

PRODUCT SURVEY

CAN-enabled models cut system costs, power use

MUXs complying with J1850 or CAN 2.0B standards find their way into cars. ICs supporting SONET and ATM are available for the traditional, yet fast-growth, telecom market.

United States makers sell multiplexer ICs into several growing markets: circuits with 4, 8, or 16 analog inputs routed to a single output

for data acquisition, instrumentation and process control; circuits capable of serializing 4, 8, or 16 relatively slow parallel inputs into a single, high-speed serial output stream for telecommunications; and chips that make it possible to combine many control messages onto a one- or two-wire bus for managing aircraft or automotive electronics.

New analog CMOS multiplexers focus on protection against various electronic hazards. Makers report a movement toward energy-saving

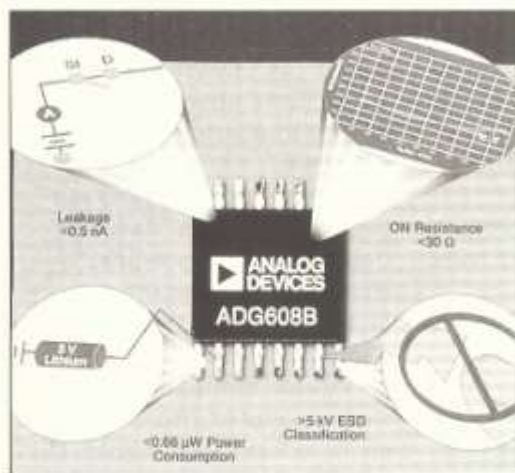
devices, higher and wider-ranging operating temperature specifications, and increased reliability (100% testing and 100% burn-in).

Pricing tends to be flat, with growth in the market resulting from new product development.

According to Bill Woodruff, director of telecommunication products for Vitesse Semiconductor, it is difficult to tell what application areas are growing in telecommunications. He is sure that "the driver of the year is the Internet. The small population that uses the Internet has made a dramatic change in phone company statistics and [has] created demand for high-speed telecom transmission equipment and switching systems."

Automotive multiplexing

Today's automobiles pack a lot of networked computing power. With multiple intelligent controllers managing car operation,



Analog Devices' models provide fault and overvoltage protection without increasing the ON resistance

Profile of Companies in the United States

Company	Year established	Annual sales (\$millions)	Factory location	Work force	Other products	Telephone Fax	InfoLink #
Vitesse Semiconductor Corp.	1987	n/a	U.S.	n/a	Telecommunications GaAs and data communication circuits, tests/instrumentation	1-805-3883700 1-805-9875896	3819
Analog Devices Inc.	1965	942 (1995)	U.S., Ireland, the Philippines, Taiwan	6,000	DSPs, general/special-purpose/linear/mixed-signal ICs	1-617-4613392 1-617-8214273	3820
Harris Semiconductor Corp.	1895	700	U.S., Ireland	8,000	Automotive, multimedia and wireless communication ICs	1-407-7247000 1-407-7247800	3821
Motorola Inc.	1928	6,900 (1994) Semiconductor Division	Worldwide	47,000	Semiconductors, advanced electronic systems and services	1-512-3282268 1-512-3285908	3822
Siemens Components Inc.	1979	>500 (1995)	n/a	1,900	Laser diodes, fiber-optic components, optoelectronic products	1-408-7774500 1-408-7774988	3823

efficient point-to-point communication for data and control signals is essential.

Multiplexing, or combining multiple signals on one- or two-wire buses, allows many devices to communicate over the same wiring. Traffic flow is controlled by one of two accepted multiplex protocols: J1850, a standard adopted in 1994 by the Society for Automotive Engineers (SAE), or CAN (Controller Area Network), a de facto standard created in the mid-1980s by German auto component manufacturer Robert Bosch GmbH.

"While the standard is not totally tied down, for general compatibility and easy serviceability, cars sold in the North American market should comply with J1850," says Jack Yellin, product marketing manager at Harris Semiconductor Corp. The standard can be implemented in the single-wire bus version adopted by Chrysler and General Motors or in the two-wire bus

used by Ford.

CAN is the multiplexing standard generally used by European manufacturers. There are current discussions within the SAE to coordinate and combine standards between North America and Europe, according to Geoff Lees, director of marketing for the microcontroller group at Siemens Components. "With data rates of 10Kbps to 40Kbps, J1850's strength is in body electronics. CAN's advanced protocol is [ideal] for power train applications."

CAN uses an Ethernet-like multiple-access scheme where all nodes have constant access to a shared bus. Each CAN message has an identifier indicating type and priority. When two messages try to access the bus simultaneously, the higher-priority, more time-critical message (such as a braking signal) takes precedence over the less-urgent message (such as temperature data for the climate-control system). CAN 2.0,

the latest version of the standard, supports extended, 20bit identifiers (specified in Part B of the standard) as well as the standard 11bit identifiers, allowing for more than 536 million unique identifiers.

"Today there are more than 15 million CAN nodes around the world," Lees says. "We expect it to grow by a factor of 10 within two years."

Electronic Components contacted Vitesse Semiconductor Corp., Analog Devices Inc., Harris Semiconductor Corp., Motorola Inc. and Siemens Components Inc.

Vitesse Semiconductor Corp. manufactures multiplexers for telecommunications. The SONET (Synchronous Optical Network, the standard for optical-fiber transmission on the public network) specification is the road map for all telecommunications products, according to Bill Woodruff. "We can make improvements such as more

Specifications of Multiplexers from the United States

Company	Series/ Model no.	Price (\$)	No. of channels	Supply voltage (V)	Power Consumption	Data rate (Mbps)	Package	Operating temperature (°C)
Vitesse	VSC8112	82 (1,000)	4	2, 5	1.5W	622	100-pin PQFP	0 - 110
Analog Devices	ADG608 ADG609	3.25 (1,000)	8 single 4 differential	3, 5, ±5	0.1µW-1.5µW	n/a	16-pin DIP/ TSSOP	-40 - 85 (DIP, TSSOP) -55 - 125 (TSSOP)
Harris	DG406 DG407	3.78 (1,000)	16 single 8 differential	±15	<1.2mW	n/a	28-pin PDIP/ SOIC	-40 - 85
Harris	HIP7030A2	<2 (OEM)	13	3, 6	n/a	10.4Kbps	28-pin PDIP/ SOIC	-40 - 125
Motorola	MC68376	n/a	16	5	n/a	≤ 1	160-pin QFP	-40 - 125
Siemens	C167CR	26.23	16	5	n/a	≤ 1	144-pin MQFP	-40 - 125

integration or lower-cost packaging, but they're primarily incremental."

Vitesse uses propriety H-GaAs

(high-integration gallium arsenide) technology to produce high-speed, low-power ICs for broadband network applications.

The company offers products that enable SONET transmissions at 622Mbps, 2.5Gbps and 10Gbps.

The 622Mbps VSC8112 (see

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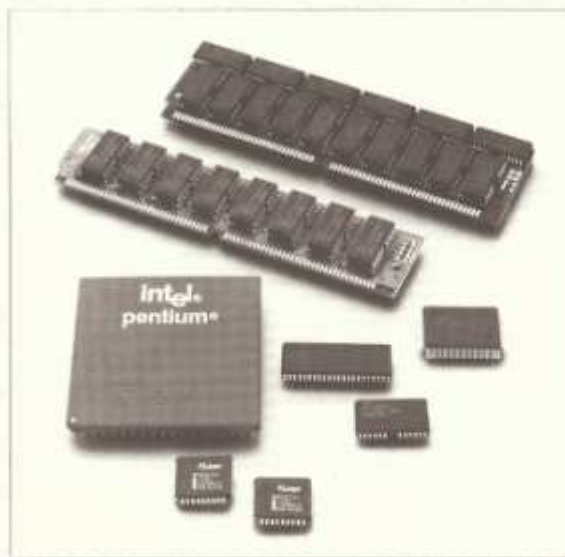
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table, page 172) offers on-chip high-speed clock generation at 622MHz from a 155MHz reference clock. This enables lower-

cost implementation for SONET/SDH transmission, switch and cross-connect systems, and ATM switch applications.

The 2.5Gbps VSC8063 accepts 16 parallel single-ended inputs at 155Mbps data rates, then serializes the inputs onto a 2.5Gbps serial output. The new VSC8071/VSC8072 chip set is a fully integrated 16:1 multiplexer and demultiplexer that serializes and deserializes between 622Mbps and 10Gbps streams. The devices are packaged in high-speed modules selling at \$2,500 in sample quantities.

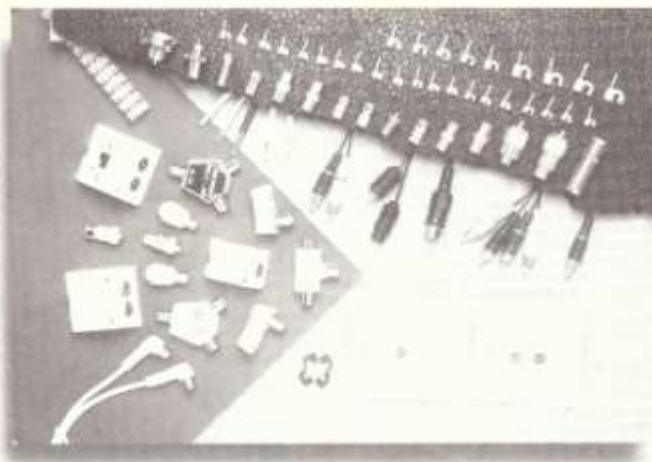
Analog Devices Inc. sells multiplexers to the automotive market, according to Leo McHugh, product manager for switches and multiplexers. Operating temperature for parts

located near the engine block ranges from -40°C to 125°C. "Temperature range for our industrial parts has been -45°C up to 85°C," McHugh says. "We have now released a multiplexer in a plastic package specified for a full range of -55°C to 125°C."

Customer demand has prompted Analog Devices to develop and patent multiplexers that "provide fault and overvoltage protection without increasing the ON resistance," McHugh notes. "And there's no price premium."

The new multiplexer family consists of the ADG508F, ADG528F and ADG509F. They offer protection against input voltages up to ±35V. Under fault conditions, an I/O appears as an open circuit, allowing only a few

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nanoamperes of leakage current flow.

The company's development of low-voltage parts as the ADG608

and ADG609 (see table, page 172) has opened a number of new markets in consumer and automotive applications.

Harris Semiconductor Corp. recently began selling into the avionics market. It has come up with "extended process flow" to meet the segment's stringent reliability requirements, says Doug Bartow, product marketing manager for data acquisition products.

He cites the industrial process control market as a "large growth opportunity." Multiplexers used in this market route signals from multiple sensors to a single measurement and control system.

The company offers about 30 different 4-channel, 8-channel and 16-channel multiplexer base parts. The single 16-channel

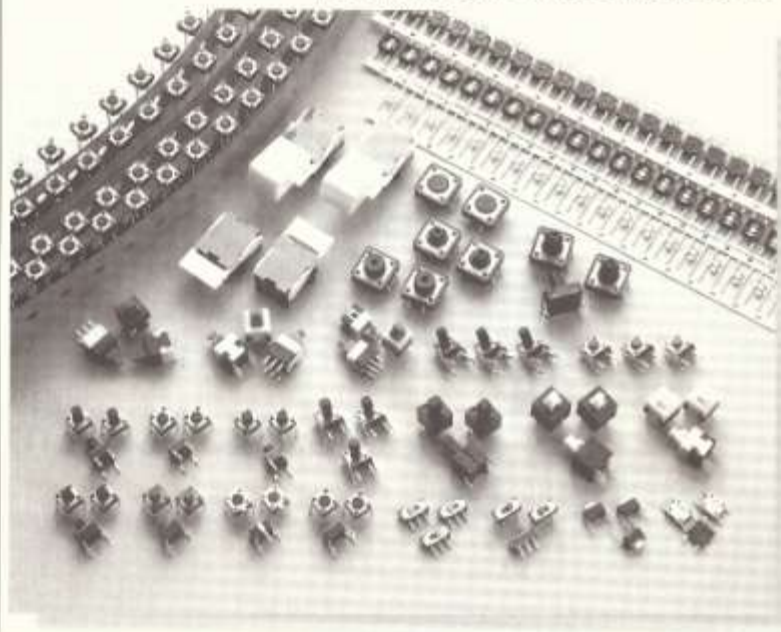
DG406 and differential 8-channel DG407 (see table, page 172) are the newest models.

Harris has worked with Chrysler to create HIP7020, a multiplexer chip set that implements the SAE J1850 standard, the bus transceiver; HIP7010, the byte-level interface circuit that connects the transceiver to a selected microprocessor; and HIP7030A2 (see table, page 172), an 8-bit microcontroller that interfaces directly to the 7020. (Also available are the HIP7030A0 and HIP7038A8, functional equivalents of the 7030A2 used in system development.)

The J1850 chip set is in pilot production for field tests and initial evaluation, says Jack Yellin, product marketing man-

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ager. The parts should be in limited production by midyear, ramping up to full production by the middle of next year.

Motorola Inc. and its Advanced Microcontroller Division currently offers on-chip support for both J1850 and CAN in its 8bit 68HC05X family. The company's new TouCAN module makes CAN 2.0B functionality available for higher-performance microcontroller families: the 16-bit 68HC16 series, the 32-bit 68300 family, and the MPC500 PowerPC RISC microcontrollers.

The first of the new CAN-enabled microcontrollers, the MC68376 (see table, page 172), integrates CAN on-chip to lower system cost, reduce power consumption and CPU burden, and increase system reliability.

Siemens Components Inc. has introduced new microcontrollers with full CAN version 2.0B — the 8-bit C515C and

16bit C167CR (see table, page 172). The company also offers the SAE81C91 and SAE81C90, passive peripherals that work in CAN 2.0B active networks.

"We've introduced it (CAN 2.0B) at the top end," says Geoff Lees. "Now, because of the huge market, we can introduce CAN 2.0B on our low-end parts."

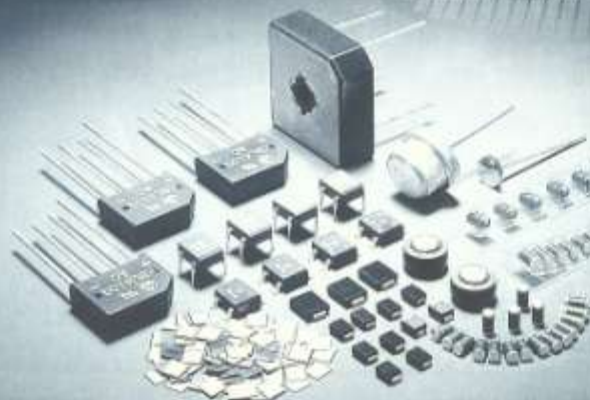
The company's roll-out plans include low-cost controllers with on-board CAN 2.0B by the first quarter of this year; specialized industrial motor controls with on-board CAN 2.0B at half the cost of existing devices; up to eight new CAN modules by the first quarter of this year; and CAN 2.0B integrated on-chip for about 60 percent of the total microcontroller line by the end of this year. EC

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