# SNx4HC241 Octal Buffers and Line Drivers With 3-State Outputs

## 1 Features

- Wide operating voltage range of 2 V to 6 V
- High-current outputs drive up to 15 LSTTL loads
- Low power consumption, 80-µA max $I_{CC}$
- Typical $t_{pd}$ =11 ns
- ±6-mA output drive at 5 V
- Low input current of 1 µA max
- 3-state outputs drive bus lines or buffer memory address registers

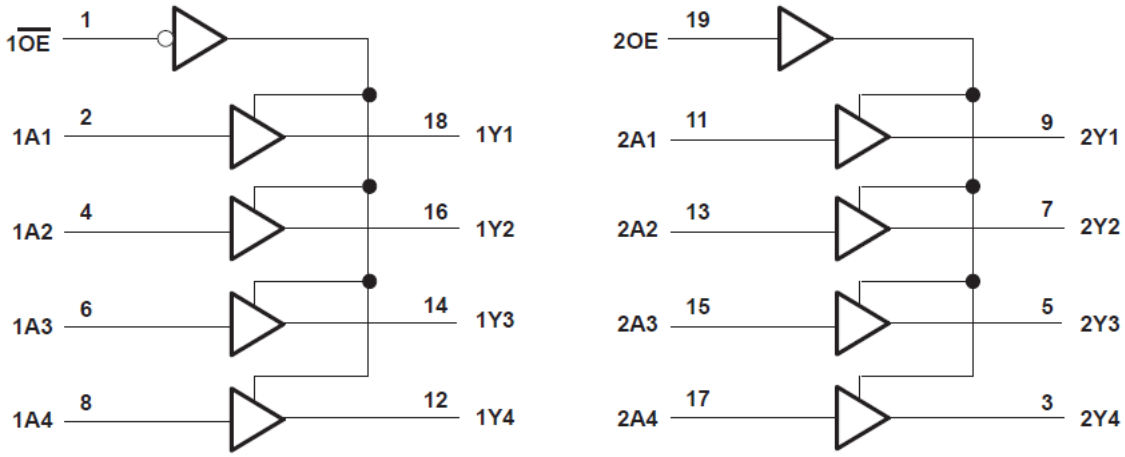
## 2 Description

These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The 'HC241 devices are organized as two 4-bit buffers/drivers with separate output-enable ($1\overline{OE}$ and 2OE) inputs. When $1\overline{OE}$ is low or 2OE is high, the device passes noninverted data from the A inputs to the Y outputs. When $1\overline{OE}$ is high or 2OE is low, the outputs for the respective buffers/drivers are in the high-impedance state.

**Device Information**

| PART NUMBER | PACKAGE(1) | BODY SIZE (NOM) |
|---|---|---|
| SN74HC241DW | SOIC (20) | 12.80 mm × 7.50 mm |
| SN74HC241N | PDIP (20) | 25.40 mm × 6.35 mm |
| SN74HC241NSR | SO (20) | 15.00 mm × 5.30 mm |
| SN74HC241PW | TSSOP (20) | 6.50 mm × 4.40 mm |
| SN54HC241J | CDIP (20) | 26.92 mm × 6.92 mm |
| SNJ54HC241FK | LCCC (20) | 8.89 mm × 8.45 mm |

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




**Functional Block Diagram**

## Table of Contents



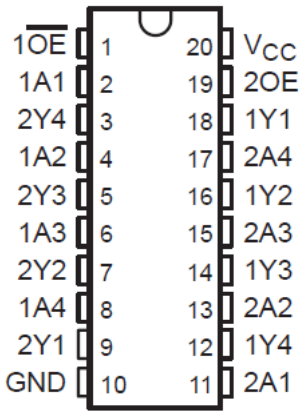
## 3 Revision History

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

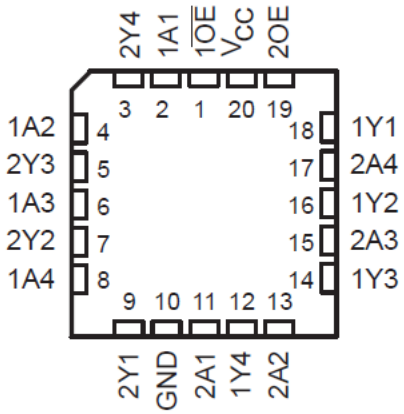
| Changes from Revision D (January 2022) to Revision E (May 2022) | Page |
|---|---|
| • Junction-to-ambient thermal resistance values increased. DW was 58 is now 109.1, N was 69 is now 84.6, NS was 60 is now 113.4, PW was 83 is now 131.8 | 4 |

| Changes from Revision C (August 2003) to Revision D (January 2022) | Page |
|---|---|
| • Updated the numbering, formatting, tables, figures, and cross-references throughout the document to reflect modern data sheet standards | 1 |

## 4 Pin Configuration and Functions




**J, DW, N, NS, or PW package**
**20-Pin CDIP, SOIC, PDIP, SO, or TSSOP**
**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)(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 |
| | Continuous current through $V_{CC}$ or GND | | | ±70 | mA |
| $T_J$ | Junction temperature | | | 150 | ℃ |
| $T_{stg}$ | Storage temperature range | | –65 | 150 | ℃ |

(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)

| | | | SN54HC241 | | | SN74HC241 | | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | NOM | MAX | MIN | NOM | MAX | |
| $V_{CC}$ | Supply voltage | | 2 | 5 | 6 | 2 | 5 | 6 | V |
| $V_{IH}$ | High-level input voltage | $V_{CC}$ = 2 V | 1.5 | | | 1.5 | | | V |
| | | $V_{CC}$ = 4.5 V | 3.15 | | | 3.15 | | | |
| | | $V_{CC}$ = 6 V | 4.2 | | | 4.2 | | | |
| $V_{IL}$ | Low-level input voltage | $V_{CC}$ = 2 V | | | 0.5 | | | 0.5 | V |
| | | $V_{CC}$ = 4.5 V | | | 1.35 | | | 1.35 | |
| | | $V_{CC}$ = 6 V | | | 1.8 | | | 1.8 | |
| $V_I$ | Input voltage | | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| $V_O$ | Output voltage | | 0 | | $V_{CC}$ | 0 | | $V_{CC}$ | V |
| Δt/Δv | Input transition rise/fall time | $V_{CC}$ = 2 V | | | 1000 | | | 1000 | ns |
| | | $V_{CC}$ = 4.5 V | | | 500 | | | 500 | |
| | | $V_{CC}$ = 6 V | | | 400 | | | 400 | |
| $T_A$ | 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, *Implicationsof Slow or Floating CMOS Inputs*, literature number SCBA004.

## 5.3 Thermal Information

| THERMAL METRIC | | DW (SOIC) 20 PINS | N (PDIP) 20 PINS | NS (SO) 20 PINS | PW (TSSOP) 20 PINS | UNIT |
|---|---|---|---|---|---|---|
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance(1) | 109.1 | 84.6 | 113.4 | 131.8 | °C/W |
| $R_{\theta JC(top)}$ | Junction-to-case (top) thermal resistance | 76 | 72.5 | 78.6 | 72.2 | °C/W |
| $R_{\theta JB}$ | Junction-to-board thermal resistance | 77.6 | 65.3 | 78.4 | 82.8 | °C/W |
| $\psi_{JT}$ | Junction-to-top characterization parameter | 51.5 | 55.3 | 47.1 | 21.5 | °C/W |
| $\psi_{JB}$ | Junction-to-top characterization parameter | 77.1 | 65.2 | 78.1 | 82.4 | °C/W |

## 5.3 Thermal Information (continued)

| THERMAL METRIC | | DW (SOIC) 20 PINS | N (PDIP) 20 PINS | NS (SO) 20 PINS | PW (TSSOP) 20 PINS | UNIT |
|---|---|---|---|---|---|---|
| $R_{\theta JC(bot)}$ | 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

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

| PARAMETER | TEST CONDITIONS | | $V_{CC}$ | $T_A$ = 25°C | | | SN54HC241 | | SN74HC241 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $V_{OH}$ | $V_I$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = −20 µA | 2 V | 1.9 | 1.998 | | 1.9 | | 1.9 | | V |
| | | | 4.5 V | 4.4 | 4.499 | | 4.4 | | 4.4 | | |
| | | | 6 V | 5.9 | 5.999 | | 5.9 | | 5.9 | | |
| | | $I_{OH}$ = −6 mA | 4.5 V | 3.98 | 4.3 | | 3.7 | | 3.84 | | |
| | | $I_{OH}$ = −7.8 mA | 6 V | 5.48 | 5.8 | | 5.2 | | 5.34 | | |
| $V_{OL}$ | $V_I$ = $V_{IH}$or $V_{IL}$ | $I_{OL}$ = 20 µA | 2 V | | 0.002 | 0.1 | | 0.1 | | 0.1 | V |
| | | | 4.5 V | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | | | 6 V | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | | $I_{OL}$ = 6 mA | 4.5 V | | 0.17 | 0.26 | | 0.4 | | 0.33 | |
| | | $I_{OL}$ = 7.8 mA | 6 V | | 0.15 | 0.26 | | 0.4 | | 0.33 | |
| $I_I$ | $V_I$ = $V_{CC}$ or 0 | | 6 V | | ±0.1 | ±100 | | ±1000 | | ±1000 | nA |
| $I_{OZ}$ | $V_O$ = $V_{CC}$ or 0 | | 6 V | | ±0.01 | ±0.5 | | ±10 | | ±5 | µA |
| $I_{CC}$ | $V_I$ = $V_{CC}$ or 0, | $I_O$ = 0 | 6 V | | | 8 | | 160 | | 80 | µA |
| $C_i$ | | | 2 V to 6 V | | 3 | 10 | | 10 | | 10 | pF |

## 5.5 Switching Characteristics

over recommended operating free-air temperature range, $C_L$ = 50 pF (unless otherwise noted) (see Parameter Measurement Information)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | SN54HC241 | | SN74HC241 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{pd}$ | A | Y | 2 V | | 39 | 115 | | 170 | | 145 | ns |
| | | | 4.5 V | | 12 | 23 | | 34 | | 29 | |
| | | | 6 V | | 11 | 20 | | 29 | | 25 | |
| $t_{en}$ | $\overline{OE}$ or OE | Y | 2 V | | 60 | 150 | | 225 | | 190 | ns |
| | | | 4.5 V | | 17 | 30 | | 45 | | 38 | |
| | | | 6 V | | 15 | 26 | | 38 | | 32 | |
| $t_{dis}$ | $\overline{OE}$ or OE | Y | 2 V | | 40 | 150 | | 225 | | 190 | ns |
| | | | 4.5 V | | 18 | 30 | | 45 | | 38 | |
| | | | 6 V | | 17 | 26 | | 38 | | 32 | |
| $t_t$ | | Y | 2 V | | 28 | 60 | | 90 | | 75 | ns |
| | | | 4.5 V | | 8 | 12 | | 18 | | 15 | |
| | | | 6 V | | 6 | 10 | | 15 | | 13 | |

## 5.6 Switching Characteristics

over recommended operating free-air temperature range, $C_L$ = 150 pF (unless otherwise noted) (see Parameter Measurement Information)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | SN54HC241 | | SN74HC241 | | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| $t_{pd}$ | A | Y | 2 V | | 50 | 165 | | 245 | | 210 | ns |
| | | | 4.5 V | | 16 | 33 | | 49 | | 42 | |
| | | | 6 V | | 14 | 28 | | 42 | | 35 | |
| $t_{en}$ | $\overline{OE}$ or OE | Y | 2 V | | 100 | 200 | | 300 | | 250 | ns |
| | | | 4.5 V | | 20 | 40 | | 60 | | 50 | |
| | | | 6 V | | 17 | 34 | | 51 | | 43 | |
| $t_t$ | | Y | 2 V | | 45 | 210 | | 315 | | 265 | ns |
| | | | 4.5 V | | 17 | 42 | | 63 | | 53 | |
| | | | 6 V | | 13 | 36 | | 53 | | 45 | |

## 5.7 Operating Characteristics

$T_A$ = 25°C

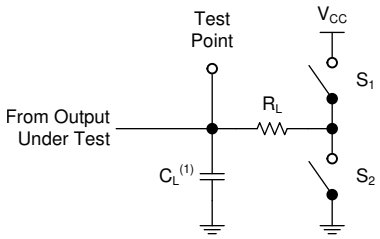
| PARAMETER | | TEST CONDITIONS | TYP | UNIT |
|---|---|---|---|---|
| $C_{pd}$ | Power dissipation capacitance per buffer/driver | No load | 35 | pF |

## 6 Parameter Measurement Information

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

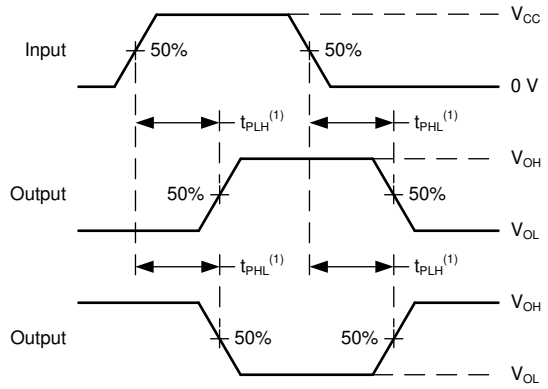
For clock inputs, $f_{max}$ is measured when the input duty cycle is 50%.

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



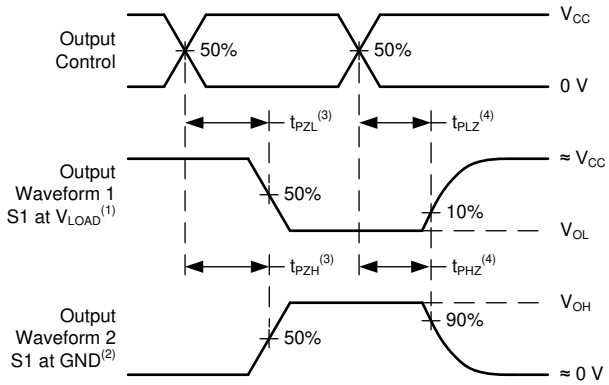

(1) $C_L$ includes probe and test-fixture capacitance.

**Figure 6-1. Load Circuit for 3-State Outputs**



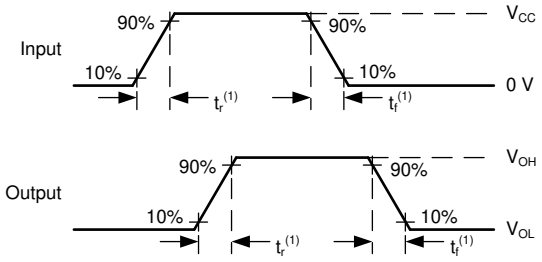

(1) The greater between $t_{PLH}$ and $t_{PHL}$ is the same as $t_{pd}$.

**Figure 6-2. Voltage Waveforms, Propagation Delays for Standard CMOS Inputs**




(1) S1 = CLOSED; S2 = OPEN.
(2) S1 = OPEN; s2 = CLOSED.
(3) $t_{PLZ}$ and $t_{PHZ}$ are the same as $t_{dis}$.
(4) $t_{PZL}$ and $t_{PZH}$ are the same as $t_{en}$.

**Figure 6-3. Voltage Waveforms, Standard CMOS Inputs Propagation Delays**




(1) The greater between $t_r$ and $t_f$ is the same as $t_t$.

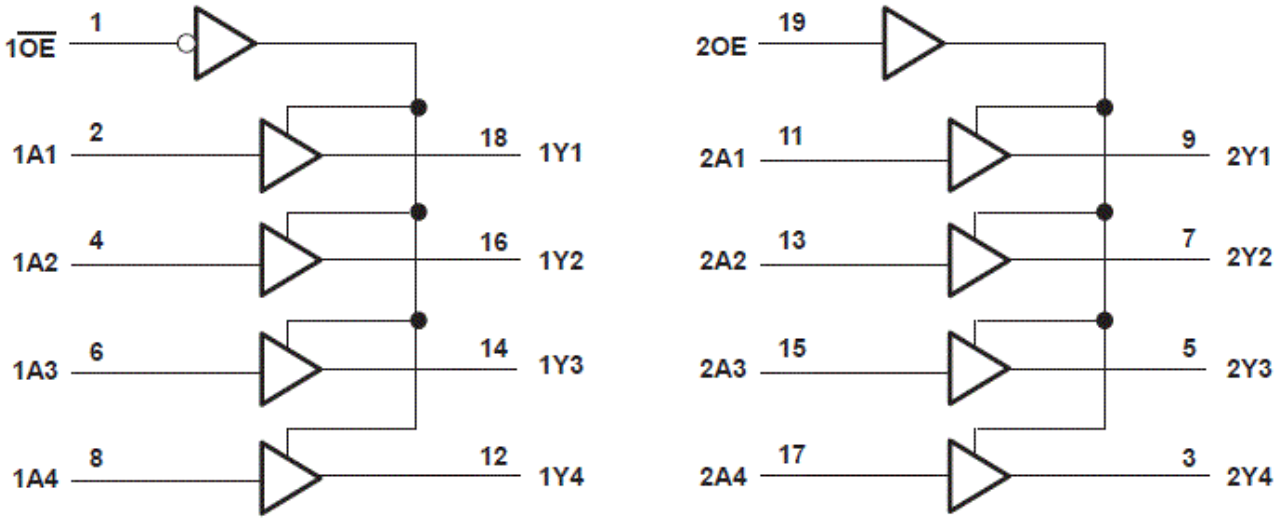
**Figure 6-4. Voltage Waveforms, Input and Output Transition Times for Standard CMOS Inputs**

# 7 Detailed Description

## 7.1 Overview

These octal buffers and line drivers are designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The ’HC241 devices are organized as two 4-bit buffers/drivers with separate output-enable ($1\overline{OE}$ and 2OE) inputs. When $1\overline{OE}$ is low or 2OE is high, the device passes noninverted data from the A inputs to the Y outputs. When $1\overline{OE}$ is high or 2OE is low, the outputs for the respective buffers/drivers are in the high-impedance state.

## 7.2 Functional Block Diagram




## 7.3 Device Functional Modes

**Table 7-1. Function Table**

| INPUTS | | OUTPUT 1Y |
|---|---|---|
| $1\overline{OE}$ | 1A | |
| L | H | H |
| L | L | L |
| H | X | Z |

**Table 7-2. Function Table**

| INPUTS | | OUTPUT 2Y |
|---|---|---|
| 2OE | 2A | |
| H | H | H |
| H | L | L |
| L | X | Z |

# 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.

# 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 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on 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.

## 10.2 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.

## 10.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

## 10.4 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.

## 10.5 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 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| JM38510/65704BRA | ACTIVE | CDIP | J | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 65704BRA | Samples |
| M38510/65704BRA | ACTIVE | CDIP | J | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | JM38510/ 65704BRA | Samples |
| SN54HC241J | ACTIVE | CDIP | J | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SN54HC241J | Samples |
| SN74HC241DWR | ACTIVE | SOIC | DW | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | HC241 | Samples |
| SN74HC241DWRG4 | ACTIVE | SOIC | DW | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | HC241 | Samples |
| SN74HC241N | ACTIVE | PDIP | N | 20 | 20 | RoHS & Non-Green | NIPDAU | N / A for Pkg Type | -40 to 85 | SN74HC241N | Samples |
| SN74HC241NSR | ACTIVE | SO | NS | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | HC241 | Samples |
| SN74HC241PWR | ACTIVE | TSSOP | PW | 20 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | HC241 | Samples |
| SNJ54HC241FK | ACTIVE | LCCC | FK | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ54HC 241FK | Samples |
| SNJ54HC241J | ACTIVE | CDIP | J | 20 | 1 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | SNJ54HC241J | 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.



**OTHER QUALIFIED VERSIONS OF SN54HC241, SN74HC241 :**

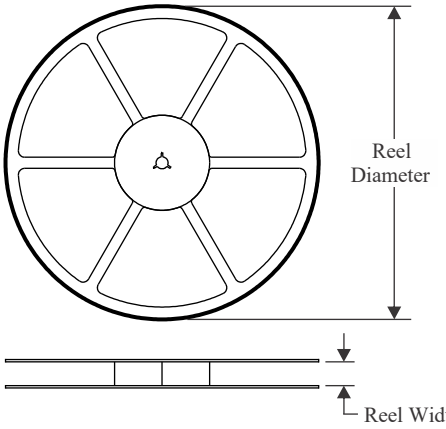
- Catalog : SN74HC241
- Military : SN54HC241

NOTE: Qualified Version Definitions:

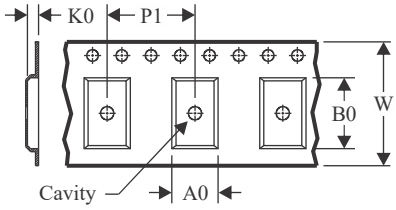
- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

## TAPE AND REEL INFORMATION

REEL DIMENSIONS

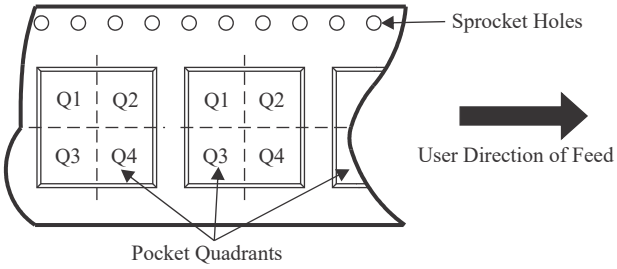



TAPE DIMENSIONS




| | |
|---|---|
| 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 |

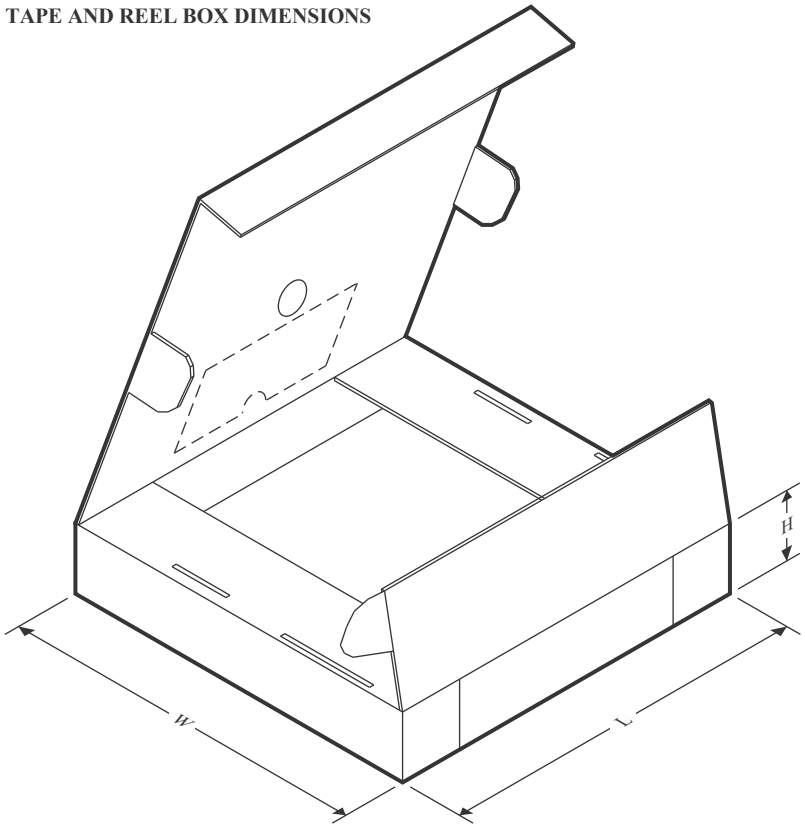
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE




*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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN74HC241DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.8 | 13.3 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74HC241DWR | SOIC | DW | 20 | 2000 | 330.0 | 24.4 | 10.9 | 13.3 | 2.7 | 12.0 | 24.0 | Q1 |
| SN74HC241NSR | SO | NS | 20 | 2000 | 330.0 | 24.4 | 8.4 | 13.0 | 2.5 | 12.0 | 24.0 | Q1 |
| SN74HC241PWR | TSSOP | PW | 20 | 2000 | 330.0 | 16.4 | 6.95 | 7.0 | 1.4 | 8.0 | 16.0 | Q1 |
| SN74HC241PWR | TSSOP | PW | 20 | 2000 | 330.0 | 16.4 | 6.95 | 7.1 | 1.6 | 8.0 | 16.0 | Q1 |

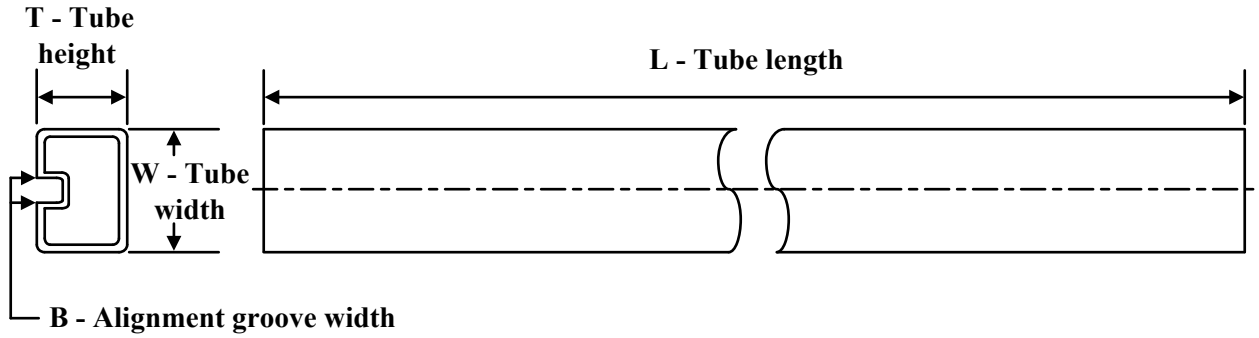
TAPE AND REEL BOX DIMENSIONS




*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| SN74HC241DWR | SOIC | DW | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74HC241DWR | SOIC | DW | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74HC241NSR | SO | NS | 20 | 2000 | 367.0 | 367.0 | 45.0 |
| SN74HC241PWR | TSSOP | PW | 20 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74HC241PWR | TSSOP | PW | 20 | 2000 | 356.0 | 356.0 | 35.0 |

## TUBE



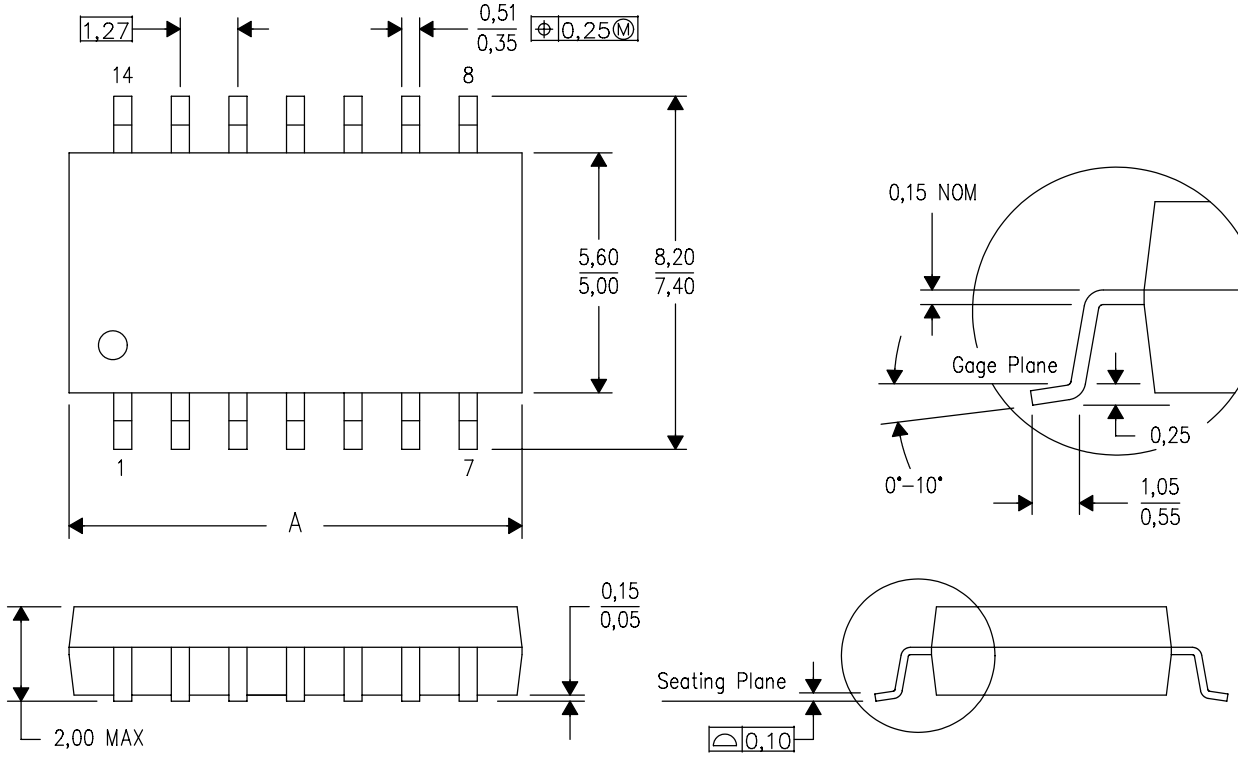

*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (µm) | B (mm) |
|---|---|---|---|---|---|---|---|---|
| SN74HC241N | N | PDIP | 20 | 20 | 506 | 13.97 | 11230 | 4.32 |
| SNJ54HC241FK | FK | LCCC | 20 | 1 | 506.98 | 12.06 | 2030 | NA |

## MECHANICAL DATA

**NS (R-PDSO-G**)** **PLASTIC SMALL-OUTLINE PACKAGE**

**14-PINS SHOWN**




| DIM \ PINS ** | 14 | 16 | 20 | 24 |
|---|---|---|---|---|
| A MAX | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN | 9,90 | 9,90 | 12,30 | 14,70 |

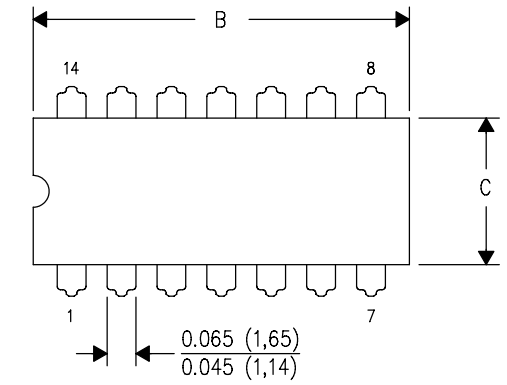
4040062/C 03/03

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.

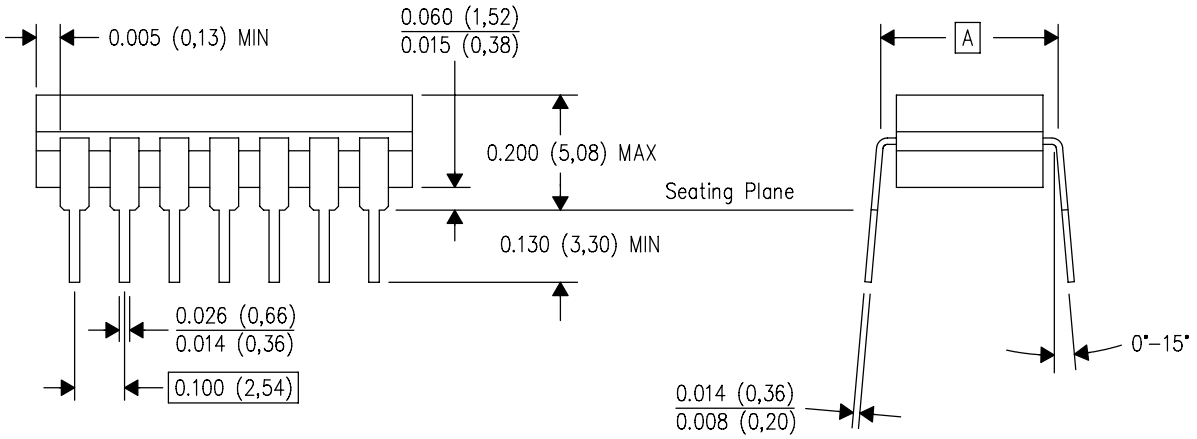
J (R–GDIP–T**)

14 LEADS SHOWN

# CERAMIC DUAL IN–LINE PACKAGE




| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC | 0.300 (7,62) BSC |
| B MAX | 0.785 (19,94) | .840 (21,34) | 0.960 (24,38) | 1.060 (26,92) |
| B MIN | — | — | — | — |
| C MAX | 0.300 (7,62) | 0.300 (7,62) | 0.310 (7,87) | 0.300 (7,62) |
| C MIN | 0.245 (6,22) | 0.245 (6,22) | 0.220 (5,59) | 0.245 (6,22) |




4040083/F 03/03

NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. This package is hermetically sealed with a ceramic lid using glass frit.
D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
E. Falls within MIL STD 1835 GDIP1–T14, GDIP1–T16, GDIP1–T18 and GDIP1–T20.

# GENERIC PACKAGE VIEW

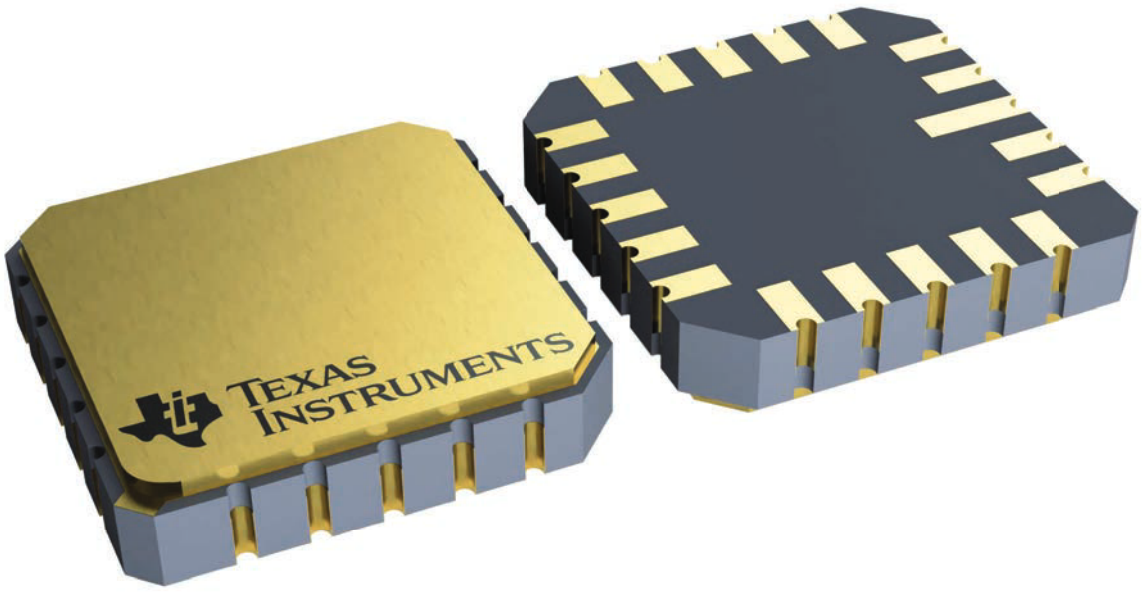
## FK 20

## LCCC - 2.03 mm max height

**8.89 x 8.89, 1.27 mm pitch**

LEADLESS CERAMIC CHIP CARRIER

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

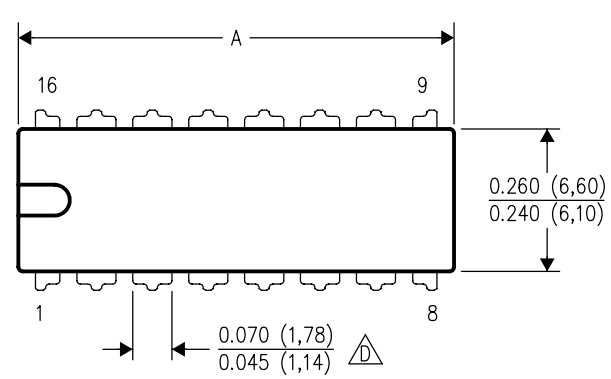



4229370VA\

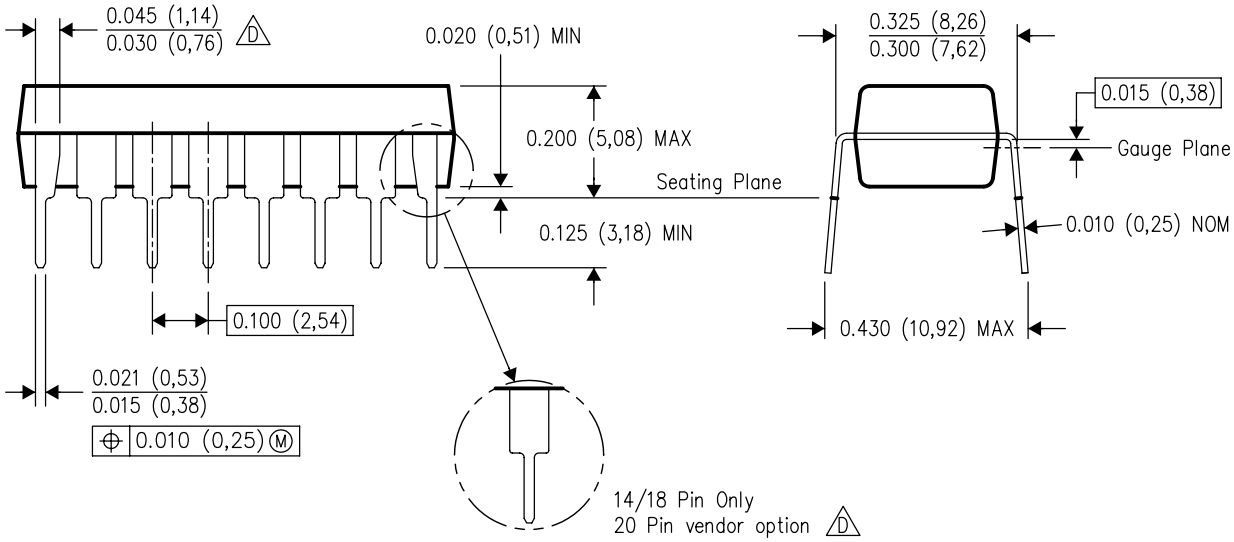
## N (R–PDIP–T**)

## PLASTIC DUAL–IN–LINE PACKAGE

16 PINS SHOWN

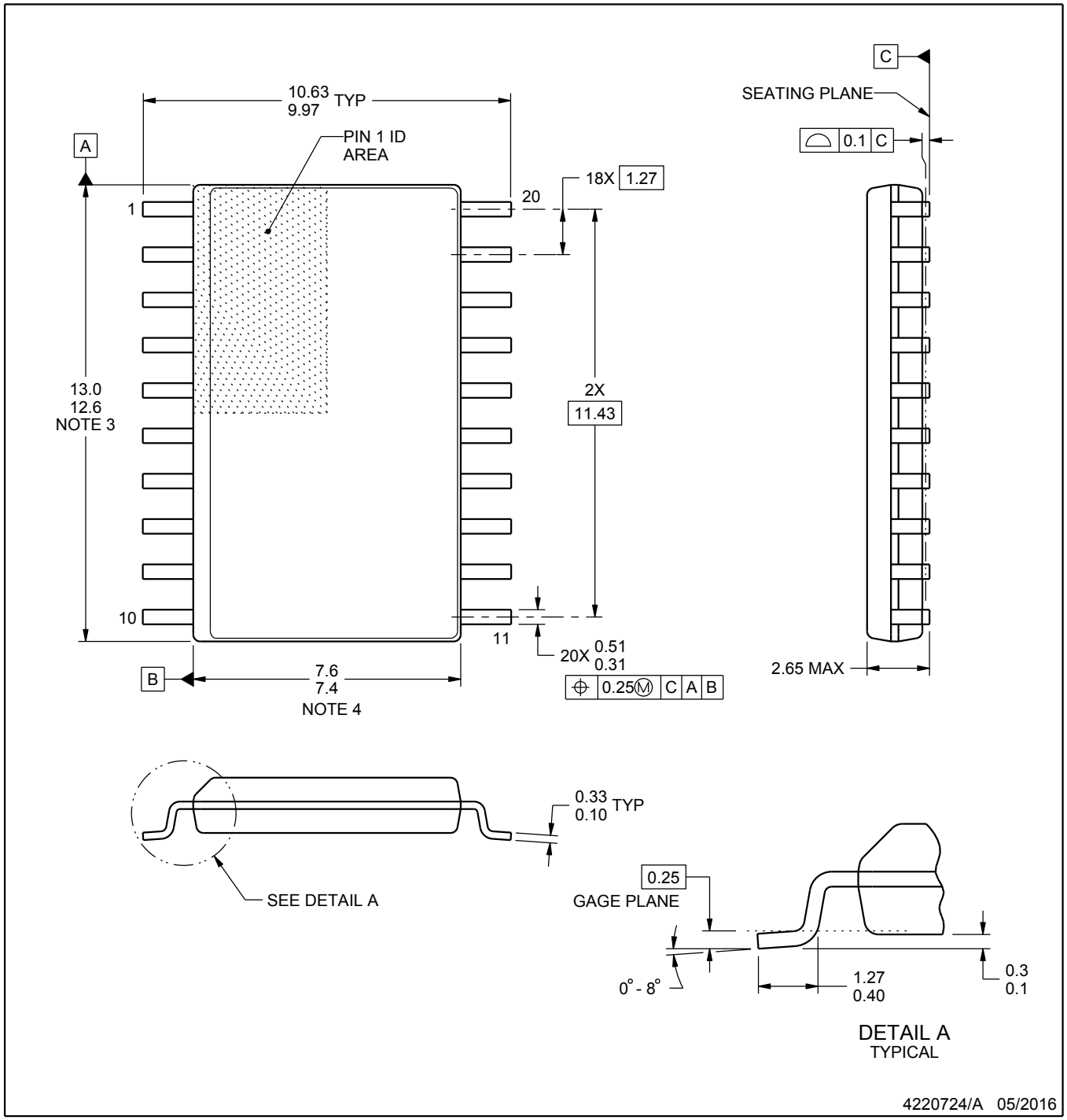



| DIM \ PINS ** | 14 | 16 | 18 | 20 |
|---|---|---|---|---|
| A MAX | 0.775 (19,69) | 0.775 (19,69) | 0.920 (23,37) | 1.060 (26,92) |
| A MIN | 0.745 (18,92) | 0.745 (18,92) | 0.850 (21,59) | 0.940 (23,88) |
| MS–001 VARIATION (C) | AA | BB | AC | AD |



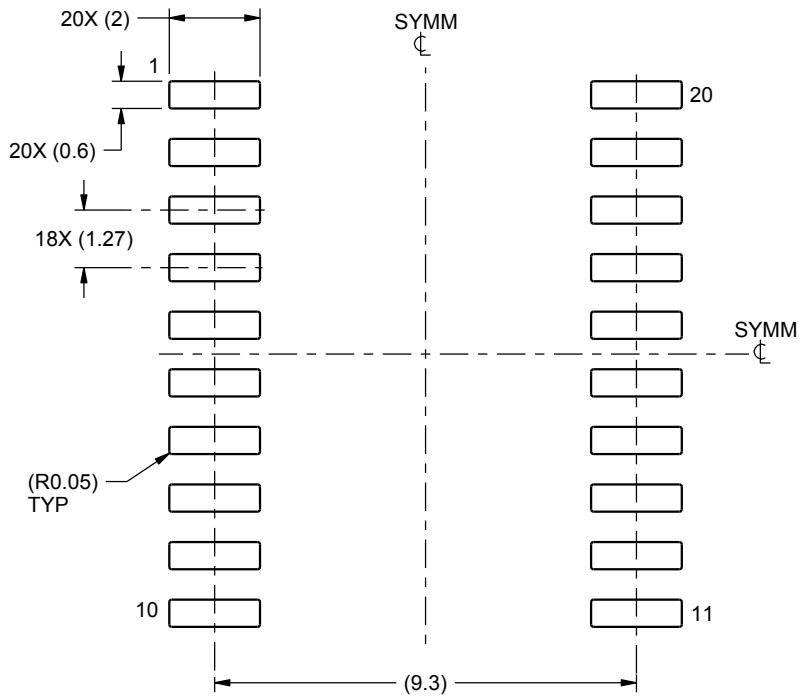

4040049/E 12/2002

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.

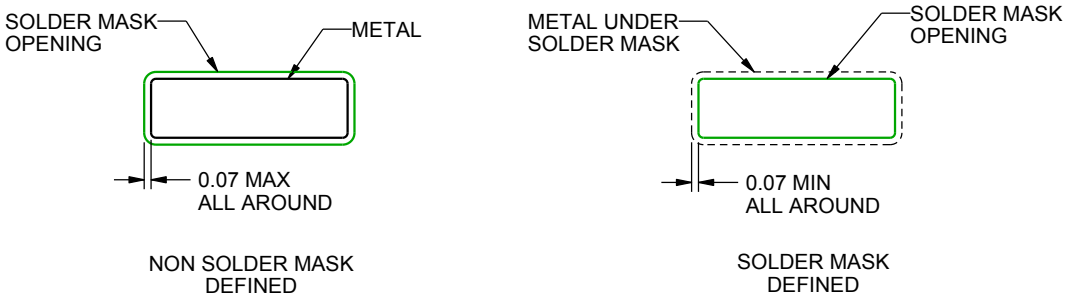



NOTES:

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-013.




LAND PATTERN EXAMPLE
SCALE:6X

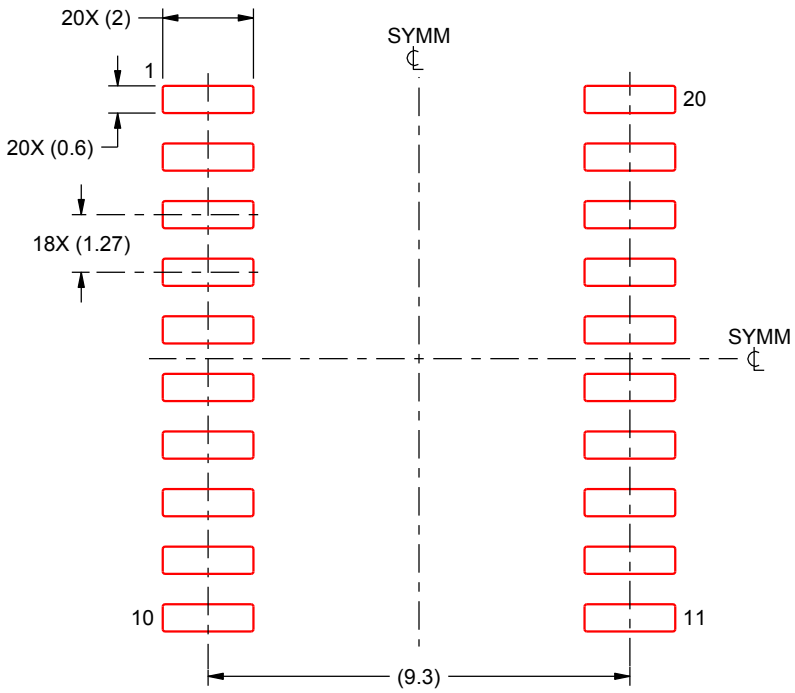



SOLDER MASK DETAILS

4220724/A 05/2016

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.




SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:6X

4220724/A 05/2016

NOTES: (continued)

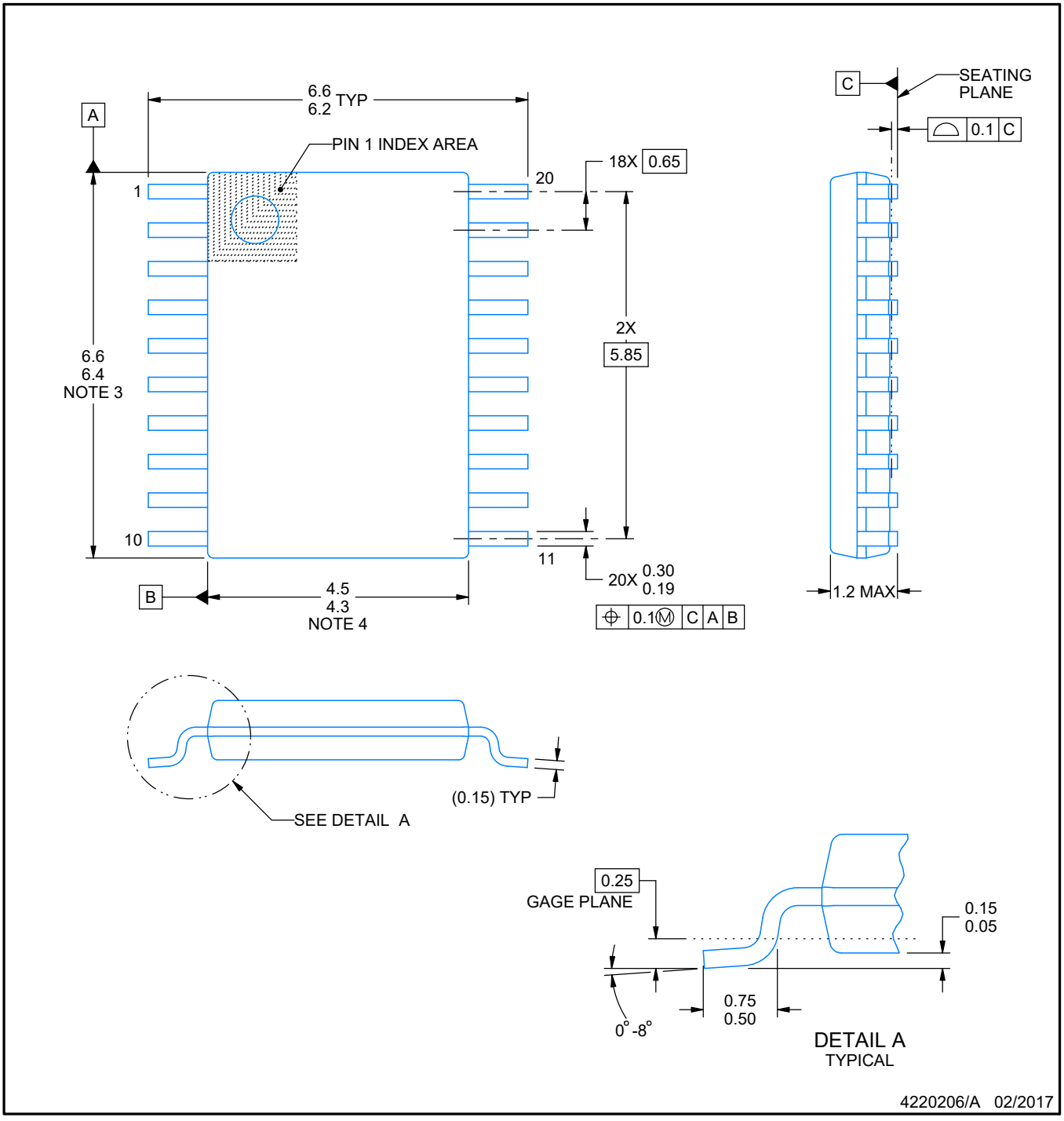
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

# PACKAGE OUTLINE

## PW0020A

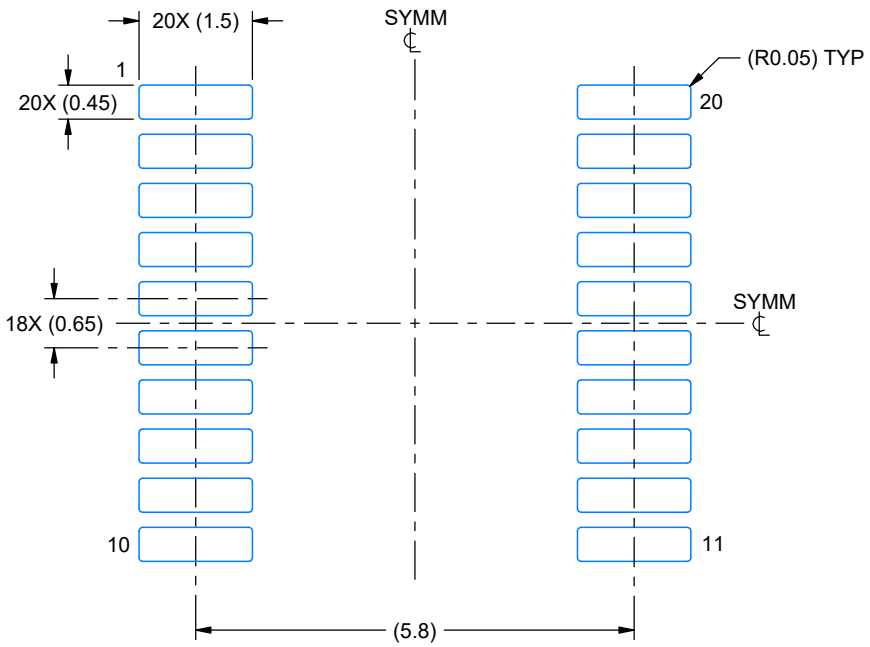
## TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE

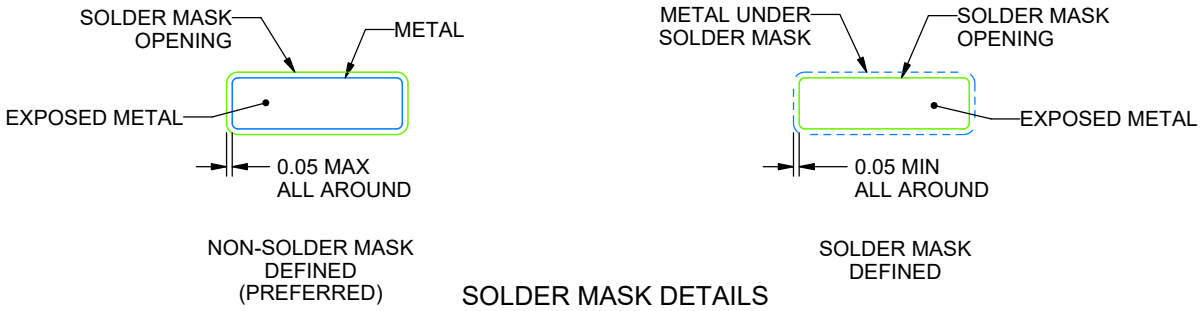



NOTES:

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.




LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

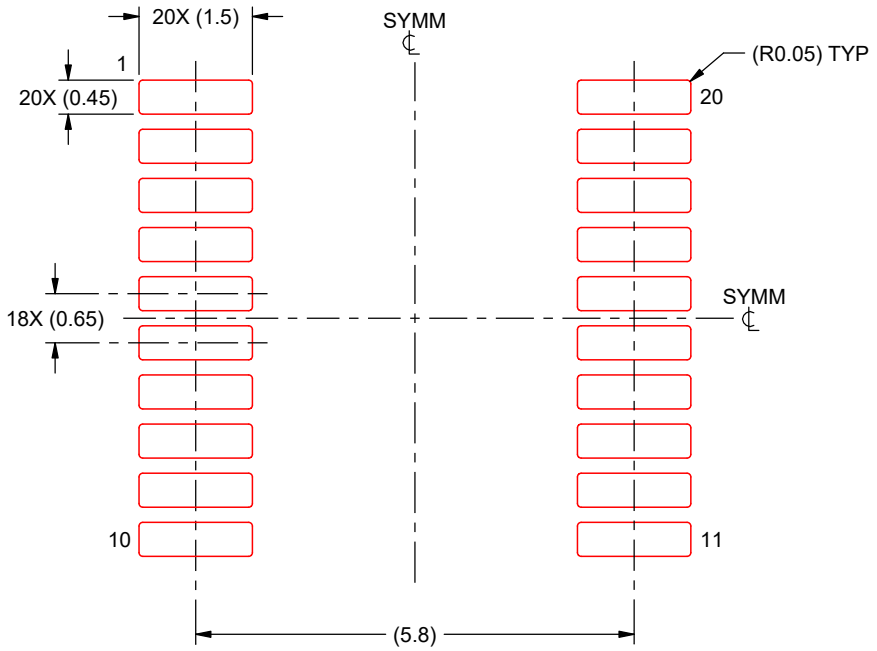



SOLDER MASK DETAILS

4220206/A 02/2017

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.



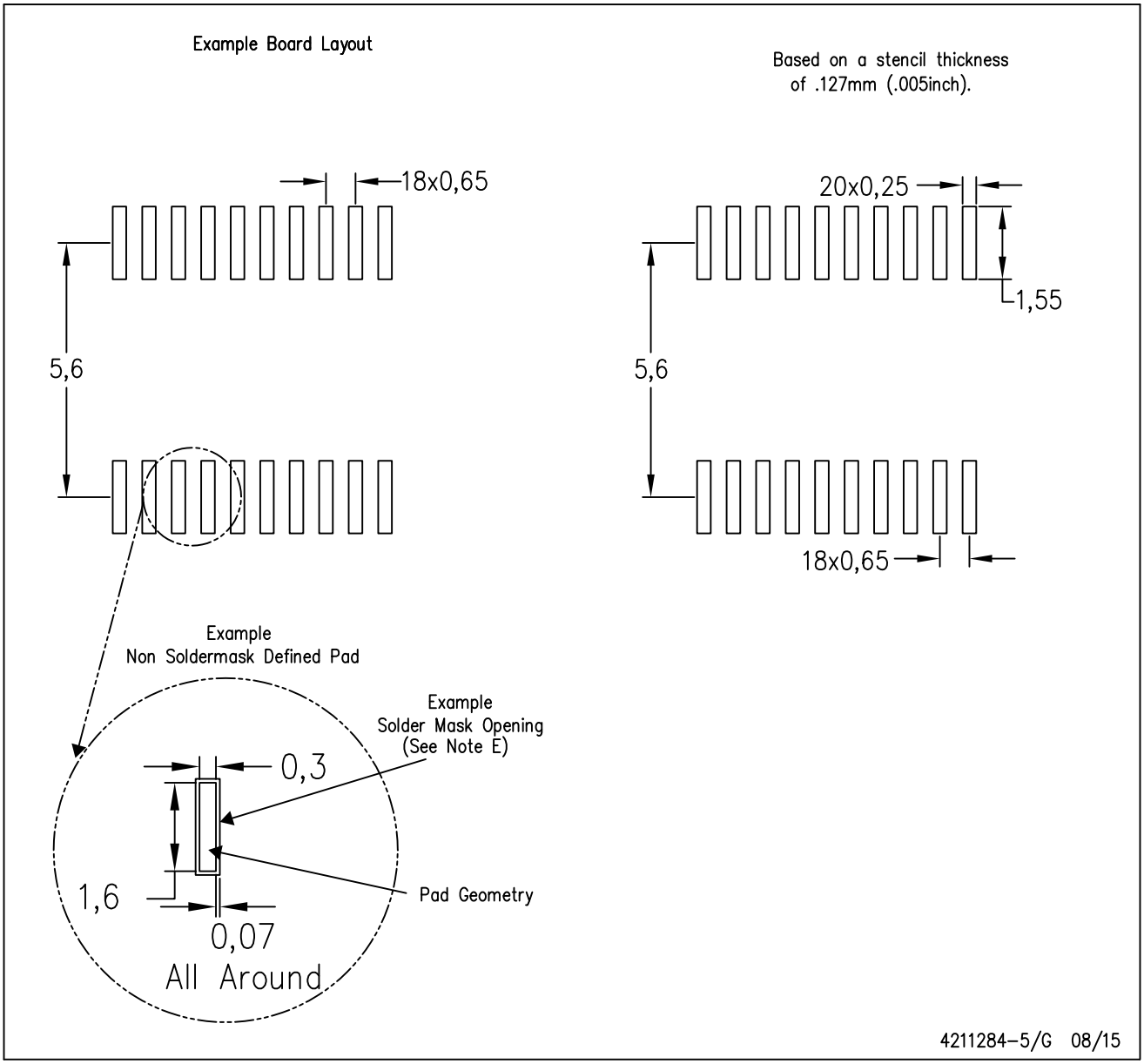

SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220206/A 02/2017

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.

PW (R–PDSO–G20) PLASTIC SMALL OUTLINE




NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate design.
D. 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.
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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