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Overcurrent-Protected Power Modules Safeguard Multiphase VRs

Alpha and Omega Semiconductor's SmartClamp family of protected DrMOS is designed specifically for the extreme power demands of AI servers, data centers, and high-end graphics cards. The SmartClamp family offers high-accuracy overcurrent protection (OCP) and negative current protection (NCP). The flagship AOZ53228QI is said to provide a unique safeguard for multiphase voltage regulators (VRs), preventing catastrophic failures in environments where high peak currents are the norm (see the figure).

In AI applications, peak workloads often push current levels beyond the physical limits of standard inductors and power stages. Traditional protection methods often suffer from delays; even a mere 50-ns OCP delay can result in a 30-A current runaway, risking permanent damage to the high-side MOSFET—especially when inductor saturation occurs.

The SmartClamp family eliminates this risk by implementing current limiting directly within the power stage rather than relying solely on the controller.

Technical highlights include:

- Cycle-by-cycle monitoring: Utilizes an internal rising-edge current ramp to monitor inductor current in real-time.
- Precision protection: Delivers accurate positive and negative current limiting to handle high di/dt slew rates.
- Universal compatibility: Optimized for industry-standard constant-on-time (COT) and fixed-frequency PWM controllers, as well as the company's own proprietary AOS Advanced Transient Modulator (A^2TM) multiphase controllers.

"AOS engineered the SmartClamp DrMOS family to address the specific 'stress tests' of modern AI workloads," said Zach Zhang, power IC marketing director at AOS. "By pairing these with our advanced controllers—such as the OVR16, OVR4-22, and Intel IMVP/AMD SVI3 compatible series—we offer a seamless, high-efficiency Vcore solution that gives designers peace of mind in high-density power applications."

Offered in different current and voltage ratings per the table, the SmartClamp series is immediately available in production quantities with a lead time of 12 weeks. The unit price for 1,000-piece quantities of AOZ53228QI is $1.40. For more information, see the company's website or see the datasheets linked to in the table.

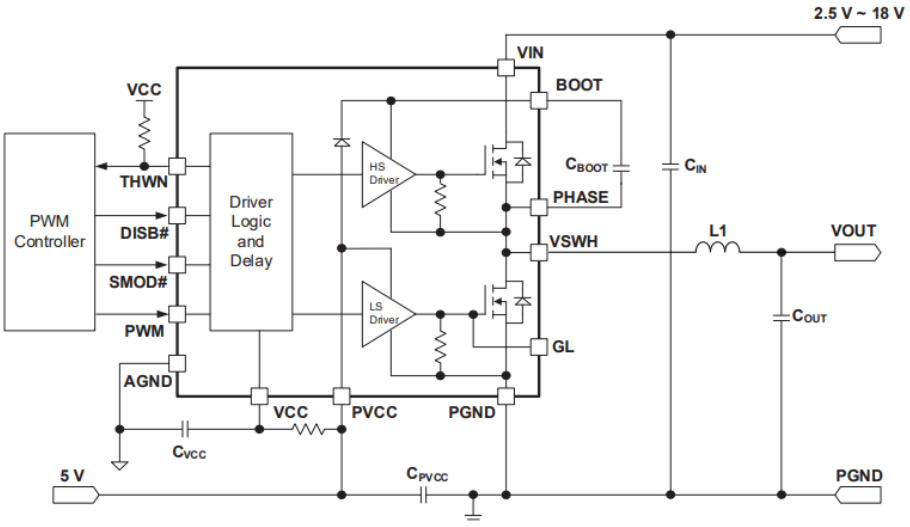

Figure. Housed in a 5-mm x 5-mm QFN, the AOZ53228QI is a high efficiency synchronous buck power stage module consisting of two asymmetrical MOSFETs and an integrated driver. It features high-accuracy temperature reporting to an external controller for thermal monitoring. The AOZ53228QI is a member of the SmartClamp family of protected DrMOS modules, which is said to deliver industry-leading peak-to-peak current limiting, ensuring safe and reliable operation for high-demand AI workloads.

Table. Ratings and applications for SmartClamp DrMOS power modules with 10% peak current accuracy.

Part Number	Voltage and current Range	Application
AOZ53228QI	18 V and 60 A	AI server, data center, high-end graphics cards
AOZ53262QI	18 V and 70 A	
AOZ53263QI	18 V and 80 A	
AOZ53261QI	25 V and 55 A	Gaming PC, AI PC
AOZ53267QI	25 V and 60 A	
AOZ53268QI	25 V and 70 A	