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MOSFET Delivers Greater Short-Circuit Robustness For 72-V+ Battery Packs

iDEAL Semiconductor's SuperQ MOSFET technology is said to solve the critical safety and efficiency tradeoff in high-voltage (72 V and higher) battery management systems (BMS). According to the vendor, the platform sets an industry benchmark for short-circuit withstand capability (SCWC), which is described as the most vital safety metric for the BMS discharge switch.

This capability is exemplified by the iS15M2R5S1T, a 150-V, 2.5-mΩ MOSFET with a peak short circuit withstand current of 800 A, enabling up to 50% component reduction in 72V+ battery management systems, says the vendor. The table offers a comparison of the iS15M2R5S1T with a competing device with similar on-resistance.

As the comparison illustrates, the SuperQ device exhibits a 1.4-times higher short-circuit failure capability than its closest competitor. This performance is achieved through a proprietary cell structure featuring a wider conduction region that maximizes power density and structural integrity under extreme stress.

The proliferation of high-voltage battery packs in e-mobility, drones and professional power tools introduces a high-stakes challenge: protecting against catastrophic failure during external short-circuit events, where currents can spike into the thousands of amps. The discharge MOSFET is the single component responsible for isolating the battery pack under these extreme conditions.

Because each SuperQ device handles a significantly higher short-circuit current, designers can use up to 50% fewer MOSFETs in parallel to meet the same safety requirements. Reducing the component count and complexity leads to a substantial decrease in the total bill of materials (BOM) and simplifies board layout. Maintaining low $R_{DS(ON)}$ of 2.5mΩ minimizes conduction losses, extending battery run-time and reducing thermal management needs (see the figure).

The SuperQ portfolio is available immediately with devices up to 200 V, providing solutions for battery platforms ranging from 72 V to over 144 V. For further details and a white paper on their use in battery management systems, see the battery management page.

Table. Comparison the short circuit robustness of a SuperQ MOSFET with a leading competitor.

Company / Product	Voltage	$R_{DS(ON)}$	SCWC (peak)
iDEAL SuperQ (iS15M2R5S1T)	150 V	2.5 mΩ	800 A
Competitor	150 V	2.5 mΩ	580 A

Figure. "In high-energy packs, robustness is non-negotiable. Traditional MOSFET designs are forced to compromise between achieving ultra-low $R_{DS(ON)}$ for efficiency and the structural integrity needed to survive a massive short-circuit current. The SuperQ platform eliminates this compromise. Our proprietary cell structure delivers the market's lowest on-resistance alongside a safety margin that is simply unmatched, giving designers the confidence to build smaller, more reliable, and lower-cost battery system," said Phil Rutter VP of design at iDEAL Semiconductor.