

4.5V to 17V Input, 500mA Synchronous Step Down SWIFT™ Converter with Advanced Eco-mode™

Check for Samples: [TPS560200](#)

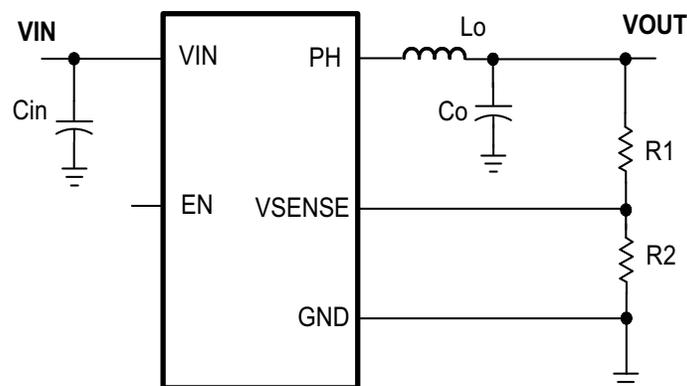
FEATURES

- **Integrated Monolithic 0.95Ω High Side and 0.33Ω Low Side MOSFETs**
- **500mA Continuous Output Current**
- **Output Voltage Range: 0.8V to 6.5V**
- **0.8V Voltage Reference with ±1.2% Accuracy Over Temperature**
- **Advanced Auto-Skip Eco-mode™ for High Efficiency at Light Loads**
- **D-CAP2™ Mode Enables Fast Transient Responses**
- **No External Compensation Needed**
- **650 kHz Switching Frequency**
- **2 ms Internal Soft Start**
- **Safe Startup into Pre-biased VOUT**
- **Thermal Shutdown**
- **–40°C to 125°C Operating Junction Temperature Range**
- **Available in 5-Pin SOT23 Packages**

APPLICATIONS

- **Set Top Boxes**
- **Modems**
- **DTBs**
- **ASDLs**

SIMPLIFIED SCHEMATIC



DESCRIPTION

The TPS560200 is an 17V, 500mA, low Iq, adaptive on-time D-CAP2™ mode synchronous monolithic buck converter with integrated MOSFETs in easy-to-use 5-pin SOT23 package.

The TPS560200 enables system designers to complete the suite of various end-equipment power bus regulators with a cost effective, low component count and low standby current solution. The main control loop for the device uses the D-CAP2™ mode control that provides a fast transient response with no external compensation components. The adaptive on-time control supports seamless transition between PWM mode at higher load conditions and advanced Eco-mode™ operation at light loads.

The TPS560200 also has a proprietary circuit that enables the device to adopt to both low equivalent series resistance (ESR) output capacitors, such as POSCAP or SP-CAP, and ultra-low ESR ceramic capacitors. The device operates from 4.5-V to 17-V VIN input. The output voltage can be programmed between 0.8 V and 6.5 V. The device also features a fixed 2 ms soft start time. The device is available in the 5-pin SOT23 package.

PRODUCT PREVIEW



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.

Eco-mode, D-CAP2 are trademarks of Texas Instruments.



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.

ORDERING INFORMATION⁽¹⁾

T _J	PACKAGE	PART NUMBER ⁽²⁾
-40°C to +125°C	5 Pin SOT23	TPS560200DBV5

- (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.
- (2) The DBV package is also available taped and reeled. Add an R suffix to the device type (i.e., TPS560200DBV5R). See applications section of data sheet for layout information.

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

		MIN	MAX	UNIT
Input voltage	V _{IN}	-0.3	20	V
	EN	-0.3	7	V
	V _{SENSE}	-0.3	3	V
Output voltage	PH	-0.6	20	V
	PH 10ns Transient	-2	20	V
Source current	EN		±100	µA
	PH	Current Limit		A
Sink current	PH	Current Limit		A
Electrostatic Discharge	Human Body Model (HBM) QSS 009-105 (JESD22-A114A)		2	kV
	Charged Device Model (CDM) QSS 009-147 (JESD22-C101B.01)		500	V
Operating junction temperature		-40	125	°C
Storage temperature		-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.

THERMAL INFORMATION

THERMAL METRIC ^{(1) (2)}		TPS560200	UNITS
		SOT23 (5 PINS)	
θ _{JA}		166.8	°C/W
θ _{JA}	Junction-to-ambient thermal resistance ⁽³⁾	100	
θ _{JCtop}	Junction-to-case (top) thermal resistance	75.5	
θ _{JB}	Junction-to-board thermal resistance	29.2	
ψ _{JT}	Junction-to-top characterization parameter	3.7	
ψ _{JB}	Junction-to-board characterization parameter	28.7	
θ _{JCbot}	Junction-to-case (bottom) thermal resistance	N/A	

- (1) For more information about traditional and new thermal metrics, see the *IC Package Thermal Metrics* application report, [SPRA953](http://www.ti.com/lit/zip/spr9953).
- (2) Power rating at a specific ambient temperature T_A should be determined with a junction temperature of 125°C. This is the point where distortion starts to substantially increase. Thermal management of the PCB should strive to keep the junction temperature at or below 125°C for best performance and long-term reliability. See power dissipation estimate in application section of this data sheet for more information.
- (3) Test boards conditions:
 - a. 2 inches x 2 inches, 2 layers, thickness: 0.062 inch
 - b. 2 oz. copper traces located on the top of the PCB
 - c. 2 oz. copper ground plane on the bottom of the PCB

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TPS560200DBVR	PREVIEW	SOT-23	DBV	5	3000	TBD	Call TI	Call TI	-40 to 125		
TPS560200DBVT	PREVIEW	SOT-23	DBV	5	250	TBD	Call TI	Call TI	-40 to 125		

(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.

(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.

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