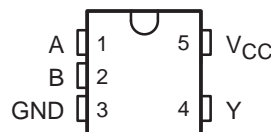


SN74AHC1G08-Q1 SINGLE 2-INPUT POSITIVE-AND GATE

SCLS592C – OCTOBER 2004 – REVISED APRIL 2008

- Qualified for Automotive Applications
- Operating Range of 2 V to 5.5 V
- Max t_{pd} of 9 ns at 5 V
- Low Power Consumption, 20- μ A Max I_{CC}
- \pm 8-mA Output Drive at 5 V
- Schmitt Trigger Action at All Inputs Makes the Circuit Tolerant for Slower Input Rise and Fall Time
- ESD Protection Level Per AEC-Q100 Classification
 - 2000-V (H2) Human-Body Model
 - 200-V (M3) Machine Model
 - 1000-V (C5) Charged-Device Model

DBV OR DCK PACKAGE
(TOP VIEW)



description/ordering information

The SN74AHC1G08 is a single 2-input positive-AND gate. The device performs the Boolean function $Y = A \cdot B$ or $Y = \overline{\overline{A} + \overline{B}}$ in positive logic.

ORDERING INFORMATION†

T_A	PACKAGE‡		ORDERABLE PART NUMBER	TOP-SIDE MARKINGS§
–40°C to 85°C	SOT (SOT-23) – DBV	Reel of 3000	SN74AHC1G08IDBVRQ1	A08_
	SOT (SC-70) – DCK	Reel of 3000	SN74AHC1G08IDCKRQ1	AE_
–40°C to 125°C	SOT (SOT-23) – DBV	Reel of 3000	SN74AHC1G08QDBVRQ1	A08_
	SOT (SC-70) – DCK	Reel of 3000	SN74AHC1G08QDCKRQ1	AE_

† For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at <http://www.ti.com>.

‡ Package drawings, thermal data, and symbolization are available at <http://www.ti.com/packaging>.

§ The actual top-side marking has one additional character that designates the wafer fab/assembly site.

FUNCTION TABLE

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



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

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SN74AHC1G08-Q1

SINGLE 2-INPUT POSITIVE-AND GATE

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logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V_{CC}	-0.5 V to 7 V
Input voltage range, V_I (see Note 1)	-0.5 V to 7 V
Output voltage range, V_O (see Note 1)	-0.5 V to $V_{CC} + 0.5$ V
Input clamp current, I_{IK} ($V_I < 0$)	-20 mA
Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$)	± 20 mA
Continuous output current, I_O ($V_O = 0$ to V_{CC})	± 25 mA
Continuous current through V_{CC} or GND	± 50 mA
Package thermal impedance, θ_{JA} (see Note 2): DBV package	206°C/W
DCK package	252°C/W
Storage temperature range, T_{stg}	-65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

		MIN	MAX	MIN	MAX	UNIT
V_{CC}	Supply voltage	2	5.5	2	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 2$ V	1.5	1.5		V
		$V_{CC} = 3$ V	2.1	2.1		
		$V_{CC} = 5.5$ V	3.85	3.85		
V_{IL}	Low-level input voltage	$V_{CC} = 2$ V		0.5	0.5	V
		$V_{CC} = 3$ V		0.9	0.9	
		$V_{CC} = 5.5$ V		1.65	1.65	
V_I	Input voltage	0	5.5	0	5.5	V
V_O	Output voltage	0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current	$V_{CC} = 2$ V		-50	-50	μ A
		$V_{CC} = 3.3$ V ± 0.3 V		-4	-4	mA
		$V_{CC} = 5$ V ± 0.5 V		-8	-8	
I_{OL}	Low-level output current	$V_{CC} = 2$ V		50	50	μ A
		$V_{CC} = 3.3$ V ± 0.3 V		4	4	mA
		$V_{CC} = 5$ V ± 0.5 V		8	8	
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 3.3$ V ± 0.3 V		100	100	ns/V
		$V_{CC} = 5$ V ± 0.5 V		20	20	
T_A	Operating free-air temperature	I Suffix	-40	85		°C
		Q Suffix			-40	

NOTE 3: 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*, literature number SCBA004.



SN74AHC1G08-Q1

SINGLE 2-INPUT POSITIVE-AND GATE

SCLS592C – OCTOBER 2004 – REVISED APRIL 2008

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	2 V	1.9	2		1.9		1.9	V	
		3 V	2.9	3		2.9		2.9		
		4.5 V	4.4	4.5		4.4		4.4		
	I _{OH} = –4 mA	3 V	2.58			2.48		2.4		
	I _{OH} = –8 mA	4.5 V	3.94			3.8		3.7		
V _{OL}	I _{OL} = 50 μA	2 V			0.1		0.1	0.1	V	
		3 V			0.1		0.1	0.1		
		4.5 V			0.1		0.1	0.1		
	I _{OL} = 4 mA	3 V			0.36		0.44	0.52		
	I _{OL} = 8 mA	4.5 V			0.36		0.44	0.52		
I _I	V _I = 5.5 V or GND	0 V to 5.5 V			±0.1		±1	±1	μA	
I _{CC}	V _I = V _{CC} or GND, I _O = 0	5.5 V			1		10	20	μA	
C _i	V _I = V _{CC} or GND	5 V		4	10		10	10	pF	

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	OUTPUT 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 or B	Y	C _L = 15 pF		6.2	8.8	1	10.5		12.5	ns
t _{PHL}					6.2	8.8	1	10.5		12.5	
t _{PLH}	A or B	Y	C _L = 50 pF		8.7	12.3	1	14		16.5	ns
t _{PHL}					8.7	12.3	1	14		16.5	

switching characteristics over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	OUTPUT 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 or B	Y	C _L = 15 pF		4.3	5.9		7		9	ns
t _{PHL}					4.3	5.9		7		9	
t _{PLH}	A or B	Y	C _L = 50 pF		5.8	7.9		9		11	ns
t _{PHL}					5.8	7.9		9		11	

operating characteristics, V_{CC} = 5 V, T_A = 25°C

PARAMETER	TEST CONDITIONS	TYP	UNIT
C _{pd} Power dissipation capacitance	No load, f = 1 MHz	18	pF

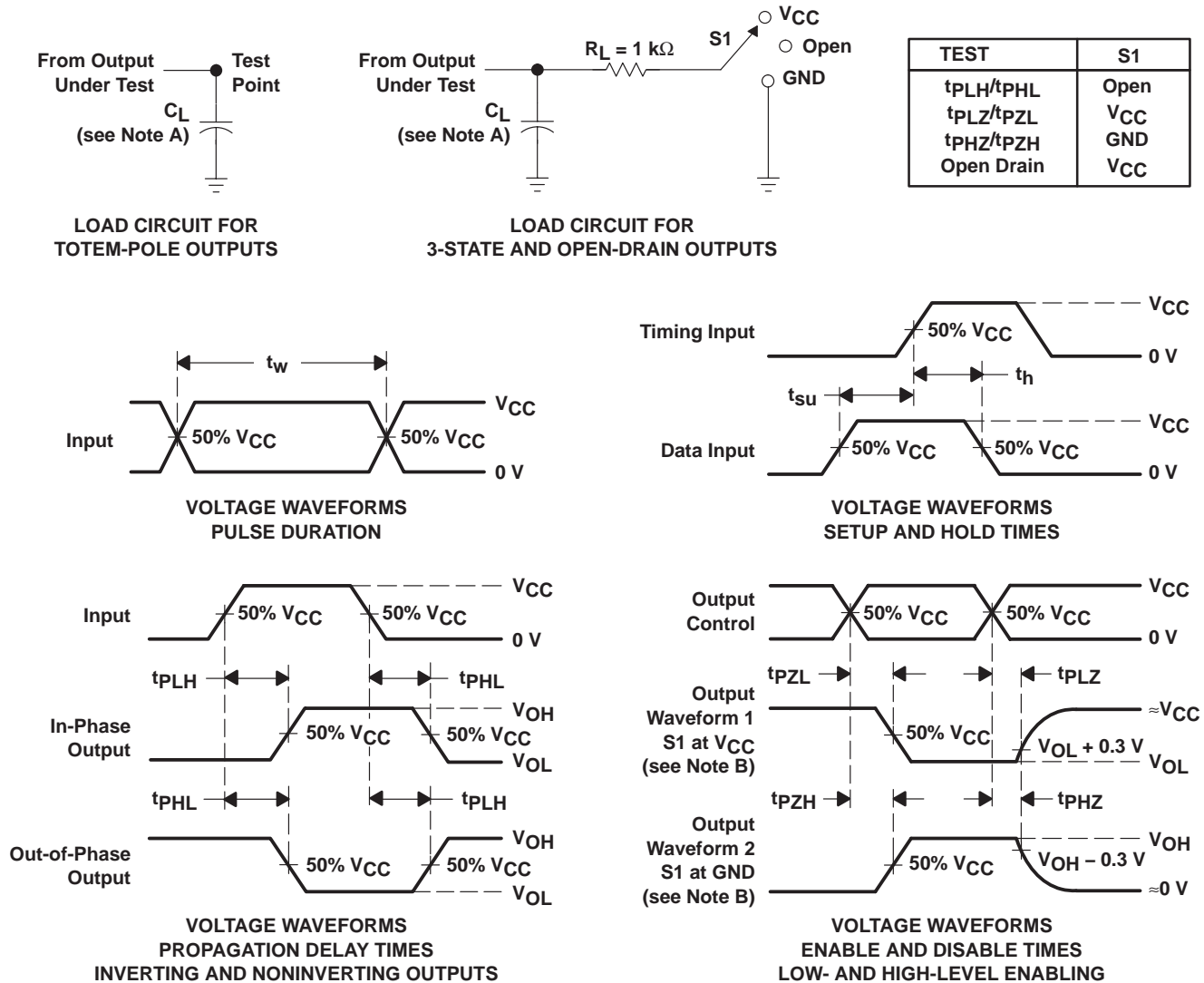


SN74AHC1G08-Q1

SINGLE 2-INPUT POSITIVE-AND GATE

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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 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
SN74AHC1G08QDBVRQ1	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	A08U	Samples
SN74AHC1G08QDCKRQ1	ACTIVE	SC70	DCK	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-40 to 125	AEU	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) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

(4) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side 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 Top-Side Marking for that device.

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OTHER QUALIFIED VERSIONS OF SN74AHC1G08-Q1 :

- Catalog: [SN74AHC1G08](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product

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
SN74AHC1G08QDBVRQ 1	SOT-23	DBV	5	3000	179.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
SN74AHC1G08QDCKRQ 1	SC70	DCK	5	3000	179.0	8.4	2.2	2.5	1.2	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

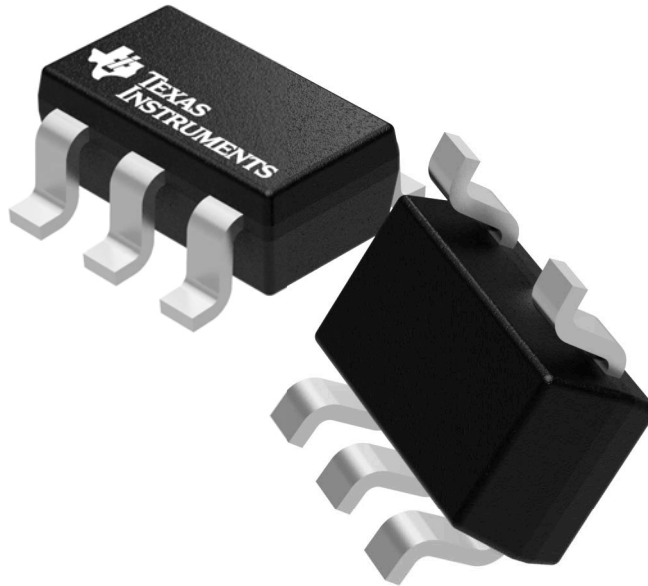
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AHC1G08QDBVRQ1	SOT-23	DBV	5	3000	203.0	203.0	35.0
SN74AHC1G08QDCKRQ1	SC70	DCK	5	3000	203.0	203.0	35.0

GENERIC PACKAGE VIEW

DBV 5

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



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

4073253/P

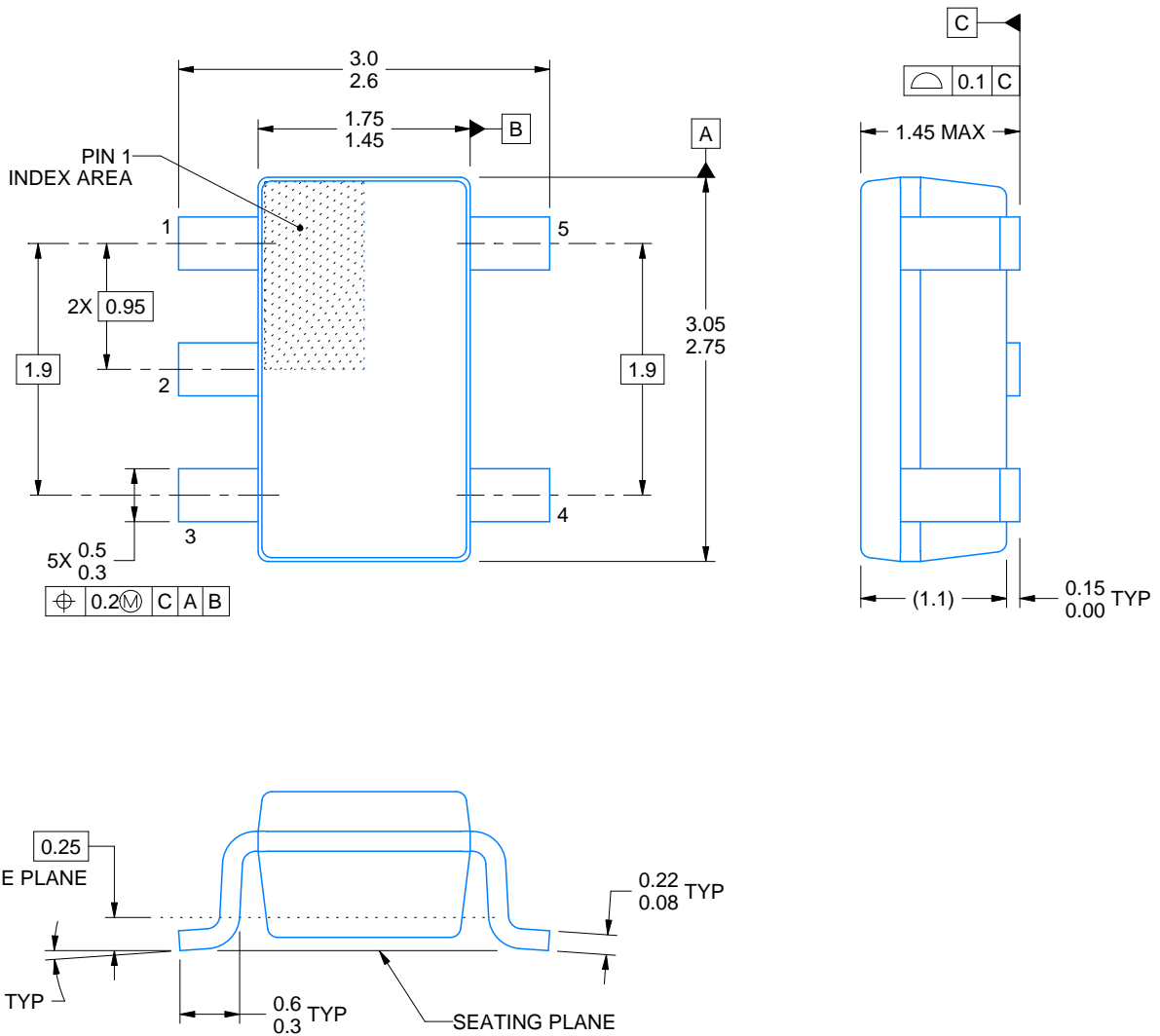
DBV0005A



PACKAGE OUTLINE

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



4214839/C 04/2017

NOTES:

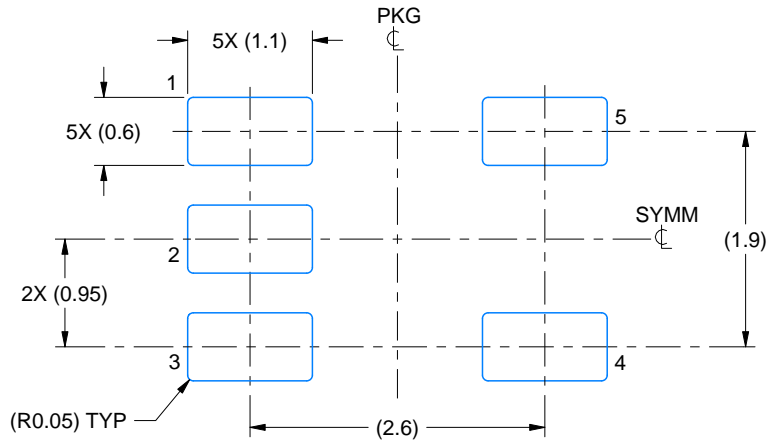
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-178.

EXAMPLE BOARD LAYOUT

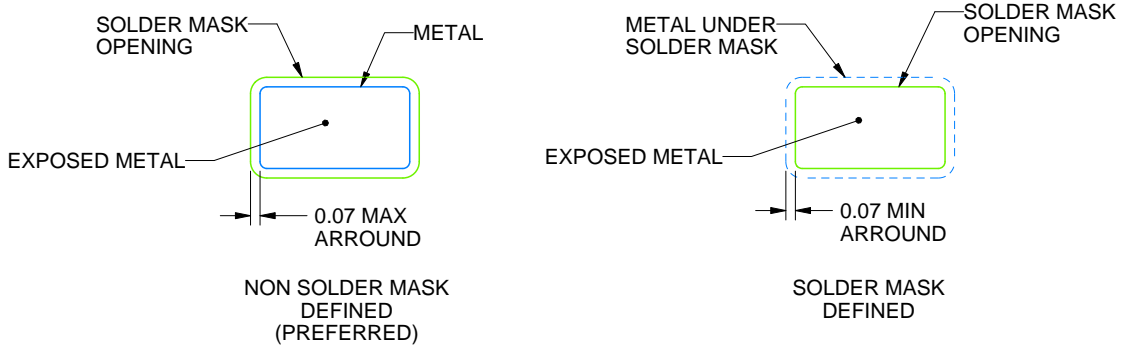
DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4214839/C 04/2017

NOTES: (continued)

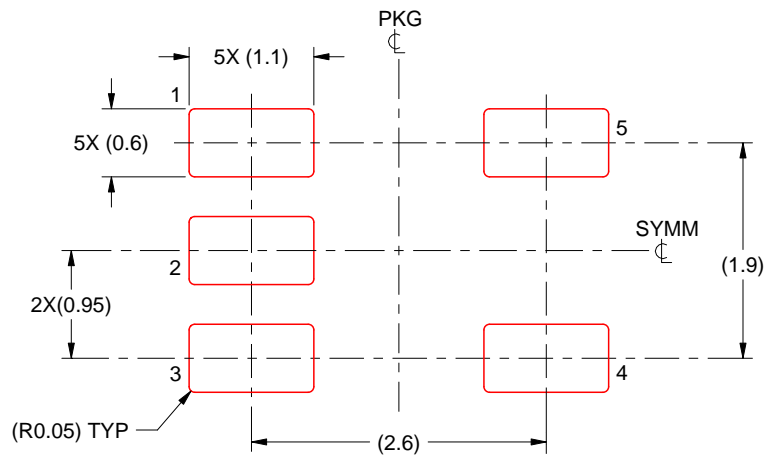
- 4. Publication IPC-7351 may have alternate designs.
- 5. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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/C 04/2017

NOTES: (continued)

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

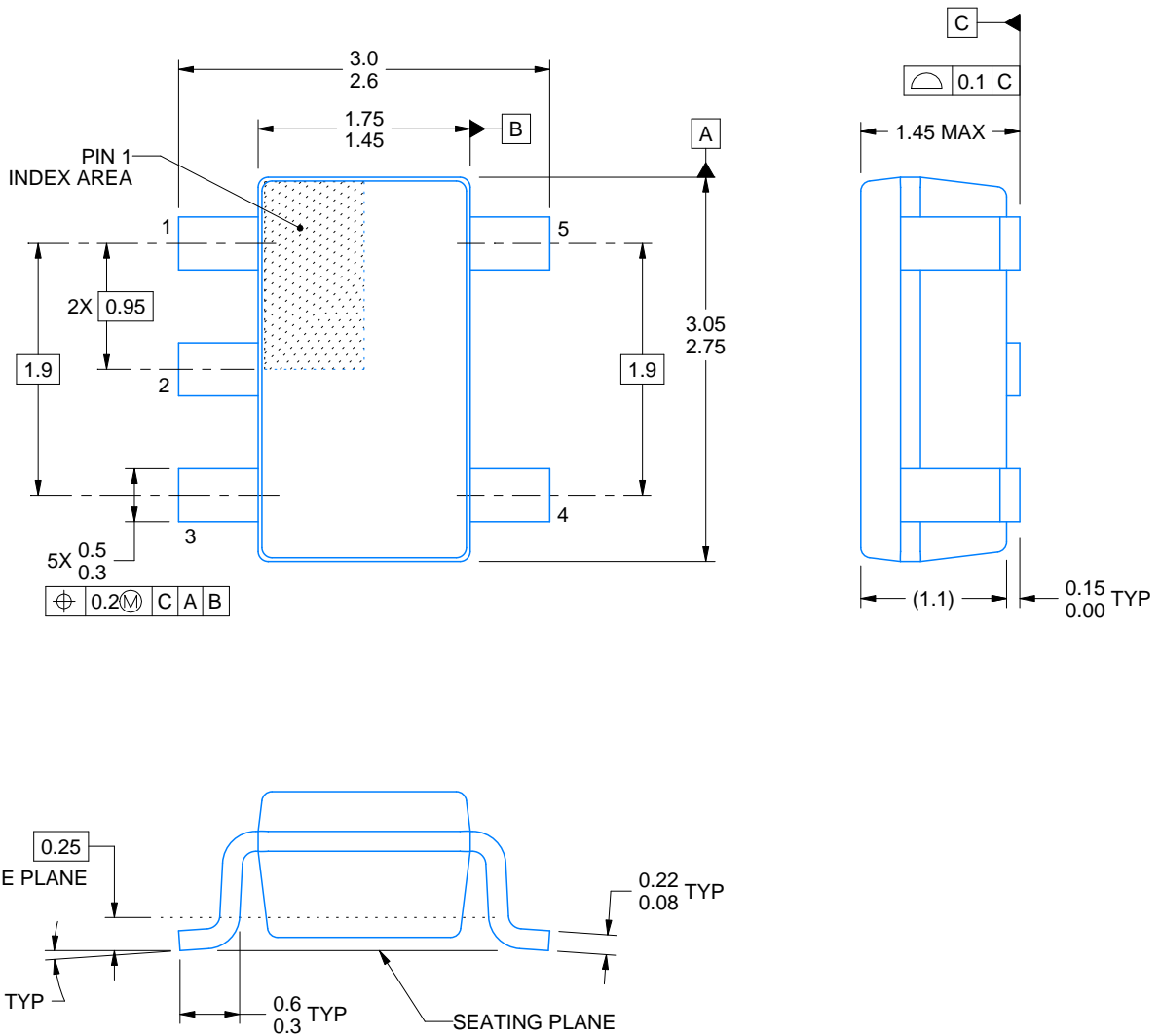
DBV0005A



PACKAGE OUTLINE

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



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NOTES:

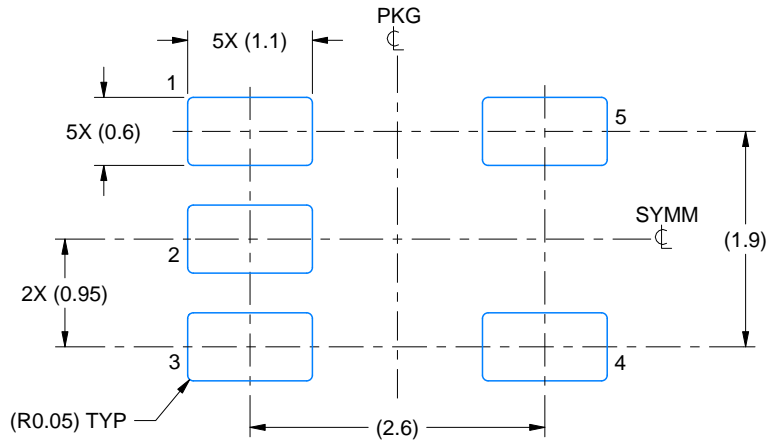
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-178.

EXAMPLE BOARD LAYOUT

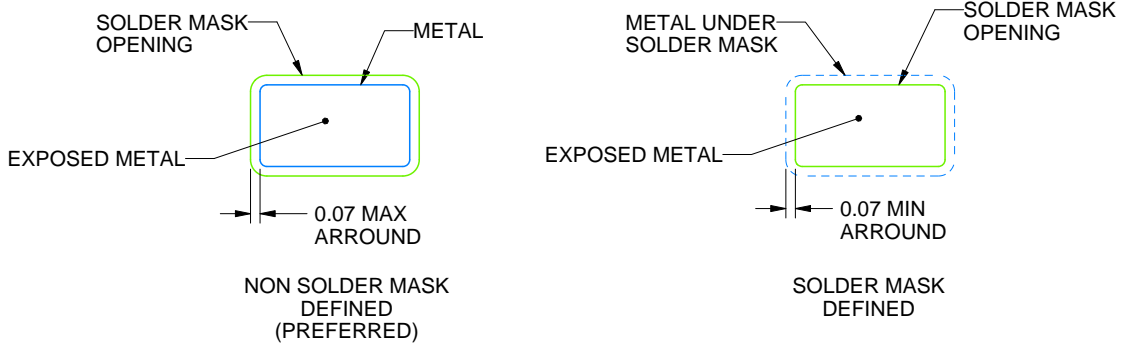
DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

4214839/C 04/2017

NOTES: (continued)

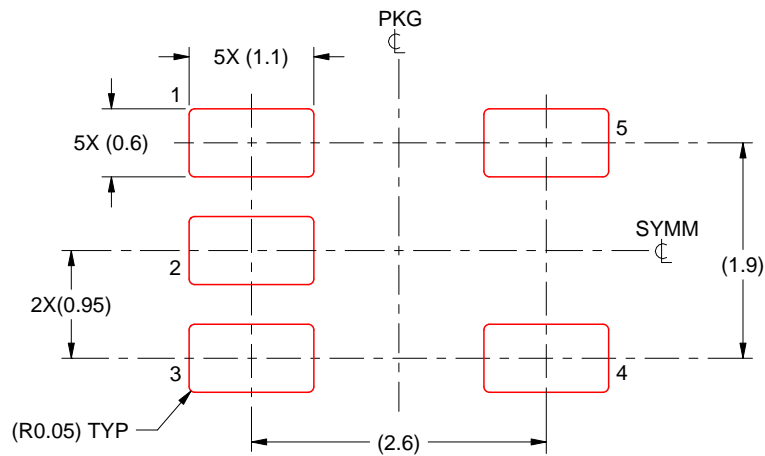
4. Publication IPC-7351 may have alternate designs.
5. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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

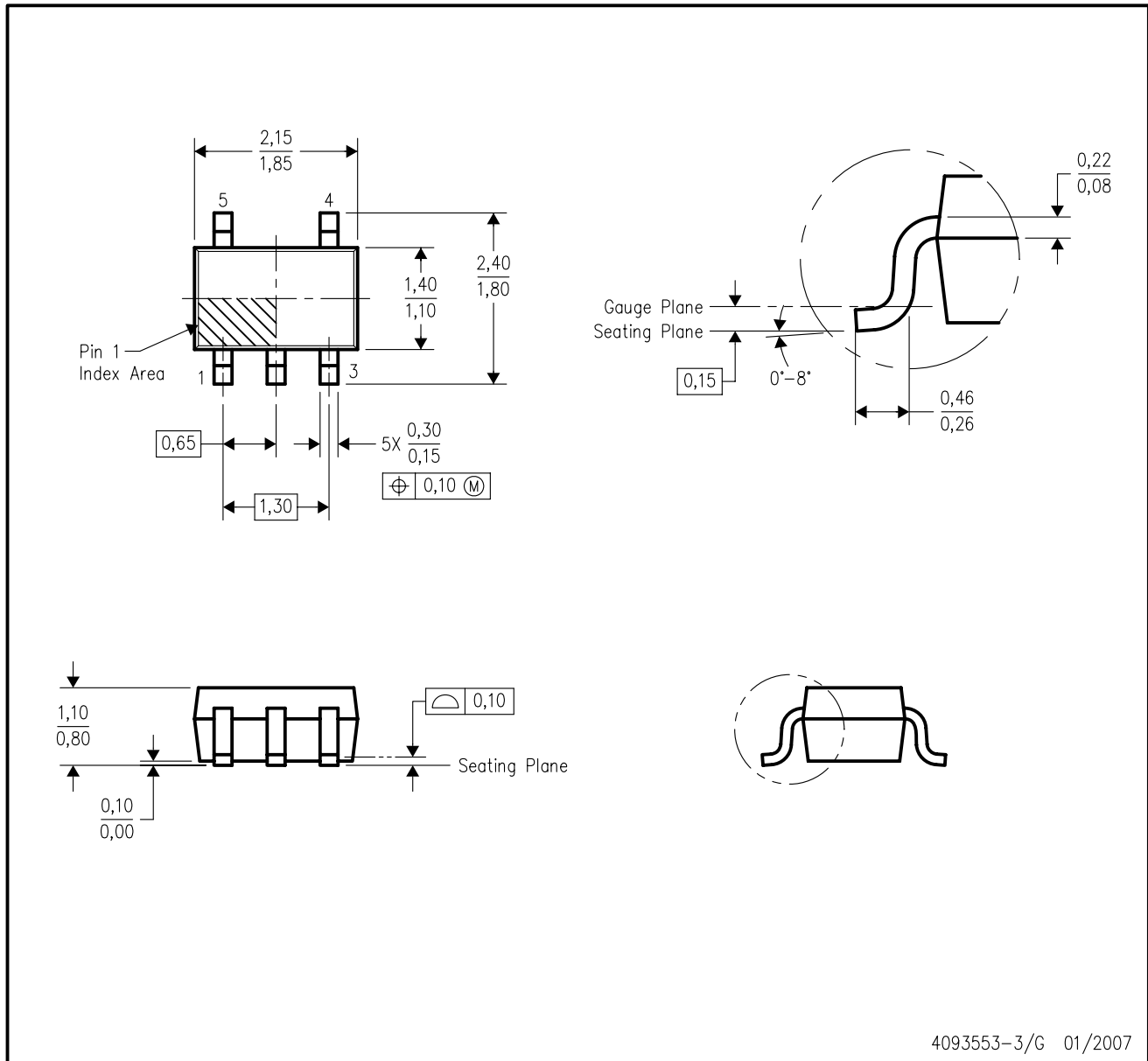
4214839/C 04/2017

NOTES: (continued)

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

DCK (R-PDSO-G5)

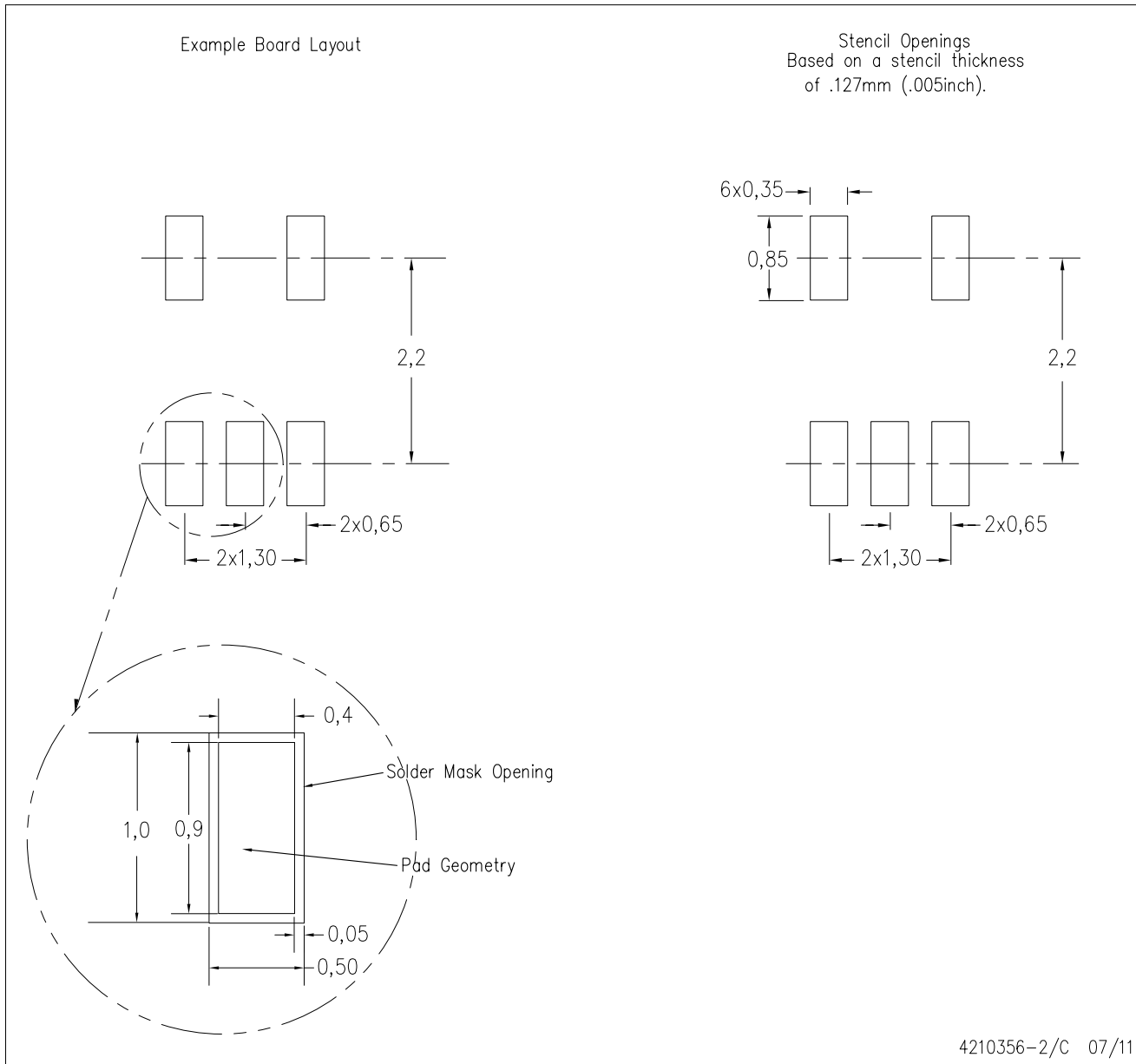
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Falls within JEDEC MO-203 variation AA.

DCK (R-PDSO-G5)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

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