

# SN74CBT3125C

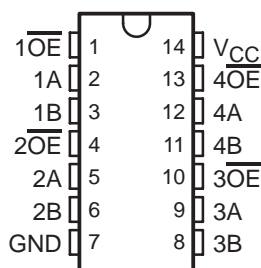
## QUADRUPLE FET BUS SWITCH

### 5-V BUS SWITCH WITH –2-V UNDERSHOOT PROTECTION

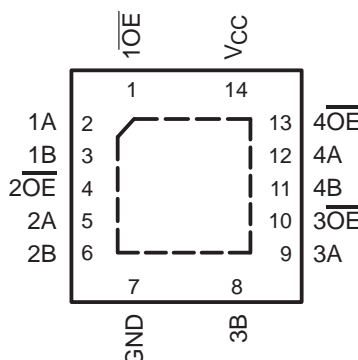
SCDS122A – JULY 2003 – REVISED OCTOBER 2003

- 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 ( $r_{on} = 3\ \Omega$  Typical)
- Low Input/Output Capacitance Minimizes Loading and Signal Distortion ( $C_{io(OFF)} = 5\text{ pF}$  Typical)
- Data and Control Inputs Provide Undershoot Clamp Diodes
- Low Power Consumption ( $I_{CC} = 3\ \mu\text{A}$  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)
- 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: USB Interface, Bus Isolation, Low-Distortion Signal Gating

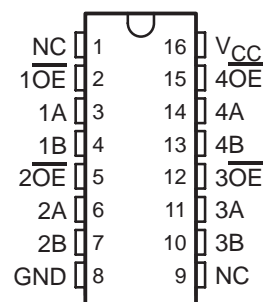
D, DB, DGV, OR PW PACKAGE  
(TOP VIEW)



RGY PACKAGE  
(TOP VIEW)



DBQ PACKAGE  
(TOP VIEW)



NC – No internal connection

## description/ordering information

The SN74CBT3125C 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 SN74CBT3125C 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 SN74CBT3125C is organized as four 1-bit bus switches with separate output-enable ( $\overline{1OE}$ ,  $\overline{2OE}$ ,  $\overline{3OE}$ ,  $\overline{4OE}$ ) inputs. It can be used as four 1-bit bus switches or as one 4-bit bus switch. When  $\overline{OE}$  is low, the associated 1-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 1-bit bus switch is OFF, and the high-impedance state exists between the A and B ports.

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.



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.

PRODUCTION DATA information is 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**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2003, Texas Instruments Incorporated

SN74CBT3125C  
QUADRUPLE FET BUS SWITCH  
5-V BUS SWITCH WITH –2-V UNDERSHOOT PROTECTION

SCDS122A – JULY 2003 – REVISED OCTOBER 2003

description/ordering information (continued)

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

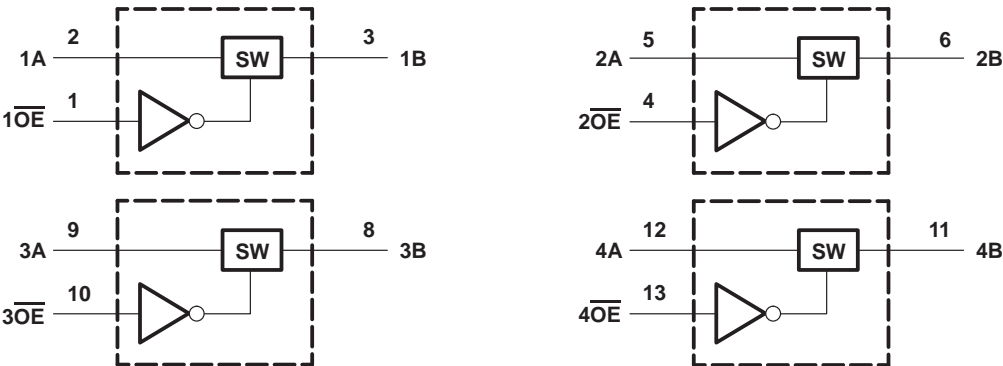
T <sub>A</sub>	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	QFN – RGY	Tape and reel	SN74CBT3125CRGYR	CU125C
	SOIC – D	Tube	SN74CBT3125CD	CBT3125C
		Tape and reel	SN74CBT3125CDR	
	SSOP – DB	Tube	SN74CBT3125CDB	CU125C
		Tape and reel	SN74CBT3125CDBR	
	SSOP (QSOP) – DBQ	Tape and reel	SN74CBT3125CDBQR	CU125C
	TSSOP – PW	Tube	SN74CBT3125CPW	CU125C
		Tape and reel	SN74CBT3125CPWR	
	TVSOP – DGV	Tape and reel	SN74CBT3125CDGVR	CU125C

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

FUNCTION TABLE  
(each bus switch)

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

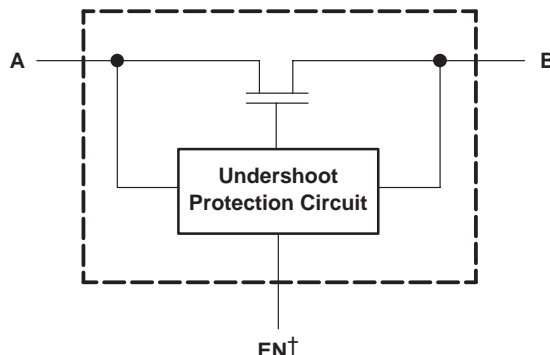
logic diagram (positive logic)



Pin numbers shown are for the D, DB, DGV, PW, and RGY packages.

**SN74CBT3125C**  
**QUADRUPLE FET BUS SWITCH**  
**5-V BUS SWITCH WITH –2-V UNDERSHOOT PROTECTION**  
SCDS122A – JULY 2003 – REVISED OCTOBER 2003

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)	±128 mA
Continuous current through $V_{CC}$ or GND terminals	±100 mA
Package thermal impedance, $\theta_{JA}$ (see Note 5): D package	86°C/W
(see Note 5): DB package	96°C/W
(see Note 5): DBQ package	90°C/W
(see Note 5): DGV package	127°C/W
(see Note 5): PW package	113°C/W
(see Note 6): RGY package	47°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
$V_{CC}$ Supply voltage	4	5.5	V
$V_{IH}$ High-level control input voltage	2	5.5	V
$V_{IL}$ Low-level control input voltage	0	0.8	V
$V_{I/O}$ Data input/output voltage	0	5.5	V
$T_A$ 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.

# SN74CBT3125C

## QUADRUPLE FET BUS SWITCH

### 5-V BUS SWITCH WITH -2-V UNDERSHOOT PROTECTION

SCDS122A – JULY 2003 – REVISED OCTOBER 2003

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
$V_{IK}$	Control inputs	$V_{CC} = 4.5\text{ V}$ ,	$I_{IN} = -18\text{ mA}$			-1.8	V
$V_{IKU}$	Data inputs	$V_{CC} = 5\text{ V}$ ,	$0\text{ mA} > I_I \geq -50\text{ mA}$ , $V_{IN} = V_{CC}$ or GND, Switch OFF			-2	V
$I_{IN}$	Control inputs	$V_{CC} = 5.5\text{ V}$ ,	$V_{IN} = V_{CC}$ or GND			$\pm 1$	$\mu\text{A}$
$I_{OZ}^\ddagger$		$V_{CC} = 5.5\text{ V}$ ,	$V_O = 0$ to $5.5\text{ V}$ , $V_I = 0$ , Switch OFF, $V_{IN} = V_{CC}$ or GND			$\pm 10$	$\mu\text{A}$
$I_{off}$		$V_{CC} = 0$ ,	$V_O = 0$ to $5.5\text{ V}$ , $V_I = 0$			10	$\mu\text{A}$
$I_{CC}$		$V_{CC} = 5.5\text{ V}$ ,	$I_{I/O} = 0$ , $V_{IN} = V_{CC}$ or GND, Switch ON or OFF			3	$\mu\text{A}$
$\Delta I_{CC}^\S$	Control inputs	$V_{CC} = 5.5\text{ V}$ ,	One input at $3.4\text{ V}$ , Other inputs at $V_{CC}$ or GND			2.5	mA
$C_{in}$	Control inputs	$V_{IN} = 3\text{ V}$ or 0			3		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
$r_{on}^\P$		$V_{CC} = 4\text{ V}$ , TYP at $V_{CC} = 4\text{ V}$	$V_I = 2.4\text{ V}$ , $I_O = -15\text{ mA}$		8	12	$\Omega$
		$V_{CC} = 4.5\text{ V}$	$V_I = 0$ , $I_O = 64\text{ mA}$		3	6	
			$I_O = 30\text{ mA}$		3	6	
			$V_I = 2.4\text{ V}$ , $I_O = -15\text{ mA}$		5	10	

$V_{IN}$  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  $V_{CC} = 5\text{ V}$  (unless otherwise noted),  $T_A = 25^\circ\text{C}$ .

‡ For I/O ports, the parameter  $I_{OZ}$  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.

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 4\text{ V}$		$V_{CC} = 5\text{ V} \pm 0.5\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	
$t_{pd}^\#$	A or B	B or A		0.24		0.15	ns
$t_{en}$	$\overline{OE}$	A or B		4.4	1.5	4	ns
$t_{dis}$	$\overline{OE}$	A or B		4.4	1.5	4.4	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).

**SN74CBT3125C**  
**QUADRUPLE FET BUS SWITCH**  
**5-V BUS SWITCH WITH -2-V UNDERSHOOT PROTECTION**  
 SCDS122A – JULY 2003 – REVISED OCTOBER 2003

undershoot characteristics (see Figures 1 and 2)

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
$V_{OUTU}$	$V_{CC} = 5.5 \text{ V}$ , 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),  $T_A = 25^\circ\text{C}$ .

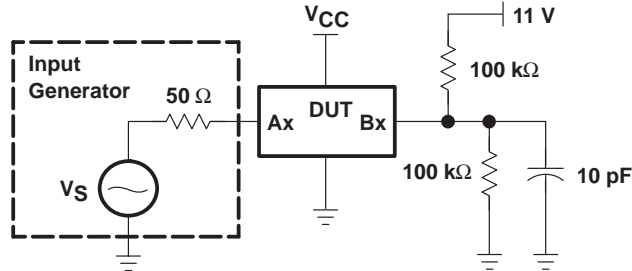


Figure 1. Device Test Setup



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

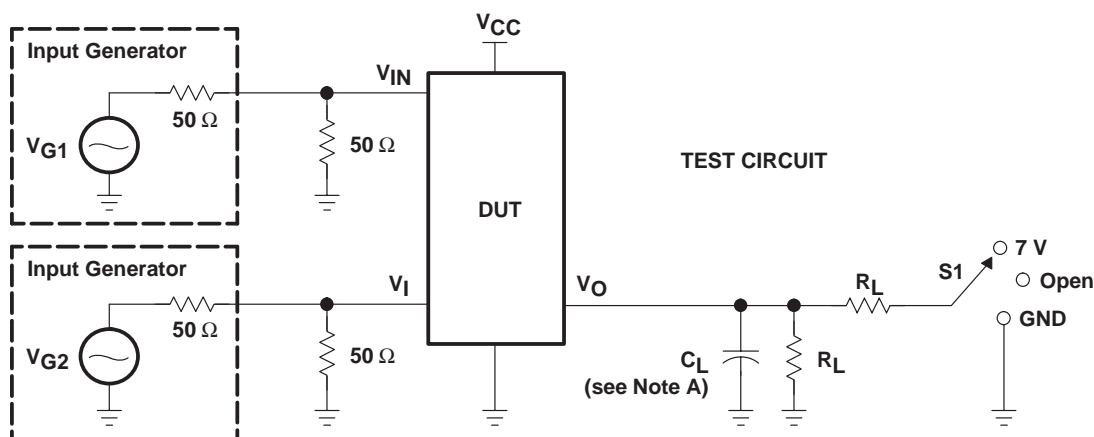
# SN74CBT3125C

## QUADRUPLE FET BUS SWITCH

### 5-V BUS SWITCH WITH -2-V UNDERSHOOT PROTECTION

SCDS122A – JULY 2003 – REVISED OCTOBER 2003

#### PARAMETER MEASUREMENT INFORMATION



TEST	V <sub>CC</sub>	S1	R <sub>L</sub>	V <sub>I</sub>	C <sub>L</sub>	V <sub>Δ</sub>
t <sub>pd</sub> (s)	5 V ± 0.5 V 4 V	Open Open	500 Ω 500 Ω	V <sub>CC</sub> or GND V <sub>CC</sub> or GND	50 pF 50 pF	
t <sub>PLZ</sub> /t <sub>PZL</sub>	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
t <sub>PHZ</sub> /t <sub>PZH</sub>	5 V ± 0.5 V 4 V	Open Open	500 Ω 500 Ω	V <sub>CC</sub> V <sub>CC</sub>	50 pF 50 pF	0.3 V 0.3 V



- NOTES:
- C<sub>L</sub> 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 ≤ 10 MHz, Z<sub>O</sub> = 50 Ω, t<sub>r</sub> ≤ 2.5 ns, t<sub>f</sub> ≤ 2.5 ns.
  - The outputs are measured one at a time with one transition per measurement.
  - t<sub>PLZ</sub> and t<sub>PHZ</sub> are the same as t<sub>dis</sub>.
  - t<sub>PZL</sub> and t<sub>PZH</sub> are the same as t<sub>en</sub>.
  - t<sub>PLH</sub> and t<sub>PHL</sub> are the same as t<sub>pd</sub>(s). The t<sub>pd</sub> 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 parameters and waveforms are not applicable to all devices.

Figure 3. Test Circuit and Voltage Waveforms

## PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">SN74CBT3125CD</a>	Active	Production	SOIC (D)   14	50   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBT3125C
SN74CBT3125CD.B	Active	Production	SOIC (D)   14	50   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBT3125C
<a href="#">SN74CBT3125CDBQR</a>	Active	Production	SSOP (DBQ)   16	2500   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CU125C
SN74CBT3125CDBQR.B	Active	Production	SSOP (DBQ)   16	2500   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CU125C
<a href="#">SN74CBT3125CDBR</a>	Active	Production	SSOP (DB)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
SN74CBT3125CDBR.B	Active	Production	SSOP (DB)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
SN74CBT3125CDBRG4	Active	Production	SSOP (DB)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
SN74CBT3125CDBRG4.B	Active	Production	SSOP (DB)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
SN74CBT3125CDE4	Active	Production	SOIC (D)   14	50   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBT3125C
<a href="#">SN74CBT3125CDR</a>	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBT3125C
SN74CBT3125CDR.B	Active	Production	SOIC (D)   14	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBT3125C
<a href="#">SN74CBT3125CPW</a>	Active	Production	TSSOP (PW)   14	90   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
SN74CBT3125CPW.B	Active	Production	TSSOP (PW)   14	90   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
SN74CBT3125CPWG4	Active	Production	TSSOP (PW)   14	90   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
SN74CBT3125CPWG4.B	Active	Production	TSSOP (PW)   14	90   TUBE	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
<a href="#">SN74CBT3125CPWR</a>	Active	Production	TSSOP (PW)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
SN74CBT3125CPWR.B	Active	Production	TSSOP (PW)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
SN74CBT3125CPWRE4	Active	Production	TSSOP (PW)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
SN74CBT3125CPWRG4	Active	Production	TSSOP (PW)   14	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CU125C
<a href="#">SN74CBT3125CRGYR</a>	Active	Production	VQFN (RGY)   14	3000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CU125C
SN74CBT3125CRGYR.B	Active	Production	VQFN (RGY)   14	3000   LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CU125C

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.



## TAPE AND REEL INFORMATION



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74CBT3125CDBQR	SSOP	DBQ	16	2500	330.0	12.5	6.4	5.2	2.1	8.0	12.0	Q1
SN74CBT3125CDBR	SSOP	DB	14	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74CBT3125CDBRG4	SSOP	DB	14	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74CBT3125CDR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74CBT3125CPWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74CBT3125CRGYR	VQFN	RGY	14	3000	330.0	12.4	3.75	3.75	1.15	8.0	12.0	Q1

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74CBT3125CDBQR	SSOP	DBQ	16	2500	353.0	353.0	32.0
SN74CBT3125CDBR	SSOP	DB	14	2000	353.0	353.0	32.0
SN74CBT3125CDBRG4	SSOP	DB	14	2000	353.0	353.0	32.0
SN74CBT3125CDR	SOIC	D	14	2500	353.0	353.0	32.0
SN74CBT3125CPWR	TSSOP	PW	14	2000	353.0	353.0	32.0
SN74CBT3125CRGYR	VQFN	RGY	14	3000	353.0	353.0	32.0

## TUBE



\*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74CBT3125CD	D	SOIC	14	50	507	8	3940	4.32
SN74CBT3125CD.B	D	SOIC	14	50	507	8	3940	4.32
SN74CBT3125CDE4	D	SOIC	14	50	507	8	3940	4.32
SN74CBT3125CPW	PW	TSSOP	14	90	530	10.2	3600	3.5
SN74CBT3125CPW.B	PW	TSSOP	14	90	530	10.2	3600	3.5
SN74CBT3125CPWG4	PW	TSSOP	14	90	530	10.2	3600	3.5
SN74CBT3125CPWG4.B	PW	TSSOP	14	90	530	10.2	3600	3.5

## GENERIC PACKAGE VIEW

**RGY 14**

**VQFN - 1 mm max height**

3.5 x 3.5, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

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





### VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



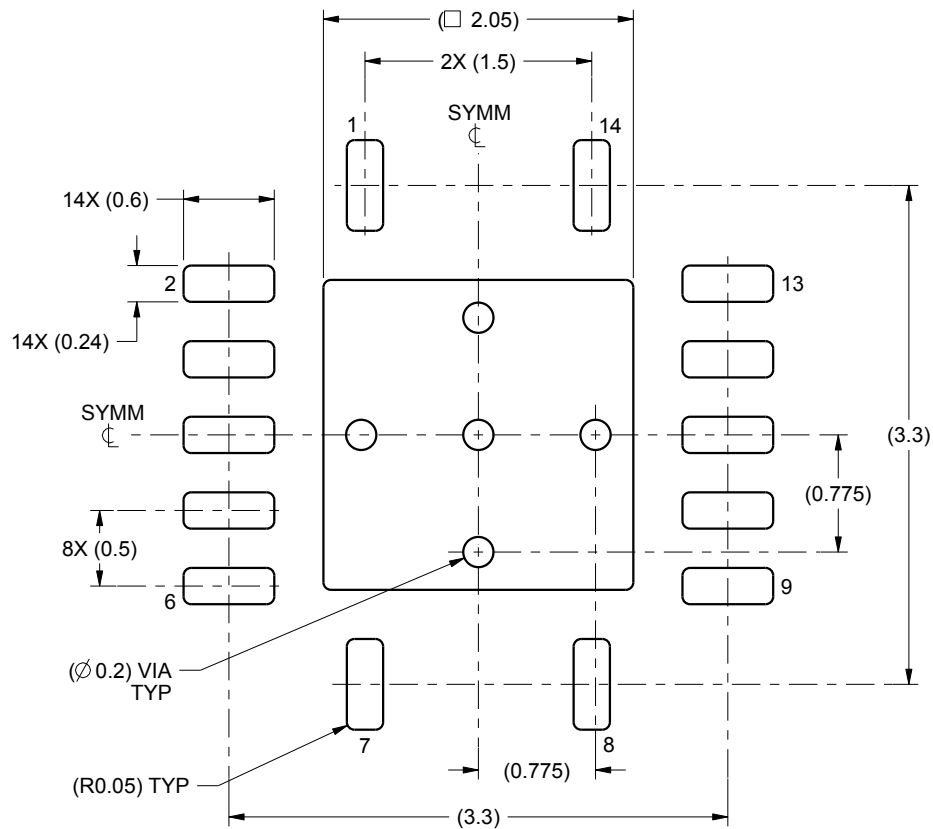
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

# EXAMPLE BOARD LAYOUT

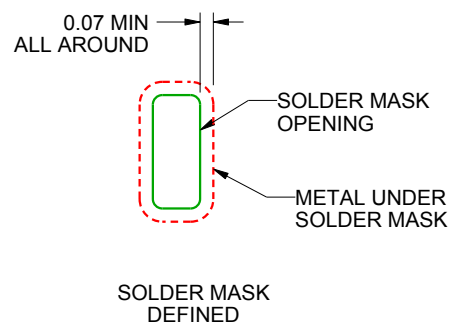
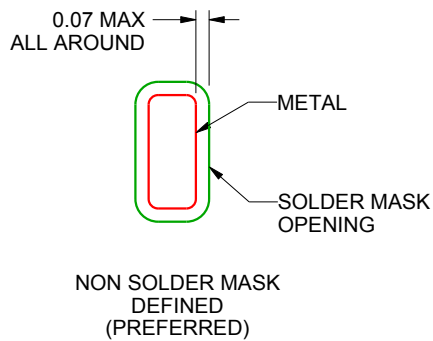
RGY0014A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE  
SCALE:20X



SOLDER MASK DETAILS

4219040/A 09/2015

NOTES: (continued)

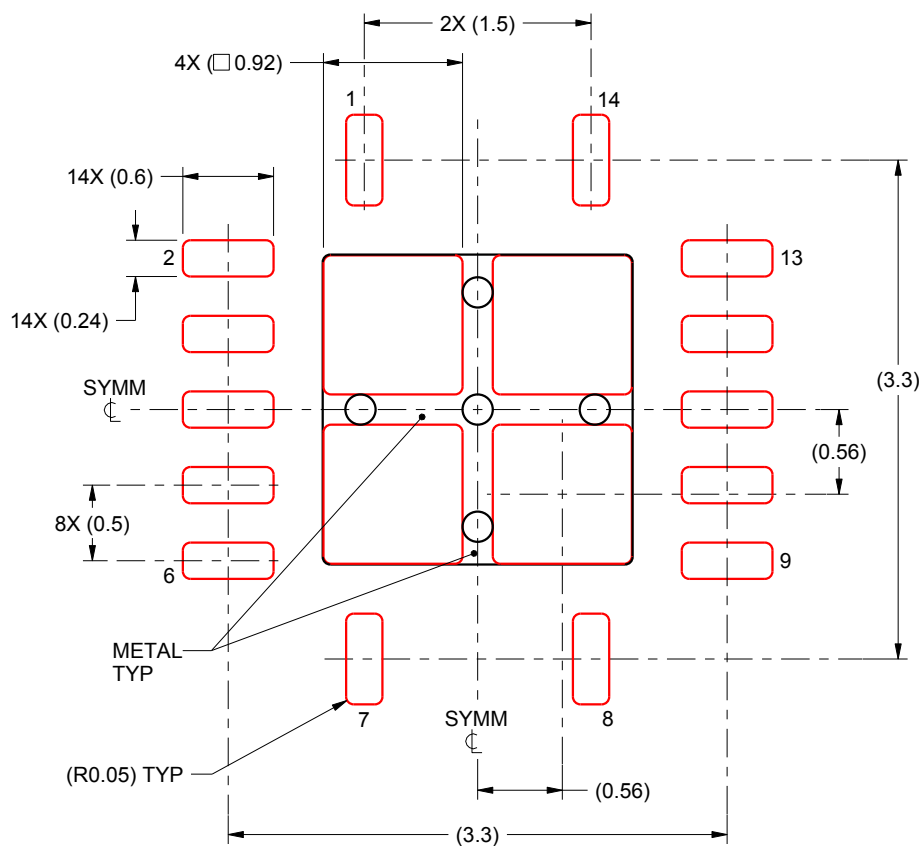
- This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slue271](http://www.ti.com/lit/slue271)).

## EXAMPLE STENCIL DESIGN

RGY0014A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



**SOLDER PASTE EXAMPLE**  
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD  
80% PRINTED SOLDER COVERAGE BY AREA  
SCALE:20X

4219040/A 09/2015

NOTES: (continued)

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

**D0014A****PACKAGE OUTLINE****SOIC - 1.75 mm max height**

SMALL OUTLINE INTEGRATED CIRCUIT



4220718/A 09/2016

**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-012, variation AB.



# EXAMPLE BOARD LAYOUT

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE  
SCALE:8X



SOLDER MASK DETAILS

4220718/A 09/2016

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.

## EXAMPLE STENCIL DESIGN

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:8X

4220718/A 09/2016

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.



4220762/A 05/2024

## 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. Reference JEDEC registration MO-150.

# EXAMPLE BOARD LAYOUT

DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4220762/A 05/2024

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220762/A 05/2024

NOTES: (continued)

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



**DBQ0016A**

# PACKAGE OUTLINE

**SSOP - 1.75 mm max height**

SHRINK SMALL-OUTLINE PACKAGE



4214846/A 03/2014

## NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. 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 .006 inch, per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MO-137, variation AB.

# EXAMPLE BOARD LAYOUT

DBQ0016A

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
SCALE:8X



SOLDER MASK DETAILS

4214846/A 03/2014

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

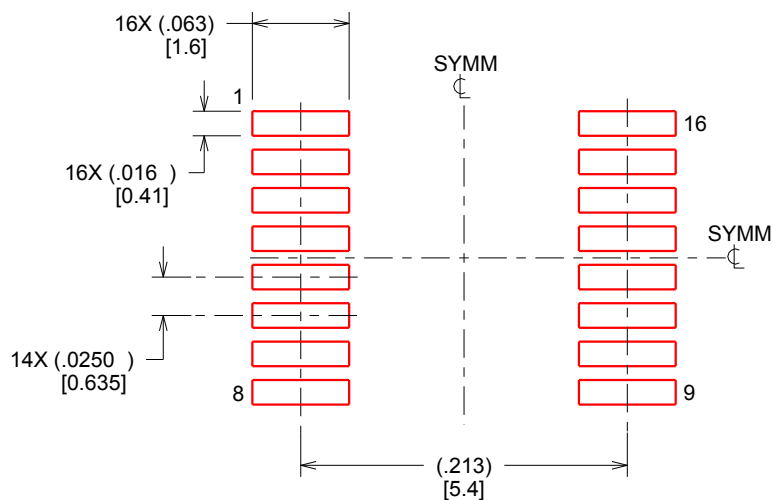
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DBQ0016A

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON .005 INCH [0.127 MM] THICK STENCIL  
SCALE:8X

4214846/A 03/2014

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.





4220202/B 12/2023

## 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.

# EXAMPLE BOARD LAYOUT

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4220202/B 12/2023

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.

# EXAMPLE STENCIL DESIGN

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE: 10X

4220202/B 12/2023

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.

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2025, Texas Instruments Incorporated