NXP MPT612 IC for Maximum Power Point Tracking

Get up to 98% efficiency with MPPT IC for solar PV/fuel-cell systems

This small, low-power MPPT solution, the first of its kind, is supported by a patent-pending MPPT algorithm, delivers up to 98% efficiency, and can be configured for customer-specific tasks.

Key features

- ARM7 TDMI-S 32-bit RISC core operating up to 70 MHz
- Multiple serial interfaces (I^2C, UART, SPI, SSP)
- Dedicated hardware functions: PV voltage & current measurement, PV panel parameter configuration
- Output signal to control external switching device
- Patent-pending MPP tracking algorithm software libraries (royalty/license-free)
- Well-documented APIs for smooth, fast development
- Up to 15 Kbytes of flash available for application software

Applications

- Charger controllers for battery charging in standalone DC application
- DC/DC converter to increase panel's extracted power
- Micro-inverter for converting panel's DC output to AC

The NXP MPT612, the first dedicated IC for performing the Maximum Power Point Tracking (MPPT) function, is designed for use in applications that use solar photovoltaic (PV) cells or in fuel cells. To simplify development and maximize system efficiency, the MPT612 is supported by a patent-pending MPPT algorithm, an application-specific software library, and easy-to-use application programming interfaces (APIs).

The IC can be used in a wide range of applications that use MPPT functions. For example, it can be used in a DC/DC converter to help increase the amount of power extracted from a solar panel, and it can be used in a micro-inverter that converts the panel's output from DC to AC format. It can also be used in a charge controller to charge a battery in standalone DC applications.

Dedicated hardware functions for PV panels, including voltage and current measurement, and panel parameter configuration, simplify design and speed development.

The MPT612 is based on a low-power ARM7 TDMI-S RISC processor that operates at up to 70 MHz and can achieve system efficiency ratings up to 98%. It can be used with any DC source that has MPP characteristics. It controls the external switching device through a signal derived from a patent-pending

MPPT algorithm. The DC source can be connected to the IC through appropriate voltage and current sensors. The IC dynamically extracts the maximum power from the DC source, without user intervention. The IC can be configured for boundary conditions set in software. There are up to 15 Kbytes of flash memory available for application software.

Software libraries and APIs

The different software components are released as object files and work together to create a layered, modular design architecture. To keep development costs to a minimum, there are no additional royalty or licensing fees for the MPPT algorithm or software libraries. An optional software library, for lead-acid battery charging, is also available.

The APIs provide smooth, fast links to the application software. The API for system configuration can set the topology to buck, boost, or buck-boost. The APIs for implementing software-based lead-acid battery charging cycles are configurable for battery type, can be programmed to use up to four stages of battery charging, and support user-defined set points, including load disconnect and reconnect. Three levels of flash Code Read Protection (CRP) in the MPT612 safeguard user-developed code.

Customer-specific functions

The MPT612 can be configured to support optional, customer-specific functions. The IC supports system status indication, and can be used to sense and measure battery voltage, battery current, temperature, or load current. The on-chip circuitry can also be used to configure load protection, battery parameters, and battery protection.

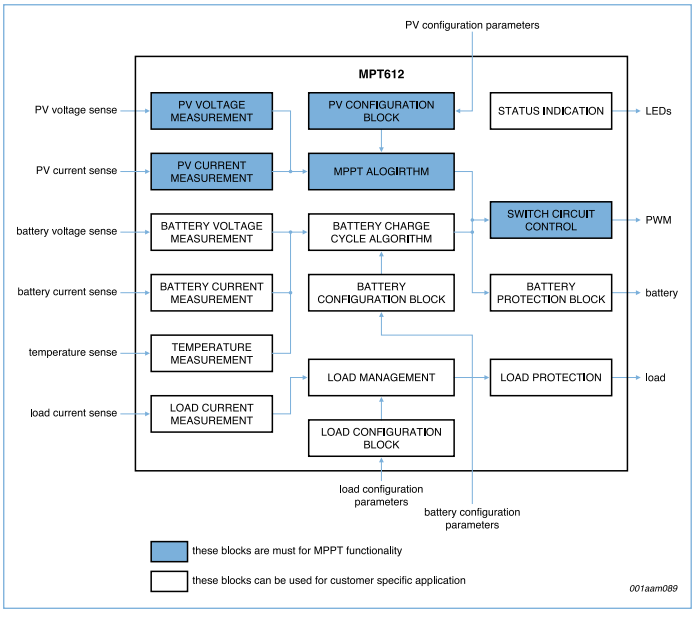
There are up to five channels of 10-bit ADC, with conversion times of 2.44 µs/channel - These are apart from the dedicated hardware functions. To increase design flexibility, serial interfaces include two UARTs, two I^2C interfaces, and single interfaces for SPI and SSP with buffering and variable data-length capabilities. There are up to 28 GPIO (all are tolerant to 5 V), and up to 13 edge/level-sensitive interrupt pins.

To reduce power consumption, there are several power-saving modes, including idle, power-down with real-time clock (RTC) active, and power-down. Peripheral functions can be enabled or disabled individually, and the IC supports peripheral clock scaling. More resources can be made available if fewer functions are selected in battery charging, status indication, and so on.

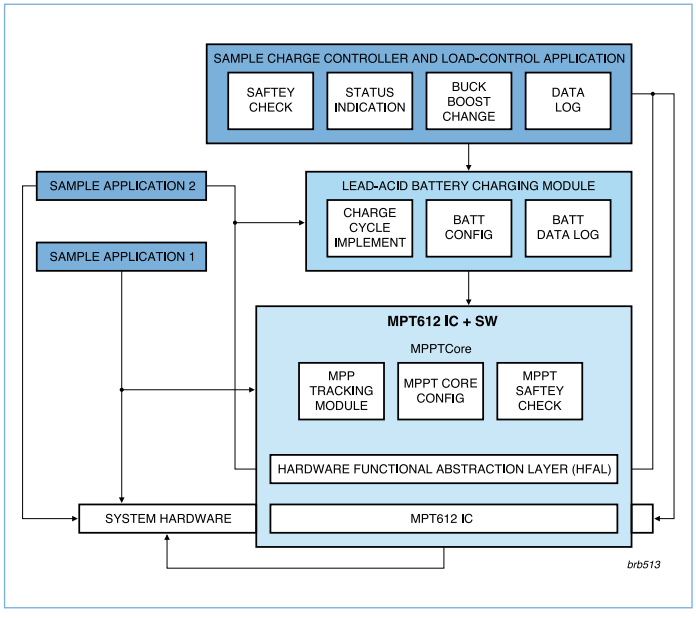
Development kit

The MPT612 is available with a development kit that includes a reference design, software libraries, a user manual, a datasheet, and an application note.

MPT612 block diagram



MPT612 software architecture



Date of release: June 2010

Document order number: 9397 750 16949

Printed in the Netherlands