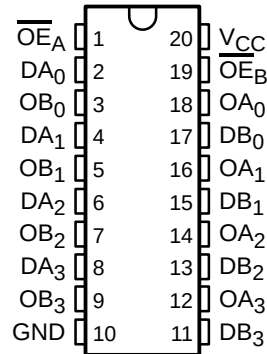


- Function and Pinout Compatible With FCT and F Logic
- 25-Ω Output Series Resistors Reduce Transmission-Line Reflection Noise
- TTL-Output-Level Version of Equivalent FCT Functions
- Edge-Rate Control Circuitry for Significantly Improved Noise Characteristics
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)
- Fully Compatible With TTL Input and Output Logic Levels
- 12-mA Output Sink Current  
15-mA Output Source Current
- 3-State Outputs

Q OR SO PACKAGE  
(TOP VIEW)



## description

The CY74FCT2244T is an octal buffer and line driver that includes on-chip 25-Ω terminating resistors at each of the outputs to minimize noise resulting from reflections or standing waves in high-performance applications. The on-chip resistors reduce overall board space and component count. Designed to be employed as a memory address driver, clock driver, and bus-oriented transmitter/receiver, this device provides speed and drive capabilities commensurate with its fastest bipolar logic counterparts, while reducing power dissipation. The input and output voltage levels allow direct interface with TTL, NMOS, and CMOS devices, without the need for external components.

This device is fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the device when it is powered down.

## ORDERING INFORMATION

| $T_A$         | PACKAGE†  |               | SPEED (ns) | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|---------------|-----------|---------------|------------|-----------------------|------------------|
| –40°C to 85°C | QSOP – Q  | Tape and reel | 4.3        | CY74FCT2244CTQCT      | FCT2244C         |
|               | SOIC – SO | Tube          | 4.3        | CY74FCT2244CTSOC      | FCT2244C         |
|               |           | Tape and reel | 4.3        | CY74FCT2244CTSOCT     |                  |
|               | QSOP – Q  | Tape and reel | 4.6        | CY74FCT2244ATQCT      | FCT2244A         |
|               | SOIC – SO | Tube          | 4.6        | CY74FCT2244ATSOC      | FCT2244A         |
|               |           | Tape and reel | 4.6        | CY74FCT2244ATSOCT     |                  |
|               | QSOP – Q  | Tape and reel | 6.5        | CY74FCT2244TQCT       | FCT2244          |
|               | SOIC – SO | Tube          | 6.5        | CY74FCT2244TSOC       | FCT2244          |
|               |           | Tape and reel | 6.5        | CY74FCT2244TSOCT      |                  |

† 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).



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**TEXAS  
INSTRUMENTS**

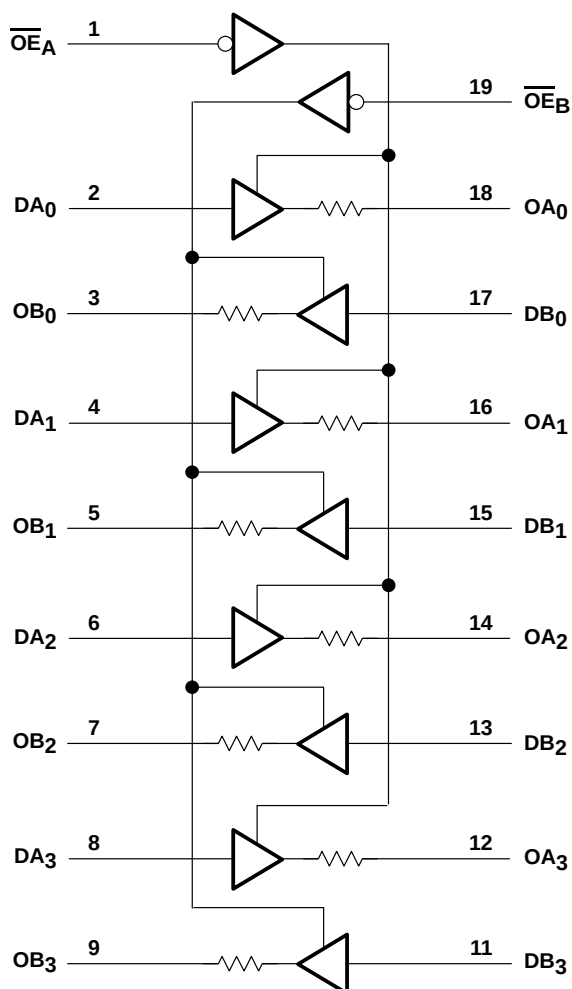
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## SCCS074 – OCTOBER 2001

| INPUTS            |                   |   | OUTPUT<br>O |
|-------------------|-------------------|---|-------------|
| $\overline{OE_A}$ | $\overline{OE_B}$ | D |             |
| L                 | L                 | L | L           |
| L                 | L                 | H | H           |
| H                 | H                 | X | Z           |

**logic diagram**



**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

|                                                                  |                 |
|------------------------------------------------------------------|-----------------|
| Supply voltage range to ground potential                         | –0.5 V to 7 V   |
| DC input voltage range                                           | –0.5 V to 7 V   |
| DC output voltage range                                          | –0.5 V to 7 V   |
| DC output current (maximum sink current/pin)                     | 120 mA          |
| Package thermal impedance, $\theta_{JA}$ (see Note 1): Q package | 68°C/W          |
| SO package                                                       | 58°C/W          |
| Ambient temperature range with power applied, $T_A$              | –65°C to +135°C |
| Storage temperature range, $T_{stg}$                             | –65°C to +150°C |

<sup>†</sup> 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.

NOTE 1: The package thermal impedance is calculated in accordance with JESD 51-7.

**recommended operating conditions (see Note 2)**

|                                      | MIN  | NOM | MAX  | UNIT |
|--------------------------------------|------|-----|------|------|
| $V_{CC}$ Supply voltage              | 4.75 | 5   | 5.25 | V    |
| $V_{IH}$ High-level input voltage    | 2    |     |      | V    |
| $V_{IL}$ Low-level input voltage     |      |     | 0.8  | V    |
| $I_{OH}$ High-level output current   |      |     | –15  | mA   |
| $I_{OL}$ Low-level output current    |      |     | 12   | mA   |
| $T_A$ Operating free-air temperature | –40  |     | 85   | °C   |

NOTE 2: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation.

# CY74FCT2244T

## 8-BIT BUFFER/LINE DRIVER

### WITH 3-STATE OUTPUTS

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

| PARAMETER           | TEST CONDITIONS                                                                                                                                                                                      |                                                                        | MIN                                                                  | TYP <sup>†</sup> | MAX     | UNIT          |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------|------------------|---------|---------------|
| $V_{IK}$            | $V_{CC} = 4.75\text{ V}$ ,                                                                                                                                                                           | $I_{IN} = -18\text{ mA}$                                               |                                                                      | -0.7             | -1.2    | V             |
| $V_{OH}$            | $V_{CC} = 4.75\text{ V}$ ,                                                                                                                                                                           | $I_{OH} = -15\text{ mA}$                                               | 2.4                                                                  | 3.3              |         | V             |
| $V_{OL}$            | $V_{CC} = 4.75\text{ V}$ ,                                                                                                                                                                           | $I_{OL} = 12\text{ mA}$                                                |                                                                      | 0.3              | 0.55    | V             |
| $R_{OUT}$           | $V_{CC} = 4.75\text{ V}$ ,                                                                                                                                                                           | $I_{OL} = 12\text{ mA}$                                                | 20                                                                   | 25               | 40      | $\Omega$      |
| $V_{hys}$           | All inputs                                                                                                                                                                                           |                                                                        |                                                                      | 0.2              |         | V             |
| $I_I$               | $V_{CC} = 5.25\text{ V}$ ,                                                                                                                                                                           | $V_{IN} = V_{CC}$                                                      |                                                                      |                  | 5       | $\mu\text{A}$ |
| $I_{IH}$            | $V_{CC} = 5.25\text{ V}$ ,                                                                                                                                                                           | $V_{IN} = 2.7\text{ V}$                                                |                                                                      |                  | $\pm 1$ | $\mu\text{A}$ |
| $I_{IL}$            | $V_{CC} = 5.25\text{ V}$ ,                                                                                                                                                                           | $V_{IN} = 0.5\text{ V}$                                                |                                                                      |                  | $\pm 1$ | $\mu\text{A}$ |
| $I_{OZH}$           | $V_{CC} = 5.25\text{ V}$ ,                                                                                                                                                                           | $V_{OUT} = 2.7\text{ V}$                                               |                                                                      |                  | 10      | $\mu\text{A}$ |
| $I_{OZL}$           | $V_{CC} = 5.25\text{ V}$ ,                                                                                                                                                                           | $V_{OUT} = 0.5\text{ V}$                                               |                                                                      |                  | -10     | $\mu\text{A}$ |
| $I_{OS}^{\ddagger}$ | $V_{CC} = 5.25\text{ V}$ ,                                                                                                                                                                           | $V_{OUT} = 0\text{ V}$                                                 | -60                                                                  | -120             | -225    | mA            |
| $I_{off}$           | $V_{CC} = 0\text{ V}$ ,                                                                                                                                                                              | $V_{OUT} = 4.5\text{ V}$                                               |                                                                      |                  | $\pm 1$ | $\mu\text{A}$ |
| $I_{CC}$            | $V_{CC} = 5.25\text{ V}$ ,                                                                                                                                                                           | $V_{IN} \leq 0.2\text{ V}$ , $V_{IN} \geq V_{CC} - 0.2\text{ V}$       |                                                                      | 0.1              | 0.2     | mA            |
| $\Delta I_{CC}$     | $V_{CC} = 5.25\text{ V}$ , $V_{IN} = 3.4\text{ V}^{\S}$ , $f_1 = 0$ , Outputs open                                                                                                                   |                                                                        |                                                                      | 0.5              | 2       | mA            |
| $I_{CCD}^{\P}$      | $V_{CC} = 5.25\text{ V}$ , One input switching at 50% duty cycle, Outputs open, $\overline{OE}_A = \overline{OE}_B = \text{GND}$ , $V_{IN} \leq 0.2\text{ V}$ or $V_{IN} \geq V_{CC} - 0.2\text{ V}$ |                                                                        |                                                                      | 0.06             | 0.12    | mA/MHz        |
| $I_C^{\#}$          | $V_{CC} = 5.25\text{ V}$ ,<br>Outputs open,<br>$\overline{OE}_A = \overline{OE}_B = \text{GND}$                                                                                                      | One bit switching<br>at $f_1 = 10\text{ MHz}$<br>at 50% duty cycle     | $V_{IN} \leq 0.2\text{ V}$ or<br>$V_{IN} \geq V_{CC} - 0.2\text{ V}$ | 0.7              | 1.4     | mA            |
|                     |                                                                                                                                                                                                      |                                                                        | $V_{IN} = 3.4\text{ V}$ or GND                                       | 1                | 2.4     |               |
|                     |                                                                                                                                                                                                      | Eight bits switching<br>at $f_1 = 2.5\text{ MHz}$<br>at 50% duty cycle | $V_{IN} \leq 0.2\text{ V}$ or<br>$V_{IN} \geq V_{CC} - 0.2\text{ V}$ | 1.3              | 2.6     |               |
|                     |                                                                                                                                                                                                      |                                                                        | $V_{IN} = 3.4\text{ V}$ or GND                                       | 3.3              | 10.6    |               |
| $C_i$               |                                                                                                                                                                                                      |                                                                        |                                                                      | 5                | 10      | pF            |
| $C_o$               |                                                                                                                                                                                                      |                                                                        |                                                                      | 9                | 12      | pF            |

<sup>†</sup> Typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

<sup>‡</sup> Not more than one output should be shorted at a time. Duration of short should not exceed one second. The use of high-speed test apparatus and/or sample-and-hold techniques are preferable to minimize internal chip heating and more accurately reflect operational values. Otherwise, prolonged shorting of a high output can raise the chip temperature well above normal and cause invalid readings in other parametric tests. In any sequence of parameter tests,  $I_{OS}$  tests should be performed last.

<sup>\S</sup> Per TTL-driven input ( $V_{IN} = 3.4\text{ V}$ ); all other inputs at  $V_{CC}$  or GND

<sup>\P</sup> This parameter is derived for use in total power-supply calculations.

<sup>\#</sup>  $I_C = I_{CC} + \Delta I_{CC} \times D_H \times N_T + I_{CCD} (f_0/2 + f_1 \times N_1)$

Where:

$I_C$  = Total supply current

$I_{CC}$  = Power-supply current with CMOS input levels

$\Delta I_{CC}$  = Power-supply current for a TTL high input ( $V_{IN} = 3.4\text{ V}$ )

$D_H$  = Duty cycle for TTL inputs high

$N_T$  = Number of TTL inputs at  $D_H$

$I_{CCD}$  = Dynamic current caused by an input transition pair (HLH or LHL)

$f_0$  = Clock frequency for registered devices, otherwise zero

$f_1$  = Input signal frequency

$N_1$  = Number of inputs changing at  $f_1$

All currents are in milliamperes and all frequencies are in megahertz.

|| Values for these conditions are examples of the  $I_{CC}$  formula.



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switching characteristics over operating free-air temperature range (see Figure 1)

| PARAMETER        | FROM<br>(INPUT) | TO<br>(OUTPUT) | CY74FCT2244T |     | CY74FCT2244AT |     | CY74FCT2244CT |     | UNIT |
|------------------|-----------------|----------------|--------------|-----|---------------|-----|---------------|-----|------|
|                  |                 |                | MIN          | MAX | MIN           | MAX | MIN           | MAX |      |
| t <sub>PLH</sub> | D               | O              | 1.5          | 6.5 | 1.5           | 4.6 | 1.5           | 4.1 | ns   |
| t <sub>PHL</sub> |                 |                | 1.5          | 6.5 | 1.5           | 4.6 | 1.5           | 4.1 |      |
| t <sub>PZH</sub> | $\overline{OE}$ | O              | 1.5          | 8   | 1.5           | 6.2 | 1.5           | 5.8 | ns   |
| t <sub>PZL</sub> |                 |                | 1.5          | 8   | 1.5           | 6.2 | 1.5           | 5.8 |      |
| t <sub>PHZ</sub> | $\overline{OE}$ | O              | 1.5          | 7   | 1.5           | 5.6 | 1.5           | 5.2 | ns   |
| t <sub>PLZ</sub> |                 |                | 1.5          | 7   | 1.5           | 5.6 | 1.5           | 5.2 |      |

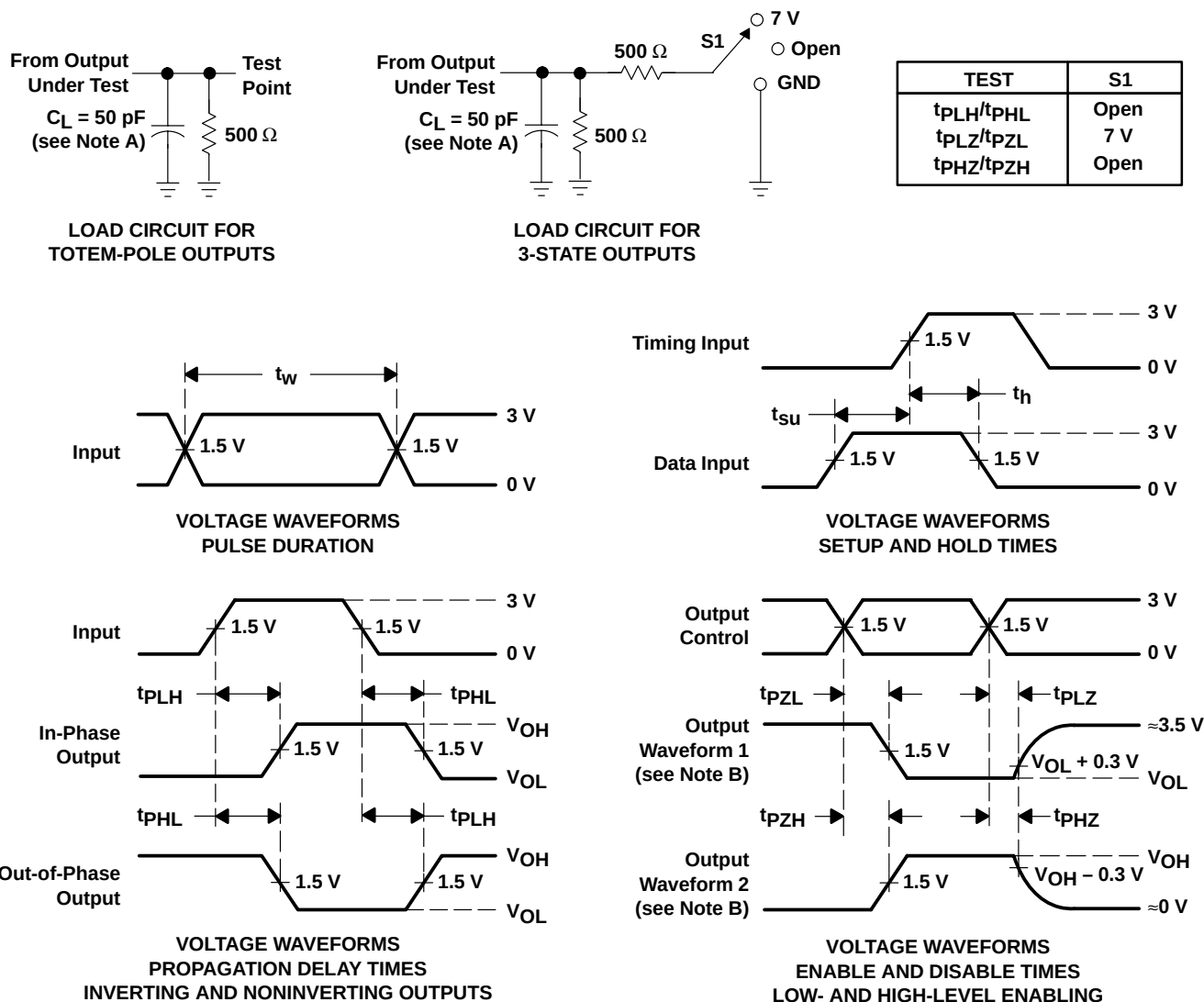
# CY74FCT2244T

## 8-BIT BUFFER/LINE DRIVER

### WITH 3-STATE OUTPUTS

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#### PARAMETER MEASUREMENT INFORMATION



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

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="#">CY74FCT2244ATQCT</a> | Active        | Production           | SSOP (DBQ)   20 | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | FCT2244A            |
| CY74FCT2244ATQCT.B               | Active        | Production           | SSOP (DBQ)   20 | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | FCT2244A            |
| <a href="#">CY74FCT2244ATSOC</a> | Active        | Production           | SOIC (DW)   20  | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | FCT2244A            |
| CY74FCT2244ATSOC.B               | Active        | Production           | SOIC (DW)   20  | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | FCT2244A            |
| <a href="#">CY74FCT2244CTQCT</a> | Active        | Production           | SSOP (DBQ)   20 | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | FCT2244C            |
| CY74FCT2244CTQCT.B               | Active        | Production           | SSOP (DBQ)   20 | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | FCT2244C            |
| <a href="#">CY74FCT2244CTSOC</a> | Active        | Production           | SOIC (DW)   20  | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | FCT2244C            |
| CY74FCT2244CTSOC.B               | Active        | Production           | SOIC (DW)   20  | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | FCT2244C            |
| <a href="#">CY74FCT2244TQCT</a>  | Active        | Production           | SSOP (DBQ)   20 | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | FCT2244             |
| CY74FCT2244TQCT.B                | Active        | Production           | SSOP (DBQ)   20 | 2500   LARGE T&R      | Yes         | NIPDAU                               | Level-2-260C-1 YEAR               | -40 to 85    | FCT2244             |
| <a href="#">CY74FCT2244TSOC</a>  | Active        | Production           | SOIC (DW)   20  | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | FCT2244             |
| CY74FCT2244TSOC.B                | Active        | Production           | SOIC (DW)   20  | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | FCT2244             |
| CY74FCT2244TSOCG4                | Active        | Production           | SOIC (DW)   20  | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | FCT2244             |
| CY74FCT2244TSOCG4.B              | Active        | Production           | SOIC (DW)   20  | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | -40 to 85    | FCT2244             |

<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.

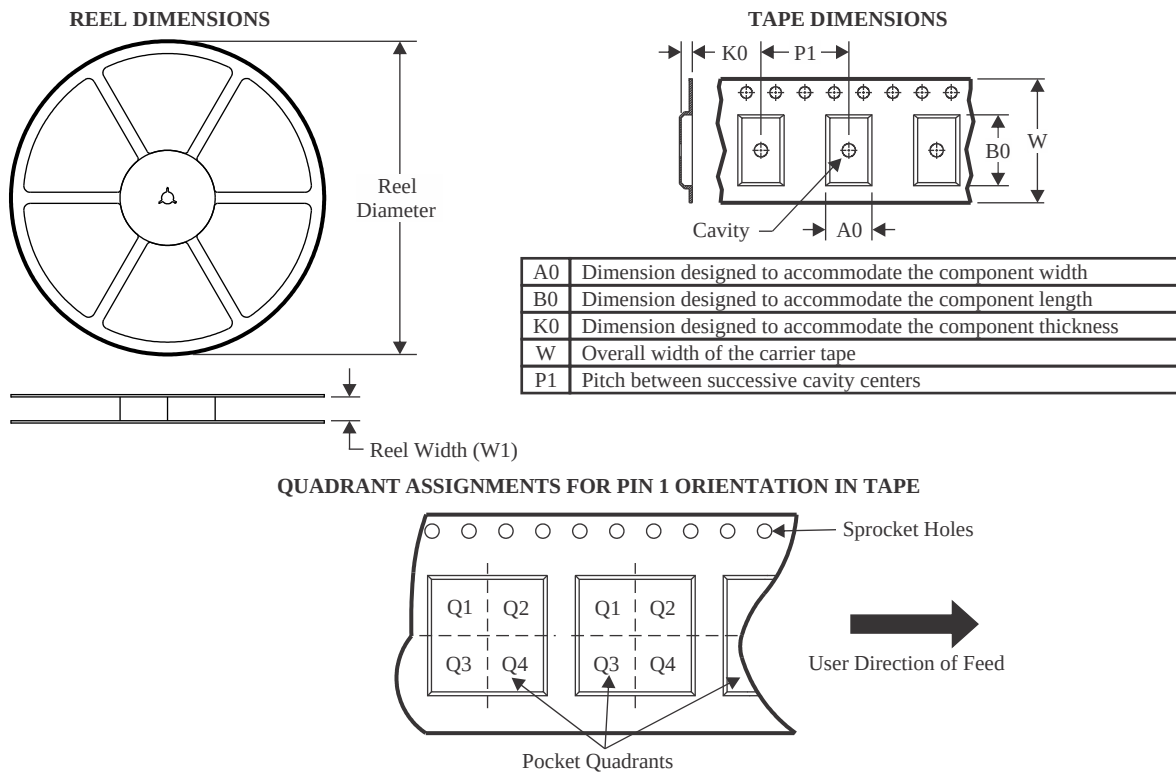
<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

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.

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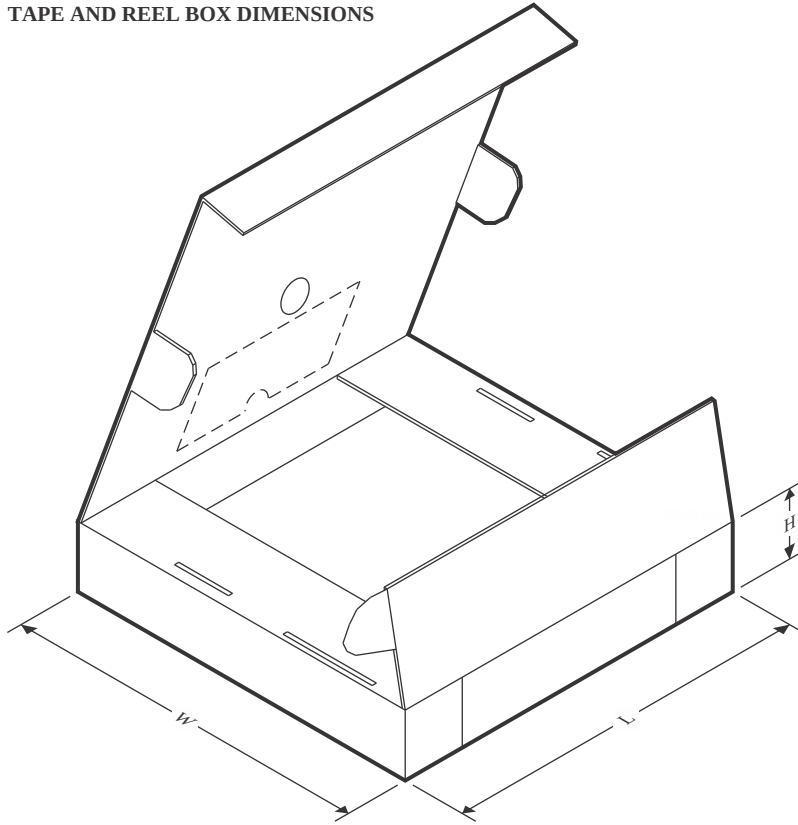
## TAPE AND REEL INFORMATION



\*All dimensions are nominal

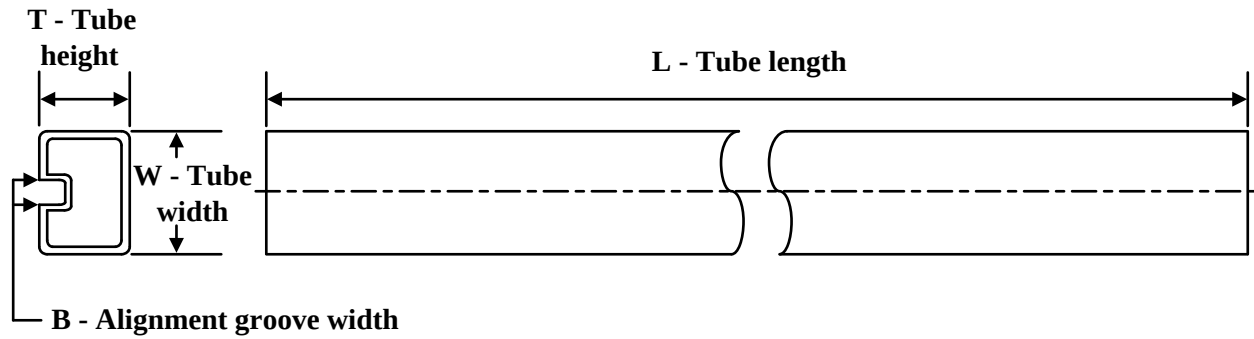
| Device           | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|------------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| CY74FCT2244ATQCT | SSOP         | DBQ             | 20   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| CY74FCT2244CTQCT | SSOP         | DBQ             | 20   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |
| CY74FCT2244TQCT  | SSOP         | DBQ             | 20   | 2500 | 330.0              | 16.4               | 6.5     | 9.0     | 2.1     | 8.0     | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



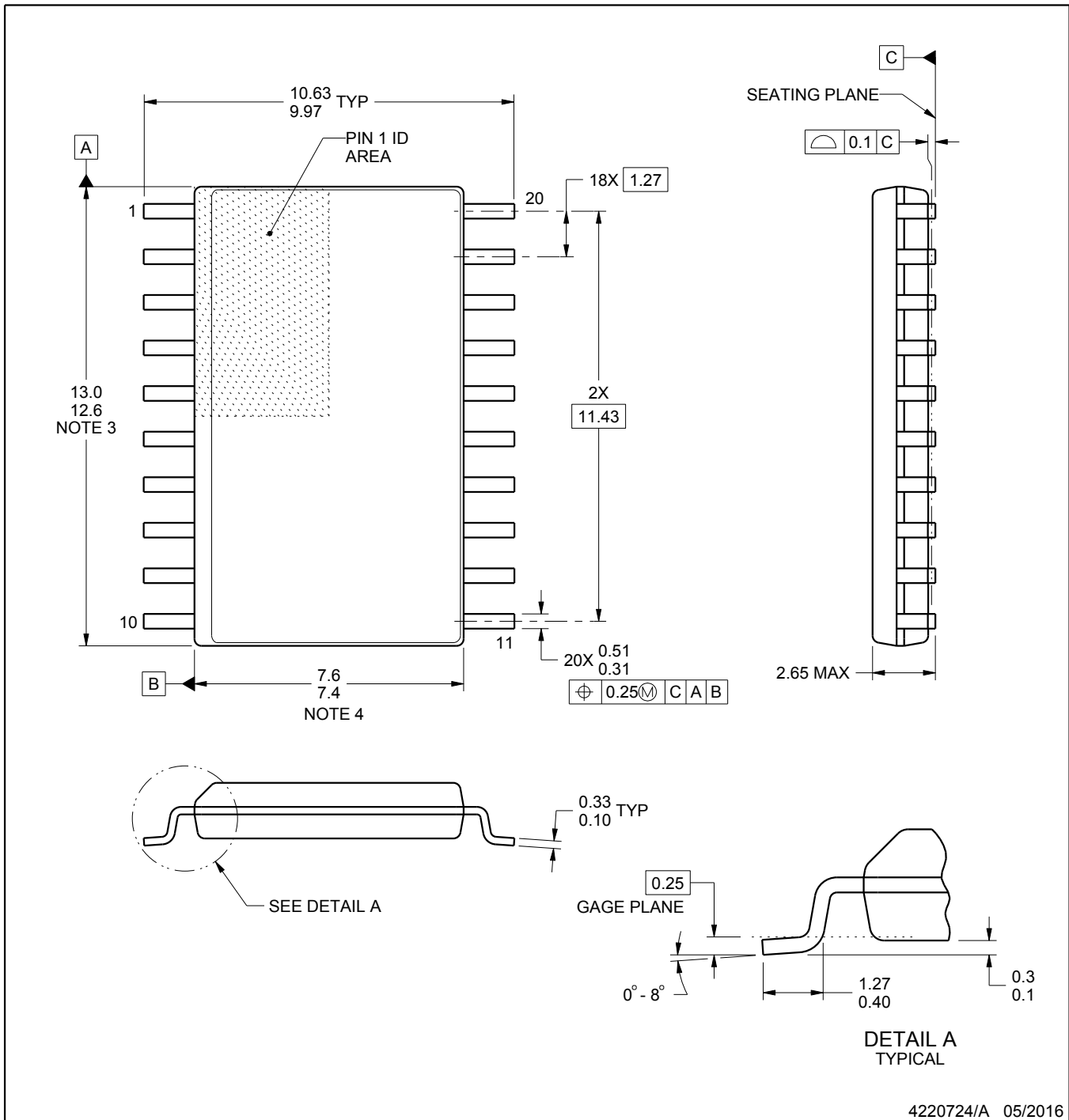
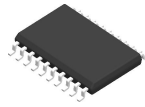
\*All dimensions are nominal

| Device           | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|------------------|--------------|-----------------|------|------|-------------|------------|-------------|
| CY74FCT2244ATQCT | SSOP         | DBQ             | 20   | 2500 | 353.0       | 353.0      | 32.0        |
| CY74FCT2244CTQCT | SSOP         | DBQ             | 20   | 2500 | 353.0       | 353.0      | 32.0        |
| CY74FCT2244TQCT  | SSOP         | DBQ             | 20   | 2500 | 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) |
|---------------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| CY74FCT2244ATSOC    | DW           | SOIC         | 20   | 25  | 507    | 12.83  | 5080   | 6.6    |
| CY74FCT2244ATSOC.B  | DW           | SOIC         | 20   | 25  | 507    | 12.83  | 5080   | 6.6    |
| CY74FCT2244CTSOC    | DW           | SOIC         | 20   | 25  | 507    | 12.83  | 5080   | 6.6    |
| CY74FCT2244CTSOC.B  | DW           | SOIC         | 20   | 25  | 507    | 12.83  | 5080   | 6.6    |
| CY74FCT2244TSOC     | DW           | SOIC         | 20   | 25  | 507    | 12.83  | 5080   | 6.6    |
| CY74FCT2244TSOC.B   | DW           | SOIC         | 20   | 25  | 507    | 12.83  | 5080   | 6.6    |
| CY74FCT2244TSOCG4   | DW           | SOIC         | 20   | 25  | 507    | 12.83  | 5080   | 6.6    |
| CY74FCT2244TSOCG4.B | DW           | SOIC         | 20   | 25  | 507    | 12.83  | 5080   | 6.6    |



## NOTES:

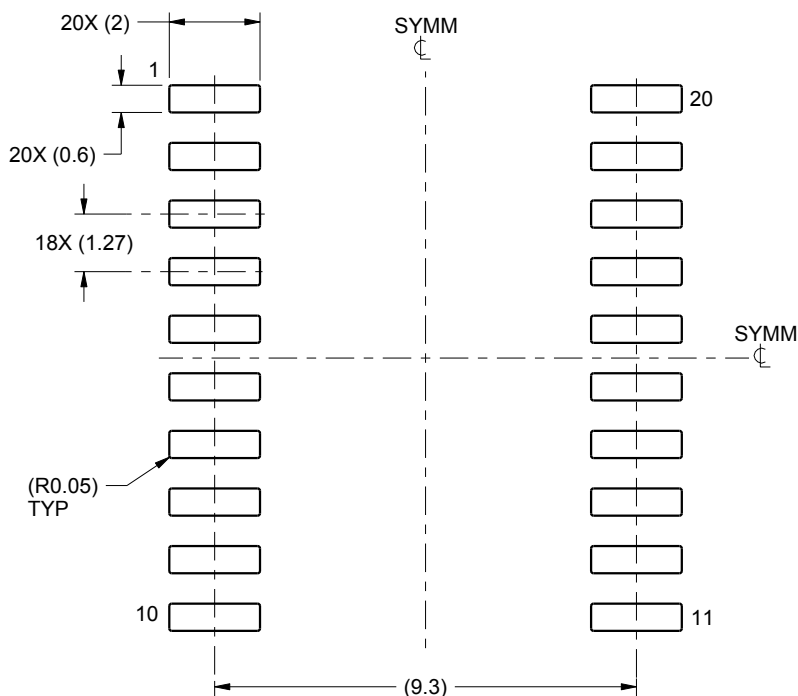
1. All linear dimensions are in millimeters. Dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate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

# EXAMPLE BOARD LAYOUT

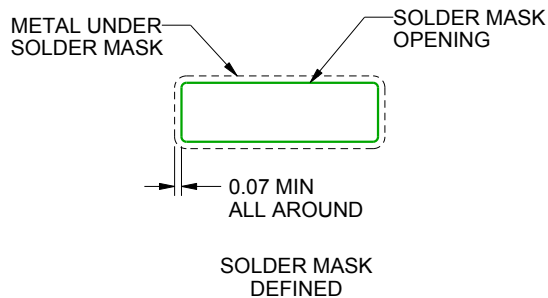
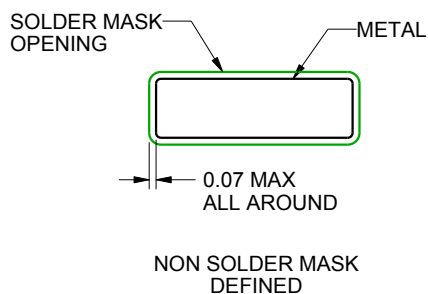
DW0020A

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.

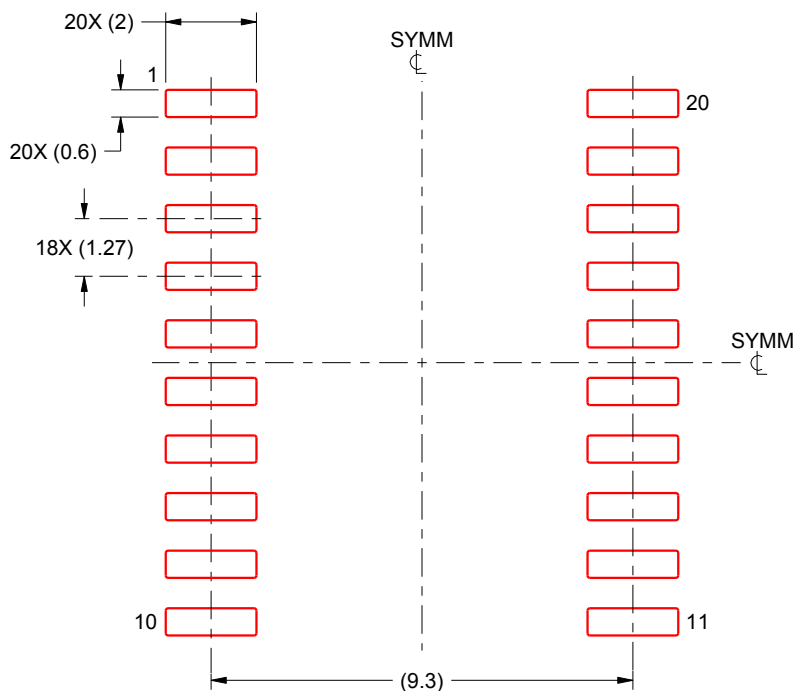
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DW0020A

SOIC - 2.65 mm max height

SOIC



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

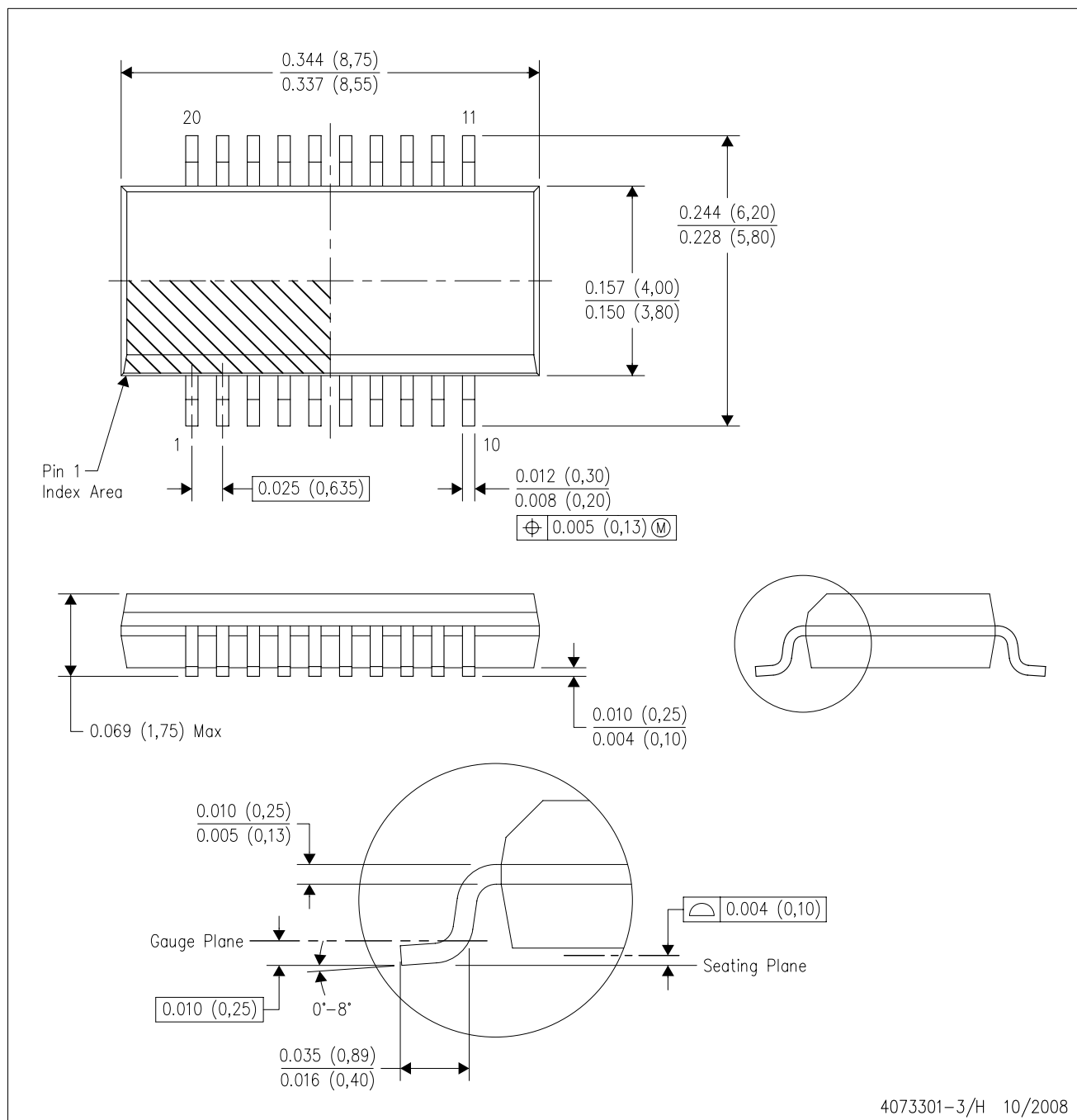
4220724/A 05/2016

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.

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.

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