

# SN74LVC2G157 シングル、2 to 1 ライン、データ・セクタ / マルチプレクサ

## 1 特長

- テキサス・インスツルメンツの NanoFree™ パッケージで供給
- 5V  $V_{CC}$  動作をサポート
- 5.5V までの入力電圧に対応
- 最大  $t_{pd}$ : 6ns (3.3V 時)
- 低消費電力、最大  $I_{CC}$ : 10 $\mu$ A
- 3.3V において  $\pm 24$ mA の出力駆動能力
- 標準  $V_{OLP}$  (出力グランド・バウンス)  $< 0.8$ V ( $V_{CC} = 3.3$ V,  $T_A = 25^\circ$ C)
- 標準  $V_{OHV}$  (出力  $V_{OH}$  アンダーシュート)  $> 2$ V ( $V_{CC} = 3.3$ V,  $T_A = 25^\circ$ C)
- $I_{off}$  により活線挿抜、部分的パワーダウン・モード、バック・ドライブ保護をサポート
- 降圧変換器として使用し、入力を最高 5.5V から  $V_{CC}$  レベルに降圧可能
- JESD 78, Class II 準拠で 100mA 超のラッチアップ性能
- JESD 22 を超える ESD 保護
  - 2000V、人体モデル (A114-A)
  - 1000V、デバイス帯電モデル (C101)

## 2 アプリケーション

- バーコード・スキャナ
- ケーブル・ソリューション
- 電子書籍
- 組み込み PC
- フィールド・トランスミッタ：温度または圧力センサ
- 指紋認証
- HVAC：暖房、換気、空調
- ネットワーク接続ストレージ (NAS)
- サーバーのマザーボードおよび PSU
- ソフトウェア無線 (SDR)
- テレビ：高解像度 (HDTV)、LCD、デジタル
- ビデオ通信システム
- ワイヤレス・データ・アクセス・カード、ヘッドセット、キーボード、マウス、LAN カード

## 3 概要

この 2 ラインから 1 ラインへのシングル・データ・セクタ / マルチプレクサは、1.65V～5.5V の  $V_{CC}$  で動作するように設計されています。

SN74LVC2G157 デバイスには、共通のストロブ ( $\bar{G}$ ) 入力があります。ストロブが HIGH のとき Y は LOW で、 $\bar{Y}$  は HIGH です。ストロブが LOW のとき、2 つのソースのどちらか 1 つのビットが選択され、出力に転送されます。本デバイスは、真の相補的データを提供します。

ダイをパッケージとして使用する NanoFree™ パッケージ技術は、IC パッケージの概念を大きく覆すものです。

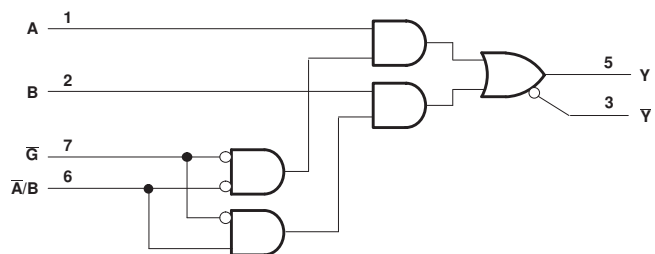
このデバイスは、 $I_{off}$  を使用する部分的パワーダウン・アプリケーション用に完全に動作が規定されています。 $I_{off}$  回路が出力をディセーブルにするため、電源切断時にデバイスに電流が逆流して損傷に至ることを回避できます。

### 製品情報<sup>(1)</sup>

| 型番              | パッケージ     | 本体サイズ (公称)    |
|-----------------|-----------|---------------|
| SN74LVC2G157DCT | SSOP (8)  | 2.95mm×2.80mm |
| SN74LVC2G157DCU | VSSOP (8) | 2.30mm×2.00mm |
| SN74LVC2G157YZP | DSBGA (8) | 1.91mm×0.91mm |

(1) 利用可能なすべてのパッケージについては、このデータシートの末尾にある注文情報を参照してください。

### ロジック図(正論理)



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## 4 改訂履歴

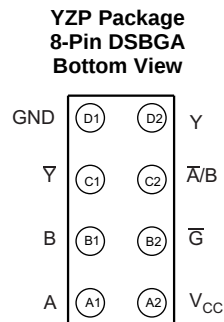
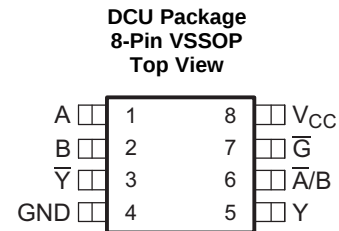
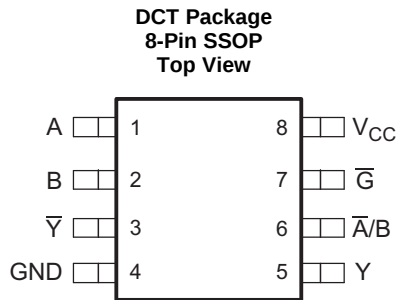
資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

| Revision M (June 2015) から Revision N に変更                                                                                                          | Page |
|---------------------------------------------------------------------------------------------------------------------------------------------------|------|
| • Changed YZP package pinout drawing to match mechanical data drawing; and, pin functions description for clarity                                 | 3    |
| • Added additional thermal metrics for all packages.                                                                                              | 5    |
| • Added detailed feature description sections for Standard CMOS Inputs, Balanced High-Drive CMOS Push-Pull Outputs, and Negative Clamping Diodes. | 8    |
| • Added improved Design Requirements and Detailed Design Procedure.                                                                               | 10   |
| • Changed verbiage to better reflect recommendations for this specific device rather than logic devices in general.                               | 12   |
| • Added layout example for the YZP package.                                                                                                       | 12   |

| Revision L (January 2014) から Revision M に変更 | Page |
|---------------------------------------------|------|
| • Added <i>ESD Ratings</i> table.           | 4    |
| • Added <i>Thermal Information</i> table.   | 5    |
| • Added <i>Typical Characteristics</i> .    | 6    |
| • 追加「メカニカル、パッケージ、および注文情報」セクション              | 14   |

| Revision K (January 2007) から Revision L に変更 | Page |
|---------------------------------------------|------|
| • ドキュメントを新しい TI データシートのフォーマットに更新            | 1    |
| • 「注文情報」表を削除                                | 1    |
| • 「特長」を更新                                   | 1    |
| • 「製品情報」の表 追加                               | 1    |

## 5 Pin Configuration and Functions



Drawing are not to scale. See mechanical drawings for dimensions

### Pin Functions

| NAME             | PIN            |       | I/O    | DESCRIPTION         |
|------------------|----------------|-------|--------|---------------------|
|                  | SSOP,<br>VSSOP | DSBGA |        |                     |
| A                | 1              | A1    | Input  | Data Input A        |
| $\overline{A/B}$ | 6              | C2    | Input  | Input Selector      |
| B                | 2              | B1    | Input  | Data Input B        |
| $\overline{G}$   | 7              | B2    | Input  | Common Strobe Input |
| GND              | 4              | D1    | —      | Ground              |
| $V_{CC}$         | 8              | A2    | —      | Positive Supply     |
| Y                | 5              | D2    | Output | Output              |
| $\overline{Y}$   | 3              | C1    | Output | Inverted Output     |

## 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 | 6.5                   | V    |
| V <sub>I</sub>   | Input voltage <sup>(2)</sup>                                                          |                    | −0.5 | 6.5                   | V    |
| V <sub>O</sub>   | Voltage applied to any output in the high-impedance or power-off state <sup>(2)</sup> |                    | −0.5 | 6.5                   | V    |
| V <sub>O</sub>   | Voltage applied to any output in the high or low state <sup>(2)(3)</sup>              |                    | −0.5 | V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>  | Input clamp current                                                                   | V <sub>I</sub> < 0 |      | −50                   | mA   |
| I <sub>OK</sub>  | Output clamp current                                                                  | V <sub>O</sub> < 0 |      | −50                   | mA   |
| I <sub>O</sub>   | Continuous output current                                                             |                    |      | ±50                   | mA   |
|                  | Continuous current through V <sub>CC</sub> or GND                                     |                    |      | ±100                  | mA   |
| T <sub>stg</sub> | Storage temperature                                                                   |                    | −65  | 150                   | °C   |
| T <sub>J</sub>   | Junction temperature                                                                  |                    |      | 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 negative-voltage and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- (3) The value of V<sub>CC</sub> is provided in the *Recommended Operating Conditions* table.

### 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 |
|                    |                         | Charged-device model (CDM), per JEDEC specification JESD22-C101 <sup>(2)</sup> | 1000 |

- (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

See <sup>(1)</sup>.

|                 |                           |                                    | MIN                    | MAX                    | UNIT |
|-----------------|---------------------------|------------------------------------|------------------------|------------------------|------|
| V <sub>CC</sub> | Supply voltage            | Operating                          | 1.65                   | 5.5                    | V    |
|                 |                           | Data retention only                | 1.5                    |                        |      |
| V <sub>IH</sub> | High-level input voltage  | V <sub>CC</sub> = 1.65 V to 1.95 V | 0.65 × V <sub>CC</sub> |                        | V    |
|                 |                           | V <sub>CC</sub> = 2.3 V to 2.7 V   | 1.7                    |                        |      |
|                 |                           | V <sub>CC</sub> = 3 V to 3.6 V     | 2                      |                        |      |
|                 |                           | V <sub>CC</sub> = 4.5 V to 5.5 V   | 0.7 × V <sub>CC</sub>  |                        |      |
| V <sub>IL</sub> | Low-level input voltage   | V <sub>CC</sub> = 1.65 V to 1.95 V |                        | 0.35 × V <sub>CC</sub> | V    |
|                 |                           | V <sub>CC</sub> = 2.3 V to 2.7 V   |                        | 0.7                    |      |
|                 |                           | V <sub>CC</sub> = 3 V to 3.6 V     |                        | 0.8                    |      |
|                 |                           | V <sub>CC</sub> = 4.5 V to 5.5 V   |                        | 0.3 × V <sub>CC</sub>  |      |
| V <sub>I</sub>  | Input voltage             |                                    | 0                      | 5.5                    | V    |
| V <sub>O</sub>  | Output voltage            |                                    | 0                      | V <sub>CC</sub>        | V    |
| I <sub>OH</sub> | High-level output current | V <sub>CC</sub> = 1.65 V           |                        | −4                     | mA   |
|                 |                           | V <sub>CC</sub> = 2.3 V            |                        | −8                     |      |
|                 |                           | V <sub>CC</sub> = 3 V              |                        | −16                    |      |
|                 |                           |                                    |                        | −24                    |      |
|                 |                           | V <sub>CC</sub> = 4.5 V            |                        | −32                    |      |

- (1) All unused 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](#).

## Recommended Operating Conditions (continued)

See <sup>(1)</sup>.

|                     |                                    | MIN                                                                      | MAX | UNIT |
|---------------------|------------------------------------|--------------------------------------------------------------------------|-----|------|
| $I_{OL}$            | Low-level output current           | $V_{CC} = 1.65\text{ V}$                                                 | 4   | mA   |
|                     |                                    | $V_{CC} = 2.3\text{ V}$                                                  | 8   |      |
|                     |                                    | $V_{CC} = 3\text{ V}$                                                    | 16  |      |
|                     |                                    |                                                                          | 24  |      |
|                     |                                    | $V_{CC} = 4.5\text{ V}$                                                  | 32  |      |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | $V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}, 2.5\text{ V} \pm 0.2\text{ V}$ | 20  | ns/V |
|                     |                                    | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$                                 | 10  |      |
|                     |                                    | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$                                   | 5   |      |
| $T_A$               | Operating free-air temperature     | –40                                                                      | 85  | °C   |

## 6.4 Thermal Information

| THERMAL METRIC <sup>(1)</sup> |                                              | SN74LVC2G157 |             |             | UNIT |
|-------------------------------|----------------------------------------------|--------------|-------------|-------------|------|
|                               |                                              | DCT (SSOP)   | DCU (VSSOP) | YZP (DSBGA) |      |
|                               |                                              | 8 PINS       | 8 PINS      | 8 PINS      |      |
| $R_{\theta JA}$               | Junction-to-ambient thermal resistance       | 192.0        | 289.9       | 99.9        | °C/W |
| $R_{\theta JCTop}$            | Junction-to-case (top) thermal resistance    | 70.2         | 86.9        | 1.0         | °C/W |
| $R_{\theta JJB}$              | Junction-to-board thermal resistance         | 105.2        | 208.5       | 27.8        | °C/W |
| $\Psi_{JT}$                   | Junction-to-top characterization parameter   | 7.7          | 23.1        | 0.4         | °C/W |
| $\Psi_{JB}$                   | Junction-to-board characterization parameter | 103.6        | 206.5       | 27.8        | °C/W |
| $R_{\theta JCBot}$            | Junction-to-case (bottom) thermal resistance | n/a          | n/a         | n/a         | °C/W |

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report, [SPRA953](#).

## 6.5 Electrical Characteristics

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

| PARAMETER       | TEST CONDITIONS                                                        | $V_{CC}$        | MIN            | TYP <sup>(1)</sup> | MAX      | UNIT          |
|-----------------|------------------------------------------------------------------------|-----------------|----------------|--------------------|----------|---------------|
| $V_{OH}$        | $I_{OH} = -100\text{ }\mu\text{A}$                                     | 1.65 V to 5.5 V | $V_{CC} - 0.1$ |                    |          | V             |
|                 | $I_{OH} = -4\text{ mA}$                                                | 1.65 V          | 1.2            |                    |          |               |
|                 | $I_{OH} = -8\text{ mA}$                                                | 2.3 V           | 1.9            |                    |          |               |
|                 | $I_{OH} = -16\text{ mA}$                                               | 3 V             | 2.4            |                    |          |               |
|                 | $I_{OH} = -24\text{ mA}$                                               |                 | 2.3            |                    |          |               |
|                 | $I_{OH} = -32\text{ mA}$                                               | 4.5 V           | 3.8            |                    |          |               |
| $V_{OL}$        | $I_{OL} = 100\text{ }\mu\text{A}$                                      | 1.65 V to 5.5 V |                |                    | 0.1      | V             |
|                 | $I_{OL} = 4\text{ mA}$                                                 | 1.65 V          |                |                    | 0.45     |               |
|                 | $I_{OL} = 8\text{ mA}$                                                 | 2.3 V           |                |                    | 0.3      |               |
|                 | $I_{OL} = 16\text{ mA}$                                                | 3 V             |                |                    | 0.4      |               |
|                 | $I_{OL} = 24\text{ mA}$                                                |                 |                |                    | 0.55     |               |
|                 | $I_{OL} = 32\text{ mA}$                                                | 4.5 V           |                |                    | 0.55     |               |
| $I_i$           | A, B, or control inputs<br>$V_i = 5.5\text{ V}$ or GND                 | 0 to 5.5 V      |                |                    | $\pm 5$  | $\mu\text{A}$ |
| $I_{off}$       | $V_i$ or $V_o = 5.5\text{ V}$                                          | 0               |                |                    | $\pm 10$ | $\mu\text{A}$ |
| $I_{CC}$        | $V_i = 5.5\text{ V}$ or GND, $I_o = 0$                                 | 1.65 V to 5.5 V |                |                    | 10       | $\mu\text{A}$ |
| $\Delta I_{CC}$ | One input at $V_{CC} - 0.6\text{ V}$ , Other inputs at $V_{CC}$ or GND | 3 V to 5.5 V    |                |                    | 500      | $\mu\text{A}$ |
| $C_i$           | $V_i = V_{CC}$ or GND                                                  | 3.3 V           |                |                    | 5        | pF            |

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

## 6.6 Switching Characteristics

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

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC} = 1.8\text{ V} \pm 0.15\text{ V}$ |     | $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ |     | $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ |     | $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$ |     | UNIT |
|-----------|-----------------|----------------|-------------------------------------------|-----|------------------------------------------|-----|------------------------------------------|-----|----------------------------------------|-----|------|
|           |                 |                | MIN                                       | MAX | MIN                                      | MAX | MIN                                      | MAX | MIN                                    | MAX |      |
| $t_{pd}$  | A or B          | Y or $\bar{Y}$ | 4.4                                       | 14  | 2.1                                      | 8   | 2                                        | 6   | 1.4                                    | 4   | ns   |
|           | $\bar{A}/B$     |                | 4.9                                       | 16  | 2.5                                      | 9   | 2.1                                      | 6   | 1.6                                    | 4   |      |
|           | $\bar{G}$       |                | 4.2                                       | 14  | 2                                        | 8   | 1.6                                      | 6   | 1.3                                    | 4   |      |

## 6.7 Operating Characteristics

$T_A = 25^\circ\text{C}$

| PARAMETER |                               | TEST CONDITIONS     | $V_{CC} = 1.8\text{ V}$ | $V_{CC} = 2.5\text{ V}$ | $V_{CC} = 3.3\text{ V}$ | $V_{CC} = 5\text{ V}$ | UNIT |
|-----------|-------------------------------|---------------------|-------------------------|-------------------------|-------------------------|-----------------------|------|
|           |                               |                     | TYP                     | TYP                     | TYP                     | TYP                   |      |
| $C_{pd}$  | Power dissipation capacitance | $f = 10\text{ MHz}$ | 35                      | 35                      | 37                      | 40                    | pF   |

## 6.8 Typical Characteristics

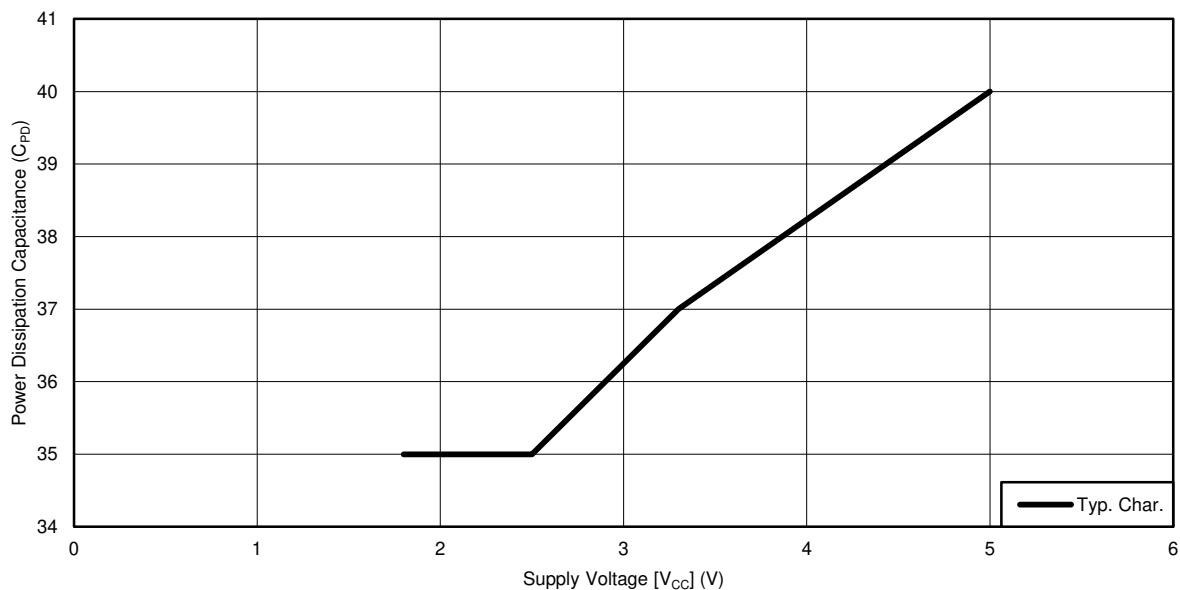
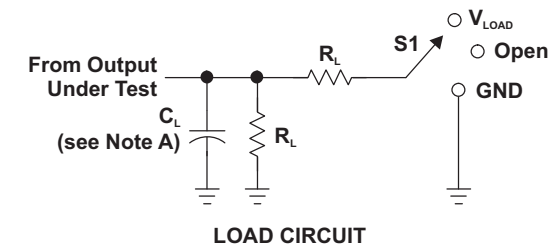


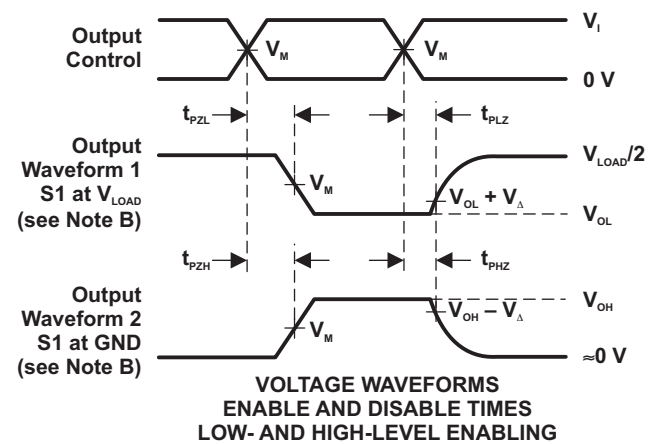
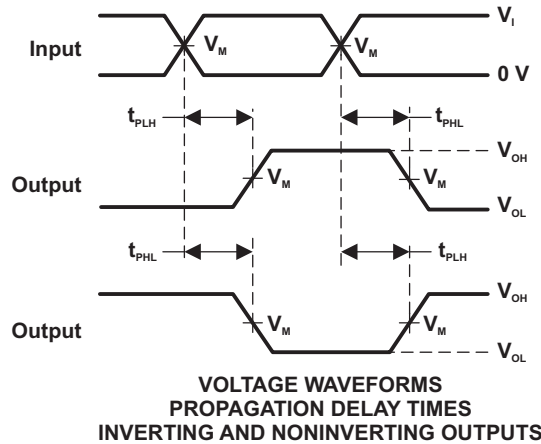
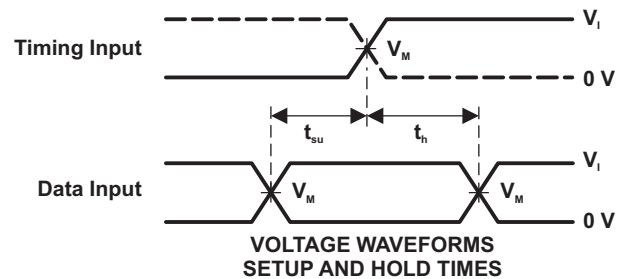
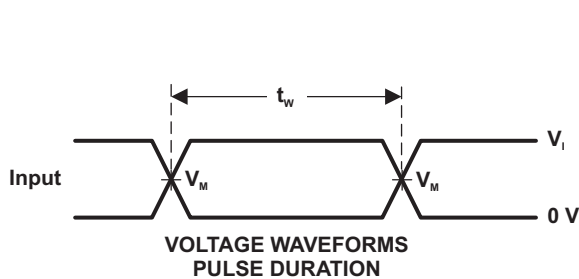
Figure 1. Voltage vs Capacitance

## 7 Parameter Measurement Information



| TEST              | S1         |
|-------------------|------------|
| $t_{PLH}/t_{PHL}$ | Open       |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |
| $t_{PHZ}/t_{PZH}$ | GND        |

| $V_{CC}$                         | INPUTS   |                      | $V_M$      | $V_{LOAD}$        | $C_L$ | $R_L$        | $V_{\Delta}$ |
|----------------------------------|----------|----------------------|------------|-------------------|-------|--------------|--------------|
|                                  | $V_i$    | $t_i/t_f$            |            |                   |       |              |              |
| $1.8\text{ V} \pm 0.15\text{ V}$ | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30 pF | 1 k $\Omega$ | 0.15 V       |
| $2.5\text{ V} \pm 0.2\text{ V}$  | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30 pF | 500 $\Omega$ | 0.15 V       |
| $3.3\text{ V} \pm 0.3\text{ V}$  | 3 V      | $\leq 2.5\text{ ns}$ | 1.5 V      | 6 V               | 50 pF | 500 $\Omega$ | 0.3 V        |
| $5\text{ V} \pm 0.5\text{ V}$    | $V_{CC}$ | $\leq 2.5\text{ ns}$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 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:  $PRR \leq 10\text{ MHz}$ ,  $Z_o = 50\ \Omega$ .
  - 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 2. Load Circuit and Voltage Waveforms

## 8 Detailed Description

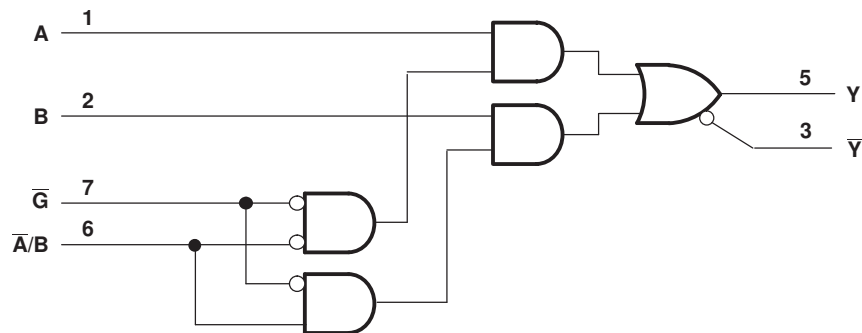
### 8.1 Overview

This single 2-line to 1-line data selector multiplexer is designed for 1.65-V to 5.5-V  $V_{CC}$  operation.

The SN74LVC2G157 device features a common strobe ( $\overline{G}$ ) input. When the strobe is high, Y is low and  $\overline{Y}$  is high. When the strobe is low, a single bit is selected from one of two sources and is routed to the outputs. The device provides true and complementary data.

This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

### 8.2 Functional Block Diagram



### 8.3 Feature Description

The SN74LVC2G157 device has a wide operating  $V_{CC}$  range of 1.65 V to 5.5 V, which allows it to be used in a broad range of systems. The 5.5 V I/Os allow down translation and also allow voltages at the inputs when  $V_{CC} = 0$ .

#### 8.3.1 Standard CMOS Inputs

Standard CMOS inputs are high impedance and are typically modeled as a resistor in parallel with the input capacitance given in the [Electrical Characteristics](#). The worst case resistance is calculated with the maximum input voltage, given in the [Absolute Maximum Ratings](#), and the maximum input leakage current, given in the [Electrical Characteristics](#), using ohm's law ( $R = V \div I$ ).

Signals applied to the inputs need to have fast edge rates, as defined by  $\Delta t/\Delta v$  in [Recommended Operating Conditions](#) to avoid excessive current consumption and oscillations. If a slow or noisy input signal is required, a device with a Schmitt-trigger input should be used to condition the input signal prior to the standard CMOS input.

#### 8.3.2 Balanced High-Drive CMOS Push-Pull Outputs

A balanced output allows the device to sink and source similar currents. The high drive capability of this device creates fast edges into light loads so routing and load conditions should be considered to prevent ringing. Additionally, the outputs of this device are capable of driving larger currents than the device can sustain without being damaged. It is important for the power output of the device to be limited to avoid thermal runaway and damage due to over-current. The electrical and thermal limits defined in the [Absolute Maximum Ratings](#) must be followed at all times.

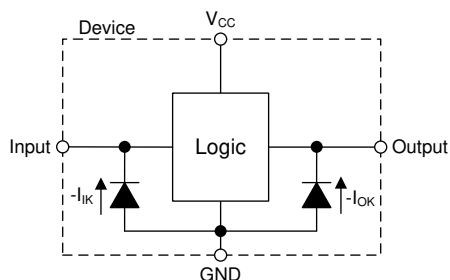
#### 8.3.3 Negative Clamping Diodes

The inputs and outputs to this device have negative clamping diodes as depicted in [Figure 3](#).

## Feature Description (continued)

### CAUTION

Voltages beyond the values specified in the [Absolute Maximum Ratings](#) table can cause damage to the device. The input negative-voltage and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.



**Figure 3. Electrical Placement of Clamping Diodes for Each Input and Output**

## 8.4 Device Functional Modes

[Table 1](#) lists the functional modes for SN74LVC2G157.

**Table 1. Function Table**

| INPUTS         |                  |   |   | OUTPUTS |                |
|----------------|------------------|---|---|---------|----------------|
| $\overline{G}$ | $\overline{A/B}$ | A | B | Y       | $\overline{Y}$ |
| H              | X                | X | X | L       | H              |
| L              | L                | L | X | L       | H              |
| L              | L                | H | X | H       | L              |
| L              | H                | X | L | L       | H              |
| L              | H                | X | H | H       | L              |

## 9 Application and Implementation

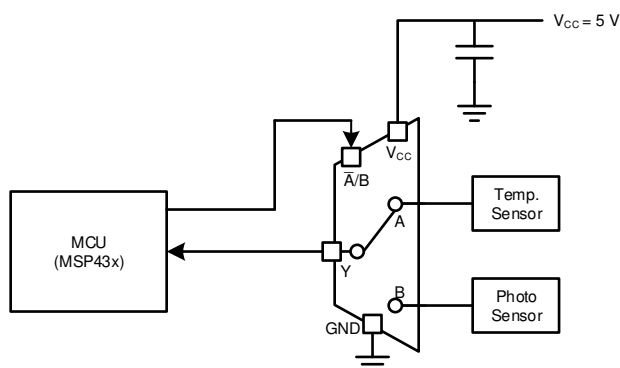
### NOTE

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 SN74LVC2G157 allows a single controller input to receive data from two different digital signal sources. In this application, a digital temperature sensor's output and a digital photo sensor's output are multiplexed. Both of these sensors have a relatively slow read rate, typically less than one read per second.

### 9.2 Typical Application



**Figure 4. Multiplexer Controlled by Processor**

#### 9.2.1 Design Requirements

- 5-V Operation
- Selectable input from two digital signal sources
  - Select LOW: Temperature Sensor, 1 kbps 5-V signal
  - Select HIGH: Photo Sensor, 1 kbps 5-V signal
- 15 pF, low leakage CMOS load

##### 9.2.1.1 Power

Ensure the desired supply voltage is within the range specified in the [Recommended Operating Conditions](#). The supply voltage sets the device's electrical characteristics as described in the [Electrical Characteristics](#).

The supply must be capable of sourcing current equal to the total current to be sourced by all outputs of the SN74LVC2G157 plus the maximum supply current,  $I_{CC}$ , listed in [Electrical Characteristics](#). The logic device can only source or sink as much current as it is provided at the supply and ground pins, respectively. Be sure not to exceed the maximum total current through GND or  $V_{CC}$  listed in [Absolute Maximum Ratings](#).

The SN74LVC2G157 can drive a load with a total capacitance less than or equal to 50 pF connected to a high-impedance CMOS input while still meeting all of the datasheet specifications. Larger capacitive loads can be applied, however it is not recommended to exceed 70 pF.

Total power consumption can be calculated using the information provided in [CMOS Power Consumption and  \$C\_{pd}\$  Calculation](#).

Thermal increase can be calculated using the information provided in [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices](#).

## Typical Application (continued)

### CAUTION

The maximum junction temperature,  $T_J(\text{max})$  listed in [Absolute Maximum Ratings](#), is an *additional limitation* to prevent damage to the device. Do not violate any values listed in the [Absolute Maximum Ratings](#). These limits are provided to prevent damage to the device.

### 9.2.1.2 Inputs

Unused inputs must be terminated to either  $V_{CC}$  or ground. These can be directly terminated if the input is completely unused, or they can be connected with a pull-up or pull-down resistor if the input is to be used sometimes, but not always. A pull-up resistor is used for a default state of HIGH, and a pull-down resistor is used for a default state of LOW. The resistor size is limited by drive current of the controller, leakage current into the SN74LVC2G157, as specified in [Electrical Characteristics](#), and the desired input transition rate. A 10 k $\Omega$  resistor value is often used due to these factors.

The SN74LVC2G157 has standard CMOS inputs, so input signal edge rates cannot be slow. Slow input edge rates can cause oscillations and damaging shoot-through current. The recommended rates are defined in the [Recommended Operating Conditions](#).

Refer to [Feature Description](#) for additional information regarding the inputs for this device.

### 9.2.1.3 Outputs

The positive supply voltage is used to produce the output HIGH voltage. Drawing current from the output will decrease the output voltage as specified by the  $V_{OH}$  specification in the [Electrical Characteristics](#). Similarly, the ground voltage is used to produce the output LOW voltage. Sinking current into the output will increase the output voltage as specified by the  $V_{OL}$  specification in the [Electrical Characteristics](#).

Unused outputs can be left floating.

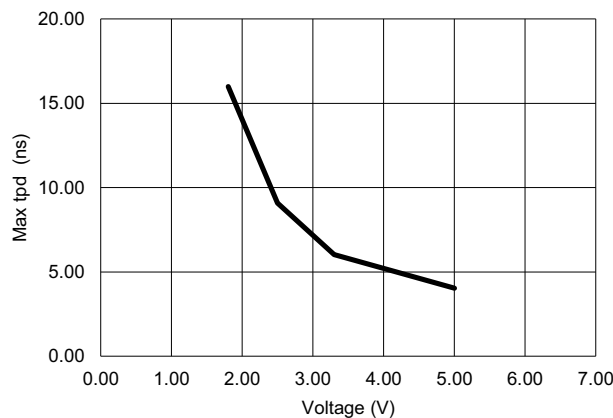
Refer to [Feature Description](#) for additional information regarding the outputs for this device.

## 9.2.2 Detailed Design Procedure

1. Add a decoupling capacitor, typically 0.1  $\mu\text{F}$ , from  $V_{CC}$  to GND. The capacitor needs to be placed physically close to the device and electrically close to both the  $V_{CC}$  and GND pins. An example layout is shown in [Figure 7](#).
2. Ensure the capacitive load at the output is  $\leq 70$  pF. This is not a hard limit, however it will ensure optimal performance. This can be accomplished by providing short, appropriately sized traces from the SN74LVC2G157 to the receiving device.
3. Ensure the resistive load at the output is larger than  $(V_{CC} / 25 \text{ mA}) \Omega$ . This will ensure that the maximum output current from the [Absolute Maximum Ratings](#) is not violated. Most CMOS inputs have a resistive load measured in megaohms; much larger than the minimum calculated above.
4. Thermal issues are rarely a concern for logic gates, however the power consumption and thermal increase can be calculated using the steps provided in the application report, [CMOS Power Consumption and Cpd Calculation](#)

## Typical Application (continued)

### 9.2.3 Application Curve



**Figure 5. Max propagation delay vs voltage for the LVC logic family**

## 10 Power Supply Recommendations

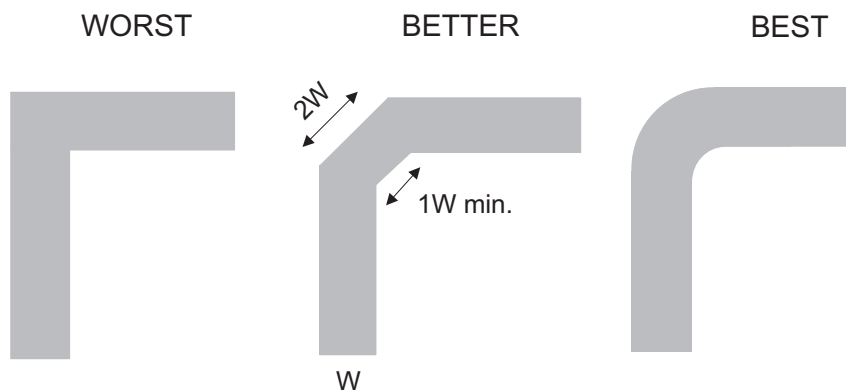
The power supply can be any voltage between the minimum and maximum supply voltage rating located in the [Recommended Operating Conditions](#). Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. A 0.1- $\mu$ F capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1- $\mu$ F and 1- $\mu$ F capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results, as shown in [Figure 7](#).

## 11 Layout

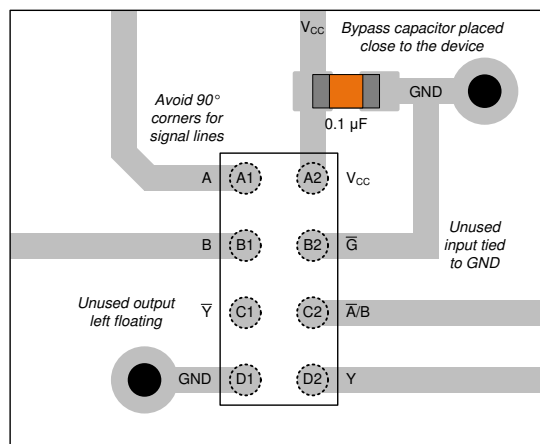
### 11.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices inputs must not ever be left floating. In many cases, functions or parts of functions of digital logic devices are unused; for example, when only two inputs of a triple-input AND gate are used or only 3 of the 4 buffer gates are used. Such unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or  $V_{CC}$ , whichever makes more sense for the logic function or is more convenient.

## 11.2 Layout Example



**Figure 6. Trace Example**



**Figure 7. Example layout for SN74LVC2G157**

## 12 デバイスおよびドキュメントのサポート

### 12.1 ドキュメントのサポート

#### 12.1.1 関連資料

関連資料については、以下を参照してください。

- 『低速またはフローティングCMOS入力の影響』、[SCBA004](#)
- 『テキサス・インスツルメンツ製信号スイッチの的確な選択』、[SZZA030](#)

### 12.2 コミュニティ・リソース

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](http://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.

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### 12.5 Glossary

[SLYZ022](#) — *TI Glossary*.

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

## 13 メカニカル、パッケージ、および注文情報

以降のページには、メカニカル、パッケージ、および注文に関する情報が記載されています。この情報は、そのデバイスについて利用可能な最新のデータです。このデータは予告なく変更されることがあり、ドキュメントが改訂される場合もあります。このデータシートのブラウザ対応版については、左側にあるナビゲーションを参照してください。

## PACKAGING INFORMATION

| Orderable part number            | Status<br>(1) | Material type<br>(2) | Package   Pins  | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6)   |
|----------------------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|-----------------------|
| 74LVC2G157DCTRE4                 | Active        | Production           | SSOP (DCT)   8  | 3000   null           | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | C57<br>(R, Z)         |
| 74LVC2G157DCTRE4.B               | Active        | Production           | SSOP (DCT)   8  | 3000   null           | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | C57<br>(R, Z)         |
| <a href="#">74LVC2G157DCURG4</a> | Active        | Production           | VSSOP (DCU)   8 | 3000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | C57R                  |
| 74LVC2G157DCURG4.B               | Active        | Production           | VSSOP (DCU)   8 | 3000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | C57R                  |
| <a href="#">74LVC2G157DCUTG4</a> | Active        | Production           | VSSOP (DCU)   8 | 250   SMALL T&R       | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | C57R                  |
| 74LVC2G157DCUTG4.B               | Active        | Production           | VSSOP (DCU)   8 | 250   SMALL T&R       | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | C57R                  |
| <a href="#">SN74LVC2G157DCT3</a> | Obsolete      | Production           | SSOP (DCT)   8  | -                     | -           | Call TI                              | Call TI                           | -40 to 85    | C57<br>Z              |
| <a href="#">SN74LVC2G157DCTR</a> | Active        | Production           | SSOP (DCT)   8  | 3000   LARGE T&R      | Yes         | NIPDAU   SN                          | Level-1-260C-UNLIM                | -40 to 85    | (2WN5, C57)<br>(R, Z) |
| SN74LVC2G157DCTR.B               | Active        | Production           | SSOP (DCT)   8  | 3000   LARGE T&R      | Yes         | SN                                   | Level-1-260C-UNLIM                | -40 to 85    | (2WN5, C57)<br>(R, Z) |
| SN74LVC2G157DCTRG4               | Active        | Production           | SSOP (DCT)   8  | 3000   LARGE T&R      | -           | Call TI                              | Call TI                           | -40 to 85    |                       |
| SN74LVC2G157DCTRG4.B             | Active        | Production           | SSOP (DCT)   8  | 3000   LARGE T&R      | -           | Call TI                              | Call TI                           | -40 to 85    |                       |
| <a href="#">SN74LVC2G157DCU3</a> | Active        | Production           | VSSOP (DCU)   8 | 3000   LARGE T&R      | Yes         | SNBI                                 | Level-1-260C-UNLIM                | -40 to 85    | 57<br>CZ              |
| SN74LVC2G157DCU3.B               | Active        | Production           | VSSOP (DCU)   8 | 3000   LARGE T&R      | Yes         | SNBI                                 | Level-1-260C-UNLIM                | -40 to 85    | 57<br>CZ              |
| <a href="#">SN74LVC2G157DCUR</a> | Active        | Production           | VSSOP (DCU)   8 | 3000   LARGE T&R      | Yes         | NIPDAU   SN                          | Level-1-260C-UNLIM                | -40 to 85    | (C57J, C57Q, C57R)    |
| SN74LVC2G157DCUR.B               | Active        | Production           | VSSOP (DCU)   8 | 3000   LARGE T&R      | Yes         | SN                                   | Level-1-260C-UNLIM                | -40 to 85    | (C57J, C57Q, C57R)    |
| <a href="#">SN74LVC2G157DCUT</a> | Active        | Production           | VSSOP (DCU)   8 | 250   SMALL T&R       | Yes         | NIPDAU   SN                          | Level-1-260C-UNLIM                | -40 to 85    | (C57J, C57Q, C57R)    |
| SN74LVC2G157DCUT.B               | Active        | Production           | VSSOP (DCU)   8 | 250   SMALL T&R       | Yes         | SN                                   | Level-1-260C-UNLIM                | -40 to 85    | (C57J, C57Q, C57R)    |
| SN74LVC2G157DCUTG4.B             | Active        | Production           | VSSOP (DCU)   8 | 250   SMALL T&R       | -           | Call TI                              | Call TI                           | -40 to 85    |                       |
| <a href="#">SN74LVC2G157YZPR</a> | Active        | Production           | DSBGA (YZP)   8 | 3000   LARGE T&R      | Yes         | SNAGCU                               | Level-1-260C-UNLIM                | -40 to 85    | (C37, C3N)            |
| SN74LVC2G157YZPR.B               | Active        | Production           | DSBGA (YZP)   8 | 3000   LARGE T&R      | Yes         | SNAGCU                               | Level-1-260C-UNLIM                | -40 to 85    | (C37, C3N)            |

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

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

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

<sup>(4)</sup> **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.

<sup>(5)</sup> **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.

<sup>(6)</sup> **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 |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| 74LVC2G157DCURG4 | VSSOP        | DCU             | 8    | 3000 | 180.0              | 8.4                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |
| 74LVC2G157DCUTG4 | VSSOP        | DCU             | 8    | 250  | 180.0              | 8.4                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |
| SN74LVC2G157DCTR | SSOP         | DCT             | 8    | 3000 | 180.0              | 12.4               | 3.15    | 4.35    | 1.55    | 4.0     | 12.0   | Q3            |
| SN74LVC2G157DCUR | VSSOP        | DCU             | 8    | 3000 | 178.0              | 9.0                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |
| SN74LVC2G157DCUT | VSSOP        | DCU             | 8    | 250  | 178.0              | 9.0                | 2.25    | 3.35    | 1.05    | 4.0     | 8.0    | Q3            |
| SN74LVC2G157YZPR | DSBGA        | YZP             | 8    | 3000 | 178.0              | 9.2                | 1.02    | 2.02    | 0.63    | 4.0     | 8.0    | Q1            |

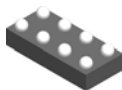
## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device           | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| 74LVC2G157DCURG4 | VSSOP        | DCU             | 8    | 3000 | 202.0       | 201.0      | 28.0        |
| 74LVC2G157DCUTG4 | VSSOP        | DCU             | 8    | 250  | 202.0       | 201.0      | 28.0        |
| SN74LVC2G157DCTR | SSOP         | DCT             | 8    | 3000 | 190.0       | 190.0      | 30.0        |
| SN74LVC2G157DCUR | VSSOP        | DCU             | 8    | 3000 | 180.0       | 180.0      | 18.0        |
| SN74LVC2G157DCUT | VSSOP        | DCU             | 8    | 250  | 180.0       | 180.0      | 18.0        |
| SN74LVC2G157YZPR | DSBGA        | YZP             | 8    | 3000 | 220.0       | 220.0      | 35.0        |

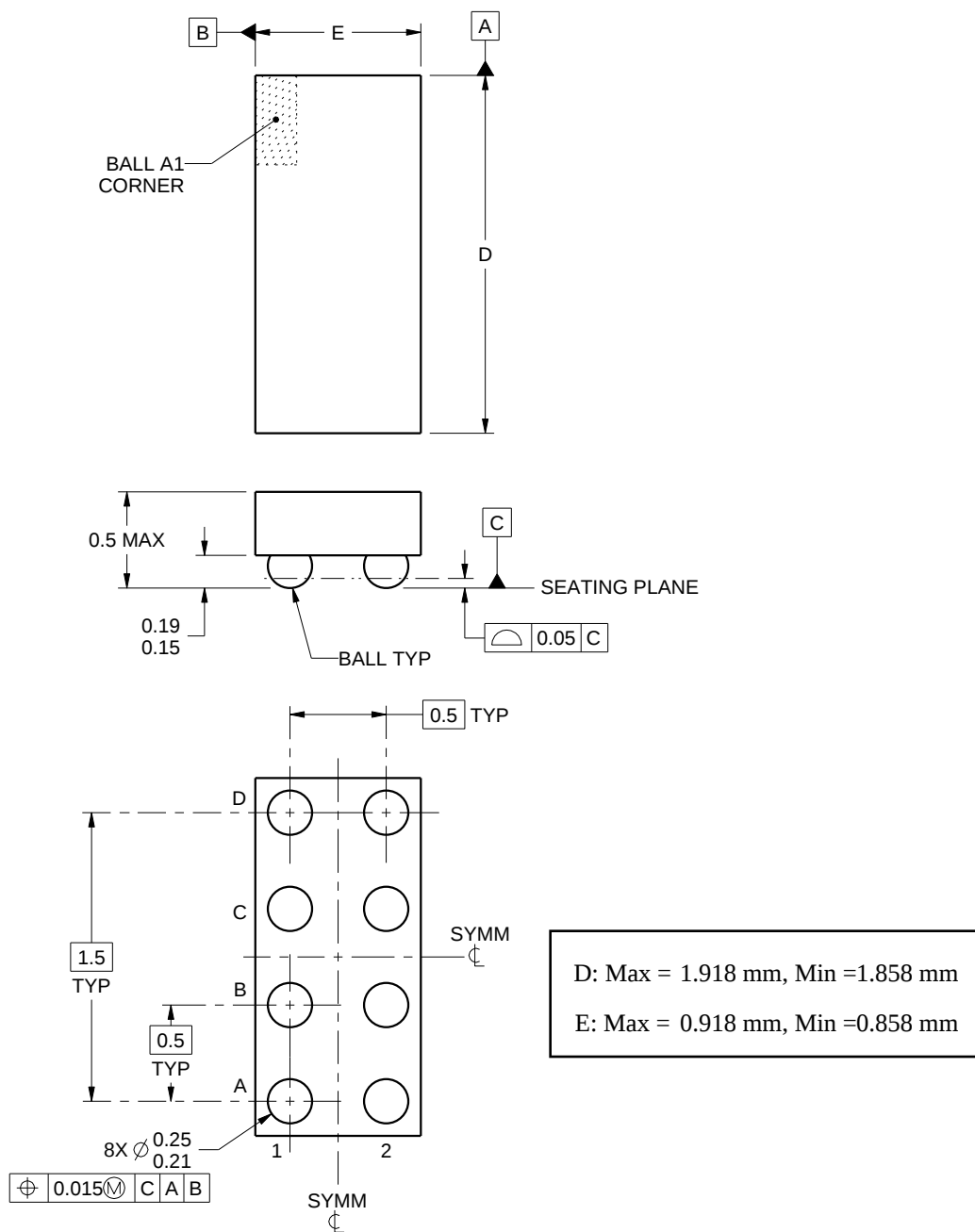
YZP0008



# PACKAGE OUTLINE

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



4223082/A 07/2016

## NOTES:

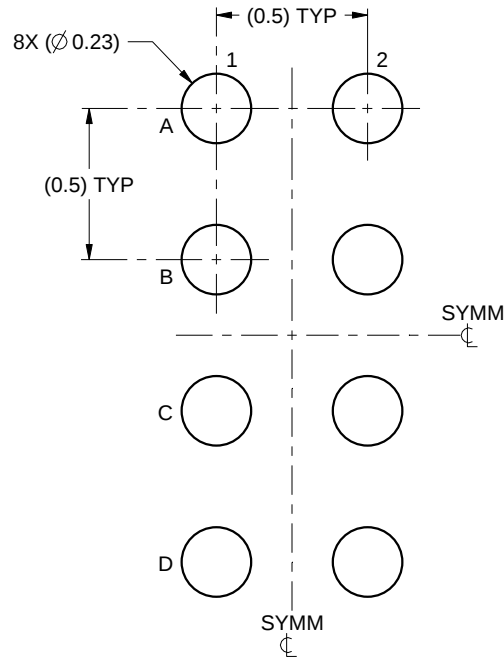
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

# EXAMPLE BOARD LAYOUT

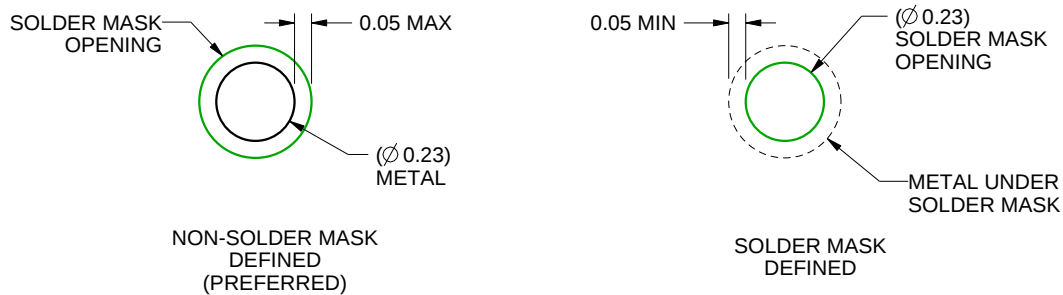
YZP0008

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE  
SCALE:40X



SOLDER MASK DETAILS  
NOT TO SCALE

4223082/A 07/2016

NOTES: (continued)

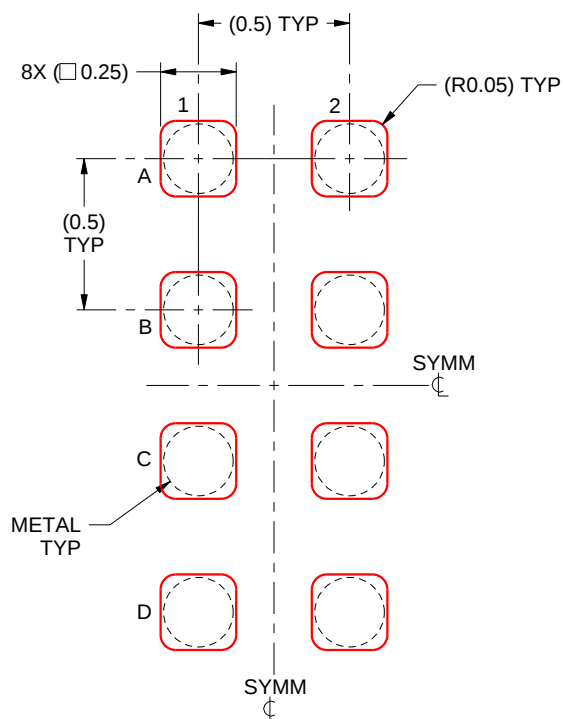
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SNVA009 ([www.ti.com/lit/snva009](http://www.ti.com/lit/snva009)).

## EXAMPLE STENCIL DESIGN

YZP0008

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY

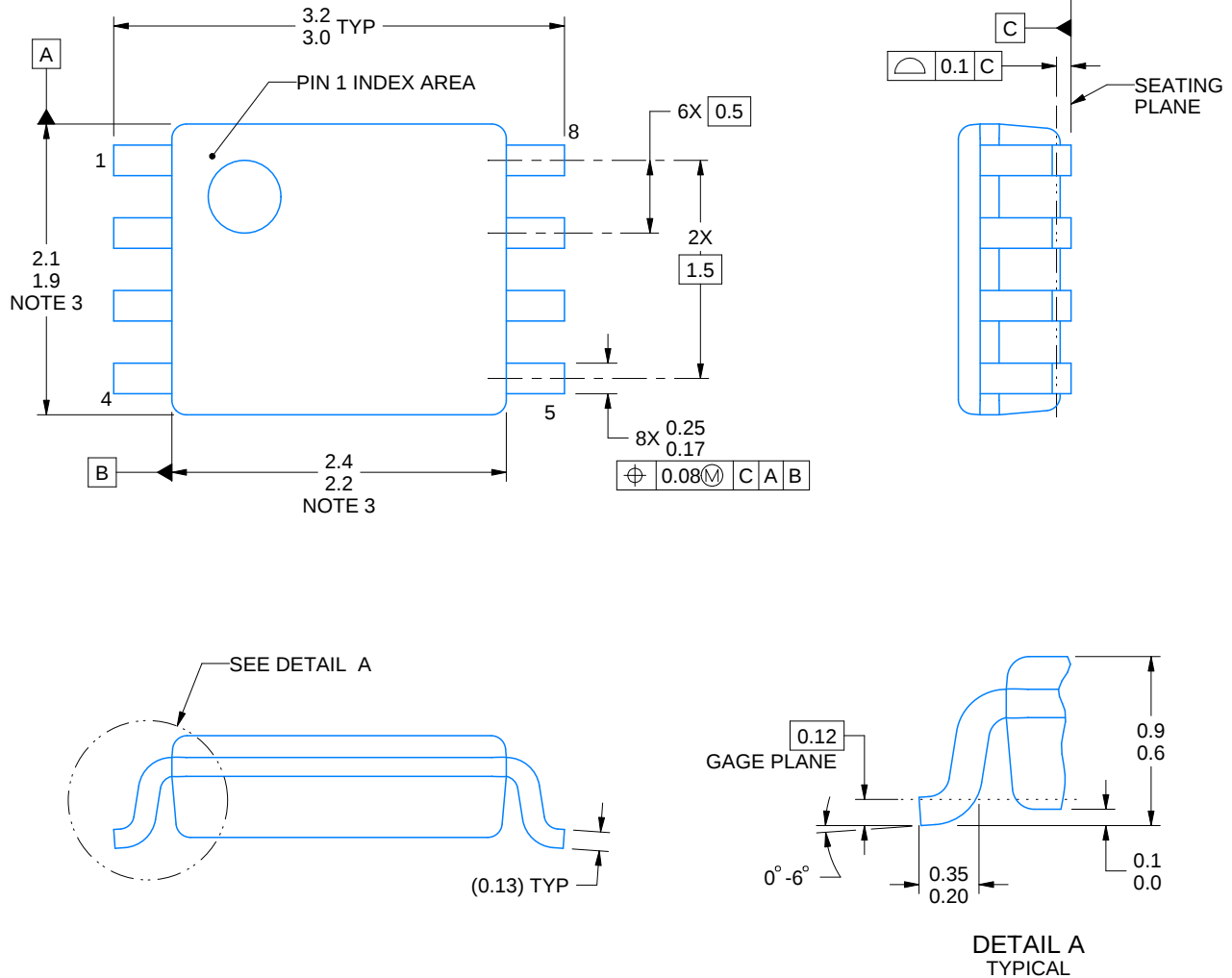


SOLDER PASTE EXAMPLE  
BASED ON 0.1 mm THICK STENCIL  
SCALE:40X

4223082/A 07/2016

NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.



4225266/A 09/2014

**NOTES:**

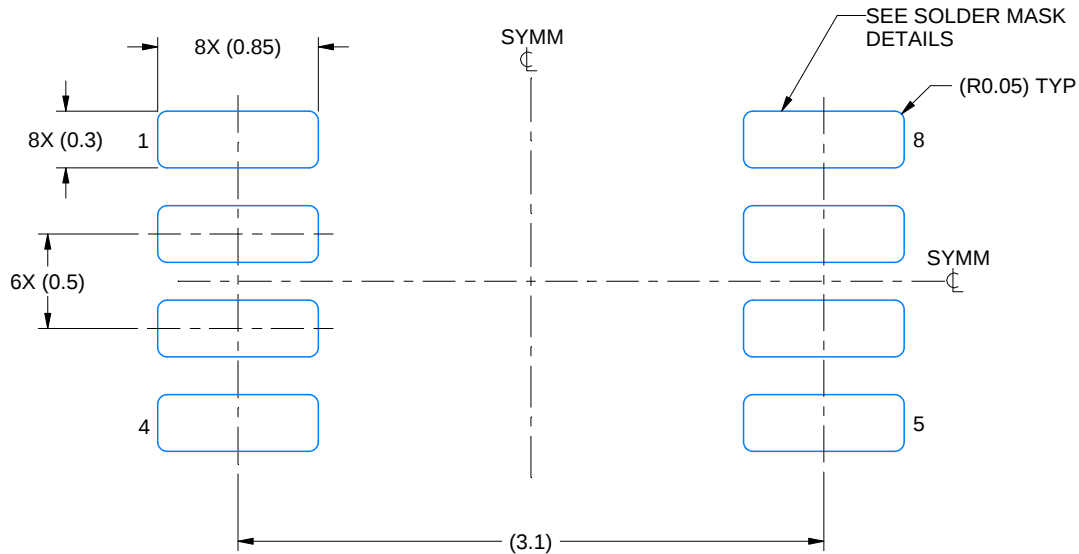
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-187 variation CA.

# EXAMPLE BOARD LAYOUT

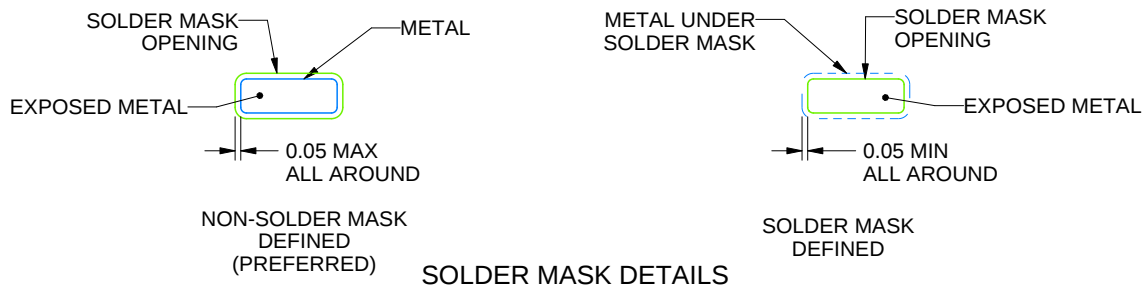
DCU0008A

VSSOP - 0.9 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 25X



4225266/A 09/2014

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

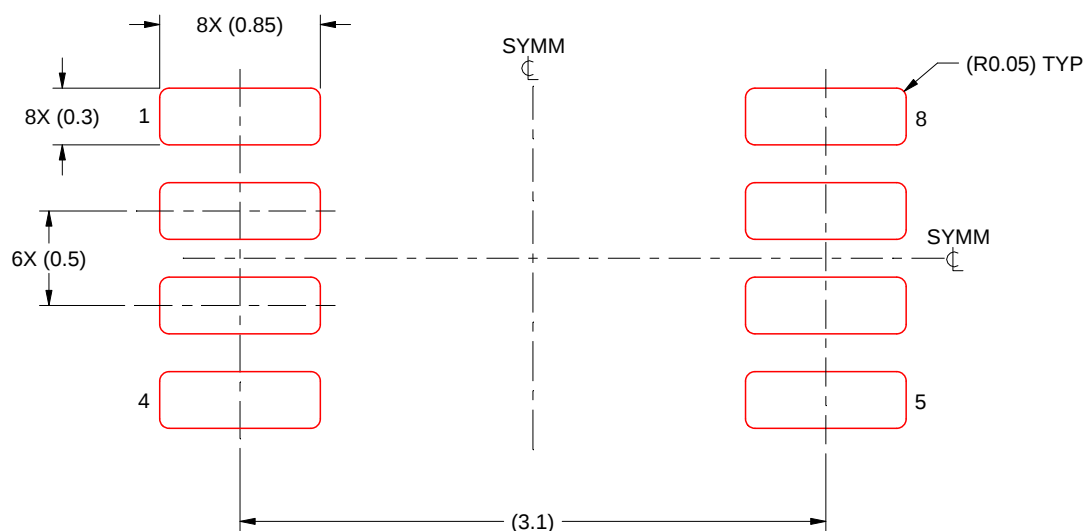
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DCU0008A

VSSOP - 0.9 mm max height

SMALL OUTLINE PACKAGE



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

4225266/A 09/2014

NOTES: (continued)

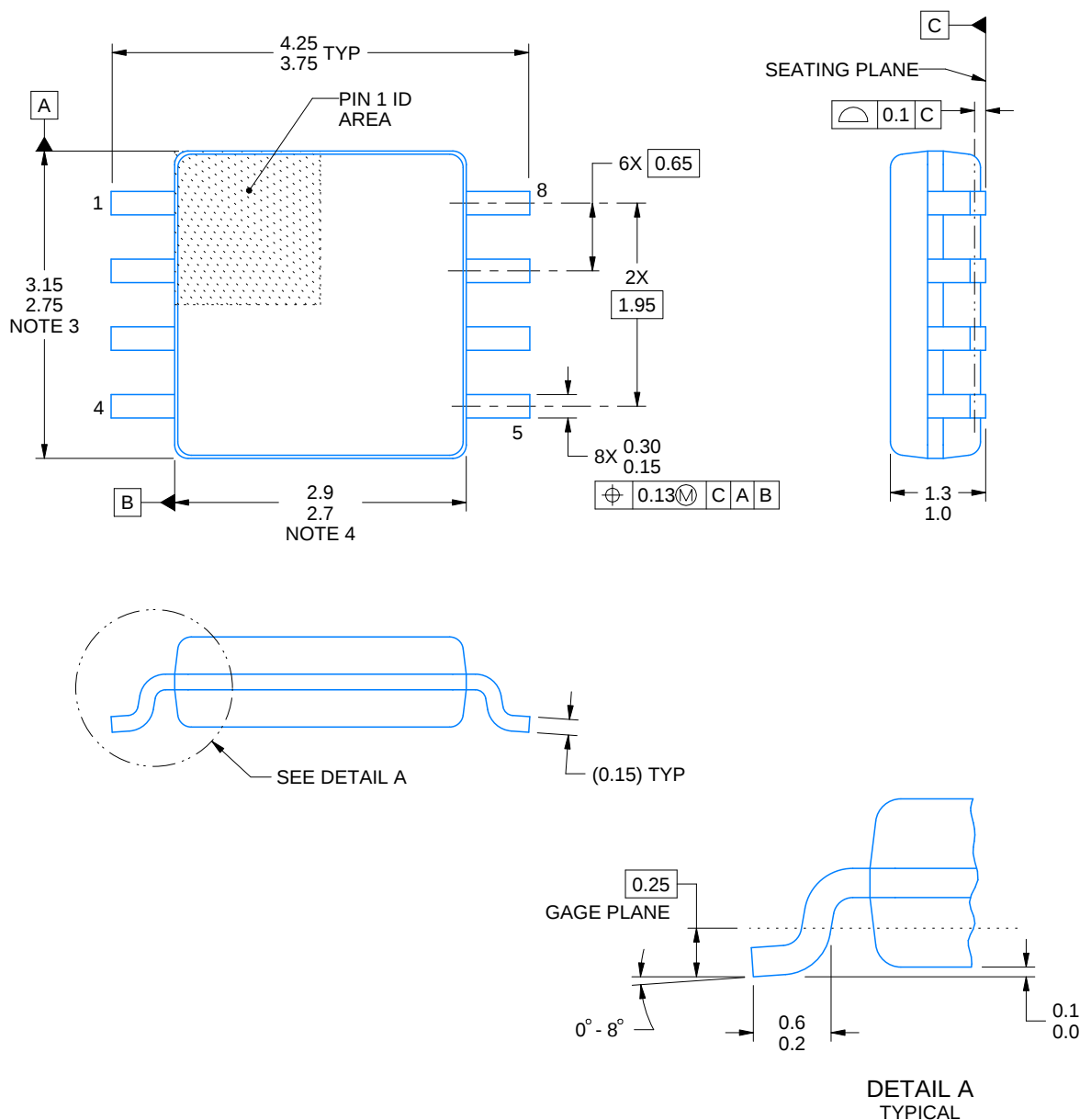
7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.



## PACKAGE OUTLINE

## SSOP - 1.3 mm max height

## SMALL OUTLINE PACKAGE



4220784/C 06/2021

NOTES:

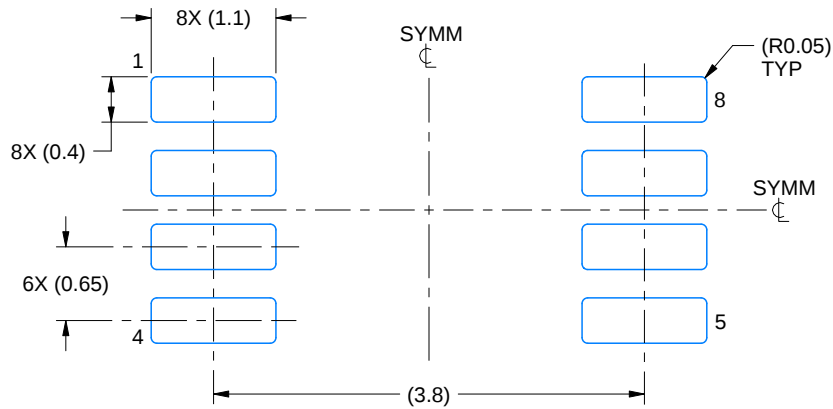
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.

# EXAMPLE BOARD LAYOUT

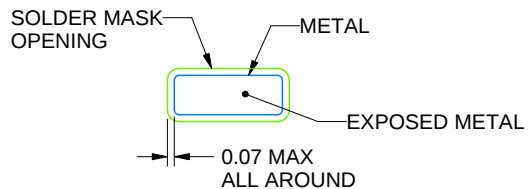
DCT0008A

SSOP - 1.3 mm max height

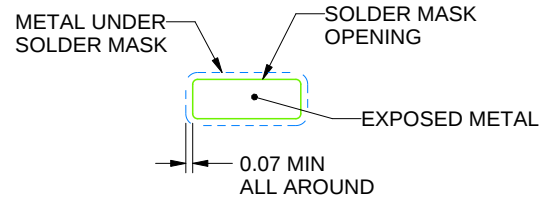
SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:15X



NON SOLDER MASK  
DEFINED



SOLDER MASK  
DEFINED

SOLDER MASK DETAILS

4220784/C 06/2021

NOTES: (continued)

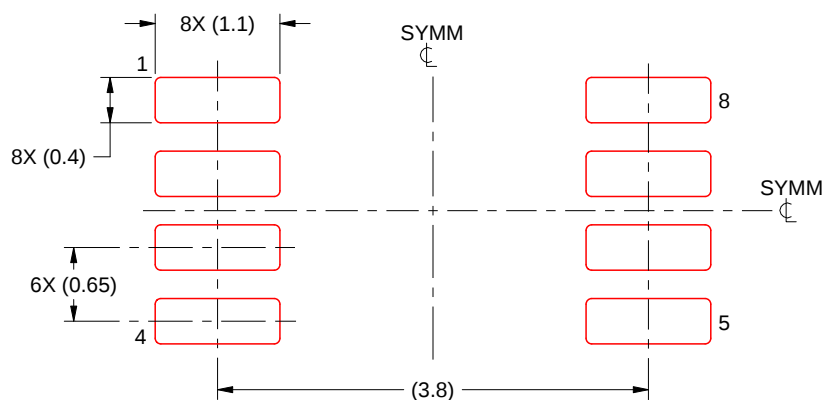
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DCT0008A

SSOP - 1.3 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:15X

4220784/C 06/2021

NOTES: (continued)

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

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