Battery Energy Storage System 1.0 with IEC 61508 SIL 2 and IEC 60730 Class B

Production-ready reference design for utility, commercial, industrial and residential high-voltage energy storage systems of up to 1500 V d.c.

NXP BESS 1.0 is a production-grade Battery Energy Storage System (BESS) reference platform.

The architecture is compliant with IEC 61508 SIL 2 and IEC 60730 class B and dedicated for a variety of High-Voltage battery management solutions for Utility, Commercial & industrial and Residential Energy Storage up to 1500 V d.c.

Complete development platform:

BMS Reference HW boards with safety pre-compliance analysis

- Battery Management Unit (BMU)
- Cell Management Unit (CMU)
- Battery Junction Box (BJB)
- CAN FD and Modbus over RS-485 and Ethernet

BMS Reference SW

- Production-ready complex device drivers, MCAL and safety libraries
- Safety application for handling system safety limits
- SIL qualified scheduler with time-slot monitoring
- Lockstep MCU core for functional safety tasks
- GUI for monitoring and configuration

Functional Safety Documentation

- Complete safety documentation set
- Safety analysis up to pre-certification level

Key General Features

Safety

- Compliance with IEC 61508 and IEC 60730 functional safety standards

Reliability

- Lifetime accurate battery monitoring across wide temperature and voltage range supporting most battery chemistries.

Modularity

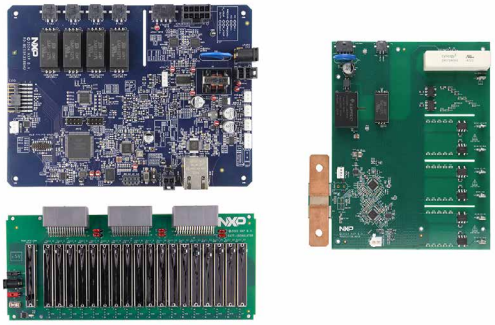
- Standardized interfaces and customizable storage capacity

Maturity

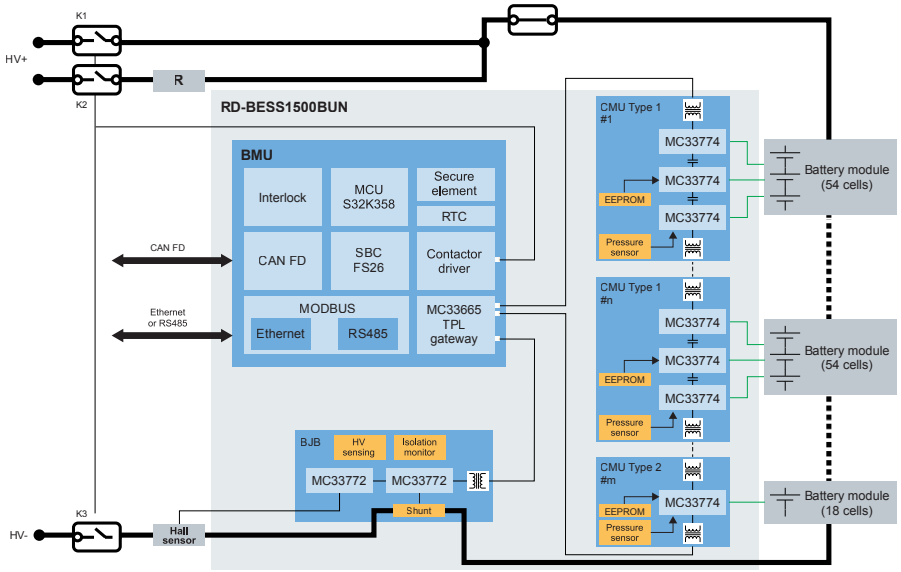
- Reduces development time and costs thanks to pre-certification

Target Applications

- Utility – Front of the Meter (FTM) energy storage systems
- Commercial & Industrial energy storage systems
- Residential energy storage systems
- Grid Load balancing
- Power Backup/UPS
- Renewable Energy Integration



BESS 1.0 system architecture



Key technical specifications

BMU	**Interfaces**	• 1x CAN FD interfaces • 4x TPL interfaces • 2x contactor drivers with PWM economization and current monitoring • 2x overcurrent and reverse polarity protected outputs for junction box and DC-Link bus pre-charge contactor
	Advanced Features	• PWM-based interlock pilot loop • Equipped with secure element • Cell voltage and battery current measurement synchronization for state of health calculation
CMU	**Voltage Measurement**	• 1 x 18 or 3 x 18 channel BCCs for up to 54 cells, extendable by adding more CMUs to the daisy chain • Life-time guaranteed high accuracy cell voltage measurement channels, with averaging and advanced filtering
	Temperature Measurement	• 3 x 8 analog inputs (including temperature sensors) or GPIOs with advanced filtering
	Cell Balancing	• Cell balancing with integrated temperature-controller function with up to 300 mA (using default setup)
	Pressure Sensing	• On board pressure sensor for thermal runaway detection
	Communication	• Isolated ETPL communication between CMU and BMU
BJB	**Voltage Measurement**	• 6 high-voltage measurements with high accuracy
	Battery Current Measurement	• Integrated Shunt in BJB Board • Provision to interface external Hall Sensor • Fully redundant current measurement up to +/-500 A • 0.5% measurement error (IC level only)
	Temperature Measurement	• Shunt temperature measurement for current measurement compensation • Pre-charge resistor temperature measurement
	Isolation Measurement	• Isolation resistance measurement between high-voltage and low-voltage domains
	Communication	• Isolated ETPL communication between BJB and BMU

Orderable samples

Part Number	Package	Description
RD-BESS1-PREM	Premium Package	HW, SW, FuSa and 100h Support
RD-BESS1500BUN	HW Bundle	BMU, CMU3, BJB, SW Drivers
RD-BESS1500-FUSA	Functional Safetfy Package	FuSa documentation and support
RD-BESSK358BMU	BMU Board	Battery Management Unit
RDBESS774A3EVB	CMU3 Board	CMU Board with 3 Analog Front Ends
RDBESS774A1EVB	CMU1 Board	CMU Board with 1 Analog Front Ends
RDBESS772BJBEVB	Battery Junction Box	Battery Junction Box Board inclunging cables
RD-BESS1500-50H	Extra Customer Support	Extra 50h Customer support
POLYBESS1500V1	Polycarbonate Sypport	Polycarbonate Sypport

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