

# HEVs Power Forward in Automotive Industry

## Powerful impact anticipated on power management semiconductor market

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Hybrid Electric Vehicles (HEVs) are one of the most exciting applications for power management semiconductors. There are few other new applications on the horizon with as much hope or hype attached to them. Given the size and the diversity of the power management market, the rate of growth in power management systems and semiconductor markets is making it an exciting time for OEMs and chip vendors.

Worldwide shipments of hybrid light vehicles are increasing every year with projections of more than 100 percent growth year-over-year for the past several years. This has been a nice ride for the semiconductor companies involved in a food chain and in the United States — the largest market for automobiles in the world — more than 83,000 new registrations of HEVs were reported in 2004, an 81 percent increase over 2003. Clearly, hybrid vehicles have moved from curiosity to the mainstream.

In light of the last few years' tremendous growth, a large market in the future is assumed, and manufacturers are scrambling for a position in the HEV market. In fact, hybrids are in the very early adoption phase — despite



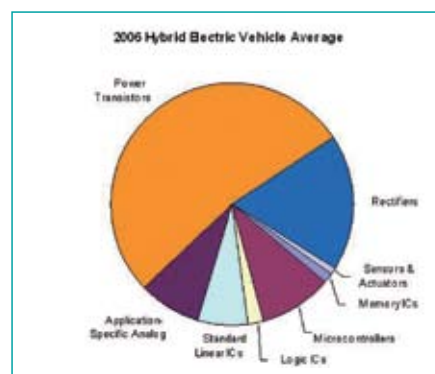
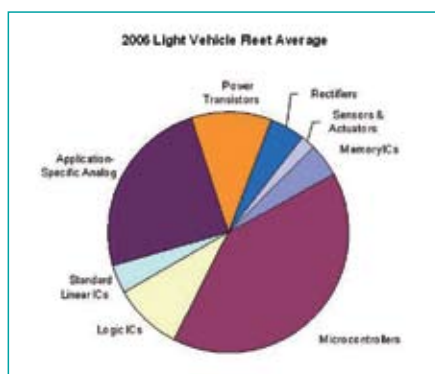
their high growth, they are still in low single digits of vehicle production — and tremendous barriers to a robust, widespread adoption of HEV technologies remain. The various growth projections offered to the market thus far vary wildly, and the corresponding potential impact on the power semiconductor market could be anywhere from mildly significant to nearly overwhelming.

Approximately 6.4 percent of total semiconductor market is contained in automobiles. This percentage has in recent years been fairly constant, with steady increases in electronic content in cars being somewhat offset by equally

steady reductions in component costs. In 2006, the automotive semiconductor market ended with more than \$16 billion in sales. The charts here present iSuppli's semiconductor content estimates in power train for standard and hybrid vehicles in 2006. Of this automotive semiconductor content, about 26 percent on average in 2006 was contained in the power train of the vehicle, in functions directly related to providing vehicle propulsion. In conventional engines, this means engine control and related electronics. In HEVs, this also includes the electronics required to process all of the information to determine ICE/electric operation balances, as well as those required to manage the electric power flow and conversion throughout the vehicle and specifically to and from the electric motor(s) that propel it.

As the overall electrical content in hybrid vehicles increased, power management content in HEV vehicles increased too. A significant measure of increase is that power transistor content increased from 11 percent in standard vehicles to 53 percent of the total semiconductor content in hybrid vehicles in 2006. At the same time content of rectifiers grew from 4.7 percent in standard vehicles to 18 percent in HEV vehicles. Semiconductor content not related to power management mainly stayed flat. For example, microcontrollers for which the absolute content number didn't change, the relative percentage dropped from 40 percent in standard vehicles to 10 percent in HEVs.

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