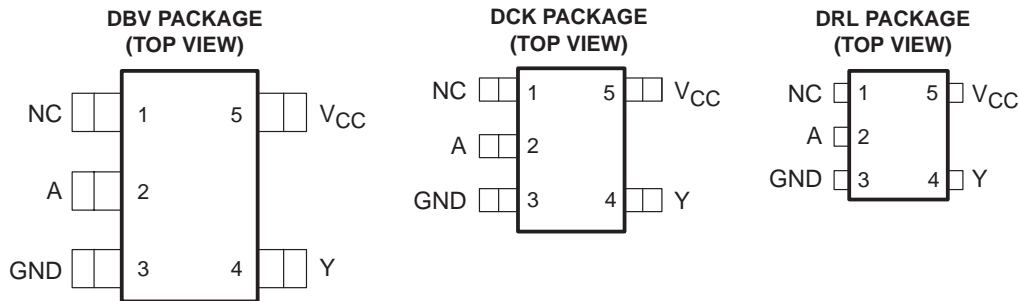


SN74AHC1G14 SINGLE SCHMITT-TRIGGER INVERTER GATE

SCLS321N – MARCH 1996 – REVISED JUNE 2005

- Operating Range of 2 V to 5.5 V
- Max t_{pd} of 10 ns at 5 V
- Low Power Consumption, 10- μ A Max I_{CC}
- ± 8 -mA Output Drive at 5 V
- Latch-Up Performance Exceeds 250 mA Per JESD 17



NC – No internal connection

See mechanical drawings for dimensions.

description/ordering information

The SN74AHC1G14 contains one inverter gate. The device performs the Boolean function $Y = \bar{A}$.

The device functions as an independent inverter gate, but because of the Schmitt action, gates may have different input threshold levels for positive- (V_{T+}) and negative-going (V_{T-}) signals.

ORDERING INFORMATION

| T_A | PACKAGE† | | ORDERABLE PART NUMBER | TOP-SIDE MARKING‡ |
|---------------|---------------------|--------------|-----------------------|-------------------|
| -40°C to 85°C | SOT (SOT-23) – DBV | Reel of 3000 | SN74AHC1G14DBVR | A14_ |
| | | Reel of 250 | SN74AHC1G14DBVT | |
| | SOT (SC-70) – DCK | Reel of 3000 | SN74AHC1G14DCKR | AF_ |
| | | Reel of 250 | SN74AHC1G14DCKT | |
| | SOT (SOT-553) – DRL | Reel or 4000 | SN74AHC1G14DRLR | AF_ |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

‡ The actual top-side marking has one additional character that designates the assembly/test site.

FUNCTION TABLE

| INPUT A | OUTPUT Y |
|------------|-------------|
| H | L |
| L | H |

logic diagram (positive logic)



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.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS
INSTRUMENTS**

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SN74AHC1G14

SINGLE SCHMITT-TRIGGER INVERTER GATE

SCLS321N – MARCH 1996 – REVISED JUNE 2005

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

| | |
|--|----------------------------|
| Supply voltage range, V_{CC} | –0.5 V to 7 V |
| Input voltage range, V_I (see Note 1) | –0.5 V to 7 V |
| Output voltage range, V_O (see Note 1) | –0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, I_{IK} ($V_I < 0$) | –20 mA |
| Output clamp current, I_{OK} ($V_O < 0$ or $V_O > V_{CC}$) | ±20 mA |
| Continuous output current, I_O ($V_O = 0$ to V_{CC}) | ±25 mA |
| Continuous current through V_{CC} or GND | ±50 mA |
| Package thermal impedance, θ_{JA} (see Note 2): | |
| DBV package | 206°C/W |
| DCK package | 252°C/W |
| DRL package | 142°C/W |
| Storage temperature range, T_{stg} | –65°C to 150°C |

† 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.

- NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
 2. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions (see Note 3)

| | | MIN | MAX | UNIT |
|----------|--------------------------------|------------------------------------|----------|------|
| V_{CC} | Supply voltage | 2 | 5.5 | V |
| V_I | Input voltage | 0 | 5.5 | V |
| V_O | Output voltage | 0 | V_{CC} | V |
| I_{OH} | High-level output current | $V_{CC} = 2$ V | –50 | µA |
| | | $V_{CC} = 3.3 \text{ V} \pm 0.3$ V | –4 | mA |
| | | $V_{CC} = 5 \text{ V} \pm 0.5$ V | –8 | |
| I_{OL} | Low-level output current | $V_{CC} = 2$ V | 50 | µA |
| | | $V_{CC} = 3.3 \text{ V} \pm 0.3$ V | 4 | mA |
| | | $V_{CC} = 5 \text{ V} \pm 0.5$ V | 8 | |
| T_A | Operating free-air temperature | –40 | 85 | °C |

NOTE 3: 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.



SN74AHC1G14

SINGLE SCHMITT-TRIGGER INVERTER GATE

SCLS321N – MARCH 1996 – REVISED JUNE 2005

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

| PARAMETER | TEST CONDITIONS | V _{CC} | T _A = 25°C | | | MIN | MAX | UNIT |
|--|---|-----------------|-----------------------|-----|------|------|------|------|
| | | | MIN | TYP | MAX | | | |
| V _{T+} Positive-going input threshold voltage | | 3 V | 1.2 | | 2.2 | 1.2 | 2.2 | V |
| | | 4.5 V | 1.75 | | 3.15 | 1.75 | 3.15 | |
| | | 5.5 V | 2.15 | | 3.85 | 2.15 | 3.85 | |
| V _{T-} Negative-going input threshold voltage | | 3 V | 0.9 | | 1.9 | 0.9 | 1.9 | V |
| | | 4.5 V | 1.35 | | 2.75 | 1.35 | 2.75 | |
| | | 5.5 V | 1.65 | | 3.35 | 1.65 | 3.35 | |
| ΔV _T Hysteresis (V _{T+} – V _{T-}) | | 3 V | 0.3 | | 1.2 | 0.3 | 1.2 | V |
| | | 4.5 V | 0.4 | | 1.4 | 0.4 | 1.4 | |
| | | 5.5 V | 0.5 | | 1.6 | 0.5 | 1.6 | |
| V _{OH} | I _{OH} = -50 μA | 2 V | 1.9 | 2 | | 1.9 | | V |
| | | 3 V | 2.9 | 3 | | 2.9 | | |
| | | 4.5 V | 4.4 | 4.5 | | 4.4 | | |
| | I _{OH} = -4 mA | 3 V | | | 2.58 | | 2.48 | |
| | I _{OH} = -8 mA | 4.5 V | | | 3.94 | | 3.8 | |
| V _{OL} | I _{OL} = 50 μA | 2 V | | | 0.1 | | 0.1 | V |
| | | 3 V | | | 0.1 | | 0.1 | |
| | | 4.5 V | | | 0.1 | | 0.1 | |
| | I _{OL} = 4 mA | 3 V | | | 0.36 | | 0.44 | |
| | I _{OL} = 8 mA | 4.5 V | | | 0.36 | | 0.44 | |
| I _I | V _I = 5.5 V or GND | 0 V to 5.5 V | | | ±0.1 | | ±1 | μA |
| I _{CC} | V _I = V _{CC} or GND, I _O = 0 | 5.5 V | | | 1 | | 10 | μA |
| C _i | V _I = V _{CC} or GND | 5 V | | 2 | 10 | | 10 | pF |

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | T _A = 25°C | | | MIN | MAX | UNIT |
|------------------|--------------|-------------|------------------------|-----------------------|------|------|-----|------|------|
| | | | | MIN | TYP | MAX | | | |
| t _{PLH} | A | Y | C _L = 15 pF | | 8.3 | 12.8 | 1 | 15 | ns |
| t _{PHL} | | | | | 8.3 | 12.8 | 1 | 15 | |
| t _{PLH} | A | Y | C _L = 50 pF | | 10.8 | 16.3 | 1 | 18.5 | ns |
| t _{PHL} | | | | | 10.8 | 16.3 | 1 | 18.5 | |

switching characteristics over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE | T _A = 25°C | | | MIN | MAX | UNIT |
|------------------|--------------|-------------|------------------------|-----------------------|-----|------|-----|-----|------|
| | | | | MIN | TYP | MAX | | | |
| t _{PLH} | A | Y | C _L = 15 pF | | 5.5 | 8.6 | 1 | 10 | ns |
| t _{PHL} | | | | | 5.5 | 8.6 | 1 | 10 | |
| t _{PLH} | A | Y | C _L = 50 pF | | 7 | 10.6 | 1 | 12 | ns |
| t _{PHL} | | | | | 7 | 10.6 | 1 | 12 | |



SN74AHC1G14

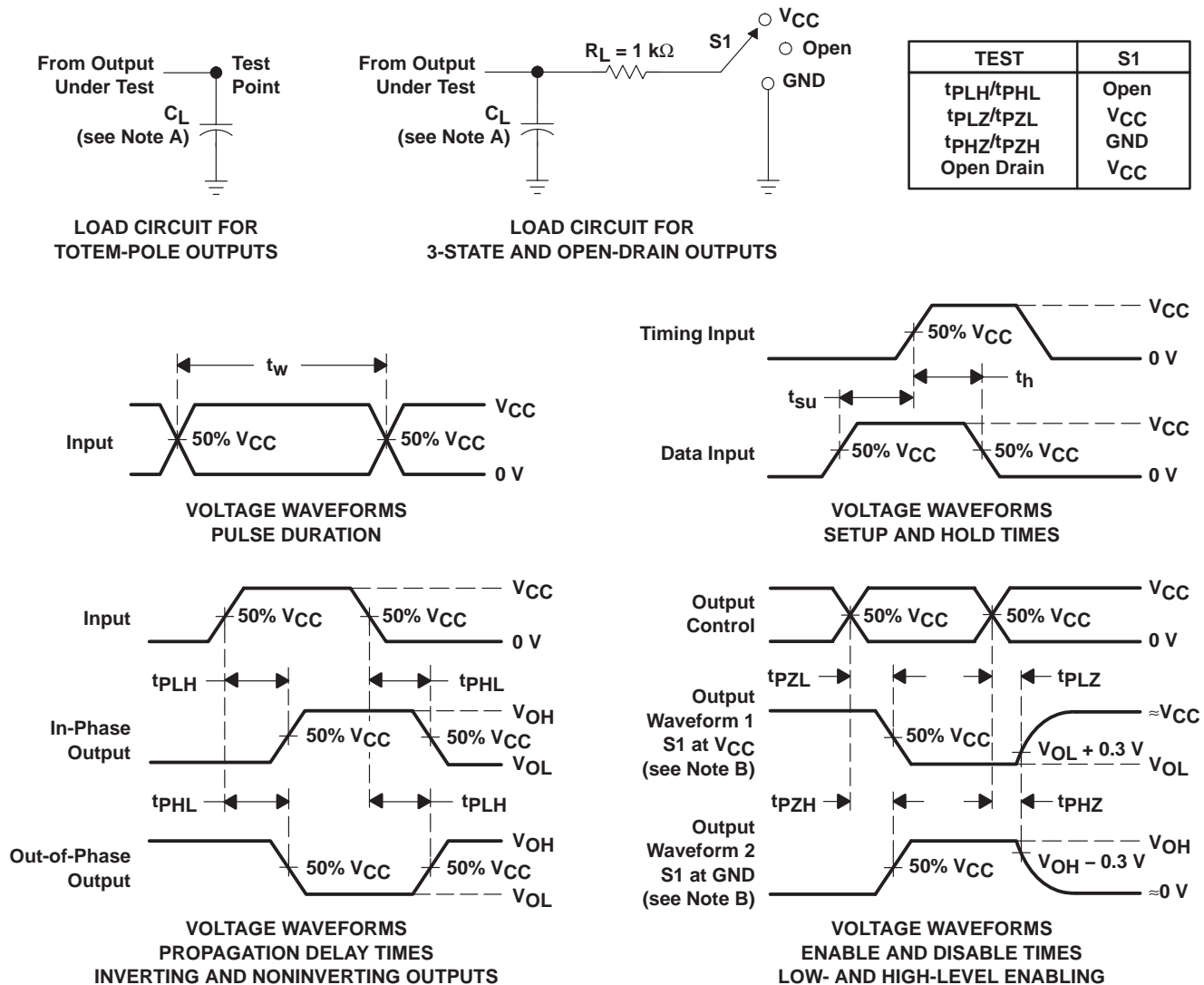
SINGLE SCHMITT-TRIGGER INVERTER GATE

SCLS321N – MARCH 1996 – REVISED JUNE 2005

operating characteristics, $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$

| PARAMETER | TEST CONDITIONS | TYP | UNIT |
|--|-----------------------------|-----|------|
| C_{pd} Power dissipation capacitance | No load, $f = 1\text{ MHz}$ | 9 | pF |

PARAMETER MEASUREMENT INFORMATION



- NOTES:
- C_L includes probe and jig capacitance.
 - Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
 - All input pulses are supplied by generators having the following characteristics: $PRR \leq 1\text{ MHz}$, $Z_O = 50\ \Omega$, $t_r \leq 3\text{ ns}$, $t_f \leq 3\text{ ns}$.
 - The outputs are measured one at a time with one input transition per measurement.
 - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuit and Voltage Waveforms

PACKAGING INFORMATION

| Orderable Device | Status ⁽¹⁾ | Package Type | Package Drawing | Pins | Package Qty | Eco Plan ⁽²⁾ | Lead/ Ball Finish | MSL Peak Temp ⁽³⁾ | Samples (Requires Login) |
|-------------------|-----------------------|--------------|-----------------|------|-------------|----------------------------|----------------------|------------------------------|-----------------------------|
| SN74AHC1G14DBVR | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DBVRE4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DBVRG4 | ACTIVE | SOT-23 | DBV | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DBVT | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DBVTE4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DBVTG4 | ACTIVE | SOT-23 | DBV | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DCKR | ACTIVE | SC70 | DCK | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DCKRE4 | ACTIVE | SC70 | DCK | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DCKRG4 | ACTIVE | SC70 | DCK | 5 | 3000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DCKT | ACTIVE | SC70 | DCK | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DCKTE4 | ACTIVE | SC70 | DCK | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DCKTG4 | ACTIVE | SC70 | DCK | 5 | 250 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DRLR | ACTIVE | SOT | DRL | 5 | 4000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |
| SN74AHC1G14DRLRG4 | ACTIVE | SOT | DRL | 5 | 4000 | Green (RoHS & no Sb/Br) | CU NIPDAU | Level-1-260C-UNLIM | |

⁽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⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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TAPE AND REEL INFORMATION
REEL DIMENSIONS

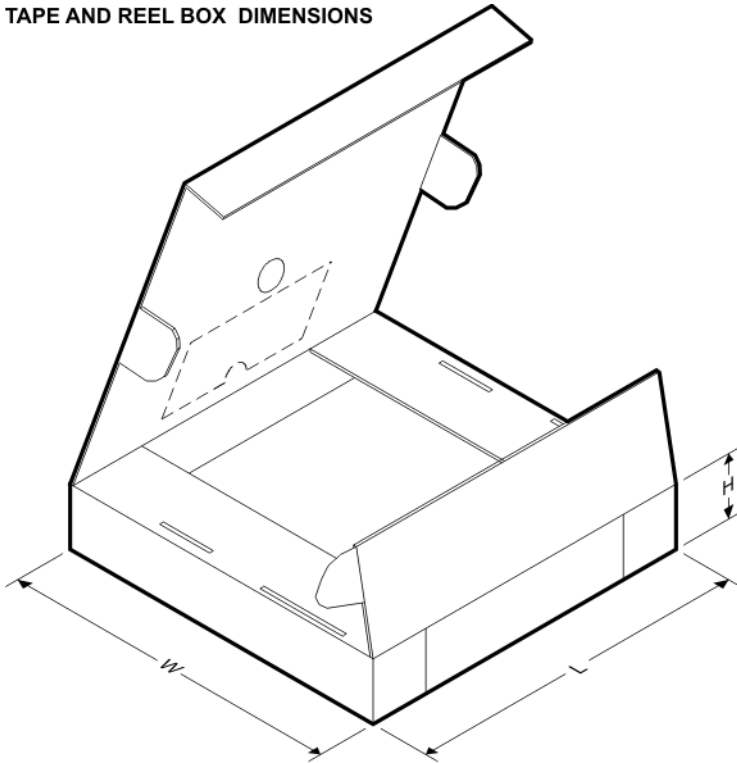
TAPE DIMENSIONS


| | |
|----|---|
| 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 |

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 |
|-----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AHC1G14DBVR | SOT-23 | DBV | 5 | 3000 | 178.0 | 9.0 | 3.23 | 3.17 | 1.37 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DBVR | SOT-23 | DBV | 5 | 3000 | 178.0 | 9.2 | 3.3 | 3.2 | 1.55 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 9.2 | 3.17 | 3.23 | 1.37 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DBVT | SOT-23 | DBV | 5 | 250 | 178.0 | 9.0 | 3.23 | 3.17 | 1.37 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DBVT | SOT-23 | DBV | 5 | 250 | 180.0 | 9.2 | 3.17 | 3.23 | 1.37 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DBVT | SOT-23 | DBV | 5 | 250 | 178.0 | 9.2 | 3.3 | 3.2 | 1.55 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DCKR | SC70 | DCK | 5 | 3000 | 180.0 | 9.2 | 2.3 | 2.55 | 1.2 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DCKR | SC70 | DCK | 5 | 3000 | 178.0 | 9.2 | 2.4 | 2.4 | 1.22 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DCKR | SC70 | DCK | 5 | 3000 | 178.0 | 9.0 | 2.4 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DCKT | SC70 | DCK | 5 | 250 | 178.0 | 9.0 | 2.4 | 2.5 | 1.2 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DCKT | SC70 | DCK | 5 | 250 | 180.0 | 9.2 | 2.3 | 2.55 | 1.2 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DCKT | SC70 | DCK | 5 | 250 | 178.0 | 9.2 | 2.4 | 2.4 | 1.22 | 4.0 | 8.0 | Q3 |
| SN74AHC1G14DRLR | SOT | DRL | 5 | 4000 | 180.0 | 8.4 | 1.98 | 1.78 | 0.69 | 4.0 | 8.0 | Q3 |

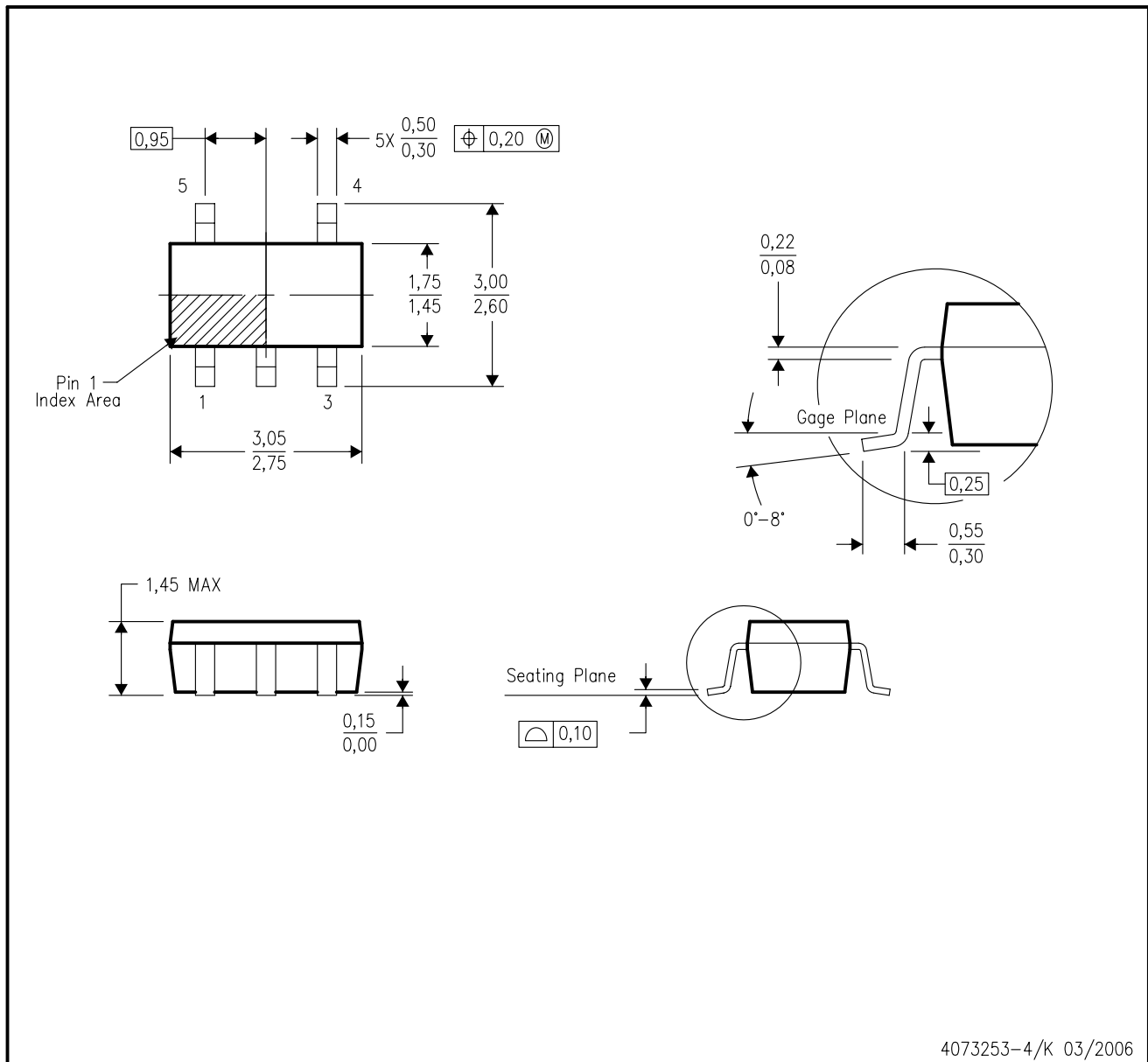
TAPE AND REEL BOX DIMENSIONS


*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|-----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AHC1G14DBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 180.0 | 18.0 |
| SN74AHC1G14DBVR | SOT-23 | DBV | 5 | 3000 | 180.0 | 180.0 | 18.0 |
| SN74AHC1G14DBVR | SOT-23 | DBV | 5 | 3000 | 205.0 | 200.0 | 33.0 |
| SN74AHC1G14DBVT | SOT-23 | DBV | 5 | 250 | 180.0 | 180.0 | 18.0 |
| SN74AHC1G14DBVT | SOT-23 | DBV | 5 | 250 | 205.0 | 200.0 | 33.0 |
| SN74AHC1G14DBVT | SOT-23 | DBV | 5 | 250 | 180.0 | 180.0 | 18.0 |
| SN74AHC1G14DCKR | SC70 | DCK | 5 | 3000 | 205.0 | 200.0 | 33.0 |
| SN74AHC1G14DCKR | SC70 | DCK | 5 | 3000 | 180.0 | 180.0 | 18.0 |
| SN74AHC1G14DCKR | SC70 | DCK | 5 | 3000 | 180.0 | 180.0 | 18.0 |
| SN74AHC1G14DCKT | SC70 | DCK | 5 | 250 | 180.0 | 180.0 | 18.0 |
| SN74AHC1G14DCKT | SC70 | DCK | 5 | 250 | 205.0 | 200.0 | 33.0 |
| SN74AHC1G14DCKT | SC70 | DCK | 5 | 250 | 180.0 | 180.0 | 18.0 |
| SN74AHC1G14DRLR | SOT | DRL | 5 | 4000 | 202.0 | 201.0 | 28.0 |

DBV (R-PDSO-G5)

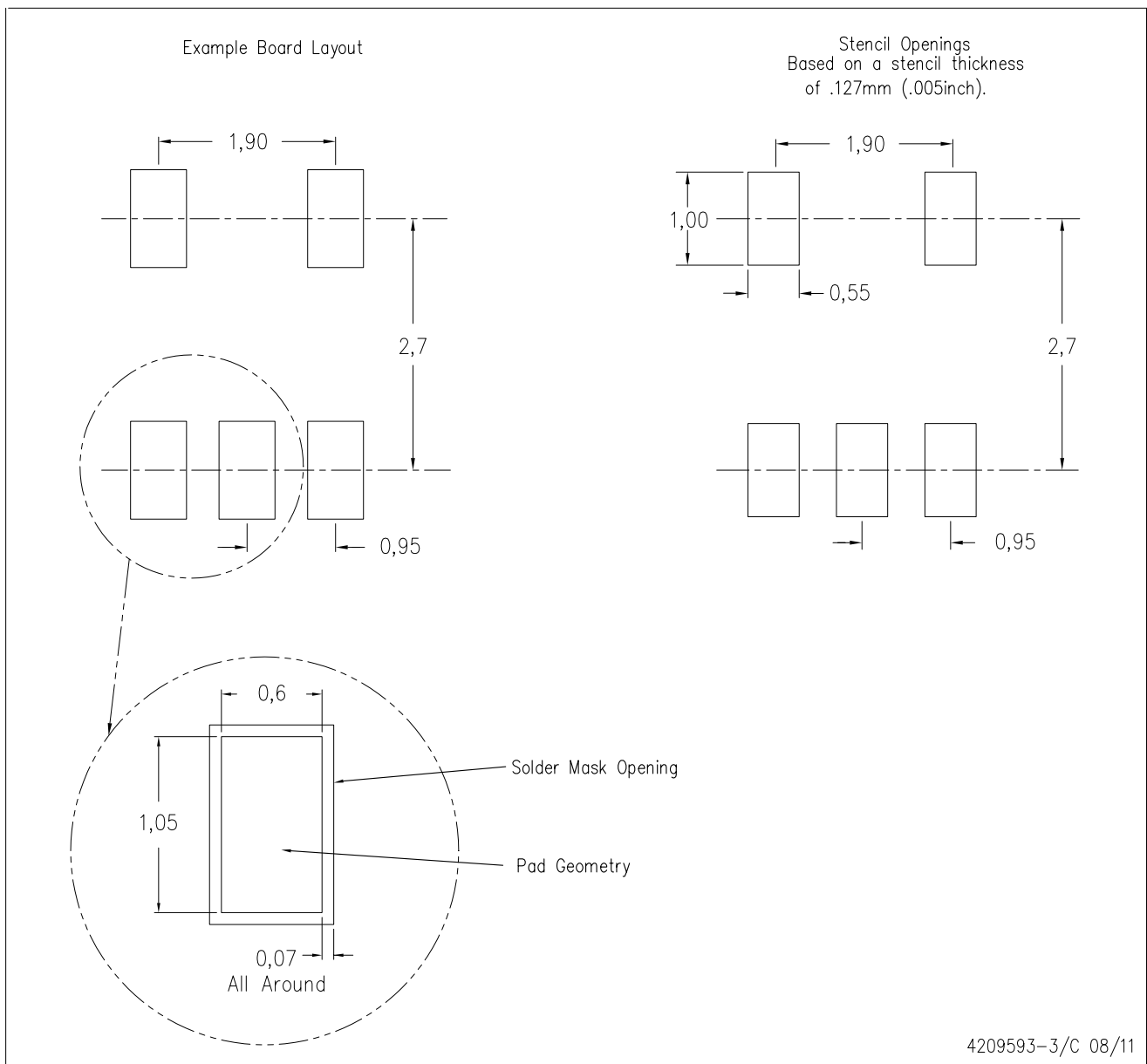
PLASTIC SMALL-OUTLINE PACKAGE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Falls within JEDEC MO-178 Variation AA.

DBV (R-PDSO-G5)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - D. Publication IPC-7351 is recommended for alternate designs.
 - E. 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.

DCK (R-PDSO-G5)

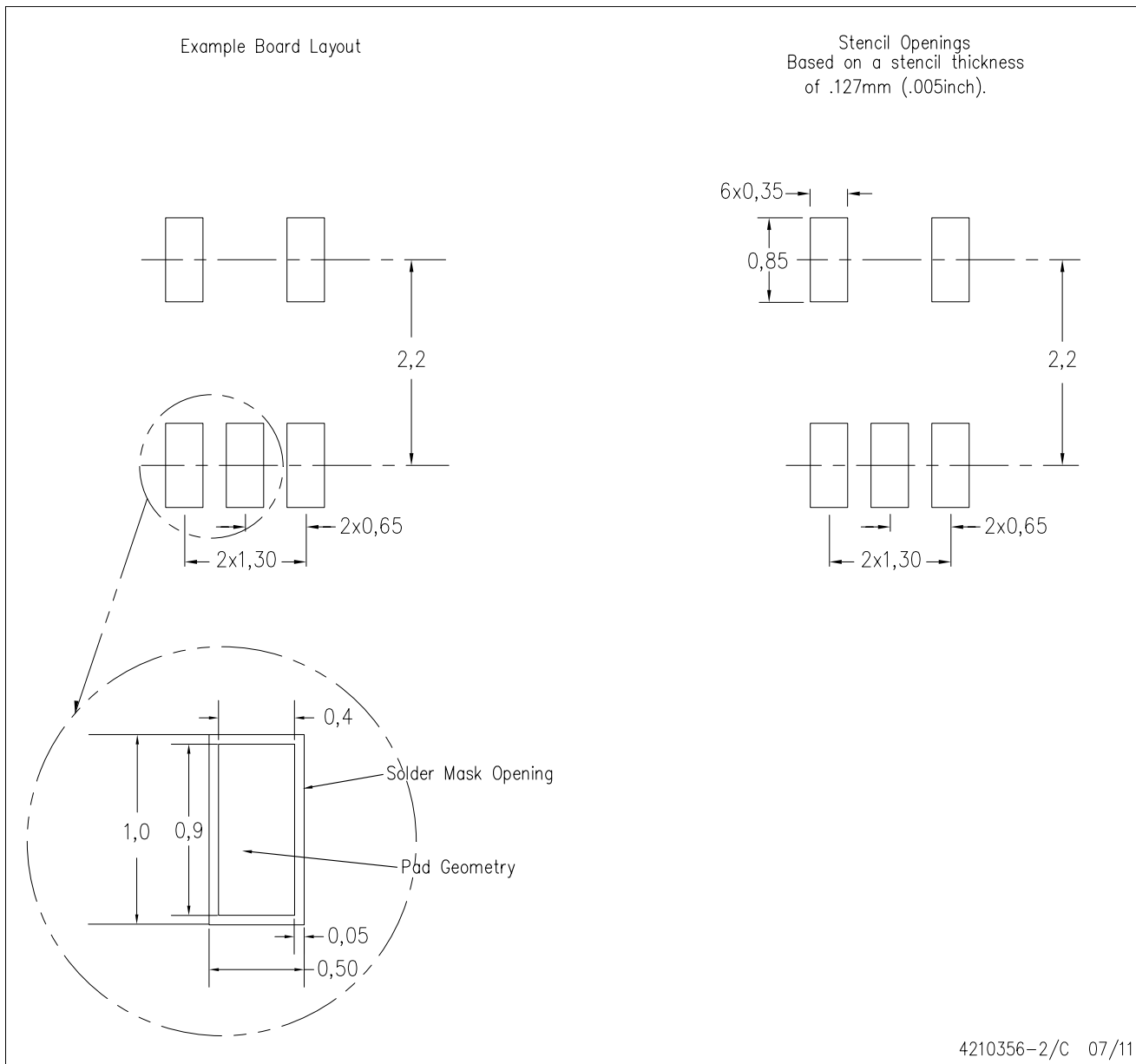
PLASTIC SMALL-OUTLINE PACKAGE



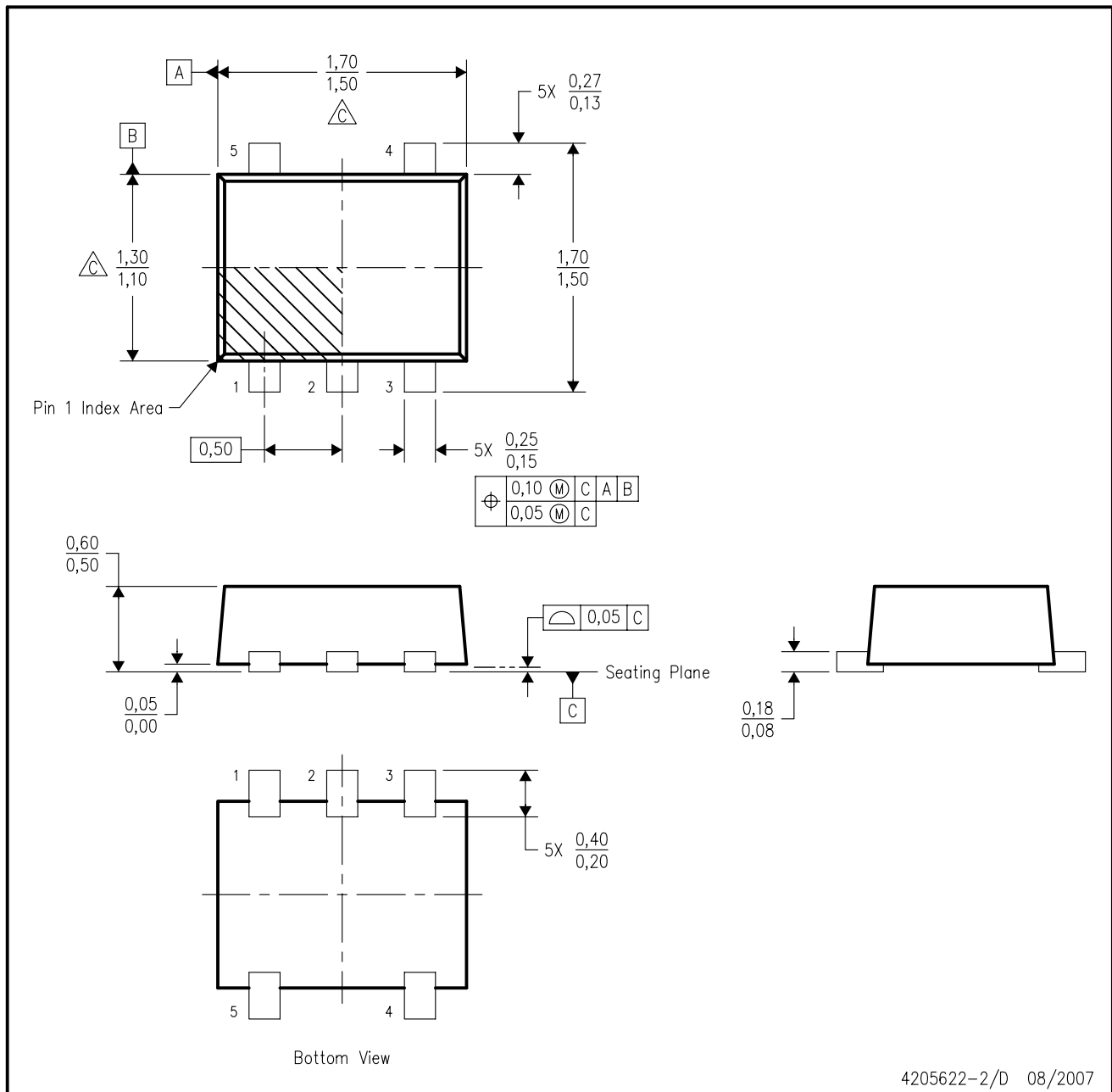
- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion. Mold flash and protrusion shall not exceed 0.15 per side.
 - D. Falls within JEDEC MO-203 variation AA.

DCK (R-PDSO-G5)

PLASTIC SMALL OUTLINE

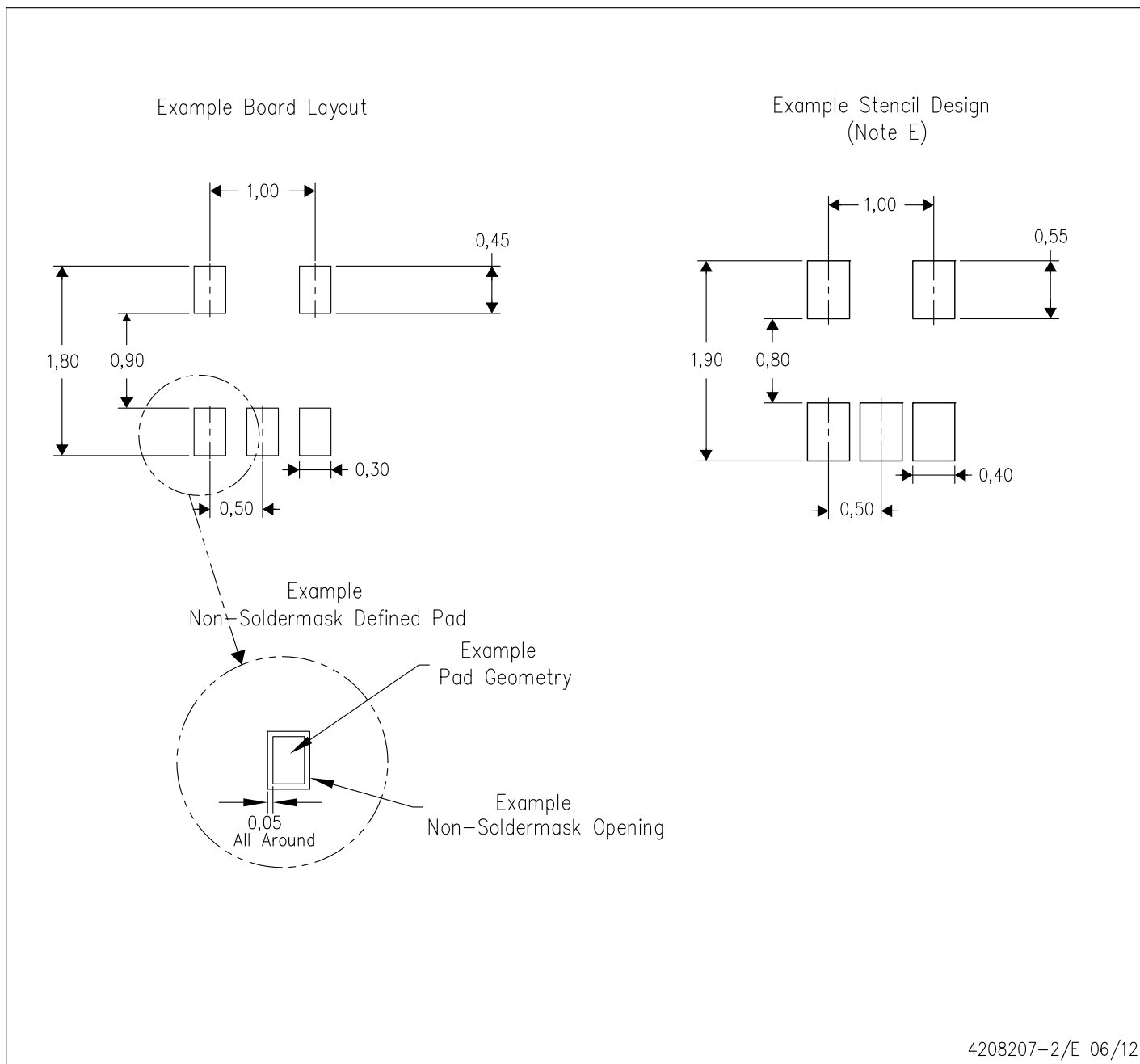


- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Customers should place a note on the circuit board fabrication drawing not to alter the center solder mask defined pad.
 - Publication IPC-7351 is recommended for alternate designs.
 - Laser cutting 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.



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- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash, interlead flash, protrusions, or gate burrs. Mold flash, interlead flash, protrusions, or gate burrs shall not exceed 0,15 per end or side.
 - D. JEDEC package registration is pending.



- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
 - E. Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
 - F. 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. Refer to IPC 7525 for stencil design considerations.
 - G. Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

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