- 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 (r_{on})
 Characteristics (r_{on} = 3 Ω Typical)
- Low Input/Output Capacitance Minimizes Loading and Signal Distortion (C_{io(OFF)} = 5 pF Typical)
- Data and Control Inputs Provide Undershoot Clamp Diodes
- Low Power Consumption (I_{CC} = 3 μA 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)

- Control Inputs Can Be Driven by TTL or 5-V/3.3-V CMOS Outputs
- I_{off} 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: PCI Interface, Memory Interleaving, Bus Isolation, Low-Distortion Signal Gating

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

10E	1	U ₂₄	v_{cc}
1B1 [2	23	2B5
1A1 [3	22	2A5
1A2[4	21	2A4
1B2 [5	20	2B4
1B3 [6	19	2B3
1A3 [7	18	2A3
1A4 [8	17	2A2
1B4 [9	16	2B2
1B5 [10	15	2B1
1A5 [11	14	2A1
GND [12	13	20E

description/ordering information

The SN74CBT3384C is a high-speed TTL-compatible FET bus switch with low ON-state resistance (r_{on}), allowing for minimal propagation delay. Active Undershoot-Protection Circuitry on the A and B ports of the SN74CBT3384C 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 SN74CBT3384C is organized as two 5-bit bus switches with separate \overline{OE} output-enable (\overline{IOE} , \overline{IOE}) inputs. It can be used as two 5-bit bus switches or as one 10-bit bus switch. When \overline{OE} is low, the associated 5-bit bus switch is ON, and the A port is connected to the B port, allowing bidirectional data flow between ports. When \overline{OE} is high, the associated 5-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	E †	ORDERABLE PART NUMBER	TOP-SIDE MARKING					
	0010 DW	Tube SN74CBT3384CDW							
	SOIC – DW	Tape and reel	SN74CBT3384CDWR	CBT3384C					
	CCOD DD	SN74CBT3384CDB	CDT2204C						
-40°C to 85°C	SSOP – DB	Tape and reel	SN74CBT3384CDBR	CBT3384C					
-40°C 10 85°C	SSOP (QSOP) – DBQ	Tape and reel	SN74CBT3384CDBQR	CBT3384C					
	TOOOD DW	Tube SN74CBT3384CPW		0110010					
	TSSOP – PW	Tape and reel	SN74CBT3384CPWR	CU384C					
	TVSOP - DGV	Tape and reel	SN74CBT3384CDGVR	CU384C					

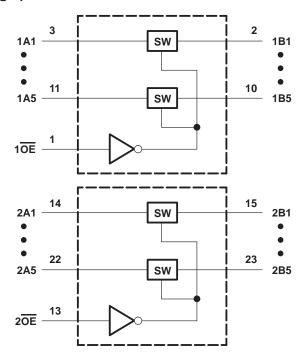
[†] Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

FUNCTION TABLE (each 5-bit bus switch)

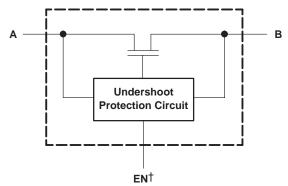
INPUT OE	INPUT/OUTPUT A	FUNCTION
L	В	A port = B port
Н	Z	Disconnect



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}	and 2)	0.5 V to 7 V 0.5 V to 7 V 50 mA 50 mA ±128 mA ±100 mA 63°C/W 61°C/W 86°C/W 46°C/W
Storage temperature range, T _{stg}		

[†] 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. II and IO are used to denote specific conditions for II/O.
 - 5. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 6)

		MIN	MAX	UNIT
VCC	Supply voltage	4	5.5	V
٧ _{IH}	High-level control input voltage	2	5.5	V
VIL	Low-level control input voltage	0	8.0	V
V _{I/O}	Data input/output voltage	0	5.5	V
TA	Operating free-air temperature	-40	85	°C

NOTE 6: 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)

PAF	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	V
I _{IN}	Control inputs	$V_{CC} = 5.5 \text{ V},$	$V_{IN} = V_{CC}$ or GND				±1	μΑ
I _{OZ} ‡		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
∆ICC§	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				3.5		pF
C _{io(OFF})	$V_{I/O} = 3 \text{ V or } 0,$	Switch OFF,	$V_{IN} = V_{CC}$ or GND		5		pF
C _{io(ON)}		$V_{I/O} = 3 \text{ V or } 0,$	Switch ON,	$V_{IN} = V_{CC}$ or GND		12.5		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} ¶			V 0	I _O = 64 mA		3	6	Ω
		V _{CC} = 4.5 V	V _I = 0	I _O = 30 mA		3	6	
			$V_1 = 2.4 V$,	$I_{O} = -15 \text{ mA}$		5	10	

 $V_{\mbox{\footnotesize{IN}}}$ and $I_{\mbox{\footnotesize{IN}}}$ refer to control inputs. $V_{\mbox{\footnotesize{I}}},\,V_{\mbox{\footnotesize{O}}},\,I_{\mbox{\footnotesize{I}}},$ and $I_{\mbox{\footnotesize{O}}}$ refer to data pins.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V _{CC} = 4 V	V _{CC} =	= 5 V 5 V	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	1.5	4.2	ns
^t dis	ŌĒ	A or B	5	1.5	4.5	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).

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

[‡] 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 CONDI	TIONS	MIN	TYP†	MAX	UNIT
ſ	Vоити	$V_{CC} = 5.5 \text{ V},$	Switch OFF,	$V_{IN} = V_{CC}$ or GND	2 '	V _{OH} -0.3		V

 $[\]overline{\dagger}$ All typical values are at $V_{CC} = 5$ V (unless otherwise noted), $T_A = 25$ °C.

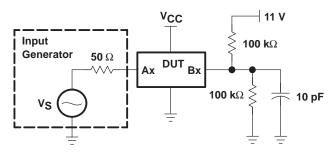


Figure 1. Device Test Setup

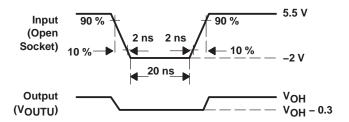
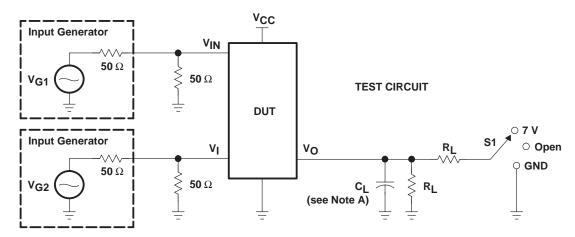
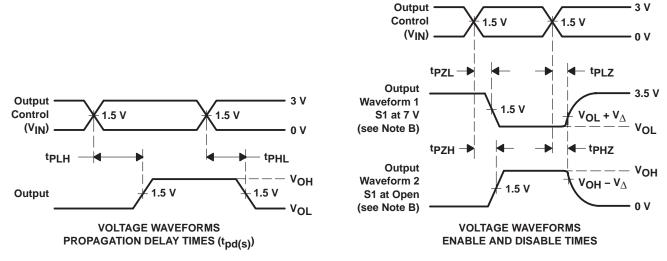


Figure 2. Transient Input Voltage (V_I) and Output Voltage (V_{OUTU}) Waveforms (Switch OFF)

PARAMETER MEASUREMENT INFORMATION



TEST	VCC	S1	RL	VI	CL	$v_{\!\scriptscriptstyle\Delta}$
^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 (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
SN74CBT3384CDBQR	ACTIVE	SSOP	DBQ	24	2500	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CBT3384C	Samples
SN74CBT3384CDGVR	ACTIVE	TVSOP	DGV	24	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU384C	Samples
SN74CBT3384CDWR	ACTIVE	SOIC	DW	24	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBT3384C	Samples
SN74CBT3384CPW	ACTIVE	TSSOP	PW	24	60	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU384C	Samples
SN74CBT3384CPWR	ACTIVE	TSSOP	PW	24	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU384C	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 (CI) 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.
- (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.



PACKAGE OPTION ADDENDUM

10-Dec-2020

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PACKAGE MATERIALS INFORMATION

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TAPE AND REEL INFORMATION





A0	Dimension designed to accommodate the component width
BO	Dimension designed to accommodate the component length
	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

All difficulties are norminal												
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
SN74CBT3384CDBQR	SSOP	DBQ	24	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74CBT3384CDGVR	TVSOP	DGV	24	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74CBT3384CDWR	SOIC	DW	24	2000	330.0	24.4	10.75	15.7	2.7	12.0	24.0	Q1
SN74CBT3384CPWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1

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*All dimensions are nominal

7 iii dimensione dre nomina							
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74CBT3384CDBQR	SSOP	DBQ	24	2500	853.0	449.0	35.0
SN74CBT3384CDGVR	TVSOP	DGV	24	2000	367.0	367.0	35.0
SN74CBT3384CDWR	SOIC	DW	24	2000	350.0	350.0	43.0
SN74CBT3384CPWR	TSSOP	PW	24	2000	853.0	449.0	35.0

DBQ (R-PDSO-G24)

PLASTIC SMALL-OUTLINE PACKAGE



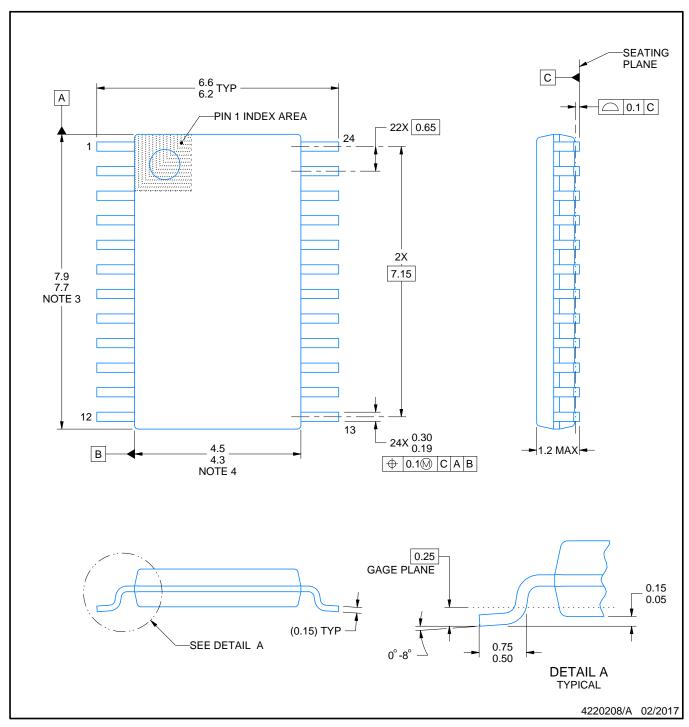
NOTES:

- 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 AE.





SMALL OUTLINE PACKAGE



NOTES:

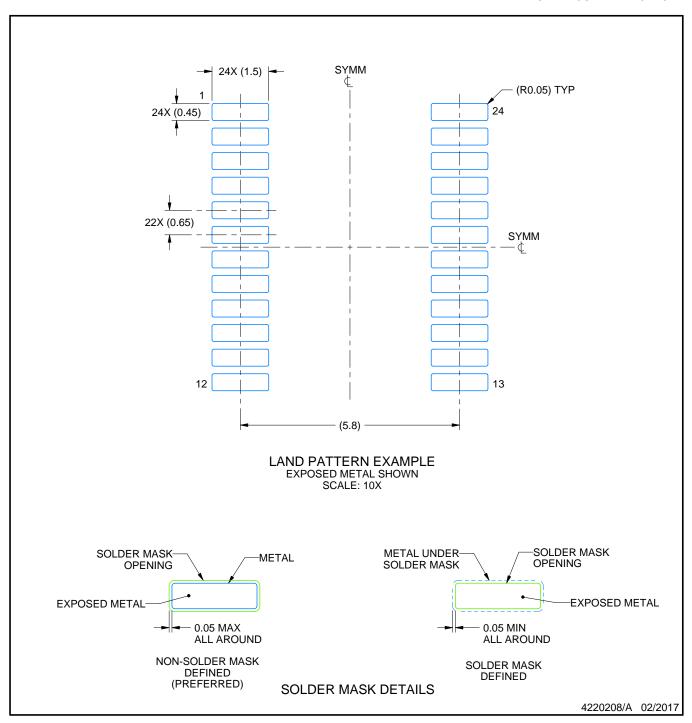
- 1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.

 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.



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 DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.

- 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).
- D. Falls within JEDEC MS-013 variation AD.



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