MCP1640 & MCP1624/3 Voltage Boost Regulators

Advanced Performance and Integration with Industry Leading Low Power

Summary

Battery powered applications have historically been a versatile market lending itself to a multitude of products in consumer, medical, personal care and entertainment. These products have the common need for intelligent control, low power and maximized battery life, and trends have emphasized the need for minimal size, portability and reduced weight. Whether it is an electric shaver, digital music player, camera or a flashlight – all of these products are shrinking but are typically limited in size by the need for two or more batteries. Therefore the ability to operate a MCU with a single battery becomes increasingly valuable to a growing number of applications.

The MCP1640/1624/1623 Synchronous Boost Regulators bring low voltage support to any PIC® microcontroller providing a flexible and customizable solution to any single cell or low voltage application. Featuring a start-up voltage of 0.65V and an operating voltage down to 0.35V, the MCP1640/1624/1623 regulators reduce the number of batteries needed in a typical design – even enabling designs to be powered from a single Alkaline, NiMh, NiCd or disposable Lithium battery cell.

The MCP1640/1624/1623 Synchronous Boost Regulators extend battery life with up to 96% typical efficiency, shutdown current of less than one micro Ampere in all states and a true load-disconnect shutdown. These devices have an operating input voltage of 0.35 to 5.5V and an adjustable output voltage range of 2.0 to 5.5V. In reducing the number of batteries required, the MCP1640/1624/1623 regulators enable more environmentally friendly designs, with reduced shipping burden and operating costs. All devices include over-temperature protection and provide 500 kHz PWM operation, enabling the use of smaller coils.

Unlike competitive low voltage microcontrollers that provide limited and fixed product options, the MCP1640/1624/1623 provides low voltage support to any PIC microcontroller for ultimate system flexibility. These regulators ultimately enable designers to reduce the size and number of batteries without increasing costs.

Key Advantages

- Low voltage support to any application
- Can be paired with any PIC microcontroller for true system flexibility
- Minimizes application size
  - Small, Portable, Lightweight
- Enables single cell battery applications
  - Fewer batteries
  - Reduced shipping burden, lighter weight and environmentally friendly
- Allows use with a single virtually drained battery
- Enables energy harvesting (i.e. solar cells)

Key Features

- Up to 96% Typical Efficiency
- 800 mA Typical Peak Input Current (MCP1640):
  - I_{OUT} > 100 mA @ 1.2V V_{IN}, 3.3V V_{OUT}
  - I_{OUT} > 350 mA @ 2.4V V_{IN}, 3.3V V_{OUT}
  - I_{OUT} > 350 mA @ 3.3V V_{IN}, 5.0V V_{OUT}
- 425 mA Typical Peak Input Current (MCP1624/3):
  - I_{OUT} > 50 mA @ 1.2V V_{IN}, 3.3V V_{OUT}
  - I_{OUT} > 175 mA @ 2.4V V_{IN}, 3.3V V_{OUT}
  - I_{OUT} > 175 mA @ 3.3V V_{IN}, 5.0V V_{OUT}
- Low Start-up Voltage: 0.65V
- Operating Input Voltage: 0.35V to 5.5V
- Adjustable Output Voltage Range: 2.0V to 5.5V
- Maximum Input Voltage ≤ V_{OUT} < 5.5V
- Automatic PFM/PWM Operation
  - PWM Operation at 500 kHz
- Low Quiescent Current:
  - 19 µA in PFM mode
- Internal Synchronous Rectifier
- Internal Compensation
- Inrush Current Limiting and Internal Soft-Start
- True Load Disconnect (MCP1640/40B/1624/1623)
- Input to Output Bypass (MCP1640C/40D)
- Shutdown Current (All States): < 1 µA
- Low Noise with Anti-Ringing Control
- Over-temperature Protection

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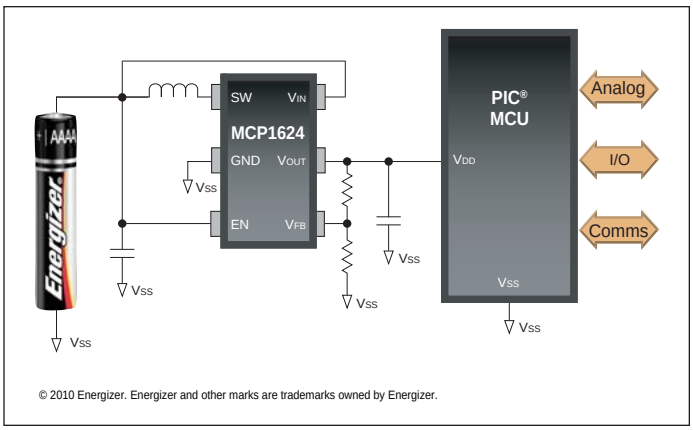
MCP1623/4 Low-Voltage Boost Regulator Circuit Diagram



Additional Information

- *MCP1640/B/C/D Data Sheet*, DS22234
- *MCP1623/24 Data Sheet*, DS41420
- *Single Cell Input Boost Converter Design*, AN1311
- *MCP1640 Synchronous Boost Converter Evaluation Board User's Guide*, DS51880
- *8-bit PIC Microcontroller Solution Brochure*, DS39630
- *Corporate Focus Product Selector Guide*, DS01308
- *Quick Guide to Microchip Development Tools Brochure*, DS51894

Sample/Purchasing Information

- On-line Sampling: **sample.microchip.com**
- On-line Purchasing: **www.microchipdirect.com**

MCP1640 & MCP1624/23 Voltage Boost Regulators

	MCP1623	MCP1624	MCP1640	MCP1640B	MCP1640C	MCP1640D
Mode	PWM	PWM/PFM	PWM/PFM	PWM	PWM/PFM	PWM
IOUT @ 1.2V VIN, 3.3V VOUT	>50 mA	>50 mA	>100 mA	>100 mA	>100 mA	>100 mA
VOUT Accuracy	±7.4%	±7.4%	±3%	±3%	±3%	±3%
Switching Frequency (kHz)	370-630	370-630	425-575	425-575	425-575	425-575
Shutdown	True Load Disconnect	True Load Disconnect	True Load Disconnect	True Load Disconnect	Input to Output Bypass	Input to Output Bypass
Packages	SOT23-6	SOT23-6	SOT23-6 2x3 DFN-8	SOT23-6 2x3 DFN-8	SOT23-6 2x3 DFN-8	SOT23-6 2x3 DFN-8
Key Attributes	Lowest Cost Lower Voltage Ripple	Lowest Cost Lower Quiescent Current	Highest Performance	Highest Performance	Highest Performance	Highest Performance

Development Tools from Microchip

Part Number	Development Tool	Description
DM183032	PIC18 Explorer Board	Low-cost demonstration board to evaluate PIC18 microcontroller families.
MCP1640EV-SBC	MCP1640 Evaluation Board	Demonstrates the MCP1640 in two boost-converter applications.
DM164130-5	F1 + Low Voltage Evaluation Platform	Demonstration/development tool for Enhanced Mid-Range PIC microcontrollers (PIC12F1XXX/PIC16F1XXX).
DV164131	PICkit™ 3 Debug Express	In-Circuit Debugger/Programmer uses in-circuit debugging logic incorporated into each chip with Flash memory to provide a low-cost hardware debugger and programmer.
DV164035	MPLAB® ICD 3 In-Circuit Debugger	Cost effective high-speed hardware debugger/programmer for Flash PIC MCU and dsPIC Digital Signal Controller (DSC) devices.

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