

The following two pages are the first two from the TPS40197 data sheet.

This device is designed specifically to power TI DSP processors (Faraday and Currie).

For a complete datasheet please contact support@ti.com



SYNCHRONOUS BUCK CONTROLLER WITH 4-BIT VID INTERFACE FOR SMART-REFLEX™ DSPs

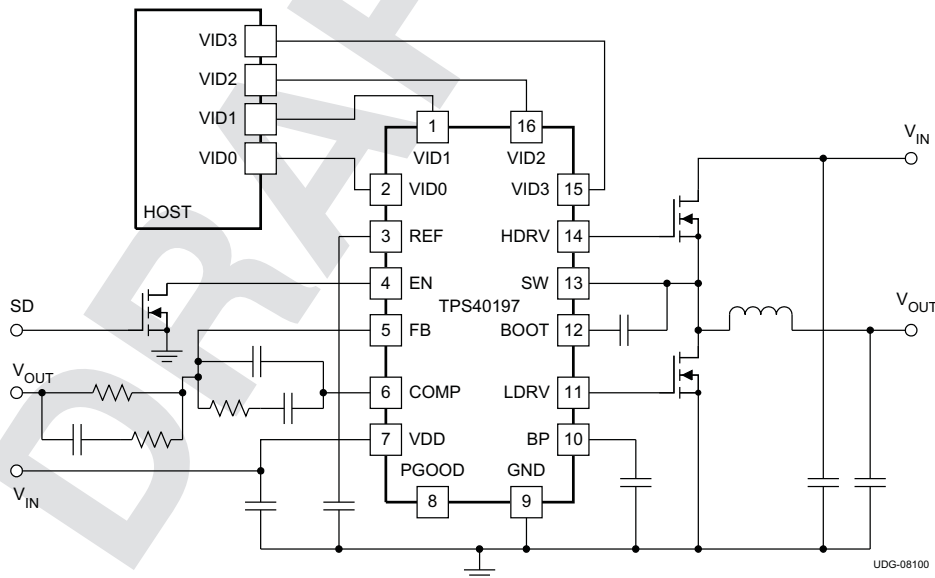
FEATURES

- Input Voltage Range: 4.5 V to 14 V
- 4-Bit Dynamic VID-On-The-Fly Support
- VID Programmable Output Voltage with Programmable Transition Rate
- Fixed Switching Frequency of 520 kHz
- Selectable Low-Side (Three Settings) and Fixed High-Side Thermally Compensated Overcurrent Protection
- Power Good Indicator
- Internal 5-V Regulator
- Voltage Mode Control
- Internally Fixed 5.5-ms Soft-Start Time
- Pre-Bias Output Safe
- Thermal Shutdown at 140°C
- 16-Pin QFN Package

APPLICATIONS

- Smart-Reflex™ DSPs
- POL Modules
- Telecom

TYPICAL APPLICATION CIRCUIT



ATTENTION

This device is specifically designed to power TI DSP™ processors that require dynamic VID capabilities such as the TMS320C6474. For a complete datasheet, contact support@ti.com.

DESCRIPTION

The TPS40197 is a synchronous buck controller that operates from 4.5 V to 14 V input supply nominally. The controller implements voltage-mode control architecture with the switching frequency fixed at 520 kHz. The higher switching frequency facilitates the use of smaller inductor and output capacitors, thereby providing a compact power-supply solution. An adaptive anti-cross conduction scheme is used to prevent shoot through current in the power FETs.

The TPS40197 integrates the PWM control and 4-bit VID interface in a single chip to allow seamless on-the-fly VID changes with programmable transition rate. It provides a simple power solution for Smart-Reflex™ DSP cores.



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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.

DESCRIPTION

Short circuit detection is done by sensing the voltage drop across the low-side FET when it is on and comparing it with a user selected threshold of 100 mV, 200 mV or 280 mV. The threshold is set with a single external resistor connected from COMP to GND. This resistor is sensed at startup and the selected threshold is latched. Pulse by pulse limiting (to prevent current runaway) is provided by sensing the voltage across the high-side FET when it is on and terminating the cycle when the voltage drop rises above a fixed threshold of 550 mV. When the controller senses an output short circuit, both FETs are turned off and a timeout period is observed before attempting to restart. This provides limited power dissipation in the event of a sustained fault.

ORDERING INFORMATION⁽¹⁾

T _A	PACKAGE	ORDERING PART NUMBER	PINS	OUTPUT SUPPLY	MINIMUM ORDER QUANTITY
-40°C to 85°C	Plastic Quad Flatpack	TPS40197RGYT	16	Tube	250
		TPS40197RGYR		Tape-and-Reel	3000

(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.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

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

		VALUE	UNIT
Input voltage range	VDD, EN	-0.3 to 20	V
	SW	-5 to 25	
	BOOT, HDRV	-0.3 to 30	
	BOOT-SW, HDRV-SW	-0.3 to 6	
	FB, BP, LDRV, PGOOD, REF	-0.3 to 6	
Output voltage range	COMP	-0.3 to 3.5	V
	VID0, VID1, VID2, VID3	-0.3 to 2	
Operating junction temperature range, T _J		-40 to 150	°C
Storage temperature, T _{st}		-55 to 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.

RECOMMENDED OPERATING CONDITIONS

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

		MIN	MAX	UNIT
Supply voltage	VDD	4.5	14	V
Operating junction temperature, T _J		-40	125	°C

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
TPS40197RGYR	VQFN	RGY	16	3000	330.0	12.4	3.8	4.3	1.5	8.0	12.0	Q1
TPS40197RGYT	VQFN	RGY	16	250	180.0	12.4	3.8	4.3	1.5	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS

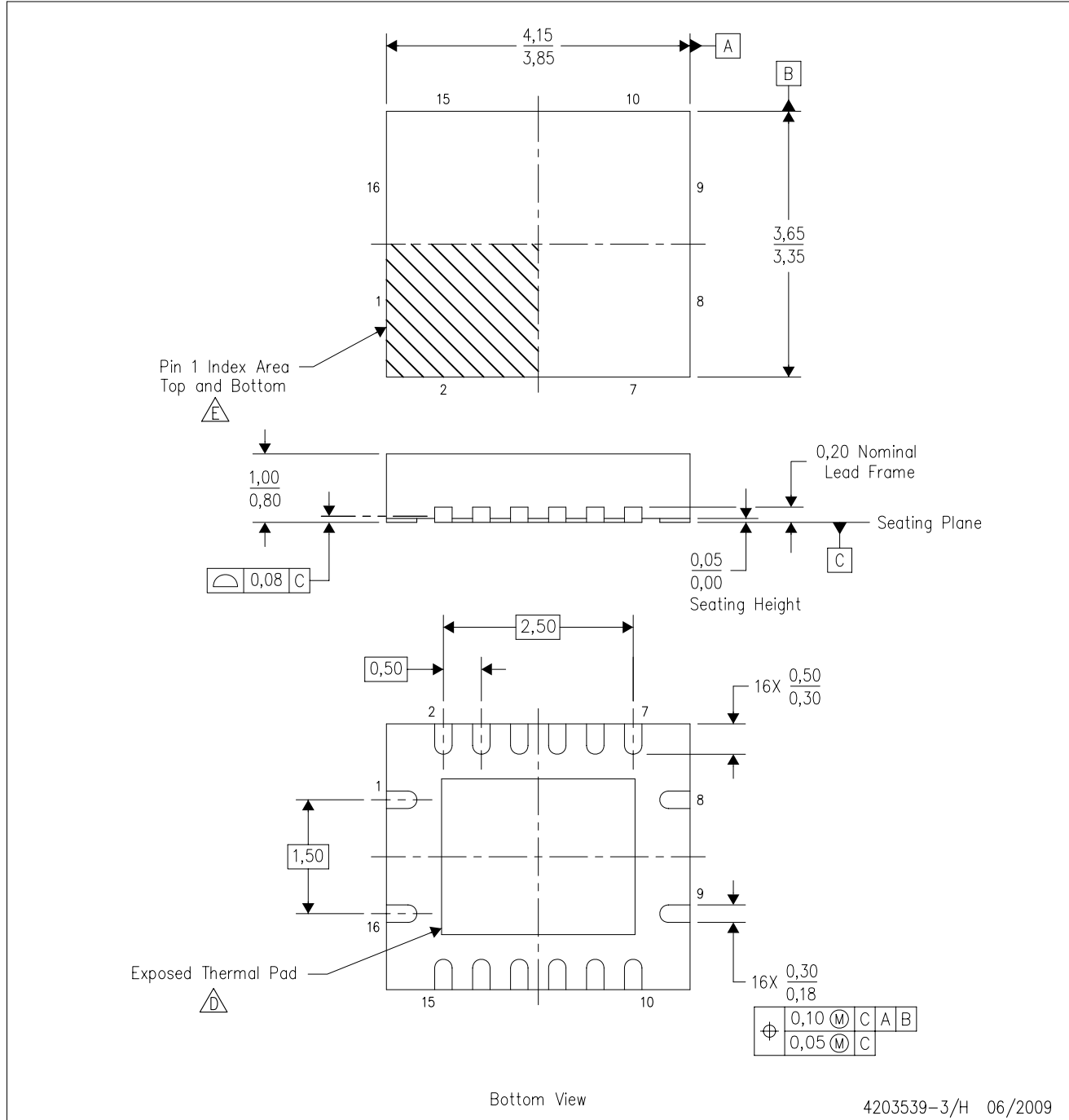




*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TPS40197RGYR	VQFN	RGY	16	3000	346.0	346.0	29.0
TPS40197RGYT	VQFN	RGY	16	250	190.5	212.7	31.8

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK 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. QFN (Quad Flatpack No-Lead) 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 dimensions.
 -  Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
 - F. Package complies to JEDEC MO-241 variation BB.

THERMAL PAD MECHANICAL DATA

RGY (R-PVQFN-N16)

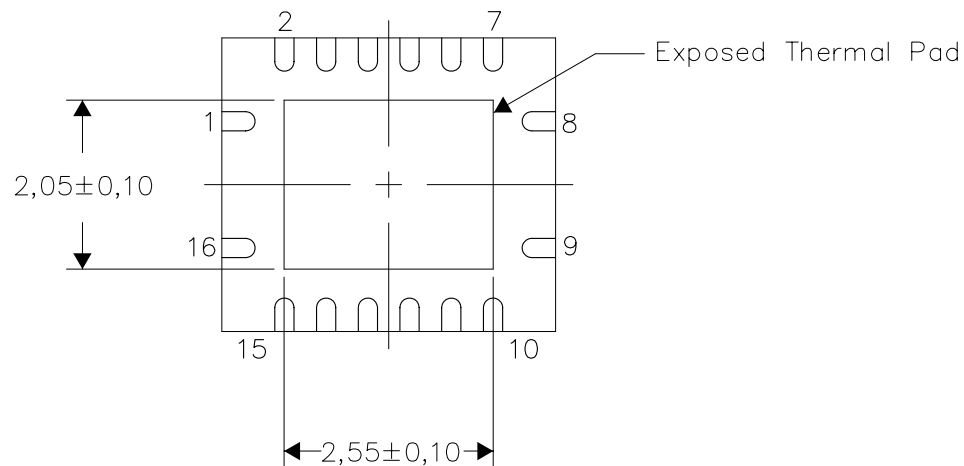
PLASTIC QUAD FLATPACK NO-LEAD

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

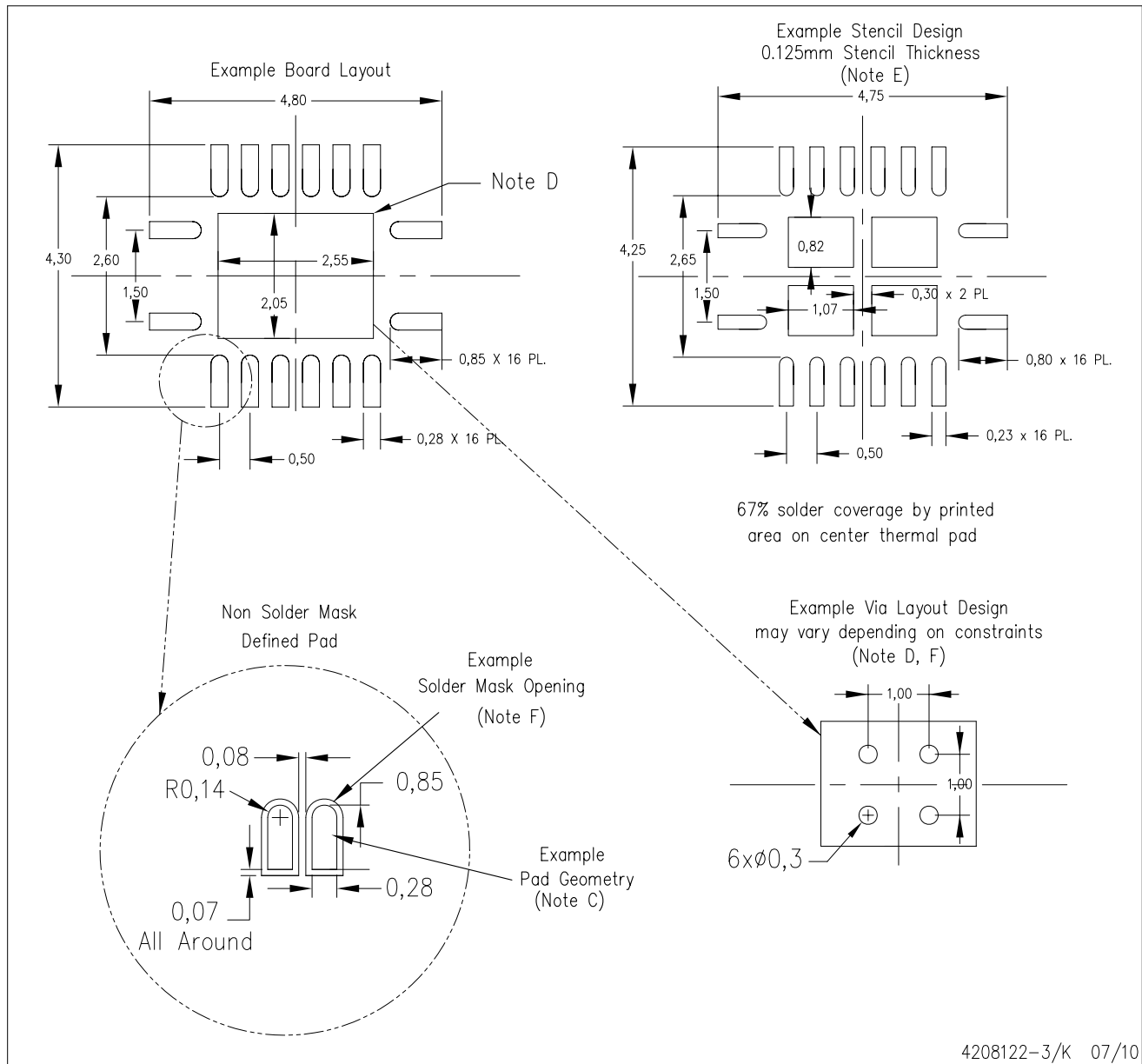
NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

4206353-3/K 07/10

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



- 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. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack QFN/SON PCB Attachment, 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>>.
 - 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. Refer to IPC 7525 for stencil design considerations.
 - F. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.

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