Application

Aegis Electronics serves customers connected to the United States military and aerospace industry, delivering high-efficiency, compact SiC power solutions—including power modules, DC-AC inverters, and DC-DC converters —for diverse power systems, with advantages in high energy efficiency, size, and weight.

The market segments include:

- Defense and Aerospace
- Energy storage
- Hybrid electric drives for vehicular transportation
- Power generation
- Renewable energy including solar and wind applications

Technology

Since 2002, Aegis Electronics has developed leading expertise in high-temperature silicon carbide (SiC) electronics and packaging. Our team includes five PhD scientists and electrical engineers, supported by partners from national labs and universities. Our funding by SBIR/STTR contracts comes from U.S. Department of Defense (DoD), NASA, and Department of Energy (DoE). Also use learned methods to iterate on in-house SiC projects. We welcome inquiries from all associated industries.

Aegis Electronics employs a range of advanced process techniques to support its SiC work, including ceramic-to-metal, carbon-to-ceramic, and carbon-to-metal brazing and sealing, as well as high-temperature interconnections and soldering. The company also performs metallization on AlN and Si_3N_4 substrates and utilizes wire bonding to ensure reliable, high-performance electronic assemblies.

Aegis Electronics is equipped with advanced facilities to support its SiC and power electronics work, including furnaces for air, vacuum, and controlled-atmosphere processing, as well as hot isostatic pressing and degassing systems. Its capabilities are further enhanced by attritor and screen-printing systems, gloveboxes, and wire bonding equipment, alongside dedicated power electronics testing laboratory. The company also maintains comprehensive thermal, mechanical, and electrical characterization tools, supported by computer systems with FEA and AutoCAD software for design and analysis.

Aegis Electronics provides customized design and prototyping of a wide range of SiC power electronics products tailored for demanding applications. These include packaged SiC switches, available as single devices or arrays mounted on aluminum nitride (AlN) or silicon nitride (Si_3N_4) substrates with copper, gold, or molybdenum metallization. The company also develops robust SiC power modules in configurations such as single-phase, three-phase, half-bridge, and full-bridge designs, including six-pack and half-bridge modules using alumina (Al_2O_3), AlN, or Si_3N_4 substrates, with power ratings from 1 kW to 100 kW. In addition, Aegis designs SiC-based and hybrid SiC/Si DC-AC inverters and DC-DC converters that integrate power modules, high-temperature packaging, efficient heatsinks, and gate drivers. Complementing these systems are high-temperature, high-frequency gate drivers engineered specifically for SiC power devices.

Aegis Electronics specializes in advanced thermal management systems for SiC power electronics, combining innovative materials with engineered designs to enable high power density and high-temperature operation. Its solutions include high-efficiency heatsinks utilizing microchannels, microjet cooling, porous media such as aluminum and graphite foam, heat pipes, and phase change materials, as well as graphite foam and carbon-carbon heat exchangers for effective heat dissipation. The company also develops high-temperature aluminum nitride (AlN) packaging capable of operating up to 600°C, along with high thermal conductivity ceramic substrates such as metallized AlN and Si_3N_4, and Cu- and Al-based metal matrix composites. These thermal management technologies support a wide range of applications, including armored and Army vehicle propulsion systems, high-power laser systems, microwave amplifiers and radar systems.