POWERING
A NEW DIMENSION

WHITE PAPER

Delivering 200C High-Power Battery Technology for Instantaneous Energy Demands

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1 Overview & Context

This white paper presents a breakthrough in battery design: a solid-state lithium-based battery capable of delivering discharge rates up to 200C — a level of power output that radically transforms what is possible in miniature electronic systems.
Historically, the miniaturization of electronics has progressed faster than the energy systems powering them. Most batteries can deliver moderate energy densities but fall short when required to deliver rapid, high-current bursts without suffering voltage drop, overheating, or degradation.
By rethinking the internal architecture of the battery — from materials to electrochemical interfaces — this technology achieves instantaneous discharge currents of up to 30 mA from cells with capacities of just 150 µAh. This level of performance enables power profiles typically associated with macro-scale cells, now compressed into millimeter-scale form factors.
Applications such as Bluetooth Low Energy (BLE) tags, wireless sensor networks and healthcare systems demand short bursts of high power without sacrificing footprint, safety, or cycle life. The solution detailed here offers all three — and does so without the need for bulky supercapacitors, external boosters, or thermal sinks.

2 Understanding 200C: What it Really Means

A C-rate indicates the speed at which a battery is charged or discharged relative to its nominal capacity.

$$C_{rate} = \frac{Current(A)}{Capacity(Ah)}$$

C-Rate	Rated Capcity	Formukla	Current	Discharge / Charge Time
200C	150µAh	150µA x 200	30mA	18 s
100C	150µAh	150µA x 100	15mA	36 s
50C	150µAh	150µA x 50	7,5mA	1 min 12 s
10C	150µAh	150µA x 10	1,5mA	6 min
1C	150µAh	150µA x1	150µA	1 h
C/2	150µAh	150µA / 2	75µA	2 h
C/5	150µAh	150µA / 5	30µA	5 h
C/10	150µAh	150µA / 10	15µA	10 h

Conventional Li-ion microbatteries are designed for energy delivery over time, not power delivery on demand (from 1 to 5C maximum). Their internal resistance and electrode design inherently limit their ability to supply high burst currents — leading to voltage collapse, slow response, or permanent degradation under stress. In contrast, POWENCY batteries are optimized for high-current, short-duration loads — a power profile much closer to that of a supercapacitor, but with the voltage stability and energy density of a true rechargeable cell.

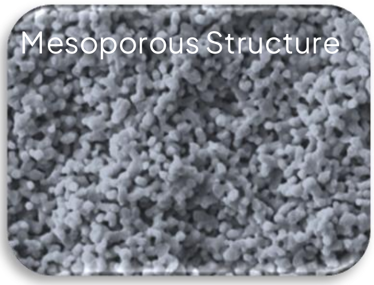
3 Architecture-Driven Performance: Why This Works

The core enabler of such extreme performance is the internal structure of ITEN Powency battery. This design is not a derivative of traditional lithium-ion cells, but the outcome of years of research in nanomaterials science, which forms the core expertise of ITEN. Unlike many players who adapt off-the-shelf components, POWENCY's development stems from a deep understanding of ion transport, interfacial kinetics, and current collector optimization at the microscale.

🧠 Key Architectural Features:

1. Full-ceramic mesoporous structure

This structure simultaneously maximizes the active surface, hence the ionic/electronic transport while minimizing resistance, heat generation, and degradation mechanisms

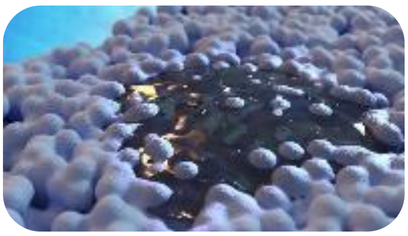


2. Nanostructured Electrodes

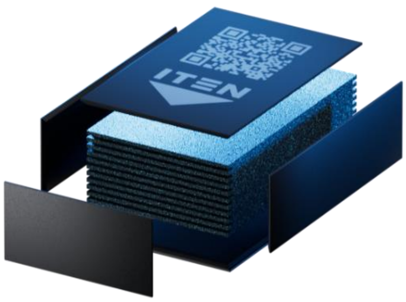
- Cathode: High-surface-area made of LMO for fast diffusion and conductivity
- Anode:Made of LTO for ultra-fast intercalation and thermal resilience

3. Solid Electrolyte

POWENCY "gel"/solid electrolyte conforms more intimately to the electrode surface topology, ensuring low interfacial resistance — crucial for short pulse currents and minimizing voltage drop under load.and offers higher ionic mobility.



4. Optimized Layer Stacking

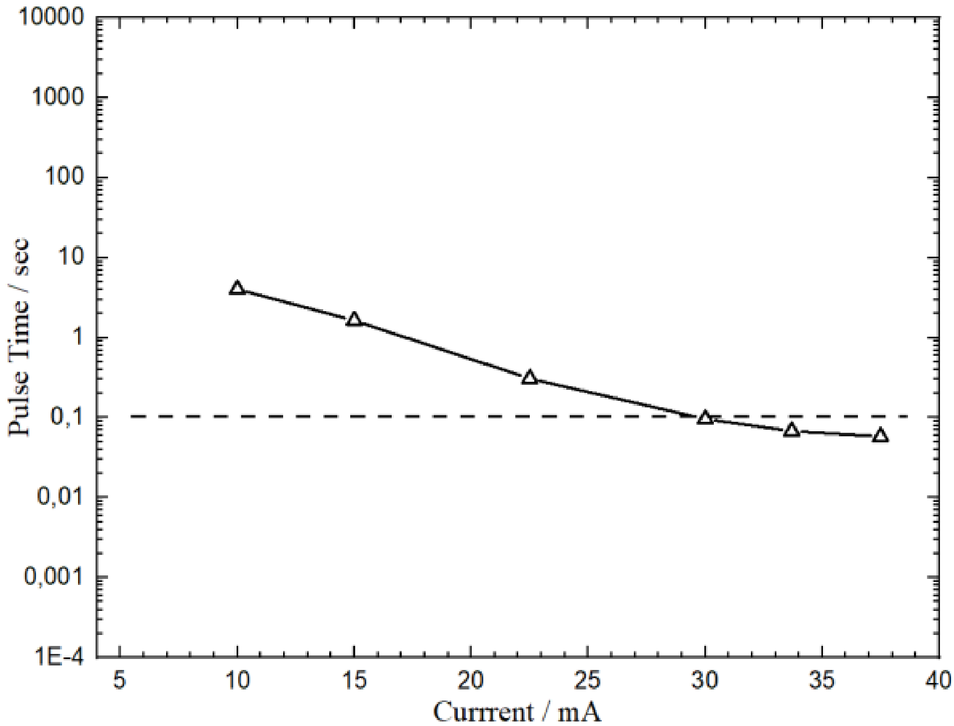


- Fine-tuned interfacial contact between layers to reduce ESR
- Packaging compatible with SMT integration

This architecture allows ultra-rapid charge transfer, minimal voltage sag, and reliable high-rate cycling, all within a structurally stable microcell.

4 Power Delivery Performance – ITEN PWY1050S

To characterize the true high-rate potential of the PWY0150S battery, we measured its ability to sustain increasing current levels over short-duration pulses. The resulting Current vs Pulse Duration curve reveals the dynamic range of the battery under burst conditions

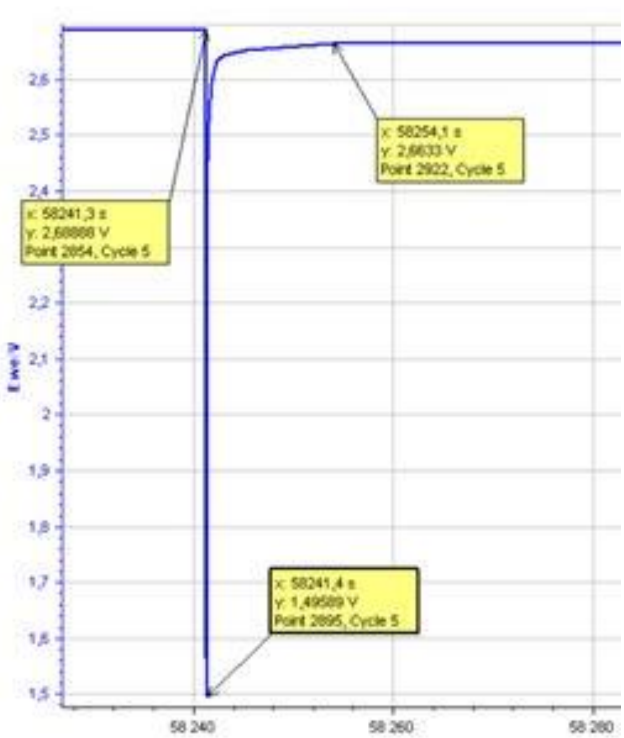


The battery can deliver currents far exceeding 200C (e.g. >30 mA) for sub-100 ms pulses without triggering voltage collapse or thermal limits.

Parameter	Value
Battery Capacity	150µAh
Discharge Rate	150µAh
Current Load	150µAh
Nominal Voltage	2,3V
Average power delivered	~90mW over 40ms
Max surface temperature rise	< 1°C

This curve illustrates the ability of the PWY0150S battery to maintain high instantaneous power output without collapse, even under extreme C-rates. Importantly, the battery sustains the full functional power envelope required by BLE radios, microcontrollers, and wireless transmitters operating in short-duty-cycle modes.

If we look how the voltage of the battery behave after such 200C peak current for 40ms:



📈 Interpreting the Curve:

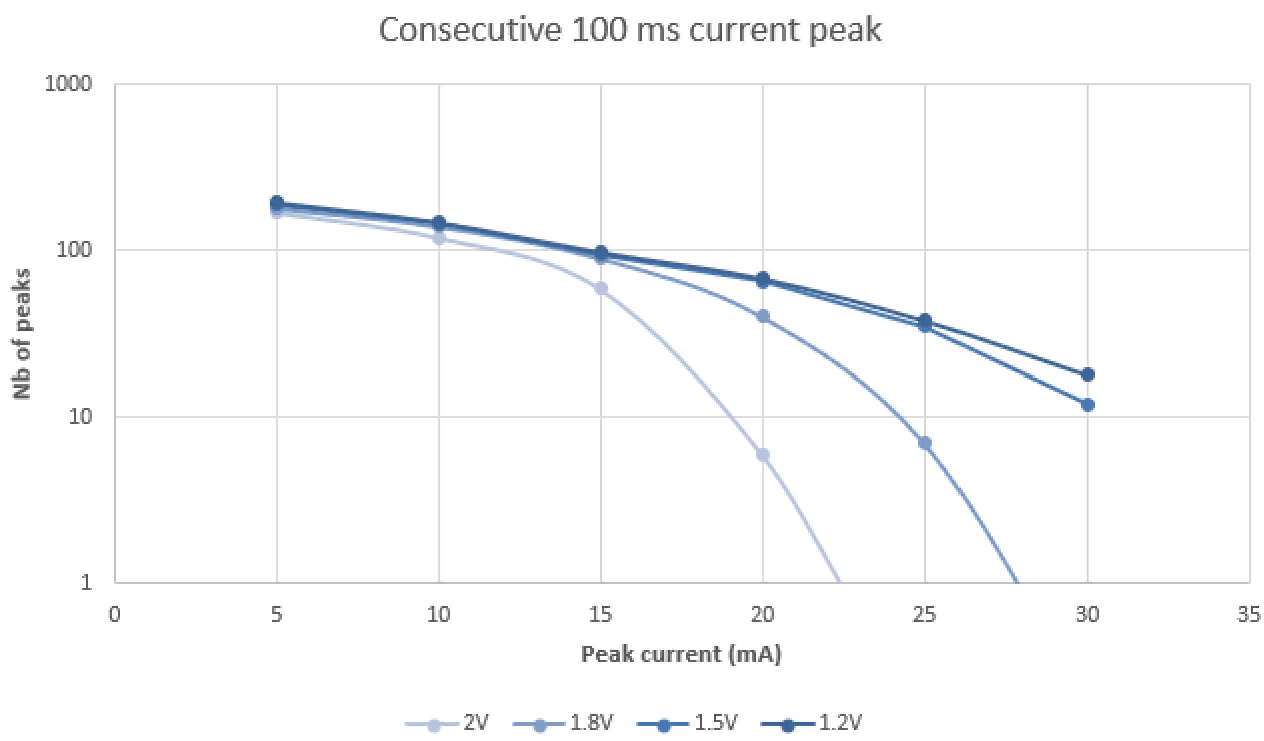
- At t = 58241s, a 30 mA current pulse is triggered, representing a 200C discharge rate.
- The voltage shows an instantaneous drop to transfer the power of the battery down to 1,5V approximatively
- At the end of the pulse, the battery enters a relaxation phase.
- At t = 58254s, ie 13s after the 200C peak current, The voltage recovers smoothly, with only a net voltage loss of 50 mV over the entire event, demonstrating:
  - Low internal impedance
  - High-rate ion transport
  - Excellent electrode/electrolyte interface integrity

🧠 Why It's Significant

Maintaining a stable voltage under a 200C load is unprecedented for batteries. In conventional Li-ion systems, such loads would typically cause:

- Severe voltage sag (>0.5 V)
- Risk of triggering undervoltage protection
- Permanent capacity loss due to electrode stress

Now, let's examine how the battery behaves under successive current peaks: a 10-second pattern with 100 ms current pulses, corresponding to a 1% duty cycle with different cut-off voltages



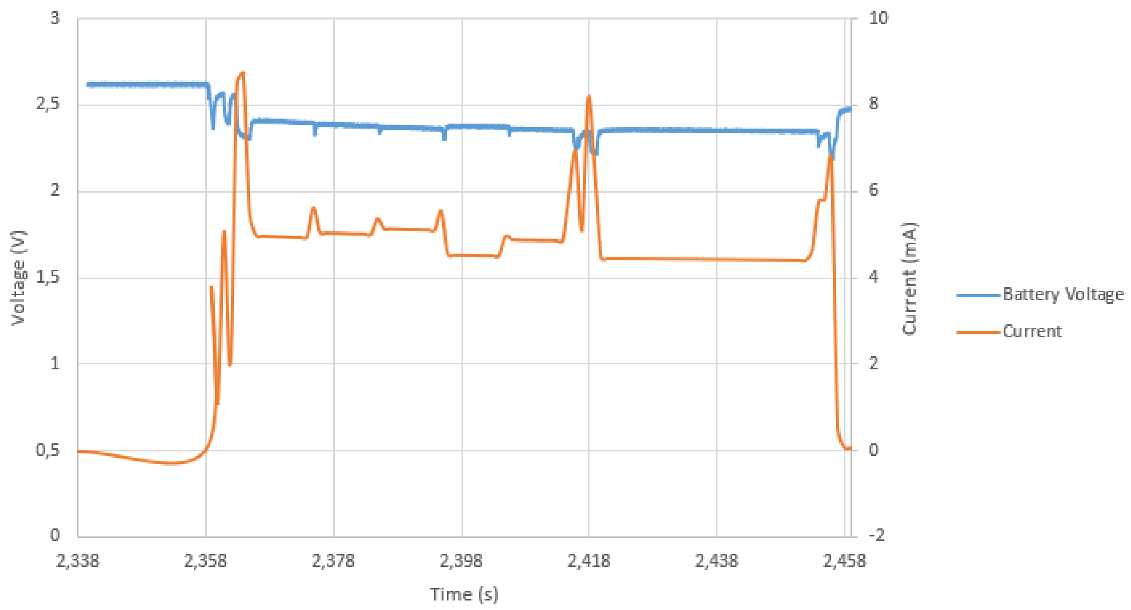
The graphs above illustrate that the battery can sustain multiple successive current peaks, confirming its ability to deliver high power consistently. Even under repeated stress, the battery's performance remains stable, and its power capabilities can be leveraged multiple times consecutively without the necessity for immediate recharge. This behavior is particularly advantageous for applications requiring frequent, short bursts of high current while maintaining operational continuity

5 Application Domains & Opportunities

The unique power profile of the POWENCY battery — combining high pulse current, low voltage drop, and fast response time — unlocks a range of applications that were previously inaccessible to conventional micro-scale energy sources.

Bluetooth Low Energy (BLE) Systems
Enables fast handshake and encrypted communication in wearables, smart tags, and asset tracking

Below is a typical behavior of a BLE current transmission and the associated battery voltage curve



Despite the current peaks associated with radio transmission, the battery exhibits only minimal instantaneous voltage drop and maintains stable output. This ensures the system can support hundreds of transmission events before requiring a recharge.

Wireless Sensor Networks (WSN)
- Perfect for event-driven transmission and energy harvesting topologies
- Ideal for Bluetooth, ZigBee with pulsed RF

Heathcare Electronics
- Can support biostimulation, pressure sensing, or telemetry bursts in regulated power envelopes

Security & Edge Compute Devices
- Cryptographic operations and local AI inference require short high-current bursts—this battery delivers

6 Conclusion

POWENCY batteries redefine what is possible in high-rate, miniature energy storage. By combining a patented mesoporous ceramic architecture, solid-state electrolyte, and deep electrochemical expertise, they deliver:

- Pulse currents above 200C
- Minimal voltage sag, even under extreme loads
- Fast response times compatible with real-time and RF applications
- Safe, compact integration without external passives

This new performance regime enables a wide range of use cases — from Bluetooth Low Energy bursts, to secure authentication modules, to event-driven sensors in wearables, industrial nodes, and medical devices. As demand grows for instant-on power in ever smaller form factors, POWENCY battery platform offers a scalable, application-ready solution. The next generation of connected, autonomous, and intelligent devices will no longer be limited by their power source

7 Revision History

Date	Version	Comment
April 2025	1,0	Initial version

8 Contact

For any technical questions, please send us an email to:

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About Us

ITEN is a French industrial gem, leader in the development and production of solid-state batteries with unrivalled power density. It is one of the few global players with the capacity for industrial production of this technology, mastering the entire design and production chain. These revolutionary batteries meet the power and miniaturization needs of electronic systems used in connected objects, autonomous sensors and wearables.
At the heart of the French DeepTech ecosystem, ITEN holds over 200 patents. ITEN is the two-time winner of the global innovation competition in 2015 and 2017, the French Tech 120 winner in 2023 and 2024 and won the CES 2024 Best of Innovation Awards in Las Vegas for its Powency 250µAh battery (the second French company to be honoured since CES was founded in 1967).