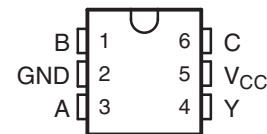
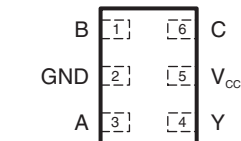
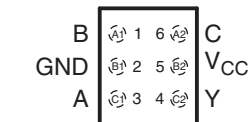


# SINGLE-SUPPLY VOLTAGE-LEVEL TRANSLATOR WITH NINE CONFIGURABLE GATE LOGIC FUNCTIONS

Check for Samples: [SN74AUP1T57](#)

## FEATURES

- Available in the Texas Instruments NanoStar™ Packages
- Single-Supply Voltage Translator
- 1.8 V to 3.3 V (at  $V_{CC} = 3.3$  V)
- 2.5 V to 3.3 V (at  $V_{CC} = 3.3$  V)
- 1.8 V to 2.5 V (at  $V_{CC} = 2.5$  V)
- 3.3 V to 2.5 V (at  $V_{CC} = 2.5$  V)
- Nine Configurable Gate Logic Functions
- Schmitt-Trigger Inputs Reject Input Noise and Provide Better Output Signal Integrity
- $I_{off}$  Supports Partial-Power-Down Mode With Low Leakage Current (0.5  $\mu$ A)
- Very Low Static and Dynamic Power Consumption
- Pb-Free Packages Available: SON (DRY or DSF), SOT-23 (DBV), SC-70 (DCK), and NanoStar WCSP
- 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)
- Related Devices: SN74AUP1T58, SN74AUP1T97, and SN74AUP1T98

DBV OR DCK PACKAGE  
(TOP VIEW)

DRY OR DSF PACKAGE  
(TOP VIEW)

YFP OR YZP PACKAGE  
(TOP VIEW)


## DESCRIPTION/ORDERING INFORMATION

AUP technology is the industry's lowest-power logic technology designed for use in battery-operated or battery backed-up equipment. The SN74AUP1T57 is designed for logic-level translation applications with input switching levels that accept 1.8-V LVCMOS signals, while operating from either a single 3.3-V or 2.5-V  $V_{CC}$  supply.

The wide  $V_{CC}$  range of 2.3 V to 3.6 V allows the possibility of battery voltage drop during system operation and ensures normal operation between this range.

Schmitt-trigger inputs ( $\Delta V_T = 210$  mV between positive and negative input transitions) offer improved noise immunity during switching transitions, which is especially useful on analog mixed-mode designs. Schmitt-trigger inputs reject input noise, ensure integrity of output signals, and allow for slow input signal transition.

The SN74AUP1T57 can be easily configured to perform a required gate function by connecting A, B, and C inputs to  $V_{CC}$  or ground (see Function Selection table). Up to nine commonly used logic gate functions can be performed.



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.

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$I_{off}$  is a feature that allows for powered-down conditions ( $V_{CC} = 0$  V) and is important in portable and mobile applications. When  $V_{CC} = 0$  V, signals in the range from 0 V to 3.6 V can be applied to the inputs and outputs of the device. No damage occurs to the device under these conditions.

The SN74AUP1T57 is designed with optimized current-drive capability of 4 mA to reduce line reflections, overshoot, and undershoot caused by high-drive outputs.

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

### ORDERING INFORMATION<sup>(1)</sup>

| $T_A$         | PACKAGE <sup>(2)</sup>                                         |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING <sup>(3)</sup> |
|---------------|----------------------------------------------------------------|--------------|-----------------------|---------------------------------|
| –40°C to 85°C | NanoStar™ – WCSP (DSBGA)<br>0.23-mm Large Bump – YZP (Pb-free) | Reel of 3000 | SN74AUP1T57YZPR       | ___TG_                          |
|               | NanoStar™ – WCSP (DSBGA)<br>0.23-mm Large Bump – YFP           | Reel of 3000 | SN74AUP1T57YFPR       | ___TG_                          |
|               | QFN – DRY                                                      | Reel of 5000 | SN74AUP1T57DRYR       | TG                              |
|               | uQFN – DSF                                                     | Reel of 5000 | SN74AUP1T57DSFR       | TG                              |
|               | SOT (SOT-23) – DBV                                             | Reel of 3000 | SN74AUP1T57DBVR       | HT3_                            |
|               | SOT (SC-70) – DCK                                              | Reel of 3000 | SN74AUP1T57DCKR       | TG_                             |

- (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](http://www.ti.com).
- (2) Package drawings, thermal data, and symbolization are available at [www.ti.com/packaging](http://www.ti.com/packaging).
- (3) DBV/DCK: The actual top-side marking has one additional character that designates the wafer fab/assembly site.  
YFP/YZP: The actual top-side marking has three preceding characters to denote year, month, and sequence code, and one following character to designate the wafer fab/assembly site. Pin 1 identifier indicates solder-bump composition (1 = SnPb, • = Pb-free).

### FUNCTION SELECTION TABLE

| LOGIC FUNCTION                             | FIGURE NO. |
|--------------------------------------------|------------|
| 2-input AND gate                           | 5          |
| 2-input NOR gate with both inputs inverted | 5          |
| 2-input NAND gate with inverted input      | 6, 7       |
| 2-input OR gate with inverted input        | 6, 7       |
| 2-input AND gate with both inputs inverted | 8          |
| 2-input NOR gate                           | 8          |
| 2-input XNOR gate                          | 9          |
| Inverter                                   | 10         |
| Noninverted buffer                         | 11         |

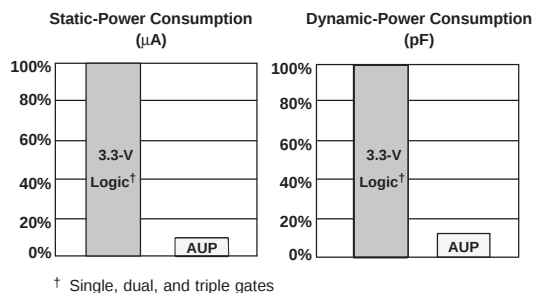


Figure 1. AUP – The Lowest-Power Family

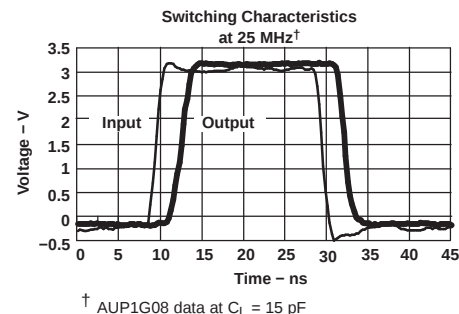
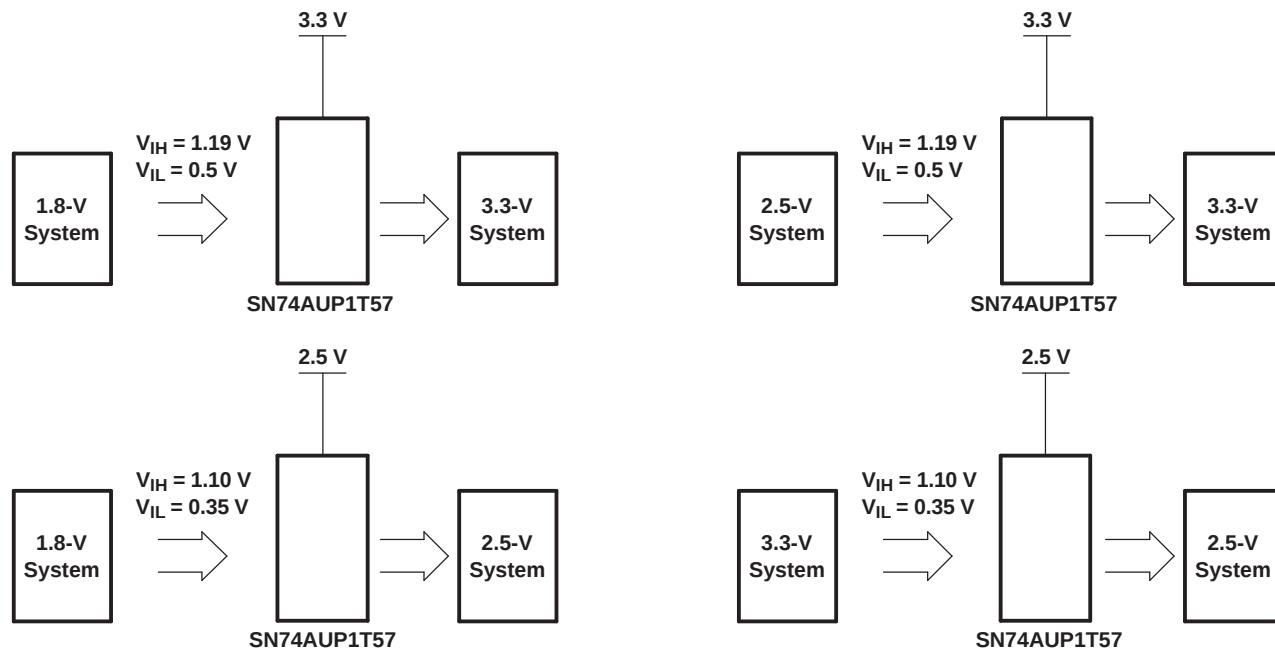
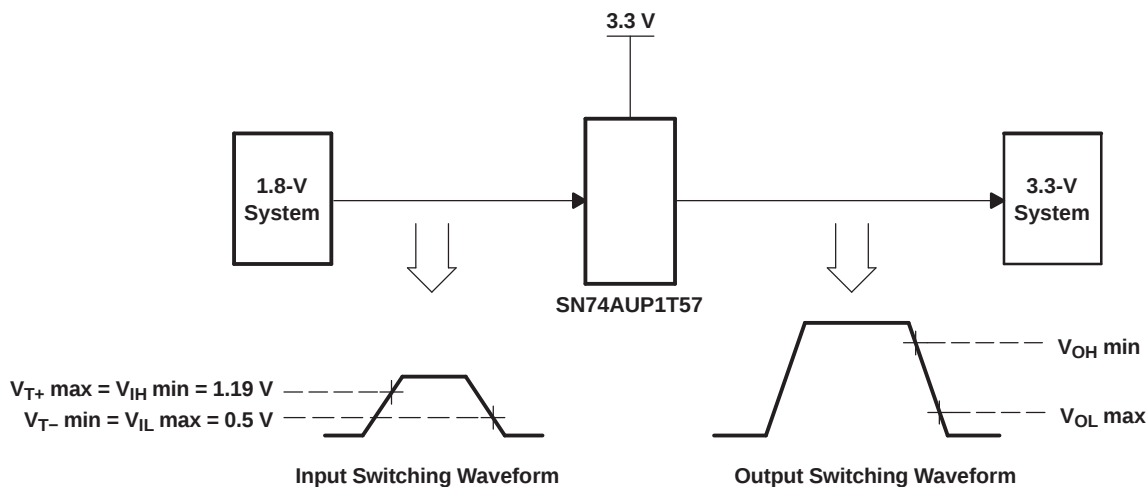


Figure 2. Excellent Signal Integrity



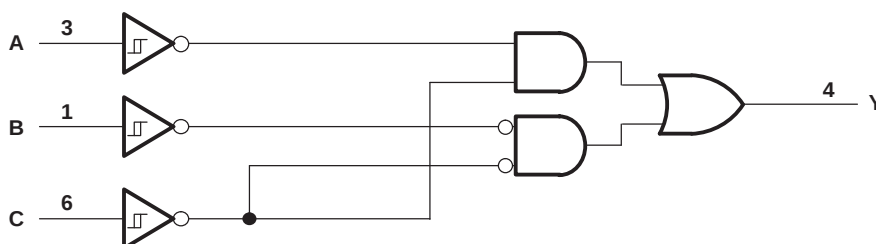
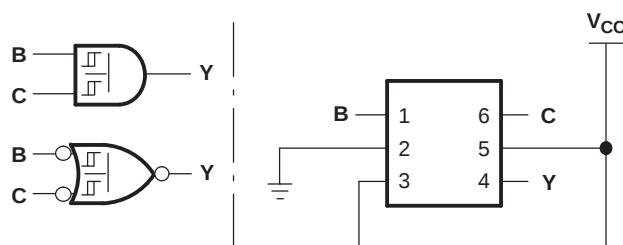
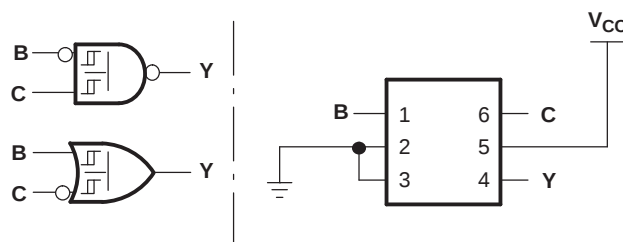
**Figure 3. Possible Voltage-Translation Combinations**

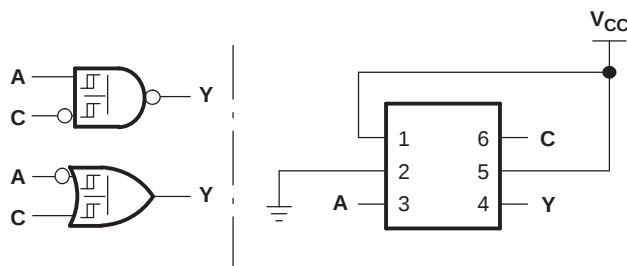


**Figure 4. Switching Thresholds for 1.8-V to 3.3-V Translation**

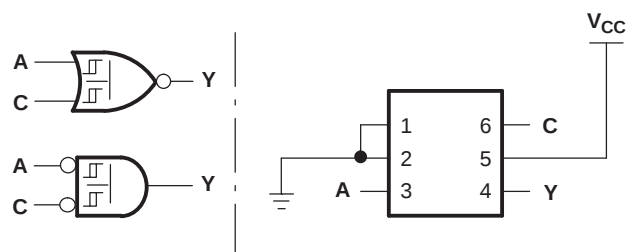
**FUNCTION TABLE**

| INPUTS |   |   | OUTPUT<br>Y |
|--------|---|---|-------------|
| C      | B | A |             |
| L      | L | L | H           |
| L      | L | H | L           |
| L      | H | L | H           |
| L      | H | H | L           |
| H      | L | L | L           |
| H      | L | H | L           |
| H      | H | L | H           |
| H      | H | H | H           |

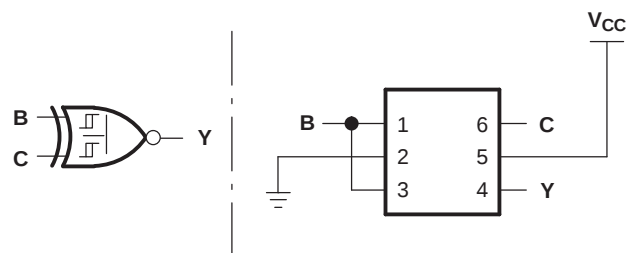
**LOGIC DIAGRAM (POSITIVE LOGIC)****LOGIC CONFIGURATIONS****Figure 5. 08/14+2: 2-Input AND Gate  
2-Input NOR Gate With Both Inputs Inverted****Figure 6. 14+00/14+32: 2-Input NAND Gate With Inverted B Input  
2-Input OR Gate With Inverted Input**



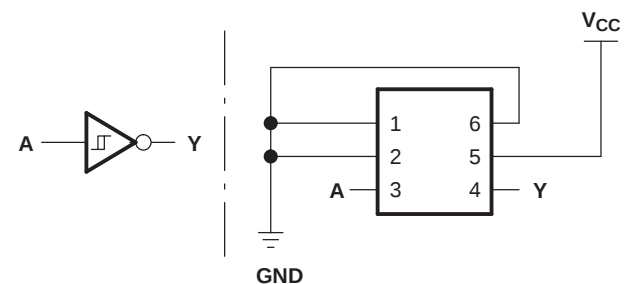
**Figure 7. 14+00/14+32: 2-Input NAND Gate With Inverted C Input  
2-Input OR Gate With Inverted Input**



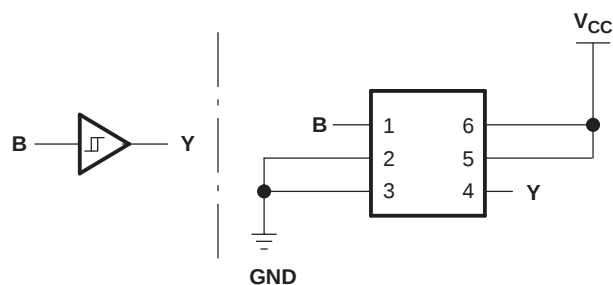
**Figure 8. 02/14+08: 2-Input OR Gate  
2-Input AND Gate With Both Inputs Inverted**



**Figure 9. 86+04: 2-Input XNOR Gate**



**Figure 10. 04/14: Inverter**

**Figure 11. 17/34: Noninverted Buffer**

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

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

|                  |                                                                                             | MIN                | MAX                   | UNIT   |
|------------------|---------------------------------------------------------------------------------------------|--------------------|-----------------------|--------|
| V <sub>CC</sub>  | Supply voltage range                                                                        | –0.5               | 4.6                   | V      |
| V <sub>I</sub>   | Input voltage range <sup>(2)</sup>                                                          | –0.5               | 4.6                   | V      |
| V <sub>O</sub>   | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | –0.5               | 4.6                   | V      |
| V <sub>O</sub>   | Output voltage range in the high or low state <sup>(2)</sup>                                | –0.5               | V <sub>CC</sub> + 0.5 | V      |
| I <sub>IK</sub>  | Input clamp current                                                                         | V <sub>I</sub> < 0 |                       | –50 mA |
| I <sub>OK</sub>  | Output clamp current                                                                        | V <sub>O</sub> < 0 |                       | –50 mA |
| I <sub>O</sub>   | Continuous output current                                                                   |                    | ±20                   | mA     |
|                  | Continuous current through V <sub>CC</sub> or GND                                           |                    | ±50                   | mA     |
| θ <sub>JA</sub>  | Package thermal impedance <sup>(3)</sup>                                                    | DBV package        |                       | 165    |
|                  |                                                                                             | DCK package        |                       | 259    |
|                  |                                                                                             | DRY package        |                       | 340    |
|                  |                                                                                             | DSF package        |                       | 300    |
|                  |                                                                                             | YFP package        |                       | 123    |
|                  |                                                                                             | YZP package        |                       | 123    |
| T <sub>stg</sub> | Storage temperature range                                                                   | –65                | 150                   | °C     |

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

## RECOMMENDED OPERATING CONDITIONS<sup>(1)</sup>

|                 |                                | MIN                     | MAX             | UNIT |
|-----------------|--------------------------------|-------------------------|-----------------|------|
| V <sub>CC</sub> | Supply voltage                 | 2.3                     | 3.6             | V    |
| V <sub>I</sub>  | Input voltage                  | 0                       | 3.6             | V    |
| V <sub>O</sub>  | Output voltage                 | 0                       | V <sub>CC</sub> | V    |
| I <sub>OH</sub> | High-level output current      | V <sub>CC</sub> = 2.3 V | –3.1            | mA   |
|                 |                                | V <sub>CC</sub> = 3 V   | –4              |      |
| I <sub>OL</sub> | Low-level output current       | V <sub>CC</sub> = 2.3 V | 3.1             | mA   |
|                 |                                | V <sub>CC</sub> = 3 V   | 4               |      |
| T <sub>A</sub>  | Operating free-air temperature | –40                     | 85              | °C   |

- (1) All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. See 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> | T <sub>A</sub> = 25°C |     |      | T <sub>A</sub> = –40°C to 85°C |      | UNIT |
|--------------------------------------------------------------------|------------|-----------------------------------------------------------------------------------------|-----------------|-----------------------|-----|------|--------------------------------|------|------|
|                                                                    |            |                                                                                         |                 | MIN                   | TYP | MAX  | MIN                            | MAX  |      |
| V <sub>T+</sub><br>Positive-going input threshold voltage          |            |                                                                                         | 2.3 V to 2.7 V  | 0.6                   |     | 1.1  | 0.6                            | 1.1  | V    |
|                                                                    |            |                                                                                         | 3 V to 3.6 V    | 0.75                  |     | 1.16 | 0.75                           | 1.19 |      |
| V <sub>T–</sub><br>Negative-going input threshold voltage          |            |                                                                                         | 2.3 V to 2.7 V  | 0.35                  |     | 0.6  | 0.35                           | 0.6  | V    |
|                                                                    |            |                                                                                         | 3 V to 3.6 V    | 0.5                   |     | 0.85 | 0.5                            | 0.85 |      |
| ΔV <sub>T</sub><br>Hysteresis (V <sub>T+</sub> – V <sub>T–</sub> ) |            |                                                                                         | 2.3 V to 2.7 V  | 0.23                  |     | 0.6  | 0.1                            | 0.6  | V    |
|                                                                    |            |                                                                                         | 3 V to 3.6 V    | 0.25                  |     | 0.56 | 0.15                           | 0.56 |      |
| V <sub>OH</sub>                                                    |            | I <sub>OH</sub> = –20 μA                                                                | 2.3 V to 3.6 V  | V <sub>CC</sub> – 0.1 |     |      | V <sub>CC</sub> – 0.1          |      | V    |
|                                                                    |            | I <sub>OH</sub> = –2.3 mA                                                               | 2.3 V           | 2.05                  |     |      | 1.97                           |      |      |
|                                                                    |            | I <sub>OH</sub> = –3.1 mA                                                               |                 | 1.9                   |     |      | 1.85                           |      |      |
|                                                                    |            | I <sub>OH</sub> = –2.7 mA                                                               | 3 V             | 2.72                  |     |      | 2.67                           |      |      |
|                                                                    |            | I <sub>OH</sub> = –4 mA                                                                 |                 | 2.6                   |     |      | 2.55                           |      |      |
| V <sub>OL</sub>                                                    |            | I <sub>OL</sub> = 20 μA                                                                 | 2.3 V to 3.6 V  | 0.1                   |     |      | 0.1                            |      | V    |
|                                                                    |            | I <sub>OL</sub> = 2.3 mA                                                                | 2.3 V           | 0.31                  |     |      | 0.33                           |      |      |
|                                                                    |            | I <sub>OL</sub> = 3.1 mA                                                                |                 | 0.44                  |     |      | 0.45                           |      |      |
|                                                                    |            | I <sub>OL</sub> = 2.7 mA                                                                | 3 V             | 0.31                  |     |      | 0.33                           |      |      |
|                                                                    |            | I <sub>OL</sub> = 4 mA                                                                  |                 | 0.44                  |     |      | 0.45                           |      |      |
| I <sub>I</sub>                                                     | All inputs | V <sub>I</sub> = 3.6 V or GND                                                           | 0 V to 3.6 V    | 0.1                   |     |      | 0.5                            | μA   |      |
| I <sub>off</sub>                                                   |            | V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V                                         | 0 V             | 0.1                   |     |      | 0.5                            | μA   |      |
| ΔI <sub>off</sub>                                                  |            | V <sub>I</sub> or V <sub>O</sub> = 3.6 V                                                | 0 V to 0.2 V    | 0.2                   |     |      | 0.5                            | μA   |      |
| I <sub>CC</sub>                                                    |            | V <sub>I</sub> = 3.6 V or GND, I <sub>O</sub> = 0                                       | 2.3 V to 3.6 V  | 0.5                   |     |      | 0.9                            | μA   |      |
| ΔI <sub>CC</sub>                                                   |            | One input at 0.3 V or 1.1 V, Other inputs at 0 or V <sub>CC</sub> , I <sub>O</sub> = 0  | 2.3 V to 2.7 V  |                       |     |      | 4                              | μA   |      |
|                                                                    |            | One input at 0.45 V or 1.2 V, Other inputs at 0 or V <sub>CC</sub> , I <sub>O</sub> = 0 | 3 V to 3.6 V    |                       |     |      | 12                             |      |      |
| C <sub>i</sub>                                                     |            | V <sub>I</sub> = V <sub>CC</sub> or GND                                                 | 3.3 V           | 1.5                   |     |      |                                | pF   |      |
| C <sub>O</sub>                                                     |            | V <sub>O</sub> = V <sub>CC</sub> or GND                                                 | 3.3 V           | 3                     |     |      |                                | pF   |      |

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range, V<sub>CC</sub> = 2.5 V ± 0.2 V, V<sub>I</sub> = 1.8 V ± 0.15 V (unless otherwise noted) (see [Figure 12](#))

| PARAMETER       | FROM (INPUT) | TO (OUTPUT) | C <sub>L</sub> | T <sub>A</sub> = 25°C |     |     | T <sub>A</sub> = –40°C to 85°C |      | UNIT |
|-----------------|--------------|-------------|----------------|-----------------------|-----|-----|--------------------------------|------|------|
|                 |              |             |                | MIN                   | TYP | MAX | MIN                            | MAX  |      |
| t <sub>pd</sub> | A, B, or C   | Y           | 5 pF           | 1.8                   | 2.3 | 2.9 | 0.5                            | 6.8  | ns   |
|                 |              |             | 10 pF          | 2.3                   | 2.8 | 3.4 | 1                              | 7.9  |      |
|                 |              |             | 15 pF          | 2.6                   | 3.1 | 3.8 | 1                              | 8.7  |      |
|                 |              |             | 30 pF          | 3.8                   | 4.4 | 5.1 | 1.5                            | 10.8 |      |

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range,  $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ ,  $V_I = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted)  
(see [Figure 12](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $C_L$ | $T_A = 25^\circ\text{C}$ |     |     | $T_A = -40^\circ\text{C}$<br>to $85^\circ\text{C}$ |     | UNIT |
|-----------|-----------------|----------------|-------|--------------------------|-----|-----|----------------------------------------------------|-----|------|
|           |                 |                |       | MIN                      | TYP | MAX | MIN                                                | MAX |      |
| $t_{pd}$  | A, B, or C      | Y              | 5 pF  | 1.8                      | 2.3 | 3.1 | 0.5                                                | 6   | ns   |
|           |                 |                | 10 pF | 2.2                      | 2.8 | 3.5 | 1                                                  | 7.1 |      |
|           |                 |                | 15 pF | 2.6                      | 3.2 | 5.2 | 1                                                  | 7.9 |      |
|           |                 |                | 30 pF | 3.7                      | 4.4 | 5.2 | 1.5                                                | 10  |      |

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range,  $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$ ,  $V_I = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted)  
(see [Figure 12](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $C_L$ | $T_A = 25^\circ\text{C}$ |     |     | $T_A = -40^\circ\text{C}$<br>to $85^\circ\text{C}$ |     | UNIT |
|-----------|-----------------|----------------|-------|--------------------------|-----|-----|----------------------------------------------------|-----|------|
|           |                 |                |       | MIN                      | TYP | MAX | MIN                                                | MAX |      |
| $t_{pd}$  | A, B, or C      | Y              | 5 pF  | 2                        | 2.7 | 3.5 | 0.5                                                | 5.5 | ns   |
|           |                 |                | 10 pF | 2.4                      | 3.1 | 3.9 | 1                                                  | 6.5 |      |
|           |                 |                | 15 pF | 2.8                      | 3.5 | 4.3 | 1                                                  | 7.4 |      |
|           |                 |                | 30 pF | 4                        | 4.7 | 5.5 | 1.5                                                | 9.5 |      |

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ ,  $V_I = 1.8\text{ V} \pm 0.15\text{ V}$  (unless otherwise noted)  
(see [Figure 12](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $C_L$ | $T_A = 25^\circ\text{C}$ |     |     | $T_A = -40^\circ\text{C}$<br>to $85^\circ\text{C}$ |     | UNIT |
|-----------|-----------------|----------------|-------|--------------------------|-----|-----|----------------------------------------------------|-----|------|
|           |                 |                |       | MIN                      | TYP | MAX | MIN                                                | MAX |      |
| $t_{pd}$  | A, B, or C      | Y              | 5 pF  | 1.6                      | 2   | 2.5 | 0.5                                                | 8   | ns   |
|           |                 |                | 10 pF | 2                        | 2.4 | 2.9 | 1                                                  | 8.5 |      |
|           |                 |                | 15 pF | 2.3                      | 2.8 | 3.3 | 1                                                  | 9.1 |      |
|           |                 |                | 30 pF | 3.4                      | 3.9 | 4.4 | 1.5                                                | 9.8 |      |

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range,  $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$ ,  $V_I = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted)  
(see [Figure 12](#))

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $C_L$ | $T_A = 25^\circ\text{C}$ |     |     | $T_A = -40^\circ\text{C}$<br>to $85^\circ\text{C}$ |     | UNIT |
|-----------|-----------------|----------------|-------|--------------------------|-----|-----|----------------------------------------------------|-----|------|
|           |                 |                |       | MIN                      | TYP | MAX | MIN                                                | MAX |      |
| $t_{pd}$  | A, B, or C      | Y              | 5 pF  | 1.6                      | 1.9 | 2.4 | 0.5                                                | 5.3 | ns   |
|           |                 |                | 10 pF | 2                        | 2.3 | 2.7 | 1                                                  | 6.1 |      |
|           |                 |                | 15 pF | 2.3                      | 2.7 | 3.1 | 1                                                  | 6.8 |      |
|           |                 |                | 30 pF | 3.4                      | 3.8 | 4.2 | 1.5                                                | 8.5 |      |

## SWITCHING CHARACTERISTICS

over recommended operating free-air temperature range,  $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ ,  $V_I = 3.3 \text{ V} \pm 0.3 \text{ V}$  (unless otherwise noted)  
(see [Figure 12](#))

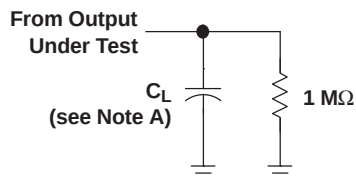
| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $C_L$ | $T_A = 25^\circ\text{C}$ |     |     | $T_A = -40^\circ\text{C}$<br>to $85^\circ\text{C}$ |     | UNIT |
|-----------|-----------------|----------------|-------|--------------------------|-----|-----|----------------------------------------------------|-----|------|
|           |                 |                |       | MIN                      | TYP | MAX | MIN                                                | MAX |      |
| $t_{pd}$  | A, B, or C      | Y              | 5 pF  | 1.6                      | 2.1 | 2.7 | 0.5                                                | 4.7 | ns   |
|           |                 |                | 10 pF | 2                        | 2.4 | 3   | 1                                                  | 5.7 |      |
|           |                 |                | 15 pF | 2.3                      | 2.7 | 3.3 | 1                                                  | 6.2 |      |
|           |                 |                | 30 pF | 3.4                      | 3.8 | 4.4 | 1.5                                                | 7.8 |      |

## OPERATING CHARACTERISTICS

$T_A = 25^\circ\text{C}$

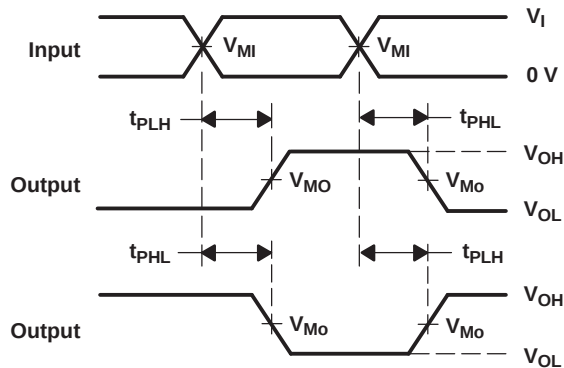
| PARAMETER |                               | TEST CONDITIONS      | $V_{CC} = 2.5 \text{ V}$ | $V_{CC} = 3.3 \text{ V}$ | UNIT |
|-----------|-------------------------------|----------------------|--------------------------|--------------------------|------|
|           |                               |                      | TYP                      | TYP                      |      |
| $C_{pd}$  | Power dissipation capacitance | $f = 10 \text{ MHz}$ | 4                        | 5                        | pF   |

## PARAMETER MEASUREMENT INFORMATION



**LOAD CIRCUIT**

|          | $V_{CC} = 2.5\text{ V}$<br>$\pm 0.2\text{ V}$ | $V_{CC} = 3.3\text{ V}$<br>$\pm 0.3\text{ V}$ |
|----------|-----------------------------------------------|-----------------------------------------------|
| $C_L$    | 5, 10, 15, 30 pF                              | 5, 10, 15, 30 pF                              |
| $V_{MI}$ | $V_I/2$                                       | $V_I/2$                                       |
| $V_{MO}$ | $V_{CC}/2$                                    | $V_{CC}/2$                                    |



**VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES  
INVERTING AND NONINVERTING OUTPUTS**

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
 B. All input pulses are supplied by generators having the following characteristics: PRR  $\leq 10\text{ MHz}$ ,  $Z_O = 50\ \Omega$ , slew rate  $\geq 1\text{ V/ns}$ .  
 C. The outputs are measured one at a time, with one transition per measurement.  
 D.  $t_{PLH}$  and  $t_{PHL}$  are the same as  $t_{pd}$ .

**Figure 12. Load Circuit and Voltage Waveforms**

## PACKAGING INFORMATION

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2) | Lead finish/<br>Ball material<br>(6) | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5) | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74AUP1T57DBVR  | ACTIVE        | SOT-23       | DBV                | 6    | 3000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | (HT3F, HT3R)            | <a href="#">Samples</a> |
| SN74AUP1T57DBVT  | ACTIVE        | SOT-23       | DBV                | 6    | 250            | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | (HT3F, HT3R)            | <a href="#">Samples</a> |
| SN74AUP1T57DCKR  | ACTIVE        | SC70         | DCK                | 6    | 3000           | RoHS & Green    | NIPDAU                               | Level-1-260C-UNLIM   | -40 to 85    | (TGF, TGR)              | <a href="#">Samples</a> |
| SN74AUP1T57DRYR  | ACTIVE        | SON          | DRY                | 6    | 5000           | RoHS & Green    | NIPDAUAG                             | Level-1-260C-UNLIM   | -40 to 85    | TG                      | <a href="#">Samples</a> |
| SN74AUP1T57DSFR  | ACTIVE        | SON          | DSF                | 6    | 5000           | RoHS & Green    | NIPDAUAG                             | Level-1-260C-UNLIM   | -40 to 85    | TG                      | <a href="#">Samples</a> |

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AUP1T57DBVR | SOT-23       | DBV             | 6    | 3000 | 180.0              | 8.4                | 3.23    | 3.17    | 1.37    | 4.0     | 8.0    | Q3            |
| SN74AUP1T57DBVT | SOT-23       | DBV             | 6    | 250  | 180.0              | 8.4                | 3.23    | 3.17    | 1.37    | 4.0     | 8.0    | Q3            |
| SN74AUP1T57DCKR | SC70         | DCK             | 6    | 3000 | 180.0              | 8.4                | 2.41    | 2.41    | 1.2     | 4.0     | 8.0    | Q3            |
| SN74AUP1T57DRYR | SON          | DRY             | 6    | 5000 | 180.0              | 8.4                | 1.25    | 1.6     | 0.7     | 4.0     | 8.0    | Q1            |
| SN74AUP1T57DSFR | SON          | DSF             | 6    | 5000 | 180.0              | 8.4                | 1.16    | 1.16    | 0.63    | 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) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AUP1T57DBVR | SOT-23       | DBV             | 6    | 3000 | 202.0       | 201.0      | 28.0        |
| SN74AUP1T57DBVT | SOT-23       | DBV             | 6    | 250  | 202.0       | 201.0      | 28.0        |
| SN74AUP1T57DCKR | SC70         | DCK             | 6    | 3000 | 202.0       | 201.0      | 28.0        |
| SN74AUP1T57DRYR | SON          | DRY             | 6    | 5000 | 202.0       | 201.0      | 28.0        |
| SN74AUP1T57DSFR | SON          | DSF             | 6    | 5000 | 202.0       | 201.0      | 28.0        |

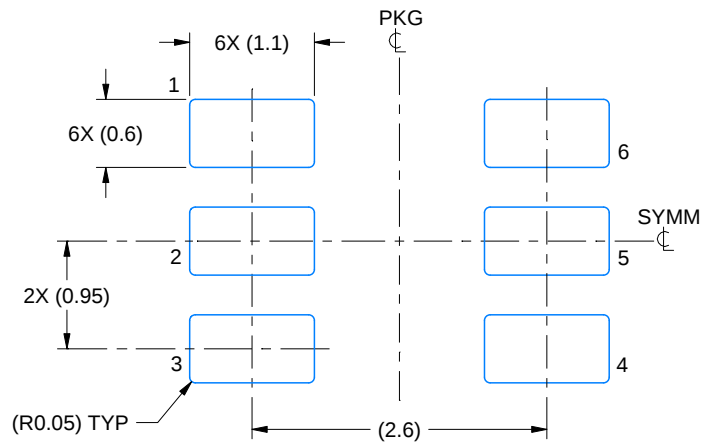


# EXAMPLE BOARD LAYOUT

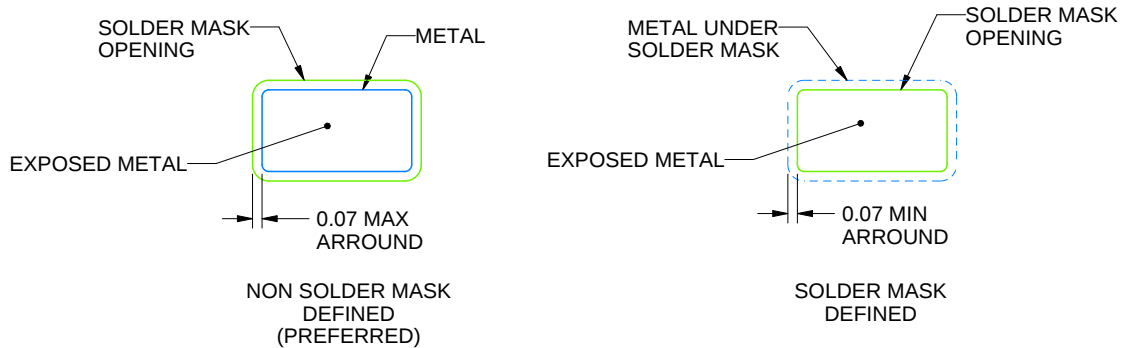
DBV0006A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:15X



SOLDER MASK DETAILS

4214840/F 05/2024

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.

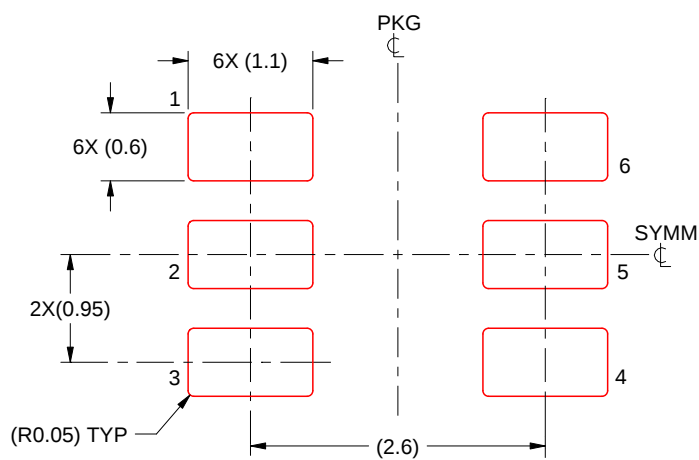
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

## EXAMPLE STENCIL DESIGN

DBV0006A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL  
SCALE:15X

4214840/F 05/2024

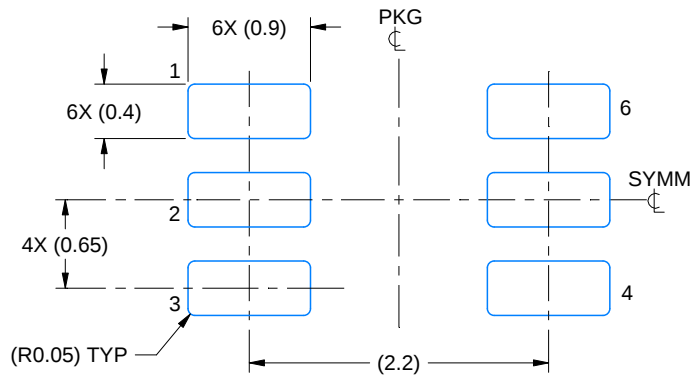
NOTES: (continued)

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.

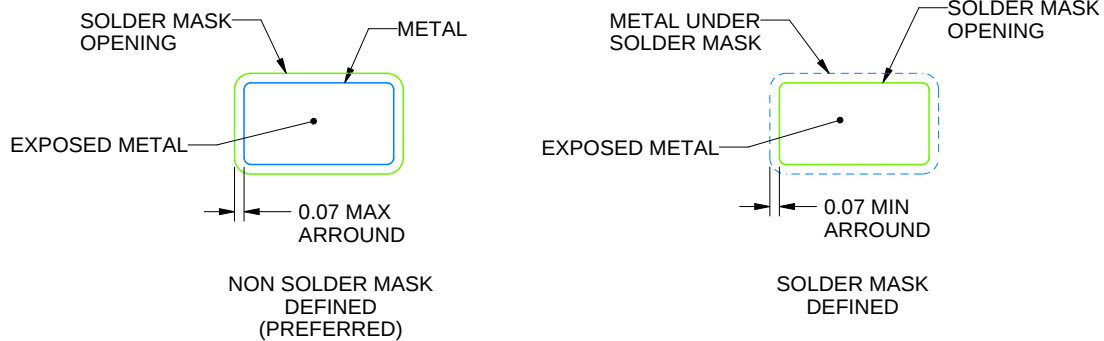


### SOT - 1.1 max height

4214835/B 04/2024



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:18X

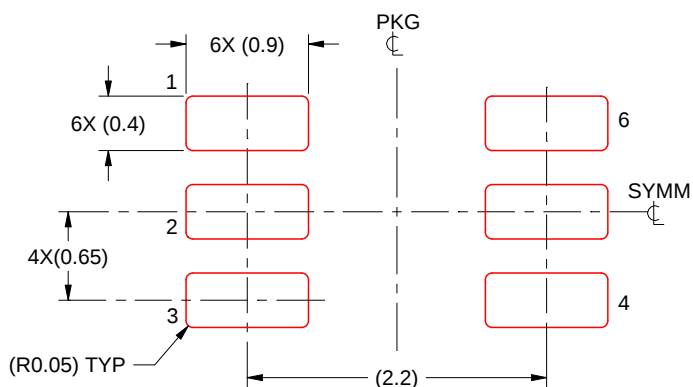


SOLDER MASK DETAILS

4214835/B 04/2024

NOTES: (continued)

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



SOLDER PASTE EXAMPLE  
BASED ON 0.125 THICK STENCIL  
SCALE:18X

4214835/B 04/2024

### NOTES: (continued)

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

## GENERIC PACKAGE VIEW

**DRY 6**

**USON - 0.6 mm max height**

PLASTIC SMALL OUTLINE - NO LEAD



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

4207181/G

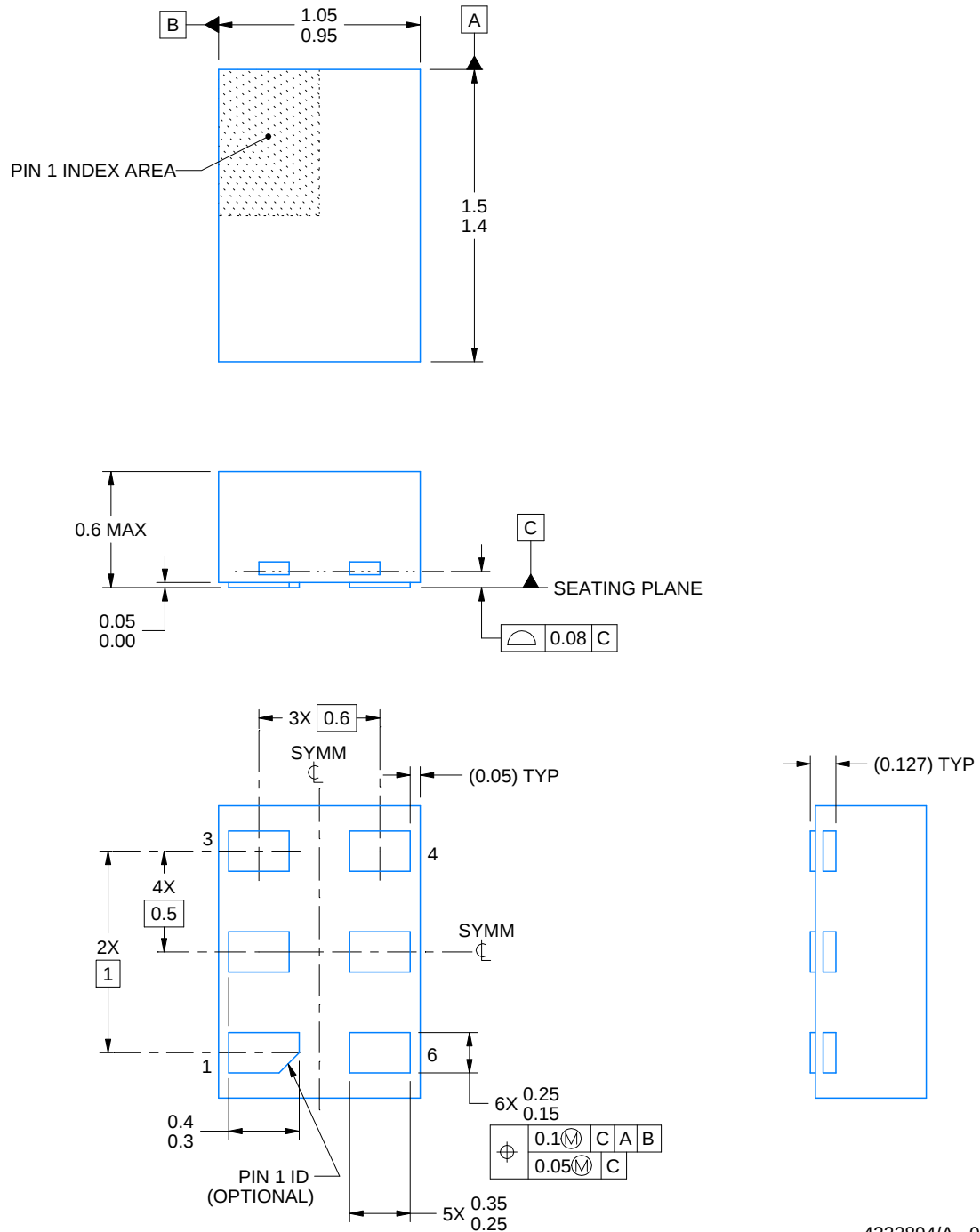
DRY0006A



## PACKAGE OUTLINE

USON - 0.6 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



4222894/A 01/2018

### 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.

# EXAMPLE BOARD LAYOUT

DRY0006A

USON - 0.6 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



**LAND PATTERN EXAMPLE**  
1:1 RATIO WITH PKG SOLDER PADS  
EXPOSED METAL SHOWN  
SCALE:40X



**SOLDER MASK DETAILS**

4222894/A 01/2018

NOTES: (continued)

3. For more information, see QFN/SON PCB application report in literature No. SLUA271 ([www.ti.com/lit/sluea271](http://www.ti.com/lit/sluea271)).

## EXAMPLE STENCIL DESIGN

DRY0006A

USON - 0.6 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.075 - 0.1 mm THICK STENCIL  
SCALE:40X

4222894/A 01/2018

NOTES: (continued)

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

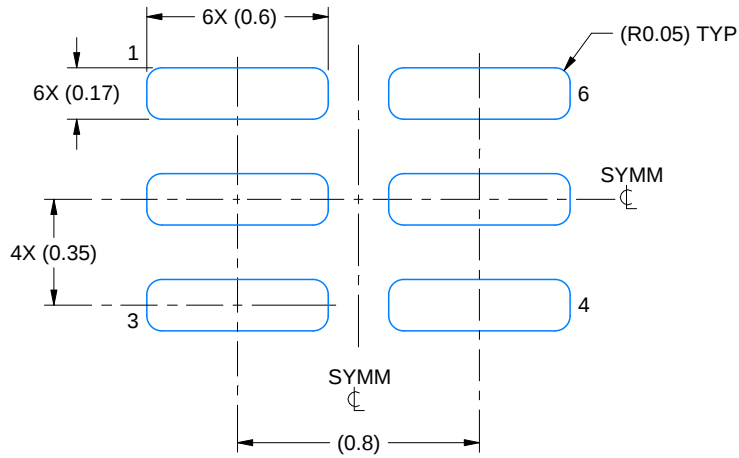


# EXAMPLE BOARD LAYOUT

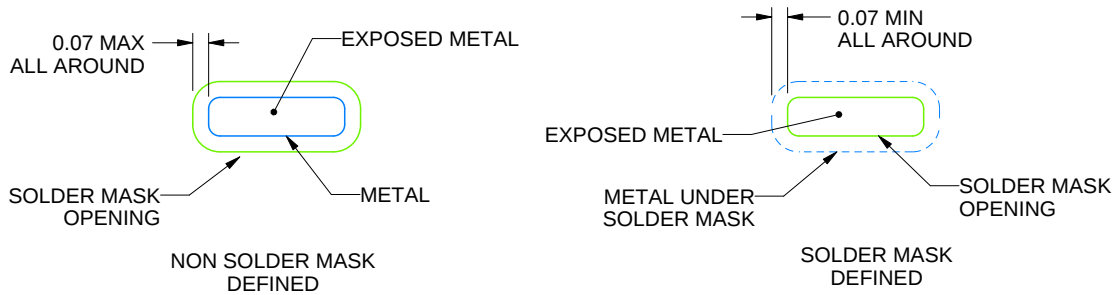
DSF0006A

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE:40X



SOLDER MASK DETAILS

4220597/B 06/2022

NOTES: (continued)

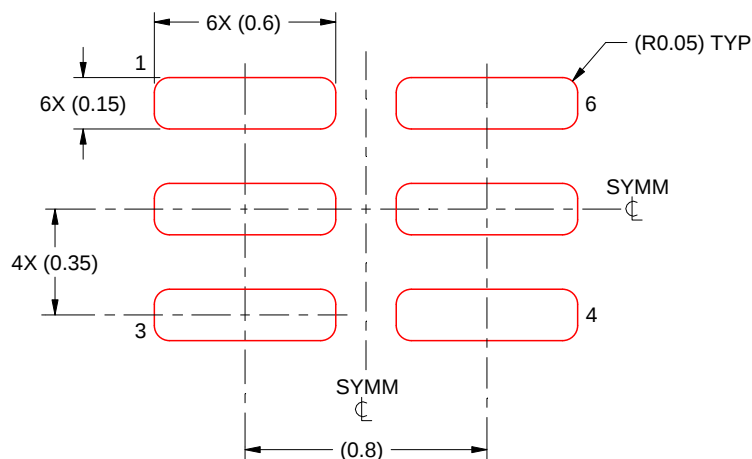
4. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/sluea271](http://www.ti.com/lit/sluea271)).

## EXAMPLE STENCIL DESIGN

DSF0006A

X2SON - 0.4 mm max height

PLASTIC SMALL OUTLINE - NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.09 mm THICK STENCIL

PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE  
SCALE:40X

4220597/B 06/2022

4. 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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