

## SNx4HCT02 Quadruple 2-Input Positive-Nor Gates

### 1 Features

- Operating voltage range of 4.5V to 5.5V
- Outputs can drive up to 10 LSTTL loads
- Low power consumption, 20-μA max  $I_{CC}$
- Typical  $t_{pd} = 10\text{ns}$
- $\pm 4\text{-mA}$  output drive at 5V
- Low input current of 1μA max
- Inputs are TTL-Voltage compatible

### 2 Description

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.

#### Device Information<sup>(1)</sup>

| PART NUMBER  | PACKAGE    | BODY SIZE (NOM)    |
|--------------|------------|--------------------|
| SN74HCT02D   | SOIC (14)  | 8.65 mm × 3.90 mm  |
| SN74HCT02N   | PDIP (14)  | 19.31 mm × 6.35 mm |
| SN74HCT02NSR | SO (14)    | 10.20 mm × 5.30 mm |
| SN74HCT02PW  | TSSOP (14) | 5.00 mm × 4.40 mm  |

(1) For all available packages, see the orderable addendum at the end of the data sheet.



**Functional Block Diagram**



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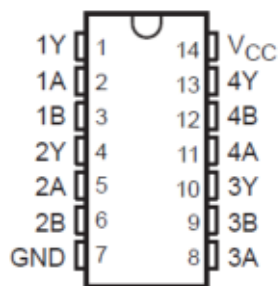
## 3 Revision History

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

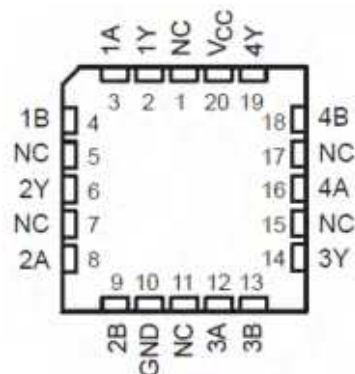
| <b>Changes from Revision F (February 2022) to Revision G (October 2022)</b>                                     | <b>Page</b> |
|-----------------------------------------------------------------------------------------------------------------|-------------|
| • Increased R $\theta$ JA for packages: D (86 to 138.7); N (80 to 67); NS (76 to 93.3); PW (113 to 120.1) ..... | <b>4</b>    |

| <b>Changes from Revision E (July 2003) to Revision F (February 2022)</b>                                                                       | <b>Page</b> |
|------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| • Updated the numbering, formatting, tables, figures, and cross-references throughout the document to reflect modern data sheet standards..... | <b>1</b>    |

## 4 Pin Configuration and Functions



**D, N, NS, PW, J or W Package**  
**14-Pin SOIC, PDIP, SO, TSSOP, CDIP, or CFP**  
**Top View**



**FK Package**  
**20-Pin LCCC**  
**Top View**

## 5 Specifications

### 5.1 Absolute Maximum Ratings

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

|           |                                                       |                                            | MIN  | MAX      | UNIT |
|-----------|-------------------------------------------------------|--------------------------------------------|------|----------|------|
| $V_{CC}$  | Supply voltage range                                  |                                            | -0.5 | 7        | V    |
| $I_{IK}$  | Input clamp current                                   | $(V_I < 0 \text{ or } V_I > V_{CC})^{(2)}$ |      | $\pm 20$ | mA   |
| $I_{OK}$  | Output clamp current                                  | $(V_O < 0 \text{ or } V_O > V_{CC})^{(2)}$ |      | $\pm 20$ | mA   |
| $I_O$     | Continuous output current                             | $(V_O = 0 \text{ to } V_{CC})$             |      | $\pm 25$ | mA   |
|           | Continuous current through $V_{CC}$ or ground current |                                            |      | $\pm 50$ | 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<sup>(1)</sup>

|                     |                                 |                                            | SN54HCT02 <sup>(2)</sup> |     |          | SN74HCT02 |     |          | 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        | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ | 2                        |     |          | 2         |     |          | V    |
| $V_{IL}$            | Low-level input voltage         | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ |                          |     | 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    |
| $\Delta t/\Delta v$ | 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) SN54HCT02 is in product preview.

### 5.3 Thermal Information

| THERMAL METRIC        |                                                       | D (SOIC) | N (PDIP) | NS (SO) | PW (TSSOP) | UNIT |
|-----------------------|-------------------------------------------------------|----------|----------|---------|------------|------|
|                       |                                                       | 14 PINS  | 14 PINS  | 14 PINS | 14 PINS    |      |
| $R_{\theta JA}$       | Junction-to-ambient thermal resistance <sup>(1)</sup> | 138.7    | 67       | 93.3    | 120.1      | °C/W |
| $R_{\theta JC (top)}$ | Junction-to-case (top) thermal resistance             | 93.8     | 55       | 50.9    | 49.4       | °C/W |
| $R_{\theta JB}$       | Junction-to-board thermal resistance                  | 94.7     | 46.7     | 53.8    | 63.1       | °C/W |
| $\Psi_{JT}$           | Junction-to-top characterization parameter            | 49.1     | 35.1     | 17.8    | 6.7        | °C/W |
| $\Psi_{JB}$           | Junction-to-board characterization parameter          | 94.3     | 46.5     | 53.3    | 62.5       | °C/W |
| $R_{\theta JC (bot)}$ | Junction-to-case (bottom) thermal resistance          | N/A      | N/A      | 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.

## 5.4 Electrical Characteristics

| PARAMETER                       |                           | TEST CONDITIONS <sup>(1)</sup>                                   | V <sub>CC</sub><br>(V) | T <sub>A</sub> = 25°C |       |      | SN54HCT00 <sup>(3)</sup> |       | SN74HCT00 |       | UNIT |
|---------------------------------|---------------------------|------------------------------------------------------------------|------------------------|-----------------------|-------|------|--------------------------|-------|-----------|-------|------|
|                                 |                           |                                                                  |                        | MIN                   | TYP   | MAX  | MIN                      | MAX   | MIN       | MAX   |      |
| V <sub>OH</sub>                 | High-level output voltage | I <sub>OH</sub> = –20 µA                                         | 4.5                    | 4.4                   | 4.499 |      | 4.4                      |       | 4.4       |       | V    |
|                                 |                           | I <sub>OH</sub> = –4 mA                                          |                        | 3.98                  | 4.3   |      | 3.7                      |       | 3.84      |       |      |
| V <sub>OL</sub>                 | Low-level output voltage  | I <sub>OL</sub> = 20 µA                                          | 5.5                    |                       | 0.001 | 0.1  |                          | 0.1   |           | 0.1   | V    |
|                                 |                           | I <sub>OL</sub> = 4 mA                                           |                        |                       | 0.17  | 0.26 |                          | 0.4   |           | 0.33  |      |
| I <sub>I</sub>                  | Input hold current        | V <sub>I</sub> = V <sub>CC</sub> or 0                            | 5.5                    |                       | ±0.1  | ±100 |                          | ±1000 |           | ±1000 | nA   |
| I <sub>CC</sub>                 | Supply current            | V <sub>I</sub> = V <sub>CC</sub> or 0. I <sub>O</sub> = 0        | 5.5                    |                       |       | 2    |                          | 40    |           | 20    | µA   |
| ΔI <sub>CC</sub> <sup>(2)</sup> | Supply-current change     | One input at 0.5V or 2.4 V, Other inputs at 0 or V <sub>CC</sub> | 5.5                    |                       | 1.4   | 2.4  |                          | 3     |           | 2.9   | mA   |
| C <sub>i</sub>                  | Input capacitance         |                                                                  | 4.5 to 5.5             |                       | 3     | 10   |                          | 10    |           | 10    | pF   |

(1) V<sub>I</sub> = V<sub>IH</sub> or V<sub>IL</sub>, 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<sub>CC</sub>.

(3) SN54HCT02 is in product preview.

## 5.5 Switching Characteristics

C<sub>L</sub> = 50 pF. See [Parameter Measurement Information](#)

| PARAMETER       |                   | FROM (INPUT) | TO (OUTPUT) | V <sub>CC</sub><br>(V) | T <sub>A</sub> = 25°C |     |     | SN54HCT02 <sup>(1)</sup> |     | SN74HCT00 |     |    |
|-----------------|-------------------|--------------|-------------|------------------------|-----------------------|-----|-----|--------------------------|-----|-----------|-----|----|
|                 |                   |              |             |                        | MIN                   | TYP | MAX | MIN                      | MAX | MIN       | MAX |    |
| t <sub>pd</sub> | Propagation delay | A or B       | Y           | 4.5                    |                       | 11  | 20  |                          | 30  |           | 25  | ns |
|                 |                   |              |             | 5.5                    |                       | 10  | 18  |                          | 27  |           | 22  |    |
| t <sub>t</sub>  | Transition time   |              | Y           | 4.5                    |                       | 9   | 15  |                          | 22  |           | 19  | ns |
|                 |                   |              |             | 5.5                    |                       | 8   | 14  |                          | 20  |           | 17  |    |

(1) SN54HCT02 is in product preview.

## 5.6 Operating Characteristics

T<sub>A</sub> = 25°C

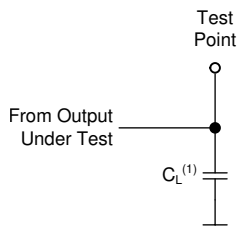
|                 |                               | Test Conditions | TYP | UNIT |
|-----------------|-------------------------------|-----------------|-----|------|
| C <sub>pd</sub> | Power dissipation capacitance | No load         | 20  | pF   |

## 6 Parameter Measurement Information

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

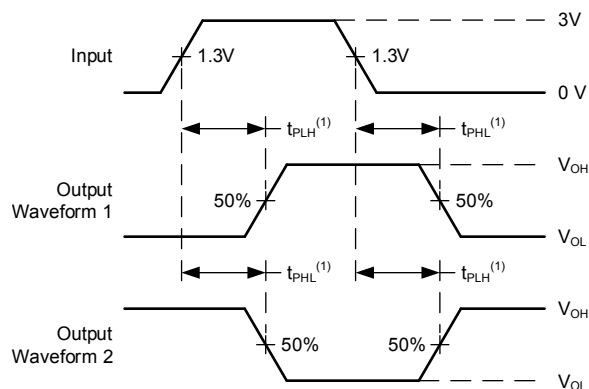
For clock inputs,  $f_{\max}$  is measured when the input duty cycle is 50%.

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



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

**Figure 6-1. Load Circuit for Push-Pull Outputs**



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

**Figure 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

**Table 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- $\mu$ F capacitor is recommended for this device. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. The 0.1- $\mu$ F and 1- $\mu$ 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 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on [ti.com](https://www.ti.com). Click on *Subscribe to updates* 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.

### 10.3 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.

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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 Glossary

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

## 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<br>(1) | Material type<br>(2) | Package   Pins  | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6) |
|--------------------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------|
| <a href="#">SN74HCT02D</a>     | Obsolete      | Production           | SOIC (D)   14   | -                     | -           | Call TI                              | Call TI                           | -40 to 85    | HCT02               |
| <a href="#">SN74HCT02DR</a>    | Active        | Production           | SOIC (D)   14   | 2500   LARGE T&R      | Yes         | NIPDAU   SN                          | Level-1-260C-UNLIM                | -40 to 85    | HCT02               |
| SN74HCT02DR.A                  | Active        | Production           | SOIC (D)   14   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HCT02               |
| <a href="#">SN74HCT02DRG4</a>  | Active        | Production           | SOIC (D)   14   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HCT02               |
| SN74HCT02DRG4.A                | Active        | Production           | SOIC (D)   14   | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HCT02               |
| <a href="#">SN74HCT02DT</a>    | Obsolete      | Production           | SOIC (D)   14   | -                     | -           | Call TI                              | Call TI                           | -40 to 85    | HCT02               |
| <a href="#">SN74HCT02N</a>     | NRND          | Production           | PDIP (N)   14   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -40 to 85    | SN74HCT02N          |
| SN74HCT02N.A                   | NRND          | Production           | PDIP (N)   14   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -40 to 85    | SN74HCT02N          |
| SN74HCT02NE4                   | NRND          | Production           | PDIP (N)   14   | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -40 to 85    | SN74HCT02N          |
| <a href="#">SN74HCT02NSR</a>   | Active        | Production           | SOP (NS)   14   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HCT02               |
| SN74HCT02NSR.A                 | Active        | Production           | SOP (NS)   14   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HCT02               |
| <a href="#">SN74HCT02PW</a>    | Obsolete      | Production           | TSSOP (PW)   14 | -                     | -           | Call TI                              | Call TI                           | -40 to 85    | HT02                |
| <a href="#">SN74HCT02PWR</a>   | Active        | Production           | TSSOP (PW)   14 | 2000   LARGE T&R      | Yes         | NIPDAU   SN                          | Level-1-260C-UNLIM                | -40 to 85    | HT02                |
| SN74HCT02PWR.A                 | Active        | Production           | TSSOP (PW)   14 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HT02                |
| <a href="#">SN74HCT02PWRG4</a> | Active        | Production           | TSSOP (PW)   14 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | HT02                |
| <a href="#">SN74HCT02PWT</a>   | Obsolete      | Production           | TSSOP (PW)   14 | -                     | -           | Call TI                              | Call TI                           | -40 to 85    | HT02                |

<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.

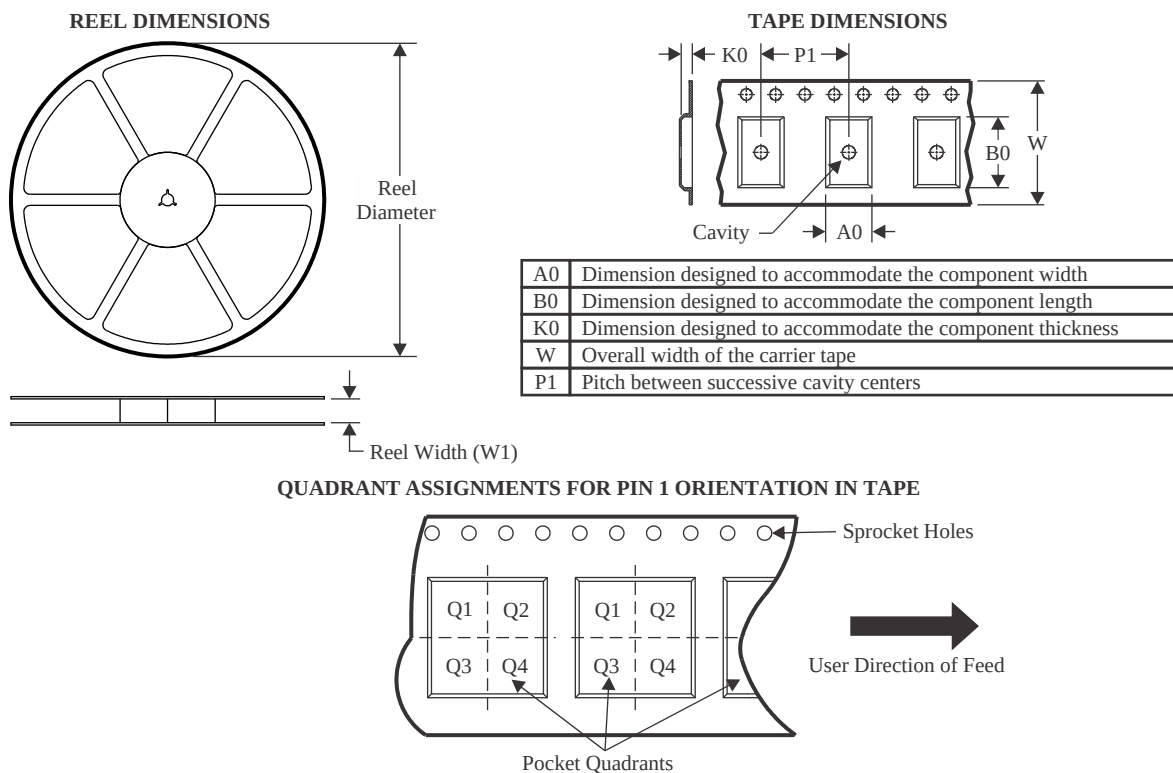
**(6) Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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.

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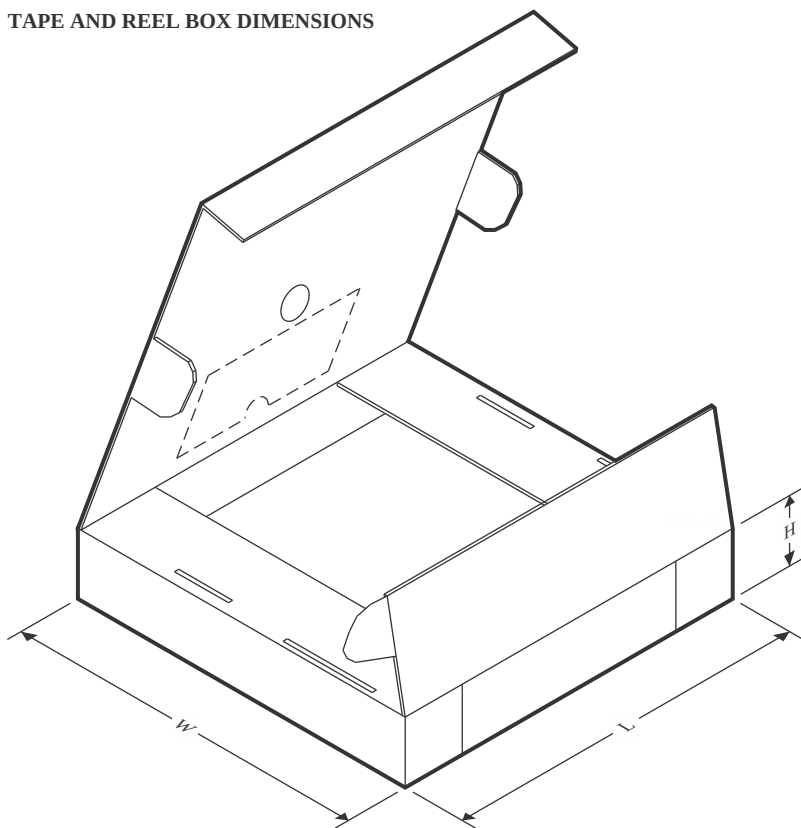
## TAPE AND REEL INFORMATION



\*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            |
| SN74HCT02DRG4  | SOIC         | D               | 14   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74HCT02NSR   | SOP          | NS              | 14   | 2000 | 330.0              | 16.4               | 8.1     | 10.4    | 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            |
| SN74HCT02PWRG4 | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74HCT02PWRG4 | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |

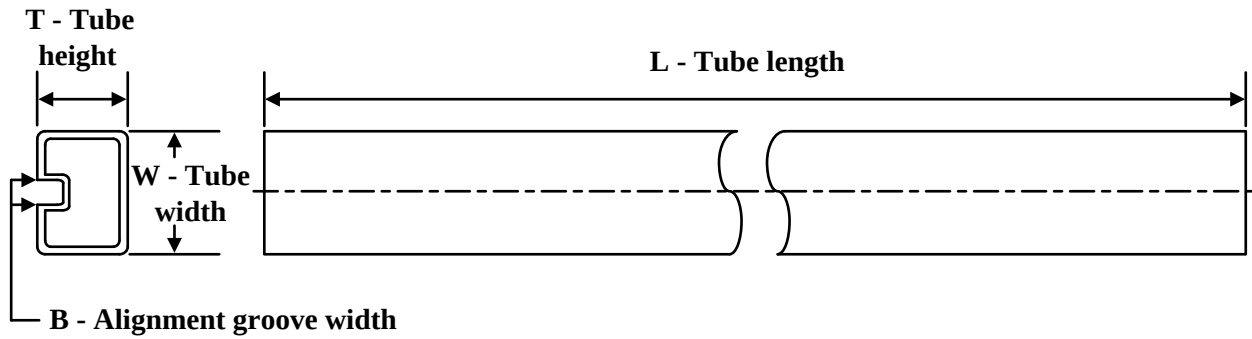
## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device         | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74HCT02DR    | SOIC         | D               | 14   | 2500 | 353.0       | 353.0      | 32.0        |
| SN74HCT02DRG4  | SOIC         | D               | 14   | 2500 | 353.0       | 353.0      | 32.0        |
| SN74HCT02NSR   | SOP          | NS              | 14   | 2000 | 353.0       | 353.0      | 32.0        |
| SN74HCT02PWR   | TSSOP        | PW              | 14   | 2000 | 356.0       | 356.0      | 35.0        |
| SN74HCT02PWRG4 | TSSOP        | PW              | 14   | 2000 | 353.0       | 353.0      | 32.0        |
| SN74HCT02PWRG4 | TSSOP        | PW              | 14   | 2000 | 356.0       | 356.0      | 35.0        |

## TUBE

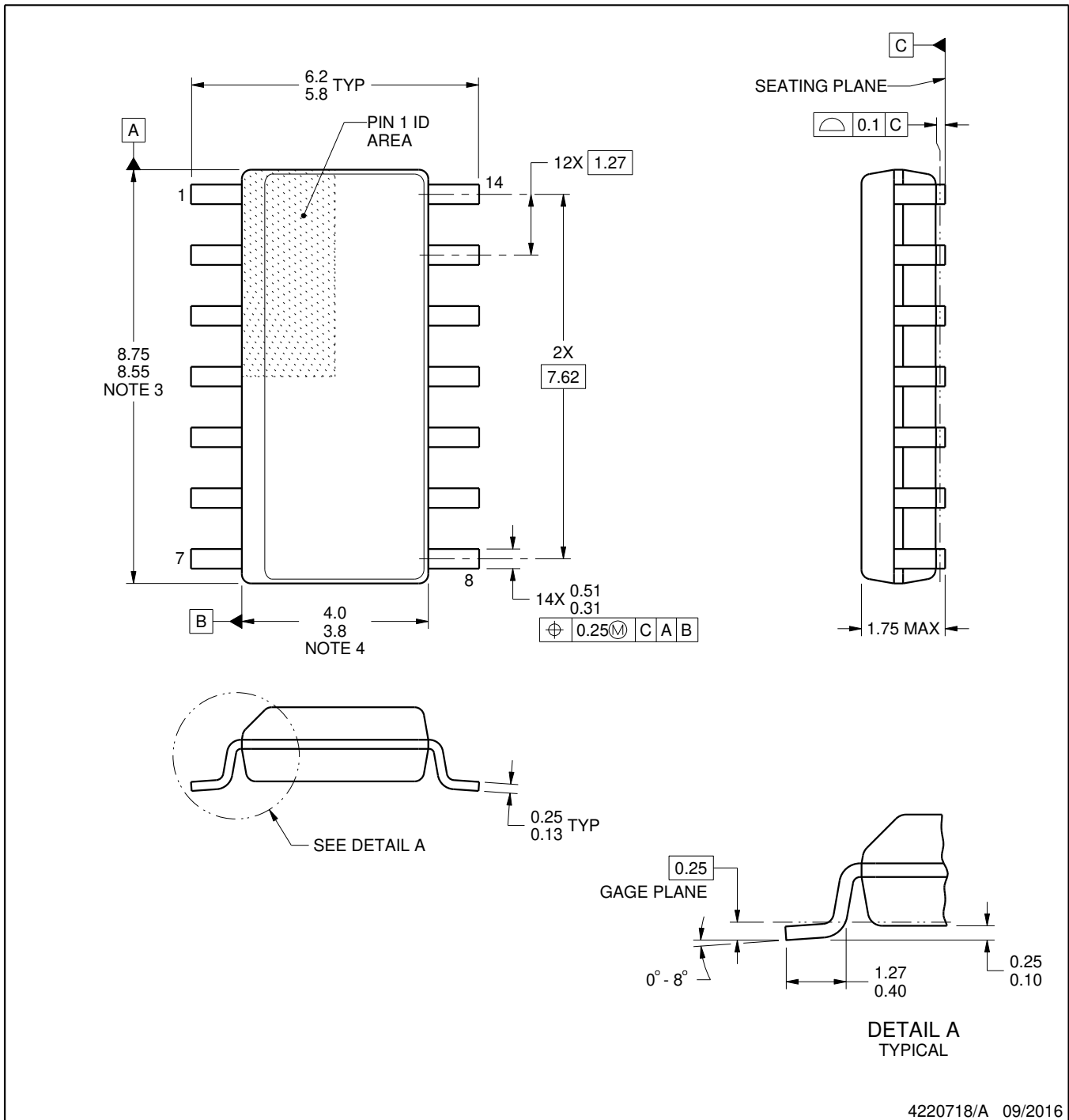


\*All dimensions are nominal

| Device       | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|--------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74HCT02N   | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74HCT02N   | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74HCT02N.A | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74HCT02N.A | 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   |

**D0014A****PACKAGE OUTLINE****SOIC - 1.75 mm max height**

SMALL OUTLINE INTEGRATED CIRCUIT



4220718/A 09/2016

**NOTES:**

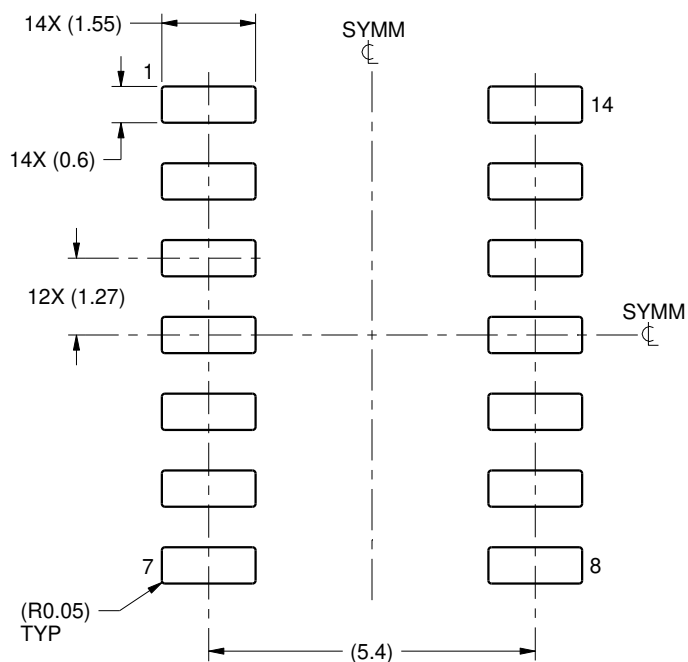
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate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

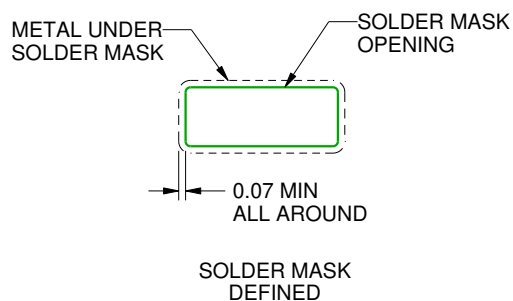
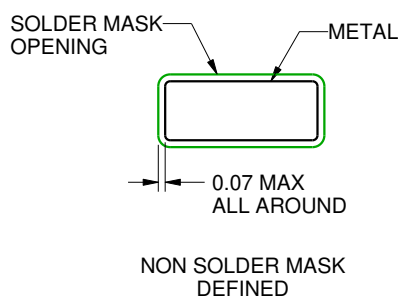
D0014A

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.

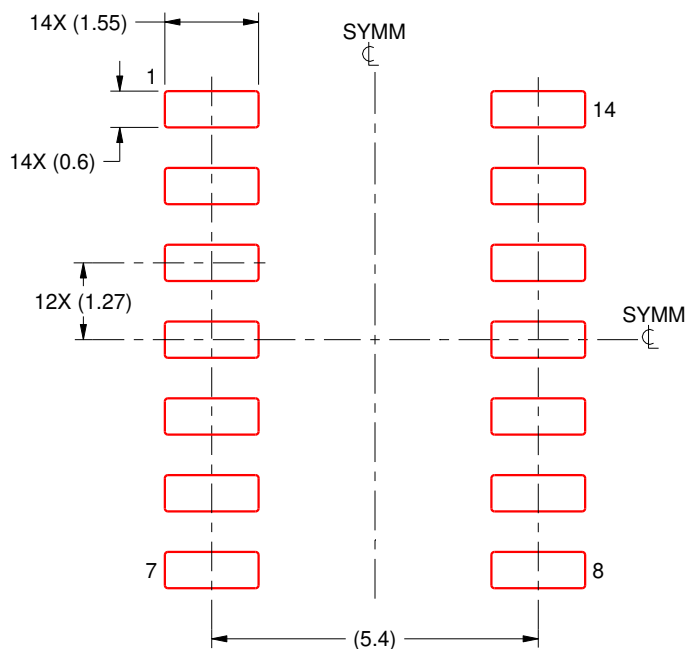
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## 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)

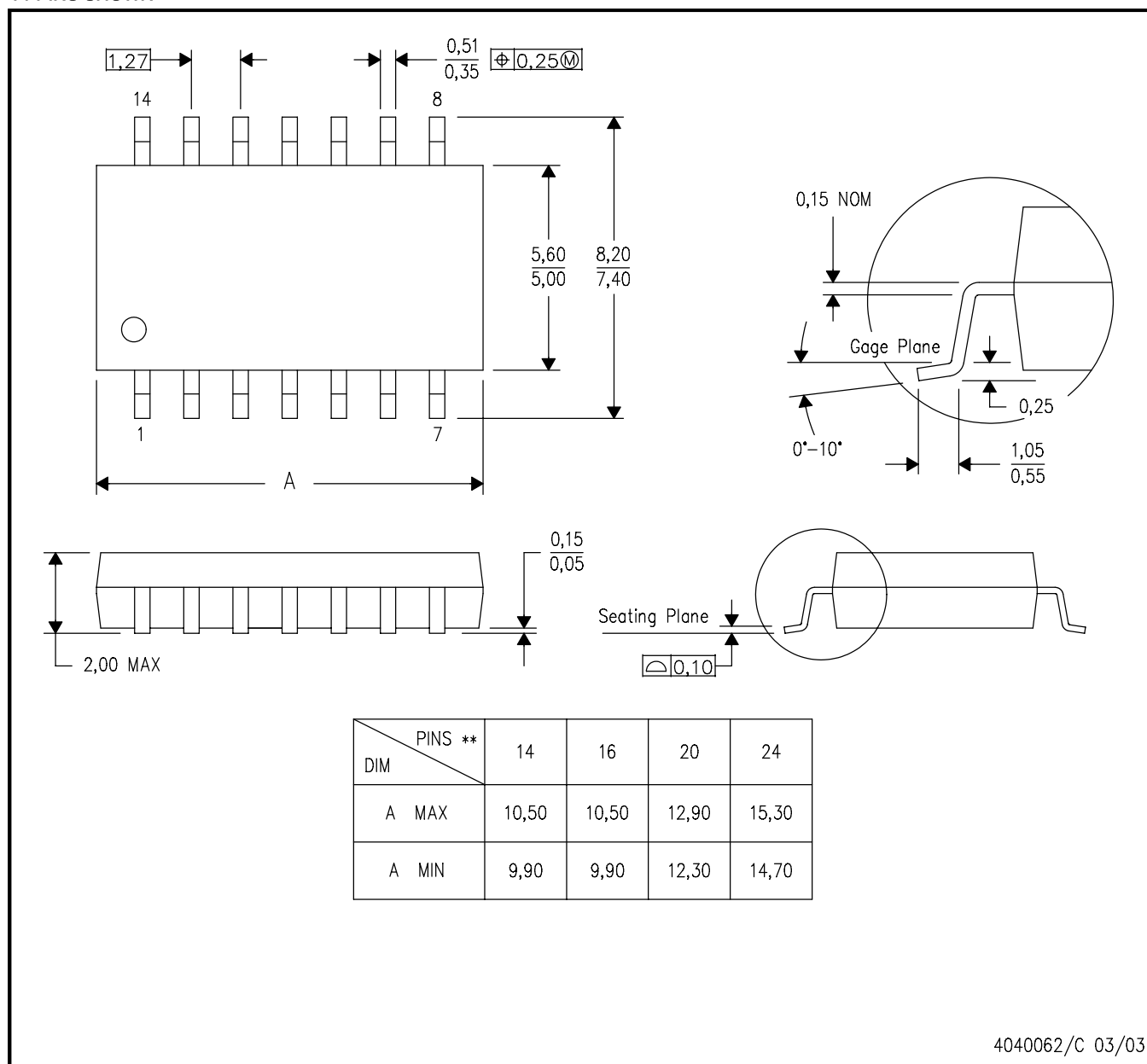
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN

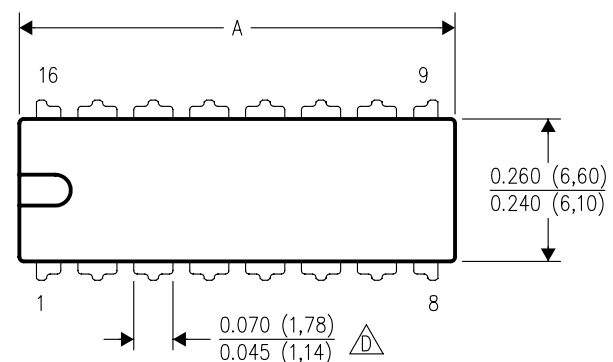


- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

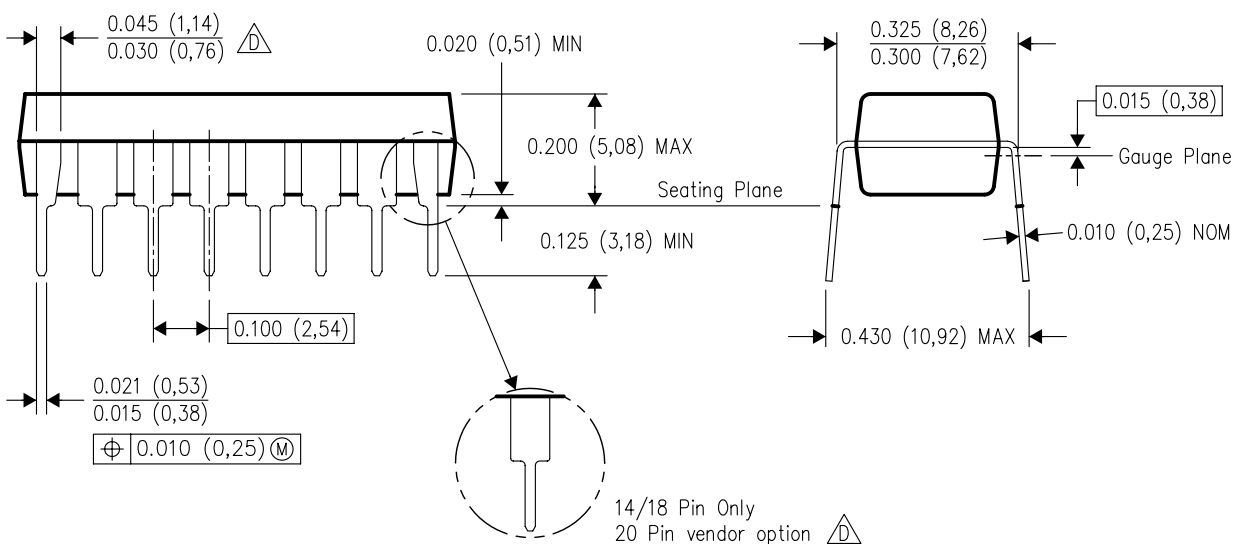
N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



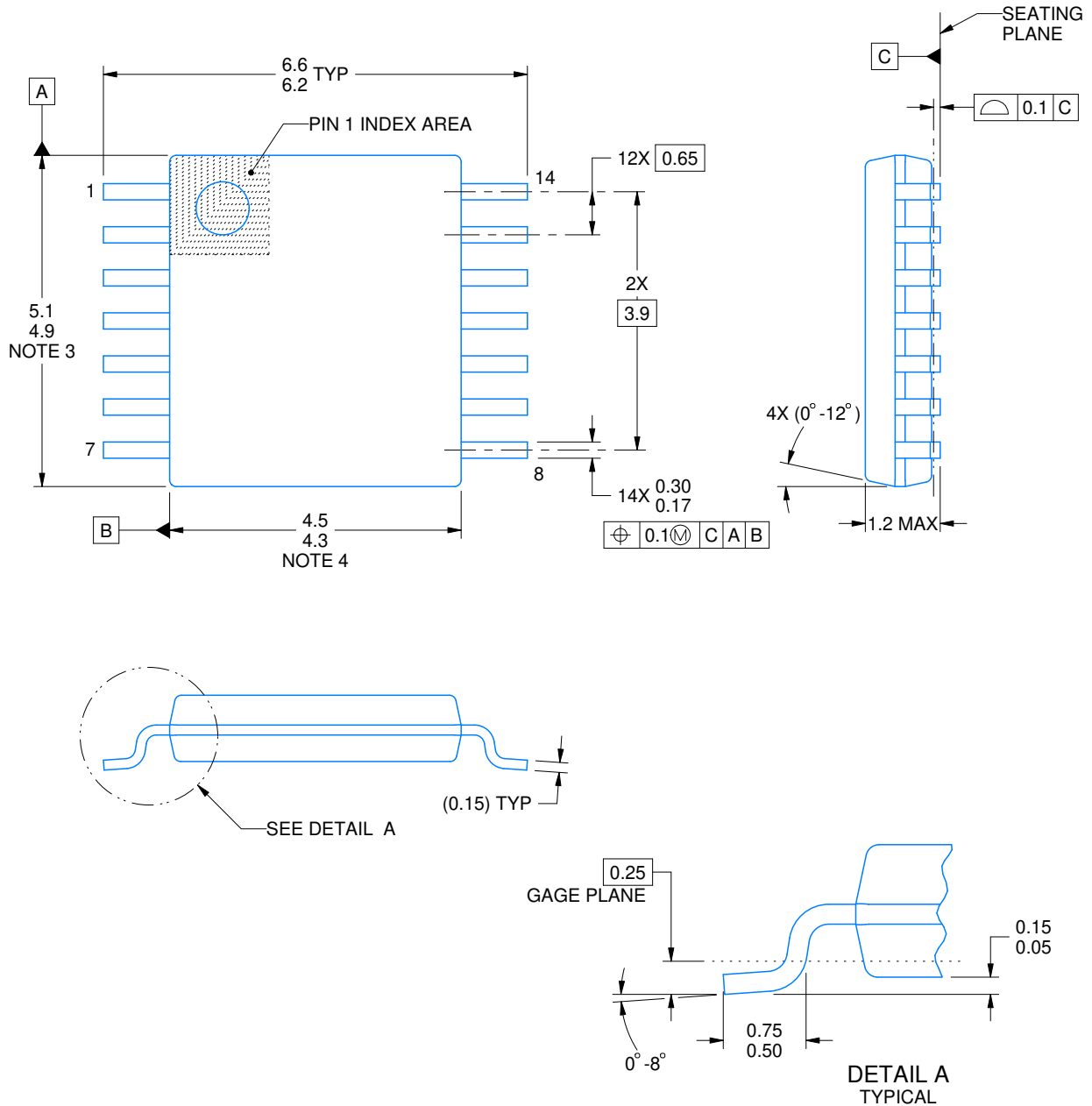
| PINS **<br>DIM      | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | 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.
-  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).  
 The 20 pin end lead shoulder width is a vendor option, either half or full width.



4220202/B 12/2023

## NOTES:

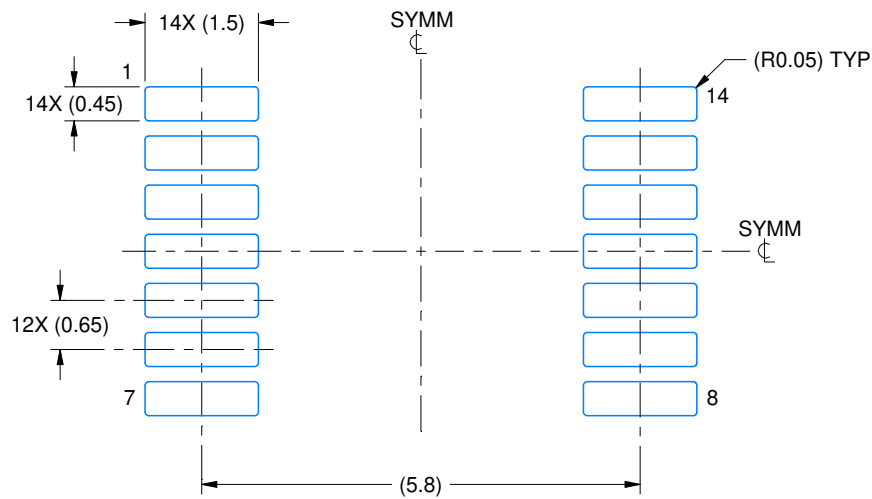
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

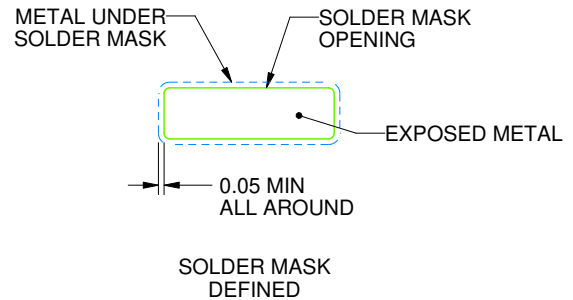
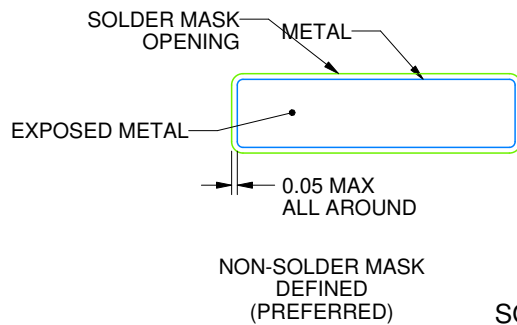
PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4220202/B 12/2023

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

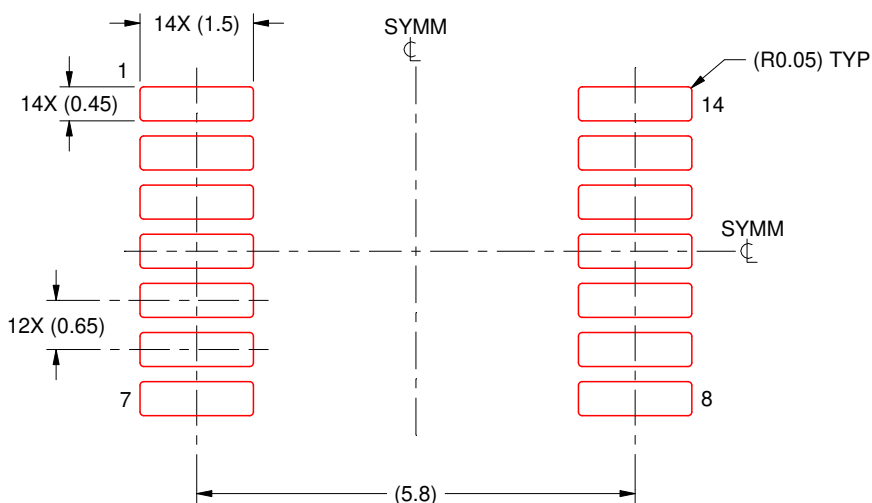
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# 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.

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