modbatt

# Modular Battery Technologies Inc.

Solutions for a Sustainable Future

## Open Technology Standard – Extendable Battery Framework™ (EBF)

- Comprehensive suite of technologies
  - Charge Node™ self-contained intelligent module with internal BMS and isolation
  - Charge Mesh™ resilient, on-demand configurable power system architecture
  - Secure device-linked digital twin Linked Control Tokens (LCTs) with enforceable control authority

### EBF High Voltage Charge Node™ Module Specification – OPEN STANDARD, ROYALTY FREE

- Several sizes and voltages
- Safety – internal relays, series-only connections, precise SOC/SOH - **prevents thermal runaway**
- Security – use control and authentication through digital twin LCTs

### EBF Diversified Ledger Architecture

- Multiple ledgers in separate cross-referenced domains
- Use Control – digital twin LCTs linked with modules and vehicles

### ModBatt business model – ModBatt is a technology and transactions company, NOT a manufacturer

- Convenience fees on transactions (ModBatt System)

# ModBatt EBF System Specification

## Open Standard based on ModBatt proprietary IP

- **Royalty free** to manufacturers of certified batteries and vehicles
- Administered by **Safe Battery Alliance** – 501(c)(6) Nonprofit

## Charge Mesh™ on-demand configurable resilient modularity

- Charge Node™ Module Physical Specification
- Charge Node™ Module Electrical Specification – isolation, BMS, communications, security, use control through digital twin LCTs
- Supports dissimilar Charge Nodes™ in parallel

## Full ecosystem support

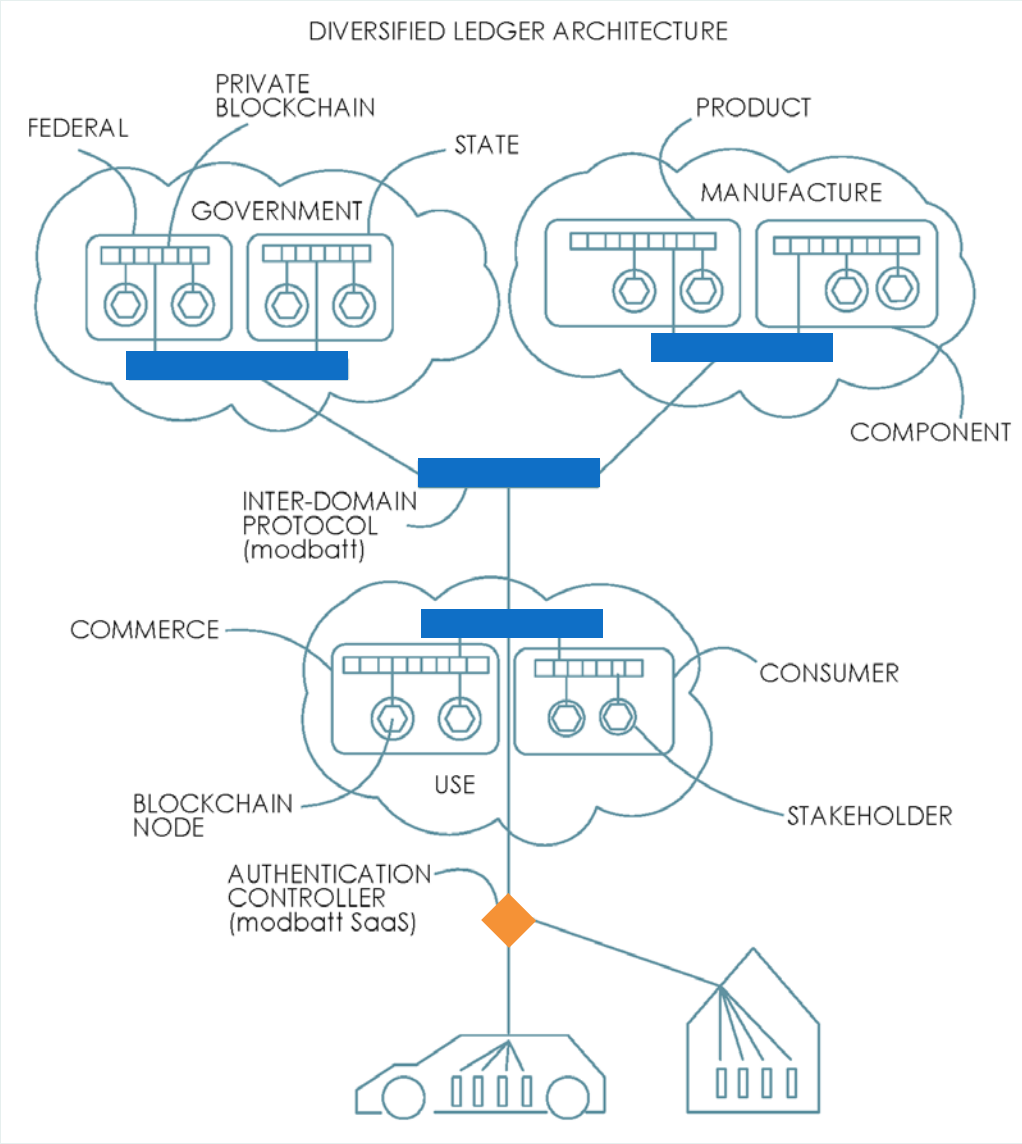
- Open hardware and software standard – Extendable Battery Framework™
- Use control – Diversified Ledger Architecture, digital twin LCTs
- Full lifecycle management with integrated regulatory oversight and reporting
- ModBatt (direct and licensed) IT infrastructure for transactions

**Example**
**Charge Node™**
**800V**
**3KWh**
**40KW peak**
200 x 21700 cells
3” x 9” x 15”
35 lbs

Motorcycle: 1-5
Car: 5-30
Truck: 50-100+

# Diversified Ledger Architecture

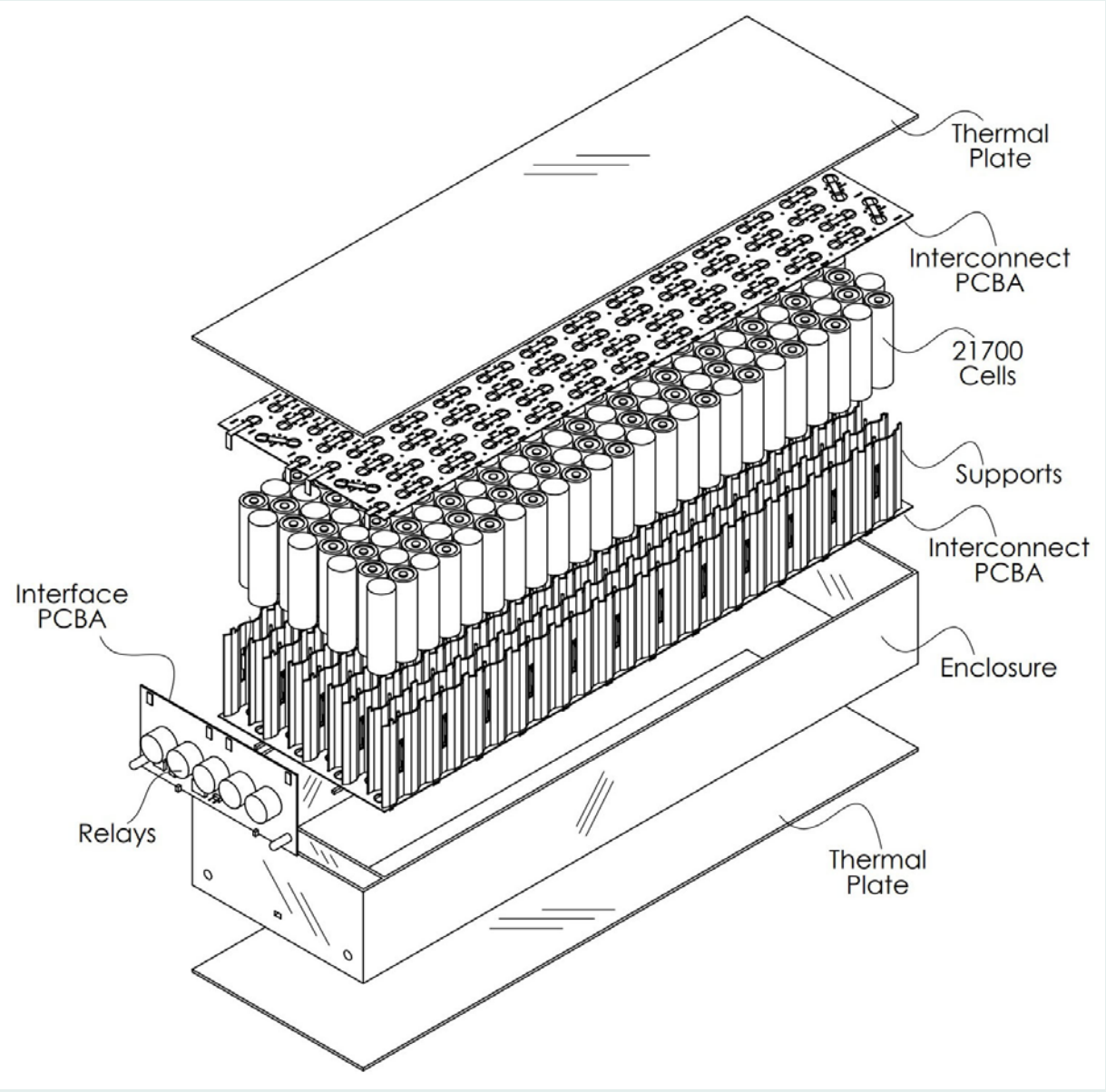
- **ModBatt IT infrastructure for battery transactions**
- Multiple Proof of Stake private blockchains
- Cross-referenced domains with secure protocols ■
- Digital twin LCTs securely linked with modules and vehicles (patents pending)
- Active use event enforcement mechanisms through authentication controllers ◆
- Open source based with proprietary layers
- Integration with existing systems
- Gradual transition
- Multi-domain chain of custody enforcement



# Charge Node™ Module Physical Specification

## Charge Node™ Mechanical Specification

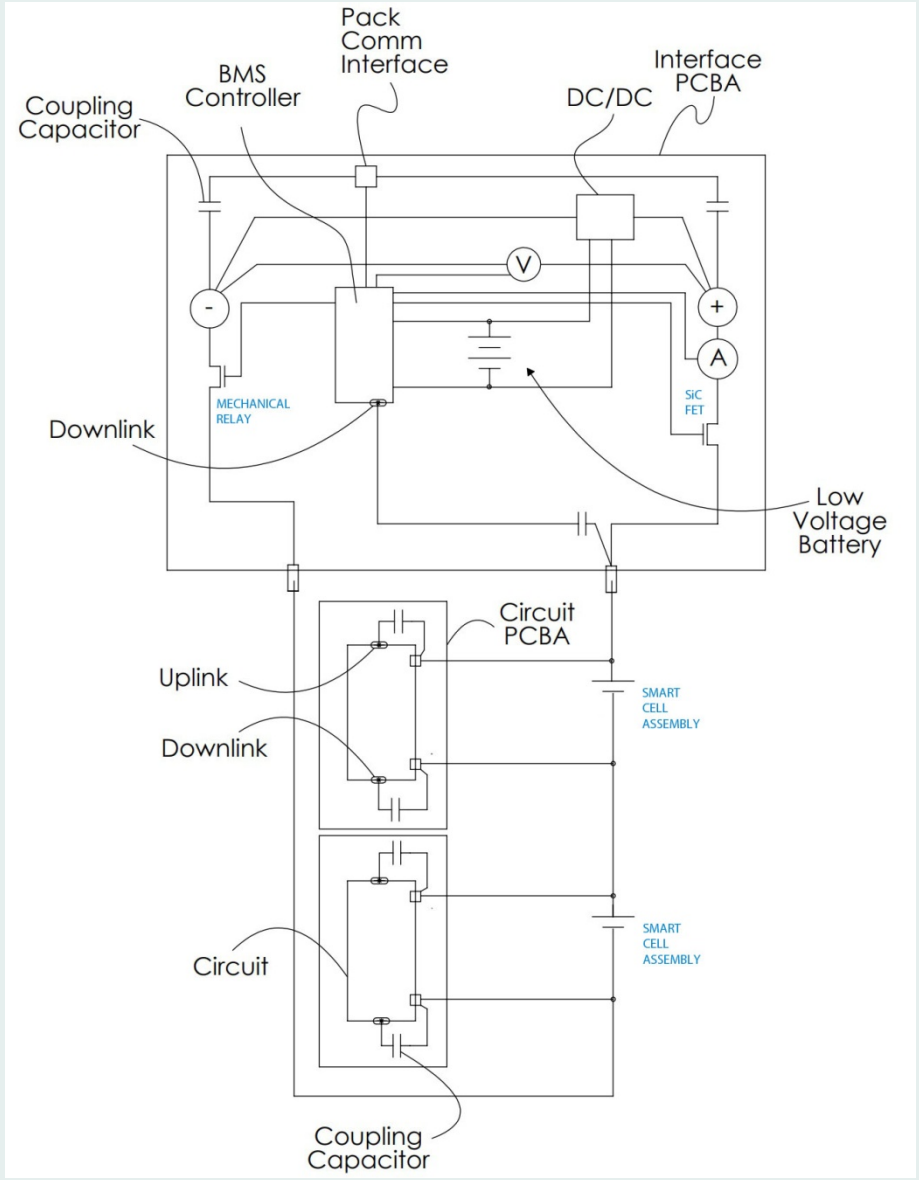
- Series connections only – **no uncontrolled or unmonitored current** prevents thermal runaway
- Low impedance interconnect – no need for fusible links
- Thermally conductive encapsulation
- Structurally robust
- Environmentally sealed
- All cells equally coupled to both thermal plates
- Facilitates external liquid cooling
- Multiple form factors/voltages



# Charge Node™ Module Electrical Specification

## Charge Node™ Electrical Specification

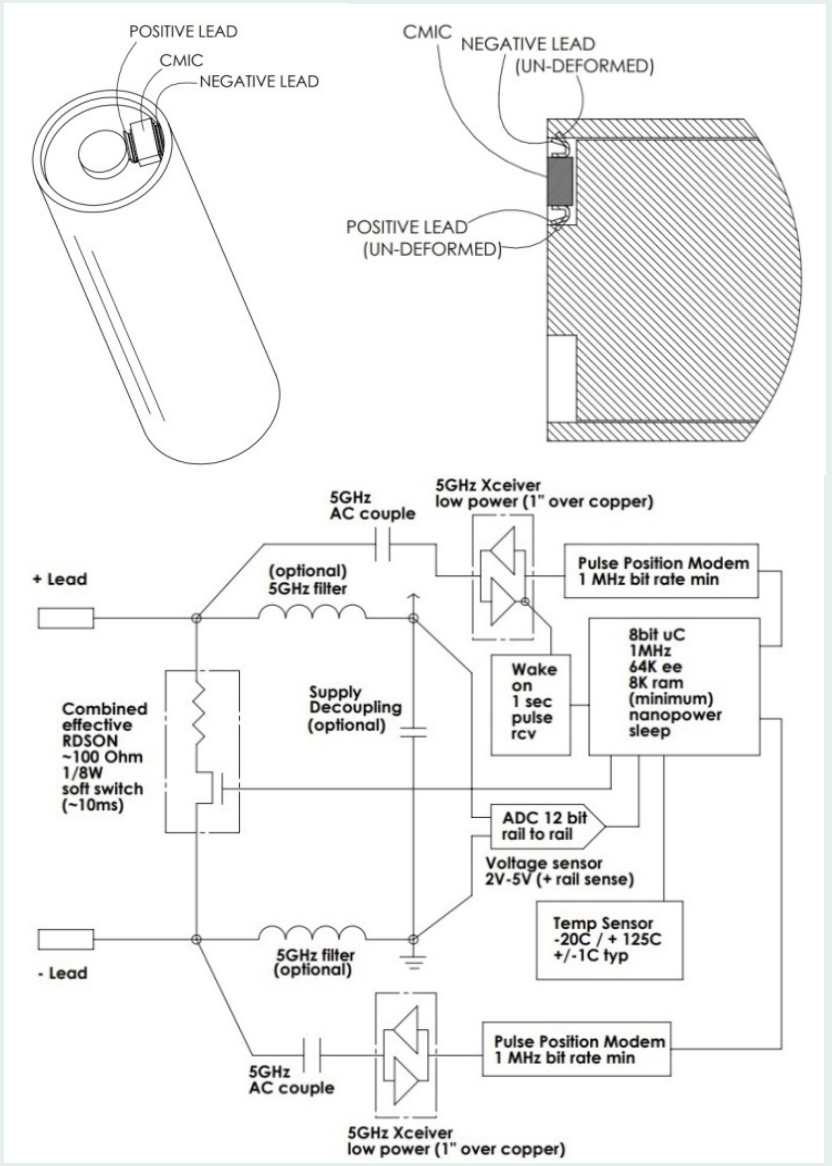
- Series connections only – no uncontrolled or unmonitored current
- Relays on both terminals
- Mechanical relay on one terminal – galvanic isolation
- SiCFET on other terminal – fast response
- Smart cell assemblies – V and T monitoring each cell, integrated balancing and heating
- Powerline Communications (PLC) between cells and BMS controller
- Powerline Communications (PLC) between modules and pack controller
- Secure protocols, unique module ID



# Charge Node™ Scalable BMS Specification

## Charge Node™ Smart Cell Circuit

- Compatible with all cell types and chemistries
- Temperature and voltage monitoring at each cell
- AC coupled transverse mode Powerline Communications (PLC) – BTLE transceivers
- Integrated balancing and heating (transistor in linear mode or resistor, heatsink to cell)
- Robust communications protocols
- Low cost IC using common IP blocks
- Unique ID for full lifecycle tracking and authentication



# Appendix A
## List of Filed IP

1. **US11,380,942** PCT/US21/50518 **HIGH VOLTAGE BATTERY MODULE WITH SERIES CONNECTED CELLS AND INTERNAL RELAYS** Filed 02-NOV-2020 *module with series connected cells and relays* - **ISSUED 7/5/2022**
2. **US11,469,470** PCT/US21/53798 **BATTERY MODULE WITH SERIES CONNECTED CELLS, INTERNAL RELAYS AND INTERNAL BATTERY MANAGMENT SYSTEM** Filed 04-JAN-2021 *cell monitoring/conditioning circuit, PCBAs, methods* - **ISSUED 10/11/2022**
3. **US11,563,241 APPARATUS AND METHODS FOR REMOVABLE BATTERY MODULE WITH INTERNAL RELAY AND INTERNAL CONTROLLER** Filed 10-FEB-2021 *authentication methods and circuits* - **ISSUED 12/14/2022**
4. **US11,575,270** PCT/US21/55047 **BATTERY MODULE WITH SERIES CONNECTED CELLS, INTERNAL RELAYS AND INTERNAL BATTERY MANAGEMENT SYSTEM** Filed 22-FEB-2021 (CIP) *AC coupled comms and methods* - **ISSUED 02/07/2023**
5. **US11,699,817** PCT/US21/54434 **APPARATUS AND METHODS FOR REMOVABLE BATTERY MODULE WITH INTERNAL RELAY AND INTERNAL CONTROLLER** Filed 31-MAR-2021 *system, pack and module controllers, blockchain* **ISSUED 07/11/2023**
6. **US11,477,027** PCT/US21/55813 **APPARATUS AND METHODS FOR MANAGEMENT OF CONTROLLED OBJECTS** Filed 11-MAY-2021 *multi-domain management of controlled objects, LCT/blockchain* - **ISSUED 10/18/2022**
7. US17/528,903 PCT/US21/60860 **ELECTRICAL POWER SYSTEM WITH REMOVABLE BATTERY MODULES** Filed 17-NOV-2021 *dissimilar modules in parallel*
8. US17/710,759 PCT/US22/24797 **APPARATUS AND METHODS FOR MANAGEMENT OF CONTROLLED OBJECTS** Filed 31-MAR-2022 *linking of identifiable records, authorizer device pairings*
9. US17/828,989 PCT/US22/xxx **HIGH VOLTAGE BATTERY MODULE WITH SERIES CONNECTED CELLS AND INTERNAL RELAYS** Filed 31-May-2022 *dissimilar relays, PLC control bus, linear and pwm modes*
10. US18/086,515 **ELECTRICAL POWER SYSTEM WITH REMOVABLE BATTERY MODULES** Filed 12-DEC-2022 *vehicle and stationary installations having a power system, energizing a bus*
11. US18/092,806 **LOW COST BATTERY CELL MONITORING CIRCUIT** Filed 3-JAN-2023 *low cost ASIC*