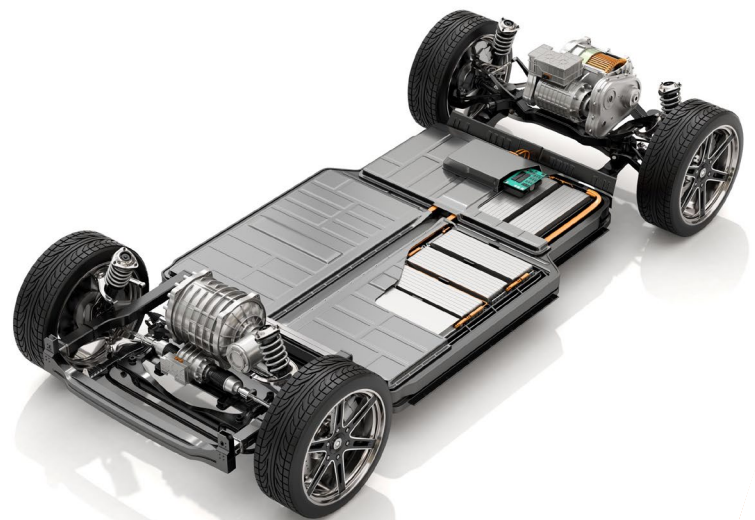




System Solution Guide - Preview

Traction Inverter



onsemi.com



Table of Contents

Get Latest
Version

| | |
|---|--|
| Overview | 03 |
| Market Information & Trend Trench is the Future, but Planar is Today's Reliable Solution | 04 |
| System Description Technology and Architecture Introduction Block Diagram | 05 06 |
| Solution Overview Traction Inverter – Power Stage VE-Trac™ SiC Modules for Traction Inverter New EliteSiC™ 1200 V M3e MOSFET Technology EliteSiC B2S & B6S Power Modules for EV Traction IGBT Technology in Electric Vehicles Discrete Double Pulse Tester – MOSFET and IGBT Evaluation Board Gate Drivers - Why the Negative Bias is Important for SiC Devices | 08 09 10 11 12 16 18 |
| Recommended Products | 19 |
| Complementary Products | 21 |
| Development Tools and Resources | 23 |



System Solution Guide
Traction Inverter



Register now to unlock all System Solution Guides



1



2



3



4



5



6



7



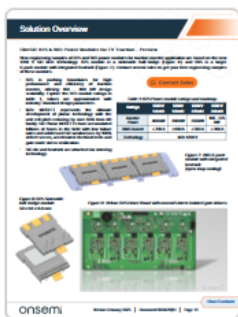
8



9



10



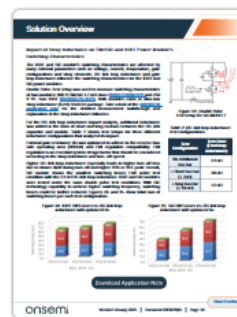
11



12



13



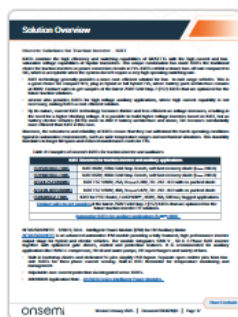
14



15



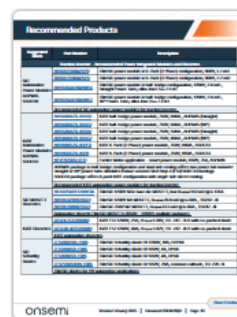
16



17



18



19



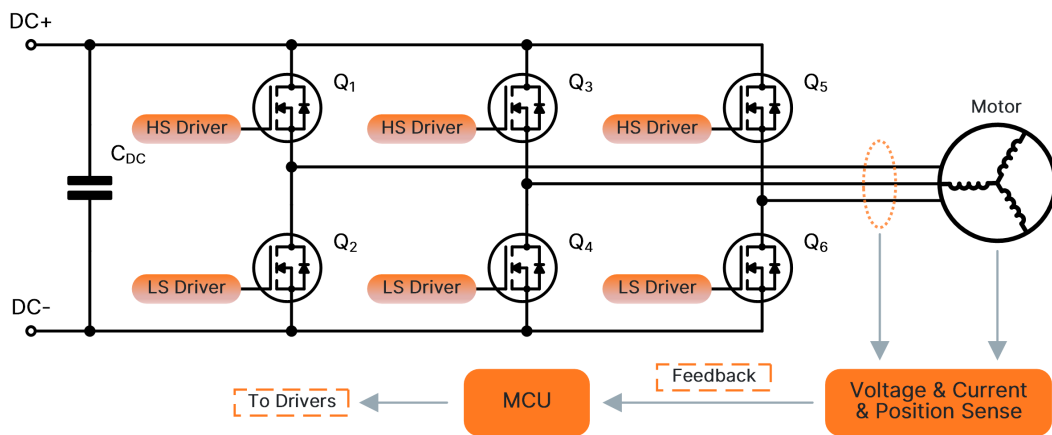
20

Traction Inverter – Power Stage

The MOSFETs in the example schematic below are the most critical components of the inverter as they control the flow of current to the motor to generate motion. Three legs of the inverter convert the DC battery voltage into three-phase AC voltage and current to drive the motor. This power stage is monitored and protected by sensing the temperature, voltage and current during operation. Output control from the MCU is transferred to the power stage in the form of PWM signals via galvanically isolated gate drivers. Efficient operation of the traction inverter and EV motor are a combination of good MCU control, fast signal feedback and accurate sensing. MCU control changes during regenerative braking, where the same power stage transfers power from motor (acting as a generator) back to the DC battery.

onsemi offers 3 approaches to building high-performance power stage with EliteSiC™ devices:

- Use a [single 6-pack module](#) (SSDC39) to achieve the most integrated solution with pin-fit heatsink.
- Use [3x half-bridge modules](#) (AHPM15) to achieve higher design flexibility while maintaining performance.
- Create your custom module design with [6x M3e MOSFET](#) in a packageless bare die format.

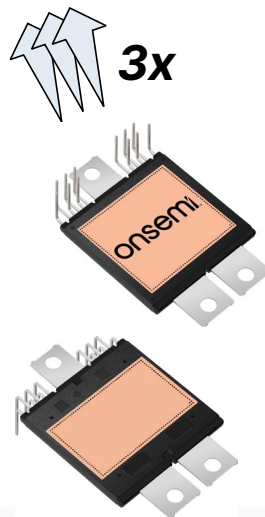


1x

Figure: VE-Trac Modules

Left: SSDC39 EliteSiC module in 6-pack configuration (Direct Cooling)

Right: AHPM15 EliteSiC module in half-bridge configuration



3x

6x

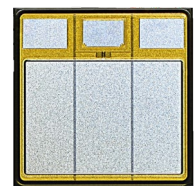


Figure: EliteSiC M3e MOSFET in a bare die format that can be implemented in any custom module design

Use our Interactive Block Diagrams Tool



Open IBD Tool

Products for Traction Inverter

Get Latest Version

VE-Trac™ SiC Modules for Traction Inverter

SiC technology is revolutionizing battery electric vehicles (BEVs) by enhancing the efficiency and performance of traction inverters. SiC offers superior efficiency and peak power, especially at higher voltages, making it ideal for EVs where range and performance are crucial. The SSDC39 six-pack power module product family offers increased performance, better efficiency, and higher power density in industry standard packaging solution. The [NVXR17S90M2SPB](#) module integrates **900 V 1.7 mΩ SiC MOSFETs in a 6-pack configuration**, SSDC39 package.

For assembly ease and reliability, a new generation of press-fit pins are integrated into the power module for signal terminals. To allow direct cooling, gel-filled package integrates an optimized pin-fin heatsink in the baseplate. Designed to meet AQG324 automotive standard.

Find Products

Download Application Note

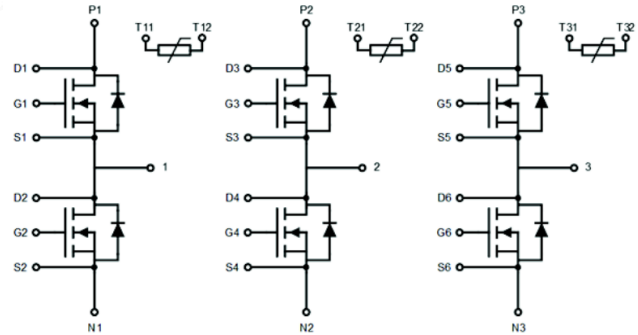
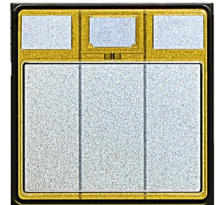


Figure: 6-pack MOSFET configuration inside the SSDC39 power module

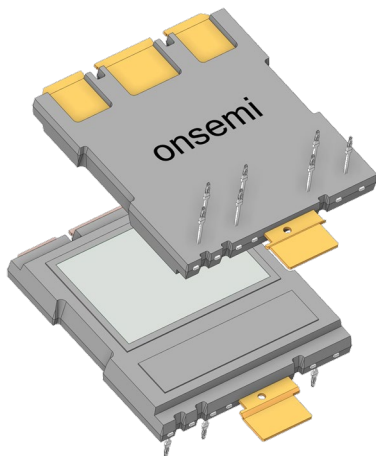
New EliteSiC™ 1200 V M3e MOSFET Technology

High-performance **onsemi's** 3rd generation 1200 V SiC MOSFET [NCS025M3E120NF06X](#) in a packageless 5x5 mm bare die format can be implemented in any custom module design. Based on the latest generation of SiC MOSFET technology from **onsemi**, the M3e product family offers the lowest on-resistance in its class, typ. 11.0 mΩ at $V_{GS} = 18\text{ V}$, $I_D = 135\text{ A}$, $T_J = 25\text{ °C}$, which makes the MOSFET the ideal choice for automotive traction inverters.



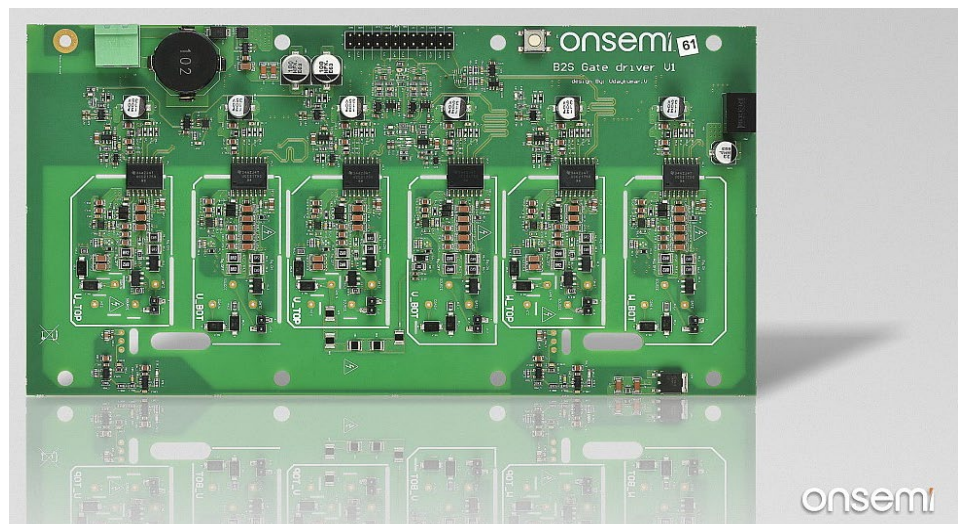
New engineering samples of B2S and B6S power modules for traction inverter application are based on the new 1200 V SiC M3e technology. B2S module is a sinterable half-bridge and B6S is a larger 6-pack module with integrated heatsink. Contact onsemi sales to get your first engineering samples of these modules.

M3e MOSFET represents the ultimate development of planar technology with the unit cell pitch reducing by over 60% from M1 family.



Above: B2S Sinterable half-bridge module
58 x 64 x 8.6 mm

Right: B2S Driver Board with onsemi's latest isolated gate drivers.



onsemi™

Intelligent Technology. Better Future.

Register now to unlock all System Solution Guides and get additional exclusive benefits!

- Join the conversation on community forum.
- Utilize Elite Power Simulator & other developer tools.
- Watch exclusive webinars and seminars.

Open full System Solution Guide



onsemi, the onsemi logo, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using onsemi products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by onsemi. "Typical" parameters which may be provided in onsemi data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. onsemi does not convey any license under any of its intellectual property rights nor the rights of others. onsemi products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use onsemi products for any such unintended or unauthorized application, Buyer shall indemnify and hold onsemi and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that onsemi was negligent regarding the design or manufacture of the part. onsemi is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.