

SN74AC08-Q1 汽车类四路双输入正与门

1 特性

- 符合汽车应用要求
- 2V 至 6V V_{CC} 运行
- 输入电压高达 6V
- t_{pd} 最大值为 7.5ns (5V 时)

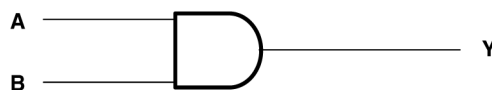
2 说明

SN74AC08 器件是四路双输入正与门。该器件以正逻辑执行布尔函数 $Y = A \cdot B$ 或 $Y = \overline{A + B}$ 。

封装信息

器件型号	封装 ⁽¹⁾	封装尺寸 ⁽²⁾	本体尺寸 ⁽³⁾
SN74AC08-Q1	D (SOIC, 14)	8.65mm × 6mm	8.65mm × 3.9mm
	PW (TSSOP, 14)	5mm × 6.4mm	5mm × 4.4mm

- 有关更多信息，请参阅节 10。
- 封装尺寸 (长 × 宽) 为标称值，并包括引脚 (如适用)。
- 本体尺寸 (长 × 宽) 为标称值，不包括引脚。



逻辑图，每个逻辑门 (正逻辑)



Table of Contents

1 特性	1	6.2 Device Functional Modes.....	8
2 说明	1	7 Application and Implementation	9
3 Pin Configuration and Functions	3	7.1 Power Supply Recommendations.....	9
4 Specifications	4	7.2 Layout.....	9
4.1 Absolute Maximum Ratings.....	4	8 Device and Documentation Support	10
4.2 Recommended Operating Conditions.....	4	8.1 Documentation Support.....	10
4.3 Thermal Information.....	5	8.2 接收文档更新通知.....	10
4.4 Electrical Characteristics.....	5	8.3 支持资源.....	10
4.5 Switching Characteristics, $V_{CC} = 3.3V \pm 0.3V$	5	8.4 Trademarks.....	10
4.6 Switching Characteristics, $V_{CC} = 5V \pm 0.5V$	5	8.5 静电放电警告.....	10
4.7 Operating Characteristics.....	6	8.6 术语表.....	10
5 Parameter Measurement Information	7	9 Revision History	10
6 Detailed Description	8	10 Mechanical, Packaging, and Orderable Information	11
6.1 Functional Block Diagram.....	8		

3 Pin Configuration and Functions

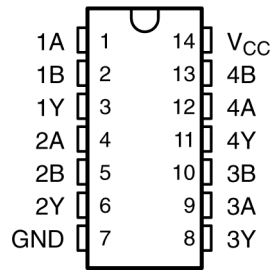


图 3-1. D or PW Package, 14-Pin SOIC or TSSOP (Top View)

表 3-1. Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
1A	1	Input	Channel 1, Input A
1B	2	Input	Channel 1, Input B
1Y	3	Output	Channel 1, Output Y
2A	4	Input	Channel 2, Input A
2B	5	Input	Channel 2, Input B
2Y	6	Output	Channel 2, Output Y
GND	7	—	Ground
3Y	8	Output	Channel 3, Output Y
3A	9	Input	Channel 3, Input A
3B	10	Input	Channel 3, Input B
4Y	11	Output	Channel 4, Output Y
4A	12	Input	Channel 4, Input A
4B	13	Input	Channel 4, Input B
V _{CC}	14	—	Positive Supply

4 Specifications

4.1 Absolute Maximum Ratings

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

		MIN	MAX	UNIT
V _{CC}	Supply voltage range	-0.5	7	V
V _I ⁽²⁾	Input voltage range	-0.5	V _{CC} + 0.5	V
V _O ⁽²⁾	Output voltage range	-0.5	V _{CC} + 0.5	V
I _{IK}	Input clamp current	(V _I < 0 or V _I > V _{CC})		±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})		±50 mA
Continuous current through V _{CC} or GND				±200 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 “recommended operating conditions” 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.

4.2 Recommended Operating Conditions

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

		MIN	MAX	UNIT
V _{CC}	Supply voltage	2	6	V
V _{IH}	High-level input voltage	V _{CC} = 3V	2.1	V
		V _{CC} = 4.5V	3.15	
		V _{CC} = 5.5V	3.85	
V _{IL}	Low-level input voltage	V _{CC} = 3V	0.9	V
		V _{CC} = 4.5V	1.35	
		V _{CC} = 5.5V	1.65	
V _I	Input voltage	0	V _{CC}	V
V _O	Output voltage	0	V _{CC}	V
I _{OH}	High-level output current	V _{CC} = 3V	-12	mA
		V _{CC} = 4.5V	-24	
		V _{CC} = 5.5V	-24	
I _{OL}	Low-level output current	V _{CC} = 3V	12	mA
		V _{CC} = 4.5V	24	
		V _{CC} = 5.5V	24	
Δt/Δv	Input transition rise or fall rate			8 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*, literature number SCBA004.

4.3 Thermal Information

THERMAL METRIC ⁽¹⁾		SN74AC08-Q1		UNIT
		D (SOIC)	PW (TSSOP)	
		14 PINS	14 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	119.9	145.7	°C/W

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

4.4 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V_{CC}	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C TO } 125^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 85^\circ\text{C}$		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	$I_{OH} = -50 \mu\text{A}$	3V	2.9			2.9		2.9	V	
		4.5V	4.4			4.4		4.4		
		5.5V	5.4			5.4		5.4		
	$I_{OH} = -12\text{mA}$	3V	2.56			2.4		2.46		
		4.5V	3.86			3.7		3.76		
		5.5V	4.86			4.7		4.76		
V_{OL}	$I_{OL} = 50 \mu\text{A}$	3V		0.002	0.1		0.1	0.1	V	
		4.5V		0.001	0.1		0.1	0.1		
		5.5V		0.001	0.1		0.1	0.1		
	$I_{OL} = 12\text{mA}$	3V			0.36		0.5	0.44		
		4.5V			0.36		0.5	0.44		
		5.5V			0.36		0.5	0.44		
I_I	A or B ports	$V_I = V_{CC}$ or GND	5.5V		± 0.1		± 1	± 1	μA	
I_{CC}		$V_I = V_{CC}$ or GND, $I_O = 0$	5.5V		2		40	20	μA	
C_i		$V_I = V_{CC}$ or GND	5V		4.5				pF	

4.5 Switching Characteristics, $V_{CC} = 3.3\text{V} \pm 0.3\text{V}$

over recommended operating free-air temperature range, $V_{CC} = 3.3\text{V} \pm 0.3\text{V}$ (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C TO } 125^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 85^\circ\text{C}$		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A or B	Y	1.5	7.5	9.5	1	12.5	1	10	ns
t_{PHL}			1.5	7	8.5	1	11.5	1	9	

4.6 Switching Characteristics, $V_{CC} = 5\text{V} \pm 0.5\text{V}$

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

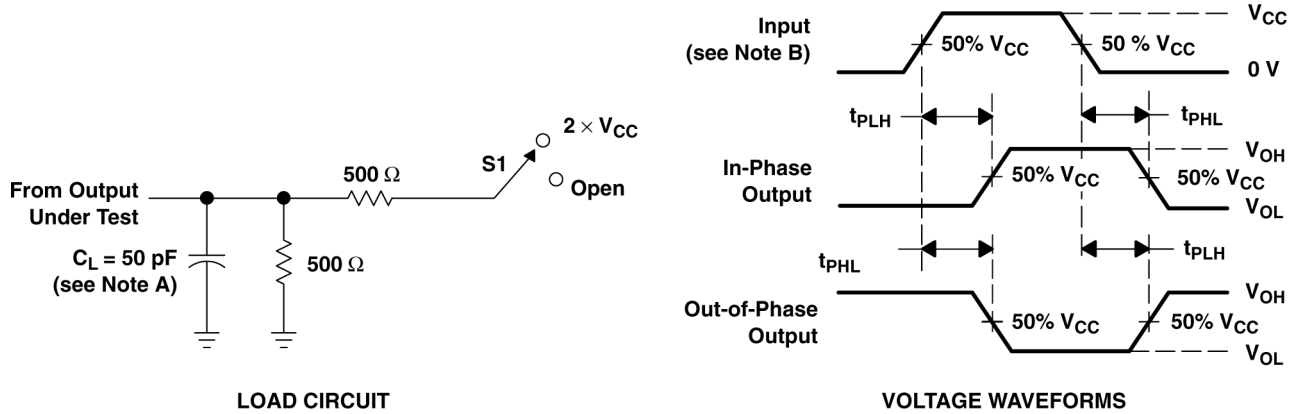
PARAMETER	FROM (INPUT)	TO (OUTPUT)	$T_A = 25^\circ\text{C}$			$T_A = -40^\circ\text{C TO } 125^\circ\text{C}$		$T_A = -40^\circ\text{C TO } 85^\circ\text{C}$		UNIT
			MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}	A or B	Y	1.5	5.5	7.5	1	9	1	8.5	ns
t_{PHL}			1.5	7	8.5	1	11.5	1	9	

4.7 Operating Characteristics

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

PARAMETER		TEST CONDITIONS		TYP	UNIT
C_{pd}	Power dissipation capacitance	$C_L = 50\text{pF}$,	$f = 1\text{ MHz}$	20	pF

5 Parameter Measurement Information



- A. C_L includes probe and jig capacitance.
- B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r v 2.5 ns, t_f v 2.5 ns.
- C. The outputs are measured one at a time, with one input transition per measurement.

图 5-1. Load Circuit and Voltage Waveforms

TEST	S1
t _{PLH} /t _{PHL}	Open

6 Detailed Description

6.1 Functional Block Diagram

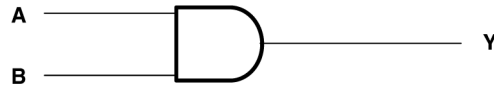


图 6-1. Logic Diagram, Each Gate (Positive Logic)

6.2 Device Functional Modes

表 6-1. Function Table (Each Gate)

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

7 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。

7.1 Power Supply Recommendations

The power supply can be any voltage between the MIN and MAX supply voltage rating located in the [Recommended Operating Conditions](#) 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.

7.2 Layout

7.2.1 Layout Guidelines

When using multiple bit logic devices, inputs should never 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 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. 节 7.2.2 shows 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 makes more sense or is more convenient. It is generally acceptable to float outputs unless the part is a transceiver. If the transceiver has an output enable pin, then it will disable the outputs section of the part when asserted. This will not disable the input section of the IOs, so they cannot float when disabled.

7.2.2 Layout Example

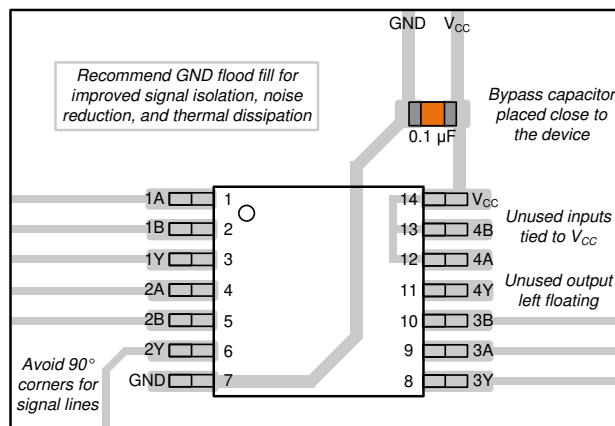


图 7-1. Example Layout for the SN74AC08-Q1

8 Device and Documentation Support

TI offers an extensive line of development tools. Tools and software to evaluate the performance of the device, generate code, and develop solutions are listed below.

8.1 Documentation Support

8.1.1 Related Documentation

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to sample or buy.

表 8-1. Related Links

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN74AC08-Q1	Click here	Click here	Click here	Click here	Click here

8.2 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 [通知](#) 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。

8.3 支持资源

[TI E2E™ 中文支持论坛](#) 是工程师的重要参考资料，可直接从专家处获得快速、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，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](#)。

8.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

所有商标均为其各自所有者的财产。

8.5 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。

8.6 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。

9 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision A (January 2008) to Revision B (July 2024)	Page
• 添加了封装信息表、引脚功能表、ESD 等级表、热性能信息表、器件功能模式、“应用和实施”部分、器件和文档支持部分以及机械、封装和可订购信息部分.....	1
• Updated R ^θ JA values: D = 86 to 119.9, PW = 113 to 145.7, all values in °C/W	5

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
SN74AC08QDRG4Q1	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AC08Q	Samples
SN74AC08QPWRG4Q1	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AC08Q	Samples
SN74AC08QPWRQ1	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 125	AC08Q	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.

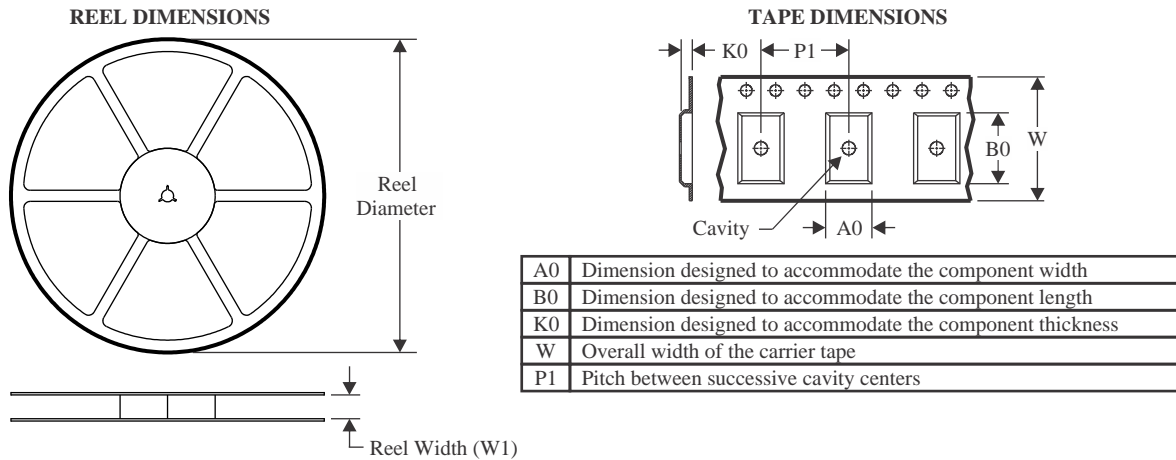
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF SN74AC08-Q1 :

- Catalog : [SN74AC08](#)
- Military : [SN54AC08](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense 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
SN74AC08QPWRG4Q1	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74AC08QPWRQ1	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74AC08QPWRG4Q1	TSSOP	PW	14	2000	356.0	356.0	35.0
SN74AC08QPWRQ1	TSSOP	PW	14	2000	356.0	356.0	35.0

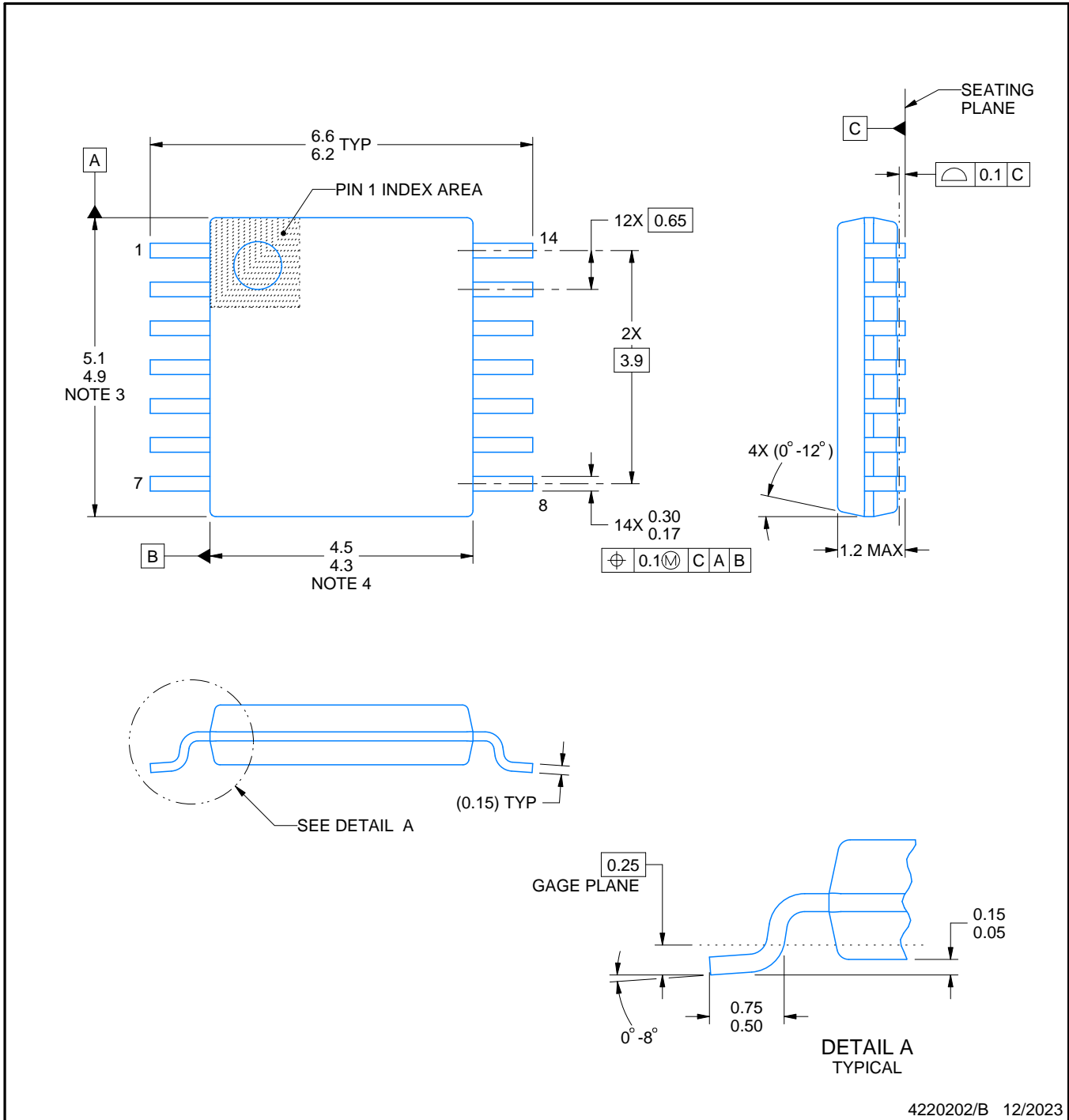
PW0014A



PACKAGE OUTLINE

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4220202/B 12/2023

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. 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. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.

EXAMPLE BOARD LAYOUT

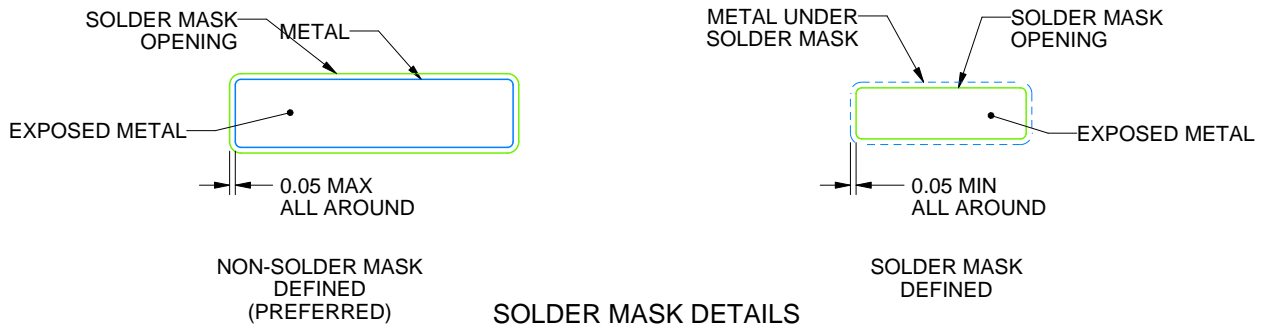
PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220202/B 12/2023

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

PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220202/B 12/2023

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.

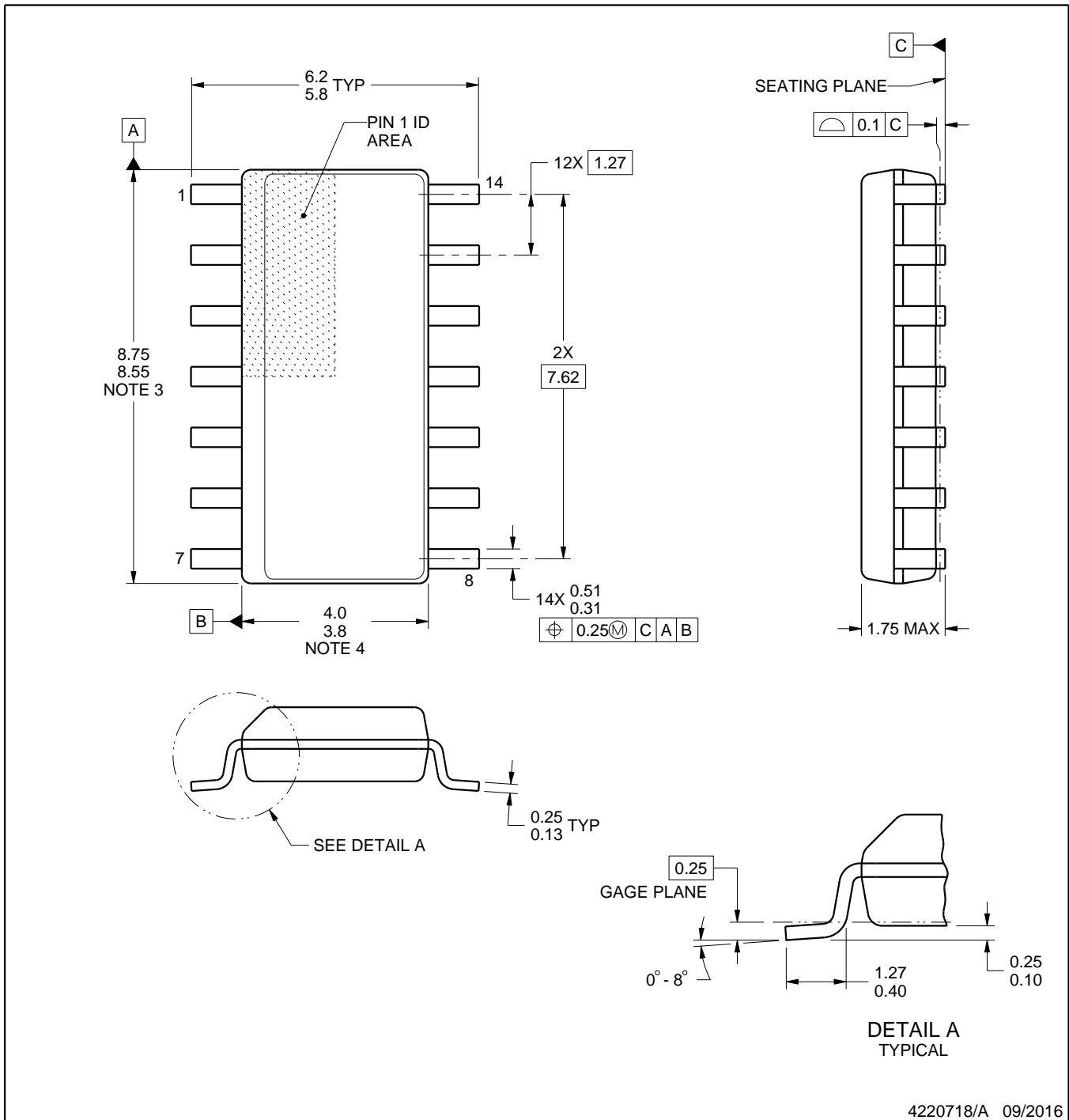
D0014A



PACKAGE OUTLINE

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



4220718/A 09/2016

NOTES:

1. All linear dimensions are in millimeters. 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. This dimension does not include interlead flash. Interlead flash shall not exceed 0.43 mm, per side.
5. Reference JEDEC registration MS-012, variation AB.

EXAMPLE BOARD LAYOUT

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



LAND PATTERN EXAMPLE
SCALE:8X



SOLDER MASK DETAILS

4220718/A 09/2016

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

D0014A

SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:8X

4220718/A 09/2016

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.

重要声明和免责声明

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