

SN74AHCT1G126 Single Bus Buffer Gate With 3-State Output

1 Features

- Operating range of 4.5V to 5.5V
- Max t_{pd} of 6ns at 5V
- Low power consumption, 10 μ A max I_{CC}
- ± 8 mA output drive at 5V
- Inputs are TTL-voltage compatible
- Latch-up performance exceeds 250mA per JESD 17

2 Applications

- Motor Controls: AC Induction
- Graphics Cards
- Advanced Driver Assistance Systems (ADAS)
- Motor Drives & Controls
- DLP Front Projection Systems
- Server Motherboards

3 Description

The SN74AHCT1G126 device is a single bus buffer gate/line driver with 3-state output. The output is disabled when the output-enable (OE) input is low. When OE is high, true data is passed from the A input to the Y output.

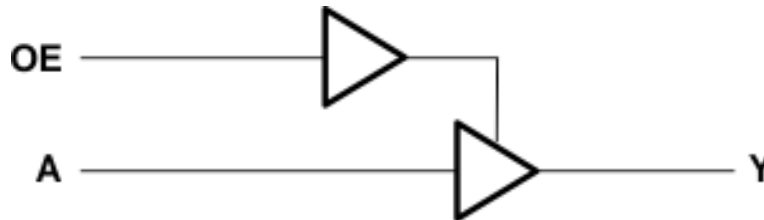
Package Information

PART NUMBER	PACKAGE ⁽¹⁾	PACKAGE SIZE ⁽²⁾	BODY SIZE ⁽³⁾
SN74AHCT1G126	DBV (SOT-23, 5)	2.9mm x 2.8mm	2.9mm x 1.6mm
	DCK (SC-70, 5)	2mm x 2.1mm	2mm x 1.25mm

(1) For more information, see [Section 11](#).

(2) The package size (length \times width) is a nominal value and includes pins, where applicable.

(3) The body size (length \times width) is a nominal value and does not include pins.



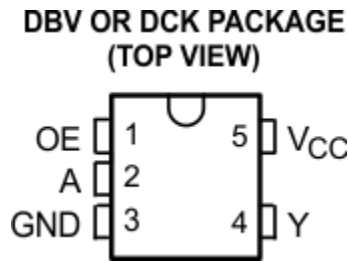
Simplified Schematic



Table of Contents

1 Features	1	7.3 Feature Description.....	8
2 Applications	1	7.4 Device Functional Modes.....	8
3 Description	1	8 Application and Implementation	9
4 Pin Configuration and Functions	3	8.1 Application Information.....	9
5 Specifications	4	8.2 Typical Application.....	9
5.1 Absolute Maximum Ratings.....	4	8.3 Power Supply Recommendations.....	10
5.2 ESD Ratings.....	4	8.4 Layout.....	10
5.3 Recommended Operating Conditions.....	4	9 Device and Documentation Support	12
5.4 Thermal Information.....	5	9.1 Documentation Support (Analog).....	12
5.5 Electrical Characteristics.....	5	9.2 Receiving Notification of Documentation Updates....	12
5.6 Switching Characteristics.....	5	9.3 Support Resources.....	12
5.7 Operating Characteristics.....	6	9.4 Trademarks.....	12
5.8 Typical Characteristics.....	6	9.5 Electrostatic Discharge Caution.....	12
6 Parameter Measurement Information	7	9.6 Glossary.....	12
7 Detailed Description	8	10 Revision History	12
7.1 Overview.....	8	11 Mechanical, Packaging, and Orderable Information	13
7.2 Functional Block Diagram.....	8		

4 Pin Configuration and Functions



PIN		TYPE	DESCRIPTION
NO.	NAME		
1	OE	I	Output Enable
2	A	I	Input A
3	GND	—	Ground Pin
4	Y	O	Output Y
5	V _{CC}	—	Power Pin

5 Specifications

5.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V _{CC}	Supply voltage	-0.5	7	V
V _I ⁽²⁾	Input voltage	-0.5	7	V
V _O ⁽²⁾	Output voltage	-0.5	V _{CC} + 0.5	V
I _{IK}	Input clamp current	(V _I < 0)	-20	mA
I _{OK}	Output clamp current	(V _O < 0 or V _O > V _{CC})	±20	mA
I _O	Continuous output current	(V _O = 0 to V _{CC})	±25	mA
	Continuous channel current through V _{CC} or GND		±50	mA
T _{stg}	Storage temperature range	-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 [Section 5.3](#) is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

5.2 ESD Ratings

		VALUE	UNIT
V _(ESD)	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins ⁽¹⁾	±2000
		Charged device model (CDM), per JEDEC specification JESD22-C101, all pins ⁽²⁾	±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)⁽¹⁾

		MIN	MAX	UNIT
V _{CC}	Supply voltage	4.5	5.5	V
V _{IH}	High-level input voltage	2		V
V _{IL}	Low-level input voltage		0.8	V
V _I	Input voltage	0	5.5	V
V _O	Output voltage	0	V _{CC}	V
I _{OH}	High-level output current		-8	mA
I _{OL}	Low-level output current		8	mA
Δt/Δv	Input transition rise or fall rate		20	ns/V
T _A	Operating free-air temperature	-40	125	°C

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

5.4 Thermal Information

THERMAL METRIC ⁽¹⁾		SN74AHCT1G126		UNIT
		DBV	DCK	
		5 PINS		
R _{θJA}	Junction-to-ambient thermal resistance	278	289.2	°C/W
R _{θJC(top)}	Junction-to-case (top) thermal resistance	180.5	205.8	
R _{θJB}	Junction-to-board thermal resistance	184.4	176.2	
ψ _{JT}	Junction-to-top characterization parameter	115.4	117.6	
ψ _{JB}	Junction-to-board characterization parameter	183.4	175.1	
R _{θJC(bot)}	Junction-to-case (bot) thermal resistance	N/A	N/A	

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

5.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V _{CC}	T _A = 25°C			–40°C to 85°C		–40°C to 125°C		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V _{OH}	I _{OH} = –50 μA	4.5 V	4.4	4.5		4.4		4.4	V	
	I _{OH} = –8 mA		3.94			3.8		3.8		
V _{OL}	I _{OL} = 50 μA	4.5 V			0.1		0.1	0.1	V	
	I _{OL} = 8 mA				0.36		0.44	0.44		
I _I	V _I = 5.5 V or GND	0 V to 5.5 V			±0.1		±1	±1	μA	
I _{OZ}	V _O = V _{CC} or GND	5.5 V			±0.25		±2.5	±2.5	μA	
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			1		10	10	μA	
ΔI _{CC} ⁽¹⁾	One input at 3.4 V, Other input at V _{CC} or GND	5.5 V			1.35		1.5	1.5	mA	
C _i	V _I = V _{CC} or GND	5 V		4	10		10		pF	
C _o	V _O = V _{CC} or GND	5 V		10					pF	

(1) This is the increase in supply current for each input at one of the specified TTL voltage levels, rather than 0 V or V_{CC}.

5.6 Switching Characteristics

over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T _A = 25°C			–40°C to 85°C		–40°C to 125°C		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t _{PLH}	A	Y	C _L = 15 pF	3.8	5.5		1	6.5	1	7	ns
t _{PHL}				3.8	5.5		1	6.5	1	7	
t _{PZH}	OE	Y	C _L = 15 pF	3.6	5.1		1	6	1	6.5	ns
t _{PZL}				3.6	5.1		1	6	1	6.5	
t _{PHZ}	OE	Y	C _L = 15 pF	4.6	6.8		1	8	1	8.5	ns
t _{PLZ}				4.6	6.8		1	8	1	8.5	
t _{PLH}	A	Y	C _L = 50 pF	5.3	7.5		1	8.5	1	9.5	ns
t _{PHL}				5.3	7.5		1	8.5	1	9.5	
t _{PZH}	OE	Y	C _L = 50 pF	5.1	7.1		1	8	1	9	ns
t _{PZL}				5.1	7.1		1	8	1	9	
t _{PHZ}	OE	Y	C _L = 50 pF	6.1	8.8		1	10	1	11	ns
t _{PLZ}				6.1	8.8		1	10	1	11	

5.7 Operating Characteristics

$V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

PARAMETER		TEST CONDITIONS	TYP	UNIT
C_{pd}	Power dissipation capacitance	No load, $f = 1\text{ MHz}$	14	pF

5.8 Typical Characteristics

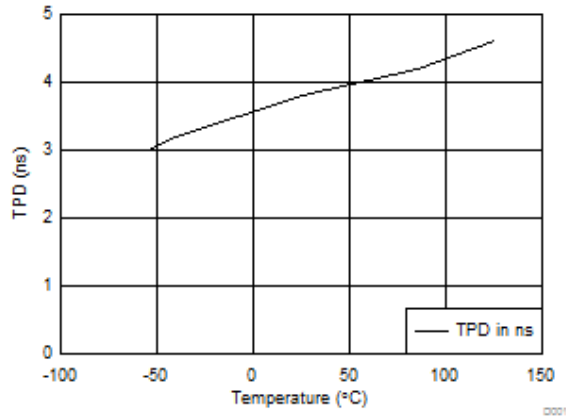
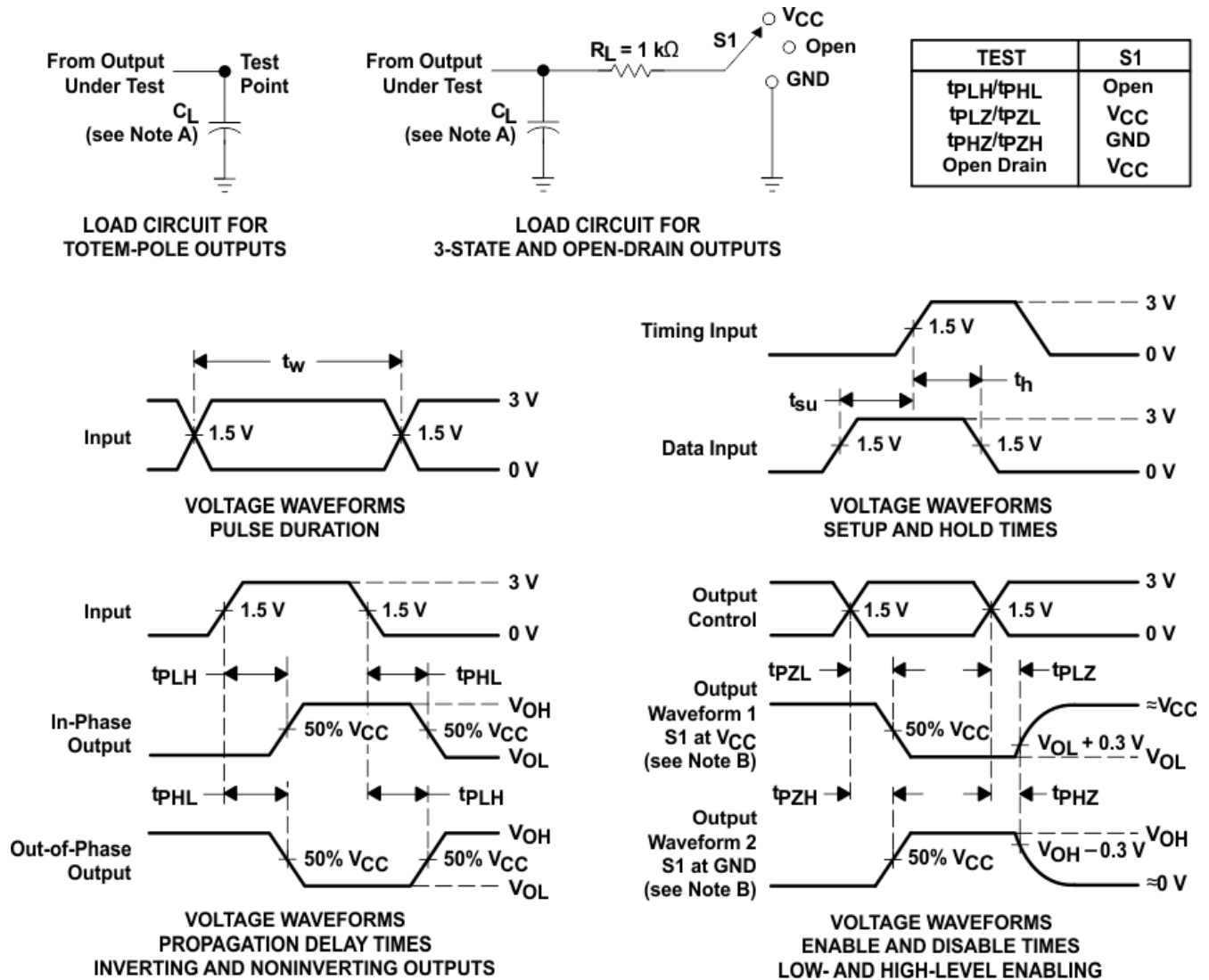


Figure 5-1. TPD vs Temperature

6 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 $\leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
 D. The outputs are measured one at a time with one input transition per measurement.
 E. All parameters and waveforms are not applicable to all devices.

Figure 6-1. Load Circuit and Voltage Waveforms

7 Detailed Description

7.1 Overview

The SN74AHCT1G126 device is a single bus buffer gate/line driver with 3-state output. The output is disabled when the output-enable (OE) input is low. When OE is high, true data is passed from the A input to the Y output.

To ensure the high-impedance state during power up or power down, OE should be tied to GND through a pulldown resistor; the minimum value of the resistor is determined by the current-sourcing capability of the driver.

7.2 Functional Block Diagram

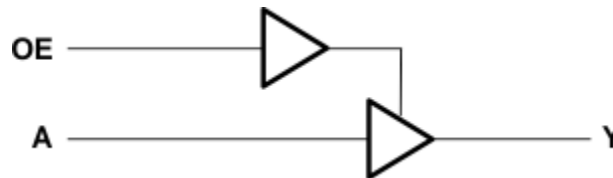


Figure 7-1. Logic Diagram (Positive Logic)

7.3 Feature Description

- TTL Inputs
 - Lowered switching threshold allows up translation 3.3 V to 5 V
- Slow edges reduce output ringing

7.4 Device Functional Modes

Table 7-1. Function Table

INPUTS		OUTPUT
OE	A	Y
H	H	H
H	L	L
L	X	Z

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

SN74AHCT1G126 is a low-drive CMOS device that can be used for a multitude of bus interface type applications where output ringing is a concern. The low drive and slow edge rates will minimize overshoot and undershoot on the outputs. The input switching levels have been lowered to accommodate TTL inputs of 0.8-V V_{IL} and 2-V V_{IH} . This feature makes it ideal for translating up from 3.3 V to 5 V. Figure 8-2 shows this type of translation.

8.2 Typical Application

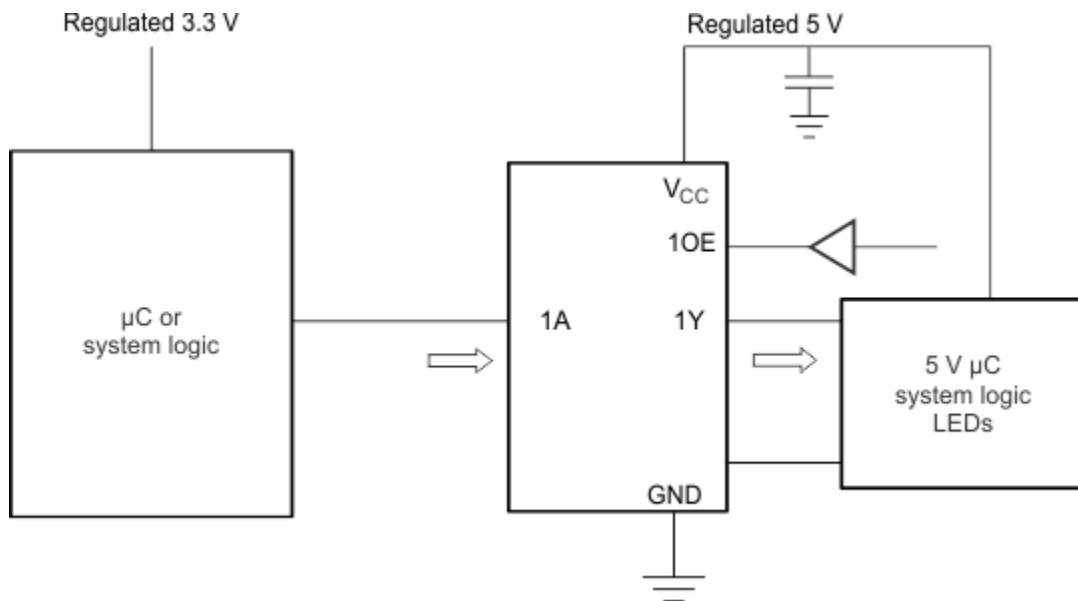


Figure 8-1. Typical Application Schematic

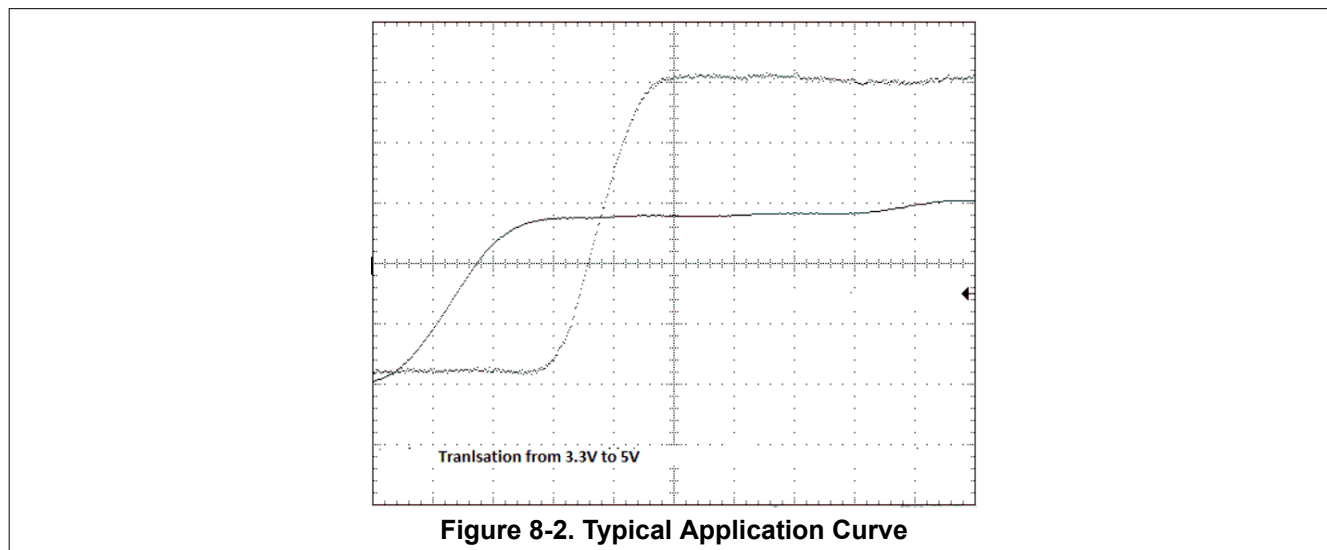
8.2.1 Design Requirements

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

8.2.2 Detailed Design Procedure

1. Recommended Input Conditions
 - For rise time and fall time specifications, see $\Delta t/\Delta V$ in the [Section 5.3](#) table.
 - For specified High and low levels, see V_{IH} and V_{IL} in the [Section 5.3](#) table.
2. Recommend Output Conditions
 - Load currents should not exceed 25 mA per output and 50 mA total for the part.
 - Outputs should not be pulled above V_{CC} .

8.2.3 Application Curves



8.3 Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply voltage rating located in the [Section 5.3](#) table.

Each V_{CC} pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, 0.1 μF is recommended. If there are multiple V_{CC} pins, 0.01 μF or 0.022 μF is recommended for each power pin. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. A 0.1 μF and 1 μF are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

8.4 Layout

8.4.1 Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when 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 8-3](#) are 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 makes more sense or is more convenient. It is acceptable 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.

8.4.1.1 Layout Example

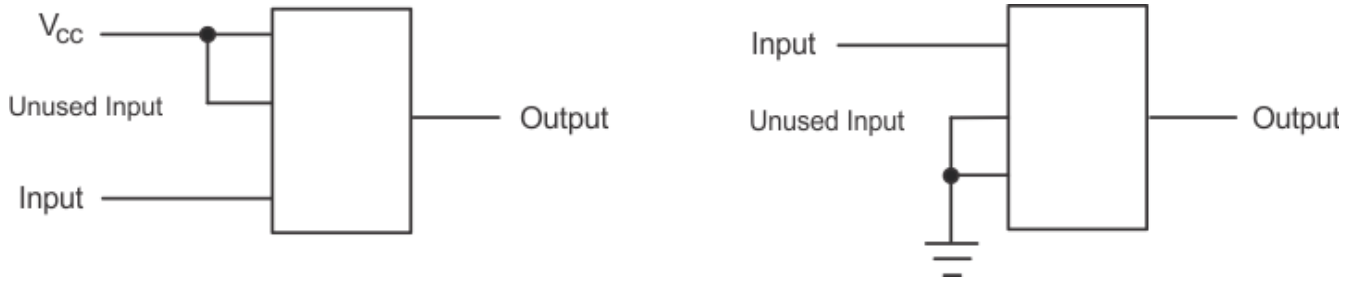


Figure 8-3. Layout Diagram

9 Device and Documentation Support

9.1 Documentation Support (Analog)

9.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, [CMOS Power Consumption and Cpd Calculation application note](#)
- Texas Instruments, [Designing With Logic application note](#)
- Texas Instruments, [Thermal Characteristics of Standard Linear and Logic \(SLL\) Packages and Devices application note](#)
- Texas Instruments, [Implications of Slow or Floating CMOS Inputs application note](#)

9.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [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.

9.3 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.

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9.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

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

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

10 Revision History

Changes from Revision K (October 2023) to Revision L (March 2024)	Page
• Added body size to <i>Package Information</i> table.....	1
• Updated thermal values for DBV package from R θ JA = 231.3 to 278, R θ JC(top) = 119.9 to 180.5, R θ JB = 60.6 to 184.4, Ψ JT = 17.8 to 115.4, Ψ JB = 60.1 to 183.4, R θ JC(bot) = N/A, all values in °C/W	5

Changes from Revision J (December 2014) to Revision K (October 2023)	Page
• Updated thermal values for DCK package from R θ JA = 287.6 to 289.2, R θ JC(top) = 97.7 to 205.8, R θ JB = 65 to 176.2, Ψ JT = 2 to 117.6, Ψ JB = 64.2 to 175.1, R θ JC(bot) = N/A, all values in °C/W	5

11 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
74AHCT1G126DBVRE4	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	B26G	Samples
74AHCT1G126DBVRG4	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	B26G	Samples
74AHCT1G126DCKRG4	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	BN3	Samples
74AHCT1G126DCKTG4	ACTIVE	SC70	DCK	5	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	BN3	Samples
SN74AHCT1G126DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	(B263, B26G, B26J, B26S)	Samples
SN74AHCT1G126DCKR	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	(1QT, BN3, BNG, BN J, BNL, BNS, B NU, BNY)	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.

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.

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OTHER QUALIFIED VERSIONS OF SN74AHCT1G126 :

- Automotive : [SN74AHCT1G126-Q1](#)

NOTE: Qualified Version Definitions:

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

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

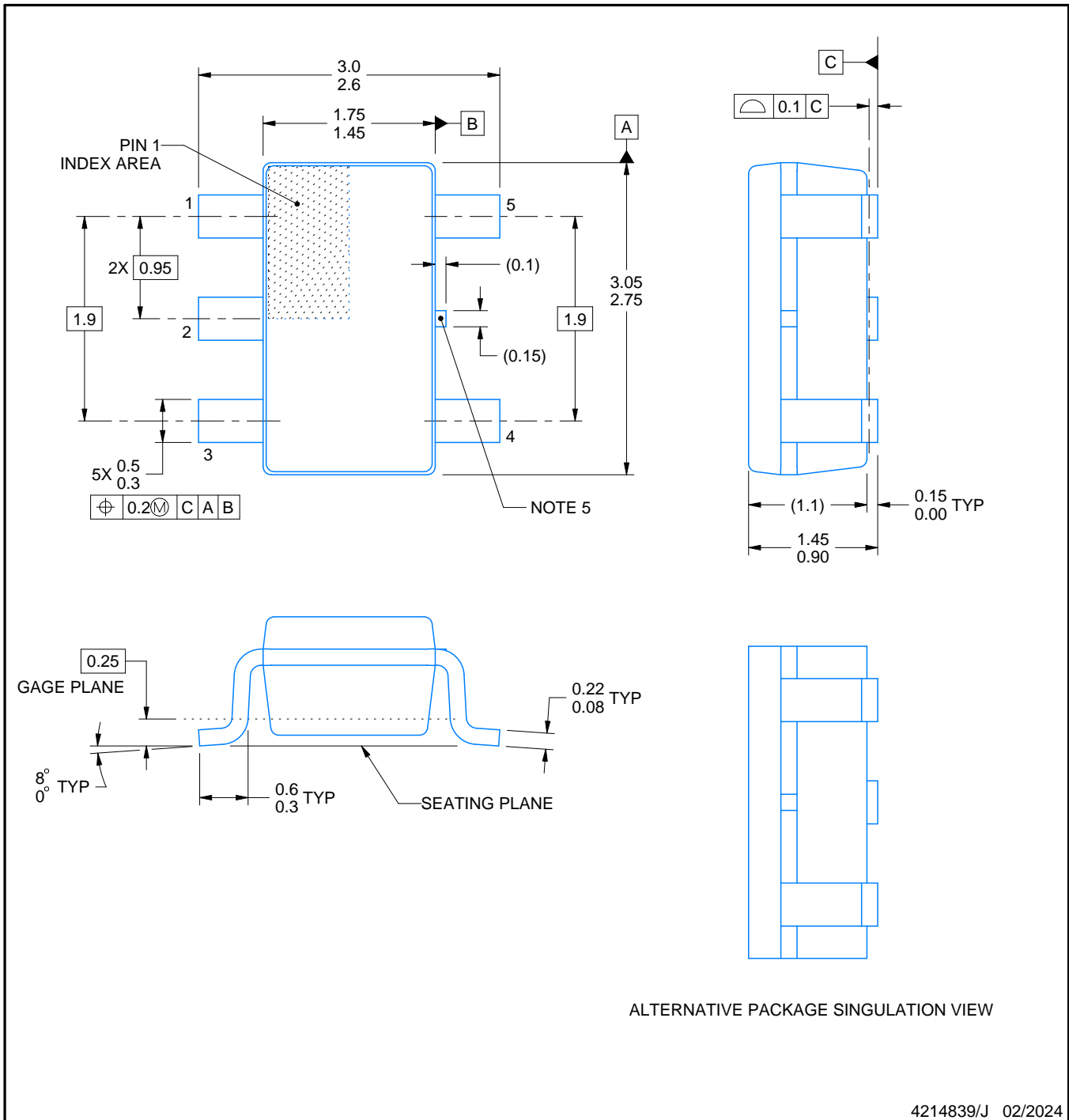
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
74AHCT1G126DBVRG4	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
74AHCT1G126DCKRG4	SC70	DCK	5	3000	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
74AHCT1G126DCKTG4	SC70	DCK	5	250	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74AHCT1G126DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
SN74AHCT1G126DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
SN74AHCT1G126DCKR	SC70	DCK	5	3000	178.0	9.2	2.4	2.4	1.22	4.0	8.0	Q3
SN74AHCT1G126DCKR	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)
74AHCT1G126DBVRG4	SOT-23	DBV	5	3000	180.0	180.0	18.0
74AHCT1G126DCKRG4	SC70	DCK	5	3000	180.0	180.0	18.0
74AHCT1G126DCKTG4	SC70	DCK	5	250	180.0	180.0	18.0
SN74AHCT1G126DBVR	SOT-23	DBV	5	3000	202.0	201.0	28.0
SN74AHCT1G126DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
SN74AHCT1G126DCKR	SC70	DCK	5	3000	180.0	180.0	18.0
SN74AHCT1G126DCKR	SC70	DCK	5	3000	180.0	180.0	18.0



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

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

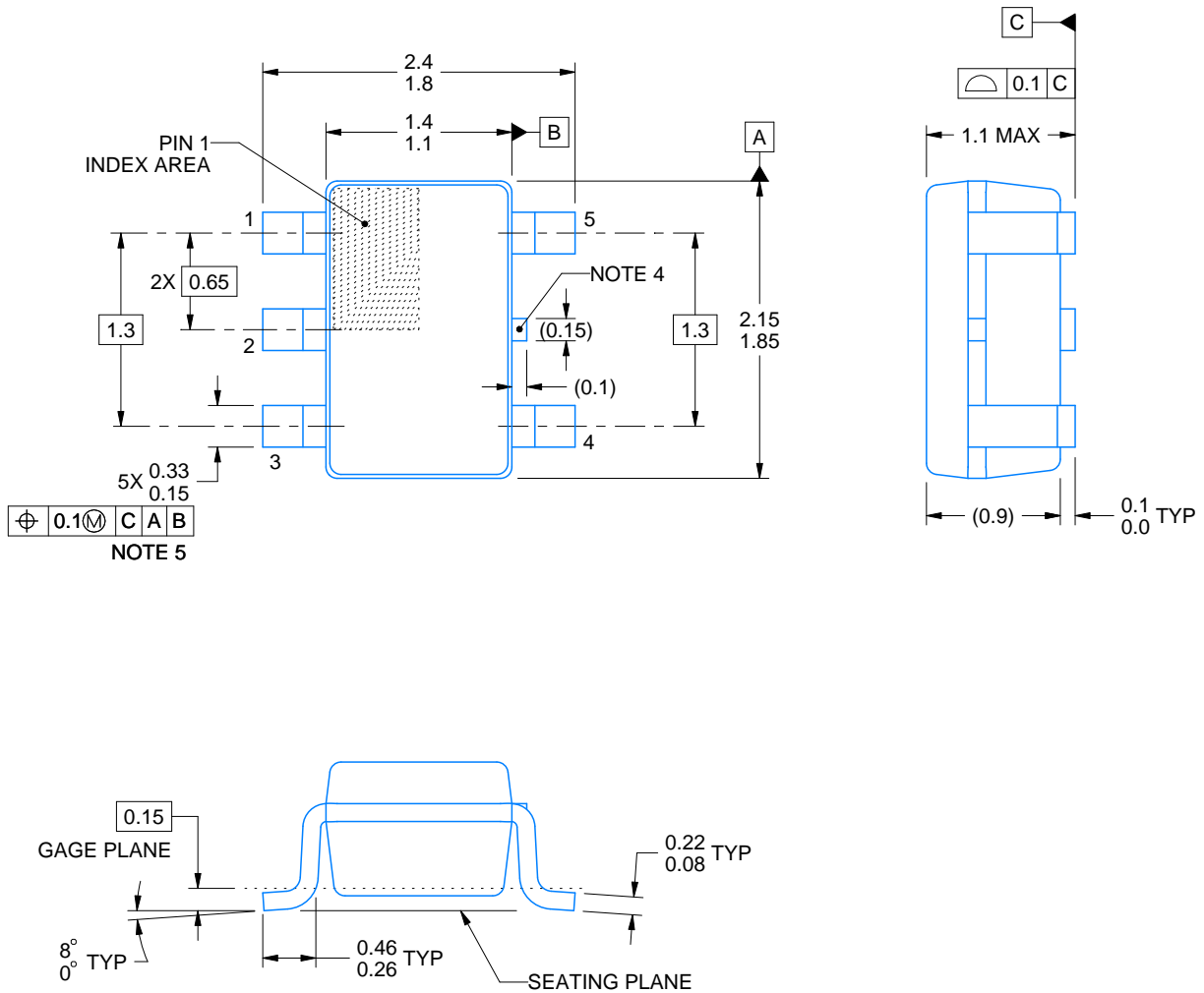


SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

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.



4214834/D 07/2023

NOTES:

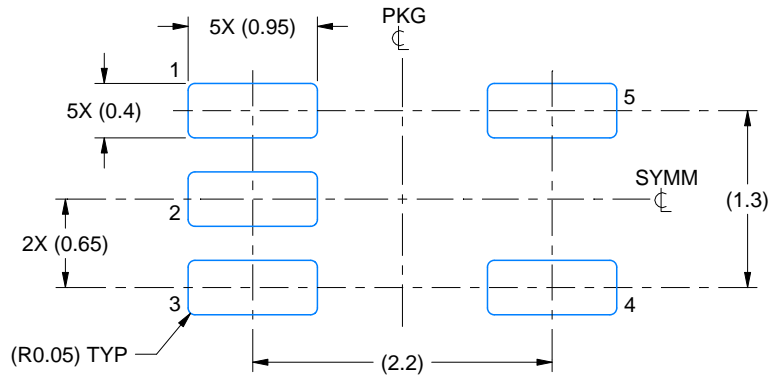
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-203.
4. Support pin may differ or may not be present.
5. Lead width does not comply with JEDEC.

EXAMPLE BOARD LAYOUT

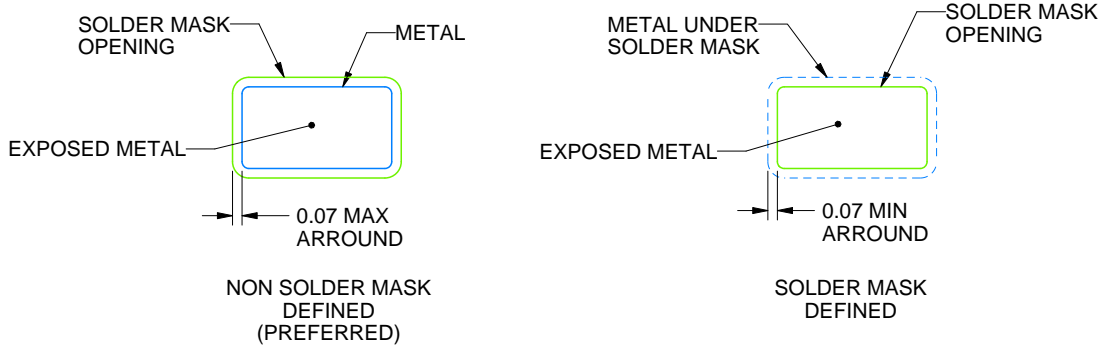
DCK0005A

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)

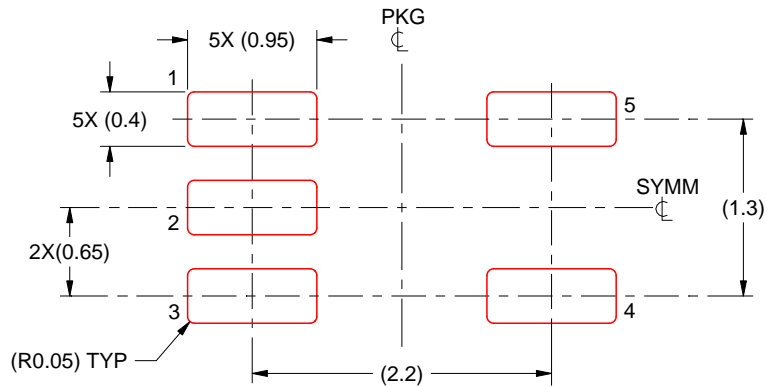
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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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