

42V vehicle systems hit

COST roadblock

IC SUPPLIERS REDUCE DEVELOPMENT PROGRAMS AS AUTOMAKERS MOVE SLOWLY TOWARD TRANSITION.

BY SPENCER CHIN

Semiconductor suppliers, whose chips are characterized by rapid development cycles and short life spans, find themselves tested by the automotive industry's leisurely transition to 42V systems for vehicles laden increasingly with electronics content.

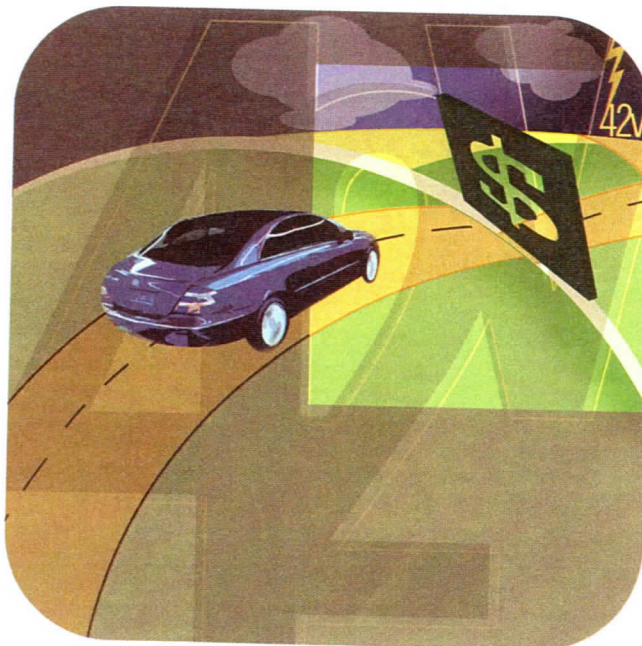
Semiconductor makers are producing chips that run on today's 14V systems using 12V batteries but which can be modified to run on 42V systems using 36V batteries. However, they don't expect the full crossover to occur until at least the middle of this decade, and in the meantime have scaled back some of their 42V programs.

Automotive OEMs and systems and parts suppliers agree the slow-paced transition is due principally to cost.

The cost of adding 42V circuitry can range from a few hundred to several thousand dollars, according to Frost & Sullivan. The low end could involve simply adding a 42V alternator and a 36V battery and starter. The high end might involve a more complete 14/42V hybrid system, the Mountain View, Calif., research firm said.

"There are no major technical hurdles in converting from 14 to 42V electrical systems, but the business case for 42V is difficult to establish for the majority of our vehicle lines," said Anson Lee, technical group leader at the Advanced Electrical Power Systems Group of DaimlerChrysler Corp., Auburn Hills, Mich.

According to industry observers, 42V systems can improve a vehicle's driving capabilities and safety by establishing electrical control of functions like



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braking and steering—often referred to as brake-by-wire and steer-by-wire.

Moreover, a 42V system lightens vehicle wiring and reduces weight, said Farhad Mafie, vice president of the ASSP Business Unit at Toshiba America Electronic Components Inc., Irvine, Calif.

"As voltage increases, current decreases," Mafie said. "This is important since smaller-gauge wires can be used in wire harnesses, resulting in a significant weight reduction."

Several years out

But despite the 42V system's demonstrable benefits, its full implementation is still several years down the road.

"I believe it won't be until 2006 before you see any serious movement toward 42V systems, and it will be driven by high-end carmakers," said Dan Leith, marketing manager at the Analog Products Division of Motorola Inc.'s Semiconductor Products Sector, Phoenix.

According to the Darnell Group Inc., Corona, Calif., vehicles with pure 42V architectures won't emerge until 2005, although hybrid 14/42V systems with dual batteries to run devices operating on either voltage are slowly emerging to help automakers move ultimately to 42V.

"Realistically, the market is out there, but the transition to 42V may take longer than early prognosticators thought," said Darnell analyst Jeff Shepard.

The slow transition to 42V doesn't surprise Will Strauss of Forward



A 42V SYSTEM LIGHTENS VEHICLE WIRING, RESULTING IN A SIGNIFICANT WEIGHT REDUCTION. FARHAD MAFIE TAEC

Mich. "Each side is trying to minimize its costs and risks."

The costs constitute a problem for Dave Wright, director of advanced engineering at Delphi Packard Electric Systems, a Warren, Ohio, supplier of automobile electronic subsystems.

"No one will do this for charity," Wright said. "The thermal and packaging technologies needed to make these technologies effective can get costly."

Wright believes it will be another five years before 42V systems gain mass acceptance. "It will eventually happen, but it will take some time for engineers to get the cost down."

Initially, only automotive systems that most require higher voltages will operate off the 42V bus. Those include electric power steering systems, electric brakes, and engine cooling fans, according to the Darnell Group. The 42V supply for the initial 14/42V hybrids will be used in products such as integrated starters/alternators for start/stop, boost, and braking energy recovery.

"We're starting to see a lot of research being done in 42V power steering systems," Visteon's Bowden said. "And electrically driven cooling systems, which eliminate a mechanical water pump, would benefit a vehicle's fuel economy and exhaust emissions."

Some cutbacks

But with no major demand in clear view for 42V systems, some semiconductor suppliers are cutting back on product development. Fairchild Semiconductor International Ltd., South Portland, Maine, is holding off on expansion of a line of trench-type MOSFETs and is trying to

sell some of the devices into the industrial market, according to Peter Blumenroether, director of automotive marketing at the company's Discrete Power Group.

Blumenroether noted that Fairchild in the last six months has shifted some of its 42V programs back to 14V systems. "We're going

back to standard applications, such as a belt-driven starter/alternator."

Siliconix Inc., the Santa Clara, Calif., semiconductor subsidiary of Vishay Intertechnology Inc., has been developing 75V MOSFETs for 42V as well as lower-voltage automotive systems, but is also looking at nonautomotive applications for the devices, said Serge Jaunay, the company's vice president of market development for MOSFETs and standard products.

Jaunay also noted that Siliconix is slowing development of D2PAK packaging to house the MOSFETs because of the automotive industry's slow embrace of 42V systems.

Question of need

Chipmakers are also discovering that some automotive systems don't need a 42V bus.

"The electrical power consumption dictates the voltage, and so far a typical U.S. car doesn't need the kind of electrical power that would be needed by a high-end luxury European car," DaimlerChrysler's Lee said.

Chip suppliers nevertheless are still engaging in research and development, hopeful that their investments will pay off in the long run.

"The R&D investment to make 42V

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Concepts Co., Phoenix. "It takes a long time for things to change in the automotive industry," Strauss said.

Some automakers have cautiously begun to implement 42V systems, for instance Toyota Corp., which this year introduced a limited-production luxury car called the Crown that is sold only in Japan.

But other automakers are delaying 42V programs, including DaimlerChrysler's Mercedes, which has pushed 42V implementation from 2005 to 2007.

Who will go first?

Automakers and semiconductor suppliers agree that the transition to 42V involves the chicken-and-egg syndrome, with both sides waiting for the other to act before committing heavily to the technology.

"Most OEMs will wait to implement 42V until they see hardware, but suppliers don't want to develop 42V hardware until demand and standards emerge," said Upton Bowden, high-voltage technology manager at automotive subsystems and parts supplier Visteon Corp., Dearborn,

THE R&D INVESTMENT TO MAKE 42V POWER SEMICONDUCTORS IS NOT A HUGE OVERHEAD YET. STEVE SELICK PHILIPS SEMICONDUCTORS

