SNx4HCT125 具有三态输出的四路总线缓冲门

1 特性

- 4.5V 至 5.5V 的工作电压范围
- 高电流可驱动多达 15 个 LSTTL 负载
- 低功耗，I_{CC} 最大值为 80μA
- t_{pd} 典型值 = 12ns
- 电压为 5V 时，输出驱动为 ±6mA
- 低输入电流，最大值 1μA
- 输入兼容 TTL 电压
- 高电流三态输出驱动总线或缓冲存储器地址寄存器

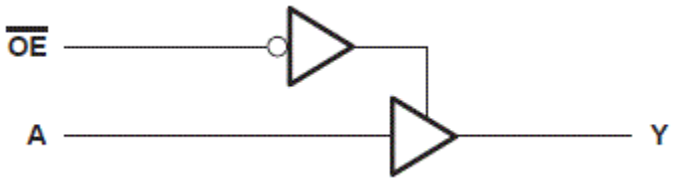
2 说明

SNx4HCT125 包含四个具有 TTL 兼容输入和三态输出的独立缓冲器。每个逻辑门以正逻辑执行布尔函数 Y = A。

器件信息

器件型号	封装[1]	封装尺寸（标称值）
SN74HCT125D	SOIC (14)	8.65mm × 3.90mm
SN74HCT125N	PDIP (14)	19.31mm × 6.35mm

(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

本文档旨在为方便起见，提供有关 TI 产品中文版本的信息，以确认产品的概要。有关适用的官方英文版本的最新信息，请访问 www.ti.com，其内容始终优先。TI 不保证翻译的准确性和有效性。在实际设计之前，请务必参考最新版本的英文版本。

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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 F (February 2022) to Revision G (October 2022)	Page
• Increased R θ JA for packages: D (86 to 138.7); N (80 to 75.3)	4

Changes from Revision E (August 2003) to Revision F (February 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

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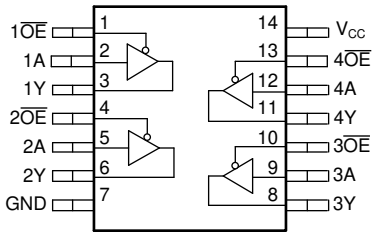
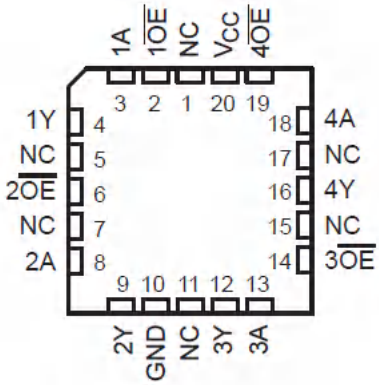
4 Pin Configuration and Functions



D, N, J or W Package
14-Pin SOIC or PDIP
Top View



NC – No internal connection

FK Package
20-Pin LCCC
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(2)	(V_I < 0 or V_I > V_{CC})		±20	mA
I_{OK}	Output clamp current(2)	(V_O < 0 or V_O > V_{CC})		±20	mA
I_O	Continuous output current	(V_O = 0 to V_{CC})		±35	mA
V_{CC} or GND	Continuous current through			±70	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)

			SN54HCT125(2)			SN74HCT125			UNIT
			MIN	NOM	MAX	MIN	NOM	MAX	
V_{CC}	Supply voltage		4.5	5	5.5	4.5	5	5.5	V
V_{IH}	High-level input voltage	V_{CC} = 4.5 V to 5.5 V	2			2			V
V_{IL}	Low-level input voltage	V_{CC} = 4.5 V to 5.5 V			0.8			0.8	V
V_I	Input voltage		0		V_{CC}	0		V_{CC}	V
V_O	Output voltage		0		V_{CC}	0		V_{CC}	V
t_t	Input transition rise/fall time				500			500	ns
T_A	Operating free-air temperature		– 55		125	– 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.
(2) SN54HCT125 is in product preview.

5.3 Thermal Information

THERMAL METRIC		D (SOIC) 14 PINS	N (PDIP) 14 PINS	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance(1)	138.7	75.3	°C/W
$R_{\theta JC}$	Junction-to-case (top) thermal resistance	93.8	68.6	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	94.7	55.1	°C/W
ψ_{JT}	Junction-to-top characterization paramete	49.1	41.1	°C/W
ψ_{JB}	Junction-to-board characterization parameter	94.3	54.9	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	N/A	N/A	°C/W

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

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5.4 Electrical Characteristics

PARAMETER		TEST CONDITIONS[1]	V_{CC} (V)	T_A = 25°C			SN54HCT125[3]		SN74HCT125		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
V_{OH}	High-level output voltage	I_{OH} = –20 μA	4.5	4.4	4.499		4.4		4.4		V
		I_{OH} = –6 mA		3.98	4.3		3.7		3.84		
V_{OL}	Low-level output voltage	I_{OL} = 20 μA	5.5		0.001	0.1		0.1		0.1	V
		I_{OL} = 6 mA			0.17	0.26		0.4		0.33	
I_I	Input hold current	$V_I = V_{CC}$ or 0	5.5		±0.1	±100		±1000		±1000	nA
I_{OZ}	Off-state output current	$V_o = V_{CC}$ or 0	5.5		±0.01	±0.5		±10		±5	μA
I_{CC}	Supply current	$V_I = V_{CC}$ or 0. I_O = 0	5.5			8		160		80	μA
ΔI_{CC} (2)	Supply-current change	One input at 0.5 V or 2.4 V, Other inputs at 0 or V_{CC}	5.5		1.4	2.4		3		2.9	mA
C_i	Input capacitance		4.5 to 5.5		3	10		10[4]		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}.
(3) SN54HCT125 is in product preview.
(4) On products compliant to MIL-PRF-38535, this parameter is not production tested.

5.5 Switching Characteristics

C_L = 50 pF. See Figure 6

PARAMETER		FROM (INPUT)	TO (OUTPUT)	V_{CC} (V)	T_A = 25°C			SN54HCT125 (1)		SN74HCT125		
					MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	Propagation delay	A	Y	4.5		11	20		39		25	ns
				5.5		10	18		35		22	
t_{en}	Enable time	$\overline{OE}$	Y	4.5		18	28		42		35	ns
				5.5		15	25		38		31	
t_{dis}	Diable time	$\overline{OE}$	Y	4.5		15	26		39		33	ns
				5.5		13	23		35		30	
t_t	Transition time		Any	4.5		8	15		22		19	ns
				5.5		7	14		21		17	

(1) SN54HCT125 is in product preview.

5.5 Switching Characteristics

C_L = 150 pF. See Figure 6

PARAMETER		FROM (INPUT)	TO (OUTPUT)	V_{CC} (V)	T_A = 25°C			SN54HCT125 (1)		SN74HCT125		
					MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{pd}	Propagation delay	A	Y	4.5		19	36		58		46	ns
				5.5		16	32		48		42	
t_{en}	Enable time	$\overline{OE}$	Y	4.5		25	40		60		50	ns
				5.5		21	35		53		43	
t_t	Transition time		Any	4.5		17	42		63		53	ns
				5.5		14	38		57		48	

(1) SN54HCT125 is in product preview.

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5.6 Operating Characteristics

T_A = 25°C

		Test Conditions	TYP	UNIT
C_{pd}	Power dissipation capacitance	No load	35	pF

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6 Parameter Measurement Information

t_{pd} is the maximum between t_{PLH} and t_{PHL}

t_t is the maximum between t_{TLH} and t_{THL}

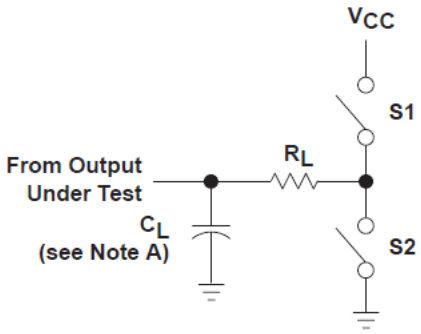

图 6-1. Load Circuit

PARAMETER		R_L	C_L	S1	S2
t_{en}	t_{PZH}	1 kΩ	50 pF or 150 pF	Open	Closed
	t_{PZL}			Closed	Open
t_{dis}	t_{PHZ}	1 kΩ	50 pF	Open	Closed
	t_{PLZ}			Closed	Open
t_{pd} or t_t		—	50 pF or 150 pF	Open	Open

图 6-2.

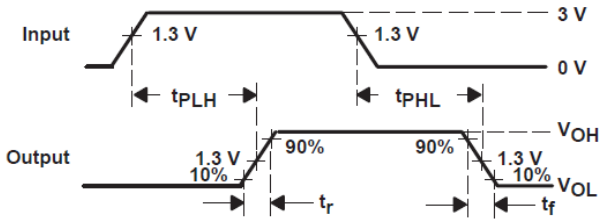

图 6-3. Voltage Waveforms
Propagation Delay Times

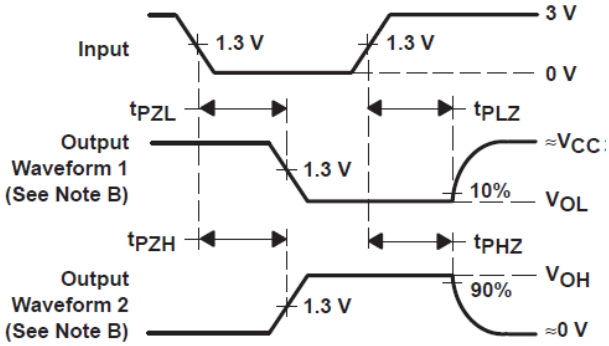

图 6-4. Voltage Waveforms
Enable and Disable Times For 3-state Outputs

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 diabled by the output control.
Waveform 2 is for an output with internal conditions such that the output is high except when diabled by the output control.

C. Phase relationships between waveforms were chosen arbitrarily. All input pulses are supplied by generators having the following charactersitics: PRR ⩽ 1 MHz, Z_O = 50 Ω, t_r = 6 ns, t_f = 6 ns.

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

E. t_{PLZ} and t_{PHZ} are the same as t_{dis}.

F. t_{PZL} and t_{PZH} are the same as t_{en}.

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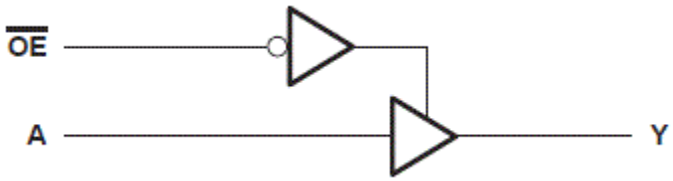
7 Detailed Description

7.1 Overview

These bus buffer gates feature independent line drivers with 3-state outputs. Each output is disabled when the associated output-enable ($\overline{OE}$) input is high.

To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

7.2 Functional Block Diagram



7.3 Device Functional Modes

表 7-1. Function Table (each gate)

INPUTS		OUTPUT
$\overline{OE}$	A	Y
L	H	H
L	L	L
H	X	Z

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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-μF capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1-μF and 1-μF 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.

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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。

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》。

10.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.
所有商标均为其各自所有者的财产。

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 part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
SN74HCT125D	Obsolete	Production	SOIC (D) | 14	-	-	Call TI	Call TI	-40 to 85	HCT125
SN74HCT125DR	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 85	HCT125
SN74HCT125DR.A	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT125
SN74HCT125DRE4	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT125
SN74HCT125DRE4.A	Active	Production	SOIC (D) | 14	2500 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HCT125
SN74HCT125DT	Obsolete	Production	SOIC (D) | 14	-	-	Call TI	Call TI	-40 to 85	HCT125
SN74HCT125N	Active	Production	PDIP (N) | 14	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HCT125N
SN74HCT125N.A	Active	Production	PDIP (N) | 14	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HCT125N
SN74HCT125NE4	Active	Production	PDIP (N) | 14	25 | TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74HCT125N

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

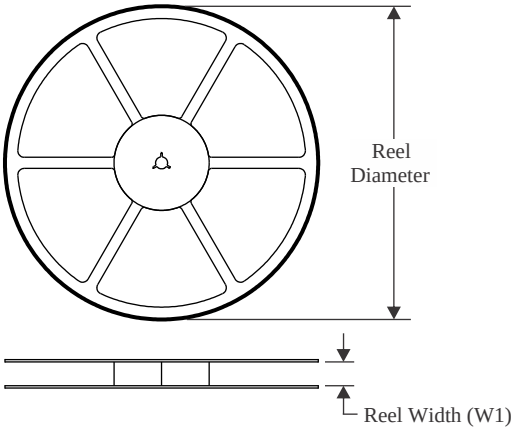
Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. 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.

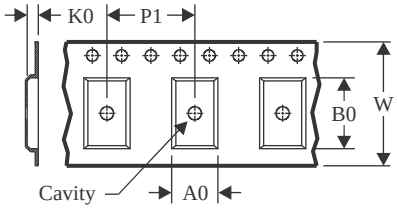
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

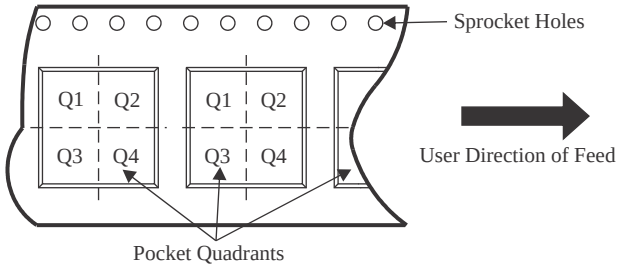


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	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

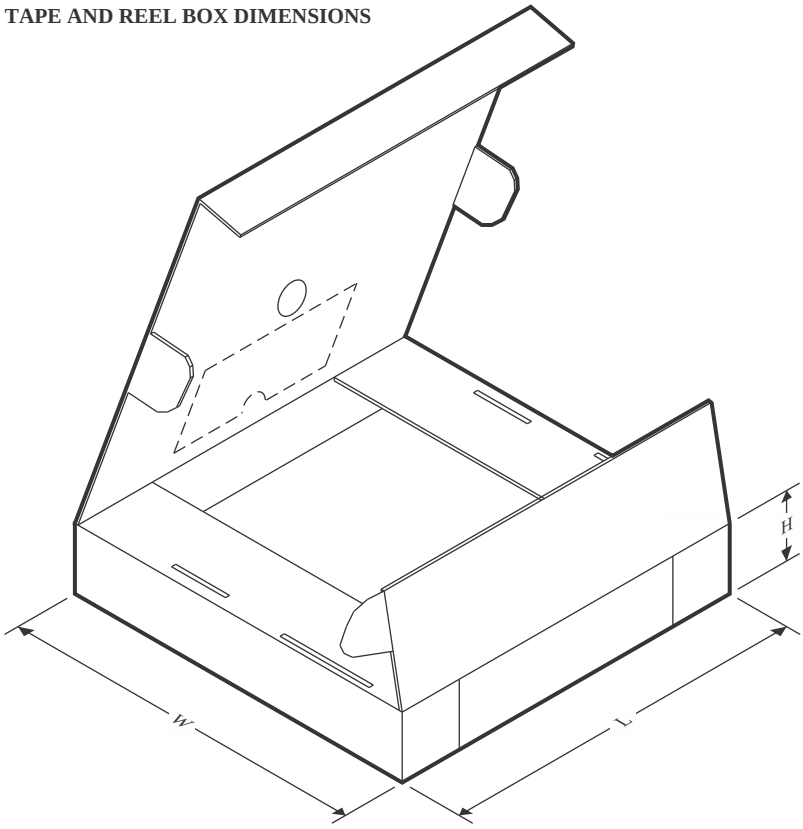
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74HCT125DR	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1
SN74HCT125DRE4	SOIC	D	14	2500	330.0	16.4	6.5	9.0	2.1	8.0	16.0	Q1

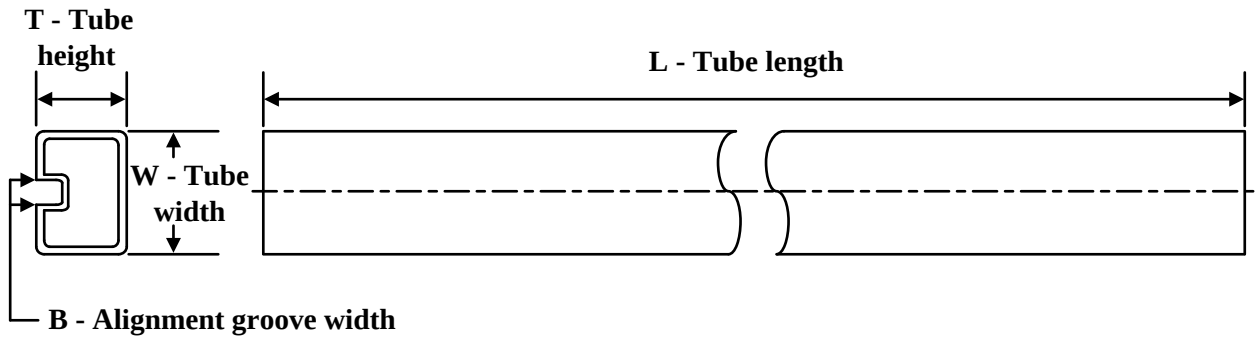
TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

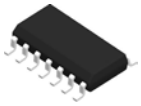
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74HCT125DR	SOIC	D	14	2500	353.0	353.0	32.0
SN74HCT125DRE4	SOIC	D	14	2500	353.0	353.0	32.0

TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
SN74HCT125N	N	PDIP	14	25	506	13.97	11230	4.32
SN74HCT125N	N	PDIP	14	25	506	13.97	11230	4.32
SN74HCT125N.A	N	PDIP	14	25	506	13.97	11230	4.32
SN74HCT125N.A	N	PDIP	14	25	506	13.97	11230	4.32
SN74HCT125NE4	N	PDIP	14	25	506	13.97	11230	4.32
SN74HCT125NE4	N	PDIP	14	25	506	13.97	11230	4.32

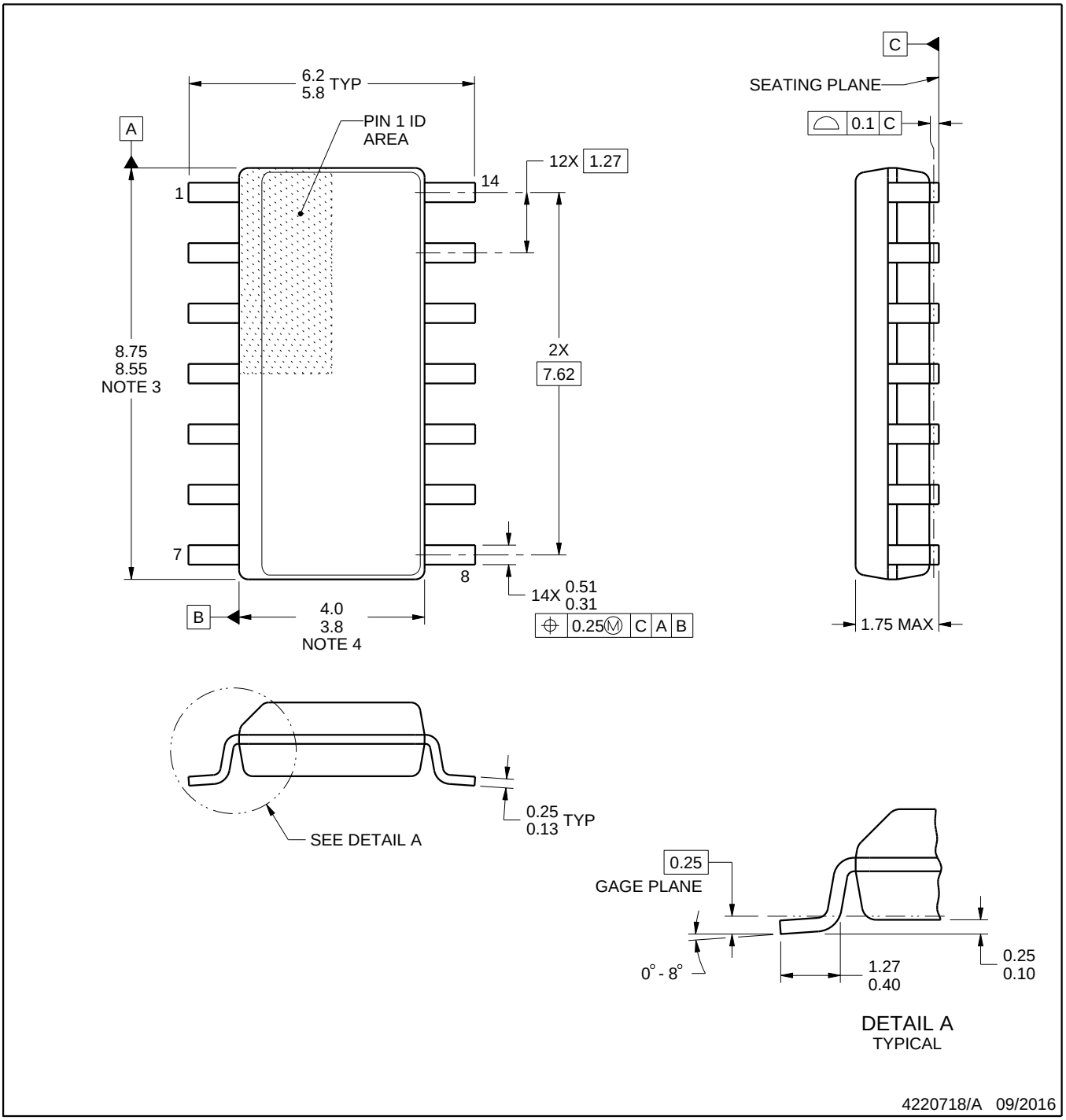


PACKAGE OUTLINE

D0014A

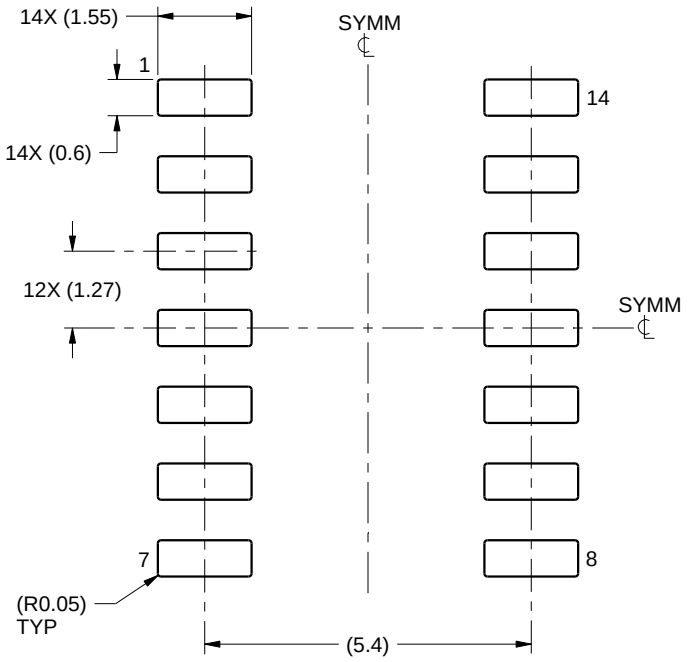
SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

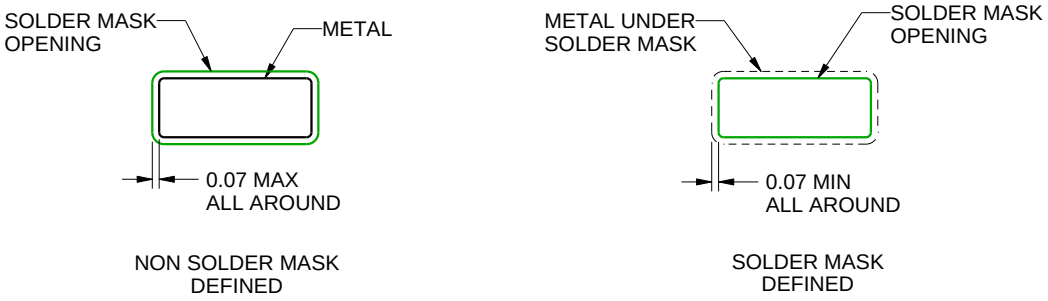


NOTES:

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.



LAND PATTERN EXAMPLE
SCALE:8X



SOLDER MASK DETAILS

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NOTES: (continued)

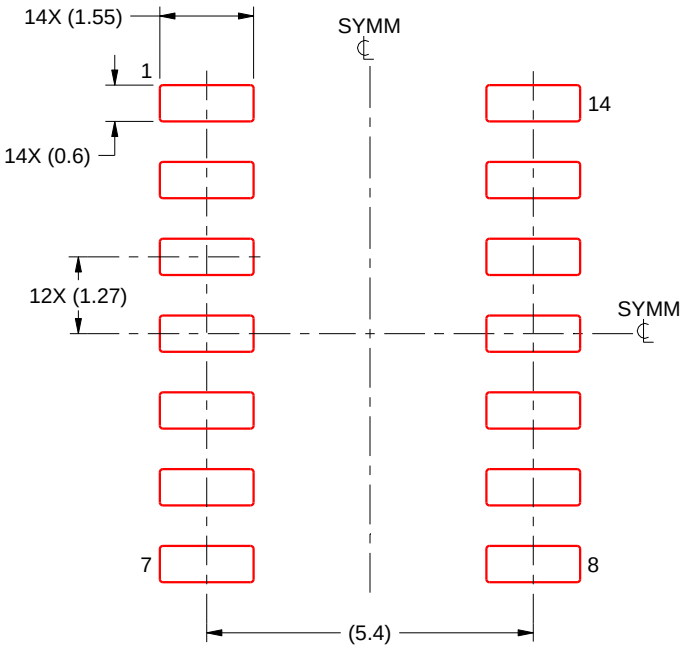
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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

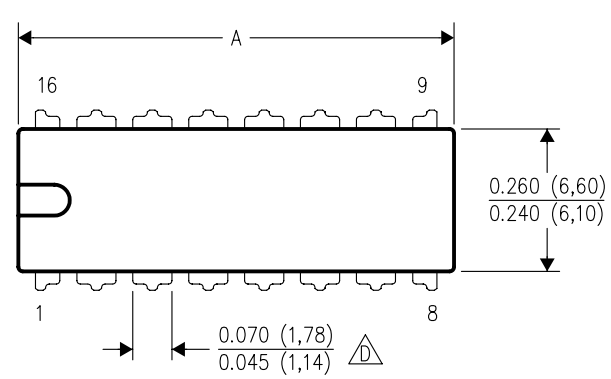
NOTES: (continued)

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.

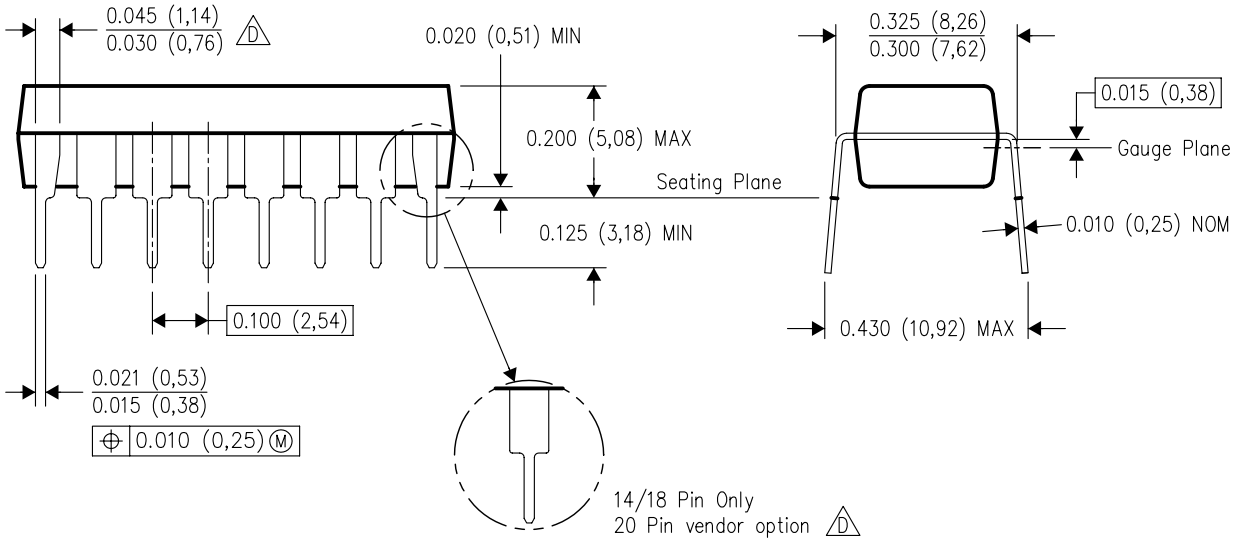
N (R–PDIP–T**)

PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN



DIM \ PINS **	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS–001 VARIATION (C)	AA	BB	AC	AD



4040049/E 12/2002

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.

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