Power management products

TDK adds full telemetry to new DC-DC converter modules for high power-density applications

- Optimized construction leads to extraordinary power density in surprisingly small modules
- The new FS1606 in the series is the smallest solution in 6A, with full telemetry via an I²C interface, in a 3.3 x 3.3 x 1.35 mm size, with a wide operating range of -40 °C to 125 °C
- Easy access to full telemetry (voltage, current & temperature)
- Easily adopted in designs anchored by ASICs, SoCs, and FPGAs
- Showing FS1606 at APEC Conference – Advanced Power Management, Use case for Predictive Maintenance, Session#: IS06.3. Atlanta, Georgia on March 18th

March 4, 2025

TDK Corporation (TSE:6762) announces the new FS160* series of its microPOL (µPOL) power modules. The FS160* series of µPOL DC-DC converters all offer full telemetry, provide increased performance, and are remarkable for extraordinary power density in the smallest sizes now in mass production.

All FS160* microPOL modules measure a mere 3.3 mm wide by 3.3 mm deep by 1.35 mm high. Because of their size and extraordinary power density, every module in this series can be easily integrated into designs anchored by ASICs, SoCs, and all the most popular FPGAs. Full telemetry (voltage, current & temperature) is accessible via an I²C interface. The modules operate across a broad junction temperature range, from -40 °C to 125 °C.

There are several versions of each of the 3-A parts (the FS1603 series), 4-A parts (the FS1604 series), and 6-A parts (the FS1606 series). The FS line also includes models at 12 A (the FS1412) and 25 A (the FS1525). The selection of DC-DC converter modules that range from 3 A to 200 A (if eight FS1525 are connected in parallel) covers a broad range of needs and applications, including big data, machine learning, artificial intelligence (AI), 5G cells, the Internet of Things (IoT), and enterprise computing.

The configuration of the module is itself innovative; the FS160* series modules integrate a high-performance controller, drivers, MOSFETs, and logic core in carefully engineered packages, using a semiconductor embedded in substrate. This packaging eliminates wire bonds & enhances thermal performance.

TDK also integrates the module's IC inductor and passives into a chip-embedded package to minimize parasitic inductance. This lowers interconnect and enhances the module's efficiency. Minimizing resistance and inductance leads to fast response and accurate regulation with dynamic load currents. Boot and Vcc capacitors are also incorporated into the module.

These and other design optimizations make it possible for the FS160* series converters to deliver an extraordinary 1 watt per cubic millimeter in modules that are roughly half the size of other products in the same class. The FS160* series modules are so effective that they require no airflow whatsoever for up to 15 W to 30 W in up to 100 °C ambient temperature. The end result of using TDK modules is a small solution size that requires less PCB board space and fewer board layers as well as fewer external components, resulting in lower system cost.

The modular approach makes designing with the FS160* flexible for either analog or digital configurations, supporting output voltages from 0.6V to 5.0V. TDK has created multiple design tools for designers to use, including tools specific to FPGAs from each of the major FPGA suppliers.

Evaluation boards are available, one each for modules at 3 A, 4 A, and 6 A, (respectively the FS1603 series, FS1604 series, and FS1606 series). Additional design tools for FS160* series includes spice simulator designs on QSPICE™. Fast starter designs for schematic and PCB layout are now available with our partners at Ultra Librarian for free, **https://www.ultralibrarian.com/partners/tdk**

Glossary

- µPOL modules: integrated DC-DC converters placed in the vicinity of complex ICs such as ASICs, FPGAs, and others
- PCB: printed circuit board

Main applications

- Big data
- Machine learning
- Artificial intelligence (AI)
- 5G cells
- The Internet of Things (IoT)
- Enterprise computing
- Advanced power management: use case for predictive maintenance.

Main features and benefits

- High power density in small modules
- Full telemetry (voltage, current & temperature)
- Part of a wider series of DC-DC converters ranging from 3 A to 25 A for maximum design and application flexibility
- Small size of 3.3 x 3.3 x 1.35 mm
- Wide operating range of -40 °C to 125 °C
- Minimizes board size and costs
- Rated for industrial application, is lead-free, and ROHS compliant

Part No.	L x W [mm]	T (Max.) [mm]	Input Voltage Range Dual Supply Mode [V]	Input Voltage Range Single Supply Mode [V]	Output Voltage [V]	Continuous Output Current (Max.) [A]	Operating Junction Temp. [°C]
FS1603-5000-AL	3.3 x 3.3	1.45	4.5 to 16	4.5 to 16	5	3	-40 to 125
FS1604-3300-AL	3.3 x 3.3	1.45	4.75 to 16	4.75 to 16	3.3	4	-40 to 125
FS1606-0600-AL	3.3 x 3.3	1.45	2.5 to 16	4.5 to 16	0.6 to 5.0V	6	-40 to 125

About TDK Corporation

TDK Corporation is a world leader in electronic solutions for the smart society based in Tokyo, Japan. Built on a foundation of material sciences mastery, TDK welcomes societal transformation by resolutely remaining at the forefront of technological evolution and deliberately “Attracting Tomorrow.” It was established in 1935 to commercialize ferrite, a key material in electronic and magnetic products. TDK‘s comprehensive, innovation-driven portfolio features passive components such as ceramic, aluminum electrolytic and film capacitors, as well as magnetics, high-frequency, and piezo and protection devices. The product spectrum also includes sensors and sensor systems such as temperature and pressure, magnetic, and MEMS sensors. In addition, TDK provides power supplies and energy devices, magnetic heads and more. These products are marketed under the product brands TDK, EPCOS, InvenSense, Micronas, Tronics and TDK-Lambda. TDK focuses on demanding markets in automotive, industrial and consumer electronics, and information and communication technology. The company has a network of design and manufacturing locations and sales offices in Asia, Europe, and in North and South America. In fiscal 2024, TDK posted total sales of USD 14.6 billion and employed about 101,000 people worldwide.

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