

SNx4HCT02 四路 2 输入正与非门

1 特性

- 4.5V 至 5.5V 的工作电压范围
- 输出可驱动多达 10 个 LSTTL 负载
- 低功耗， I_{CC} 最大值为 20 μ A
- 典型值 $t_{pd} = 10$ ns
- ± 4 mA 输出驱动 (在 5V 时)
- 低输入电流，最大值 1 μ A
- 输入兼容 TTL 电压

2 说明

这些器件包含四个独立双输入或非门。它们以正逻辑执行布尔函数 $Y = \overline{A \cdot B}$ or $Y = \overline{A + B}$ 。

器件信息⁽¹⁾

器件型号	封装	封装尺寸 (标称值)
SN74HCT02D	SOIC (14)	8.65mm × 3.90mm
SN74HCT02N	PDIP (14)	19.31mm × 6.35mm
SN74HCT02NSR	SO (14)	10.20mm × 5.30mm
SN74HCT02PW	TSSOP (14)	5.00mm × 4.40mm

(1) 如需了解所有可用封装，请参阅数据表末尾的可订购产品附录。



功能方框图



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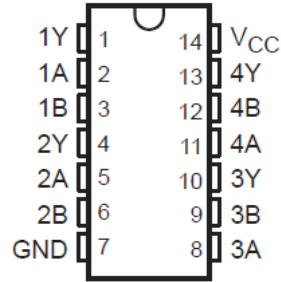
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3 Revision History

注：以前版本的页码可能与当前版本的页码不同

Changes from Revision E (July 2003) to Revision F (January 2022)	Page
• 更新了整个文档中的编号、格式、表格、图和交叉参考，以反映现代数据表标准.....	1

4 Pin Configuration and Functions



D, N, NS, or PW Package
14-Pin SOIC, PDIP, SO, TSSOP
Top View

5 Specifications

5.1 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
I_{IK}	Input clamp current	$(V_I < 0 \text{ or } V_I > V_{CC})^{(2)}$		± 20 mA
I_{OK}	Output clamp current	$(V_O < 0 \text{ or } V_O > V_{CC})^{(2)}$		± 20 mA
I_O	Continuous output current	$(V_O = 0 \text{ to } V_{CC})$		± 25 mA
	Continuous current through V_{CC} or ground current			± 50 mA
T_J	Junction temperature			150 °C
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 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.

5.2 Recommended Operating Conditions⁽¹⁾

		SN74HCT02			UNIT
		MIN	NOM	MAX	
V_{CC}	Supply voltage	4.5	5	5.5	V
V_{IH}	High-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$		2	V
V_{IL}	Low-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$		0.8	V
V_I	Input voltage	0		V_{CC}	V
V_O	Output voltage	0		V_{CC}	V
$\Delta t / \Delta v$	Input transition rise/fall time			500	ns
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. Refer to the TI application report *Implications of Slow or Floating SMOS Inputs*, literature number [SCBA004](#).

5.3 Thermal Information

THERMAL METRIC		D (SOIC)	DB (SSOP)	N (PDIP)	NS (SO)	PW (TSSOP)	UNIT
		14 PINS	14 PINS	14 PINS	14 PINS	14 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance ⁽¹⁾	86	96	80	76	113	°C/W

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

5.4 Electrical Characteristics

PARAMETER		TEST CONDITIONS ⁽¹⁾	V _{CC} (V)	T _A = 25°C			SN74HCT00		UNIT
				MIN	TYP	MAX	MIN	MAX	
V _{OH}	High-level output voltage	I _{OH} = -20 μA	4.5	4.4	4.499		4.4		V
		I _{OH} = -4 mA		3.98	4.3		3.84		
V _{OL}	Low-level output voltage	I _{OL} = 20 μA	5.5		0.001	0.1		0.1	V
		I _{OL} = 4 mA			0.17	0.26		0.33	
I _I	Input hold current	V _I = V _{CC} or 0	5.5		±0.1	±100		±1000	nA
I _{CC}	Supply current	V _I = V _{CC} or 0. I _O = 0	5.5			2		20	μA
Δ I _{CC} ⁽²⁾	Supply-current change	One input at 0.5V or 2.4 V, Other inputs at 0 or V _{CC}	5.5		1.4	2.4		2.9	mA
C _i	Input capacitance		4.5 to 5.5		3	10		10	pF

(1) V_I = V_{IH} or V_{IL}, unless otherwise noted.

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

5.5 Switching Characteristics

C_L = 50 pF. See [Parameter Measurement Information](#)

PARAMETER		FROM (INPUT)	TO (OUTPUT)	V _{CC} (V)	T _A = 25°C			SN74HCT00		UNIT
					MIN	TYP	MAX	MIN	MAX	
t _{pd}	Propagation delay	A or B	Y	4.5		11	20		25	ns
				5.5		10	18		22	
t _t	Transition time		Y	4.5		9	15		19	ns
				5.5		8	14		17	

5.6 Operating Characteristics

T_A = 25°C

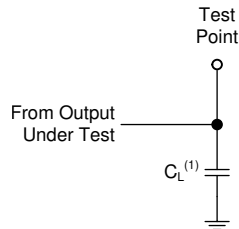
		Test Conditions	TYP	UNIT
C _{pd}	Power dissipation capacitance	No load	20	pF

6 Parameter Measurement Information

Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1 \text{ MHz}$, $Z_O = 50 \Omega$, $t_t < 6 \text{ ns}$.

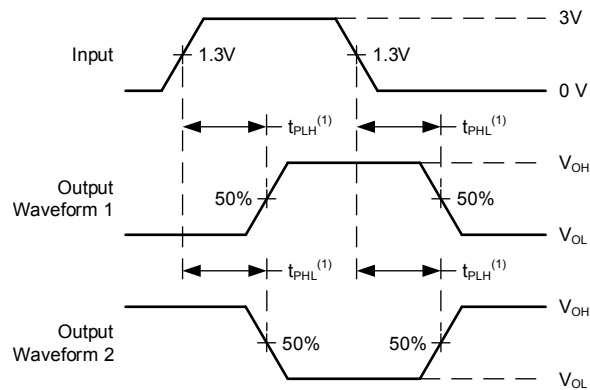
For clock inputs, f_{max} is measured when the input duty cycle is 50%.

The outputs are measured one at a time with one input transition per measurement.



(1) C_L includes probe and test-fixture capacitance.

图 6-1. Load Circuit for Push-Pull Outputs



(1) The greater between t_{PLH} and t_{PHL} is the same as t_{pd} .

图 6-2. Voltage Waveforms, Propagation Delays for TTL-Compatible Inputs

7 Detailed Description

7.1 Overview

These devices contain four independent 2-input NOR gates. They perform the Boolean function $Y = \overline{A} \cdot \overline{B}$ or $Y = \overline{A + B}$ in positive logic.

7.2 Functional Block Diagram



7.3 Device Functional Modes

表 7-1. Function Table
(each gate)

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

8 Power Supply Recommendations

The power supply can be any voltage between the minimum and maximum supply voltage rating located in the *Recommended Operating Conditions*. Each V_{CC} terminal should have a good bypass capacitor to prevent power disturbance. A 0.1- μ F capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1- μ F and 1- μ F capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for best results.

9 Layout

9.1 Layout Guidelines

When using multiple-input and multiple-channel logic devices inputs must not ever be left floating. 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 unused input pins must not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. All unused inputs of digital logic devices must be connected to a logic high or logic low voltage, as defined by the input voltage specifications, to prevent them from floating. The logic level that must be applied to any particular unused input depends on the function of the device. Generally, the inputs are tied to GND or V_{CC} , whichever makes more sense for the logic function or is more convenient.

10 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.

10.1 Documentation Support

10.1.1 Related Documentation

10.2 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。

10.3 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。

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10.4 Trademarks

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10.5 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.

10.6 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。

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.

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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
SN74HCT02D	ACTIVE	SOIC	D	14	50	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02DR	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02DRG4	ACTIVE	SOIC	D	14	2500	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02DT	ACTIVE	SOIC	D	14	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02N	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCT02N	Samples
SN74HCT02NE4	ACTIVE	PDIP	N	14	25	RoHS & Green	NIPDAU	N / A for Pkg Type	-40 to 85	SN74HCT02N	Samples
SN74HCT02NSR	ACTIVE	SO	NS	14	2000	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT02	Samples
SN74HCT02PW	ACTIVE	TSSOP	PW	14	90	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT02	Samples
SN74HCT02PWR	ACTIVE	TSSOP	PW	14	2000	RoHS & Green	NIPDAU SN	Level-1-260C-UNLIM	-40 to 85	HT02	Samples
SN74HCT02PWT	ACTIVE	TSSOP	PW	14	250	RoHS & Green	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HT02	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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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
SN74HCT02DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCT02DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCT02DR	SOIC	D	14	2500	330.0	16.4	6.6	9.3	2.1	8.0	16.0	Q1
SN74HCT02DT	SOIC	D	14	250	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCT02NSR	SO	NS	14	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1
SN74HCT02PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HCT02PWR	TSSOP	PW	14	2000	330.0	12.4	6.85	5.45	1.6	8.0	12.0	Q1
SN74HCT02PWR	TSSOP	PW	14	2000	330.0	12.4	6.9	5.6	1.6	8.0	12.0	Q1
SN74HCT02PWT	TSSOP	PW	14	250	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)
SN74HCT02DR	SOIC	D	14	2500	356.0	356.0	35.0
SN74HCT02DR	SOIC	D	14	2500	356.0	356.0	35.0
SN74HCT02DR	SOIC	D	14	2500	366.0	364.0	50.0
SN74HCT02DT	SOIC	D	14	250	210.0	185.0	35.0
SN74HCT02NSR	SO	NS	14	2000	356.0	356.0	35.0
SN74HCT02PWR	TSSOP	PW	14	2000	356.0	356.0	35.0
SN74HCT02PWR	TSSOP	PW	14	2000	366.0	364.0	50.0
SN74HCT02PWR	TSSOP	PW	14	2000	356.0	356.0	35.0
SN74HCT02PWT	TSSOP	PW	14	250	356.0	356.0	35.0

TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
SN74HCT02D	D	SOIC	14	50	506.6	8	3940	4.32
SN74HCT02N	N	PDIP	14	25	506	13.97	11230	4.32
SN74HCT02N	N	PDIP	14	25	506	13.97	11230	4.32
SN74HCT02NE4	N	PDIP	14	25	506	13.97	11230	4.32
SN74HCT02NE4	N	PDIP	14	25	506	13.97	11230	4.32
SN74HCT02PW	PW	TSSOP	14	90	530	10.2	3600	3.5

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

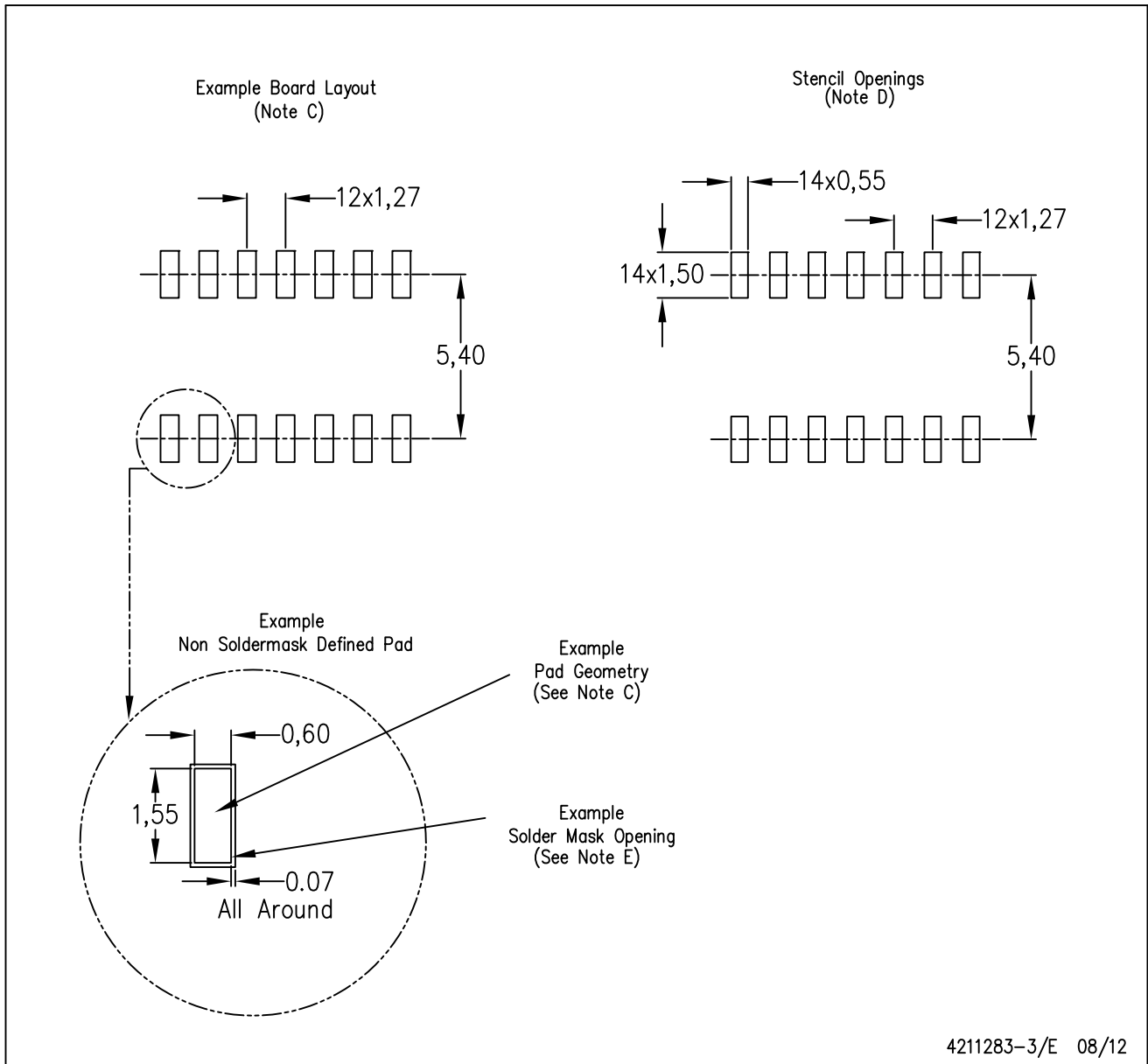
14-PINS SHOWN



- 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, not to exceed 0,15.

D (R-PDSO-G14)

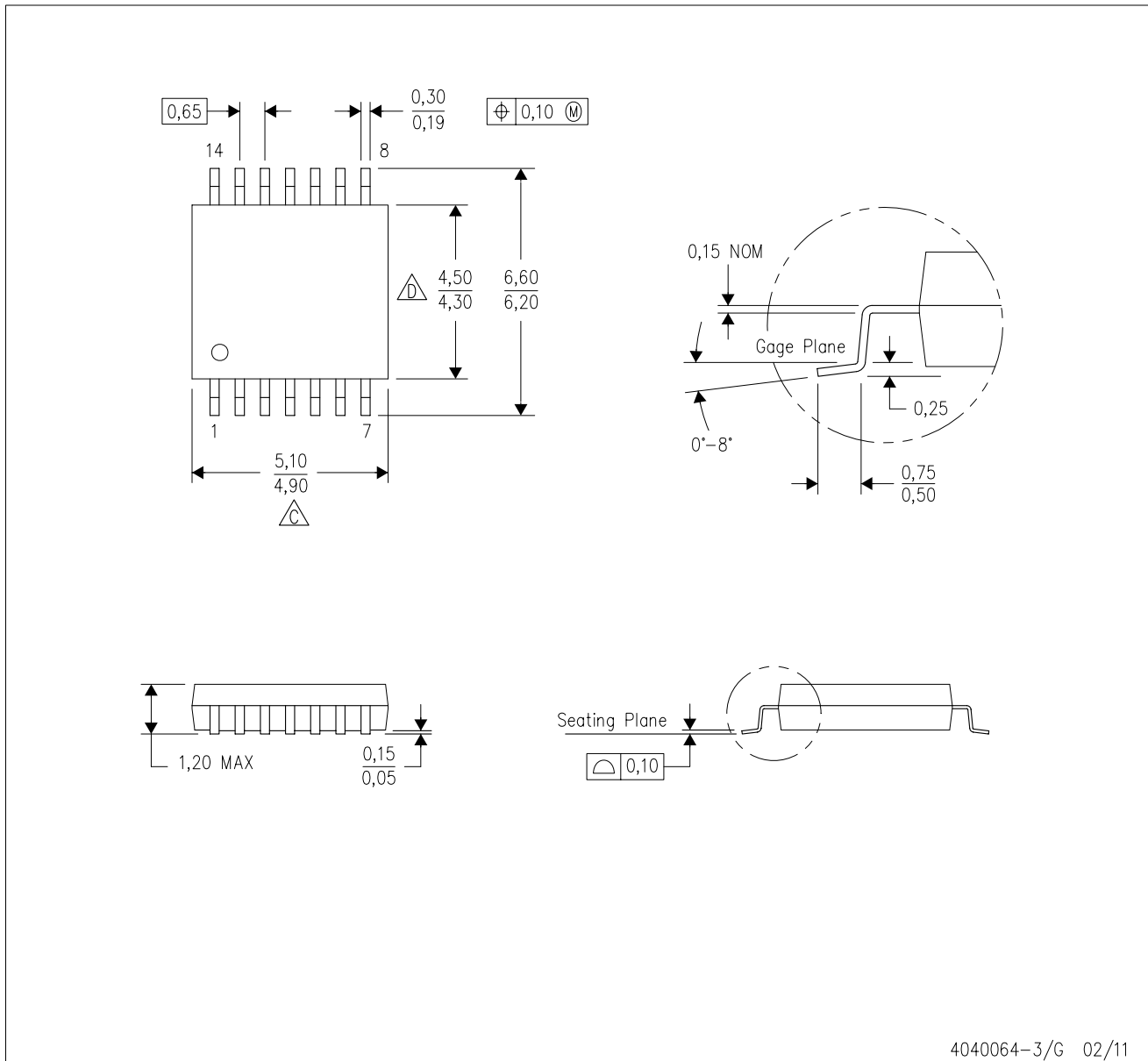
PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - 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. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE

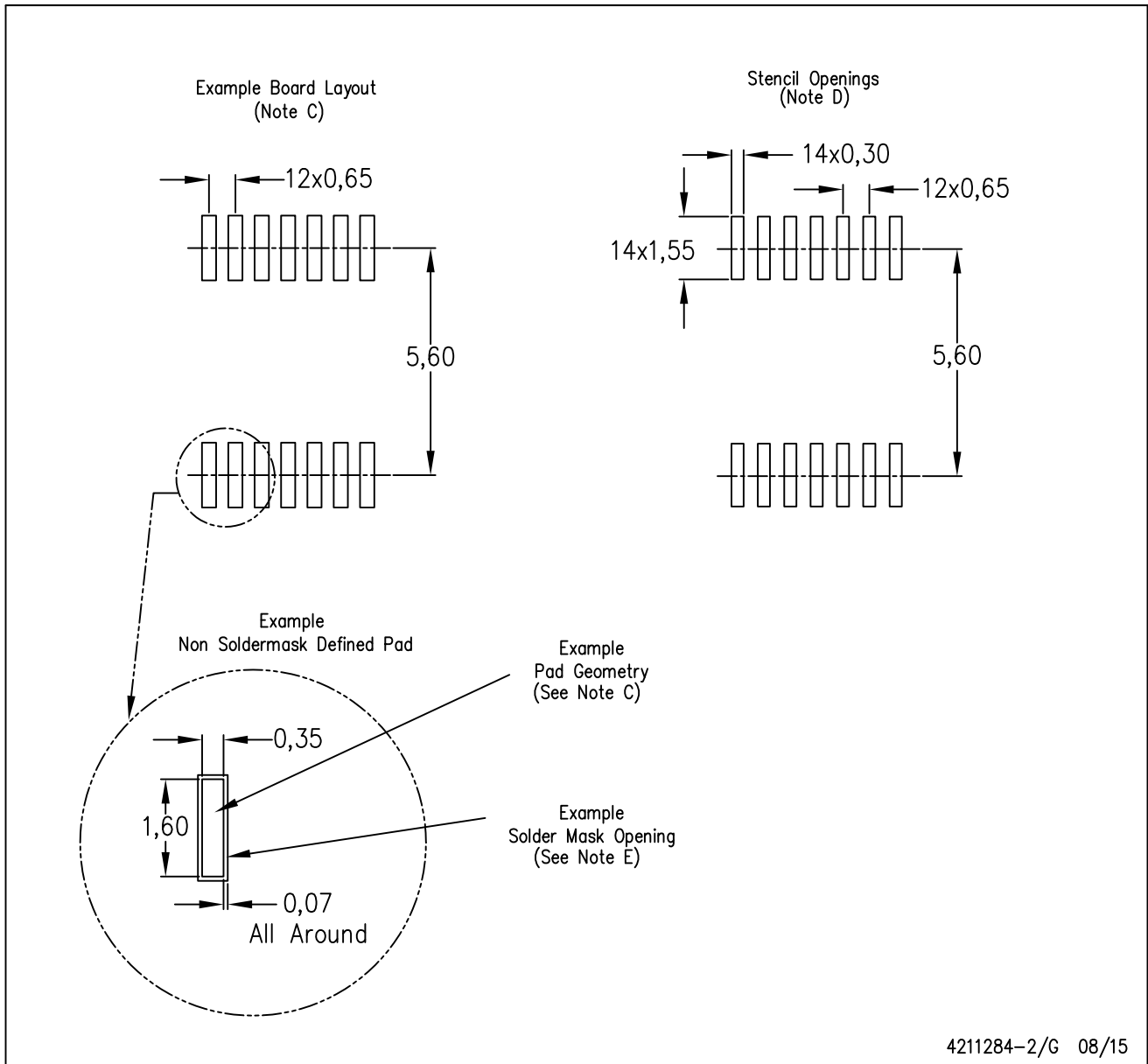


4040064-3/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
 - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
 - E. Falls within JEDEC MO-153

PW (R-PDSO-G14)

PLASTIC SMALL OUTLINE



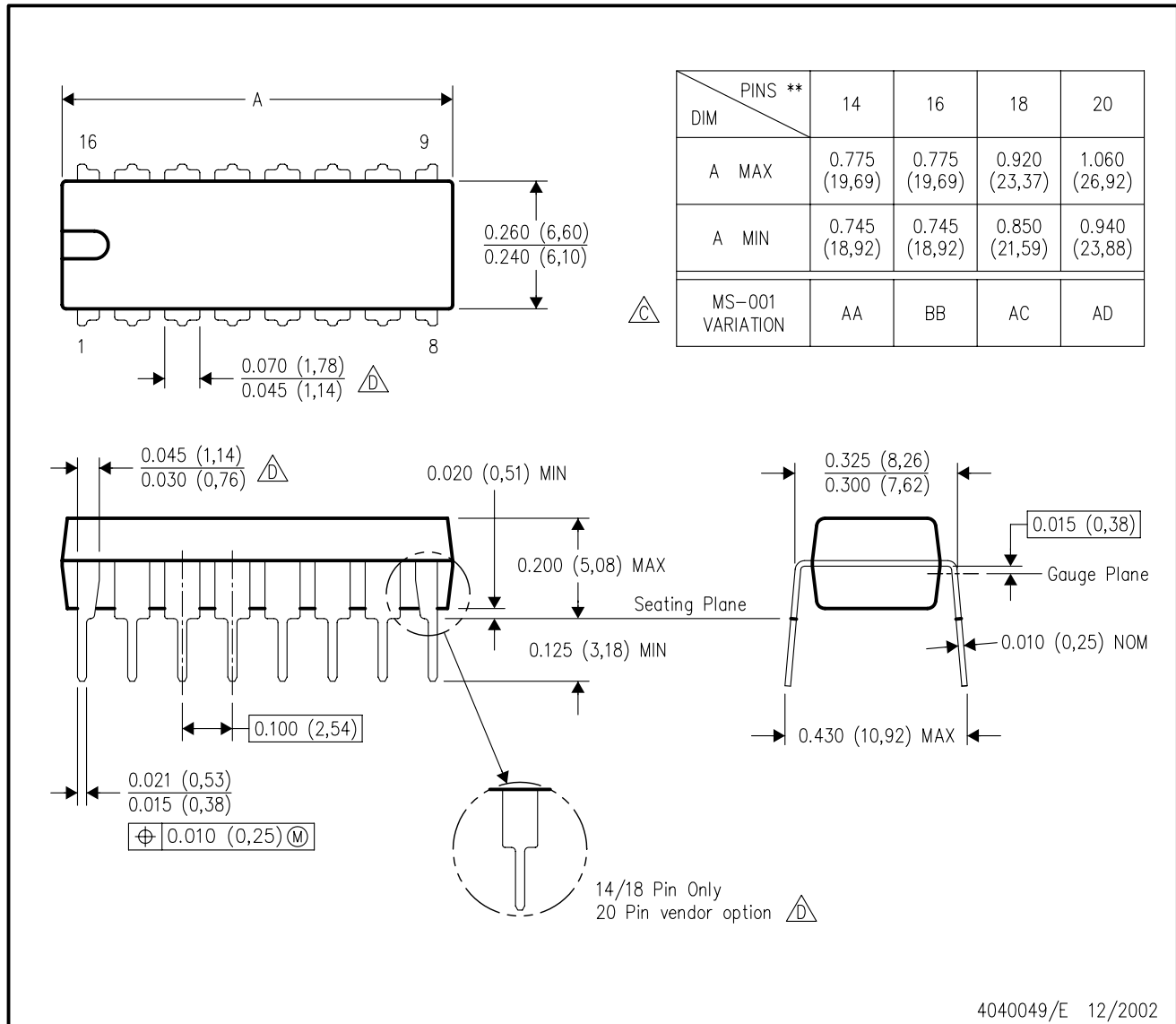
4211284-2/G 08/15

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - 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. Refer to IPC-7525 for other stencil recommendations.
 - Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - D The 20 pin end lead shoulder width is a vendor option, either half or full width.

4040049/E 12/2002

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