LM10504

Flexible Integrated Power Management Unit



TEXAS INSTRUMENTS

Product Bulletin

High Efficiency Solution Optimized for Solid State Drives

Overview

The LM10504 from Texas Instruments is a fully integrated power management unit (PMU) capable of powering all supply rails in Solid State Drives (SSD). This ultra-compact, reliable/flexible, and highly efficient power solution replaces up to four (4) discrete components typically used in these drives. It functions cooperatively with a controller IC to optimize the supply voltage for low power conditions and features additional proprietary power saving modes to obtain maximum system efficiency.

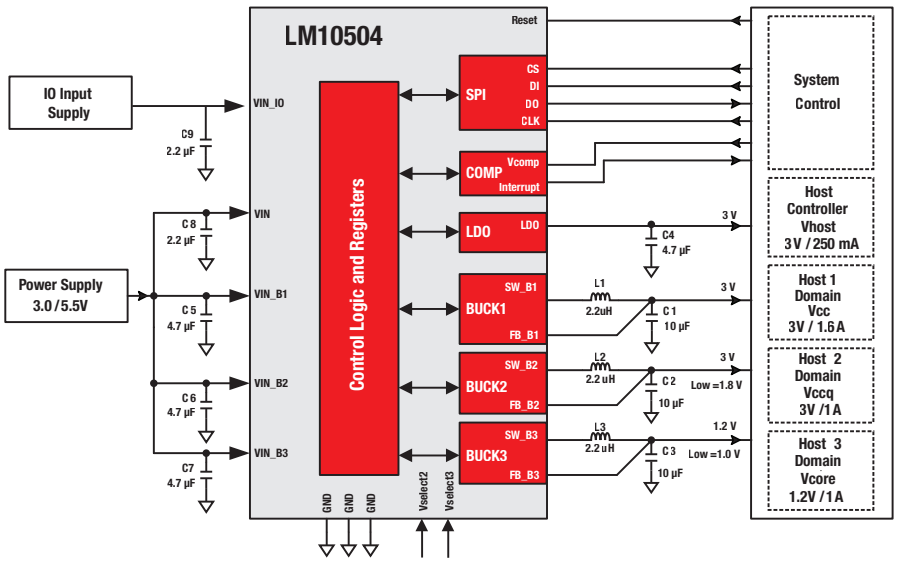
This design scheme delivers longer battery life for portable devices with solid state drives. The chip also uses a 4-wire SPI interface to communicate with processors to achieve output voltage programmability. Unlike discrete solutions available today, the highly integrated, all-in-one PMU solution from TI delivers a higher performance to cost ratio and is specifically designed and optimized with features geared for SSD and flash drive applications.

Product Highlights

- Three highly efficient SPI-programmable buck regulators plus an LDO
- Power down data protection
- Deep Sleep mode saves power during idle times
- Automatic internal soft-start on each supply limits startup inrush current
- Phase-shifted buck operation reduces input current ripple and capacitor size

Key Specifications

- ±3% feedback voltage accuracy
- Up to 95% efficient buck regulators
- 2 MHz switching frequency for smaller inductor size
- 2.8 x 2.8 mm with 0.4 mm pitch microSMD package



LM10504 typical application diagram

Features and Benefits

Better performance to cost ratio compared to discrete solutions

- Integrated all-in-one power solution saves valuable board space
- 2 MHz switching frequency for smaller inductor size
- High bandwidth provides fast turn-on without overshoot
- No loop compensation needed
- PFM mode for low load high efficiency operation

Reliability and flexibility at a low cost

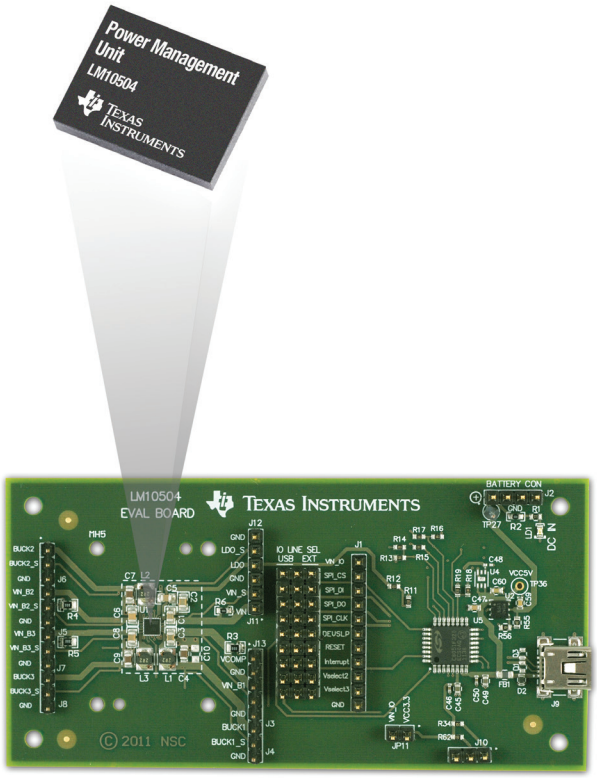
- Built-in over-current limit and thermal protection improves safety
- All three supply voltages offer user-programmable options for maximum flexibility
- Customizable startup sequencing for greater flexibility
- Bypass mode on Buck1 and Buck2 for power down data protection to enhance data integrity
- Easy-to-interface GUI for accelerated design
- Integrated solution leads to higher overall reliability of SSD

Extremely energy-efficient design

- Operates cooperatively with ASIC to optimize the supply voltage for low power conditions
  – Dynamic Voltage Scaling (DVS)
- Power saving modes via SPI interface
  – Sleep mode (DEVSLP) and DVS

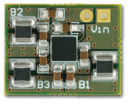
Regulator Table

Regulator	Programmable V_{OUT}	Maximum Output Current	Description
Buck1	1.1 – 3.6V, 50 mV steps	1.6A	Flash power
Buck2	1.1 – 3.6V, 50 mV steps	1A	Interface
Buck3	0.7 – 1.335V, 5 mV steps	1A	Core
LDO	1.2 – 3.1V	250 mA	Reference for host



LM10504 evaluation board

LM10504 SSD solution board demonstrates the reduced size possible with the integrated PMU, actual size 13 mm x 10 mm



Visit ti.com/LM10504 for more product information.

Important Notice: The products and services of Texas Instruments Incorporated and its subsidiaries described herein are sold subject to TI's standard terms and conditions of sale. Customers are advised to obtain the most current and complete information about TI products and services before placing orders. TI assumes no liability for applications assistance, customer's applications or product designs, software performance, or infringement of patents. The publication of information regarding any other company's products or services does not constitute TI's approval, warranty, or endorsement thereof.

The platform bar is a trademark of Texas Instruments.
©2013 Texas Instruments Incorporated

Texas Instruments

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products (also referred to herein as “components”) are sold subject to TI’s terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI’s terms and conditions of sale of semiconductor products. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers’ products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers’ products and applications, Buyers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of significant portions of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI components or services with statements different from or beyond the parameters stated by TI for that component or service voids all express and any implied warranties for the associated TI component or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards which anticipate dangerous consequences of failures, monitor failures and their consequences, lessen the likelihood of failures that might cause harm and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI’s goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed a special agreement specifically governing such use.

Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.

Products		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Applications Processors	www.ti.com/omap	**TI E2E Community**	e2e.ti.com
Wireless Connectivity	www.ti.com/wirelessconnectivity		

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2013, Texas Instruments Incorporated