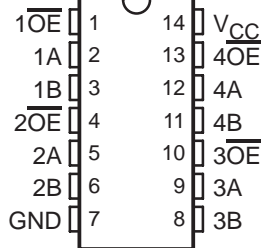


SN74CBTLV3125 LOW-VOLTAGE QUADRUPLE FET BUS SWITCH

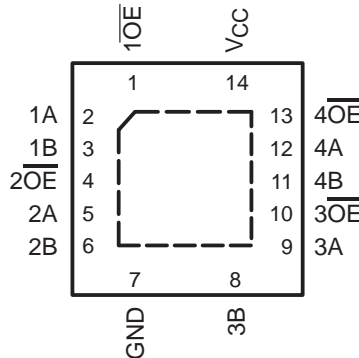
SCDS037J – DECEMBER 1997 – REVISED OCTOBER 2003

- Standard '125-Type Pinout
- 5- Ω Switch Connection Between Two Ports
- Rail-to-Rail Switching on Data I/O Ports
- I_{off} Supports Partial-Power-Down Mode Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II

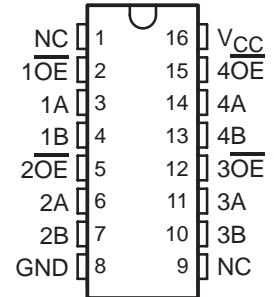
D, DGV, NS, OR PW PACKAGE
(TOP VIEW)



RGY PACKAGE
(TOP VIEW)



DBQ PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

The SN74CBTLV3125 quadruple FET bus switch features independent line switches. Each switch is disabled when the associated output-enable (\overline{OE}) input is high.

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

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	QFN – RGY	Tape and reel	SN74CBTLV3125RGYR	CL125
	SOIC – D	Tube	SN74CBTLV3125D	CBTLV3125
		Tape and reel	SN74CBTLV3125DR	
	SOP – NS	Tape and reel	SN74CBTLV3125NSR	CBTLV3125
	SSOP (QSOP) – DBQ	Tape and reel	SN74CBTLV3125DBQR	CL125
	TSSOP – PW	Tape and reel	SN74CBTLV3125PWR	CL125
	TVSOP – DGV	Tape and reel	SN74CBTLV3125DGV	CL125

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



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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**

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SN74CBTLV3125

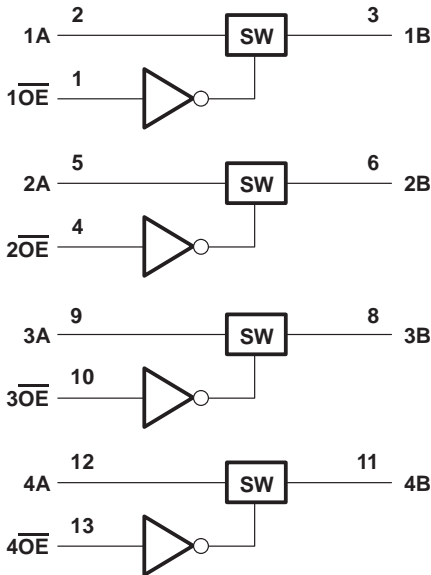
LOW-VOLTAGE QUADRUPLE FET BUS SWITCH

SCDS037J – DECEMBER 1997 – REVISED OCTOBER 2003

FUNCTION TABLE
(each bus switch)

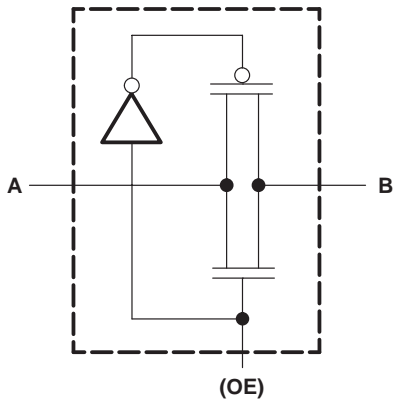
INPUT \overline{OE}	FUNCTION
L	A port = B port
H	Disconnect

logic diagram (positive logic)



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

simplified schematic, each FET switch



SN74CBTLV3125

LOW-VOLTAGE QUADRUPLE FET BUS SWITCH

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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, θ_{JA} (see Note 2): D package	86°C/W
(see Note 2): DBQ package	90°C/W
(see Note 2): DGV package	127°C/W
(see Note 2): NS package	76°C/W
(see Note 2): PW package	113°C/W
(see Note 3): 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. 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 51-7.
 3. The package thermal impedance is calculated in accordance with JESD 51-5.

recommended operating conditions (see Note 4)

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

NOTE 4: 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.



SN74CBTLV3125

LOW-VOLTAGE QUADRUPLE FET BUS SWITCH

SCDS037J – DECEMBER 1997 – REVISED OCTOBER 2003

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

PARAMETER		TEST CONDITIONS		MIN	TYP†	MAX	UNIT
V_{IK}		$V_{CC} = 3\text{ V}$,	$I_I = -18\text{ mA}$			-1.2	V
I_I		$V_{CC} = 3.6\text{ V}$,	$V_I = V_{CC}$ or GND			± 1	μA
I_{off}		$V_{CC} = 0$,	V_I or $V_O = 0$ to 3.6 V			10	μA
I_{CC}		$V_{CC} = 3.6\text{ V}$,	$I_O = 0$, $V_I = V_{CC}$ or GND			10	μA
ΔI_{CC}^\ddagger	Control inputs	$V_{CC} = 3.6\text{ V}$,	One input at 3 V , Other inputs at V_{CC} or GND			300	μA
C_i	Control inputs	$V_I = 3\text{ V}$ or 0				2.5	pF
$C_{io(OFF)}$		$V_O = 3\text{ V}$ or 0 , $\overline{OE} = V_{CC}$				7	pF
r_{on}^\S	$V_{CC} = 2.3\text{ V}$, TYP at $V_{CC} = 2.5\text{ V}$	$V_I = 0$	$I_I = 64\text{ mA}$			5	8
			$I_I = 24\text{ mA}$			5	8
		$V_I = 1.7\text{ V}$,	$I_I = 15\text{ mA}$			27	40
	$V_{CC} = 3\text{ V}$	$V_I = 0$	$I_I = 64\text{ mA}$			5	7
			$I_I = 24\text{ mA}$			5	7
		$V_I = 2.4\text{ V}$,	$I_I = 15\text{ mA}$			10	15

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

‡ 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.

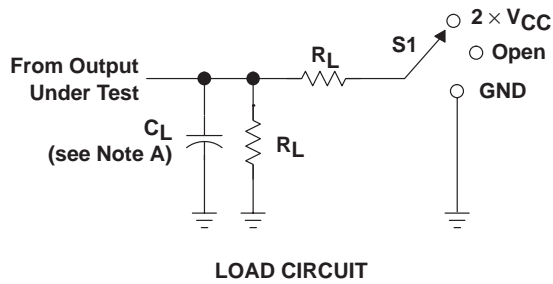
switching characteristics over recommended operating free-air temperature range (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$		$V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$		UNIT
			MIN	MAX	MIN	MAX	
t_{pd}^\P	A or B	B or A		0.15		0.25	ns
t_{en}	\overline{OE}	A or B	2	4.6	2	4.4	ns
t_{dis}	\overline{OE}	A or B	1.1	3.9	1	4.2	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).

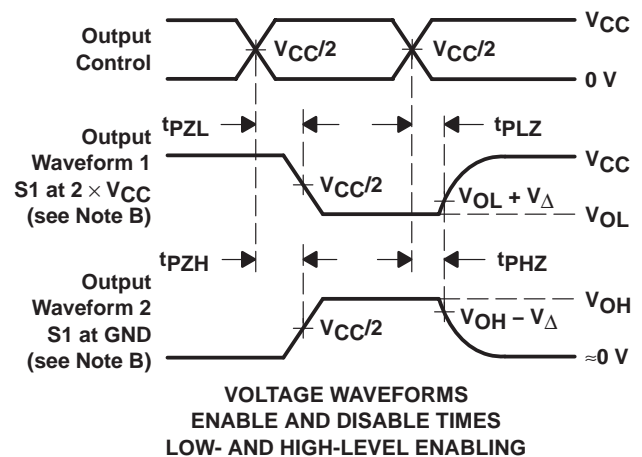
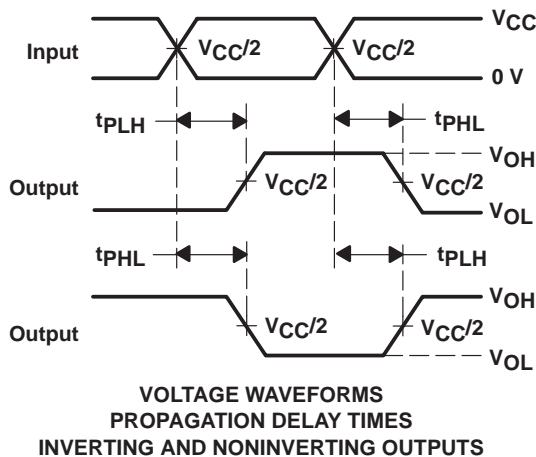
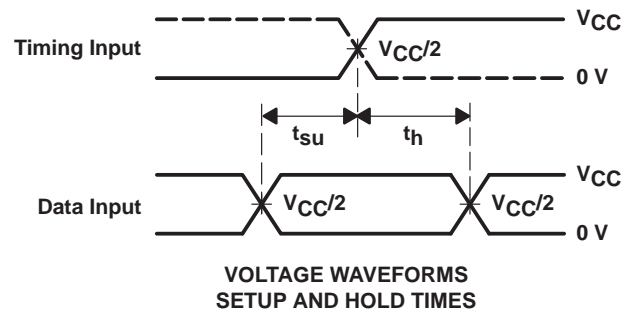
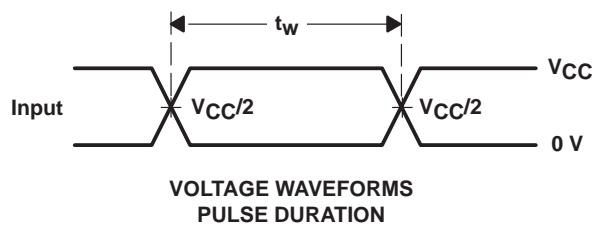


PARAMETER MEASUREMENT INFORMATION



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

V_{CC}	C_L	R_L	V_{Δ}
$2.5 \text{ V} \pm 0.2 \text{ V}$	30 pF	500 Ω	0.15 V
$3.3 \text{ V} \pm 0.3 \text{ V}$	50 pF	500 Ω	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: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r \leq 2 \text{ ns}$, $t_f \leq 2 \text{ ns}$.
 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} .
 H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load 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)
74CBTLV3125RGYRG4	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CL125
74CBTLV3125RGYRG4.A	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CL125
74CBTLV3125RGYRG4.B	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CL125
SN74CBTLV3125D	Obsolete	Production	SOIC (D) 14	-	-	Call TI	Call TI	-40 to 85	CBTLV3125
SN74CBTLV3125DBQR	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CL125
SN74CBTLV3125DBQR.A	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CL125
SN74CBTLV3125DBQR.B	Active	Production	SSOP (DBQ) 16	2500 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CL125
SN74CBTLV3125DGVR	Active	Production	TVSOP (DGV) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CL125
SN74CBTLV3125DGVR.B	Active	Production	TVSOP (DGV) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CL125
SN74CBTLV3125DR	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBTLV3125
SN74CBTLV3125DR.A	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBTLV3125
SN74CBTLV3125DR.B	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBTLV3125
SN74CBTLV3125DRG4	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBTLV3125
SN74CBTLV3125DRG4.A	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBTLV3125
SN74CBTLV3125DRG4.B	Active	Production	SOIC (D) 14	2500 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CBTLV3125
SN74CBTLV3125PW	Obsolete	Production	TSSOP (PW) 14	-	-	Call TI	Call TI	-40 to 85	CL125
SN74CBTLV3125PWR	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CL125
SN74CBTLV3125PWR.A	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CL125
SN74CBTLV3125PWR.B	Active	Production	TSSOP (PW) 14	2000 LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	CL125
SN74CBTLV3125RGYR	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CL125
SN74CBTLV3125RGYR.A	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CL125
SN74CBTLV3125RGYR.B	Active	Production	VQFN (RGY) 14	3000 LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	CL125

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

(2) **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.

(3) **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.

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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
74CBTLV3125RGYRG4	VQFN	RGY	14	3000	330.0	12.4	3.75	3.75	1.15	8.0	12.0	Q1
SN74CBTLV3125DBQR	SSOP	DBQ	16	2500	330.0	12.5	6.4	5.2	2.1	8.0	12.0	Q1
SN74CBTLV3125DGVR	TVSOP	DGV	14	2000	330.0	12.4	6.8	4.0	1.6	8.0	12.0	Q1
SN74CBTLV3125DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74CBTLV3125DRG4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74CBTLV3125PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74CBTLV3125RGYR	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)
74CBTLV3125RGYRG4	VQFN	RGY	14	3000	353.0	353.0	32.0
SN74CBTLV3125DBQR	SSOP	DBQ	16	2500	353.0	353.0	32.0
SN74CBTLV3125DGVR	TVSOP	DGV	14	2000	353.0	353.0	32.0
SN74CBTLV3125DR	SOIC	D	14	2500	353.0	353.0	32.0
SN74CBTLV3125DRG4	SOIC	D	14	2500	353.0	353.0	32.0
SN74CBTLV3125PWR	TSSOP	PW	14	2000	353.0	353.0	32.0
SN74CBTLV3125RGYR	VQFN	RGY	14	3000	353.0	353.0	32.0

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

SMALL OUTLINE INTEGRATED CIRCUIT



4220718/A 09/2016

NOTES:

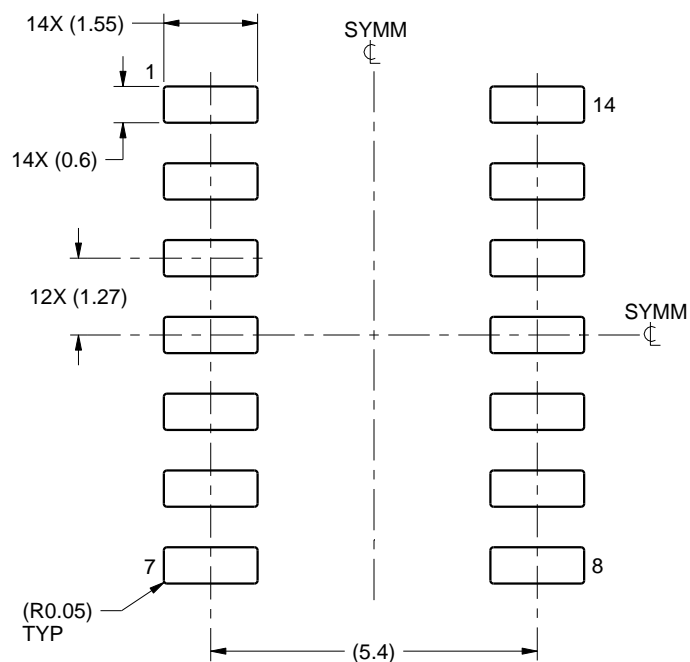
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate 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

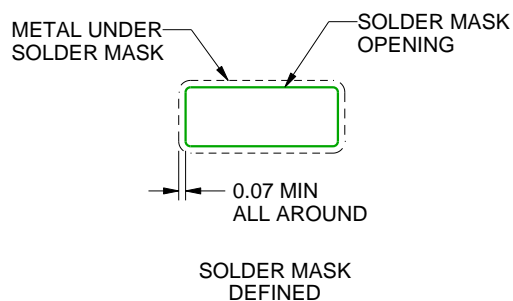
D0014A

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.

DGV (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



- 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



DBQ0016A

PACKAGE OUTLINE

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



4214846/A 03/2014

NOTES:

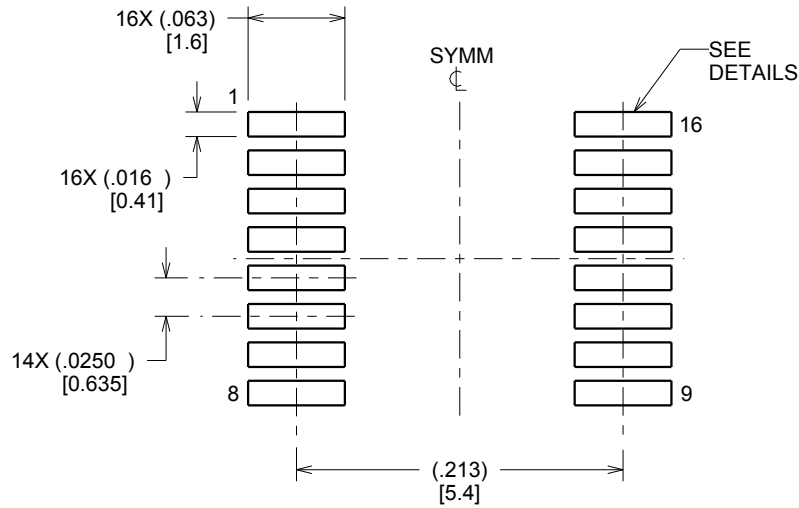
- Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 inch, per side.
- This dimension does not include interlead flash.
- Reference JEDEC registration MO-137, variation AB.

EXAMPLE BOARD LAYOUT

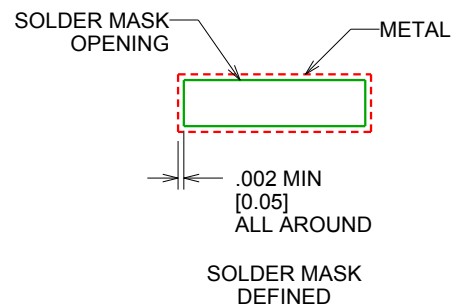
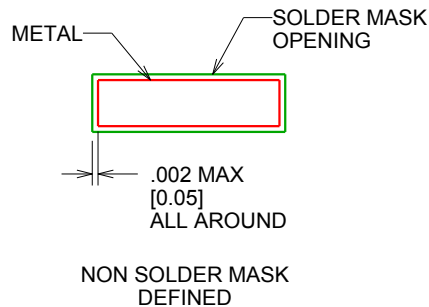
DBQ0016A

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.

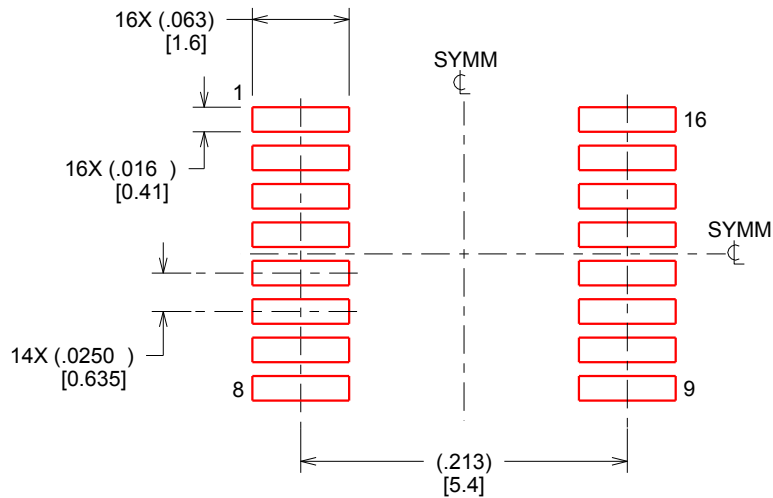
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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.

GENERIC PACKAGE VIEW

RGY 14

VQFN - 1 mm max height

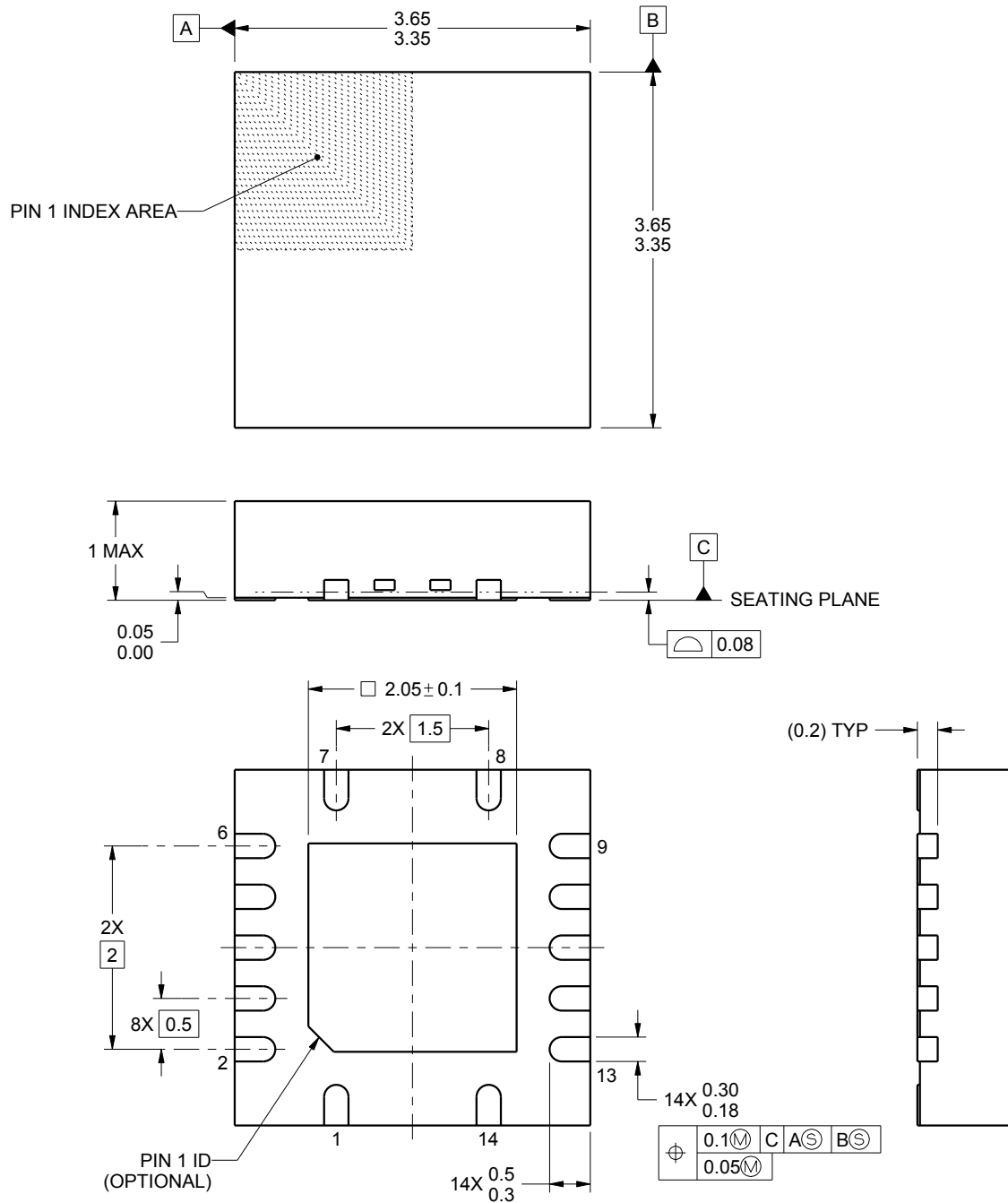
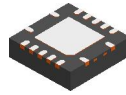
3.5 x 3.5, 0.5 mm pitch

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.



4231541/A



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NOTES:

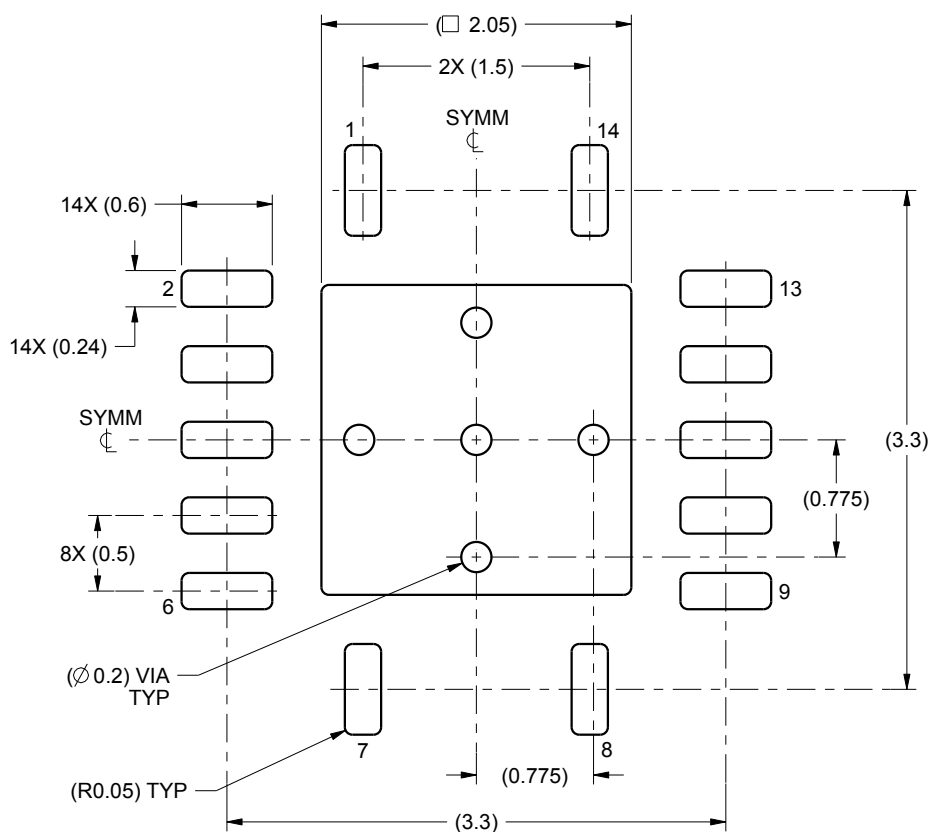
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

EXAMPLE BOARD LAYOUT

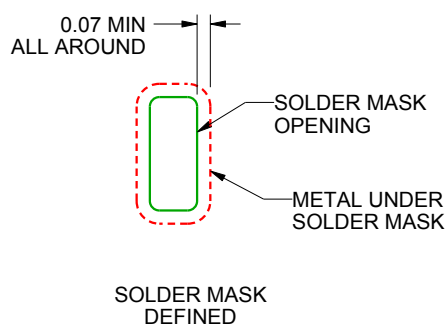
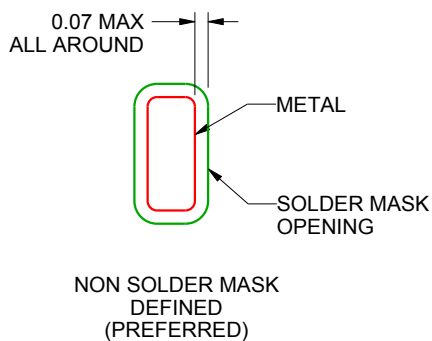
RGY0014A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE
SCALE:20X



SOLDER MASK DETAILS

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NOTES: (continued)

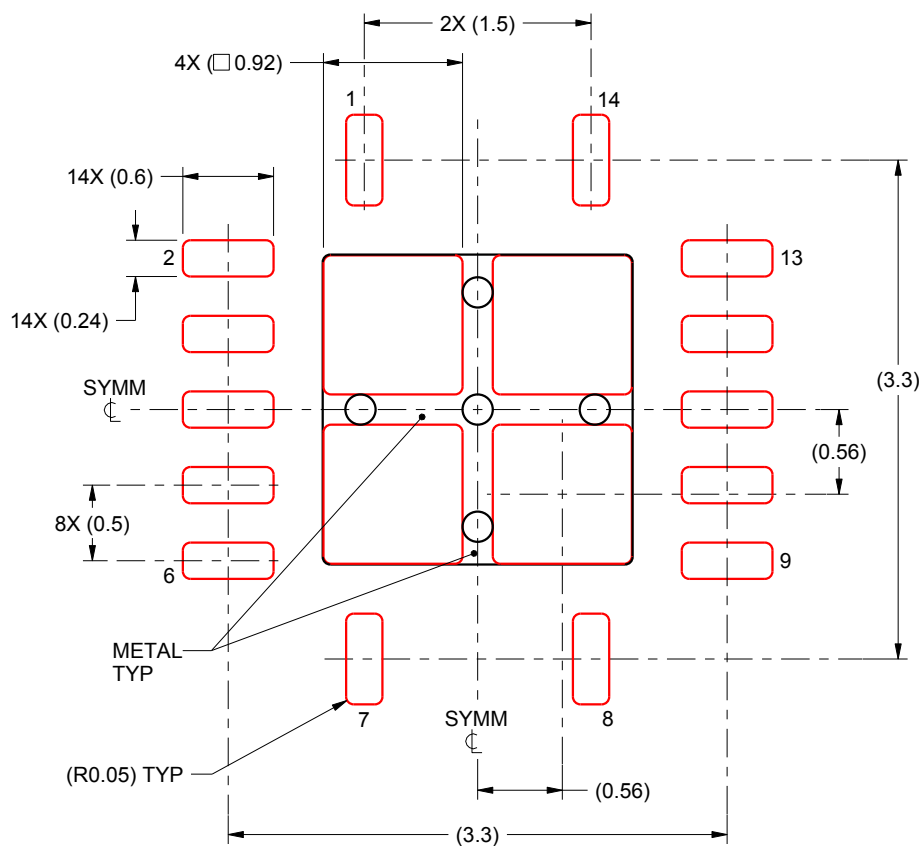
- This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slue271).

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

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NOTES: (continued)

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

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