

STMicroelectronics Breaks the Rules with Smaller and More Robust Power Devices

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Automotive applications will be first to benefit from breakthrough technology

[STMicroelectronics](#), one of the world's largest [semiconductor](#) manufacturers, has reinforced its leadership in smart power technologies with the introduction of a new generation of its proprietary VIPower(TM) (Vertical Intelligent Power) family of technologies. Called M0-5, the new technology employs a patented control strategy that allows the Company to significantly reduce chip and package sizes while delivering the same power level as currently available devices, and at the same time dramatically increasing robustness. The new technology is particularly suitable for automotive applications, which are characterized by a demand for smaller, lighter and less expensive modules. The M0-5 technology provides devices that must operate

robustly under highly challenging physical and electrical conditions.

ST's new generation of automotive smart power technology is based on a thorough analysis of the physical mechanisms that can lead to device failure during abnormal operating conditions such as temporary or permanent short circuits and the fast thermal transients that can occur when a circuit is first switched on. The Company developed innovative control strategies that reduce the effect of these stresses on the most vulnerable elements of the circuit through active power limitation. In this way, while the die size (and hence the package size, with consequent decrease in system cost) required to implement a given power-handling specification has been reduced by an average of about 40%, the robustness of the devices has been enormously increased.

"This is the most significant breakthrough in automotive semiconductor technology in many years," said Domenico Bille, VIPower & RF Division General Manager. "Historically, reducing the physical dimensions of the power transistors has always made them more susceptible to the kind of stresses that are inevitably found in real automotive applications. Now, through the embedding of novel active protection circuits, our new devices are not only more compact and cost-effective but also much more resistant to the effects of the anomalous operating conditions encountered in automotive applications."

Like all of ST's VIPower technologies, the new M0-5 technology is based on vertical current flow, i.e. the high current (which typically drives lamps, motors, and solenoids in the car) flows vertically between the top and bottom of the silicon chip through high-performance power-transistor configurations, while the integrated control and diagnostic circuitry is formed horizontally on a top layer of the chip. This proven device architecture allows VIPower devices to achieve power-handling performances equal to or better than those of discrete devices while simultaneously allowing the integration of sophisticated control and

diagnostic circuitry.

ST's new technology combines advances in several different areas of chip and package design. In addition to the novel control strategy, which limits power dissipation under a variety of operating conditions, and the improved EMC (Electromagnetic Compatibility) characteristics, the new technology exhibits greatly reduced standby currents, down from 12-microamps per chip to only 2-microamps per chip.

ST has designed a family of new high-side drivers based on the new technology. The new product family includes single, dual, and quad drivers with RDS(ON) values from 2 to 160mOhm. Samples will be available to automotive customers from Q4 2004.

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