









SN74AHCT1G86 ZHCSQW0P - MARCH 1996 - REVISED FEBRUARY 2024

SN74AHCT1G86 单路 2 输入异或门

1 特性

- 工作电压范围为 4.5V 至 5.5V
- 电压为 5V 时, t_{pd} 最大值为 8ns
- 低功耗, Icc 最大值为 10A
- 电压为 5V 时,输出驱动为 8mA
- 输入兼容 TTL 电压
- 闩锁性能超过 250mA, 符合 JESD 17 规范

2 应用

- 工业 PC
- 步进电机
- 交流逆变器驱动器
- 笔记本电脑
- 智能仪表: 数据集中器
- 企业级服务器

3 说明

SN74AHCT1G86 是一款单路 2 输入异或门。该器件 采用正逻辑执行布尔函数

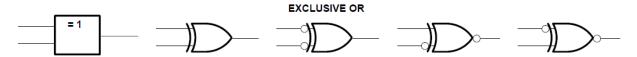
 $Y = A \oplus B \text{ or } Y = \overline{A}B + A \overline{B}_{\circ}$

封装信息

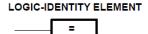
器件型号	封装 ⁽¹⁾	封装尺寸 ⁽²⁾	封装尺寸 ⁽³⁾
SN74AHCT1G86	DBV (SOT-23 , 5)	2.90mm × 2.8mm	2.9mm × 1.6mm
31174AHC11G00	DCK (SC-70 , 5)	2.00mm × 1.25mm	2.00mm × 1.25mm

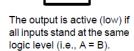
- 更多相关信息,请参阅第11节。
- 封装尺寸(长×宽)为标称值,并包括引脚(如适用)。 (2)
- 封装尺寸(长×宽)为标称值,不包括引脚。

An exclusive-OR gate has many applications, some of which can be represented better by alternative logic

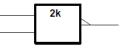


These five equivalent exclusive-OR symbols are valid for an SN74AHCT1G86 gate in positive logic; negation may be shown at any two ports.



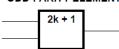


EVEN-PARITY ELEMENT



The output is active (low) if an even number of inputs (i.e., 0 or 2) are active.

ODD-PARITY ELEMENT



The output is active (high) if an odd number of inputs (i.e., only 1 of the 2) are active.

异或逻辑



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4 Pin Configuration and Functions

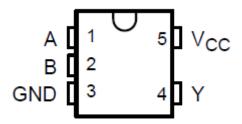


图 4-1. DBV or DCK Package 5-Pin SOT-23 Top View

	PIN	TYPE ⁽¹⁾	DESCRIPTION					
NO.	NAME	ITPE\"	DESCRIPTION					
1	А	I	A input					
2	В	I	B input					
3	GND	-	Ground pin					
4	Y	0	Output					
5	V _{CC}	-	Power pin					

(1) Signal Types: I = Input, O = Output, I/O = Input or Output

3



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
VI	Input voltage ⁽²⁾		- 0.5	7	V
Vo	Output voltage ⁽²⁾		- 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	20	mA
Io	Continuous output current	$V_O = 0$ to V_{CC}	- 25	25	mA
	Continuous current through V _{CC} or GND		- 50	50	mA
T _{stg}	Storage temperature		- 65	150	°C
TJ	Junction Temperature			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

5.2 ESD Ratings

			VALUE	UNIT
		Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾	±2000	
V _(ESD)	Electrostatic discharge	Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾	±1000	V

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

5.3 Recommended Operating Conditions

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

		MIN	NOM 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
VI	Input voltage	0	5.5	V
Vo	Output voltage	0	V _{CC}	V
I _{OH}	High-level output current		- 8	mA
I _{OL}	Low-level output current		8	mA
t/v	Input transition rise or fall rate		20	ns/V
T _A	Operating free-air temperature	- 40	125	°C

Product Folder Links: SN74AHCT1G86
English Data Sheet: SCLS324

⁽²⁾ The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

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



5.4 Thermal Information

		SN74AHCT1G86			
	THERMAL METRIC ⁽¹⁾	DBV (SOT-23)	DCK (SC-70)	UNIT	
		5 PINS	5 PINS		
R ₀ JA	Junction-to-ambient thermal resistance	278	289.2		
R _{θ JC(top)}	Junction-to-case (top) thermal resistance	180.5	205.8		
R ₀ JB	Junction-to-board thermal resistance	184.4	176.2	°C/W	
ψJT	Junction-to-top characterization parameter	115.4	117.6	C/VV	
ψ ЈВ	Junction-to-board characterization parameter	183.4	175.1		
R ₀ JC(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 operating free-air temperature range (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	v	T _A = 25°C			- 40°C to	85°C	- 40°C to 125°C		UNIT
	PARAMETER	TEST CONDITIONS	V _{cc}	MIN	TYP	MAX	MIN	MAX	MIN	MAX	UNII
V	High level output	I _{OH} = -50 μA	4.5 V	4.4	4.5		4.4		4.4		V
V _{OH}	voltage	I _{OH} = -8 mA	4.5 V	3.94			3.8		3.8		V
V	Low level output	I _{OL} = 50 μA	4.5 V			0.1		0.1		0.1	V
V _{OL}	voltage	I _{OL} = 8 mA	4.5 V			0.36		0.44		0.44	V
I _I	Input leakage current	V _I = 5.5 V or GND	0 V to 5.5 V			±0.1		±1		±1	μΑ
Icc	Supply current	V _I = V _{CC} or GND, I _O = 0	5.5 V			1		10		10	μΑ
Δ I _{CC} (1)	Supply-current change	One input at 3.4 V, Other inputs at V _{CC} or GND	5.5 V			1.35		1.5		1.5	mA
Ci	Input capacitance	V _I = V _{CC} or GND	5 V		2	10		10		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

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

PARAMETER	FROM	то	LOAD	T _A = 25°C		- 40°C to 85°C		- 40°C to 125°C		UNIT
FARAWETER	(INPUT)	(OUTPUT)	CAPACITANCE	TYP	MAX	MIN	MAX	MIN	MAX	ONII
t _{PLH}	A or B	Υ	C _L = 15 pF	5	6.2	1	8	1	9	ns
t _{PHL}	AUB			C _L = 13 βi	5	6.2	1	8	1	9
t _{PLH}	A or B	V	C = 50 = F	5.5	7.9	1	9	1	10	no
t _{PHL}	AUID	1	C _L = 50 pF	5.5	7.9	1	9	1	10	ns

Product Folder Links: SN74AHCT1G86

English Data Sheet: SCLS324



5.7 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

5.8 Typical Characteristics

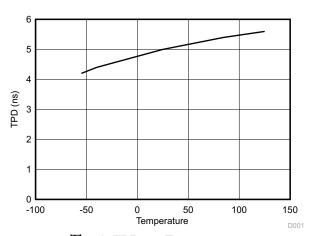
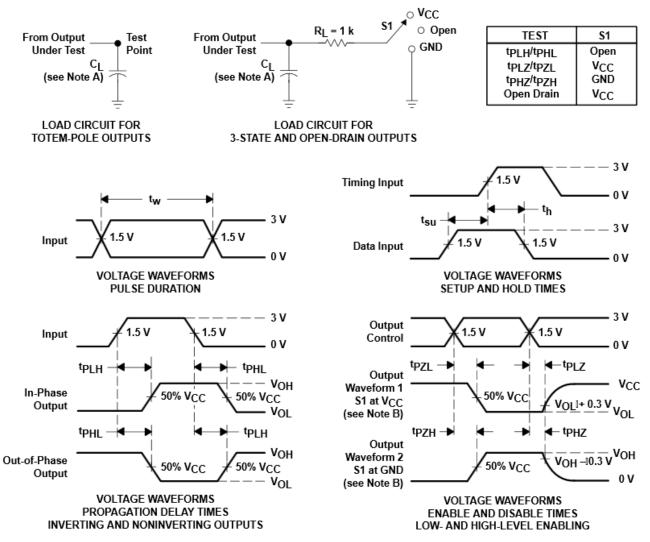


图 5-1. TPD vs. Temperature



6 Parameter Measurement Information



NOTES: A. CL 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 1 MHz, Z_O = 50 , t_f 3 ns, t_f 3 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.

图 6-1. Load Circuit and Voltage Waveforms

7 Detailed Description

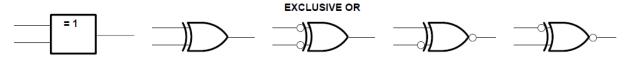
7.1 Overview

The SN74AHCT1G86 is a single 2-input exclusive-OR gate. The device performs the Boolean function $Y = A \oplus B$ or $Y = \overline{AB} + A \overline{B}$ in positive logic.

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

An exclusive-OR gate has many applications, some of which can be represented better by alternative logic symbols.



These five equivalent exclusive-OR symbols are valid for an SN74AHCT1G86 gate in positive logic; negation may be shown at any two ports.

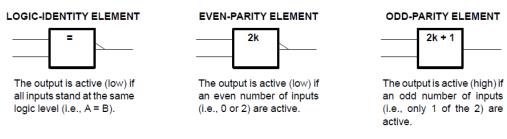


图 7-1. Exclusive-OR Logic

7.3 Feature Description

The device is ideal for operating in a 5-V logic system. The low propagation delay allows fast switching and higher speeds of operation. In addition, the low power consumption makes this device a good choice for portable and battery power-sensitive applications.

7.4 Device Functional Modes

表 7-1. Function Table

INPU	ITS ⁽¹⁾	OUTPUT ⁽²⁾
Α	В	Y
L	L	L
L	Н	Н
Н	L	Н
Н	Н	L

- (1) H = High Voltage Level, L = Low Voltage Level, X = Don't Care
- (2) H = Driving High, L = Driving Low, Z = High Impedance State

Product Folder Links: SN74AHCT1G86

8 Application and Implementation

备注

以下应用部分中的信息不属于 TI 器件规格的范围, TI 不担保其准确性和完整性。TI 的客户应负责确定器件是否适用于其应用。客户应验证并测试其设计,以确保系统功能。

8.1 Application Information

The SN74AHCT1G86 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.

8.2 Typical Application

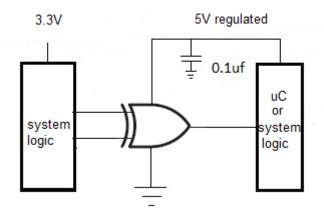


图 8-1. Typical Application Schematic

8.2.1 Design Requirements

This 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. The high drive will also create fast edges into light loads so consider routing and load conditions to prevent ringing.

8.2.2 Detailed Design Procedure

- Recommended input conditions:
 - Rise time and fall time specs. See ($\triangle t/\triangle V$) in # 5.3.
 - Specified high and low levels. See (V_{IH} and V_{II}) in # 5.3.
- Recommended 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}.

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8.2.3 Application Curves

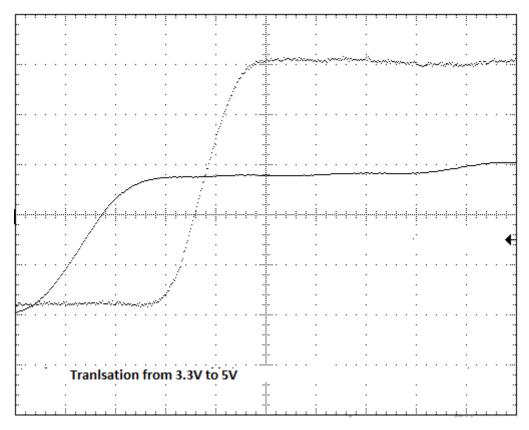


图 8-2. Translation From 3.3 V to 5.5 V

8.3 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the

Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, TI recommends a 0.1- μ F capacitor and if there are multiple V_{CC} terminals then TI recommends a 0.01μF or 0.022-μF capacitor for each power terminal. Multiple bypass capacitors can be paralleled to reject different frequencies of noise. Frequencies of 0.1 μF and 1 μF are commonly used in parallel. The bypass capacitor should be installed as close as possible to the power terminal for best results.

8.4 Layout

8.4.1 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 three of the four 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 below 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. Floating outputs is generally acceptable, 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.O' s so they also cannot float when disabled.

8.4.2 Layout Example

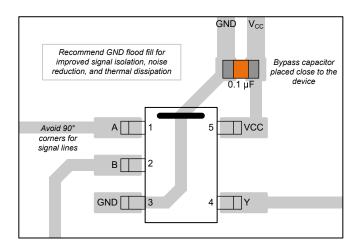


图 8-3. Layout Example for the SN74AHCT1G86

Product Folder Links: SN74AHCT1G86

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9 Device and Documentation Support

9.1 Documentation Support

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 接收文档更新通知

要接收文档更新通知,请导航至 ti.com 上的器件产品文件夹。点击*订阅更新* 进行注册,即可每周接收产品信息更改摘要。有关更改的详细信息,请查看任何已修订文档中包含的修订历史记录。

9.3 支持资源

TI E2E™ 支持论坛是工程师的重要参考资料,可直接从专家获得快速、经过验证的解答和设计帮助。搜索现有解答或提出自己的问题可获得所需的快速设计帮助。

链接的内容由各个贡献者"按原样"提供。这些内容并不构成 TI 技术规范,并且不一定反映 TI 的观点;请参阅 TI 的《使用条款》。

9.4 Trademarks

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9.5 静电放电警告



静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序,可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级,大至整个器件故障。精密的集成电路可能更容易受到损坏,这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

9.6 术语表

TI术语表本术语表列出并解释了术语、首字母缩略词和定义。

10 Revision History

Changes from Revision O (October 2023) to Revision P (February 2024)

Page

• Updated thermal values for DBV package from R θ JA = 208.2 to 278, R θ JC(top) = 76.1 to 180.5, R θ JB = 52.5 to 184.4, Ψ JT = 4 to 115.4, Ψ JB = 51.8 to 183.4, R θ JC(bot) = N/A, all values in °C/W5

Changes from Revision N (August 2022) to Revision O (October 2023)

Page

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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.

Product Folder Links: SN74AHCT1G86

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PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead finish/ Ball material	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
74AHCT1G86DBVRG4	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	B86G	Samples
SN74AHCT1G86DBVR	ACTIVE	SOT-23	DBV	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	(B863, B86G, B86J, B86S)	Samples
SN74AHCT1G86DCKR	ACTIVE	SC70	DCK	5	3000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 125	(1QV, BH3, BHG, BH J, BHL, BHS)	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.

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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.

OTHER QUALIFIED VERSIONS OF SN74AHCT1G86:

Automotive: SN74AHCT1G86-Q1

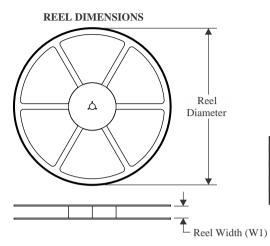
NOTE: Qualified Version Definitions:

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

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
74AHCT1G86DBVRG4	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
SN74AHCT1G86DBVR	SOT-23	DBV	5	3000	178.0	9.0	3.3	3.2	1.4	4.0	8.0	Q3
SN74AHCT1G86DBVR	SOT-23	DBV	5	3000	180.0	8.4	3.23	3.17	1.37	4.0	8.0	Q3
SN74AHCT1G86DCKR	SC70	DCK	5	3000	180.0	8.4	2.3	2.5	1.2	4.0	8.0	Q3



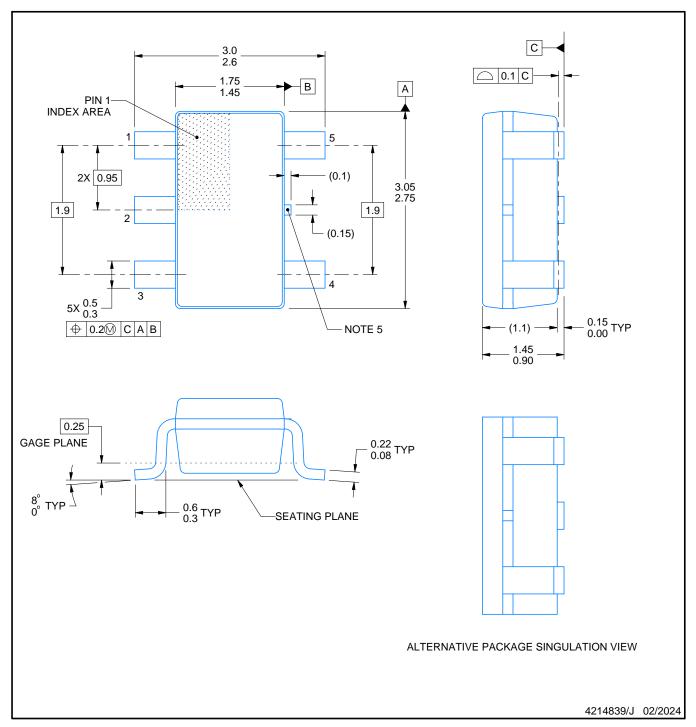
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*All dimensions are nominal

7 iii diiriorio die rierimidi										
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)			
74AHCT1G86DBVRG4	SOT-23	DBV	5	3000	180.0	180.0	18.0			
SN74AHCT1G86DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0			
SN74AHCT1G86DBVR	SOT-23	DBV	5	3000	202.0	201.0	28.0			
SN74AHCT1G86DCKR	SC70	DCK	5	3000	210.0	185.0	35.0			



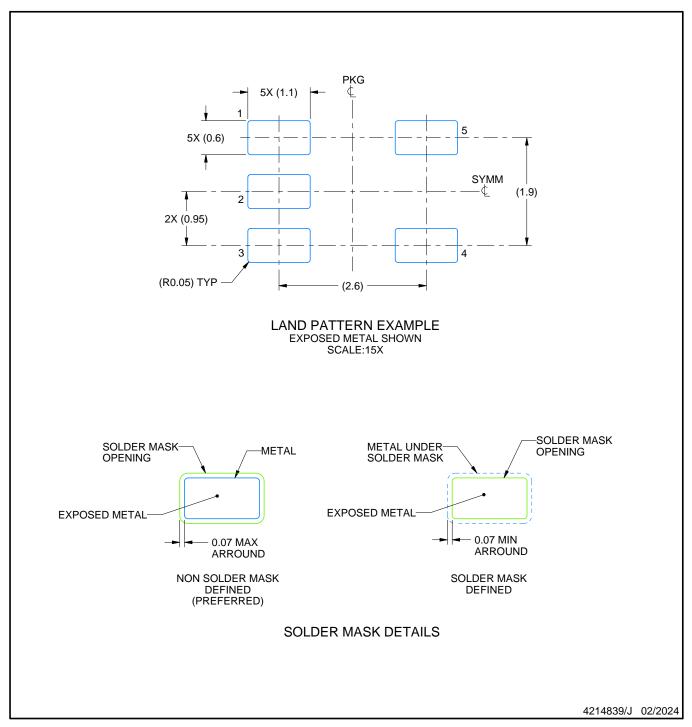


NOTES:

- 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.



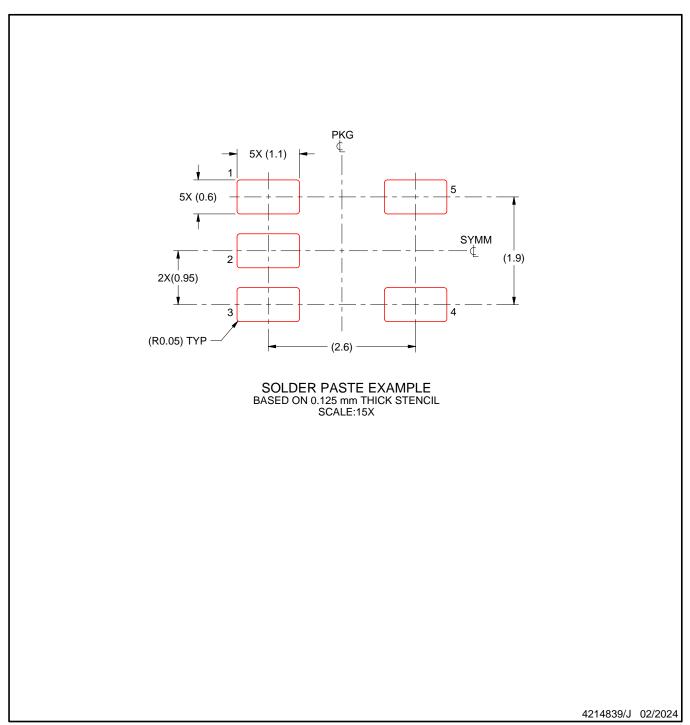


NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



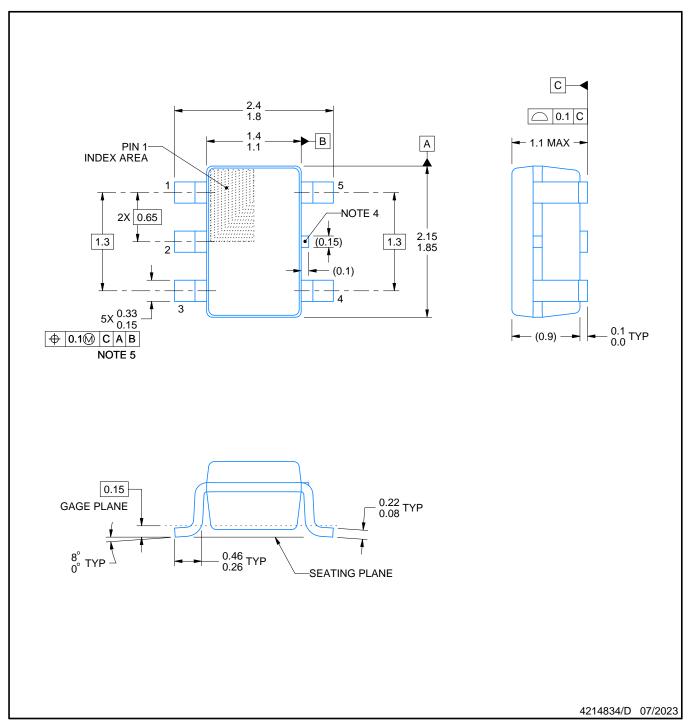


NOTES: (continued)

- 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:

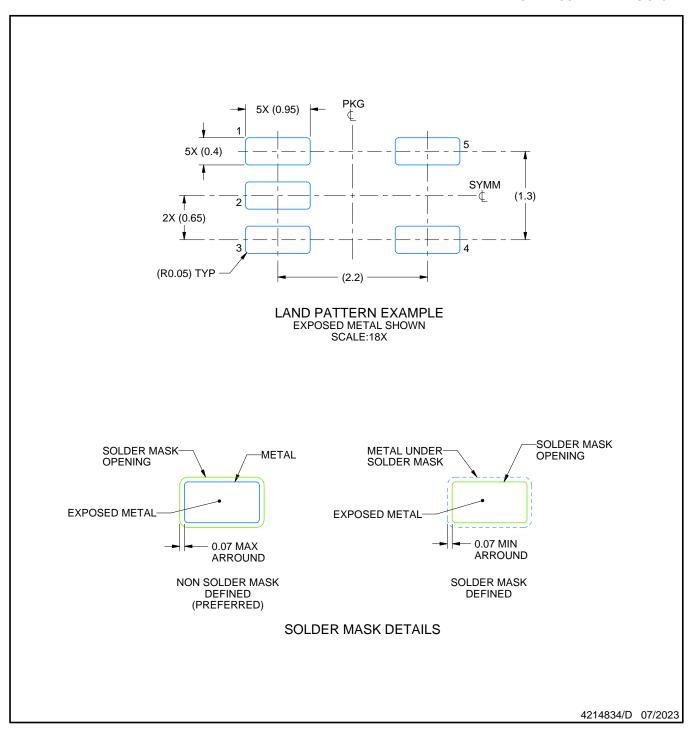
- 1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.

 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.

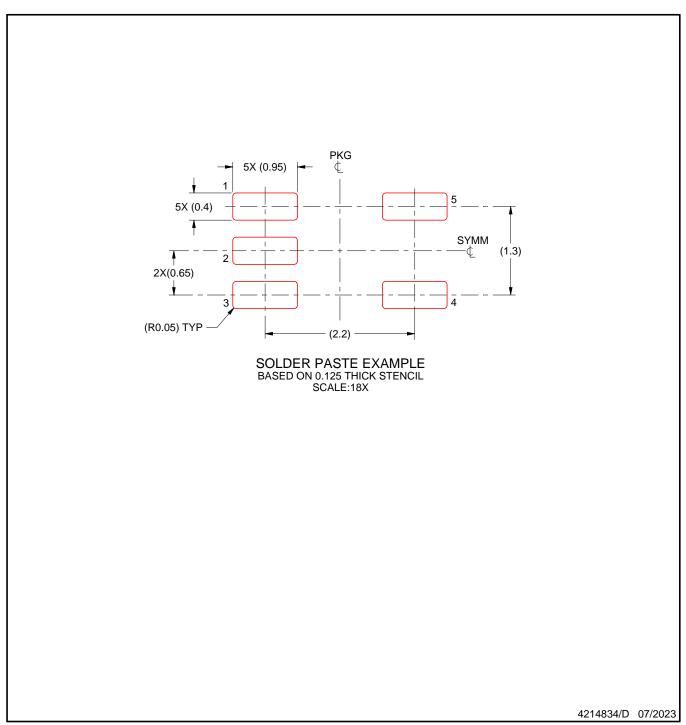




NOTES: (continued)

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.



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