Battery Management System Solutions

Power Tools | Battery Backup | Robotics | Energy Storage | E-Mobility

Quality Assurance & Reliability Commitment

The MPS Quality Assurance organization develops, coordinates, and champions strategic quality initiatives throughout MPS Inc., its foundries, and subcontractors. Its mission is to enable MPS to design, develop, manufacture, and deliver products to our customers with world-class quality and reliability that meet and exceed our customers' expectations.

Quality and Compliance Certificates:

- Quality Policy (MPS)
- ISO 9001 Certificate (MPS)
- ISO 14001 Certificate (MPS)
- ISO 45001 Certificate (Suppliers)
- ISO 27001 Certificate (MPS)
- ISO13849 TUV certificate
- RBA Certificate (MPS)

Product Quality:

- Automotive Products Qualified per AEC-Q100 Standard
- Standard Products Qualified per JEDEC and Military Standards
- Reliability Failure Rate < 10FIT
- Product Quality Level < 1.0ppm

Quality Control and Monitoring:

- On-Site Foundry and Assembly Teams for Real-Time Actions
- Quarterly Supplier Quality Review and Annual Supplier Audit
- Short-Term Reliability Monitor Test – Daily
- Long-Term Reliability Monitor Test – Monthly
- Real-Time Engineering Actions on Monitor Failure
- Quarterly Reliability Monitor Reports

Environmental Compliances:

- EU RoHS/HF/REACH Compliant
- UL Compliant
- Sony Green Partner
- Samsung Eco-Partner
- MPS Conflict Minerals Policy

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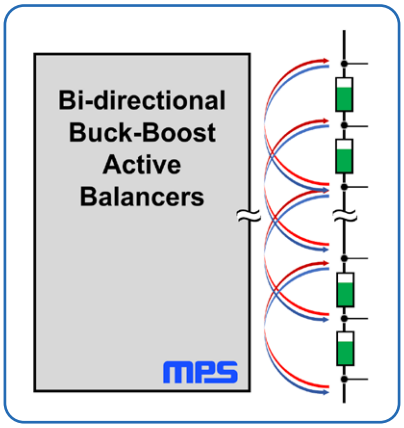
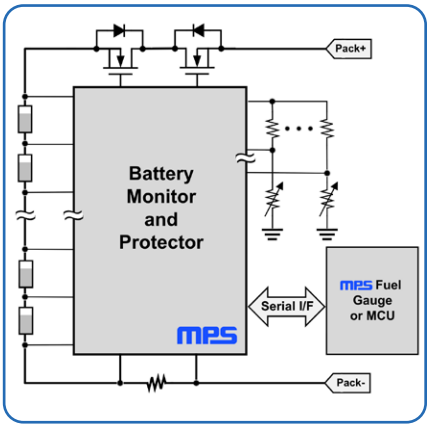
MPS Battery Management Solutions

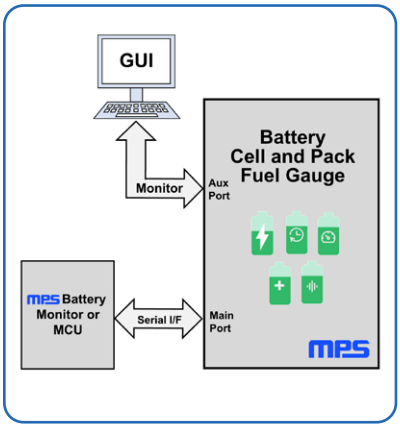
Active Balancers



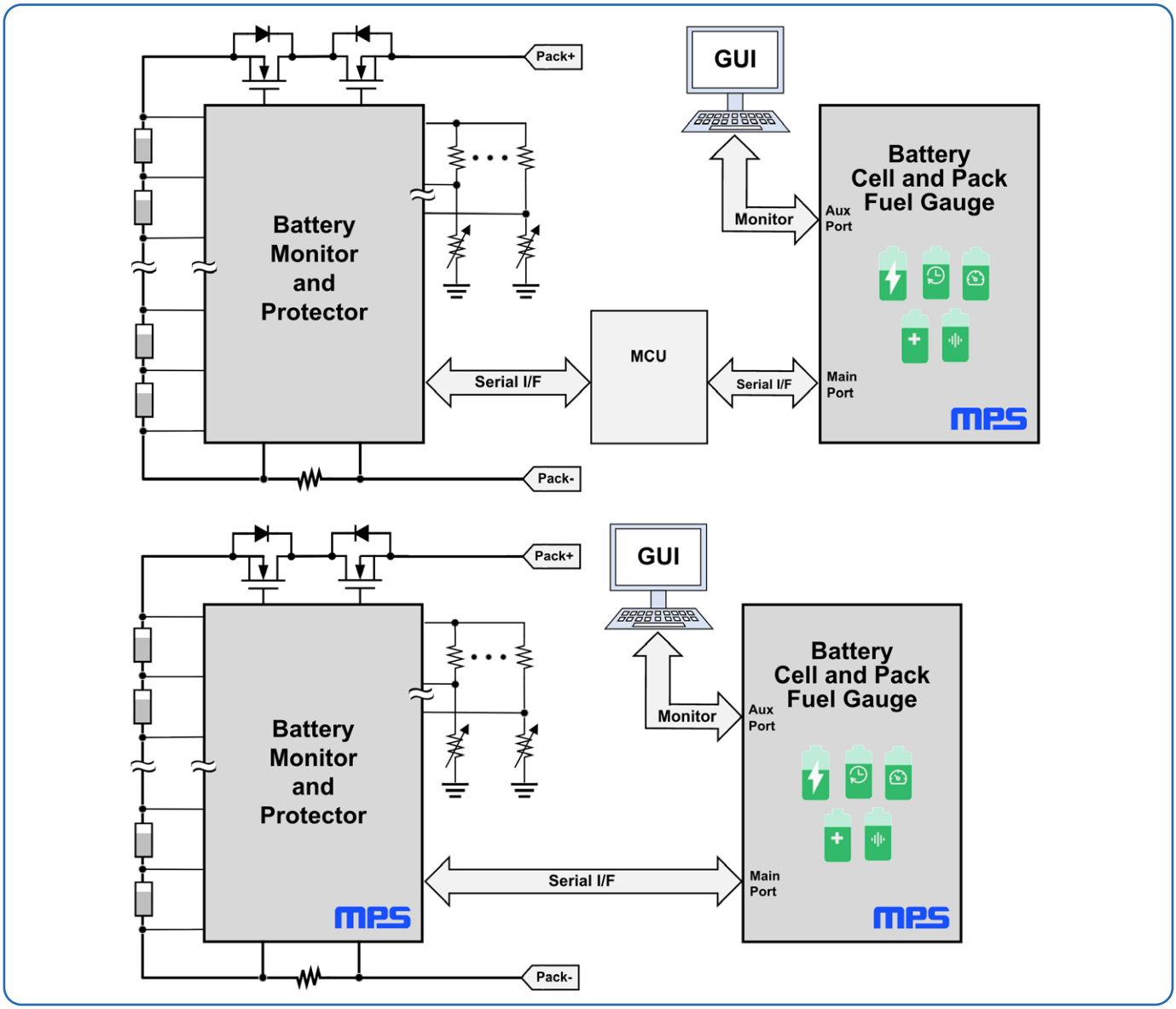
Battery Monitors



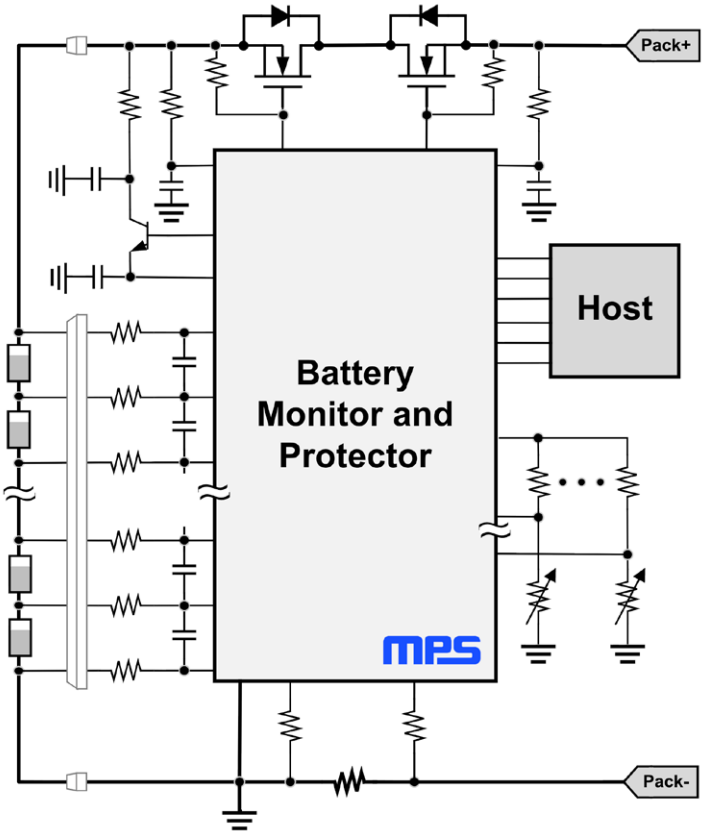
Fuel Gauges



BMS Complete Solutions



Battery Stack Monitors & Protectors



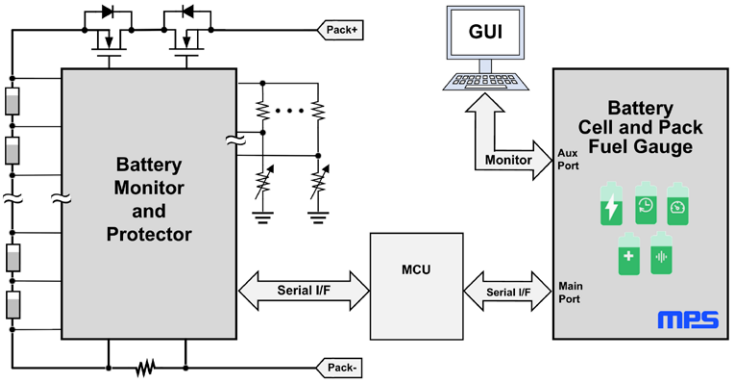
Battery Monitors & Protectors

These highly integrated solutions are designed for monitoring and protecting Li-ion battery strings from 3 to 24 cells in series.

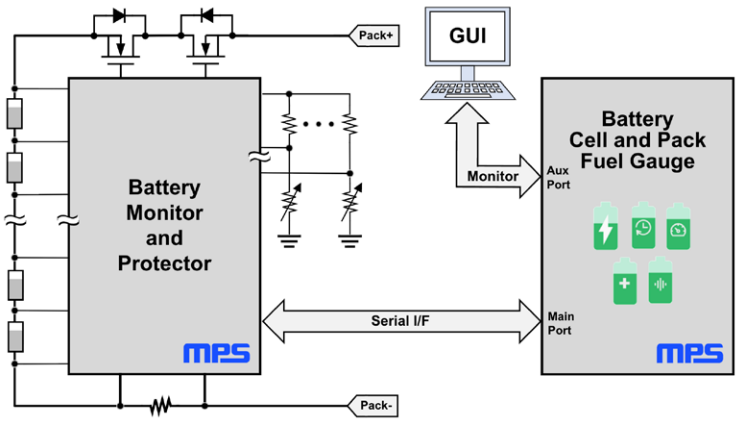
These devices include charge and discharge control, current-sensing, Coulomb counting, passive balancing, and an industry-standard serial communication interface.

Your Need	MPS Advantage
Devices that Support Battery Packs from 7V to 100V+	Battery Monitor & Protectors for Packs from 3 to 24 Cells in Series
Ability to Estimate Precise, Real-Time Metrics on Battery Health	Accurate, Strictly Synchronized Cell Voltage and Current Measurements
A Safe, Fault-Protected System	Integrated, Separately Controlled High-Side Charge/Disharge MOSFET Drivers
Elimination of Pre-Charge Circuitry	MPS Discharge Soft Start to Replace Pre-Charge Circuit
Minimal External Circuitry for Lowest Cost and Footprint	Integrated Balancing FETs, 5V and 3.3V Regulator, and Fuse Driver

Battery Stack Fuel Gauges



MCU Connection Type



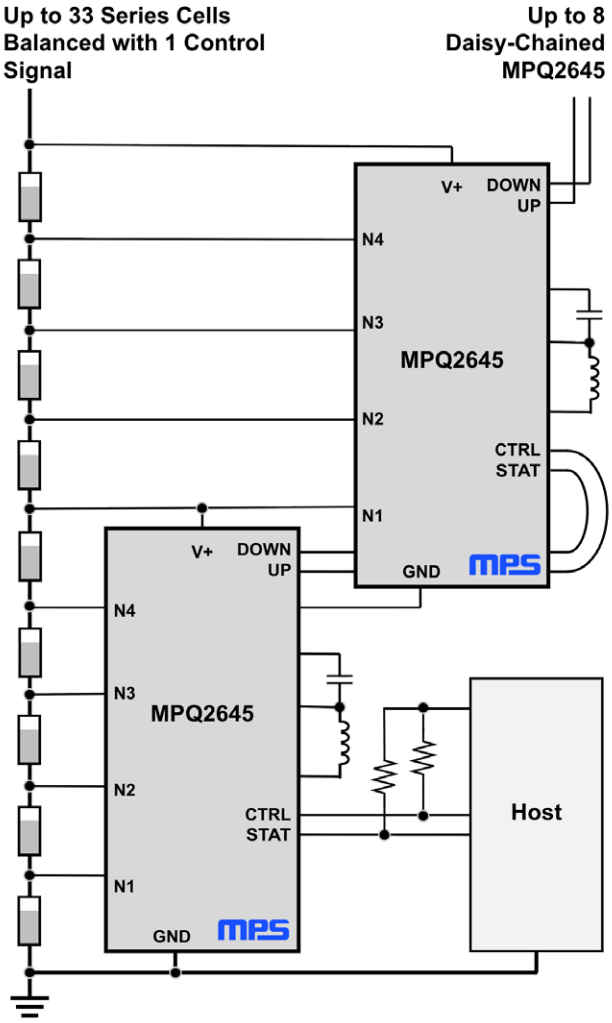
Direct Connection Type

Fuel Gauges

A single MPS fuel gauge can support fuel gauging for packs ranging from 2 to 112 cells in series. MPS fuel gauges support all common battery chemistries, such as Li-ion, Li-polymer, and LFP.

Your Need	MPS Advantage
Maximum Usable Battery Capacity	Precise State-of-Charge on Every Cell and the Full Pack
Predictable Runtime and Charge Time	Accurate Pack Charge and Discharge Estimates
Continuously Extract Peak Performance from the Battery	Instantaneous Pack Max Power, Time-to-Full, Time-to-Empty
Reliable and Safe Operation	Accurate State-of-Health on Every Cell and the Full Pack
Ability to Monitor and Track Battery Aging	Up-to-Date Cell-Level Equivalent Series Resistance Estimates

Battery Stack Active Balancers



Active Balancers

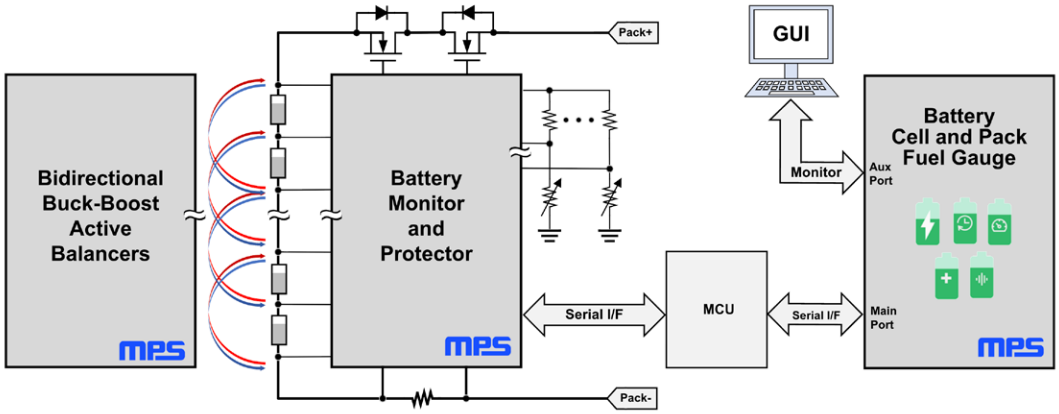
As an alternative to passive balancing, active balancers efficiently move charge between 2 to 5 cells using a simple buck or boost power conversion operation. Interleaving multiple devices allows scaling to any number of series cells to redistribute charge to and from any cells within a pack.

Your Need	MPS Advantage
Short Cycle Operation with Fast Charge and Discharge	Up to 3.75A of Balancing Current for Minimum Balance Time
Minimal Heat Dissipation and Energy Loss	>92% Energy Transfer Efficiency
Support for High Charge and Discharge Rates	Continuous Balancing during Charge and Discharge
Support for Large, High-Voltage Battery Packs	Can Be Interleaved to Balance All Cells of Any Pack Size
Simple, Minimal Control and Monitoring Requirements	One Control and One Status Signal for Balancing Up to 33 Cells

BMS Complete Solution

3 to 16 Series Cell Battery Management System

- ±5mV Cell Measurement Error
- ±0.5% Current Measurement Error
- ±1% Temperature Measurement Error
- ±2.5% State-of-Charge (SOC) Error
- ±1% State-of-Health (SOH) Error
- MPS Offers a Production-Ready, Fully Validated Solution

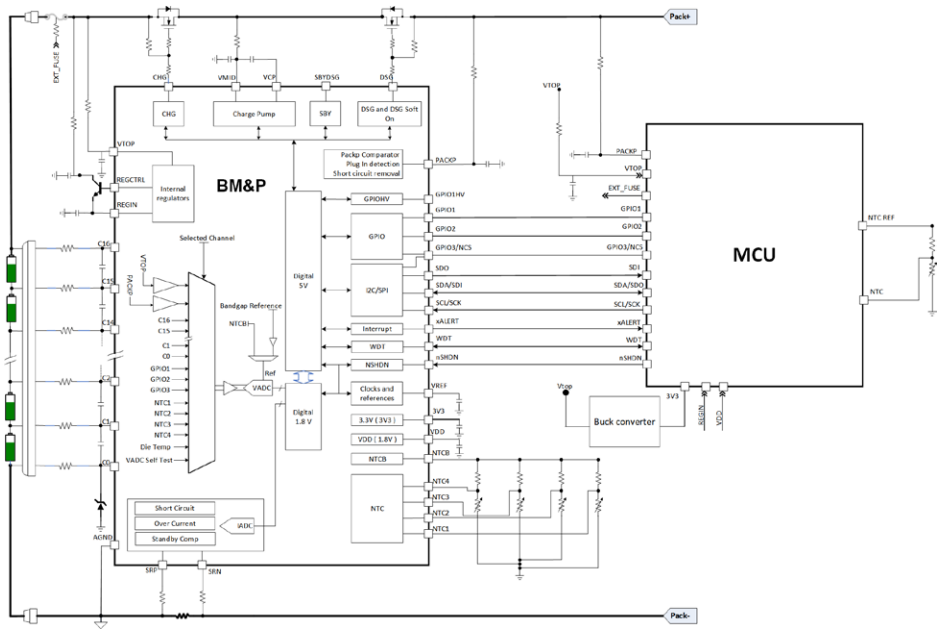


Your Need	MPS Advantage
High State-of-Charge Accuracy for LFP and Other Li-Ion Chemistries	<2.5% SOC Error by Combining MPS Battery Monitors and Fuel Gauges
Fast Time-to-Market	Complete MPS Plug-and-Play Solution
Flexible, Customizable Approach	MCU Source Code Available
High-Current Active Balancing	Option to Add MPS Active Balancing Solution
Functional Safety and UL Standard Compliance	Guidance with Recommended Safety Measures and Architecture

MPS Functional Safety Concept

ISO 13849 PL-C Architecture Certified

MPS's functional safety concept uses a redundancy architecture in which the MCU senses key parameters for the battery and for the battery monitor and protector to ensure correct functioning. A PL-C functional safety level can be achieved with MPS's safety concept.



Your Need	MPS Advantage
A Complete BMS Solution	Fully Validated Comprehensive Design
Meet Functional Safety Requirements	Pre-Certified FuSa-Ready Architecture
Straightforward Implementation	MPS's Dedicated FuSa Software
Customizable Hardware	Hardware Schematics Provided
Minimal Design and Schedule Risk	Reference Designs and Complete Solutions Available

Power & Gardening Tools

Application Characteristics

- Battery pack performance is key to success
  - Competition is motivating suppliers to offer more power, energy, and runtime
- Each OEM seeks to sell a full suite of tools
  - A single battery design must support many tools with diverse requirements
- Cost-sensitive as the battery pack is a large percentage of tool cost

MPS Advantages

Battery Monitors

- Cost-effective, small footprint with advanced integrated features to minimize external components
- Support for 3- to 24-cell stacks to cover a wide range of pack sizes
- Onboard FET control for up to 200A with separate discharge and charge, as well as fast protection response
- Low standby current for maximum battery storage time

Fuel Gauges

- Compact solution when directly connected to MPS battery monitors without a microprocessor
- Advanced fuel gauging provides competitive features such as time-to-full and time-to-empty

Market Trends for Power & Gardening Tool BMS					
Gov. Regulation	Industry Standards	Evolving Batteries	Cost Differentiation	End-Product Differentiation	Manufacturing Localization
	√		√	√	

Products for Power & Gardening Tools

Battery Monitors & Protectors

	Part Number	# of Series Cells	Pack Voltage (V)	Charge/Discharge MOSFET Driver	Separate Charge/Discharge Control	Cell-Balancing	Coulomb Counting	Discharge Soft Start	Load/Charger Detection	Sync Voltage & Current Measurement	OT Cell Voltage Accuracy (-20°C to +65°C)	MPS Advantages for Power & Gardening Tools
N	**MP2793**	4 to 16	10 to 86	High-Side	✓	✓	✓	✓	✓	✓	±7.5mV	Integrated drivers for independently controlled charge/discharge protection MOSFETs, soft start eliminates pre-charge circuit
N	**MP3710**	3 to 18	7.5 to 86	High-Side	✓	✓	-	✓	✓	-	-	Standalone protection device for 3- to 18-cell packs; supports broad range of pack sizes; no communication required for operation; can directly control protection MOSFETs, fuses, and generate interrupts or alarms
N	**MP3712**	3 to 8	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer
N	**MP3713**	3 to 10	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer
N	**MP3714**	3 to 16	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer
N	**MP3716**	3 to 18	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer
S	**MP3717**	4 to 20	10 to 140	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer
S	**MP3718**	4 to 24	10 to 140	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer

Products for Power & Gardening Tools

Battery Pack Fuel Gauges

	Part Number	# of Series Cells	Chemistry	Communication Interface	External SOC Indication	Pack SOC Accuracy	Cell Impedance Monitoring	Thermal Model	Recommended Battery Monitor	Battery Monitor Interface	MPS Advantages for Power & Gardening Tools
	MPF42791	2 to 16	Li-Ion, Li-Polymer	I²C	LED	±3%	✓	✓	MP3714	Via MCU	Provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
	MPF42792	2 to 16	Li-Ion, Li-Polymer	I²C	-	±3%	-	-	MP2793	Via MCU	Streamlined feature set for lowest cost; provides high-accuracy cell and pack battery metrics with lifetime logging
	MPF42795	2 to 10	Li-Ion, Li-Polymer	I²C	LED	±3%	-	-	MP3712, MP3713	Via MCU	Provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
	MPF42797	2 to 10	Li-Ion, Li-Polymer	I²C	-	±3%	-	-	MP3712, MP3713	Via MCU	Streamlined feature set for lowest cost; provides high-accuracy cell and pack battery metrics with lifetime logging
S	**MPF42780**	4 to 16	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP2793	Direct	Supports all battery chemistries, including LFP; eliminates need for MCU by directly controlling MPS battery monitor; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42781**	3 to 18	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP3712, MP3713, MP3713, MP3714, MP3715, MP3716	Direct	Supports all battery chemistries, including LFP; eliminates need for MCU by directly controlling MPS battery monitor; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42794**	2 to 24	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP3717, MP3718	Via MCU	Supports all battery chemistries, including LFP; provides high-accuracy cell and pack SOC estimates, SOH estimates, max available power, impedance, charge and runtime, lifetime logging

N New Product S Sampling Product P Preview Product

E-Mobility

Application Characteristics

- Growing regulations for e-mobility battery safety (worldwide)
- Increasing functional safety requirements, such as ISO 13849 (worldwide)
- Highly competitive market with many OEMs
  - End-user access to extensive, precise battery fuel gauging enables OEM product differentiation
  - OEMs driven to lower-cost, more integrated solutions

MPS Advantages

Battery Monitors

- Support for 3- to 24-cell designs with minimal BOM
- Include cell-balancing, onboard LDOs, and soft start to eliminate pre-charge circuitry
- Offer very low standby current to minimize charge depletion in storage
- Include onboard FET drivers with separate discharge/charge control and fast protection response

Fuel Gauges

- Include advanced estimates to enhance end-user experience
- Provide more accurate, more detailed results with fewer complications compared to competitors
- MPS e-bike reference design available

Market Trends for E-Mobility BMS					
Gov. Regulation	Industry Standards	Evolving Batteries	Cost Differentiation	End-Product Differentiation	Manufacturing Localization
√	√		√	√	

Products for E-Mobility

Battery Monitors & Protectors

	Part Number	# of Series Cells	Pack Voltage (V)	Charge/Discharge MOSFET Driver	Separate Charge/Discharge Control	Cell-Balancing	Coulomb Counting	Discharge Soft Start	Load/Charger Detection	Sync Voltage & Current Measurement	OT Cell Voltage Accuracy (-20°C to +65°C)	MPS Advantages for E-Mobility
N	**MP2793**	4 to 16	10 to 86	High-Side	✓	✓	✓	✓	✓	✓	±7.5mV	Integrated drivers for independently controlled charge/discharge protection MOSFETs, soft start eliminates pre-charge circuit
N	**MP3710**	3 to 18	7.5 to 86	High-Side	✓	✓	-	✓	✓	-	-	Standalone protection device for 3- to 18-cell packs; supports broad range of pack sizes; no communication required for operation; can directly control protection MOSFETs, fuses, and generate interrupts or alarms
N	**MP3712**	3 to 8	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer
N	**MP3713**	3 to 10	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer
N	**MP3714**	3 to 16	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer
N	**MP3716**	3 to 18	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer
S	**MP3717**	4 to 20	10 to 140	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer
S	**MP3718**	4 to 24	10 to 140	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; supports low-side control, low-current standby mode; load and charge plug-in/removal detection; integrated 3.3V and 5V LDOs; fuse driver, watchdog timer

Products for E-Mobility

Battery Pack Fuel Gauges

	Part Number	# of Series Cells	Chemistry	Communication Interface	External SOC Indication	Pack SOC Accuracy	Cell Impedance Monitoring	Thermal Model	Recommended Battery Monitor	Battery Monitor Interface	MPS Advantages for E-Mobility
	MPF42791	2 to 16	Li-Ion, Li-Polymer	I²C	LED	±3%	✓	✓	MP3714	Via MCU	Provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
	MPF42792	2 to 16	Li-Ion, Li-Polymer	I²C	-	±3%	-	-	MP2793	Via MCU	Streamlined feature set for lowest cost; provides high-accuracy cell and pack battery metrics with lifetime logging
	MPF42795	2 to 10	Li-Ion, Li-Polymer	I²C	LED	±3%	-	-	MP3712, MP3713	Via MCU	Provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
	MPF42797	2 to 10	Li-Ion, Li-Polymer	I²C	-	±3%	-	-	MP3712, MP3713	Via MCU	Streamlined feature set for lowest cost; provides high-accuracy cell and pack battery metrics with lifetime logging
S	**MPF42780**	4 to 16	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP2793	Direct	Supports all battery chemistries, including LFP; eliminates need for MCU by directly controlling MPS battery monitor; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42781**	3 to 18	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP3712, MP3713, MP3713, MP3714, MP3715, MP3716	Direct	Supports all battery chemistries, including LFP; eliminates need for MCU by directly controlling MPS battery monitor; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42794**	2 to 24	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP3717, MP3718	Via MCU	Supports all battery chemistries, including LFP; provides high-accuracy cell and pack SOC estimates, SOH estimates, max available power, impedance, charge and runtime, lifetime logging

Battery Backup Units (BBUs)

Application Characteristics

- Current systems typically use 48V to 54V; new high-power systems are targeting 400V to 800V
- Battery reliability is critical to product success
  - Systems subject to “rarely used pack” condition
  - State-of-health (SOH) must be periodically assessed to guarantee uptime
  - System must always know the available energy and power with high accuracy
- Evolving architectures for growing power requirements
  - Two common voltage ranges: 48V, or 400V to 800V
  - Rack-mounted and floor-mounted systems
  - Integrated supercapacitors for peak shaving
- Commonly requires high discharge rates (15C+)
  - Accurate fuel gauging becomes increasingly important and difficult
  - MOSFET-based current control requires parallel devices with very strong charge/discharge drive capability

MPS Advantages

Battery Monitors

- Enable outstanding product reliability and lifetime via high-accuracy, I/V synchronized measurements
- Very strong drive capacity, up to 10x the leading competitor, which is particularly important for short-circuit protection (SCP)
- Support LFP, Li-ion, and Li-polymer chemistries

Fuel Gauges

- Provide accurate pack and cell state-of-charge (SOC) for challenging LiFePO4 cells, particularly for the high C-rate requirements of BBUs
- Provide accurate pack and cell SOH estimates for guaranteed performance at all times

Active Balancers

- Extend reliability and lifetime by maintaining continuously balanced cells

Market Trends for Battery Backup Unit BMS

Gov. Regulation	Industry Standards	Evolving Batteries	Cost Differentiation	End-Product Differentiation	Manufacturing Localization
	√	√	√	√	√

Products for Battery Backup Units (BBUs)

Battery Monitors & Protectors

	Part Number	# of Series Cells	Pack Voltage (V)	Charge/Discharge MOSFET Driver	Separate Charge/Discharge Control	Cell-Balancing	Coulomb Counting	Discharge Soft Start	Load/Charger Detection	Sync Voltage & Current Measurement	OT Cell Voltage Accuracy (-20°C to +65°C)	MPS Advantages for Battery Backup Units
N	**MP2798**	3 to 18	7.5 to 86	High-Side	-	✓	✓	-	-	✓	±4mV	For systems with separate current control circuitry (no integrated FET drivers); supports low-current standby mode; includes 4 dedicated NTC inputs, 3 additional I/O (config. as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs
N	**MP3713**	3 to 10	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	For small packs; includes drivers for HS-FETs or GaN FETs, current-regulated discharge (soft start) to eliminate pre-charge circuit; supports low-side control, low-current standby mode; includes onboard 3.3V and 5V LDOs, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs
N	**MP3714**	3 to 16	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs, current-regulated discharge (soft start) to eliminate pre-charge circuit; supports low-side control, low-current standby mode; includes 4 dedicated NTC inputs, 3 additional I/O (config. as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs
N	**MP3716**	3 to 18	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs, current-regulated discharge (soft start) to eliminate pre-charge circuit; supports low-side control, low-current standby mode; includes 4 dedicated NTC inputs, 3 additional I/O (config. as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs
S	**MP3717**	4 to 20	10 to 140	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs, current-regulated discharge (soft start) to eliminate pre-charge circuit; supports low-side control, low-current standby mode; includes 4 dedicated NTC inputs, 6 additional I/O (config. as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs
S	**MP3718**	4 to 24	10 to 140	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs, current-regulated discharge (soft start) to eliminate pre-charge circuit; supports low-side control, low-current standby mode; includes 4 dedicated NTC inputs, 6 additional I/O (config. as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs

Products for Battery Backup Units (BBUs)

Battery Pack Fuel Gauges

	Part Number	# of Series Cells	Chemistry	Communication Interface	External SOC Indication	Pack SOC Accuracy	Cell Impedance Monitoring	Thermal Model	Recommended Battery Monitor	Battery Monitor Interface	MPS Advantages for Battery Backup Units
	MPF42791	2 to 16	Li-Ion, Li-Polymer	I²C	LED	±3%	✓	✓	MP3714	Via MCU	Provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
	MPF42793	2 to 16	LFP	I²C	-	±5%	✓	✓	MP3714	Via MCU	Designed for LFP cells; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42781**	3 to 18	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP2798, MP3714, MP3715, MP3716	Direct	Supports all battery chemistries, including LFP; eliminates need for MCU by directly controlling MPS battery monitor; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42786**	2 to 112	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP2798, MP3714, MP3715, MP3716	Via MCU	Supports multiple battery monitors used for up to 112 series cells; supports all Li-ion chemistries including LFP; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42794**	2 to 24	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP3717, MP3718	Via MCU	Supports all battery chemistries, including LFP; provides high-accuracy cell and pack SOC estimates, SOH estimates, max available power, impedance, charge and runtime, lifetime logging

Active Balancers

	Part Number	Topology	# of Series Cells	Maximum Balance Current (A)	Minimum V_{IN} (V)	Maximum V_{IN} (V)	Shutdown Current (µA)	Efficiency @ V_{CELL} = 3.3V	Control Interface	Package	MPS Advantages for Battery Backup Units
N	**MP2642**	Bidirectional, Buck-Boost	2	1	3.8	16	12	0.928	2-Pin	QFN-26 (4x4)	Integrated FETs, watchdog timer, OVP, UVP, thermal shutdown; operates w/ single inductor/capacitor per IC, interleaveable to support high cell-count strings; supports Li-Ion, Li-Polymer, LFP
N	**MP2643**	Bidirectional, Buck-Boost	2	2	3.8	16	12	0.928	2-Pin	QFN-26 (4x4)	Integrated FETs, watchdog timer, OVP, UVP, thermal shutdown; operates w/ single inductor/capacitor per IC, interleaveable to support high cell-count strings; supports Li-Ion, Li-Polymer, LFP
N	**MP2645**	Bidirectional, Buck-Boost	2 to 5	3.75	5	24	2	0.93	1-Wire Serial	QFN-19 (4x4)	Integrated FETs, watchdog timer, thermal shutdown; operates w/ single inductor/capacitor per IC, supports 8 MPQ2645 devices for up to 33 series cells via 1 control and 1 status signal
S	**MPQ2645**	Bidirectional, Buck-Boost	2 to 5	3.75	5	24	2	0.93	1-Wire Serial	QFN-19 (4x4)	AEC-Q100 qualified; integrated FETs, watchdog timer, thermal shutdown; operates w/ single inductor/capacitor per IC, supports 8 MPQ2645 devices for up to 33 series cells via 1 control and 1 status signal

N New Product S Sampling Product P Preview Product

Robotics & Supply Chain

Application Characteristics

- Wide, diverse range of products among many small- to mid-sized OEMs
- Compact pack designs required for tight size constraints
  - Typically 4- to 18-cell packs, with high level of design integration
- NMC and LiPo battery cells
  - High energy density cells required due to size constraints
  - High power density cells required due to large load variations
- Safety critical
  - Products are designed for indoor usage within close proximity to humans

MPS Advantages

Battery Monitors

- Support highly integrated BMS with FET control for up to 200A of current control, soft start to eliminate pre-charge circuitry

Fuel Gauges

- Offer full suite of pack and cell estimations to maximize pack utilization and user experience

Active Balancers

- Extend runtime and decrease charge time for high duty cycle applications such as forklifts

Complete Battery Management System Solutions

- Provide fast time-to-market, minimal upfront investment, and support for industry and safety standards

Market Trends for Robotics & Supply-Chain BMS					
Gov. Regulation	Industry Standards	Evolving Batteries	Cost Differentiation	End-Product Differentiation	Manufacturing Localization
√	√	√		√	√

Products for Robotics & Supply Chain

Battery Monitors & Protectors

	Part Number	# of Series Cells	Pack Voltage (V)	Charge/Discharg e MOSFET Driver	Separate Charge/Discharge Control	Cell-Balancing	Coulomb Counting	Discharge Soft Start	Load/Charger Detection	Sync Voltage & Current Measurement	OT Cell Voltage Accuracy (-20°C to +65°C)	MPS Advantages for Robotics & Supply Chain
N	**MP2793**	4 to 16	10 to 86	High-Side	✓	✓	✓	✓	✓	✓	±7.5mV	Integrated drivers for independently controlled charge/discharge protection MOSFETs, soft start eliminates pre-charge circuit
N	**MP3712**	3 to 8	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for high side MOSFETs or GaN FETs, current regulated discharge (soft-start) to eliminate pre-charge circuit, supports low-side control, low current standby mode; includes 4 dedicated NTC inputs, 3 additional I/O (configurable as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; supports internal and external cell balancing
N	**MP3713**	3 to 10	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; current-regulated discharge (soft start) eliminates pre-charge circuit; supports low-side control, low-current standby mode; 4 dedicated NTC inputs, 3 additional I/O (configurable as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer
N	**MP3714**	3 to 16	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; current-regulated discharge (soft start) eliminates pre-charge circuit; supports low-side control, low-current standby mode; 4 dedicated NTC inputs, 3 additional I/O (configurable as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer
N	**MP3716**	3 to 18	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; current-regulated discharge (soft start) eliminates pre-charge circuit; supports low-side control, low-current standby mode; 4 dedicated NTC inputs, 3 additional I/O (configurable as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer
S	**MP3717**	4 to 20	10 to 140	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; current-regulated discharge (soft start) eliminates pre-charge circuit; supports low-side control, low-current standby mode; 4 dedicated NTC inputs, 6 additional I/O (configurable as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer
S	**MP3718**	4 to 24	10 to 140	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs; current-regulated discharge (soft start) eliminates pre-charge circuit; supports low-side control, low-current standby mode; 4 dedicated NTC inputs, 6 additional I/O (configurable as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer

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Products for Robotics & Supply Chain

Battery Pack Fuel Gauges

	Part Number	# of Series Cells	Chemistry	Communication Interface	External SOC Indication	Pack SOC Accuracy	Cell Impedance Monitoring	Thermal Model	Recommended Battery Monitor	Battery Monitor Interface	MPS Advantages for Robotics & Supply Chain
	MPF42791	2 to 16	Li-Ion, Li-Polymer	I²C	LED	±3%	✓	✓	MP3712, MP3713, MP3714	Via MCU	Provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
	MPF42793	2 to 16	LFP	I²C	-	±5%	✓	✓	MP3712, MP3713, MP3714	Via MCU	Designed for LFP cells; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42780**	4 to 16	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP2793	Direct	Supports all battery chemistries, including LFP; eliminates need for MCU by directly controlling MPS battery monitor; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42781**	3 to 18	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP3712, MP3713, MP3714, MP3715, MP3716	Direct	Supports all battery chemistries, including LFP; eliminates need for MCU by directly controlling MPS battery monitor; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42794**	2 to 24	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP3717, MP3718	Via MCU	Supports all battery chemistries, including LFP; provides high-accuracy cell and pack SOC estimates, SOH estimates, max available power, impedance, charge and runtime, lifetime logging

Active Balancers

	Part Number	Topology	# of Series Cells	Maximum Balance Current (A)	Minimum V_{IN} (V)	Maximum V_{IN} (V)	Shutdown Current (µA)	Efficiency @ V_{CELL} = 3.3V	Control Interface	Package	MPS Advantages for Robotics & Supply Chain
N	**MP2642**	Bidirectional, Buck-Boost	2	1	3.8	16	12	0.928	2-Pin	QFN-26 (4x4)	Integrated FETs, watchdog timer, OVP, UVP, thermal shutdown; operates w/ single inductor/ capacitor per IC, interleaveable to support high cell-count strings; supports Li-Ion, Li-Polymer, LFP
N	**MP2643**	Bidirectional, Buck-Boost	2	2	3.8	16	12	0.928	2-Pin	QFN-26 (4x4)	Integrated FETs, watchdog timer, OVP, UVP, thermal shutdown; operates w/ single inductor/ capacitor per IC, interleaveable to support high cell-count strings; supports Li-Ion, Li-Polymer, LFP
N	**MP2645**	Bidirectional, Buck-Boost	2 to 5	3.75	5	24	2	0.93	1-Wire Serial	QFN-19 (4x4)	Integrated FETs, watchdog timer, thermal shutdown; operates w/ single inductor/capacitor per IC, supports 8 MPQ2645 devices for up to 33 series cells via 1 control and 1 status signal
S	**MPQ2645**	Bidirectional, Buck-Boost	2 to 5	3.75	5	24	2	0.93	1-Wire Serial	QFN-19 (4x4)	AEC-Q100 qualified; integrated FETs, watchdog timer, thermal shutdown; operates w/ single inductor/capacitor per IC, supports 8 MPQ2645 devices for up to 33 series cells via 1 control and 1 status signal

N New Product S Sampling Product P Preview Product

Energy Storage Systems (ESS)

Application Characteristics

- Modular designs
  - Modularity allows ESS to be sized and expanded as needed
  - 48V to 400V modules
  - Current measurement may be separated into the junction box to consolidate safety cutoff points (fuses, contactors, etc.)
- Battery cells
  - Typically large-format cells, often 280Ah and higher
  - Relatively lower space constraints allow for lower-cost, lower energy density LiFePO4 cells
- End-product differentiators
  - Longer runtime to maximize value of energy arbitrage
  - Faster cycle time to guarantee performance during grid variability

MPS Advantages

Battery Monitors

- Support modules up to 24 cells in a single IC, with or without integrated FET control
- Stackable for multi-module systems

Fuel Gauges

- Provide an extensive set of precise cell and pack estimations, critical for LiFePO4 cells
- Support up to 112 series cells across a stack of battery monitors

Active Balancers

- >3.75A of balancing current enables short cycle operation, improved energy efficiency, and increased system runtime

Market Trends for Energy Storage System BMS					
Gov. Regulation	Industry Standards	Evolving Batteries	Cost Differentiation	End-Product Differentiation	Manufacturing Localization
√		√	√	√	√

Products for Energy Storage Systems (ESS)

Battery Monitors & Protectors

	Part Number	# of Series Cells	Pack Voltage (V)	Charge/Discharge MOSFET Driver	Separate Charge/Discharge Control	Cell-Balancing	Coulomb Counting	Discharge Soft Start	Load/Charger Detection	Sync Voltage & Current Measurement	OT Cell Voltage Accuracy (-20°C to +65°C)	MPS Advantages for Energy Storage Systems
N	**MP2798**	3 to 18	7.5 to 86	High-Side	-	✓	✓	-	-	✓	±4mV	For systems with separate current control circuitry (no integrated FET drivers); supports low current standby mode; includes 4 dedicated NTC inputs, 3 additional I/O (config. as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs
N	**MP3714**	3 to 16	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs, current-regulated discharge (soft start) to eliminate pre-charge circuit; supports low-side control, low-current standby mode; includes 4 dedicated NTC inputs, 3 additional I/O (config. as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs
N	**MP3716**	3 to 18	7.5 to 86	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs, current-regulated discharge (soft start) to eliminate pre-charge circuit; supports low-side control, low-current standby mode; includes 4 dedicated NTC inputs, 3 additional I/O (config. as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs
S	**MP3717**	4 to 20	10 to 140	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs, current-regulated discharge (soft start) to eliminate pre-charge circuit; supports low-side control, low-current standby mode; includes 4 dedicated NTC inputs, 6 additional I/O (config. as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs
S	**MP3718**	4 to 24	10 to 140	High-Side	✓	✓	✓	✓	✓	✓	±4mV	Integrated drivers for HS-FETs or GaN FETs, current-regulated discharge (soft start) to eliminate pre-charge circuit; supports low-side control, low-current standby mode; includes 4 dedicated NTC inputs, 6 additional I/O (config. as NTC inputs), 3.3V LDO, 5V LDO, fuse driver, watchdog timer; integrated cell-balancers support external MOSFETs

Products for Energy Storage Systems Systems (ESS)

Battery Pack Fuel Gauges

	Part Number	# of Series Cells	Chemistry	Communication Interface	External SOC Indication	Pack SOC Accuracy	Cell Impedance Monitoring	Thermal Model	Recommended Battery Monitor	Battery Monitor I/F	MPS Advantages for Energy Storage Systems
	MPF42791	2 to 16	Li-Ion, Li-Polymer	I²C	LED	±3%	✓	✓	MP3714	Via MCU	Provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
	MPF42793	2 to 16	LFP	I²C	-	±5%	✓	✓	MP3714	Via MCU	Designed for LFP cells; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42781**	3 to 18	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP2798, MP3714, MP3715, MP3716	Direct	Supports all battery chemistries, including LFP; eliminates need for MCU by directly controlling MPS battery monitor; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42786**	2 to 112	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP2798, MP3714, MP3715, MP3716	Via MCU	Supports multiple battery monitors used for up to 112 series cells; supports all Li-ion chemistries including LFP; provides high-accuracy cell and pack SOC estimates, SOH estimates, impedance, max available power, charge and runtime, lifetime logging
S	**MPF42794**	2 to 24	Li-Ion, Li-Polymer, LFP	I²C	LED	±3% ±5% (LFP)	✓	✓	MP3717, MP3718	Via MCU	Supports all battery chemistries, including LFP; provides high-accuracy cell and pack SOC estimates, SOH estimates, max available power, impedance, charge and runtime, lifetime logging

Active Balancers

	Part Number	Topology	# of Series Cells	Maximum Balance Current (A)	Minimum V_{IN} (V)	Maximum V_{IN} (V)	Shutdown Current (µA)	Efficiency @ V_{CELL} = 3.3V	Control Interface	Package	MPS Advantages for Energy Storage Systems
N	**MP2642**	Bidirectional, Buck-Boost	2	1	3.8	16	12	0.928	2-Pin	QFN-26 (4x4)	Integrated FETs, watchdog timer, OVP, UVP, thermal shutdown; operates w/ single inductor/capacitor per IC, interleaveable to support high cell-count strings; supports Li-Ion, Li-Polymer, LFP
N	**MP2643**	Bidirectional, Buck-Boost	2	2	3.8	16	12	0.928	2-Pin	QFN-26 (4x4)	Integrated FETs, watchdog timer, OVP, UVP, thermal shutdown; operates w/ single inductor/capacitor per IC, interleaveable to support high cell-count strings; supports Li-Ion, Li-Polymer, LFP
N	**MP2645**	Bidirectional, Buck-Boost	2 to 5	3.75	5	24	2	0.93	1-Wire Serial	QFN-19 (4x4)	Integrated FETs, watchdog timer, thermal shutdown; operates w/ single inductor/capacitor per IC, supports 8 MPQ2645 devices for up to 33 series cells via 1 control and 1 status signal
S	**MPQ2645**	Bidirectional, Buck-Boost	2 to 5	3.75	5	24	2	0.93	1-Wire Serial	QFN-19 (4x4)	AEC-Q100 qualified; integrated FETs, watchdog timer, thermal shutdown; operates w/ single inductor/capacitor per IC, supports 8 MPQ2645 devices for up to 33 series cells via 1 control and 1 status signal

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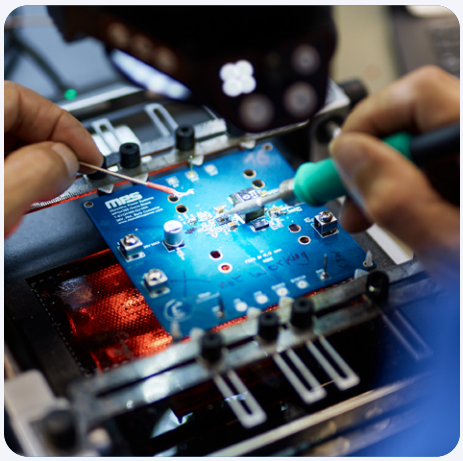

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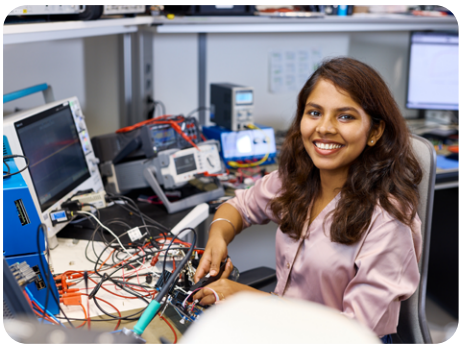

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