{IN} and I_{IN} refer to control inputs. V_{I} , V_{O} , I_{I} , and I_{O} refer to data pins. † All typical values are at $V_{CC} = 5$ V (unless otherwise noted), $T_{A} = 25$ °C.

[‡] For I/O ports, the parameter IOZ includes the input leakage current.

[§] This is the increase in supply current for each input that is at the specified voltage level, rather than V_{CC} 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.

undershoot characteristics (see Figures 1 and 2)

PARAMETER		TEST CONDIT	TIONS	MIN	TYP†	MAX	UNIT
Voutu	$V_{CC} = 5.5 \text{ V},$	Switch OFF,	$V_{IN} = V_{CC}$ or GND	2 '	V _{OH} -0.3		V

[†] All typical values are at $V_{CC} = 5 \text{ V}$ (unless otherwise noted), $T_A = 25^{\circ}C$.

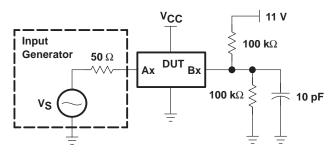


Figure 1. Device Test Setup

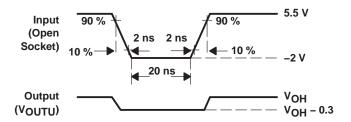
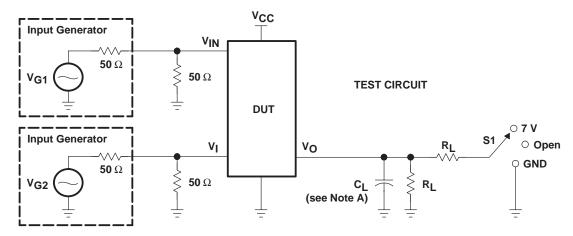
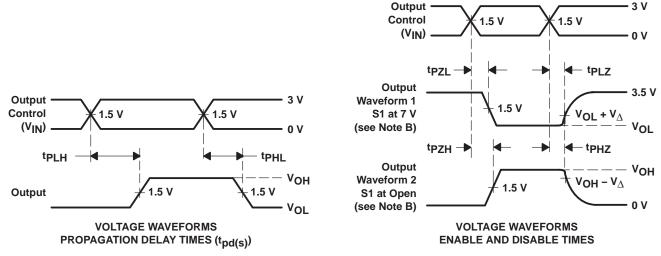


Figure 2. Transient Input Voltage (V_I) and Output Voltage (V_{OUTU}) Waveforms (Switch OFF)

PARAMETER MEASUREMENT INFORMATION



TEST	VCC	S1	RL	VI	CL	${f v}_{\!\Delta}$
^t pd(s)	$\begin{array}{c} \textbf{5 V} \pm \textbf{0.5 V} \\ \textbf{4 V} \end{array}$	Open Open	500 Ω 500 Ω	V _{CC} or GND	50 pF 50 pF	
tPLZ/tPZL	5 V ± 0.5 V 4 V	7 V 7 V	500 Ω 500 Ω	GND GND	50 pF 50 pF	0.3 V 0.3 V
tPHZ/tPZH	5 V ± 0.5 V 4 V	Open Open	500 Ω 500 Ω	v _{CC}	50 pF 50 pF	0.3 V 0.3 V



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 MHz, $Z_Q = 50 \Omega$, $t_f \leq 2.5 \text{ ns.}$
- D. The outputs are measured one at a time with one transition per measurement.
- E. tpLZ and tpHZ are the same as tdis.
- F. tpzL and tpzH are the same as ten.
- G. tpLH and tpHL are the same as tpd(s). The tpd 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).
- H. All parameters and waveforms are not applicable to all devices.

Figure 3. Test Circuit and Voltage Waveforms







10-Dec-2020

PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
							(6)				
SN74CBT3244CDBQR	ACTIVE	SSOP	DBQ	20	2500	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CBT3244C	Samples
SN74CBT3244CDGVR	ACTIVE	TVSOP	DGV	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU244C	Samples
SN74CBT3244CDW	ACTIVE	SOIC	DW	20	25	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBT3244C	Samples
SN74CBT3244CDWR	ACTIVE	SOIC	DW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBT3244C	Samples
SN74CBT3244CPW	ACTIVE	TSSOP	PW	20	70	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU244C	Samples
SN74CBT3244CPWR	ACTIVE	TSSOP	PW	20	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU244C	Samples
SN74CBT3244CRGYR	ACTIVE	VQFN	RGY	20	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CU244C	Samples

(1) The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

(2) RoHS: TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

⁽³⁾ MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

⁽⁴⁾ There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

⁽⁵⁾ Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.



PACKAGE OPTION ADDENDUM

10-Dec-2020

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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PACKAGE MATERIALS INFORMATION

www.ti.com 3-Jun-2022

TAPE AND REEL INFORMATION





A0	Dimension designed to accommodate the component width
В0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74CBT3244CDBQR	SSOP	DBQ	20	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74CBT3244CDGVR	TVSOP	DGV	20	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74CBT3244CDWR	SOIC	DW	20	2000	330.0	24.4	10.8	13.3	2.7	12.0	24.0	Q1
SN74CBT3244CPWR	TSSOP	PW	20	2000	330.0	16.4	6.95	7.1	1.6	8.0	16.0	Q1
SN74CBT3244CRGYR	VQFN	RGY	20	3000	330.0	12.4	3.8	4.8	1.6	8.0	12.0	Q1



www.ti.com 3-Jun-2022



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74CBT3244CDBQR	SSOP	DBQ	20	2500	356.0	356.0	35.0
SN74CBT3244CDGVR	TVSOP	DGV	20	2000	367.0	367.0	35.0
SN74CBT3244CDWR	SOIC	DW	20	2000	367.0	367.0	45.0
SN74CBT3244CPWR	TSSOP	PW	20	2000	356.0	356.0	35.0
SN74CBT3244CRGYR	VQFN	RGY	20	3000	367.0	367.0	35.0

PACKAGE MATERIALS INFORMATION

www.ti.com 3-Jun-2022

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
SN74CBT3244CDW	DW	SOIC	20	25	507	12.83	5080	6.6
SN74CBT3244CPW	PW	TSSOP	20	70	530	10.2	3600	3.5



SMALL OUTLINE PACKAGE



NOTES:

- 1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.

 2. This drawing is subject to change without notice.

 3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not
- exceed 0.15 mm per side.
- 4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
- 5. Reference JEDEC registration MO-153.



SMALL OUTLINE PACKAGE



NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SMALL OUTLINE PACKAGE



NOTES: (continued)

- 8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 9. Board assembly site may have different recommendations for stencil design.



PW (R-PDSO-G20)

PLASTIC SMALL OUTLINE



NOTES:

- All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
 C. Publication IPC-7351 is recommended for alternate design.
- D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
- E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.



DBQ (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15) per side.
- D. Falls within JEDEC MO-137 variation AD.



DGV (R-PDSO-G**)

24 PINS SHOWN

PLASTIC SMALL-OUTLINE



NOTES: A. All linear dimensions are in millimeters.

B. This drawing is subject to change without notice.

C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.

D. Falls within JEDEC: 24/48 Pins – MO-153 14/16/20/56 Pins – MO-194 3.5 x 4.5, 0.5 mm pitch

PLASTIC QUAD FGLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary. Refer to the product data sheet for package details.





PLASTIC QUAD FLATPACK - NO LEAD



NOTES:

- 1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
 2. This drawing is subject to change without notice.
- 3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.



PLASTIC QUAD FLATPACK - NO LEAD



NOTES: (continued)

- 4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
- Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.



PLASTIC QUAD FLATPACK - NO LEAD



NOTES: (continued)

6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.





SOIC



NOTES:

- 1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.

 2. This drawing is subject to change without notice.

 3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not
- exceed 0.15 mm per side.
- 4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm per side.
- 5. Reference JEDEC registration MS-013.



SOIC



NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOIC



NOTES: (continued)

- 8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
- 9. Board assembly site may have different recommendations for stencil design.



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