

## SNx4AHC04 HEX INVERTERS

### 1 Features

- Operating range of 2 V to 5.5 V
- Latch-up performance exceeds 250 mA per JESD 17

### 2 Description

The 'AHC04 devices contain six independent inverters. These devices perform the Boolean function  $Y = \bar{A}$ .

#### Device Information

| PART NUMBER | PACKAGE <sup>1</sup> | BODY SIZE <sup>2</sup> |
|-------------|----------------------|------------------------|
| SN54AHC04   | J (CDIP, 14)         | 19.56 mm × 6.67 mm     |
|             | W (CFP, 14)          | 13.1 mm × 6.92 mm      |
|             | FK (LCCC, 20)        | 8.9 mm × 8.9 mm        |
| SN74AHC04   | N (PDIP, 14)         | 19.3 mm × 6.35 mm      |
|             | D (SOIC, 14)         | 8.65 mm × 3.91 mm      |
|             | DB (SSOP, 14)        | 6.20 mm × 5.30 mm      |
|             | NS (SOP, 14)         | 12.60 mm × 5.30 mm     |
|             | PW (TSSOP, 14)       | 5.00 mm × 4.40 mm      |
|             | DGV (TVSOP, 14)      | 3.6 mm × 4.4 mm        |
|             | RGY (VQFN, 14)       | 3.50 mm × 3.50 mm      |
|             | BQA (WQFN, 14)       | 3 mm × 2.5 mm          |

1. For all available packages, see the orderable addendum at the end of the data sheet.
2. The package size (length × width) is a nominal value and includes pins, where applicable.

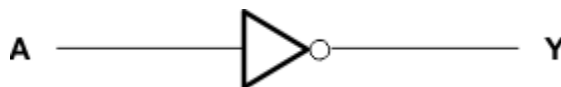


Figure 2-1. Logic Diagram, Each Gate (Positive Logic)



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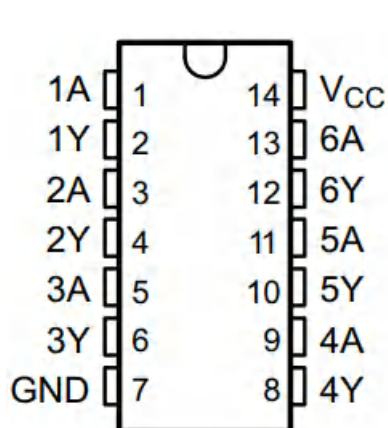
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## 3 Revision History

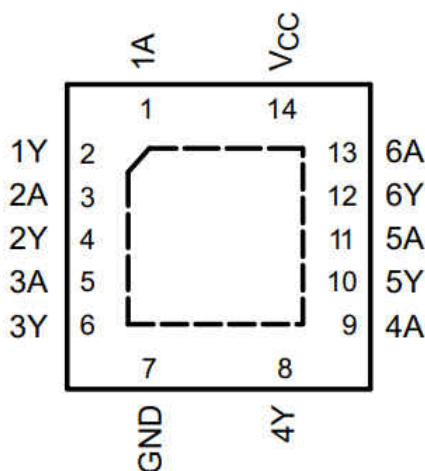
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| <b>Changes from Revision O (May 2023) to Revision P (June 2023)</b>                                                                | <b>Page</b> |
|------------------------------------------------------------------------------------------------------------------------------------|-------------|
| • Added BQA package to <i>Device Information</i> table.....                                                                        | <b>1</b>    |
| • Added <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section ..... | <b>1</b>    |
| • Updated thermal values for RθJA: D = 86 to 124.5, PW = 113 to 147.7, all values in °C/W .....                                    | <b>5</b>    |
| • Added thermal value for RθJA: BQA = 88.3, all values in °C/W.....                                                                | <b>5</b>    |
| <b>Changes from Revision N (May 2013) to Revision O (May 2023)</b>                                                                 | <b>Page</b> |
| • Added <i>Package Information</i> table, <i>Pin Functions</i> table, and <i>Thermal Information</i> table.....                    | <b>1</b>    |

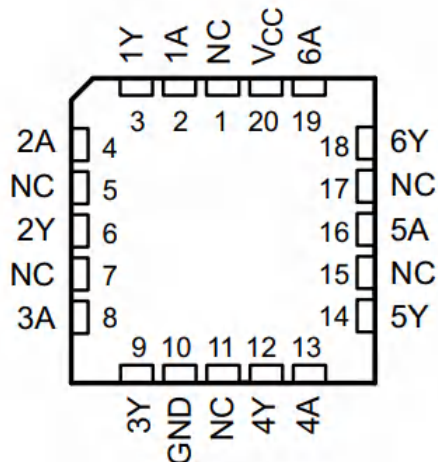
## 4 Pin Configuration and Functions



**Figure 4-1. SN54AHC04 J or W Package SN74AHC04 D, DB, DGV, N, NS, or PW Package (Top View)**



**Figure 4-2. SN74AHC04 RGY or BQA Package (Top View)**



**Figure 4-3. SN54AHC04 FK Package (Top View)**

**Table 4-1. Pin Functions**

| PIN             |                          |          |           |    | I/O | DESCRIPTION   |
|-----------------|--------------------------|----------|-----------|----|-----|---------------|
| NAME            | SN74AHC04                |          | SN54AHC04 |    |     |               |
|                 | D, DB, DGV,<br>N, NS, PW | RGY, BQA | J, W      | FK |     |               |
| 1A              | 1                        | 1        | 1         | 2  | I   | 1A Input      |
| 1Y              | 2                        | 2        | 2         | 3  | O   | 1Y Output     |
| 2A              | 3                        | 3        | 3         | 4  | I   | 2A Input      |
| 2Y              | 4                        | 4        | 4         | 6  | O   | 2Y Output     |
| 3A              | 5                        | 5        | 5         | 8  | I   | 3A Input      |
| 3Y              | 6                        | 6        | 6         | 9  | O   | 3Y Output     |
| 4A              | 9                        | 9        | 9         | 13 | I   | 4A Input      |
| 4Y              | 8                        | 8        | 8         | 12 | O   | 4Y Output     |
| 5A              | 11                       | 11       | 11        | 16 | I   | 5A Input      |
| 5Y              | 10                       | 10       | 10        | 14 | I   | 5Y Output     |
| 6A              | 13                       | 13       | 13        | 19 | I   | 6A Input      |
| 6Y              | 12                       | 12       | 12        | 18 | O   | 6Y Output     |
| GND             | 7                        | 7        | 7         | 10 | —   | Ground Pin    |
| NC              | —                        | —        | —         | 1  | —   | No Connection |
|                 |                          |          |           | 5  |     |               |
|                 |                          |          |           | 7  |     |               |
|                 |                          |          |           | 11 |     |               |
|                 |                          |          |           | 15 |     |               |
|                 |                          |          |           | 17 |     |               |
| V <sub>CC</sub> | 14                       | 14       | 14        | 20 | —   | Power Pin     |

## 5 Specifications

### 5.1 Absolute Maximum Ratings

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

|                                                   |                           |                                                           | MIN  | MAX                   | UNIT |
|---------------------------------------------------|---------------------------|-----------------------------------------------------------|------|-----------------------|------|
| V <sub>CC</sub>                                   | Supply voltage range      |                                                           | −0.5 | 7                     | V    |
| V <sub>I</sub> <sup>(2)</sup>                     | Input voltage range       |                                                           | −0.5 | 7                     | V    |
| V <sub>O</sub> <sup>(2)</sup>                     | Output voltage range      |                                                           | −0.5 | V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>                                   | Input clamp current       | (V <sub>I</sub> < 0)                                      | −20  |                       | mA   |
| I <sub>OK</sub>                                   | Output clamp current      | (V <sub>O</sub> < 0 or V <sub>O</sub> > V <sub>CC</sub> ) | ±20  |                       | mA   |
| I <sub>OK</sub>                                   | Continuous output current | (V <sub>O</sub> = 0 to V <sub>CC</sub> )                  | ±25  |                       | mA   |
| Continuous current through V <sub>CC</sub> or GND |                           |                                                           | ±50  |                       | mA   |
| T <sub>stg</sub>                                  | Storage temperature range |                                                           | −65  | 150                   | °C   |

- (1) Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

### 5.2 ESD Ratings

|             |                         | VALUE                                                                                    | UNIT  |
|-------------|-------------------------|------------------------------------------------------------------------------------------|-------|
| $V_{(ESD)}$ | Electrostatic discharge | Human body model (HBM), per ANSI/ESDA/JEDEC JS-001, all pins <sup>(1)</sup>              | ±2000 |
|             |                         | Charged device model (CDM), per JEDEC specification JESD22-C101, all pins <sup>(2)</sup> | ±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

|                     |                                    |                                            | SN54AHC04 |          | SN74AHC04 |          | UNIT |
|---------------------|------------------------------------|--------------------------------------------|-----------|----------|-----------|----------|------|
|                     |                                    |                                            | MIN       | MAX      | MIN       | MAX      |      |
| $V_{CC}$            | Supply voltage                     |                                            | 2         | 5.5      | 2         | 5.5      | V    |
| $V_{IH}$            | High-level input voltage           | $V_{CC} = 2 \text{ V}$                     | 1.5       |          | 1.5       |          | V    |
|                     |                                    | $V_{CC} = 3 \text{ V}$                     | 2.1       |          | 2.1       |          |      |
|                     |                                    | $V_{CC} = 5.5 \text{ V}$                   | 3.85      |          | 3.85      |          |      |
| $V_{IL}$            | Low-level Input voltage            | $V_{CC} = 2 \text{ V}$                     |           | 0.5      |           | 0.5      | V    |
|                     |                                    | $V_{CC} = 3 \text{ V}$                     |           | 0.9      |           | 0.9      |      |
|                     |                                    | $V_{CC} = 5.5 \text{ V}$                   |           | 1.65     |           | 1.65     |      |
| $V_I$               | Input voltage                      |                                            | 0         | 5.5      | 0         | 5.5      | V    |
| $V_O$               | Output voltage                     |                                            | 0         | $V_{CC}$ | 0         | $V_{CC}$ | V    |
| $I_{OH}$            | High-level output current          | $V_{CC} = 2 \text{ V}$                     |           | −50      |           | −50      | mA   |
|                     |                                    | $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ |           | −4       |           | −4       |      |
|                     |                                    | $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$   |           | −8       |           | −8       |      |
| $I_{OL}$            | Low-level output current           | $V_{CC} = 2 \text{ V}$                     |           | 50       |           | 50       | mA   |
|                     |                                    | $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ |           | 4        |           | 4        |      |
|                     |                                    | $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$   |           | 8        |           | 8        |      |
| $\Delta t/\Delta v$ | Input Transition rise or fall rate | $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ |           | 100      |           | 100      | ns/V |
|                     |                                    | $V_{CC} = 5 \text{ V} \pm 0.5 \text{ V}$   |           | 20       |           | 20       |      |
| $T_A$               | Operating free-air temperature     |                                            | −55       | 125      | −40       | 125      | °C   |

## 5.4 Thermal Information

| THERMAL METRIC <sup>1</sup> |                                        | SNx4AHC04 |    |     |    |    |       |     |      | UNIT |
|-----------------------------|----------------------------------------|-----------|----|-----|----|----|-------|-----|------|------|
|                             |                                        | D         | DB | DGV | N  | NS | PW    | RGY | BQA  |      |
|                             |                                        | 14 PINS   |    |     |    |    |       |     |      |      |
| R <sub>θJA</sub>            | Junction-to-ambient thermal resistance | 124.5     | 96 | 127 | 80 | 76 | 147.7 | 47  | 88.3 | °C/W |

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

## 5.5 Electrical Characteristics

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

| PARAMETER       | TEST CONDITIONS                                                | V <sub>CC</sub> | T <sub>A</sub> = 25°C |     |      | T <sub>A</sub> = –55°C TO 125°C |                   | T <sub>A</sub> = –40°C TO 85°C |      | T <sub>A</sub> = –40°C TO 125°C |     | UNIT |
|-----------------|----------------------------------------------------------------|-----------------|-----------------------|-----|------|---------------------------------|-------------------|--------------------------------|------|---------------------------------|-----|------|
|                 |                                                                |                 |                       |     |      | SN54AHC04                       |                   | SN74AHC04                      |      | Recommended<br>SN74AHC04        |     |      |
|                 |                                                                |                 | MIN                   | TYP | MAX  | MIN                             | MAX               | MIN                            | MAX  | MIN                             | MAX |      |
| V <sub>OH</sub> | I <sub>OH</sub> = –50 μA                                       | 2 V             | 1.9                   | 2   |      | 1.9                             |                   | 1.9                            |      | 1.9                             | V   |      |
|                 |                                                                | 3 V             | 2.9                   | 3   |      | 2.9                             |                   | 2.9                            |      | 2.9                             |     |      |
|                 |                                                                | 4.5 V           | 4.4                   | 4.5 |      | 4.4                             |                   | 4.4                            |      | 4.4                             |     |      |
|                 | I <sub>OH</sub> = –4 mA                                        | 3 V             | 2.58                  |     |      | 2.48                            |                   | 2.48                           |      | 2.48                            |     |      |
|                 | I <sub>OH</sub> = –8 mA                                        | 4.5 V           | 3.94                  |     |      | 3.8                             |                   | 3.8                            |      | 3.8                             |     |      |
| V <sub>OL</sub> | I <sub>OL</sub> = 50 μA                                        | 2 V             |                       |     | 0.1  |                                 | 0.1               |                                | 0.1  |                                 | 0.1 | V    |
|                 |                                                                | 3 V             |                       |     | 0.1  |                                 | 0.1               |                                | 0.1  |                                 | 0.1 |      |
|                 |                                                                | 4.5 V           |                       |     | 0.1  |                                 | 0.1               |                                | 0.1  |                                 | 0.1 |      |
|                 | I <sub>OH</sub> = 4 mA                                         | 3 V             |                       |     | 0.36 |                                 | 0.5               |                                | 0.44 |                                 | 0.5 |      |
|                 | I <sub>OH</sub> = 8 mA                                         | 4.5 V           |                       |     | 0.36 |                                 | 0.5               |                                | 0.44 |                                 | 0.5 |      |
| I <sub>I</sub>  | V <sub>I</sub> = 5.5 V or GND                                  | 0 V to 5.5 V    |                       |     | ±0.1 |                                 | ±1 <sup>(1)</sup> |                                | ±1   |                                 | ±1  | μA   |
| I <sub>CC</sub> | V <sub>I</sub> = V <sub>CC</sub> or GND,<br>I <sub>O</sub> = 0 | 5.5 V           |                       |     | 2    |                                 | 20                |                                | 20   |                                 | 20  | μA   |
| C <sub>i</sub>  | V <sub>I</sub> = V <sub>CC</sub> or GND                        | 5 V             |                       | 2   | 10   |                                 |                   |                                | 10   |                                 |     | pF   |

(1) On products compliant to MIL-PRF-38535, this parameter is not production tested at V<sub>CC</sub> = 0 V.

## 5.6 Switching Characteristics

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

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | LOAD<br>CAPACITANCE    | T <sub>A</sub> = 25°C |                    | T <sub>A</sub> = –55°C TO 125°C |                     | T <sub>A</sub> = –40°C TO 85°C |      | T <sub>A</sub> = –40°C TO 125°C |      | UNIT |
|------------------|-----------------|----------------|------------------------|-----------------------|--------------------|---------------------------------|---------------------|--------------------------------|------|---------------------------------|------|------|
|                  |                 |                |                        |                       |                    | SN54AHC04                       |                     | SN74AHC04                      |      | Recommended                     |      |      |
|                  |                 |                |                        | SN74AHC04             |                    |                                 |                     |                                |      |                                 |      |      |
|                  |                 |                |                        | TYP                   | MAX                | MIN                             | MAX                 | MIN                            | MAX  | MIN                             | MAX  |      |
| t <sub>PLH</sub> | A               | Y              | C <sub>L</sub> = 15 pF | 5 <sup>(1)</sup>      | 8.9 <sup>(1)</sup> | 1 <sup>(1)</sup>                | 10.5 <sup>(1)</sup> | 1                              | 10.5 | 1                               | 10.5 | ns   |
| t <sub>PHL</sub> |                 |                |                        | 5 <sup>(1)</sup>      | 8.9 <sup>(1)</sup> | 1 <sup>(1)</sup>                | 10.5 <sup>(1)</sup> | 1                              | 10.5 | 1                               | 10.5 |      |
| t <sub>PLH</sub> | A               | Y              | C <sub>L</sub> = 50 pF | 7.5                   | 11.4               | 1                               | 13                  | 1                              | 13   | 1                               | 13   | ns   |
| t <sub>PHL</sub> |                 |                |                        | 7.5                   | 11.4               | 1                               | 13                  | 1                              | 13   | 1                               | 13   |      |

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

## 5.7 Switching Characteristics, $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$

over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see [Load Circuit and Voltage Waveforms](#))

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | TEST<br>CONDITIONS     | T <sub>A</sub> = 25°C |                  | T <sub>A</sub> = −55°C TO 125°C |                  | T <sub>A</sub> = −40°C TO 85°C |     | T <sub>A</sub> = −40°C TO 125°C |     | UNIT |
|------------------|-----------------|----------------|------------------------|-----------------------|------------------|---------------------------------|------------------|--------------------------------|-----|---------------------------------|-----|------|
|                  |                 |                |                        |                       |                  | SN54AHC04                       |                  | SN74AHC04                      |     | SN74AHC04                       |     |      |
|                  |                 |                |                        | Recommended           |                  |                                 |                  |                                |     |                                 |     |      |
|                  |                 |                |                        | TYP                   | MAX              | MIN                             | MAX              | MIN                            | MAX | MIN                             | MAX |      |
| t <sub>PLH</sub> | A               | Y              | C <sub>L</sub> = 15 pF | 3.8 <sup>1</sup>      | 5.5 <sup>1</sup> | 1 <sup>1</sup>                  | 6.5 <sup>1</sup> | 1                              | 6.5 | 1                               | 6.5 | ns   |
| t <sub>PHL</sub> |                 |                |                        | 3.8 <sup>1</sup>      | 5.5 <sup>1</sup> | 1 <sup>1</sup>                  | 6.5 <sup>1</sup> | 1                              | 6.5 | 1                               | 6.5 |      |
| t <sub>PLH</sub> | A               | Y              | C <sub>L</sub> = 50 pF | 5.3                   | 7.5              | 1                               | 8.5              | 1                              | 8.5 | 1                               | 8.5 | ns   |
| t <sub>PHL</sub> |                 |                |                        | 5.3                   | 7.5              | 1                               | 8.5              | 1                              | 8.5 | 1                               | 8.5 |      |

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

## 5.8 Noise Characteristics

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

| PARAMETER   |                                        | SN74AHC04 |      |     | UNIT |
|-------------|----------------------------------------|-----------|------|-----|------|
|             |                                        | MIN       | TYP  | MAX |      |
| $V_{OL(P)}$ | Quiet output, maximum dynamic $V_{OL}$ |           | 0.4  |     | V    |
| $V_{OL(V)}$ | Quiet output, minimum dynamic $V_{OL}$ |           | -0.4 |     | V    |
| $V_{OH(V)}$ | Quiet output, minimum dynamic $V_{OH}$ |           | 4.8  |     | V    |
| $V_{IH(D)}$ | High-level dynamic input voltage       | 3.5       |      |     | V    |
| $V_{IL(D)}$ | Low-level dynamic input voltage        |           |      | 1.5 | V    |

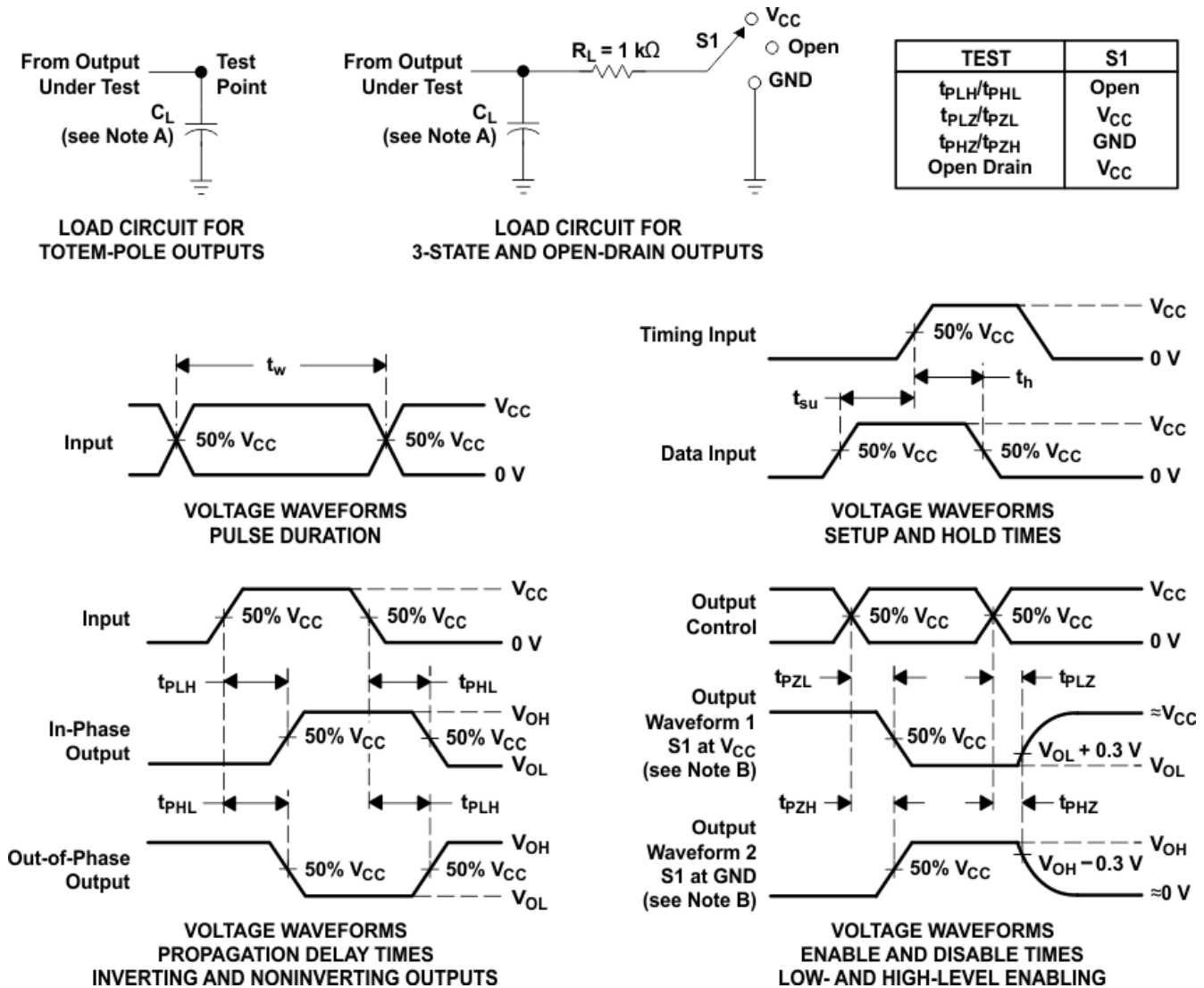
(1) Characteristics are for surface-mount packages only.

## 5.9 Operating Characteristics

$V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

| PARAMETER |                               | TEST CONDITIONS |                    | TYP | UNIT |
|-----------|-------------------------------|-----------------|--------------------|-----|------|
| $C_{pd}$  | Power dissipation capacitance | No load,        | $f = 1\text{ MHz}$ | 12  | pF   |

## 6 Parameter Measurement Information

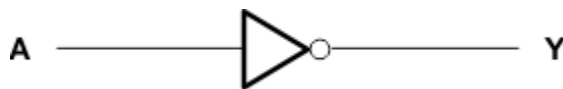


- A.  $C_L$  includes probe and jig capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ .
- D. The outputs are measured one at a time with one input transition per measurement.
- E. All parameters and waveforms are not applicable to all devices.

**Figure 6-1. Load Circuit and Voltage Waveforms**

## 7 Detailed Description

### 7.1 Functional Block Diagram



### 7.2 Device Functional Modes

**Table 7-1. Function Table  
(Each Inverter)**

| INPUT<br>A | OUTPUT<br>Y |
|------------|-------------|
| H          | L           |
| L          | H           |

## 8 Device and Documentation Support

### 8.1 Documentation Support (Analog)

#### 8.1.1 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 8-1. Related Links**

| PARTS     | PRODUCT FOLDER             | SAMPLE & BUY               | TECHNICAL DOCUMENTS        | TOOLS & SOFTWARE           | SUPPORT & COMMUNITY        |
|-----------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| SN54AHC04 | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> |
| SN74AHC04 | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> | <a href="#">Click here</a> |

### 8.2 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.

### 8.3 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](#).

### 8.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.

All trademarks are the property of their respective owners.

### 8.5 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.

### 8.6 Glossary

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

## 9 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="#">5962-9680501Q2A</a> | Active        | Production           | LCCC (FK)   20   | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-<br>9680501Q2A<br>SNJ54AHC<br>04FK |
| <a href="#">5962-9680501QCA</a> | Active        | Production           | CDIP (J)   14    | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9680501QC<br>A<br>SNJ54AHC04J      |
| <a href="#">5962-9680501QDA</a> | Active        | Production           | CFP (W)   14     | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9680501QD<br>A<br>SNJ54AHC04W      |
| <a href="#">SN74AHC04BQAR</a>   | Active        | Production           | WQFN (BQA)   14  | 3000   LARGE T&R      | Yes         | SELECTIVE<br>AG (TOP SIDE)           | Level-1-260C-UNLIM                | -40 to 125   | AHC04                                   |
| SN74AHC04BQAR.A                 | Active        | Production           | WQFN (BQA)   14  | 3000   LARGE T&R      | Yes         | SELECTIVE<br>AG (TOP SIDE)           | Level-1-260C-UNLIM                | -40 to 125   | AHC04                                   |
| <a href="#">SN74AHC04D</a>      | Obsolete      | Production           | SOIC (D)   14    | -                     | -           | Call TI                              | Call TI                           | -40 to 125   | AHC04                                   |
| <a href="#">SN74AHC04DBR</a>    | Active        | Production           | SSOP (DB)   14   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | HA04                                    |
| SN74AHC04DBR.A                  | Active        | Production           | SSOP (DB)   14   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | HA04                                    |
| <a href="#">SN74AHC04DGVR</a>   | Active        | Production           | TVSOP (DGV)   14 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | HA04                                    |
| SN74AHC04DGVR.A                 | Active        | Production           | TVSOP (DGV)   14 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | HA04                                    |
| <a href="#">SN74AHC04DR</a>     | Active        | Production           | SOIC (D)   14    | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | AHC04                                   |
| SN74AHC04DR.A                   | Active        | Production           | SOIC (D)   14    | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | AHC04                                   |
| <a href="#">SN74AHC04N</a>      | Active        | Production           | PDIP (N)   14    | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -40 to 125   | SN74AHC04N                              |
| SN74AHC04N.A                    | Active        | Production           | PDIP (N)   14    | 25   TUBE             | Yes         | NIPDAU                               | N/A for Pkg Type                  | -40 to 125   | SN74AHC04N                              |
| <a href="#">SN74AHC04NSR</a>    | Active        | Production           | SOP (NS)   14    | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | AHC04                                   |
| SN74AHC04NSR.A                  | Active        | Production           | SOP (NS)   14    | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | AHC04                                   |
| <a href="#">SN74AHC04PW</a>     | Obsolete      | Production           | TSSOP (PW)   14  | -                     | -           | Call TI                              | Call TI                           | -40 to 125   | HA04                                    |
| <a href="#">SN74AHC04PWR</a>    | Active        | Production           | TSSOP (PW)   14  | 2000   LARGE T&R      | Yes         | NIPDAU   SN                          | Level-1-260C-UNLIM                | -40 to 125   | HA04                                    |
| SN74AHC04PWR.A                  | Active        | Production           | TSSOP (PW)   14  | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 125   | HA04                                    |
| <a href="#">SN74AHC04RGYR</a>   | Active        | Production           | VQFN (RGY)   14  | 3000   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 125   | HA04                                    |
| SN74AHC04RGYR.A                 | Active        | Production           | VQFN (RGY)   14  | 3000   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 125   | HA04                                    |

| 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="#">SNJ54AHC04FK</a> | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9680501Q2A<br>SNJ54AHC<br>04FK |
| SNJ54AHC04FK.A               | Active        | Production           | LCCC (FK)   20 | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9680501Q2A<br>SNJ54AHC<br>04FK |
| <a href="#">SNJ54AHC04J</a>  | Active        | Production           | CDIP (J)   14  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9680501QC<br>A<br>SNJ54AHC04J  |
| SNJ54AHC04J.A                | Active        | Production           | CDIP (J)   14  | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9680501QC<br>A<br>SNJ54AHC04J  |
| <a href="#">SNJ54AHC04W</a>  | Active        | Production           | CFP (W)   14   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9680501QD<br>A<br>SNJ54AHC04W  |
| SNJ54AHC04W.A                | Active        | Production           | CFP (W)   14   | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9680501QD<br>A<br>SNJ54AHC04W  |

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

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

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

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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

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

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

**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 SN54AHC04, SN74AHC04 :**

- Catalog : [SN74AHC04](#)
- Automotive : [SN74AHC04-Q1](#), [SN74AHC04-Q1](#)
- Enhanced Product : [SN74AHC04-EP](#), [SN74AHC04-EP](#)
- Military : [SN54AHC04](#)

**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



\*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 |
|---------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AHC04BQAR | WQFN         | BQA             | 14   | 3000 | 180.0              | 12.4               | 2.8     | 3.3     | 1.1     | 4.0     | 12.0   | Q1            |
| SN74AHC04DBR  | SSOP         | DB              | 14   | 2000 | 330.0              | 16.4               | 8.35    | 6.6     | 2.4     | 12.0    | 16.0   | Q1            |
| SN74AHC04DGVR | TVSOP        | DGV             | 14   | 2000 | 330.0              | 12.4               | 6.8     | 4.0     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74AHC04DR   | SOIC         | D               | 14   | 2500 | 330.0              | 12.4               | 3.75    | 3.75    | 1.15    | 8.0     | 12.0   | Q1            |
| SN74AHC04NSR  | SOP          | NS              | 14   | 2000 | 330.0              | 16.4               | 8.1     | 10.4    | 2.5     | 12.0    | 16.0   | Q1            |
| SN74AHC04PWR  | TSSOP        | PW              | 14   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74AHC04RGYR | VQFN         | RGY             | 14   | 3000 | 330.0              | 12.4               | 3.75    | 3.75    | 1.15    | 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) |
|---------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AHC04BQAR | WQFN         | BQA             | 14   | 3000 | 210.0       | 185.0      | 35.0        |
| SN74AHC04DBR  | SSOP         | DB              | 14   | 2000 | 353.0       | 353.0      | 32.0        |
| SN74AHC04DGVR | TVSOP        | DGV             | 14   | 2000 | 353.0       | 353.0      | 32.0        |
| SN74AHC04DR   | SOIC         | D               | 14   | 2500 | 340.5       | 336.1      | 32.0        |
| SN74AHC04NSR  | SOP          | NS              | 14   | 2000 | 353.0       | 353.0      | 32.0        |
| SN74AHC04PWR  | TSSOP        | PW              | 14   | 2000 | 353.0       | 353.0      | 32.0        |
| SN74AHC04RGYR | VQFN         | RGY             | 14   | 3000 | 353.0       | 353.0      | 32.0        |

## TUBE



\*All dimensions are nominal

| Device          | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|-----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| 5962-9680501Q2A | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| 5962-9680501QDA | W            | CFP          | 14   | 25  | 506.98 | 26.16  | 6220   | NA     |
| SN74AHC04N      | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74AHC04N      | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74AHC04N.A    | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SN74AHC04N.A    | N            | PDIP         | 14   | 25  | 506    | 13.97  | 11230  | 4.32   |
| SNJ54AHC04FK    | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| SNJ54AHC04FK.A  | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| SNJ54AHC04W     | W            | CFP          | 14   | 25  | 506.98 | 26.16  | 6220   | NA     |
| SNJ54AHC04W.A   | 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

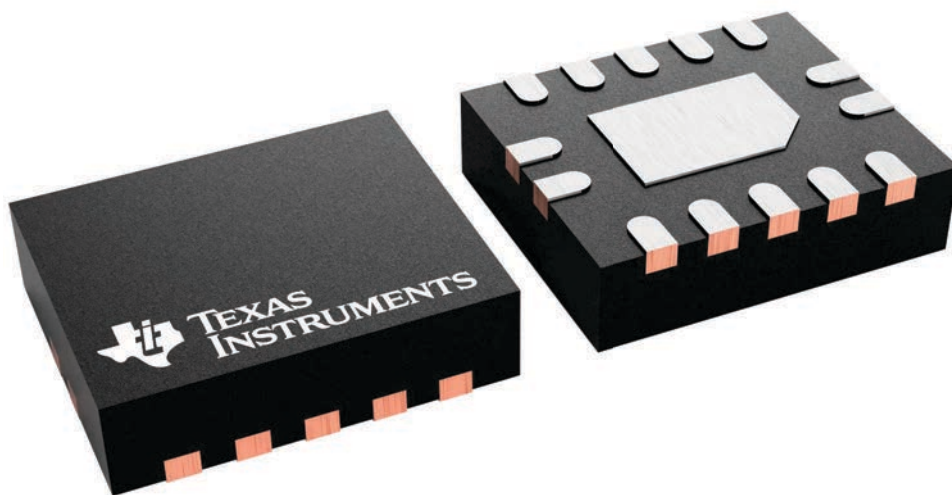
**BQA 14**

**WQFN - 0.8 mm max height**

2.5 x 3, 0.5 mm pitch

PLASTIC QUAD FLATPACK - NO LEAD

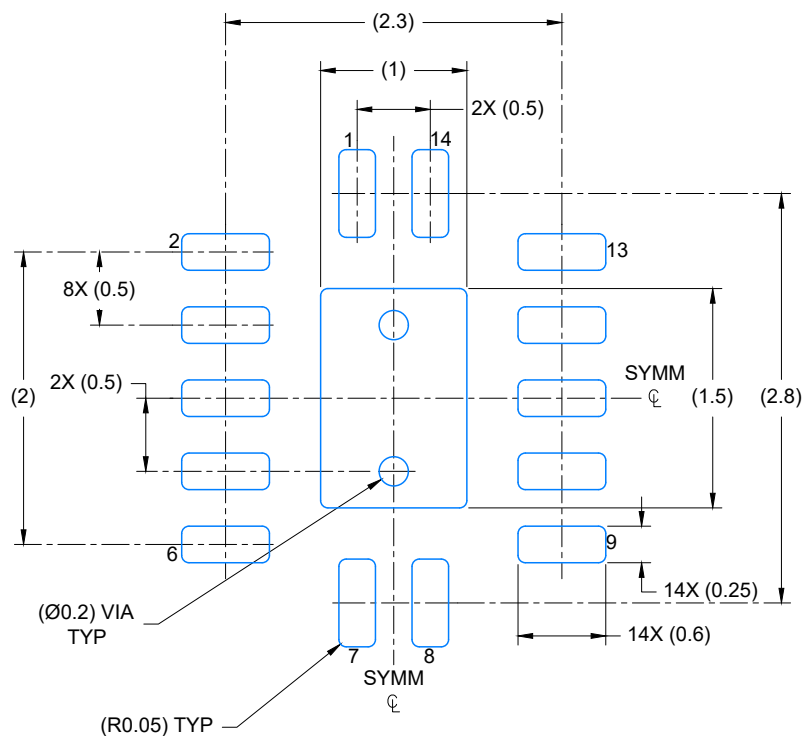
This image is a representation of the package family, actual package may vary.  
Refer to the product data sheet for package details.



**WQFN - 0.8 mm max height**

4224636/A 11/2018

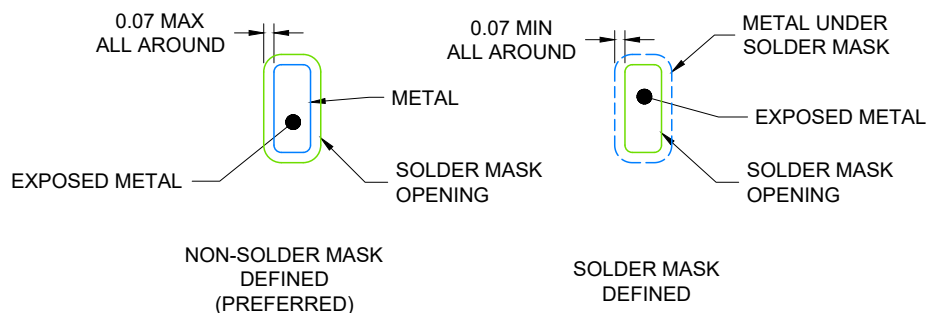
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for optimal thermal and mechanical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



## LAND PATTERN EXAMPLE

EXPOSED METAL SHOWN

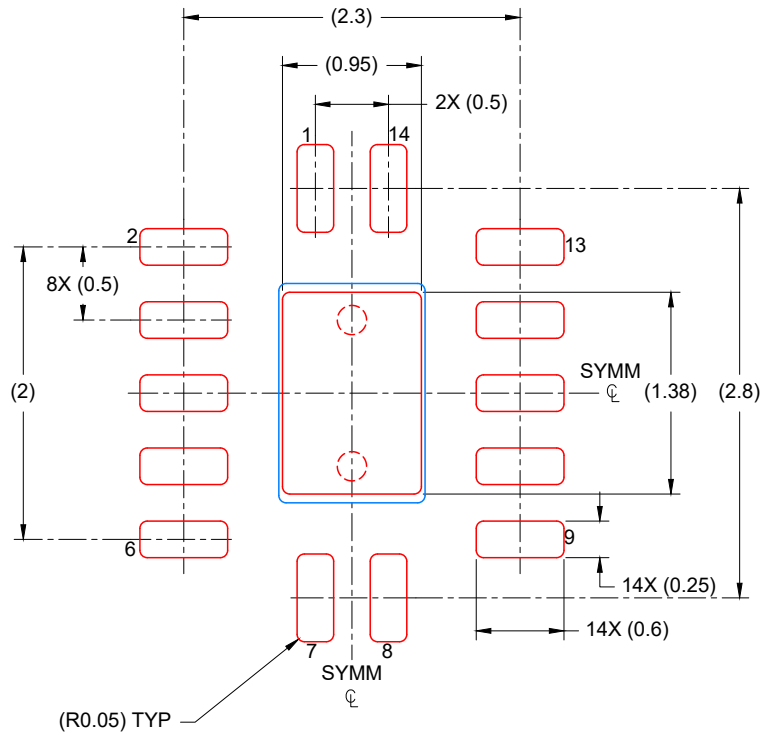
SCALE: 20X



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/sluea271](http://www.ti.com/lit/sluea271)).
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.



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)

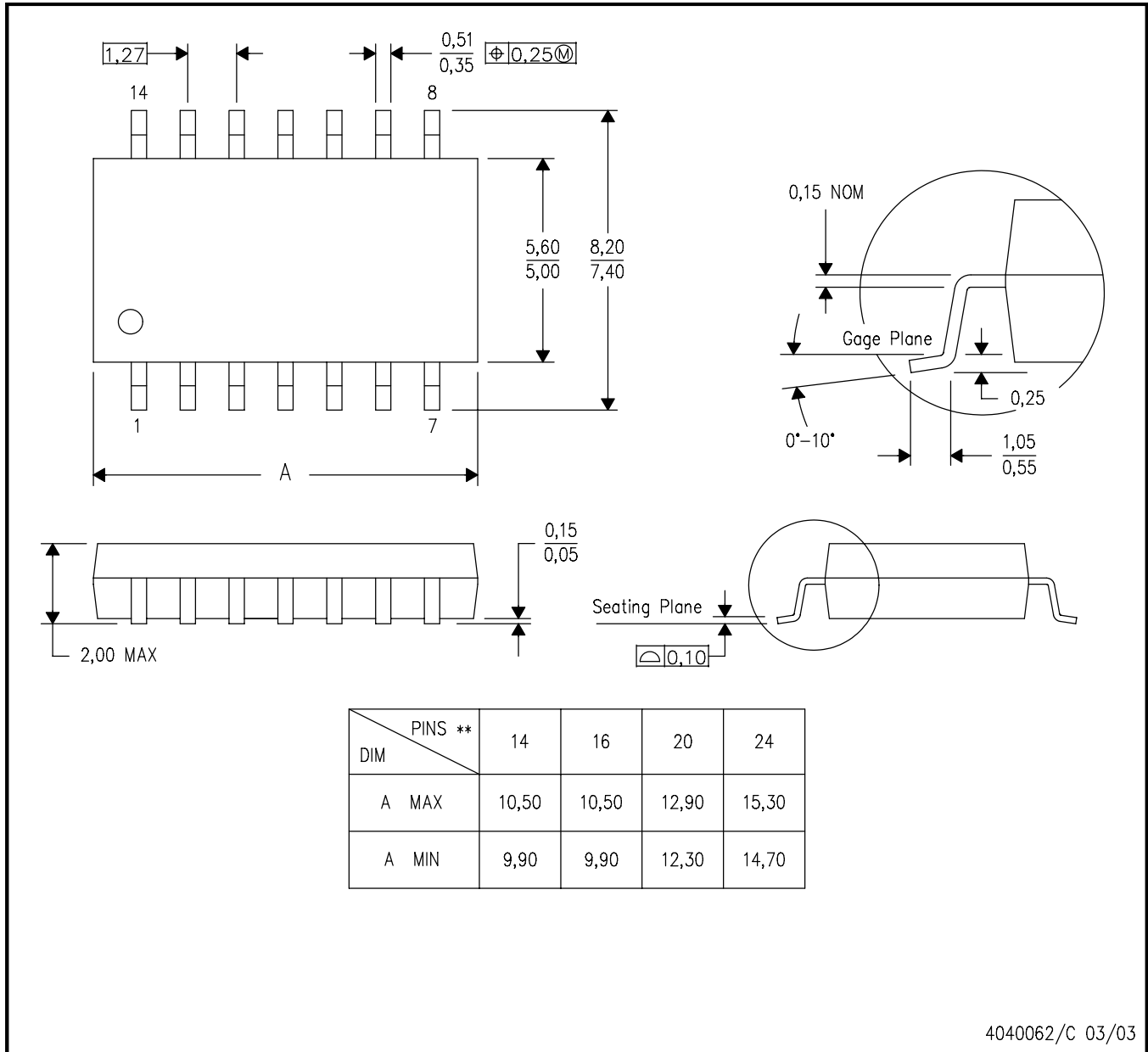
6. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

# 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



## DGV (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

24 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 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194



4220762/A 05/2024

## NOTES:

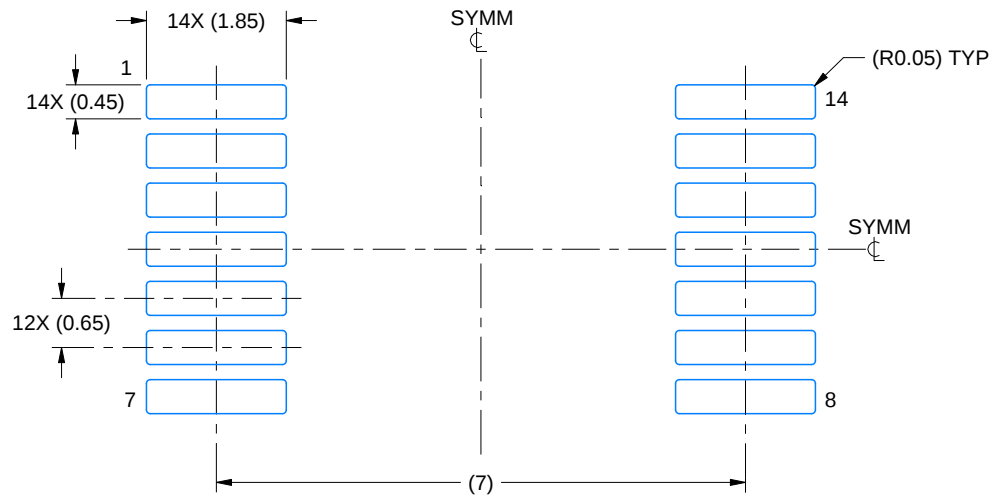
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

# EXAMPLE BOARD LAYOUT

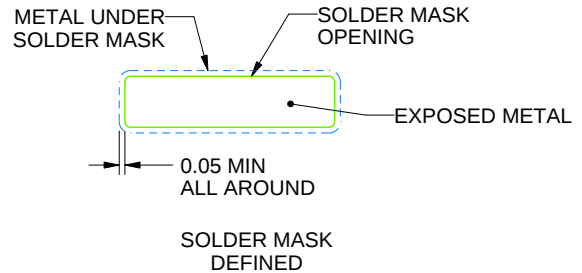
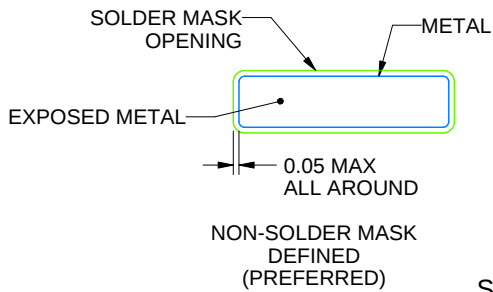
DB0014A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

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

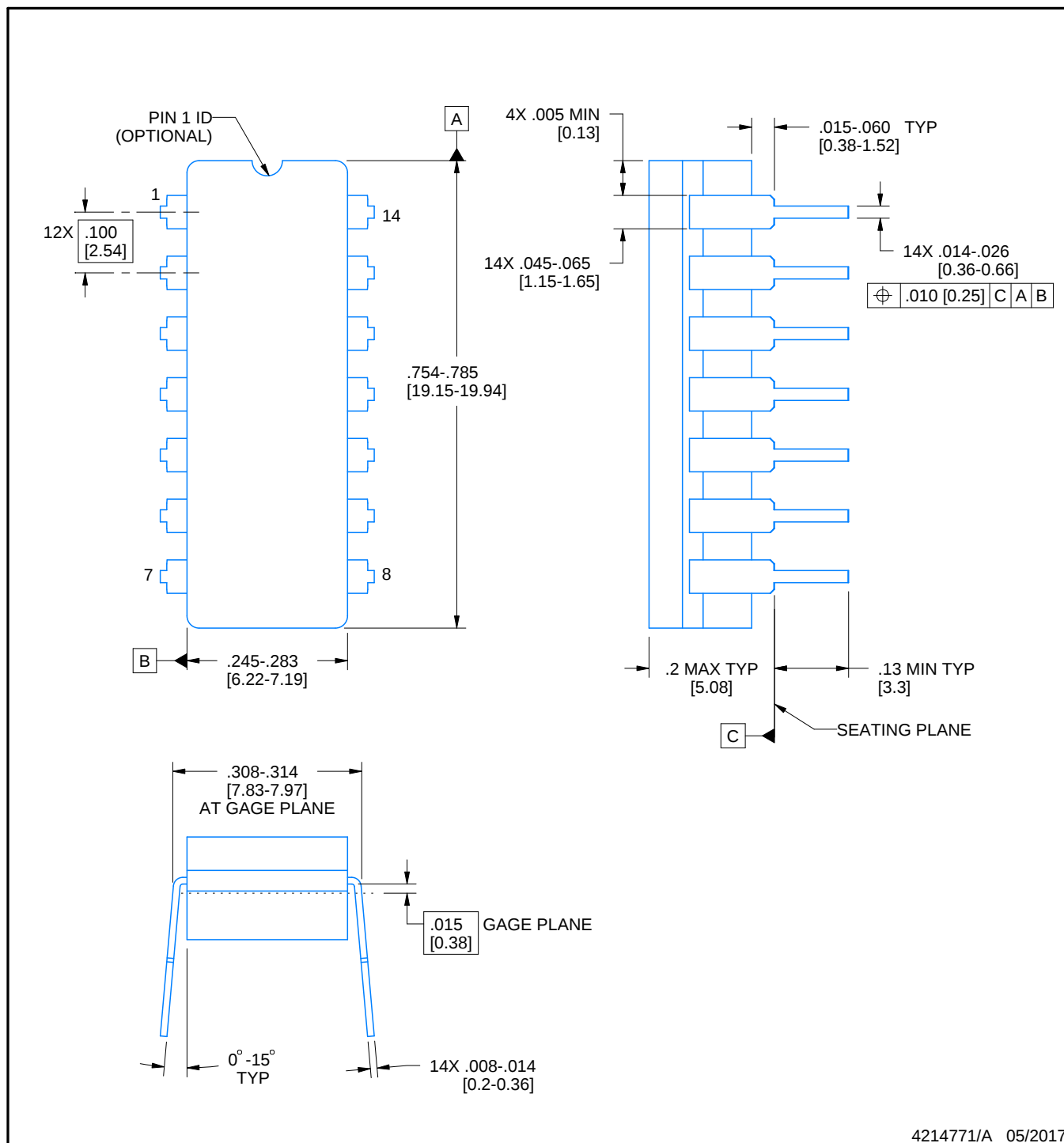


**J0014A**

## 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\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| 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               |



14/18 Pin Only  
20 Pin vendor option

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.

**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



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.

## GENERIC PACKAGE VIEW

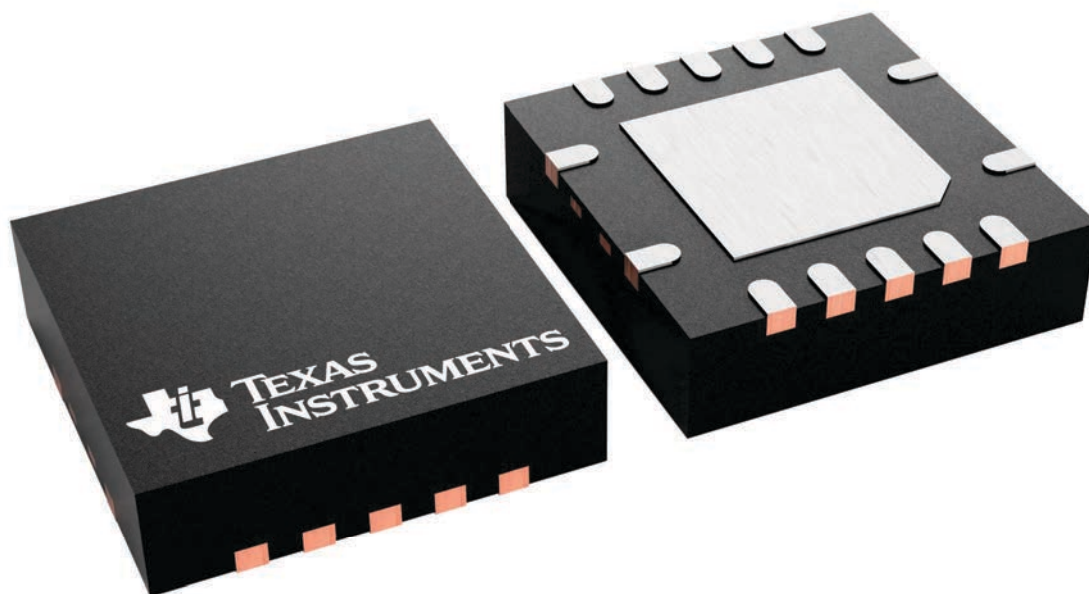
**RGY 14**

**VQFN - 1 mm max height**

3.5 x 3.5, 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.



4231541/A



### VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



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 thermal and mechanical performance.

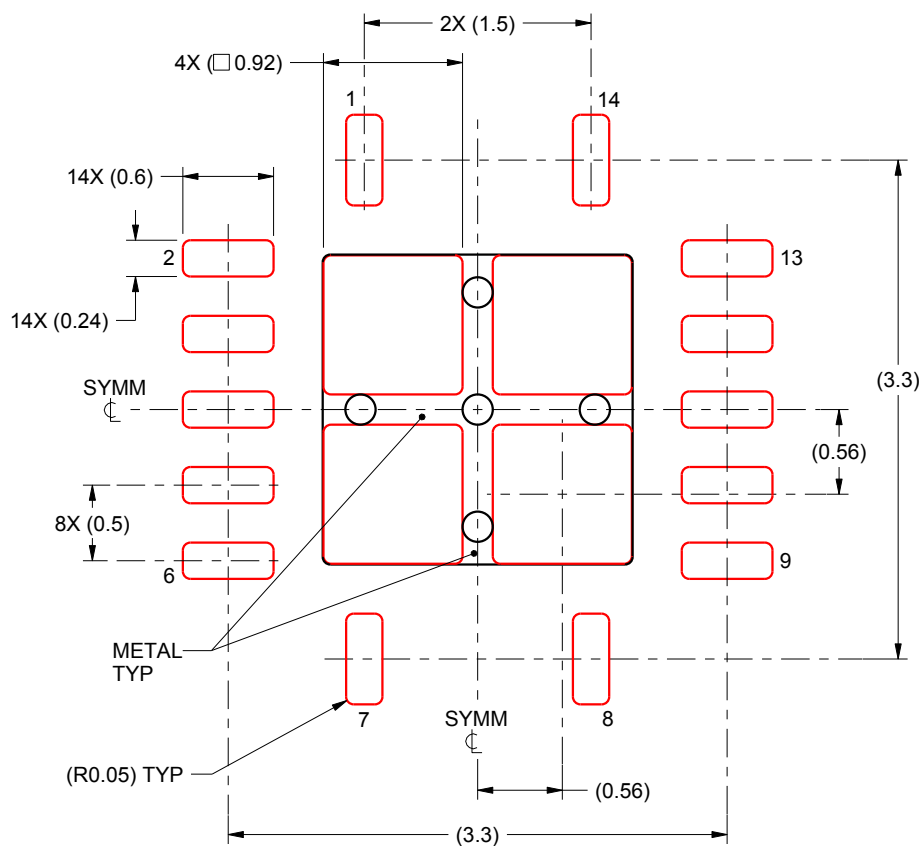


# EXAMPLE STENCIL DESIGN

RGY0014A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



**SOLDER PASTE EXAMPLE**  
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD  
80% PRINTED SOLDER COVERAGE BY AREA  
SCALE:20X

4219040/A 09/2015

NOTES: (continued)

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

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