

**Industrial battery monitors:
Introduction to the BQ76942 / BQ76952**

Battery electronics options

Protector

- Simple hardware-based protection to respond to unsafe conditions like over-voltage, under-voltage, over-current, over-temperature, under-temperature, over-current, or short circuit.

Lowest complexity

Monitor

- Measures individual cell voltages
- Measures current (coulomb counting)
- Measures die temperature and external thermistors
- Cell balancing to extend battery run-time and battery life
- Protections with flexible thresholds
- Communicates data and status to MCU or stand-alone gauge

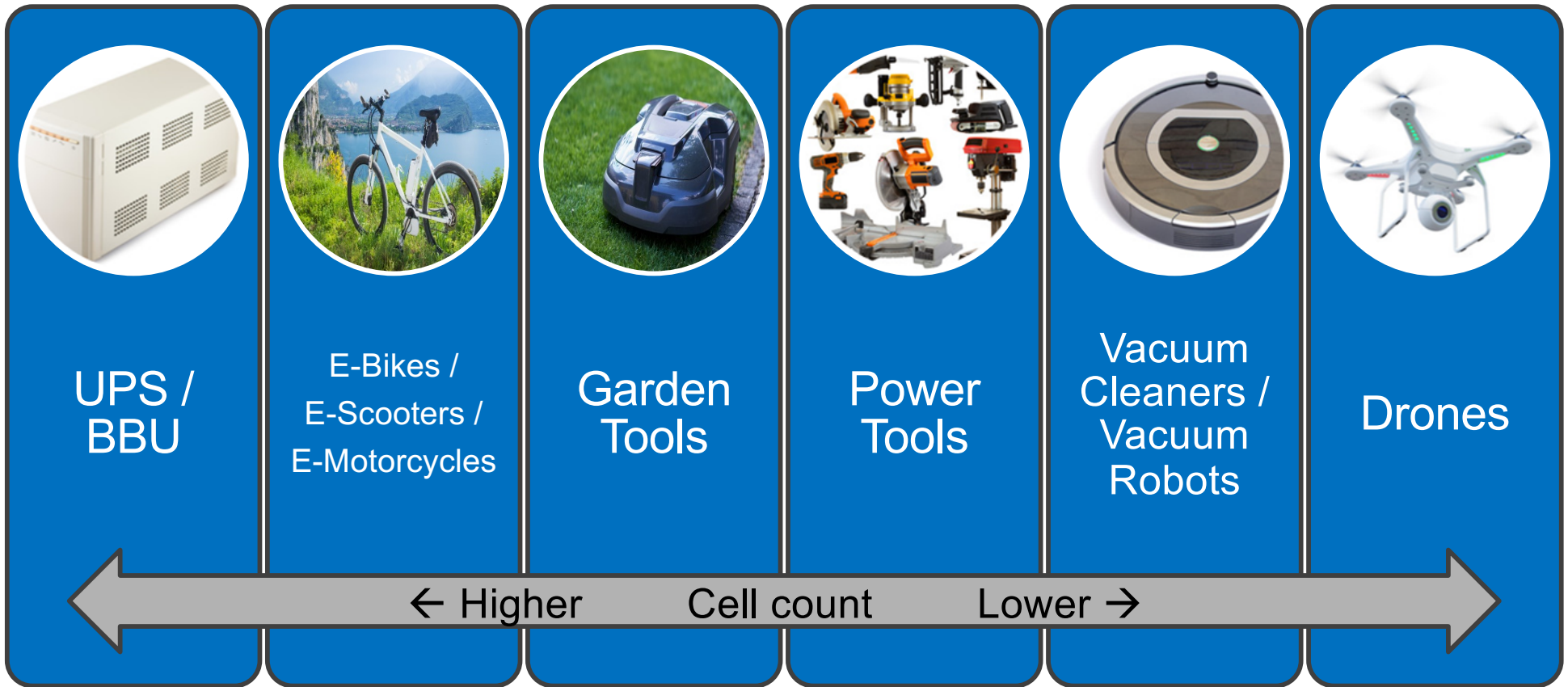
Highest Flexibility

Gauge

- Reports capacity, run-time, state-of-charge
- Enhanced protections
- Black box features to diagnose battery failure
- Extends run-time of battery due to accurately determining how much capacity is remaining
- Extends lifetime by dynamically controlling healthy, safe, fast charging
- Authentication, State-of-Health, Traceability...

Highest Integration

Systems with high cell counts



BQ76952

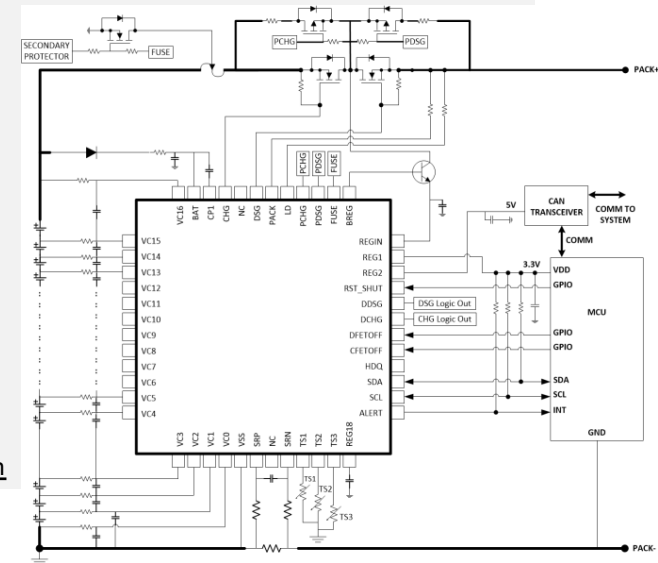
3S to 16S Battery Monitor with High-Side FET Drivers & Standalone Protection

Features

- **Digital V/I/T data** with 16/24-bit ADC and 16/24-bit Coulomb Counter
- **Fast data refresh rate:** all cells measured every 63ms, current every 3ms
- **Integrated high side nFET driver** with <10us DSG turnoff
- **Precharge and predischage modes** supported with external pFETs
- **High voltage accuracy** with optional calibration support
 - +/-5mV(typ), +/-10mV from 0~60degC
- **Standalone Mode** with full built-in protector or **MCU Mode** for host control
 - Voltage: OV / UV / OW / cell imbalance
 - Current: SCD/ OCD1,2,3 / OCC
 - Temperature: OTC / OTD / UTC / UTD / OTF
- **Flexible communication options:** I2C w/CRC, SPI w/CRC, HDQ
- **Secondary protection** can disable FETs or blow an in-line fuse
- **Autonomous cell balancing** option
- **Dual Programmable LDOs:** Output 1.8V to 5.0V, up to 45mA each
- **Low Power Modes:**
 - **SLEEP** (DSG FET + LDO on, periodic protections): **20 - 60uA typ**
 - **DEEPSLEEP** (LDO on, both FETs off): **10 - 14uA typ**
 - **SHUTDOWN** (all functionality off): **1uA typ**
- Package: 48-pin TQFP

Benefits

- **Solution Cost Saving** with highly integrated features
 - Save an external level shifter/driver w/ integrated HS driver
 - Reduce MCU code w/ Standalone Mode + autonomous CB
 - Save an external LDO w/ high loading integrated LDO support
- **Maximize cell capacity** with high voltage measurement accuracy
 - Further accuracy improvement with calibration option
- **Support flexible implementation with optimized power modes**
 - Configurable for Standalone Mode vs. MCU Mode
 - SLEEP and DEEPSLEEP low power options
- **Improve system robustness**
 - CB timeout, reset/shutdown input, random cell connection



TI industrial battery monitor family comparison

	BQ76925	BQ76920, BQ76930, BQ76940	BQ76942, BQ76952
Cell Count	6S	5S, 10S, 15S	10S, 16S
V / I / T Output	Analog	Digital	Digital
Voltage Accuracy	Dependent on host ADC accuracy	+/-10mV typ +/- 40mV (0-60°C)	+/-5mV typical +/-10mV (0C/+60°C) +/-15mV (-40C/+85C)
Synchronized Voltage + Current	No	No	Yes
Measurement Refresh Rate	N/A	250ms	Voltages 22.5ms~63ms, Current 3ms or 1.5ms
Independent protection	No	Yes, but needs MCU for recovery	Yes
FET Drivers	No	Integrated low-side driver	Integrated high-side driver
LDO	3.3V / 4mA, or > 4mA w/ external bypass FET	3.3V / 20mA	Programmable LDO1 & LDO2 (5V / 3.3V / 3.0V / 2.5V / 1.8V), 45mA each
Cell balancing current (internal)	50mA	50mA (920) 5mA (930/940)	50mA
Communication Interface	I2C	I2C	I2C / SPI / HDQ



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