Issue Number | 001
October 2015

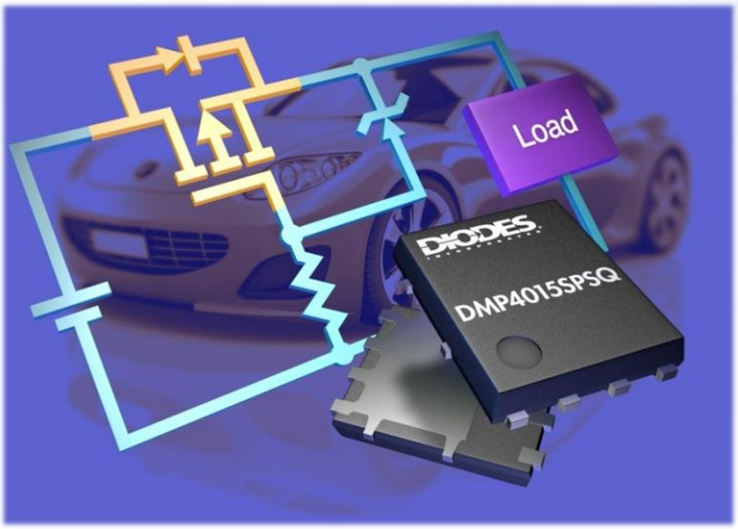
New Product Announcement

DMP4015SPSQ

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 mOhm**
  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.

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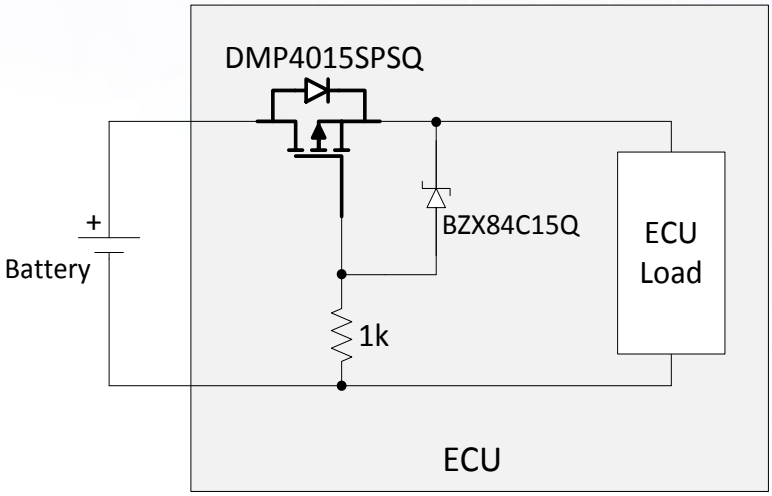
Reverse Battery Protection Circuit



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 <15mΩ 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)	$R_{DS(on)}$ max @ V_{GS} = 10V (mΩ)	$R_{DS(on)}$ max @ V_{GS} = 4.5V (mΩ)	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