

Telecom Site Lithium-Ion Battery (LiFePO₄) Thermal Runaway Prevention - Official Technical Overview & Hardware Datasheet

EXECUTIVE SUMMARY

The Telecom Site Lithium-Ion Battery (LiFePO₄) Thermal Runaway Prevention solution is a carrier-grade energy storage platform engineered specifically for outdoor and indoor telecom sites requiring uncompromising safety, reliability, and longevity. Unlike conventional lithium-ion chemistries, this LiFePO₄ (Lithium Iron Phosphate) battery system integrates a multi-layered thermal runaway prevention architecture that combines intrinsically safe cell chemistry, advanced Battery Management System (BMS) firmware, and proprietary passive/active containment hardware. The platform delivers 48 VDC nominal output with scalable capacity from 100 Ah to 400 Ah per string, supporting high-availability telecom loads such as 5G RRUs, edge compute nodes, and optical transport equipment. This datasheet provides a comprehensive technical overview of the hardware, safety mechanisms, compliance standards, and deployment options for network operators seeking to future-proof their site power infrastructure while mitigating fire and explosion risks associated with lithium-ion deployments.



ARCHITECTURE & CHASSIS DESIGN

The system is housed in a ruggedized, IP65-rated outdoor enclosure or a 3U/4U rack-mountable chassis for indoor applications. The chassis is constructed from galvanized steel with a flame-retardant powder coating (UL94 V-0) and includes dedicated thermal isolation compartments between cell modules. Each battery module contains 16 LiFePO₄ prismatic cells (3.2 V, 100 Ah) configured in a 16S1P arrangement, delivering 51.2 V nominal and 5.12 kWh per module. The modules are interconnected via a front-access busbar system with torque-limited terminals and integrated cell-level fusing. A central Battery Management Unit (BMU) communicates with each module over an isolated CAN bus (500 kbps) and controls the thermal runaway prevention subsystem, which includes: (1) cell-level pressure and temperature sensors sampled at 100 Hz; (2) a passive thermal barrier of aerogel insulation between cell groups; (3)

an active venting mechanism with pressure relief valves and a non-toxic aerosol suppression cartridge; and (4) a solid-state disconnect relay that isolates the string within 5 ms of detecting an abnormal condition. The chassis also features a dedicated smoke/gas sensor (CO and VOC) and an emergency stop button for manual isolation.

HARDWARE FEATURES

- Intrinsically safe LiFePO₄ chemistry with olivine structure and high thermal stability (decomposition temperature > 270°C).
- Multi-stage thermal runaway detection: cell voltage delta ($\Delta V > 50 \text{ mV}$), temperature rate-of-rise (> 3°C/min), pressure rise (> 10 kPa), and smoke/gas detection.
- Active suppression: aerosol cartridges (per module) with automatic activation upon detection, plus passive aerogel barriers to delay propagation.
- Redundant BMS architecture: primary BMU plus a secondary independent safety controller (SIL-2 rated) that can force-open the main contactor.
- Cell balancing: passive balancing (100 mA) with adaptive algorithm to prevent overcharge-induced heating.
- Communication interfaces: CAN 2.0B, RS-485 (Modbus RTU), and dry-contact alarms for integration with site controllers (SCADA/EMS).
- Remote monitoring: SNMP v3 and web GUI via optional Ethernet module for

real-time thermal runaway risk scoring.

- Operating temperature range: -20°C to +60°C (discharge), 0°C to +45°C (charge) with derating above +45°C.
- Cycle life: > 6,000 cycles at 80% DoD, 25°C, to 80% capacity retention.
- Self-discharge: < 3% per month at 25°C.

COMPLIANCE & STANDARDS

The Telecom Site Lithium-Ion Battery (LiFePO4) Thermal Runaway Prevention platform has been tested and certified to the following standards:

- Safety: IEC 62619:2022 (Secondary lithium cells and batteries for industrial applications), UL 1973 (Batteries for stationary applications), UL 9540A (Thermal runaway fire propagation test), UN 38.3 (Transport).
- EMC: EN 55032 Class A, EN 55035, FCC Part 15 Subpart B.
- Environmental: IEC 61439-1, IP65 (IEC 60529), RoHS 3, REACH.
- Telecom: Telcordia GR-3150-CORE (Bellcore) for outdoor battery cabinets, CE marking.

TECHNICAL SPECIFICATIONS

[Text describing key parameters, with the detailed table below]

Parameter	Specification
Form Factor	Outdoor IP65 cabinet (100/200 Ah) or 4U rack-mount (400 Ah)
Nominal Voltage	51.2 VDC (16S LiFePO4)
Capacity Range	100 Ah to 400 Ah per string
Energy per Module	5.12 kWh (100 Ah, 51.2 V)
Max Continuous Discharge	100 A per string (1C)
Max Continuous Charge	50 A per string (0.5C)
Operating Temperature	-20 °C to +60 °C (discharge); 0 °C to +45°C (charge)
Thermal Runaway Detection	Cell voltage delta, temperature rate-of-rise, pressure, smoke/gas
Suppression Activation Time	< 2 seconds after detection
Main Contactor Isolation Time	< 5 ms (safety controller)
Communication Interfaces	CAN 2.0B, RS-485 (Modbus RTU), dry contacts; optional Ethernet (SNMP v3)
Cycle Life	> 6,000 cycles at 80% DoD, 25 °C, to 80% capacity
Self-Discharge	< 3% per month at 25°C
Safety Certifications	IEC 62619, UL 1973, UL 9540A, UN 38.3
EMC Compliance	EN 55032 Class A, EN 55035, FCC Part

	15 Subpart B
Ingress Protection	IP65 (outdoor models)

ORDERING OPTIONS

Available configurations:

- TSLB-100-48: 100 Ah (5.12 kWh) single-string outdoor cabinet, includes aerosol suppression and BMU.
- TSLB-200-48: 200 Ah (10.24 kWh) dual-string outdoor cabinet with redundant BMU.
- TSLB-400-48: 400 Ah (20.48 kWh) four-string rack-mount chassis (4U), includes active venting and secondary safety controller.
- TSLB-100-48-NS: 100 Ah module without suppression (for integration into existing cabinets with third-party suppression).
- Accessories: Ethernet monitoring module (TSLB-ETH), spare aerosol cartridge (TSLB-AER-01), aerogel barrier kit (TSLB-AER-BAR).

All models include a 5-year limited warranty with optional extension to 10 years.

