

Expansion Modules Address SBC Form Factor Fragmentation

New analog and digital I/O module family brings identical features to PCI/104-Express, PC/104-Plus, and SUMIT single-board computer stacks

San Jose, Calif. — May 2, 2011 — Diamond Systems Corporation, a leading global supplier of compact, rugged, embedded computing solutions for real-world applications in a broad range of markets, today unveiled a new family of I/O expansion modules for systems based on single-board computers (SBCs) that expand using either PCI/104-Express, PC/104-Plus, or SUMIT-ISM. The modules implement identical analog and digital I/O feature-sets on all three formats, letting companies choose their favorite expansion format now, while reserving the option of migrating to an alternate format in the future without major rework to the application's I/O software or interfaces.

High Performance Analog I/O Modules

The E104-DAQ1616, P104-DAQ1616, and SMT-DAQ1616 modules are implemented on the PCI/104-Express, PC/104-Plus, and SUMIT-ISM Type1 expansion formats, respectively. Each includes sixteen 16-bit A/D inputs and sixteen 16-bit D/A output channels, with programmable range and polarity. The modules' high performance A/D converter operates at a 2MHz sample rate, the fastest of any I/O board currently available on PC/104-Plus or SUMIT-ISM, and the fastest available on PCI/104-Express for under \$2,000.

Each module also includes seven 8-bit digital I/O ports (with a mix of bit-wide and byte-wide direction control), two 32-bit up/down counter/timers with programmable input source and gate, four 24-bit pulse-width modulation circuits with 0-100% duty cycle, and a watchdog timer. Diamond's industry-leading autocalibration technology, with independent calibration factors for each input and output range, ensures maximum A/D and D/A accuracy across all operating modes and throughout the modules' -40°C to +85°C operating temperature range.



**E104-DAQ1616:
Analog I/O on
PCI/104-Express**



**P104-DAQ1616:
Analog I/O on
PC/104-Plus**



**SMT-DAQ1616:
Analog I/O on
SUMIT-ISM Type 1**

FPGA-controlled Digital I/O Modules

Like their analog I/O counterparts, Diamond's new E104-GPIO96, P104-GPIO96, and SMT-GPIO96 modules are implemented on the PCI/104-Express, PC/104-Plus, and SUMIT-ISM Type 1 expansion formats, respectively. Each contains a high-capacity FPGA, which supports multiple standard I/O personalities, as well as customization to match the needs of a particular end application.

Each module's set of I/O ports is organized into a combination of byte-wide, nibble-wide, and bit-wide direction control, for maximum flexibility and application compatibility. Outputs implement 3.3V logic levels with 5.0V compatibility, and inputs are buffered to protect the FPGA. Although the standard, default configuration supports 96 programmable digital I/O lines, the modules can be reconfigured to enable an array of additional features, including eight 32-bit up/down counter/timers with programmable input source and gate, four 24-bit PWM circuits with 0-100% duty cycle capability, and interrupt/latched mode operation. The flash-based design enables easy field upgrades using a

Diamond-provided software utility (no cable or third-party software required!) as well as custom code development.



**E104-GPIO96:
FPGA & Digital I/O
on PCI/104-Express**



**P104-GPIO96:
FPGA & Digital I/O
on PC/104-Plus**



**SMT-GPIO96:
FPGA & Digital I/O on
SUMIT-ISM Type 1**

Software Toolkits Speed Application Development

Diamond supports each of its six new I/O modules with a free Universal Driver software toolkit, which simplifies the task of implementing data acquisition and control functions in applications under Linux, Windows XP, Windows Embedded Standard, and Windows Embedded CE. The toolkits also include demo programs and example code for each supported OS, to further accelerate application development.

Mitigating the Risks of Expansion Format Fragmentation

As is evident from the above photos, each of these six new I/O modules derives its feature set – whether analog I/O or FPGA with digital I/O – from a tiny, low profile, highly integrated FeaturePak card, which snaps into an onboard connector. The same module is used across all form-factors, offering identical functionality regardless of the physical format. “The FeaturePak cards’ small size and easy reusability are truly significant benefits for both vendors and customers,” states Jonathan Miller, founder and CEO of Diamond Systems. “This design approach has allowed us to reduce development costs and time-to-market, as well as reach customers in different market segments, by leveraging a common ‘macrocomponent’.”

“The board-level embedded market’s inability to rally around a single standard for PC/104-sized stackable, small-form-factor SBC expansion has created risks for both system developers and board vendors, since it’s unclear what will win out in the market” adds Miller. “By offering the identical feature set on multiple form-factors, Diamond lets embedded customers pick a path – whether PCI/104-Express, PC/104-Plus, or SUMIT – without worrying that they will be unable to obtain the I/O they need over the long term.”

Pricing and Availability

All six modules are shipping now. Single unit pricing of each is given in the table below. Contact Diamond Systems for quantity pricing and customization services.

Model	Description	Quantity 1 price
E104-DAQ1616	Analog I/O PCI/104-Express module	\$750
E104-GPIO96	FPGA & Digital I/O PCI/104-Express module	\$365
P104-DAQ1616	Analog I/O PC/104-Plus module	\$750
P104-GPIO96	FPGA & Digital I/O PC/104-Plus module	\$365
SMT-DAQ1616	Analog I/O SUMIT Type 1 module	\$750
SMT-GPIO96	FPGA & Digital I/O SUMIT Type 1 module	\$365

About Diamond Systems

Founded in 1989 and based in Mountain View, California, Diamond Systems Corporation is a leading global provider of compact, rugged, board- and system-level real world embedded computing solutions to companies in a broad range of markets, including transportation, energy, aerospace, defense, manufacturing, medical, and research. The company is renowned as an innovator of embedded I/O standards and technologies; it originated the FeaturePak I/O modules standard, was an early adopter of PC/104 module technology, and holds a patent for a unique analog I/O autocalibration technique.

Diamond's extensive product line includes compact, highly integrated single-board computers (SBCs); an extensive series of expansion modules for analog and digital I/O, wired and wireless communications, GPS, solid-state disk, and power supply functions; and complete system-level solutions. In support of performance-critical embedded application requirements, these products are engineered to operate reliably over wide operating temperature ranges, such as -40°C to $+85^{\circ}\text{C}$, and at high levels of shock and vibration. Additionally, the company offers a comprehensive suite of hardware, software, and system integration and customization services.

For further information, please visit www.diamondsystems.com or call +1-800-367-2104.

MEDIA RESOURCES

Model	Description	Web Page	Hi-Res Photo
E104-DAQ1616	Analog I/O on PCI/104-Express	Web Page	Photo
E104-GPIO96	FPGA & Digital I/O on PCI/104-Express	Web Page	Photo
P104-DAQ1616	Analog I/O on PC/104-Plus	Web Page	Photo
P104-GPIO96	FPGA & Digital I/O on PC/104-Plus	Web Page	Photo
SMT-DAQ1616	Analog I/O on SUMIT Type 1	Web Page	Photo
SMT-GPIO96	FPGA & Digital I/O on SUMIT Type 1	Web Page	Photo

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