



**THE DATASHEET OF  
SN74CBTLV3257RGYR**



## SN74CBTLV3257 Low-Voltage 4-Bit 1-of-2 FET Multiplexer/Demultiplexer

### 1 Features

- 5- $\Omega$  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
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)

### 2 Applications

- Internet of Things
- Wireless Headphones
- Television Set
- 4-Bit Bus Multiplexing and Demultiplexing

### 3 Description

The SN74CBTLV3257 device is a 4-bit 1-of-2 high-speed FET multiplexer/demultiplexer. The low on-state resistance of the switch allows connections to be made with minimal propagation delay.

The select (S) input controls the data flow. The FET multiplexers/demultiplexers are disabled when the 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.

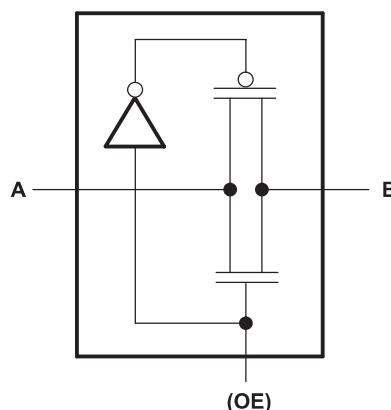
To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

#### Device Information<sup>(1)</sup>

| PART NUMBER      | PACKAGE    | BODY SIZE (NOM)   |
|------------------|------------|-------------------|
| SN74CBTLV3257DBQ | SSOP (16)  | 4.90 mm x 3.90 mm |
| SN74CBTLV3257PW  | TSSOP (16) | 5.00 mm x 4.40 mm |
| SN74CBTLV3257DGV | TVSOP (16) | 3.60 mm x 4.40 mm |
| SN74CBTLV3257D   | SOIC (16)  | 9.90 mm x 3.91 mm |
| SN74CBTLV3257RGY | VQFN (16)  | 4.00 mm x 3.50 mm |
| SN74CBTLV3257RSV | UQFN (16)  | 2.60 mm x 1.80 mm |

(1) For all available packages, see the orderable addendum at the end of the datasheet.

#### Simplified Schematic (Each FET Switch)



## Table of Contents

|   |   |
|---|---|
| <b>1 Features</b> ..... 1<br><b>2 Applications</b> ..... 1<br><b>3 Description</b> ..... 1<br><b>4 Revision History</b> ..... 2<br><b>5 Pin Configuration and Functions</b> ..... 3<br><b>6 Specifications</b> ..... 5<br>6.1 Absolute Maximum Ratings ..... 5<br>6.2 ESD Ratings ..... 5<br>6.3 Recommended Operating Conditions ..... 5<br>6.4 Thermal Information ..... 5<br>6.5 Electrical Characteristics ..... 6<br>6.6 Switching Characteristics ..... 6<br><b>7 Parameter Measurement Information</b> ..... 7<br><b>8 Detailed Description</b> ..... 8<br>8.1 Overview ..... 8<br>8.2 Functional Block Diagram ..... 8<br>8.3 Feature Description ..... 8 | 8.4 Device Functional Modes ..... 8<br><b>9 Application and Implementation</b> ..... 9<br>9.1 Application Information ..... 9<br>9.2 Typical Application ..... 9<br><b>10 Power Supply Recommendations</b> ..... 10<br><b>11 Layout</b> ..... 11<br>11.1 Layout Guidelines ..... 11<br>11.2 Layout Example ..... 11<br><b>12 Device and Documentation Support</b> ..... 12<br>12.1 Documentation Support ..... 12<br>12.2 Receiving Notification of Documentation Updates ..... 12<br>12.3 Community Resources ..... 12<br>12.4 Trademarks ..... 12<br>12.5 Electrostatic Discharge Caution ..... 12<br>12.6 Glossary ..... 12<br><b>13 Mechanical, Packaging, and Orderable Information</b> ..... 12 |
|---|---|

## 4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| Changes from Revision L (October 2016) to Revision M | Page |
|--|------|
| • Changed the pin images appearance .....            | 3    |
| • Changed the <i>Thermal Information</i> table ..... | 5    |

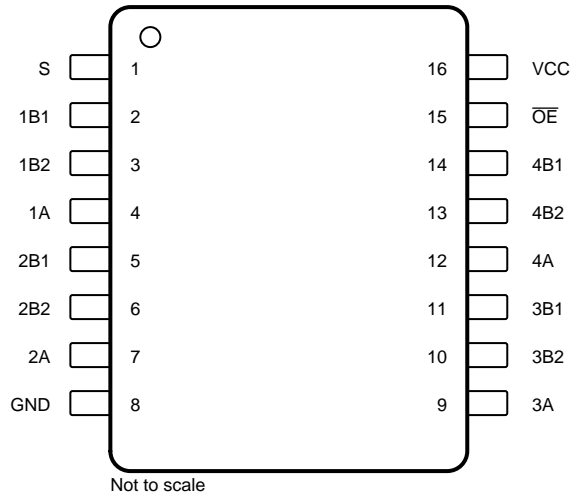
| Changes from Revision K (April 2015) to Revision L  | Page |
|---|------|
| • Added TSSOP (16) to <i>Device Information</i> table.....  | 1    |
| • Added Junction temperature, $T_J$ in <i>Absolute Maximum Ratings</i> .....  | 5    |
| • Changed wording in <i>Detailed Design Procedure</i> to clarify device operation .....                             | 10   |
| • Added <i>Receiving Notification of Documentation Updates</i> section and <i>Community Resources</i> section ..... | 12   |

| Changes from Revision J (December 2012) to Revision K  | Page |
|--|------|
| • Removed <i>Ordering Information</i> table, see <a href="#">Mechanical, Packaging, and Orderable Information</a> .....  | 1    |
| • Added <i>Pin Configuration and Functions</i> section, <i>ESD Ratings</i> table, <i>Feature Description</i> section, <i>Device Functional Modes</i> , <i>Application and Implementation</i> section, <i>Power Supply Recommendations</i> section, <i>Layout</i> section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section ..... | 1    |
| • Added <i>Applications</i> .....  | 1    |
| • Added <i>Device Information</i> table. ....  | 1    |

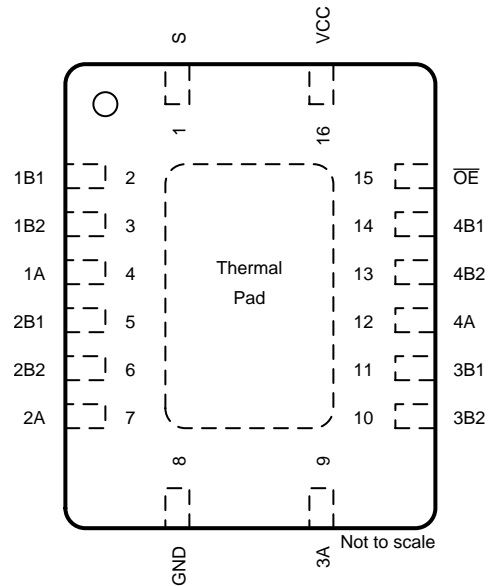
| Changes from Revision I (October 2003) to Revision J | Page |
|--|------|
| • Added QFN ordering info and package pinout .....   | 1    |

## 5 Pin Configuration and Functions

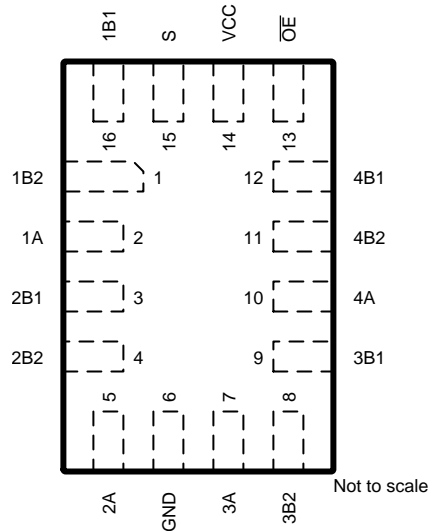
**D, DBQ, DGV, and PW Package  
16-Pin SOIC, SSOP, TVSOP, and TSSOP  
(Top View)**



**RGY Package  
16-Pin VQFN  
(Top View)**



**RSV Package  
16-Pin UQFN  
(Top View)**



**Pin Functions**

| NAME            | PIN                            |      | I/O | DESCRIPTION               |
|-----------------|--------------------------------|------|-----|---------------------------|
|                 | SOIC, SSOP, TVSOP, TSSOP, VQFN | UQFN |     |                           |
| 1A              | 4                              | 2    | I/O | Channel 1 out/in common   |
| 1B1             | 2                              | 16   | I/O | Channel 1 in/out 1        |
| 1B2             | 3                              | 1    | I/O | Channel 1 in/out 2        |
| 2A              | 7                              | 5    | I/O | Channel 2 out/in common   |
| 2B1             | 5                              | 3    | I/O | Channel 2 in/out 1        |
| 2B2             | 6                              | 4    | I/O | Channel 2 in/out 2        |
| 3A              | 9                              | 7    | I/O | Channel 3 out/in common   |
| 3B1             | 11                             | 9    | I/O | Channel 3 in/out 1        |
| 3B2             | 10                             | 8    | I/O | Channel 3 in/out 2        |
| 4A              | 12                             | 10   | I/O | Channel 4 out/in common   |
| 4B1             | 14                             | 12   | I/O | Channel 4 in/out 1        |
| 4B2             | 13                             | 11   | I/O | Channel 4 in/out 2        |
| GND             | 8                              | 6    | —   | Ground                    |
| $\overline{OE}$ | 15                             | 13   | I   | Output Enable, active low |
| S               | 1                              | 15   | I   | Select                    |
| V <sub>CC</sub> | 16                             | 14   | —   | Power                     |

## 6 Specifications

### 6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

|                  |                              | MIN                  | MAX | UNIT |
|------------------|------------------------------|----------------------|-----|------|
| V <sub>CC</sub>  | Supply voltage               | -0.5                 | 4.6 | V    |
| V <sub>I</sub>   | Input voltage <sup>(2)</sup> | -0.5                 | 4.6 | V    |
|                  | Continuous channel current   |                      | 128 | mA   |
| I <sub>IK</sub>  | Input clamp current          | V <sub>I/O</sub> < 0 | -50 | mA   |
| T <sub>J</sub>   | Junction temperature         |                      | 150 | °C   |
| T <sub>stg</sub> | Storage temperature          | -65                  | 150 | °C   |

- (1) 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.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

### 6.2 ESD Ratings

|                    |                         | VALUE   | UNIT   |
|--------------------|-------------------------|---|--------|
| V <sub>(ESD)</sub> | Electrostatic discharge | Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup> | 2000 V |

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

### 6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

|                 |                                  | MIN                              | MAX | UNIT |
|-----------------|----------------------------------|----------------------------------|-----|------|
| V <sub>CC</sub> | Supply voltage                   | 2.3                              | 3.6 | V    |
| V <sub>IH</sub> | High-level control input voltage | V <sub>CC</sub> = 2.3 V to 2.7 V | 1.7 | V    |
|                 |                                  | V <sub>CC</sub> = 2.7 V to 3.6 V | 2   |      |
| V <sub>IL</sub> | Low-level control input voltage  | V <sub>CC</sub> = 2.3 V to 2.7 V | 0.7 | V    |
|                 |                                  | V <sub>CC</sub> = 2.7 V to 3.6 V | 0.8 |      |
| T <sub>A</sub>  | Operating free-air temperature   | -40                              | 85  | °C   |

- (1) All unused control inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. See [Implications of Slow or Floating CMOS Inputs](#) SCBA004.

### 6.4 Thermal Information

| THERMAL METRIC <sup>(1)</sup> | SN74CBTLV3257                                |         |         |         |         | UNIT |      |
|-------------------------------|--|---------|---------|---------|---------|------|------|
|                               | D  | DBQ     | DGV     | PW      | RGY     |      |      |
|                               | 16 PINS                                      | 16 PINS | 16 PINS | 16 PINS | 16 PINS |      |      |
| R <sub>θJA</sub>              | Junction-to-ambient thermal resistance       | 86.7    | 112.4   | 123.1   | 110.9   | 43.8 | °C/W |
| R <sub>θJC(top)</sub>         | Junction-to-case (top) thermal resistance    | 47.8    | 63.6    | 48.7    | 45.8    | 57.2 | °C/W |
| R <sub>θJB</sub>              | Junction-to-board thermal resistance         | 43.7    | 54.8    | 54.9    | 56.0    | 21.4 | °C/W |
| ψ <sub>JT</sub>               | Junction-to-top characterization parameter   | 12.3    | 17.0    | 5.2     | 5.4     | 1.7  | °C/W |
| ψ <sub>JB</sub>               | Junction to board characterization parameter | 43.5    | 54.4    | 54.3    | 55.4    | 21.5 | °C/W |
| R <sub>θJC(botto<br/>m</sub>  | Junction-to-case (bottom) thermal resistance | -       | -       | -       | -       | 9.7  | °C/W |

- (1) For more information about traditional and new thermal metrics, see the [Semiconductor and IC Package Thermal Metrics](#) application report.

## 6.5 Electrical Characteristics

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

| PARAMETER                      |   | TEST CONDITIONS  |                      |                      | MIN                       | TYP <sup>(1)</sup> | MAX      | UNIT          |
|--------------------------------|---|--|----------------------|----------------------|---------------------------|--------------------|----------|---------------|
| $V_{IK}$                       |   | $V_{CC} = 3\text{ V}$ ,<br>$I_I = -18\text{ mA}$   |                      |                      |                           |                    | -1.2     | V             |
| $I_I$                          |   | $V_{CC} = 3.6\text{ V}$ ,<br>$V_I = V_{CC}$ or GND   |                      |                      |                           |                    | $\pm 1$  | $\mu\text{A}$ |
| $I_{off}$                      |   | $V_{CC} = 0$ ,<br>$V_I$ or $V_O = 0$ to $3.6\text{ V}$   |                      |                      |                           |                    | 15       | $\mu\text{A}$ |
| $I_{CC}$                       |   | $V_{CC} = 3.6\text{ V}$ ,<br>$I_O = 0$ ,<br>$V_I = V_{CC}$ or GND                              |                      |                      |                           |                    | 10       | $\mu\text{A}$ |
| $\Delta I_{CC}$ <sup>(2)</sup> | Control inputs  | $V_{CC} = 3.6\text{ V}$ ,<br>One input at $3\text{ V}$ ,<br>Other inputs at $V_{CC}$<br>or GND |                      |                      |                           |                    | 300      | $\mu\text{A}$ |
| $C_i$                          |   |  |                      |                      | $V_I = 3\text{ V}$ or $0$ |                    |          | 3             |
| $C_{io(OFF)}$                  | A port  | $V_O = 3\text{ V}$ or $0$ ,<br>$\overline{OE} = V_{CC}$  |                      |                      |                           |                    | 10.5     | $\mu\text{F}$ |
|                                | B port  |  |                      |                      |                           |                    | 5.5      |               |
| $r_{on}$ <sup>(3)</sup>        | $V_{CC} = 2.3\text{ V}$ ,<br>TYP at $V_{CC} = 2.5\text{ V}$ |  | $V_I = 0$            | $I_I = 64\text{ mA}$ | 5                         | 8                  | $\Omega$ |               |
|                                |   |  |                      | $I_I = 24\text{ mA}$ | 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                 |          |               |

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

 (2) This is the increase in supply current for each input that is at the specified voltage level, rather than  $V_{CC}$  or GND.

(3) Measured by the voltage drop between the A and the 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.

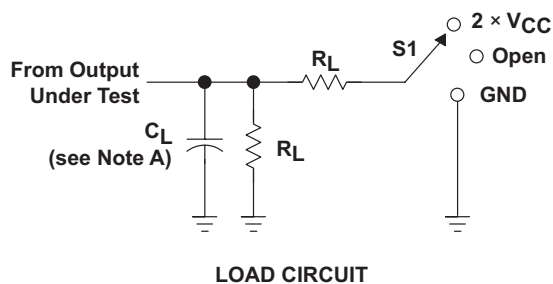
## 6.6 Switching Characteristics

 over recommended operating free-air temperature range (unless otherwise noted) (See [Figure 1](#))

| PARAMETER | FROM (INPUT)          | TO (OUTPUT) | $V_{CC} = 2.5 \pm 0.2\text{ V}$ |     | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ |     | UNIT |
|-----------|-----------------------|-------------|---------------------------------|-----|--|-----|------|
|           |                       |             | MIN                             | MAX | MIN                                      | MAX |      |
| $t_{pd}$  | A or B <sup>(1)</sup> | B or A      | 0.15                            |     | 0.25                                     |     | ns   |
|           | S                     | A or B      | 1.8                             | 6.1 | 1.8                                      | 5.3 |      |
| $t_{en}$  | S                     | A or B      | 1.7                             | 6.1 | 1.7                                      | 5.3 | ns   |
| $t_{dis}$ | S                     | A or B      | 1                               | 4.8 | 1  | 4.5 | ns   |
| $t_{en}$  | $\overline{OE}$       | A or B      | 1.9                             | 5.6 | 2  | 5   | ns   |
| $t_{dis}$ | $\overline{OE}$       | A or B      | 1                               | 5.5 | 1.6                                      | 5.5 | ns   |

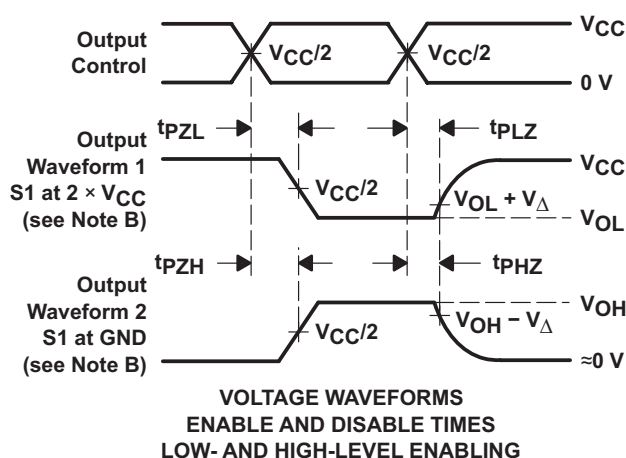
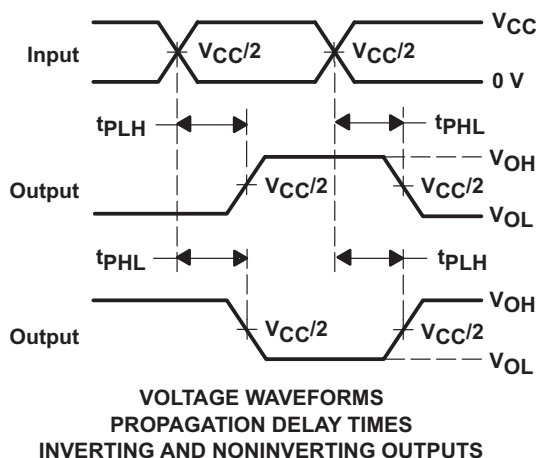
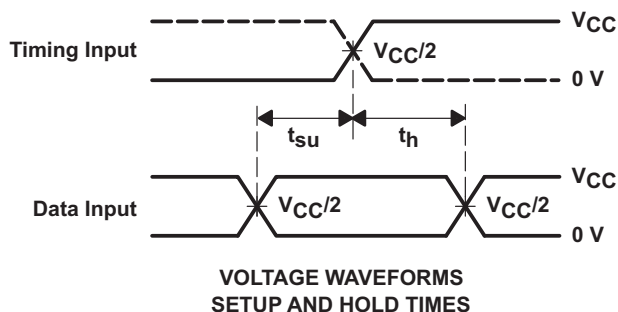
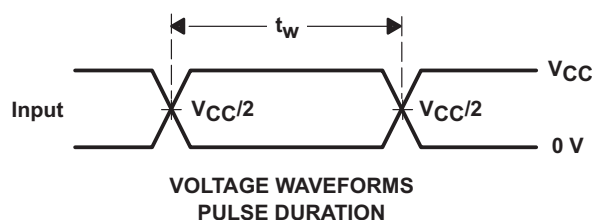
(1) The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

## 7 Parameter Measurement Information



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

| $V_{CC}$                        | $C_L$ | $R_L$        | $V_{\Delta}$ |
|---------------------------------|-------|--------------|--------------|
| $2.5\text{ V} \pm 0.2\text{ V}$ | 30 pF | 500 $\Omega$ | 0.15 V       |
| $3.3\text{ V} \pm 0.3\text{ V}$ | 50 pF | 500 $\Omega$ | 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**

## 8 Detailed Description

### 8.1 Overview

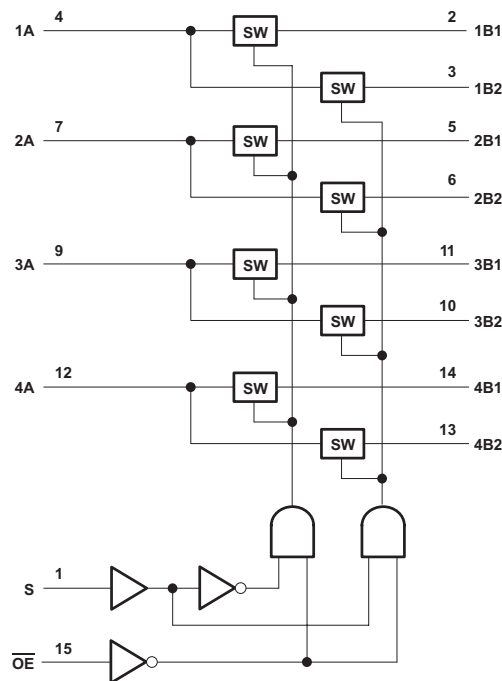
The SN74CBTLV3257 device is a 4-bit 1-of-2 high-speed FET multiplexer and demultiplexer. The low ON-state resistance of the switch allows connections to be made with minimal propagation delay.

The select (S) input controls the data flow. The FET multiplexers and demultiplexers are disabled when the 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.

### 8.2 Functional Block Diagram



### 8.3 Feature Description

The SN74CBTLV3257 features 5- $\Omega$  switch connection between ports, allowing for low signal loss across the switch. Rail-to-rail switching on data I/O allows for full voltage swing outputs.  $I_{off}$  supports partial-power-down mode operation, protecting the chip from voltages at output ports when it is not powered on. Latch-up performance exceeds 100 mA per JESD 78, Class II.

### 8.4 Device Functional Modes

Table 1 shows the functional modes of SN74CBTLV3257.

Table 1. Function Table

| INPUTS          |   | FUNCTION         |
|-----------------|---|------------------|
| $\overline{OE}$ | S |                  |
| L               | L | A port = B1 port |
| L               | H | A port = B2 port |
| H               | X | Disconnect       |

## 9 Application and Implementation

### NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

### 9.1 Application Information

The SN74CBTLV3257 can be used to multiplex and demultiplex up to 4 channels simultaneously in a 2:1 configuration. The application shown here is a 4-bit bus being multiplexed between two devices. The  $\overline{OE}$  and S pins are used to control the chip from the bus controller. This is a very generic example, and could apply to many situations. If an application requires less than 4 bits, be sure to tie the A side to either high or low on unused channels.

### 9.2 Typical Application

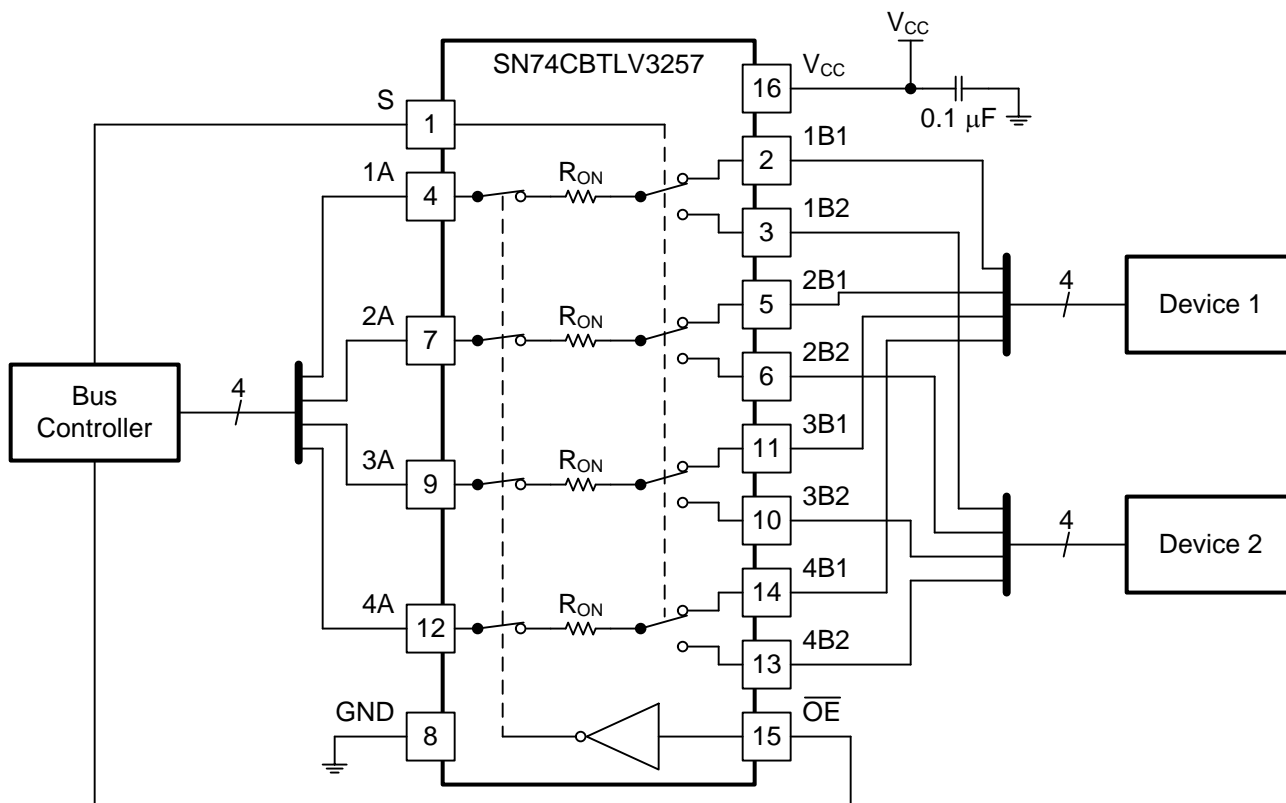


Figure 2. Typical Application of the SN74CBTLV3257

#### 9.2.1 Design Requirements

1. Recommended Input Conditions:
  - For specified high and low levels, see  $V_{IH}$  and  $V_{IL}$  in [Recommended Operating Conditions](#).
  - Inputs and outputs are overvoltage tolerant allowing them to go as high as 4.6 V at any valid  $V_{CC}$ .
2. Recommended Output Conditions:
  - Load currents should not exceed  $\pm 128$  mA per channel.
3. Frequency Selection Criterion:
  - Maximum frequency tested is 200 MHz.

## Typical Application (continued)

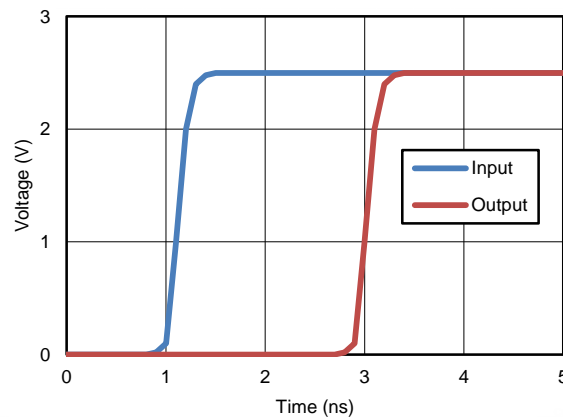
- Added trace resistance/capacitance can reduce maximum frequency capability; use layout practices as directed in [Layout](#).

### 9.2.2 Detailed Design Procedure

The 4-bit bus is connected directly to the 1A, 2A, 3A, and 4A ports (known as the xA port) on the SN74CBTLV3257, which essentially splits it into two busses, coming out of the xB1 and xB2 ports. When S is high, xB2 is the active bus, and when S is low, xB1 is the active bus. This means that Device 2 is connected to the bus controller when S is high, and Device 1 is connected to the bus controller when S is low. This setup is especially useful when two devices are hard coded with the same address and only one bus is available. The  $\overline{OE}$  connection can be used to disconnect all devices from the bus controller if necessary.

The 0.1- $\mu\text{F}$  capacitor on  $V_{CC}$  is a decoupling capacitor and should be placed as close as possible to the device.

### 9.2.3 Application Curve



**Figure 3. Propagation Delay ( $t_{pd}$ ) Simulation Result at  $V_{CC} = 2.5 \text{ V}$**

## 10 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating listed in the [Recommended Operating Conditions](#) table.

Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1- $\mu\text{F}$  bypass capacitor is recommended. If multiple pins are labeled  $V_{CC}$ , then a 0.01- $\mu\text{F}$  or 0.022- $\mu\text{F}$  capacitor is recommended for each  $V_{CC}$  because the  $V_{CC}$  pins are tied together internally. For devices with dual-supply pins operating at different voltages, for example  $V_{CC}$  and  $V_{DD}$ , a 0.1- $\mu\text{F}$  bypass capacitor is recommended for each supply pin. To reject different frequencies of noise, use multiple bypass capacitors in parallel. Capacitors with values of 0.1  $\mu\text{F}$  and 1  $\mu\text{F}$  are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

## 11 Layout

### 11.1 Layout Guidelines

Reflections and matching are closely related to the loop antenna theory but are different enough to be discussed separately from the theory. When a PCB trace turns a corner at a 90° angle, a reflection can occur. A reflection occurs primarily because of the change of width of the trace. At the apex of the turn, the trace width increases to 1.414 times the width. This increase upsets the transmission-line characteristics, especially the distributed capacitance and self-inductance of the trace which results in the reflection. Not all PCB traces can be straight and therefore some traces must turn corners. [Figure 4](#) shows progressively better techniques of rounding corners. Only the last example (BEST) maintains constant trace width and minimizes reflections.

### 11.2 Layout Example

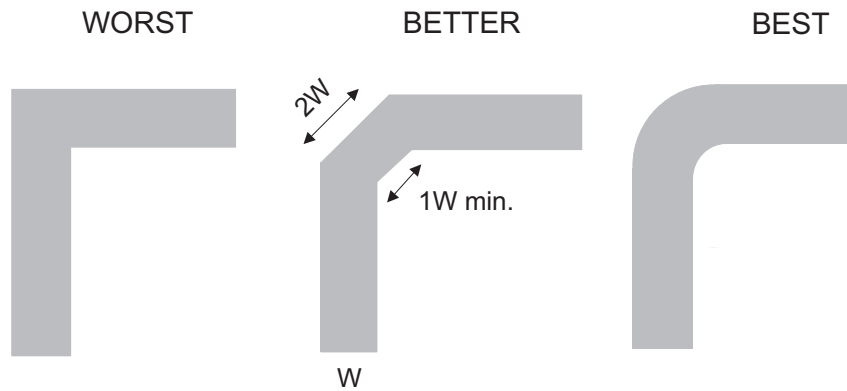


Figure 4. Trace Example

## 12 Device and Documentation Support

### 12.1 Documentation Support

#### 12.1.1 Related Documentation

For related documentation see the following:

- [Implications of Slow or Floating CMOS Inputs](#), SCBA004
- [Selecting the Right Texas Instruments Signal Switch](#), SZZA030

### 12.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 12.3 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

**TI E2E™ Online Community** *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

**Design Support** *TI's Design Support* Quickly find helpful E2E forums along with design support tools and contact information for technical support.

### 12.4 Trademarks

E2E is a trademark of Texas Instruments.

All other trademarks are the property of their respective owners.

### 12.5 Electrostatic Discharge Caution



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

### 12.6 Glossary

[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

## 13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

**PACKAGING INFORMATION**

| Orderable Device  | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2)         | Lead/Ball Finish<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|-------------------|---------------|--------------|-----------------|------|-------------|-------------------------|-------------------------|----------------------|--------------|-------------------------|-------------------------|
| 74CBTLV3257PWRE4  | ACTIVE        | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CL257                   | <a href="#">Samples</a> |
| 74CBTLV3257PWRG4  | ACTIVE        | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CL257                   | <a href="#">Samples</a> |
| 74CBTLV3257RGYRG4 | ACTIVE        | VQFN         | RGY             | 16   | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | CL257                   | <a href="#">Samples</a> |
| SN74CBTLV3257D    | ACTIVE        | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CBTLV3257               | <a href="#">Samples</a> |
| SN74CBTLV3257DBQR | ACTIVE        | SSOP         | DBQ             | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | CL257                   | <a href="#">Samples</a> |
| SN74CBTLV3257DE4  | ACTIVE        | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CBTLV3257               | <a href="#">Samples</a> |
| SN74CBTLV3257DGVR | ACTIVE        | TVSOP        | DGV             | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CL257                   | <a href="#">Samples</a> |
| SN74CBTLV3257DR   | ACTIVE        | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CBTLV3257               | <a href="#">Samples</a> |
| SN74CBTLV3257DRE4 | ACTIVE        | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CBTLV3257               | <a href="#">Samples</a> |
| SN74CBTLV3257PW   | ACTIVE        | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CL257                   | <a href="#">Samples</a> |
| SN74CBTLV3257PWE4 | ACTIVE        | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CL257                   | <a href="#">Samples</a> |
| SN74CBTLV3257PWG4 | ACTIVE        | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | CL257                   | <a href="#">Samples</a> |
| SN74CBTLV3257PWR  | ACTIVE        | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU   CU SN       | Level-1-260C-UNLIM   | -40 to 85    | CL257                   | <a href="#">Samples</a> |
| SN74CBTLV3257RGYR | ACTIVE        | VQFN         | RGY             | 16   | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-2-260C-1 YEAR  | -40 to 85    | CL257                   | <a href="#">Samples</a> |
| SN74CBTLV3257RSVR | ACTIVE        | UQFN         | RSV             | 16   | 3000        | Green (RoHS & no Sb/Br) | CU NIPDAU               | Level-1-260C-UNLIM   | -40 to 85    | ZTR                     | <a href="#">Samples</a> |

(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.

<sup>(2)</sup> **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  $\leq 1000$ ppm threshold. Antimony trioxide based flame retardants must also meet the  $\leq 1000$ ppm threshold requirement.

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

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

<sup>(5)</sup> 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.

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

**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.

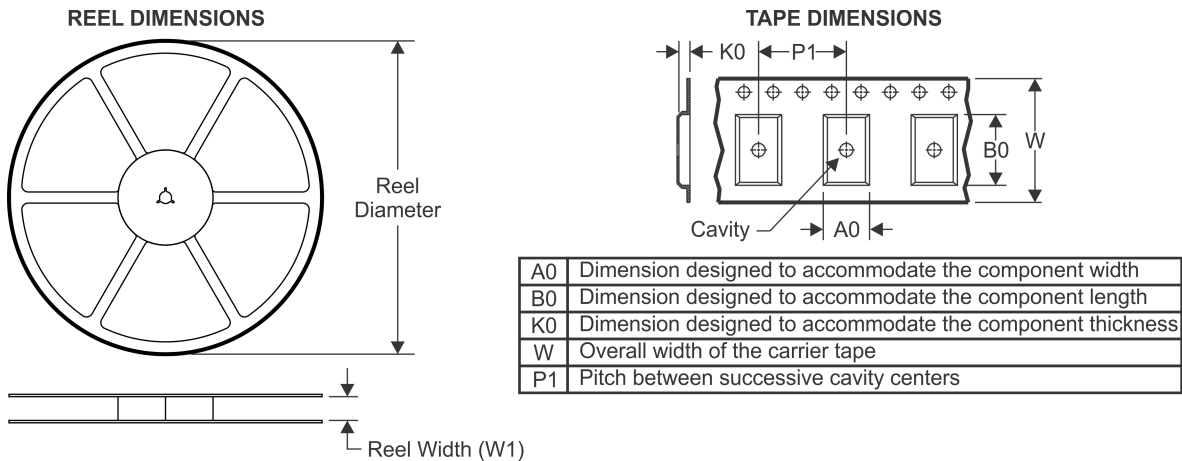
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**OTHER QUALIFIED VERSIONS OF SN74CBTLV3257 :**

- Enhanced Product: [SN74CBTLV3257-EP](#)

NOTE: Qualified Version Definitions:

- Enhanced Product - Supports Defense, Aerospace and Medical Applications

**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**


\*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 |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| 74CBTLV3257PWRG4  | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74CBTLV3257DBQR | SSOP         | DBQ             | 16   | 2500 | 330.0              | 12.5               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| SN74CBTLV3257DGVR | TVSOP        | DGV             | 16   | 2000 | 330.0              | 12.4               | 6.8     | 4.0     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74CBTLV3257DR   | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74CBTLV3257PWR  | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74CBTLV3257PWR  | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74CBTLV3257RGYR | VQFN         | RGY             | 16   | 3000 | 330.0              | 12.4               | 3.8     | 4.3     | 1.5     | 8.0     | 12.0   | Q1            |
| SN74CBTLV3257RSVR | UQFN         | RSV             | 16   | 3000 | 180.0              | 13.2               | 2.1     | 2.9     | 0.75    | 4.0     | 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) |
|-------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| 74CBTLV3257PWRG4  | TSSOP        | PW              | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74CBTLV3257DBQR | SSOP         | DBQ             | 16   | 2500 | 340.5       | 338.1      | 20.6        |
| SN74CBTLV3257DGVR | TVSOP        | DGV             | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74CBTLV3257DR   | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |
| SN74CBTLV3257PWR  | TSSOP        | PW              | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74CBTLV3257PWR  | TSSOP        | PW              | 16   | 2000 | 364.0       | 364.0      | 27.0        |
| SN74CBTLV3257RGYR | VQFN         | RGY             | 16   | 3000 | 367.0       | 367.0      | 35.0        |
| SN74CBTLV3257RSVR | UQFN         | RSV             | 16   | 3000 | 180.0       | 180.0      | 30.0        |

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AC.

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - 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.



4220204/A 02/2017

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

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220204/A 02/2017

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

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220204/A 02/2017

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.

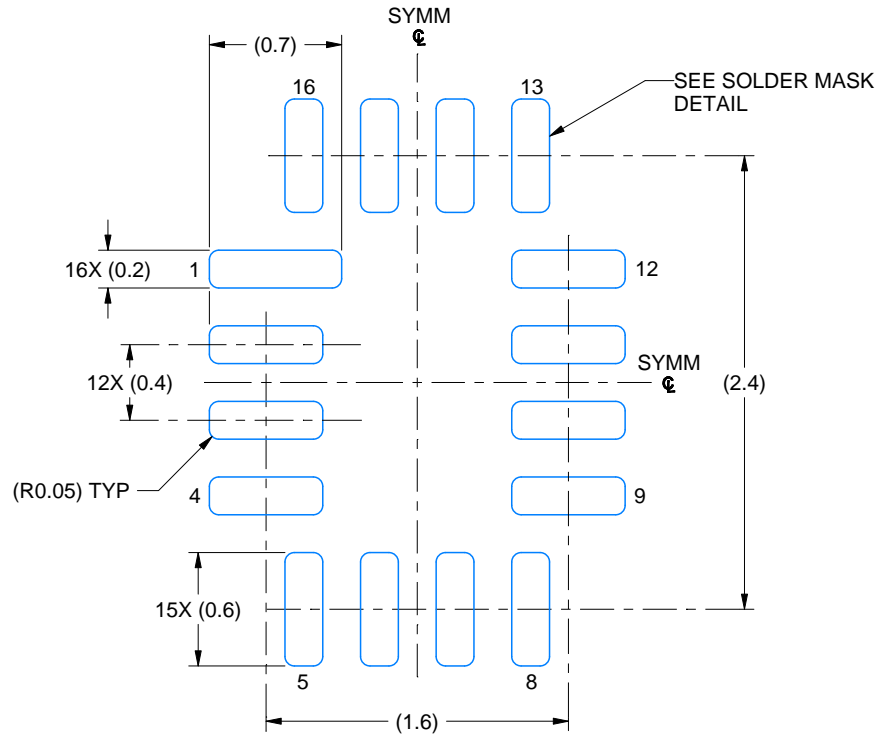


# EXAMPLE BOARD LAYOUT

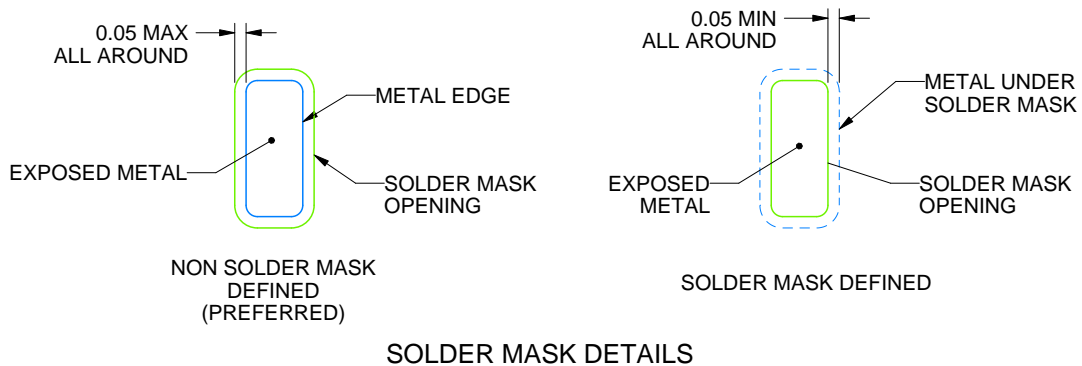
RSV0016A

UQFN - 0.55 mm max height

ULTRA THIN QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 25X



4220314/B 05/2019

NOTES: (continued)

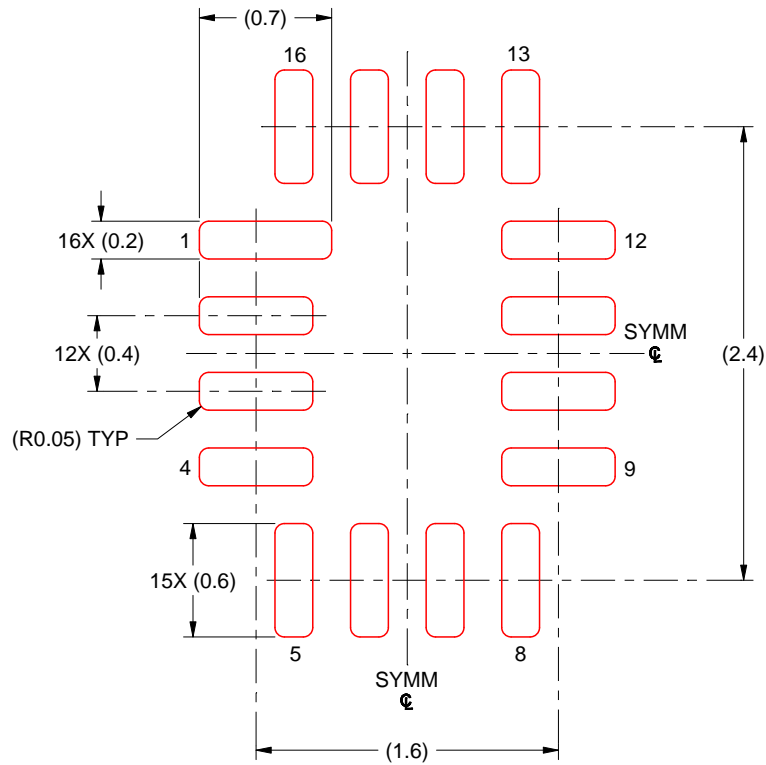
- This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).

# EXAMPLE STENCIL DESIGN

RSV0016A

UQFN - 0.55 mm max height

ULTRA THIN QUAD FLATPACK - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.125 MM THICK STENCIL  
SCALE: 25X

4220314/B 05/2019

NOTES: (continued)

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

DGV (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

24 PINS SHOWN



4073251/E 08/00

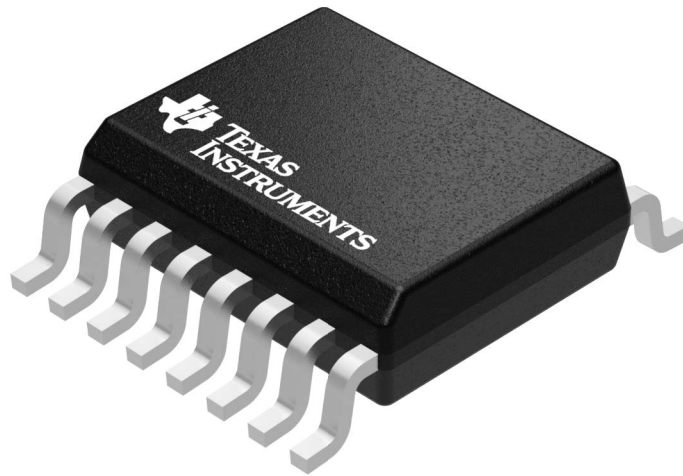
- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

**GENERIC PACKAGE VIEW**

**DBQ 16**

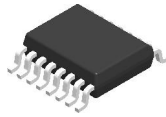
**SSOP - 1.75 mm max height**

SHRINK SMALL-OUTLINE PACKAGE



Images above are just a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.

4073301-2/1

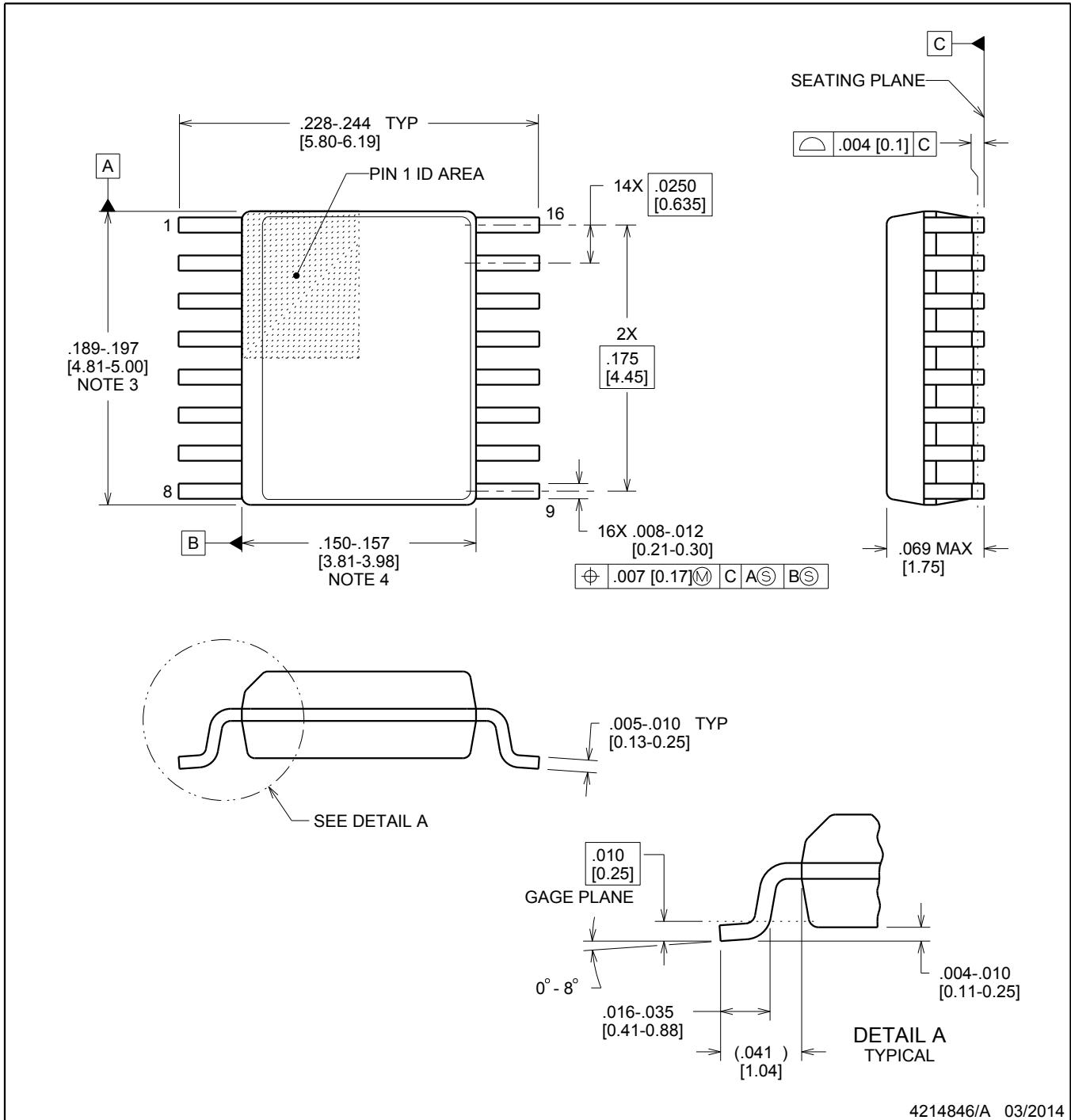


# DBQ0016A

# PACKAGE OUTLINE

## SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



4214846/A 03/2014

### NOTES:

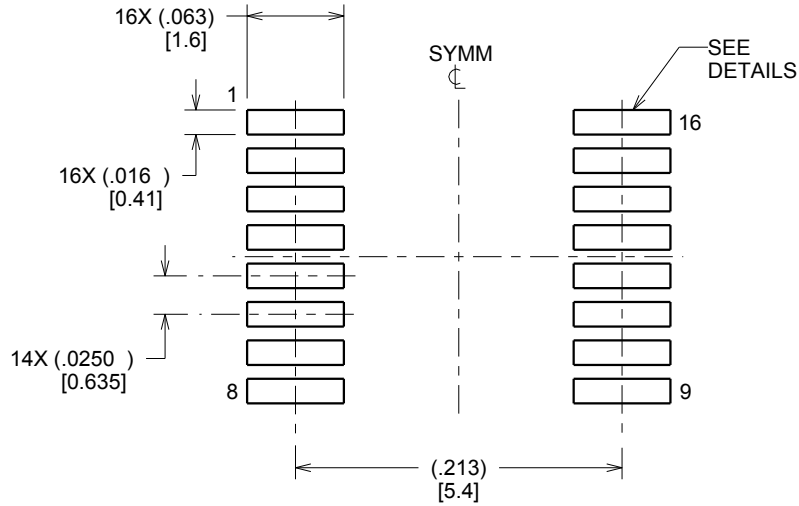
1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate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

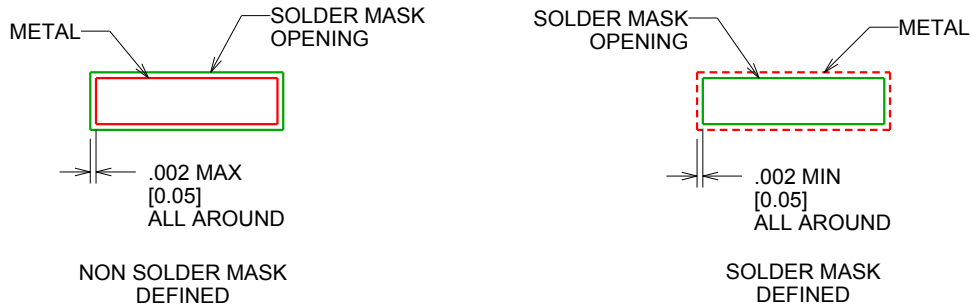
DBQ0016A

SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
SCALE:8X



SOLDER MASK DETAILS

4214846/A 03/2014

NOTES: (continued)

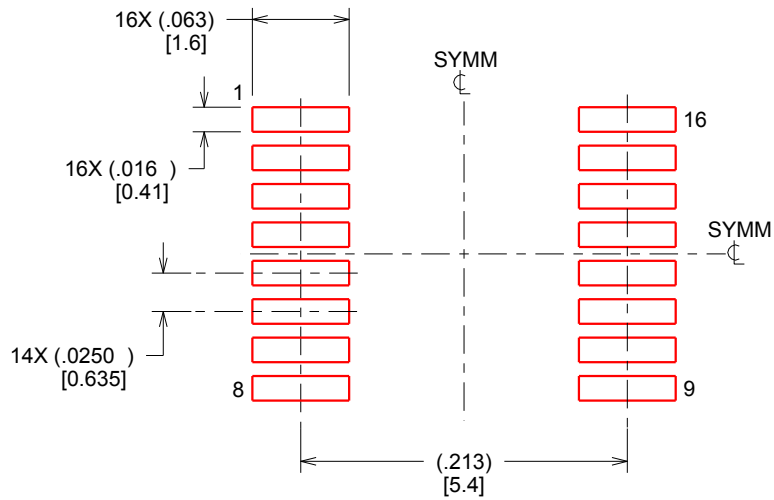
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# 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

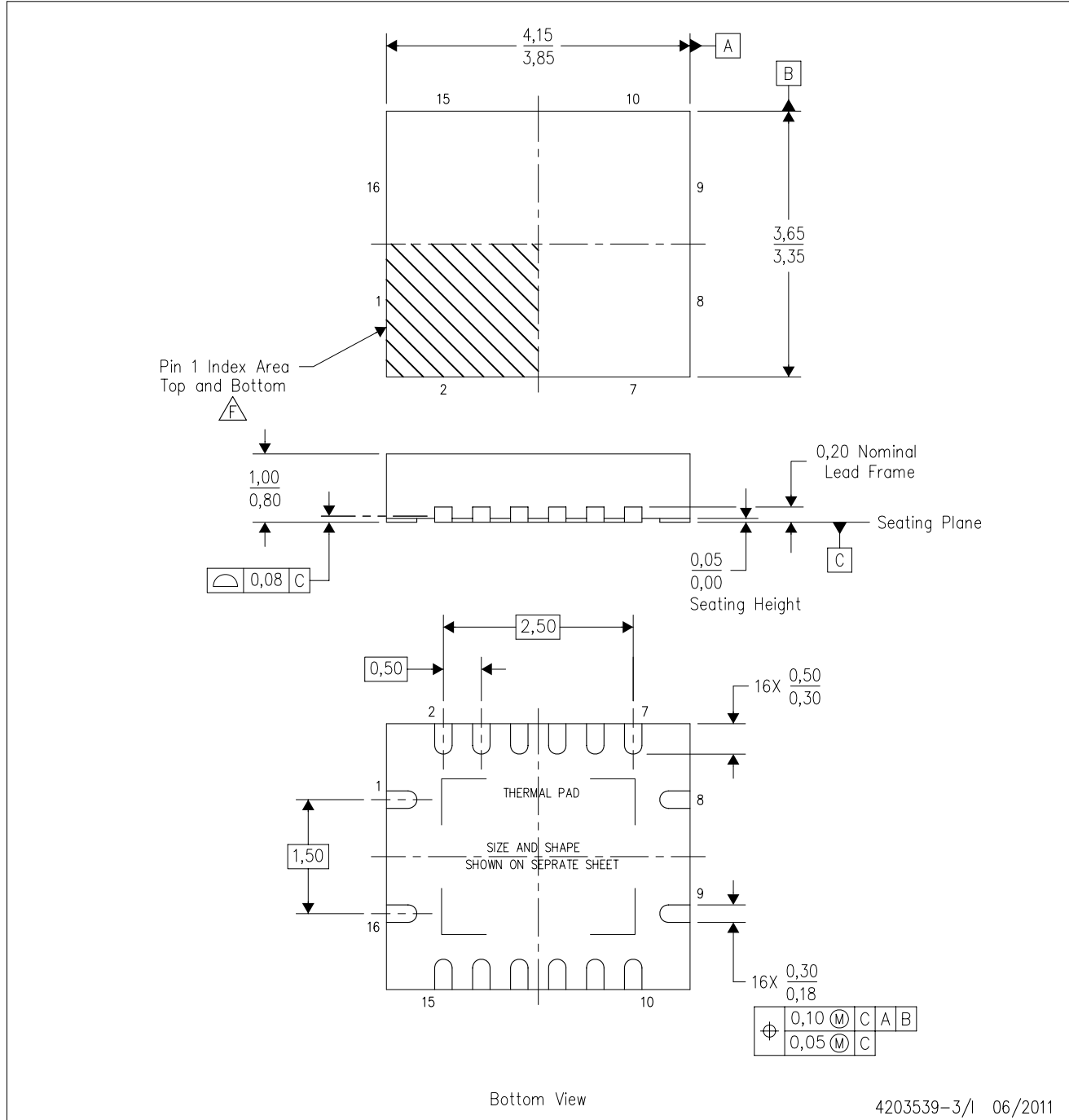
4214846/A 03/2014

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.

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. QFN (Quad Flatpack No-Lead) package configuration.
  - D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
  - E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
  - △ Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
  - G. Package complies to JEDEC MO-241 variation BA.

RGY (R-PVQFN-N16)

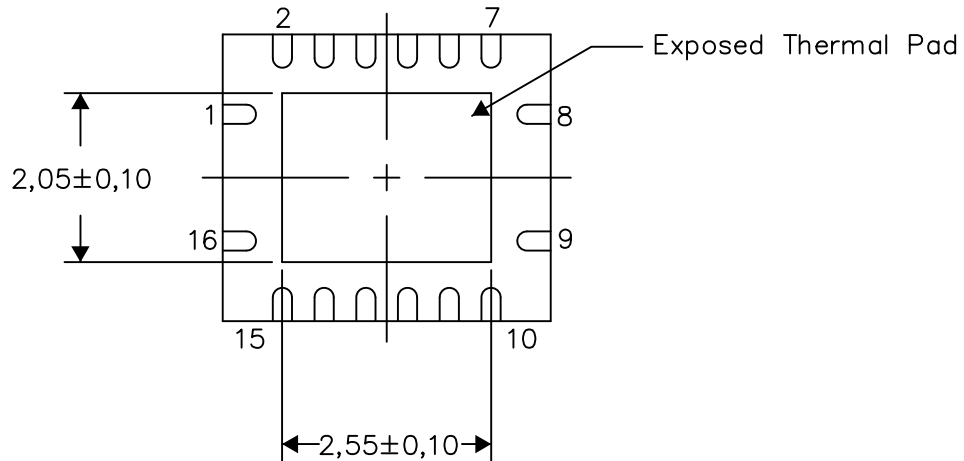
PLASTIC QUAD FLATPACK NO-LEAD

**THERMAL INFORMATION**

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at [www.ti.com](http://www.ti.com).

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

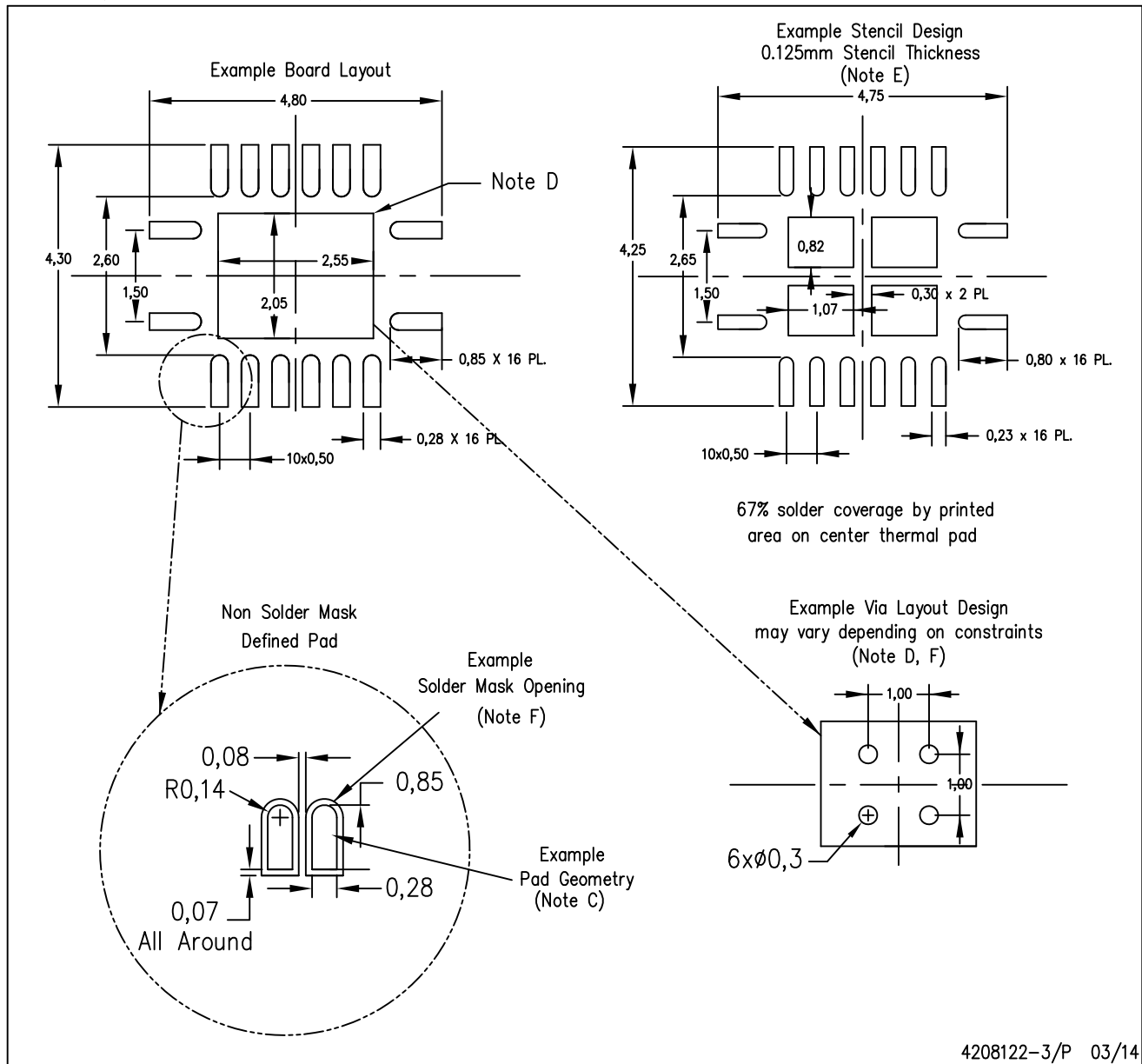
Exposed Thermal Pad Dimensions

4206353-3/P 03/14

NOTE: All linear dimensions are in millimeters

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



4208122-3/P 03/14

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at [www.ti.com](http://www.ti.com) <<http://www.ti.com>>.
  - E. 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 stencil design considerations.
  - F. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.

## IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), 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, 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 ([www.ti.com/legal/termsofsale.html](http://www.ti.com/legal/termsofsale.html)) or other applicable terms available either on [ti.com](http://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.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2019, Texas Instruments Incorporated

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View SN74CBTLV3257RGYR on WIN SOURCE](#)

 [Texas Instruments](#) Information

## Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management