













SCES374P - SEPTEMBER 2001 - REVISED JUNE 2017

# **SN74AUC1G08 Single 2-Input Positive-AND Gate**

#### **Features**

- 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)
- Available in the Texas Instruments NanoFree™ Package
- Optimized for 1.8-V Operation and Is 3.6-V I/O Tolerant to Support Mixed-Mode Signal Operation
- Ioff Supports Partial-Power-Down Mode and Back **Drive Protection**
- Sub-1-V Operable
- Max  $t_{pd}$  of 2.4 ns at 1.8 V
- Low Power Consumption, 10-µA Max I<sub>CC</sub>
- ±8-mA Output Drive at 1.8 V

### **Applications**

- **AV Receiver**
- Audio Dock: Portable
- Blu-Ray Player and Home Theater
- Embedded PC
- MP3 Player/Recorder (Portable Audio)
- Personal Digital Assistant (PDA)
- Power: Telecom/Server AC/DC Supply: Single Controller: Analog and Digital
- Solid State Drive (SSD): Client and Enterprise
- TV: LCD/Digital and High-Definition (HDTV)
- Tablet: Enterprise
- Video Analytics: Server
- Wireless Headset, Keyboard, and Mouse

#### 3 Description

This single 2-input positive-AND gate is operational at 0.8-V to 2.7-V V<sub>CC</sub>, but is designed specifically for 1.65-V to 1.95-V  $V_{CC}$  operation.

The SN74AUC1G08 device performs the Boolean function  $Y = A \bullet B$  or  $Y = \overline{A} + \overline{B}$  in positive logic.

NanoFree<sup>™</sup> package technology is a major breakthrough in IC packaging concepts, using the die as the package.

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

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

PART NUMBER	PACKAGE	BODY SIZE (NOM)
SN74AUC1G08DBV	SOT-23 (5)	2.90 mm × 1.60 mm
SN74AUC1G08DCK	SC70 (5)	2.00 mm × 1.25 mm
SN74AUC1G08DRL	SOT-5X3 (5)	1.60 mm × 1.20 mm
SN74AUC1G08YZP	DSBGA (5)	1.75 mm × 1.25 mm

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

#### Logic Diagram (Positive Logic)





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# 4 Revision History

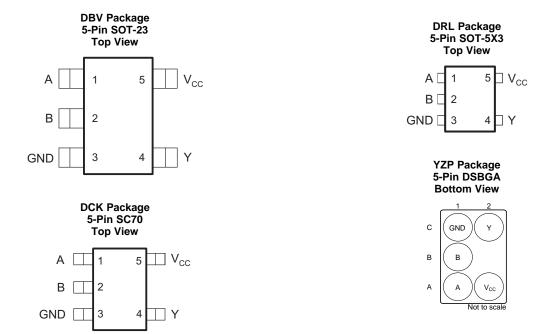
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

C	hanges from Revision O (April 2007) to Revision P	Page
•	Deleted DRY Package throughout data sheet	1
•	Added Applications, Device Information table, ESD Ratings table, Thermal Information table, Detailed Description, Device and Documentation Support, and Mechanical, Packaging, and Orderable Information	1
•	Deleted Ordering Information, see Mechanical, Packaging, and Orderable Information	1

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### 5 Pin Configuration and Functions



#### **Pin Functions**

	PIN						
NAME	DBV, DCK, DRL	YZP	I/O	DESCRIPTION			
Α	1	A1	I	A logic input			
В	2	B1	I	B logic input			
GND	3	C1	_	Ground			
Υ	4	C2	0	Y AND Logic Output			
V <sub>CC</sub>	5	A2	_	Positive Supply			

### 6 Specifications

### 6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) (1)

			MIN	MAX	UNIT
$V_{CC}$	Supply voltage		-0.5	3.6	V
$V_{I}$	Input voltage <sup>(2)</sup>	<u> </u>			V
Vo	Voltage range applied to any output in the high-impeda	-0.5	3.6	V	
Vo	Output voltage <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		<b>-</b> 50	mA
Io	Continuous output current			±20	mA
	Continuous current through V <sub>CC</sub> or GND	Continuous current through V <sub>CC</sub> or GND			
T <sub>stg</sub>	Storage temperature		-65	150	°C

<sup>(1)</sup> Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

<sup>(2)</sup> The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.



### 6.2 ESD Ratings

			VALUE	UNIT
		Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup>	2000	
V <sub>(ESD)</sub>	Electrostatic discharge	Charged-device model (CDM), per JEDEC specification JESD22-C101 (2)	1000	V
		Machine Model (A115-A)	200	

- (1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
- (2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

### 6.3 Recommended Operating Conditions

See (1)

			MIN	MAX	UNIT	
V <sub>CC</sub>	Supply voltage		0.8	2.7	V	
.,	High level inner water as	V <sub>CC</sub> = 0.8 V to 1.95 V	0.65 × V <sub>CC</sub>		V	
VIH	High-level input voltage	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.7		V	
17	Low level input valtage	$V_{CC} = 0.8 \text{ V to } 1.95 \text{ V}$		$0.35 \times V_{CC}$	V	
VIL	High-level input voltage  Low-level input voltage  Input voltage  Output voltage  High-level output current  Low-level output current	$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$		0.7	V	
$V_{I}$	Input voltage		0	3.6	V	
Vo	Output voltage		0	$V_{CC}$	V	
		V <sub>CC</sub> = 0.8 V		-0.7		
		V <sub>CC</sub> = 1.1 V		-3		
$I_{OH}$	High-level output current	V <sub>CC</sub> = 1.4 V		<b>-</b> 5	mA	
		V <sub>CC</sub> = 1.65 V		-8		
		V <sub>CC</sub> = 2.3 V		-9	İ	
V <sub>O</sub> I <sub>OH</sub> Δt/Δv		V <sub>CC</sub> = 0.8 V		0.7		
		V <sub>CC</sub> = 1.1 V		3		
$I_{OL}$	Low-level output current	V <sub>CC</sub> = 1.4 V		5	mA	
		V <sub>CC</sub> = 1.65 V		8		
		V <sub>CC</sub> = 2.3 V		9		
A4/A	lament translation via a su fall sate	V <sub>CC</sub> = 0.8 V to 1.95 V		20	//	
ΔΨΔν	Input transition rise or fall rate	V <sub>CC</sub> = 2.3 V to 2.7 V		10	ns/V	
T <sub>A</sub>	Operating free-air temperature	·	-40	85	°C	

All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. See *Implications of Slow or Floating CMOS Inputs*, SCBA004.

#### 6.4 Thermal Information

			SN74AU	C1G08		
	THERMAL METRIC <sup>(1)</sup>	DBV (SOT-23)	DCK (SC70)	DRL (SOT- 5X3)	YZP (DSBGA)	UNIT
		5 PINS	5 PINS	5 PINS	5 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	206	252	142	132	°C/W

 For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application report.



#### 6.5 Electrical Characteristics

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

PARAM	METER	TEST CON	IDITIONS	V <sub>cc</sub>	MIN	TYP <sup>(1)</sup>	MAX	UNIT		
		$I_{OH} = -100 \ \mu A$		0.8 V to 2.7 V	$V_{CC} - 0.1$					
		$I_{OH} = -0.7 \text{ mA}$		V 8.0		0.55				
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		$I_{OH} = -3 \text{ mA}$		1.1 V	0.8			V		
V <sub>OH</sub>		$I_{OH} = -5 \text{ mA}$		1.4 V	1			V		
		$I_{OH} = -8 \text{ mA}$		1.65 V	1.2					
		$I_{OH} = -9 \text{ mA}$		2.3 V	1.8					
		$I_{OL} = 100 \mu A$		0.8 V to 2.7 V			0.2			
		I <sub>OL</sub> = 0.7 mA		0.8 V		0.25				
V		I <sub>OL</sub> = 3 mA		1.1 V			0.3			
V <sub>OL</sub>		$I_{OL} = 5 \text{ mA}$		1.4 V			0.4	] V		
		$I_{OL} = 8 \text{ mA}$		1.65 V			0.45			
		$I_{OL} = 9 \text{ mA}$		2.3 V			0.6			
I <sub>I</sub> A	or B input	$V_I = V_{CC}$ or GND		0 to 2.7 V			±5	μΑ		
I <sub>off</sub>		$V_I$ or $V_O = 2.7 V$		0			±10	μΑ		
I <sub>CC</sub>		$V_I = V_{CC}$ or GND,	I <sub>O</sub> = 0	0.8 V to 2.7 V			10	μΑ		
C <sub>I</sub>		$V_I = V_{CC}$ or GND		2.5 V		3		рF		

<sup>(1)</sup> All typical values are at  $T_A = 25$ °C.

# 6.6 Switching Characteristics: $C_L = 15 pF$

over recommended operating free-air temperature range,  $C_L$  = 15 pF (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO			V <sub>CC</sub> = 1.5 V ± 0.1 V		V <sub>CC</sub> = 1.8 V ± 0.15 V		V <sub>CC</sub> = 2.5 V ± 0.2 V		UNIT		
		(INPUT) (OUTPUT)	TYP	MIN	MAX	MIN	MAX	MIN	TYP	MAX	MIN	MAX	
t <sub>pd</sub>	A or B	Υ	4.7	0.9	3.3	0.6	2.3	0.4	1.1	1.7	0.2	1.6	ns

# 6.7 Switching Characteristics: $C_L = 30 pF$

over recommended operating free-air temperature range,  $C_L = 30 \text{ pF}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM	TO (OUTPUT)	V <sub>CC</sub> = 1.8 V ± 0.15 V			V <sub>CC</sub> = 2.5 ± 0.2 V	UNIT	
	(INPUT)		MIN	TYP	MAX	MIN	MAX	
t <sub>pd</sub>	A or B	Y	0.7	1.3	2.4	0.5	2	ns

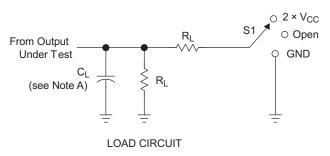
### 6.8 Operating Characteristics

 $T_A = 25^{\circ}C$ 

	PARAMETER	TEST CONDITIONS	V <sub>CC</sub> = 0.8 V TYP	V <sub>CC</sub> = 1.2 V TYP	V <sub>CC</sub> = 1.5 V TYP	V <sub>CC</sub> = 1.8 V TYP	V <sub>CC</sub> = 2.5 V TYP	UNIT
C <sub>pd</sub>	Power dissipation capacitance	f = 10 MHz	15	15	15	15	19	pF

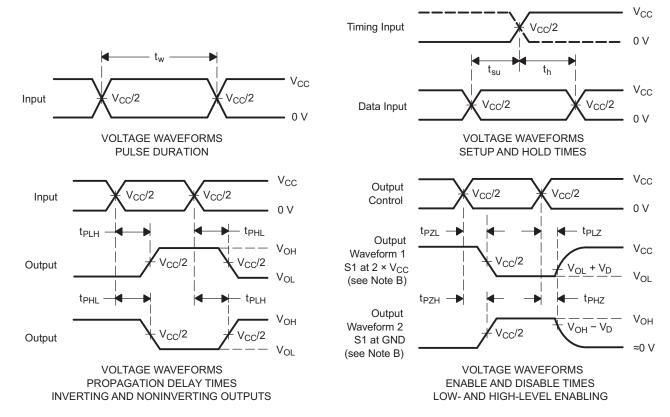


#### 7 Parameter Measurement Information



TEST	S1
t <sub>PLH</sub> /t <sub>PHL</sub>	Open
t <sub>PLZ</sub> /t <sub>PZL</sub>	2 × V <sub>CC</sub>
t <sub>PHZ</sub> /t <sub>PZH</sub>	GND

V <sub>CC</sub>	C <sub>L</sub>	R <sub>L</sub>	$V_D$
0.8 V	15 pF	2 kΩ	0.1 V
1.2 V ± 0.1 V	15 pF	2 kΩ	0.1 V
1.5 V ± 0.1 V	15 pF	2 kΩ	0.1 V
1.8 V ± 0.15 V	15 pF	2 kΩ	0.15 V
2.5 V ± 0.2 V	15 pF	2 kΩ	0.15 V
1.8 V ± 0.15 V	30 pF	1 kΩ	0.15 V
2.5 V ± 0.2 V	30 pF	500 Ω	0.15 V



NOTES: A. C<sub>L</sub> 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 MHz,  $Z_0$  = 50  $\Omega$ , slew rate  $\geq$  1 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.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
- H. All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

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# 8 Detailed Description

# 8.1 Functional Block Diagram



Figure 2. Logic Diagram (Positive Logic)

### 8.2 Device Functional Modes

Table 1 lists the functional modes of the SN74AUC1G08.

**Table 1. Function Table** 

INP	UTS	OUTPUT
Α	В	Y
Н	Н	Н
L	Χ	L
Х	L	L



### 9 Device and Documentation Support

#### 9.1 Documentation Support

#### 9.1.1 Related Documentation

For related documentation see the following:

Implications of Slow or Floating CMOS Inputs, SCBA004.

#### 9.2 Receiving Notification of Documentation Updates

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

#### 9.3 Community Resources

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

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

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

#### 9.4 Trademarks

NanoFree, E2E are trademarks of Texas Instruments. All other trademarks are the property of their respective owners.

#### 9.5 Electrostatic Discharge Caution



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

#### 9.6 Glossary

SLYZ022 — TI Glossary.

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

## 10 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.

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#### PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
							(6)				
SN74AUC1G08DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(U08K, U08R)	Samples
SN74AUC1G08DCKR	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(UE5, UEF, UER)	Samples
SN74AUC1G08DCKRG4	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	(UE5, UEF, UER)	Samples
SN74AUC1G08DRLR	ACTIVE	SOT-5X3	DRL	5	4000	RoHS & Green	NIPDAU   NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	(UE7, UER)	Samples
SN74AUC1G08DRLRG4	ACTIVE	SOT-5X3	DRL	5	4000	RoHS & Green	NIPDAUAG	Level-1-260C-UNLIM	-40 to 85	(UE7, UER)	Samples
SN74AUC1G08YZPR	ACTIVE	DSBGA	YZP	5	3000	RoHS & Green	SNAGCU	Level-1-260C-UNLIM	-40 to 85	UEN	Samples

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

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

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

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

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

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

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

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

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

- (3) MSL, Peak Temp. The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.
- (4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.
- (5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.
- (6) Lead finish/Ball material Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.



### PACKAGE OPTION ADDENDUM

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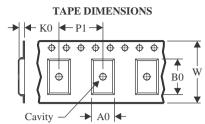
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

# **PACKAGE MATERIALS INFORMATION**

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### TAPE AND REEL INFORMATION





A0	Dimension designed to accommodate the component width
В0	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		SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74AUC1G08DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
SN74AUC1G08DCKR	SC70	DCK	5	3000	178.0	9.0	2.4	2.5	1.2	4.0	8.0	Q3
SN74AUC1G08DCKR	SC70	DCK	5	3000	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74AUC1G08DRLR	SOT-5X3	DRL	5	4000	180.0	8.4	1.98	1.78	0.69	4.0	8.0	Q3
SN74AUC1G08YZPR	DSBGA	YZP	5	3000	178.0	9.2	1.02	1.52	0.63	4.0	8.0	Q1



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#### \*All dimensions are nominal

7 III dii i i ci i ci i ci i ci i ci i ci							
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AUC1G08DBVR	SOT-23	DBV	5	3000	202.0	201.0	28.0
SN74AUC1G08DCKR	SC70	DCK	5	3000	180.0	180.0	18.0
SN74AUC1G08DCKR	SC70	DCK	5	3000	180.0	180.0	18.0
SN74AUC1G08DRLR	SOT-5X3	DRL	5	4000	202.0	201.0	28.0
SN74AUC1G08YZPR	DSBGA	YZP	5	3000	220.0	220.0	35.0



DIE SIZE BALL GRID ARRAY



#### NOTES:

- 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.



DIE SIZE BALL GRID ARRAY



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).



DIE SIZE BALL GRID ARRAY



NOTES: (continued)

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







#### 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.





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.





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.







#### 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.





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.





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.





PLASTIC SMALL OUTLINE



#### 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



PLASTIC SMALL OUTLINE



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.



PLASTIC SMALL OUTLINE



NOTES: (continued)



<sup>7.</sup> Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

<sup>8.</sup> Board assembly site may have different recommendations for stencil design.

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