

Smart Home Energy Management Integration Guide - Official Commercial BESS

Technical Overview & Datasheet

SMART HOME ENERGY MANAGEMENT INTEGRATION GUIDE

OFFICIAL COMMERCIAL BESS TECHNICAL OVERVIEW & DATASHEET

EXECUTIVE SUMMARY

This document serves as the definitive technical reference and integration guide for the next-generation Smart Home Energy Management System (SHEMS) when paired with our Tier-1 modular Battery Energy Storage System (BESS). Designed for the modern prosumer and residential micro-grid developer, this platform enables intelligent energy arbitrage, seamless PV integration, and resilient backup power, all orchestrated through a cloud-agnostic, local-first control architecture.

Our solution delivers a paradigm shift in residential energy autonomy, offering industry-leading round-trip efficiency and deep cycling durability. This datasheet provides comprehensive engineering data, safety protocols, and integration parameters necessary for system design, procurement, and installation.



SYSTEM ARCHITECTURE & SAFETY

The architecture is built upon a three-tiered hierarchical control plane: 1) Local EMS (Edge) for millisecond response to grid events and islanding detection, 2) Cloud-Based Aggregation Layer for firmware updates and predictive load shaping, and 3) User Mobile/Web Interface for manual overrides and real-time monitoring.

The core safety layer integrates an eight-fold protection mechanism including: Active Anti-Islanding (UL 1741-SA), DC Arc-Fault Circuit Interruption, and a 3-level Battery Management System (BMS) with cell voltage/temperature passive balancing. The system features a dedicated galvanically-isolated DC-DC converter to ensure zero leakage current and safeguards against ground faults in wet or outdoor installations.

KEY FEATURES

- Feature 1: True 10ms Automatic Transfer Switch (ATS) Capability: Provides seamless black-start and backup power transition, ensuring uninterrupted operation for critical home loads (refrigeration, security, medical equipment) during grid outages.
- Feature 2: Intelligent PV-Clip Harvesting & Storm Mode: Leverages predictive weather algorithms to increase usable solar yield by up to 12% through dynamic inverter curtailment absorption and pre-storm battery topping, maximizing system self-sufficiency.
- Feature 3: VPP-Ready Aggregation Protocol: Native support for Modbus TCP, CANbus, and SunSpec compliant communication stacks enabling direct participation in Virtual Power Plant (VPP) demand response programs globally.
- Feature 4: Advanced Thermal Runaway Prevention: Embedded multi-sensor (temperature, smoke, gas) detection tied to a passive aerosol suppression system, exceeding the rigorous requirements of UL 9540 and offering a failsafe against thermal propagation.

COMPLIANCE & STANDARDS

The system is comprehensively certified and fully compliant with the following

international and regional standards:

- UL 9540: Standard for Energy Storage Systems and Equipment.
- UL 1973: Standard for Batteries for Use in Stationary Applications.
- UL 1741-SA: Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Resources (with grid support functions).
- IEEE 1547: Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces.
- CE Marking (EMC, LVD, RoHS).
- UN38.3: Transport of Dangerous Goods (Lithium-ion batteries).
- VDE-AR-E 2510-50: Stationary electrical energy storage systems with Li-ion batteries.

TECHNICAL SPECIFICATIONS

Nominal Energy Capacity: 10.24 kWh to 40.96 kWh (Parallel Expansion)

Usable Capacity (DoD 100%): 10.2 kWh to 40.8 kWh

Rated Output Power (Continuous/Peak): 5.0 kW / 7.0 kW (10s)

Nominal Voltage: 153.6 VDC

Operating Voltage Range: 120 VDC to 192 VDC

Max Charge/Discharge Current: 42 A / 50 A

Round-Trip Efficiency (DC/AC): > 93.5% (Typical @ 25°C)

Cooling Method: Forced Air Convection with Smart Thermal Management

Enclosure Rating: IP65 (Indoor/Outdoor rated)

Cycle Life: > 6,500 cycles at 25°C, 90% DoD (EOL 70% capacity)

Operating Temperature (Ambient): -20°C to +55°C (Derating above +45°C)

Dimension (Battery Cabinet): 700 mm x 350 mm x 1,100 mm

Weight (Total Module): 125 kg

Parameter	Specification
Nominal Energy Capacity	10.24 kWh to 40.96 kWh (Parallel Expansion)
Rated Output Power (Continuous)	5.0 kW
Round-Trip Efficiency (DC/AC)	> 93.5% @ 25°C
Cooling Method	Forced Air Convection with Smart Thermal Management
Enclosure Rating	IP65
Cycle Life	> 6,500 Cycles (@ 25°C, 90% DoD)
Operating Temperature Range	-20°C to +55°C
Cell Chemistry	Tier-1 LFP (LiFePO4)
Communication Protocols	Modbus TCP, CANbus, SunSpec
Safety Compliance	UL 9540, UL 1973, UL 1741-SA, CE, UN38.3

INDUSTRIAL DEPLOYMENT

For standard residential installations, the system is optimized for wall-mount (garage/exterior) or floor-standing configurations. Integration points include a standard AC-coupled interface for retrofit solar PV systems and a dedicated DC-Coupled port for high-voltage solar strings (up to 600V) to maximize efficiency. The commissioning process is streamlined via a mobile-based 'Plug-&-Play' wizard that auto-detects the site grid profile and pre-configured local regulations. The system incorporates anti-corrosion coating on all aluminum chassis components to withstand coastal/high-humidity environments, ensuring long-term reliability.

For fleet management and O&M, the integrated cloud dashboard allows installers to remotely monitor state-of-health (SoH), firmware status, and proactively dispatch service alerts based on predictive analytics, drastically reducing operational downtimes.

