Document Conventions

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<td>Caution: Indicates potential damage to hardware or software, or loss of data.</td>
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Patent(s) Pending—Products identified in this document may be covered by one or more Marvell patents and/or patent applications.
Overview

Marvell® leverages its innovative system design to provide unprecedented high-efficient, high-performance, and cost-effective DC/DC regulators for low power state-of-the-art computing, communications, consumer and Internet of Things (IoT) platform solutions.

**DC/DC Power Regulator Product Selection Guide**

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**Notes:**

SDI = Marvell Proprietary Serial Digital Interface  
SLPn = Sleep Mode  
FPWM = Forced PWM Mode  
DVC = Digital Voltage Control  
DSP Switchers\textsuperscript{®} = Marvell DSP (Digital) Regulators
88PG8111

The 88PG8111 is a high performance power management DC/DC regulator for low power applications such as WiFi SoCs, IoT lower power processors and general purpose applications. The step-down switching regulator provides up to 500mA load current. The 50mA LDO is designed for low power applications such as “always on” power domains in low power mode as well as low noise analog circuitries. The small footprint QFN package is ideal for module applications with the small inductor minimizing the system PCB size and cost.

The 88PG8111 supports different operating modes including active, sleep and shutdown modes. It also meets the state-of-the-art IoT low power platform requirements.

Features

- 2.7V to 5.5V input voltage range
- 2.7MHz (typical) switching frequency
- Up to 90% efficiency for step-down regulators at 1.2V and 1.8V outputs
- Supports small and low profile inductor
- Internal compensation for step-down regulator
- Soft start to minimize in-rush current
- Built-in under-voltage lock-out, over voltage protection, and over temperature protection
- Built-in startup sequence
- Supports Marvell proprietary serial interface

Package Options

- 3mm x 3mm 20-lead QFN

Applications

- Low power IoT SoCs
- WiFi HDD, SSD, Printers and DTVs
- Smartphones, Tablets and portable devices.

88PG8111 Typical Application

Get more: Technical Documentation
88PG8211

The 88PG8211 are high performance power management DC/DC regulators for low power applications such as WiFi SoCs, IoT lower power processors and general purpose applications. The two step-down switching regulators provide up to 500mA load current each. The 50mA LDO is designed for low power applications such as “always on” power domains in low power mode as well as low noise analog circuitries.

The small footprint QFN package is ideal for module applications with the small inductor minimizing the system PCB size and cost.

The 88PG8211 supports different operating modes including active, sleep and shutdown modes. It also meets the state-of-the-art IoT low power platform requirements.

Features
- 2.7V to 5.5V input voltage range
- 2.7MHz (typical) switching frequency
- 22µA sleep mode with all regulators enabled
- Up to 90% efficiency for step-down regulators at 1.2V and 1.8V outputs
- Supports small and low profile inductor
- Internal compensation for step-down regulators
- Soft start to minimize in-rush current
- Built-in under-voltage lock-out, over voltage protection, and over temperature protection
- Built-in startup sequence

Package Options
- 3mm x 3mm 20-lead QFN
- 1.125mm x 1.085mm 13-Lead WLCSP

Applications
- Low power IoT SoCs
- WiFi HDD, SSD, Printers and DTVs
- Smartphones, Tablets and portable devices.

88PG8211 Typical Application

Get more: Technical Documentation
88PG821A

The 88PG821A are high performance power management DC/DC regulators for low power applications such as WiFi SoCs, IoT lower power processors and general purpose applications. The two switching step-down regulators provide up to 500mA load current each. The 50mA LDO is designed for low power applications such as “always on” power domains in low power mode as well as low noise analog circuitries.

The small footprint QFN package is ideal for module applications with the small inductor minimizing the system PCB size and cost.

The 88PG821A supports different operating modes including active, sleep and shutdown modes. It also meets the state-of-the-art IoT low power platform requirements.

Features

- 2.7V to 5.5V input voltage range
- 2.7MHz (typical) switching frequency
- 22µA sleep mode with all regulators enabled
- Up to 90% efficiency for step-down regulators at 1.2V and 1.8V outputs
- Supports small and low profile inductor
- Internal compensation for step-down regulators
- Soft start to minimize in-rush current
- Built-in under-voltage lock-out, over voltage protection, and over temperature protection
- Built-in startup sequence
- Supports Marvell proprietary serial interface

Package Options

- 3mm x 3mm 20-lead QFN

Applications

- Low power IoT SoCs
- WiFi HDD, SSD, Printers and DTVs
- Smartphones, Tablets and portable devices

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The 88PG823 Family is the next generation high efficiency low cost power regulators. It consists of two 1.5A buck regulators and one 525mA LDO. The LDO can be powered by the buck converter output (≥1.6V) to minimize the power loss and simplify the system thermal design.

The 88PG823 Family is optimized for module applications. It minimizes the PCB footprint and BOM costs. The 12-bump WLCSP package provides the smallest footprint for the state of the art module applications. For general purpose applications, the 24-pin QFN package can meet the low cost PCB requirements. The QFN package also provides additional functions such as power good outputs.

The 88PG823 Family includes a Dynamic Voltage Scaling (DVS) feature supporting the latest Marvell SoC and processor power control scheme. This device also supports Marvell proprietary Adaptive Voltage Scaling (AVS). The serial interface can be used to program it to meet different application requirements.

**Features**
- Supports 2.7V~5.5V operating voltage
- Two 1.5A synchronous buck converters
- Single LDO supports up to 525mA
- Ultra low 15µA sleep current
- 3MHz switching frequency
- High output voltage accuracy
- Supports both DVS and AVS
- Single wire proprietary serial interface

**Package Options**
- 4mm x 4mm 24-Lead QFN
- 1.260mm x 1.545mm 12-Lead WLCSP

**Applications**
- WiFi Modules, WiFi Hubs, Access Points
- Smart TVs, Set-top Boxes, Game Consoles
- HDD, SSD, Printers
- Smartphones, Tablets, IoT Devices

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The 88PG8318 is a high performance general purpose power management regulator housed in a 3mm x 4mm DFN-12 package with multiple outputs to power I/O, analog, and core voltage for DSP or CPU applications. It includes one switching regulator and two Low Dropout (LDO) regulators. The switching regulator utilizes a proprietary internally compensated PWM control to regulate the output voltage, which offers fast transient response and minimal external components. The 88PG8318 operates from 2.7V to 5.5V input voltage range. The step-down switching regulator can deliver up to 1.2A output current while each LDO is capable of sourcing up to 2.5V/150mA and 1.8V/150mA. The switching regulator output voltage can be set to one of eight standard voltages through the VSET resistor. The step-down regulator can also be programmed from 0.72V to 3.63V through the EN/SDI input. The switching frequency is 2MHz (typical), allowing the use of low profile surface mounted inductors and low value capacitors.

Input quiescent currents of the 88PG8318 at no loads is 85µA (typical), resulting in high efficiencies at both light and full loads.

**Features**
- Input voltage range 2.7V to 5.5V
- Three outputs:
  - Switching regulator:
    - VSET: 0.8V, 1.0V, 1.2V, 1.5V, 1.8V, 2.5V, 3.0V, 3.3V
    - SDI: 0.72V to 3.63V
  - LDO regulator 1: 2.5V (default)
  - LDO regulator 2: 1.8V (default)
- 85µA quiescent current (all regulation on)
- 2MHz (typical) switching frequency
- Use small and low profile inductors
- Stable with Low-ESR ceramic output capacitor
- Up to 95% efficiency
- Build in under voltage lockout and over voltage protection and thermal shutdown
- Soft start to minimize the in-rush current
- One wire serial interface

**Package Options**
- 3mm x 4mm 12-lead DFN

**Applications**
- WiFi modules, WiFi Hubs, Access Points
- Smart TVs, Set-top boxes, Game Consoles
- HDD, SSD, Printers
- Smartphones, Tablets, IoT Devices

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The 88PG839 is a high performance, hysteretic step-down switching regulator that utilizes a proprietary, internally compensated Pulse Width Modulation (PWM) control to regulate the output voltage. The regulator offers fast transient response time and requires no external compensation. The device operates from an input voltage range of 2.7V to 5.5V and delivers up to 2A DC output current. The switching frequency is typically 2MHz, allowing the use of low profile surface mounted inductors and low value ceramic capacitors.

The step-down regulator includes the ability to easily program the output voltage with external resistors. The output voltage range is 0.64V to 3.63V. The output voltage can be changed On-the-Fly (OTF) from a nominal value by a percentage through connecting the OTF pin to a high level, making it ideal for portable applications.

**Features**
- Input voltage range 2.7V to 5.5V
- Output voltage range 0.64V to 3.63V
- Hysteretic step-down regulator
- 32μA (typical) quiescent current
- 2MHz switching frequency
- Small and low-profile inductors
- Stable with low-ESR ceramic output capacitor
- -20% to +10% On-the-Fly output voltage adjustment
- Internal compensation
- Up to 95% efficiency
- 2A DC output current
- 72 output voltage selections using AnyVoltage™ Technology
- Built-in under/over voltage lockout
- Thermal shutdown protection
- Soft start to minimize the in-rush current

**Package Options**
- 3mm x 4mm 12-lead DFN

**Applications**
- Portable computing
- Personal Digital Assistant (PDA)
- Cell phones
- Ultra-Mobile PC (UMPC)
The 88PG852 Family is the next generation high efficiency, low cost buck converter. The 6 and 8 lead configurations provide a simple to use interface as well as all the necessary features for state-of-the-art low power system applications.

The 88PG852 Family also provides Auto PFM/PWM switching control to reduce power consumption during light load current. It also supports forced PWM mode to reduce voltage ripple for low noise applications such as powering the RF or analog circuitries.

The ultra low 15µA quiescent current is ideal for battery powered applications. The dual row 2x3 (6-bump) WLCSP package provides the smallest footprint solution. It can support non-HDI PCB even with 0.4mm bump pitch package. It provides a low cost and small footprint solution for low power IoT and wearable applications.

### Features
- Supports 2.7V - 5.5V input Voltage
- Supports up to 2A output current
- 3MHz switching frequency
- Ultra low 15µA quiescent current
- Precise PFM and PWM transition control
- High output voltage accuracy
- Small output ripple in PFM/PWM operation modes
- High efficiency in both PFM and PWM modes
- Supports 100% duty cycle

### Package Options
- 3mm x 3mm 8-lead QFN
- 1.275mm x 0.855mm 6-Lead WLCSP

### Applications
- IoT SoC., IoT Devices
- Smartphones, Tablets, Wireless Modules
- Hard Disk Drives, Solid State Drives
- Smart TVs, Set-top Boxes, Game Consoles
- Digital Cameras, Security Cameras, Printers

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The 88PG867 Family is a dual synchronous step-down DC/DC converter with built-in MOSFETs and I2C control interfaces. Each switching regulator utilizes a proprietary internally compensated PWM control to regulate the output voltage, which offers fast transient response and requires no external compensation circuit or components. It supports 2.7V to 5.5V operating voltage. The two step-down switching regulators can deliver up to 3A and 1A output currents. Each output voltage can be dynamically controlled and programmed to support high efficiency mobile processor cores. The switching frequency is 2.2MHz for Step-down regulator 1 (Buck1) and Step-down regulator 2 (Buck2) for low profile surface mounted inductors and smaller capacitors.

The 88PG867 sleep mode can lower its quiescent current. With the programmable output voltage, the system can significantly reduce the power consumption of the low power modes.

**Features**
- 2.7V to 5.5V input voltage range
- High performance step-down DC/DC converters (3A, 1A)
- 2.2MHz switching frequency for Buck1 and Buck2
- ±3% PWM DC voltage accuracy
- Low 28mA (typical) total quiescent current in sleep mode
- Supports Dynamic Voltage Control (DVC)
- Up to 92% efficiency
- I2C (Fast Mode) interface control
- Soft-start operation to reduce inrush current

**Package Options**
- 3mm x 4mm 24-lead QFN
- 1.255mm x 2.455mm 18-Lead WLCSP

**Applications**
- Mobile baseband and SoC Processors
- Point of load applications
- Low voltage, high density power systems

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The 88PG868 Family is part of the Marvell dual synchronous step-down DC/DC converters with built-in MOSFETs and I²C control interface. Each switching buck regulator utilizes a proprietary internally compensated PWM control that offers fast transient responses without requiring any additional external compensation components.

The 88PG868 Family supports supply voltages from 2.7V to 5.5V. The two switching regulators within the 88PG868 Family can deliver load currents of 3A (buck1) and 1A (buck2). Each buck regulator output voltage can be dynamically and independently controlled and programmed to support high efficiency mobile processor core applications. The regulator switching frequencies are 1.1MHz to provide the best efficiency.

The 88PG868 sleep mode can lower its quiescent current. With the programmable output voltage, the system can significantly reduce the power consumption of the low power modes.

**Features**

- 2.7V to 5.5V input voltage range
- High performance dual step-down DC/DC converters (3A, 1A)
- 1.1MHz switching frequency for Buck1 and Buck2 regulators
- +/-3% PWM DC voltage accuracy
- Low 28μA (typical) total quiescent current during sleep mode
- Supports Dynamic Voltage Control (DVC)
- Up to 97% efficiency
- I²C (Fast Mode) interface control
- Soft-start operation to reduce inrush current

**Package Options**

- 3mm x 4mm 24-lead QFN

**Applications**

- Mobile baseband and SoC processors
- Point of load applications
- Low voltage, high density power systems

**88PG868 Typical Application**

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The 88PG870 Family is a high performance and high efficiency dual phase 6A step down regulator with ultra low quiescent current.

Its proprietary internal compensated PWM control and remote voltage sense capability provide the fast load transient response which allows the application processor to further reduce power consumption.

The 88PG870 Family also provides programmable Dynamic Voltage Control (DVC) to support the power management requirements of the state-of-the-art processors.

The 88PG870 Family I2C interface provides a simple and easy programming interface. The SLEEPn pin is used to enter the low power sleep mode. With the programmable output voltage, the system can significantly reduce the power consumption for the low power modes.

**Features**
- Supports 2.7V~5.5V input voltage
- Supports up to 6A output current
- Switching frequency: 2MHz
- Differential remote output voltage sense
- High output voltage accuracy (+/-2%)<br />
- Supports Dynamic Voltage Control (DVC)
- Low output ripple in both PFM/PWM operation modes
- Programmable Soft-start
- I2C interface with programmable slave address

**Packages**
- 1.675mm x 2.475mm 22-lead WLCSP
- 4mm x 4mm 24-lead QFN

**Applications**
- Smartphones & Tablets
- Printers and DTVs
- SSD and HDD

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The 88PG877 is an intelligent digital synchronous step-down (buck) switching regulator housed in a 3mm x 4mm QFN-18 package. Internally self-compensated, these step-down regulators require no external compensation and work with low-ESR output capacitors to simplify the design, minimize board space, and reduce the amount of external components. The switching frequency for the step-down regulator is 1MHz, allowing the use of low profile surface mount inductors and low value capacitors. The step-down regulator includes programmable output voltage to provide the user the ability to easily set the output voltage with external resistors, logic control, or serial data interface. The output voltage range is 0.72V to 3.63V.

Other key features of the 88PG877 include soft start, an internal current limit, an under voltage lockout, thermal shutdown, over voltage protection, and a power good (PG) signal.

### Features
- 1MHz switching frequency
- Low quiescent current
- Stable with ceramic output capacitors
- No external compensation required
- Up to 95% efficiency
- Peak switch current limit up to 7.5A
- Input voltage range: 3.0V to 5.5V
- Serial / logic programmability
- AnyVoltage™ technology providing 64 output voltage selections providing flexibility for user
- Programmable output voltage range: 0.72V to 3.63V
- Built-in under voltage lockout
- Over voltage protection
- Thermal shutdown protection
- Output voltage margining capability

### Package Options
- 3mm x 4mm 18-lead QFN

### Applications
- Portable Computing
- Disk Drive Power Supplies
- DTVs and Set-top Boxes

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**88PG877 Typical Application**

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88PG878

The 88PG878 device is an intelligent digital synchronous Step-down (buck) switching regulator housed in a 3x4mm QFN-18 package. Internally self-compensated, the step-down regulator requires no external compensation and work with low-ESR output capacitors to simplify the design, minimize board space, and reduce the amount of external components. The 1MHz switching frequency allows the use of low profile surface mount inductors and low value capacitors. The step-down regulator includes programmable output voltage to provide the user the ability to easily set the output voltage with external resistors, logic control, or serial data interface. The output voltage range is 0.72V to 3.63V.

Other key features of the 88PG878 family include soft start, an internal current limit, an under voltage lockout, thermal shutdown, over voltage protection, and a Power Good (PG) signal.

**Features**
- 1MHz Switching frequency
- Low quiescent current of 1.9mA (typ.)
- Stable with ceramic output capacitors
- No external compensation required
- Up to 95% efficiency
- Input voltage range: 3.0V to 5.5V
- Serial / Logic Programmability
- Any Voltage™ Technology provides 64 output voltage selections to provide flexibility
- Programmable output voltage range:
  - 0.72V to 3.63V
- Built-in under voltage lockout
- Over voltage protection
- Thermal shutdown protection
- Output voltage margining capability

**Package Options**
- 3mm x 4mm 18-lead QFN

**Applications**
- Portable Computing
- Disk Drive Power Supplies
- DTVs and Set-top Boxes

88PG878 Typical Application

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The 88PH845 device is a simple, easy to use high-voltage synchronous buck switching regulator. A digital control algorithm provides a fast transient response and requires no external compensation components, minimizing the external component count. The output voltage of the Marvell® regulator can be set with external resistors (one allows a minor range of settings, while two are used to achieve a full range of program settings), logic programmability, or a serial interface. The input voltage range is 4.5V to 15.7V. The output voltage range is 0.9V to 5.5V.

The step-down regulator is internally self-compensated and requires no external compensation. The regulator works with low-ESR output capacitors to simplify the design, minimize board space, and reduce the amount of external components. The switching frequency for the step-down regulator is 500kHz, allowing the use of low profile surface mount inductors and low value capacitors.

**Features**
- 3.0A DC output current
- 4.5V to 15.7V input operating range
- 0.9V to 5.5V output voltage
- 500kHz switching frequency
- Stable with low-ESR ceramic output capacitors
- Up to 95% efficiency
- Internal soft startup
- Serial/Logic programmability
- 72 output voltage selections using AnyVoltage™ Technology
- RoHS 6/6 compliant package

**Package Options**
- 3mm x 4mm 18-lead QFN

**Applications**
- WiFi Access Hub
- Home Automation Appliances
- Network Attached Storage (NAS)
- Network Switch Routers

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## Revision History

**Table 1: Revision History**

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<tr>
<td>Introduced 88PG823 product.</td>
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<tr>
<td>Release</td>
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<td>First release.</td>
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- Introduced 88PG823 product.
- First release.