eInfochips

ENRICHING LIVES THROUGH ENGINEERING EXCELLENCE

NXP

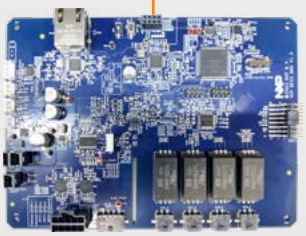


High-Voltage ESS Reference Development Platform

Reliability, resilience and sustainability requirements drive the transformation in the power and energy infrastructure towards battery energy storage. This in turn poses a greater need for battery management systems (BMS). BMS is the first line of defense to monitor, balance and optimize the battery health & performance in real-time, allowing improved power system efficiency, lifetime and safety of battery applications.

NXP ESS is a production-grade battery management system reference development platform. It is an IEC 61508 and IEC 60730 compliant architecture of up to 1500V intended for a variety of high-voltage battery management solutions for utility, commercial & industrial and residential energy storage. NXP ESS is a complete hardware, software and safety package encompassing product safety life-cycle libraries and documentation considering IEC 61508 and UL 9540.





Battery Management Unit (BMU)



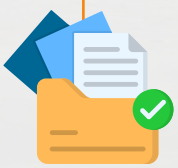
Cell Management Unit (CMU)



Battery Junction Box (BJB)



BMS Software



Safety Documentation

What's Included?

Hardware

- BMU, CMU, BJB reference hardware printed circuit boards (PCBs)
- PCB resources (schematic, layout, BOM, manual)
- PCB accessories (cabling, emulator, etc.)

Software

- BMS device driver package
- BMS safety library package
- S32K3 RTD/MCAL
- BMS advanced GUI

Documentation

- Functional Safety documentation
- Product safety documentation

Application Areas

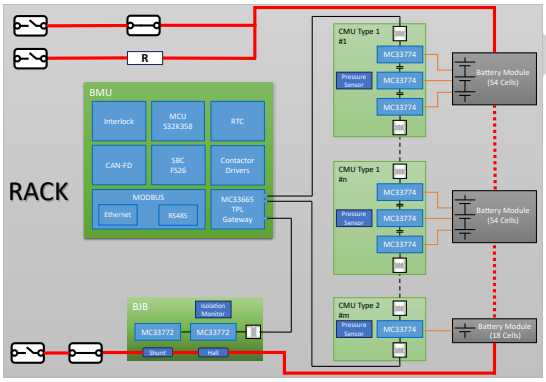
- Energy Storage Systems
- Industrial Equipment (i.e., Cranes, Forklifts, Excavators)
- Renewable Energy Integration
- Grid Load Balancing Applications
- Power Backup / UPS
- Residential Applications

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Benefits of NXP Platform in ESS Development Process

	Regulatory / Technical Specifications	Operational and Design Considerations	Hardware Design	System Development and Testing	Compliance and Certification
Standard ESS Development Process	• Application specific applicability • Geographical considerations • Electrical safety • Functional Safety	• Scalability • Modularity • Sensing and control • External communication interface • Eco-system considerations	• System / board level • functionality • Cell control and management • Safety testing	• Communication protocol • Safety implementation • Safety assessment	• EMC testing • Documentation
NXP ESS Based Approach	**ESS Safety Analysis** All necessary regulatory considerations and artifacts from system down to hardware and software	**ESS Architecture** Modular design with options to different requirements	**ESS Reference Hardware** (BMU) Battery Management Unit (BJB) Battery Junction Box (CMU) Cell Management Unit	**ESS Reference Software** Production ready device drivers and safety libraries	**Test & Artefacts** Safety Assessment & EMC Pre-test pass results
Benefits	Reduces development timelines by 4 to 5 months, cost savings of more than 1 year's development efforts				

One-Stop Solution for Production-grade High-voltage BMS Development



BMS Reference Hardware

Hardware boards with Functional Safety pre-compliance analysis

- Battery Management Unit (BMU)
- Cell Management Unit (CMU)
- Battery Junction Box (BJB)

Interfaces:

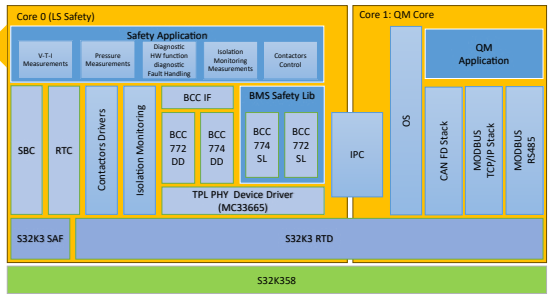
- MODBUS over RS485, Ethernet, CAN-FD

Pre-compliances:

- IEC 61508:2010-04, UL 9540:2020, UL 1973:2022, UL 991/1998, ISO 13849, IEC 62933, IEC 62619, IEC 60730

BMS Reference Software

- Production-intent complex device drivers and MCAL software package
- Complete software package developed according to IEC 61508 SIL2 and IEC 60730
- Production-ready device firmware & safety libraries
- Safety application for handling system safety limits violation
- GUI for display and system configuration
- SIL qualified scheduler with time-slot monitoring running on safety core
- Lockstep MCU for Functional Safety





eInfochips BMS Development Services

- Hardware design, BoM optimization prototyping, firmware development and testing
- IEC 61508 SIL2 safety design, assessment with complete safety documentation
- Cloud enablement, web/mobile app development
- Regulatory compliances and certification support
- BMS algorithm optimization, porting and testing
- Test automation, cybersecurity assessment

Technical Specifications

BMU	**Interfaces**	• 1x CAN FD interface & 4x TPL interfaces • 1x RS-485 interface • 1x gigabit Ethernet interface • 2x contactor drivers with PWM economization and current monitoring • 2x overcurrent and reverse polarity protected outputs for battery junction box and DC-Link bus pre-charge contactor
	Advance Features	• PWM-based interlock pilot loop • Lower current consumption in sleep mode • Cell voltage and battery current measurement synchronization for state of health calculation
CMU	**Voltage Measurement**	• 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 300mA (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
	Current Measurement	• 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	• Isolation resistance measurement between high-voltage and low voltage domains
	Communication	• Isolated ETPL communication between BJB and BMU

What's included in the package?

Reference Designs and Software	BMU, CMU, BJB (schematics, layout, BOM, gerber files and manual)
	Software package - RTOS and application layer for both cores (safety core and QM core)
	Software device drivers for all chips
	Safety Libraries for all chips
	SAF library (required for lock step boot up)
	Software GUI for configuration and monitoring
Safety Documentation	Complete safety documentation set along with all analysis up to pre-compliance level
	Hardware and software design and testing documentation
Support	100 hours of support through private portal access

Ordering Information

RD-BESSK358BMU	BMU
RDBESS774A3EVB	CMU3 (CMU with 3 AFEs, this will be in the bundle)
RDBESS774A1EVB	CMU1 (CMU with 1 AFE, this will be an option to add to the bundle)
RDBESS772BJBEVB	BJB (including cables)
RD-BESS1500BUN	Complete System

About eInfochips

eInfochips is a leading provider of digital transformation and product engineering services. eInfochips accelerates time to market for its customers with its expertise in the areas of IoT, AI/ML, security, sensors, wireless, cloud, and power. eInfochips has been recognized as a leader in Engineering R&D services by many top analysts and industry bodies, including Gartner, Zinnov, ISG, IDC, Nasscom and others.