

# SN74AHCT174 Hex D-Type Flip-Flops with Clear

## 1 Features

- Inputs are TTL-voltage compatible
- Contain six flip-flops with single-rail outputs
- Latch-Up performance exceeds 250mA per JESD 17

## 2 Applications

- Buffer/Storage Registers
- [Shift Registers](#)
- Pattern Generators

## 3 Description

These positive-edge-triggered D-type flip-flops have a direct clear ( $\overline{CLR}$ ) input.

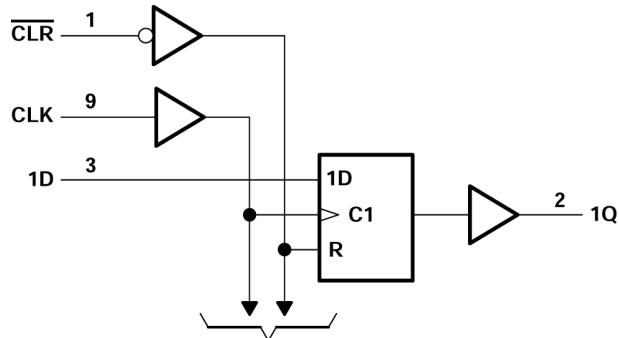
### Package Information

PART NUMBER	PACKAGE <sup>(1)</sup>	PACKAGE <sup>(2)</sup>	BODY SIZE <sup>(3)</sup>
SN74AHCT174	D (SOIC, 16)	9.9mm × 6mm	9.00mm × 3.90mm
	DB (SSOP, 16)	6.2mm × 7.8mm	6.2mm × 5.3mm
	N (PDIP, 16)	19.3mm × 9.4mm	19.3mm × 6.35mm
	NS (SOP, 16)	10.2mm × 7.8mm	10.2mm × 5.3mm
	PW (TSSOP, 16)	5mm × 6.4mm	5.00mm × 4.40mm

(1) For more information, see [Mechanical, Packaging, and Orderable Information](#).

(2) The package size (length × width) is a nominal value and includes pins, where applicable.

(3) The body size (length × width) is a nominal value and does not include pins.



To Five Other Channels  
Logic Diagram (Positive Logic)

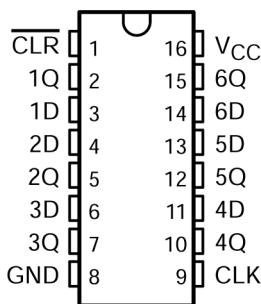


An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. UNLESS OTHERWISE NOTED, this document contains PRODUCTION DATA.

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## 4 Pin Configuration and Functions



**Figure 4-1. Package SN74AHCT174 D, DB, DGV, N, NS, or PW Package (Top View)**

**Table 4-1. Pin Functions**

PIN		I/O <sup>(1)</sup>	DESCRIPTION
NO.	NAME		
1	CLR	I	Clear all channels, active low
2	1Q	O	Channel 1, Q output
3	1D	I	Channel 1, D input
4	2D	I	Channel 2, D input
5	2Q	O	Channel 2, Q output
6	3D	I	Channel 3, D input
7	3Q	O	Channel 3, Q output
8	GND	—	Ground
9	CLK	I	Clock all channels, rising edge triggered
10	4Q	O	Channel 4, Q output
11	4D	I	Channel 4, D input
12	5Q	O	Channel 5, Q output
13	5D	I	Channel 5, D input
14	6D	I	Channel 6, D input
15	6Q	O	Channel 6, Q output
16	V <sub>CC</sub>	—	Positive supply

## 5 Specifications

### 5.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>

		MIN	MAX	UNIT
V <sub>CC</sub>	Supply voltage range	-0.5	7	V
V <sub>I</sub> <sup>(1)</sup>	Input voltage range	-0.5	7	V
V <sub>O</sub> <sup>(1)</sup>	Output voltage range	-0.5	V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	Input clamp current (V <sub>I</sub> < 0)		-20	mA
I <sub>OK</sub>	Output clamp current (V <sub>O</sub> < 0 or V <sub>O</sub> > V <sub>CC</sub> )		±20	mA
I <sub>O</sub>	Continuous output current (V <sub>O</sub> = 0 to V <sub>CC</sub> )		±25	mA
	Continuous current through V <sub>CC</sub> or GND		±50	mA
T <sub>stg</sub>	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.

### 5.2 ESD Ratings

		VALUE	UNIT
V <sub>(ESD)</sub>	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 <sup>(1)</sup>	±2000
		Charged-device model (CDM), per ANSI/ESDA/JEDEC JS-002 <sup>(2)</sup>	

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

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

### 5.3 Recommended Operating Conditions

(over operating free-air temperature range (unless otherwise noted)<sup>(1)</sup>)

		SN74AHCT174		UNIT
		MIN	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5.5	V
V <sub>IH</sub>	High-level input voltage	2		V
V <sub>IL</sub>	Low-level input voltage		0.8	V
V <sub>I</sub>	Input voltage	0	5.5	V
V <sub>O</sub>	Output voltage	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current		-8	mA
I <sub>OL</sub>	Low-level output current		8	mA
Δt/Δv	Input transition rise or fall time		20	ns/V
T <sub>A</sub>	Operating free-air temperature	-40	85	°C

- (1) All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

### 5.4 Thermal Information

THERMAL METRIC <sup>(1)</sup>		SN74AHCT174						UNIT
		D (SOIC)	DB (SSOP)	DGV (TSSOP)	N (PDIP)	NS (SOP)	PW (TSSOP)	
16 PINS								
R <sub>θJA</sub>	Junction-to-ambient thermal resistance	73	82	120	67	64	135.9	°C/W

- (1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report ([SPRA953](#)).

## 5.5 Electrical Characteristics

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	T <sub>A</sub> = 25 °C			SN74AHCT174		UNIT
			MIN	TYP	MAX	MIN	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -50 µA	4.5 V	4.4	4.5		4.4		V
	I <sub>OH</sub> = -8 mA		3.94			3.8		
V <sub>OL</sub>	I <sub>OL</sub> = 50 µA	4.5 V		0.1		0.1		V
	I <sub>OL</sub> = 8 mA			0.36		0.44		
I <sub>I</sub>	V <sub>I</sub> = 5.5 V or GND	0 V to 5.5 V		±0.1		±1	µA	
I <sub>CC</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V		4		40	µA	
ΔI <sub>CC</sub> <sup>(1)</sup>	One input at 3.4 V, Other inputs at V <sub>CC</sub> or GND	5.5 V		1.35		1.5	µA	
C <sub>i</sub>	V <sub>I</sub> = V <sub>CC</sub> or GND	5 V	2	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<sub>CC</sub>.

## 5.6 Timing Requirements

over recommended operating free-air temperature range, V<sub>CC</sub> = 5 V ± 0.5 V (unless otherwise noted)

			T <sub>A</sub> = 25°C		SN74AHCT174		UNIT
			MIN	MAX	MIN	MAX	
t <sub>w</sub>	Pulse duration	CLR low	5		5		ns
		CLK high or low	5		5		
t <sub>su</sub>	Setup time before CLK↑	Data	5		5		ns
		CLR inactive	3.5		3.5		
t <sub>h</sub>	Hold time, data after CLK↑		0		0		ns

## 5.7 Switching Characteristics

over recommended operating free-air temperature range, V<sub>CC</sub> = 5 V ± 0.5 V (unless otherwise noted) (see [Figure 6-1](#))

PARAMETER	FROM (INPUT)	TO (OUTPUT)	LOAD CAPACITANCE	T <sub>A</sub> = 25°C			SN74AHCT174		UNIT
				MIN	TYP	MAX	MIN	MAX	
f <sub>max</sub>			C <sub>L</sub> = 15 pF	100 <sup>(1)</sup>	135 <sup>(1)</sup>		80		MHz
			C <sub>L</sub> = 50 pF	80	115		65		
t <sub>PHL</sub>	CLR	Any Q	C <sub>L</sub> = 15 pF		7.6 <sup>(1)</sup>	10.4 <sup>(1)</sup>	1	13	ns
t <sub>PLH</sub>	CLK	Any Q	C <sub>L</sub> = 15 pF		5.8 <sup>(1)</sup>	7.8 <sup>(1)</sup>	1	9	ns
					5.8 <sup>(1)</sup>	7.8 <sup>(1)</sup>	1	9	
t <sub>PHL</sub>	CLR	Any Q	C <sub>L</sub> = 50 pF		8.1	11.4	1	13	ns
t <sub>PLH</sub>	CLK	Any Q	C <sub>L</sub> = 50 pF		6.3	8.8	1	10	ns
					6.3	8.8	1	10	
t <sub>sk(o)</sub>			C <sub>L</sub> = 50 pF			1 <sup>(2)</sup>		1	ns

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested.

(2) On products compliant to MIL-PRF-38535, this parameter does not apply.

## 5.8 Noise Characteristics

V<sub>CC</sub> = 5 V, C<sub>L</sub> = 50 pF, T<sub>A</sub> = 25°C<sup>(1)</sup>

PARAMETER	SN74AHCT174			UNIT
	MIN	TYP	MAX	
V <sub>OL(P)</sub>	Quiet output, maximum dynamic V <sub>OL</sub>		0.8	V
V <sub>OL(V)</sub>	Quiet output, minimum dynamic V <sub>OL</sub>		-0.8	V

$V_{CC} = 5 \text{ V}$ ,  $C_L = 50 \text{ pF}$ ,  $T_A = 25^\circ\text{C}$ <sup>(1)</sup>

PARAMETER	SN74AHCT174			UNIT
	MIN	TYP	MAX	
$V_{OH(V)}$ Quiet output, minimum dynamic $V_{OH}$	4			V
$V_{IH(D)}$ High-level dynamic input voltage	2			V
$V_{IL(D)}$ Low-level dynamic input voltage			0.8	V

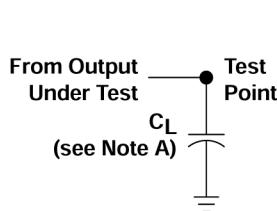
(1) Characteristics are for surface-mount packages only.

## 5.9 Operating Characteristics

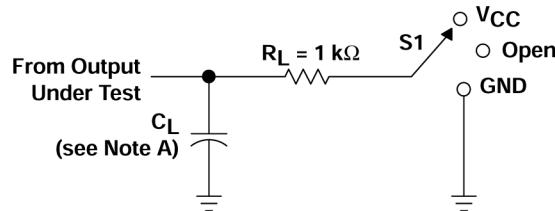
 $T_A = 25^\circ\text{C}$ 

PARAMETER	TEST CONDITIONS	TYP	UNIT
$C_{pd}$ Power dissipation capacitance	No load, $f = 1 \text{ MHz}$	28	pF

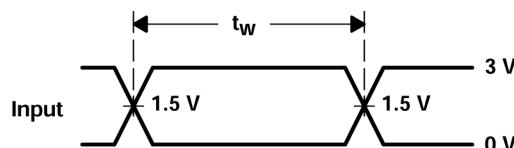
## 6 Parameter Measurement Information



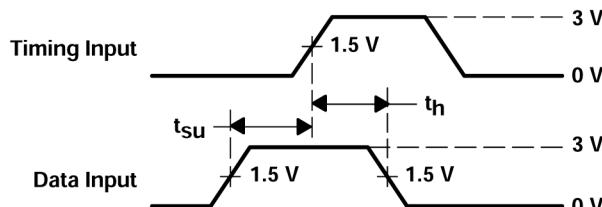
LOAD CIRCUIT FOR  
TOTEM-POLE OUTPUTS



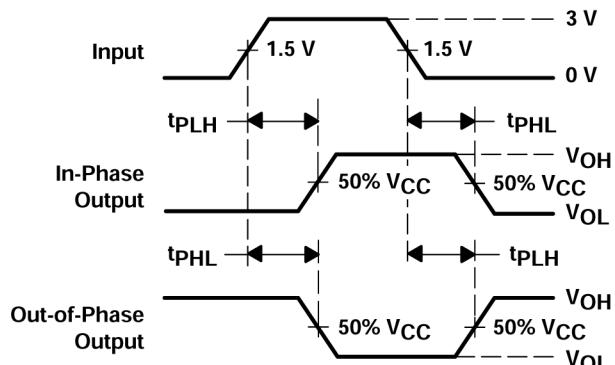
LOAD CIRCUIT FOR  
3-STATE AND OPEN-DRAIN OUTPUTS



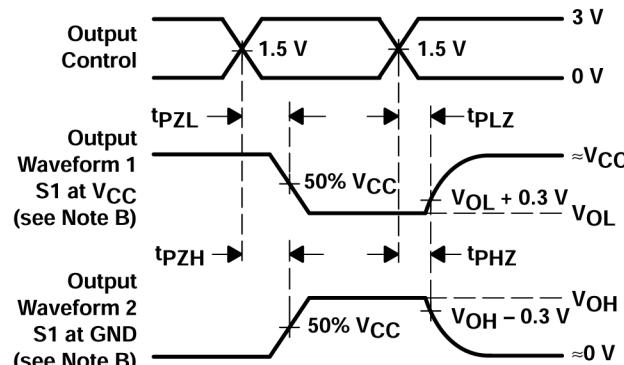
VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES  
LOW- AND HIGH-LEVEL ENABLING

- 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.

Figure 6-1. Load Circuit and Voltage Waveforms

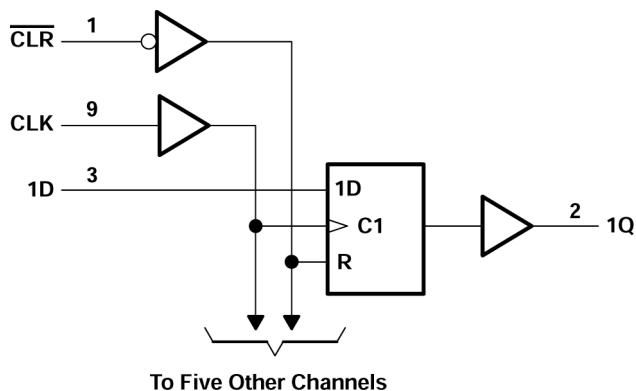
TEST	S1
$t_{PLH}/t_{PHL}$	Open
$t_{PLZ}/t_{PZL}$	$V_{CC}$
$t_{PHZ}/t_{PZH}$	$GND$
Open Drain	$V_{CC}$

## 7 Detailed Description

## 7.1 Overview

Information at the data (D) inputs meeting the setup time requirements is transferred to the outputs on the positive-going edge of the clock (CLK) pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going edge of CLK. When CLK is at either the high or low level, the D input has no effect at the output.

## 7.2 Functional Block Diagram



**Figure 7-1. Logic Diagram (Positive Logic)**

Pin numbers shown are for the D, DB, DGV, J, N, NS, PW, and W packages.

### 7.3 Device Functional Modes

**Table 7-1. Function Table**

INPUTS <sup>(1)</sup>			OUTPUT
CLR	CLK	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Qo

(1) H = High Voltage Level, L = Low Voltage Level, X = Do not Care, Z = High Impedance

## 8 Application and Implementation

### Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

### 8.1 Power Supply Recommendations

The power supply can be any voltage between the min and max supply voltage rating located in [Section 5.3](#).

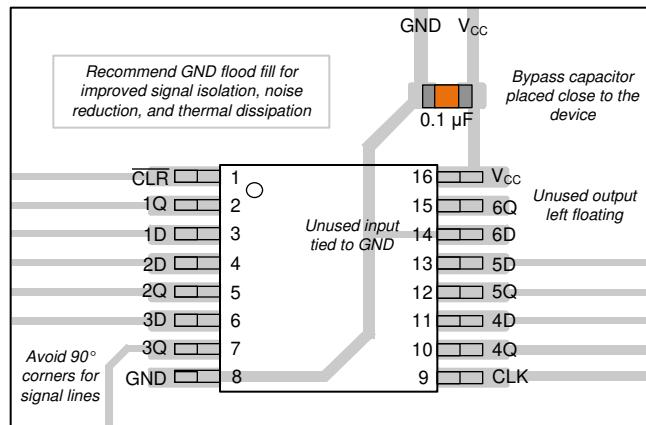
Each  $V_{CC}$  terminal should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, a  $0.1\ \mu F$  capacitor is recommended. If there are multiple  $V_{CC}$  terminals then  $0.01\ \mu F$  or  $0.022\ \mu F$  capacitors are recommended for each power terminal. It is ok to parallel multiple bypass capacitors to reject different frequencies of noise.  $0.1\ \mu F$  and  $1.0\ \mu F$  capacitors are commonly used in parallel. The bypass capacitor should be installed as close to the power terminal as possible for the best results.

### 8.2 Layout

#### 8.2.1 Layout Guidelines

When using multiple bit logic devices, inputs should not float. In many cases, functions or parts of functions of digital logic devices are unused. Some examples are when only two inputs of a triple-input AND gate are used, or when 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.

#### 8.2.2 Layout Example



**Figure 8-1. Example layout for the SN74AHCT174 in the PW package.**

## 9 Device and Documentation Support

### 9.1 Documentation Support (Analog)

#### 9.1.1 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.

**Table 9-1. Related Links**

PARTS	PRODUCT FOLDER	SAMPLE & BUY	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
SN74AHCT174	<a href="#">Click here</a>				

### 9.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](#). Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 9.3 Support Resources

[TI E2E™ support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

### 9.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 9.5 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.

### 9.6 Glossary

[TI Glossary](#) This glossary lists and explains terms, acronyms, and definitions.

## 10 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

<b>Changes from Revision G (May 2023) to Revision H (July 2024)</b>	<b>Page</b>
• Added package size to <i>Package Information</i> table.....	<a href="#">1</a>
• Deleted machine model from <i>ESD Ratings</i> table.....	<a href="#">4</a>
• Updated R <sub>0JA</sub> value: PW = 108 to 135.9, all values in °C/W.....	<a href="#">4</a>
• Added <i>Application and Implementation</i> section.....	<a href="#">9</a>
• Added <i>Device and Documentation Support</i> section .....	<a href="#">10</a>

<b>Changes from Revision F (April 2002) to Revision G (May 2023)</b>	<b>Page</b>
• Added <i>Applications</i> , <i>Package Information</i> table, <i>Pin Functions</i> table, and <i>Thermal Information</i> table.....	<a href="#">1</a>

## 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.

**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)
<a href="#">SN74AHCT174D</a>	Obsolete	Production	SOIC (D)   16	-	-	Call TI	Call TI	-40 to 85	AHCT174
<a href="#">SN74AHCT174DBR</a>	Active	Production	SSOP (DB)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB174
<a href="#">SN74AHCT174DBR.A</a>	Active	Production	SSOP (DB)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB174
<a href="#">SN74AHCT174DR</a>	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT174
<a href="#">SN74AHCT174DR.A</a>	Active	Production	SOIC (D)   16	2500   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT174
<a href="#">SN74AHCT174N</a>	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74AHCT174N
<a href="#">SN74AHCT174N.A</a>	Active	Production	PDIP (N)   16	25   TUBE	Yes	NIPDAU	N/A for Pkg Type	-40 to 85	SN74AHCT174N
<a href="#">SN74AHCT174NSR</a>	Active	Production	SOP (NS)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT174
<a href="#">SN74AHCT174NSR.A</a>	Active	Production	SOP (NS)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	AHCT174
<a href="#">SN74AHCT174PWR</a>	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU   SN	Level-1-260C-UNLIM	-40 to 85	HB174
<a href="#">SN74AHCT174PWR.A</a>	Active	Production	TSSOP (PW)   16	2000   LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	HB174

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **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.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **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.

<sup>(5)</sup> **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.

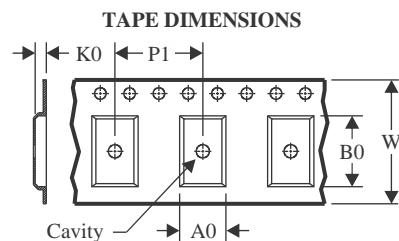
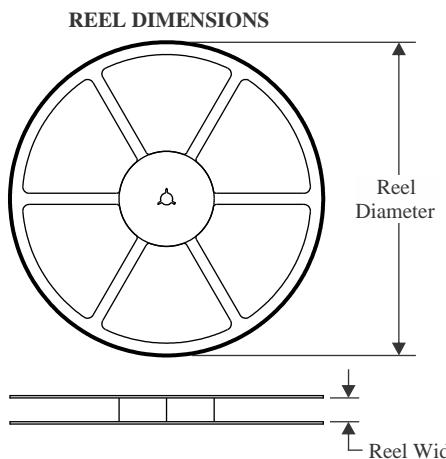
<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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.

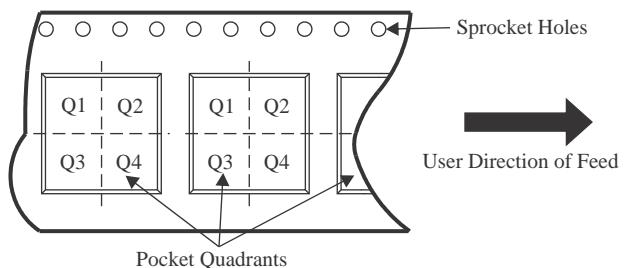
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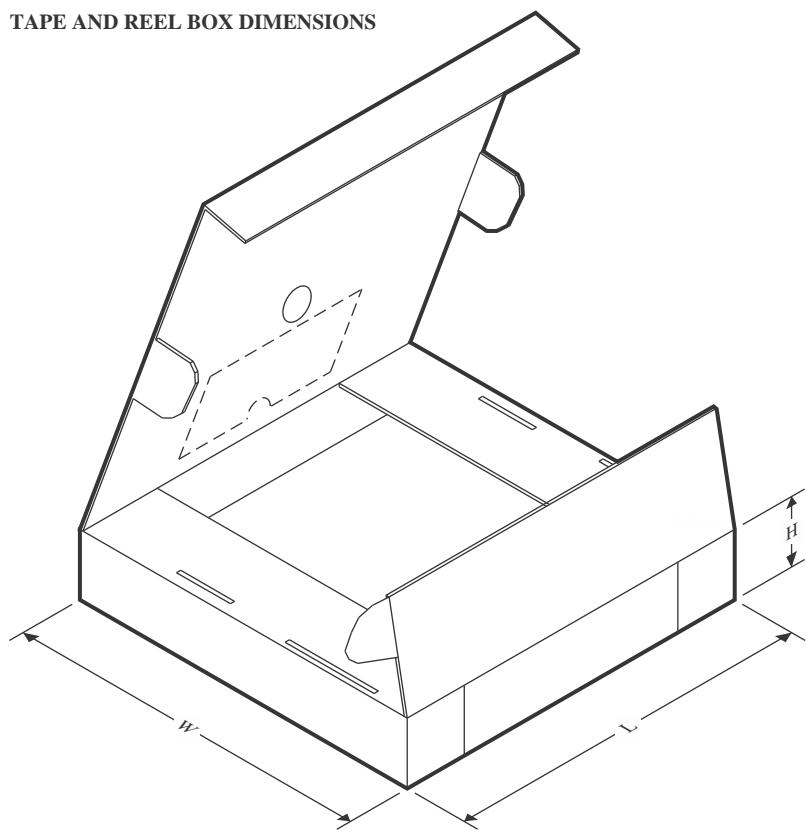
**TAPE AND REEL INFORMATION**


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**


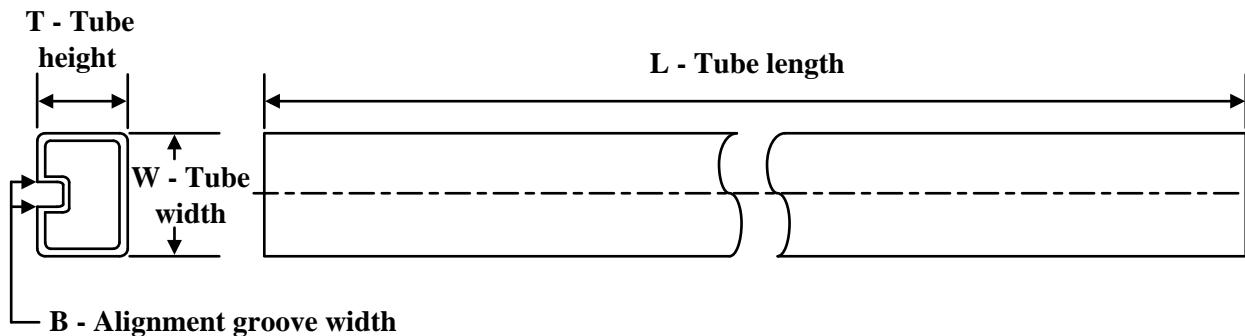
\*All dimensions are nominal

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
SN74AHCT174DBR	SSOP	DB	16	2000	330.0	16.4	8.35	6.6	2.4	12.0	16.0	Q1
SN74AHCT174DR	SOIC	D	16	2500	330.0	16.4	6.5	10.3	2.1	8.0	16.0	Q1
SN74AHCT174NSR	SOP	NS	16	2000	330.0	16.4	8.1	10.4	2.5	12.0	16.0	Q1
SN74AHCT174PWR	TSSOP	PW	16	2000	330.0	16.4	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)
SN74AHCT174DBR	SSOP	DB	16	2000	353.0	353.0	32.0
SN74AHCT174DR	SOIC	D	16	2500	353.0	353.0	32.0
SN74AHCT174NSR	SOP	NS	16	2000	353.0	353.0	32.0
SN74AHCT174PWR	TSSOP	PW	16	2000	353.0	353.0	32.0

**TUBE**


\*All dimensions are nominal

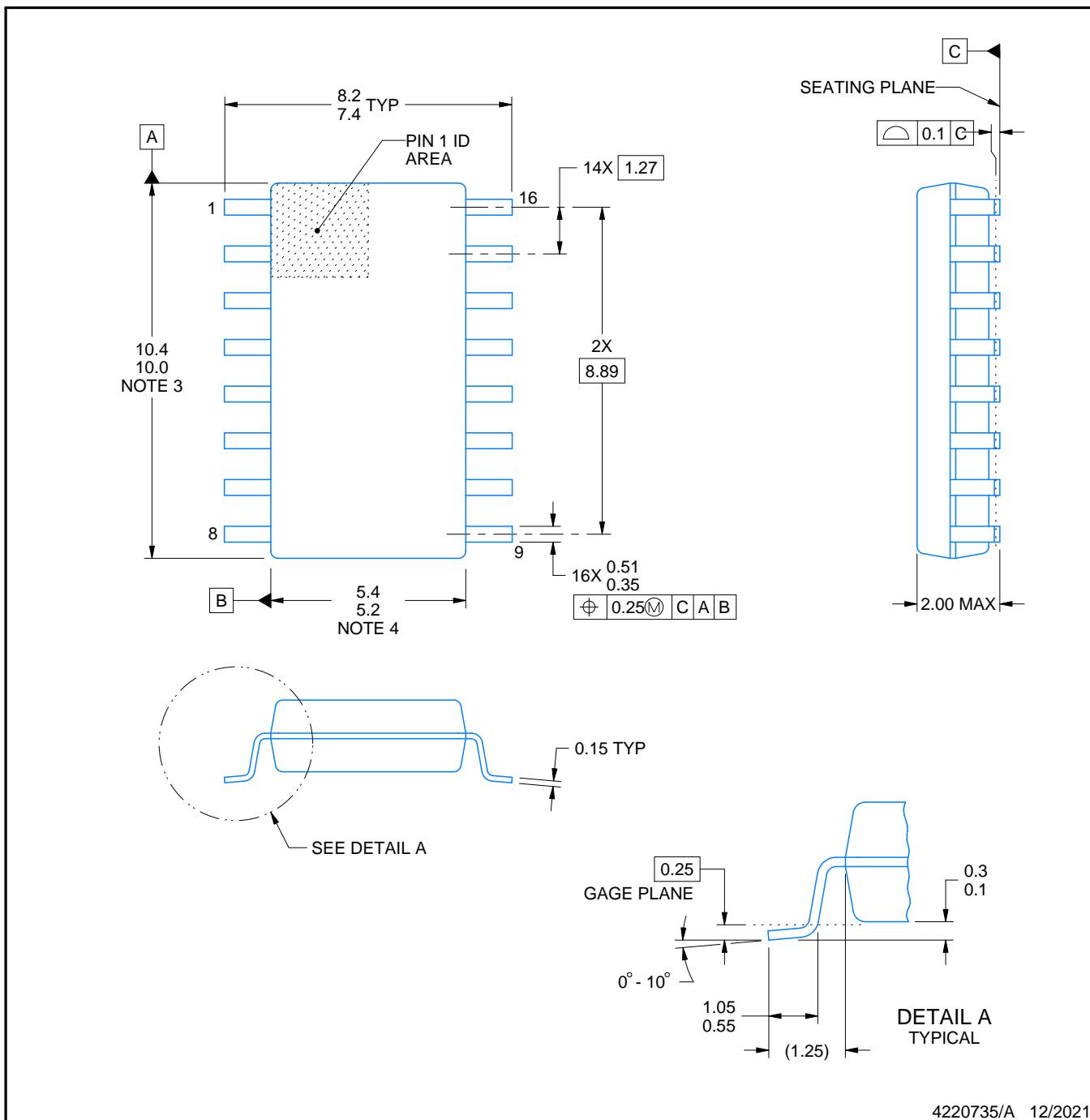
Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T ( $\mu$ m)	B (mm)
SN74AHCT174N	N	PDIP	16	25	506	13.97	11230	4.32
SN74AHCT174N	N	PDIP	16	25	506	13.97	11230	4.32
SN74AHCT174N.A	N	PDIP	16	25	506	13.97	11230	4.32
SN74AHCT174N.A	N	PDIP	16	25	506	13.97	11230	4.32



# PACKAGE OUTLINE

## SOP - 2.00 mm max height

SOP



### NOTES:

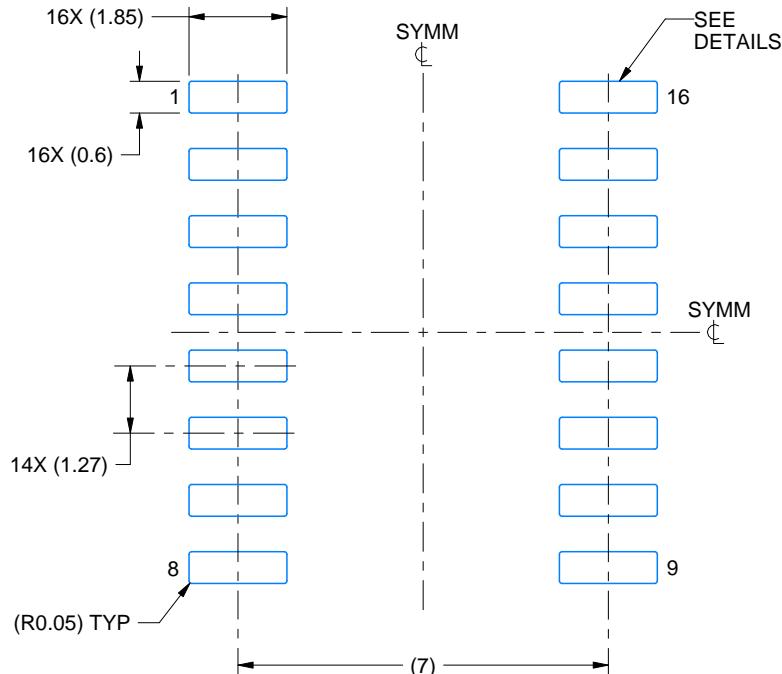
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm, per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm, per side.

# EXAMPLE BOARD LAYOUT

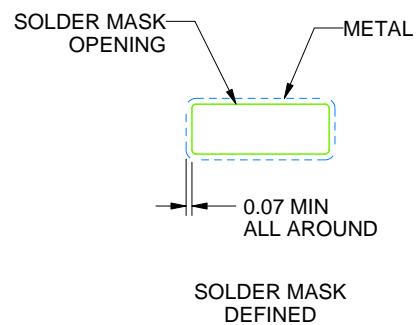
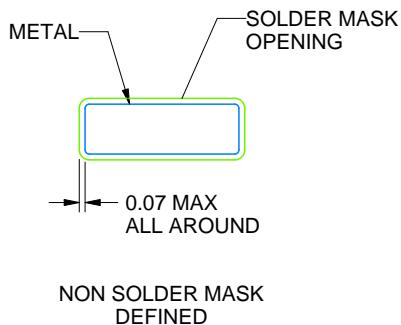
NS0016A

SOP - 2.00 mm max height

SOP



LAND PATTERN EXAMPLE  
SCALE:7X



SOLDER MASK DETAILS

4220735/A 12/2021

NOTES: (continued)

5. Publication IPC-7351 may have alternate designs.

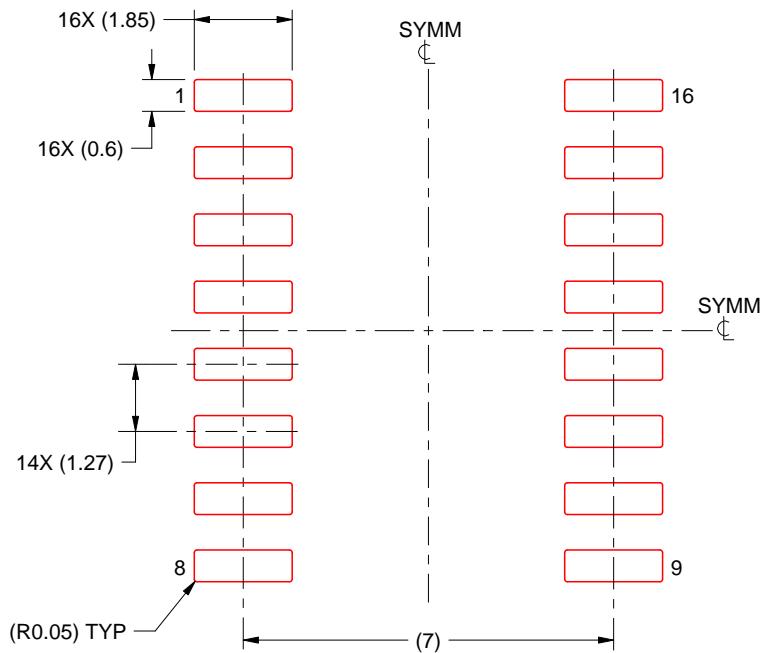
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

NS0016A

SOP - 2.00 mm max height

SOP



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:7X

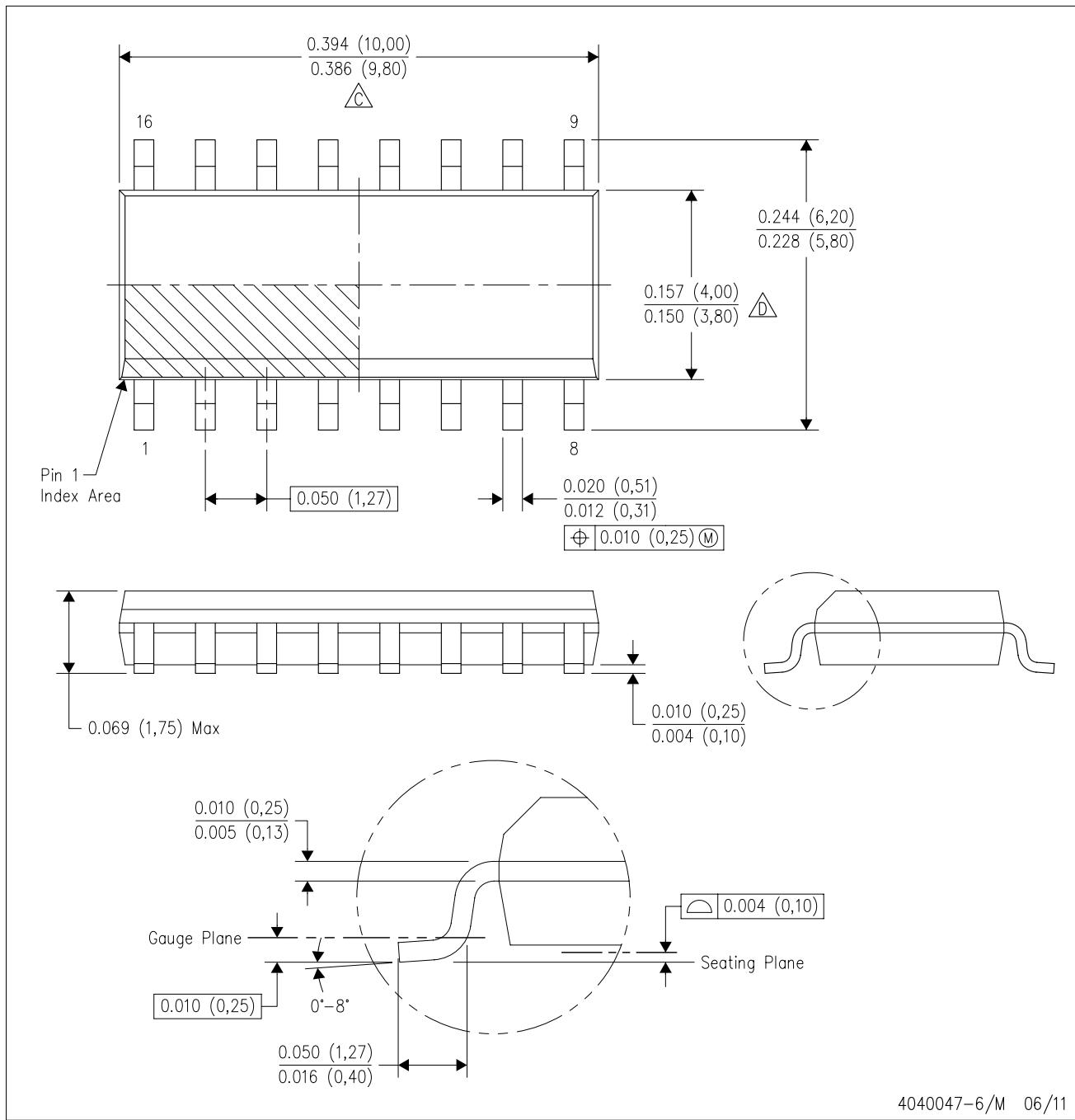
4220735/A 12/2021

NOTES: (continued)

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

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters).

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 0.006 (0,15) each side.

D. Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.

E. Reference JEDEC MS-012 variation AC.

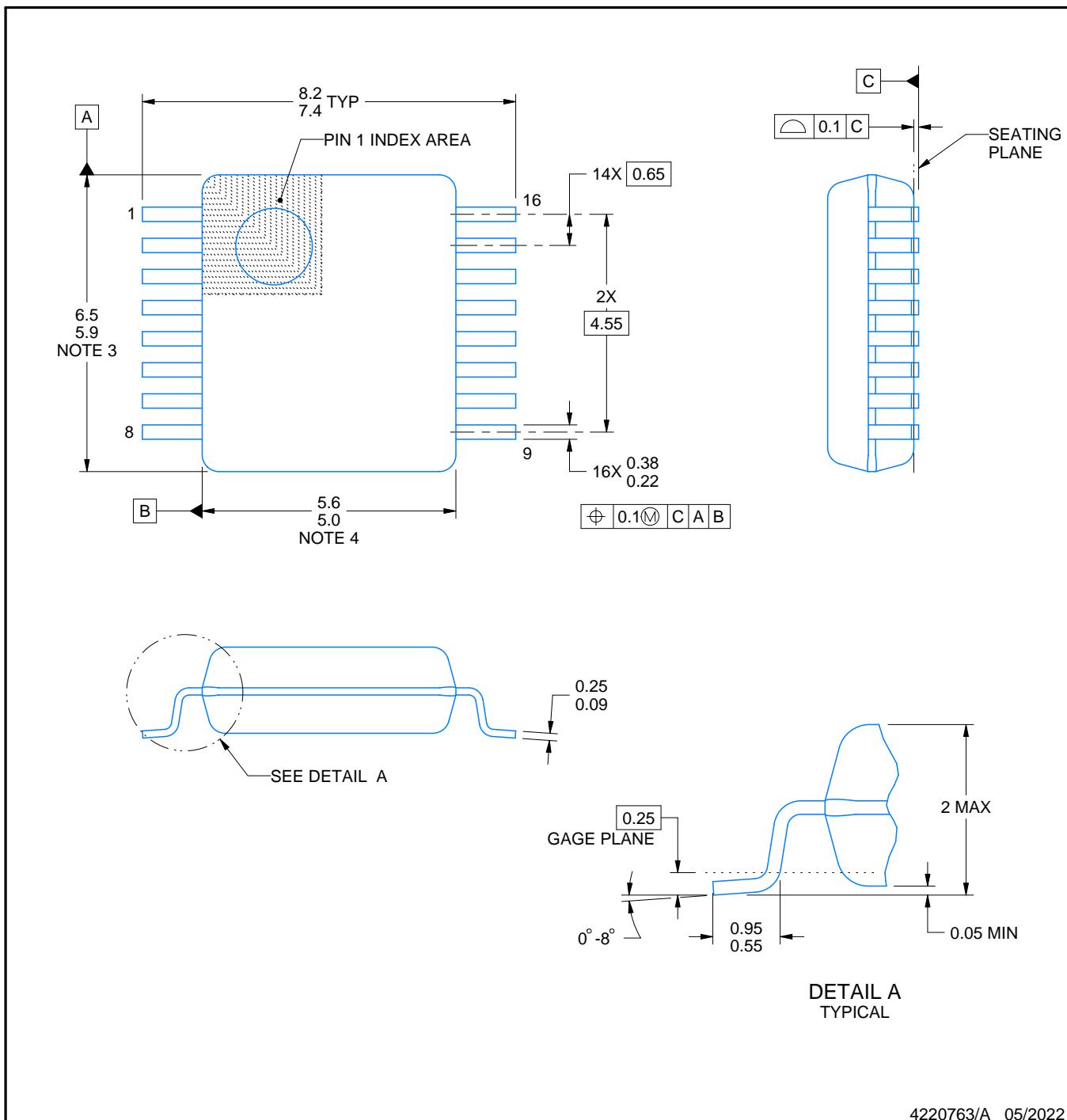
# PACKAGE OUTLINE

DB0016A



SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



NOTES:

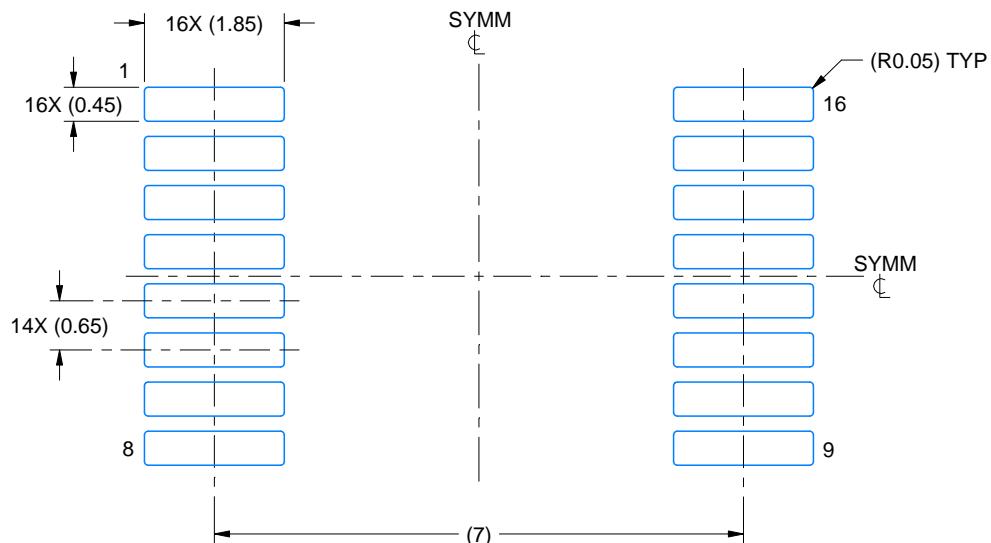
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-150.

# EXAMPLE BOARD LAYOUT

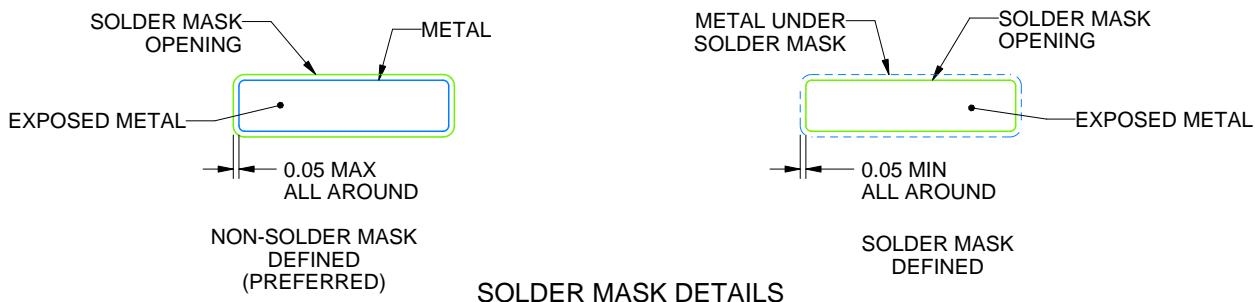
DB0016A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220763/A 05/2022

NOTES: (continued)

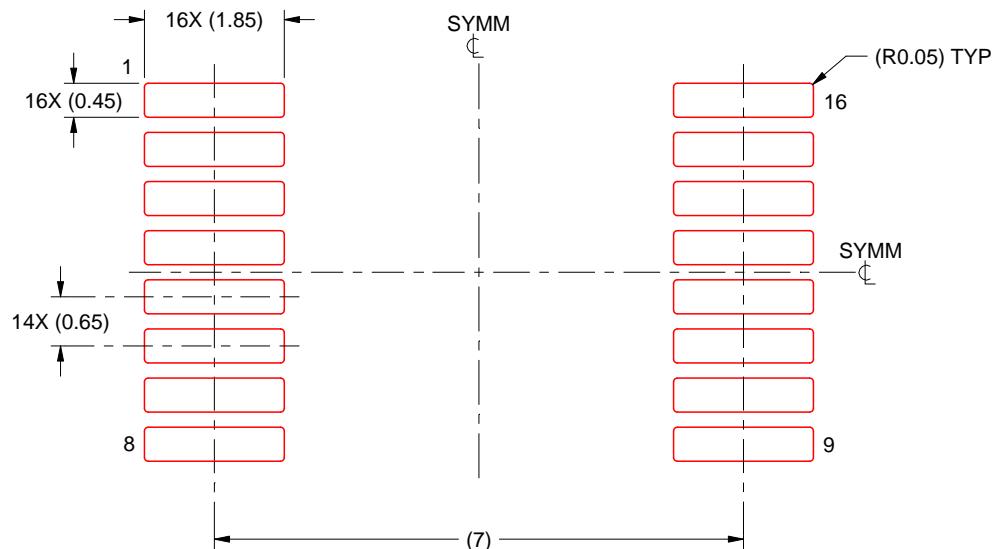
5. Publication IPC-7351 may have alternate designs.
6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

DB0016A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

4220763/A 05/2022

NOTES: (continued)

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

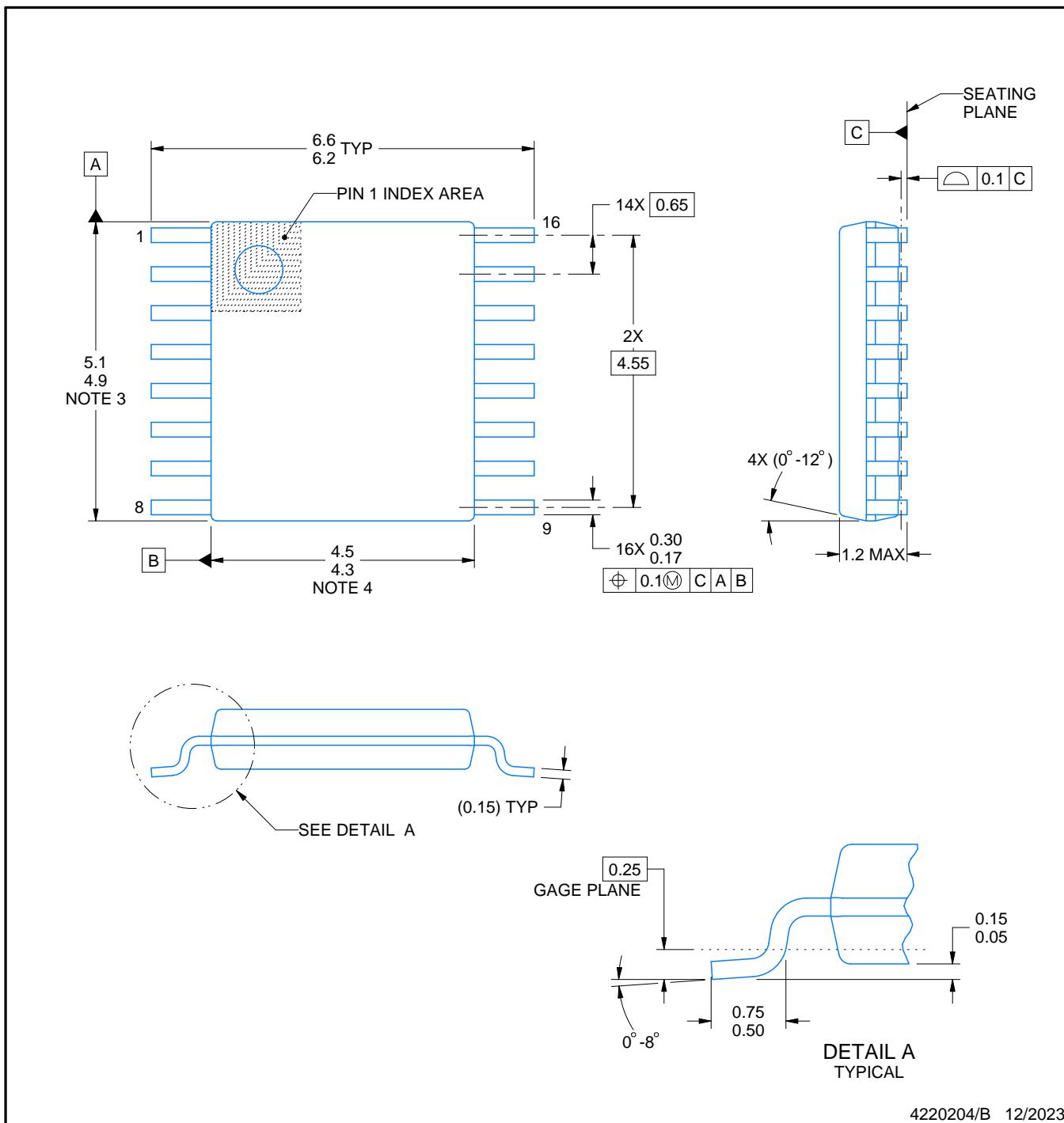
## PACKAGE OUTLINE

**PW0016A**



## **TSSOP - 1.2 mm max height**

## SMALL OUTLINE PACKAGE



## NOTES:

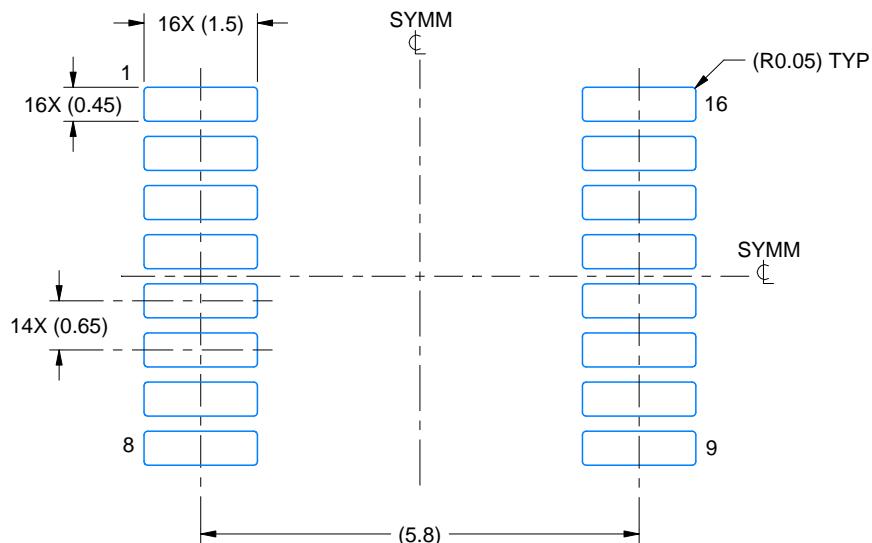
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
  2. This drawing is subject to change without notice.
  3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, 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

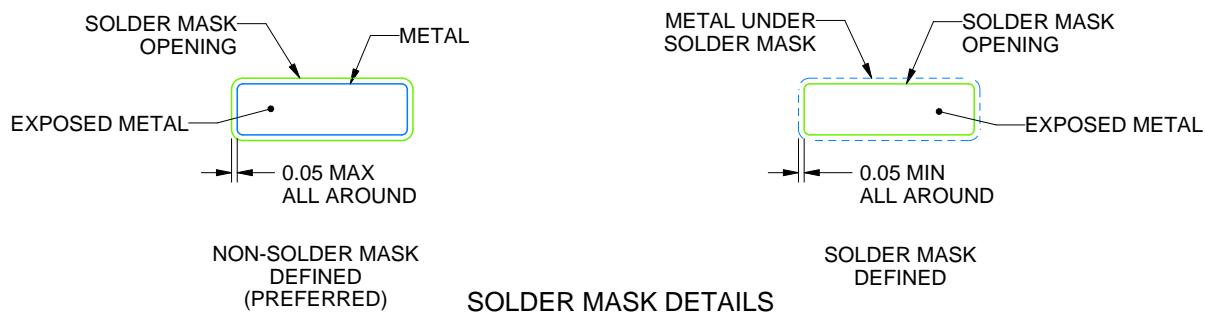
PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220204/B 12/2023

NOTES: (continued)

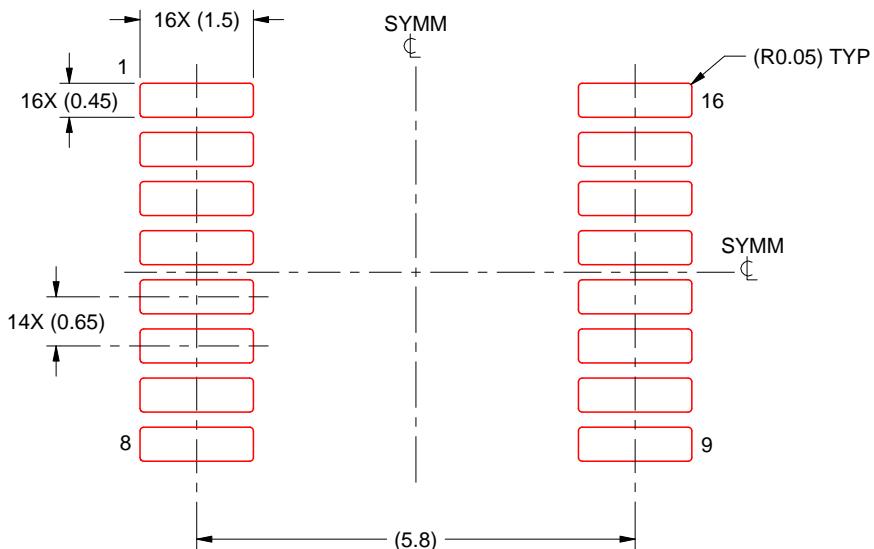
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

PW0016A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220204/B 12/2023

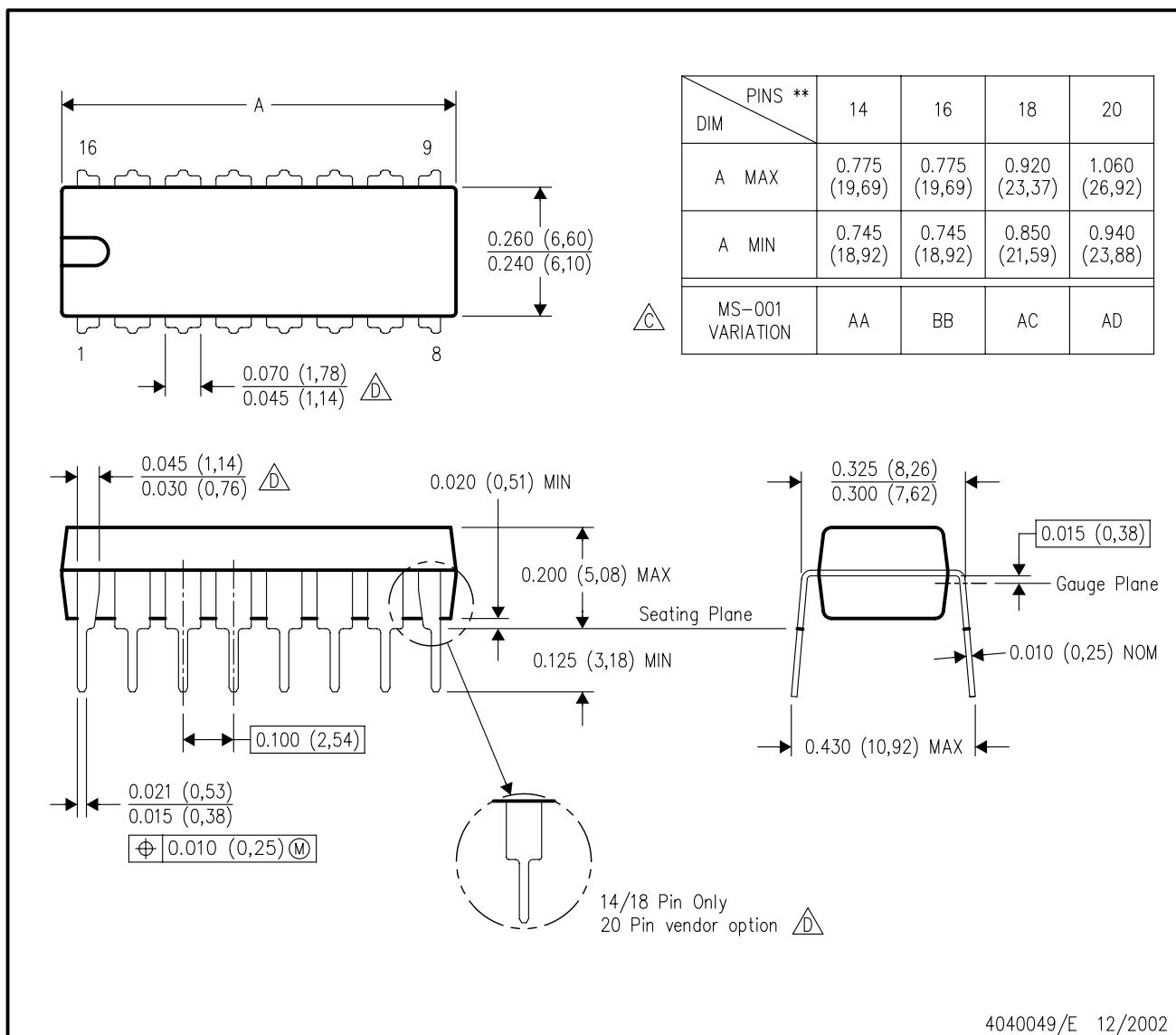
NOTES: (continued)

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.

## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



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