

4.7V to 60V Input, 200mA Synchronous Step-Down Converter with Low IQ

Check for Samples: [TPS54061](#)

FEATURES

- Integrated High Side and Low Side MOSFET
- Peak Current Mode Control
- 90 μ A (typical) Operating Quiescent Current
- 50 kHz to 1100 kHz Switching Frequency
- Synchronizes to External Clock
- Internal Slow Start
- 0.8 V \pm 1% Voltage Reference
- Stable with Ceramic Output Capacitors or Low Cost Aluminum Electrolytic
- Cycle-by-Cycle Current Limit, Thermal and Frequency Fold Back Protection
- VSON-8 Package, 3 mm X 3 mm

APPLICATIONS

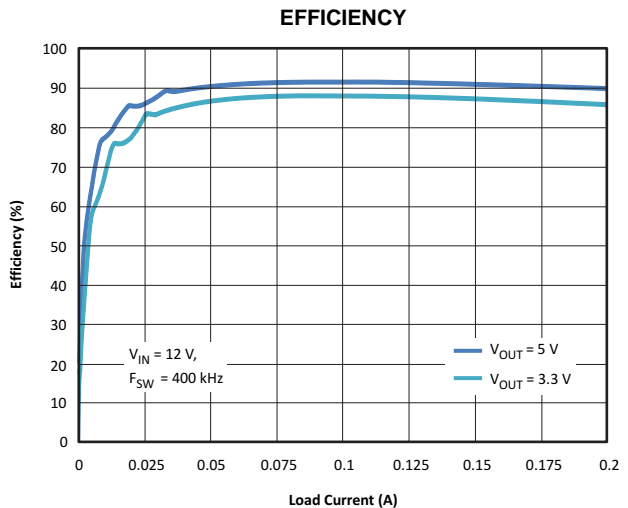
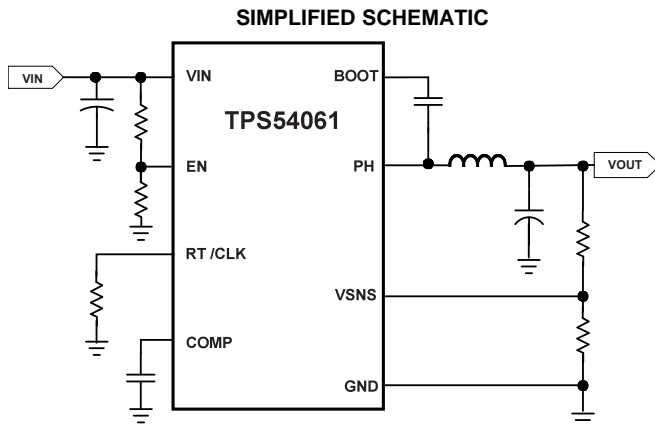
- Low Power Standby or Bias Voltage Supplies
- 4-20 mA Current-Loop Powered Sensors
- Industrial Process Control, Metering, and Security Systems
- High Voltage Linear Regulator Replacement

DESCRIPTION

The TPS54061 device is a 60 V, 200-mA, synchronous step-down converter with integrated high side and low side MOSFETs. Current mode control provides simple external compensation and flexible component selection. The non-switching supply current is 90 μ A. Using the enable pin, shutdown supply current is reduced to 1.4 μ A.

Under voltage lockout is internally set at 4.5 V, but can be increased using the accurate enable pin threshold. The output voltage startup ramp is controlled by the internal slow start time.

Adjustable switching frequency range allows efficiency and external component size to be optimized. Frequency fold back and thermal shutdown protects the part during an overload condition.



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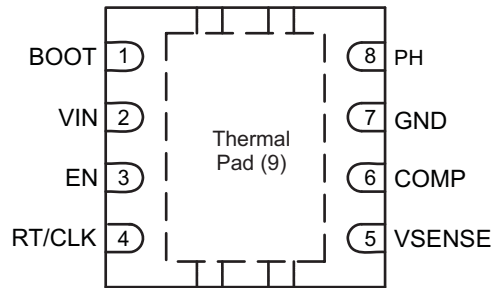
These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Table 1. ORDERING INFORMATION⁽¹⁾

T _J	PACKAGE	PART NUMBER ⁽²⁾
-40°C to 150°C	VSON-8 DRB	TPS54061DRB

- (1) For the most current package and ordering information see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.
- (2) The DRB package is also available taped and reeled. Add an R suffix to the device type (i.e., TPS54061DRBR).

**PIN CONFIGURATION
VSON-8 PACKAGE
(TOP VIEW)**

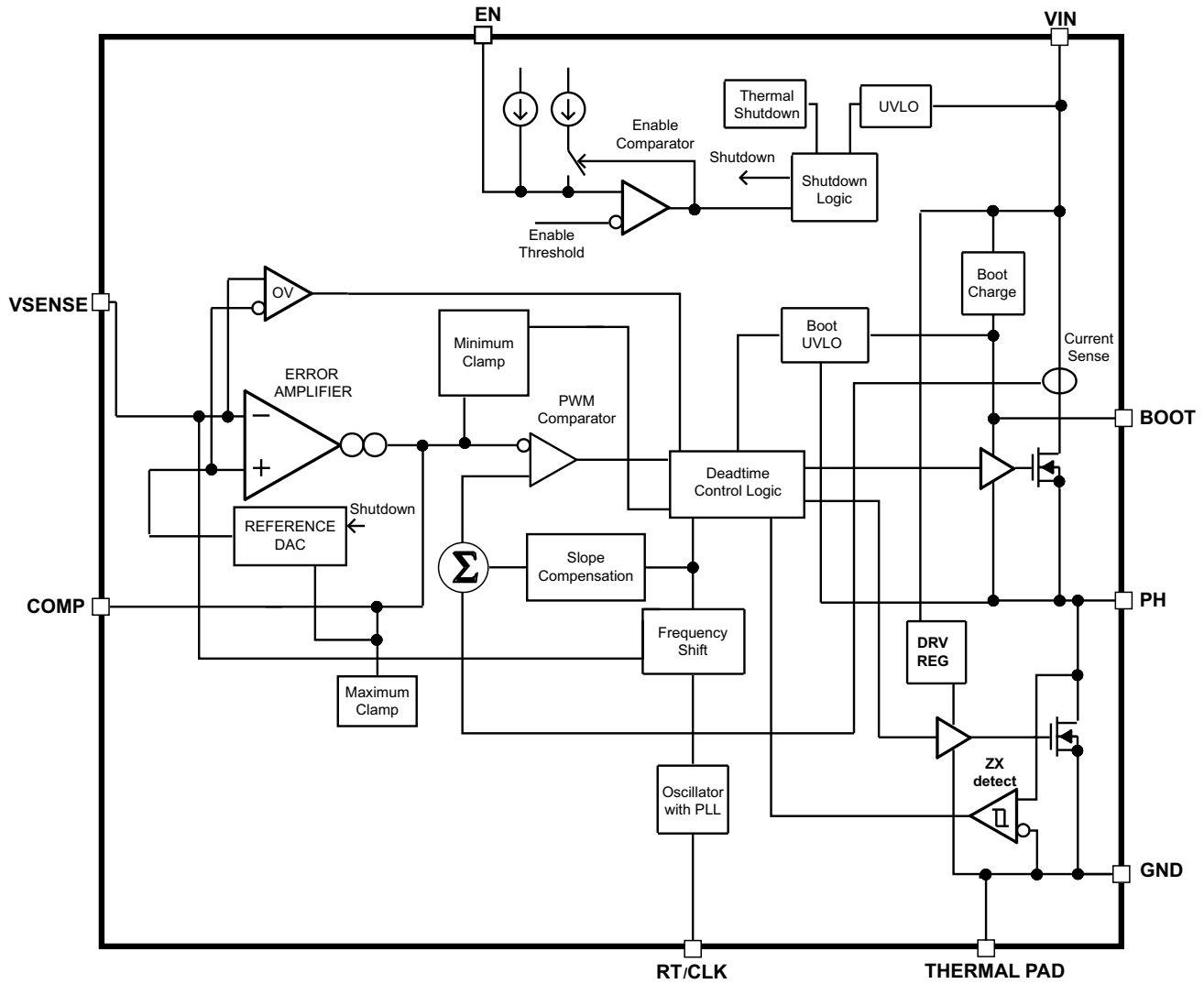


PIN FUNCTIONS

PIN		DESCRIPTION
NAME	NUMBER	
BOOT	1	A bootstrap capacitor is required between BOOT and PH. If the voltage on this capacitor is below the minimum required by the output device, the output is forced to switch off until the capacitor is refreshed.
VIN	2	Input supply voltage, 4.7 V to 60 V.
EN	3	Enable pin, internal pull-up current source. Pull below 1.18 V to disable. Float to enable. Adjust the input undervoltage lockout with two resistors, see the Enable and Adjusting Undervoltage Lockout section.
RT/CLK	4	Resistor Timing and External Clock. An internal amplifier holds this pin at a fixed voltage when using an external resistor to ground to set the switching frequency. If the pin is pulled above the PLL upper threshold, a mode change occurs and the pin becomes a synchronization input. The internal amplifier is disabled and the pin is a high impedance clock input to the internal PLL. If clocking edges stop, the internal amplifier is re-enabled and the mode returns to a resistor frequency programming.
VSENSE	5	Inverting input of the transconductance (gm) error amplifier.
COMP	6	Error amplifier output, and input to the output switch current comparator. Connect frequency compensation components to this pin.
GND	7	Ground
PH	8	The source of the internal high-side power MOSFET and drain of the internal low side MOSFET
Thermal Pad	9	GND pin must be electrically connected to the exposed pad on the printed circuit board for proper operation.

PRODUCT PREVIEW

FUNCTIONAL BLOCK DIAGRAM



PRODUCT PREVIEW

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)
TPS54061DRBR	ACTIVE	SON	DRB	8	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	
TPS54061DRBT	ACTIVE	SON	DRB	8	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR	

⁽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⁾ 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.

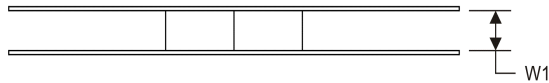
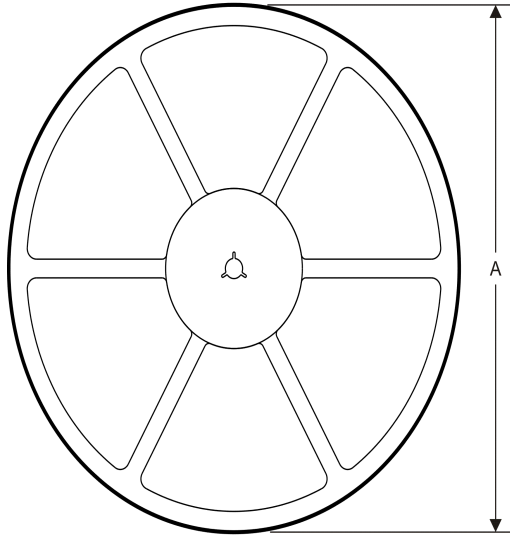
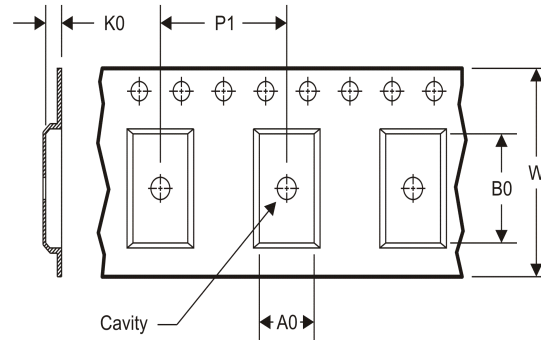
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

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
TPS54061DRBR	SON	DRB	8	3000	330.0	12.4	3.3	3.3	1.1	8.0	12.0	Q2
TPS54061DRBT	SON	DRB	8	250	180.0	12.4	3.3	3.3	1.1	8.0	12.0	Q2

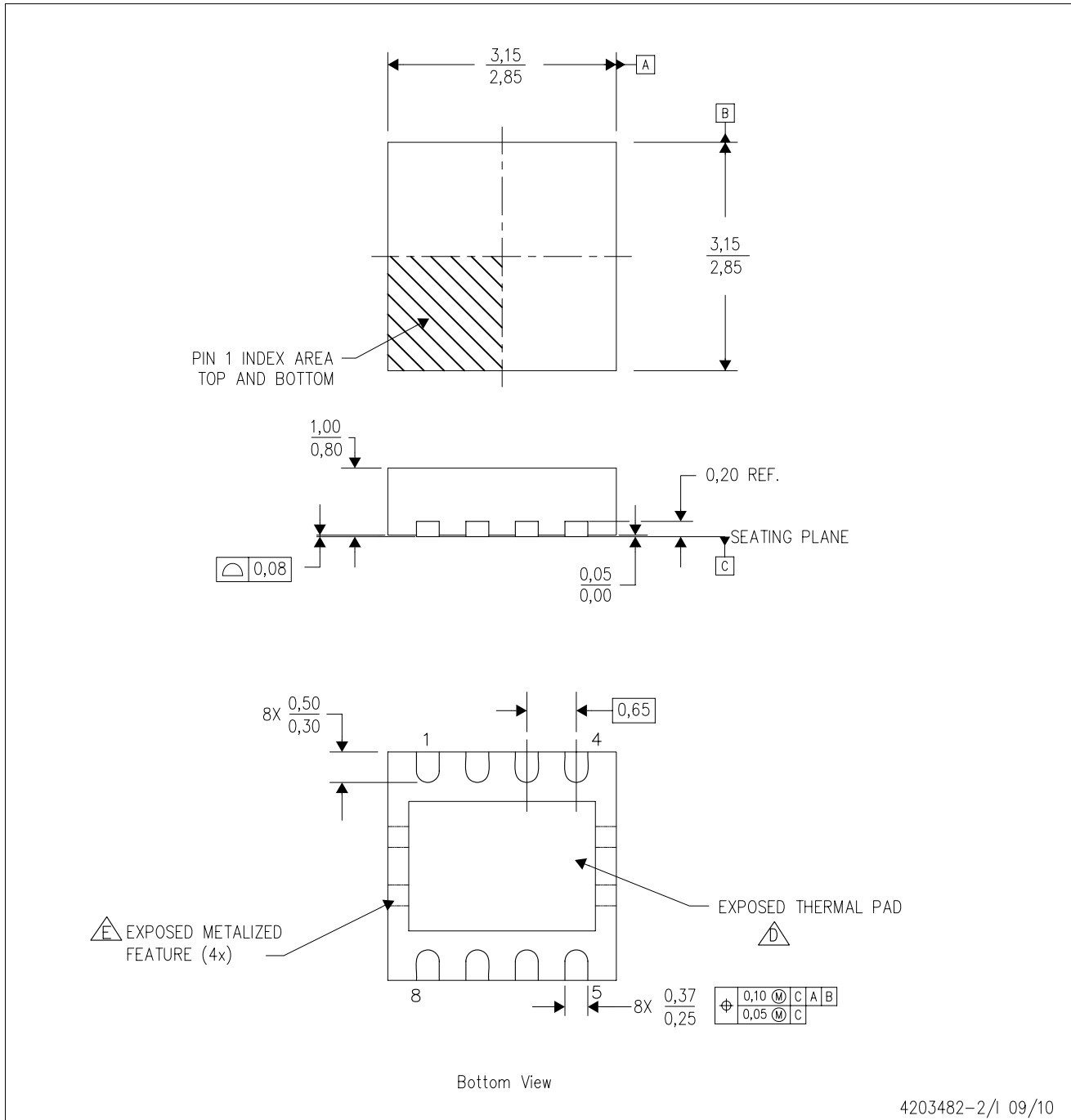
TAPE AND REEL BOX DIMENSIONS




*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS54061DRBR	SON	DRB	8	3000	346.0	346.0	29.0
TPS54061DRBT	SON	DRB	8	250	210.0	185.0	35.0

DRB (S-PVSON-N8)

PLASTIC SMALL OUTLINE NO-LEAD



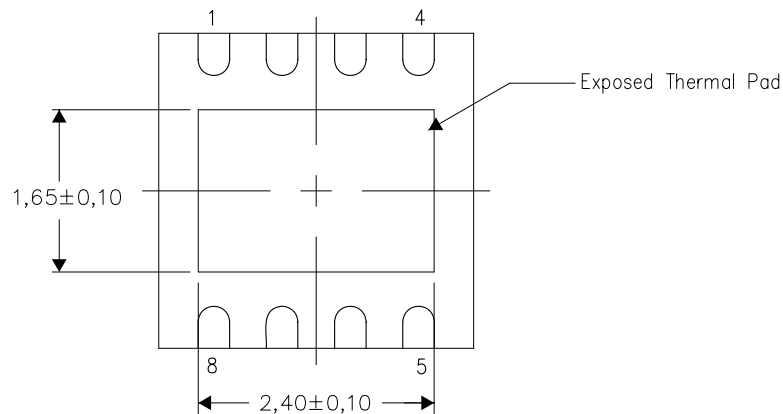
- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. Small Outline No-Lead (SON) package configuration.
 -  The package thermal pad must be soldered to the board for thermal and mechanical performance.
 -  See the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



Bottom View

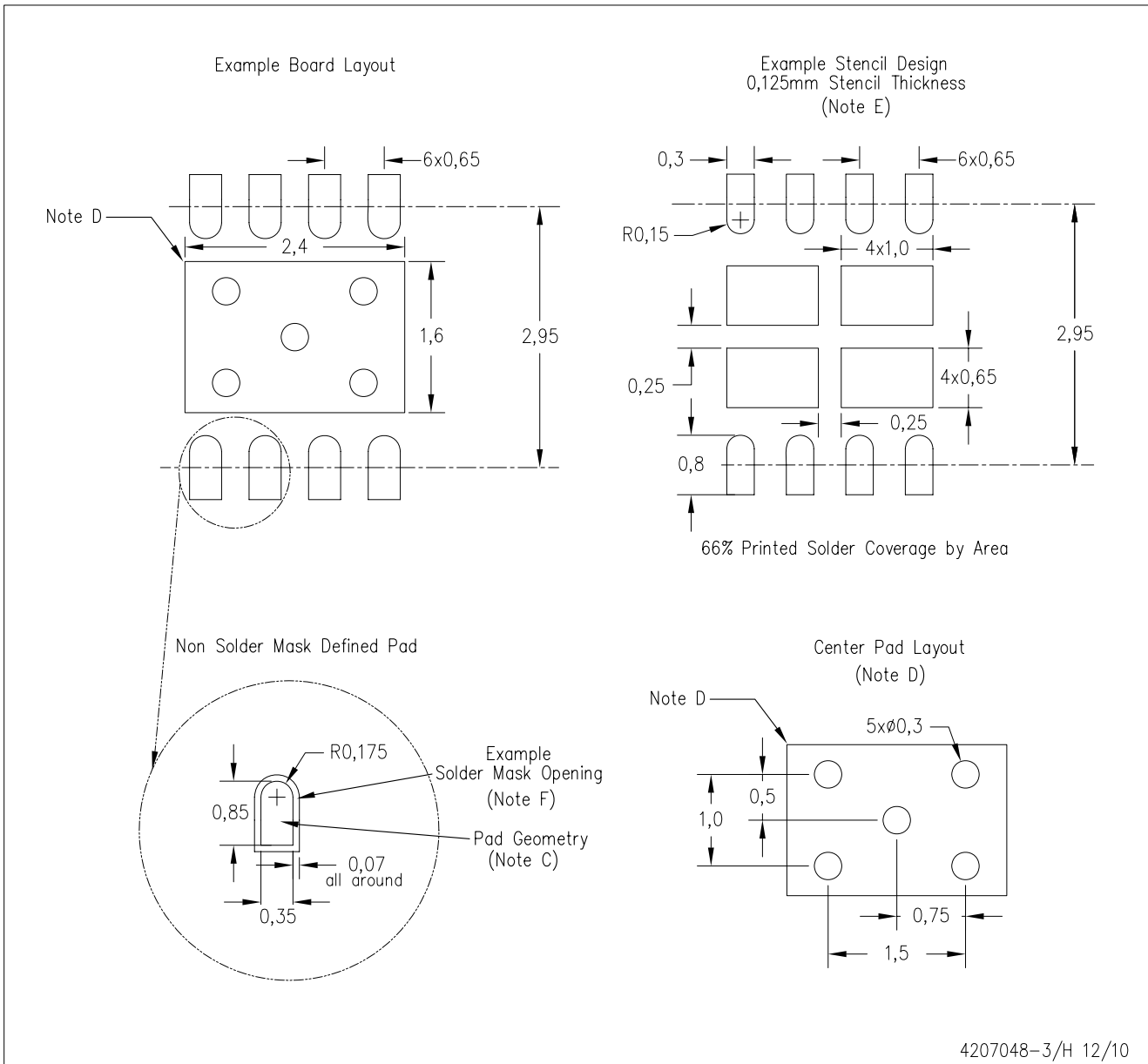
Exposed Thermal Pad Dimensions

4206340-3/L 12/10

NOTE: A. All linear dimensions are in millimeters

DRB (S-PVSON-N8)

PLASTIC SMALL OUTLINE NO-LEAD



- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Publication IPC-7351 is recommended for alternate designs.
 - This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, QFN Packages, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <<http://www.ti.com>>.
 - 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.
 - Customers should contact their board fabrication site for solder mask tolerances.

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