

# SN74AUP1G08 Low-Power Single 2-Input Positive-AND Gate

## 1 Features

- Available in the Ultra Small 0.64mm<sup>2</sup> Package (DPW) With 0.5mm Pitch
- Low Static-Power Consumption:  
 $I_{CC} = 0.9\mu\text{A}$  Maximum
- Low Dynamic-Power Consumption:  
 $C_{pd} = 4.3\text{pF}$  Typical at 3.3V
- Low Input Capacitance:  $C_i = 1.5\text{pF}$  Typical
- Low Noise: Overshoot and Undershoot <10% of  $V_{CC}$
- $I_{off}$  Supports Live Insertion, Partial-Power-Down Mode, and Back Drive Protection
- Schmitt-Trigger Action Allows Slow Input Transition and Better Switching Noise Immunity at the Input ( $V_{hys} = 250\text{ mV}$  Typical at 3.3V)
- Wide Operating  $V_{CC}$  Range of 0.8V to 3.6V
- Optimized for 3.3V Operation
- 3.6V I/O Tolerant to Support Mixed-Mode Signal Operation
- $t_{pd} = 4.3\text{ns}$  Maximum at 3.3V
- Suitable for Point-to-Point Applications
- Latch-Up Performance Exceeds 100mA Per JESD 78, Class II
- ESD Performance Tested Per JESD 22
  - 2000V Human-Body Model (A114-B, Class II)
  - 1000V Charged-Device Model (C101)



**Simplified Schematic**

## 2 Applications

- ATCA Solutions
- Active Noise Cancellation (ANC)
- Barcode Scanner
- Blood Pressure Monitor
- CPAP Machine
- Cable Solutions
- DLP 3D Machine Vision, Hyperspectral Imaging, Optical Networking, and Spectroscopy
- E-Book
- Embedded PC
- Field Transmitter: Temperature or Pressure Sensor
- Fingerprint Biometrics
- HVAC: Heating, Ventilating, and Air Conditioning
- Network-Attached Storage (NAS)
- Server Motherboard and PSU
- Software Defined Radio (SDR)
- TV: High-Definition (HDTV), LCD, and Digital
- Video Communications System
- Wireless Data Access Card, Headset, Keyboard, Mouse, and LAN Card
- X-ray: Baggage Scanner, Medical, and Dental

## 3 Description

This single 2-input positive-AND gate is designed for 0.8V to 3.6V  $V_{CC}$  operation and performs the Boolean function  $Y = A \bullet B$  or  $Y = \overline{\overline{A} + \overline{B}}$  in positive logic.

### Device Information

PART NUMBER	PACKAGE <sup>(1)</sup>	BODY SIZE (NOM)
SN74AUP1G08DBV	SOT-23 (5)	2.90 mm × 1.60mm
SN74AUP1G08DRL	SOT (5)	1.60 mm × 1.20mm
SN74AUP1G08DRY	SON (6)	1.45 mm × 1.00mm
SN74AUP1G08DPW	X2SON (5)	0.80 mm × 0.80mm
SN74AUP1G08YZP	DSBGA (5)	1.37 mm × 0.88mm
SN74AUP1G08DCK	SC70 (5)	1.25 mm x 2.00mm
SN74AUP1G08DSF	SON (6)	1.00 mm x 1.00mm
SN74AUP1G08YFP	DSBGA (6)	1.16 mm x 0.76mm

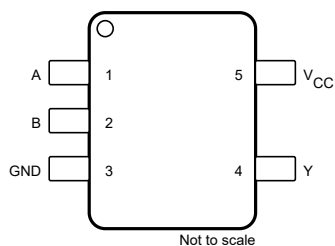
- (1) For all available packages, see the orderable addendum at the end of the data sheet.



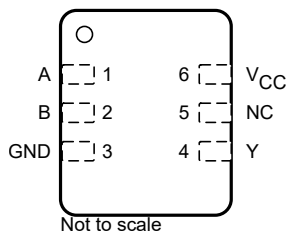
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## 4 Pin Configuration and Functions

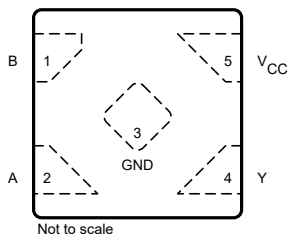


**Figure 4-1. DRL, DCK, or DBV Packages 5-Pin SOT, SC70, or SOT-23 Top View**



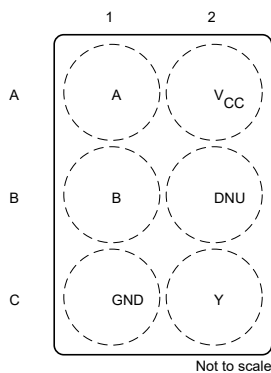
N.C. – No internal connection

**Figure 4-2. DRY or DSF Packages 6-Pin SON Top View**



See mechanical drawings for dimensions.

**Figure 4-3. DPW Package 5-PIN X2SON Top View**



DNU – Do not use

**Figure 4-4. YFP Package 6-Pin DSBGA Top View**

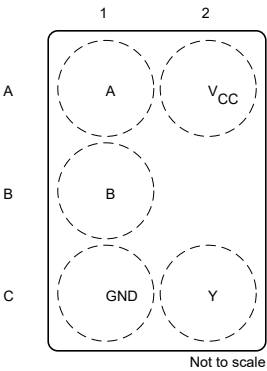


Figure 4-5. YZP Package 5-Pin DSBGA Top View

Table 4-1. Pin Functions

NAME	PIN					I/O	DESCRIPTION
	DRL, DCK, DBV	DPW	DRY, DSF	YZP	YFP		
A	1	2	1	A1	A1	I	Input A
B	2	1	2	B1	B1	I	Input B
DNU	–	–	–	–	B2	–	Do not use
GND	3	3	3	C1	C1	–	Ground
N.C.	–	–	5	–	–	–	No internal connection
V <sub>CC</sub>	5	5	6	A2	A2	–	Power Pin
Y	4	4	4	C2	C2	O	Output Y

## 5 Specifications

### 5.1 Absolute Maximum Ratings

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

			MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage		−0.5	4.6	V
V <sub>I</sub>	Input voltage <sup>(2)</sup>		−0.5	4.6	V
V <sub>O</sub>	Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup>		−0.5	4.6	V
V <sub>O</sub>	Output voltage range in the high or low state <sup>(2)</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		±20		mA
	Continuous current through V <sub>CC</sub> or GND		±50		mA
T <sub>J</sub>	Maximum junction temperature		150		°C
T <sub>stg</sub>	Storage temperature		−65	150	°C

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

### 5.2 ESD Ratings

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

### 5.3 Recommended Operating Conditions

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

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage	0.8	3.6	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 0.8 V	V <sub>CC</sub>	V
		V <sub>CC</sub> = 1.1 V to 1.95 V	0.65 × V <sub>CC</sub>	
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	
		V <sub>CC</sub> = 3 V to 3.6 V	2	
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 0.8 V	0	V
		V <sub>CC</sub> = 1.1 V to 1.95 V	0.35 × V <sub>CC</sub>	
		V <sub>CC</sub> = 2.3 V to 2.7 V	0.7	
		V <sub>CC</sub> = 3 V to 3.6 V	0.9	
V <sub>I</sub>	Input voltage	0	3.6	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> = 0.8 V	−20	mA
		V <sub>CC</sub> = 1.1 V	−1.1	
		V <sub>CC</sub> = 1.4 V	−1.7	
		V <sub>CC</sub> = 1.65	−1.9	
		V <sub>CC</sub> = 2.3 V	−3.1	
		V <sub>CC</sub> = 3 V	−4	

### 5.3 Recommended Operating Conditions (continued)

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

		MIN	MAX	UNIT
$I_{OL}$ Low-level output current	$V_{CC} = 0.8\text{ V}$		20	$\mu\text{A}$
	$V_{CC} = 1.1\text{ V}$		1.1	mA
	$V_{CC} = 1.4\text{ V}$		1.7	
	$V_{CC} = 1.65\text{ V}$		1.9	
	$V_{CC} = 2.3\text{ V}$		3.1	
	$V_{CC} = 3\text{ V}$		4	
$\Delta t/\Delta v$ Input transition rise or fall rate	$V_{CC} = 0.8\text{ V to } 3.6\text{ V}$		200	ns/V
$T_A$ Operating free-air temperature		-40	85	$^{\circ}\text{C}$

- (1) All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. See the TI application report *Implications of Slow or Floating CMOS Inputs*, literature number [SCBA004](#).

### 5.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		SN74AUP1G08						UNIT
		DBV (SOT-23)	DCK (SC70)	DRL (SOT)	DSF (SON)	DRY (SON)	DPW (X2SON)	
		5 PINS	5 PINS	5 PINS	6 PINS	6 PINS	5 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	298.6	314.4	349.7	407.1	554.9	291.8	$^{\circ}\text{C/W}$
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	240.2	128.7	120.5	232	385.4	224.2	$^{\circ}\text{C/W}$
$R_{\theta JB}$	Junction-to-board thermal resistance	134.6	100.6	171.4	306.9	388.2	245.8	$^{\circ}\text{C/W}$
$\psi_{JT}$	Junction-to-top characterization parameter	114.5	7.1	10.8	40.3	159	245.6	$^{\circ}\text{C/W}$
$\psi_{JB}$	Junction-to-board characterization parameter	133.9	99.8	169.4	306	384.1	195.4	$^{\circ}\text{C/W}$

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

## 5.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25°C			T <sub>A</sub> = –40°C to +85°C		UNIT
			MIN	TYP	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = –20 μA	0.8 V to 3.6 V	V <sub>CC</sub> – 0.1			V <sub>CC</sub> – 0.1		V
	I <sub>OH</sub> = –1.1 mA	1.1 V	0.75 × V <sub>CC</sub>			0.7 × V <sub>CC</sub>		
	I <sub>OH</sub> = –1.7 mA	1.4 V	1.11			1.03		
	I <sub>OH</sub> = –1.9 mA	1.65 V	1.32			1.3		
	I <sub>OH</sub> = –2.3 mA	2.3 V	2.05			1.97		
	I <sub>OH</sub> = –3.1 mA		1.9			1.85		
	I <sub>OH</sub> = –2.7 mA	3 V	2.72			2.67		
	I <sub>OH</sub> = –4 mA		2.6			2.55		
V <sub>OL</sub>	I <sub>OL</sub> = 20 μA	0.8 V to 3.6 V	0.1			0.1		V
	I <sub>OL</sub> = 1.1 mA	1.1 V	0.3 × V <sub>CC</sub>			0.3 × V <sub>CC</sub>		
	I <sub>OL</sub> = 1.7 mA	1.4 V	0.31			0.37		
	I <sub>OL</sub> = 1.9 mA	1.65 V	0.31			0.35		
	I <sub>OL</sub> = 2.3 mA	2.3 V	0.31			0.33		
	I <sub>OL</sub> = 3.1 mA		0.44			0.45		
	I <sub>OL</sub> = 2.7 mA	3 V	0.31			0.33		
	I <sub>OL</sub> = 4 mA		0.44			0.45		
I <sub>I</sub> A or B input	V <sub>I</sub> = GND to 3.6 V	0 V to 3.6 V	0.1			0.5		μA
I <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V	0 V	0.2			0.6		μA
ΔI <sub>off</sub>	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V	0 V to 0.2 V	0.2			0.6		μA
I <sub>CC</sub>	V <sub>I</sub> = GND or (V <sub>CC</sub> to 3.6 V)    I <sub>O</sub> = 0	0.8 V to 3.6 V	0.5			0.9		μA
ΔI <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> – 0.6 V <sup>(1)</sup> I <sub>O</sub> = 0	3.3 V	40			50		μA
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	0 V	1.5					pF
		3.6 V	1.5					
C <sub>o</sub>	V <sub>O</sub> = GND	0 V	3					pF

(1) One input at V<sub>CC</sub> – 0.6 V, other input at V<sub>CC</sub> or GND.

## 5.6 Switching Characteristics, C<sub>L</sub> = 5 pF

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 6-1](#) and [Figure 6-2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	V <sub>CC</sub>	T <sub>A</sub> = 25°C			T <sub>A</sub> = –40°C to +85°C		UNIT
				MIN	TYP	MAX	MIN	MAX	
t <sub>pd</sub>	A or B	Y	0.8 V	18					ns
			1.2 V ± 0.1 V	2.6	7.3	12.8	2.1	15.6	
			1.5 V ± 0.1 V	1.4	5.2	8.7	0.9	10.3	
			1.8 V ± 0.15 V	1	4.2	6.6	0.5	8.2	
			2.5 V ± 0.2 V	1	3	4.4	0.5	5.5	
			3.3 V ± 0.3 V	1	2.4	3.5	0.5	4.3	

## 5.7 Switching Characteristics, $C_L = 10\text{ pF}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 6-1](#) and [Figure 6-2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		UNIT
				MIN	TYP	MAX	MIN	MAX	
$t_{pd}$	A or B	Y	0.8 V		21				ns
			1.2 V $\pm$ 0.1 V	1.5	8.5	14.7	1	17.2	
			1.5 V $\pm$ 0.1 V	1	6.2	10	0.5	11.3	
			1.8 V $\pm$ 0.15 V	1	5	7.7	0.5	9	
			2.5 V $\pm$ 0.2 V	1	3.6	5.2	0.5	6.1	
			3.3 V $\pm$ 0.3 V	1	2.9	4.2	0.5	4.7	

## 5.8 Switching Characteristics, $C_L = 15\text{ pF}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 6-1](#) and [Figure 6-2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		UNIT
				MIN	TYP	MAX	MIN	MAX	
$t_{pd}$	A or B	Y	0.8 V		24				ns
			1.2 V $\pm$ 0.1 V	3.6	9.9	16.3	3.1	19.9	
			1.5 V $\pm$ 0.1 V	2.3	7.2	11.1	1.8	13.2	
			1.8 V $\pm$ 0.15 V	1.6	5.8	8.7	1.1	10.6	
			2.5 V $\pm$ 0.2 V	1	4.3	5.9	0.5	7.3	
			3.3 V $\pm$ 0.3 V	1	3.4	4.8	0.5	5.9	

## 5.9 Switching Characteristics, $C_L = 30\text{ pF}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 6-1](#) and [Figure 6-2](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$V_{CC}$	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		UNIT
				MIN	TYP	MAX	MIN	MAX	
$t_{pd}$	A or B	Y	0.8 V		32.8				ns
			1.2 V $\pm$ 0.1 V	4.9	13.1	20.9	4.4	25.5	
			1.5 V $\pm$ 0.1 V	3.4	9.5	14.2	2.9	16.9	
			1.8 V $\pm$ 0.15 V	2.5	7.7	11	2	13.5	
			2.5 V $\pm$ 0.2 V	1.8	5.7	7.6	1.3	9.4	
			3.3 V $\pm$ 0.3 V	1.5	4.7	6.2	1	7.5	

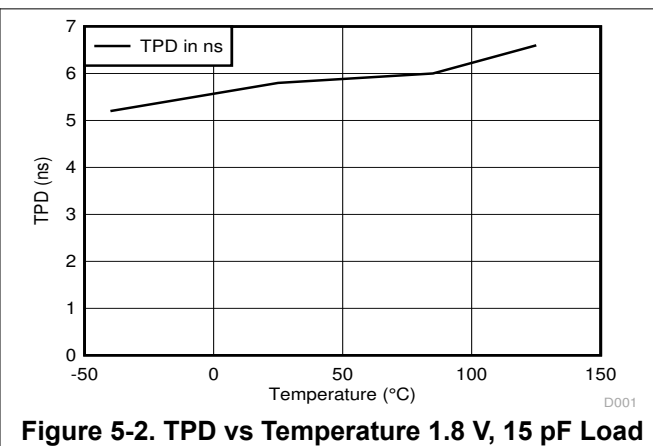
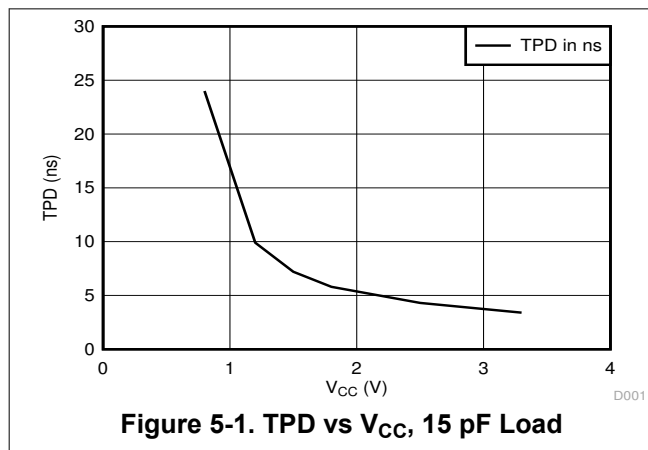
## 5.10 Operating Characteristics

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

PARAMETER		TEST CONDITIONS	$V_{CC}$	TYP	UNIT
$C_{pd}$	Power dissipation capacitance	$f = 10\text{ MHz}$	0.8 V	4	pF
			1.2 V $\pm$ 0.1 V	4	
			1.5 V $\pm$ 0.1 V	4	
			1.8 V $\pm$ 0.15 V	4	
			2.5 V $\pm$ 0.2 V	4.1	
			3.3 V $\pm$ 0.3 V	4.3	

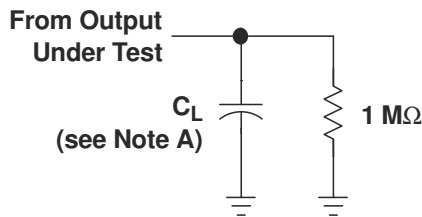


## 5.11 Typical Characteristics



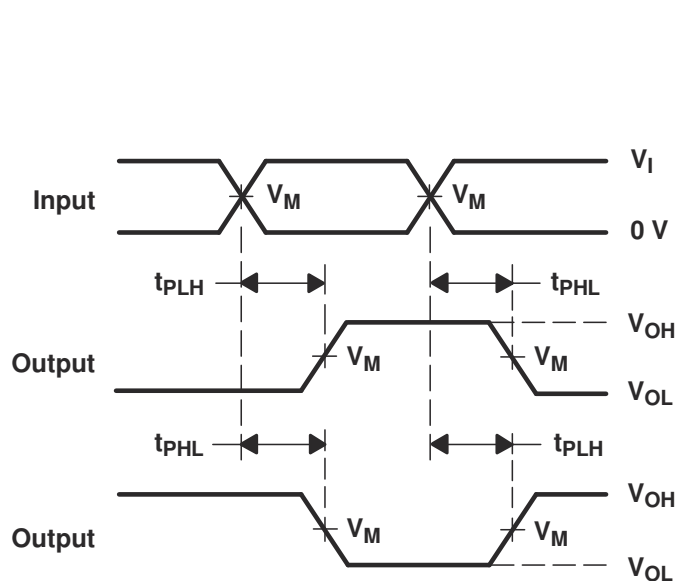
## 6 Parameter Measurement Information

### 6.1 Propagation Delays, Setup and Hold Times, and Pulse Duration

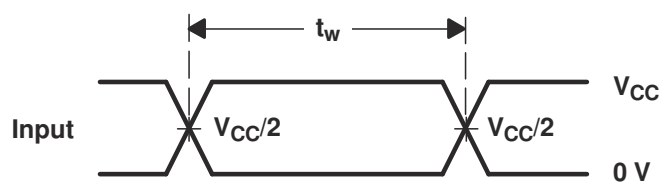


LOAD CIRCUIT

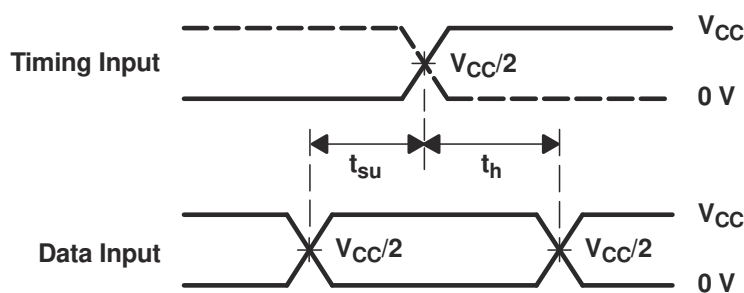
	$V_{CC} = 0.8 \text{ V}$	$V_{CC} = 1.2 \text{ V} \pm 0.1 \text{ V}$	$V_{CC} = 1.5 \text{ V} \pm 0.1 \text{ V}$	$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$	$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$
$C_L$	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF
$V_M$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$V_I$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS  
PULSE DURATION

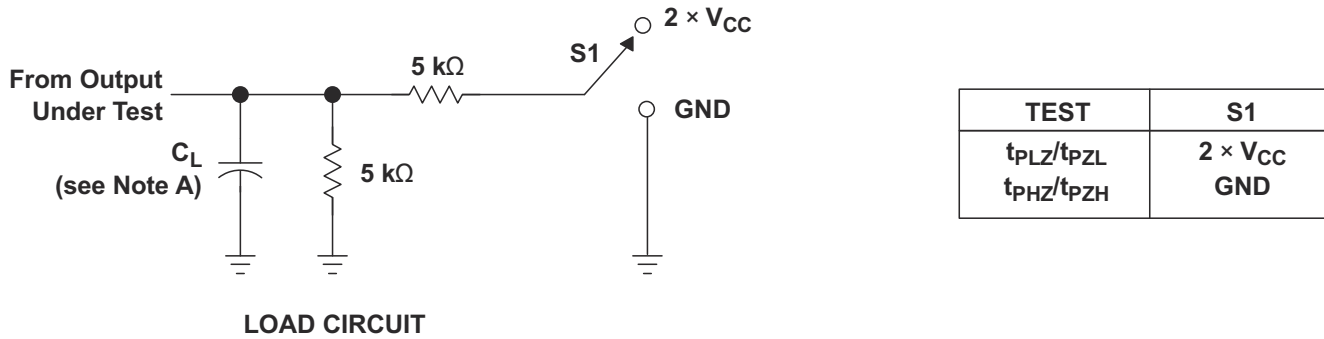


VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES

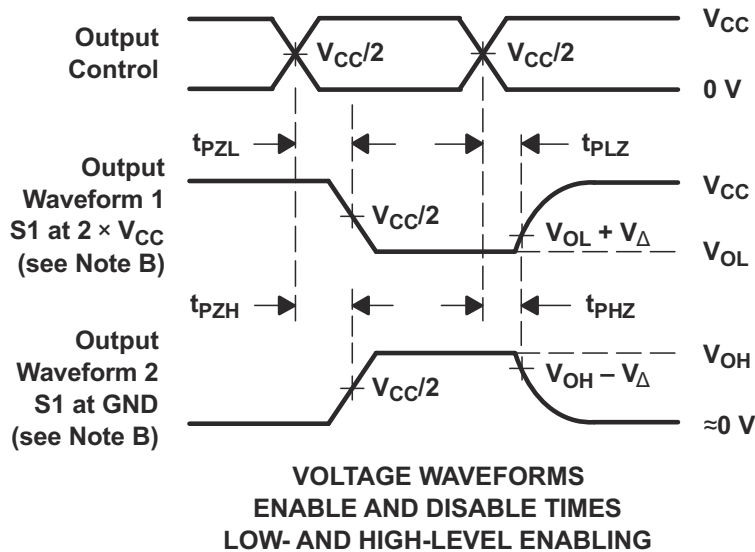
- NOTES:
- A.  $C_L$  includes probe and jig capacitance.
  - B. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ , slew rate  $\geq 1 \text{ V/ns}$ .
  - C. The outputs are measured one at a time, with one transition per measurement.
  - D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - E. All parameters and waveforms are not applicable to all devices.

Figure 6-1. Load Circuit and Voltage Waveforms

## 6.2 Enable and Disable Times



	$V_{CC} = 0.8 \text{ V}$	$V_{CC} = 1.2 \text{ V} \pm 0.1 \text{ V}$	$V_{CC} = 1.5 \text{ V} \pm 0.1 \text{ V}$	$V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$	$V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$	$V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$
$C_L$	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF	5, 10, 15, 30 pF
$V_M$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$	$V_{CC}/2$
$V_I$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$	$V_{CC}$
$V_{\Delta}$	0.1 V	0.1 V	0.1 V	0.15 V	0.15 V	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:  $PRR \leq 10 \text{ MHz}$ ,  $Z_O = 50 \Omega$ , slew rate  $\geq 1 \text{ V/ns}$ .
  - D. The outputs are measured one at a time, with one transition per measurement.
  - E.  $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - F.  $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - G. All parameters and waveforms are not applicable to all devices.

**Figure 6-2. Load Circuit and Voltage Waveforms**

## 7 Detailed Description

### 7.1 Overview

This single 2-input positive-AND gate is designed for 0.8-V to 3.6-V  $V_{CC}$  operation and performs the Boolean function  $Y = A \bullet B$  or  $Y = \overline{\overline{A} + \overline{B}}$  in positive logic.

The AUP family of devices has quiescent power consumption less than 1  $\mu A$  and comes in the ultra small DPW package. The DPW package technology is a major breakthrough in IC packaging. Its tiny 0.64 mm<sup>2</sup> square footprint saves significant board space over other package options while still retaining the traditional manufacturing friendly lead pitch of 0.5 mm.

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. The  $I_{off}$  feature also allows for live insertion.

### 7.2 Functional Block Diagram



### 7.3 Feature Description

- Wide operating  $V_{CC}$  range of 0.8 V to 3.6 V
- 3.6-V I/O tolerant to support down translation
- Input hysteresis allows slow input transition and better switching noise immunity at the input
- $I_{off}$  feature allows voltages on the inputs and outputs when  $V_{CC}$  is 0 V
- Low noise due to slower edge rates

### 7.4 Device Functional Modes

**Table 7-1. Function Table**

INPUTS		OUTPUT Y
A	B	
L	L	L
L	H	L
H	L	L
H	H	H

## 8 Application and Implementation

### Note

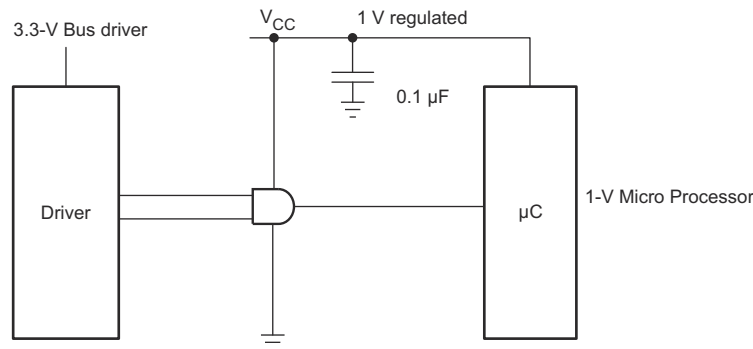
Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation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

### 8.1 Application Information

The AUP family is TI's premier solution to the industry's low-power needs in battery-powered portable applications. This family ensures a very low static and dynamic power consumption across the entire  $V_{CC}$  range of 0.8 V to 3.6 V, resulting in an increased battery life. This product also maintains excellent signal integrity. It has a small amount of hysteresis built in allowing for slower or noisy input signals. The lowered drive produces slower edges and prevents overshoot and undershoot on the outputs.

The AUP family of single gate logic makes excellent translators for the new lower voltage Micro- processors that typically are powered from 0.8 V to 1.2 V. They can drop the voltage of peripheral drivers and accessories that are still powered by 3.3 V to the new  $\mu C$  power levels.

### 8.2 Typical Application



**Figure 8-1. Typical Application Schematic**

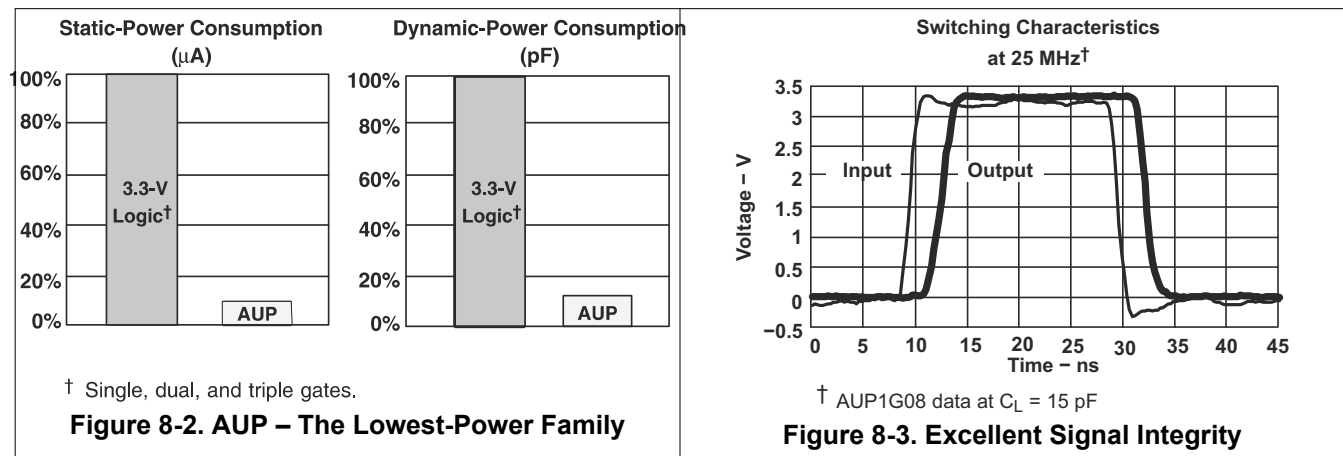
#### 8.2.1 Design Requirements

SN74AUP1G08 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.

#### 8.2.2 Detailed Design Procedure

1. Recommended Input conditions
  - Rise time and fall time specifications. See  $(\Delta t/\Delta V)$  in [Recommended Operating Conditions](#) table.
  - Specified high and low levels. See  $(V_{IH}$  and  $V_{IL})$  in [Recommended Operating Conditions](#) table.
  - Inputs are overvoltage tolerant allowing them to go as high as 3.6 V at any valid  $V_{CC}$
2. Recommended output conditions
  - Load currents should not exceed 20 mA on the output and 50 mA total for the part
  - Outputs should not be pulled above  $V_{CC}$

### 8.2.3 Application Curves



## 9 Power Supply Recommendations

The power supply can be any voltage between the Min and Max supply voltage rating located in the [Recommended Operating Conditions](#) table.

Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, 0.1  $\mu\text{F}$  is recommended and if there are multiple  $V_{CC}$  terminals then 0.01  $\mu\text{F}$  or 0.022  $\mu\text{F}$  is recommended for each power terminal. It is ok to parallel multiple bypass caps to reject different frequencies of noise. A 0.1  $\mu\text{F}$  and 1  $\mu\text{F}$  are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

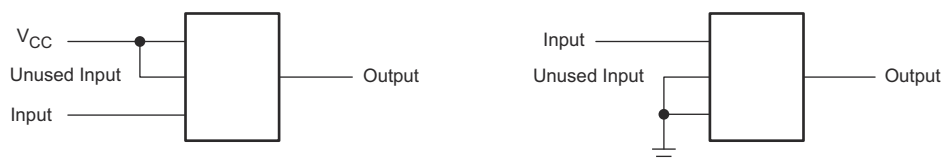
## 10 Layout

### 10.1 Layout Guidelines

When using multiple bit logic devices inputs should not ever float.

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 input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. Specified in [Figure 10-1](#) are the rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or  $V_{CC}$  whichever make more sense or is more convenient. It is generally OK to float outputs unless the part is a transceiver. If the transceiver has an output enable pin it will disable the outputs section of the part when asserted. This will not disable the input section of the I/Os so they also cannot float when disabled.

### 10.2 Layout Example



**Figure 10-1. Layout Diagram**

## 11 Device and Documentation Support

### 11.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](http://ti.com). Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 11.2 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is 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](#).

### 11.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 11.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 11.5 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 12 Revision History

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

### Changes from Revision P (June 2016) to Revision Q (March 2024) Page

- Updated the numbering format for tables, figures, and cross-references throughout the document ..... 1

### Changes from Revision O (June 2014) to Revision P (June 2016) Page

- Updated *Applications* and *Device Information* table..... 1
- Updated pinout images and *Pin Functions* table..... 3
- Added temperature ranges for Storage temperature,  $T_{stg}$  and Junction temperature,  $T_j$  in *Absolute Maximum Ratings* ..... 5
- Changed *Handling Ratings* to *ESD Ratings* and changed MIN, MAX column to a VALUE column..... 5

### Changes from Revision N (November 2012) to Revision O (June 2014) Page

- Updated document to new TI data sheet format..... 1
- Removed ordering information..... 1
- Added Applications..... 1
- Fixed typo in YFP package drawing. .... 3
- Added *Handling Ratings* table..... 5
- Added Thermal Information table..... 6
- Added Typical Characteristics..... 9

Changes from Revision M (September 2012) to Revision N (November 2012)	Page
• Changed DPW package pinout.....	<a href="#">3</a>

Changes from Revision K (October 2011) to Revision L (May 2012)	Page
• Revised document to fix package addendum issue.....	<a href="#">1</a>

## 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)
<a href="#">SN74AUP1G08DBVR</a>	Active	Production	SOT-23 (DBV)   5	3000   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 85	(H08F, H08R)
SN74AUP1G08DBVR.B	Active	Production	SOT-23 (DBV)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(H08F, H08R)
SN74AUP1G08DBVRG4.B	Active	Production	SOT-23 (DBV)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	H08F
<a href="#">SN74AUP1G08DBVT</a>	Active	Production	SOT-23 (DBV)   5	250   SMALL T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 85	(H08F, H08R)
SN74AUP1G08DBVT.B	Active	Production	SOT-23 (DBV)   5	250   SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(H08F, H08R)
<a href="#">SN74AUP1G08DCKR</a>	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 85	(HE5, HEF, HEK, HE R) (HEH, HEP, HES)
SN74AUP1G08DCKR.B	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	SN	Level-1-260C-UNLIM	-40 to 85	(HE5, HEF, HEK, HE R) (HEH, HEP, HES)
<a href="#">SN74AUP1G08DCKRE4</a>	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(HE5, HEF, HEK, HE R) (HEH, HEP, HES)
SN74AUP1G08DCKRE4.B	Active	Production	SC70 (DCK)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(HE5, HEF, HEK, HE R) (HEH, HEP, HES)
<a href="#">SN74AUP1G08DCKT</a>	Active	Production	SC70 (DCK)   5	250   SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(HE5, HER)
SN74AUP1G08DCKT.B	Active	Production	SC70 (DCK)   5	250   SMALL T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(HE5, HER)
<a href="#">SN74AUP1G08DPWR</a>	Active	Production	X2SON (DPW)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(E, E4)
SN74AUP1G08DPWR.B	Active	Production	X2SON (DPW)   5	3000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(E, E4)
SN74AUP1G08DPWRG4.B	Active	Production	X2SON (DPW)   5	3000   LARGE T&R	-	Call TI	Call TI	-40 to 85	
<a href="#">SN74AUP1G08DRLR</a>	Active	Production	SOT-5X3 (DRL)   5	4000   LARGE T&R	Yes	NIPDAU   NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	(HE7, HER)
SN74AUP1G08DRLR.B	Active	Production	SOT-5X3 (DRL)   5	4000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	(HE7, HER)
<a href="#">SN74AUP1G08DRY2</a>	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HE
SN74AUP1G08DRY2.B	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HE
SN74AUP1G08DRY2G4	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HE
SN74AUP1G08DRY2G4.B	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HE
<a href="#">SN74AUP1G08DRYR</a>	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAU   NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	HE
SN74AUP1G08DRYR.B	Active	Production	SON (DRY)   6	5000   LARGE T&R	Yes	NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	HE

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="#">SN74AUP1G08DSF2</a>	Active	Production	SON (DSF)   6	5000   LARGE T&R	Yes	NIPDAU   NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	(HE, HER) HEH
SN74AUP1G08DSF2.B	Active	Production	SON (DSF)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(HE, HER) HEH
SN74AUP1G08DSF2G4	Active	Production	SON (DSF)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HE
SN74AUP1G08DSF2G4.B	Active	Production	SON (DSF)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HE
<a href="#">SN74AUP1G08DSFR</a>	Active	Production	SON (DSF)   6	5000   LARGE T&R	Yes	NIPDAU   NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	(HE, HER) HEH
SN74AUP1G08DSFR.B	Active	Production	SON (DSF)   6	5000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(HE, HER) HEH
<a href="#">SN74AUP1G08YFPR</a>	Active	Production	DSBGA (YFP)   6	3000   LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-	HEN
SN74AUP1G08YFPR.B	Active	Production	DSBGA (YFP)   6	3000   LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 85	HEN
<a href="#">SN74AUP1G08YZPR</a>	Active	Production	DSBGA (YZP)   5	3000   LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 85	HEN
SN74AUP1G08YZPR.B	Active	Production	DSBGA (YZP)   5	3000   LARGE T&R	Yes	SNAGCU	Level-1-260C-UNLIM	-40 to 85	HEN

<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.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

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

**OTHER QUALIFIED VERSIONS OF SN74AUP1G08 :**

- Automotive : [SN74AUP1G08-Q1](#)

NOTE: Qualified Version Definitions:

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

**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
SN74AUP1G08DBVR	SOT-23	DBV	5	3000	178.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
SN74AUP1G08DBVT	SOT-23	DBV	5	250	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
SN74AUP1G08DBVT	SOT-23	DBV	5	250	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
SN74AUP1G08DCKR	SC70	DCK	5	3000	178.0	8.4	2.25	2.45	1.2	4.0	8.0	Q3
SN74AUP1G08DCKRE4	SC70	DCK	5	3000	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74AUP1G08DCKT	SC70	DCK	5	250	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74AUP1G08DCKT	SC70	DCK	5	250	180.0	8.4	2.47	2.3	1.25	4.0	8.0	Q3
SN74AUP1G08DPWR	X2SON	DPW	5	3000	178.0	8.4	0.91	0.91	0.5	2.0	8.0	Q3
SN74AUP1G08DRLR	SOT-5X3	DRL	5	4000	180.0	8.4	1.98	1.78	0.69	4.0	8.0	Q3
SN74AUP1G08DRY2	SON	DRY	6	5000	180.0	9.5	1.15	1.6	0.75	4.0	8.0	Q3
SN74AUP1G08DRY2G4	SON	DRY	6	5000	180.0	9.5	1.15	1.6	0.75	4.0	8.0	Q3
SN74AUP1G08DRYR	SON	DRY	6	5000	180.0	9.5	1.15	1.6	0.75	4.0	8.0	Q1
SN74AUP1G08DSF2	SON	DSF	6	5000	180.0	8.4	1.16	1.16	0.5	4.0	8.0	Q3
SN74AUP1G08DSF2G4	SON	DSF	6	5000	180.0	8.4	1.16	1.16	0.5	4.0	8.0	Q3
SN74AUP1G08DSFR	SON	DSF	6	5000	180.0	8.4	1.16	1.16	0.5	4.0	8.0	Q2
SN74AUP1G08YFPR	DSBGA	YFP	6	3000	178.0	9.2	0.89	1.29	0.62	4.0	8.0	Q1

---

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
SN74AUP1G08YZPR	DSBGA	YZP	5	3000	178.0	9.2	1.02	1.52	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)
SN74AUP1G08DBVR	SOT-23	DBV	5	3000	208.0	191.0	35.0
SN74AUP1G08DBVT	SOT-23	DBV	5	250	210.0	185.0	35.0
SN74AUP1G08DBVT	SOT-23	DBV	5	250	210.0	185.0	35.0
SN74AUP1G08DCKR	SC70	DCK	5	3000	208.0	191.0	35.0
SN74AUP1G08DCKRE4	SC70	DCK	5	3000	180.0	180.0	18.0
SN74AUP1G08DCKT	SC70	DCK	5	250	180.0	180.0	18.0
SN74AUP1G08DCKT	SC70	DCK	5	250	202.0	201.0	28.0
SN74AUP1G08DPWR	X2SON	DPW	5	3000	205.0	200.0	33.0
SN74AUP1G08DRLR	SOT-5X3	DRL	5	4000	202.0	201.0	28.0
SN74AUP1G08DRY2	SON	DRY	6	5000	184.0	184.0	19.0
SN74AUP1G08DRY2G4	SON	DRY	6	5000	184.0	184.0	19.0
SN74AUP1G08DRYR	SON	DRY	6	5000	184.0	184.0	19.0
SN74AUP1G08DSF2	SON	DSF	6	5000	210.0	185.0	35.0
SN74AUP1G08DSF2G4	SON	DSF	6	5000	210.0	185.0	35.0
SN74AUP1G08DSFR	SON	DSF	6	5000	210.0	185.0	35.0
SN74AUP1G08YFPR	DSBGA	YFP	6	3000	220.0	220.0	35.0
SN74AUP1G08YZPR	DSBGA	YZP	5	3000	220.0	220.0	35.0

**DBV0005A****PACKAGE OUTLINE****SOT-23 - 1.45 mm max height**

SMALL OUTLINE TRANSISTOR



4214839/K 08/2024

**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. Reference JEDEC MO-178.
4. 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.
5. 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

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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.



**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.

## GENERIC PACKAGE VIEW

**DRY 6**

**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



### USON - 0.6 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



4222894/A 01/2018

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.

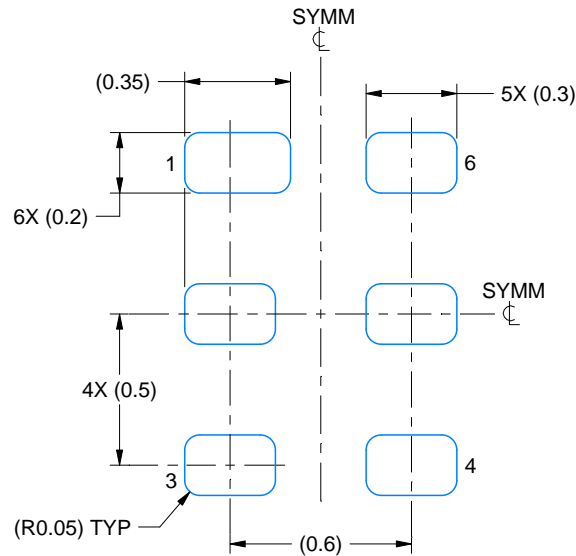
2. This drawing is subject to change without notice.

# 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/slue271](http://www.ti.com/lit/slue271)).

## 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.



DSF0006A

## PACKAGE OUTLINE

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

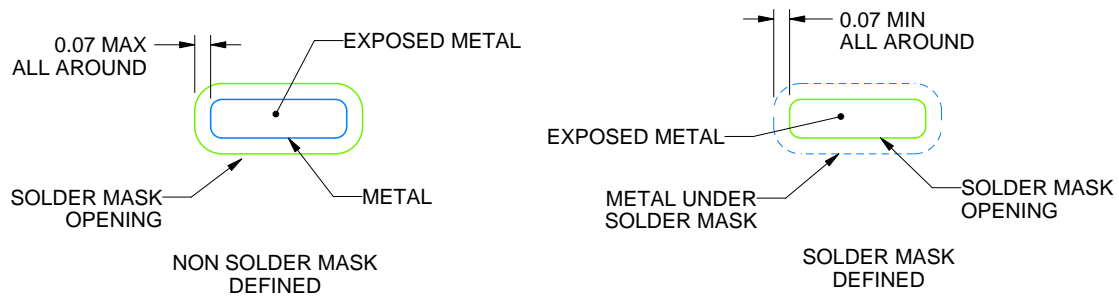
DSF0006A

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/slue271](http://www.ti.com/lit/slue271)).

# 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.





**SOT - 0.6 mm max height**

## PLASTIC SMALL OUTLINE



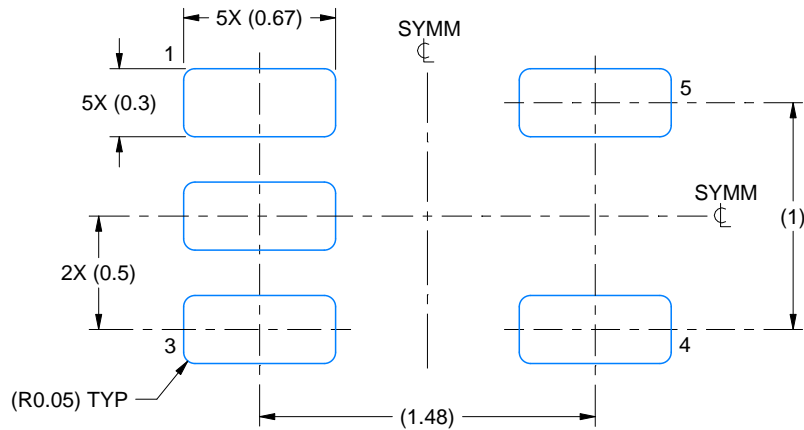
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

# EXAMPLE BOARD LAYOUT

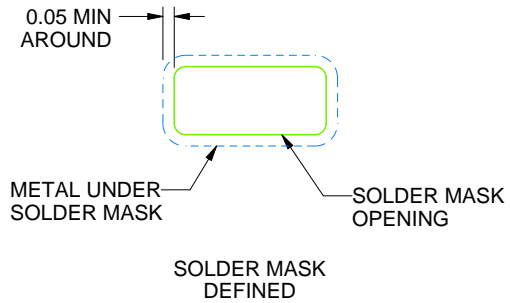
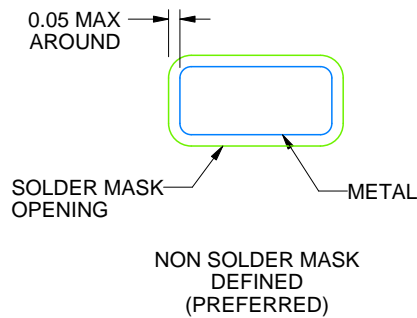
DRL0005A

SOT - 0.6 mm max height

PLASTIC SMALL OUTLINE



LAND PATTERN EXAMPLE  
SCALE:30X



SOLDERMASK DETAILS

4220753/E 11/2024

NOTES: (continued)

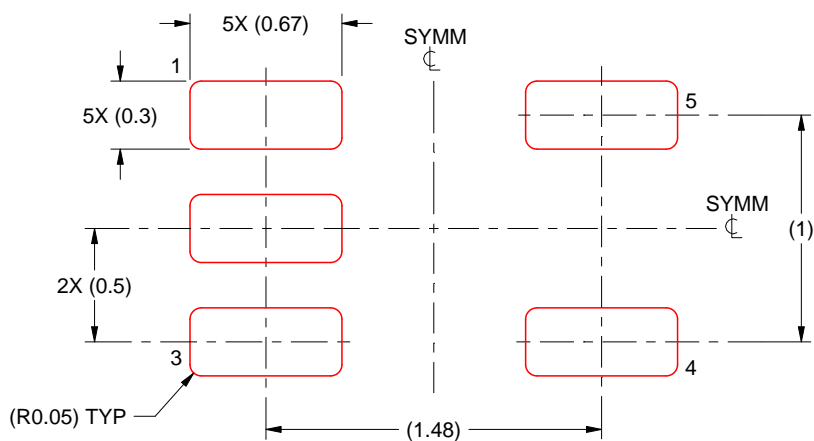
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## 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**

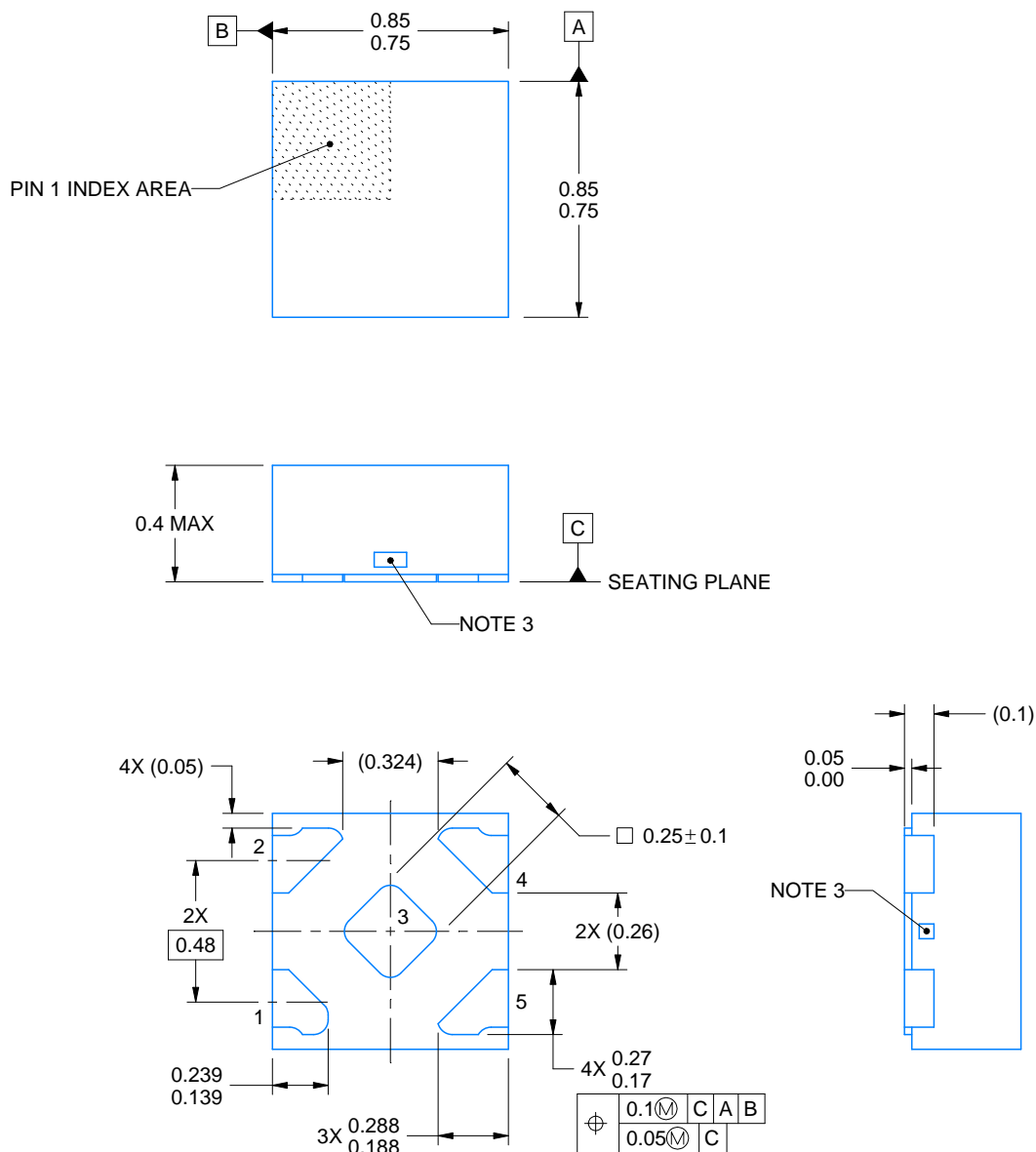
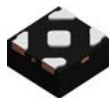
**X2SON - 0.4 mm max height**

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



4223102/D 03/2022

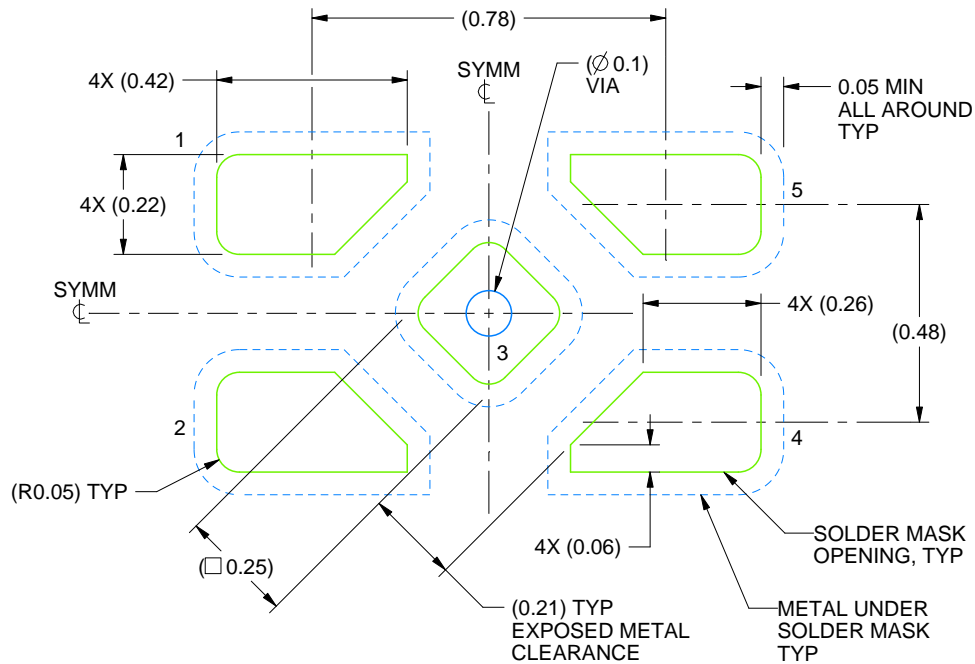
## NOTES:

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.

**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



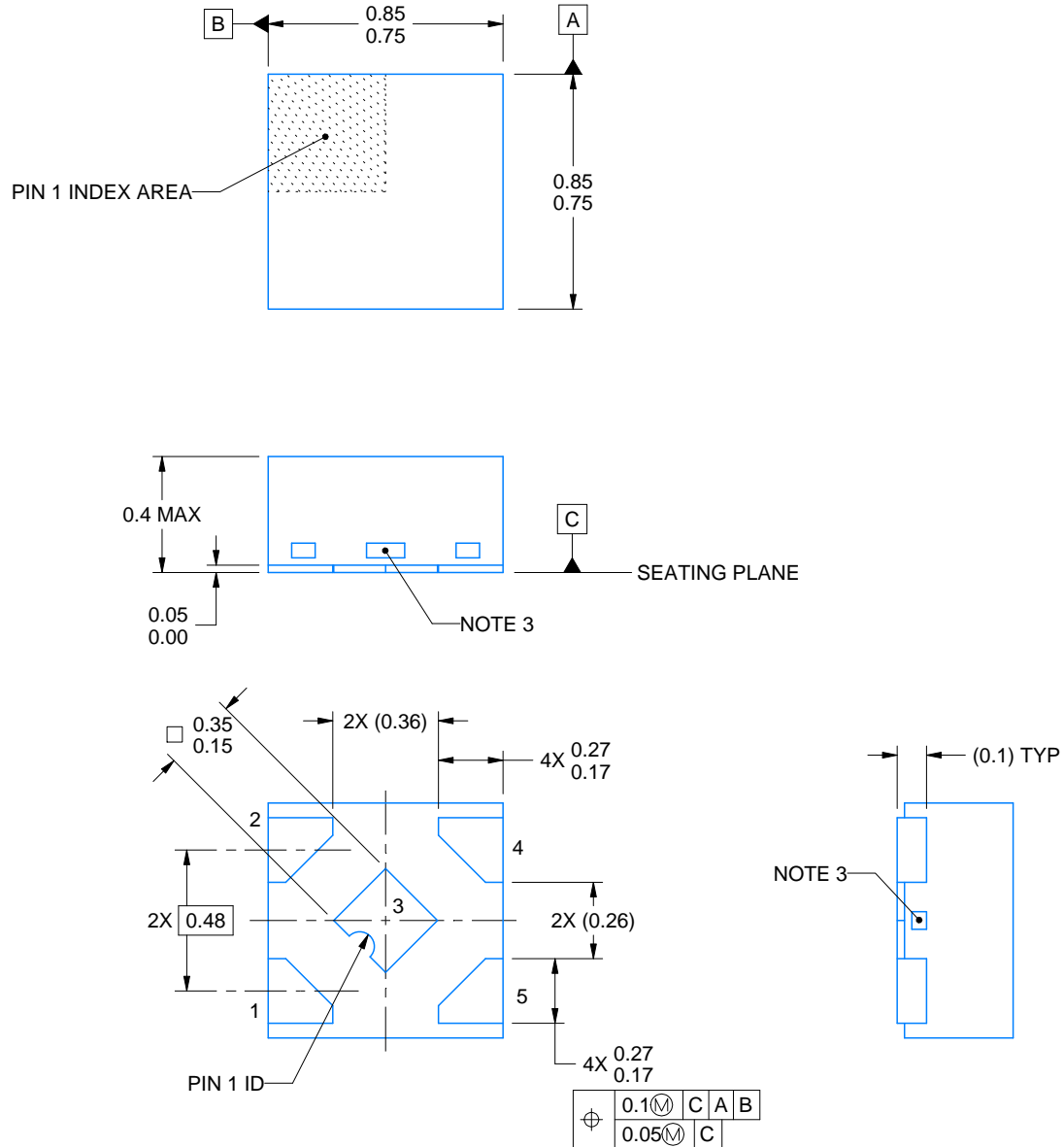
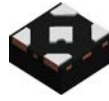
SOLDER PASTE EXAMPLE  
BASED ON 0.1 mm THICK STENCIL

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.



4228233/D 09/2023

## NOTES:

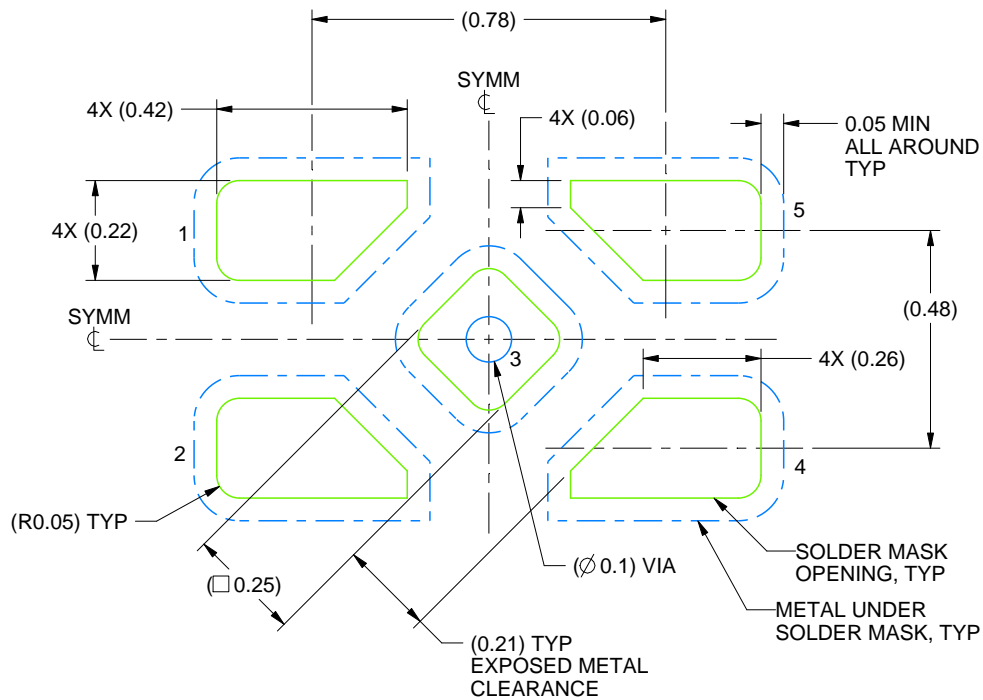
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The size and shape of this feature may vary.



**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)

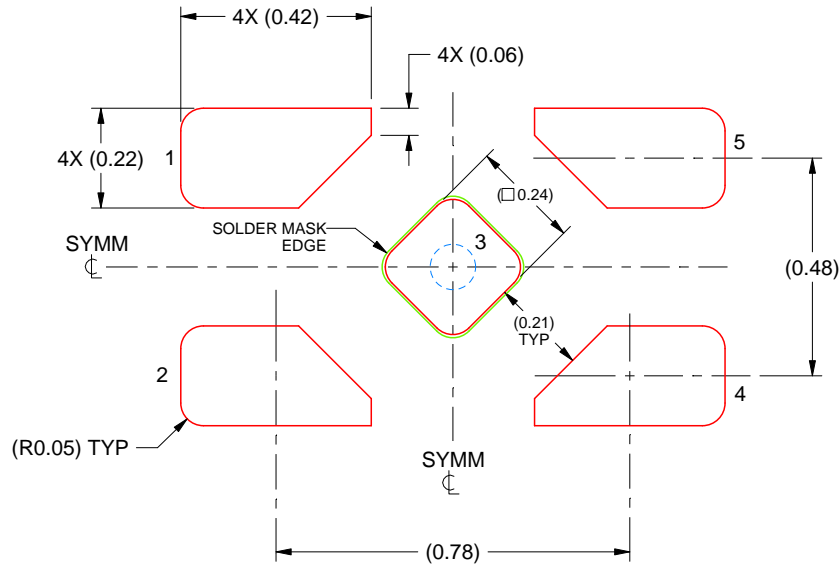
4. This package is designed to be soldered to a thermal pad on the board. For more information, refer to QFN/SON PCB application note in literature No. SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).

# 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.

YZP0005



# PACKAGE OUTLINE

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



D: Max = 1.418 mm, Min = 1.358 mm

E: Max = 0.918 mm, Min = 0.858 mm

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

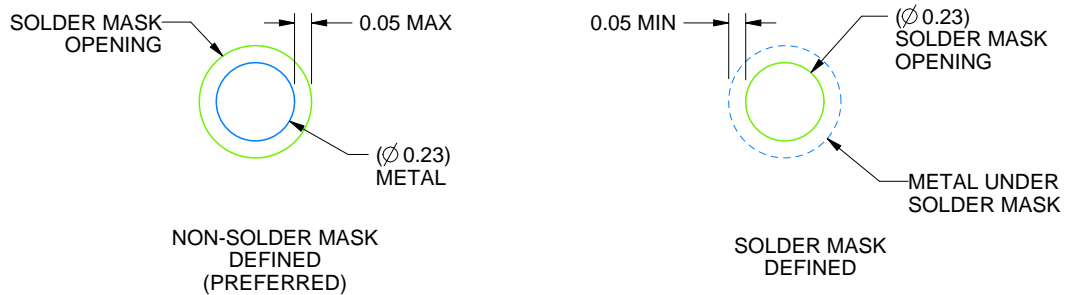
YZP0005

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)

- 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.

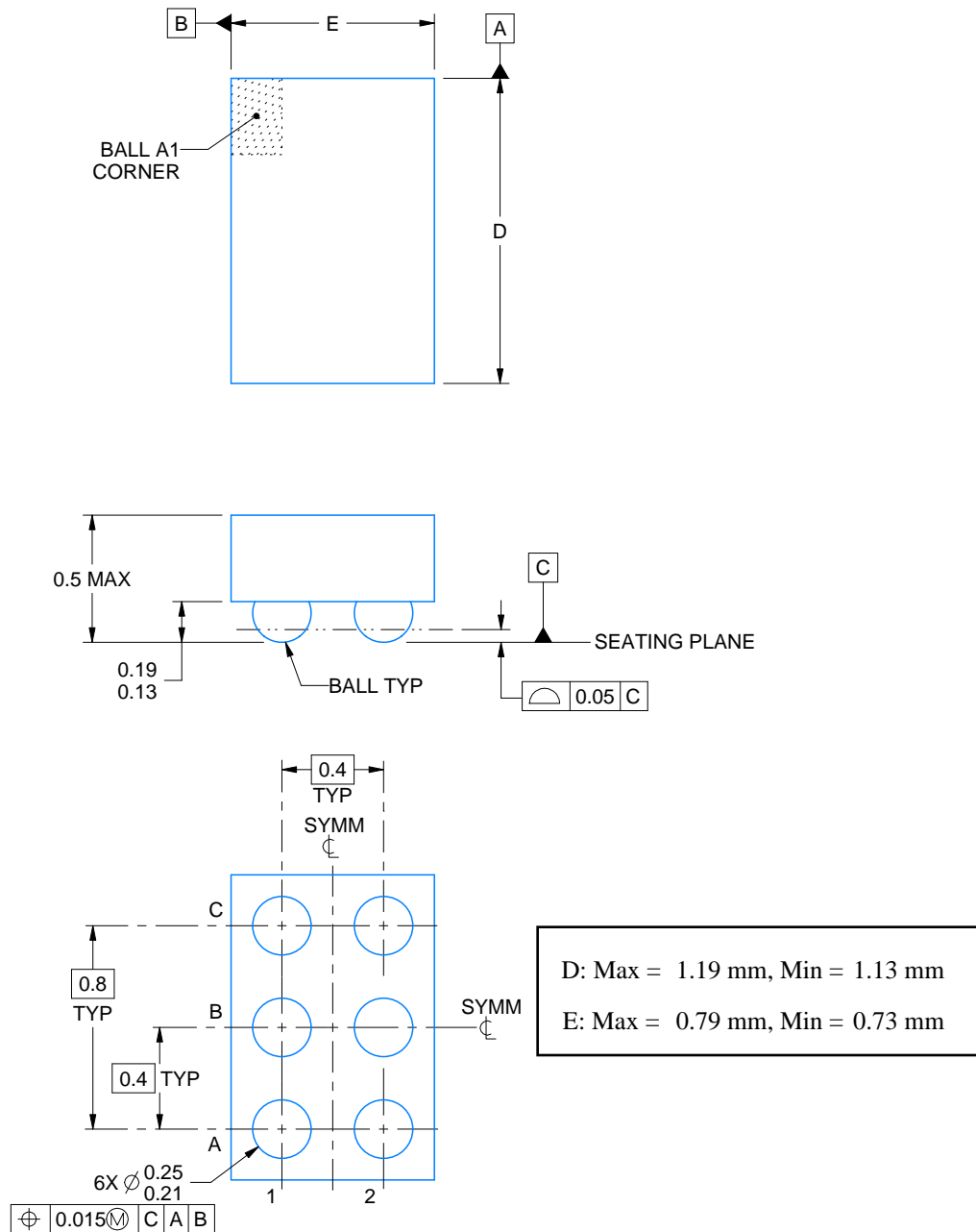
YFP0006



## PACKAGE OUTLINE

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



4223410/A 11/2016

### NOTES:

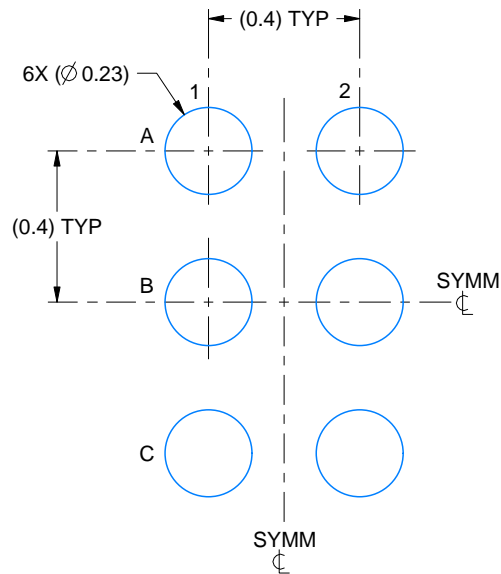
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

# EXAMPLE BOARD LAYOUT

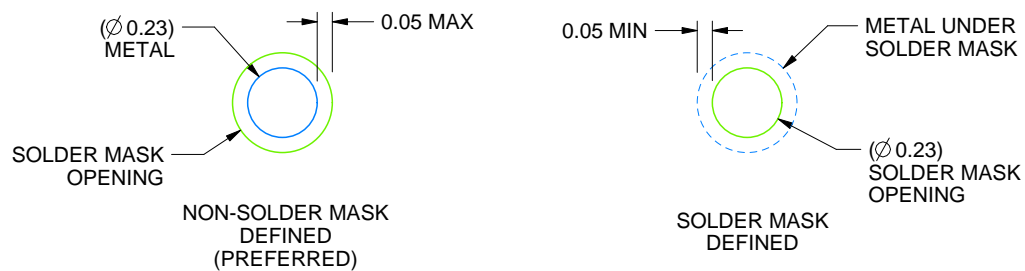
YFP0006

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE  
SCALE:50X



SOLDER MASK DETAILS  
NOT TO SCALE

4223410/A 11/2016

NOTES: (continued)

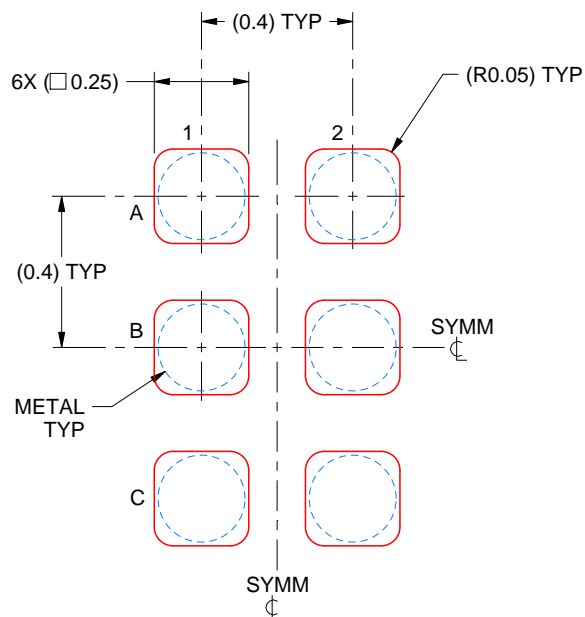
3. Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints.  
For more information, see Texas Instruments literature number SNVA009 ([www.ti.com/lit/snva009](http://www.ti.com/lit/snva009)).

## EXAMPLE STENCIL DESIGN

YFP0006

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



SOLDER PASTE EXAMPLE  
BASED ON 0.1 mm THICK STENCIL  
SCALE:50X

4223410/A 11/2016

NOTES: (continued)

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



DCK0005A



## PACKAGE OUTLINE

SOT - 1.1 max height

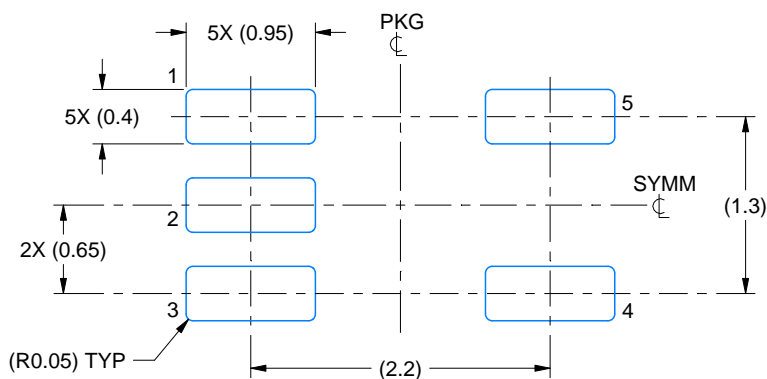
SMALL OUTLINE TRANSISTOR



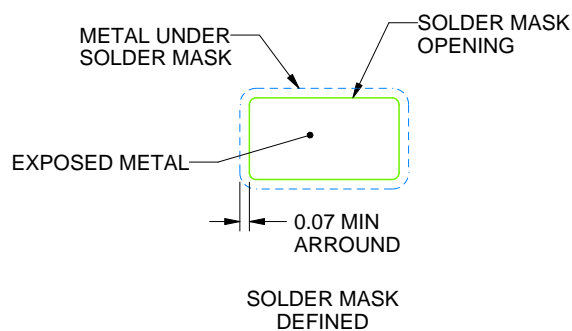
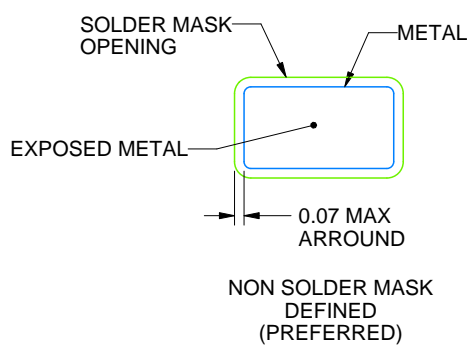
4214834/G 11/2024

### 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. 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.



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:18X



SOLDER MASK DETAILS

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.



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

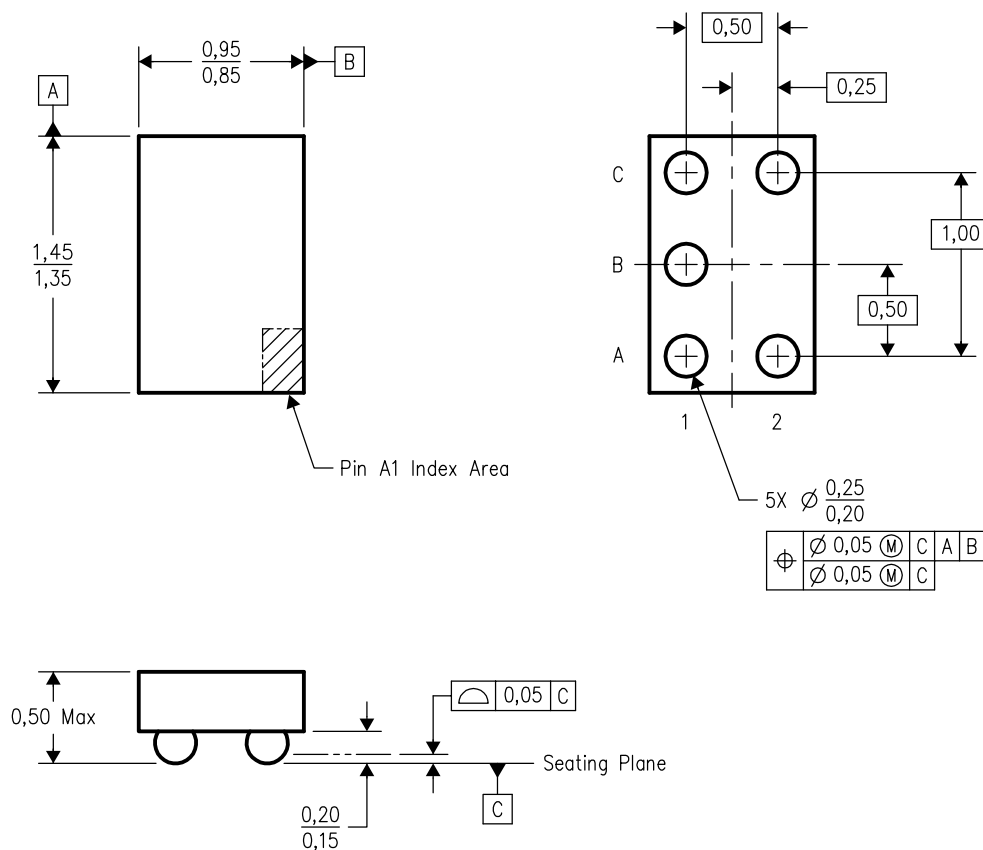
4214834/G 11/2024

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.

YEP (R-XBGA-N5)

DIE-SIZE BALL GRID ARRAY



4204725-2/A 10/2002

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. NanoStar™ package configuration.
  - D. This package is tin-lead (SnPb). Refer to the 5 YZP package (drawing 4204741) for lead-free.

NanoStar is a trademark of Texas Instruments.

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