

Don't Design by Half: Power Processing is the Whole Solution

By Tim McDonald, VP International Rectifier, Power Stage Business Unit

Power processing has a key role to play in conserving the world's energy, which cost around \$3.7 trillion in 2005 and is estimated to grow to an even more staggering \$5 trillion by 2025. Put simply, power processing is taking a voltage and current and turning it into a different voltage and current in a way that's consistent with the needs of an application. It incorporates control and communications, regulation, drive, protection and power train switching, and encompasses both the power management and power conversion stages.

Over the years, the definition of power management has become blurred. Power management involves power sequencing or communication and in some cases, regulation. In other words, it is one half of power processing; not the whole. Besides power management, there is the power train that processes the power. This requires power switches that need to be actuated or driven. When you combine the drivers of the switches and the switches, you have a power conversion stage - the actual processing of the current and voltage. When both power management and the power conversion stage are considered together you get power processing which can result in dramatic system improvements and efficiency.

Take motor control as an example. Electric motors consume over 50 percent of the world's electricity usage. More than 80 percent of these motors are wastefully controlled electromechanically. They are used in fans,



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pumps, air conditioners, washing machines, refrigerators, elevators, and conveyors; turning on and off at top-end speed and wasting half the energy in the process. Designs are moving away from these conductively wound motors to permanent magnet motors. These permanent magnet motors are smaller, lighter and lower cost, and, as long as you have a good control technique, they achieve very high efficiency. In fact, permanent magnet inverterized motor

control can achieve 95 percent efficiency, a significantly higher performance than traditional systems using line operated single-phase induction motors. The efficiency is achieved by co-designing, the power train and the driver, and an algorithm to control them - in other words providing a complete power processing solution.

Another application example is the microprocessor. Currently around 15 percent of our electricity powers computers around the world. But how to improve energy efficiency? Start with selecting a power conversion stage with switch and driver optimized for efficiency. Couple that with power management that allows the microprocessor to go through various states of load all the while changing the voltage supply so it dissipates less power when it is processing less. This is the role of power processing.

Power processing is about trying to solve real problems by providing complete solutions, from switch to drive scheme to power management. rather than to deliver components and leave designers to solve the problems themselves. Through use of Power Processing methodology, great energy savings are enabled.

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