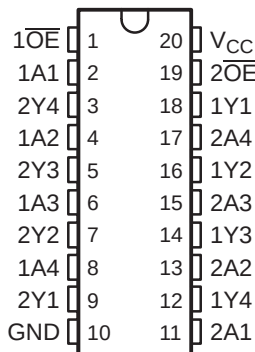


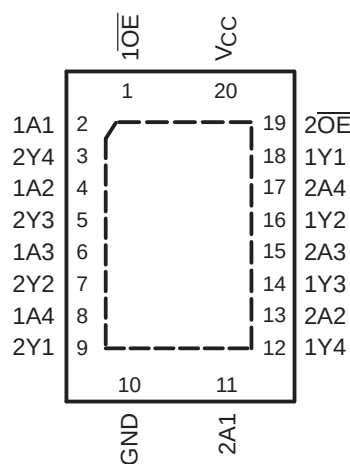
## FEATURES

- Operate From 1.65 V to 3.6 V
- Inputs Accept Voltages to 5.5 V
- Max  $t_{pd}$  of 5.9 ns at 3.3 V
- Typical  $V_{OLP}$  (Output Ground Bounce)  $<0.8$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  $>2$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Support Mixed-Mode Signal Operation on All Ports  
(5-V Input/Output Voltage With 3.3-V  $V_{CC}$ )
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Bus Hold on Data Inputs Eliminates the Need for External Pullup/Pulldown Resistors
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

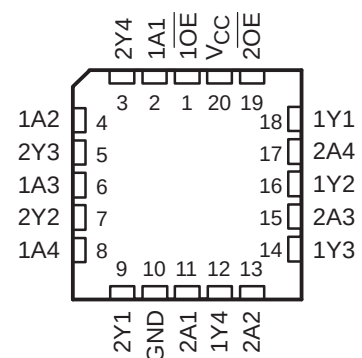
SN54LVCH244A . . . J OR W PACKAGE  
SN74LVCH244A . . . DB, DBQ, DGV, DW,  
NS, OR PW PACKAGE  
(TOP VIEW)



SN74LVCH244A . . . RGY PACKAGE  
(TOP VIEW)



SN54LVCH244A . . . FK PACKAGE  
(TOP VIEW)



## DESCRIPTION/ORDERING INFORMATION

The SN54LVCH244A octal buffer/line driver is designed for 2.7-V to 3.6-V  $V_{CC}$  operation, and the SN74LVCH244A octal buffer/line driver is designed for 1.65-V to 3.6-V  $V_{CC}$  operation.

These devices are organized as two 4-bit line drivers with separate output-enable ( $\overline{OE}$ ) inputs. When  $\overline{OE}$  is low, these devices pass data from the A inputs to the Y outputs. When  $\overline{OE}$  is high, the outputs are in the high-impedance state.

Active bus-hold circuitry holds unused or undriven inputs at a valid logic state. Use of pullup or pulldown resistors with the bus-hold circuitry is not recommended.

Inputs can be driven from either 3.3-V or 5-V devices. This feature allows the use of these devices as translators in a mixed 3.3-V/5-V system environment.

These devices are fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

# SN54LVCH244A, SN74LVCH244A

## OCTAL BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

SCES0090–JULY 1995–REVISED FEBRUARY 2007

#### ORDERING INFORMATION

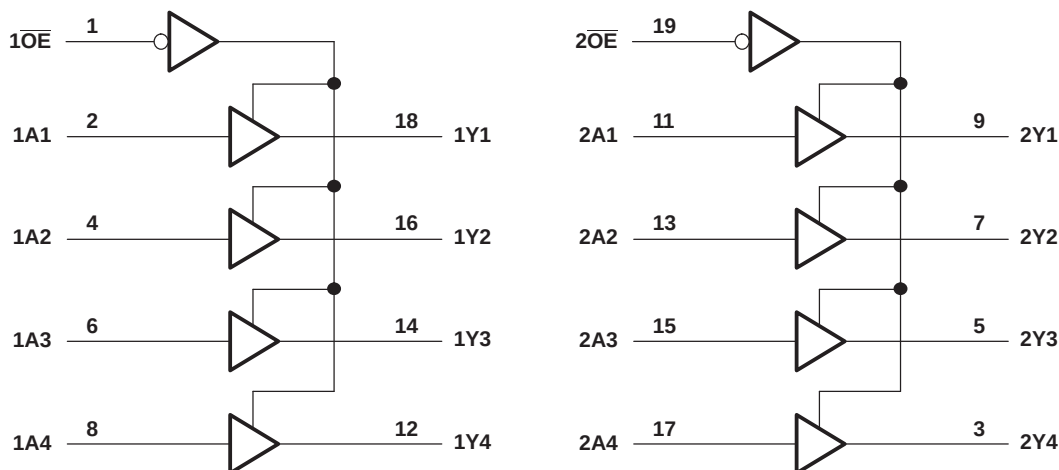
| T <sub>A</sub> | PACKAGE <sup>(1)</sup> |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------------------|--------------|-----------------------|------------------|
| –40°C to 85°C  | QFN – RGY              | Reel of 1000 | SN74LVCH244ARGYR      | LCH244A          |
|                | SOIC – DW              | Tube of 25   | SN74LVCH244ADW        | LVCH244A         |
|                |                        | Reel of 2000 | SN74LVCH244ADWR       |                  |
|                | SOP – NS               | Reel of 2000 | SN74LVCH244ANSR       | LVCH244A         |
|                | SSOP – DB              | Reel of 2000 | SN74LVCH244ADBR       | LCH244A          |
|                | SSOP (QSOP) – DBQ      | Reel of 2500 | SN74LVCH244ADBQR      | LVCH244A         |
|                | TSSOP – PW             | Tube of 70   | SN74LVCH244APW        | LCH244A          |
|                |                        | Reel of 2000 | SN74LVCH244APWR       |                  |
|                |                        | Reel of 250  | SN74LVCH244APWT       |                  |
|                | TVSOP – DGV            | Reel of 2000 | SN74LVCH244ADGVR      | LCH244A          |
| –55°C to 125°C | CDIP – J               | Tube of 20   | SNJ54LVCH244AJ        | SNJ54LVCH244AJ   |
|                | CFP – W                | Tube of 85   | SNJ54LVCH244AW        | SNJ54LVCH244AW   |
|                | LCCC – FK              | Tube of 55   | SNJ54LVCH244AFK       | SNJ54LVCH244AFK  |

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

#### FUNCTION TABLE (EACH BUFFER)

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

#### LOGIC DIAGRAM (POSITIVE LOGIC)



## Absolute Maximum Ratings<sup>(1)</sup>

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

|               |                                                                                             | MIN                        | MAX            | UNIT   |
|---------------|---------------------------------------------------------------------------------------------|----------------------------|----------------|--------|
| $V_{CC}$      | Supply voltage range                                                                        | –0.5                       | 6.5            | V      |
| $V_I$         | Input voltage range <sup>(2)</sup>                                                          | –0.5                       | 6.5            | V      |
| $V_O$         | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | –0.5                       | 6.5            | V      |
| $V_O$         | Voltage range applied to any output in the high or low state <sup>(2)(3)</sup>              | –0.5                       | $V_{CC} + 0.5$ | V      |
| $I_{IK}$      | Input clamp current                                                                         | $V_I < 0$                  |                | –50 mA |
| $I_{OK}$      | Output clamp current                                                                        | $V_O < 0$                  |                | –50 mA |
| $I_O$         | Continuous output current                                                                   |                            | ±50            | mA     |
|               | Continuous current through $V_{CC}$ or GND                                                  |                            | ±100           | mA     |
| $\theta_{JA}$ | Package thermal impedance                                                                   | DB package <sup>(4)</sup>  |                | 70     |
|               |                                                                                             | DBQ package <sup>(4)</sup> |                | 68     |
|               |                                                                                             | DGV package <sup>(4)</sup> |                | 92     |
|               |                                                                                             | DW package <sup>(4)</sup>  |                | 58     |
|               |                                                                                             | NS package <sup>(4)</sup>  |                | 60     |
|               |                                                                                             | PW package <sup>(4)</sup>  |                | 83     |
|               |                                                                                             | RGY package <sup>(5)</sup> |                | 37     |
| $T_{stg}$     | 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 negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

(3) The value of  $V_{CC}$  is provided in the recommended operating conditions table.

(4) The package thermal impedance is calculated in accordance with JESD 51-7.

(5) The package thermal impedance is calculated in accordance with JESD 51-5.

# SN54LVCH244A, SN74LVCH244A

## OCTAL BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

SCES0090–JULY 1995–REVISED FEBRUARY 2007

#### Recommended Operating Conditions<sup>(1)</sup>

|                 |                                    |                                    | SN54LVCH244A |                 | SN74LVCH244A           |                 | UNIT |
|-----------------|------------------------------------|------------------------------------|--------------|-----------------|------------------------|-----------------|------|
|                 |                                    |                                    | MIN          | MAX             | MIN                    | MAX             |      |
| V <sub>CC</sub> | Supply voltage                     | Operating                          | 2            | 3.6             | 1.65                   | 3.6             | V    |
|                 |                                    | Data retention only                | 1.5          |                 | 1.5                    |                 |      |
| V <sub>IH</sub> | High-level input voltage           | V <sub>CC</sub> = 1.65 V to 1.95 V |              |                 | 0.65 × V <sub>CC</sub> |                 | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V   |              |                 | 1.7                    |                 |      |
|                 |                                    | V <sub>CC</sub> = 2.7 V to 3.6 V   | 2            |                 | 2                      |                 |      |
| V <sub>IL</sub> | Low-level input voltage            | V <sub>CC</sub> = 1.65 V to 1.95 V |              |                 | 0.35 × V <sub>CC</sub> |                 | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V   |              |                 | 0.7                    |                 |      |
|                 |                                    | V <sub>CC</sub> = 2.7 V to 3.6 V   |              | 0.8             | 0.8                    |                 |      |
| V <sub>I</sub>  | Input voltage                      |                                    | 0            | 5.5             | 0                      | 5.5             | V    |
| V <sub>O</sub>  | Output voltage                     | High or low state                  | 0            | V <sub>CC</sub> | 0                      | V <sub>CC</sub> | V    |
|                 |                                    | 3-state                            | 0            | 5.5             | 0                      | 5.5             |      |
| I <sub>OH</sub> | High-level output current          | V <sub>CC</sub> = 1.65 V           |              |                 |                        | –4              | mA   |
|                 |                                    | V <sub>CC</sub> = 2.3 V            |              |                 |                        | –8              |      |
|                 |                                    | V <sub>CC</sub> = 2.7 V            |              | –12             |                        | –12             |      |
|                 |                                    | V <sub>CC</sub> = 3 V              |              | –24             |                        | –24             |      |
| I <sub>OL</sub> | Low-level output current           | V <sub>CC</sub> = 1.65 V           |              |                 |                        | 4               | mA   |
|                 |                                    | V <sub>CC</sub> = 2.3 V            |              |                 |                        | 8               |      |
|                 |                                    | V <sub>CC</sub> = 2.7 V            |              | 12              |                        | 12              |      |
|                 |                                    | V <sub>CC</sub> = 3 V              |              | 24              |                        | 24              |      |
| Δt/Δv           | Input transition rise or fall rate |                                    |              | 10              |                        | 10              | ns/V |
| T <sub>A</sub>  | Operating free-air temperature     |                                    | –55          | 125             | –40                    | 85              | °C   |

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

## Electrical Characteristics

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

| PARAMETER                | TEST CONDITIONS                                                                 |     | V <sub>CC</sub>    | SN54LVCH244A          |                        | SN74LVCH244A          |                        | UNIT |    |    |
|--------------------------|---------------------------------------------------------------------------------|-----|--------------------|-----------------------|------------------------|-----------------------|------------------------|------|----|----|
|                          |                                                                                 |     |                    | MIN                   | TYP <sup>(1)</sup> MAX | MIN                   | TYP <sup>(1)</sup> MAX |      |    |    |
| V <sub>OH</sub>          | I <sub>OH</sub> = –100 μA                                                       |     | 1.65 V to 3.6 V    |                       |                        | V <sub>CC</sub> – 0.2 |                        | V    |    |    |
|                          |                                                                                 |     | 2.7 V to 3.6 V     | V <sub>CC</sub> – 0.2 |                        |                       |                        |      |    |    |
|                          | I <sub>OH</sub> = –4 mA                                                         |     | 1.65 V             |                       | 1.2                    |                       |                        |      |    |    |
|                          | I <sub>OH</sub> = –8 mA                                                         |     | 2.3 V              |                       | 1.7                    |                       |                        |      |    |    |
|                          | I <sub>OH</sub> = –12 mA                                                        |     | 2.7 V              |                       | 2.2                    |                       |                        |      |    |    |
|                          |                                                                                 |     | 3 V                |                       | 2.4                    |                       |                        |      |    |    |
| I <sub>OH</sub> = –24 mA |                                                                                 | 3 V |                    | 2.2                   |                        | 2.2                   |                        |      |    |    |
| V <sub>OL</sub>          | I <sub>OL</sub> = 100 μA                                                        |     | 1.65 V to 3.6 V    |                       |                        | 0.2                   |                        | V    |    |    |
|                          |                                                                                 |     | 2.7 V to 3.6 V     | 0.2                   |                        |                       |                        |      |    |    |
|                          | I <sub>OL</sub> = 4 mA                                                          |     | 1.65 V             |                       | 0.45                   |                       |                        |      |    |    |
|                          | I <sub>OL</sub> = 8 mA                                                          |     | 2.3 V              |                       | 0.7                    |                       |                        |      |    |    |
|                          | I <sub>OL</sub> = 12 mA                                                         |     | 2.7 V              |                       | 0.4                    |                       |                        |      |    |    |
|                          | I <sub>OL</sub> = 24 mA                                                         |     | 3 V                |                       | 0.55                   |                       |                        |      |    |    |
| I <sub>I</sub>           | V <sub>I</sub> = 0 to 5.5 V                                                     |     | 3.6 V              |                       | ±5                     |                       | ±5                     |      | μA |    |
| I <sub>off</sub>         | V <sub>I</sub> or V <sub>O</sub> = 5.5 V                                        |     | 0                  |                       |                        |                       | ±10                    |      | μA |    |
| I <sub>I(hold)</sub>     | V <sub>I</sub> = 0.58 V                                                         |     | 1.65 V             |                       |                        | (2)                   |                        | μA   |    |    |
|                          | V <sub>I</sub> = 1.07 V                                                         |     |                    |                       |                        | (2)                   |                        |      |    |    |
|                          | V <sub>I</sub> = 0.7 V                                                          |     | 2.3 V              |                       | 45                     |                       |                        |      |    |    |
|                          | V <sub>I</sub> = 1.7 V                                                          |     |                    |                       | –45                    |                       |                        |      |    |    |
|                          | V <sub>I</sub> = 0.8 V                                                          |     | 3 V                | 75                    |                        | 75                    |                        |      |    |    |
|                          | V <sub>I</sub> = 2 V                                                            |     |                    | –75                   |                        | –75                   |                        |      |    |    |
|                          | V <sub>I</sub> = 0 to 3.6 V <sup>(3)</sup>                                      |     | 3.6 V              |                       | ±500                   |                       | ±500                   |      |    |    |
| I <sub>OZ</sub>          | V <sub>O</sub> = 0 to 5.5 V                                                     |     | 3.6 V              |                       | ±15                    |                       | ±10                    |      | μA |    |
| I <sub>CC</sub>          | V <sub>I</sub> = V <sub>CC</sub> or GND                                         |     | I <sub>O</sub> = 0 | 3.6 V                 |                        | 10                    |                        | 10   |    | μA |
|                          | 3.6 V ≤ V <sub>I</sub> ≤ 5.5 V <sup>(4)</sup>                                   |     |                    | 10                    |                        | 10                    |                        |      |    |    |
| ΔI <sub>CC</sub>         | One input at V <sub>CC</sub> – 0.6 V,<br>Other inputs at V <sub>CC</sub> or GND |     | 2.7 V to 3.6 V     |                       | 500                    |                       | 500                    |      | μA |    |
| C <sub>i</sub>           | V <sub>I</sub> = V <sub>CC</sub> or GND                                         |     | 3.3 V              |                       | 4 12                   |                       | 4                      |      | pF |    |
| C <sub>o</sub>           | V <sub>O</sub> = V <sub>CC</sub> or GND                                         |     | 3.3 V              |                       | 5.5 12                 |                       | 5.5                    |      | pF |    |

(1) All typical values are at V<sub>CC</sub> = 3.3 V, T<sub>A</sub> = 25°C.

(2) This information was not available at the time of publication.

(3) This is the bus-hold maximum dynamic current required to switch the input from one state to another.

(4) This applies in the disabled state only.

# SN54LVCH244A, SN74LVCH244A

## OCTAL BUFFERS/DRIVERS

### WITH 3-STATE OUTPUTS

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## Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 1](#))

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | SN54LVCH244A            |     |                                    | UNIT |     |
|------------------|-----------------|----------------|-------------------------|-----|------------------------------------|------|-----|
|                  |                 |                | V <sub>CC</sub> = 2.7 V |     | V <sub>CC</sub> = 3.3 V<br>± 0.3 V |      |     |
|                  |                 |                | MIN                     | MAX | MIN                                |      | MAX |
| t <sub>pd</sub>  | A               | Y              | 7.5                     |     | 1                                  | 6.5  | ns  |
| t <sub>en</sub>  | $\overline{OE}$ | Y              | 9                       |     | 1                                  | 8    | ns  |
| t <sub>dis</sub> | $\overline{OE}$ | Y              | 8                       |     | 1                                  | 7    | ns  |

## Switching Characteristics

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 1](#))

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | SN74LVCH244A                        |     |                                    |     |                         |     |                                    |     | UNIT |
|------------------|-----------------|----------------|-------------------------------------|-----|------------------------------------|-----|-------------------------|-----|------------------------------------|-----|------|
|                  |                 |                | V <sub>CC</sub> = 1.8 V<br>± 0.15 V |     | V <sub>CC</sub> = 2.5 V<br>± 0.2 V |     | V <sub>CC</sub> = 2.7 V |     | V <sub>CC</sub> = 3.3 V<br>± 0.3 V |     |      |
|                  |                 |                | MIN                                 | MAX | MIN                                | MAX | MIN                     | MAX | MIN                                | MAX |      |
| t <sub>pd</sub>  | A               | Y              | (1)                                 | (1) | (1)                                | (1) | 6.9                     | 1.5 | 5.9                                | ns  |      |
| t <sub>en</sub>  | $\overline{OE}$ | Y              | (1)                                 | (1) | (1)                                | (1) | 8.6                     | 1   | 7.6                                | ns  |      |
| t <sub>dis</sub> | $\overline{OE}$ | Y              | (1)                                 | (1) | (1)                                | (1) | 6.8                     | 1.5 | 5.8                                | ns  |      |

(1) This information was not available at the time of publication.

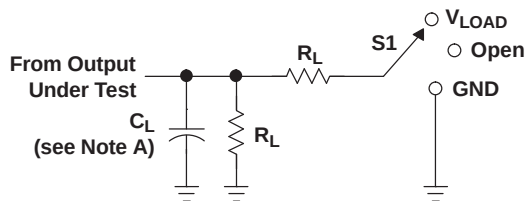
## Operating Characteristics

T<sub>A</sub> = 25°C

| PARAMETER       |                                                    |                  | TEST<br>CONDITIONS | V <sub>CC</sub> = 1.8 V | V <sub>CC</sub> = 2.5 V | V <sub>CC</sub> = 3.3 V | UNIT |
|-----------------|----------------------------------------------------|------------------|--------------------|-------------------------|-------------------------|-------------------------|------|
|                 |                                                    |                  |                    | TYP                     | TYP                     | TYP                     |      |
| C <sub>pd</sub> | Power dissipation capacitance<br>per buffer/driver | Outputs enabled  | f = 10 MHz         | (1)                     | (1)                     | 47                      | pF   |
|                 |                                                    | Outputs disabled |                    | (1)                     | (1)                     | 2                       |      |

(1) This information was not available at the time of publication.

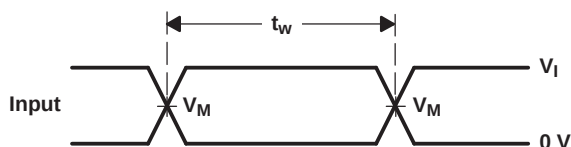
## PARAMETER MEASUREMENT INFORMATION



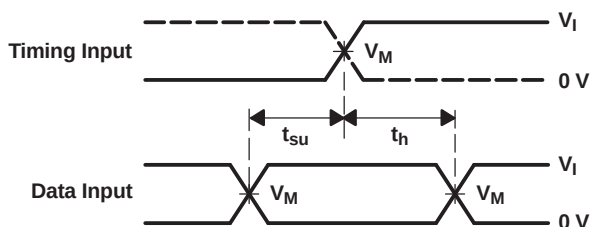
LOAD CIRCUIT

| TEST              | S1         |
|-------------------|------------|
| $t_{PLH}/t_{PHL}$ | Open       |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |
| $t_{PHZ}/t_{PZH}$ | GND        |

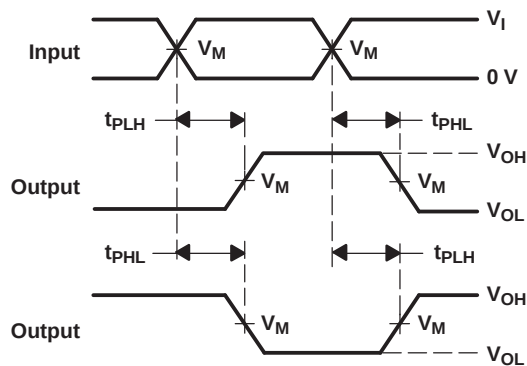
| $V_{CC}$                         | INPUTS   |                      | $V_M$      | $V_{LOAD}$        | $C_L$ | $R_L$        | $V_{\Delta}$ |
|----------------------------------|----------|----------------------|------------|-------------------|-------|--------------|--------------|
|                                  | $V_I$    | $t_r/t_f$            |            |                   |       |              |              |
| $1.8\text{ V} \pm 0.15\text{ V}$ | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30 pF | 1 k $\Omega$ | 0.15 V       |
| $2.5\text{ V} \pm 0.2\text{ V}$  | $V_{CC}$ | $\leq 2\text{ ns}$   | $V_{CC}/2$ | $2 \times V_{CC}$ | 30 pF | 500 $\Omega$ | 0.15 V       |
| 2.7 V                            | 2.7 V    | $\leq 2.5\text{ ns}$ | 1.5 V      | 6 V               | 50 pF | 500 $\Omega$ | 0.3 V        |
| $3.3\text{ V} \pm 0.3\text{ V}$  | 2.7 V    | $\leq 2.5\text{ ns}$ | 1.5 V      | 6 V               | 50 pF | 500 $\Omega$ | 0.3 V        |



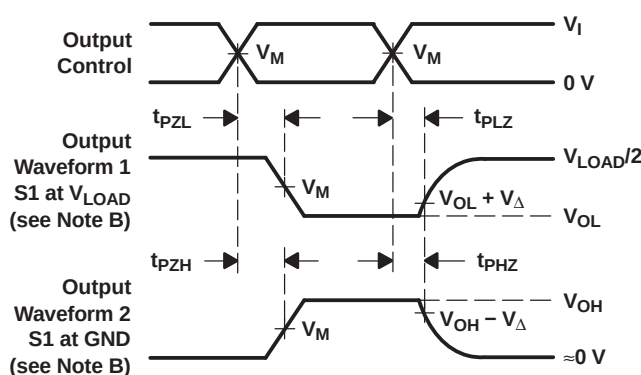
VOLTAGE WAVEFORMS  
PULSE DURATION



VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES



VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS



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

- NOTES:
- $C_L$  includes probe and jig capacitance.
  - 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.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ .
  - The outputs are measured one at a time, with one transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .
  - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

## 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="#">5962-9754201Q2A</a>  | Active        | Production           | LCCC (FK)   20   | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-<br>9754201Q2A<br>SNJ54LVCH<br>244AFK |
| <a href="#">5962-9754201QRA</a>  | Active        | Production           | CDIP (J)   20    | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9754201QR<br>A<br>SNJ54LVCH244AJ      |
| <a href="#">5962-9754201QSA</a>  | Active        | Production           | CFP (W)   20     | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9754201QS<br>A<br>SNJ54LVCH244AW      |
| <a href="#">5962-9754201V2A</a>  | Active        | Production           | LCCC (FK)   20   | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-<br>9754201V2A<br>SNV54LVCH<br>244AFK |
| <a href="#">5962-9754201VSA</a>  | Active        | Production           | CFP (W)   20     | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9754201VS<br>A<br>SNV54LVCH244AW      |
| <a href="#">SN74LVCH244ADBQR</a> | Active        | Production           | SSOP (DBQ)   20  | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | LVCH244A                                   |
| SN74LVCH244ADBQR.B               | Active        | Production           | SSOP (DBQ)   20  | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | LVCH244A                                   |
| SN74LVCH244ADBQRG4               | Active        | Production           | SSOP (DBQ)   20  | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | LVCH244A                                   |
| SN74LVCH244ADBQRG4.B             | Active        | Production           | SSOP (DBQ)   20  | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | LVCH244A                                   |
| <a href="#">SN74LVCH244ADBR</a>  | Active        | Production           | SSOP (DB)   20   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                    |
| SN74LVCH244ADBR.B                | Active        | Production           | SSOP (DB)   20   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                    |
| <a href="#">SN74LVCH244ADGVR</a> | Active        | Production           | TVSOP (DGV)   20 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                    |
| SN74LVCH244ADGVR.B               | Active        | Production           | TVSOP (DGV)   20 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                    |
| SN74LVCH244ADGVRG4               | Active        | Production           | TVSOP (DGV)   20 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                    |
| SN74LVCH244ADGVRG4.B             | Active        | Production           | TVSOP (DGV)   20 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                    |
| <a href="#">SN74LVCH244ADW</a>   | Active        | Production           | SOIC (DW)   20   | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LVCH244A                                   |
| SN74LVCH244ADW.B                 | Active        | Production           | SOIC (DW)   20   | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LVCH244A                                   |
| <a href="#">SN74LVCH244ADWR</a>  | Active        | Production           | SOIC (DW)   20   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LVCH244A                                   |
| SN74LVCH244ADWR.B                | Active        | Production           | SOIC (DW)   20   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LVCH244A                                   |
| SN74LVCH244ADWRG4                | Active        | Production           | SOIC (DW)   20   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LVCH244A                                   |



| 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)                    |
|----------------------------------|---------------|----------------------|-----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|----------------------------------------|
| SN74LVCH244ADWRG4.B              | Active        | Production           | SOIC (DW)   20  | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LVCH244A                               |
| <a href="#">SN74LVCH244ANSR</a>  | Active        | Production           | SOP (NS)   20   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LVCH244A                               |
| SN74LVCH244ANSR.B                | Active        | Production           | SOP (NS)   20   | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LVCH244A                               |
| <a href="#">SN74LVCH244APW</a>   | Active        | Production           | TSSOP (PW)   20 | 70   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                |
| SN74LVCH244APW.B                 | Active        | Production           | TSSOP (PW)   20 | 70   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                |
| <a href="#">SN74LVCH244APWR</a>  | Active        | Production           | TSSOP (PW)   20 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                |
| SN74LVCH244APWR.B                | Active        | Production           | TSSOP (PW)   20 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                |
| SN74LVCH244APWRG4                | Active        | Production           | TSSOP (PW)   20 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                |
| <a href="#">SN74LVCH244APWT</a>  | Active        | Production           | TSSOP (PW)   20 | 250   SMALL T&R       | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                |
| SN74LVCH244APWT.B                | Active        | Production           | TSSOP (PW)   20 | 250   SMALL T&R       | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | LCH244A                                |
| <a href="#">SN74LVCH244ARGYR</a> | Active        | Production           | VQFN (RGY)   20 | 3000   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | LCH244A                                |
| SN74LVCH244ARGYR.B               | Active        | Production           | VQFN (RGY)   20 | 3000   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | LCH244A                                |
| <a href="#">SNJ54LVCH244AFK</a>  | Active        | Production           | LCCC (FK)   20  | 55   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9754201Q2A<br>SNJ54LVCH<br>244AFK |
| <a href="#">SNJ54LVCH244AJ</a>   | Active        | Production           | CDIP (J)   20   | 20   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9754201QR<br>A<br>SNJ54LVCH244AJ  |
| <a href="#">SNJ54LVCH244AW</a>   | Active        | Production           | CFP (W)   20    | 25   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9754201QS<br>A<br>SNJ54LVCH244AW  |

<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.

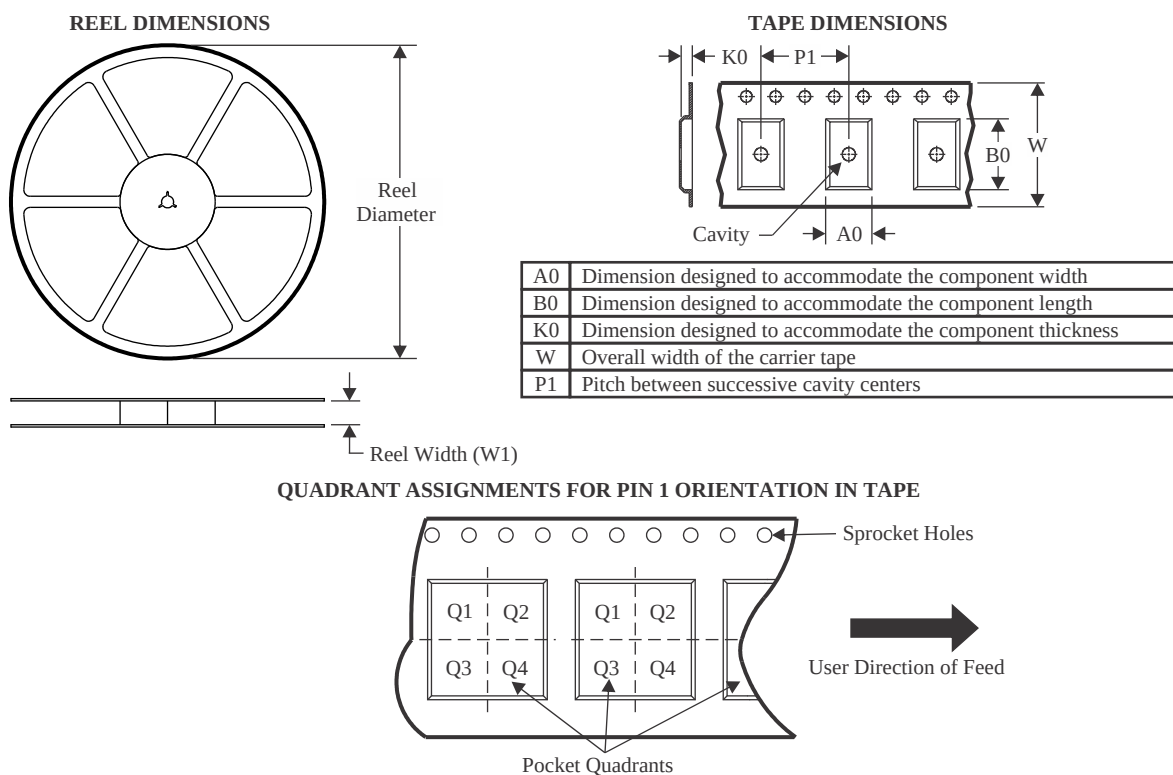
**OTHER QUALIFIED VERSIONS OF SN54LVCH244A, SN54LVCH244A-SP, SN74LVCH244A :**

- Catalog : [SN74LVCH244A](#), [SN54LVCH244A](#)
- Military : [SN54LVCH244A](#)
- Space : [SN54LVCH244A-SP](#)

**NOTE: Qualified Version Definitions:**

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications
- Space - Radiation tolerant, ceramic packaging and qualified for use in Space-based application

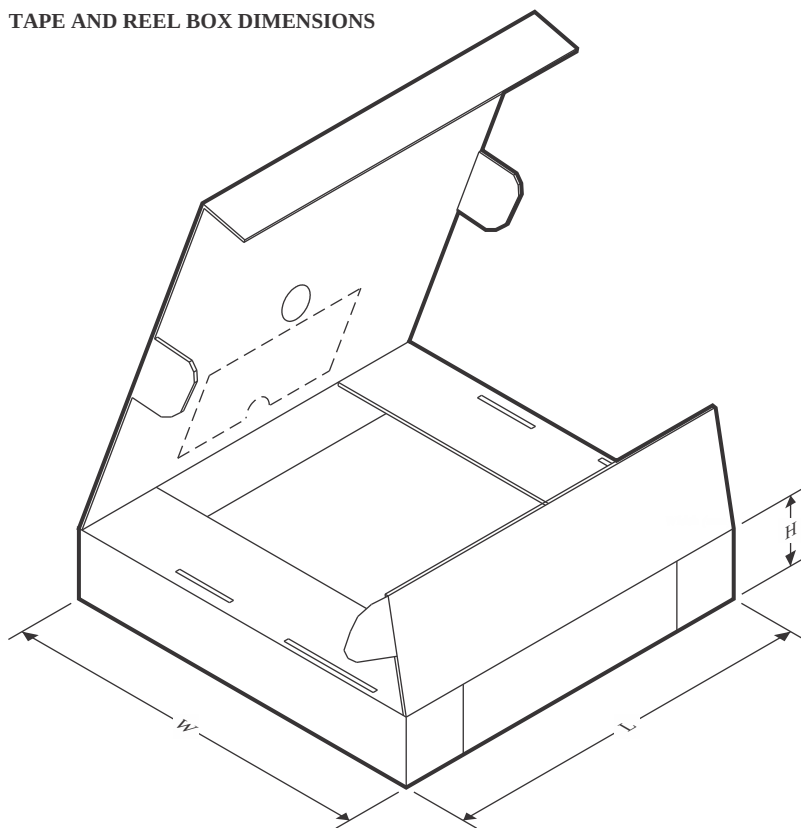
## TAPE AND REEL INFORMATION



\*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 |
|--------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LVCH244ADBQR   | SSOP         | DBQ             | 20   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LVCH244ADBQRG4 | SSOP         | DBQ             | 20   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LVCH244ADBR    | SSOP         | DB              | 20   | 2000 | 330.0              | 16.4               | 8.2     | 7.5     | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LVCH244ADGVR   | TVSOP        | DGV             | 20   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LVCH244ADGVRG4 | TVSOP        | DGV             | 20   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LVCH244ADWR    | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.3    | 2.7     | 12.0    | 24.0   | Q1            |
| SN74LVCH244ADWRG4  | SOIC         | DW              | 20   | 2000 | 330.0              | 24.4               | 10.8    | 13.3    | 2.7     | 12.0    | 24.0   | Q1            |
| SN74LVCH244ANSR    | SOP          | NS              | 20   | 2000 | 330.0              | 24.4               | 8.4     | 13.0    | 2.5     | 12.0    | 24.0   | Q1            |
| SN74LVCH244APWR    | TSSOP        | PW              | 20   | 2000 | 330.0              | 16.4               | 6.95    | 7.0     | 1.4     | 8.0     | 16.0   | Q1            |
| SN74LVCH244APWT    | TSSOP        | PW              | 20   | 250  | 330.0              | 16.4               | 6.95    | 7.0     | 1.4     | 8.0     | 16.0   | Q1            |
| SN74LVCH244ARGYR   | VQFN         | RGY             | 20   | 3000 | 330.0              | 12.4               | 3.71    | 4.71    | 1.1     | 8.0     | 12.0   | Q1            |

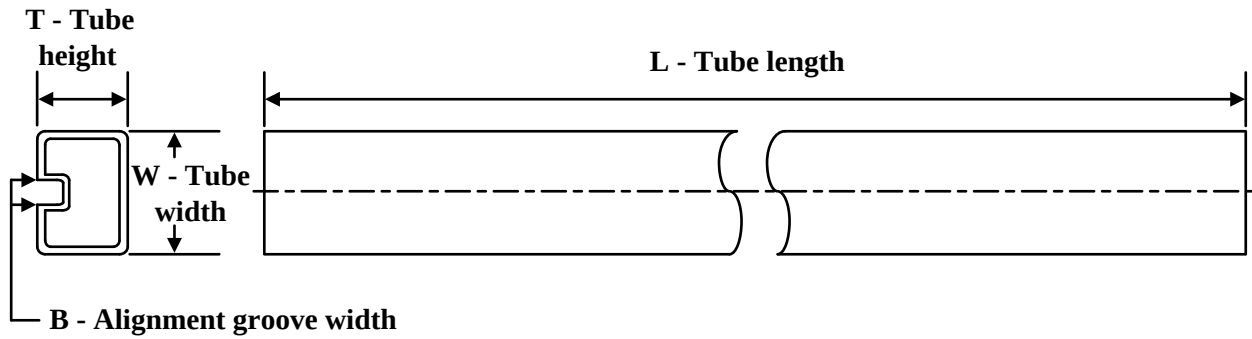
## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device             | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|--------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LVCH244ADBQR   | SSOP         | DBQ             | 20   | 2500 | 353.0       | 353.0      | 32.0        |
| SN74LVCH244ADBQRG4 | SSOP         | DBQ             | 20   | 2500 | 353.0       | 353.0      | 32.0        |
| SN74LVCH244ADBR    | SSOP         | DB              | 20   | 2000 | 353.0       | 353.0      | 32.0        |
| SN74LVCH244ADGVR   | TVSOP        | DGV             | 20   | 2000 | 353.0       | 353.0      | 32.0        |
| SN74LVCH244ADGVRG4 | TVSOP        | DGV             | 20   | 2000 | 353.0       | 353.0      | 32.0        |
| SN74LVCH244ADWR    | SOIC         | DW              | 20   | 2000 | 356.0       | 356.0      | 45.0        |
| SN74LVCH244ADWRG4  | SOIC         | DW              | 20   | 2000 | 356.0       | 356.0      | 45.0        |
| SN74LVCH244ANSR    | SOP          | NS              | 20   | 2000 | 356.0       | 356.0      | 45.0        |
| SN74LVCH244APWR    | TSSOP        | PW              | 20   | 2000 | 353.0       | 353.0      | 32.0        |
| SN74LVCH244APWT    | TSSOP        | PW              | 20   | 250  | 353.0       | 353.0      | 32.0        |
| SN74LVCH244ARGYR   | VQFN         | RGY             | 20   | 3000 | 353.0       | 353.0      | 32.0        |

## TUBE

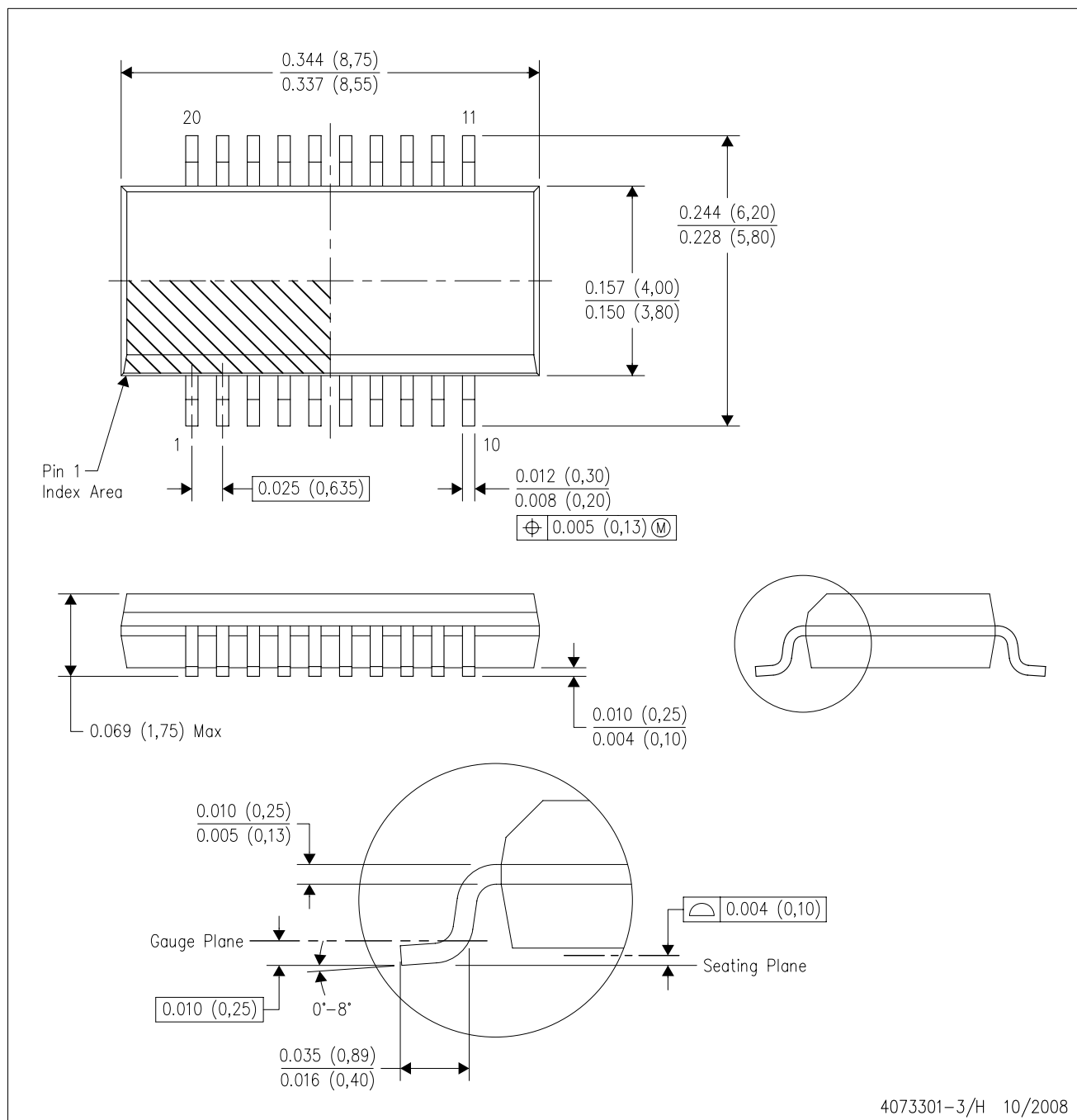


\*All dimensions are nominal

| Device           | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|------------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| 5962-9754201Q2A  | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| 5962-9754201V2A  | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |
| 5962-9754201VSA  | W            | CFP          | 20   | 25  | 506.98 | 26.16  | 6220   | NA     |
| SN74LVCH244ADW   | DW           | SOIC         | 20   | 25  | 507    | 12.83  | 5080   | 6.6    |
| SN74LVCH244ADW.B | DW           | SOIC         | 20   | 25  | 507    | 12.83  | 5080   | 6.6    |
| SN74LVCH244APW   | PW           | TSSOP        | 20   | 70  | 530    | 10.2   | 3600   | 3.5    |
| SN74LVCH244APW.B | PW           | TSSOP        | 20   | 70  | 530    | 10.2   | 3600   | 3.5    |
| SNJ54LVCH244AFK  | FK           | LCCC         | 20   | 55  | 506.98 | 12.06  | 2030   | NA     |

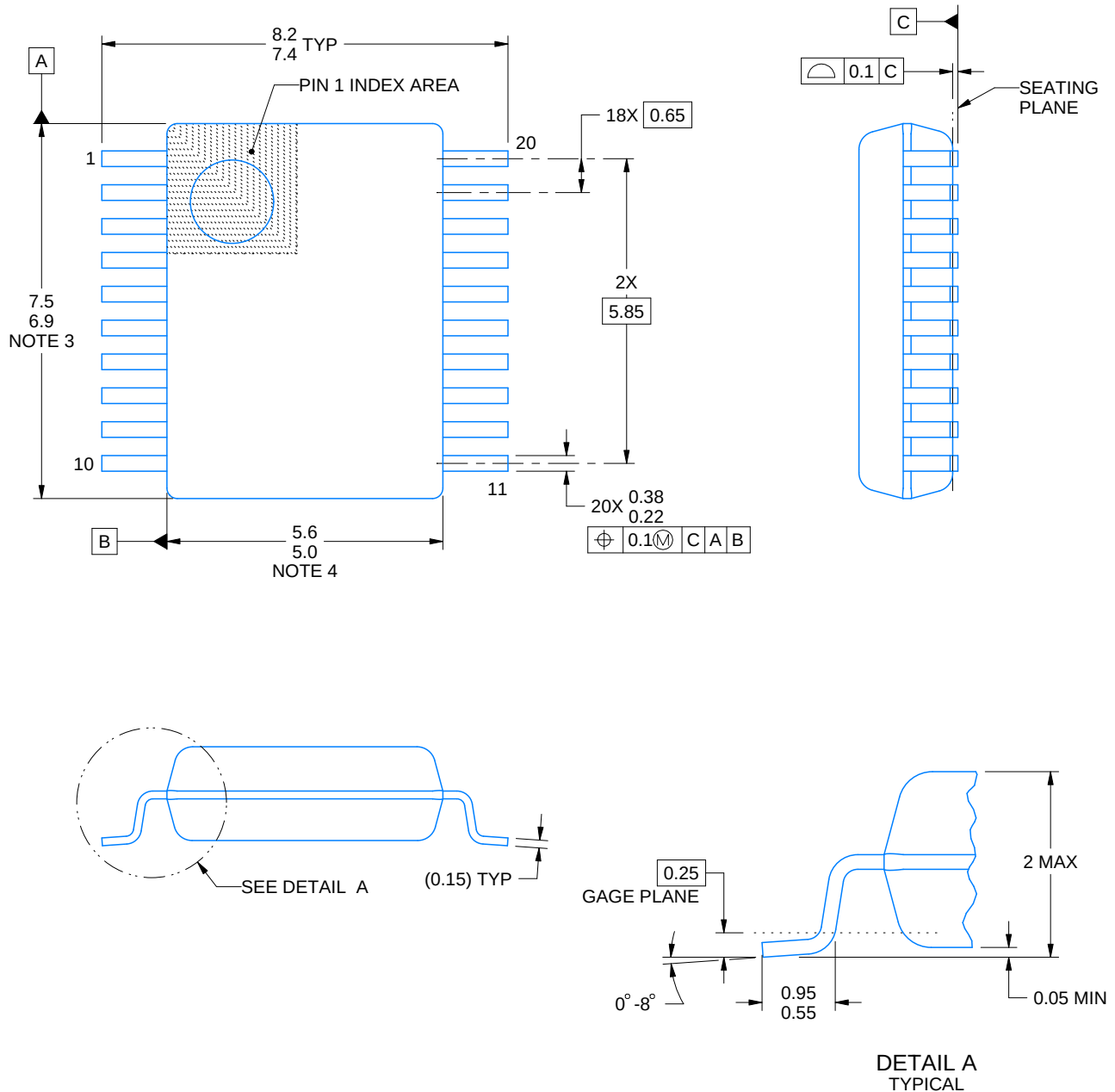
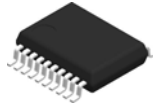
DBQ (R-PDSO-G20)

PLASTIC SMALL-OUTLINE PACKAGE



4073301-3/H 10/2008

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15) per side.
  - Falls within JEDEC MO-137 variation AD.



4214851/B 08/2019

## NOTES:

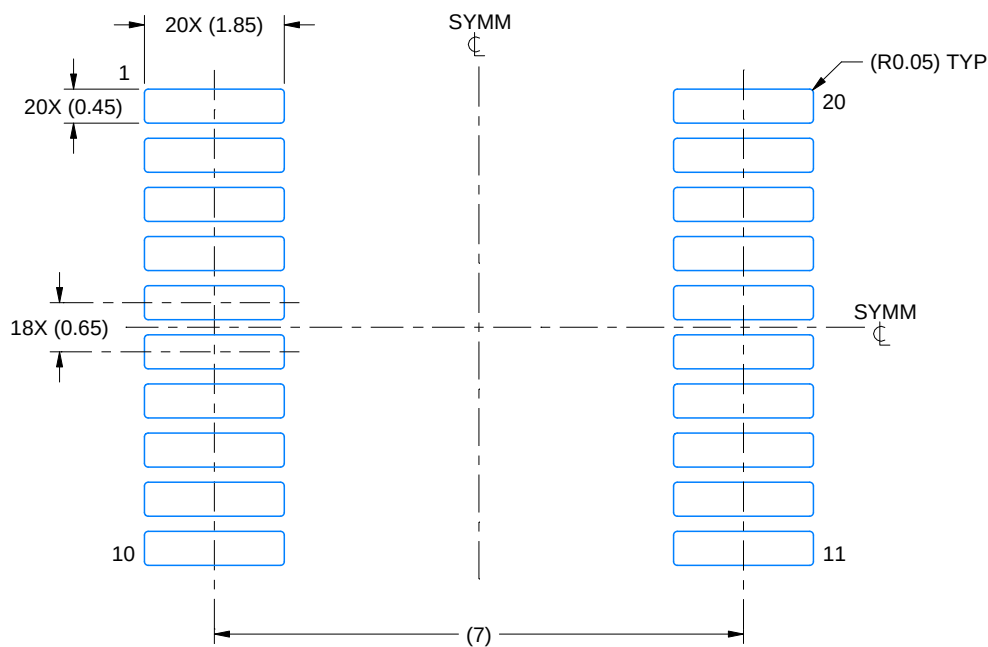
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

# EXAMPLE BOARD LAYOUT

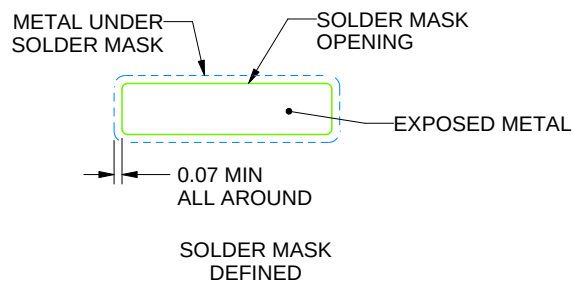
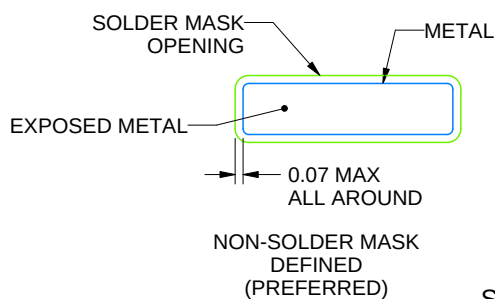
DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



SOLDER MASK DETAILS

4214851/B 08/2019

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.

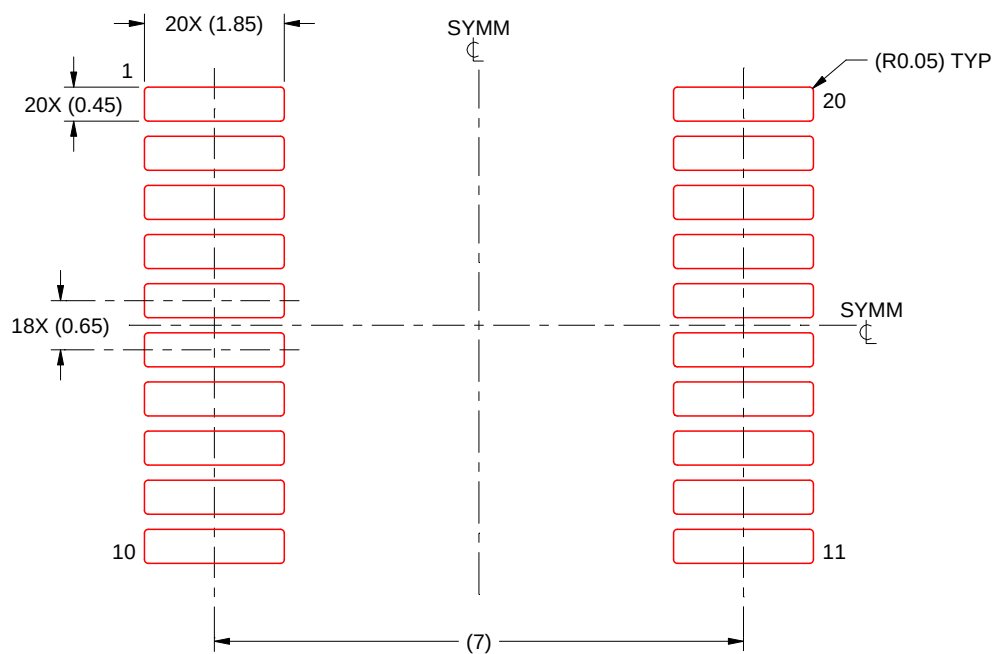


## EXAMPLE STENCIL DESIGN

DB0020A

SSOP - 2 mm max height

SMALL OUTLINE PACKAGE



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

4214851/B 08/2019

NOTES: (continued)

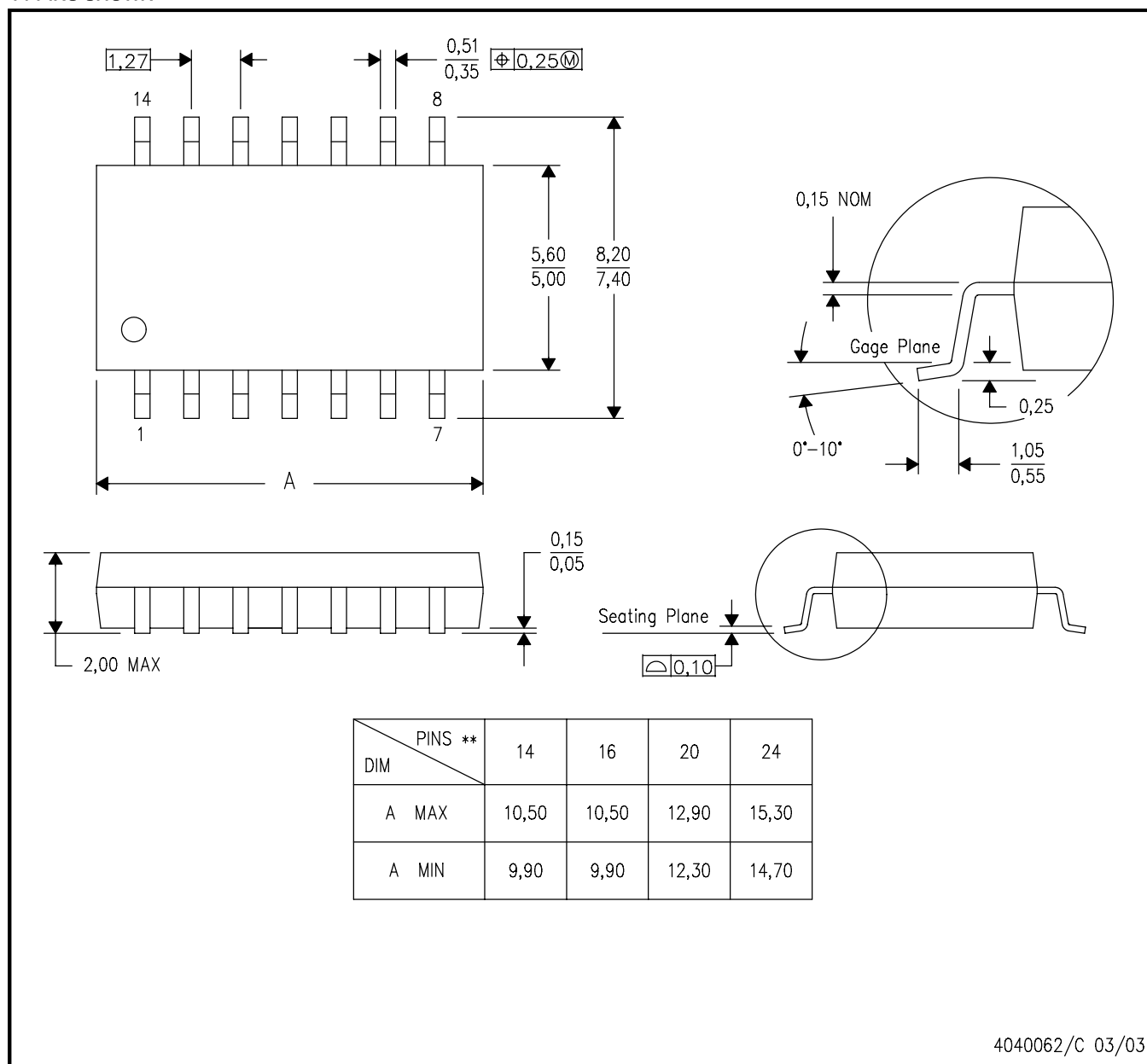
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

# MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN

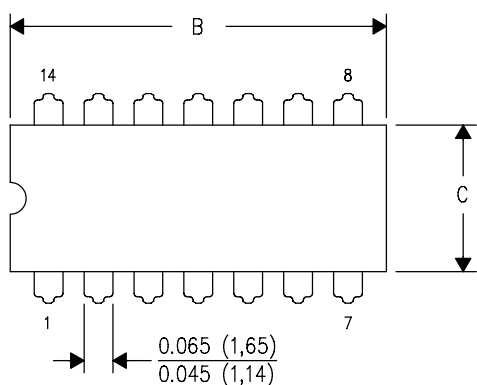


- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

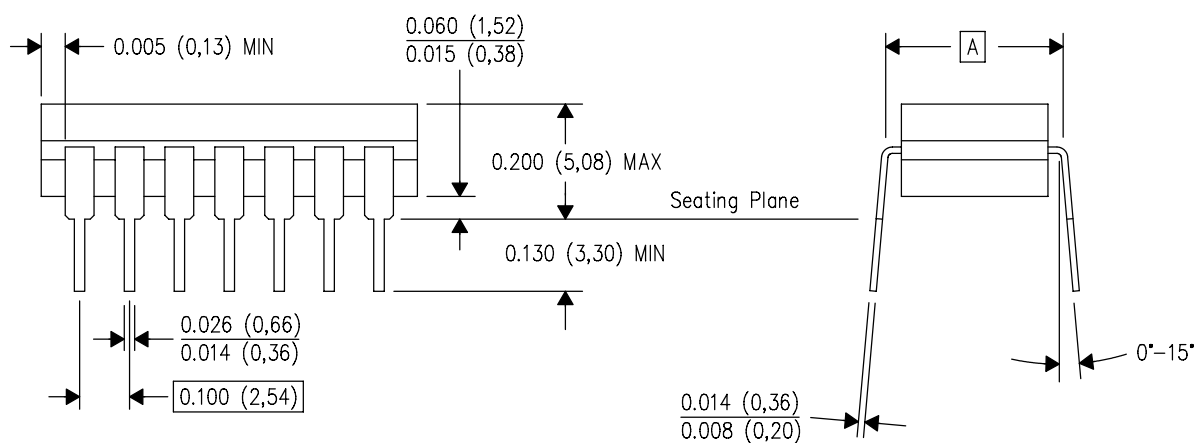
J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



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



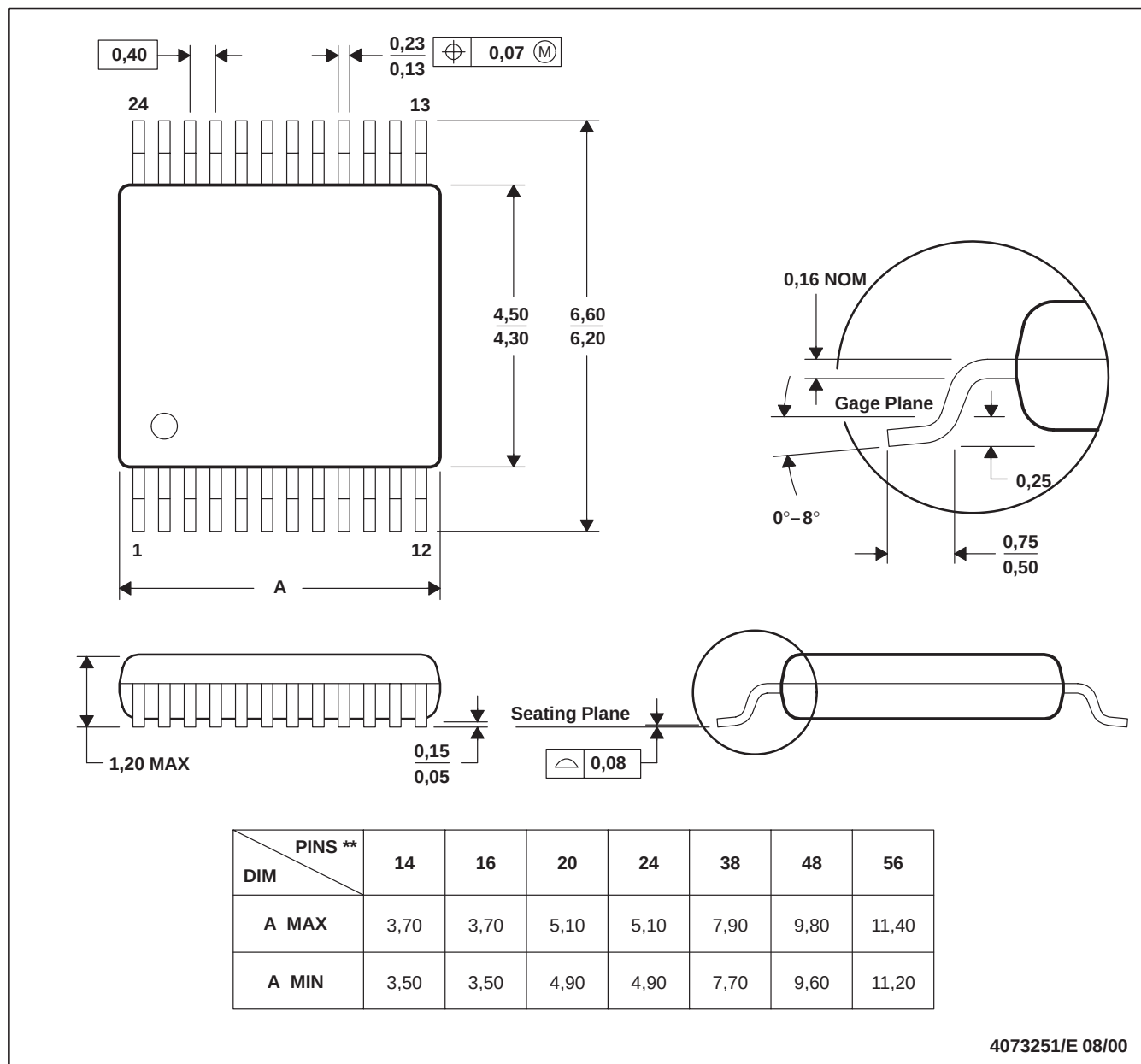
4040083/F 03/03

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

## 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

## GENERIC PACKAGE VIEW

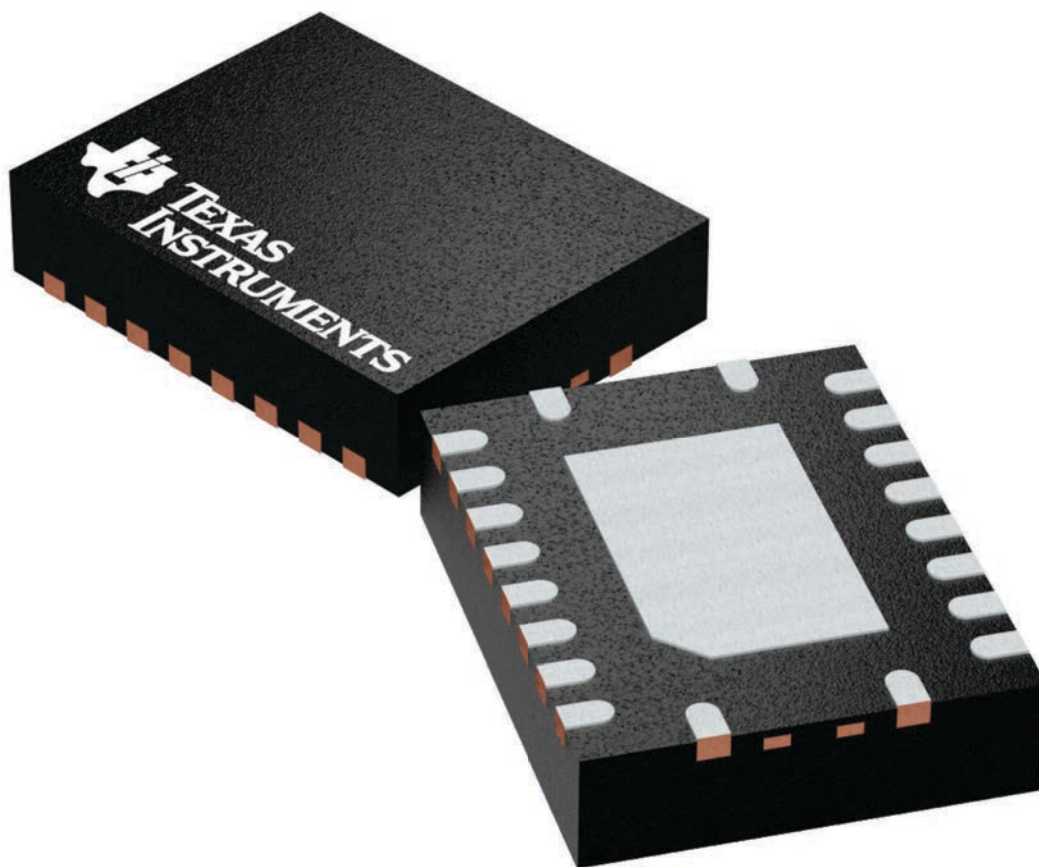
**RGY 20**

**VQFN - 1 mm max height**

3.5 x 4.5, 0.5 mm pitch

PLASTIC QUAD FGLATPACK - NO LEAD

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



4225264/A



## VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



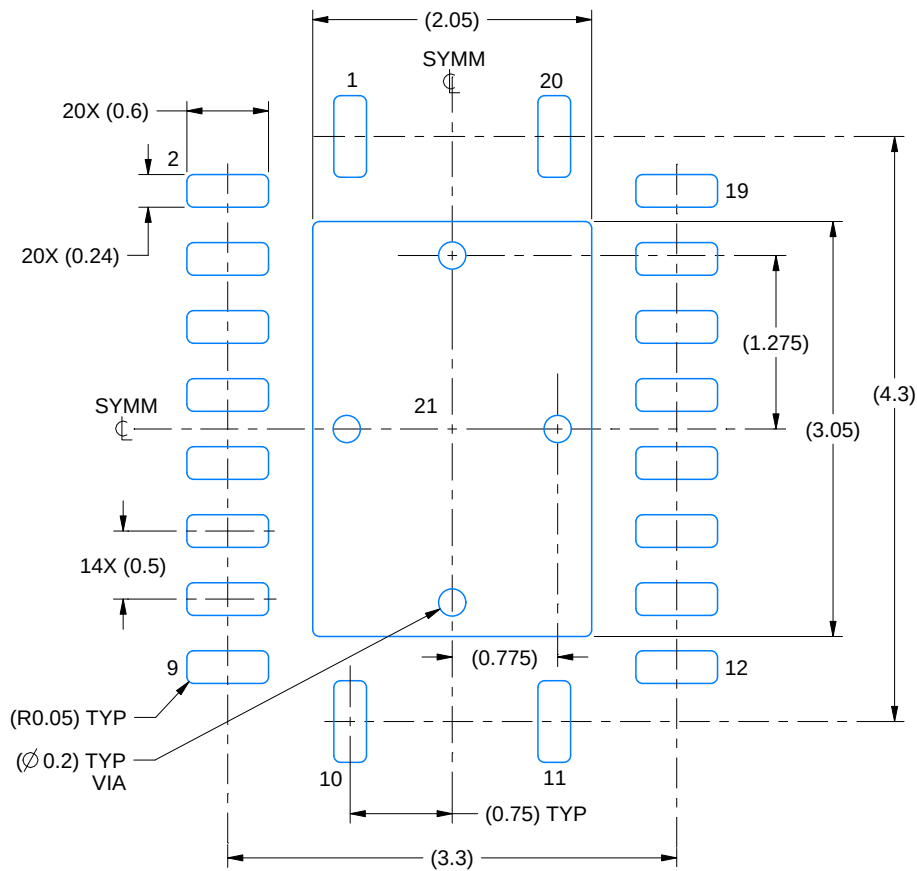
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

# EXAMPLE BOARD LAYOUT

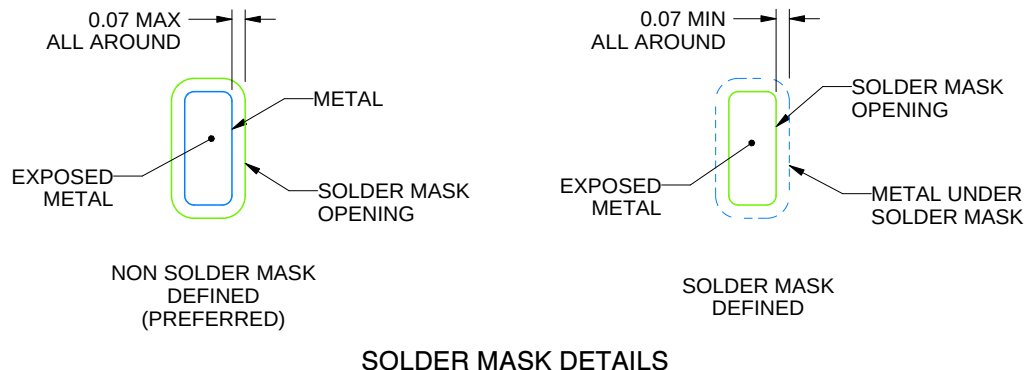
RGY0020A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:18X



4225320/A 09/2019

NOTES: (continued)

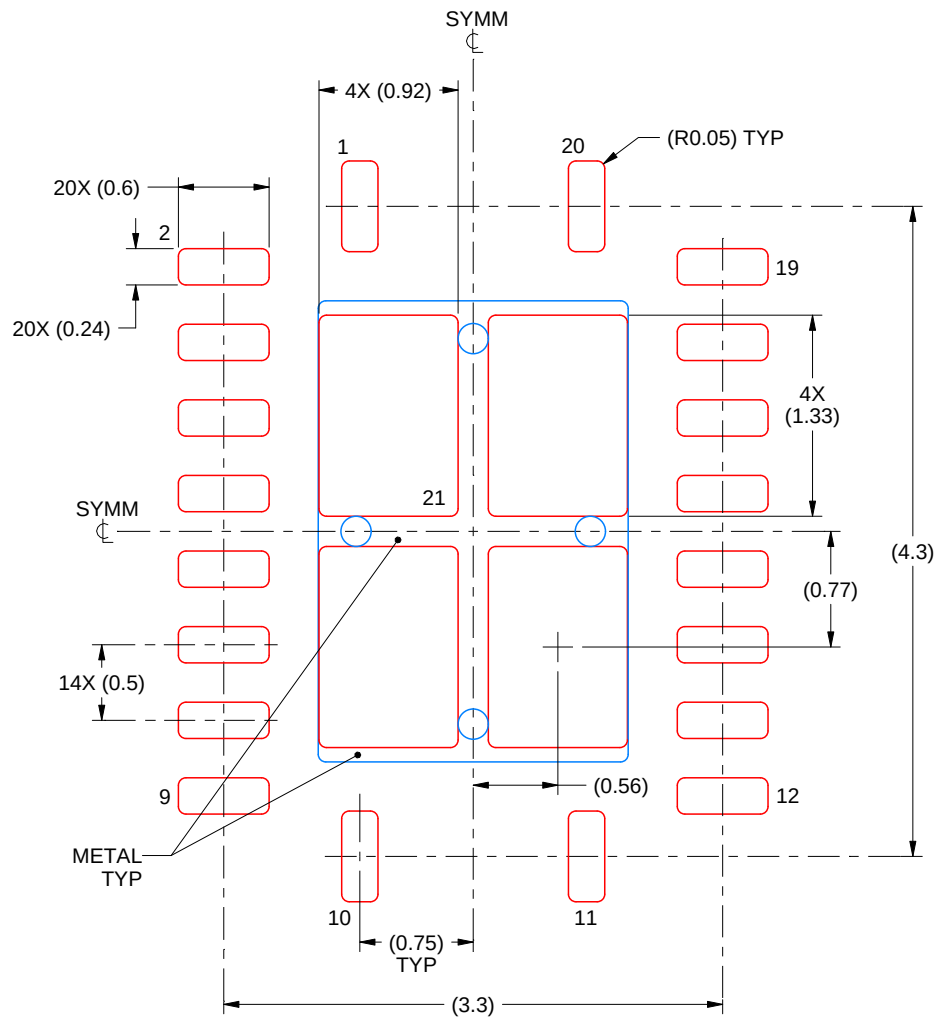
- This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/sluea271](http://www.ti.com/lit/sluea271)).
- Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

# EXAMPLE STENCIL DESIGN

RGY0020A

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



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

EXPOSED PAD 21  
78% PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE  
SCALE:20X

4225320/A 09/2019

NOTES: (continued)

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



## GENERIC PACKAGE VIEW

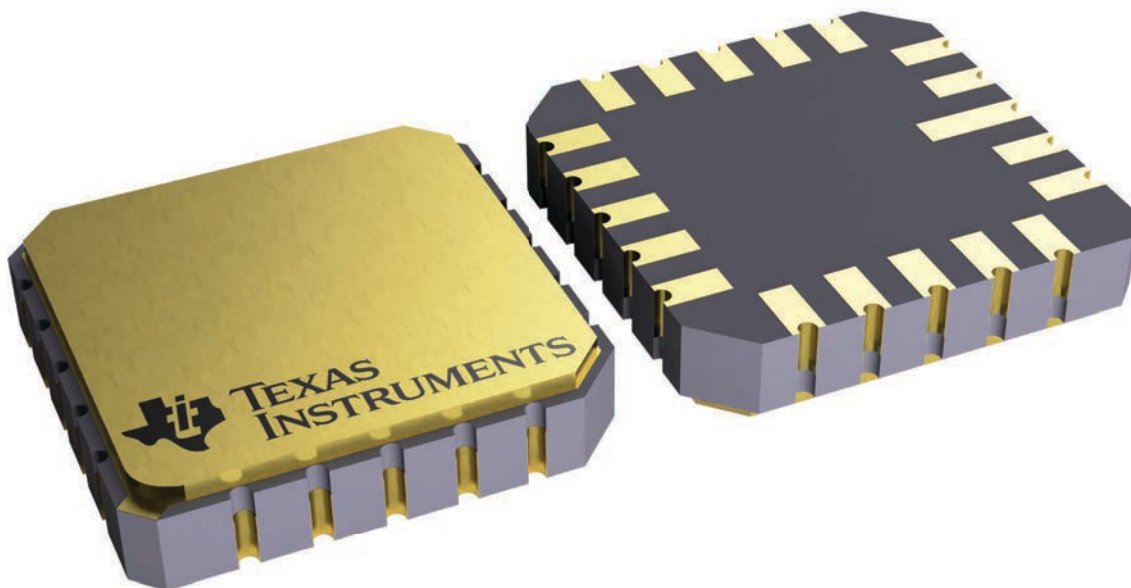
**FK 20**

**LCCC - 2.03 mm max height**

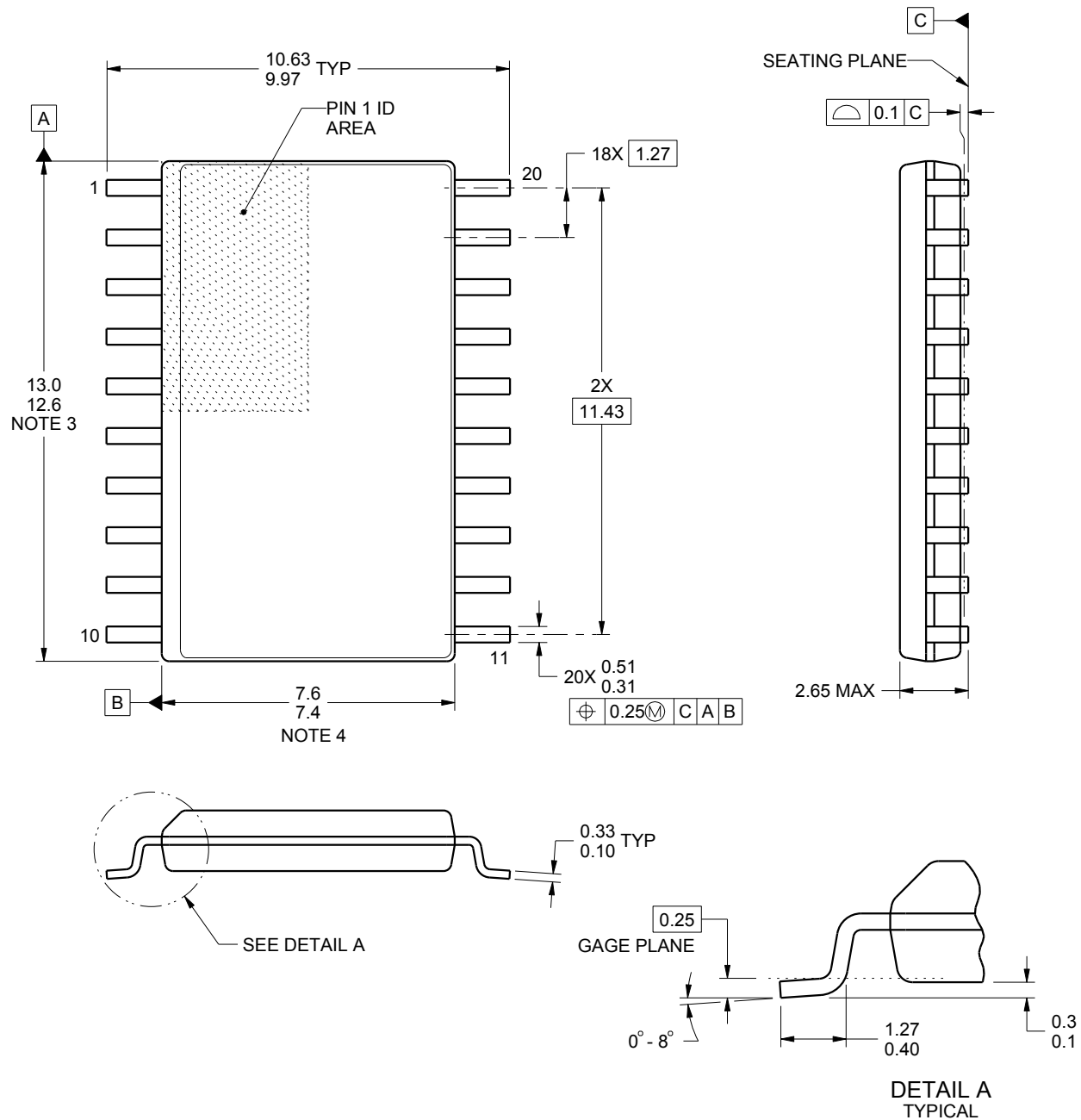
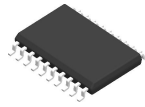
8.89 x 8.89, 1.27 mm pitch

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\



4220724/A 05/2016

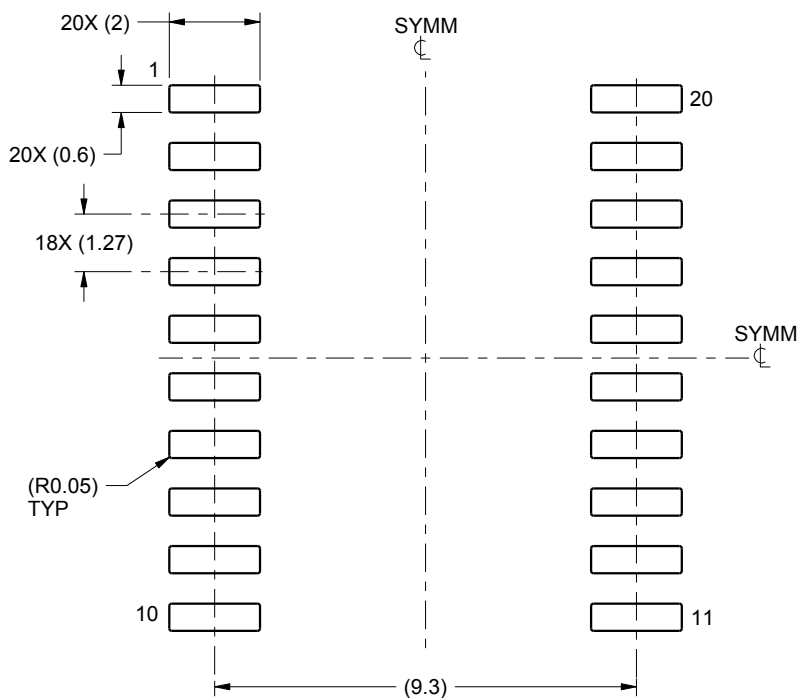
## NOTES:

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-013.

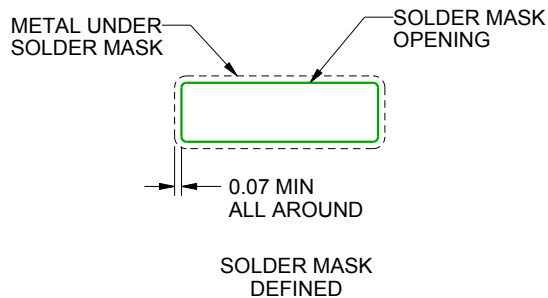
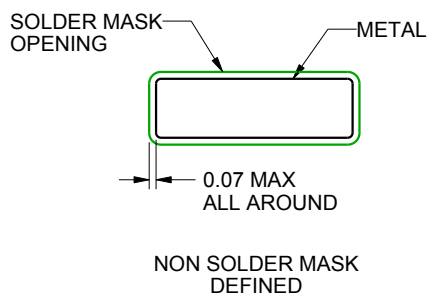
**DW0020A**

### SOIC - 2.65 mm max height

SOIC



LAND PATTERN EXAMPLE  
SCALE:6X



## SOLDER MASK DETAILS

4220724/A 05/2016

NOTES: (continued)

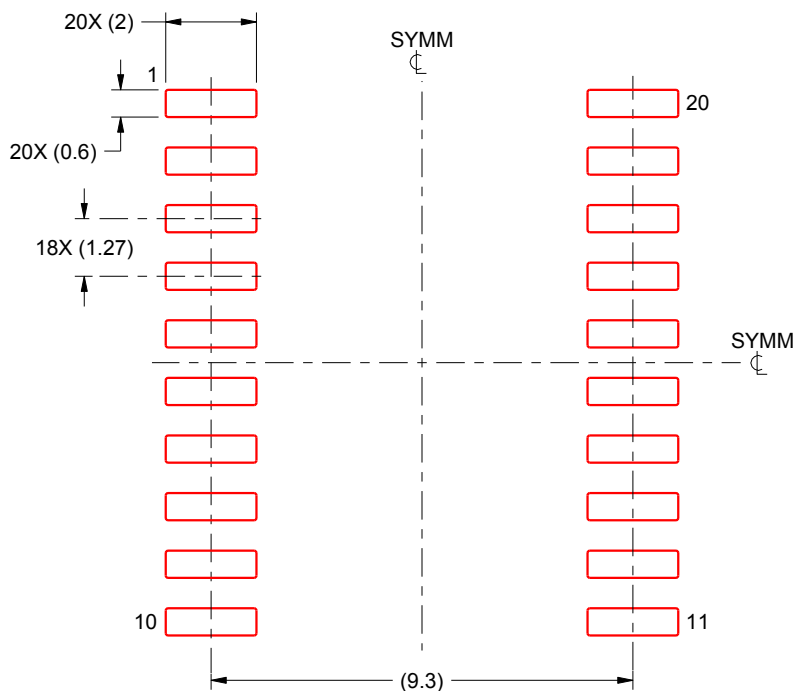
6. Publication IPC-7351 may have alternate designs.  
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



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

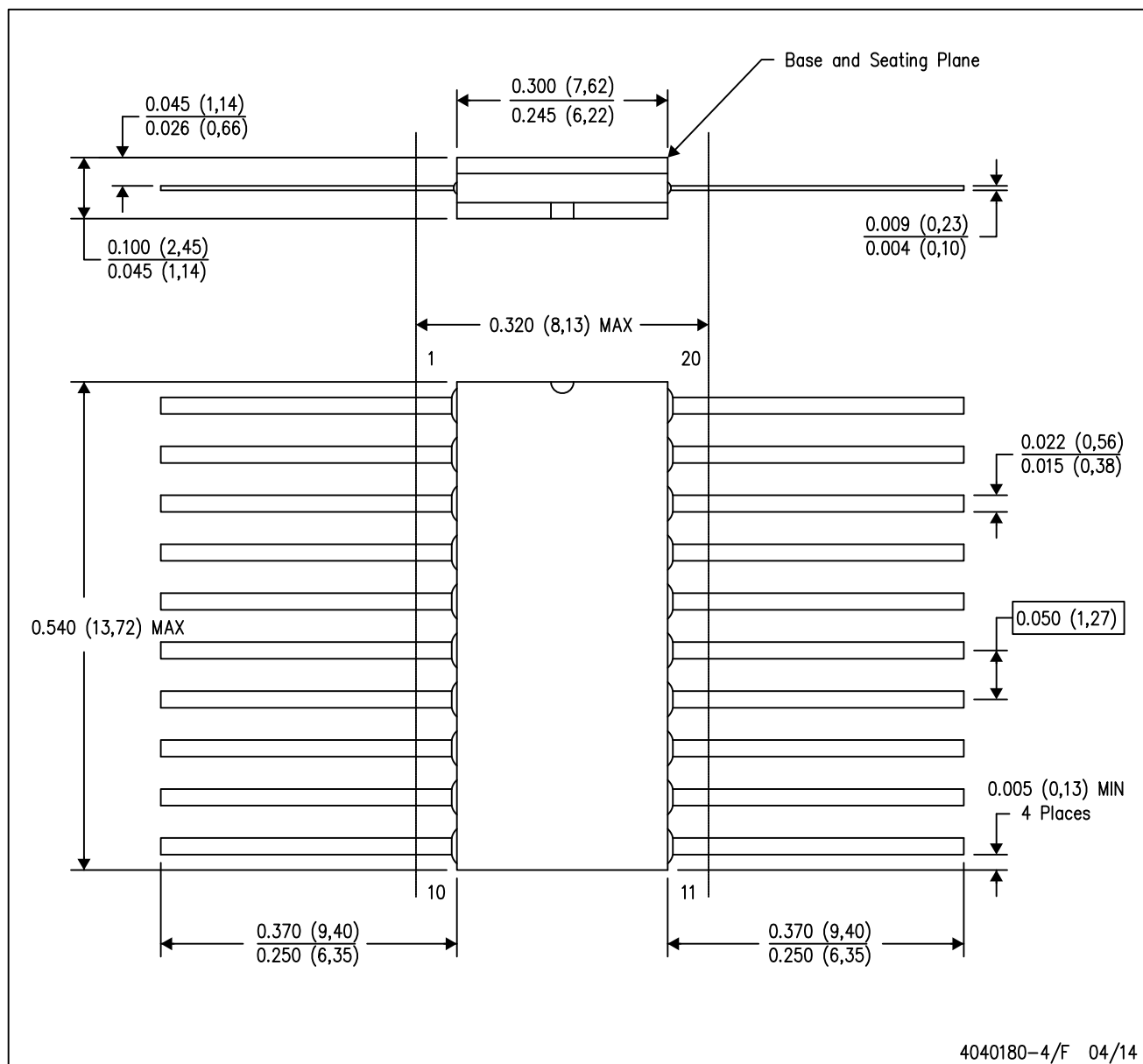
4220724/A 05/2016

NOTES: (continued)

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

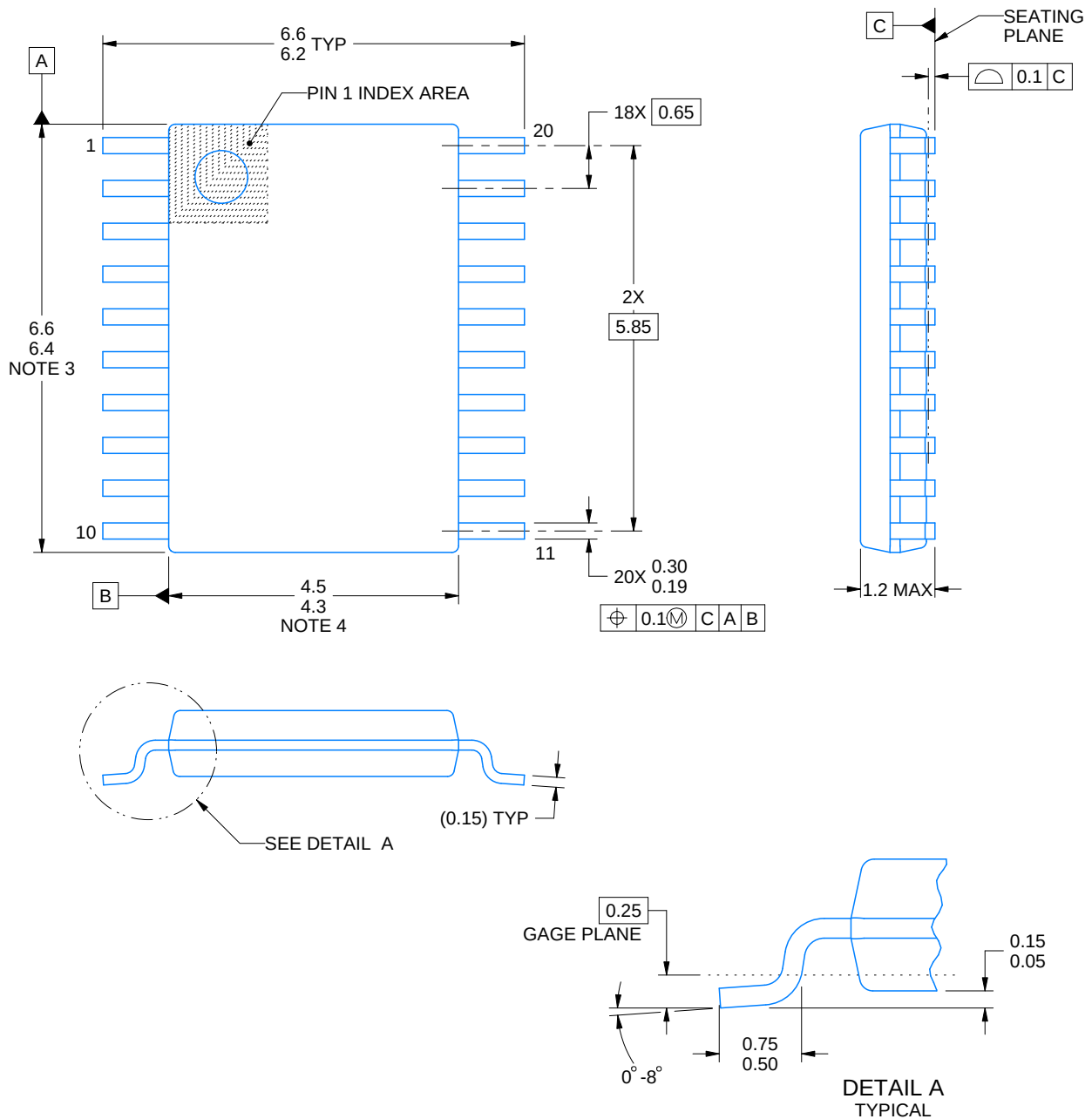
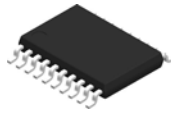
W (R-GDFP-F20)

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 GDFP2-F20



4220206/A 02/2017

## NOTES:

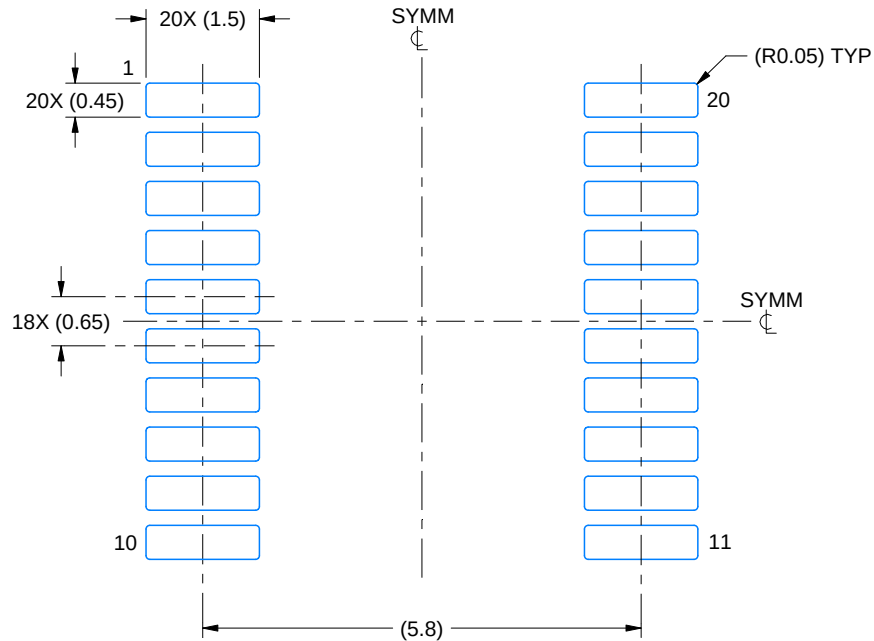
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or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

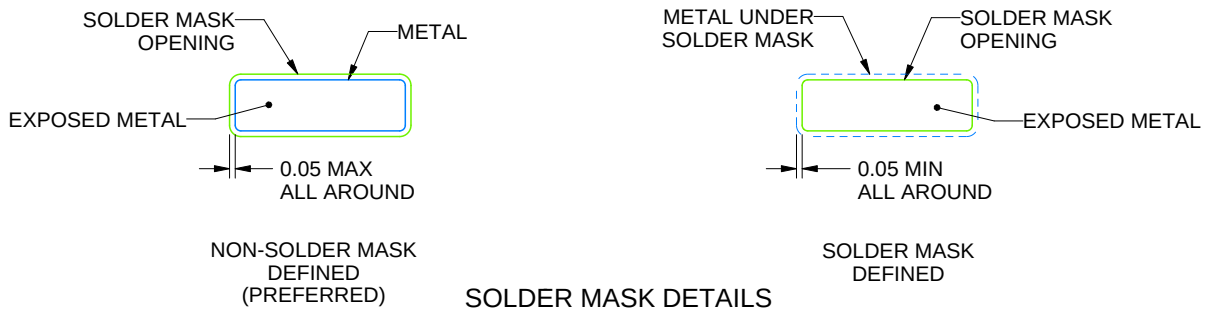
PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 10X



4220206/A 02/2017

NOTES: (continued)

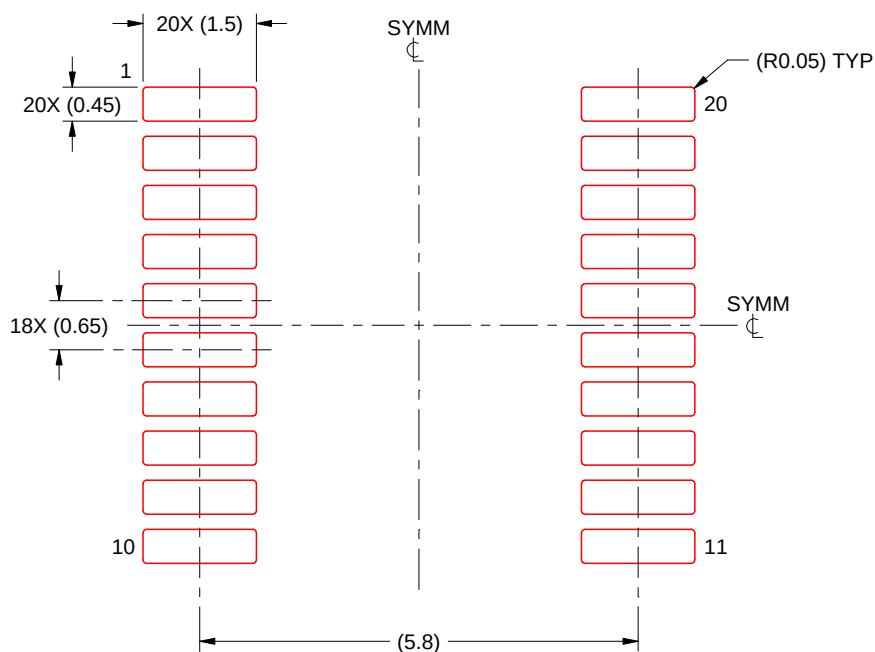
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

PW0020A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

4220206/A 02/2017

NOTES: (continued)

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



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