

## SN74LVC1GU04 Single Inverter Gate

### 1 Features

- Available in the Texas Instruments NanoFree™ Package
- Supports 5-V  $V_{CC}$  Operation
- Inputs Accept Voltages to 5.5 V
- Unbuffered Output
- Maximum  $t_{pd}$  of 3.7 ns at 3.3 V
- Low Power Consumption, 10- $\mu$ A Maximum  $I_{CC}$
- $\pm 24$ -mA Output Drive at 3.3 V
- $I_{off}$  Supports Live Insertion, Partial-Power-Down Mode, and Back-Drive Protection
- 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)
  - 1000-V Charged-Device Model (C101)

### 2 Applications

- AV Receivers
- Blu-ray Players and Home Theaters
- DVD Recorders and Players
- Desktop or Notebook PCs
- Digital Radio or Internet Radio Players
- Digital Video Cameras (DVC)
- Embedded PCs
- GPS: Personal Navigation Devices
- Mobile Internet Devices
- Network Projector Front-Ends
- Portable Media Players
- Pro Audio Mixers
- Smoke Detectors
- Solid-State Drive (SSD): Enterprise
- High-Definition (HDTV)
- Tablets: Enterprise
- Audio Docks: Portable
- DLP Front Projection Systems
- DVR and DVS
- Digital Picture Frame (DPF)
- Digital Still Cameras

### 3 Description

This single inverter gate is designed for 1.65-V to 5.5-V  $V_{CC}$  operation.

The SN74LVC1GU04 device contains one inverter with an unbuffered output and performs the Boolean function  $Y = \bar{A}$ .

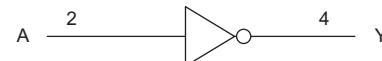
NanoFree package technology is a major breakthrough in device packaging concepts, using the die as the package.

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

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN74LVC1GU04DBV	SOT-23 (5)	2.90 mm x 1.60 mm
SN74LVC1GU04DCK	SC70 (5)	2.00 mm x 1.25 mm
SN74LVC1GU04DRL	SOT-5X3 (5)	1.60 mm x 1.20 mm
SN74LVC1GU04DRY	SON (6)	1.45 mm x 1.00 mm
SN74LVC1GU04DSF	SON (6)	1.00 mm x 1.00 mm
SN74LVC1GU04YZP	DSBGA (5)	1.44 mm x 0.94 mm
SN74LVC1GU04YZV	DSBGA (4)	0.91 mm x 0.91 mm
SN74LVC1GU04DPW	X2SON (5)	0.80 mm x 0.80 mm

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

#### Logic Diagram (Positive Logic)



An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.

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## 4 Revision History

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

### Changes from Revision X (November 2017) to Revision Y

	Page
• Updated input voltage minimum from 0.5 V to $-0.5$ V in Absolute Maximum Ratings table.....	<b>5</b>

### Changes from Revision W (January 2016) to Revision X

	Page
• Changed values in the Thermal Information table to align with JEDEC standards.....	<b>6</b>
• Updated Feature Description to include more detailed information about specific device features. ....	<b>9</b>
• Changed Typical Application to oscillator circuit. ....	<b>11</b>
• Added DPW layout example.....	<b>13</b>

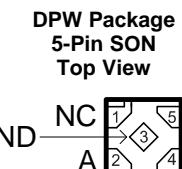
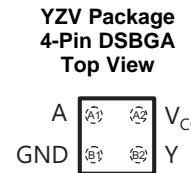
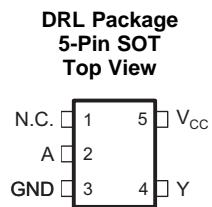
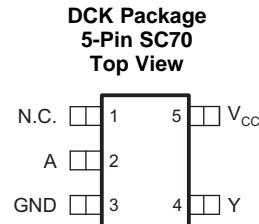
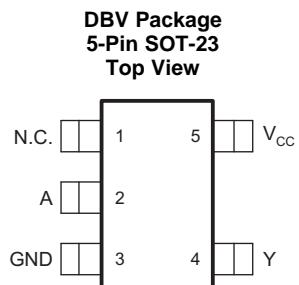
### Changes from Revision V (November 2013) to Revision W

	Page
• Added Applications section, Device Information table, ESD Ratings table, Thermal Information table, Typical Characteristics, Feature Description section, Device Functional Modes, Application and Implementation section, Power Supply Recommendations section, Layout section, Device and Documentation Support section, and Mechanical, Packaging, and Orderable Information section. ....	<b>1</b>

### Changes from Revision U (June 2011) to Revision V

	Page
• Updated document to new TI data sheet format. ....	<b>1</b>
• Updated operating free-air temperature range in Recommended Operating Conditions table.....	<b>5</b>

## 5 Pin Configuration and Functions



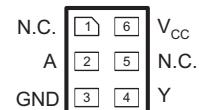
### Pin Functions<sup>(1)(2)</sup>

PIN			I/O	DESCRIPTION
NAME	DBV, DRL, DCK, DPW	YZV		
A	2	A1	I	Input
GND	3	B1	—	Ground
NC	1	—	—	Not connected
V <sub>CC</sub>	5	A2	—	Positive Supply
Y	4	B2	O	Output

(1) NC – No internal connection

(2) See [Mechanical, Packaging, and Orderable Information](#) for dimensions

**DSF Package**
**6-Pin SON  
Top View**

**DRY Package**
**6-Pin SON  
Top View**

**YZP Package**  
**6-Pin DSBGA  
Top View**


DNU – Do not use

**Pin Functions<sup>(1)(2)</sup>**

PIN			I/O	DESCRIPTION
NAME	DSF, DRY	YZP		
A	2	B1	I	Input
GND	3	C1	—	Ground
NC	1, 5	A1, B2	—	Not connected
V <sub>CC</sub>	6	A2	—	Positive Supply
Y	4	C2	O	Output

(1) NC – No internal connection

(2) See [Mechanical, Packaging, and Orderable Information](#) for dimensions

## 6 Specifications

### 6.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	–0.5	6.5	V
$V_I$	Input voltage <sup>(2)</sup>	–0.5	6.5	V
$V_O$	Voltage applied to any output in the high or low state <sup>(2)(3)</sup>	–0.5	$V_{CC} + 0.5$	V
$I_{IK}$	Input clamp current $V_I < 0$		–50	mA
$I_{OK}$	Output clamp current $V_O < 0$		–50	mA
$I_O$	Continuous output current		±50	mA
	Continuous current through $V_{CC}$ or GND		±100	mA
$T_J$	Maximum junction temperature		150	°C
$T_{stg}$	Storage temperature	–65	150	°C

- Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- The value of  $V_{CC}$  is provided in *Recommended Operating Conditions*.

### 6.2 ESD Ratings

		VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001	±2000 V
		Charged-device model (CDM), per JEDEC specification JESD22-C101	

### 6.3 Recommended Operating Conditions

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

		MIN	MAX	UNIT
$V_{CC}$	Supply voltage	1.65	5.5	V
$V_{IH}$	High-level input voltage	$I_O = -100 \mu A$	$0.75 \times V_{CC}$	V
$V_{IL}$	Low-level input voltage	$I_O = 100 \mu A$	$0.25 \times V_{CC}$	V
$V_I$	Input voltage	0	5.5	V
$V_O$	Output voltage	0	$V_{CC}$	V
$I_{OH}$	High-level output current	$V_{CC} = 1.65 \text{ V}$	–4	mA
		$V_{CC} = 2.3 \text{ V}$	–8	
		$V_{CC} = 3 \text{ V}$	–16	
		$V_{CC} = 4.5 \text{ V}$	–24	
$I_{OL}$	Low-level output current	$V_{CC} = 1.65 \text{ V}$	–32	mA
		$V_{CC} = 2.3 \text{ V}$	4	
		$V_{CC} = 3 \text{ V}$	8	
		$V_{CC} = 4.5 \text{ V}$	16	
$T_A$	Operating free-air temperature		24	mA
			32	
		–40	125	°C

- All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. For more information, see the *Implications of Slow or Floating CMOS Inputs* application report.

## 6.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>	SN74LVC1GU04								UNIT	
	DBV (SOT-23)	DCK (SC70)	DRL (SOT-5X3)	DRY (SON)	DSF (SON)	DPW (X2SON)	YZV (DSBGA)	YZP (DSBGA)		
	5 PINS	5 PINS	5 PINS	5 PINS	5 PINS	5 PINS	4 PINS	5 PINS		
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	231.5	276.1	296.2	369.6	410.3	511	168.2	144.4	°C/W
R <sub>θJC(top)</sub>	Junction-to-case (top) thermal resistance	139.4	178.9	137.3	257.6	208.4	241.9	2.1	1.3	°C/W
R <sub>θJB</sub>	Junction-to-board thermal resistance	71.1	70.9	145.3	230.8	262.6	374.2	55.9	39.9	°C/W
Ψ <sub>JT</sub>	Junction-to-top characterization parameter	45.2	47	14.7	77.2	36	45	1.1	0.5	°C/W
Ψ <sub>JB</sub>	Junction-to-board characterization parameter	70.7	69.3	145.9	231	262.3	373.3	56.3	39.7	°C/W
R <sub>θJC(bot)</sub>	Junction-to-case (bottom) thermal resistance	N/A	N/A	N/A	N/A	N/A	168.0	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](#).

## 6.5 Electrical Characteristics

over recommended operating free-air temperature range, T<sub>A</sub> = –40°C to +125°C (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP <sup>(1)</sup>	MAX	UNIT
V <sub>OH</sub>	V <sub>IL</sub> = 0 V, I <sub>OH</sub> = –100 μA, V <sub>CC</sub> = 1.65 V to 5.5 V	V <sub>CC</sub>	–0.1		V
	V <sub>IL</sub> = 0 V, I <sub>OH</sub> = –4 mA, V <sub>CC</sub> = 1.65 V		1.2		
	V <sub>IL</sub> = 0 V, I <sub>OH</sub> = –8 mA, V <sub>CC</sub> = 2.3 V		1.9		
	V <sub>IL</sub> = 0 V, I <sub>OH</sub> = –16 mA, V <sub>CC</sub> = 3 V		2.4		
	V <sub>IL</sub> = 0 V, I <sub>OH</sub> = –24 mA, V <sub>CC</sub> = 3 V		2.3		
	V <sub>IL</sub> = 0 V, I <sub>OH</sub> = –32 mA, V <sub>CC</sub> = 4.5 V		3.8		
V <sub>OL</sub>	V <sub>IH</sub> = V <sub>CC</sub> , I <sub>OL</sub> = 100 μA, V <sub>CC</sub> = 1.65 V to 5.5 V			0.1	V
	V <sub>IH</sub> = V <sub>CC</sub> , I <sub>OL</sub> = 4 mA, V <sub>CC</sub> = 1.65 V			0.45	
	V <sub>IH</sub> = V <sub>CC</sub> , I <sub>OL</sub> = 8 mA, V <sub>CC</sub> = 2.3 V			0.3	
	V <sub>IH</sub> = V <sub>CC</sub> , I <sub>OL</sub> = 16 mA, V <sub>CC</sub> = 3 V			0.4	
	V <sub>IH</sub> = V <sub>CC</sub> , I <sub>OL</sub> = 24 mA, V <sub>CC</sub> = 3 V			0.55	
	V <sub>IH</sub> = V <sub>CC</sub> , I <sub>OL</sub> = 32 mA, V <sub>CC</sub> = 4.5 V			0.55	
I <sub>I</sub>	Input leakage current A Input: V <sub>I</sub> = 5.5 V or GND, V <sub>CC</sub> = 0 V to 5.5 V			±5	μA
I <sub>CC</sub>	Supply current V <sub>I</sub> = 5.5 V or GND, I <sub>O</sub> = 0, V <sub>CC</sub> = 1.65 V to 5.5 V			10	μA
C <sub>I</sub>	Input capacitance V <sub>I</sub> = V <sub>CC</sub> or GND, V <sub>CC</sub> = 3.3 V, T <sub>A</sub> = –40°C to 85°C			7	pF

(1) All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

## 6.6 Switching Characteristics: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$

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

PARAMETER		TEST CONDITIONS		MIN	MAX	UNIT
$t_{pd}$	Propagation delay	A-to-Y	$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$	1.3	5	ns
			$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$	1	4	
			$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	1.1	3.7	
			$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$	1	3	

## 6.7 Switching Characteristics: $T_A = -40^\circ\text{C}$ to $+125^\circ\text{C}$

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

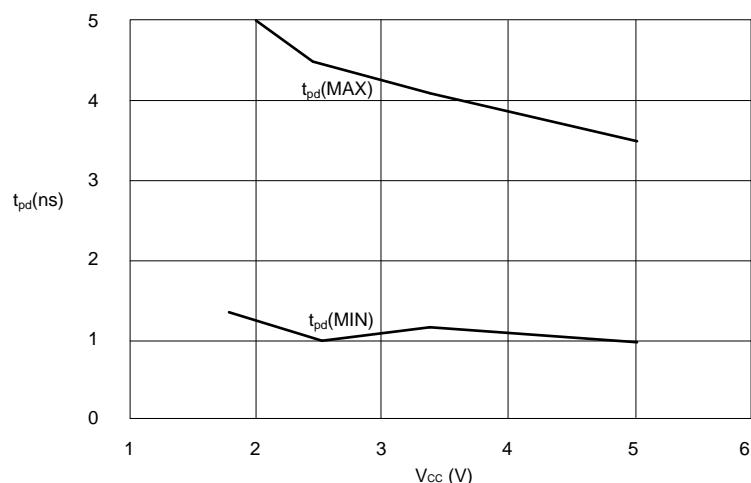
PARAMETER		TEST CONDITIONS		MIN	MAX	UNIT
$t_{pd}$	Propagation delay	A-to-Y	$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$	1.3	5.5	ns
			$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$	1	4.5	
			$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$	1.1	4.2	
			$V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$	1	3.5	

## 6.8 Operating Characteristics

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

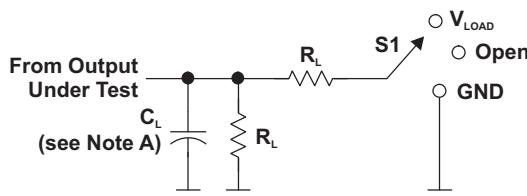
PARAMETER		TEST CONDITIONS		TYP	UNIT
$C_{pd}$	Power dissipation capacitance	$f = 10 \text{ MHz}$	$V_{CC} = 1.8 \text{ V}$	9	pF
			$V_{CC} = 2.5 \text{ V}$	11	
			$V_{CC} = 3.3 \text{ V}$	13	
			$V_{CC} = 5 \text{ V}$	27	

## 6.9 Typical Characteristic



**Figure 1.  $t_{pd}$  vs  $V_{CC}$**

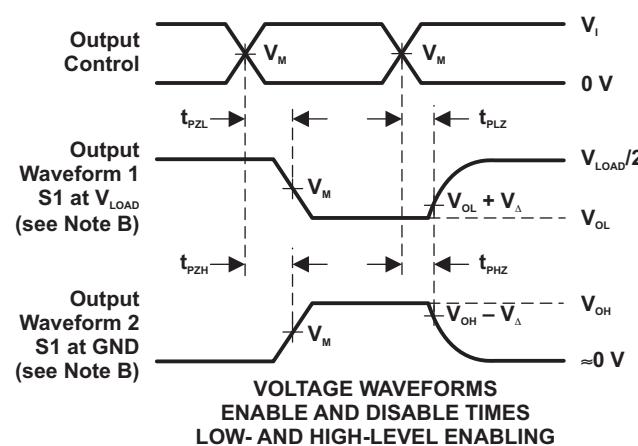
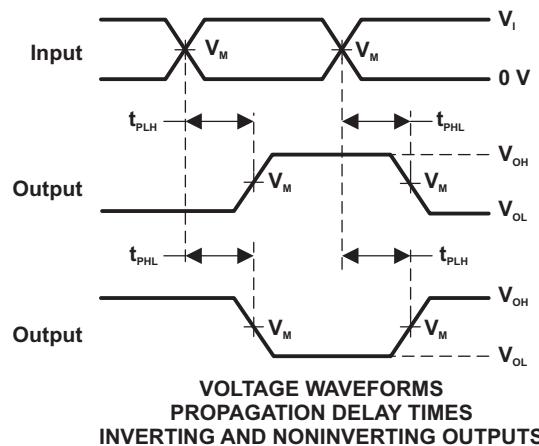
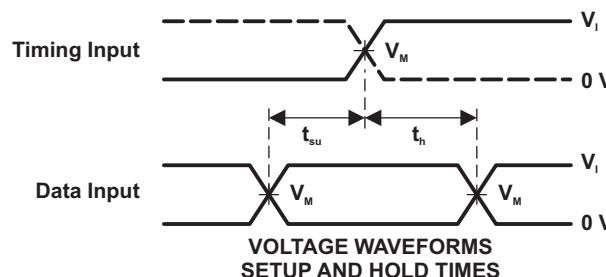
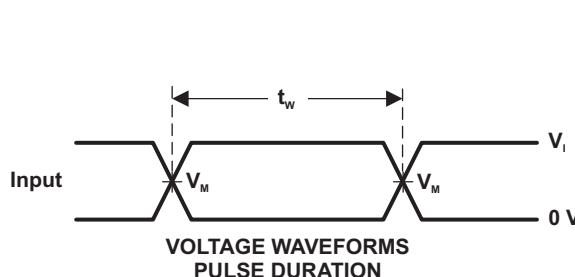
## 7 Parameter Measurement Information



TEST	$S_1$
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{LOAD}$
$t_{PHZ}/t_{PZH}$	GND

LOAD CIRCUIT

$V_{cc}$	INPUTS		$V_M$	$V_{LOAD}$	$C_L$	$R_L$	$V_\Delta$
	$V_I$	$t/t_f$					
$1.8\text{ V} \pm 0.15\text{ V}$	$V_{cc}$	$\leq 2\text{ ns}$	$V_{cc}/2$	$2 \times V_{cc}$	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  $\leq 10\text{ MHz}$ ,  $Z_o = 50\text{ }\Omega$ .
- 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.

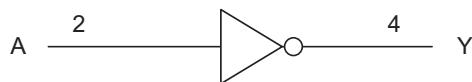
Figure 2. Load Circuit and Voltage Waveforms

## 8 Detailed Description

### 8.1 Overview

The SN74LVC1GU04 device contains one inverter with an unbuffered output with a maximum sink current of 32 mA.

### 8.2 Functional Block Diagram



**Figure 3. Logic Diagram (Positive Logic)**

### 8.3 Feature Description

#### 8.3.1 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 must 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 overcurrent. The electrical and thermal limits defined in the *Absolute Maximum Ratings* must be followed at all times.

#### 8.3.2 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 ( $R = V \div I$ ).

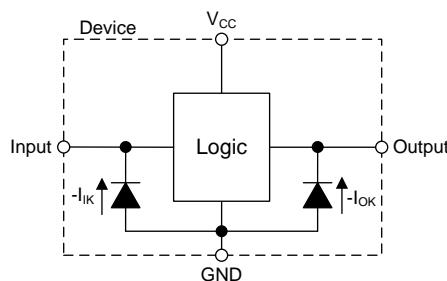
Signals that are applied to the inputs need to have fast edge rates, as shown by  $\Delta t/\Delta v$  in the *Recommended Operating Conditions*, to avoid excessive current consumption and oscillations. If a slow or noisy input signal is required, a device with a Schmitt-trigger input should be used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

#### 8.3.3 Negative Clamping Diodes

The inputs and outputs to this device have negative clamping diodes as shown in Figure 4.

#### 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 4. Electrical Placement of Clamping Diodes for Each Input and Output**

## Feature Description (continued)

### 8.3.4 Partial Power Down ( $I_{off}$ )

The inputs and outputs for this device enter a high-impedance state when the supply voltage is 0 V. The maximum leakage into or out of any input or output pin on the device is specified by  $I_{off}$  in the [Electrical Characteristics](#).

### 8.3.5 Over-voltage Tolerant Inputs

Input signals to this device can be driven above the supply voltage so long as they remain below the maximum input voltage value specified in the [Recommended Operating Conditions](#).

### 8.3.6 Unbuffered Logic

A standard CMOS logic function typically consists of at least three stages: the input inverter, the logic function, and the output inverter. Some devices have multiple stages at the input or output for various reasons. An unbuffered CMOS logic function eliminates the extra input and output stages; the device only contains the required logic function which is directly driven from the inputs and directly drives the outputs.

The unbuffered inverter is commonly used in oscillator circuits because it is less sensitive to parameter changes in the oscillator circuit due to having lower total gain than a buffered equivalent. To learn more about how to use an unbuffered inverter in an oscillator circuit, see [Use of the CMOS Unbuffered Inverter in Oscillator Circuits](#).

## 8.4 Device Functional Modes

[Table 1](#) lists the functional modes of the SN74LVC1GU04.

**Table 1. Function Table**

INPUT A	OUTPUT Y
H	L
L	H

## 9 Application and Implementation

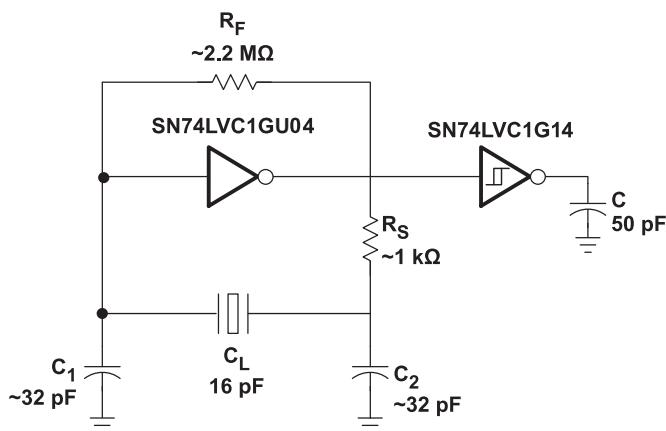
### NOTE

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 unbuffered inverter is commonly used in oscillator circuits because it is less sensitive to parameter changes in the oscillator circuit due to having lower total gain than a buffered equivalent. An example application circuit is shown in [Figure 5](#). To learn more about how to use an unbuffered inverter in an oscillator circuit, refer to the [Use of the CMOS Unbuffered Inverter in Oscillator Circuits](#) application report.

### 9.2 Typical Application



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**Figure 5. Typical Application Diagram**

#### 9.2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Take care to avoid bus contention because it can drive currents that would exceed maximum limits. The high drive also creates fast edges into light loads, so routing and load conditions should be considered to prevent ringing.

#### 9.2.2 Detailed Design Procedure

To learn more about how to use an unbuffered inverter in an oscillator circuit, refer to the [Use of the CMOS Unbuffered Inverter in Oscillator Circuits](#) application report.

##### 1. Recommended Input Conditions

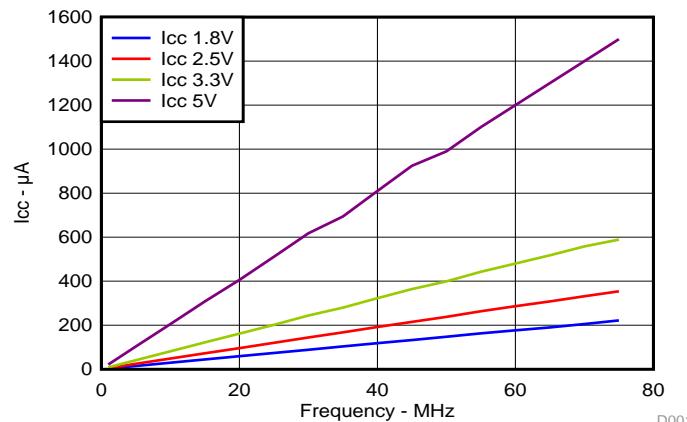
- Specified high and low levels. See ( $V_{IH}$  and  $V_{IL}$ ) in [Recommended Operating Conditions](#).
- Inputs are overvoltage tolerant allowing them to go as high as ( $V_I$  max) in [Recommended Operating Conditions](#) at any valid  $V_{CC}$ .

##### 2. Absolute Maximum Output Conditions

- Load currents must not exceed ( $I_O$  max) per output and must not exceed (Continuous current through  $V_{CC}$  or GND) total current for the part. These limits are located in [Absolute Maximum Ratings](#).
- Outputs must not be pulled above the voltage rated in the [Absolute Maximum Ratings](#).

## Typical Application (continued)

### 9.2.3 Application Curve



**Figure 6.  $I_{CC}$  vs Frequency**

## 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* table.

The  $V_{CC}$  pin must have a good bypass capacitor to prevent power disturbance. A  $0.1\text{-}\mu\text{F}$  capacitor is recommended, and it is ok to parallel multiple bypass caps to reject different frequencies of noise.  $0.1\text{-}\mu\text{F}$  and  $1\text{-}\mu\text{F}$  capacitors are commonly used in parallel. The bypass capacitor must be installed as close to the power pin as possible for best results.

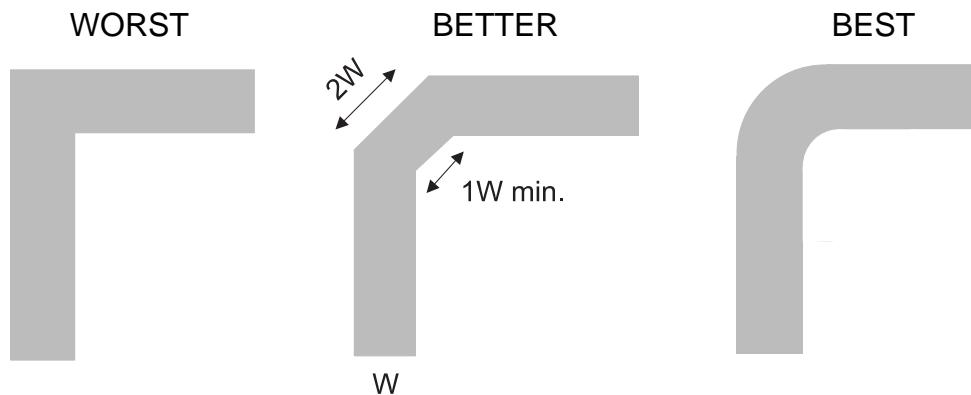
## 11 Layout

### 11.1 Layout Guidelines

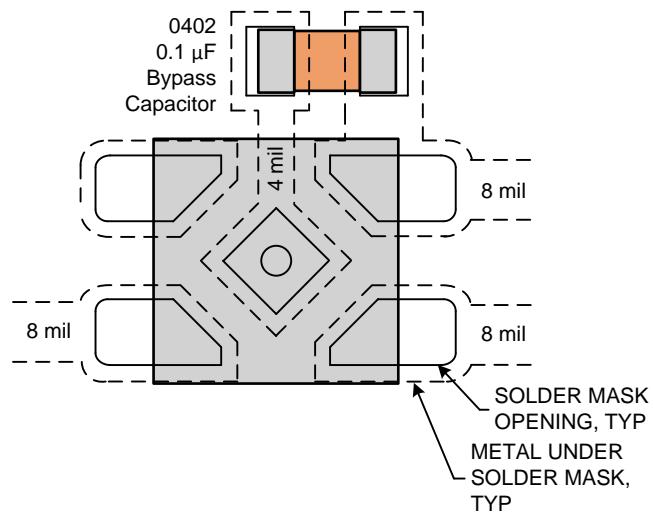
Even low data rate digital signals can contain high-frequency signal components due to fast edge rates. When a printed-circuit board (PCB) trace turns a corner at a 90° angle, a reflection can occur. A reflection occurs primarily because of the change of width of the trace. At the apex of the turn, the 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 7](#) shows progressively better techniques of rounding corners. Only the last example (BEST) maintains constant trace width and minimizes reflections.

An example layout is given in [Figure 8](#) for the DPW (X2SON-5) package. This example layout includes a 0402 (metric) capacitor and uses the measurements found in the example board layout appended to this end of this datasheet. A via of diameter 0.1 mm (3.973 mil) is placed directly in the center of the device. This via can be used to trace out the center pin connection through another board layer, or it can be left out of the layout.

### 11.2 Layout Example



**Figure 7. Trace Example**



**Figure 8. Example Layout With DPW (X2SON-5) Package**

## 12 Device and Documentation Support

### 12.1 Documentation Support

#### 12.1.1 Related Documentation

For related documentation, see the following:

Texas Instruments, [Implications of Slow or Floating CMOS Inputs](#) application report

### 12.2 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](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.

### 12.3 Trademarks

NanoFree, E2E are trademarks of Texas Instruments.

All other trademarks are the property of their respective owners.

### 12.4 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.

### 12.5 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 part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
74LVC1GU04DBVRE4	Active	Production	SOT-23 (DBV)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CU4F
<b>74LVC1GU04DBVRG4</b>	Active	Production	SOT-23 (DBV)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CU4F
74LVC1GU04DBVRG4.B	Active	Production	SOT-23 (DBV)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CU4F
<b>74LVC1GU04DBVTG4</b>	Active	Production	SOT-23 (DBV)   5	250   SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CU4F
74LVC1GU04DBVTG4.B	Active	Production	SOT-23 (DBV)   5	250   SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CU4F
74LVC1GU04DCKRE4	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CD5 CDS
<b>74LVC1GU04DCKRG4</b>	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CD5 CDS
74LVC1GU04DCKRG4.B	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CD5 CDS
<b>74LVC1GU04DCKTG4</b>	Active	Production	SC70 (DCK)   5	250   SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CD5 CDS
74LVC1GU04DCKTG4.B	Active	Production	SC70 (DCK)   5	250   SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CD5 CDS
74LVC1GU04DRLRG4	Active	Production	SOT-5X3 (DRL)   5	4000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	CDR
<b>SN74LVC1GU04DBVR</b>	Active	Production	SOT-23 (DBV)   5	3000   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 125	(CU45, CU4F, CU4J, CU4R, CU4T) (CU4H, CU4P, CU4S)
SN74LVC1GU04DBVR.B	Active	Production	SOT-23 (DBV)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(CU45, CU4F, CU4J, CU4R, CU4T) (CU4H, CU4P, CU4S)
SN74LVC1GU04DBVRG4.B	Active	Production	SOT-23 (DBV)   5	3000   LARGE T&R	-	Call TI	Call TI	-40 to 125	CU4J
<b>SN74LVC1GU04DBVT</b>	Active	Production	SOT-23 (DBV)   5	250   SMALL T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 125	(CU45, CU4F, CU4J, CU4R) (CU4H, CU4P, CU4S)
SN74LVC1GU04DBVT.B	Active	Production	SOT-23 (DBV)   5	250   SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(CU45, CU4F, CU4J, CU4R) (CU4H, CU4P, CU4S)

Orderable part number	Status (1)	Material type (2)	Package   Pins	Package qty   Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
<a href="#">SN74LVC1GU04DCKR</a>	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 125	(CD5, CDF, CDJ, CDK, CDR, CDT) (CDH, CDP, CDS)
<a href="#">SN74LVC1GU04DCKR.B</a>	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	(CD5, CDF, CDJ, CDK, CDR, CDT) (CDH, CDP, CDS)
<a href="#">SN74LVC1GU04DCKT</a>	Active	Production	SC70 (DCK)   5	250   SMALL T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 125	(CD5, CDF, CDJ, CDK, CDR, CDT) (CDH, CDP, CDS)
<a href="#">SN74LVC1GU04DCKT.B</a>	Active	Production	SC70 (DCK)   5	250   SMALL T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 125	(CD5, CDF, CDJ, CDK, CDR, CDT) (CDH, CDP, CDS)
<a href="#">SN74LVC1GU04DPWR</a>	Active	Production	X2SON (DPW)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C, CM)
<a href="#">SN74LVC1GU04DPWR.B</a>	Active	Production	X2SON (DPW)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(C, CM)
<a href="#">SN74LVC1GU04DRLR</a>	Active	Production	SOT-5X3 (DRL)   5	4000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	CDR
<a href="#">SN74LVC1GU04DRLR.B</a>	Active	Production	SOT-5X3 (DRL)   5	4000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	CDR
<a href="#">SN74LVC1GU04DRY2</a>	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAU   NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	CD
<a href="#">SN74LVC1GU04DRY2.B</a>	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	CD
<a href="#">SN74LVC1GU04DRYR</a>	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAU   NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	CD
<a href="#">SN74LVC1GU04DRYR.B</a>	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	CD
<a href="#">SN74LVC1GU04DRYRG4</a>	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CD
<a href="#">SN74LVC1GU04DRYRG4.B</a>	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CD
<a href="#">SN74LVC1GU04DSFR</a>	Active	Production	SON (DSF)   6	5000   LARGE T&R	Yes	NIPDAU   NIPDAUAG	Level-1-260C-UNLIM	-40 to 125	CD
<a href="#">SN74LVC1GU04DSFR.B</a>	Active	Production	SON (DSF)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CD
<a href="#">SN74LVC1GU04DSFRG4</a>	Active	Production	SON (DSF)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CD
<a href="#">SN74LVC1GU04DSFRG4.B</a>	Active	Production	SON (DSF)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	CD
<a href="#">SN74LVC1GU04YZPR</a>	Active	Production	DSBGA (YZP)   5	3000   LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 85	CDN
<a href="#">SN74LVC1GU04YZPR.B</a>	Active	Production	DSBGA (YZP)   5	3000   LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 85	CDN
<a href="#">SN74LVC1GU04YZVR</a>	Active	Production	DSBGA (YZV)   4	3000   LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 85	CD (7, N)
<a href="#">SN74LVC1GU04YZVR.B</a>	Active	Production	DSBGA (YZV)   4	3000   LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 85	CD (7, N)

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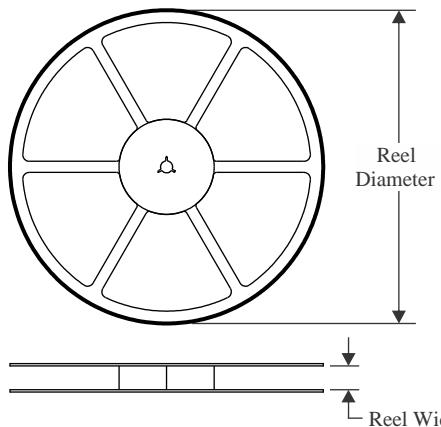
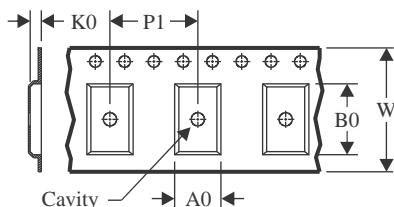
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**OTHER QUALIFIED VERSIONS OF SN74LVC1GU04 :**

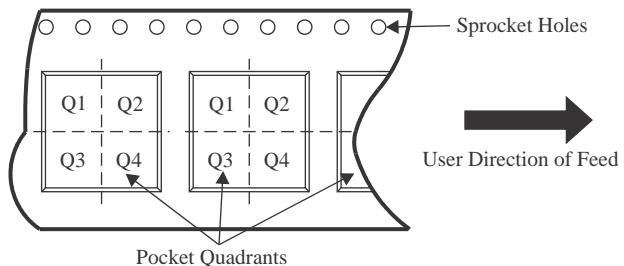
- Automotive : [SN74LVC1GU04-Q1](#)

NOTE: Qualified Version Definitions:

- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

**TAPE AND REEL INFORMATION**
**REEL DIMENSIONS**

**TAPE DIMENSIONS**


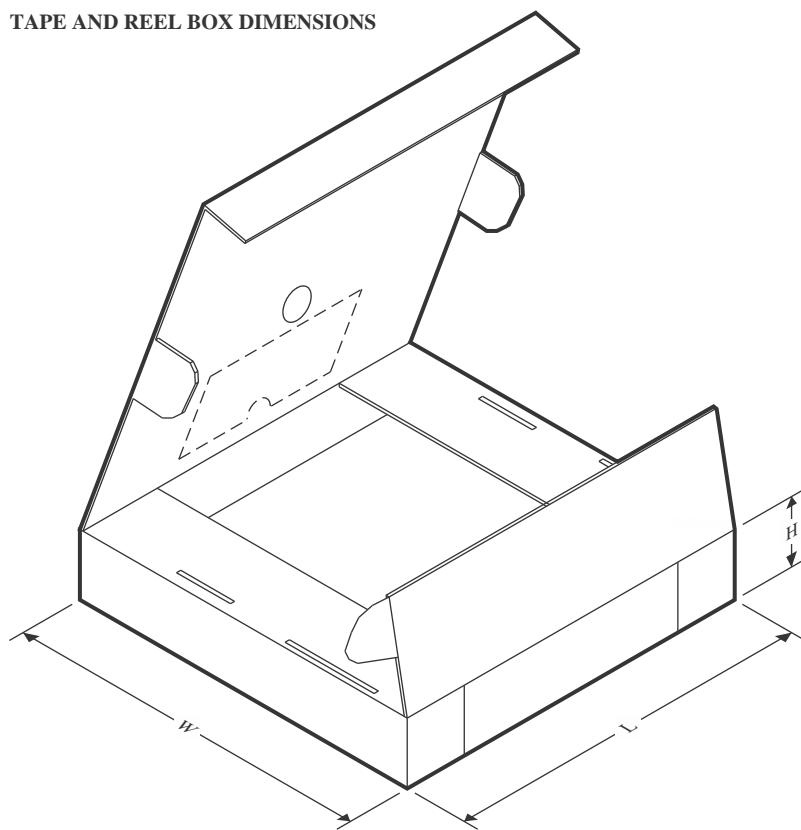
A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

**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
74LVC1GU04DBVRG4	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
74LVC1GU04DBVTG4	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
74LVC1GU04DCKRG4	SC70	DCK	5	3000	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
74LVC1GU04DCKTG4	SC70	DCK	5	250	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74LVC1GU04DBVR	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
SN74LVC1GU04DBVT	SOT-23	DBV	5	250	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
SN74LVC1GU04DBVT	SOT-23	DBV	5	250	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
SN74LVC1GU04DCKR	SC70	DCK	5	3000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
SN74LVC1GU04DCKT	SC70	DCK	5	250	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
SN74LVC1GU04DCKT	SC70	DCK	5	250	180.0	8.4	2.3	2.5	1.2	4.0	8.0	Q3
SN74LVC1GU04DPWR	X2SON	DPW	5	3000	180.0	8.4	0.91	0.91	0.5	2.0	8.0	Q3
SN74LVC1GU04DRLR	SOT-5X3	DRL	5	4000	180.0	8.4	1.98	1.78	0.69	4.0	8.0	Q3
SN74LVC1GU04DRY2	SON	DRY	6	5000	180.0	9.5	1.6	1.15	0.75	4.0	8.0	Q3
SN74LVC1GU04DRYR	SON	DRY	6	5000	180.0	9.5	1.15	1.6	0.75	4.0	8.0	Q1
SN74LVC1GU04DRYRG4	SON	DRY	6	5000	180.0	9.5	1.15	1.6	0.75	4.0	8.0	Q1
SN74LVC1GU04DSFR	SON	DSF	6	5000	180.0	8.4	1.16	1.16	0.5	4.0	8.0	Q2

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
SN74LVC1GU04DSFRG4	SON	DSF	6	5000	180.0	8.4	1.16	1.16	0.5	4.0	8.0	Q2
SN74LVC1GU04YZPR	DSBGA	YZP	5	3000	178.0	9.2	1.02	1.52	0.63	4.0	8.0	Q1
SN74LVC1GU04YZVR	DSBGA	YZV	4	3000	178.0	9.2	1.0	1.0	0.63	4.0	8.0	Q1

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

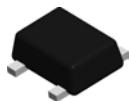
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
74LVC1GU04DBVRG4	SOT-23	DBV	5	3000	180.0	180.0	18.0
74LVC1GU04DBVTG4	SOT-23	DBV	5	250	180.0	180.0	18.0
74LVC1GU04DCKRG4	SC70	DCK	5	3000	180.0	180.0	18.0
74LVC1GU04DCKTG4	SC70	DCK	5	250	180.0	180.0	18.0
SN74LVC1GU04DBVR	SOT-23	DBV	5	3000	208.0	191.0	35.0
SN74LVC1GU04DBVT	SOT-23	DBV	5	250	210.0	185.0	35.0
SN74LVC1GU04DBVT	SOT-23	DBV	5	250	210.0	185.0	35.0
SN74LVC1GU04DCKR	SC70	DCK	5	3000	208.0	191.0	35.0
SN74LVC1GU04DCKT	SC70	DCK	5	250	208.0	191.0	35.0
SN74LVC1GU04DCKT	SC70	DCK	5	250	210.0	185.0	35.0
SN74LVC1GU04DPWR	X2SON	DPW	5	3000	210.0	185.0	35.0
SN74LVC1GU04DRLR	SOT-5X3	DRL	5	4000	202.0	201.0	28.0
SN74LVC1GU04DRY2	SON	DRY	6	5000	184.0	184.0	19.0
SN74LVC1GU04DRYR	SON	DRY	6	5000	184.0	184.0	19.0
SN74LVC1GU04DRYRG4	SON	DRY	6	5000	184.0	184.0	19.0
SN74LVC1GU04DSFR	SON	DSF	6	5000	210.0	185.0	35.0
SN74LVC1GU04DSFRG4	SON	DSF	6	5000	210.0	185.0	35.0
SN74LVC1GU04YZPR	DSBGA	YZP	5	3000	220.0	220.0	35.0

---

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LVC1GU04YZVR	DSBGA	YZV	4	3000	220.0	220.0	35.0

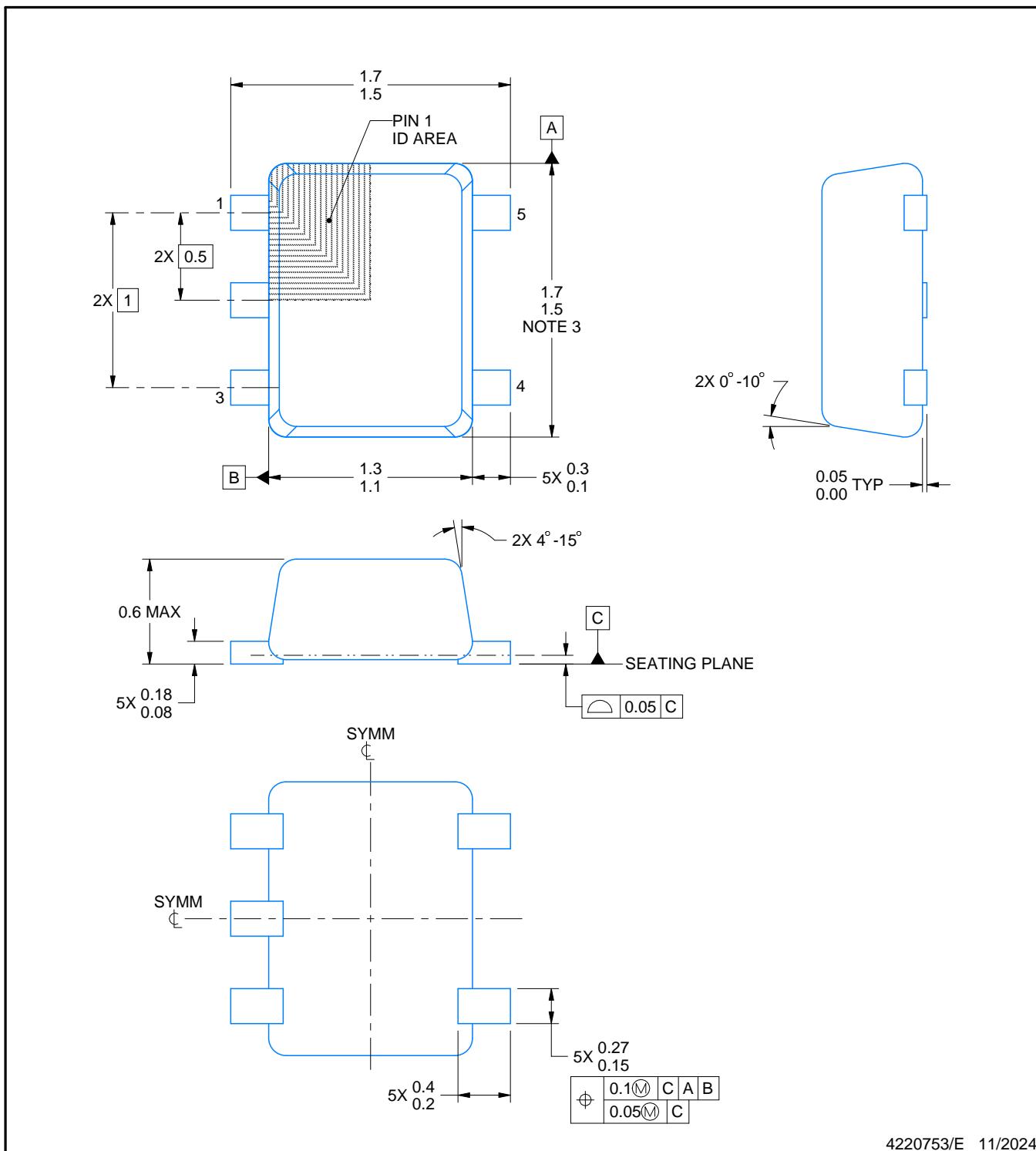
# PACKAGE OUTLINE

DRL0005A



SOT - 0.6 mm max height

PLASTIC SMALL OUTLINE



4220753/E 11/2024

## NOTES:

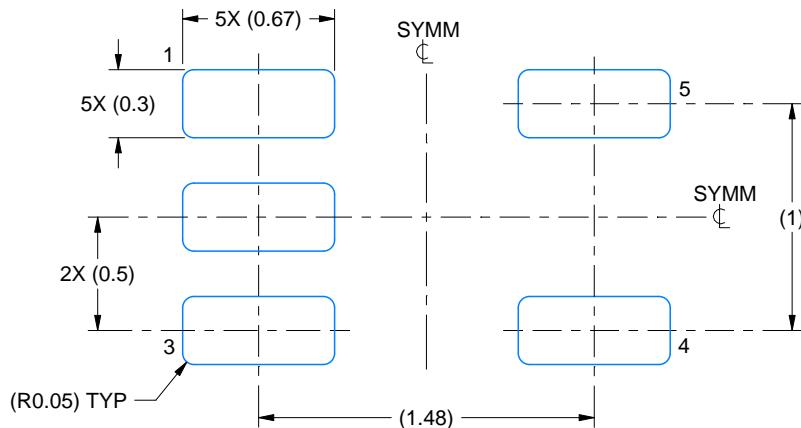
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-293 Variation UAAD-1

# EXAMPLE BOARD LAYOUT

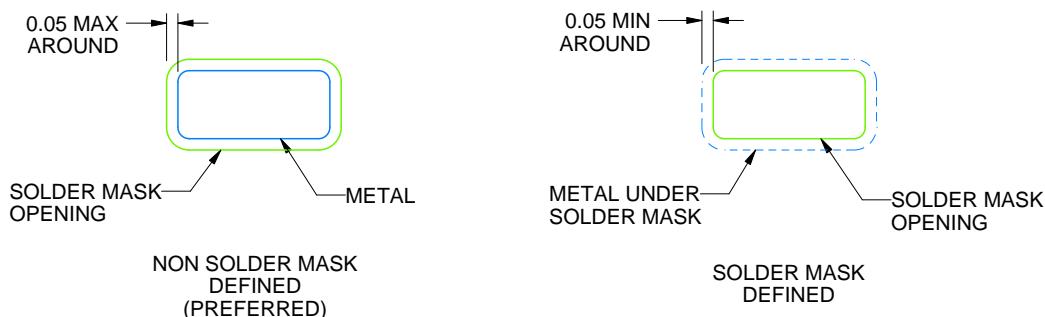
DRL0005A

SOT - 0.6 mm max height

PLASTIC SMALL OUTLINE



LAND PATTERN EXAMPLE  
SCALE:30X



SOLDERMASK DETAILS

4220753/E 11/2024

NOTES: (continued)

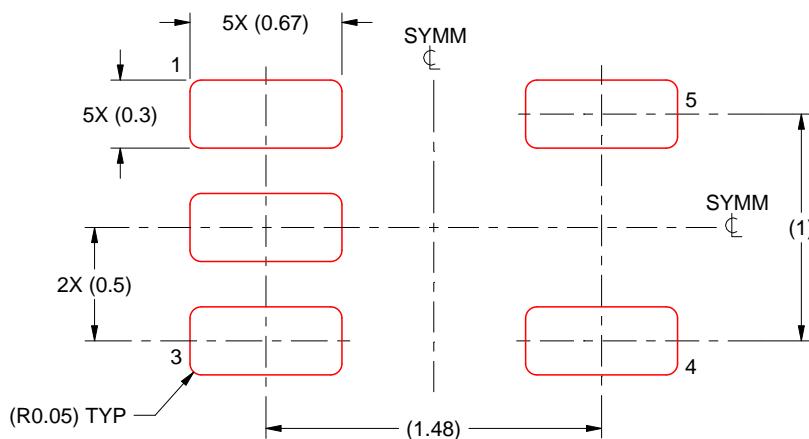
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DRL0005A

SOT - 0.6 mm max height

PLASTIC SMALL OUTLINE



SOLDER PASTE EXAMPLE  
BASED ON 0.1 mm THICK STENCIL  
SCALE:30X

4220753/E 11/2024

NOTES: (continued)

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

## GENERIC PACKAGE VIEW

DPW 5

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



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

4211218-3/D

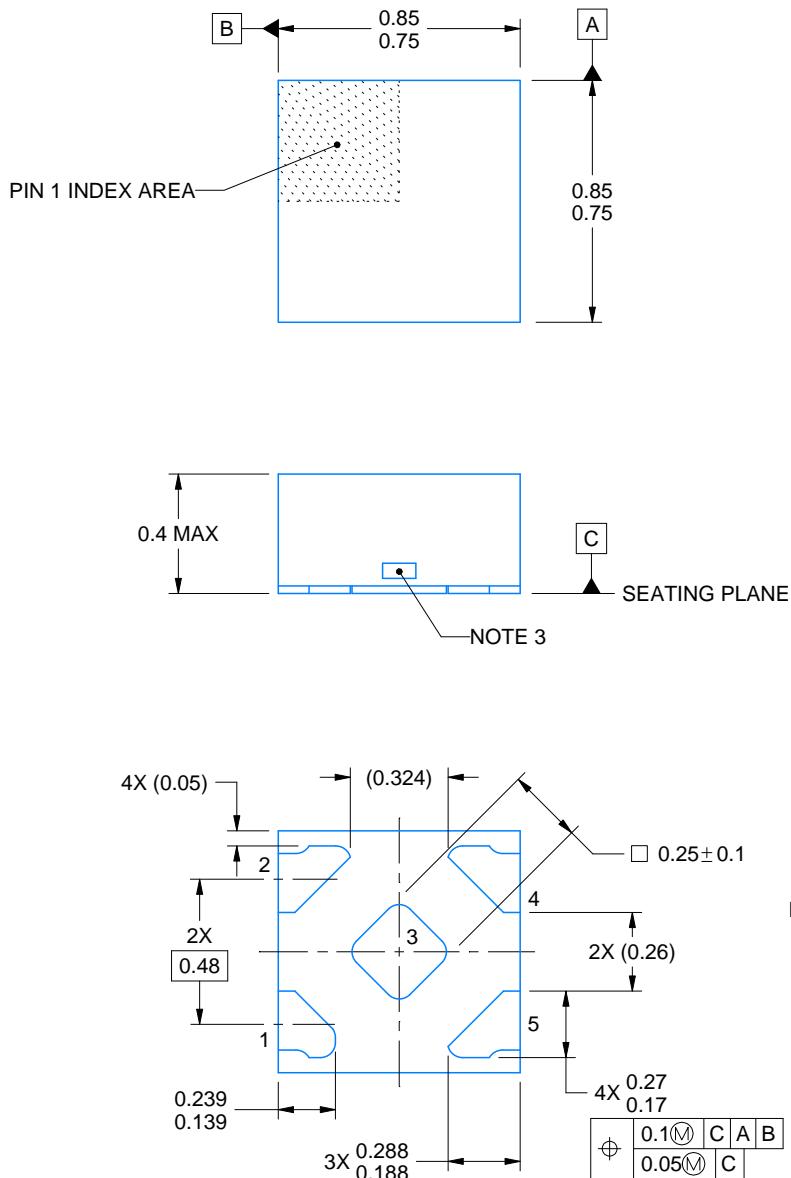
# PACKAGE OUTLINE

DPW0005A



X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



4223102/D 03/2022

NOTES:

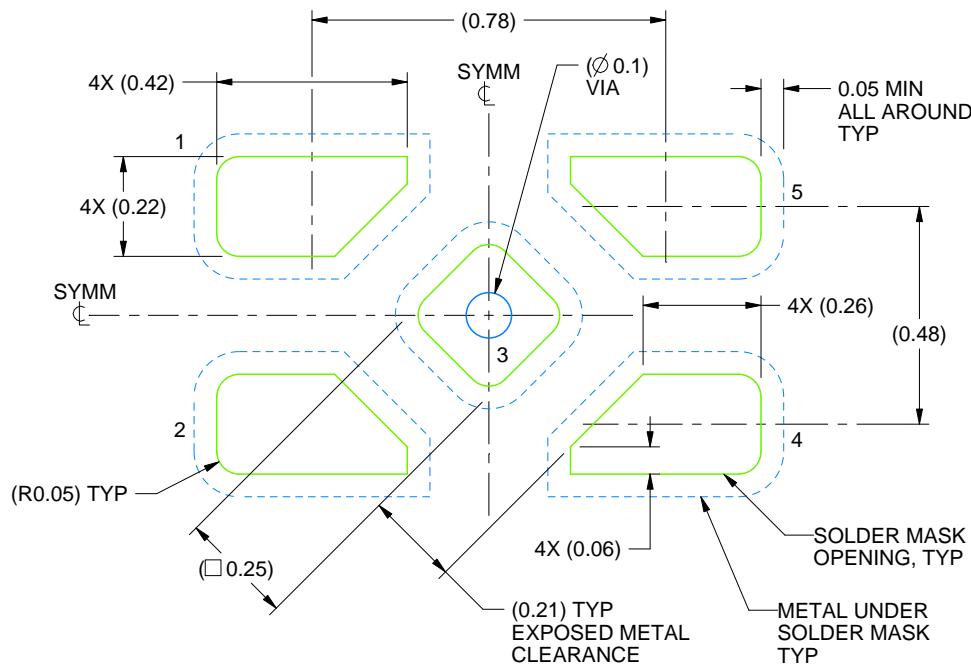
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The size and shape of this feature may vary.

# EXAMPLE BOARD LAYOUT

DPW0005A

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



LAND PATTERN EXAMPLE  
SOLDER MASK DEFINED  
SCALE:60X

4223102/D 03/2022

NOTES: (continued)

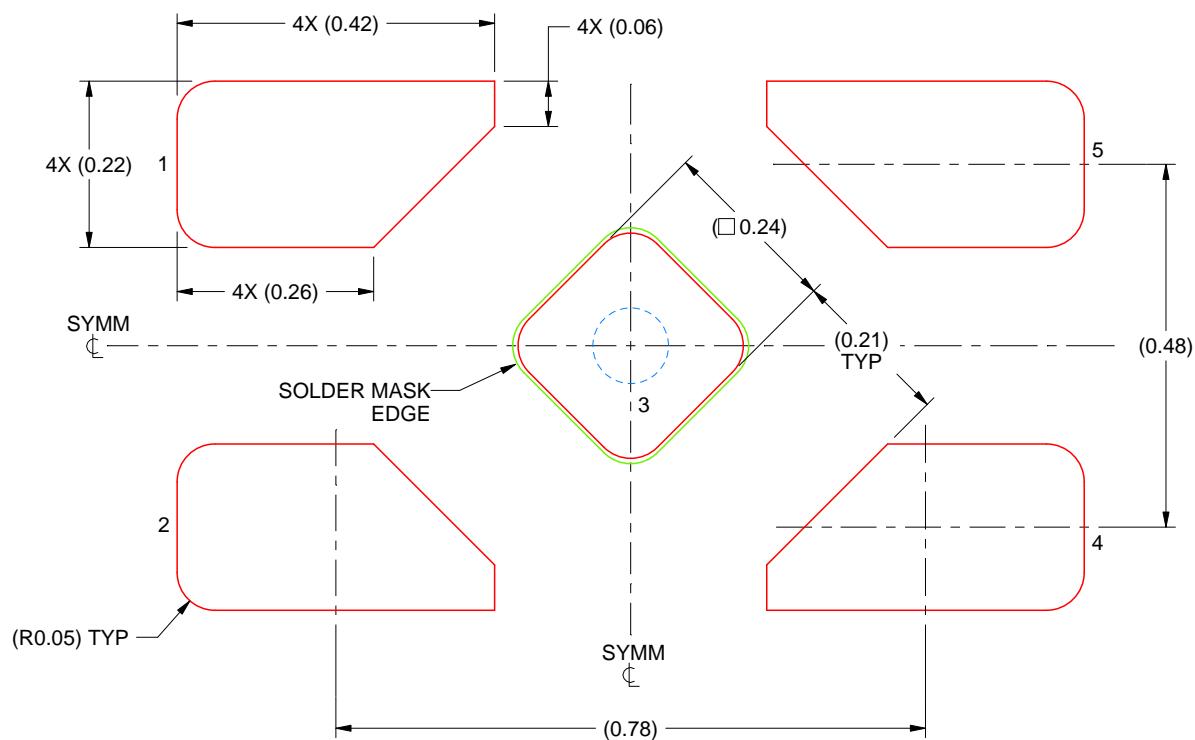
4. This package is designed to be soldered to a thermal pad on the board. For more information, refer to QFN/SON PCB application note in literature No. SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).

# EXAMPLE STENCIL DESIGN

DPW0005A

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.1 mm THICK STENCIL

EXPOSED PAD 3  
92% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE  
SCALE:100X

4223102/D 03/2022

NOTES: (continued)

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

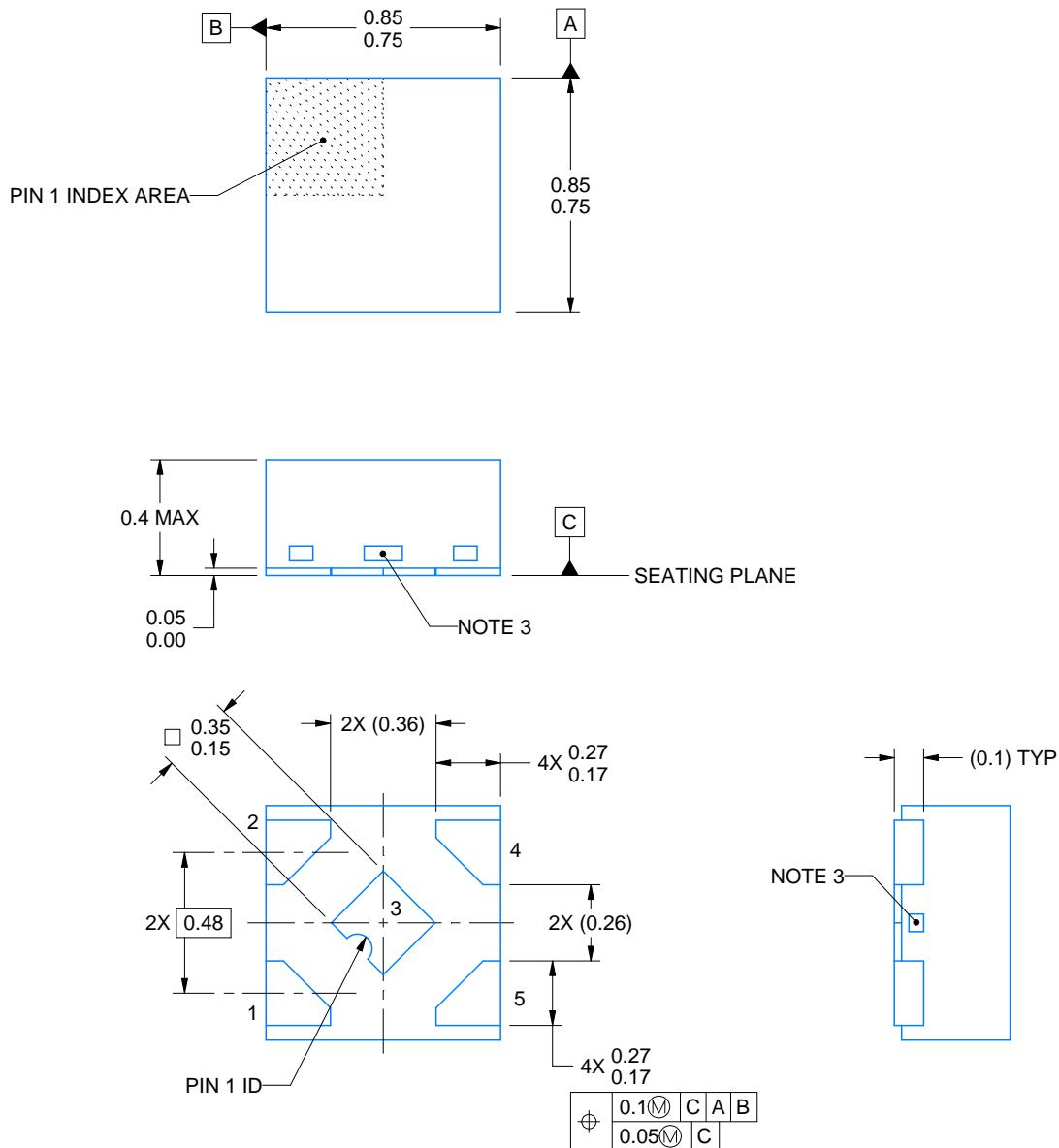
# PACKAGE OUTLINE

DPW0005B



X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



4228233/D 09/2023

NOTES:

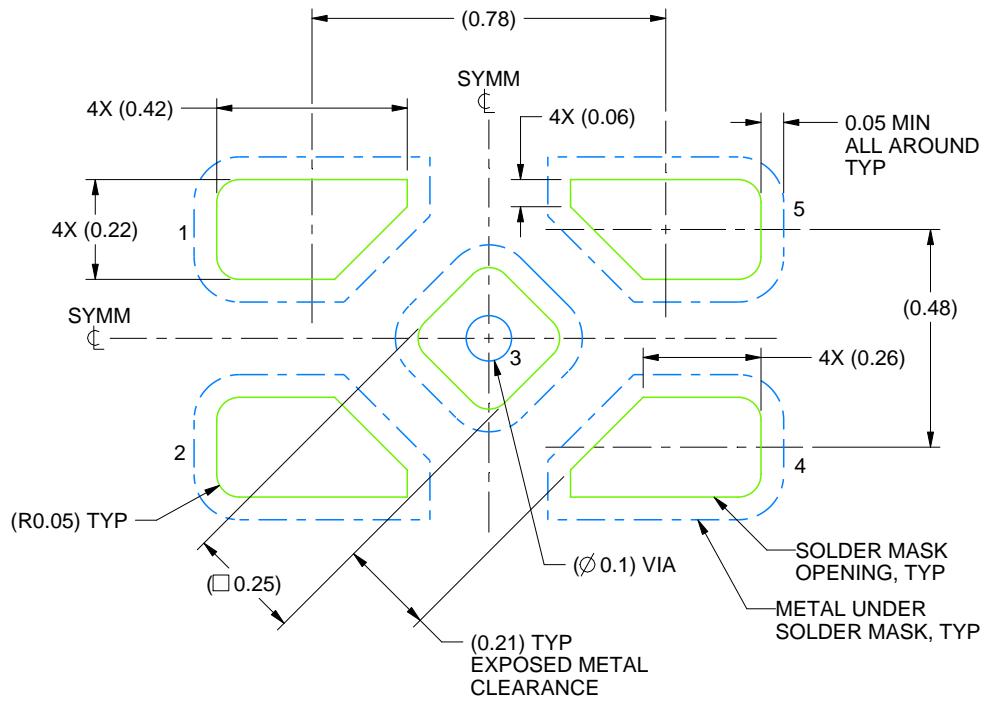
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The size and shape of this feature may vary.

# EXAMPLE BOARD LAYOUT

DPW0005B

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



LAND PATTERN EXAMPLE  
SOLDER MASK DEFINED  
SCALE:60X

4228233/D 09/2023

NOTES: (continued)

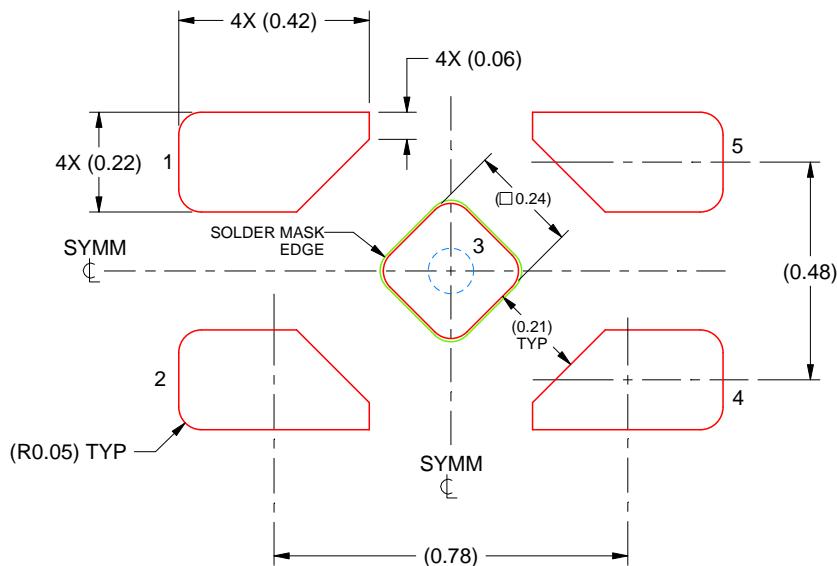
4. This package is designed to be soldered to a thermal pad on the board. For more information, refer to QFN/SON PCB application note in literature No. SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).

# EXAMPLE STENCIL DESIGN

DPW0005B

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.1 mm THICK STENCIL

EXPOSED PAD 5  
92% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE  
SCALE:60X

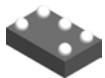
4228233/D 09/2023

NOTES: (continued)

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

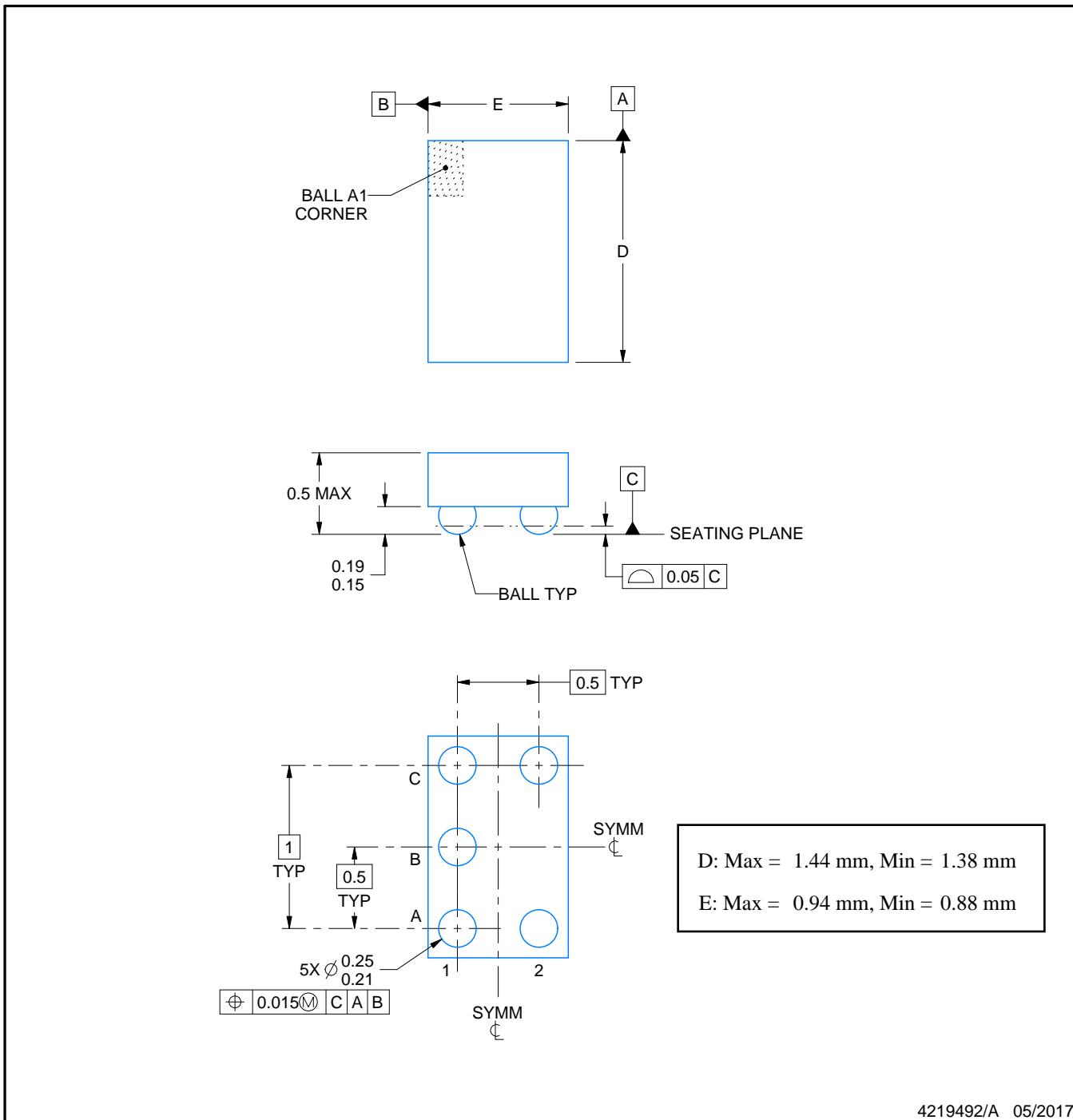
# PACKAGE OUTLINE

YZP0005



DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



4219492/A 05/2017

## NOTES:

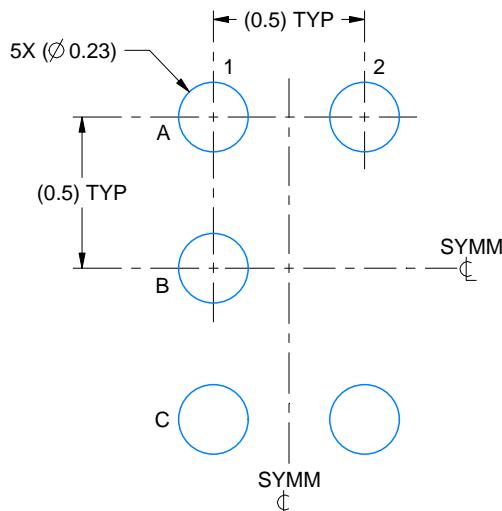
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

# EXAMPLE BOARD LAYOUT

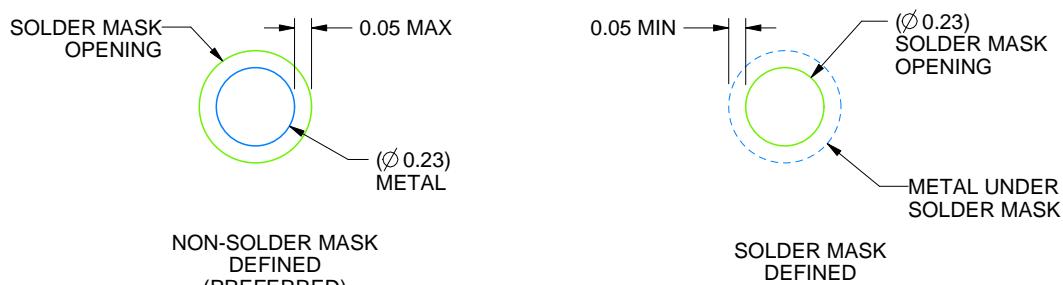
YZP0005

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE  
SCALE:40X



SOLDER MASK DETAILS  
NOT TO SCALE

4219492/A 05/2017

NOTES: (continued)

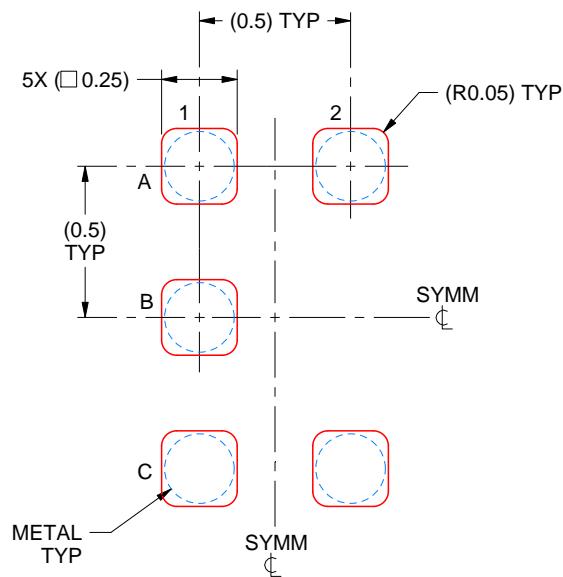
3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SNVA009 ([www.ti.com/lit/snva009](http://www.ti.com/lit/snva009)).

# EXAMPLE STENCIL DESIGN

YZP0005

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



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

4219492/A 05/2017

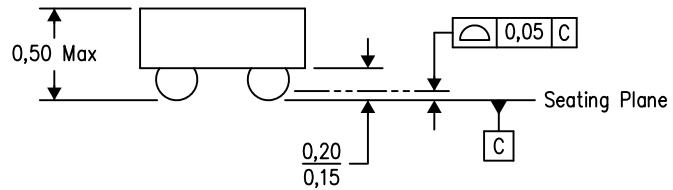
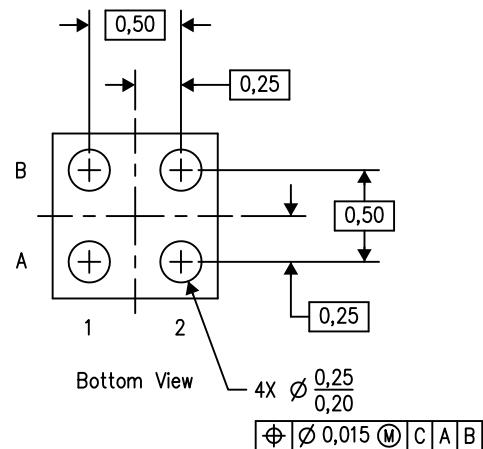
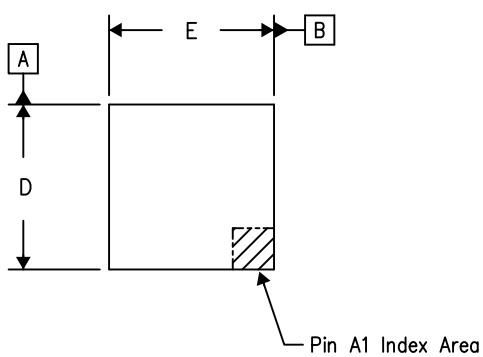
NOTES: (continued)

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

## MECHANICAL DATA

YZV (S-XBGA-N4)

DIE-SIZE BALL GRID ARRAY



D: Max = 0.918 mm, Min = 0.858 mm  
E: Max = 0.918 mm, Min = 0.858 mm

4206083/C 07/13

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. NanoFree™ package configuration.

NanoFree is a trademark of Texas Instruments.

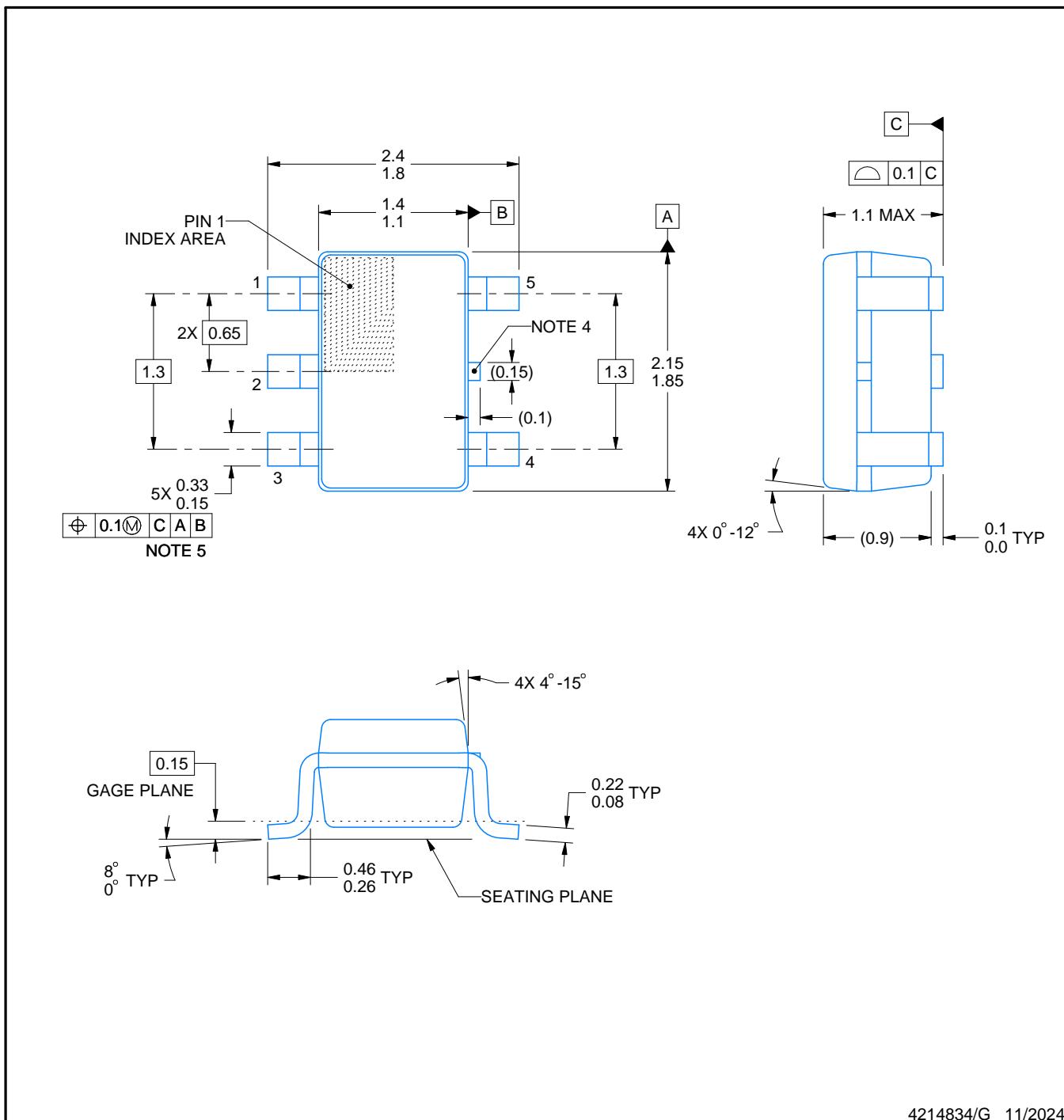
# PACKAGE OUTLINE

DCK0005A



SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



## NOTES:

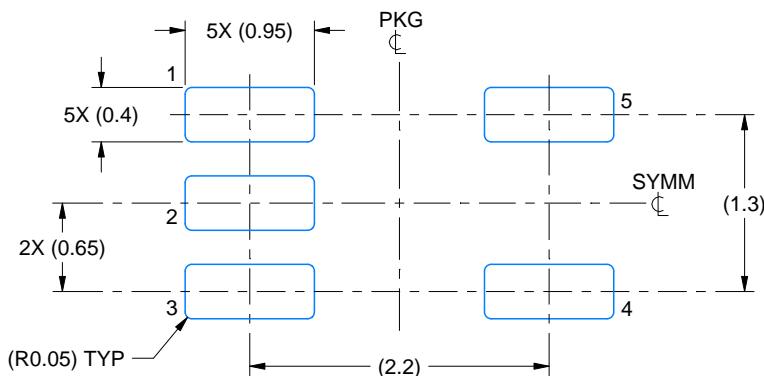
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-203.
4. Support pin may differ or may not be present.
5. Lead width does not comply with JEDEC.
6. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25mm per side

# EXAMPLE BOARD LAYOUT

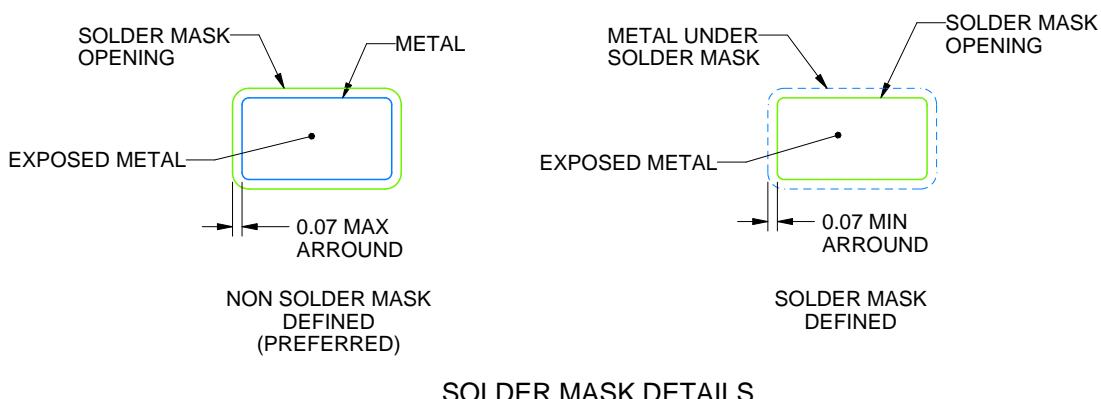
DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:18X



4214834/G 11/2024

NOTES: (continued)

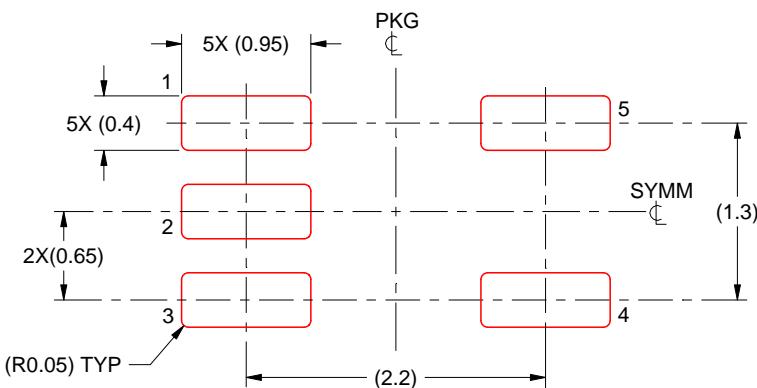
7. Publication IPC-7351 may have alternate designs.
8. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE  
BASED ON 0.125 THICK STENCIL  
SCALE:18X

4214834/G 11/2024

NOTES: (continued)

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

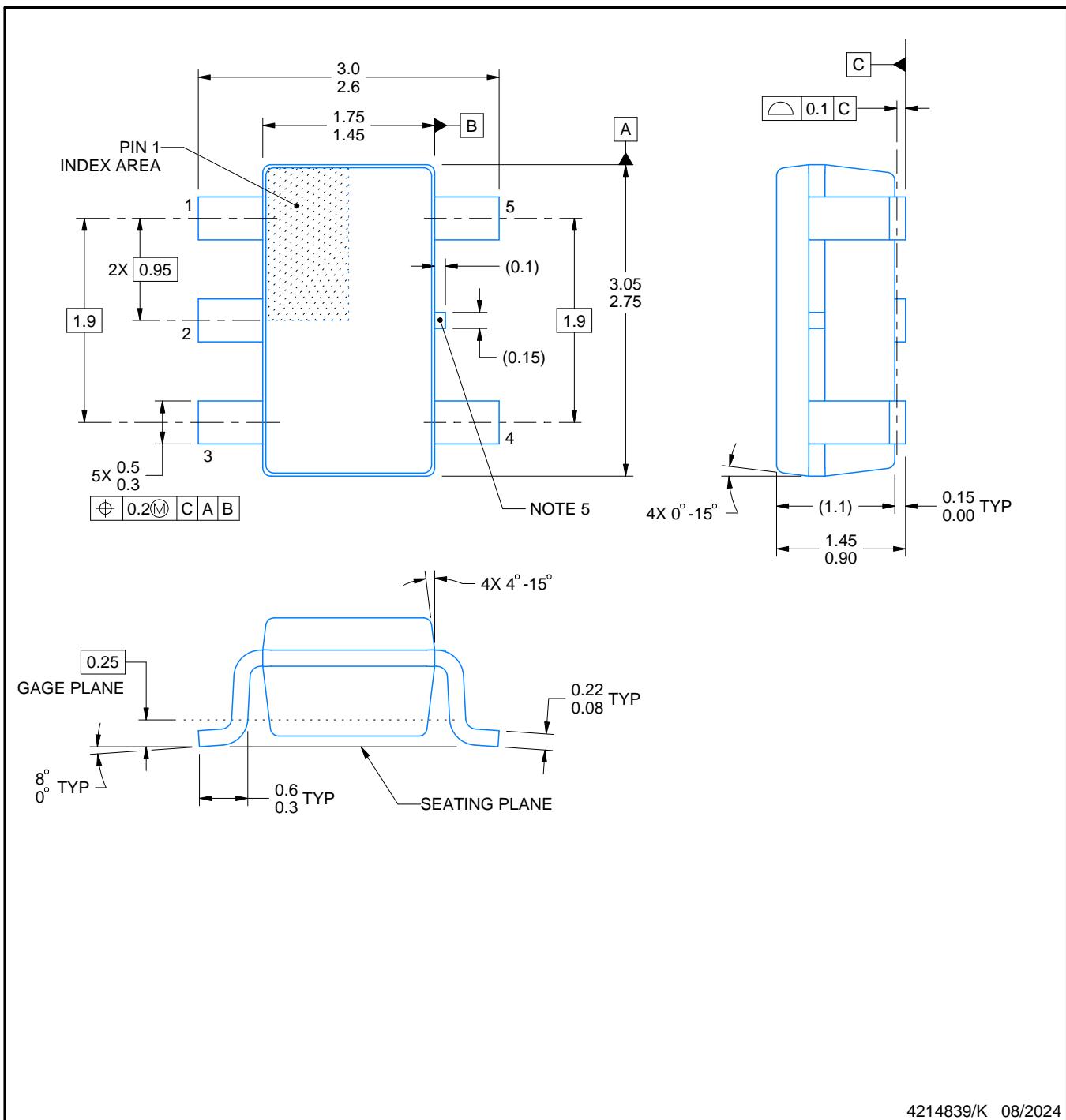
# PACKAGE OUTLINE

DBV0005A



SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



NOTES:

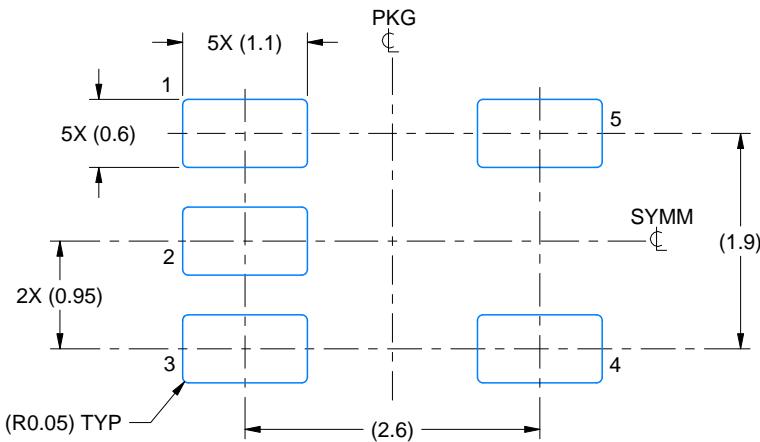
- All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
- This drawing is subject to change without notice.
- Reference JEDEC MO-178.
- Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
- Support pin may differ or may not be present.

# EXAMPLE BOARD LAYOUT

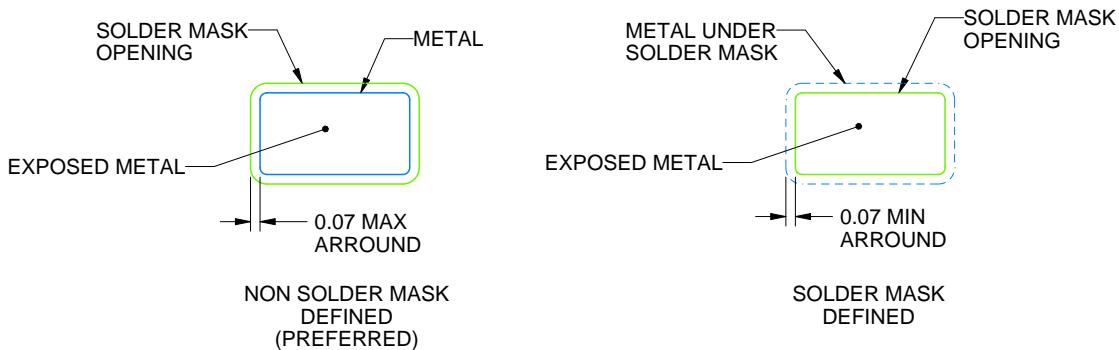
DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:15X



SOLDER MASK DETAILS

4214839/K 08/2024

NOTES: (continued)

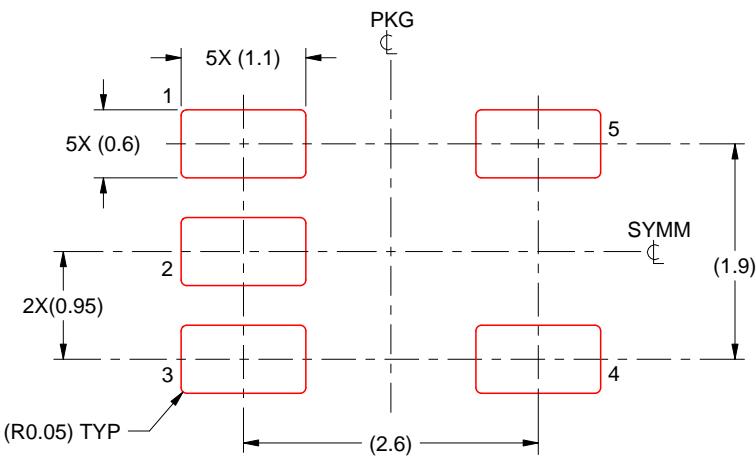
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



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

4214839/K 08/2024

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.

DRY 6

## GENERIC PACKAGE VIEW

### USON - 0.6 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



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

4207181/G

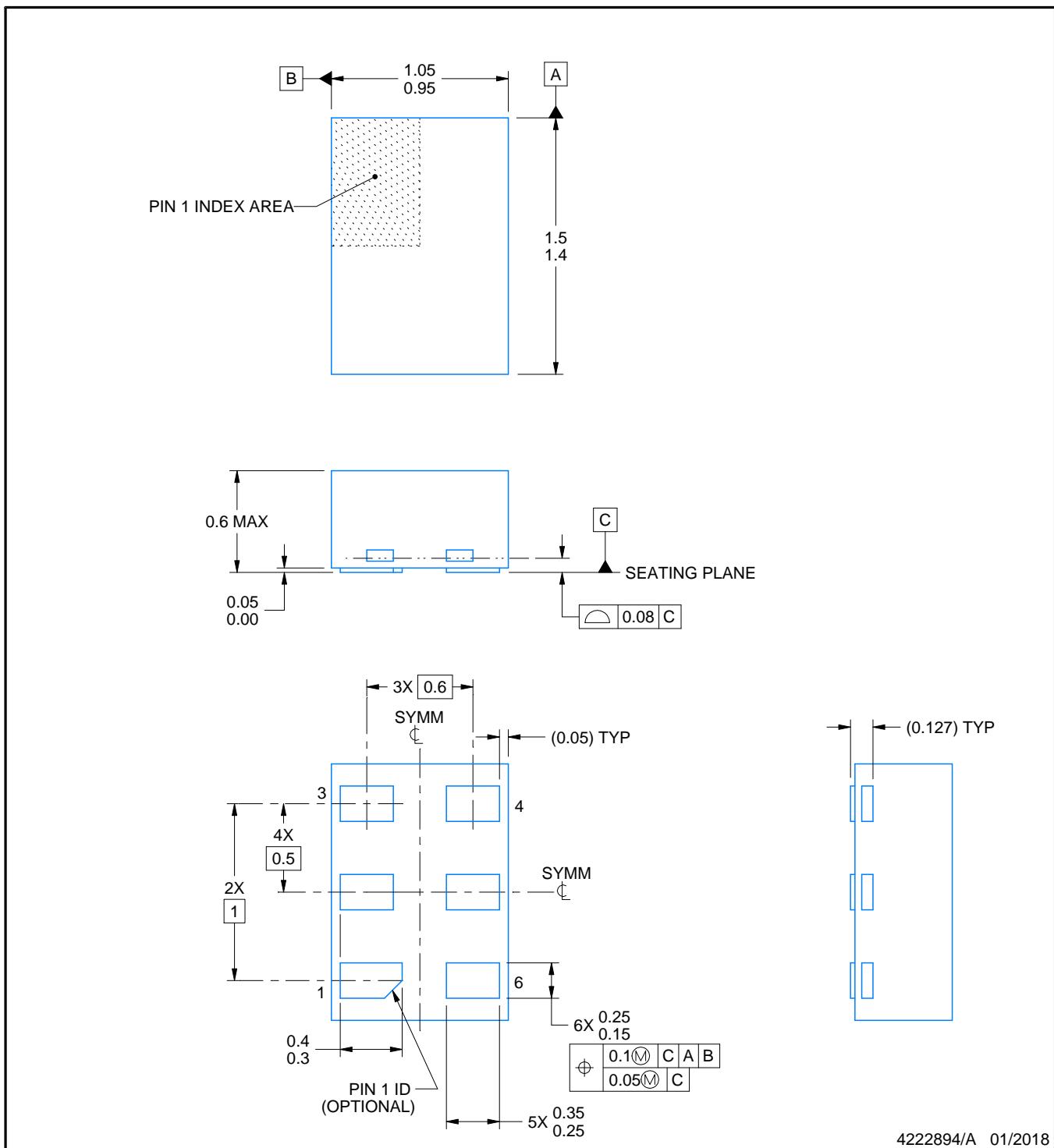
# PACKAGE OUTLINE

DRY0006A



USON - 0.6 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



4222894/A 01/2018

## NOTES:

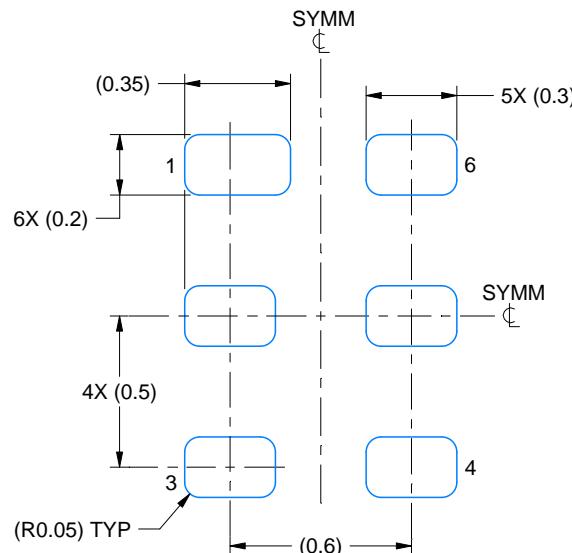
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

# EXAMPLE BOARD LAYOUT

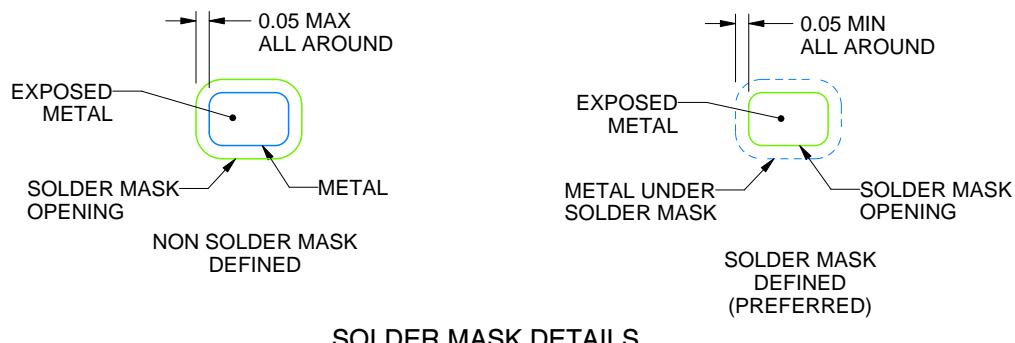
DRY0006A

USON - 0.6 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



LAND PATTERN EXAMPLE  
1:1 RATIO WITH PKG SOLDER PADS  
EXPOSED METAL SHOWN  
SCALE:40X



SOLDER MASK DETAILS

4222894/A 01/2018

NOTES: (continued)

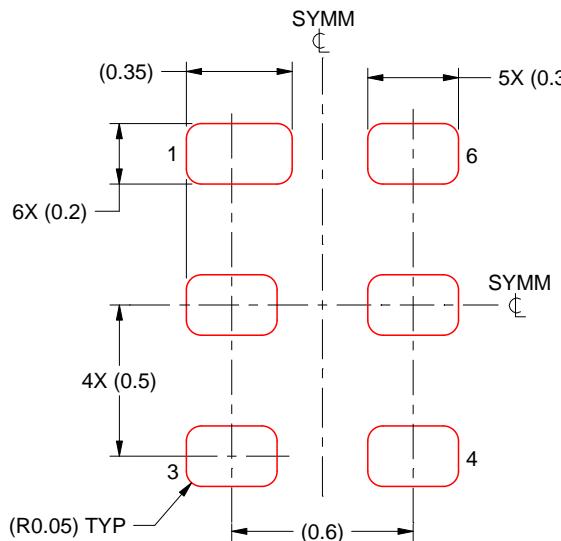
3. For more information, see QFN/SON PCB application report in literature No. SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).

# EXAMPLE STENCIL DESIGN

DRY0006A

USON - 0.6 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.075 - 0.1 mm THICK STENCIL  
SCALE:40X

4222894/A 01/2018

NOTES: (continued)

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

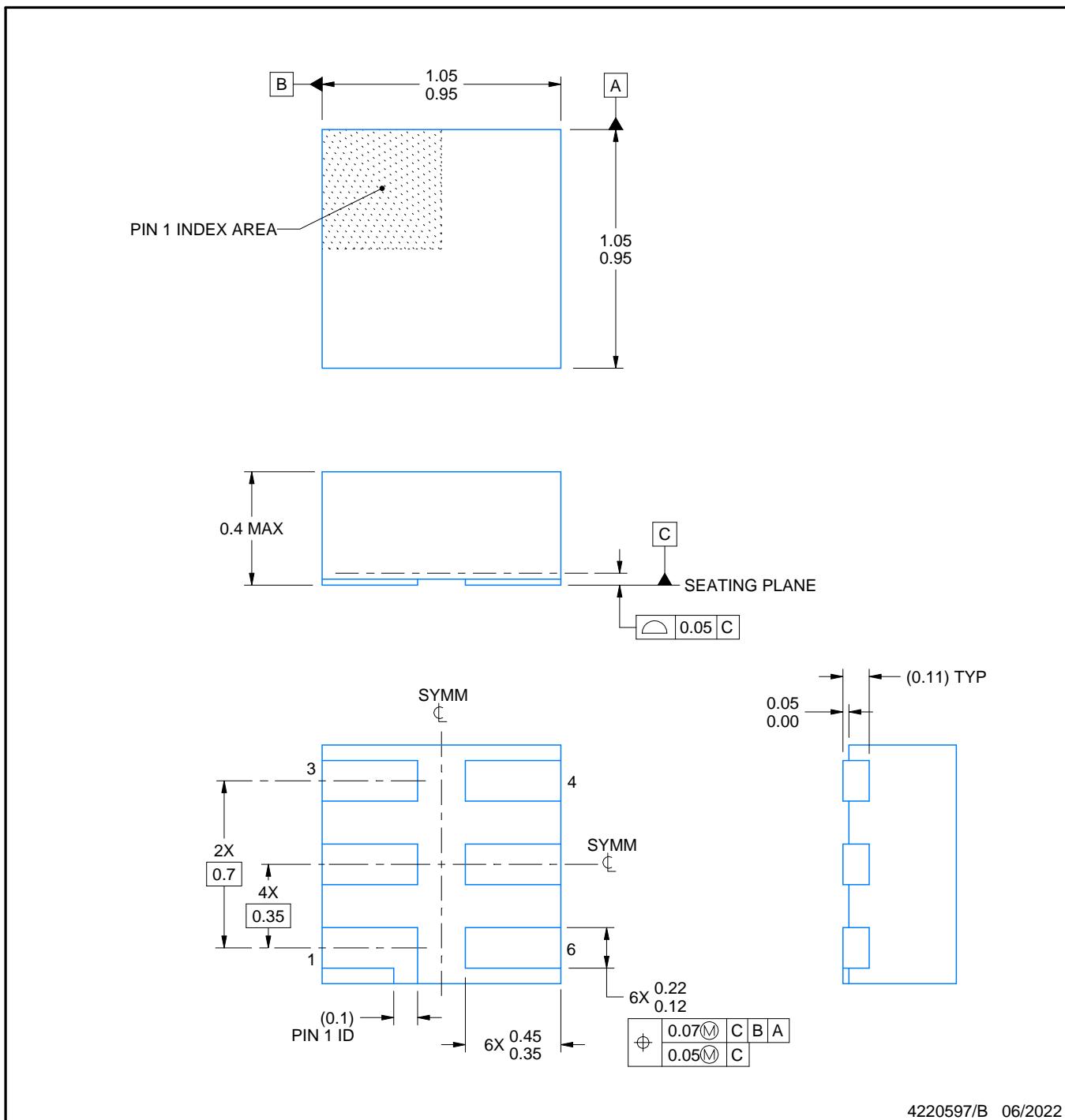


# PACKAGE OUTLINE

**DSF0006A**

**X2SON - 0.4 mm max height**

PLASTIC SMALL OUTLINE - NO LEAD



4220597/B 06/2022

## NOTES:

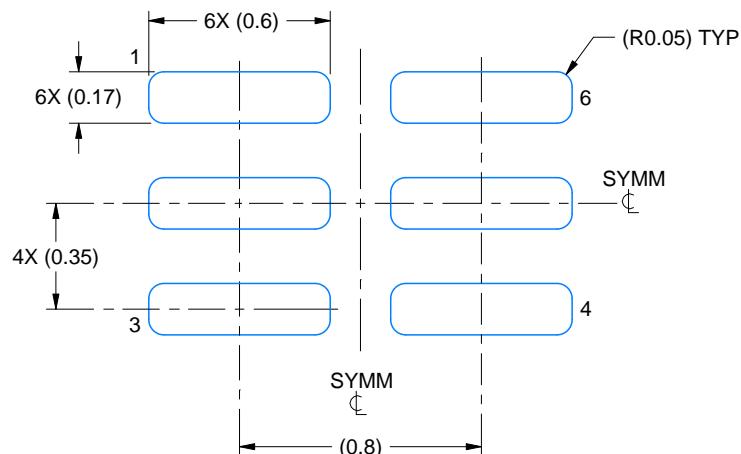
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC registration MO-287, variation X2AAF.

# EXAMPLE BOARD LAYOUT

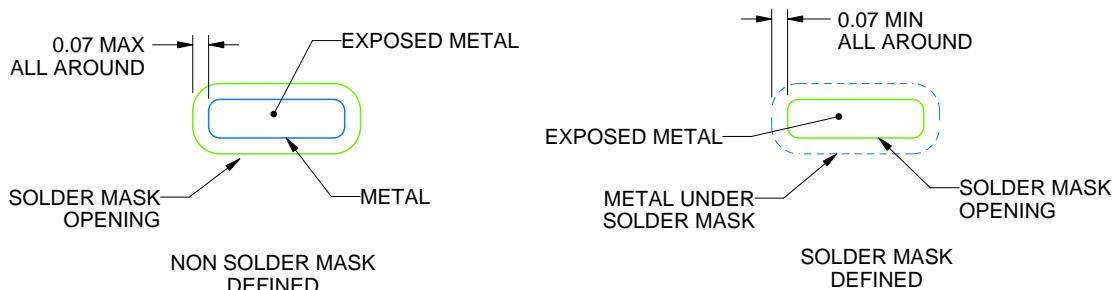
DSF0006A

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:40X



SOLDER MASK DETAILS

4220597/B 06/2022

NOTES: (continued)

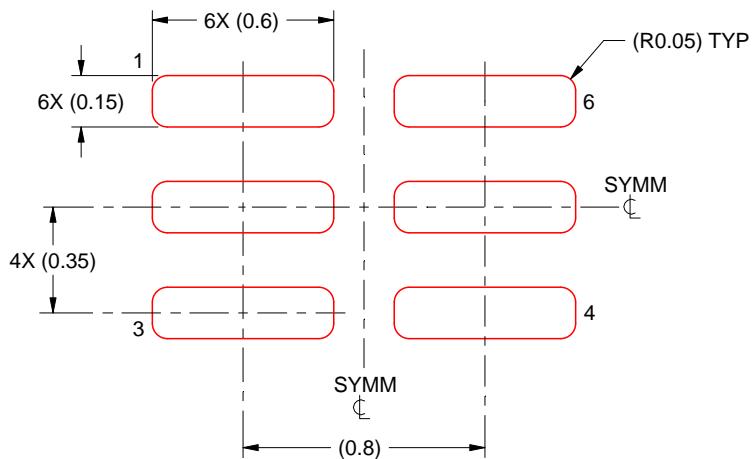
4. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).

# EXAMPLE STENCIL DESIGN

DSF0006A

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.09 mm THICK STENCIL

PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE  
SCALE:40X

4220597/B 06/2022

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

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