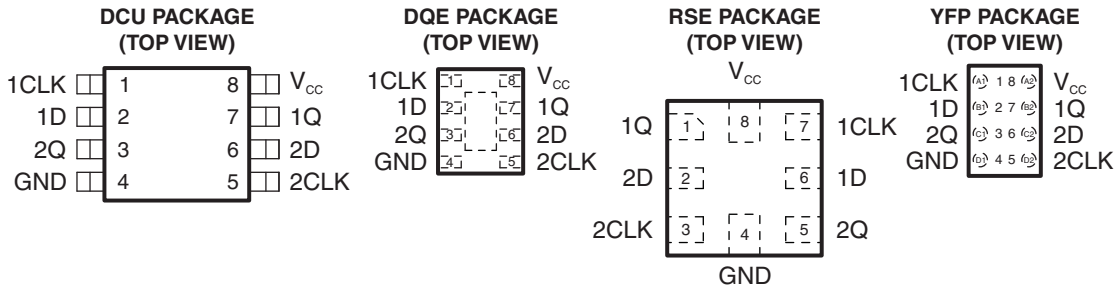
# LOW-POWER DUAL POSITIVE EDGE-TRIGGERED D-TYPE FLIP-FLOP

**Check for Samples: SN74AUP2G79**

## FEATURES

- **Available in the Texas Instruments NanoStar™ Package**
- **Low Static-Power Consumption ($I_{CC}$ = 0.9 µA Maximum)**
- **Low Dynamic-Power Consumption ($C_{pd}$ = 3 pF Typ at 3.3 V)**
- **Low Input Capacitance ($C_i$ = 1.5 pF Typical)**
- **Low Noise – Overshoot and Undershoot <10% of $V_{CC}$**
- **$I_{off}$ Supports Partial-Power-Down Mode Operation**
- **Wide Operating $V_{CC}$ Range of 0.8 V to 3.6 V**
- **Optimized for 3.3-V Operation**
- **3.6-V I/O Tolerant to Support Mixed-Mode Signal Operation**
- **$t_{pd}$ = 4 ns Maximum at 3.3 V**
- **Suitable for Point-to-Point Applications**
- **Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II**
- **ESD Performance Tested Per JESD 22**
  - **2000-V Human-Body Model (A114-B, Class II)**
  - **1000-V Charged-Device Model (C101)**




See mechanical drawings for dimensions.

## DESCRIPTION/ORDERING INFORMATION

The AUP family is TI's premier solution to the industry's low-power needs in battery-powered portable applications. This family ensures a very low static- and dynamic-power consumption across the entire $V_{CC}$ range of 0.8 V to 3.6 V, resulting in increased battery life (see Figure 1). This product also maintains excellent signal integrity (see the very low undershoot and overshoot characteristics shown in Figure 2).

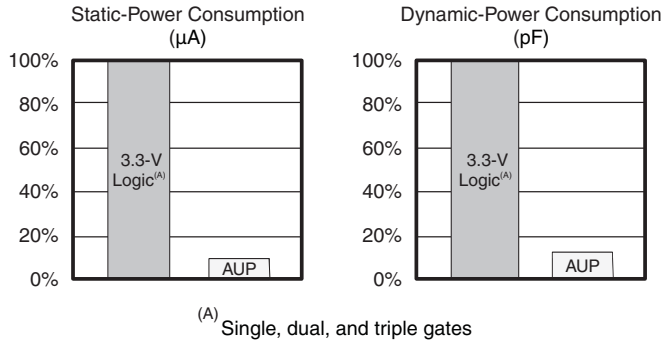
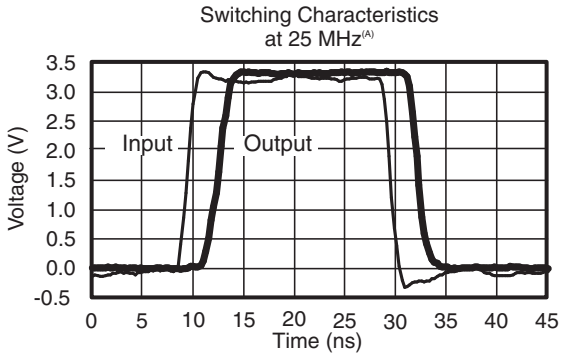



**Figure 1. AUP – The Lowest-Power Family**




(A) SN74AUP2Gxx data at $C_L$ = 15 pF.

**Figure 2. Excellent Signal Integrity**

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When data at the data (D) input meets the setup time requirement, the data is transferred to the Q output on the positive-going edge of the clock pulse. Clock triggering occurs at a voltage level and is not directly related to the rise time of the clock pulse. Following the hold-time interval, data at the D input can be changed without affecting the levels at the outputs.

NanoStar™ package technology is a major breakthrough in IC packaging concepts, using the die as the package.

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(1)

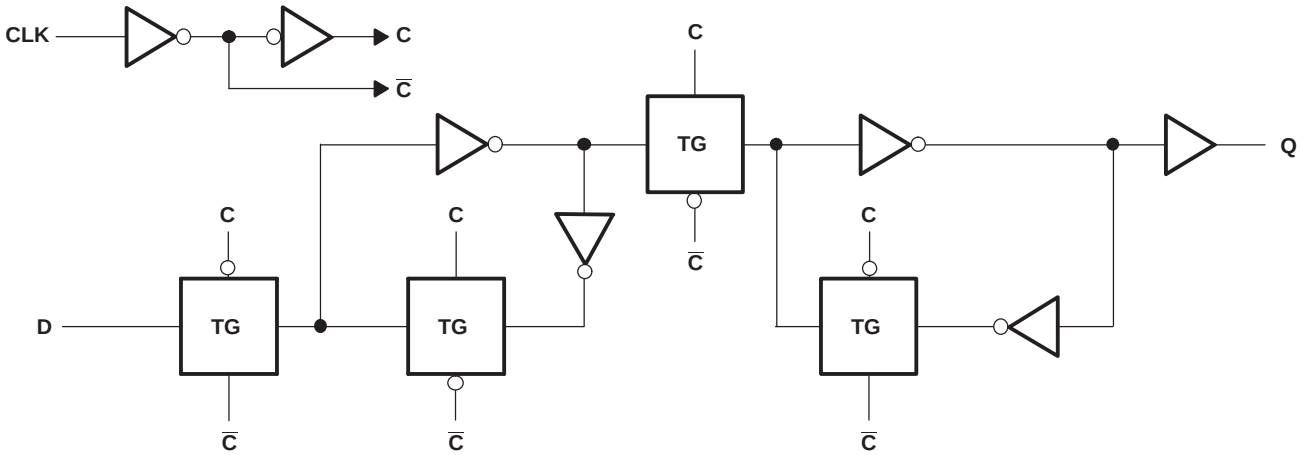
| $T_A$ | PACKAGE(2) | | ORDERABLE PART NUMBER | TOP-SIDE MARKING(3) |
|---|---|---|---|---|
| –40°C to 85°C | NanoStar™ – WCSP (DSBGA) 0.23-mm Large Bump – YFP (Pb-free) | Reel of 3000 | SN74AUP2G79YFPR | _ _ H W _ |
| | uQFN – DQE | Reel of 5000 | SN74AUP2G79DQER | PT |
| | QFN – RSE | Reel of 5000 | SN74AUP2G79RSER | PT |
| | SSOP – DCU | Reel of 3000 | SN74AUP2G79DCUR | H79_ |

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI web site at www.ti.com.
(2) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.
(3) DCU: The actual top-side marking has one additional character that designates the wafer fab/assembly site.
YFP: The actual top-side marking has three preceding characters to denote year, month, and sequence code, and one following character to designate wafer fab/assembly site. Pin 1 identifier indicates solder-bump composition (1 = SnPb, • = Pb-free).

## FUNCTION TABLE

| INPUTS | | OUTPUT |
|---|---|---|
| CLK | D | Q |
| ↑ | H | H |
| ↑ | L | L |
| L | X | $Q_0$ |
| H | X | $Q_0$ |

## LOGIC DIAGRAM, EACH FLIP-FLOP (POSITIVE LOGIC)




Pin numbers shown are for the DCU and DQE packages.


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## ABSOLUTE MAXIMUM RATINGS(1)

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

| | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage range | | –0.5 | 4.6 | V |
| $V_I$ | Input voltage range(2) | | –0.5 | 4.6 | V |
| $V_O$ | Voltage range applied to any output in the high-impedance or power-off state(2) | | –0.5 | 4.6 | V |
| $V_O$ | Output voltage range in the high or low state(2) | | –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 | | | ±20 | mA |
| | Continuous current through $V_{CC}$ or GND | | | ±50 | mA |
| $\theta_{JA}$ | Package thermal impedance(3) | DCU package | | 220 | °C/W |
| | | DQE package | | 261 | |
| | | RSE package | | 253 | |
| | | YFP package | | 132 | |
| $T_{stg}$ | 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 package thermal impedance is calculated in accordance with JESD 51-7.

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## RECOMMENDED OPERATING CONDITIONS(1)

| | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply voltage | | 0.8 | 3.6 | V |
| $V_{IH}$ | High-level input voltage | $V_{CC}$ = 0.8 V | $V_{CC}$ | | V |
| | | $V_{CC}$ = 1.1 V to 1.95 V | 0.65 × $V_{CC}$ | | |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.6 | | |
| | | $V_{CC}$ = 3 V to 3.6 V | 2 | | |
| $V_{IL}$ | Low-level input voltage | $V_{CC}$ = 0.8 V | | 0 | V |
| | | $V_{CC}$ = 1.1 V to 1.95 V | | 0.35 × $V_{CC}$ | |
| | | $V_{CC}$ = 2.3 V to 2.7 V | | 0.7 | |
| | | $V_{CC}$ = 3 V to 3.6 V | | 0.9 | |
| $V_I$ | Input voltage | | 0 | 3.6 | V |
| $V_O$ | Output voltage | | 0 | $V_{CC}$ | V |
| $I_{OH}$ | High-level output current | $V_{CC}$ = 0.8 V | | –20 | μA |
| | | $V_{CC}$ = 1.1 V | | –1.1 | mA |
| | | $V_{CC}$ = 1.4 V | | –1.7 | |
| | | $V_{CC}$ = 1.65 | | –1.9 | |
| | | $V_{CC}$ = 2.3 V | | –3.1 | |
| | | $V_{CC}$ = 3 V | | –4 | |
| $I_{OL}$ | Low-level output current | $V_{CC}$ = 0.8 V | | 20 | μA |
| | | $V_{CC}$ = 1.1 V | | 1.1 | mA |
| | | $V_{CC}$ = 1.4 V | | 1.7 | |
| | | $V_{CC}$ = 1.65 V | | 1.9 | |
| | | $V_{CC}$ = 2.3 V | | 3.1 | |
| | | $V_{CC}$ = 3 V | | 4 | |
| Δt/Δv | Input transition rise or fall rate | $V_{CC}$ = 0.8 V to 3.6 V | | 200 | ns/V |
| $T_A$ | Operating free-air temperature | | –40 | 85 | °C |

(1) All unused inputs of the device must be held at $V_{CC}$ or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.


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## ELECTRICAL CHARACTERISTICS

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

| PARAMETER | TEST CONDITIONS | $V_{CC}$ | $T_A$ = 25°C | | | $T_A$ = –40°C to 85°C | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | MIN | TYP | MAX | MIN | MAX | |
| $V_{OH}$ | $I_{OH}$ = –20 µA | 0.8 V to 3.6 V | $V_{CC}$ – 0.1 | | | $V_{CC}$ – 0.1 | | V |
| | $I_{OH}$ = –1.1 mA | 1.1 V | 0.75 × $V_{CC}$ | | | 0.7 × $V_{CC}$ | | |
| | $I_{OH}$ = –1.7 mA | 1.4 V | 1.11 | | | 1.03 | | |
| | $I_{OH}$ = –1.9 mA | 1.65 V | 1.32 | | | 1.3 | | |
| | $I_{OH}$ = –2.3 mA | 2.3 V | 2.05 | | | 1.97 | | |
| | $I_{OH}$ = –3.1 mA | | 1.9 | | | 1.85 | | |
| | $I_{OH}$ = –2.7 mA | 3 V | 2.72 | | | 2.67 | | |
| | $I_{OH}$ = –4 mA | | 2.6 | | | 2.55 | | |
| $V_{OL}$ | $I_{OL}$ = 20 µA | 0.8 V to 3.6 V | | | 0.1 | | 0.1 | V |
| | $I_{OL}$ = 1.1 mA | 1.1 V | | | 0.3 × $V_{CC}$ | | 0.3 × $V_{CC}$ | |
| | $I_{OL}$ = 1.7 mA | 1.4 V | | | 0.31 | | 0.37 | |
| | $I_{OL}$ = 1.9 mA | 1.65 V | | | 0.31 | | 0.35 | |
| | $I_{OL}$ = 2.3 mA | 2.3 V | | | 0.31 | | 0.33 | |
| | $I_{OL}$ = 3.1 mA | | | | 0.44 | | 0.45 | |
| | $I_{OL}$ = 2.7 mA | 3 V | | | 0.31 | | 0.33 | |
| | $I_{OL}$ = 4 mA | | | | 0.44 | | 0.45 | |
| $I_I$ A or B input | $V_I$ = GND to 3.6 V | 0 V to 3.6 V | | | 0.1 | | 0.5 | µA |
| $I_{off}$ | $V_I$ or $V_O$ = 0 V to 3.6 V | 0 V | | | 0.2 | | 0.6 | µA |
| $\Delta I_{off}$ | $V_I$ or $V_O$ = 0 V to 3.6 V | 0 V to 0.2 V | | | 0.2 | | 0.6 | µA |
| $I_{CC}$ | $V_I$ = GND or ($V_{CC}$ to 3.6 V), $I_O$ = 0 | 0.8 V to 3.6 V | | | 0.5 | | 0.9 | µA |
| $\Delta I_{CC}$ | $V_I$ = $V_{CC}$ – 0.6 V[(1)], $I_O$ = 0 | 3.3 V | | | 40 | | 50 | µA |
| $C_i$ | $V_I$ = $V_{CC}$ or GND | 0 V | | 1.5 | | | | pF |
| | | 3.6 V | | 1.5 | | | | |
| $C_o$ | $V_O$ = GND | 0 V | | 3 | | | | pF |

(1) One input at $V_{CC}$ – 0.6 V, other input at $V_{CC}$ or GND

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## TIMING REQUIREMENTS

over recommended operating free-air temperature range (unless otherwise noted) (see Figure 4)

| | | | $V_{CC}$ | $T_A$ = 25°C | $T_A$ = –40°C to 85°C | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | TYP | MIN | MAX | |
| $f_{clock}$ | Clock frequency | | 0.8 V | | | 20 | MHz |
| | | | 1.2 V ± 0.1 V | | | 80 | |
| | | | 1.5 V ± 0.1 V | | | 100 | |
| | | | 1.8 V ± 0.15 V | | | 140 | |
| | | | 2.5 V ± 0.2 V | | | 210 | |
| | | | 3.3 V ± 0.3 V | | | 260 | |
| $t_w$ | Pulse duration, CLK high or low | | 0.8 V | | 4.8 | | ns |
| | | | 1.2 V ± 0.1 V | | 2.2 | | |
| | | | 1.5 V ± 0.1 V | | 1.5 | | |
| | | | 1.8 V ± 0.15 V | | 1.6 | | |
| | | | 2.5 V ± 0.2 V | | 1.7 | | |
| | | | 3.3 V ± 0.3 V | | 1.9 | | |
| $t_{su}$ | Setup time before CLK↑ | Data high | 0.8 V | 2.9 | 4.2 | | ns |
| | | | 1.2 V ± 0.1 V | | 1.4 | | |
| | | | 1.5 V ± 0.1 V | | 1 | | |
| | | | 1.8 V ± 0.15 V | | 0.9 | | |
| | | | 2.5 V ± 0.2 V | | 0.7 | | |
| | | | 3.3 V ± 0.3 V | | 0.6 | | |
| | | Data low | 0.8 V | 3.5 | 5.3 | | |
| | | | 1.2 V ± 0.1 V | | 1.8 | | |
| | | | 1.5 V ± 0.1 V | | 1.2 | | |
| | | | 1.8 V ± 0.15 V | | 1.1 | | |
| | | | 2.5 V ± 0.2 V | | 1 | | |
| | | | 3.3 V ± 0.3 V | | 1 | | |
| $t_h$ | Hold time, data after CLK↑ | | 0.8 V | 0 | 0 | | ns |
| | | | 1.2 V ± 0.1 V | | 0 | | |
| | | | 1.5 V ± 0.1 V | | 0 | | |
| | | | 1.8 V ± 0.15 V | | 0 | | |
| | | | 2.5 V ± 0.2 V | | 0 | | |
| | | | 3.3 V ± 0.3 V | | 0 | | |


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## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $C_L$ = 5 pF (unless otherwise noted) (see Figure 3 and Figure 4)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | $T_A$ = –40°C to 85°C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| $f_{max}$ | | | 0.8 V | | 93 | | 90 | | MHz |
| | | | 1.2 V ± 0.1 V | | 199 | | 220 | | |
| | | | 1.5 V ± 0.1 V | | 250 | | 230 | | |
| | | | 1.8 V ± 0.15 V | | 271 | | 240 | | |
| | | | 2.5 V ± 0.2 V | | 280 | | 250 | | |
| | | | 3.3 V ± 0.3 V | | 280 | | 260 | | |
| $t_{pd}$ | CLK | Q | 0.8 V | | 15.9 | | | | ns |
| | | | 1.2 V ± 0.1 V | 3.7 | 6.9 | 11 | 2.6 | 13.1 | |
| | | | 1.5 V ± 0.1 V | 3 | 4.8 | 7.6 | 2 | 8.8 | |
| | | | 1.8 V ± 0.15 V | 2.4 | 3.8 | 6.1 | 1.5 | 7.1 | |
| | | | 2.5 V ± 0.2 V | 1.8 | 2.7 | 4.4 | 1.1 | 5 | |
| | | | 3.3 V ± 0.3 V | 1.5 | 2.1 | 3.6 | 0.9 | 4 | |

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $C_L$ = 10 pF (unless otherwise noted) (see Figure 3 and Figure 4)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | $T_A$ = –40°C to 85°C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| $f_{max}$ | | | 0.8 V | | 62 | | 50 | | MHz |
| | | | 1.2 V ± 0.1 V | | 147 | | 160 | | |
| | | | 1.5 V ± 0.1 V | | 189 | | 200 | | |
| | | | 1.8 V ± 0.15 V | | 180 | | 240 | | |
| | | | 2.5 V ± 0.2 V | | 260 | | 250 | | |
| | | | 3.3 V ± 0.3 V | | 280 | | 260 | | |
| $t_{pd}$ | CLK | Q | 0.8 V | | 18 | | | | ns |
| | | | 1.2 V ± 0.1 V | 4.3 | 7.8 | 12.3 | 3.2 | 14.4 | |
| | | | 1.5 V ± 0.1 V | 3.5 | 5.5 | 8.4 | 2.5 | 9.8 | |
| | | | 1.8 V ± 0.15 V | 2.8 | 4.4 | 6.8 | 1.9 | 8 | |
| | | | 2.5 V ± 0.2 V | 2.2 | 3.2 | 5 | 1.5 | 5.7 | |
| | | | 3.3 V ± 0.3 V | 1.8 | 2.6 | 4.1 | 1.3 | 4.5 | |

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## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $C_L$ = 15 pF (unless otherwise noted) (see Figure 3 and Figure 4)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | $T_A$ = –40°C to 85°C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| $f_{max}$ | | | 0.8 V | | 48 | | 30 | | MHz |
| | | | 1.2 V ± 0.1 V | | 112 | | 120 | | |
| | | | 1.5 V ± 0.1 V | | 151 | | 160 | | |
| | | | 1.8 V ± 0.15 V | | 194 | | 220 | | |
| | | | 2.5 V ± 0.2 V | | 248 | | 250 | | |
| | | | 3.3 V ± 0.3 V | | 280 | | 260 | | |
| $t_{pd}$ | CLK | Q | 0.8 V | | 20.3 | | | | ns |
| | | | 1.2 V ± 0.1 V | 5 | 8.7 | 13.6 | 3.9 | 15.6 | |
| | | | 1.5 V ± 0.1 V | 4.1 | 6.3 | 9.3 | 3.1 | 10.7 | |
| | | | 1.8 V ± 0.15 V | 3.3 | 4 | 7.6 | 2.4 | 8.7 | |
| | | | 2.5 V ± 0.2 V | 2.6 | 3.6 | 5.5 | 1.9 | 6.3 | |
| | | | 3.3 V ± 0.3 V | 2.2 | 3 | 4.5 | 1.6 | 5 | |

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, $C_L$ = 30 pF (unless otherwise noted) (see Figure 3 and Figure 4)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | $V_{CC}$ | $T_A$ = 25°C | | | $T_A$ = –40°C to 85°C | | UNIT |
|---|---|---|---|---|---|---|---|---|---|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| $f_{max}$ | | | 0.8 V | | 24 | | 20 | | MHz |
| | | | 1.2 V ± 0.1 V | | 72 | | 80 | | |
| | | | 1.5 V ± 0.1 V | | 100 | | 100 | | |
| | | | 1.8 V ± 0.15 V | | 127 | | 140 | | |
| | | | 2.5 V ± 0.2 V | | 185 | | 210 | | |
| | | | 3.3 V ± 0.3 V | | 266 | | 260 | | |
| $t_{pd}$ | CLK | Q | 0.8 V | | 27.2 | | | | ns |
| | | | 1.2 V ± 0.1 V | 7 | 11.5 | 17.3 | 5.9 | 24 | |
| | | | 1.5 V ± 0.1 V | 5.7 | 8.3 | 13.3 | 4.6 | 15.9 | |
| | | | 1.8 V ± 0.15 V | 4.7 | 6.7 | 11.3 | 3.8 | 13 | |
| | | | 2.5 V ± 0.2 V | 3.7 | 4.9 | 7.8 | 2.9 | 9 | |
| | | | 3.3 V ± 0.3 V | 3.2 | 4.1 | 6.3 | 2.6 | 7.2 | |

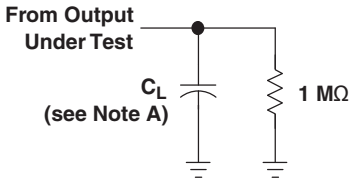
## OPERATING CHARACTERISTICS

$T_A$ = 25°C

| PARAMETER | | TEST CONDITIONS | $V_{CC}$ | TYP | UNIT |
|---|---|---|---|---|---|
| $C_{pd}$ | Power dissipation capacitance | f = 10 MHz | 0.8 V | 2.5 | pF |
| | | | 1.2 V ± 0.1 V | 2.5 | |
| | | | 1.5 V ± 0.1 V | 2.5 | |
| | | | 1.8 V ± 0.15 V | 2.5 | |
| | | | 2.5 V ± 0.2 V | 3 | |
| | | | 3.3 V ± 0.3 V | 3 | |

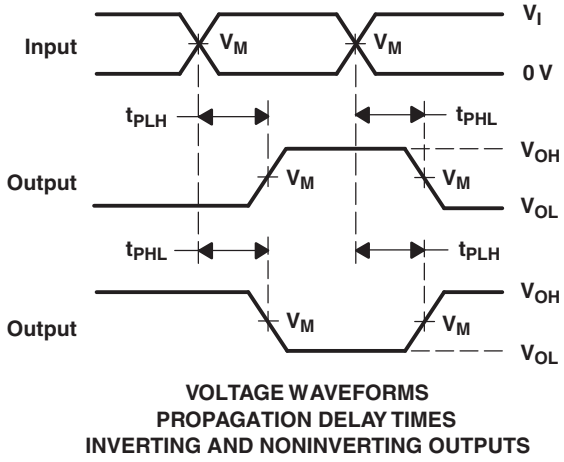

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## PARAMETER MEASUREMENT INFORMATION
## (Propagation Delays, Setup and Hold Times, and Pulse Width)

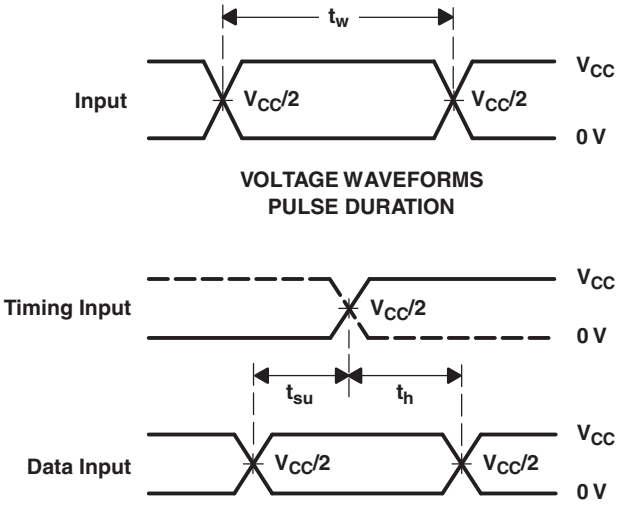



LOAD CIRCUIT

| | $V_{CC}$ = 0.8 V | $V_{CC}$ = 1.2 V ± 0.1 V | $V_{CC}$ = 1.5 V ± 0.1 V | $V_{CC}$ = 1.8 V ± 0.15 V | $V_{CC}$ = 2.5 V ± 0.2 V | $V_{CC}$ = 3.3 V ± 0.3 V |
|---|---|---|---|---|---|---|
| $C_L$ | 5, 10, 15, 30 pF | 5, 10, 15, 30 pF | 5, 10, 15, 30 pF | 5, 10, 15, 30 pF | 5, 10, 15, 30 pF | 5, 10, 15, 30 pF |
| $V_M$ | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ |
| $V_I$ | $V_{CC}$ | $V_{CC}$ | $V_{CC}$ | $V_{CC}$ | $V_{CC}$ | $V_{CC}$ |




VOLTAGE WAVEFORMS
PROPAGATION DELAY TIMES
INVERTING AND NONINVERTING OUTPUTS




VOLTAGE WAVEFORMS
PULSE DURATION

VOLTAGE WAVEFORMS
SETUP AND HOLD TIMES

A. $C_L$ includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O$ = 50 Ω, for propagation delays $t_r/t_f$ = 3 ns, for setup and hold times and pulse width $t_r/t_f$ = 1.2 ns.

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

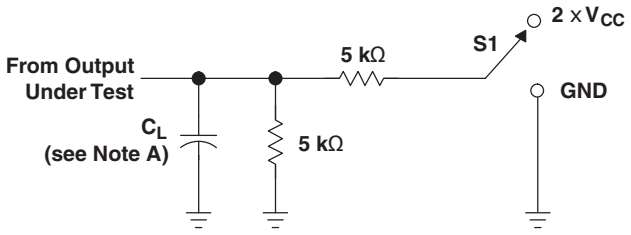
E. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{pd}$.

F. All parameters and waveforms are not applicable to all devices.

**Figure 3. Load Circuit and Voltage Waveforms**

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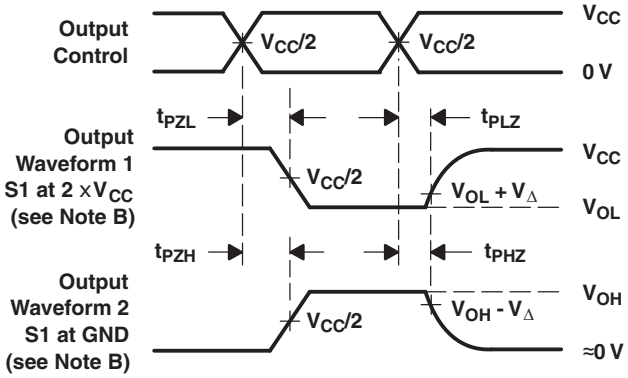
## PARAMETER MEASUREMENT INFORMATION
## (Enable and Disable Times)




LOAD CIRCUIT

| TEST | S1 |
|---|---|
| $t_{PLZ}/t_{PZL}$<br>$t_{PHZ}/t_{PZH}$ | 2 × $V_{CC}$<br>GND |

| | $V_{CC}$ = 0.8 V | $V_{CC}$ = 1.2 V ± 0.1 V | $V_{CC}$ = 1.5 V ± 0.1 V | $V_{CC}$ = 1.8 V ± 0.15 V | $V_{CC}$ = 2.5 V ± 0.2 V | $V_{CC}$ = 3.3 V ± 0.3 V |
|---|---|---|---|---|---|---|
| $C_L$ | 5, 10, 15, 30 pF | 5, 10, 15, 30 pF | 5, 10, 15, 30 pF | 5, 10, 15, 30 pF | 5, 10, 15, 30 pF | 5, 10, 15, 30 pF |
| $V_M$ | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ | $V_{CC}/2$ |
| $V_I$ | $V_{CC}$ | $V_{CC}$ | $V_{CC}$ | $V_{CC}$ | $V_{CC}$ | $V_{CC}$ |
| $V_\Delta$ | 0.1 V | 0.1 V | 0.1 V | 0.15 V | 0.15 V | 0.3 V |




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

A. $C_L$ includes probe and jig capacitance.

B. Waveform 1 is for an output with internal conditions such that the output is low, except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high, except when disabled by the output control.

C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, $Z_O$ = 50 Ω, $t_r/t_f$ = 3 ns.

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

E. $t_{PLZ}$ and $t_{PHZ}$ are the same as $t_{dis}$.

F. $t_{PLH}$ and $t_{PHL}$ are the same as $t_{pd}$.

G. All parameters and waveforms are not applicable to all devices.

**Figure 4. Load Circuit and Voltage Waveforms**


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## REVISION HISTORY

| Changes from Revision B (March 2010) to Revision C | Page |
|---|---|
| • Added clock high to FUNCTION TABLE. | 2 |

## PACKAGING INFORMATION

| Orderable part number | Status (1) | Material type (2) | Package \| Pins | Package qty \| Carrier | RoHS (3) | Lead finish/ Ball material (4) | MSL rating/ Peak reflow (5) | Op temp (°C) | Part marking (6) |
|---|---|---|---|---|---|---|---|---|---|
| SN74AUP2G79DCUR | Active | Production | VSSOP (DCU) \| 8 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | H79R |
| SN74AUP2G79DCUR.B | Active | Production | VSSOP (DCU) \| 8 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | H79R |
| SN74AUP2G79DCURG4 | Active | Production | VSSOP (DCU) \| 8 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | H79R |
| SN74AUP2G79DCURG4.B | Active | Production | VSSOP (DCU) \| 8 | 3000 \| LARGE T&R | Yes | NIPDAU | Level-1-260C-UNLIM | -40 to 85 | H79R |
| SN74AUP2G79DQER | Active | Production | X2SON (DQE) \| 8 | 5000 \| LARGE T&R | Yes | NIPDAUAG | Level-1-260C-UNLIM | -40 to 85 | PT |
| SN74AUP2G79DQER.B | Active | Production | X2SON (DQE) \| 8 | 5000 \| LARGE T&R | Yes | NIPDAUAG | Level-1-260C-UNLIM | -40 to 85 | PT |
| SN74AUP2G79RSER | Active | Production | UQFN (RSE) \| 8 | 5000 \| LARGE T&R | Yes | NIPDAUAG | Level-1-260C-UNLIM | -40 to 85 | PT |
| SN74AUP2G79RSER.B | Active | Production | UQFN (RSE) \| 8 | 5000 \| LARGE T&R | Yes | NIPDAUAG | Level-1-260C-UNLIM | -40 to 85 | PT |

(1) **Status:** For more details on status, see our product life cycle.

(2) **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.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **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.

(5) **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.

(6) **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.

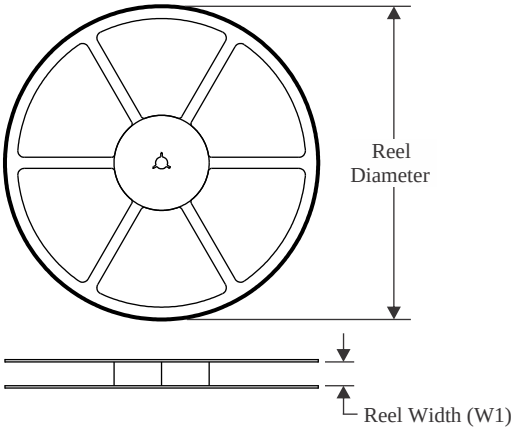
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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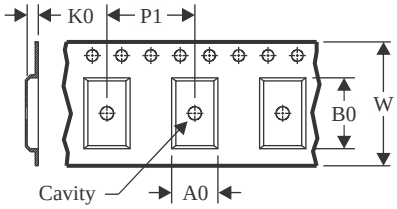
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## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

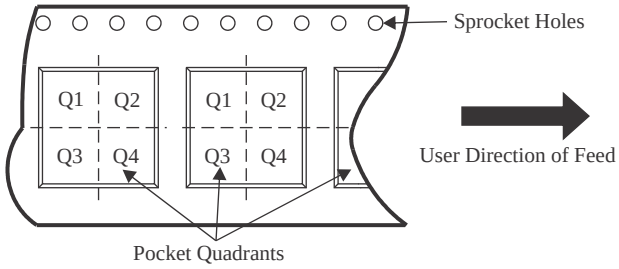



**TAPE DIMENSIONS**




| | |
|---|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

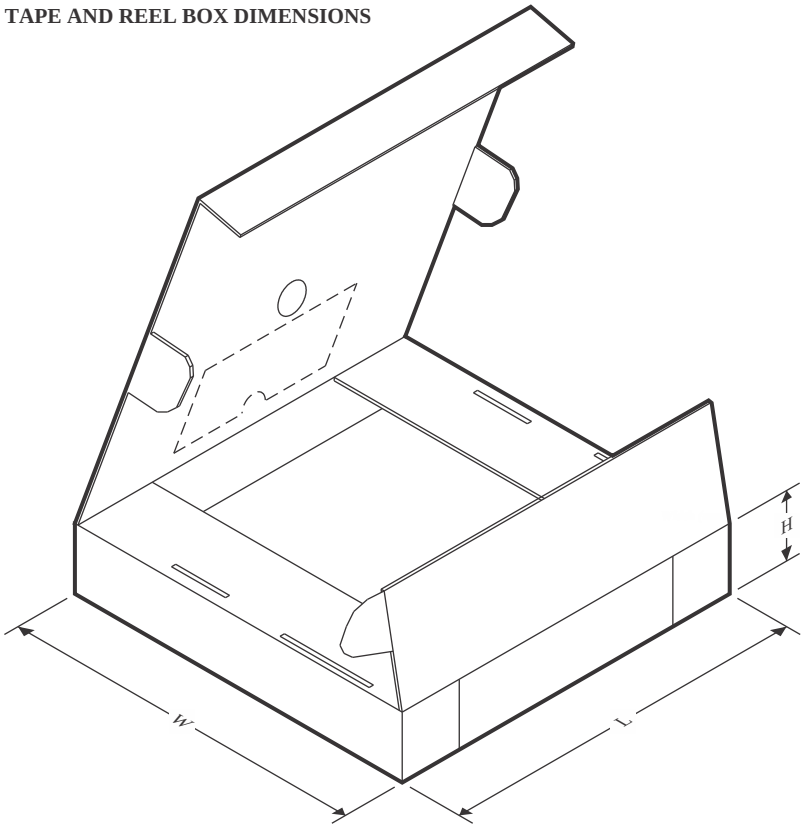
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SN74AUP2G79DCUR | VSSOP | DCU | 8 | 3000 | 180.0 | 8.4 | 2.25 | 3.35 | 1.05 | 4.0 | 8.0 | Q3 |
| SN74AUP2G79DCURG4 | VSSOP | DCU | 8 | 3000 | 180.0 | 8.4 | 2.25 | 3.35 | 1.05 | 4.0 | 8.0 | Q3 |
| SN74AUP2G79DQER | X2SON | DQE | 8 | 5000 | 180.0 | 8.4 | 1.2 | 1.6 | 0.55 | 4.0 | 8.0 | Q1 |
| SN74AUP2G79RSER | UQFN | RSE | 8 | 5000 | 180.0 | 8.4 | 1.7 | 1.7 | 0.7 | 4.0 | 8.0 | Q2 |

TAPE AND REEL BOX DIMENSIONS




*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| SN74AUP2G79DCUR | VSSOP | DCU | 8 | 3000 | 202.0 | 201.0 | 28.0 |
| SN74AUP2G79DCURG4 | VSSOP | DCU | 8 | 3000 | 202.0 | 201.0 | 28.0 |
| SN74AUP2G79DQER | X2SON | DQE | 8 | 5000 | 202.0 | 201.0 | 28.0 |
| SN74AUP2G79RSER | UQFN | RSE | 8 | 5000 | 202.0 | 201.0 | 28.0 |

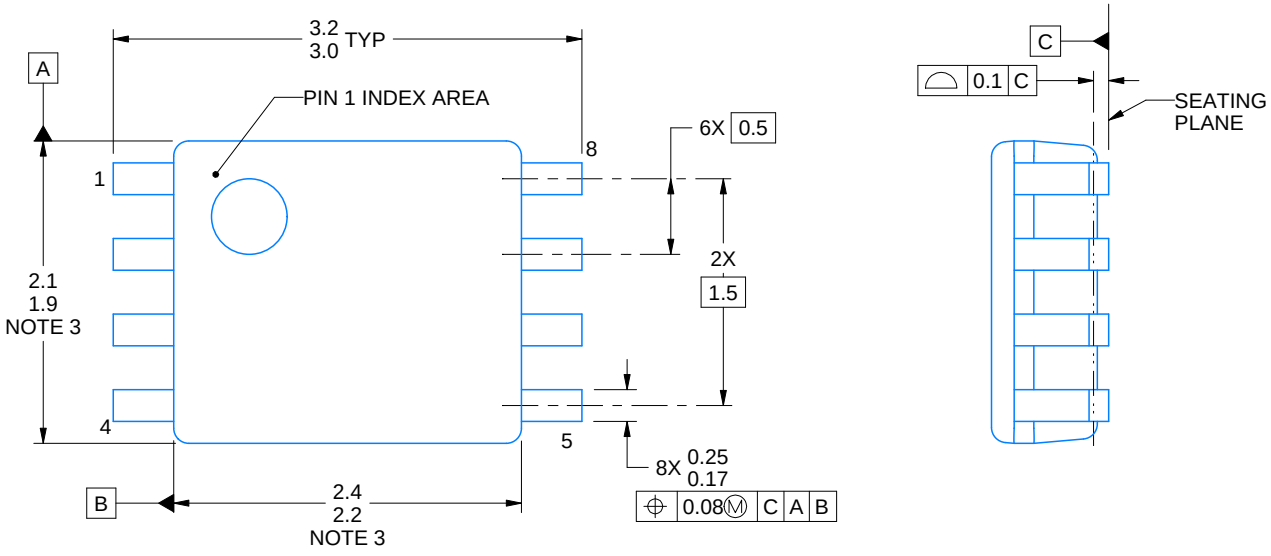
# DCU0008A

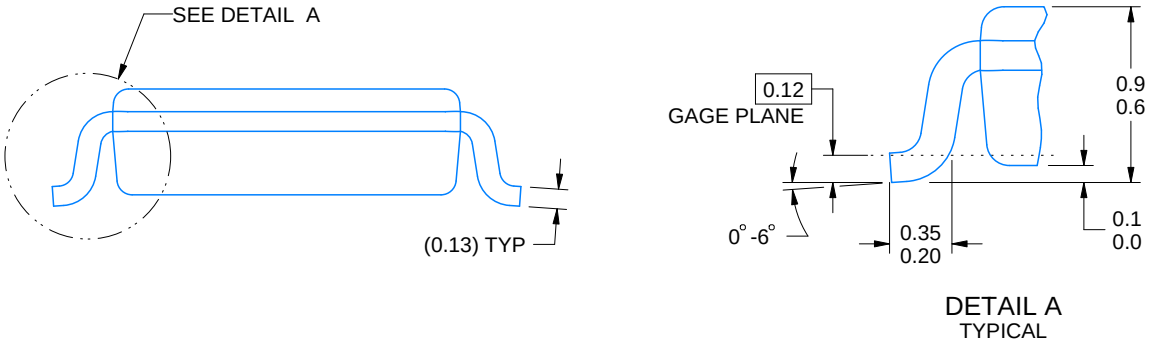


# PACKAGE OUTLINE

## VSSOP - 0.9 mm max height

SMALL OUTLINE PACKAGE

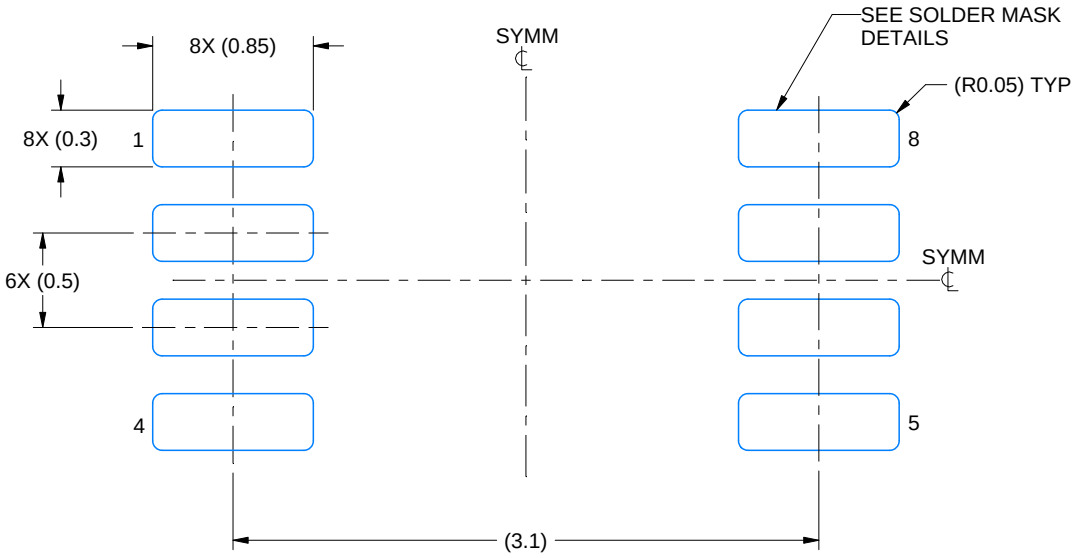


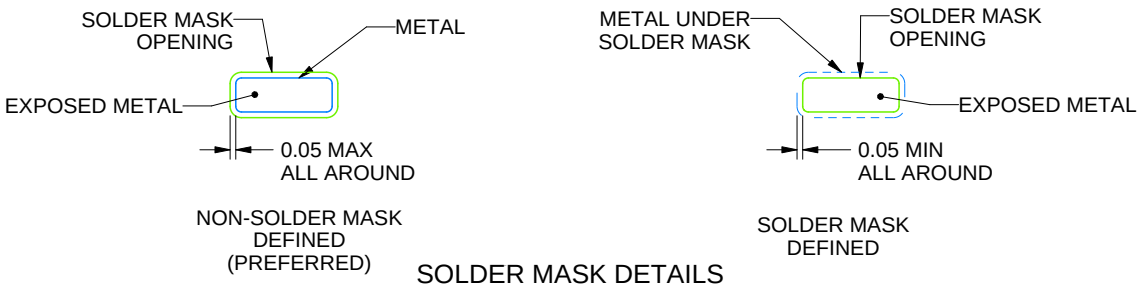

4225266/A 09/2014

NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. Reference JEDEC registration MO-187 variation CA.




LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 25X

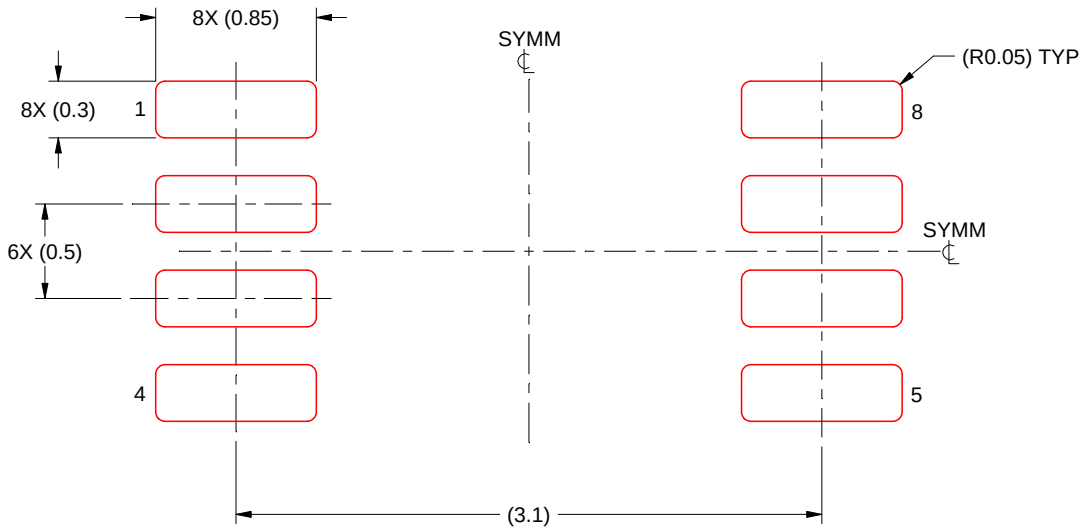



SOLDER MASK DETAILS

4225266/A 09/2014

NOTES: (continued)

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




SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 25X

4225266/A 09/2014

NOTES: (continued)

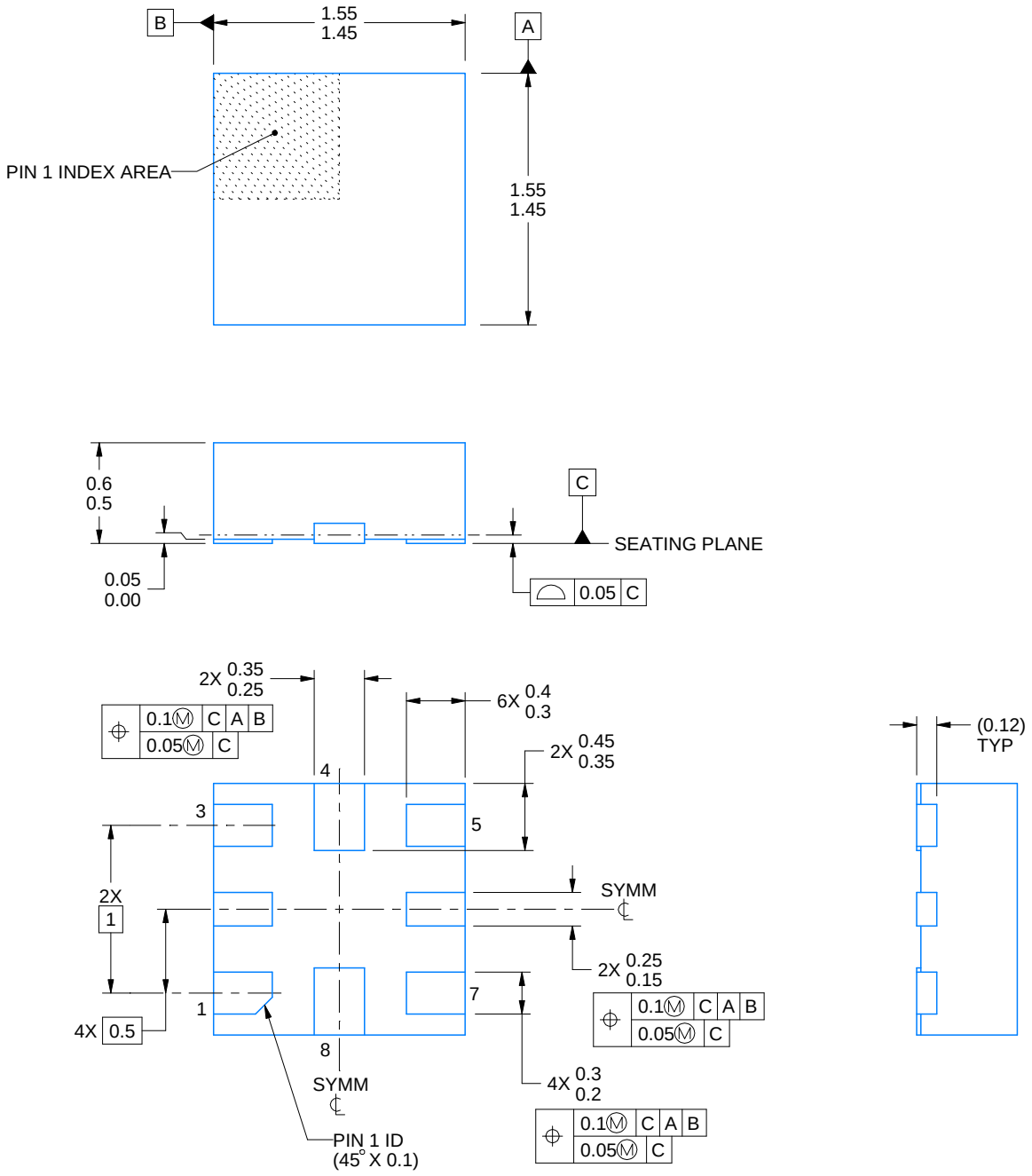
7. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
8. Board assembly site may have different recommendations for stencil design.

# RSE0008A

# PACKAGE OUTLINE

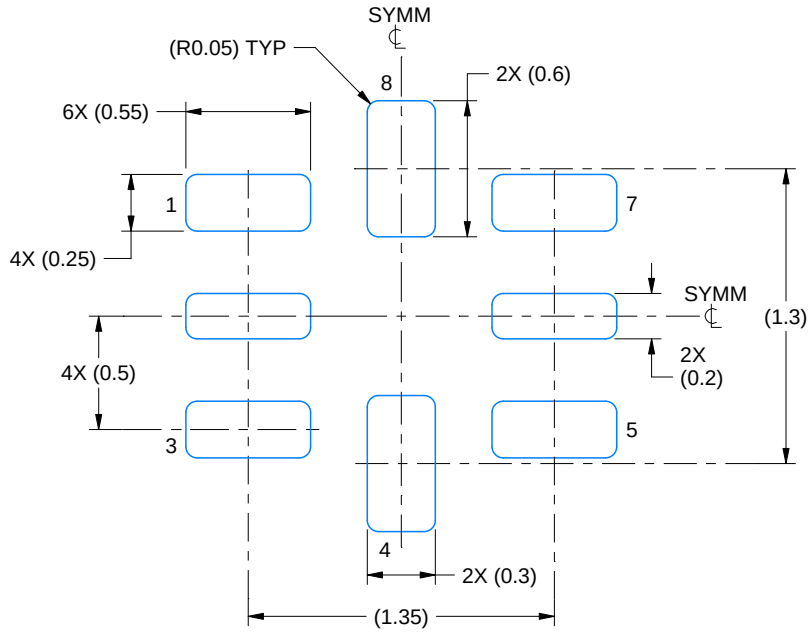
## UQFN - 0.6 mm max height

PLASTIC QUAD FLATPACK - NO LEAD

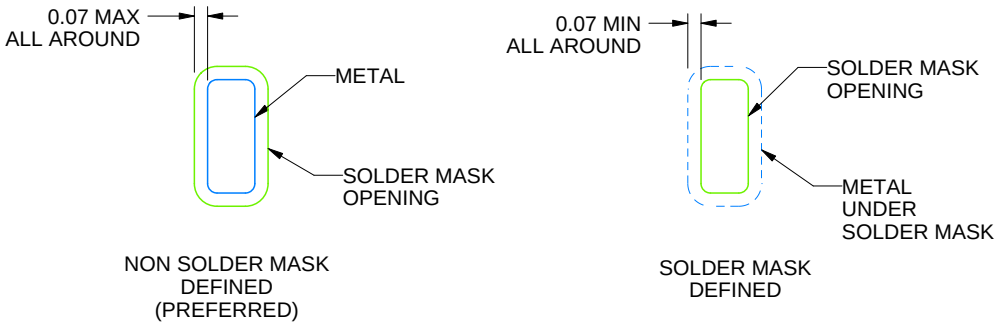



NOTES:

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.




LAND PATTERN EXAMPLE
SCALE:30X

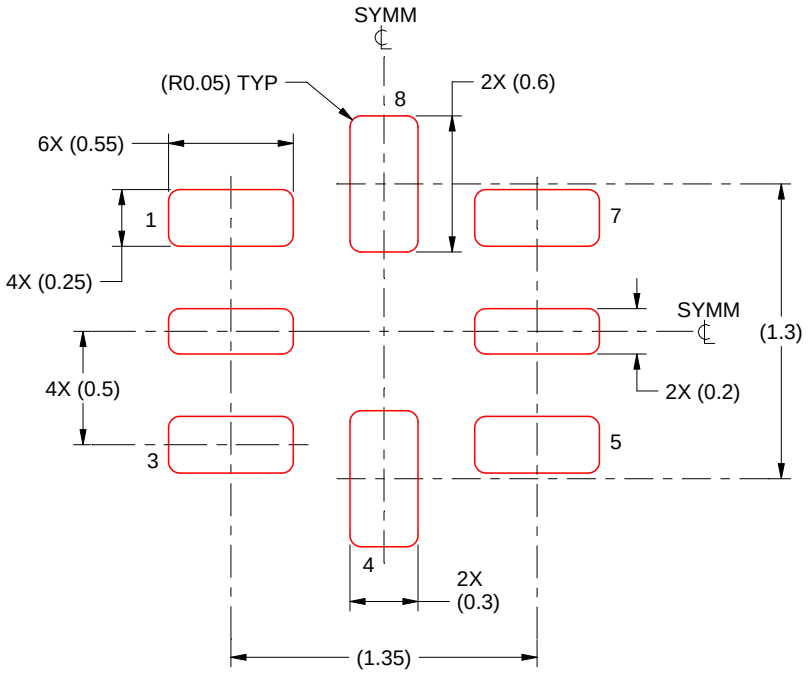



SOLDER MASK DETAILS
NOT TO SCALE

4220323/B 03/2018

NOTES: (continued)

3. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).




SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICKNESS
SCALE: 30X

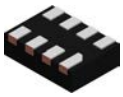
4220323/B 03/2018

NOTES: (continued)

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

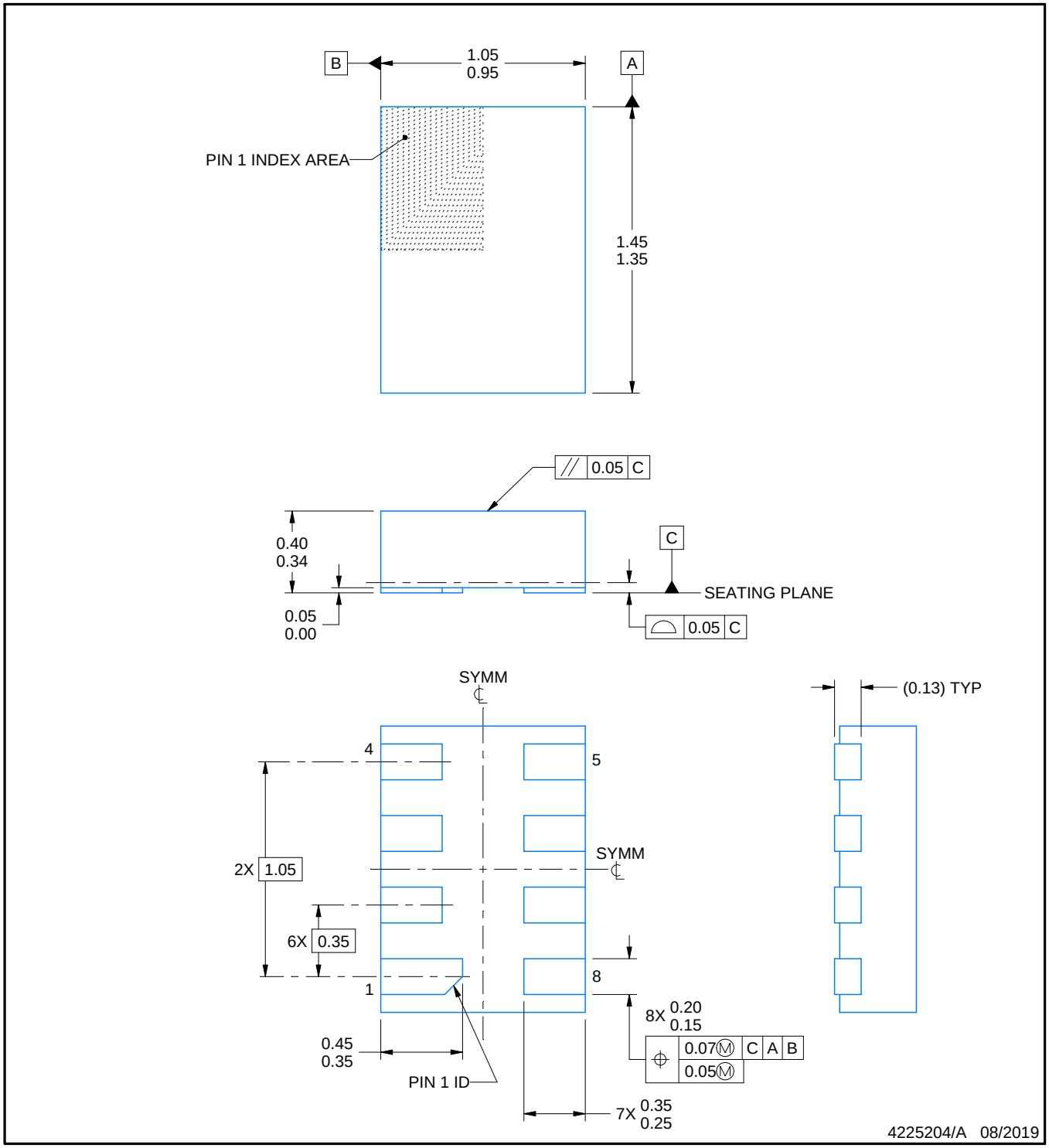
# PACKAGE OUTLINE

## DQE0008A



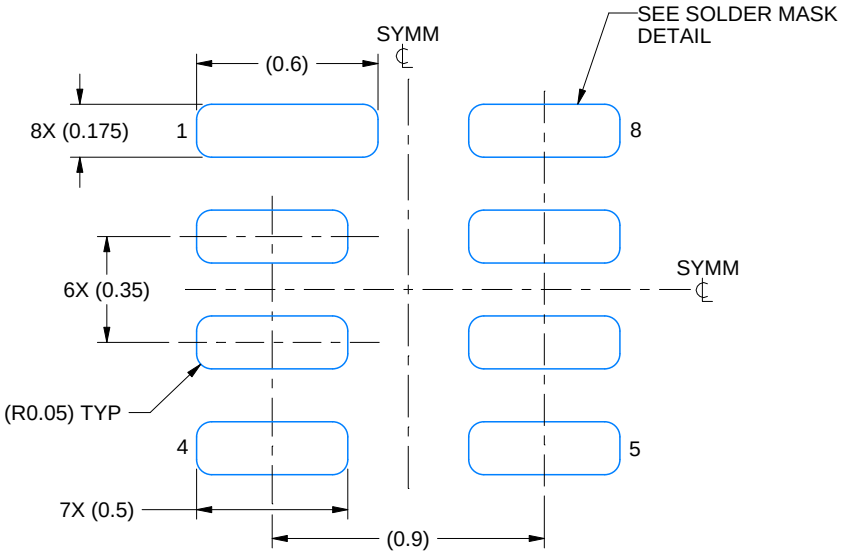
## X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD

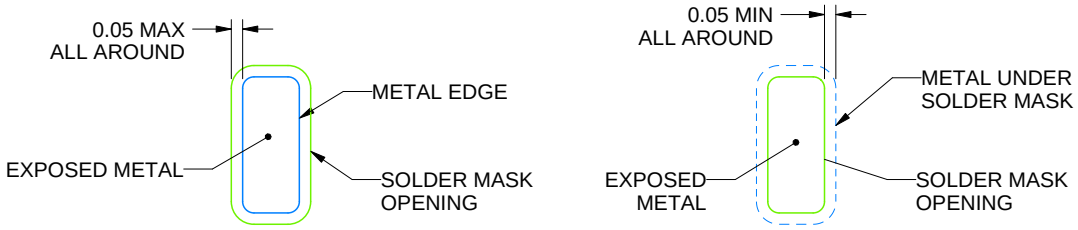



NOTES:

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 package complies to JEDEC MO-287 variation X2EAF.




LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 40X

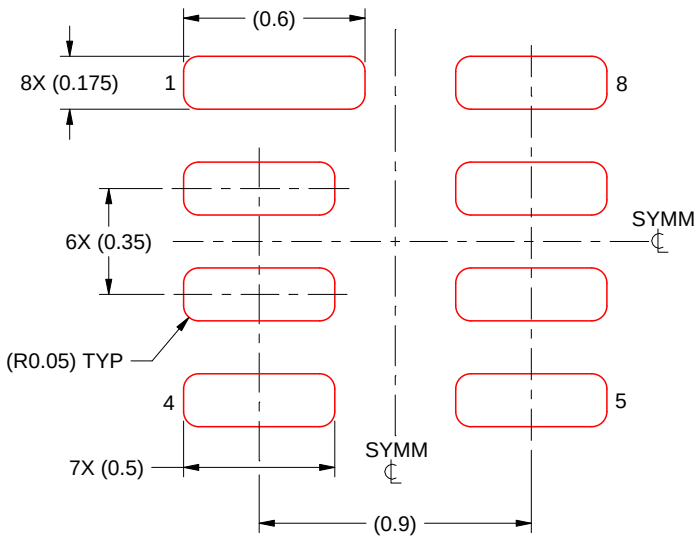



SOLDER MASK DETAILS

4225204/A 08/2019

NOTES: (continued)

4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).




SOLDER PASTE EXAMPLE
BASED ON 0.075 MM THICK STENCIL
SCALE: 40X

4225204/A 08/2019

NOTES: (continued)

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

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