

# SN74CBTLV3253 低电压、双 4 选 1 FET 多路复用器/多路信号分离器

## 1 特性

- 在功能上与 QS3253 等效
- 两个端口间使用  $5\Omega$  开关连接
- 数据 I/O 端口上的轨至轨开关
- $I_{off}$  支持局部关断模式运行
- 锁断性能超过 100mA，符合 JESD 78 II 类规范的要求

## 2 应用

- 视频广播：基于 IP 的多格式转码器
- 视频通信系统

## 3 说明

SN74CBTLV3253 器件是一款双 4 选 1 高速 FET 多路复用器和多路信号分离器。此开关具有低导通状态电阻，可以在最短传播延迟情况下建立连接。

选择 (S0, S1) 输入端控制数据流。当相关输出使能 ( $\overline{OE}$ ) 输入为高电平时，FET 多路复用器/多路信号分离器被禁用。

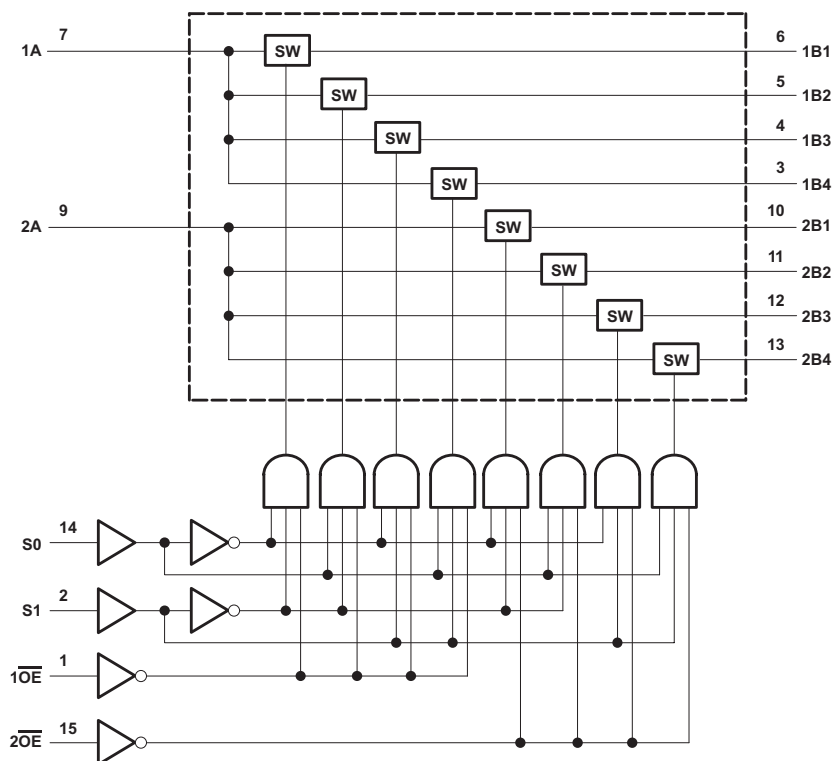
SN74CBTLV3253 器件完全适用于使用  $I_{off}$  的局部掉电应用。 $I_{off}$  特性确保在关断时防止损坏电流通过器件回流。该器件可在关断时提供隔离。

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

| PART NUMBER      | PACKAGE    | BODY SIZE (NOM)   |
|------------------|------------|-------------------|
| SN74CBTLV3253D   | SOIC (16)  | 9.90mm x 3.90mm   |
| SN74CBTLV3253DBQ | SSOP (16)  | 4.90mm x 3.90mm   |
| SN74CBTLV3253DGV | TVSOP (16) | 3.60mm x 4.40mm   |
| SN74CBTLV3253RGY | VQFN (16)  | 4.00mm x 3.50mm   |
| SN74CBTLV3253PW  | TSSOP (16) | 5.00 mm x 4.40 mm |

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

逻辑图（正逻辑）



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## 4 修订历史记录

注：之前版本的页码可能与当前版本有所不同。

### Changes from Revision I (February 2014) to Revision J Page

- Changed the *Thermal Information* table .....

**4**

### Changes from Revision H (February 2014) to Revision I Page

- 已添加应用部分、器件信息表、引脚配置和功能部分、ESD 额定值表、特性说明部分、器件功能模式、应用和实施部分、电源建议部分、布局部分、器件和文档支持部分以及机械、封装和可订购信息部分 .....

**1**

### Changes from Revision G (February 2014) to Revision H Page

- 更新了产品说明书 - 无特定更改 .....

**1**

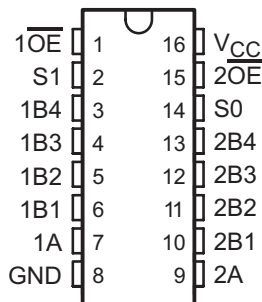
### Changes from Revision F (July 2012) to Revision G Page

- 已删除 订购信息表。 .....

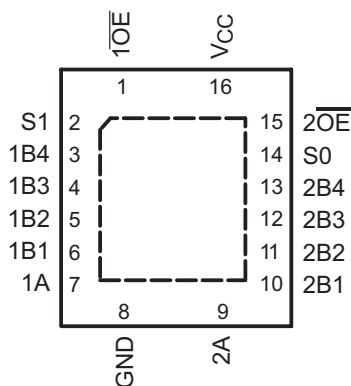
**1**

## 5 Pin Configuration and Functions

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



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



### Pin Functions

| PIN              |     | I/O | DESCRIPTION                |
|------------------|-----|-----|----------------------------|
| NAME             | NO. |     |                            |
| $\overline{1OE}$ | 1   | I   | Output Enable 1 Active-Low |
| S1               | 2   | I   | Select Pin 1               |
| 1B4              | 3   | I/O | Channel 1 I/O 4            |
| 1B3              | 4   | I/O | Channel 1 I/O 3            |
| 1B2              | 5   | I/O | Channel 1 I/O 2            |
| 1B1              | 6   | I/O | Channel 1 I/O 1            |
| 1A               | 7   | I/O | Channel 1 common           |
| GND              | 8   | —   | Ground                     |
| 2A               | 9   | I/O | Channel 2 common           |
| 2B1              | 10  | I/O | Channel 2 I/O 1            |
| 2B2              | 11  | I/O | Channel 2 I/O 2            |
| 2B3              | 12  | I/O | Channel 2 I/O 3            |
| 2B4              | 13  | I/O | Channel 2 I/O 4            |
| S0               | 14  | I   | Select Pin 0               |
| $\overline{2OE}$ | 15  | I   | Output Enable 2 Active-Low |
| V <sub>CC</sub>  | 16  | —   | 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>IN</sub>                                   | Control input voltage <sup>(2)</sup> | -0.5                 | 4.6  | V    |
| V <sub>I/O</sub>                                  | Switch I/O voltage <sup>(2)</sup>    | -0.5                 | 4.6  | V    |
| I <sub>IK</sub>                                   | Control input clamp current          | V <sub>IN</sub> < 0  | -50  | mA   |
| I <sub>I/OK</sub>                                 | I/O port clamp current               | V <sub>I/O</sub> < 0 | -50  | mA   |
| Continuous current through V <sub>CC</sub> or GND |                                      |                      | ±128 | 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, all pins <sup>(1)</sup>              | +2000 | V |
|                  |                         | Charged-Device Model (CDM), per JEDEC specification JESD22-C101, all pins <sup>(2)</sup> | +1000 | V |

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM 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. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, [SCBA004](#).

### 6.4 Thermal Information

| THERMAL METRIC <sup>(1)</sup> | SN74CBTLV3253                                |            |             |            |            | UNIT |      |
|-------------------------------|--|------------|-------------|------------|------------|------|------|
|                               | D (SOIC)                                     | DBQ (SSOP) | DGV (TVSOP) | PW (TSSOP) | RGY (VQFN) |      |      |
|                               | 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      | 47.1 | °C/W |
| R <sub>θJC(to p)</sub>        | Junction-to-case (top) thermal resistance    | 47.8       | 63.6        | 48.7       | 45.8       | 58.5 | °C/W |
| R <sub>θJB</sub>              | Junction-to-board thermal resistance         | 43.7       | 54.8        | 54.9       | 56.0       | 24.0 | °C/W |
| ψ <sub>JT</sub>               | Junction-to-top characterization parameter   | 12.3       | 17.0        | 5.2        | 5.4        | 1.8  | °C/W |
| ψ <sub>JB</sub>               | Junction-to-board characterization parameter | 43.5       | 54.4        | 54.3       | 55.4       | 24.0 | °C/W |
| R <sub>θJC(bot)</sub>         | Junction-to-case (bottom) thermal resistance | n/a        | n/a         | n/a        | n/a        | 9.6  | °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          |
|--------------------------------|---|---------------------------|---------------------------------|-----|--------------------|----------|---------------|
| $V_{IK}$                       |   | $V_{CC} = 3\text{ V}$ ,   | $I_I = -18\text{ mA}$           |     |                    | -1.2     | V             |
| $I_I$                          |   | $V_{CC} = 3.6\text{ V}$ , | $V_I = V_{CC}$ or GND           |     |                    | $\pm 1$  | $\mu\text{A}$ |
| $I_{off}$                      |   | $V_{CC} = 0$ ,            | $V_I$ or $V_O = 0$ to 3.6 V     |     |                    | 15       | $\mu\text{A}$ |
| $I_{CC}$                       |   | $V_{CC} = 3.6\text{ V}$ , | $I_O = 0$ ,                     |     |                    | 10       | $\mu\text{A}$ |
| $\Delta I_{CC}$ <sup>(2)</sup> | Control inputs  | $V_{CC} = 3.6\text{ V}$ , | One input at 3 V,               |     |                    | 300      | $\mu\text{A}$ |
|                                |   |                           | Other inputs at $V_{CC}$ or GND |     |                    |          |               |
| $C_i$                          | Control inputs  | $V_I = 3\text{ V}$ or 0   |                                 |     | 3                  |          | pF            |
| $C_{io(OFF)}$                  | A port  | $V_O = 3\text{ V}$ or 0,  | $\overline{OE} = V_{CC}$        |     | 20.5               |          | pF            |
|                                | 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.

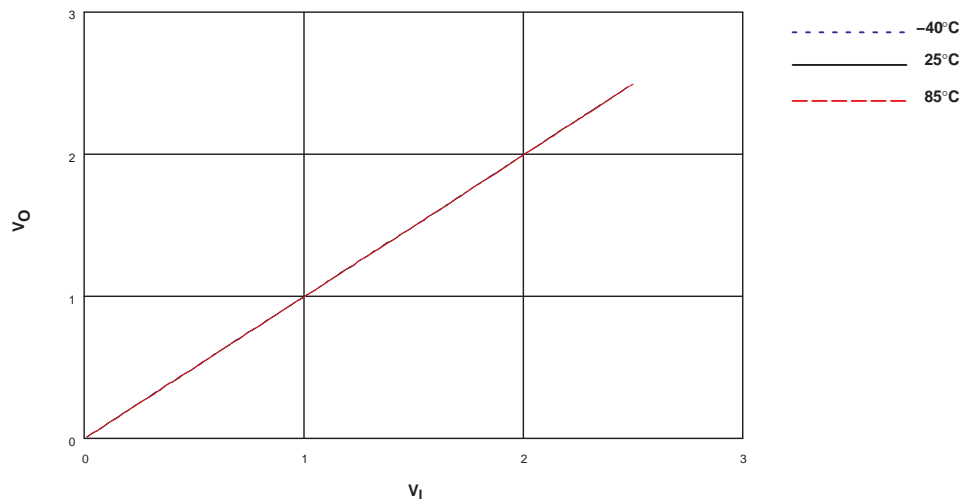
## 6.6 Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 2](#))

| 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  |      |
| $t_{pd}$  | A or B <sup>(1)</sup> | B or A      |  | 0.15 |  | 0.25 | ns   |
|           | S                     | A or B      | 1  | 6.8  | 1  | 5.5  |      |
| $t_{en}$  | S                     | A or B      | 1  | 4.3  | 1  | 4    | ns   |
| $t_{dis}$ | S                     | A or B      | 1  | 5.1  | 1  | 5.5  | ns   |
| $t_{en}$  | $\overline{OE}$       | A or B      | 1  | 5    | 1  | 4.8  | ns   |
| $t_{dis}$ | $\overline{OE}$       | A or B      | 1  | 5.5  | 1  | 5.4  | ns   |

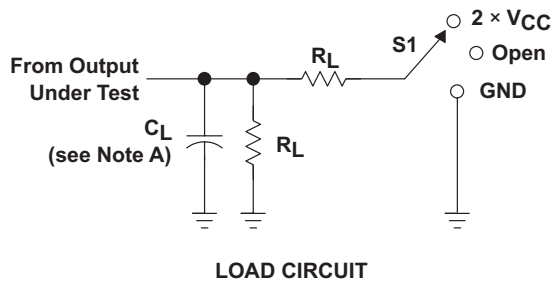
(1) The propagation delay is the calculated RC time constant of the typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

**6.7 Typical Characteristics**



**Figure 1.  $V_O$  vs  $V_I$ ,  $V_{CC} = 2.5\text{ V}$**

## 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        |

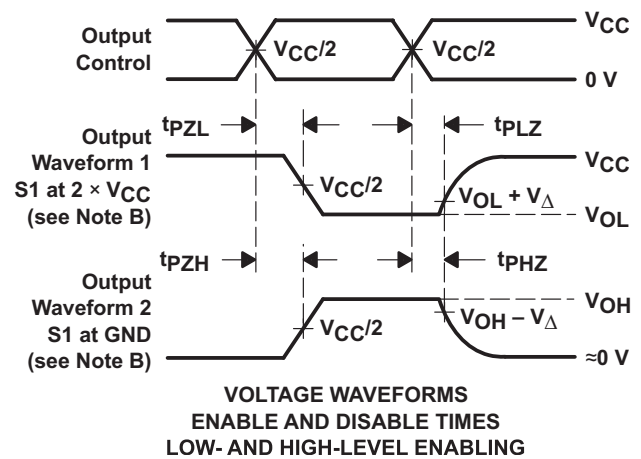
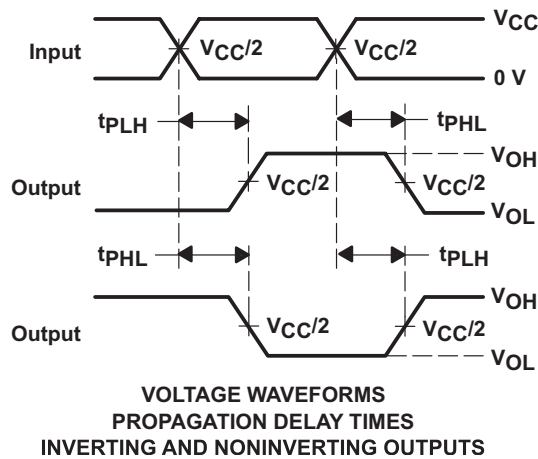
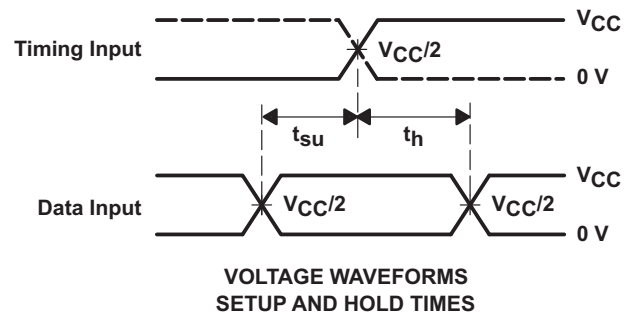
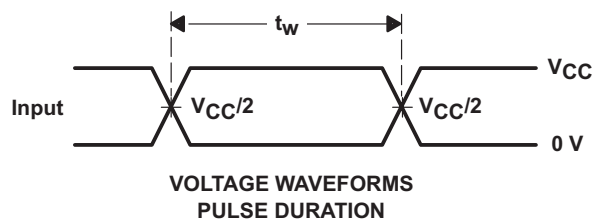


Figure 2. Test Circuit and Voltage Waveforms

## 8 Detailed Description

### 8.1 Overview

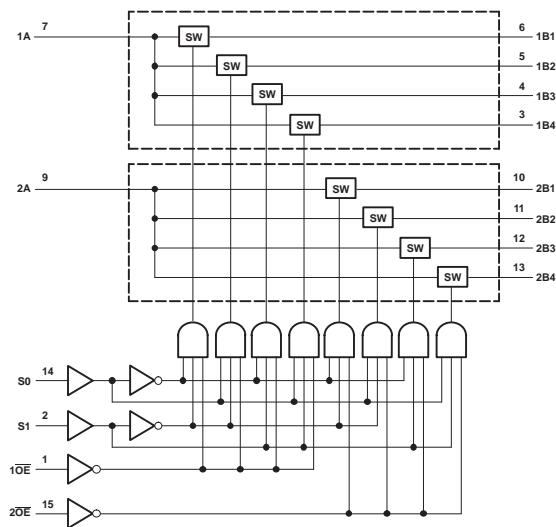
The SN74CBTLV3253 device is a dual 1-of-4 high-speed FET multiplexer/demultiplexer. The low ON-state resistance of the switch allows connections to be made with minimal propagation delay.

The select (S0, S1) inputs control the data flow. The FET multiplexers and demultiplexers are disabled when the associated output-enable ( $\overline{OE}$ ) input is high.

The SN74CBTLV3253 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 SN74CBTLV3253 device is functionally equivalent to the QS3253 and has a 5- $\Omega$  switch connection between two ports

It also has rail-to-rail switching on data I/O ports as well as  $I_{off}$  supporting partial-power-down mode operation

### 8.4 Device Functional Modes

Table 1 lists the functional modes of the SN74CBTLV3253.

**Table 1. Function Table  
(Each Multiplexer/Demultiplexer)**

| INPUTS          |    |    | FUNCTION         |
|-----------------|----|----|------------------|
| $\overline{OE}$ | S1 | S0 |                  |
| L               | L  | L  | A port = B1 port |
| L               | L  | H  | A port = B2 port |
| L               | H  | L  | A port = B3 port |
| L               | H  | H  | A port = B4 port |
| H               | X  | 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 SN74CBTLV3253 can be used to multiplex and demultiplex up to 2 channels simultaneously in a 4:1 configuration. The application shown here is a 2-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.

### 9.2 Typical Application

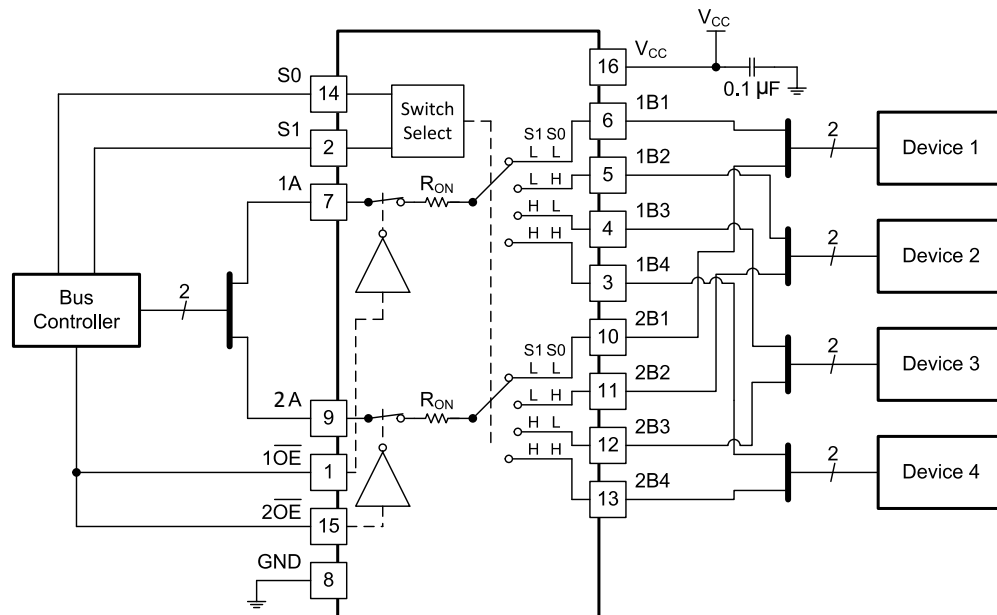


Figure 3. Typical Application of the SN74CBTLV3253

#### 9.2.1 Design Requirements

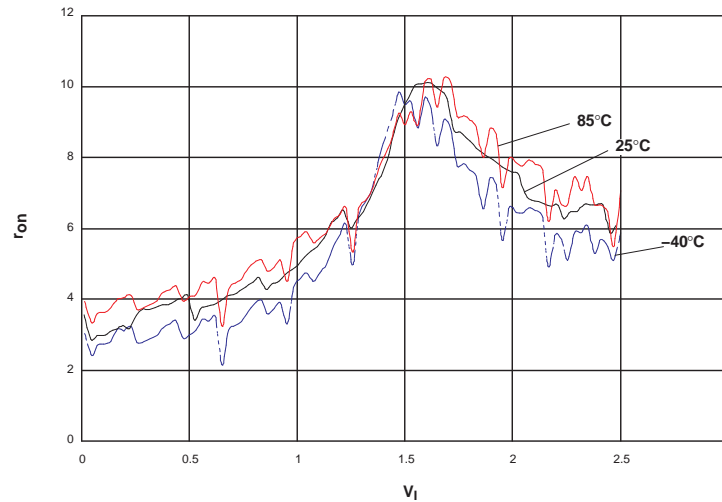
The 0.1µF capacitor should be placed as close as possible to the device.

#### 9.2.2 Detailed Design Procedure

- 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  $V_{CC}$ .
- Recommended Output Conditions:
  - Load currents should not exceed  $\pm 128$  mA per channel.
- Frequency Selection Criterion:
  - Added trace resistance/capacitance can reduce maximum frequency capability; use layout practices as directed in [Layout](#).

## Typical Application (continued)

### 9.2.3 Application Curve



**Figure 4.**  $r_{on}$  vs  $V_I$ ,  $V_{CC} = 2.5$  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.

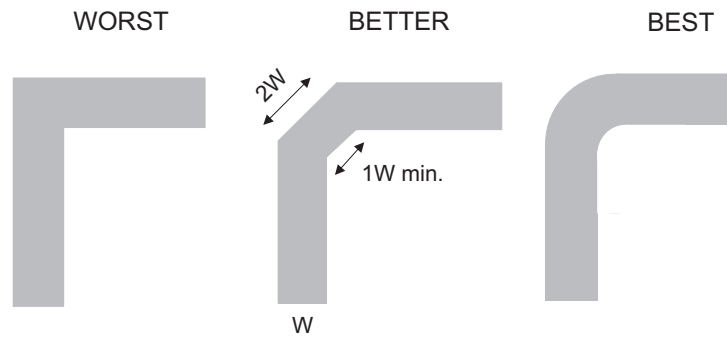
Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a 0.1- $\mu$ F bypass capacitor is recommended. If multiple pins are labeled  $V_{CC}$ , then a 0.01- $\mu$ F or 0.022- $\mu$ F capacitor is recommended for each  $V_{CC}$  because 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- $\mu$ 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  $\mu$ F and 1  $\mu$ 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 5](#) shows progressively better techniques of rounding corners. Only the last example (BEST) maintains constant trace width and minimizes reflections.

### 11.2 Layout Example



**Figure 5. Trace Example**

## 12 器件和文档支持

### 12.1 Documentation Support

#### 12.1.1 相关文档

请参阅如下相关文档：

《CMOS 输入缓慢变化或悬空的影响》， [SCBA004](#)

### 12.2 社区资源

下列链接提供到 TI 社区资源的连接。链接的内容由各个分销商“按照原样”提供。这些内容并不构成 TI 技术规范，并且不一定反映 TI 的观点；请参阅 TI 的《使用条款》。

**TI E2E™ 在线社区** *TI 的工程师对工程师 (E2E) 社区*。此社区的创建目的在于促进工程师之间的协作。在 [e2e.ti.com](http://e2e.ti.com) 中，您可以咨询问题、分享知识、拓展思路并与同行工程师一道帮助解决问题。

**设计支持** *TI 参考设计支持* 可帮助您快速查找有帮助的 E2E 论坛、设计支持工具以及技术支持的联系信息。

### 12.3 商标

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### 12.4 静电放电警告



这些装置包含有限的内置 ESD 保护。存储或装卸时，应将导线一起截短或将装置放置于导电泡棉中，以防止 MOS 门极遭受静电损伤。

### 12.5 Glossary

[SLYZ022](#) — *TI Glossary*.

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

## 13 机械、封装和可订购信息

以下页面包含机械、封装和可订购信息。这些信息是指定器件的最新可用数据。数据如有变更，恕不另行通知和修订此文档。如欲获取此数据表的浏览器版本，请参阅左侧的导航。

**PACKAGING INFORMATION**

| Orderable Device  | Status<br>(1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan<br>(2) | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples |
|-------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|---------|
| 74CBTLV3253PWRG4  | LIFEBUY       | TSSOP        | PW              | 16   | 2000        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | CL253                   |         |
| SN74CBTLV3253D    | LIFEBUY       | SOIC         | D               | 16   | 40          | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | CBTLV3253               |         |
| SN74CBTLV3253DBQR | ACTIVE        | SSOP         | DBQ             | 16   | 2500        | RoHS & Green    | NIPDAU                               | Level-2-260C-1 YEAR  | -40 to 85    | CL253                   | Samples |
| SN74CBTLV3253DE4  | LIFEBUY       | SOIC         | D               | 16   | 40          | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | CBTLV3253               |         |
| SN74CBTLV3253DGVR | ACTIVE        | TVSOP        | DGV             | 16   | 2000        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | CL253                   | Samples |
| SN74CBTLV3253DR   | ACTIVE        | SOIC         | D               | 16   | 2500        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | CBTLV3253               | Samples |
| SN74CBTLV3253PW   | LIFEBUY       | TSSOP        | PW              | 16   | 90          | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | CL253                   |         |
| SN74CBTLV3253PWR  | ACTIVE        | TSSOP        | PW              | 16   | 2000        | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | CL253                   | Samples |
| SN74CBTLV3253RGYR | ACTIVE        | VQFN         | RGY             | 16   | 3000        | RoHS & Green    | NIPDAU                               | Level-2-260C-1 YEAR  | -40 to 85    | CL253                   | Samples |

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

**ACTIVE:** Product device recommended for new designs.

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

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

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

**OBSOLETE:** TI has discontinued the production of the device.

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

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

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

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

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

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

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

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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**

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


\*All dimensions are nominal

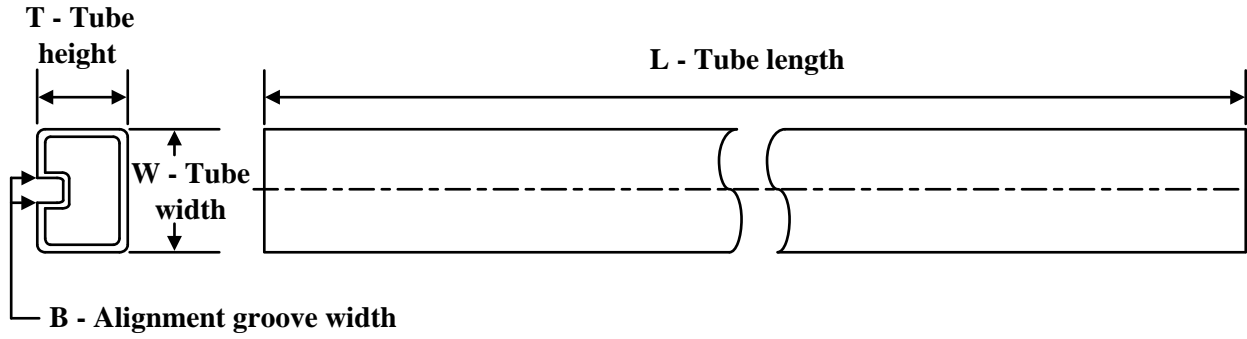
| Device            | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74CBTLV3253DBQR | SSOP         | DBQ             | 16   | 2500 | 330.0              | 12.5               | 6.4     | 5.2     | 2.1     | 8.0     | 12.0   | Q1            |
| SN74CBTLV3253DGVR | TVSOP        | DGV             | 16   | 2000 | 330.0              | 12.4               | 6.8     | 4.0     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74CBTLV3253DR   | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74CBTLV3253PWR  | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74CBTLV3253RGYR | VQFN         | RGY             | 16   | 3000 | 330.0              | 12.4               | 3.8     | 4.3     | 1.5     | 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) |
|-------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74CBTLV3253DBQR | SSOP         | DBQ             | 16   | 2500 | 353.0       | 353.0      | 32.0        |
| SN74CBTLV3253DGVR | TVSOP        | DGV             | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74CBTLV3253DR   | SOIC         | D               | 16   | 2500 | 353.0       | 353.0      | 32.0        |
| SN74CBTLV3253PWR  | TSSOP        | PW              | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74CBTLV3253RGYR | VQFN         | RGY             | 16   | 3000 | 367.0       | 367.0      | 35.0        |



**TUBE**


\*All dimensions are nominal

| Device           | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|------------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74CBTLV3253D   | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| SN74CBTLV3253DE4 | D            | SOIC         | 16   | 40  | 507    | 8      | 3940   | 4.32   |
| SN74CBTLV3253PW  | PW           | TSSOP        | 16   | 90  | 530    | 10.2   | 3600   | 3.5    |

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.



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



SOLDER MASK DETAILS

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.

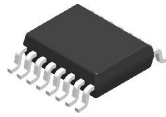
DGV (R-PDSO-G\*\*)

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

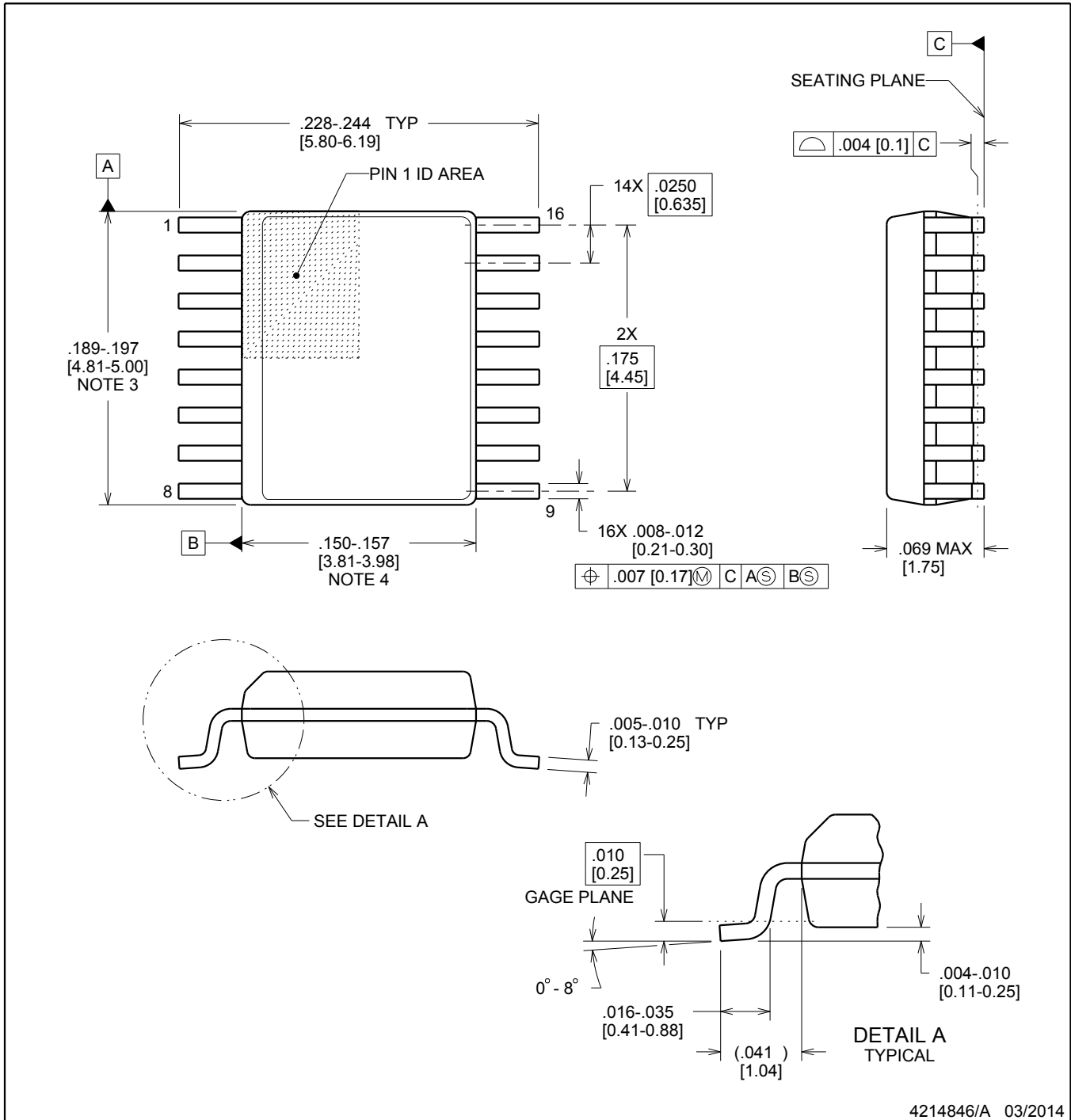


# DBQ0016A

# PACKAGE OUTLINE

## SSOP - 1.75 mm max height

SHRINK SMALL-OUTLINE PACKAGE



4214846/A 03/2014

### NOTES:

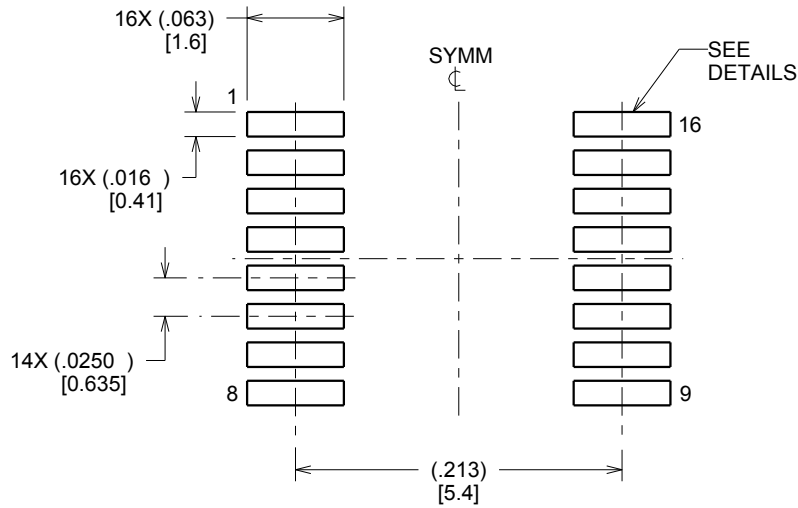
- Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- This dimension does not include mold flash, protrusions, or gate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

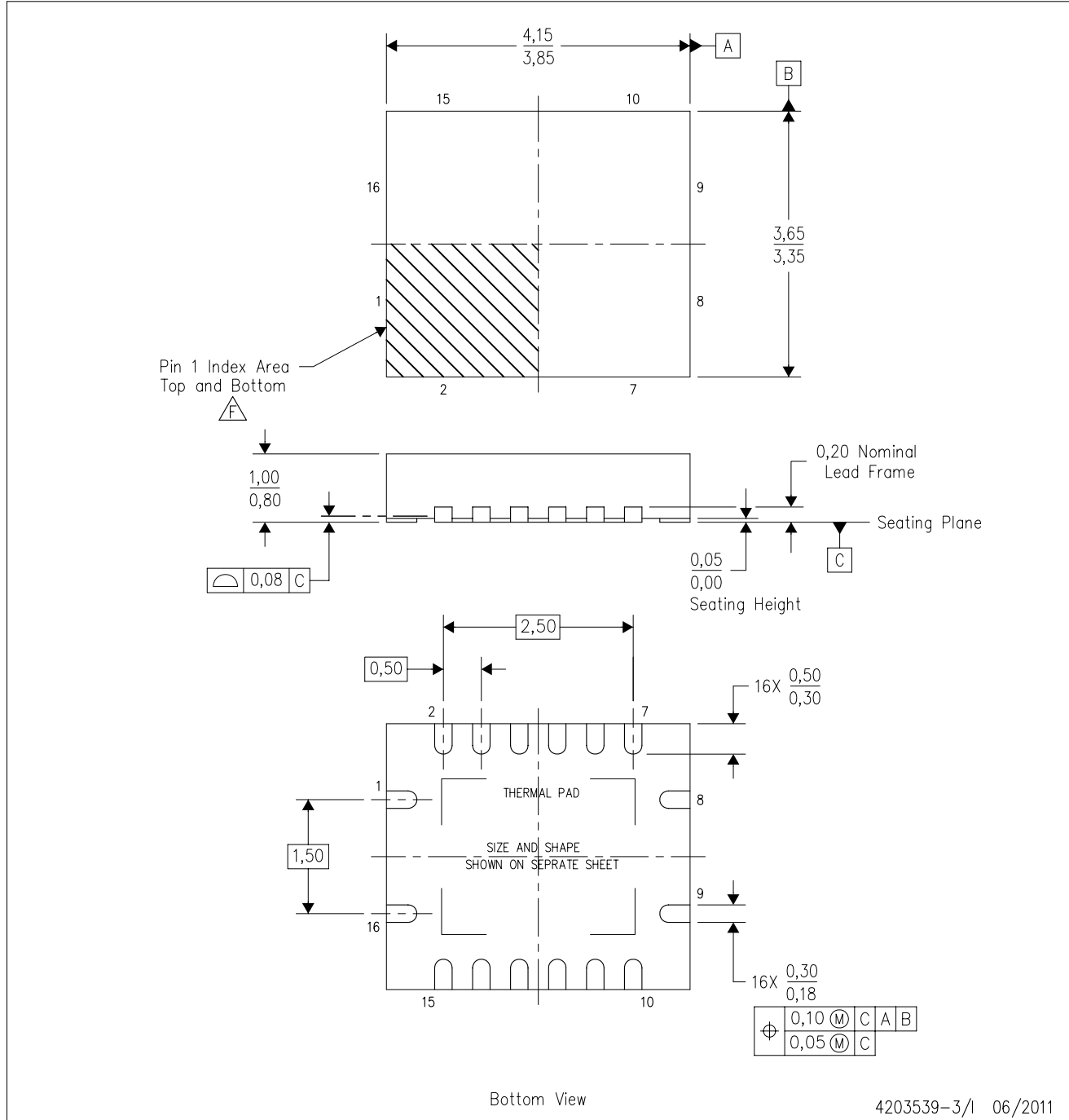
4214846/A 03/2014

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.

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



4203539-3/1 06/2011

- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - QFN (Quad Flatpack No-Lead) package configuration.
  - The package thermal pad must be soldered to the board for thermal and mechanical performance.
  - 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.
  - 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.

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