

SN74AUC1G14 Single Schmitt-Trigger Inverter

1 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
- I_{off} Supports Partial-Power-Down Mode Operation
- Sub-1-V Operable
- Max t_{pd} of 2.5 ns at 1.8 V
- Low Power Consumption, 10- μ A Max I_{CC}
- ± 8 -mA Output Drive at 1.8 V

2 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 Schmitt-trigger inverter is operational at 0.8-V to 2.7-V V_{CC} , but is designed specifically for 1.65-V to 1.95-V V_{CC} operation.

The SN74AUC1G14 contains one inverter and performs the Boolean function $Y = \bar{A}$. The device functions as an independent inverter, but because of Schmitt action, it may have different input threshold levels for positive-going (V_{T+}) and negative-going (V_{T-}) signals.

NanoFree™ 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 I_{off} . The I_{off} circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

For more information about AUC Little Logic devices, see [Applications of Texas Instruments AUC Sub-1-V Little Logic Devices](#), SCEA027.

Device Information⁽¹⁾

| PART NUMBER | PACKAGE | BODY SIZE (NOM) |
|----------------|------------|-------------------|
| SN74AUC1G14DBV | SOT-23 (5) | 2.90 mm x 1.60 mm |
| SN74AUC1G14DCK | SC70 (5) | 2.00 mm x 1.25 mm |
| SN74AUC1G14YZP | DSBGA (5) | 1.75 mm x 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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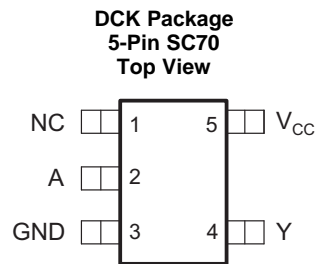
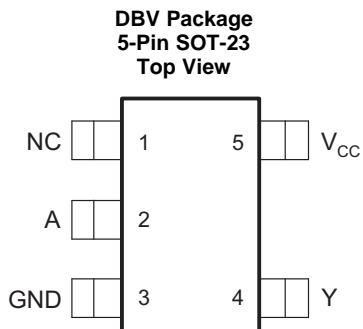
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4 Revision History

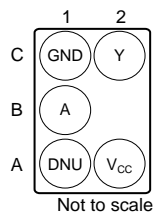
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| Changes from Revision O (August 2007) to Revision P | Page |
|--|-------------|
| • Deleted DRY package throughout data sheet..... | 1 |
| • Added <i>Applications</i> , <i>Device Information</i> table, <i>ESD Ratings</i> table, <i>Thermal Information</i> table, <i>Feature Description</i> section, <i>Device Functional Modes</i> , <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section | 1 |
| • Deleted <i>Ordering Information</i> table, see <i>Mechanical, Packaging, and Orderable Information</i> at the end of the data sheet. 1 | 1 |

5 Pin Configuration and Functions



**YZP Package
5-Pin DSBGA
Bottom View**



See mechanical drawings for dimensions.

DNU – Do not use

NC – No internal connection

Pin Functions

| NAME | PIN | | I/O | DESCRIPTION |
|-----------------|----------|-----|-----|------------------------|
| | DBV, DCK | YZP | | |
| A | 2 | B1 | I | Logic input |
| DNU | — | A1 | — | Do not use |
| GND | 3 | C1 | — | Ground |
| NC | 1 | — | — | No internal connection |
| V _{CC} | 5 | A2 | — | Positive supply |
| Y | 4 | C2 | O | Inverted output |

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 ⁽²⁾ | -0.5 | 3.6 | V |
| V _O | Voltage range applied to any output in the high-impedance or power-off state ⁽²⁾ | -0.5 | 3.6 | V |
| V _O | Output voltage range ⁽²⁾ | -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 | | ±20 | mA |
| | Continuous current through V _{CC} or GND | | ±100 | mA |
| T _{stg} | 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, 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.
- (2) 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 |
|--------------------|-------------------------|--|------|
| V _(ESD) | Electrostatic discharge | Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾ | 2000 |
| | | Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾ | 1000 |
| | | 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 _{CC} | Supply voltage | 0.8 | 2.7 | V |
| V _I | Input voltage | 0 | 3.6 | V |
| V _O | Output voltage | 0 | V _{CC} | V |
| I _{OH} | High-level output current | V _{CC} = 0.8 V | -0.7 | mA |
| | | V _{CC} = 1.1 V | -3 | |
| | | V _{CC} = 1.4 V | -5 | |
| | | V _{CC} = 1.65 V | -8 | |
| | | V _{CC} = 2.3 V | -9 | |
| I _{OL} | Low-level output current | V _{CC} = 0.8 V | 0.7 | mA |
| | | V _{CC} = 1.1 V | 3 | |
| | | V _{CC} = 1.4 V | 5 | |
| | | V _{CC} = 1.65 V | 8 | |
| | | V _{CC} = 2.3 V | 9 | |
| T _A | Operating free-air temperature | -40 | 85 | °C |

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

6.4 Thermal Information

| THERMAL METRIC ⁽¹⁾ | SN74AUC1G14 | | | UNIT |
|---|--------------|------------|-------------|------|
| | DBV (SOT-23) | DCK (SC70) | YZP (DSBGA) | |
| | 5 PINS | 5 PINS | 5 PINS | |
| R _{θJA} Junction-to-ambient thermal resistance | 206 | 252 | 132 | °C/W |

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

6.5 Electrical Characteristics

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

| PARAMETER | TEST CONDITIONS | V _{CC} | MIN | TYP ⁽¹⁾ | MAX | UNIT |
|---|---------------------------|---|-----------------------|--------------------|------|------|
| V _{T+} Positive-going input threshold voltage | | 0.8 V | | 0.5 | | V |
| | | 1.1 V | 0.51 | | 0.86 | |
| | | 1.4 V | 0.65 | | 1 | |
| | | 1.65 V | 0.79 | | 1.16 | |
| | | 2.3 V | 1.11 | | 1.56 | |
| V _{T-} Negative-going input threshold voltage | | 0.8 V | | 0.3 | | V |
| | | 1.1 V | 0.22 | | 0.53 | |
| | | 1.4 V | 0.3 | | 0.58 | |
| | | 1.65 V | 0.39 | | 0.62 | |
| | | 2.3 V | 0.58 | | 0.87 | |
| ΔV _T Hysteresis (V _{T+} – V _{T-}) | | 0.8 V | | 0.21 | | V |
| | | 1.1 V | 0.25 | | 0.38 | |
| | | 1.4 V | 0.31 | | 0.5 | |
| | | 1.65 V | 0.37 | | 0.62 | |
| | | 2.3 V | 0.48 | | 0.77 | |
| V _{OH} | I _{OH} = –100 μA | 0.8 V to 2.7 V | V _{CC} – 0.1 | | | V |
| | I _{OH} = –0.7 mA | 0.8 V | 0.55 | | | |
| | I _{OH} = –3 mA | 1.1 V | 0.8 | | | |
| | I _{OH} = –5 mA | 1.4 V | 1 | | | |
| | I _{OH} = –8 mA | 1.65 V | 1.2 | | | |
| | I _{OH} = –9 mA | 2.3 V | 1.8 | | | |
| V _{OL} | I _{OL} = 100 μA | 0.8 V to 2.7 V | | | 0.2 | V |
| | I _{OL} = 0.7 mA | 0.8 V | 0.25 | | | |
| | I _{OL} = 3 mA | 1.1 V | | | 0.3 | |
| | I _{OL} = 5 mA | 1.4 V | | | 0.4 | |
| | I _{OL} = 8 mA | 1.65 V | | | 0.45 | |
| | I _{OL} = 9 mA | 2.3 V | | | 0.6 | |
| I _I | A input | V _I = V _{CC} or GND | 0 to 2.7 V | | ±5 | μA |
| I _{off} | | V _I or V _O = 2.7 V | 0 | | ±10 | μA |
| I _{CC} | | V _I = V _{CC} or GND, I _O = 0 | 0.8 V to 2.7 V | | 10 | μA |
| C _i | | V _I = V _{CC} or GND | 2.5 V | | 3.5 | pF |

(1) All typical values are at T_A = 25°C.

SN74AUC1G14

SCES375P –SEPTEMBER 2001–REVISED JUNE 2017

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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 (OUTPUT) | $V_{CC} = 0.8$ V | $V_{CC} = 1.2$ V ± 0.1 V | $V_{CC} = 1.5$ V ± 0.1 V | $V_{CC} = 1.8$ V ± 0.15 V | $V_{CC} = 2.5$ V ± 0.2 V | UNIT |
|-----------|-----------------|----------------|------------------|---------------------------------|---------------------------------|----------------------------------|---------------------------------|------|
| | | | TYP | MIN MAX | MIN MAX | MIN TYP MAX | MIN MAX | |
| t_{pd} | A | Y | 5.8 | 0.7 4 | 0.6 2.3 | 0.5 1.2 1.9 | 0.5 1.6 | ns |

6.7 Switching Characteristics: $C_L = 30$ pF

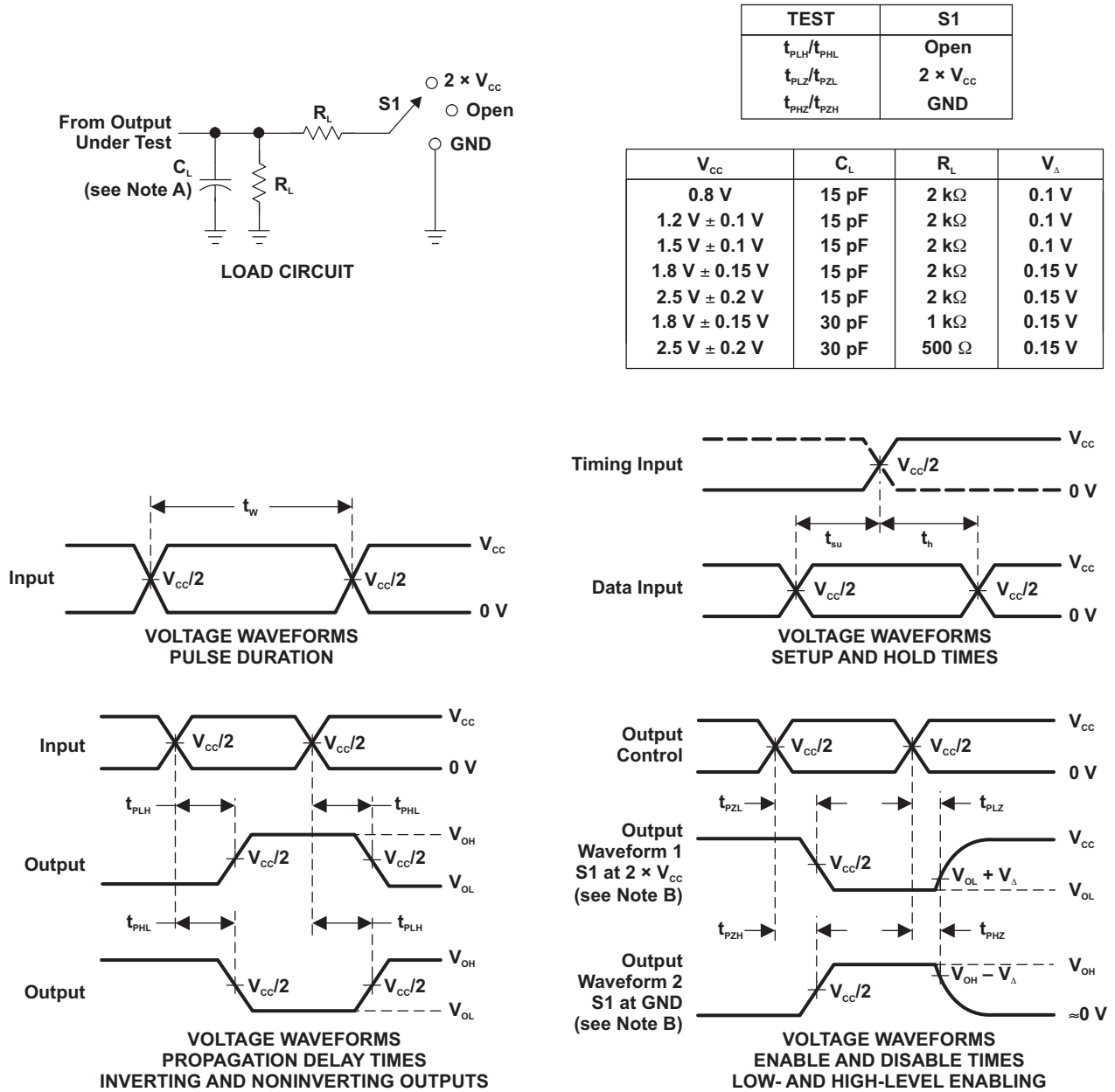
 over recommended operating free-air temperature range, $C_L = 30$ pF (unless otherwise noted) (see [Figure 1](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC} = 1.8$ V ± 0.15 V | | | $V_{CC} = 2.5$ V ± 0.2 V | | UNIT |
|-----------|-----------------|----------------|----------------------------------|-----|-----|---------------------------------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | |
| t_{pd} | A | Y | 0.7 | 1.6 | 2.5 | 0.5 | 2.5 | ns |

6.8 Operating Characteristics
 $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | $V_{CC} = 0.8$ V | $V_{CC} = 1.2$ V | $V_{CC} = 1.5$ V | $V_{CC} = 1.8$ V | $V_{CC} = 2.5$ V | UNIT |
|--|--------------------|------------------|------------------|------------------|------------------|------------------|------|
| | | TYP | TYP | TYP | TYP | TYP | |
| C_{pd} Power dissipation capacitance | $f = 10$ MHz | 14 | 15 | 15 | 16 | 19 | pF |

7 Parameter Measurement Information



- 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 MHz, $Z_o = 50 \Omega$, slew rate ≥ 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} .

Figure 1. Load Circuit and Voltage Waveforms

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 SN74AUC1G14.

Table 1. Function Table

| INPUT A | OUTPUT Y |
|------------|-------------|
| H | L |
| L | H |

9 Device and Documentation Support

9.1 Documentation Support

9.1.1 Related Documentation

For related documentation see the following:

- [Applications of Texas Instruments AUC Sub-1-V Little Logic Devices](#), SCEA027
- [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.
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9.5 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.

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.

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|-------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74AUC1G14DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | RoHS & Green | NIPDAU SN | Level-1-260C-UNLIM | -40 to 85 | (U14F, U14R) | Samples |
| SN74AUC1G14DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | U14F | Samples |
| SN74AUC1G14DCKR | ACTIVE | SC70 | DCK | 5 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | (UFF, UFR) | Samples |

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

ACTIVE: Product device recommended for new designs.

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

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

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

OBSOLETE: TI has discontinued the production of the device.

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

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

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

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

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

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

(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.

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OTHER QUALIFIED VERSIONS OF SN74AUC1G14 :

- Enhanced Product : [SN74AUC1G14-EP](#)

NOTE: Qualified Version Definitions:

- Enhanced Product - Supports Defense, Aerospace and Medical Applications

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|-------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AUC1G14DBVR | SOT-23 | DBV | 5 | 3000 | 178.0 | 9.0 | 3.23 | 3.17 | 1.37 | 4.0 | 8.0 | Q3 |
| SN74AUC1G14DBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 8.4 | 3.23 | 3.17 | 1.37 | 4.0 | 8.0 | Q3 |
| SN74AUC1G14DBVRG4 | SOT-23 | DBV | 5 | 3000 | 178.0 | 9.0 | 3.23 | 3.17 | 1.37 | 4.0 | 8.0 | Q3 |
| SN74AUC1G14DCKR | SC70 | DCK | 5 | 3000 | 180.0 | 8.4 | 2.47 | 2.3 | 1.25 | 4.0 | 8.0 | Q3 |
| SN74AUC1G14DCKR | SC70 | DCK | 5 | 3000 | 178.0 | 9.0 | 2.4 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AUC1G14DBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 180.0 | 18.0 |
| SN74AUC1G14DBVR | SOT-23 | DBV | 5 | 3000 | 202.0 | 201.0 | 28.0 |
| SN74AUC1G14DBVRG4 | SOT-23 | DBV | 5 | 3000 | 180.0 | 180.0 | 18.0 |
| SN74AUC1G14DCKR | SC70 | DCK | 5 | 3000 | 202.0 | 201.0 | 28.0 |
| SN74AUC1G14DCKR | SC70 | DCK | 5 | 3000 | 180.0 | 180.0 | 18.0 |

EXAMPLE BOARD LAYOUT

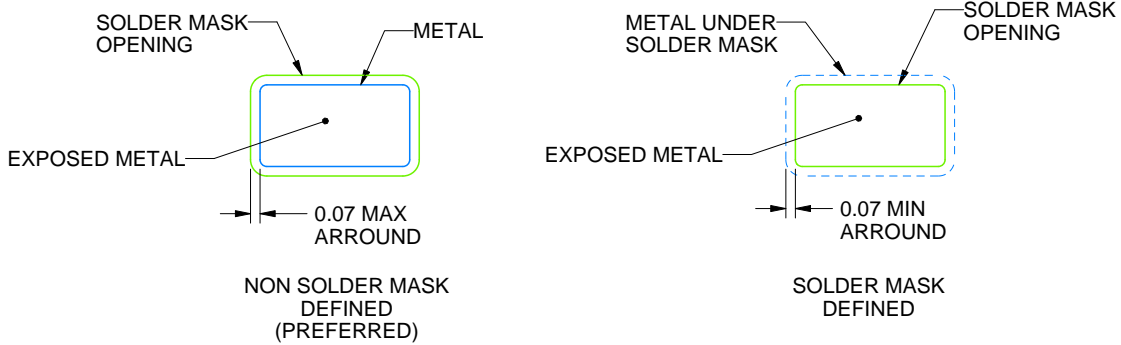
DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4214839/J 02/2024

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/J 02/2024

NOTES: (continued)

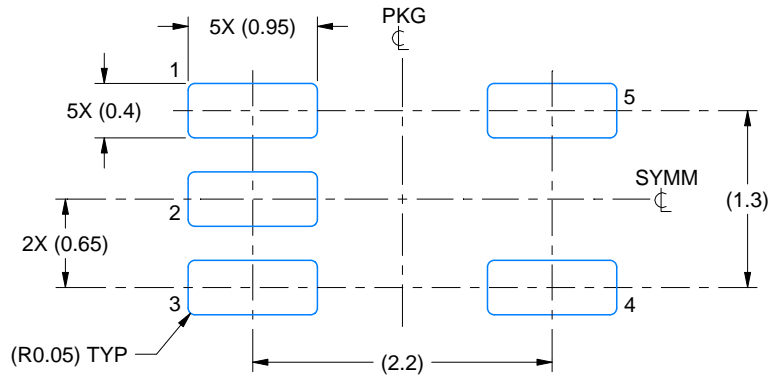
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

EXAMPLE BOARD LAYOUT

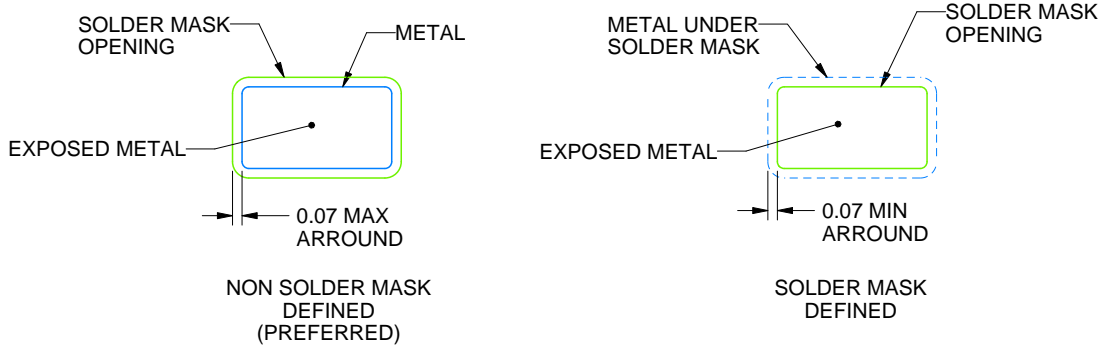
DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:18X



SOLDER MASK DETAILS

4214834/D 07/2023

NOTES: (continued)

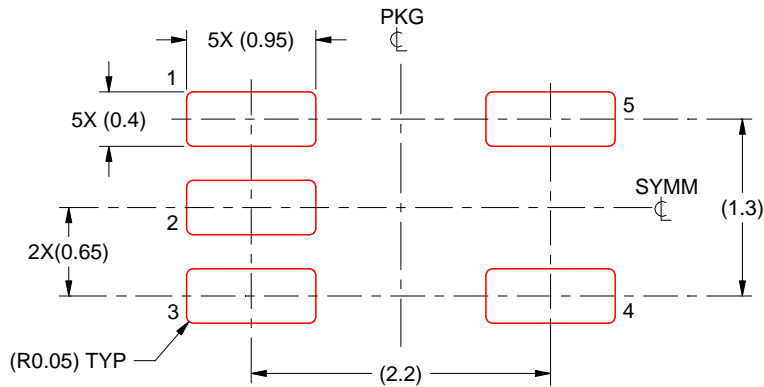
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DCK0005A

SOT - 1.1 max height

SMALL OUTLINE TRANSISTOR



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

4214834/D 07/2023

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.

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