POWEREXTRA

News of Importance to Power Semiconductor Users www.pwrx.com Second QUARTER 2007

Youngwood Factory Renamed "Stan Hunt Manufacturing Facility"

NEW President and CEO of Powerex Appointed

Powerex, Inc. recently named Craig Morrow as its new President and Chief Executive Officer.

Craig succeeds Stan Hunt, who retired at the end of March after sixteen years of distinguished leadership as the President and CEO of Powerex. Craig had been working with Stan and the Powerex team since November, 2006, preparing for the transition. He officially took over on April 1.

In recognition of Stan's contributions at Powerex, in February, the manufacturing building, located at Powerex headquarters in Youngwood, was renamed the "Stan Hunt Manufacturing Facility."

In 1985, as General Manager for Westinghouse Electric Corporation's Semiconductor Division, Stan was instrumental in bringing all parties together to establish Powerex, Inc., a joint venture of General Electric Company and Mitsubishi Electric Corporation. In 1991, Stan was appointed as President and CEO. Building on the company's foundation as a pioneer in high power applications, during Stan's tenure, Powerex emerged as a market leader, supplying discrete, modular and integrated high power semiconductor solutions.

Craig comes to Powerex from General Electric where he held several leadership positions, including Leader of Controls Product Lines at GE Energy, Vice President of Power Conversion at GE Drives and Controls, and Engineering Manager at GE Industrial Systems.

Prior to joining GE, Craig worked for Rockwell Automation and held additional leadership roles there as Regional Manager and Engineering Manager in Global Technical Services. He brings to Powerex a track record of creating customer value, driving profitable growth, championing new product introductions, and expanding into global markets.

Craig Morrow (shown at right) took over April 1 as the new President and CEO of Powerex, Inc. He succeeds Stan Hunt (shown at left) who retired in March.

Craig received a Bachelor of Science degree in Electrical Engineering from Tennessee Technological University, obtained a Master of Science degree in Electrical Engineering (Controls Emphasis) from Auburn University, and earned a Masters of Business Administration from UCLA's Anderson School of Management.

UPCOMING **TRADE SHOWS** AND CONFERENCES

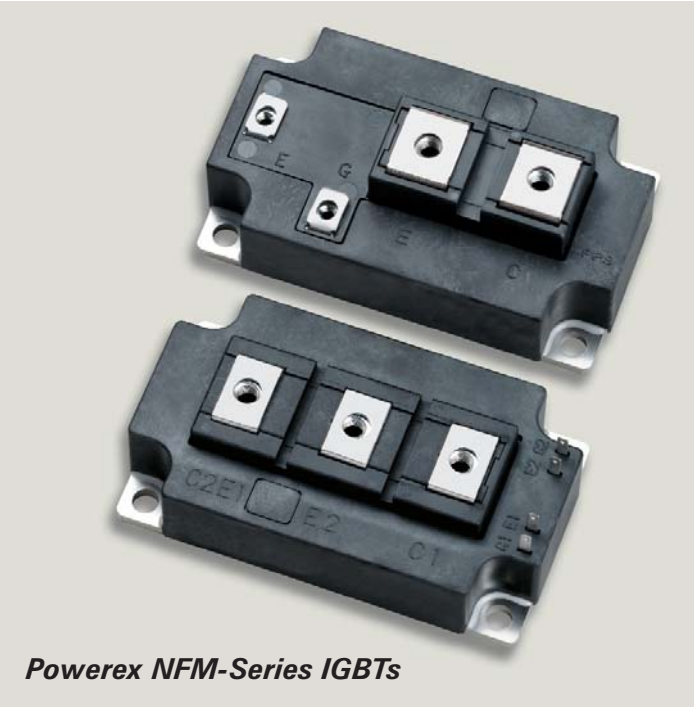
2007 IEEE International Conference on Pulsed Power

June 17-22, 2007
Albuquerque Convention Center
Albuquerque, NM
Booth 301

PowerSystems World 2007

October 30-November 1, 2007
The Hilton Anatole
Dallas, TX
Booths 414, 416

Powerex NFM-Series Closes the Gap in Higher Frequency Applications



Powerex NFM-Series IGBTs

Optimized for applications in frequencies of operation between 20 and 30 kHz, the new NFM-Series not only fills a requirement in medium to high frequency applications but also does so with the only single device of its type on the market.

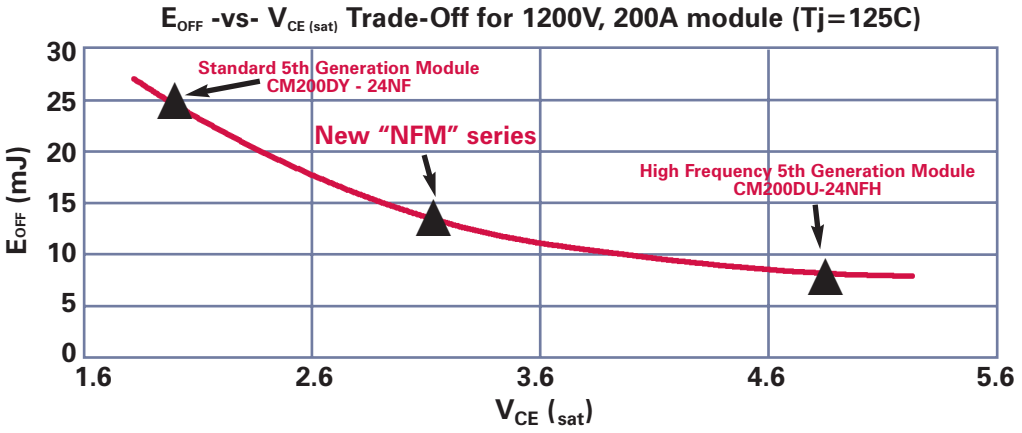
Standard industrial IGBT modules are optimized for hard switched PWM inverters with carrier frequencies less than approximately 20kHz. With these devices, low $V_{CE(sat)}$ is key. However, some applications, e.g., induction heating, require a higher frequency (30kHz to 60kHz) operation where low $ESW_{(off)}$ is most important.

In 2003, Powerex introduced NFH-Series to meet the high frequency requirements needed in applications including power supplies for medical equipment, such as CT and MRI; inverter type welders; and UPS for telecom. The design of NFH incorporated an optimized fifth generation CSTBT (Carrier Stored Trench Gate Bipolar Transistor) chip, trading $V_{CE(sat)}$ for increased switching speed. Offered in a wide range of voltage and current (100A to 400A/600V, 100A to 600A/1200V), NFH features superior turn-off switching energy, providing as little as 20% of the turn-off switching loss when compared to competitive devices.

NFH opened up new possibilities for high frequency applications, providing 30-60 kHz operation. However, a gap still existed for medium frequency applications where operation between 20 and 30 kHz is required. Powerex has now filled that gap with the introduction of the NFM-Series IGBT.

Rated at 1200V, the NFM-Series offers low loss and hard switching at 20 to 30 kHz. Duals are available from 100 to 300 amperes in a 108 x 62 mm mounting hole package while singles are available in the higher current range of 400 to 600 amperes with the same mounting. The single configuration on this kind of device is the only one currently available on the market.

The turn-off contribution to total losses is smaller in applications having hard turn-on switching and this leads to a somewhat slower optimization point than the standard high frequency device. The selected optimization for the new module (NFM-Series) is shown below. The new device has lower $ESW_{(OFF)}$ than the standard speed device and lower $V_{CE(sat)}$ than the high frequency optimized device. In addition, for hard turn-on applications, a new free wheeling diode was developed for the NFM-Series to reduce diode recovery and turn-on losses. The new diode uses a shallow P-I-N junction structure formed using epitaxial silicon wafer material to achieve fast recovery with minimal tail current.



Samples are available and the devices are currently in mass production. For more information, call 724-925-7272.

Powerex Launches New Web Site

Powerex recently launched its redesigned web site. Still located at www.pwrx.com, the site was streamlined to provide quicker results for customer searches. Some of its new features include:

- **A "Search by Product Category" Online Selector Grid System**
  The online selector grid system adds a third search option. Keeping and further enhancing its search by part number and parametric search by specification options, Powerex added this third search area to allow customers an opportunity to narrow their searches by offering an overview of various product categories and subcategories. The product categories and subcategories used to group the broad Powerex product offering are the same groupings used in the new 2007 Powerex Catalog, which is available for download on the new site.
- ***Search by Part Number Expanded to Include Search by Keyword***
- ***Addition of Enhanced Technical Library, Searchable by Keyword***
  Responding to customer requests, Powerex greatly improved and enhanced its technical library. Powerex application notes, conference papers and other technical documents were separated into a stand-alone technical library, which is now searchable by keyword. Once a search is completed, the results include a brief summary of the document, a listing of related keywords, and links to products related to the document.
- ***RoHS Status Added for Each Part Number***
- ***Where Applicable, Recommended Accessories Are Now Listed with Individual Part Numbers.***

Although the new site has been launched, Powerex continues to strive to improve and enhance its web site. With this in mind, an online survey form is included on the site to provide users with a place to make comments and suggestions. The link ("Tell Us What You Think") can be found on the homepage. For more information, please contact Kelly Bandieramonte (kbandieramonte@pwrx.com).

www.pwrx.com

New 2007 Powerex Short Form Catalog

The Powerex short form catalog was recently updated and is available to order in print or cd-rom version. This publication includes technical specifications and outline drawings for all Powerex products recommended for new designs.

To obtain a copy, please contact Kelly Bandieramonte at kbandieramonte@pwrx.com. Please specify if you want a catalog, cd or both.

The electronic version of this publication is also available to download from the Powerex homepage.

External Components Reduced in New Interface Circuit Design Kit

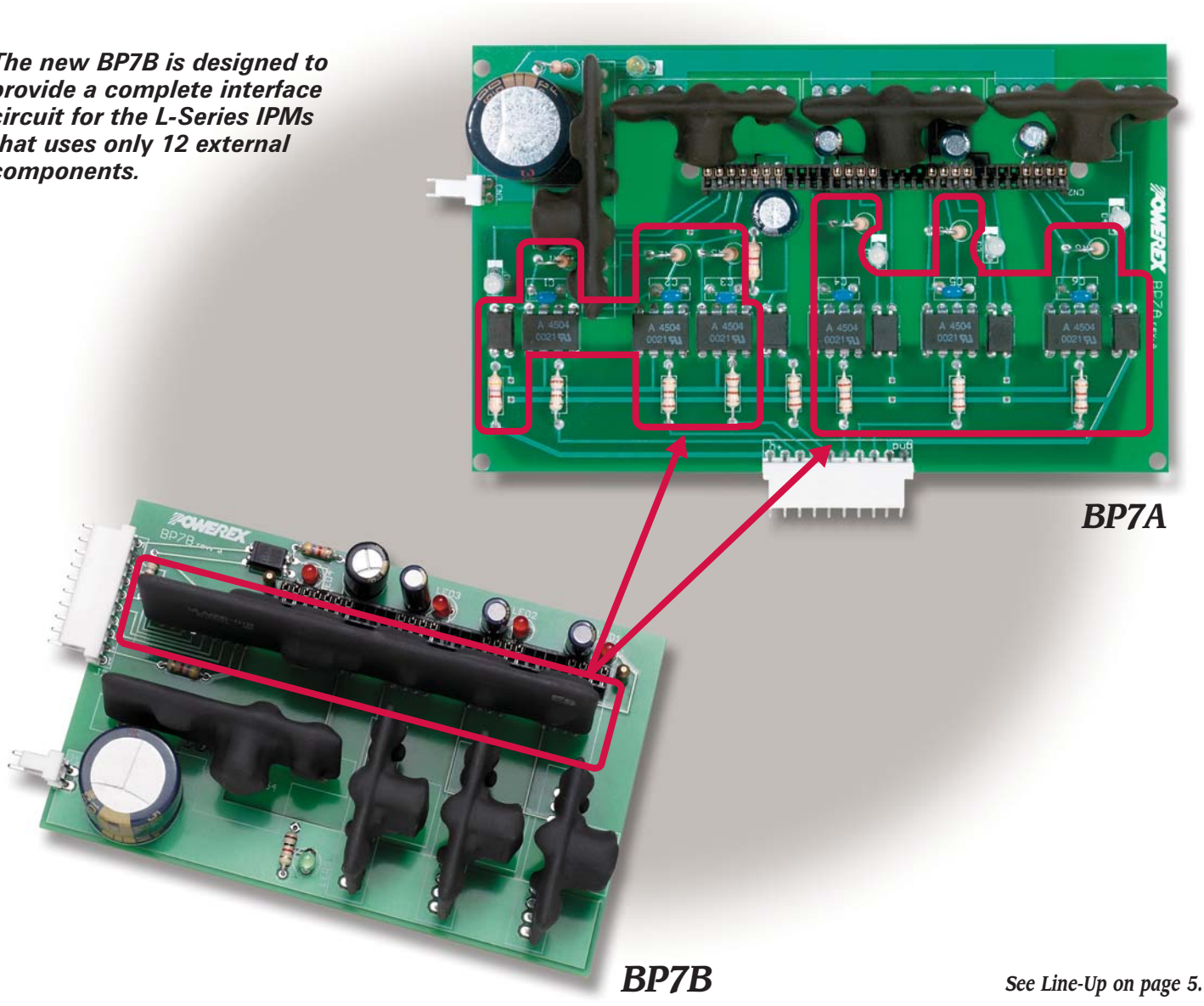
Powerex recently introduced a new interface circuit design kit for L-series IPMs rated from 50A to 300A at 600V and 25A to 150A at 1200V.

The BP7B is a complete isolated interface circuit for 6 and 7-pac low and medium power L-Series IPMs. This circuit features the VLA606-01R opto-interface IC for isolation of control signals and isolated power supplies for the IPM's built-in gate drive and protection circuits. The isolated interface helps to simplify prototype development and minimize design time by providing a direct connection to logic level control circuits.

The new VLA606-01R replaces 28 circuit components. This is illustrated in the figure shown at the bottom of this page which compares the earlier reference design kit, the BP7A, to the new BP7B. This demonstrates the ability to have a complete interface circuit for the L-series IPMs that uses only 12 external components. (Indicator LEDs and connectors are optional).

For more information, contact the Powerex Applications Department at 724-925-7272.

The new BP7B is designed to provide a complete interface circuit for the L-Series IPMs that uses only 12 external components.



See Line-Up on page 5.

L-Series IPM Line-Up and Interface Circuit

Part Number	Voltage (V)	Current (A)	Package	Recommended DC to DC Converters	Reference Design
PM50(#)L(*)060	600	50	A or B	VLA106-24151 x 4pc.	BP7B
PM75(#)L(*)060		75			
PM100(#)L(*)060		100			
PM150(#)L(*)060		150			
PM200(#)LA060		200	C	VLA106-24151 x 3pc. VLA106-24154 x 1pc.	
PM300(#)LA060		300			
PM450CLA060		450	D	VLA106-24151 x 6pc.	BP6A
PM600CLA060		600			
PM25(#)L(*)120	1200	25	A or B	VLA106-24151 x 4pc.	BP7B
PM50(#)L(*)120		50			
PM75(#)L(*)120		75			
PM100(#)LA120		100	C	VLA106-24151 x 3pc. VLA106-24154 x 1pc.	
PM150(#)LA120		150			
PM200CLA120		200	D	VLA106-24151 x 6pc.	BP6A
PM300CLA120		300			
PM450CLA120		450			

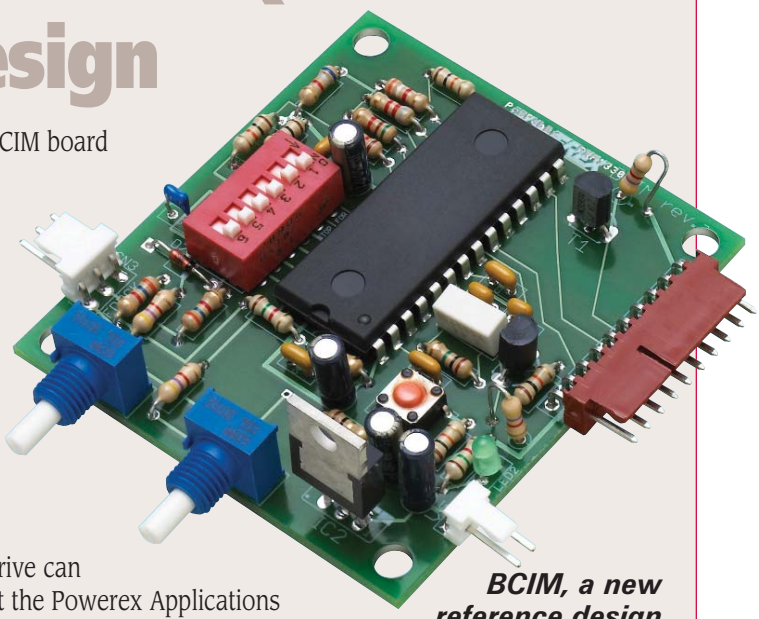
*(*) Package Option: **B**=Solder pin, **A**=Screw terminal*
*(#) Circuit Option: **R**=6-pac+Brake, **C**=6-pac*
Example: PM75RLB120 is a 75A, 1200V 6-pac with brake in a solder pin package

New BCIM Board Allows Quick Verification and Design

Powerex recently introduced a new reference design board. The BCIM board features a three-phase AC induction motor controller at its core. Designed to provide an interface between the controller and Powerex IPM design kits, the BCIM board provides PWM signals for the IGBTs in the three legs of a three-phase inverter plus a brake signal.

Using this board in conjunction with Powerex DIP-IPM design kits and L-series IPMs, along with their respective development boards (example:BP7B), gives designers a complete motor drive design and allows quick verification of the power circuit layout.

With this approach, a complete three-phase AC induction motor drive can be designed in a one-month period. For more information, contact the Powerex Applications Department at 724-925-7272.



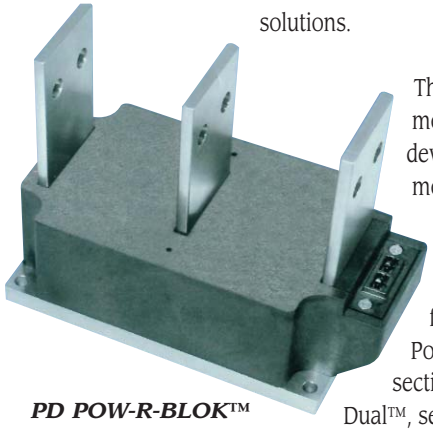
BCIM, a new reference design board from Powerex.

BLOKs Expanded to Include 4000V Blocking Voltage

Powerex is expanding its product offering on its two largest POW-R-BLOKs™.

For 600A LD and 1100A PD BLOKs, the maximum blocking voltage had previously been 2400V. These lines have been expanded to include devices with 4000V blocking voltage.

Powerex POW-R-BLOK™ modules feature combinations of SCR and Diode configurations in an electrically-isolated baseplate construction that allows for mounting with other components on a common heatsink without additional clamping or insulation components being required. The POW-R-BLOK™ series adds convenience and overall size reduction in comparison to other solutions.



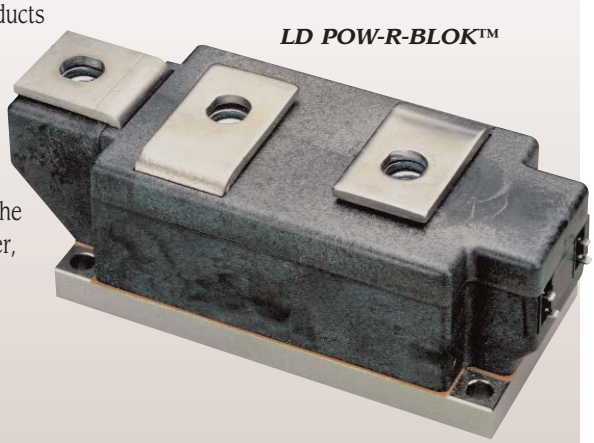
PD POW-R-BLOK™

The PD BLOK is the largest dual isolated module on the market. Applications for these devices include UPS/Static Switch, large motor drives, traction (transportation), induction heating and power generation/alternative energy. The PD POW-R-BLOK™ can also be used as a front end converter with the Powerex Mega Power Dual™ IGBT module in the inverter section. (For more details on Mega Power Dual™, see ad on this page.)

The LD is designed for use in applications requiring phase control and isolated packaging. Applications include large IGBT circuit front ends, AC & DC motor drives, battery supplies, power supplies and bridge circuits.

The new LD and PD products have been submitted to Underwriters Laboratories for approval. Based on the UL testing schedule, approval is expected at the end of the second quarter, 2007.

LD POW-R-BLOK™



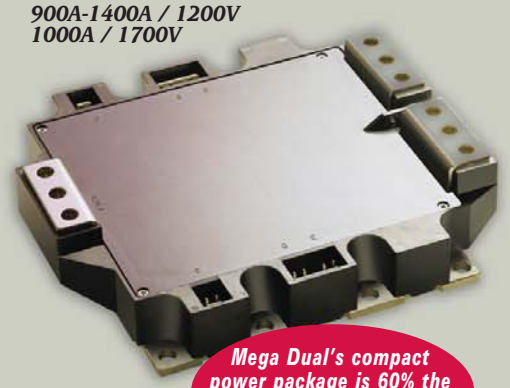
Optimized IGBT Power Package

for High Power Inverter Applications

MEGA POWER DUAL™

3 NEW TECHNOLOGIES IN ONE

900A-1400A / 1200V
1000A / 1700V



Mega Dual's compact power package is 60% the size of two Powerex single 1000A devices.

1 **CSTBT** *(Carrier Stored Trench Gate Bipolar Transistor Chip) for improved ($V_{CE(sat)}$ vs E_{off}) for optimizing total power loss*

2 **PCM** *(Plug Cell Merged) design improves short circuit safe operating area*

- *Controls saturation current level*
- *Reduces gate capacitance*

3 **LPT** *(Light Punch Through) process for decreasing current leakage and mitigation of thermal run-away*

- *Lowers cross point for positive temperature co-efficient*
- *Can be paralleled without matching*

Version 4 Super Mini:

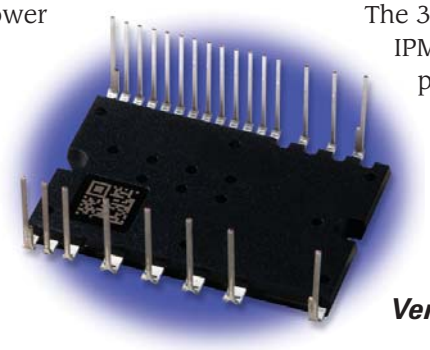
Widest Line-Up, Smallest Package

The Powerex Version 4 Super Mini-DIP-IPM family offers the widest line-up available in the smallest package on the market. The Super Mini package measures in at 24x38x3.5mm but packs a super power in this small size, covering 3A through 30A at 600V in one package.

This family of devices allows the end user to incorporate one board design across multiple drive frame ratings. The end result is decreased size, lower parts count and lower cost. The Super Mini is also completely RoHS compliant.

Designed with a 5th generation IGBT that provides low loss, the Version 4 family also offers low thermal impedance due to the incorporation of new isolation technology. The new isolation material yields a 20% reduction in thermal resistance in comparison to the previous generation device.

Additional options available with this family include longer leads, zigzag lead form and open emitters, which will allow current sensing in each phase leg for motor and circuit optimization. Over temperature protection is yet another option. While an actual operating temperature is not provided, this option provides internal protection for the module.



The 3-20A Version 4 Super Mini DIP-IPMs are currently in mass production. Samples of the 30A device will be available in May with mass production commencing in August.

Actual Product Size
Version 4 Super Mini DIP-IPM

Powerex Expands its High Temperature, High Voltage Packaging Capability

Powerex has developed 200C capable modules for evaluation of high-voltage silicon carbide (SiC) devices for research and development programs and is working to extend this technology to higher temperatures.

Power devices fabricated from silicon wafers have fundamental limitations when scaling up to high voltages and operating at high temperatures. Present maximum operating temperatures for silicon-based diodes are 150C – 200C and 125C – 150C for SCRs & IGBTs. However, due to different material properties, power devices fabricated from SiC wafers can be scaled to voltages higher than 10kV and can operate at temperatures in excess of 250C. Silicon carbide MOSFETs presently operate up to 200C.

In order to fully utilize the high operating temperature capability of SiC devices, module package technology must move from the present 150C operating/storage level to as high as 300C. While the ceramic and metal components typically used in power modules can operate at temperatures above 200C, the other materials that are used in modules, such as solder, potting gel and case plastics, have to be carefully selected. Solders with melting temperatures well above 200C, are readily available and are currently used by Powerex to form strong, reliable high temperature solder joints in power modules. Machinable and injection-moldable plastics are also commercially available that can operate in the 250C range. Silicone potting gels presently used in power modules are capable of extended operation at 200C, making them the limiting factor in the temperature capability of the module.

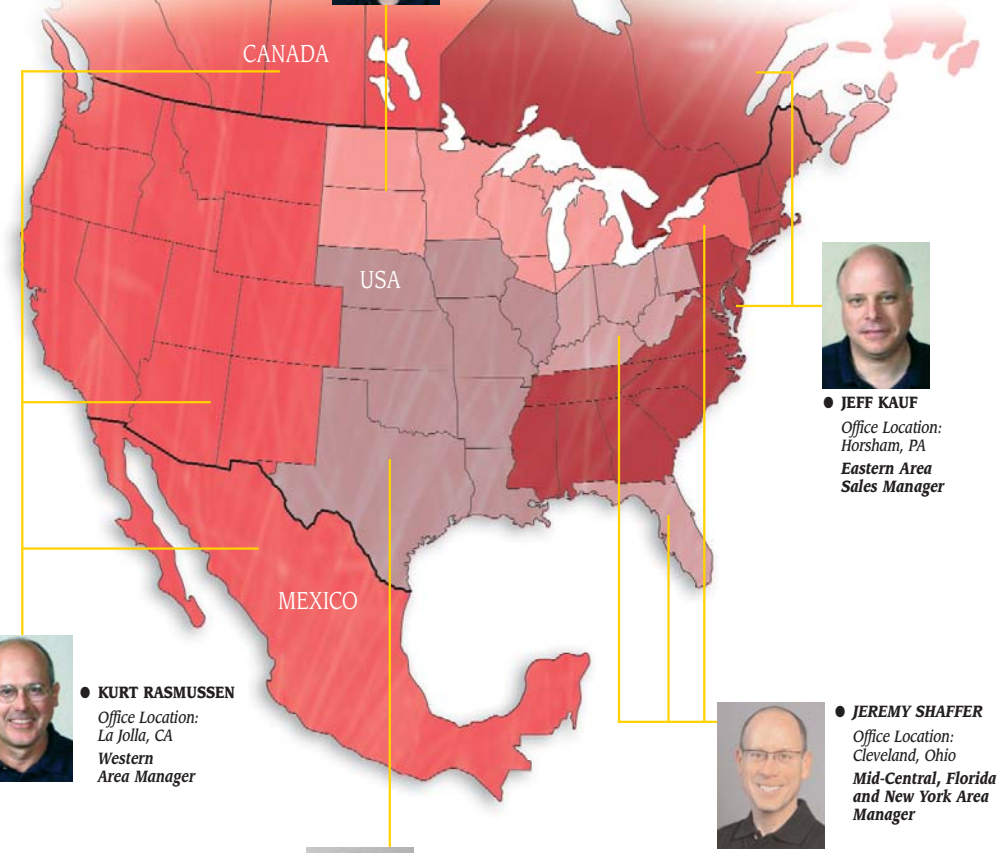
As SiC device technology price becomes lower with time and volume, Powerex is positioned to support commercial packaging of SiC devices. For more information, contact Duane Prusia at 724-925-4402

Powerex Territory Management

*For a complete listing of Powerex manufacturers representatives and distributors, visit the Powerex web site at www.pwrx.com. Look for the **Sales (Where to Buy)** link on the homepage.*

● ***KATHY CULLEN***
Office Location:
Youngwood, PA
Distributor
Sales Manager

● **GREGG EHLERT**
Office Location:
New Berlin, WI
North-Central
Area Manager



● **JEFF KAUF**
Office Location:
Horsham, PA
Eastern Area
Sales Manager

● **KURT RASMUSSEN**
Office Location:
La Jolla, CA
Western
Area Manager

● ***JEREMY SHAFFER***
Office Location:
Cleveland, Ohio
Mid-Central, Florida
and New York Area
Manager

● **KEN JONES**
Office Location:
Dallas, TX
South-Central
Area Manager

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