

SN74AUP2G07 Low-Power Dual Buffer/Driver With Open-Drain Outputs

1 Features

- Low static-power consumption ($I_{CC} = 0.9 \mu\text{A}$ maximum)
- Low dynamic-power consumption ($C_{pd} = 1 \text{ pF}$ typical at 3.3 V)
- Low input capacitance ($C_i = 1.5 \text{ pF}$ typical)
- Low noise – overshoot and undershoot <math><10\%</math> of V_{CC}
- I_{off} supports live insertion, partial-power-down mode, and back-drive protection
- Input hysteresis allows slow input transition and better switching noise immunity at the input ($V_{hys} = 250 \text{ mV}$ typical at 3.3 V)
- 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
- $t_{pd} = 3.3 \text{ ns}$ 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
 - 4500-V human-body model
 - 1500-V charged-device model

2 Applications

- Active noise cancellation (ANC)
- Barcode scanners
- Blood pressure monitors
- CPAP machines
- Cable solutions
- DLP 3D machine vision, hyperspectral imaging, optical networking, and spectroscopy
- E-books and smartphones
- Embedded PCs
- Field transmitters: temperature or pressure sensor
- Fingerprint biometrics
- HVAC: heating, ventilating, and air conditioning
- Network-attached storage (NAS)
- Server motherboards and PSUs
- Software defined radios (SDR)
- TVs: high-definition (HDTV), LCD, and digital
- Video communication systems
- Wireless data access cards, headsets, keyboards, mice, and LAN cards
- X-ray: baggage scanners, medical, and dental

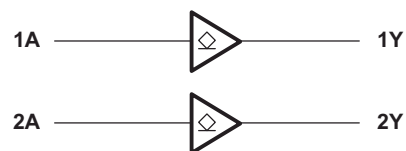
3 Description

The SN74AUP2G07 device is a dual buffer gate with open drain output that operates from 0.8 V to 3.6 V.

Device Information

| PART NUMBER | PACKAGE ⁽¹⁾ | BODY SIZE (NOM) |
|-------------|------------------------|-------------------|
| SN74AUP2G07 | SC70 (6) | 3.00 mm × 1.25 mm |
| | SON (6) | 1.45 mm × 1.00 mm |
| | SON (6) | 1.00 mm × 1.00 mm |
| | DSBGA (6) | 1.16 mm × 0.76 mm |

(1) For all available packages, see the orderable addendum at the end of the data sheet.



Simplified Block Diagram



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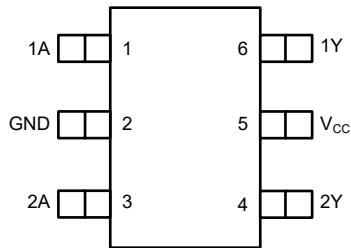
| | | | |
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4 Revision History

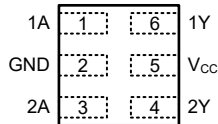
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| Changes from Revision D (February 2016) to Revision E (October 2021) | Page |
|--|------|
| • Changed pinout images style and formatting, removed overlapping letters in YZP package drawing, corrected BGA pin numbers in the <i>Pin Functions</i> table, changed V_{CC} and GND pin TYPE From: "—" To: "P" in the <i>Pin Functions</i> table and added footnote to the <i>Pin Functions</i> table to define pin types..... | 3 |
| • Changed maximum output voltage in the low state in the Section 6.1 table to 4.6 V..... | 4 |
| • Changed the V_O Output voltage in the Section 6.3 table from ' V_{CC} ' to '3.6'..... | 5 |
| • Updated $R_{\theta JA}$ values to more accurately reflect device characteristics: YFP 132 to 125.4, DCK 252 to 302.4, DRY 234 to 338, DSF 300 to 372.5, added standard thermal characteristics for all packages ($R_{\theta JC(top)}$, $R_{\theta JB}$, Ψ_{JT} , Ψ_{JB} , $R_{\theta JC(bot)}$)..... | 5 |
| Changes from Revision C (November 2014) to Revision D (February 2016) | Page |
| • Changed the V_{CC} pin TYPE From: "I" To: "—" in the <i>Pin Functions</i> table..... | 3 |
| • Added "Junction temperature" to the Section 6.1 table..... | 4 |
| • Deleted the I_{OH} High-level output current from the Section 6.3 table..... | 5 |
| • Deleted V_{OH} PARAMETER from the Section 6.5 table, these specifications do not pertain to open drain devices..... | 6 |
| Changes from Revision B (September 2009) to Revision C (November 2014) | Page |
| • Removed <i>Ordering Information</i> table..... | 1 |
| • Added <i>Applications</i> , <i>Device Information</i> table, <i>Pin Functions</i> table, <i>Handling Ratings</i> table, <i>Thermal Information</i> table, <i>Typical Characteristics</i> , <i>Feature Description</i> section, <i>Device Functional Modes</i> , <i>Application and Implementation</i> section, <i>Power Supply Recommendations</i> section, <i>Layout</i> section, <i>Device and Documentation Support</i> section, and <i>Mechanical, Packaging, and Orderable Information</i> section..... | 1 |
| • Updated I_{off} in <i>Features</i> | 1 |

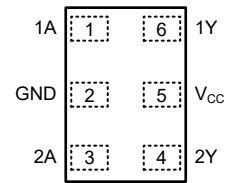
5 Pin Configuration and Functions



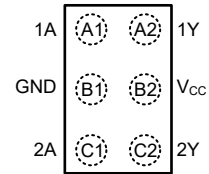
**Figure 5-1. DCK Package
6-Pin SC70
Top View**



**Figure 5-3. DSF Package
6-Pin SON
Transparent Top View**



**Figure 5-2. DRY Package
6-Pin SON
Transparent Top View**



**Figure 5-4. YFP Package
6-Pin DSBGA
Transparent Top View**

See the mechanical drawings for dimensions.

Table 5-1. Pin Functions

| NAME | PIN | | TYPE ⁽¹⁾ | DESCRIPTION |
|-----------------|-----------------------|-----------|---------------------|-------------|
| | DCK, DSF, DRY, YFP | (BGA) YFP | | |
| 1A | 1 | A1 | I | Input 1 |
| 1Y | 6 | A2 | O | Output 1 |
| 2A | 3 | C1 | I | Input 2 |
| 2Y | 4 | C2 | O | Output 2 |
| GND | 2 | B1 | P | Ground |
| V _{CC} | 5 | B2 | P | Power Pin |

(1) I = Input, O = Output, P = Power

6 Specifications

6.1 Absolute Maximum Ratings

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 ⁽¹⁾ | -0.5 | 4.6 | V |
| V _O | Voltage range applied to any output in the high-impedance or power-off state ⁽¹⁾ | -0.5 | 4.6 | V |
| V _O | Output voltage range in the low state ⁽¹⁾ | -0.5 | 4.6 | 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 |
| T _J | Junction temperature | | | 150 °C |
| T _{stg} | Storage temperature range | -65 | 150 | °C |

(1) The input negative-voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.

6.2 ESD Ratings

| | | VALUE | UNIT |
|--------------------|-------------------------|--|-------|
| V _(ESD) | Electrostatic discharge | Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 ⁽¹⁾ | ±4500 |
| | | Charged-device model (CDM), per JEDEC specification JESD22-C101 ⁽²⁾ | ±1500 |

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 500-V HBM is possible with the necessary precautions.

(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process. Manufacturing with less than 250-V CDM is possible with the necessary precautions.

6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)⁽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 | 3.6 | V |
| I _{OL} | Low-level output current | V _{CC} = 0.8 V | 20 | μA |
| | | V _{CC} = 1.1 V | 1.1 | |
| | | 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](#).

6.4 Thermal Information

| THERMAL METRIC ⁽¹⁾ | YFP | DCK | DRY | DSF | UNIT | |
|-------------------------------|--|--------|--------|--------|-------|------|
| | 6 PINS | 6 PINS | 6 PINS | 6 PINS | | |
| R _{θJA} | Junction-to-ambient thermal resistance | 125.4 | 302.4 | 338.0 | 372.5 | °C/W |
| R _{θJC(top)} | Junction-to-case (top) thermal resistance | 1.9 | 219.5 | 228.9 | 179.9 | °C/W |
| R _{θJB} | Junction-to-board thermal resistance | 37.2 | 106.7 | 203.5 | 231.2 | °C/W |
| Ψ _{JT} | Junction-to-top characterization parameter | 0.5 | 84.2 | 62.4 | 28.6 | °C/W |
| Ψ _{JB} | Junction-to-board characterization parameter | 37.5 | 106.0 | 203.6 | 230.9 | °C/W |
| R _{θJC(bot)} | Junction-to-case (bottom) thermal resistance | N/A | N/A | N/A | N/A | °C/W |

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

6.5 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 _{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 | | | 0.1 | | 0.5 | μA |
| I _{off} | | V _I or V _O = 0 V to 3.6 V | | | 0.2 | | 0.6 | μA |
| ΔI _{off} | | V _I or V _O = 0 V to 3.6 V | | | 0.2 | | 0.6 | μA |
| I _{CC} | | V _I = GND or (V _{CC} to 3.6 V), I _O = 0 | | | 0.5 | | 0.9 | μA |
| ΔI _{CC} | | V _I = V _{CC} – 0.6 V ⁽¹⁾ , I _O = 0 | | | 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.

6.6 Switching Characteristics, $C_L = 5\text{ pF}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 7-1](#) and [Figure 7-2](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V_{CC} | $T_A = 25^\circ\text{C}$ | | | $T_A = -40^\circ\text{C}$ to 85°C | | UNIT |
|-----------|--------------|-------------|----------------------------------|--------------------------|-----|-----|---|------|------|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| t_{pd} | A | Y | 0.8 V | 12.2 | | | | | ns |
| | | | $1.2\text{ V} \pm 0.1\text{ V}$ | 3.4 | 5.1 | 7.5 | 1.5 | 14.7 | |
| | | | $1.5\text{ V} \pm 0.1\text{ V}$ | 2.3 | 3.6 | 5.1 | 1.3 | 8.3 | |
| | | | $1.8\text{ V} \pm 0.15\text{ V}$ | 2.4 | 3.1 | 4 | 1 | 6.3 | |
| | | | $2.5\text{ V} \pm 0.2\text{ V}$ | 1.5 | 2.1 | 2.9 | 0.9 | 4.1 | |
| | | | $3.3\text{ V} \pm 0.3\text{ V}$ | 1.8 | 2.2 | 2.8 | 1.1 | 3.3 | |

6.7 Switching Characteristics, $C_L = 10\text{ pF}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 7-1](#) and [Figure 7-2](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V_{CC} | $T_A = 25^\circ\text{C}$ | | | $T_A = -40^\circ\text{C}$ to 85°C | | UNIT |
|-----------|--------------|-------------|----------------------------------|--------------------------|-----|-----|---|------|------|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| t_{pd} | A | Y | 0.8 V | 15 | | | | | ns |
| | | | $1.2\text{ V} \pm 0.1\text{ V}$ | 4 | 6.2 | 9 | 2.4 | 16.2 | |
| | | | $1.5\text{ V} \pm 0.1\text{ V}$ | 3.1 | 4.4 | 6.1 | 2 | 9.4 | |
| | | | $1.8\text{ V} \pm 0.15\text{ V}$ | 3.3 | 3.9 | 4.8 | 1.6 | 7.1 | |
| | | | $2.5\text{ V} \pm 0.2\text{ V}$ | 2.1 | 2.8 | 3.5 | 1.3 | 4.8 | |
| | | | $3.3\text{ V} \pm 0.3\text{ V}$ | 2.3 | 3 | 4 | 1.4 | 4.5 | |

6.8 Switching Characteristics, $C_L = 15\text{ pF}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 7-1](#) and [Figure 7-2](#))

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V_{CC} | $T_A = 25^\circ\text{C}$ | | | $T_A = -40^\circ\text{C}$ to 85°C | | UNIT |
|-----------|--------------|-------------|----------------------------------|--------------------------|-----|------|---|------|------|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| t_{pd} | A | Y | 0.8 V | 18.2 | | | | | ns |
| | | | $1.2\text{ V} \pm 0.1\text{ V}$ | 4.9 | 7.3 | 10.4 | 3.2 | 17.6 | |
| | | | $1.5\text{ V} \pm 0.1\text{ V}$ | 3.8 | 5.2 | 6.8 | 2.6 | 10.2 | |
| | | | $1.8\text{ V} \pm 0.15\text{ V}$ | 3.4 | 4.8 | 6.7 | 2.2 | 7.9 | |
| | | | $2.5\text{ V} \pm 0.2\text{ V}$ | 2.4 | 3.4 | 4.5 | 1.9 | 5.3 | |
| | | | $3.3\text{ V} \pm 0.3\text{ V}$ | 2.2 | 3.7 | 5.4 | 1.8 | 6.1 | |

6.9 Switching Characteristics, $C_L = 30\text{ pF}$

over recommended operating free-air temperature range (unless otherwise noted) (see [Figure 7-1](#) and [Figure 7-2](#))

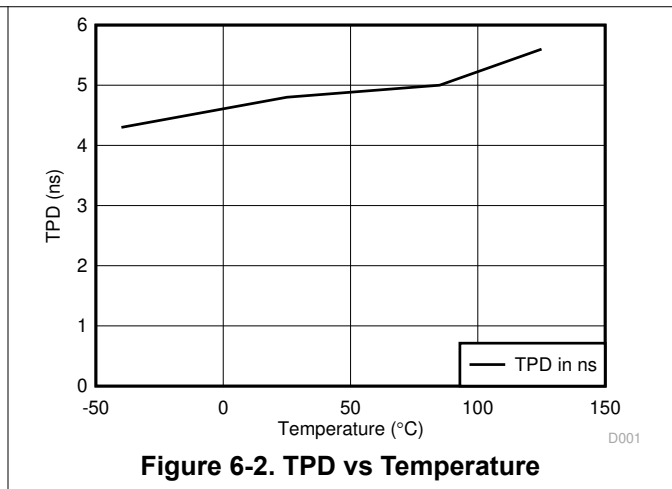
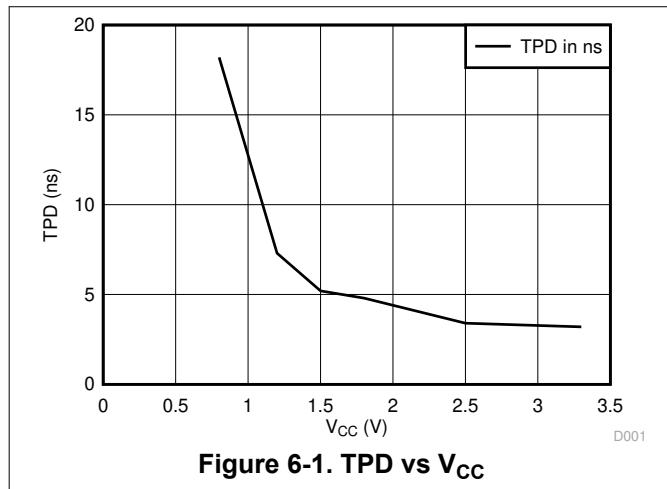
| PARAMETER | FROM (INPUT) | TO (OUTPUT) | V_{CC} | $T_A = 25^\circ\text{C}$ | | | $T_A = -40^\circ\text{C}$ to 85°C | | UNIT |
|-----------|--------------|-------------|----------------------------------|--------------------------|------|------|---|------|------|
| | | | | MIN | TYP | MAX | MIN | MAX | |
| t_{pd} | A | Y | 0.8 V | 26.5 | | | | | ns |
| | | | $1.2\text{ V} \pm 0.1\text{ V}$ | 8.1 | 10.7 | 14.4 | 4.5 | 21.9 | |
| | | | $1.5\text{ V} \pm 0.1\text{ V}$ | 6.5 | 7.7 | 9.4 | 3.8 | 13 | |
| | | | $1.8\text{ V} \pm 0.15\text{ V}$ | 5.8 | 7.5 | 9.7 | 3.2 | 11 | |
| | | | $2.5\text{ V} \pm 0.2\text{ V}$ | 4.5 | 5.4 | 6.7 | 3 | 7.1 | |
| | | | $3.3\text{ V} \pm 0.3\text{ V}$ | 3.9 | 6.3 | 9.7 | 2.8 | 10.4 | |

6.10 Operating Characteristics

T_A = 25°C

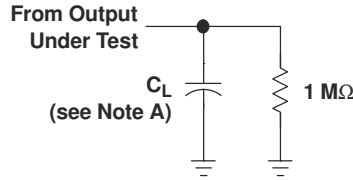
| PARAMETER | | TEST CONDITIONS | V _{CC} | TYP | UNIT |
|-----------------|-------------------------------|-----------------|-----------------|-----|------|
| C _{pd} | Power dissipation capacitance | f = 10 MHz | 0.8 V | 4 | pF |
| | | | 1.2 V ± 0.1 V | 4 | |
| | | | 1.5 V ± 0.1 V | 4 | |
| | | | 1.8 V ± 0.15 V | 4 | |
| | | | 2.5 V ± 0.2 V | 4.1 | |
| | | | 3.3 V ± 0.3 V | 4.3 | |

6.11 Typical Characteristics



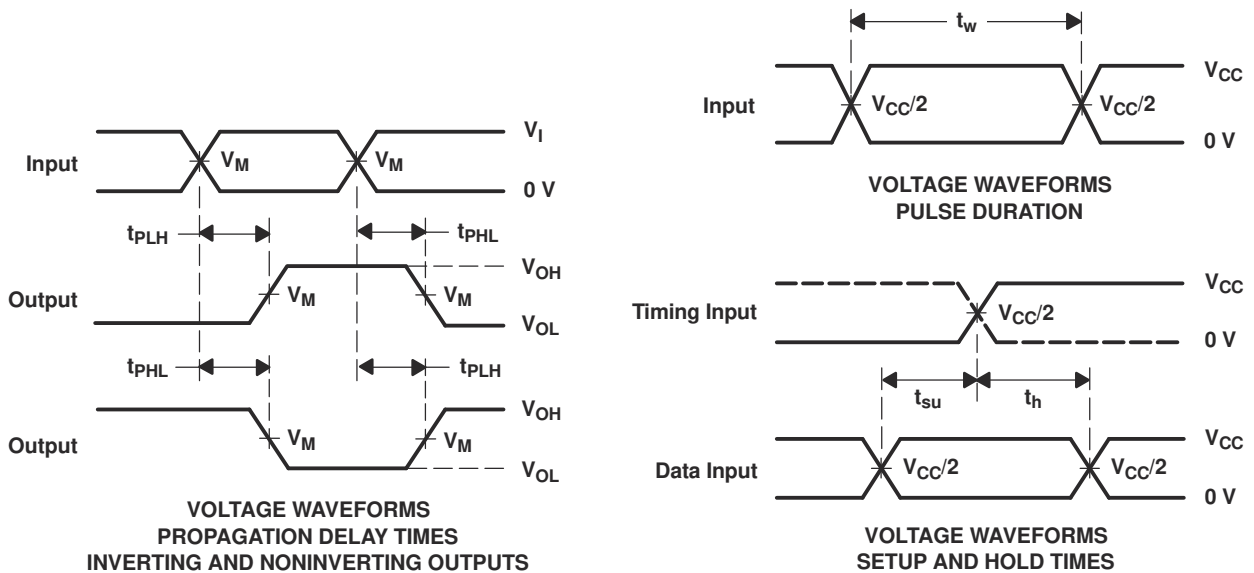
7 Parameter Measurement Information

7.1 Propagation Delays, Setup and Hold Times, and Pulse Duration



LOAD CIRCUIT

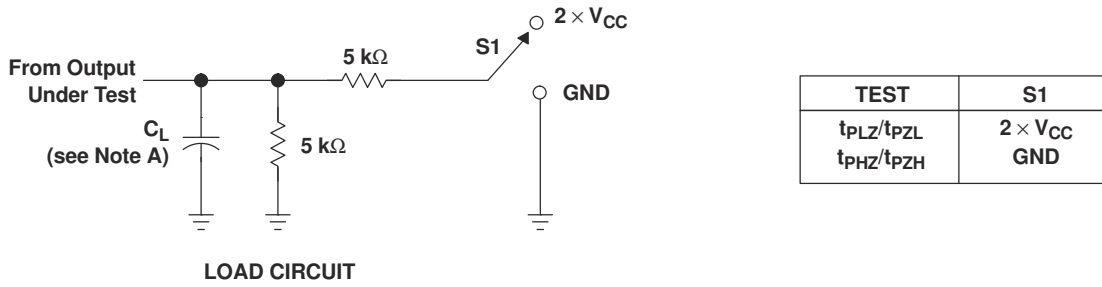
| | $V_{CC} = 0.8\text{ V}$ | $V_{CC} = 1.2\text{ V}$ $\pm 0.1\text{ V}$ | $V_{CC} = 1.5\text{ V}$ $\pm 0.1\text{ V}$ | $V_{CC} = 1.8\text{ V}$ $\pm 0.15\text{ V}$ | $V_{CC} = 2.5\text{ V}$ $\pm 0.2\text{ V}$ | $V_{CC} = 3.3\text{ V}$ $\pm 0.3\text{ V}$ |
|-------|-------------------------|---|---|--|---|---|
| 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} |



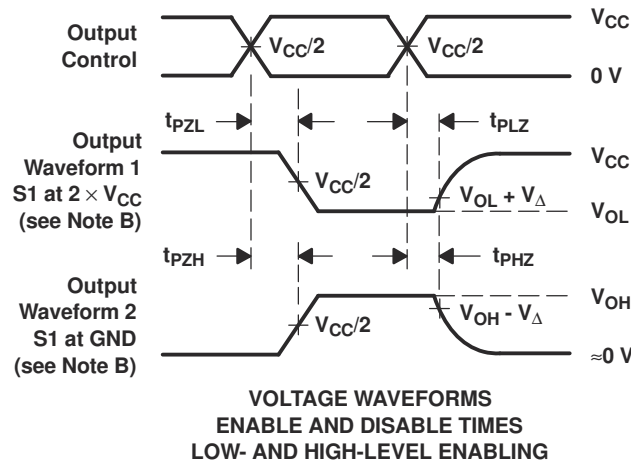
- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r/t_f = 3\text{ ns}$.
 - C. The outputs are measured one at a time, with one transition per measurement.
 - D. t_{PLH} and t_{PHL} are the same as t_{pd} .
 - E. All parameters and waveforms are not applicable to all devices.

Figure 7-1. Load Circuit and Voltage Waveforms

7.2 Enable and Disable Times



| | $V_{CC} = 0.8 \text{ V}$ | $V_{CC} = 1.2 \text{ V} \pm 0.1 \text{ V}$ | $V_{CC} = 1.5 \text{ V} \pm 0.1 \text{ V}$ | $V_{CC} = 1.8 \text{ V} \pm 0.15 \text{ V}$ | $V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$ | $V_{CC} = 3.3 \text{ V} \pm 0.3 \text{ V}$ |
|--------------|--------------------------|--|--|---|--|--|
| 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_{Δ} | 0.1 V | 0.1 V | 0.1 V | 0.15 V | 0.15 V | 0.3 V |



- 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. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r/t_f = 3 \text{ ns}$.
 - 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_{PZL} and t_{PZH} are the same as t_{en} .
 - G. All parameters and waveforms are not applicable to all devices.

Figure 7-2. Load Circuit and Voltage Waveforms

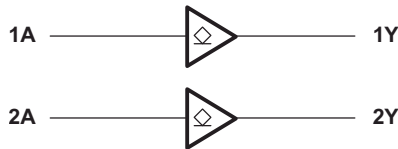
8 Detailed Description

8.1 Overview

The SN74AUP2G07 device is a dual buffer gate with open-drain outputs that operate from 0.8 V to 3.6 V. The output of this dual buffer/driver is open-drain, and can be connected to other open-drain outputs to implement active-low wired-OR or active-high wired-AND functions.

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. The I_{off} feature also allows for live insertion.

8.2 Functional Block Diagram



8.3 Feature Description

- Wide operating V_{CC} range of 0.8 V to 3.6 V
- 3.6-V I/O tolerant to support down translation
- Input hysteresis allows slow input transition and better switching noise immunity at the input
- I_{off} feature allows voltages on the inputs and outputs when V_{CC} is 0 V
- Low noise due to slower edge rates

8.4 Device Functional Modes

Table 8-1 is the function table for SN74AUP2G07.

Table 8-1. Function Table

| INPUT ⁽¹⁾ A | OUTPUT ⁽²⁾ Y |
|---------------------------|----------------------------|
| H | Z |
| L | L |

(1) L = Input low, H = Input high

(2) L = Output low, Z = High impedance

9 Application and Implementation

Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

9.1 Application Information

The AUP family is TI's premier solution to the industry's low-power needs in battery-powered portable applications. This family ensures 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. This product also maintains excellent signal integrity. It has a small amount of hysteresis built in, allowing for slower or noisy input signals. The lowered drive produces slower edges and prevents overshoot and undershoot on the outputs.

9.2 Typical Application

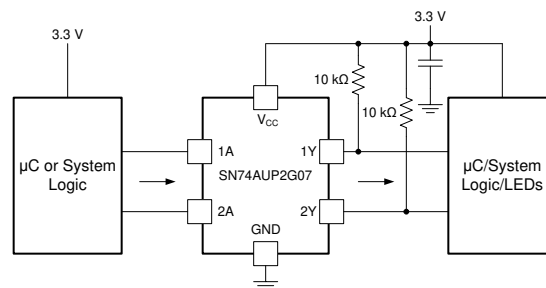


Figure 9-1. Typical Application Schematic

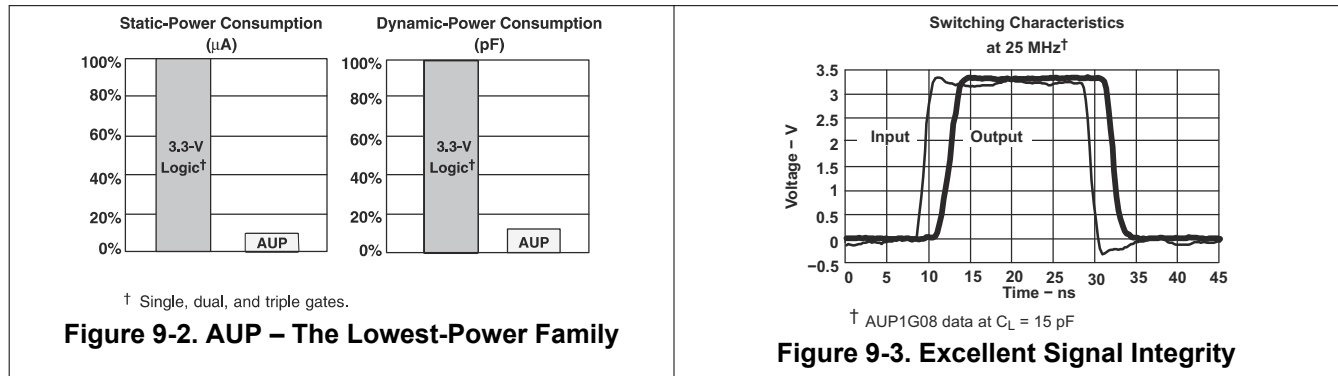
9.2.1 Design Requirements

This device uses CMOS technology and has balanced output drive. Care should be taken to avoid bus contention because it can drive currents that would exceed maximum limits.

9.2.2 Detailed Design Procedure

- Recommended Input Conditions:
 - For rise time and fall time specifications, see $\Delta t/\Delta V$ in the [Section 6.3](#) table.
 - For specified high and low levels. See V_{IH} and V_{IL} in the [Section 6.3](#) table.
 - Inputs are overvoltage tolerant allowing them to go as high as 3.6 V at any valid V_{CC} .
- Recommend Output Conditions:
 - Load currents should not exceed 20 mA on the output and 50 mA total for the part.

9.2.3 Application Curves



The AUP family of single gate logic makes excellent translators for the new lower voltage microprocessors that typically are powered from 0.8 V to 1.2 V. They can drop the voltage of peripheral drivers and accessories that are still powered by 3.3 V to the new uC power levels.

10 Power Supply Recommendations

The power supply can be any voltage between the Min and Max supply voltage rating located in the [Section 6.3](#) table.

Each V_{CC} pin should have a good bypass capacitor to prevent power disturbance. For devices with a single supply, 0.1 μF is recommended; if there are multiple V_{CC} pins, then 0.01 μF or 0.022 μF is recommended for each power pin. It is acceptable to parallel multiple bypass capacitors to reject different frequencies of noise. A 0.1 μF and a 1 μF are commonly used in parallel. The bypass capacitor should be installed as close to the power pin as possible for best results.

11 Layout

11.1 Layout Guidelines

In many cases, functions or parts of functions of digital logic devices are unused, for example, when only two inputs of a triple-input AND gate are used, or when only 3 of the 4 buffer gates are used.

Such input pins should not be left unconnected because the undefined voltages at the outside connections result in undefined operational states. [Figure 11-1](#) specifies the rules that must be observed under all circumstances. All unused inputs of digital logic devices must be connected to a high or low bias to prevent them from floating. The logic level that should be applied to any particular unused input depends on the function of the device. Generally they will be tied to GND or V_{CC} , whichever makes more sense or is more convenient. It is acceptable to float outputs, unless the part is a transceiver. If the transceiver has an output enable pin, it will disable the output section of the part when asserted. This will not disable the input section of the I/Os, so they cannot float when disabled.

11.2 Layout Example

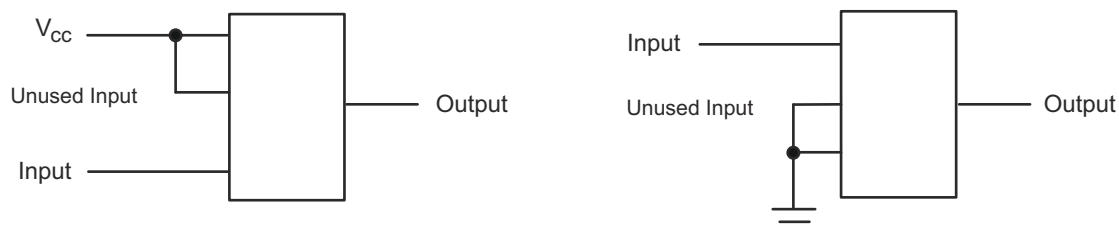


Figure 11-1. Layout Diagram

12 Device and Documentation Support

12.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

12.2 Support Resources

TI E2E™ [support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

12.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.

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12.4 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

12.5 Glossary

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

13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|------------------|---------------|--------------|-----------------|------|-------------|-----------------|--------------------------------------|----------------------|--------------|-------------------------|-------------------------|
| SN74AUP2G07DCKR | ACTIVE | SC70 | DCK | 6 | 3000 | RoHS & Green | NIPDAU SN | Level-1-260C-UNLIM | -40 to 85 | (H55, H5F) | Samples |
| SN74AUP2G07DRYR | ACTIVE | SON | DRY | 6 | 5000 | RoHS & Green | NIPDAU NIPDAUAG | Level-1-260C-UNLIM | -40 to 85 | H5 | Samples |
| SN74AUP2G07DSFR | ACTIVE | SON | DSF | 6 | 5000 | RoHS & Green | NIPDAU NIPDAUAG | Level-1-260C-UNLIM | -40 to 85 | H5 | Samples |
| SN74AUP2G07YFPR | ACTIVE | DSBGA | YFP | 6 | 3000 | RoHS & Green | SNAGCU | Level-1-260C-UNLIM | -40 to 85 | HVN | Samples |

(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.

OBSELETE: 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

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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AUP2G07DCKR | SC70 | DCK | 6 | 3000 | 180.0 | 8.4 | 2.3 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| SN74AUP2G07DRYR | SON | DRY | 6 | 5000 | 180.0 | 8.4 | 1.25 | 1.6 | 0.7 | 4.0 | 8.0 | Q1 |
| SN74AUP2G07DRYR | SON | DRY | 6 | 5000 | 180.0 | 9.5 | 1.15 | 1.6 | 0.75 | 4.0 | 8.0 | Q1 |
| SN74AUP2G07DSFR | SON | DSF | 6 | 5000 | 180.0 | 9.5 | 1.16 | 1.16 | 0.5 | 4.0 | 8.0 | Q2 |
| SN74AUP2G07YFPR | DSBGA | YFP | 6 | 3000 | 178.0 | 9.2 | 0.89 | 1.29 | 0.62 | 4.0 | 8.0 | Q1 |

TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AUP2G07DCKR | SC70 | DCK | 6 | 3000 | 210.0 | 185.0 | 35.0 |
| SN74AUP2G07DRYR | SON | DRY | 6 | 5000 | 202.0 | 201.0 | 28.0 |
| SN74AUP2G07DRYR | SON | DRY | 6 | 5000 | 184.0 | 184.0 | 19.0 |
| SN74AUP2G07DSFR | SON | DSF | 6 | 5000 | 184.0 | 184.0 | 19.0 |
| SN74AUP2G07YFPR | DSBGA | YFP | 6 | 3000 | 220.0 | 220.0 | 35.0 |

GENERIC PACKAGE VIEW

DRY 6

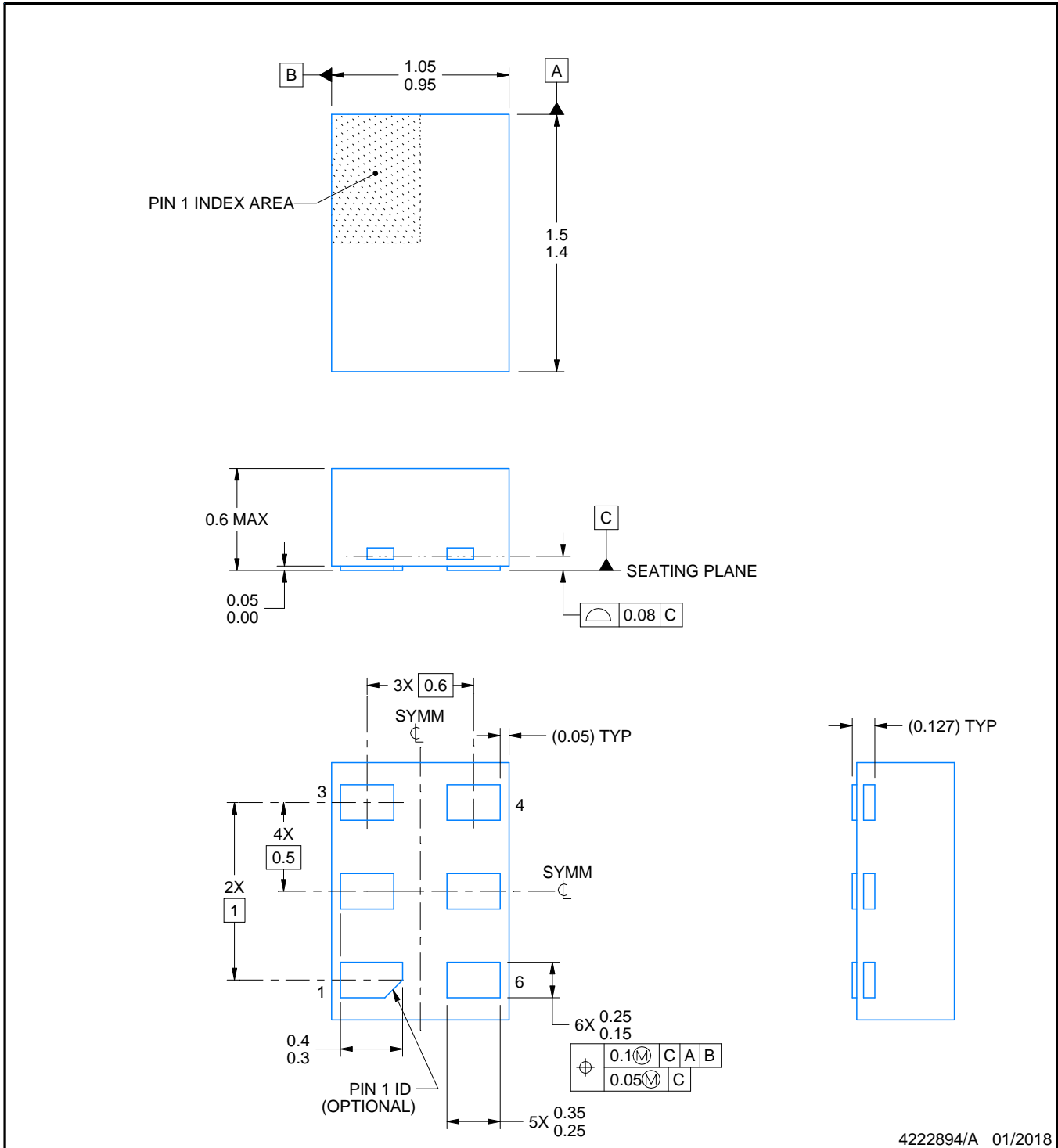
USON - 0.6 mm max height

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



NOTES:

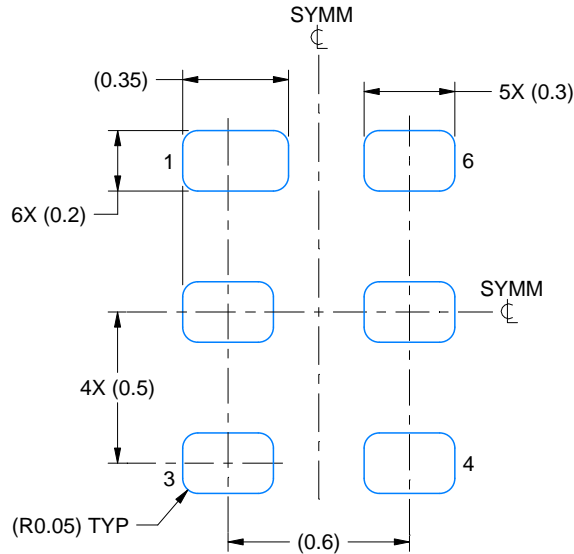
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

EXAMPLE BOARD LAYOUT

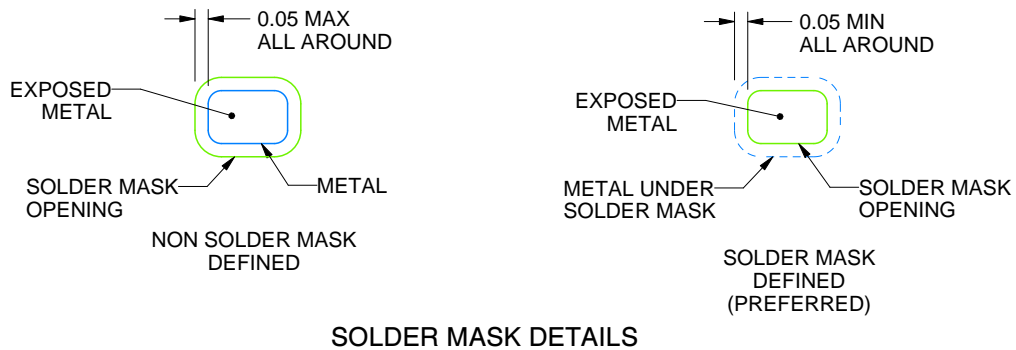
DRY0006A

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)

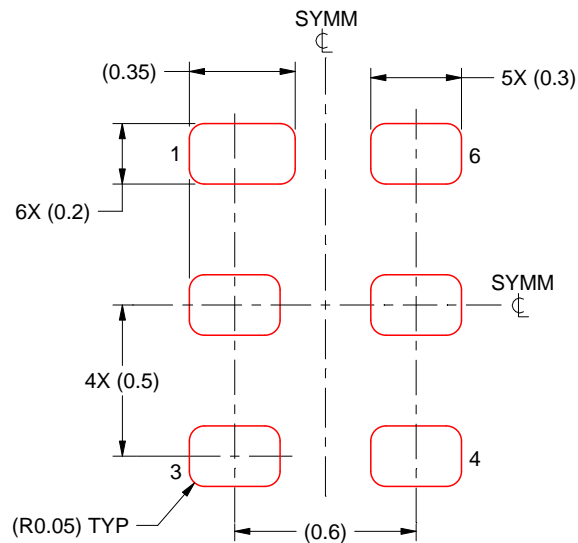
3. For more information, see QFN/SON PCB application report in literature No. SLUA271 (www.ti.com/lit/slue271).

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)

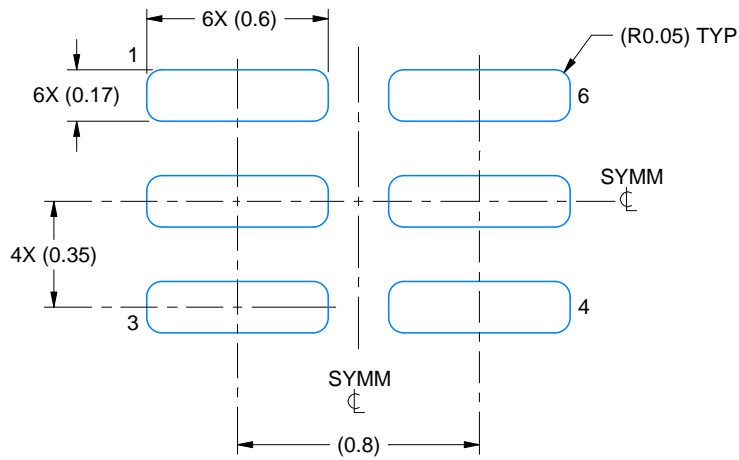
4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

EXAMPLE BOARD LAYOUT

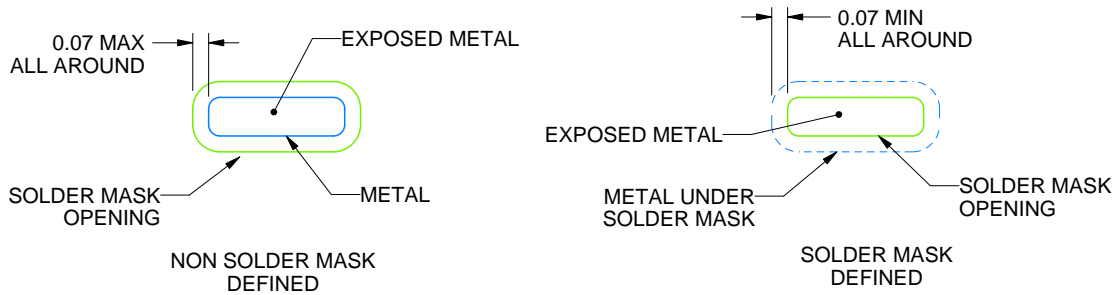
DSF0006A

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)

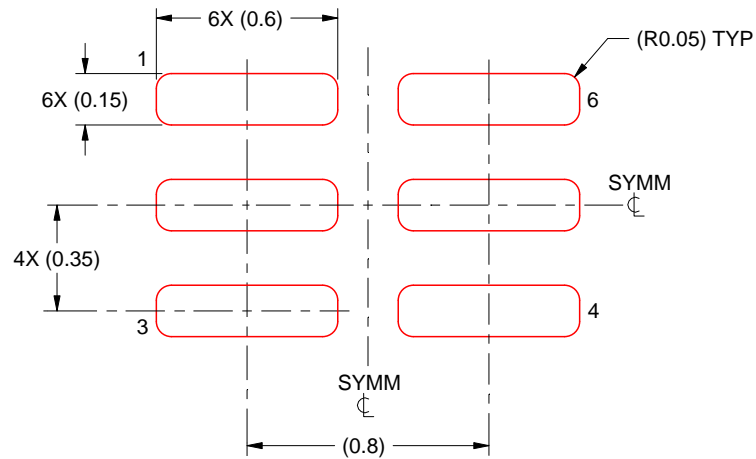
4. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).

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

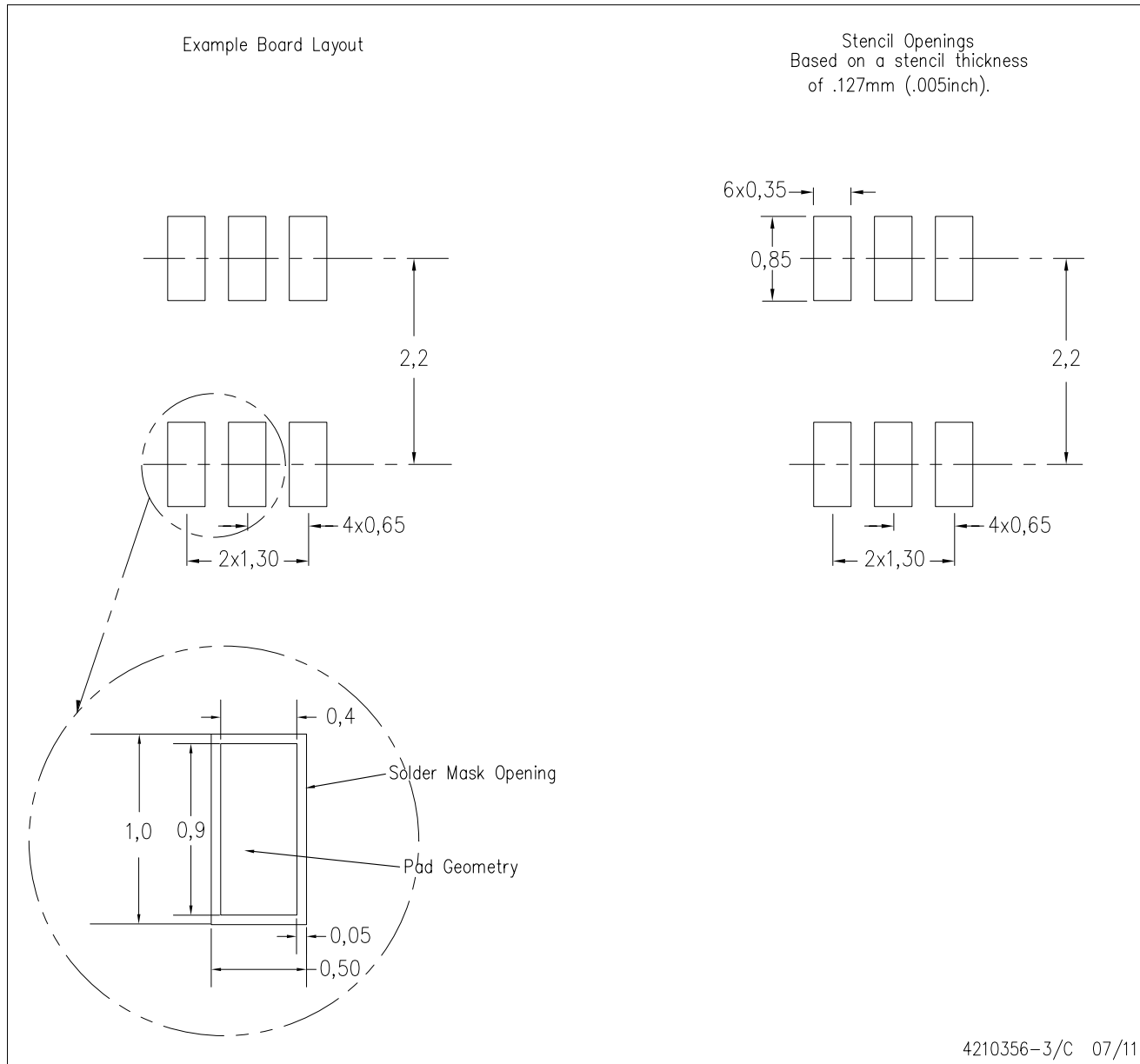
PRINTED SOLDER COVERAGE BY AREA UNDER PACKAGE
SCALE:40X

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.

DCK (R-PDSO-G6)

PLASTIC SMALL OUTLINE



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Example stencil design based on a 50% volumetric metal load solder paste. Refer to IPC-7525 for other stencil recommendations.

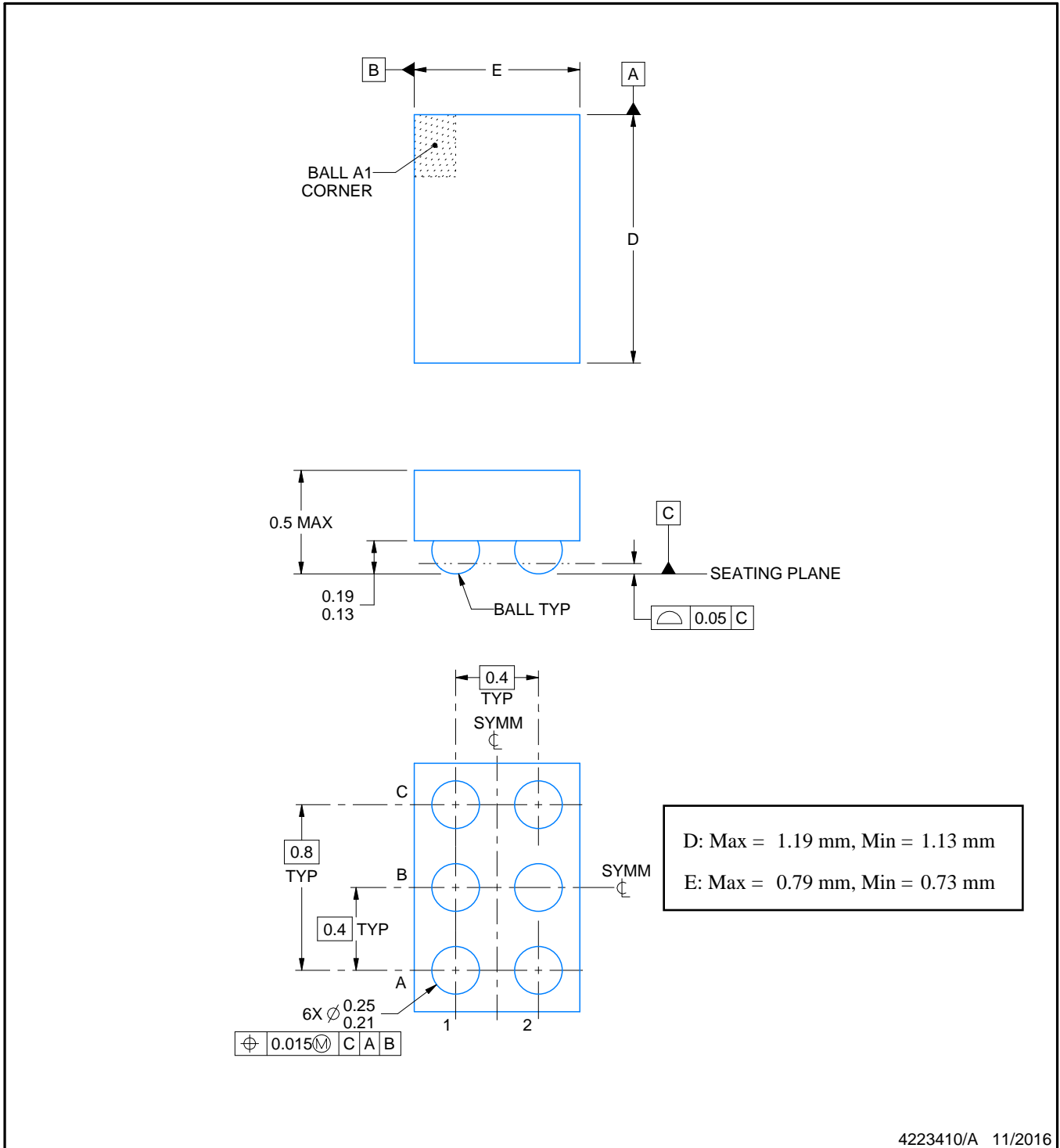
YFP0006



PACKAGE OUTLINE

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



4223410/A 11/2016

NOTES:

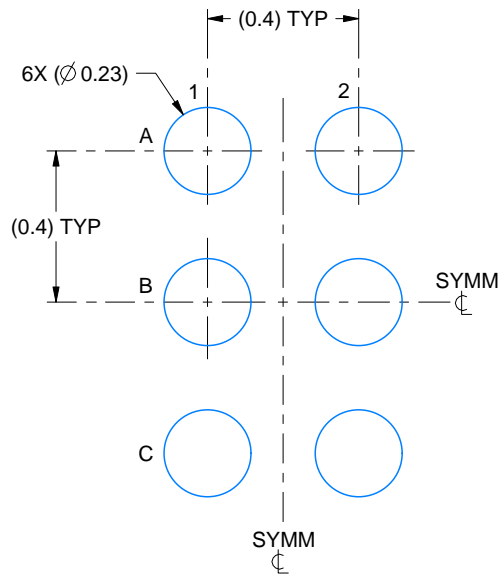
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.

EXAMPLE BOARD LAYOUT

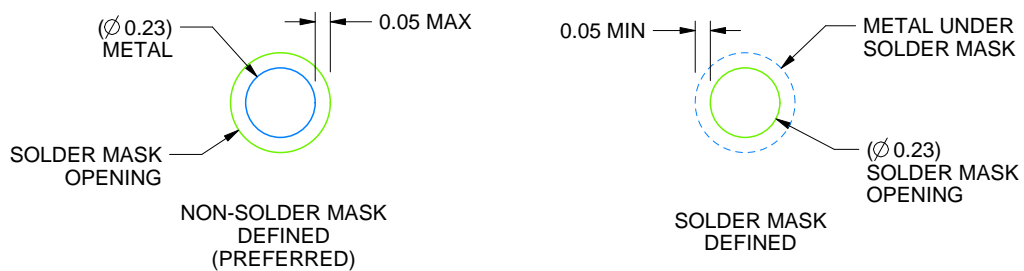
YFP0006

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



LAND PATTERN EXAMPLE
SCALE:50X



SOLDER MASK DETAILS
NOT TO SCALE

4223410/A 11/2016

NOTES: (continued)

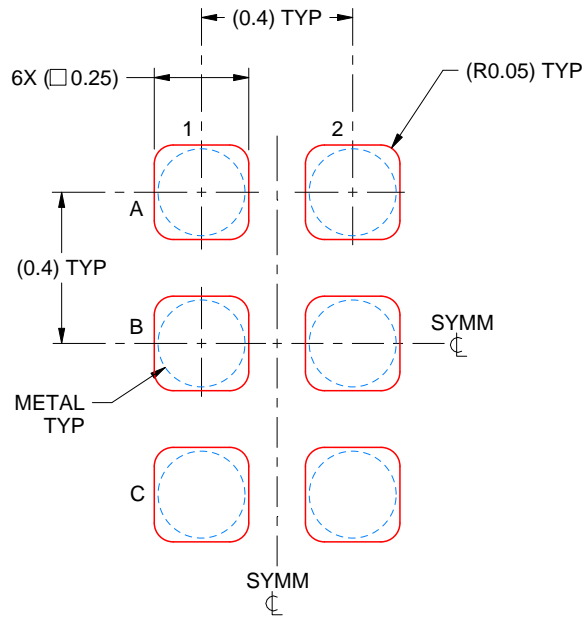
- Final dimensions may vary due to manufacturing tolerance considerations and also routing constraints. For more information, see Texas Instruments literature number SNVA009 (www.ti.com/lit/snva009).

EXAMPLE STENCIL DESIGN

YFP0006

DSBGA - 0.5 mm max height

DIE SIZE BALL GRID ARRAY



SOLDER PASTE EXAMPLE
BASED ON 0.1 mm THICK STENCIL
SCALE:50X

4223410/A 11/2016

NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release.

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