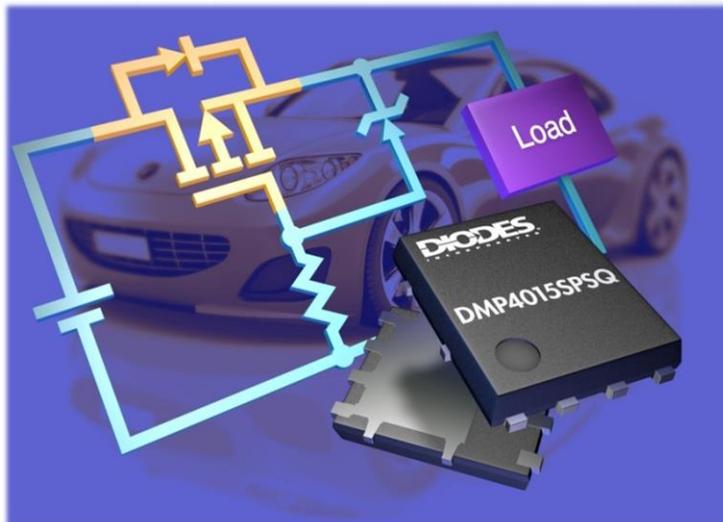




Automotive MOSFETs Protect ECUs

The DMP4015SPSQ 40V P-channel MOSFET is designed to protect automotive Electronic Control Units (ECUs) against the risk of reverse battery connection. ECUs are used in a growing number of automotive control applications and, with some vehicles deploying up to 80 ECUs, the need to protect each one demands a simple and cost-effective solution, which this MOSFET provides.

Driving this device only requires a minimal number of passive components. By comparison, N-channel MOSFETs require a charge pump to provide the gate drive voltage, adding complexity, cost and component count. Eliminating the switching topology of a charge pump also avoids issues with EMI emissions.



The Diodes' Advantage

The DMP4015SPSQ is a 40V P-channel MOSFET in the thermally efficient PowerDI5060 designed for reverse battery protection.

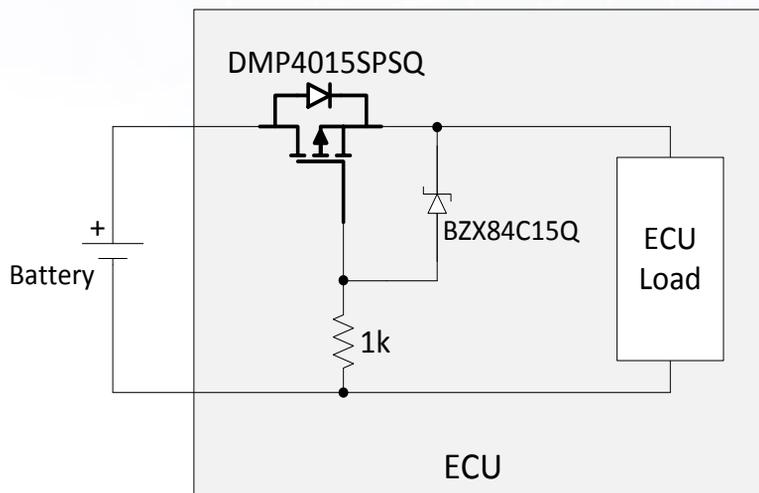
- **$R_{DS(on)} < 11 \text{ m}\Omega$**
Ideal diode minimizing power loss to lower operating temperature – this eases thermal design considerations and improves reliability.
- **Simple and Cost-Effective**
Driving this device only requires a minimal number of passive components, when compared to an N-channel MOSFET.
- **100% UIS Tested**
Each device subjected to an Unclamped Inductive Switch (UIS) test for withstanding the worst case ISO7637 energy pulses.

Circuit Function

Acting as an ideal diode, the P-channel MOSFET, allows current to flow when the battery is correctly connected and blocking the current when accidentally connected in the reverse.



Reverse Battery Protection Circuit



DMP4015SPSQ is the ideal diode switch for protecting the ECU load against reverse battery connection during vehicle maintenance. During reconnection of a vehicle's battery it is possible to reverse the battery polarities causing damage to the ECUs.

Under normal forward operation, the 12V battery can drop to 4.5V for 15ms during stop-start cold cranking. During this event, the DMP4015SPSQ can remain fully enhanced with $<15\text{m}\Omega$ resistance to minimize the potential difference drop as high currents are drawn.

When battery voltages spike greater than 15V, the Zener (BZX84C15Q) will clamp the gate-source voltage to avoid damaging the MOSFETs gate oxide structure. Furthermore, if the battery is disconnected whilst sourcing a high current into an inductive ECU load, then the rugged MOSFET can withstand the worst case ISO7637 avalanche pulse.

40V P-channel MOSFETs for Automotive

Part Number	Polarity	BV_{DSS} (V)	I_{DS}^* (A)	P_D^* (W)	$R_{DS(on)} \text{ max}$ @ $V_{GS} = 10\text{V}$ ($\text{m}\Omega$)	$R_{DS(on)} \text{ max}$ @ $V_{GS} = 4.5\text{V}$ ($\text{m}\Omega$)	Package
DMP4015SPSQ	P	-40	-11	2.1	11	15	POWERDI5060-8
DMP4015SK3Q	P	-40	-14	3.5	11	15	TO252 (DPAK)
DMP4015SSSQ	P	-40	-10	1.8	11	15	SO-8

* Device mounted on FR4 PCB with drain terminals on 1inch square area of 2oz copper. Gate driven at 10V with 25degC ambient temperature under steady state conditions