

SNx4AC04 Hex Inverters

1 Features

- V_{CC} operation of 2V to 6V
- Inputs accept voltages to 6V
- Max t_{pd} of 7ns at 5V

2 Applications

- [Synchronize inverted clock inputs](#)
- [Debounce a switch](#)
- Invert a digital signal

3 Description

The 'AC04 devices contain six independent inverters. The devices perform the Boolean function $Y = \bar{A}$.

Device Information

| PART NUMBER | PACKAGE ⁽¹⁾ | PACKAGE SIZE ⁽²⁾ | BODY SIZE ⁽³⁾ |
|-------------|------------------------|-----------------------------|--------------------------|
| SNx4AC04 | BQA (WQFN, 14) | 3mm x 2.5mm | 3mm x 2.5mm |
| | DB (SSOP, 14) | 6.2mm x 7.8mm | 6.2mm x 5.3mm |
| | D (SOIC, 14) | 8.65mm x 6mm | 8.65mm x 3.9mm |
| | NS (SOP, 14) | 10.2mm x 7.8mm | 10.3mm x 5.3mm |
| | PW (TSSOP, 14) | 5mm x 6.4mm | 5mm x 4.4mm |

- (1) For more information, see [Mechanical, Packaging, and Orderable Information](#).
- (2) The package size (length x width) is a nominal value and includes pins, where applicable.
- (3) The body size (length x width) is a nominal value and does not include pins.



Logic Diagram (Positive Logic)



Table of Contents

| | | | |
|--|---|--|----|
| 1 Features | 1 | 7.4 Device Functional Modes..... | 7 |
| 2 Applications | 1 | 8 Application and Implementation | 8 |
| 3 Description | 1 | 8.1 Application Information..... | 8 |
| 4 Pin Configuration and Functions | 3 | 8.2 Typical Application..... | 8 |
| 5 Specifications | 4 | 8.3 Power Supply Recommendations..... | 10 |
| 5.1 Absolute Maximum Ratings..... | 4 | 8.4 Layout..... | 10 |
| 5.2 ESD Ratings..... | 4 | 9 Device and Documentation Support | 11 |
| 5.3 Recommended Operating Conditions..... | 4 | 9.1 Device and Documentation Support..... | 11 |
| 5.4 Thermal Information..... | 5 | 9.2 Receiving Notification of Documentation Updates.... | 11 |
| 5.5 Electrical Characteristics..... | 5 | 9.3 Support Resources..... | 11 |
| 5.6 Switching Characteristics..... | 5 | 9.4 Trademarks..... | 11 |
| 5.7 Operating Characteristics..... | 5 | 9.5 Electrostatic Discharge Caution..... | 11 |
| 6 Parameter Measurement Information | 6 | 9.6 Glossary..... | 11 |
| 7 Detailed Description | 7 | 10 Revision History | 11 |
| 7.1 Overview..... | 7 | 11 Mechanical, Packaging, and Orderable Information | 12 |
| 7.2 Functional Block Diagram..... | 7 | | |
| 7.3 Feature Description..... | 7 | | |

4 Pin Configuration and Functions

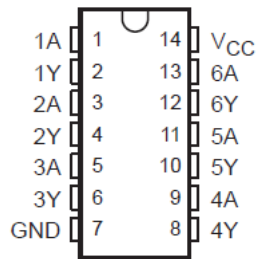


Figure 4-1. SN54AC04 J or W Package; SN74AC04 D, DB, N, NS, or PW Package; 14-Pin CDIP, CFP, SOIC, SSOP, PDIP, SOP, and TSSOP (Top View)

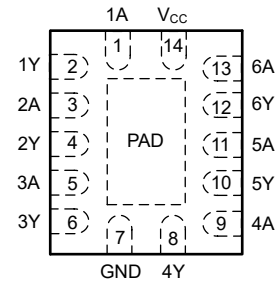


Figure 4-2. SN74AC04 BQA Package, 14-Pin WQFN (Top View)

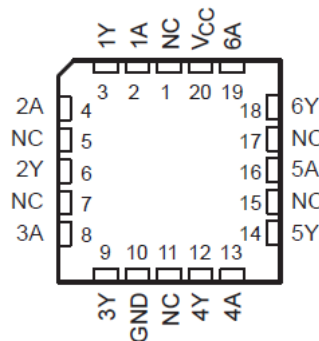


Figure 4-3. SN54AC04 FK Package, 20-Pin LCCC (Top View)

| NAME | PIN | | I/O | DESCRIPTION |
|----------------------------|--------------------------------|---------------------|--------|---|
| | D, DB, N, NS, PW, J, W, or BQA | FK | | |
| 1A | 1 | 2 | Input | Channel 1, Input A |
| 1Y | 2 | 3 | Output | Channel 1, Output Y |
| 2A | 3 | 4 | Input | Channel 2, Input A |
| 2Y | 4 | 6 | Output | Channel 2, Output Y |
| 3A | 5 | 8 | Input | Channel 3, Input A |
| 3Y | 6 | 9 | Output | Channel 3, Output Y |
| GND | 7 | 10 | — | Ground |
| 4Y | 8 | 12 | Output | Channel 4, Output Y |
| 4A | 9 | 13 | Input | Channel 4, Input A |
| 5Y | 10 | 14 | Output | Channel 5, Output Y |
| 5A | 11 | 16 | Input | Channel 5, Input A |
| 6Y | 12 | 18 | Output | Channel 6, Output Y |
| 6A | 13 | 19 | Input | Channel 6, Input A |
| V _{CC} | 14 | 20 | — | Positive Supply |
| NC | | 1, 5, 7, 11, 15, 17 | — | Not internally connected |
| Thermal Pad ⁽¹⁾ | | | — | The thermal pad can be connected to GND or left floating. Do not connect to any other signal or supply. |

(1) BQA package only.

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 |
| V_I | Input voltage range ⁽²⁾ | -0.5 | $V_{CC} + 0.5$ | V |
| V_O | Output voltage range ⁽²⁾ | -0.5 | $V_{CC} + 0.5$ | V |
| I_{IK} | Input clamp current | $V_I < 0$ or $V_I > V_{CC}$ | | ±20 mA |
| I_{OK} | Output clamp current | $V_O < 0$ or $V_O > V_{CC}$ | | ±20 mA |
| I_O | Continuous output current | $V_O = 0$ to V_{CC} | | ±50 mA |
| | Continuous current through V_{CC} or GND | | | ±200 mA |
| T_{stg} | Storage temperature range | -60 | 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 |
|-------------|-------------------------|--|-------|
| $V_{(ESD)}$ | Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾ | ±3000 |
| | | Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾ | ±1000 |

- (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 recommended operating free-air temperature range (unless otherwise noted)⁽¹⁾

| | | SN54AC04 | | SN74AC04 | | UNIT |
|---------------------|------------------------------------|------------------|----------|----------|----------|------|
| | | MIN | MAX | MIN | MAX | |
| V_{CC} | Supply voltage | 2 | 6 | 2 | 6 | V |
| V_{IH} | High-level input voltage | $V_{CC} = 3$ V | | 2.1 | | V |
| | | $V_{CC} = 4.5$ V | | 3.15 | | |
| | | $V_{CC} = 5.5$ V | | 3.85 | | |
| V_{IL} | Low-level input voltage | $V_{CC} = 3$ V | | 0.9 | | V |
| | | $V_{CC} = 4.5$ V | | 1.35 | | |
| | | $V_{CC} = 5.5$ V | | 1.65 | | |
| V_I | Input voltage | 0 | V_{CC} | 0 | V_{CC} | V |
| V_O | Output voltage | 0 | V_{CC} | 0 | V_{CC} | V |
| I_{OH} | High-level output current | $V_{CC} = 3$ V | | -12 | | mA |
| | | $V_{CC} = 4.5$ V | | -24 | | |
| | | $V_{CC} = 5.5$ V | | -24 | | |
| I_{OL} | Low-level output current | $V_{CC} = 3$ V | | 12 | | mA |
| | | $V_{CC} = 4.5$ V | | 24 | | |
| | | $V_{CC} = 5.5$ V | | 24 | | |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | 8 | | 8 | | ns/V |
| 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 CMOS Inputs*, literature number [SCBA004](#).

5.4 Thermal Information

| THERMAL METRIC ⁽¹⁾ | SN74AC04 | | | | | | UNIT |
|---|---------------|-------------|--------------|-------------|-------------|---------------|------|
| | BQA (WQFN) | D (SOIC) | DB (SSOP) | N (PDIP) | NS (SOP) | PW (TSSOP) | |
| | 14 PINS | | | | | | |
| R _{θJA} Junction-to-ambient thermal resistance | 93.4 | 89.9 | 96 | 80 | 92.4 | 148 | °C/W |

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and 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 _{CC} | T _A = 25°C | | | SN54AC04 | | SN74AC04 | | UNIT |
|-----------------|---|-----------------|-----------------------|-------|------|----------|------|----------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| V _{OH} | I _{OH} = -50 μA | 3 V | 2.9 | 2.99 | | 2.9 | | 2.9 | V | |
| | | 4.5 V | 4.4 | 4.49 | | 4.4 | | 4.4 | | |
| | | 5.5 V | 5.4 | 5.49 | | 5.4 | | 5.4 | | |
| | I _{OH} = -12 mA | 3 V | 2.56 | | | 2.4 | | 2.46 | | |
| | | 4.5 V | 3.86 | | | 3.7 | | 3.76 | | |
| | I _{OH} = -24 mA | 5.5 V | 4.86 | | | 4.7 | | 4.76 | | |
| | | 5.5 V | | | | 3.85 | | | | |
| | I _{OH} = -50 mA ⁽¹⁾ | 5.5 V | | | | | | | | |
| | I _{OH} = -75 mA ⁽¹⁾ | 5.5 V | | | | | 3.85 | | | |
| V _{OL} | I _{OL} = 50 μA | 3 V | | 0.002 | 0.1 | | 0.1 | 0.1 | V | |
| | | 4.5 V | | 0.001 | 0.1 | | 0.1 | 0.1 | | |
| | | 5.5 V | | 0.001 | 0.1 | | 0.1 | 0.1 | | |
| | I _{OL} = 12 mA | 3 V | | | 0.36 | | 0.5 | 0.44 | | |
| | | 4.5 V | | | 0.36 | | 0.5 | 0.44 | | |
| | I _{OL} = 24 mA | 5.5 V | | | 0.36 | | 0.5 | 0.44 | | |
| | | 5.5 V | | | | | 1.65 | | | |
| | I _{OL} = 50 mA ⁽¹⁾ | 5.5 V | | | | | 1.65 | | | |
| | I _{OL} = 75 mA ⁽¹⁾ | 5.5 V | | | | | | | | |
| I _I | V _I = V _{CC} or GND | 5.5 V | | | ±0.1 | | ±1 | ±1 | μA | |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | | | 2 | | 40 | 20 | μA | |
| C _i | V _I = V _{CC} or GND | | | 2.8 | | | | | pF | |

(1) Not more than one output should be tested at a time, and the duration of the test should not exceed 2 ms.

5.6 Switching Characteristics

over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | T _A = 25°C | | | SN54AC04 | | SN74AC04 | | UNIT |
|------------------|-----------------|----------------|-----------------------|-----|-----|----------|-----|----------|-----|------|
| | | | MIN | TYP | MAX | MIN | MAX | MIN | MAX | |
| t _{PLH} | A | Y | 1.5 | 4.5 | 9 | 1 | 11 | 1 | 10 | ns |
| t _{PHL} | | | 1.5 | 4.5 | 8.5 | 1 | 10 | 1 | 9.5 | |

5.7 Operating Characteristics

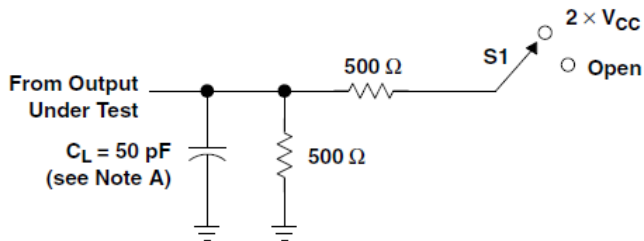
V_{CC} = 5 V, T_A = 25°C

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|---|----------------------------------|-----|------|
| C _{pd} Power dissipation capacitance | C _L = 50 pF f = 1 MHz | 45 | pF |

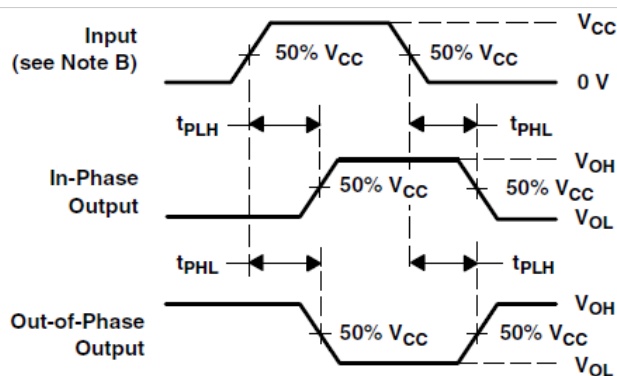
6 Parameter Measurement Information

Load Circuit and Voltage Waveforms

| TEST | S1 |
|-------------------|------|
| t_{PLH}/t_{PHL} | Open |



LOAD CIRCUIT



VOLTAGE WAVEFORMS

- NOTES: A. C_L includes probe and jig capacitance.
 B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r ≤ 2.5 ns, t_f ≤ 2.5 ns.
 C. The outputs are measured one at a time with one input transition per measurement.

7 Detailed Description

7.1 Overview

The 'AC04 devices contain six independent inverters. The devices perform the Boolean function $Y = \bar{A}$.

7.2 Functional Block Diagram



Logic Diagram (Positive Logic)

7.3 Feature Description

The SNx4AC04 devices have an operating V_{CC} range from 2 V to 6 V.

7.4 Device Functional Modes

Function Table lists the function modes of the SNx4ACT04.

Function Table
(Each Inverter)

| INPUT | OUTPUT |
|-------|--------|
| A | Y |
| H | L |
| L | H |

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 Application Information

The SNx4ACT04 is a low-drive CMOS device that can be used for a multitude of bus interface type applications where output ringing is a concern. The low drive and slow edge rates will minimize overshoot and undershoot on the outputs.

8.2 Typical Application

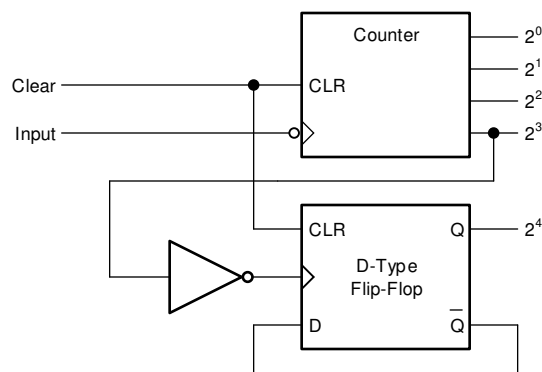


Figure 8-1. Typical Application Schematic

8.2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits. Outputs can be combined to produce higher drive but the high drive will also create faster edges into light loads, so routing and load conditions should be considered to prevent ringing.

8.2.2 Detailed Design Procedure

- Recommended Input Conditions
 - Rise time and fall time specs: See $(\Delta t/\Delta V)$ in the [Section 5.3](#).
 - Specified high and low levels: See $(V_{IH}$ and $V_{IL})$ in the [Section 5.3](#).
- Recommend Output Conditions
 - Load currents should not exceed 25 mA per output and 75 mA total for the part.
 - Outputs should not be pulled above V_{CC} .

8.2.3 Application Curve

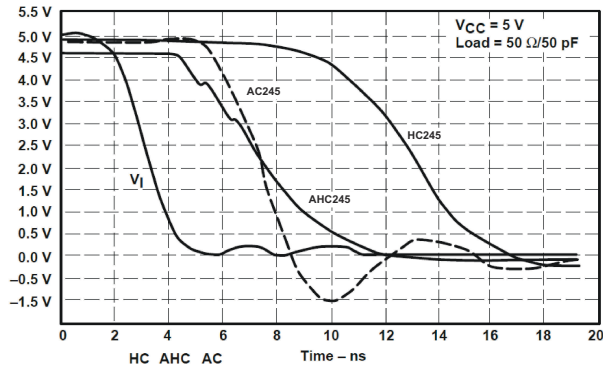


Figure 8-2. Switching Characteristics Comparison

8.3 Power Supply Recommendations

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

Each V_{CC} pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, 0.1 μF is recommended; if there are multiple V_{CC} pins, then 0.01 μF or 0.022 μF is recommended for each power pin. It is acceptable to parallel multiple bypass caps to reject different frequencies of noise. A 0.1 μF and a 1 μF are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

8.4 Layout

8.4.1 Layout Guidelines

When using multiple-bit logic devices, inputs should never float.

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 input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. [Section 8.4.1.1](#) specifies the rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or V_{CC} , whichever makes more sense or is more convenient. It is generally acceptable to float outputs, unless the part is a transceiver. If the transceiver has an output enable pin, it will disable the output section of the part when asserted. This will not disable the input section of the IOs, so they cannot float when disabled.

8.4.1.1 Layout Example

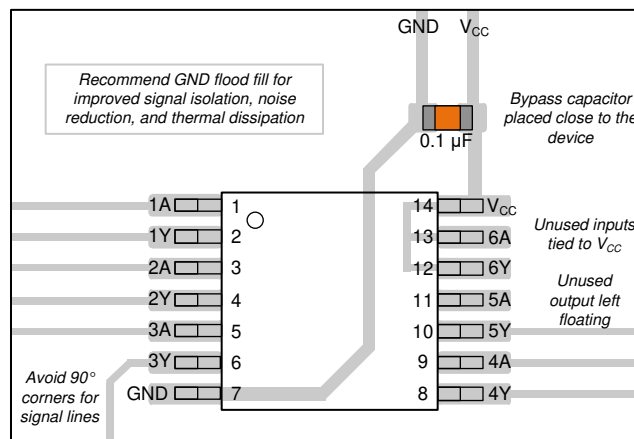


Figure 8-3. Example Layout of the SN74AC04

9 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.

9.1 Device and Documentation Support

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 |
|----------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| SN54AC04 | Click here | Click here | Click here | Click here | Click here |
| SN74AC04 | Click here | Click here | Click here | Click here | Click here |

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.

| Changes from Revision F (January 2023) to Revision G (July 2024) | Page |
|---|-------------|
| • Added BQA package to <i>Device Information</i> table, <i>Pin Configuration and Functions</i> section, and <i>Thermal Information</i> table..... | 1 |
| • Added package size to <i>Device Information</i> table..... | 1 |
| • Updated RθJA values: D = 86 to 89.9, NS = 76 to 92.4, PW = 113 to 148, all values in °C/W..... | 5 |
| • Updated <i>Layout Example</i> image..... | 10 |

Changes from Revision E (July 1995) to Revision F (January 2023) **Page**

- Added *Applications*, *Device Information* table, *Pin Functions* table, *ESD Ratings* table, *Thermal Information* table, *Typical Characteristics*, *Feature Description* section, *Device Functional Modes*, *Application and Implementation* section, *Power Supply Recommendations* section, *Layout* section, *Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section..... 1
-

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 |
|------------------|---------------|--------------|-----------------|------|-------------|------------------|--------------------------------------|----------------------|--------------|-----------------------------------|-------------------------|
| 5962-87609012A | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-87609012A SNJ54AC 04FK | Samples |
| 5962-8760901CA | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8760901CA SNJ54AC04J | Samples |
| 5962-8760901DA | ACTIVE | CFP | W | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8760901DA SNJ54AC04W | Samples |
| SN74AC04BQAR | ACTIVE | WQFN | BQA | 14 | 3000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 125 | AC04 | Samples |
| SN74AC04D | OBSOLETE | SOIC | D | 14 | | TBD | Call TI | Call TI | -40 to 85 | AC04 | |
| SN74AC04DBR | ACTIVE | SSOP | DB | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AC04 | Samples |
| SN74AC04DR | ACTIVE | SOIC | D | 14 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AC04 | Samples |
| SN74AC04N | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | -40 to 85 | SN74AC04N | Samples |
| SN74AC04NE4 | ACTIVE | PDIP | N | 14 | 25 | RoHS & Green | NIPDAU | N / A for Pkg Type | -40 to 85 | SN74AC04N | Samples |
| SN74AC04NSR | ACTIVE | SO | NS | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AC04 | Samples |
| SN74AC04PW | OBSOLETE | TSSOP | PW | 14 | | TBD | Call TI | Call TI | -40 to 85 | AC04 | |
| SN74AC04PWR | ACTIVE | TSSOP | PW | 14 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | AC04 | Samples |
| SNJ54AC04FK | ACTIVE | LCCC | FK | 20 | 55 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-87609012A SNJ54AC 04FK | Samples |
| SNJ54AC04J | ACTIVE | CDIP | J | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8760901CA SNJ54AC04J | Samples |
| SNJ54AC04W | ACTIVE | CFP | W | 14 | 25 | Non-RoHS & Green | SNPB | N / A for Pkg Type | -55 to 125 | 5962-8760901DA SNJ54AC04W | 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 ≤ 1000 ppm threshold. Antimony trioxide based flame retardants must also meet the ≤ 1000 ppm 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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

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

OTHER QUALIFIED VERSIONS OF SN54AC04, SN74AC04 :

- Catalog : [SN74AC04](#)
- Automotive : [SN74AC04-Q1](#), [SN74AC04-Q1](#)
- Enhanced Product : [SN74AC04-EP](#), [SN74AC04-EP](#)
- Military : [SN54AC04](#)

NOTE: Qualified Version Definitions:

- Catalog - TI's standard catalog product
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product - Supports Defense, Aerospace and Medical Applications
- Military - QML certified for Military and Defense Applications

TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|--------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AC04BQAR | WQFN | BQA | 14 | 3000 | 180.0 | 12.4 | 2.8 | 3.3 | 1.1 | 4.0 | 12.0 | Q1 |
| SN74AC04DBR | SSOP | DB | 14 | 2000 | 330.0 | 16.4 | 8.35 | 6.6 | 2.4 | 12.0 | 16.0 | Q1 |
| SN74AC04DR | SOIC | D | 14 | 2500 | 330.0 | 12.4 | 3.75 | 3.75 | 1.15 | 8.0 | 12.0 | Q1 |
| SN74AC04DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74AC04DR | SOIC | D | 14 | 2500 | 330.0 | 16.4 | 6.5 | 9.0 | 2.1 | 8.0 | 16.0 | Q1 |
| SN74AC04NSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.45 | 10.55 | 2.5 | 12.0 | 16.2 | Q1 |
| SN74AC04NSR | SO | NS | 14 | 2000 | 330.0 | 16.4 | 8.2 | 10.5 | 2.5 | 12.0 | 16.0 | Q1 |
| SN74AC04PWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |
| SN74AC04PWR | TSSOP | PW | 14 | 2000 | 330.0 | 12.4 | 6.9 | 5.6 | 1.6 | 8.0 | 12.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS



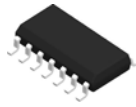
*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|--------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AC04BQAR | WQFN | BQA | 14 | 3000 | 210.0 | 185.0 | 35.0 |
| SN74AC04DBR | SSOP | DB | 14 | 2000 | 356.0 | 356.0 | 35.0 |
| SN74AC04DR | SOIC | D | 14 | 2500 | 340.5 | 336.1 | 32.0 |
| SN74AC04DR | SOIC | D | 14 | 2500 | 353.0 | 353.0 | 32.0 |
| SN74AC04DR | SOIC | D | 14 | 2500 | 356.0 | 356.0 | 35.0 |
| SN74AC04NSR | SO | NS | 14 | 2000 | 353.0 | 353.0 | 32.0 |
| SN74AC04NSR | SO | NS | 14 | 2000 | 367.0 | 367.0 | 38.0 |
| SN74AC04PWR | TSSOP | PW | 14 | 2000 | 353.0 | 353.0 | 32.0 |
| SN74AC04PWR | 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) |
|----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| 5962-87609012A | FK | LCCC | 20 | 55 | 506.98 | 12.06 | 2030 | NA |
| 5962-8760901DA | W | CFP | 14 | 25 | 506.98 | 26.16 | 6220 | NA |
| SN74AC04N | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74AC04N | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74AC04NE4 | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SN74AC04NE4 | N | PDIP | 14 | 25 | 506 | 13.97 | 11230 | 4.32 |
| SNJ54AC04FK | FK | LCCC | 20 | 55 | 506.98 | 12.06 | 2030 | NA |
| SNJ54AC04W | W | CFP | 14 | 25 | 506.98 | 26.16 | 6220 | NA |

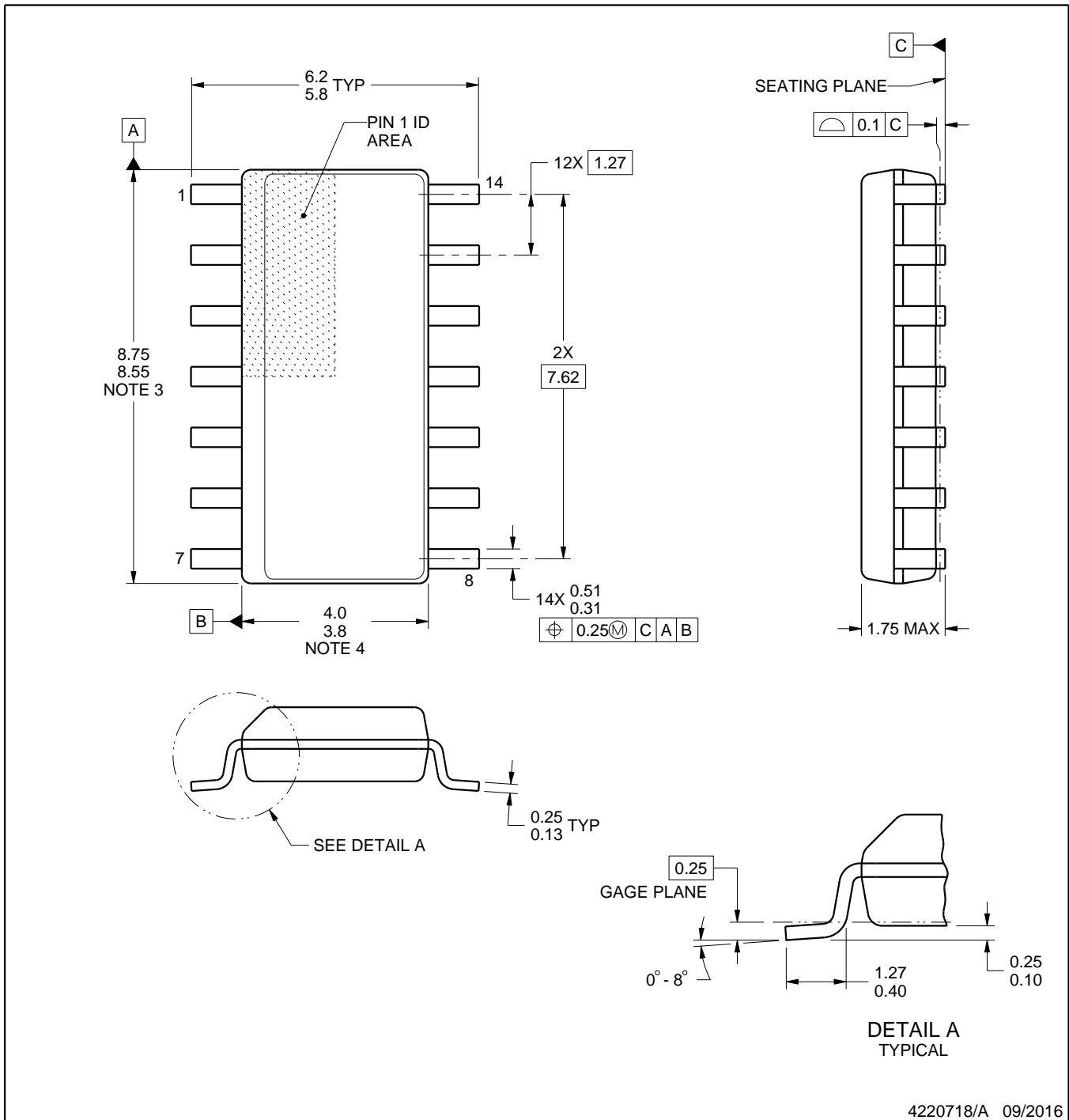


D0014A

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.

GENERIC PACKAGE VIEW

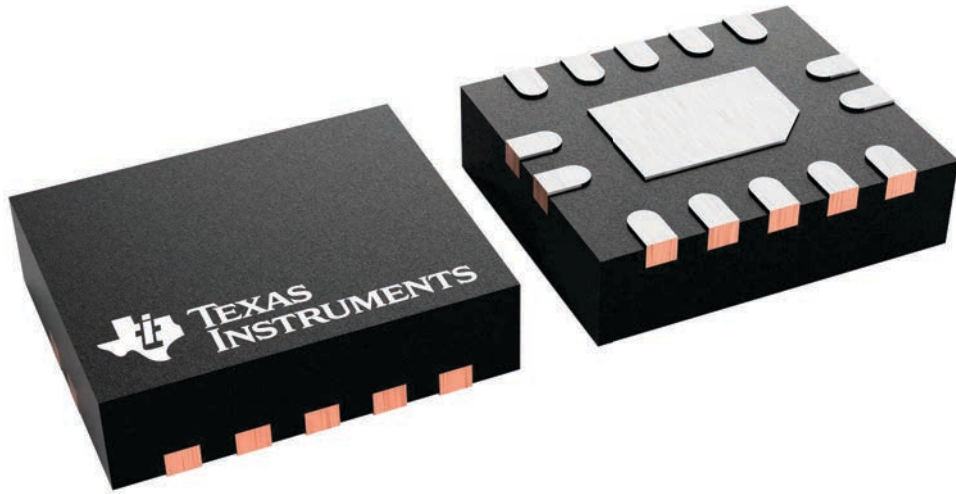
BQA 14

WQFN - 0.8 mm max height

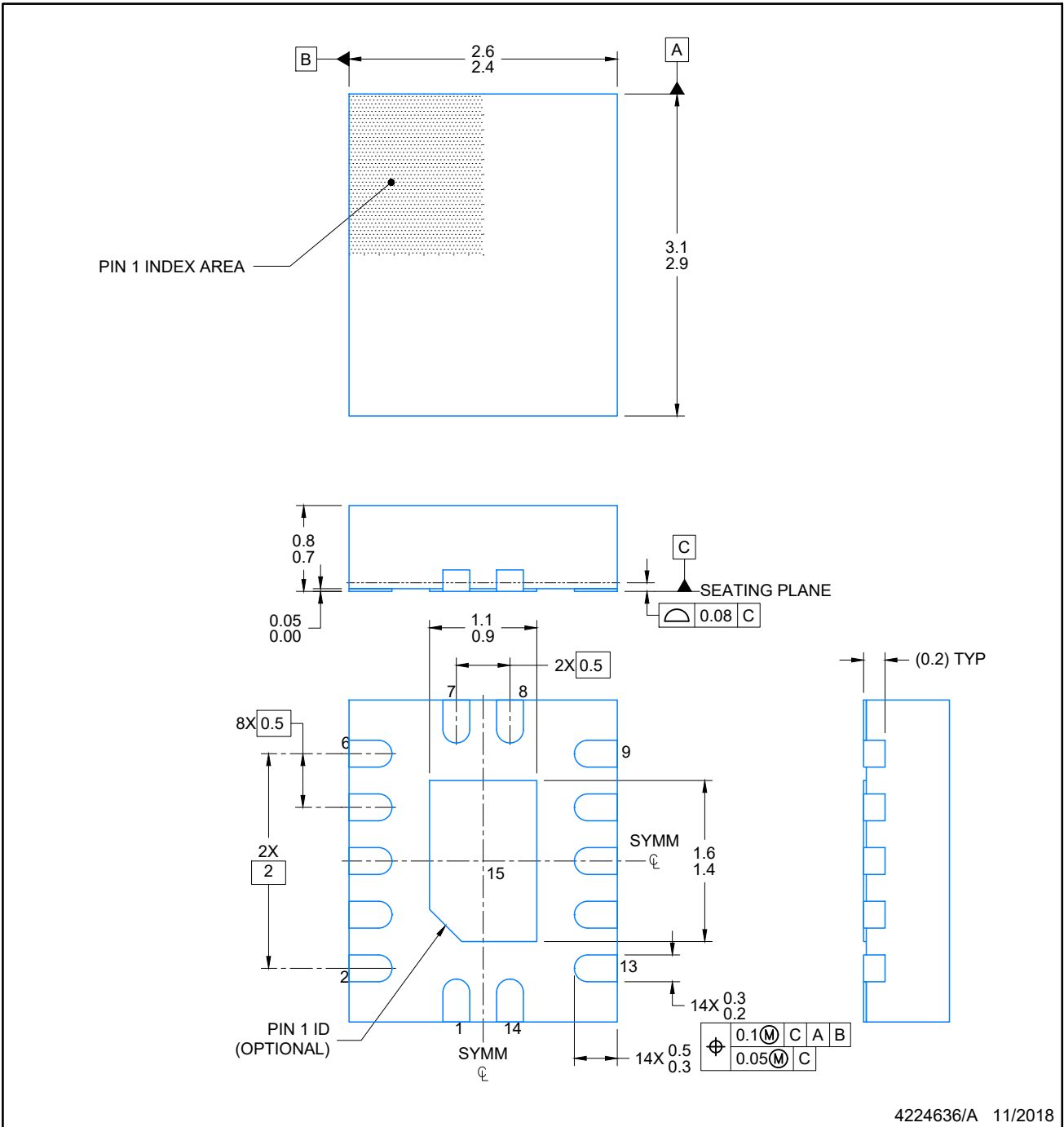
2.5 x 3, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

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



4227145/A



NOTES:

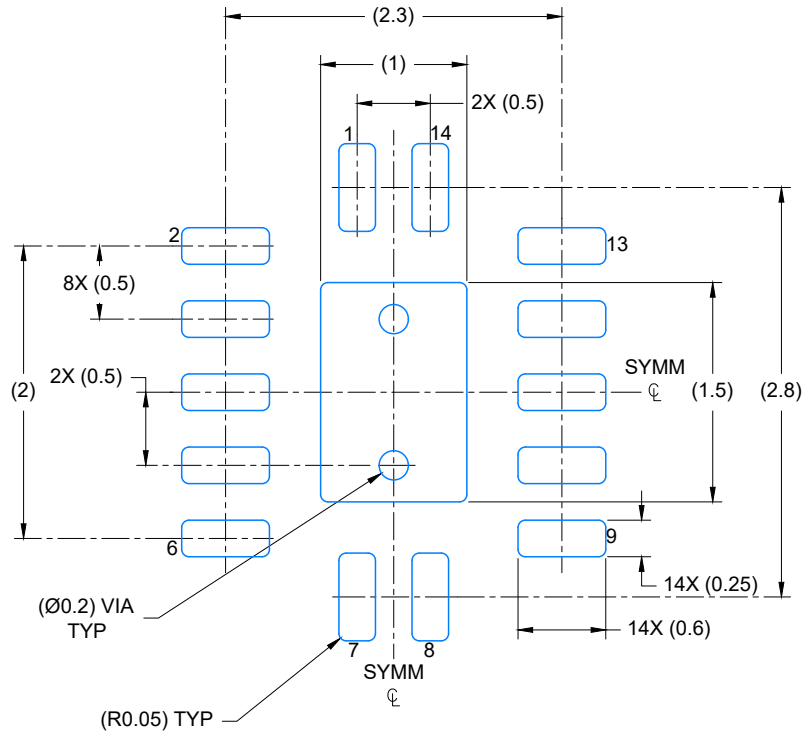
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for optimal thermal and mechanical performance.

EXAMPLE BOARD LAYOUT

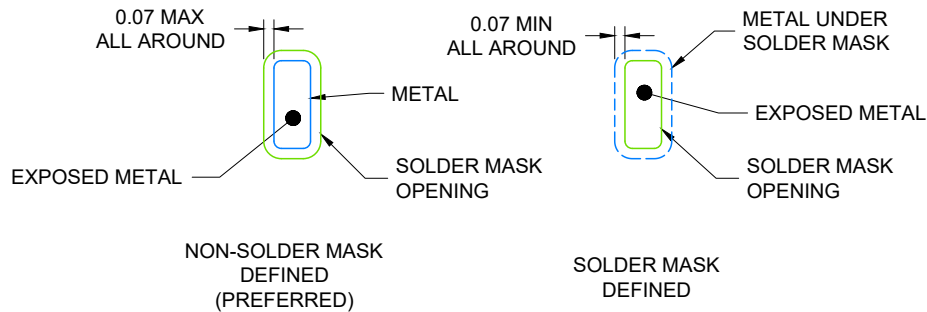
BQA0014A

WQFN - 0.8 mm max height

PLASTIC QUAD FLAT PACK-NO LEAD



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 20X



4224636/A 11/2018

NOTES: (continued)

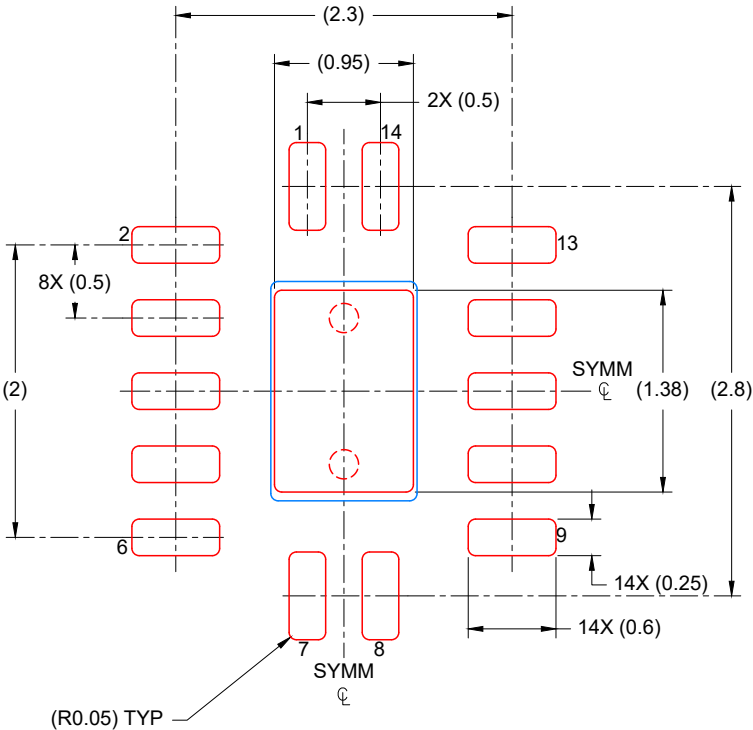
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

EXAMPLE STENCIL DESIGN

BQA0014A

WQFN - 0.8 mm max height

PLASTIC QUAD FLAT PACK-NO LEAD



SOLDER PASTE EXAMPLE
 BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD
 88% PRINTED COVERAGE BY AREA
 SCALE: 20X

4224636/A 11/2018

NOTES: (continued)

- 6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

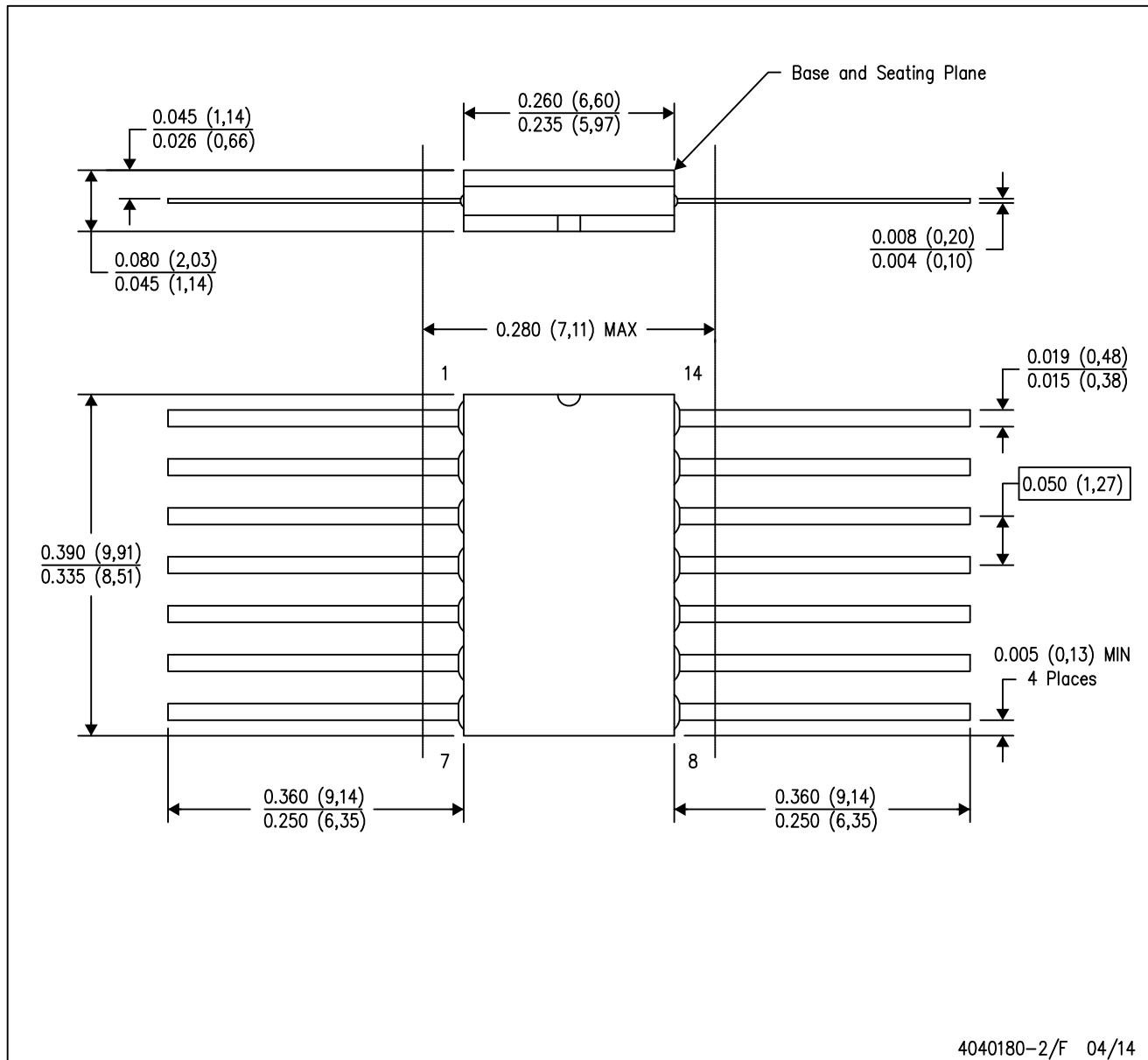
14-PINS SHOWN



- 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.

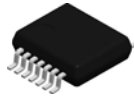
W (R-GDFP-F14)

CERAMIC DUAL FLATPACK



- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - C. This package can be hermetically sealed with a ceramic lid using glass frit.
 - D. Index point is provided on cap for terminal identification only.
 - E. Falls within MIL STD 1835 GDFP1-F14

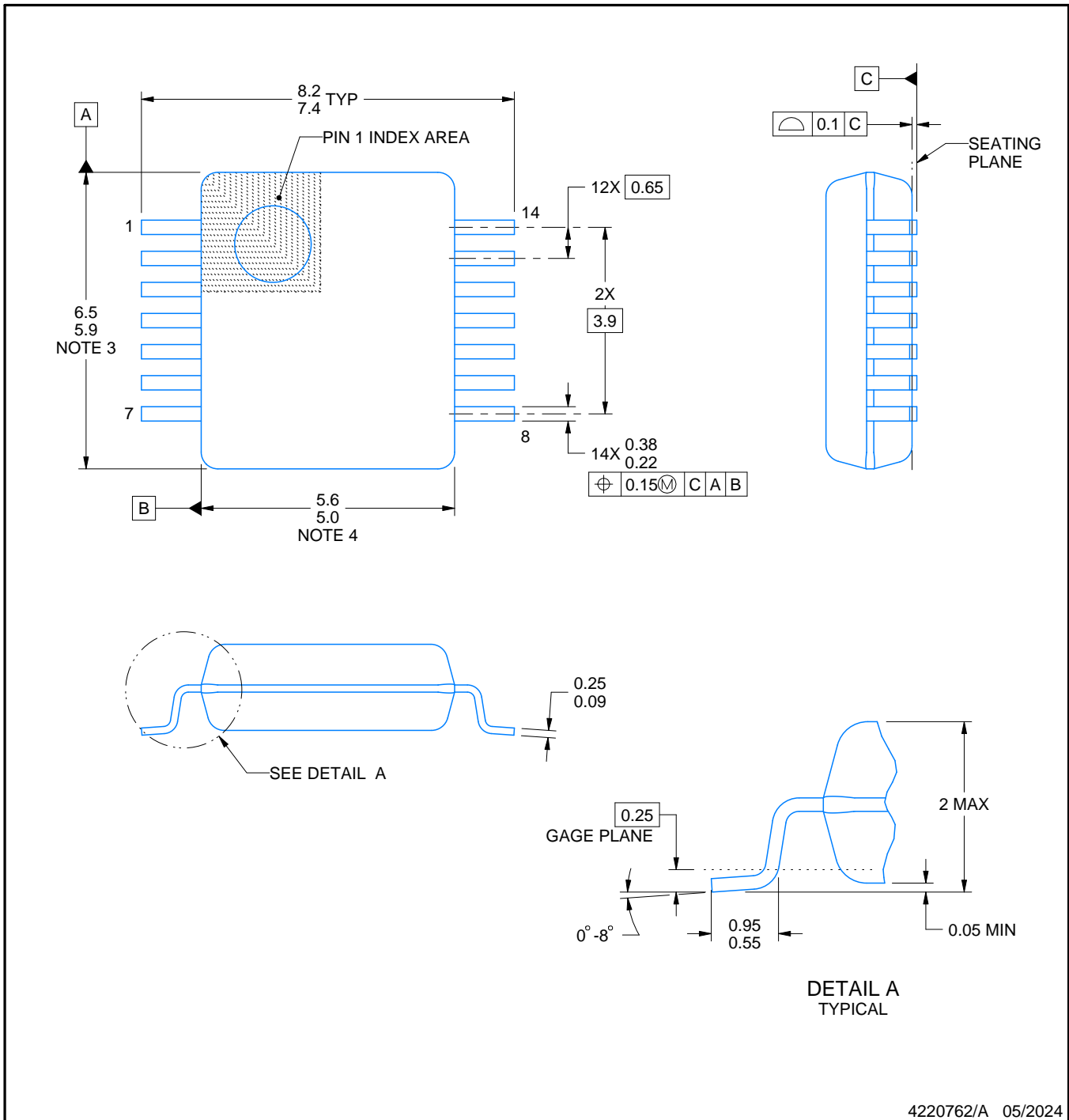
DB0014A



PACKAGE OUTLINE

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



NOTES:

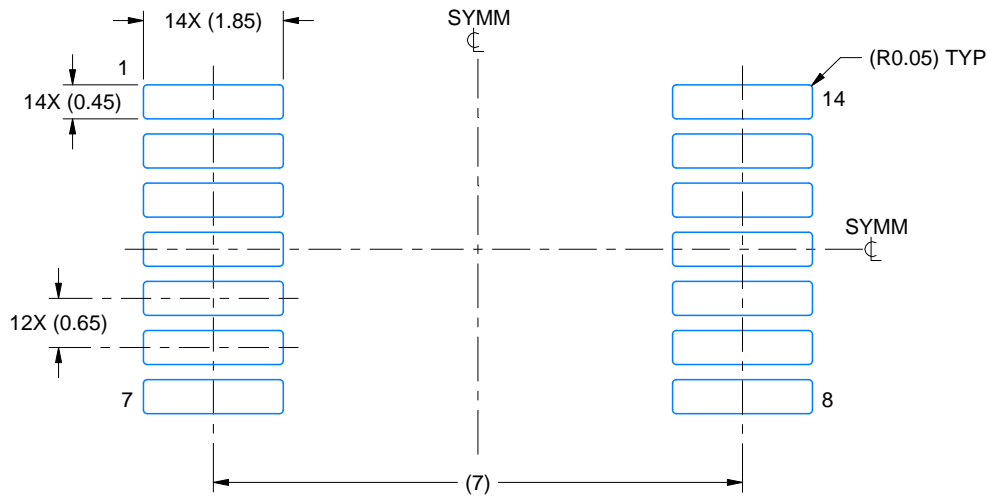
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

EXAMPLE BOARD LAYOUT

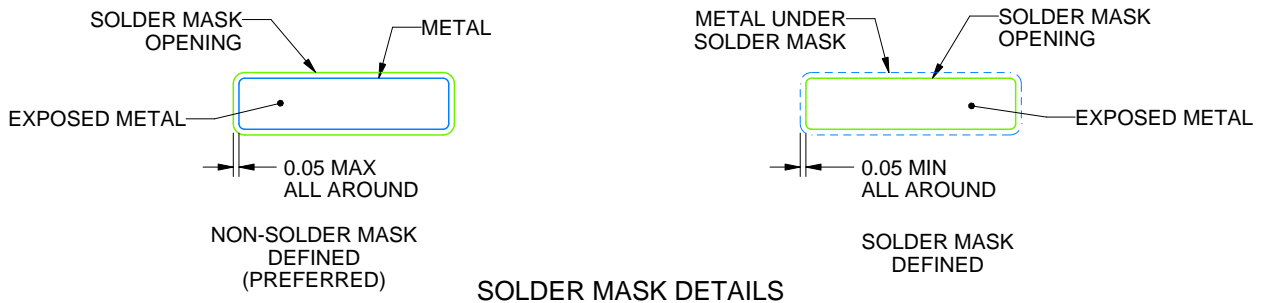
DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220762/A 05/2024

NOTES: (continued)

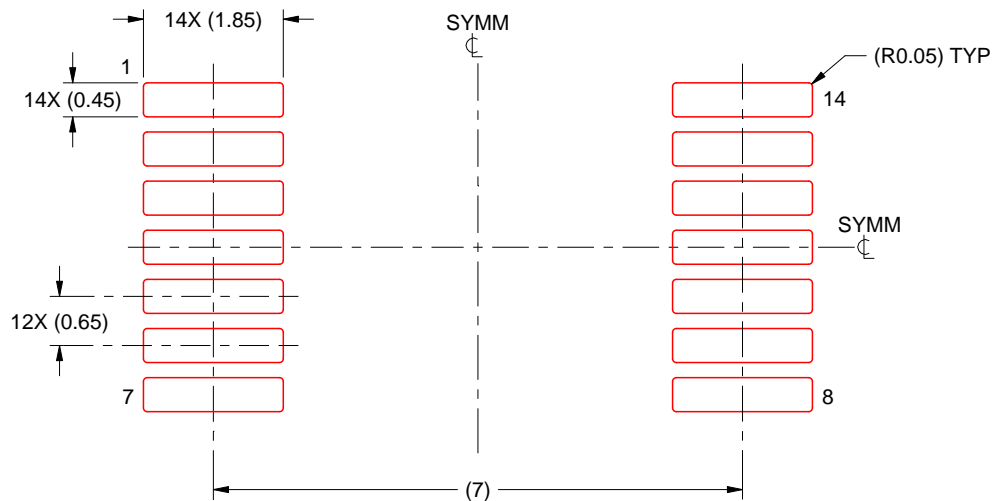
- 5. Publication IPC-7351 may have alternate designs.
- 6. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

4220762/A 05/2024

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.

GENERIC PACKAGE VIEW

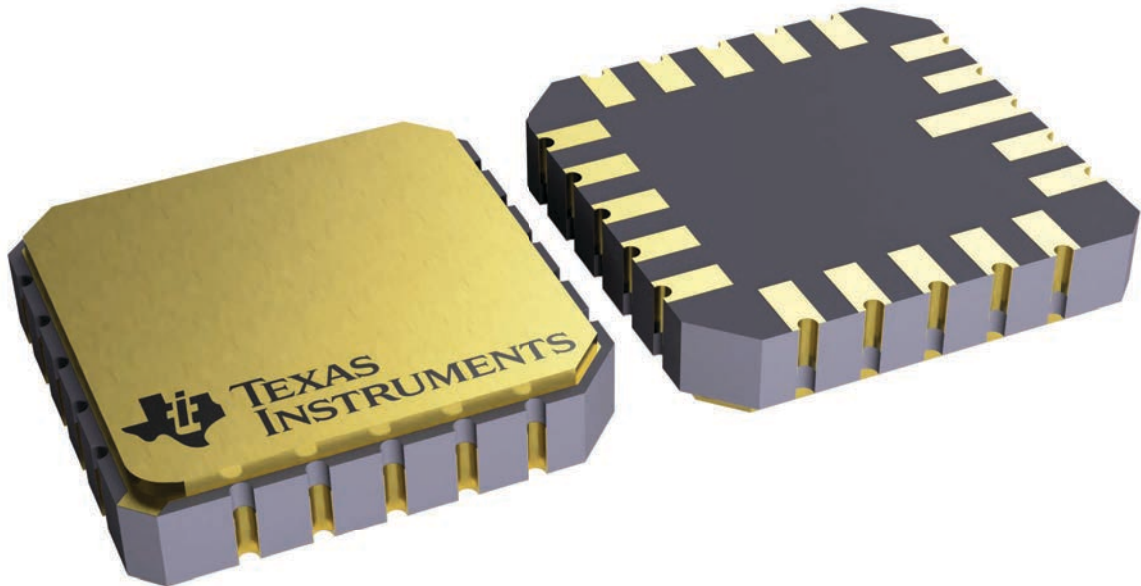
FK 20

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\

J 14

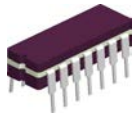
GENERIC PACKAGE VIEW
CDIP - 5.08 mm max height
CERAMIC DUAL IN LINE PACKAGE



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4040083-5/G

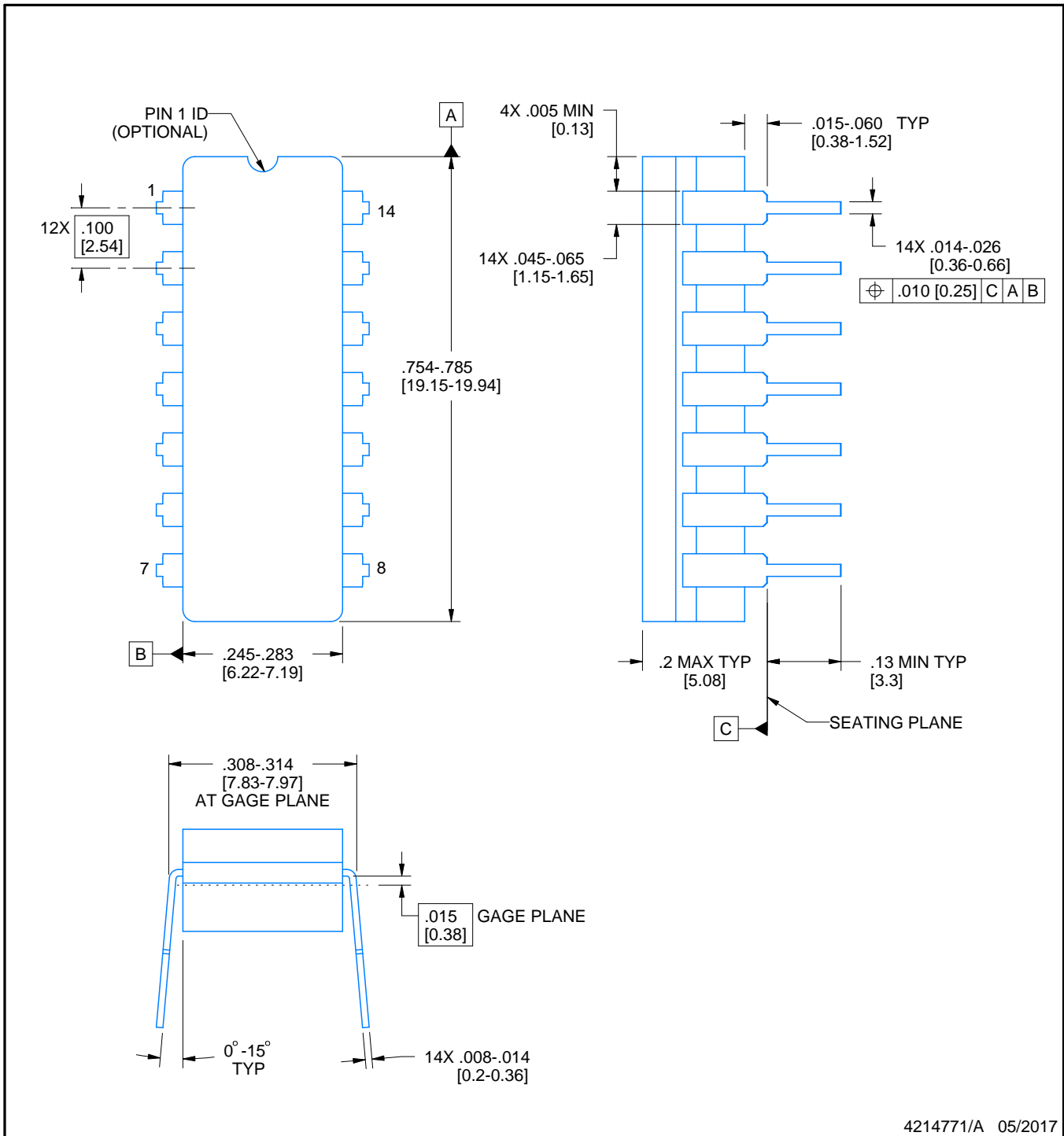
J0014A



PACKAGE OUTLINE

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



4214771/A 05/2017

NOTES:

1. All controlling linear dimensions are in inches. Dimensions in brackets are in millimeters. Any dimension in brackets or parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This package is hermetically sealed with a ceramic lid using glass frit.
4. Index point is provided on cap for terminal identification only and on press ceramic glass frit seal only.
5. Falls within MIL-STD-1835 and GDIP1-T14.

EXAMPLE BOARD LAYOUT

J0014A

CDIP - 5.08 mm max height

CERAMIC DUAL IN LINE PACKAGE



LAND PATTERN EXAMPLE
NON-SOLDER MASK DEFINED
SCALE: 5X



4214771/A 05/2017

N (R-PDIP-T**)

PLASTIC DUAL-IN-LINE PACKAGE

16 PINS SHOWN



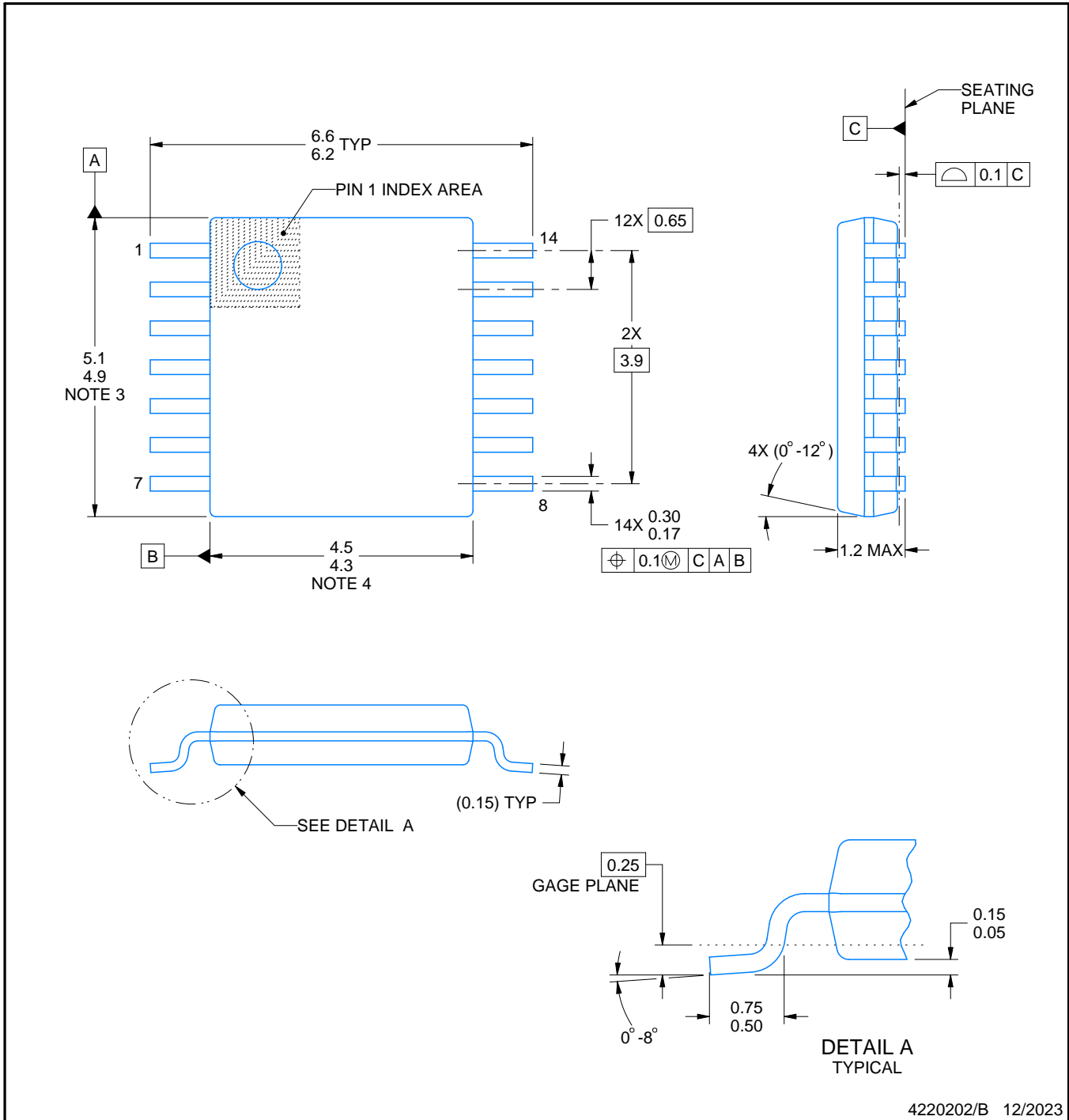
- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 - The 20 pin end lead shoulder width is a vendor option, either half or full width.

PW0014A



PACKAGE OUTLINE
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



4220202/B 12/2023

NOTES:

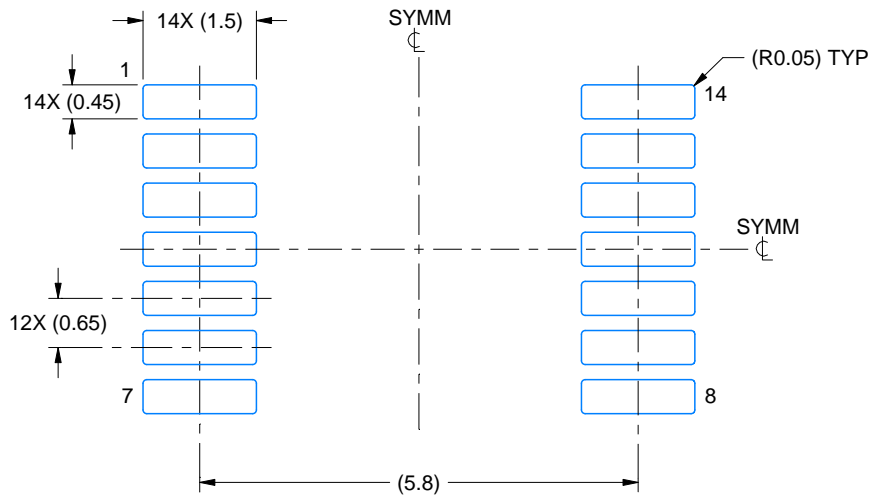
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

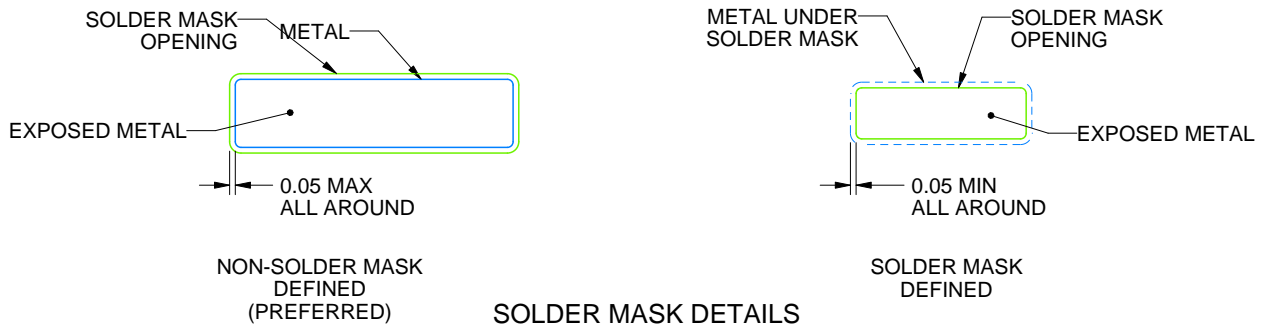
PW0014A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X



4220202/B 12/2023

NOTES: (continued)

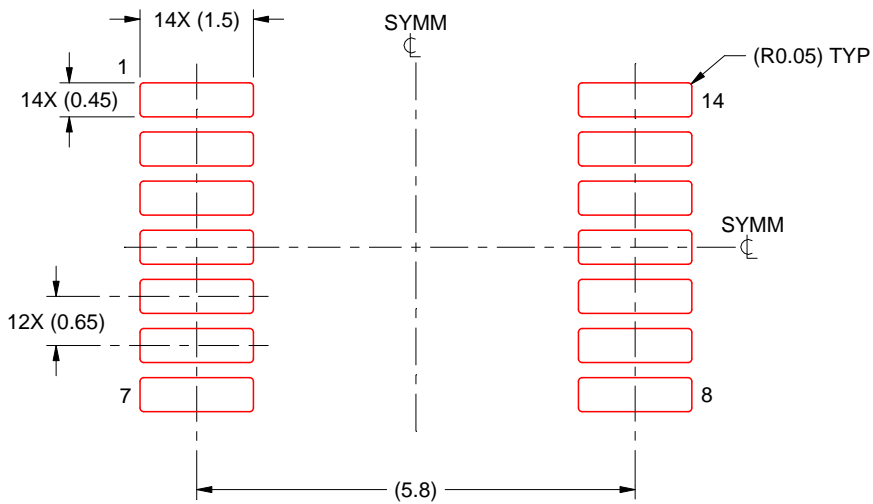
- 6. Publication IPC-7351 may have alternate designs.
- 7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

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.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2024, Texas Instruments Incorporated