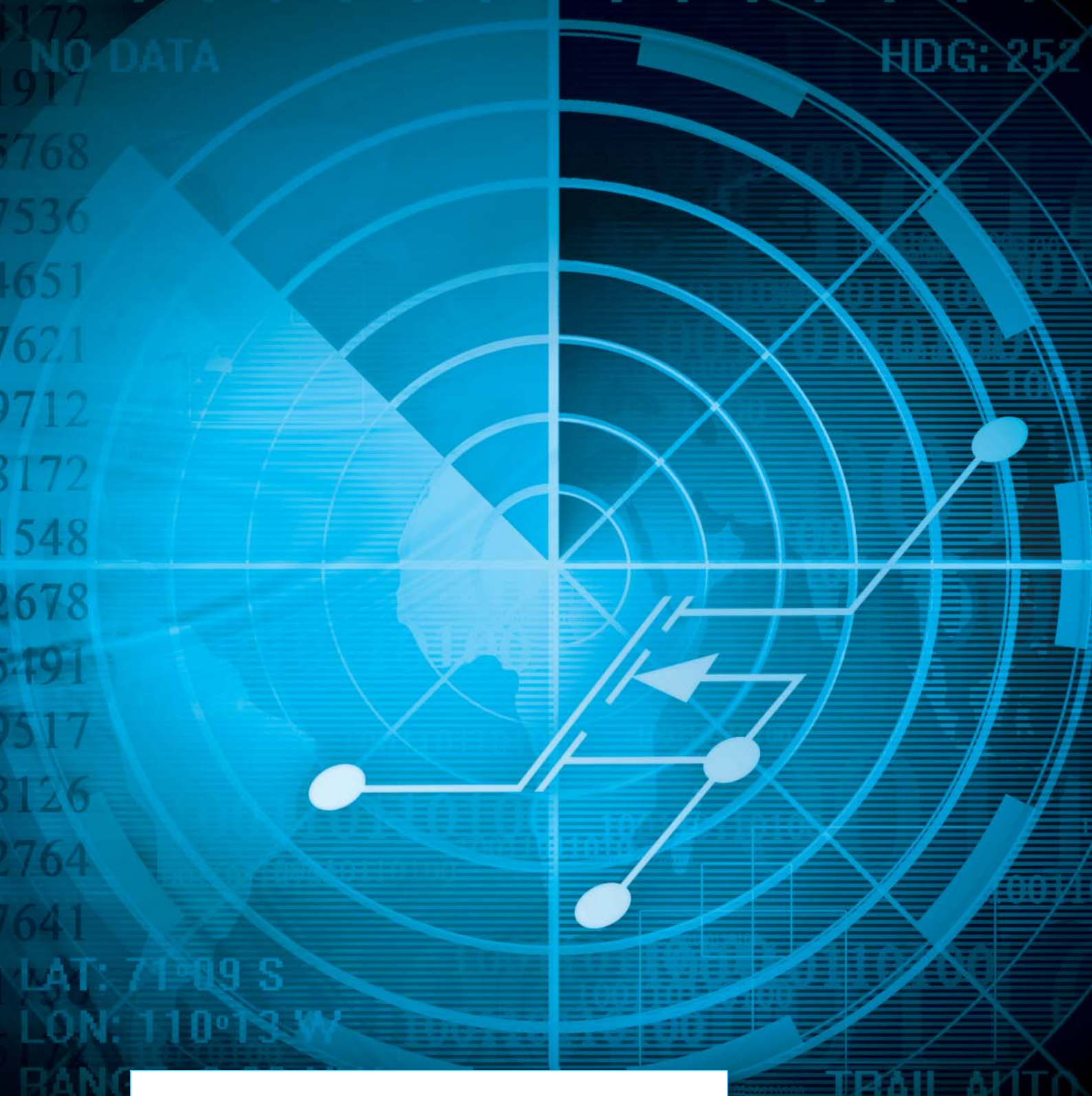
ISSN: 1863-5598

ZKZ 64717
02-12

Bodo's Power Systems®

Electronics in Motion and Conversion

February 2012



SECURING YOUR PROJECTS

GvA Power Electronics

Welcome to the House of Competence.

GvA is your expert in individual problem solutions for all sectors of power electronics – state of the art know how and profound experience as an engineering service provider, manufacturer and distributor.

Consulting – Design & Development – Production – Distribution

GvA Leistungselektronik GmbH | Boehringer Straße 10 - 12 | D-68307 Mannheim
Phone +49 (0) 621/7 89 92-0 | www.gva-leistungselektronik.de | info@gva-leistungselektronik.de

Bodo's Power Systems®

CONTENTS

The Gallery

Need High Power Inverter Design Support?

Components > Designs > Assemblies

From active and passive component selection to development of complete assemblies, Richardson RFPD can help find the best solution for every high power (>1 kW) inverter design.

Specializing in:

- Global engineering and technical support for high power design projects
- Design and assembly of power semiconductor assemblies, power passive assemblies and inverter subsystems

Component design-in from industry-leading suppliers:

CDE CORNELL DUBILIER — Capacitor Solutions for Power Electronics

CONCEPT — INTELLIGENT POWER ELECTRONICS

The Capacitance Company KEMET CHARGED.

Kendeil

Maxwell TECHNOLOGIES

Microsemi POWER PRODUCTS GROUP

OHMITE

MITSUBISHI ELECTRIC

TAMURA

Reduce development cost and time-to-market – Put Richardson RFPD's 30 years of high power assembly and design expertise to work for you.

Learn more or order online at www.richardsonrfpd.com

Your Global Source for RF, Wireless & Energy Technologies

RichardsonRFPD
An Arrow Company

www.richardsonrfpd.com

Bodo´s Power Systems®

A Media
Katzbek 17a
D-24235 Laboe, Germany
Phone: +49 4343 42 17 90
Fax: +49 4343 42 17 89
editor@bodospower.com
www.bodospower.com

Publishing Editor
Bodo Arlt, *Dipl.-Ing.*
editor@bodospower.com

Creative Direction & Production
Repro Studio Peschke
Repro.Peschke@t-online.de

Free Subscription to qualified readers

Bodo´s Power Systems
is available for the following
subscription charges:
Annual charge (12 issues) is 150 €
world wide
Single issue is 18 €
subscription@bodospower.com

circulation ASC audit since 09/2005 print run 20 000

Printing by:
Central-Druck Trost GmbH & Co
Heusenstamm, Germany

Events

Smart Grids Summit Stockholm, Jan. 24th -25th www.thesmartgridsummit.com

APEC, Orlando, Florida, Feb. 5th -9th http://apec-conf.org

EMC, Düsseldorf, Germany, Feb. 7th -9th www.mesago.de/en/EMV/main.htm

Embedded world, Nuremberg, Germany, Feb 28th- March 1st www.embedded-world.de

Cips, Nuremberg, Germany,March 6th-8th www.cips-conference.de

New Energy Husum, Germany, March 15th-18th www.new-energy.de

PEMD Bristol, UK, March 27th-29th www.theiet.org/pemd

eCarTec Paris, France, April 3rd-5th www.ecartec.de

expoelectronica, Moscow Russia, April 11th-13th http://expoelectronica.primexpo.com

PCIM Europe, Nuremberg Germany, May 8th 10th www.mesago.de/de/PCIM

SMT Hybrid, Nuremberg Germany, May 8th 10th www.mesago.de/de/SMT/home.htm

Serving the China Market

Working globally includes taking the time to listen to customers and to focus on the needs of engineers in all regions of the world. For this reason, the company i2i, and Bodo's Power Systems (BPS) are partnering to transfer BPS content into a Chinese edition of Bodo's Power Systems. Alexander Glos, CEO of i2i, and I have signed a contract to serve China with up to date information on Power Electronics. This cooperation is a perfect fit, as i2i is a partner to a number of Power Electronic events in Asia .PCIM Asia is organized by Mesago together with i2i - another perfect fit. The substance of the Chinese magazine will be taken from my Global Edition. Moving ahead and making good progress with industry is my main goal.

The next big industry meeting is APEC, in Orlando, Florida. The Advanced Power Electronics Conference, APEC, is the most visionary power conference and show in North America, and will take place at Disney World this month. It is practically a must-see event to gauge progress in Power Electronic Technology – a place where experts from science and industry come together and join in conversation in the inspiring atmosphere of a man with great ideas and the faith to see them through to completion.

Communication is the only way to progress. We delivered twelve issues last year and this year we will continue on time, every time. As a media partner, Bodo's Power Systems is internationally positioned.

My Green Power Tip for February:
Have your house well insulated to withstand both cold and warm weather, conserving energy for both heating and cooling. Energy is a limited resource. We must save some for our next generations.

See you at APEC

Best regards

Bodo's Power System Launches China Publication With i2i China

BPS is pleased to announce the launch of a Chinese / Mandarin language publication in greater China this spring. China is one of the fastest growing power electronics and power conversion marketplaces in the world. Both from a research and sales perspective, as well as extensive growth in application areas including solar, wind and mobility, China will be one of the most important business markets for the industry in the coming years.

BPS-China will be offered bimonthly with a printed circulation of approximately 8000. The magazine will feature many of the same news, information and content found in the global publication, with a unique Chinese perspective added, and the entire publication available in Mandarin.

i2i Group is a leading specialty business-to-business technology publisher, conference and exhibition organizer with offices in Shanghai and Beijing, operating in China since 1999 and founded by myself. i2i brings a unique market knowledge and experience to the project, having produced PCIM Asia for the past three years.

The effort will include in addition to the print magazine, development and circulation of electronic newsletter, website and other content rich products and services to bridge the international and Chinese power electronics and power conversion industries.

BPS is the leading publication for the industry and we are excited to cooperate with them in developing this Chinese language and China focused effort. We plan to bring the same quality content, circulation and readership to this China publication as Bodo has developed globally".

Best regards
Alexander Glos
CEO i2i

www.bodospowerchina.com

Future precision.
Future performance.
Now available.

CAS-CASR-CKSR

The transducers of tomorrow. LEM creates them today. Unbeatable in size, they are also adaptable and adjustable. Not to mention extremely precise. After all, they have been created to achieve great performance not only today – but as far into the future as you can imagine.

- Several current ranges from 6 to 50 A_{RMS}
- PCB mounted
- Up to 30% smaller size (height)
- Up to 8.2 mm Clearance / Creepage distances +CTI 600 for high insulation
- Multi-Range configuration
- +5 V Single Supply
- Low offset and gain drift
- High Accuracy @ +85° C
- Access to Voltage Reference
- Analog Voltage output

www.lem.com

At the heart of power electronics.

LEM®

Predicting Performance of Lightweight Construction Materials

The first International VDI-Conference “Simulation in Automotive Lightweight Engineering” on May 09 and 10, 2012 in Wiesbaden addresses the subject calculating lightweight construction materials. Lightweight construction materials pose a particular challenge for calculations engineers and developers in the automotive industry. Which data is needed for current and future simulations? Can the performance of hybrid structures be accurately determined? Can close-to realistic construction models be predicted? Experts provide answers to these and other questions during the 1st International VDI-Conference “Simulation in Automotive Lightweight Engineering” on May 09 and 10, 2012 in Wiesbaden, Germany.

Experts from Lamborghini present the “Automobil Lamborghini Carbon Fiber Strategy“. Composite Consultant Dr. Alastair Johnson, a former staff member at the DLR German Aerospace Center, provides insight into interdisciplinary crash behavior simulations and trials of lightweight construction materials in aviation.
Representatives of BMW, Daimler and Opel discuss how the performance of fiber reinforced synthetics can be incorporated in calculations, and which conclusions can be drawn from building components and their behavior during crash simulations. Experts from the Ford Research Center demonstrate how ultra-strong steel as well as magna for aluminum- and magnesium castings such as materials, construction components and construction material data may be understood in simulations.
BMW and Suisse Technology Partners broach the subject of how fatigue strength can be forecast for notched CFRP and welded Steel- and aluminum components.
In conclusion, the conference will provide a platform for spokespersons of the University of Leicester and the Polytec UK, to discuss this specialized field.
Further information, registration and program at www.vdi.de/simulationlightweight or via VDI Wissensforum Kundenzentrum, P.O. Box 10 11 39, 40002 Duesseldorf, E-mail: wissensforum@vdi.de, Telephone: +49 (0) 211 62 14-201, Fax: -154.

www.vdi.de/simulationlightweight

INTELEC® 2012, Call for Papers

INTELEC 2012 will be held between September 30 and October 4, 2012 at the Talking Stick Resort and Conference Center in Sunny Scottsdale, Arizona. The conference theme is “Star gazing in the desert: What keeps power people up at night?”
INTELEC©, the International Telecommunications Energy Conference, is the annual world-class technical forum which presents the latest developments in communications energy systems and related power-processing devices and circuits. This Conference, which serves the broad community of researchers, suppliers and operators, explores new technologies of power conversion, energy storage and systems for telecom applications and environment. For more information on INTELEC please see www.intelec.org
The conference program will include key note and plenary sessions, technical presentations, workshops and poster sessions. Manuscripts of accepted paper will be included in the conference proceedings.

Please submit your technical papers on the following topics:

- Power systems for communications and Data Centers: Higher Voltage DC, distribution, monitoring, disaster resiliency and recovery
- Power electronics circuits: Rectifiers, Converters, Inverters, topologies and control.
- Energy storage systems – electrochemical and alternative systems.
- Power sources: renewable and alternative power generation.
- Environment: cooling, physical and thermal design, power protection and grounding.
- New Services: Powering broadband with line powering, 4G, WIMAX, wireless power transfer.

Submit your 500 word to 1500 word digest on line by March 16, 2012 at www.intelec.org/intelec2012 or http://submissions.miracd.com/intelec2012
There will also be a tutorial program, a technical exhibition of products and equipment, and exhibitor seminars. An extensive social program will include two exhibit receptions, afternoon tour, banquet and a comprehensive partner program.
For more information including Call for Papers brochure, Patron Opportunities and Booking a Booth please go to

www.intelec.org/intelec2012/

PCIM Europe 2012 - for the First Time in Two Halls

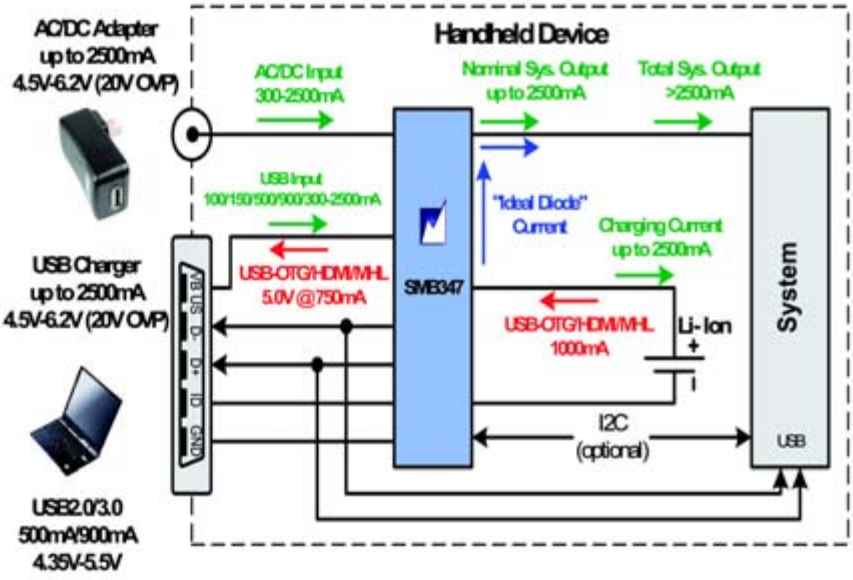
Due to the strong growth in floor space, PCIM Europe will in 2012 take place in two exhibition halls (11 and 12) for the first time. Visitor management concept as well as the integration of the PCIM Europe conference will connect both halls ideally and thus provide the best possible visitor circulation. Besides well-known industry names like Infineon, Semikron, Mitsubishi, ABB, International Rectifier or Fairchild, medium-sized companies and young enterprises will exhibit at PCIM Europe. The amount of participating companies from the US and Asia is growing continuously. Registrations in general are well above those of 2011.

www.pcim.de

Smart and Flexible 2.5A Li+ Charger, Tiny Solution for Big Batteries

High-Efficiency, Programmable Flexibility, Universal USB/AC/DC Inputs & Robust Safety Features Deliver a Complete, Cost-Effective Solution

Fastest, Safest and Most Flexible Charging Solution



SMB347 Features

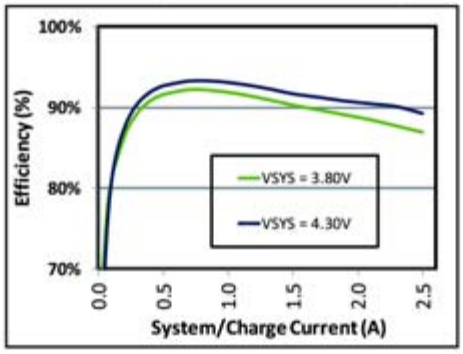
- Dual Inputs - AC/DC/USB2.0/3.0
- Dual Output CurrentPath™ for low/dead battery with 'ideal diode'
- +3.6V to +6.2V Input (+20V OVP)
- USB BC1.1/1.2 Source Detection
- Programmable Input Limit to 2.5A
- Automatic Input Limit Detection*
- Programmable Charge Current to 2.5A
- Integrated 5V USB-OTG Boost Output
- TurboCharge™* for 40% Faster Charging
- Robust Safety: JEITA/IEEE1725 Support
  - Over-Current/Over-Voltage
  - Thermal Monitor
  - Input Detection and Fault Status
- <10uA standby current
- I²C Programmable (Volatile and Non-Volatile)
- 2.5mm x 3.0mm CSP Packaging

** Patented*

Programmable Switch-Mode Battery Charger Family

	SMB347/346	SMB328A/B	SMB137B/136	SMB329B	SMB338P
Input Voltage Range (OVP)	4.0 to 6.2 (20)	4.0 to 6.3 (20)	4.0 to 6.0 (18)	4.0 to 6.2 (20)	4.0 to 6.2 (18)
# of Inputs/Outputs	2/2	1/1	2/2, 1/2	1/1	1/1
Maximum Charge Current (mA)	2500/1250	1200	1500	1150	1250
Battery Thermal Protection	HW JEITA	HW JEITA	SW JEITA	√	
USB Charging Spec	rev 1.1/1.2		rev 1.0	rev 1.0	
Package (mm)	3.0x2.5 CSP	2.2x2.0 CSP	3.0x2.5 CSP	2.2x1.9 CSP 4x4 QFN	2.2x1.9 CSP

>90% System Efficiency



For more information see:
www.summitmicro.com/SMB347

SUMMIT MICROELECTRONICS
Programmable Power for a Green Planet™

Robert Taylor receives IEC 1906 Award

TDK-Lambda UK, a group company of the TDK Corporation, is proud to announce that Robert 'Bob' Taylor, Safety Engineering Manager, has been awarded the prestigious International Electrotechnical Commission (IEC) 1906 Award. The award, which was created to commemorate the founding of the IEC in 1906, honours those experts who have made an exceptional contribution to the development of an IEC standard.

Mr. Taylor has been recognised by the Chairman and Secretary of IEC Technical Committee 22 (TC 22) as an "Expert of IEC Subcommittee No. 22E, Power Electronic Systems and Equipment Stabilised Power Supplies". The IEC 1906 Award certificate states that Mr Taylor was honoured 'for his valuable contribution and consistent dedication as an

expert and convenor in latest MT 5 for IEC 61204-3, before WG 2 on IEC 61204-7. Over the years, he has been a driving force in his projects contributing to the standards thanks to his expertise and active participation in writing and editing them. He especially focussed on integrating the safety and EMC requirements into the SC 22E standards.'

About Mr Taylor being presented the IEC 1906 Award Phil Scotcher, General Manager of TDK-Lambda UK, comments: "Bob has been involved with the IEC Technical Committee for 15 years and is acknowledged as an expert in the field of safety engineering. It is only fitting that he is recognised by the IEC for his dedication and contribution to the development of safety and EMC standards."

Picture: British Electrotechnical Committee President Geoff Young presents Robert Taylor with the IEC 1906 Award for his work on standardisation.

www.uk.tdk-lambda.com

Microchip Wins Elektra European Electronic Industry Award 2011

Microchip Technology Inc., a leading provider of microcontroller, analog and Flash-IP solutions, today announced that its MPLAB® X Integrated Development Environment (IDE) has won the prestigious 2011 Elektra Award in the Design Tools and Development Software Award category.

MPLAB X is the industry's only IDE that combines industry-leading productivity features with seamless migration through an entire product range. In making this award the Elektra judges commented; "Microchip has successfully adopted an open source software approach for its MPLAB X Integrated Development Environment which supports the complete product range of microcontrollers, digital signal controllers and memory devices in a single, multi-project environment"

"Since the introduction of MPLAB X customers around the world have experienced as much as a 20% increase in productivity as its full benefits are harnessed and explored" adds Steve Sanghi, Microchip president and CEO. "I would personally like to thank all those involved in developing this best-in-class design environment for embedded development and the Elektra judges for presenting Microchip with another major international award."

MPLAB X IDE includes a feature-rich editor, source-level debugger, project manager, software simulator, and supports Microchip's popular hardware tools, such as the MPLAB ICD 3 in-circuit debugger, PICkit™ 3, and MPLAB PM3 programmer. Based on the open-source NetBeans platform, MPLAB X runs on Windows® OS, MAC® OS and Linux, supports many third-party tools, and is compatible with many NetBeans plug-ins.

www.microchip.com/mplabx

Sales Channel Structure for Industrial-TFT System Solutions

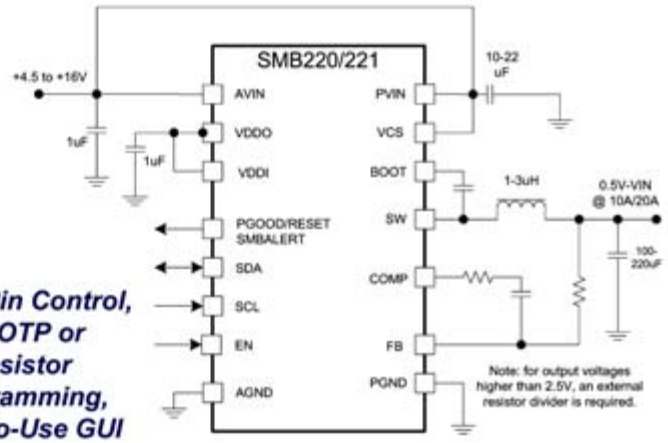
Mitsubishi Electric Europe has complemented its sales channel with the introduction of the innovative Premium Distributors Scheme in order to expand the market for high-end industrial TFTs. The new and heavily customer-focused Premium Distributors Scheme has been established in addition to the existing and important Value Added Resellers (VAR), as a growing number of customers need complete system solutions in addition to just the TFT-LCD module itself. These system solutions enable the customers' design teams to reduce the time to market without the need to employ new specialists even though the new product will implement mission-critical innovative display concepts. The two sales channel schemes complement each other to cover the broad spectrum of customer groups. Each of these customer groups has its individual requirements in terms of products and services.

The first partner, who qualified for the Premium Distributor Scheme, is the German company Ultratronik providing significant added-value. "We are very proud of being the first accepted premium distributor of Mitsubishi Electric, and we are looking forward to intensifying our already excellent relationship with Mitsubishi Electric", says Erwin Hölzl, Sales and Marketing Manager Displays at Ultratronik. Mr. Hölzl continues: "Combining Mitsubishi Electric's unparalleled industrial-TFT product portfolio for rugged applications with Ultratronik's extensive solution business will give the end-customer a tightly integrated solution that adds more value than just adding a product to a system. Quite often these solutions are ready-to-use, and of course always easy-to-use".

www.MitsubishiElectric.de

Programmable Integrated DC-DCs Deliver Big Power and Small Size

10A and 20A Output with Built-in MOSFET's and Digital Control Advanced Power Management with No Extra Components or Cost



I²C or Pin Control, NV OTP or Resistor Programming, Easy-to-Use GUI

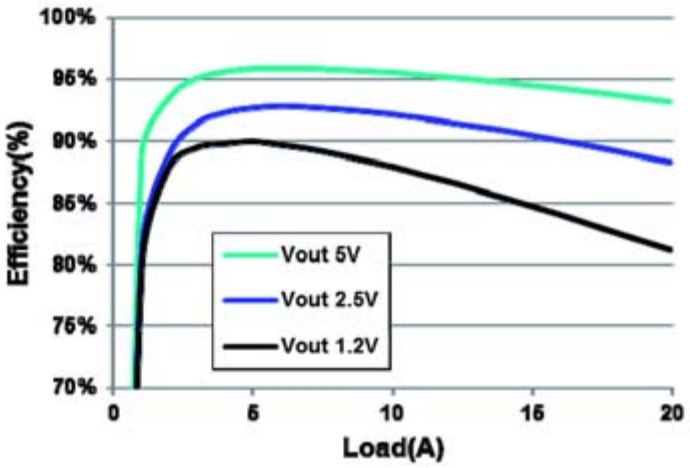
Features

- Integrated MOSFETs up to 10A/20A output
- 1% Output accuracy
- Digitally Programmable with Non-Volatile OTP Configuration or External Resistors
  - Static/dynamic output voltage/margining
  - Softstart timing/slew rate
  - RESET/PGOOD behavior
- True Current-Mode PWM Control
- Built-in Safety and Protection
  - Cycle-by-cycle current limit
  - Over-temperature protection
- Tiny 5mm x 6mm QFN Package

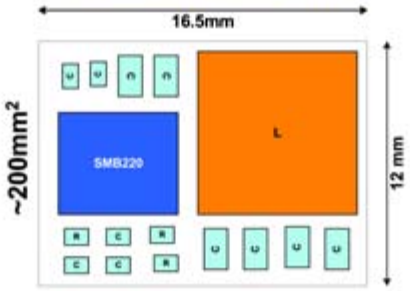
Applications

- Server, Notebook and Tablet Computing
- Enterprise Switches/Telecom Routers
- POL Power Modules
- Digital/IP Set-Top-Box/DTV/Smart TV
- Storage Equipment and Disk Drives

Efficiency with +12V Input



Fewest Components Smallest Footprint



Summit Programmable DC-DC Family

	SMB109/8/6	SMB206/7/8/A	SMB209/10/A	SMB211	SMB220/1
Input Voltage Range (V)	4.5 to 28	4.5 to 16	4.5 to 16	4.5 to 16	4.5 to 16
# of Outputs	2/3/4/8	2	1	1	1
Output Current (A)	>20	1/2/3	4/6	>20	10/20
Switching Frequency (kHz)	300-1200	500/1000	500/1000	250-1000	250-1000
Output Voltage Range (V)	0.5-VIN (Prog)	0.8-VIN (Prog)	0.8-VIN (Prog)	0.5-VIN (Prog)	0.5-VIN (Prog)
Internal/External FETs	External	Internal	Internal	External	Internal
Output Voltage, Seq., Softstart, OCP	Prog	Prog	Prog	Prog	Prog
Output UV/OV Monitor	Prog	√	√	Prog	Prog
RESET/POWER GOOD Output	√	√	√	√	√
I2C/SMBus Interface	√	√	√	√	√
Packages	7x7 QFN-56 5x5 QFN-32	3x3 QFN-20 TSSOP-24	3x3 QFN-20 TSSOP-24	3x3 QFN-20	5x6 QFN-28

For more information see:

www.summitmicro.com/SMB220

www.summitmicro.com/MobileGreen

MobileGreen™ TECHNOLOGIES

SUMMIT MICROELECTRONICS

Programmable Power for a Green Planet™

Frantz Saintellemy Executive VP, Worldwide Sales and Marketing

ZMD AG a global supplier of energy-efficient analog and mixed-signal solutions for information technology applications, has announced that Frantz Saintellemy will assume responsibility for Worldwide Sales & Marketing as of 01 January. Mr. Saintellemy takes the helm from 67-year-old Carlo Rebughini, who will retire at the end of this year. To ensure a smooth transition Mr. Rebughini continues to oversee strategic business development projects until his retirement. Mr. Saintellemy comes to ZMDI from Future Electronics, the global market leader in distribution and marketing of semiconductors and passive, interconnect, and electro-mechanical components. Before joining ZMDI, he served as chief technical officer and corporate vice-president of technical marketing. Prior to that, he held various management positions at Analog Devices (ADI).

www.zmdi.com

Team-Up for Global Distribution

Richardson RFPD, Inc. announced it has entered into a global distribution agreement with RECOM Power, Inc., a leading provider of DC/DC and AC/DC converter modules, switching regulators, and constant current LED drivers. A high-quality manufacturer for more than 35 years, RECOM's DC/DC converter modules are used by power electronics design engineers around the world.

"With this agreement, we continue to expand our global reach with a distributor that is committed to the OEM design-in process in all energy and power markets," said Christoph Wolf, RECOM Power Senior Executive Vice-President. "The field sales engineers at Richardson RFPD are considered to be among the best in the industry, with a key focus on high power electronics applications. Richardson RFPD has a reputation for in-depth application knowledge, full design support, and a bias toward action on behalf of their customers."

Over the past two decades, it has become common practice for OEMs to purchase DC/DC converters as a finished module, instead of designing each converter circuit themselves. This trend also applies to all segments of the electronics industry, including industrial automation, transportation engineering, telecommunications, data technology, measurement technology, and medical electronics.

Kevin Connor, Richardson RFPD vice president of the Energy, Power & Interconnect responded: "Recently, our customers started requesting additional help with DC/DC converters, LED driver modules, and other key building block solutions for high-power inverter applications. We sought a key addition to our already substantial product offering in order to best meet these needs." Connor further added, "RECOM's dedication to design excellence, product availability and quality manufacturing fills an important gap, improving time-to-market and increasing system performance and reliability for our OEM customers."

Richardson RFPD's worldwide field sales engineering teams are now assisting circuit designers in integrating RECOM converter modules into inverter designs.

www.richardsonrfpd.com

Kevin Parmenter for Business Development

Voltech announces that Kevin Parmenter has assumed responsibility for Business Development, Sales, marketing and applications in the Americas. Voltech is a leader in the development of test and measurement instrumentation for the power electronics and magnetics component industry. Mr. Parmenter has extensive knowledge and experience in the power electronics industry which he will be utilizing to expand and grow the customer base and channels to market in the Americas. Mr Parmenter has had previous experience in the semiconductor and electronics industry and is named in several US patents, is an IEEE member and has served as the general chair for APEC 2009. Mr. Parmenter holds both a BSEE and a BS in Business Administration. His Interests include Amateur Radio, holding an Extra class license – call sign KG5Q, as well as an FCC First Class Radio Telephone license.

www.voltech.com

Completion of the Acquisition of Eldre

Mersen has completed the acquisition of Eldre as planned. The acquisition of Eldre is part of Mersen's strategy to support its partners in the development of the power electronic application market with the critical components that improve system reliability and safety. Mersen's expanded product offering combines product expertise in laminated busbar, cooling, and semiconductor fuses with application knowledge to maximize performance and balance cost. Mersen's global operation's platform delivers the support and service required by the world's leading power electronic producers.

Sustainability and energy efficiency represent two driving forces in global growth markets like renewable energy, mass transportation, and motor control (drives and inverters). Power electronics applications are at the center of these growth markets.

Marc Vinet, Group VP, Electrical Protection and member of the Management Board of Mersen states, "The Eldre team is a welcome addition to Mersen. The Eldre acquisition represents a continuation of our product portfolio expansion and uniquely positions Mersen to be able to bundle key products—laminated busbar, cooling, and semiconductor fuses—with application expertise to the benefit of our partner customers."

Eldre is based in Rochester, NY (United States) with manufacturing facilities in the U.S. (Rochester, NY) and France (Saint Sylvain d'Anjou) and employs approximately 300 people. The business will be integrated into Mersen's Electrical Components and Technologies segment.

www.mersen.com

Progress for POWER ELECTRONICS, ENERGY AND ENERGY SAVING in Moscow

Power Electronics, Energy and Energy Saving in Moscow 2011 ended with a plus in visitor number of 12%. 3025 unique visitors (2010: 2700) meet 100 exhibitors (2010: 96) to discuss the latest developments and products in the sector of power electronics.
The 2011 statistics at a glance:

- Exhibition area – 1700 sqm
- 100 exhibitors
- Companies from 10 countries: Germany, Israel, Italy, China, Poland, Russia, Taiwan, Ukraine, France, Czech Republic
- 3969 visits
- 3025 unique visitors
- 204 business program attendees

The event highlights included:
International Conference on Electric Drive supported by the Department of Electric Power Engineering at the Tula State University. At the conference issues of modern state of technological development, competitive ability of products of Russian and foreign manufacturers of electric drives, topical issues of electric drive application in various industries, as well as energy and resources saving, were discussed.
Seminar “Power Supply Sources for LED Equipment. Economic and Technical Issues” supported by the Noncommercial Partnership of Manufacturers of LEDs and LEDsystems.
The Day of High Fashion of Power Electronics
The second day of event the leading well known exhibitors such as Semikron, Mitsubishi Electric, Infineon Technologies, MMP-Irbis, Electrovypryamitel, Teseq held their tutorials and presentations for consumers of power electronics, shares about new ideas and cutting-edge issues.

Exhibition comments:
Participation in exhibition Power Electronics, Energy and Energy Saving has answered again our expectations. Especially I would like to mark traditional absence of strangers and visitors high qualification.
Andrey Kolpakov; SEMIKRON
The expert knowledge of the visitors increased in recent years. Many fruitful and interesting discussions were held at the stand of the company and attracted many visitors. The arrangement of the exhibition was excellent.
Evgeny Obzherin; Infineon Technologies RUS
The exhibition 2011 is notable for great interest of foreign visitors in our products, and for high level of the visitors` competence as a whole.
Lyudmila P. Akimova; Elektrovypryamitel
There were no “empty” days at the exhibition. The visitors competence level is unexpected higher than average, which is a pleasant surprise for a Moscow exhibition. A lot of chief executives: directors, top managers, real specialists.
Sergey Chaplygin; ZEZ SILKO
The analysis of the exhibitor survey:

- 91% of participants established new business contacts at the exhibition and/or made agreements on further cooperation;
- 98% of participants were satisfied with the number and quality of participants;
- 92% of participants have confirmed their participation in the exhibition 2012.

Power Electronics, Energy and Energy Saving 2012 will take place 27-29 November 2012 in Crocus Expo, Moscow, Russia.

http://power.primexpo.com/

Specialized Distributor for Power Electronics

Since last year, R3Tec is offering one of the largest product portfolios in power Electronics within Europe. This distributor, based in Mainz (Germany), covers the demand in Germany and Europe for power electronics components with new sources of supply and new technologies.
The product range covers power semiconductors manufactured by Semisouth Laboratory, which produces SiC jFET's and diodes mainly used for high frequency applications, and also for improving efficiency and switching loss reduction. LSIS is a Korean company which was previously an entity of LG, and is producing IGBT, MOSFET and Diode modules with short lead times and attractive pricing. IRPERI is a producer of Thyristor, Diode and IGBT modules, and one of their largest investors is International Rectifier, which is well known also in the power electronic market. Additionally, on the line card are manufacturers such as Macmic and SIRECTIFIER who are producing IGBTs, Diodes, Thyristors and MOSFETs in Modules, as well as discretes, both of these are well known in Asia and are trying slowly to win a market share in Europe. Surely through their short lead time, quality and large product range, they possess a strong capacity to quickly achieve a good standing in the European market.
Furthermore, R3Tec is also a distributor for WEPOWER, who is a very good IGBT driver manufacturer, which is mainly compatible to well-known other manufacturers and can offer driver ranges, which are working at high temperatures up to 125°c and from 650V to 6500V.
Trinno is also a Korean company producing MOSFET in discrete packaging and plan to expand their product line with high voltage and current.
Finally, to round off the product range of Power Semiconductors, R3Tec is also an official distributor to Electrovipryamittel, which is a producer of high current and voltage IGBTs, Diodes and Thyristors, as well as heatsinks. This company, founded 40 years ago, has a very long track record and recognized expertise on high power Electronics and can offer an extensive product range in press-pack package.
To complete the range of the power Electronic, the EMC filter should not be forgotten, and, with the partner FUSS-EMV founded 100 years ago, R3Tec has the ideal partner for the EMC. Power resistors are also available in the product portfolio through SIR which is producing resistor from 2W up to 120KW.
However, besides the large product range in power electronics components, the main objective of R3Tec is to deliver a level of support and competence with the best technology and commercial outcome. "Today the electronic world is demanding size reduction and more efficiency, this demands to have specialized partners which are offering a complete product range but also an expertise and competence, which should support the R&D engineer in their projects in the short term. This is our goal, objectives and added value." Explain Jean-Marc Renard, managing Director of R3Tec GmbH.

www.r3tec.de

EMV 2012 Expects More Exhibitors

The number of exhibitors already registered is currently higher than in the comparison period of the event in 2010. The key players in the industry have already booked their stands and partly enlarged. More exhibitors than in previous years are expected.
New technologies with high EMC-relevance like eMobility, renewable energies and Smart grid as well as increasingly complex systems give the industry additional impulses which are also reflected at the exhibition. Thus, in 2012, eMobility in conjunction with electromagnetic compatibility plays again an important role.
The audience, originating first and foremost from electrical engineering, information technology and machinery and vehicles, finds latest products, services and trends in an area of over 3500 square meters.
Parallel to the exhibition Europe´s leading EMC conference takes place. The biennial conference provides a comprehensive and top-class program. It is the ideal platform for dialogue between research, product development and application.

www.e-emc.com

PCIM Chairman Receives Power Electronics Award

The prestigious IEEE Gerald Kliman Innovator Award 2011 has been given to the PCIM Advisory Board chairman Prof. Leo Lorenz. The award may be presented annually to an individual for meritorious contributions to the advancement of power conversion technologies trough innovations and their application to industry. The technical field for this award includes, but is not limited to Electrical Machines, Electrical Drives, Power Electronic Systems and Power Electronic Devices. This Award is named in honor of Dr. Gerald Kliman, in Memory of his many contributions and innovations to these technical areas.
The awardee is judged to be outstanding in the multidisciplinary field of power electronics.
Based on his scientific background along with his record on application oriented achievements Dr. Lorenz pioneered power electronic system development from the conventional bipolar devices to power conversion systems operating at high switching frequencies to achieve high efficiency ratings and ultra high power densities. With his numerous invited speeches and key note presentations at international conferences, his university lectures for Master & PhD students and expert seminars multinational operations he initiated and supervised significant research directions and set important milestones in the whole field of power electronics. He shaped power electronics system integration to a great extent and pushed for the energy saving mindset.
Prof. Leo Lorenz is a Senior Principal at Infineon Technologies Munich, Professor for Power Electronics System Integration at TU Ilmenau, President of ECPE, an IEEE Fellow and Member of German Academy of Science.

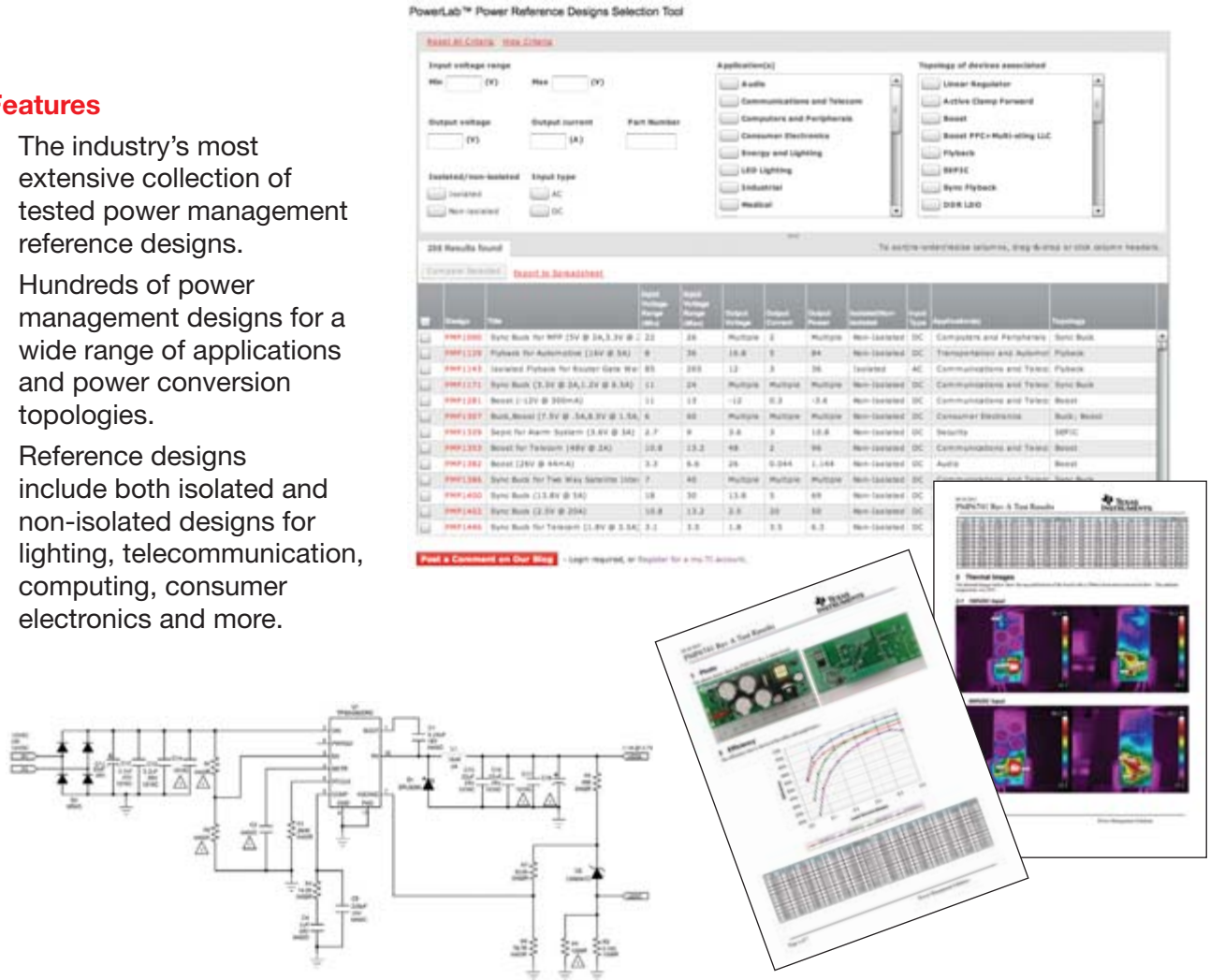
www.pcim.de

PowerLab™ Power Reference Design Library

The PowerLab™ library includes an interactive and powerful search engine for design engineers looking for a proven and tested solution to their power supply requirements. This interactive search tool allows engineers to find designs by application, topology, input type, input voltage or output voltage.

Features

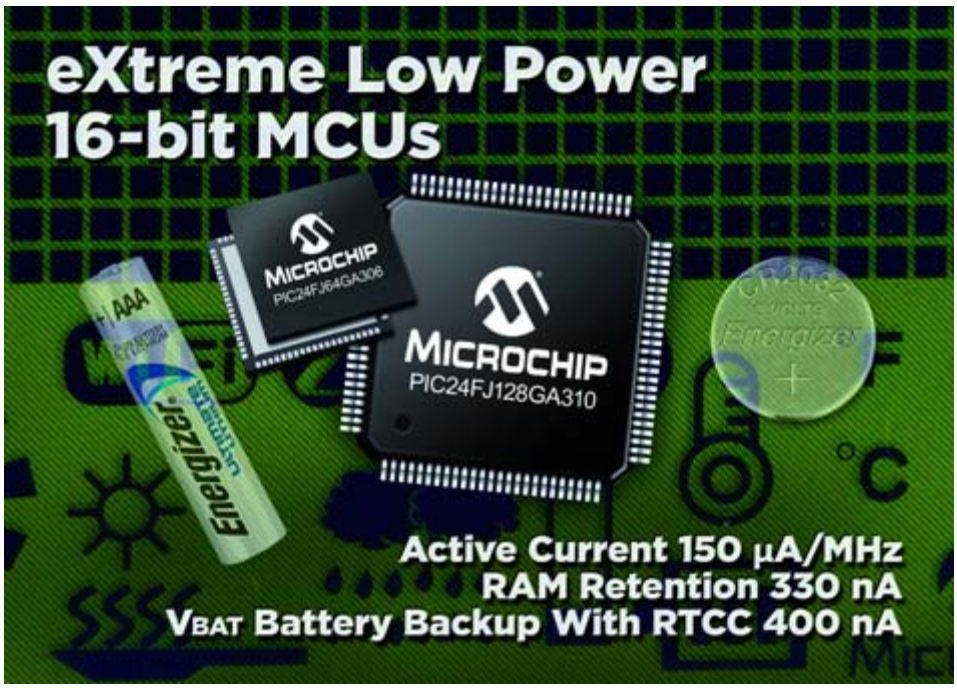
- The industry's most extensive collection of tested power management reference designs.
- Hundreds of power management designs for a wide range of applications and power conversion topologies.
- Reference designs include both isolated and non-isolated designs for lighting, telecommunication, computing, consumer electronics and more.



www.ti.com/powerlab

Learn more, find answers and stay up to date

XLP PIC® MCU Portfolio with Industry's Lowest Active Current for 16-bit MCUs



Microchip announces the expansion of its eXtreme Low Power (XLP) microcontrollers (MCUs) with the PIC24F 'GA3' family, which features the industry's lowest active current for 16-bit Flash MCUs, as well as several flexible new low-power sleep modes. The PIC24F 'GA3' devices feature 150 microamperes/MHz active current, as well as six DMA channels, which allow a routine to be executed with less power consumption and increased throughput. The family demonstrates the continual advancement of Microchip's XLP technology and adds a new low-power sleep mode with RAM retention down to 330 nA. Additionally, these are the first PIC® MCUs with VBAT for battery backup of the on-chip Real-Time Clock Calendar. With these features, plus an integrated LCD driver and numerous other peripherals, the PIC24F 'GA3' devices enable more efficient, less expensive designs for consumer thermostats, door locks, and home automation; industrial products such as security, wired and wireless sensors, and controls; portable medical devices and medical diagnostic equipment; and metering products including e-Meters, energy monitoring, automated meter reading and meters for gas, water or heat; in addition to other applications.

Some applications require battery life to approach the operational life of the end product. With its operating current of 150 microamperes/MHz, numerous low-power modes, and a low-power sleep mode with RAM retention down to 330 nA, the PIC24F 'GA3' MCUs enable maximum battery life by reducing the overall amount of power that the application consumes. To allow the application's Real-Time Clock to continue running when primary power is removed, a VBAT pin can be used to supply back-up power with only 400 nA. Additionally, the transition from VDD to the VBAT supply pin occurs automatically as VDD is removed. The integrated LCD display driver provides the ability to directly drive up to 480 segments, with an eight-common-drive capability, enabling more informative and flexible displays that include descriptive icons and scrolling.

The MCUs also include a Charge Time Measurement Unit (CTMU) with a constant current source that can be used for mTouch™ capacitive sensing, ultrasonic flow measurement and many other sensors.

The on-chip, 12-bit ADC features threshold detection and works in conjunction with the CTMU to perform proximity sensing while in sleep, to further reduce power consumption.

To support development of designs based on the PIC24F 'GA3' family, Microchip also announces the PIC24FJ128GA310 Plug-In Module (PIM) (MA240029), priced at $25.00, for the Explorer 16 Development Board.

To evaluate or develop designs with a 480-segment LCD, the LCD Explorer Development Board (DM240314), priced at $125.00, will be available in January.

The PIC24F 'GA3' family is available today for sampling and volume production in versions with 64 KB or 128 KB of Flash. The PIC24FJXXXGA306 MCUs are available in 64-pin QFN and TQFP packages; PIC24FJXXGA308 versions are available in an 80-pin TQFP package; whilst PIC24FJXXXGA310 are available in 100-pin TQFP and 121 BGA packages.

For further information, visit Microchip's Web site at:

www.microchip.com/get/0KJV

DC link power film capacitors

TYPE 947C POWER FILM CAPACITORS

85, 90 & 116 mm CASE SIZES

CAPACITANCE VALUES TO 1500 µF

APPLIED VOLTAGE TO 1300 Vdc

RIPPLE CURRENT RATINGS TO 100 A_{rms}

Next generation inverter designs for renewable energy applications demand reliable DC link capacitors with higher capacitance values, voltage, and current ratings. Now available in new case sizes, Cornell Dubilier's expanded range of Type 947C power film capacitors meet or exceed the requirements for bulk energy storage, ripple filtering and life expectancy for wind and solar power inverter designs, as well as electric vehicle applications. Select from hundreds of standard catalog listings, or connect with CDE engineers to develop special designs to your requirements.

For sample requests or more technical information, visit www.cde.com/bodo

CAPACITOR SOLUTIONS FOR POWER ELECTRONICS

CDE CORNELL DUBILIER

True Digital Power Solution Features on All New 3-Way Digital GIGABYTE™ 3D Power™ X79 Motherboard Platforms

IR's Digital Power Solution Offers Significant System-Level Benefits over Hybrid Digital and Analog Alternatives

International Rectifier has announced that its digital power solution featuring GUI-based VR design for fast, real-time tuning and system-level optimization powers All New 3-Way Digital X79 motherboards from GIGABYTE™, a leading manufacturer of motherboards and graphics cards.

"As a pioneer in the manufacture of motherboards and graphics cards, we embraced the leading-edge true digital power solution offered by IR. We were able to implement an extremely high performance overclocking feature set using IR's unique range of technologies. As a result, IR's easily implementable, highly efficient and effective system-level solution was exceptionally well suited to our all digital 3D Power™ X79 Series of motherboards," said Henry Gao, Vice President of the GIGABYTE Motherboard Business Unit.

"As demonstrated by this new high performance X79 Series, IR's true digital power platform offers significant system-level benefits to GIGABYTE and their customers. We engineered enormous flexibility and superior voltage regulation into our controllers, allowing GIGABYTE and their customers to overclock these newest complex processors and DDR memory to levels that were not possible with analog or hybrid digital control," said Deepak Savadatti, Vice President and General Manager, IR's Enterprise Power Business Unit.

Featuring Dynamic Phase Control (DPC) and Variable Gate Drive (VGD) technology, IR's true digital solution enables more efficient delivery of power to the processor over the entire load range to enhance system performance and end-user experience. IR's CHiL digital controller eliminates many external components necessary using hybrid digital or analog controller solutions to offer an extremely small, high density solution that allows incremental space on the motherboard to add extra system-level features.

The IR digital platform features a non-linear control architecture (adaptive transient algorithm, ATA) to allow best dynamic response with reduced output capacitor count to keep up with the demanding and highly variable workloads of the processor. Its true digital engine allows superior on-the-fly performance optimization across the full operating range and even above the range of the processor without the need to modify hardware, while maintaining fully stable operation. The solution also provides a full suite of telemetry via built-in I2C digital interface to offer real-time monitoring of voltage, current, temperature and power to fully optimize and maximize power delivery to the processor.

Digital Feature	Performance Improvements
Supports Overclocking with Intel Turbo Boost Technology	Allows overclockers to accelerate CPU clock speeds and voltage, without the CPU throttling back - a built in behavior of the CPU. Users can get more performance from lower cost CPUs
Feedback to the system about the operating point by sending back voltage and current	Overclockers can safely push boards to the limit with feedback on system performance
Accuracy	IR digital power is architected to measure voltage, current, temperature, etc. to optimize performance
VR reconfiguration on the fly while running	IR's architecture allows real-time changing so no more booting up and down required to change parameters
Easy updates through Bios	Board makers and customers can optimize and update the power system to take advantage of component and system changes

IR's industry proven end-to-end DC-DC solutions offer an opportunity to optimize performance, power density, solution cost and time-to-market for customers. IR's CHiL true digital controllers may be paired with high performance, high density integrated PowIRstage® devices or discrete MOSFETs and drivers to meet end-customers power management requirements. More information is available on the International Rectifier website at www.irf.com

About International Rectifier
International Rectifier (NYSE:IRF) is a world leader in power management technology. IR's analog and mixed signal ICs, advanced circuit devices, integrated power systems and components help enable high performance computing and reduce energy waste from motors, the world's single largest consumer of electricity. Leading manufacturers of computers, energy efficient appliances, lighting, automobiles, satellites, aircraft and defense systems rely on IR's power management benchmarks to power their next generation products. For more information, go to www.irf.com.

Trademark Notice
IR®, CHIL® and PowIRstage® are registered trademarks of International Rectifier Corporation. All other product names noted herein may be trademarks of their respective holders.

www.irf.com

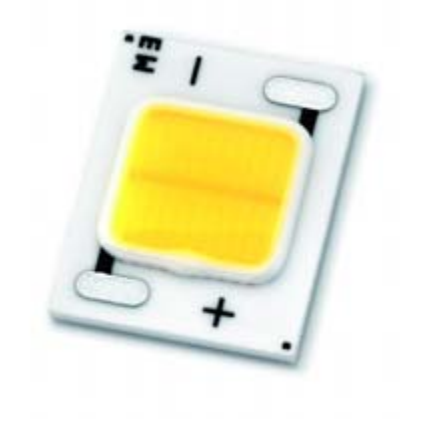
New Generation of 10W LED Arrays

The 2nd generation of the 10W Mini Zeni variant from Sharp now radiates with an even higher efficacy of up to 106 lm/W, a greater luminous flux of up to 900 lm and is available with a (typical) CRI value of 82.

The new product generation is based on the technical advances made in LED production, improving the efficiency by up to 47%. The 2nd generation of the 10W arrays has four distinguishing features in this regard: they are compact, lightweight, economical and significantly brighter than before.

Sharp has retained the dimensions of 15 x 12 x 1.6 millimetres unchanged, along with an aluminium ceramic plate as carrier material. The flat surface of the ceramic plate and the soldering points already in place make it possible to attach the modules to a suitable heat sink, without too much effort or additional connecting material, thereby achieving efficient heat dissipation.

operated using a current of up to 800 mA, whereby values of up to 1300 lm can be reached. With the shades "Natural White", "Warm White", and "Pure White", the colour temperatures of the new white light LED arrays are in the range of 3,000 to 5,000 Kelvin.



Model	GW5BMJ30K04		GW5BMJ40K04		GW5BMJ50K04	
LED colour	Warm White		Natural White		Pure White	
Colour range X / Y in CE 1931 coordinates	0.435	0.403	0.381	0.435	0.403	0.381
Number of dies	60		60		60	
Dimension [L x W x H] mm	15 x 12 x 1.6		15 x 12 x 1.6		15 x 12 x 1.6	
Colour temperature [K]	3.000		4.000		5.000	
CRI (TYP)	82		82		82	
Light output [lm]	840		880		900	
Luminous efficacy [lm/W]	99		103		106	
Supply voltage [V]	17,7		17,7		17,7	
Life time **at 90°C	40.000 h**		40.000 h**		40.000 h**	

bei I_F = 480 mA

Depending on the module, the new types offer a light output of up to 900 lumens, a luminous efficacy of up to 106 lm/W in standard operation, high CRI values of 82 and a long service life of 40,000 operating hours at an operating temperature of up to 90°C. The new generation is specified for use with a forward voltage of 17.7 V and a forward current of 480 mA. But the arrays can also be

The extensive range of LED lighting arrays allows Sharp to provide numerous marketable solutions for the use of LEDs as light sources for lamps and lighting fixtures. The luminous Mini Zeni LED modules from Sharp are suitable for numerous applications, e.g. spot lighting and for use in LED retrofit lamps, etc.

Line-up LED lighting module 10W "Mega Zeni" (CRI xx)
For availability of these products and components outside Europe, please check with the Sharp Device Sales Offices in the respective markets.

Availability
Initial samples are available in the colour temperatures of 3000 and 4000K. These can now be ordered from Sharp sales offices and distribution partners across Europe.

Contact: Sharp Microelectronics Europe
Service hotline: +49 (0)180 507 35 07 (EUR 0.14/min. from the landline network of DTAG.)
Service e-mail: info.sme@sharp.eu

About Sharp Microelectronics Europe
Sharp Microelectronics Europe, Hamburg, Germany, is a divisional company of Sharp Electronics (Europe) GmbH, which is a subsidiary of Sharp Corporation, Osaka, Japan. Sharp is a worldwide developer of core digital technologies shaping the next generation of electronic applications and products. With a portfolio of more than 2,000 components in the ranges of TFT LCDs in screen sizes up to 108 inches, high brightness white and colour LEDs, optoelectronics, CCD and CMOS camera sensors, photovoltaic components, RF-, IC- und LSI-components as well as advanced packaging and integration skills Sharp Microelectronics Europe offers groundbreaking solutions in particular for applications in automotive electronics, mobile / communications technology, industrial automation, TV- and consumer electronics, e-signage and LED based lighting technology. Sharp is dedicated to the improvement of people's lives and environmental protection through the use of advanced technologies. Technology and product development at Sharp is strongly determined by innovation, quality, usability and saving of resources.

www.sharpleds.eu

SOCs are SO...
Last Year

CS5484/80/90 AFEs : Energy Measurement Made Easy

The AFE + MCU advantage offers high accuracy with unlimited design flexibility and lowest cost.

The CS5484/80/90 family of analog front end (AFE) energy measurement ICs offer a clear alternative to using SOCs:

- Highest precision measurement in the industry
- Easier to design and more flexibility
- Lowest cost

With an energy measurement accuracy of 0.1 over 4,000:1 dynamic range, the CS548/9X family offers superior measurement performance with no user programming required, and up to 10X faster calibration.

Stay current with innovation,
learn more and request a sample at: cirrus.com/bpsmeter

CIRRUS LOGIC®

BPS022012

What we have here is a Failure to Communicate

By Mark Adams, VP Advanced Power, CUI Inc.

For years now we have all read that digital power is the wave of the future for system power design, with report after report forecasting impressive compounded growth rates in this space. I believe, along with many of my colleagues, that we are beginning to see an inflection point for digital power designs, with growth quickly coming as design cycles reach completion. However, this is not another editorial on digital power taking over the world. Instead, my intention is to share recent revelations obtained in the development process for CUI's digital POL products that will hopefully allow designers to better understand some important considerations in implementing a fully digital power system.

Interoperable is defined by IEEE as the ability to exchange and make use of exchanged information between 2 or more components or systems. In 2004, this was a key area of focus for the founding members of the Power Management Bus (PMBus) group, the standard by which the majority of digital power companies and OEMs adopt. PMBus was developed to insure that devices within a power structure could communicate regardless of the manufacturer or type of power device. PMBus is broken down into two areas, the physical layer and the command layer. PMBus commands are communicated over the widely used SMBus/I2C per the specification (www.pmbus.org). The command language is currently on rev 2.0 and has a working group of more than 40 organizations that represent power supply companies, semiconductor companies, and OEMs actually implementing the digital power system.

This seems great in theory— an open standard, clearly defined, and widely supported by all. Unfortunately, it isn't as straightforward as that. PMBus does not ensure interoperability. PMBus does a great job of defining the structure for a majority of the functions from a system level, but it does not define other critical features.

The semiconductor companies designing digital power controllers have begun to implement a separate proprietary bi-directional serial bus to handle functions like active current sharing, fault management, and in some instances, even PMBus commands that also reside on the SMBus, such as sequencing. The primary purpose of this serial bus is to reduce the traffic on the already congested SMBus, as well as provide a higher speed bus to support some of these critical functions. It is something that many designers view simply as an added feature, but this serial bus has transformed into a critical portion of the latest digital controllers on the market. As a result, the ability to have a truly interoperable system at the POL level has been eliminated.

In July 2011, CUI announced a cooperation with Ericsson regarding the second sourcing for POL products. In order to achieve true second source modules, we needed to thoroughly examine the required PMBus commands, the physical layer that supported each of the commands, and physical and command structures of the additional module features.

This seemingly simple task began to take on a life of its own as we broke down the datasheets between the Ericsson POL modules and our existing POL products. Each product is based on a different digital PWM controller. Through our analysis we began to realize, to our surprise, that we had an interoperability issue. The digital controllers that we each used supported the same PMBus commands, but the physical communication of those commands would not support a second source. What we have here is a failure to communicate. We had been so focused on our development of modules that would hit the smarter, faster, smaller targets, searching for the required controller that would assist in those targets, that we didn't focus on our ability to work with others within a power management system. We assumed that PMBus would cover our assumptions— shame on us.

In order to achieve a true interoperable digital system that includes fault management, active current sharing, and other power management functions, designers will need to pick a company/controller family of choice. The existence of the proprietary serial bus will prevent designers from using more than one company's controller. At first glance, this doesn't appear to be a big deal for companies. A designer will more than likely select a controller company of choice and utilize that controller company for their discrete designs, similar to their usage of MCUs or FPGAs. The issue arises when designers want to have a mix of higher power POL modules and down/discrete designs, or design 100% of their power rails utilizing modules. These companies will need to align their designs to ensure that the module company selected uses the same controller as the discrete portion of the design, or, in the case of a power system exclusively utilizing 100% module power system, that the power module companies use the same controller.

Because a majority of companies utilize a mixed solution of discrete designs and modules in their systems, CUI is moving forward with a mixed controller solution platform. While other power supply companies typically offer a portfolio based on only one controller, CUI has developed a roadmap that will provide customers with the ability to pick a controller family that best fits their needs. Today CUI offers 2 different controllers in our Novum® Advanced Power POL product family: Intersil/Zilker Labs and Powervation. Going forward it is our intent to become a controller-agnostic company. As a power supply manufacturer, it is our job to provide our customers with the best digital controller

technology available in our modules, allowing them to make the decision that fits their specific needs.

Digital power provides a number of benefits to optimize complex systems or provide integration of simple management tasks, but we are finding that communication has become a critical barrier to taking full advantage of this technology. A design engineer needs to consider the future usage when choosing a digital controller platform. At CUI, our approach is to create multiple platforms that break down this barrier and offer designers true interoperability regardless of their controller choice within their digital power system.

Mark Adams will be speaking in greater detail about this topic at the Applied Power Electronics Conference (APEC) held on February 5-9, 2012 in Orlando, Florida. His seminar, titled "Overcoming Interoperability Challenges in Digital Power Systems," will take place Tuesday, February 7, 3:00-3:30 pm in Coronado room E/F.

www.cui.com

Electronics Industry Digest

By Aubrey Dunford, Europartners

GENERAL

Booming shipments of ultrabooks during the next four years will shake up various semiconductor markets, boosting the prospects for sensors as well as power and analog semiconductors, but decreasing the market opportunity for upgrade memory modules, so IHS iSuppli. Global ultrabook shipments are expected to soar to 136.5 million units in 2015, up from less than 1 million in 2011.

SEMICONDUCTORS

As many semiconductor vendors announced relatively weak sales for the third quarter of 2011, and preannounced poor guidance for the fourth quarter, the anticipated inventory correction is well under way, so Gartner. This process will continue to dampen sales prospects for at least the remainder of the year before sequential growth can return in 2012.

Global semiconductor revenue in 2011 now is expected to rise by 1.2 percent compared to 2010, so IHS iSuppli. This is down from the previous IHS forecast of 2.9 percent issued in September. IHS forecasts 2012 semiconductor revenue growth will amount to an anemic 3.2 percent. A return to stronger growth will not begin until 2013.

40 years ago, Intel introduced the world's first commercially available microprocessor – the Intel 4004 – triggering the start of the digital revolution. Compared to the Intel 4004, today's second-generation Intel Core processors are more than 350,000 times the performance and each transistor uses about 5,000 times less energy.

Globalfoundries has postponed its plan to start building the Gulf's first microprocessor-fabrication plant in Abu Dhabi next year. The company, which is 91 per cent owned by Abu Dhabi's Advanced Technology Investment Company (ATIC), will not start construction of the facility next year because of the uncertain global economic outlook, so local media reports.

The ENIAC Joint Undertaking announced that the project "Nanoelectronics for an Energy Efficient Electrical Car (E3Car)" received its 2011 innovation award, demonstrating 35 percent energy savings, lower costs, improved reliability and shorter time to market by introducing innovations at component and sub-system level, some of which are being adopted in real-life applications as early as in 2012. With a combined R&D budget of € 180 M and more than 100 participants from the whole value-creation chain, these projects shall generate knowledge and product prototypes substantiating the European claim for electronic leadership in the rapidly growing electro-mobility sector. The consortium is coordinated by Infineon Technologies.

OPTOELECTRONICS

Innovation Network Corporation of Japan (INCJ), Hitachi, Sony and Toshiba have signed definitive agreements to integrate their small- and medium-sized display businesses in a new company to be established and operated by INCJ, which is planned to be named Japan Display. INCJ.

Based on panel makers' shipment targets in Q411, 209 million LCD TV panels will be shipped in 2011, 5 percent less than the 220.8 million shipped during 2010. This would make 2011 the first year that LCD TV panel shipments decreased.

PASSIVE COMPONENTS

Germany's PCB revenues for August reached the third highest level of the last 10 years, so the ZVEI. Sequentially, August revenues were up 2 percent, while year-to-date figure improved by 14 percent over the same period last year.

OTHER COMPONENTS

Agilent announced that Ron Nersesian has been appointed executive vice president and chief operating officer. He has been president of Agilent's largest business, the Electronic Measurement Group (EMG), since 2009.

DISTRIBUTION

European distribution bookings in Q311 declined by 18.4 percent compared to the previous quarter and by 22.7 percent when compared to the same period in the previous year, so the IDEA (International Distribution of Electronics Association). Sector specific bookings changes in Q311 compared to the same period in 2010 were: semiconductors declined by 27.5 percent; passives declined by 20.6 percent; and electro-mechs and other components declined by 5.2 percent. European distribution billings in Q311 declined by 11.8 percent, when compared to the previous quarter and by 2.4 percent compared to Q310.
Avnet has agreed to purchase the French company DE2, to strengthen its Avnet Embedded business unit in EMEA.

In the first half Electrocomponents revenue grew by 11 percent year on year at £ 626.5 M, the International business grew by 14 percent and the UK by 5 percent. Profit before tax grew by 17.6 percent at £ 59.4 M. eCommerce revenue grew by 26 percent and represents 54 percent of group sales at the exit of the half year.

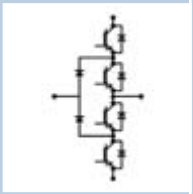
This is the comprehensive power related extract from the « Electronics Industry Digest », the successor of The Lennox Report. For a full subscription of the report contact: eid@europartners.eu.com

or by fax 44/1494 563503.

www.europartners.eu.com

High efficiency by 3-Level Topology

650V 3-Level-IGBT-Modules with PressFIT-Technology



Infineon‘s new family of 3-Level Inverter modules offers significant advantages for designing highly efficient UPS and solar inverters.

the three level inverter proves to be an attractive candidate for low and medium power low voltage applications which require high switching frequencies, complex filtering and high efficiency like double conversion UPS and solar inverters. Integrating all elements of
a phase leg into one module optimizes stray inductance and handling efforts.

- 30A - 400A/650V modules
- Low inductive design
- High reliability due to PressFIT
- Optimized thermal performance
- RoHS compliant

Infineon Technologies Industrial Power, 1050 Route 22, Lebanon, NJ 08833
Phone: 908-236-5600, info.usa@infineon.com

[www.infineon.com/highpower]

Power Measurement Increasing in Importance

By Linnea Brush, Senior Research Analyst, Darnell

Measuring real-time energy consumption, and adjusting power delivery at critical loads, is becoming increasingly important in today's commercial and industrial environments. The ability to "fine-tune" energy usage requires sophisticated power monitoring and measurement techniques, such as digital power management. At the front end, digital controllers are being designed with an integrated power factor correction (PFC) function to provide more accurate input power metering, for example. These new PFC controller designs, along with new current sensing ICs, could be used in ac-dc power supplies at the front end to "intelligently solve increasingly complex power management challenges" in future smart grid applications.

Darnell Group's first-edition report on *Power Measurement Systems: Worldwide Power Supply Market Forecasts* identifies some of the emerging applications that can benefit from an energy management system (EMS) that measures and dynamically adjusts power consumption at critical loads. Not all applications need such monitoring and control, and some only need it for certain functions. The applications that could benefit from real-time power measurement and fine-tuning (as opposed to simple "on-off" functions) include servers, storage, network equipment, telecom equipment, metering, industrial automation, building automation, and home automation; along with their associated power supplies (e.g. rectifiers, embedded ac-dc power supplies, motor drives, power distribution units and so on).

Energy management systems are being implemented in a variety of facilities, but not all of these systems are "critical" or complex enough to require dynamic power measurement and control. Economic factors will drive this "first wave" of implementations that can benefit from these functions. Data centers, industrial facilities, commercial buildings, telecom sites, and utility demand response are some of the applications where such power monitoring and measurement are both needed and cost-effective. Residential applications (such as solar, smart appliances and electric vehicle battery chargers) are expected to be a good market later in the forecast period. Initially, these applications would be part of the overall utility demand response metering.

In fact, demand response is expected to be the underlying driver for utilities' use of energy management and related power measurement systems. This includes smart meters, primarily. Although a single device, its measurement use is spread over a number of applications that are frequently seen as separate markets, including smart appliances, home automation, photovoltaics, and electric vehicle charging. Utilities are implementing energy management systems that can monitor, measure and control multiple devices in a variety of settings. Since precise energy usage and measurement is the goal, leading to rate reporting and adjustments, accurate data transmission is critical. Power measurement can provide this kind of accuracy.

Digital power management is part of almost all energy management solutions, since "intelligent" data communication is an essential feature of these systems. Accuracy of data acquisition and power measurement is challenging from a number of perspectives, and its importance (and how precise it needs to be) determines, in part, the market penetration rates used to derive a forecast. For instance, a data center may only need to be "accurate enough" but still cost-effective: going above 3% accuracy may involve a significant cost-adder. Utilities will need more accuracy, on the other hand.

Power factor correction is a function that could be integrated into power measurement products at the higher wattage levels where it is required. PFC is not a requirement for power measurement, however, so not all products with PFC are candidates for power measurement. Semiconductor companies are targeting some of their ICs at both the power measurement and PFC markets, however. These companies are integrating such functions on the controller IC to more accurately measure ac power metering, for instance. PFC has been most commonly used in motor drives and pumps over 75W. PFC could be making its way into lower-power devices in very different applications, including distributed power architectures. This also makes these markets good candidates for energy management systems.

Wattages will be a defining factor in the power measurement systems market, as well, with the lower wattage levels represented by smart meter sales and the higher wattages encompassing the remaining application segments. PFC is a function that could be integrated into power measurement products at the higher wattage levels where it is required. PFC is not a requirement for power measurement, however, so not all products with PFC are candidates for power measurement.

Due to their more complex architectures, distributed power systems are already a major market for general "energy management." These are less price-sensitive markets, and they require the more sophisticated measurement and control offered by such systems. Servers, for example, need accurate ac- and dc-power measurement, active calibration of dc current measurements, sufficient VRM slew rates to support advanced processor power management, and power system communication to ensure that the entire system stays operational when redundancy is lost during "oversubscription" events. The efficiency improvements that come from power measuring and real-time optimization can off-set the extra cost.

Another factor expected to help drive power measurement is *data center infrastructure management* (DCIM), which is the integration of information technology (IT) and facility management disciplines to centralize monitoring, management and intelligent capacity planning of a data center's critical systems. Achieved through the implementation of specialized software, hardware and sensors, DCIM enables a common, real-time monitoring and management platform for all interdependent systems across IT and facility infrastructures.

"Smart" electronic metering for monitoring and measurement of residential, commercial and industrial electricity, water and gas is a high-volume market that is based on accurate power measurement. Water and gas meters typically have different challenges related to power than electricity meters. For example, low power is a major concern with gas and water meters because electricity is generally not wired to the locations of these meters. In general, electronic meters that measure electricity are the "best" opportunity for advanced power measurement functions. Smart electricity meters enable greater consumer control over consumption and are being deployed at an increasing pace, especially in North America and Europe. These new meters will communicate information on household use back to the utility company directly, to better monitor power usage and help utilities manage power distribution.

In addition, government regulations and trends in smart metering, along with advanced metering infrastructure (AMI), have dramatically increased the need for products that offer precise measurements in multi-phase metering, while simplifying designs and reducing costs. According to some companies, most electromechanical energy meters are designed on the assumption that their load (the user application) is of a resistive nature (lights, heating elements and so on), but this is increasingly becoming a wrong assumption. The proportion of reactive (motors can account for up to 40% of total electricity usage) and nonlinear loads is constantly growing, posing a burden on the electricity suppliers.

Opportunities will vary by application. For instance, very few smart appliances are currently available because standards for communication and capability are still being worked out. A major issue is the low percentage of utilities with time-of-use (TOU) rates, which are considered necessary for smart appliance adoption and use. Several utilities are not planning to offer TOU rates for the general public until the end of the forecast period, so smart appliances are a longer-term opportunity.

Smart meters and telecom equipment currently have the highest market penetration of advanced power measurement functions, although other applications are expected to catch up over the next five years. These developments offer opportunities for embedded ac-dc power supply makers to distinguish themselves in the market at the beginning of this emerging trend.

Power Measurement Systems:
Worldwide Power Supply Market Forecasts

www.darnell.com/pwrmeas

Modern Production of Power Semiconductor Devices – Flexible Production

In spite of uneasy financial and economic situation of the latest years, power semiconductors nowadays is in one of the most developing directions of the world industry. And it's not so surprising, because only power electronics helps solving key questions in increase of energy efficiency. And this problem should be solved by mankind in the nearest future.

By A.V. Stavtsev, A.M. Surma, Proton-Electrotex JSC

Power semiconductor devices are the most important elements in power electronics. Type of power semiconductors, set of characteristics, reliability figures, all of these create the image of modern power electronics. As a result many strict and specific requirements have to be taken into consideration in modern production of power semiconductor devices.
Power semiconductors production is not so large scale as production of microelectronics, though the nomenclature is quite high. A considerable quantity of devices is produced in small batches with special requirements of the end user.

Requirements to quality and reliability of the produced devices as a rule are quite stiff because the cost of faulty device in power electronics can be very high.
Moreover, modern economics set strict requirements to price and delivery time.
To fulfill the stiff and controversial requirements is possible with development of flexible production system, i.e. production adapted to fast delivery of special orders and production of devices in massive or small lots ensuring modern requirements to quality and reliability of the produced devices for acceptable price.

The main features of such flexible production we can describe on the example of our company Proton-Electrotex JSC. The overall area of the production facilities is 8000 m². Proton-Electrotex JSC has an advanced production infrastructure, which allows realizing the complete production cycle. To provide a unifying information space between all departments, an ERP system is being used in the company to assure more effective planning and work of the company on the whole (Figure 2).

Figure 1: Production areas of Proton-Electrotex JSC

Figure 2: Screen print of the system of production status integrated with ERP system.

Nominally the complete production cycle has four main stages which are detached into separate subdivisions:

- production of diffused semiconductor elements that includes silicon wafers polishing area, diffusion process area and lithographic processing area.
- production of elements with thermal compensator that includes alloy and evaporation processes, bevel polishing and bevel jet etching.
- semiconductor element measurement that includes measurement systems for determination of static and dynamic parameters in whole range of device operating temperature.
- assembling of disk, module and stud devices as well as power assemblies with heat-sinks on their basis including processes of semiconductor assembling and encapsulation itself and approval tests.

Thus, production is quite complicated and has many operating steps. To optimize the production time and load of the production areas ERP system is being used. Its integration into production of power semiconductor devices happened to be quite difficult, because the features of such production process cannot be fully organized by any

New 8-bit Microcontrollers with integrated configurable logic in 6- to 20-pin packages

Microchip's new PIC10F/LF32X and PIC12/16F/LF150X 8-bit microcontrollers (MCUs) let you add functionality, reduce size, and cut the cost and power consumption in your designs for low-cost or disposable products, with on-board Configurable Logic Cells (CLCs), Complementary Waveform Generator (CWG) and Numerically Controlled Oscillator (NCO).

The Configurable Logic Cells (CLCs) give you software control of combinational and sequential logic, to let you add functionality, cut your external component count and save code space. Then the Complementary Waveform Generator (CWG) helps you to improve switching efficiencies across multiple peripherals; whilst the Numerically Controlled Oscillator (NCO) provides linear frequency control and higher resolution for applications like tone generators and ballast control.

PIC10F/LF32X and PIC12/16F/LF150X MCUs combine low current consumption, with an on-board 16MHz internal oscillator, ADC, temperature-indicator module, and up to four PWM peripherals. All packed into compact 6- to 20-pin packages.

FAST-START DEVELOPMENT TOOLS

PICDEM™ Lab Development Kit - DM163045

PIC16F193X 'F1' Evaluation Platform - DM164130-1

PICkit™ Low Pin Count Demo Board - DM164120-1

Free CLC Configuration Tool:
www.microchip.com/get/euclctool

Go to www.microchip.com/get/eunew8bit to find out more about low pin-count PIC® MCUs with next-generation peripherals

microchip DIRECT
www.microchipdirect.com

www.microchip.com

MICROCHIP

of modern ERP system. That's why we had to develop our own logic, which could fully use the standard features of ERP, and the specific tasks are being processed by the program we develop by ourselves. Nowadays the main blocks of the system are operating with no problems. Due to that we advanced the production processes, optimized cooperation with suppliers of materials, what as a result allows a precise forecasting the shipment date of the ordered devices. An advanced system of production enables to in time optimize the capacity of all areas, which helps increasing the smooth production flow, and as a result helps decreasing the production time.

The process of production is adapted to produce on special additional requirements of the customer. Lots of devices with non-standard set of main electrical characteristics can be produced, as well as precise grouping of the devices according to some characteristics, for example production of special wire connections.

Undoubtedly order based production is modern and much demanded, but it doesn't mean that we start purchasing the materials and production only after receiving the purchase order. This would lead to increase of production time – the complete cycle of production (starting with purchase of the required materials and finishing with the shipment of the ordered devices to the customer) takes more than 5 months. Supply and preliminary processing of silicon takes at least 3 months, and average production time in our company takes about 6-8 weeks. To optimize the production time we study demand in devices together with the most demanded types of silicon, go through standardization of necessary silicon, work out the forecast of sales with our customers, and plan our own requirements with suppliers. Such system allows us to have the most demanded materials in our storage (or as half-finished product in our production) and complete the orders in very short terms.

Order based production means that our company produces the devices not to keep in storage for the potential customer, but adapt the products to the requirements of a certain customer (so called special requirements). As an example the production of series of thyristors for series and/or parallel connection with low variation in such electrical characteristics as on-state voltage drop, reverse recovery time and charge.

To achieve low variation in the above mentioned characteristics it's necessary to ensure high precision during production of the dopant profiles of the semiconductor layers as well as distribution of life time of the carriers in the layers of the semiconductor elements. Adequacy of distribution of the doping agents is possible due to high level of technology of semiconductor elements production, precise control of carriers' life time is done with the help of electron and/or proton irradiation technology.

Major part in ensuring quick and quality production of power semiconductors plays automation of the production processes. To produce lots of devices based on specific order it's very important to quickly measure the electric characteristics, which is possible by automated measurement units.

To change the characteristics of the produced by Proton-Electrotex JSC modules ATSM automated system is used. It is Proton-Electrotex JSC own development (Figure 3).

The system is used to test the following characteristics:
- high-voltage insulation breakdown
- blocking voltage
- gate characteristics
- Utm at room temperature and at max junction temperature (Tjmax).

It is possible to test all produced devices (modules) with internal commutation and in different cases.
In this system there is the marking reading unit, which can recognize one and two-dimensional bar codes. With the help of this unit the system assigns the test results with certain device. Also the system can automatically label the devices. To ensure this task printer-applicator is used: label is printed right before application.

Transition of devices between units of the system is done by robotic manipulator, which is exclusive development of Proton-Electrotex JSC specialists. The robot is three-dimensional linear manipulator with operating space 3600x1000x400mm and weight-carrying capacity 7,5kg.

Conclusion

Flexible production of power semiconductor devices with possibility of quick production based on customers' specific orders is modern and demanded direction.
Execution of such production with the help of automated systems of planning and record, progressive operating processes, robotic multipurpose equipment, allows meeting the modern demands in power electronics industry.

www.proton-electrotex.com

Figure 3: Automated testing system ATSM

POWER MADE SIMPLE, MADE SMARTER

Being simple is good. Being smart is even better. With Intersil's growing line of power modules, you get both.

Our new 17 Amp ZL9117M combines excellent efficiency with the industry's easiest-to-use, point-and-click configuration GUI. The industry's first fully-encapsulated PMBus-compliant solutions support remote performance monitoring and even re-programming of installed systems around the world.

Whether you're looking for analog or digital power solutions, the only name you need to remember is Intersil. That's just one more way we've made your design job simpler.

intersil™

Full line. Fully encapsulated.

From 4 Amps to 17 Amps, Intersil has the right power module for your design.
Go to intersil.com/powermodules for videos and design resources including eval boards, software, drivers and gerber files.

SIMPLY SMARTER™

▶START DESIGNING NOW

INTERSIL.COM/POWERMODULES

Power Stage 3x3 in OptiMOS™

Technology for more Power Density

This article illustrates the Power Stage 3x3 package introduced by Infineon Technologies. A brief description about the package characteristics is given in the first part of the article. In the second part the benefits of the new package in combination with Infineon`s OptiMOS™ Technology in terms of power density, efficiency and layout are described.

By Paolucci Milko and Peter Blaschitz, Infineon

In today´s notebook market the proliferation of features like HD DVD player, network connections (BLUETOOTH ™, Wireless), USB interfaces, corresponds directly to a sudden increase of voltage regulators. In addition there is a trend ongoing in the mobile computing area to go for smaller form factors. Thin, sleek and light weight notebooks are requested by the end customer and are gaining market shares. Direct consequences are the more challenging area consumption requirements and power constrains. In other words the power density is becoming a more and more important factor. Infineon`s answer to this requirement is the introduction of products in the PowerStage3x3 package.

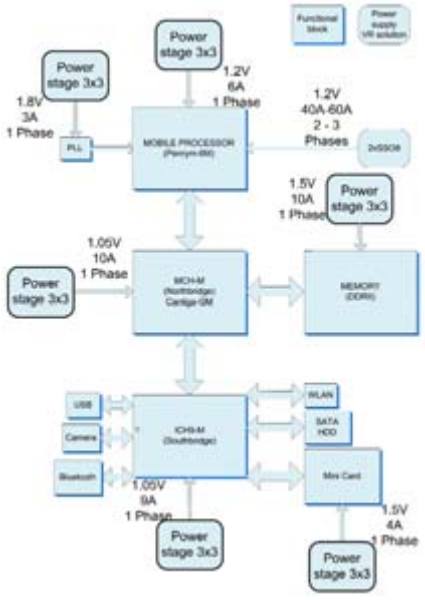


Figure 1: A simplified block diagram of a typical notebook-application

Beside the power supply for the CPU, that requires high current and therefore high power dissipation capability, all other rails are in the range of 5A to 10A. That is where the Power Stage 3x3 fits perfectly.

The typical topology for the power conversion in the above mentioned applications is the buck converter. Today`s standard solution is realized in a 5x6mm (SuperSO8) or 3x3mm (S3O8) package. Figure 2 shows the comparison of the area consumption in a buck converter with one high-side and one low-side MOSFET. With the PowerStage3x3, designers can dramatically save space compared to two single products.

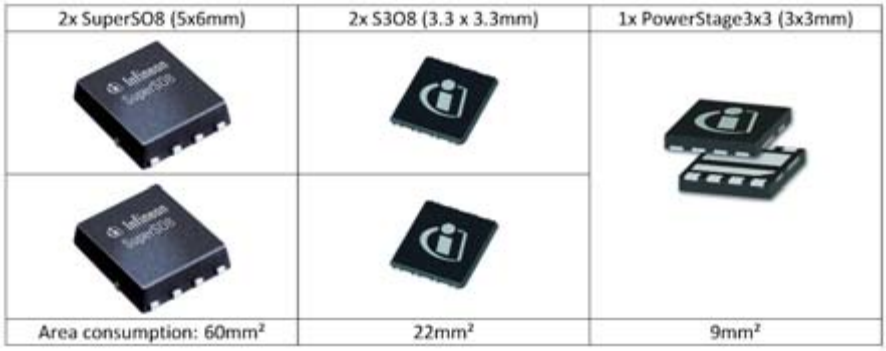


Figure 2: Comparison of area consumption for different packages

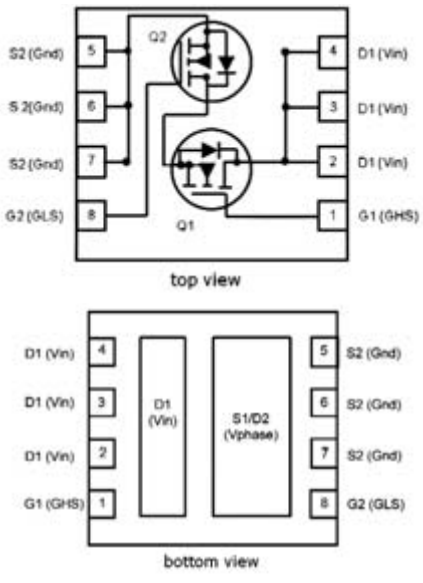


Figure 3: Power Stage 3x3 package outline

Power Stage 3x3 description

The Power Stage 3x3 is a leadless SMD package, which integrates the low-side and high-side MOSFET of a synchronous DC/DC converter into a 3.0 x 3.0mm² package outline with only 0.8mm package height.

On the bottom of the Power Stage 3x3, two separated exposed pads are located which are optimized for the chip size of the low-side and the high-side MOSFET for an advanced power dissipation.

Power Stage 3x3 product family

With the BSZ0907ND and BSZ0908ND Infineon Technologies offers two different products in the Power Stage 3x3 package. Both products are realized in the OptiMOSTM 30V voltage class which targets voltage regulation applications in the computing and telecom segment.

With the low R_{DSON} values in the BSZ0907ND the product can handle 12.5A (without airflow) and more, depending on the cooling conditions in the application.

With higher R_{DSON} values in the high-side and low-side MOSFET, the BSZ0908ND is designed to handle currents in the range of 5-10 Ampere.

The R_{DSON} ratio of both products is adjusted to fit to a broad range of power conversions for different applications and especially for

applications like mobile computing with a conversion from 21V or 16V down to 1,5V. The Q_{GD} of the high-side MOSFET (in both products) is low in order to keep the switching losses balanced with the conduction losses and have very high peak efficiency; this is quite important especially in notebook applications where the system is working in low power range most of the time.

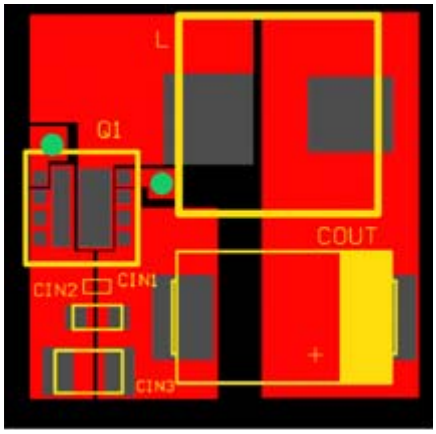


Figure 4: Layout solution with the PowerStage 3x3

A low Q_G is realized in order to preserve a high efficiency at very low load or when the system is in idle state. This helps to maintain the battery charged for a longer time.The very low thermal resistance [55 K/W] allows the products to bring up to 2.3 [W] of power; the interconnection of the chip and the pins are designed to handle high current 30 [A], which can occur in the voltage regulation during load transients.

The Power Stage 3x3 package technology combined with the OptiMOS™ silicon technology offers products with high efficiency in a space saving package outline for currents up to 12.5 Ampere (no airflow) in DC/DC voltage regulation applications.

Performances of the Power Stage 3x3 in the application

The Power Stage 3x3 not only offers a very compact solution for half bridge MOSFETs itself, but also simplifies the layout of the overall buck converter. In figure 4 an easy layout solution with the Power Stage 3x3 is shown. The area for the overall solution is 12mm X 12mm; this very dense layout is possible due to the optimal pin out of the package. The input capacitance can be located easily between the drain of the high side and the source of the low side MOSFET. This minimizes the parasitics of the connections. The two gates of the low-side and high-side MOSFETs can easily be connected to the driver on the bottom of the board through two small vias. The output filter can effortless be accommodated on the right side of the package.

Efficiency measurements

With particular attention to the notebook market, some tests were performed in order to show the package capabilities as well as product performances. The tests are performed mainly in the notebook conditions, but they can also be used as a reference for other applications.

The curves (figure 5) show the efficiency versus output current for two different input voltages: 12V and 21V. In the notebook application 12V corresponds to the operating conditions with a battery (3 cells Li-Ion) and 21V is related to the adapter output voltage.

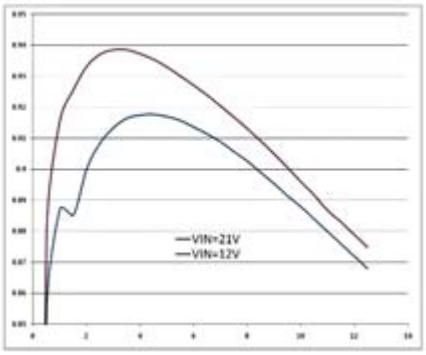
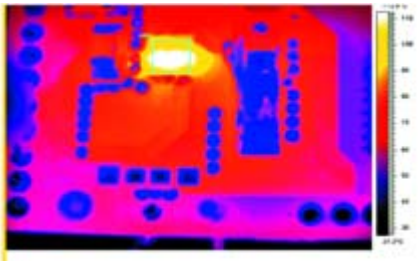


Figure 5: Performance test

Conditions of the measurements
VIN=12V / 21V
FSW=500KHz
VOUT=1.5V
L=1.2uH (Coilcraft SER1590, DCR=0.8 mOhm)
Driver: PX3516
Product: BSZ0907ND

In both cases the efficiency is above 90% in the range of 20% to 80% of the output load. For low load condition (0.5A) efficiency values above 80% can be achieved.



Conditions
- BSZ0907ND
  - Iout=12.5 A
  - Tcase,topmax=110°C
  - Tamb=25°C
  - VIN=21V
  - VOUT=1.5V

Figure 6: Thermal capabilities of the PowerStage 3x3

		VDS [V]	R_{DSON} [mOhm]	Q_G [nC]	Q_{GD} [nC]	COSS [pF]	RTHJA [K/W]	PTOT [W]	ID [A]
BSZ0907ND	Q1	30	10.3	4.3	1.4	220	65	1.9	25
	Q2	30	7.9	5.5	1.7	280	55	2.3	30
BSZ0908ND	Q1	30	21	2.0	0.7	120	65	1.9	15
	Q2	30	10	4.3	1.4	220	55	2.3	30

Table 1: Summary of the most important parameters. (Typical values at 4.5V driving voltage)

Thermal measurements
In figure 6 the thermal capabilities of the package are shown; once a continuous current of 12.5A is applied the top case temperature will not exceed the 110°C.

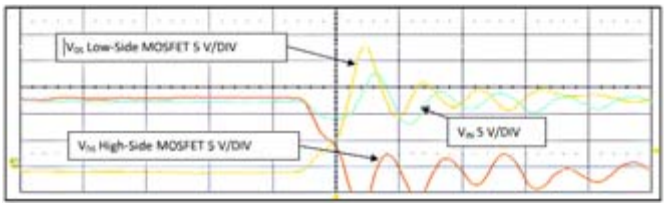


Figure 7: Waveform measurements

Waveforms measurements
In the waveforms (figure 7) are the VDS High-Side MOSFET, Low-Side MOSFET and the input voltage plotted.

Conditions of the measurement:
VIN=12V
FSW=500KHz
VOUT=1.5V
L=1.2uH (Coilcraft SER1590, DCR=0.8 mOhm)
Driver: PX3516

The overshoot (the value of the maximum voltage during the oscillation across the device) on the Low Side MOSFET is 23V which is below of 80% of the VBDSS value specified in the datasheet.

Also the damping factor of the ringing is high in order to have low noise irradiation and therefore a low EMI influence. Especially for equipments with wave transmitters where many logic signals occur (e.g. Notebook) this low noise irradiation gives a great benefit.

Conclusion
The Power Stage 3x3 package combined with the OptiMOS™ MOSFET technology offers an optimized solution for DC/DC voltage regulation in applications with space critical requirements. The thermal capability and the increased damping factor are features which helping to realize a more safe and stable-working design. Power Stage 3x3 products fit perfectly in buck converter architectures where designers target to simplify the layout and significantly save space without compromising on efficiency.

www.infineon.com

CONCEPT
INTELLIGENT POWER ELECTRONICS

Taming the Beast

New 3.3kV SCALE-2 IGBT Driver Core

2SC0535T2A0-33

The new dual-channel IGBT driver core 2SC0535T for high voltage IGBT modules eases the design of high power inverters. Using this highly integrated device provides significant reliability advantages, shortens the design cycle and reduces the engineering risk. Beside the cost advantage resulting from the SCALE-2 ASIC integration, the user can consider to have a pure electrical interface, thus saving the expensive fiber optic interfaces. The driver is equipped with a transformer technology to operate from -55°..+85°C with its full performance and no derating. All important traction and industrial norms are satisfied.

SAMPLES AVAILABLE!

Features

Highly integrated dual channel IGBT driver
2-level and multilevel topologies
IGBT blocking voltages up to 3300V
Operating temperature -55..+85°C
<100ns delay time
±4ns jitter
±35A gate current
Isolated DC/DC converter
2 x 5W output power
Regulated gate-emitter voltage
Supply under-voltage lockout
Short-circuit protection
Embedded paralleling capability
Meets EN50124 and IEC60077
UL compliant

CT-Concept Technologie AG, Renferstrasse 15, CH-2504 Biel, Switzerland, Phone +41-32-344 47 47

www.IGBT-Driver.com

GaN-on-Si Materials Optimised for High Power Electronics

In-situ passivated GaN HEMT structures for enhanced efficiency in power conversion

While GaN-on-Si technology appears as the most attractive and cost-efficient solution for high power switching applications to overcome the Si limits, EpiGaN is offering state-of-the-art material, specifically optimised for state-of-the-art power electronic devices.

By M. Germain, J. Derluyn and S. Degroote, EpiGaN nv

Among clean technologies which are enabling more efficient production, transport or use of energy, power conversion plays an essential role. The need for ever more efficient energy management creates new challenges in power-handling systems. In particular, electronic devices able to handle higher power density, to reduce switching loss, or to operate at higher frequency would offer new solutions for enhancing efficiency, reducing mass and weight of power inverters, such as e.g. motor drives or solar inverters, as well as enabling cleaner more electrical transportation technologies with reduced environmental impact. As Si electronics development is dealing today on how to overcome intrinsic material limitations, wide bandgap technologies are more and more sought as a reasonable alternative to extend Si electronics capability. Among those, GaN deposited on Si substrates (GaN-on-Si) offers the most attractive and cost-efficient solution.

Standard epi-material characteristics, such as crystal properties, are primary essential key performance indicators to specify the epiwafer quality. However, the quality of a given epilayer cannot solely be optimised through crystalline measurements: in particular in GaN technology, the presence of buffer point defects or the filling of surface states directly impact the dynamic characteristics of the switching devices. It is therefore not only important to assess the epiwafer characteristics by material characterization techniques, but also to have an in-depth look into their electrical behavior. After reviewing the potential of GaN-on-Si, we discuss here the different aspects that must be addressed to optimise the GaN epitaxy for superior device performance.

GaN-on-Si: the most cost-efficient solution

The III-nitrides are today very successfully used for optoelectronics. While LED production still essentially occurs on sapphire in wafer diameters below 150mm, (and more often below 4”), an important economical driver for implementing GaN-on-Si in power electronic applications is the possibility to deposit GaN on larger Si substrates diameters, up to 200mm [1].

More than cost savings by enlarging processing area, the availability of large wafer diameters opens attractive perspective to (re-)use existing 150mm or 200 mm fabs. The possibility to develop CMOS-compatible processes significantly reduces the barrier for implementation of this technology. Starting from the right epi-material, it becomes possible, by leveraging on power electronics device design knowledge and packaging aspects, to accelerate the developments of GaN components and their subsequent use in more efficient power inverters. The problem device manufacturers are left with appears to be essentially the material itself: the epilayer quality is indeed setting up the upper limit for device performance.

III-Nitrides: designing the proper heterostructure

While talking about “GaN”, one has to appreciate that a complete family of compound semiconductors, the “III-nitride” family, is actually available for designing complex heterostructures and thus for defining new device concepts. By adding either Al or In to the GaN compound semiconductor, materials with even larger bandgap than GaN can be created, with AlN reaching 6.2 eV, or lattice matched structure such as GaN/InAlN. Ternary or quaternary alloys can easily be deposited by Metal-Organic Chemical Vapour Deposition (MOCVD), an industrial process enabling for accurate interface control and allowing simultaneous bandgap and stress engineering. Combined with proper bandgap engineering, piezoelectric fields in nitrides are responsible, without the need of any extra impurity doping, for the formation of two-dimensional electron gas (2DEG), with high mobility (2000 cm^2/Vs) and high carrier density (10^{13} cm^{-2}). The most successful GaN devices are High Electron Mobility Transistors (HEMT) using this 2DEG as the transistor channel. This channel can also be used for Schottky-like type of devices. As a matter of fact, current density, breakdown voltage, threshold voltage, gate capacitance, switching charges ... are ultimately resulting from the material proper-

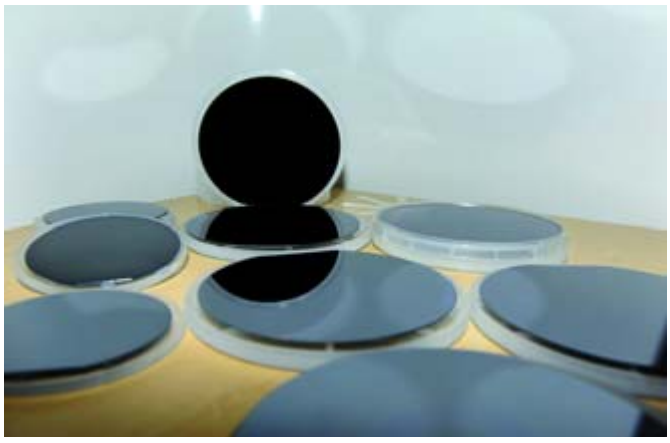


Figure 1: EpiGaN epiwafers: GaN-on-Si 4” and 150 mm wafer diameters.

Rogers Power Electronic Solutions

Visit Us At
APEC 2012
Booth #1009/1011

Powerful Products For Power Electronics

Power Distribution Systems

PDS designs and manufactures high reliability busbars and advanced power delivery systems. Our industry standard RO-LINX series feature UL listed constructions for safety and long life performance. Our *NEW* RO-LINX® PowerCircuit™ busbar delivers both power and circuit functionalities in a single innovative footprint for emerging applications in the (H)EV, Solar, Wind, and Variable Frequency Drive (VFD) markets featuring:

- 3D Capabilities / Assembly Simplification
- Multi-functional – Power / Circuitry Together
- Solder Process Compatible

curamik Product Family

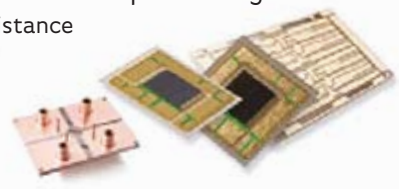
curamik offers the most innovative solutions for your power electronic applications.

DBC Substrates. The availability of different ceramic materials (Al_2O_3 and AlN) with thick copper cladding makes curamik's DBC substrates ideally suited for high power modules.

- High Thermal Conductivity
- Excellent Heat Spreading
- High Insulation Voltage
- Enables Chip On Board

Micro Channel Coolers. curamik's micro channel structure allows customized cooler design with four times the efficiency of traditional liquid cooling

- Optimum Thermal Resistance
- Minimal Pressure Drop
- Excellent Flow Rate



ROGERS CORPORATION
Power Electronic Solutions

www.rogerscorp.com

PDS	USA +1-480-917-6000	EUROPE +32-9-235-3611 ASIA + 65-6747-3521
curamik	USA +1-480-917-6000	EUROPE & ASIA +49-9645-92220

ties themselves and from the design of the epilayer stack. This possibility to fine tune device characteristics at material level opens numerous opportunity to develop high voltage switching electronics, based on field-effect transistors concept.

In EpiGaN, co-founders have optimised GaN material for electronic device purpose, for the last ten years in "imec", an independent international research center in micro- and nanoelectronics located in Belgium. A very fast feedback of device performance results has been used as the key driver for any material optimisation: not only material aspects (such as channel conductivity, defect density...), but also device related aspects (in-situ passivation, dynamic performance, enhancement-mode devices, high voltage operation, power density, operating frequency...) and last but not least reliability aspects have been simultaneously addressed, while paying careful attention to reproducibility of the results.

GaN-on-Si growth optimisation

GaN-on-Si epitaxial growth deals first with strain engineering: the large crystal and thermal mismatch are responsible for the presence of a large strain in the epilayer and in the substrate, leading to bow or even cracks in the wafers. Careful stress engineering in the heterostructure is mandatory to achieve wafers suited to the manufacturing line. Wafer bow well below 50µm (typ. 20-30 µm depending on wafer specs) on 150mm wafer diameter can be achieved. The wafer uniformity is typically below 3%, when controlling either the uniformity of the layer thickness, (see Figure 2) or the uniformity of the electrical characteristics, as shown in Figure 3. Further to stress engineering, the epiwafers are optimised for high voltage/high frequency operation: this imposes two constraints in the material development. First, the buffer of the epilayer must be able to stand very high voltage. It has been shown that the upper breakdown voltage of a GaN-on-Si epiwafer is currently limited not by the resistivity of the GaN layer itself but by the distance between the transistor channel and the Si substrate [2]. Our standard GaN-on-Si epiwafers for high voltage application purpose are designed to show a buffer leakage current well below µA/mm at 600V. Other device structures have been optimised to reach above 1000V. Second, the effect of buffer traps has been reduced to allow for high frequency operation. High frequency operation has been demonstrated on EpiGaN wafers up to 100GHz [3].

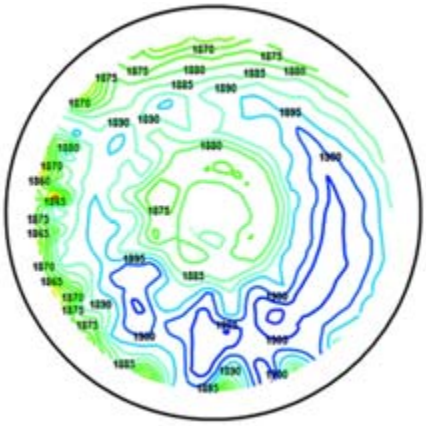


Figure 2: Thickness mapping uniformity obtained by in-situ metrology. σ is 0.6% over the 150 mm III-Nitrides layer, with 5mm edge exclusion.

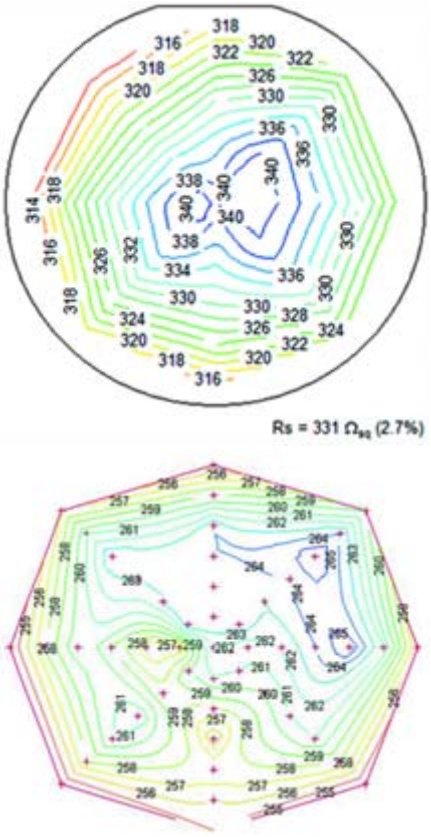


Figure 3: Sheet resistivity Uniformity of 4" GaN-on-SiC and 150 mm GaN-on-Si HEMT epiwafers (different top epilayer design), capped with in-situ SiN

In-situ SiN passivation

However, in III-Nitrides, dynamic behavior often doesn't entirely correspond to the expected performance deduced from DC measurements. This so-called dispersion problem encountered in III-Nitrides may originate not only from buffer traps but also from surface states. As piezoelectric fields are inducing the channel formation, the surface traps, which filling may be modified during processing or during device operation, are actually playing an important role. Uncontrolled charging or discharging of these surface states severely degrades the dynamic properties of the devices. To address surface passivation, a unique in-situ SiN capping layer, which is grown by MOCVD as part of the epitaxy process, is deposited on top of FET wafers. It provides a perfect passivation of the surface states as indicated by the smooth interface between SiN and the top

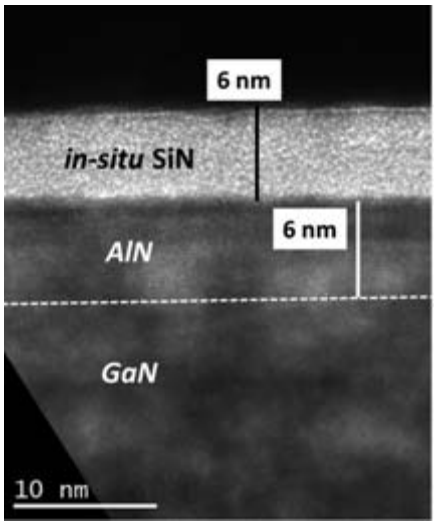


Figure 4: TEM picture of In-situ SiN/AlN/GaN heterostructure, with an electron sheet concentration of 2.15×10¹³ cm⁻² and a mobility of 1250 cm²/Vs. This shows the high quality of the interfaces between in-situ SiN and AlN and AlN and GaN, respectively. (Courtesy : Prof F. Medjdoub, IEMN, Lille, France)

III-Nitride layer (Figure 4). Its use has been shown to properly control the filling of the surface states during device operation. Indeed, the SiN is believed to provide enough charge to neutralize the surface charge of the AlGaN barrier layer, so that its surface potential no longer contributes to 2DEG depletion [4].

The in-situ SiN layer is also shown to be a key parameter for device stability at elevated temperatures, significantly enhancing the device reliability in high temperature accelerated lifetime tests [5].

Lower R_{on}, Higher current density or Normally-off

In-situ SiN further offers a very interesting tool for developing lower channel resistance and thus offers an interesting additional degree of freedom to engineer the top part of the HEMT structure towards different device specifications. As GaN FETs are lateral devices, reducing the conduction loss is actually crucial. In switching applications, in a typical AlGaN/GaN structure, Al rich barri-

PROTON-ELECTROTEX

Power Semiconductor Devices

Have Delivery Time Burning?

Call us. We produce in time.

+7 (4862) 44 06 42, +7 (4862) 44 04 12

inbox@proton-electrotex.com | www.proton-electrotex.com

ers, inducing a higher piezoelectric field when grown on GaN, are thus highly desired for increasing the current density in the transistor, as well as for reducing as much as possible the specific on-resistance. We have shown that thanks to the SiN cap layer, the Al concentration can be increased without any significant material degradation. Contrarily, in uncapped or GaN-capped AlGaN/GaN 2DEG, relaxation of the strained top AlGaN layer typically prevents high Al content in the top layer. The use of in-situ SiN capping appears to postpone the relaxation mechanism of the strained AlGaN onto the GaN. We demonstrated SiN/$Al_{0.35}Ga_{0.65}N$/GaN/AlGaN DHFET with sheet resistance (R_{sh}) well below 300Ω/sq on 100mm and 150mm Si (111) substrates, as shown in Figure 3. The advantages of in-situ SiN passivation are of course independent of the substrate selection: we show in Figure 3 the sheet resistivity mapping of a SiN/AlGaN/GaN HEMT deposited on a 4" SiC substrate, which a uniformity of 2.7%.

In Figure 4, we show a TEM picture of a very low sheet resistivity material, by using thin AlN (6nm) covered by in-situ SiN. For a SiN/AlN//AlGaN design, such as disclosed in Figure 4, the sheet resistance goes down to 235 Ω/sq. Hall measurements show an electron sheet concentration of 2.15×10^{13} cm^{-2} and a mobility of 1250 cm^2/Vs. This results in high transconductance values even for relatively large gate length, opening as well new perspectives for high frequency operation. Further taking into account the role played by SiN to neutralize the surface charges, we have proposed an innovative approach to develop enhancement-mode devices, required for power converters, by combining a thin AlGaN barrier layer and local removal of the SiN under the gate [6]. This represents a nice example of the flexibility offered by the III-Nitride heterostructure to define new device concepts.

Outlook: from 6" to 200 mm and up to 1200V

While 4" and 150 mm high voltage and/or high frequency epiwafers are available today from EpiGaN and while we are ramping up our production capacity by developing our new installation site, EpiGaN is also active developing the next GaN-on-Si wafer generation with diameters of 200 mm, for high voltage (600V-1200V) application purpose.

References:

[1] "Growth of GaN/AlGaN on 200 mm diameter silicon (111) wafers by MOCVD", A. R. Boyd, S. Degroote, M. Leys, F. Schulte, O. Rockenfeller, M. Luenenbuerger, M. Germain, J. Kaeppeler, M. Heuken, Phys. Status Solidi C 6, S1045–S1048, 2009.

[2] AlGaN/GaN/AlGaN Double Heterostructures on Silicon Substrates for High Breakdown Voltage Field-Effect transistors with low On-Resistance ", D. Visalli, M. Van hove, J. Derluyn, S. Degroote, M. Leys, K; Cheng, M. Germain, G. Borghs, Jpn. J. Appl. Phys. 48, 04C101, 2009.

[3] "Beyond 100 GHz AlN/GaN HEMTs on silicon substrate", F. Medjdoub, M. Zegaoui, N. Rolland, Electronics letter, 47, 1345-1346, 2011.

[4] "Excellent Stability of GaN-on-Si High Electron Mobility Transistors with 5µm Gate–Drain Spacing Tested in Off-State at a Record Drain Voltage of 200V and 200°C", D. Marcon, M. Van Hove, D. Visalli, J. Derluyn, J. Das, F. Medjdoub, Jpn. J. Appl. Phys. 49 04DF07, 2010.

[5] "Improvement of AlGaN/GaN high electron mobility transistor structures by in situ deposition of a Si3N4 surface layer", J. Derluyn, S. Boeykens, K. Cheng, R. Vandersmissen, J. Das, W. Ruythooren, S. Degroote, M. Leys, M. Germain, G. Borghs, J. Appl. Phys. 98, 54501, 2005.

[6] " Low leakage high breakdown e-mode GaN DHFET on Si by selective removal of in-situ grown Si_3N_4 ", J. Derluyn, M. Van Hove, D. Visalli, A. Lorenz, D. Marcon, P. Srivastava, K. Geens, B. Sijmus, J. Viaene, X. Kang, J. Das, F. Medjdoub, K. Cheng, S. degroote, M. Leys, G. Borghs, M. Germain, IEDM Tech. Dig. , Baltimore, Dec. 2009, p1-4.

EpiGaN nv, Kempische Steenweg, 293, B-3500 Hasselt, Belgium

info@epigan.com

Ferraz Shawmut is now

MERSEN

We've shortened our name. And increased your expertise in ensuring the safety and integrity of power electronics systems.

Power electronic protection covers a lot of ground, from air- and liquid-cooled heat sinks, to semiconductor fuses and fuse holders, to switches, wire management, and surge protection. Mersen helps you cover all of it. Now we have more products, solutions, and support to help you increase uptime and energy efficiency while protecting equipment — and the people who work with it. Ready for more? It's waiting for you at **fsisnowmersen.com/eu/bps_pe**

mersen.com

Mersen France SB S.A.S.
Rue Jacques de Vaucanson
F-69720 Saint-Bonnet-de-Mure
Tel: + 33 4 72 22 66 11
info.sbm@mersen.com

600 V GaN Based Power Devices

Still early times in the commercialization

The near term commercialization of 600 V rated GaN based power devices by International Rectifier will provide significant improvement in the performance to cost metric available for such electronic systems as ac-dc converters, solar power inverters, as well as motor drives for appliances and electric vehicles. This is made possible through the combination of a cost effective technology platform such as IR's GaNpowIR® and the inherent performance advantages of GaN based HEMTs.

By Michael A. Briere, ACOO Enterprises LLC under contract for International Rectifier

IR's GanpowIR® technology platform is based on the use of AlGaN/GaN high electron mobility transistors (HEMTs) developed on large diameter (at least 150 mm) silicon substrates and fabricated in silicon foundries using CMOS compatible wafer fabrication processes.

The compelling performance of the GaN based power HEMTs is due to the intrinsic high breakdown field strength for the III-Nitride materials of > 1 MV/cm vs. 0.2 MV/cm for silicon. This allows for correspondingly smaller device dimensions, resulting in much lower on-resistance for a given device breakdown voltage. The availability of high electron mobility and relatively high carrier concentration of the two dimensional electron gas (2DEG) is a strong advantage over other wide bandgap material based devices such as SiC JFETs or MOSFETs. Together with the substantially lower cost of fabrication made possible by the silicon substrate based epitaxy and the CMOS compatible device processing, GaNpowIR® based devices are clearly a superior commercial alternative to SiC based devices, at least below 1200 V operation, where the lateral GaN based HEMTs are currently practical to fabricate.

One of the long standing barriers to commercialization of GaN based HEMT power devices has been the instability in performance due to charge trapping in the bulk of the epitaxial layer and at the various interfaces in the device structure. This is particularly severe in these device structures due to the fact that there are few free carriers in the layers around the two dimensional electron gas to shield it from the effects of localized net charges. The density of such charge is altered by the application of large electric fields, as defect related traps change their charge state (e.g. from neutral to charged). The resulting electric fields must terminate on available charges, and here it is for the most part on the electrons in the 2DEG. This in turn alters the density of available conduction electrons in the 2DEG, thereby changing the resistance between the source and drain terminals of the HEMT. This degradation in performance, often referred to as dynamic Rdson (for switches, e.g. power applications) or current collapse (for linear modulation, e.g. RF amplifier applications), is a limiting factor in the commercialization of GaN based devices. It is imperative, therefore, that such effects be minimized or effectively eliminated. This requires optimization of the epitaxial layers, to reduce the available bulk trap densities, the overlying passivation layers to reduce surface traps, as well as the device design, to minimize the applied electric fields for a given device operating voltage. Figure 1 shows the continuous improvement achieved in addressing this technological barrier to commercialization at International Rectifier using the GaNpowIR® platform. As can be seen, the dynamic Rdson effect can be effectively minimized in practical GaN based power devices.

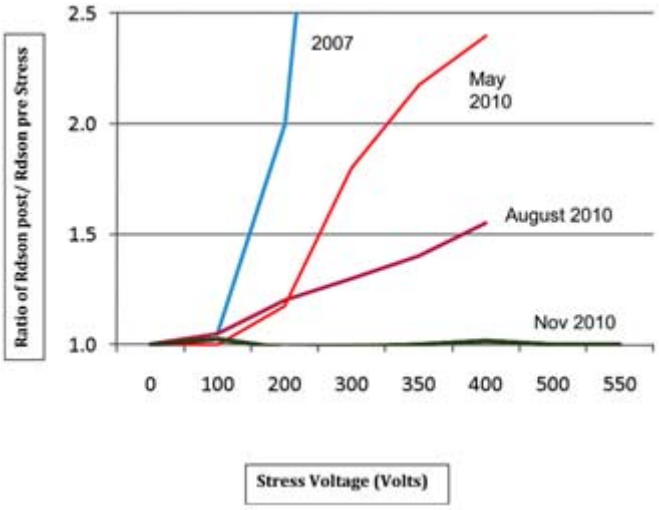


Figure 1: Measured improvement in the dynamic RDS(on) effect, defined as the ratio of RDS(on) post and pre applied reverse bias stress voltage, as measured within 1 us of the transition between the off state and the on state

In addition, the device leakage currents, between the source, drain, gate and substrate terminals are expected to achieve the performance levels of incumbent silicon devices. This has also been achieved in the GaNpowIR® platform, with currents < 0.1 uA/mm throughout the device operating voltage specification. Robust operation under extended reverse bias stress or wide forward biased safe operation (FBSOA) has also been demonstrated.

One major application for 600 V power devices is in offline ac-dc power conversion, including the power factor correction (PFC) circuit. This function is most often implemented using a single inductor based boost circuit involving a 600 V rated switch and rectifier pair, usually operating at switching frequencies between 20 to 100 kHz. The rectifier is predominantly a fast recovery silicon p-n diode, though SiC based Schottky or merged p-n/Schottky diodes have found a niche in high end applications. The well established advan-

tage of the wideband based rectifier is the lack of minority carriers and therefore the significantly improved reverse recovery behavior and corresponding switching loss and noise reductions. The latter allows for the elimination of noise filtering snubber circuits, thereby reducing overall circuit complexity and costs. This benefit is shared for GaN as well as SiC based devices. The substantially lower cost of the GaN based technology will result in a much wider adoption of these benefits. Today, the switch is most often a silicon based superjunction FET, since the frequency is too high for most silicon based IGBTs to be used, due to high associated switching losses. As even early prototype GaN based switches provide significantly lower on resistance, as well as much lower input and output capacitances, compared to state of the art superjunction devices, the GaN based devices switch much faster, and cleaner, than the silicon counterparts, resulting in lower switching losses. Figure 2 shows the significantly improved energy conversion efficiency of a 430 W PFC boost converter (including all losses) when using prototype GaN based switches instead of a state of the art silicon based superjunction FETs.

Another major application for 600 V power devices is motion control. Generally, silicon based IGBTs are used together with optimized silicon based diodes in the half bridge power legs for such applications. In principle, since GaN based HEMTs are bi-directional in nature, motor drives could be developed without the further need of the companion diodes. However, for the sake of simplicity, drop in replacement GaN switches can be used in current circuit topologies. Once again, the GaN devices exhibit lower on-resistance and capacitances and most dramatically the lack of minority carrier effects, so prominent in the behavior of bipolar devices such as the IGBT. This provides dramatically reduced losses in the inverter circuit as shown in Figure 3, in terms of conduction*switching losses.

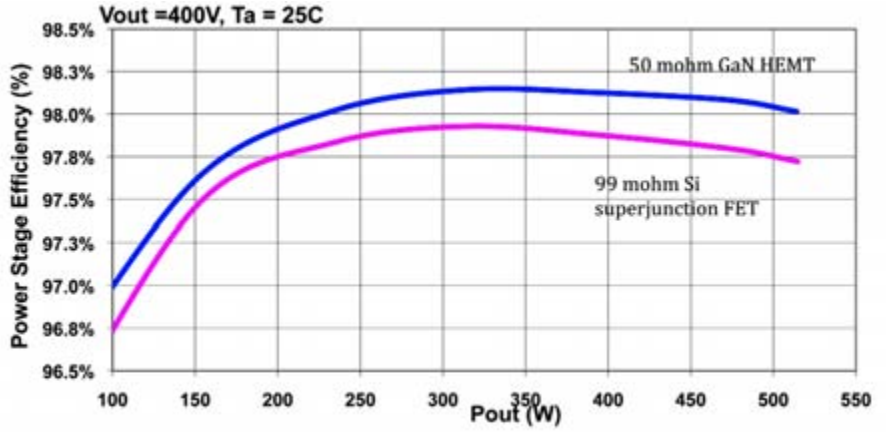


Figure 2: Significantly improved energy conversion efficiency of a 430 W PFC boost converter (including all losses) when using prototype GaN based switches instead of a state of the art silicon based superjunction FETs.

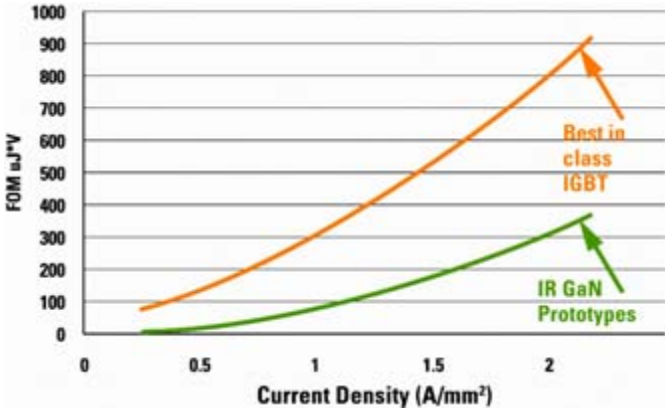


Figure 3 : Measured performance comparison between state of the art 600 V rated silicon based trench IGBTs and prototype first generation 600 V rated GaN based devices in terms of conduction switching loss figure of merit [Von*(Eoff+Eon)] vs current density at 25ºC.*

Though these are still early times in the commercialization of GaN based power devices, it is clear that the combination of significantly higher performance at competitive costs will likely revolutionize the power electronic industry.

PowerSMART™ Design Tool Improves Design Flexibility and Reduces Design Time

The design tool enables the user to program the controller and optimize its performance

Designing a modern SMPS that balances key metrics such as cost and size, while meeting the design's requirements and engineering schedule can be a challenging task, even for experienced power supply design engineers. Although achieving the basic characteristics of the power supply may be relatively straightforward, there are many inherent aspects of the design that are both complex and time consuming.

By David New, Director, Product Marketing, Powervation

The use of digital control ICs for the control of power supplies is one technology that is helping designers. Coupled with an intuitive GUI-based design tool, digital control ICs are able to help to reduce design complexity, and allow greater design flexibility, while helping to reduce design time.

Most existing power supplies are still based on analog technology. However, new digital power management solutions are emerging from companies such as Powervation. Powervation has developed a unique architecture for single and multi-phase DC/DC converters; this system-on-chip (SoC) solutions consist of an ultra-lean proprietary dual core processor (DSP and RISC), both RAM and non-volatile memory (NVM), power conversion blocks, SMBus serial interface to support the use of PMBus™ commands, ADC and DAC, and timing sources. This mixed-signal digital power management controller, with its on-board processing power and memory, combines power management and mixed-signal functions, and is able to store and run computational algorithms in firmware. The architecture also allows the digital controllers to be extremely flexible in their configuration, and for users to easily store (in memory) a large number of parameters used in the design of switch mode power supplies – thus maximizing configuration flexibility while eliminating external components.

To unlock the power and flexibility of this architecture, Powervation has developed a graphical user interface (GUI) based design tool called PowerSMART™, the Setup, Monitor, And Reporting Tool for the design of digital power converters. Users of PowerSMART quickly realize the advantages over traditional solutions based on analog controllers and external programming components. As programming of Powervation's controllers is managed via a digital interface (over the SMBus lines), the controller is not "pin limited" and does not require the use of external programming components. From the user's point of view, more features are accessible, they no longer need to add/change external programming components during the design phase, and with PowerSMART's GUI-environment, coding, calculations, and design tool specific training are eliminated.

The PowerSMART tool allows users to communicate with and configure the Powervation digital power control ICs (e.g., PV3012) from PC & MAC platforms using a standard USB connection. The design tool enables the user to program the controller and optimize its performance, while carefully monitoring key power supply status parameters. Users may use the tool to make simple point-and-click or numeric entry changes to parameters and quickly configure/power-up the power supply. Additionally, users may take advantage of its advanced settings to access more than 60 parameters (including switching frequency, phase add/drop transition points, VOUT level, and protection and fault limits) and finely tune the features to their specific needs within the GUI environment, with precision and flexibility beyond that of hardware programmed analog-based solutions.

The GUI-based design tool can connect and control multiple devices in a system concurrently (addressing support for up to 112 devices). For a single device used in a single- or dual-phase converter, users will utilize the Single Mode feature of the design tool. The PowerS-

MART design software also provides a System Mode feature where multiple Powervation devices can be used in parallel to control a multi-phase converter (e.g., 6 phases), and multiple Powervation devices can be used within a common platform to provide power management for multiple rails and the sequencing of these rails.

The framing of the GUI display provides status and fault indicators that are available to the user at all times. The main PowerSMART display page has been designed to provide a heads-up view of VOUT, VIN, and IOUT against a time axis, so that users may view these key parameters the way engineers typically see them displayed on today's popular digital oscilloscopes. Additionally, the Monitoring indicator box on the main page summarizes, numerically, the current telemetry information for temperature (IC and external sensors), current, and voltages, giving the user easy access to this data for both design and debugging activities.

During the design stage, the GUI-environment allows users to easily select and program the desired parameters, while helping users fully utilize the capabilities of our digital controllers without coding or training. From engineers that desire to use the tool's automatic setup, to users that need advanced optimization and access to dozens of parameters, the software supports a wide range of users. Additionally, Powervation's control ICs, such as the recently-launched PV3012, are equipped with Powervation's Single Pin CONFIG™ technology that provides the user access to eight configuration tables, or profiles, within the IC's non-volatile memory. Each of the eight configuration tables can be configured within the tool, and allows the user access to more than 60 parameters (e.g., VOUT settings, switching frequency, slew rate, VOUT tracking, protection feature set-points, master/slave, etc.) that may be used when designing a power supply. Using the device's on-board configuration profiles allows a single controller to be used in up to eight converters, and eliminates the need to configure the part through PMBus or via multiple external programming components. The PowerSMART tool provides users flexible access to this feature, and many more, in a simple and intuitive environment, that has been designed to be usable for engineers new to digital power, as well as those already well on their way.

www.powervation.com

Silicon Carbide Thyristors usher in the Smart Grid Revolution

These devices offer near-theoretical, on-state blocking voltage and switching performance

Global demand for high-efficiency, green energy technologies and products has placed new challenges on the electrical grid, on efficient exploitation of renewable energy resources, and on electric-based solutions for ship systems. All of these applications require ultra-high-voltage power devices (to reduce energy loss) with high-frequency ratings (to reduce system size, weight, and volume).

By Ranbir Singh, GeneSiC Semiconductor,
43670 Trade Center Pl, Suite 155, Dulles, Virginia 20166, USA.

Annually, over $2 trillion of electricity is processed through the U.S. electric grid. Thus, even relatively small improvements in system efficiency represent tremendous economic and environmental benefits. By increasing power electronics efficiency, advanced interconnection technologies widen the practical end use of fuel cells, photovoltaics, wind power, batteries, superconducting magnetic storage, adjustable speed drives, and efficient power supplies. It is well recognized that silicon-based semiconductors have inherent limitations that reduce their suitability for use in utility-scale applications. Power electronics applications including static transfer switches, dynamic voltage restorers, static VAR compensators (SVCs), high-voltage direct current (HVDC) transmission, and flexible alternate current transmission systems (FACTS) will become economically feasible. Some of these applications require voltage-blocking capabilities in the tens and hundreds of kV, and thousands of amperes.

Figure 1 shows the future vision by Electric Power Research Institute (EPRI, San Jose CA) for applications of Thyristors in Smart Grids.

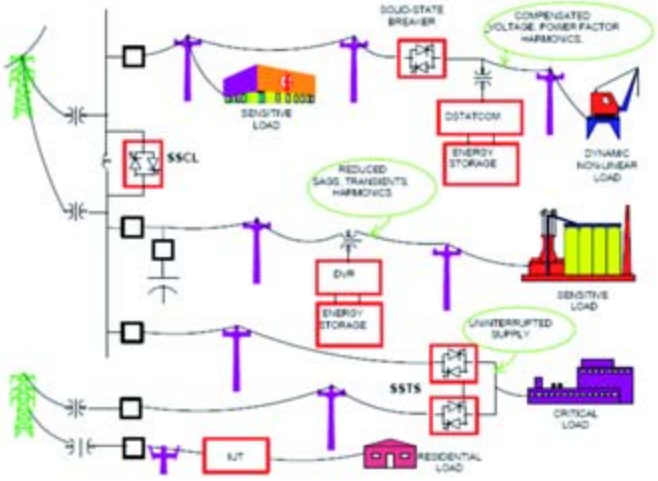


Figure 1: Solid-state current limiters, energy storage elements and solid-state breakers play a critical role in future vision of Smart Grid power electronics based technologies.

According to this futuristic vision, the growth in the generation of electrical energy, increased penetration of distributed resources, and increased interconnection of the networks will lead to higher incidence of faults. The growth in capacity requires replacing existing circuit breakers with higher fault-current ratings results has a significant impact on cost and down time.

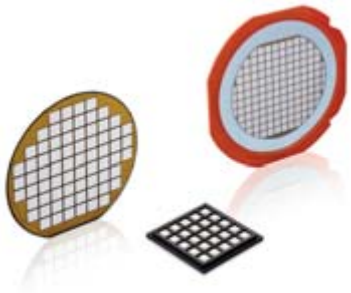
Utility-Scale Power Semiconductor Devices

All utility-scale power electronics systems in use today rely on silicon-based semiconductor switches to perform their functions. Indeed, for over five decades, silicon-based semiconductors have been the power device of choice for most, if not all, high power applications. In particular, silicon-based insulated-gate bipolar transistors (IGBTs) and gate turn-off thyristors (GTO s) have been the dominant semiconductor switches for high-power applications, and technology improvements over the last several decades have resulted in consistently higher power levels for these devices. Nevertheless, silicon-based semiconductors have inherent limitations that reduce their suitability for use in utility-scale applications. These limitations include a low-voltage blocking capability, low switching speeds, and a limited junction operating temperature. Although switch-mode power supplies (e.g., pulse-width modulation-based converters), which feature greater control capability and provide better conversion efficiency, have been developed in the last two decades and have changed the way power is converted in many high-power applications, utility scale applications would directly benefit from the development of semiconductor switches with higher voltage blocking capability and a higher junction temperature (greater than 100oC). Presently, the three challenges power conversion elements face are thermal management of semiconductor losses generated during system operation;

large stacks of high-voltage devices required to be usable in >4.16 kV line voltages; and slow speed (<4 kHz) prevents widespread use of pulse width modulators (PWM) circuits to maintain power quality.

Recently, new, wide-band-gap materials such as silicon carbide (SiC) have become attractive alternatives to silicon for semiconductor switches. These materials offer the potential for higher switching

SPT™ IGBT chipsets. The reference for demanding power applications.



SPT™, which includes SPT and SPT+ technology, is a trademark of ABB's planar BiMOS platform and is used to infuse even more power into the chips. To best serve demanding applications, our high voltage IGBTs and diodes are individually tested for their dynamic and static parameters. For more information please visit our webpage: **www.abb.com/semiconductors**

ABB Switzerland Ltd
ABB s.r.o.
www.abb.com/semiconductors
m.abb.com

Power and productivity
for a better world™

speeds, a higher breakdown voltage, lower switching losses, and a higher junction temperature than traditional silicon-based switches. SiC-based diodes are coming on the market now and switching devices with increased capabilities are currently being developed. Higher voltages and higher operating temperatures pose numerous development challenges which must be resolved before commercial systems can be built. These devices offer all of the advantages of SiC-based devices as well as improved voltage standoff capability, increased operational flexibility, and higher current carrying capability than traditional silicon-based devices.

SiC-based Thyristors offer 10X higher voltage, 100X faster switching frequencies and higher-temperature operation compared with conventional Silicon-based Thyristors. Targeted research applications include general-purpose medium-voltage power conversion (MVDC), grid-tied solar inverters, wind-power inverters, pulsed power, weapon systems, ignition control, and trigger control. Ultra-high-voltage (>10 kV) SiC device technology will play a revolutionary role in the next-generation utility grid. SiC-based Thyristors also offer the best chance of early adoption due to their similarities to conventional power grid elements. Deploying these power semiconductor technologies could provide as much as a 25–30% reduction in electricity consumption through increased efficiencies in the delivery of electrical power.

Figure 2: GeneSiC recently introduced 6.5kV-class Silicon Carbide Thyristors to researchers investigating utility-scale power conversion circuits.

The utilization of a single-chip packaged ultra-fast, high-temperature 6.5 kV SiC GTO Thyristor module will revolutionize electricity delivery, renewable energy integration, and energy storage technology. GeneSiC recently introduced world's first commercially available, high-voltage, high-frequency, high-current, high-temperature, single-chip devices with ratings exceeding 6.5 kV, 200 kHz (pulsed), 80 A, and 200oC, as shown in Figure 2. As compared to other commercial SiC devices—which comprise of only two terminal rectifiers—these devices offer much higher (3–4X) blocking voltages and current/voltage control capability. As compared to Silicon Thyristors, SiC Thyristors offer much higher switching speeds (100–1000X) and higher temperature operation (up to 300oC, versus 125oC). These advantages result in exceptionally high usability and efficiencies in next-generation power circuits.

Design of Silicon Carbide (SiC) Thyristors

SiC Thyristors control large amounts of electrical power (Voltage, Current) through high- frequency switching of high voltages, currents at high temperatures. SiC is a novel, wide bandgap material which offers the realization of semiconductor devices that can offer an order of magnitude higher rating as compared to silicon. However, the design and fabrication techniques required to fully exploit this important material system is extremely challenging.

As shown in Figure 3, SiC Thyristors are three-terminal, bipolar-mode devices (as compared to uncontrolled two-terminal, unipolar devices such as diodes) that use diffusion physics of operation relying on minority carrier transportation during on-state operation. Minority carrier transportation allows much lower on-state voltage for >3 kV power devices as compared to unipolar power devices. In contrast to commercially available SiC unipolar Schottky diodes, three terminal devices like SiC Thyristors are critical towards actively controlling electrical power.

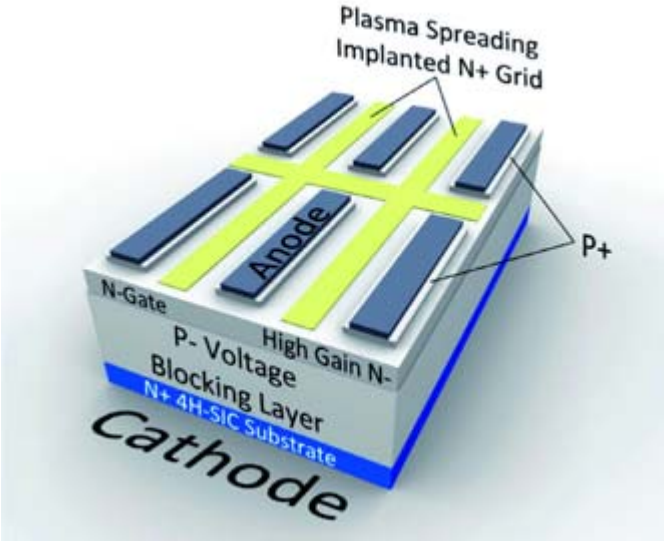


Figure 3: SiC npnp Thyristors have their three electrical terminals–Anode and Gate regions on top, and Cathode contact at the bottom. Various SiC layers and their doping types from the top are P+ Anode layer, N-type Gate layer, P- blocking layer, and the N+ Cathode layer. The rated voltage is supported between with n-Gate/p-blocking layers, so that the p-blocking layer doping and thickness primarily determines the breakdown voltage of the device.

When no current flows through the gate-anode junction, the device blocks a high voltage in both the forward and the reverse bias. To turn the device on, a trigger current flows through the Anode-Gate junction, thereby activating the inherent Anode-Gate-P-based transistor. This gate current is amplified to supply the gate current to the other inherent N-Gate/P Blocking and N-Cathode transistor. This leads to a turn-on of both inherent transistors by a regenerative action. A Thyristor conducts a large current between the Anode and Cathode terminals with little forward voltage drop in this condition.

To turn the device off, the Gate-Anode junction is reverse biased for a short period of time by the application of an external current pulse. When a sufficient loss of minority base current occurs through the gate terminal of the pnp transistor, it turns off and stops supplying gate current to the npn transistor as well. Hence, the npn transistor also turns off. The device is capable of supporting a large anode-Cathode voltage under this condition. A high-performance thyristor developed here offers withdrawal of the gate charge more effective through stringent design of the Gate-anode layout design, The gate contact must surround the anode region everywhere and must be closely spaced. The developed thyristor provides highly inter-digitated Gate-anode patterns, like the involute patterns, as shown in Figure 4. Additionally, it has an implanted n+ type region below the gate contact of the device. this makes the extraction of gate charge from the pnp transistor more eff ective during the turn-off of the device, thereby requiring a smaller gate current requirement for both turn-on and turn-off .

SEMIKRON
innovation+service

SKiN Technology
Wire bond-free

Reliable and space-saving packaging technology for power semiconductors

- Free from thermal paste and solder
- 10 x higher power cycling
- Current density of power unit doubled: 3 A/cm²
- For 35% smaller inverters

SKiN Technology

Standard
Technology

■ **Australia** +61 3-85 61 56 00 ■ **Brasil** +55 11-41 86 95 00 ■ **Cesko** +420 37 80 51 400 ■ **China** +852 34 26 33 66 ■ **Deutschland** +49 911-65 59-0 ■ **España** +34 9 36 33 58 90 ■ **France** +33 1-30 86 80 00
■ **India** +91 222 76 28 600 ■ **Italia** +39 06-9 11 42 41 ■ **Japan** +81 68 95 13 96 ■ **Korea** +82 32-3 46 28 30 ■ **Mexico** +52 55-53 00 11 51 ■ **Nederland** +31 55-5 29 52 95 ■ **Österreich** +43 1-58 63 65 80
■ **Polska** +48 22-6 15 79 84 ■ **Russia** +7 38 33 55 58 69 ■ **Schweiz** +41 44-9 14 13 33 ■ **Slovensko** +421 3 37 97 03 05 ■ **Suid-Afrika** +27 12-3 45 60 60 ■ **Suomi** +358 9-7 74 38 80 ■ **Sverige** +46 8-59 4768 50
■ **Türkiye** +90 21 6-688 32 88 ■ **United Kingdom** +44 19 92-58 46 77 ■ **USA** +1 603-8 83 81 02 **sales.skd@semikron.com** **www.semikron.com**

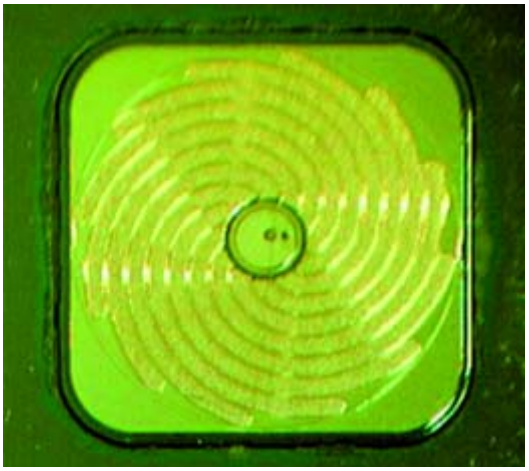


Figure 4: Various Anode-Gate inter-digitations patterns of the Thyristor structure were explored during the development of these Thyristors. An involute pattern shown here was found to provide the best switching performance. In this chip structure, a central Gate terminal provides trigger currents to turn on this Thyristor by flowing the impressed gate current through equidistant Anode-Gate fingers.

Operation of SiC Thyristors

SiC Thyristors developed by GeneSiC were turned on by increasing the Gate current in 10 mA steps until the device latched on, while keeping the VAK bias fixed at 5 V. A very low Von of 3.8 V and a differential specific on-resistance of 2.55 m?-cm2 at 100 A/cm2 was measured on the 4.1x 4.1 mm Thyristors, indicating a high-level of conductivity modulation of the p- drift region and the achievement of low contact resistances, especially for the p+ Anode contacts. Some devices were found to block voltages in excess of 8.1 kV (an example curve is shown in Figure 5 (a)). This represents > 84% of the theoretical (unipolar) breakdown voltage of 9700 V for the p- epilayer used for fabrication. This result was made possible by the optimized edge termination and passivation schemes utilized for fabricating these Thyristors. A histogram of forward blocking voltages measured on all devices from a 3 inch wafer is shown in Figure 5 (b). It was found that 85% of all 8.1x8.1 mm devices blocked voltages in excess of 6 kV. After packaging the Thyristors, high-current (up to 50 A) measurements were performed at in the 25-200oC temperature range.

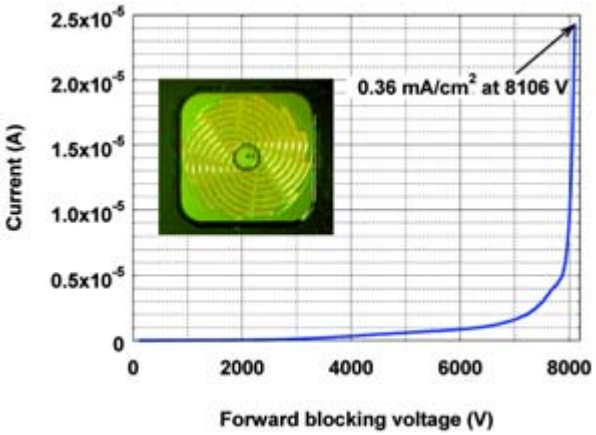


Figure 5a: Forward blocking voltage measured on a representative 4.1x4.1 mm involute GTO Thyristor

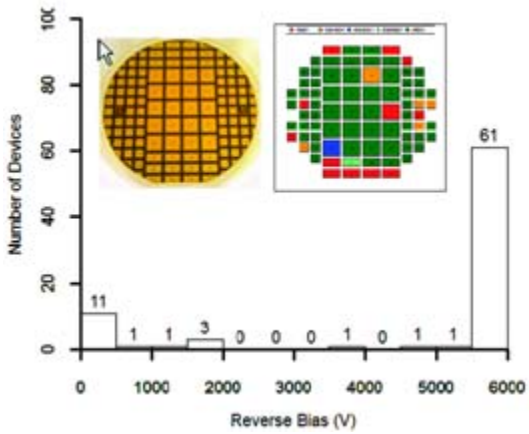


Figure 5b: Histogram of forward blocking voltages measured on all devices from a 3" SiC wafer. A photograph of the wafer is shown as an inset.

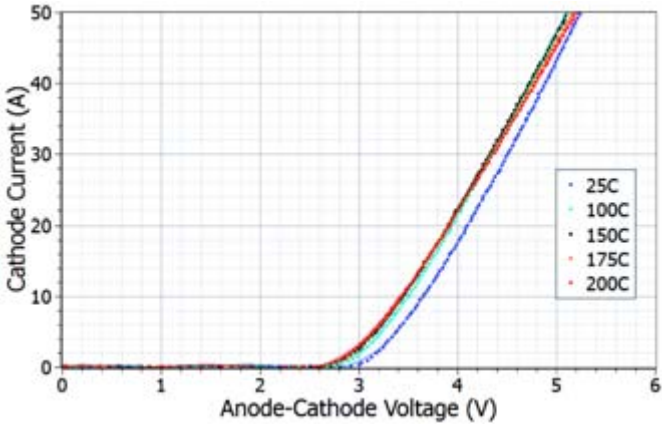


Figure 6: High-current I-V measurement performed on a packaged 8 kV SiC Thyristor.

Forward I-V measurements performed at different temperatures on a 4.1 x 4.1 mm packaged Thyristor are shown in Figure 6. The on-state measurements were performed by ramping the Anode-Cathode bias and the triggering the device into its on-state by the application of Gate current. The built-in voltage decreases slightly with increasing temperature, whereas the on-resistance shows a gradual increase with temperature.

SiC Thyristors are used to switch very high voltages and very high currents. Figure 7 shows the Anode-Cathode Voltage, Anode-Current and Gate-Current pulse waveforms of a SiC Thyristor turning off 16 A of anode current in a unity-gain turn-off condition. Here, the entire anode current is extracted from the gate terminal to turn-off the Thyristor. Initially, the Thyristor is blocking a VAK of 2000 V, following which it is triggered to its on-state by applying a gate current pulse of 2.4 A. For turning off the device, the anode current is switched off using an external MOSFET and the entire anode current is commutated to the gate electrode and the Thyristor turns off like an open-base npn transistor. It can be seen that a unity gain turn-off condition is established here (IG = IAK). The total turn-off time was measured to be 1.5 ìs. The entire turn-on and turn-off transient takes less than 4 ìsec, indicating that the device is capable of a pulsed switching frequency of >250 kHz.

High Power IGBTs

We never sell a product alone
It always comes with Quality

		I_C	1200V	1700V	3300V AlSiC Baseplate
1-Pack	 130 x 140 mm	800A			●
		1000A			●
		1200A	●	●	
		1600A	●	●	
	 140 x 190 mm	1200A			●
		1500A			●
		2400A	●	●	
		3600A	●	●	
2-Pack	 130 x 140 mm	600A	●	●	
		800A	●	●	
		1200A	●	●	
	 89 x 172 mm	600A	●		
		650A		●	
		900A	●		
	 89 x 250 mm	1000A		●	
		1400A	●	●	

FUJI ELECTRIC EUROPE
e-Front runners

Fuji Electric Europe GmbH
Goethering 58 · 63067 Offenbach am Main · Germany
Fon +49 (0)69 - 66 90 29 0 · Fax +49 (0)69 - 66 90 29 56
semi-info@fujielectric.de . www.fujielectric.de

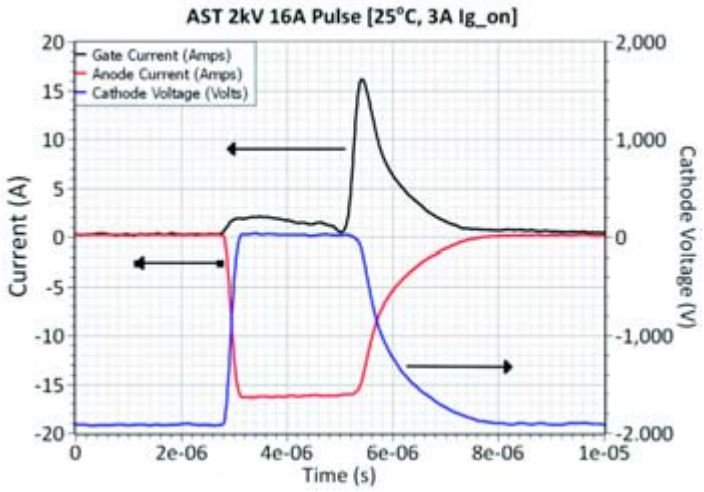


Figure 7: A Silicon Carbide Thyristor being switched under a unity-gain turn-off condition. In this plot, the SiC Thyristor undergoes a switching between 2000 V and 16 Amperes of current.

Conclusions

Although bipolar devices in Silicon Thyristors have been known previously, bipolar devices in Silicon Carbide have been demonstrated to operate in somewhat unexpected performance levels (e.g., 1000X lower minority carrier charge; lower temperature-dependence). These new modes of operation were verified and optimized upon by GeneSiC researchers through this commercial offering. These commercial devices offer near-theoretical, on-state blocking voltage and switching performance as compared to anything that has ever been demonstrated before, even in a laboratory.

Silicon Carbide Thyristors not only improves on the competition, but it is a revolutionary step towards power electronic system integration. GeneSiC's Thyristors offer unique and pioneering performance advantages as compared to any competing technologies. In the near future, power semiconductor switches applicable towards power conversion tied to the power grid are likely to be SiC-based Thyristors due to their high-voltage capability, high-temperature capability, and fast switching speeds.

www.genesicsemi.com

MAKING MODERN LIVING POSSIBLE

Drive happy while staying cool
Reliable power density for tomorrow's vehicles

It cannot be stressed enough: efficient cooling is the most important feature in power modules. Danfoss Silicon Power's cutting-edge ShowerPower® solution is designed to secure an even cooling across base plates. In addition, our modules can be customized to meet your automation requirements in detail, offering low weight, compact design, extended life and very low lifecycle costs. In short, when you choose Danfoss Silicon Power as your supplier you choose a thoroughly tested solution with unsurpassed power density.

Please go to http://siliconpower.danfoss.com for more information.

http://siliconpower.danfoss.com

Cost-Effective 3-Line Filters for Frequency Converters

TDK-EPC, a group company of the TDK Corporation, presents a new series of EPCOS 3-line EMC filters for frequency converters and other power electronics applications. The use of improved materials has led to a particularly cost-effective design of these input filters.
All types of the B84143*166 series have UL/CSA approval and are designed for currents of 10, 20 or 35 A at rated voltages of 520 or 300 V AC. These filters satisfy protection class IP20 specifications and are suitable for operating temperatures of up to 50 °C. Their electrical design is optimized for short motor leads of up to about 10 m to industry limit value class C2. These new filters are contacted via tab connectors or clamp terminals, depending on the type.

www.epcos.com/emc

High Brightness LEDs in Low-Voltage Lighting Applications

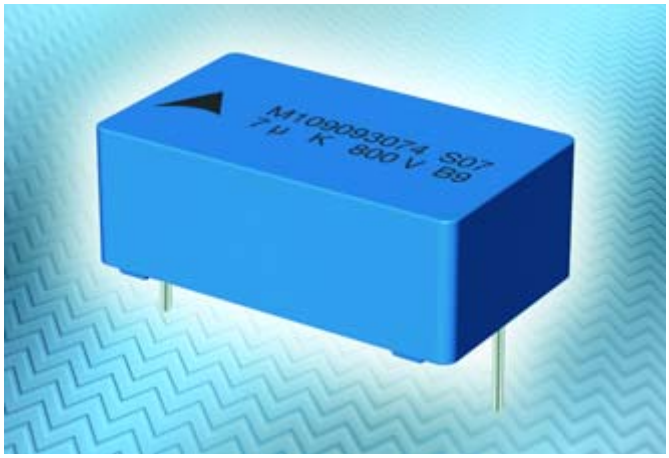
ZMD AG, a global supplier of analog and mixed-signal solutions for automotive, industrial, and medical applications, is introducing its first step-up converter with integrated 35 V power switch for high brightness LEDs. It is optimal for driving multiple white LEDs connected in series from a low voltage supply. The ZLED7015 can also drive devices that require a constant voltage and the wide input voltage range of 6V to 30V supports applications with input voltage from multi-cell batteries or regulated 12V and 24V power rails. A low voltage feedback mechanism helps maximize the operating efficiency and the device's soft-start function and open circuit detection protects the application circuit and extends the LED life.

The low voltage, constant current operation makes the ZLED7015 an ideal choice for safety extra-low voltage (SELV) applications with less than 24V in damp environments. The device is also an ideal driver for multi-faceted reflector (MR16) lamps, frequently found in residential and retail lighting applications. Other key application areas include low voltage retrofit lighting, replacement tubes, LED backlighting, aftermarket automotive lighting products, low voltage general purpose industrial and consumer applications, as well as signage, outdoor, architectural and building lighting.

www.zmdi.com

Wide Range Film Capacitors With Low Insertion Height

TDK-EPC, a group company of the TDK Corporation, has developed a wide range of EPCOS MKP and MKT film capacitors with low insertion heights. The new capacitors of the B32*6T series with a lead spacing of 37.5 mm feature insertion heights of only 15 or 19 mm. These components are designed for rated voltages of between 63 and 2000 V DC or 250 to 400 V AC. Their capacitance ranges from 0.1 to 82 µF. Depending on type and technology (MKT or MKP), these capacitors are designed for maximum operating temperatures of 105, 110 or 125 °C.

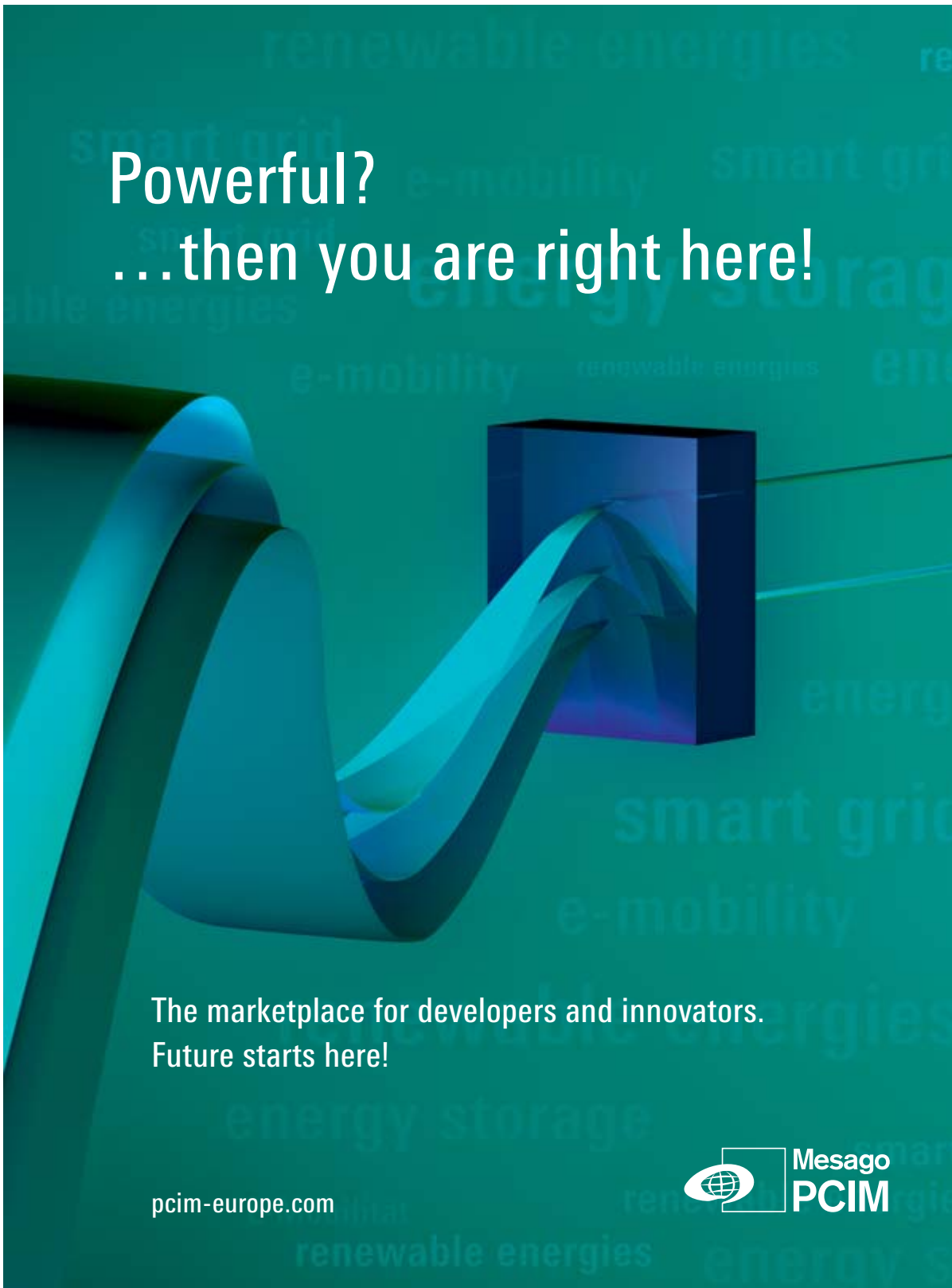


Applications include DC link circuits as well as DC or AC filtering in converters and power supplies. Their reduced insertion heights make these capacitors especially suitable for applications that require a low-profile design for constructional reasons. These include induction cookers, photovoltaic micro inverters, power supplies for flat-screen TV sets and LED lighting. Thanks to their low insertion heights, they offer very high mechanical resistance to vibrations and shocks, making them equally suitable for subassemblies in automotive electronics.

www.epcos.com/film_capacitors

PCIM
EUROPE

International Exhibition and Conference
for Power Electronics, Intelligent Motion, Power Quality
Nuremberg, 8 – 10 May 2012



LEDs and LED Driver Packages for Advanced Indicator Applications

ROHM Semiconductor announced its new low current, high brightness chip LED SMLx family featuring various package sizes and colour ranges for usage in advanced automotive cluster and indicator applications.
Due to the increasing number and enhanced performance of indicator applications, LEDs have to meet high expectations in terms of efficiency, luminous excellence, low power and reliability. Based on a big variety of packages, an excellent heat radiation and high brightness parts, ROHM's new line-up ideally complies with these particular needs. In addition, the new SMLTx , SMLMs and SMLZ families are able to emit OEM colours such as blue lagoon, ice blue, sapphire blue and blue green, including InGaN-based pure green. Different package types and sizes provide designers with a wide range of devices in order to facilitate the optimum solution for their LED design.

With the development of its new BD8377 LED driver series, ROHM is able to provide a complete design solution for indicator lights in automotive cluster applications. This new IC is a 12 channel 50mA/ch LED driver in a small SSOP-B20 package. It supports cascade connections in order to increase the number of channels and the number of LEDs which can be driven and controlled. Also the devices features a 35V DMOS Open Drain output MOSFET for multiple driving and efficient power saving as well as low EMC noise with an output slew rate of 20V/usec.
The BD8377 is the first product of a new family of Automotive Indicator LED drivers. ROHM is already developing the next generation versions of this driver which will expand the feature set by adding advanced diagnostic and dimming functions.

www.rohm.com/eu

LDO Simplifies Powering Noise Sensitive RF Applications

Exar Corporation (Nasdaq:EXAR) released the XRP6272, a new low noise high performance LDO for up to 2 Amps point-of-loads. Supporting a single 1.8V to 6V wide input voltage rail, the XRP6272 provides a 2 Amps point-of-load with an adjustable output voltage. It is equally capable of delivering power from as low as 0.7V for core voltage to a 5V for RF circuitry. Very low output noise combined with a high Power Supply Rejection Ratio (PSSR) makes it the ideal device for noise sensitive applications. The XRP6272's very low quiescent current provides enough versatility and performances to be used in portable equipment.
Capable of a constant output current of up to 2 Amps, the XRP6272 supports a wide 1.8V to 6V input voltage range which allows for single supply operations from numerous industry standard power rails as well as the dedicated RF 5.8V rail. Better than +/-2% output voltage accuracy, low 24µVRMS output noise and 70dB PSRR make the XRP6272 perfectly suited for powering wireless RF circuitries.

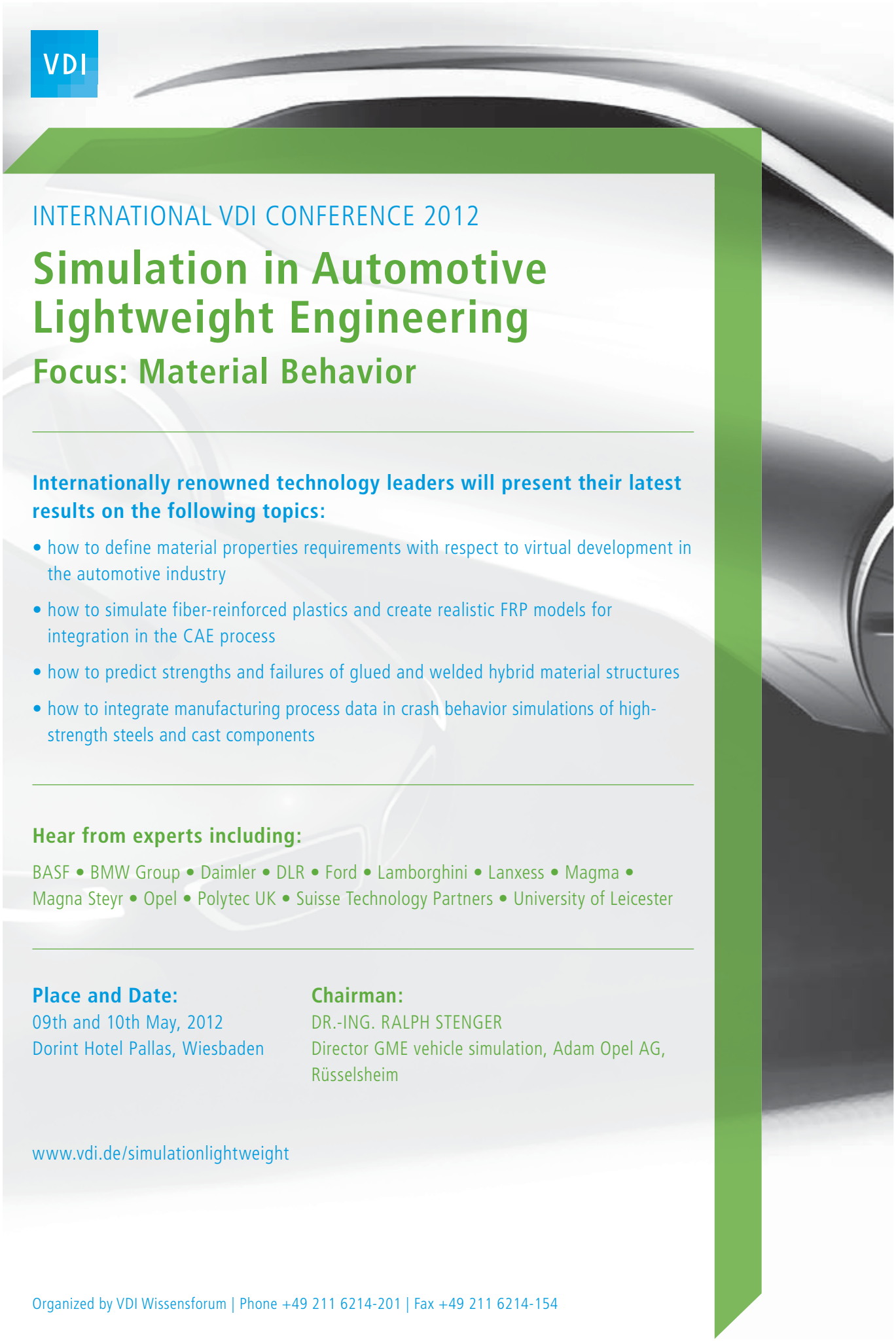
www.exar.com

CUI Releases 600 W Dc-Dc Converter with Integrated Heat Sink

CUI Inc announces a 600 W addition to their line of rugged chassis mount dc-dc converters. The VFK600 series measures 7.8" x 5.0" x 1.5" and includes an integrated heat sink for improved thermal performance. The aluminum heat sink allows the unit to operate at higher temperatures with a minimal amount of air flow.

The VFK600 series accepts a 2:1 input voltage range, supporting either 18-36 Vdc or 36-75 Vdc input voltages. For higher power requirements, the isolated converters feature active current sharing up to 1200 W and support N+1 redundancy operation. The VFK600 is offered in five different regulated output voltage versions: 12, 24, 28, 32 and 48 Vdc. Efficiency up to 92%, fast response, tight regulation, remote sense and remote on/off control make these converters useful in a range industrial, communications, and transportation applications.
Additional features include under-voltage, over-temperature, over-current, over-voltage, and input transient voltage protection.

www.cui.com



INTERNATIONAL VDI CONFERENCE 2012

Simulation in Automotive Lightweight Engineering

Focus: Material Behavior

Internationally renowned technology leaders will present their latest results on the following topics:

- how to define material properties requirements with respect to virtual development in the automotive industry
- how to simulate fiber-reinforced plastics and create realistic FRP models for integration in the CAE process
- how to predict strengths and failures of glued and welded hybrid material structures
- how to integrate manufacturing process data in crash behavior simulations of high-strength steels and cast components

Hear from experts including:

BASF • BMW Group • Daimler • DLR • Ford • Lamborghini • Lanxess • Magma • Magna Steyr • Opel • Polytec UK • Suisse Technology Partners • University of Leicester

Place and Date:
09th and 10th May, 2012
Dorint Hotel Pallas, Wiesbaden

Chairman:
DR.-ING. RALPH STENGER
Director GME vehicle simulation, Adam Opel AG, Rüsselsheim

www.vdi.de/simulationlightweight

Organized by VDI Wissensforum | Phone +49 211 6214-201 | Fax +49 211 6214-154

we are the future

Get a free ticket for your future now:

www.embedded-world.de

Nuremberg, Germany

28.2 – 1.3.2012

embedded world 2012

Exhibition&Conference

... it's a smarter world

Exhibition organizer
NürnbergMesse GmbH
Tel +49 (0) 9 11. 86 06-49 12
visitorservice@nuernbergmesse.de

Conference organizer
WEKA FACHMEDIEN GmbH
Tel +49 (0) 89. 255 56-13 49
info@embedded-world.eu

elektroniknet.de
computer-automation.de
energie-und-technik.de
karriere-ing.de
Markt&Technik
DESIGN&ELEKTRONIK
KNOW-HOW FÜR ENTWICKLER

Elektronik
Elektronik automotive
ENERGIE & TECHNIK
Computer & AUTOMATION

NÜRNBERG MESSE

Granted Patent for New Power Supply Topology

TDK-Lambda UK, a group company of the TDK Corporation, is pleased to announce that it's Zero Voltage Switching Converter (ZVSC) UK patent application has been approved for grant by the UK Intellectual Property Office.

"There is an ongoing push for power supply manufacturers to develop smaller, more feature-rich products," explains Andy Skinner, Chief Technology Officer at TDK-Lambda UK. "Since the use of an EMC filter can represent a significant percent of the overall volume of the unit, reduction of the common-mode noise flowing back into the power source is a key criterion for a more compact design."

In essence, the ZVSC topology uses a half-bridge switching circuit with additional noise cancelling circuitry to reduce conducted common-mode noise. Since noise is reduced, a much smaller EMC filter is needed for the power supply to comply with EMC regulations, thus achieving a compact, high power density unit. TDK-Lambda's NV300 uses such a topology, achieving a power density of 8.3W/in3.

www.uk.tdk-lambda.com

Power MOSFET Featuring Industry Lowest On-Resistance

Alpha and Omega Semiconductor a designer, developer and global supplier of a broad range of power semiconductors, today introduced the AON7418, adding to a growing portfolio of power MOSFETs in small, ultra-thin packages. The new device provides exceptionally low on-resistance that is optimized for demanding applications such as tablet PCs, eReaders, notebooks, telecom and networking.

AON7418 is the best-in-class 30V N-channel device implemented on AOS' proprietary AlphaMOS technology, with the lowest RDS(ON) in the market of similar package types. AlphaMOS technology improves RDS(ON) by 40% over the previous generation. The device provides power designers the flexibility in optimizing space, performance and cost.

"This new AlphaMOS 30V Technology device follows the already set benchmark by AOS for power density and performance" said Peter Wilson, Director of Low Voltage MOSFETs at AOS. "AON7418 enables designers to reduce power losses and increase performance in space-constrained applications."

AON7418 is in halogen-free DFN3.3x3.3 package and is 100% UIS and Rg tested.

www.aosmd.com

Surface Mount Inductor

As more details of our lives are converted into digital formats, demand for computing devices and network systems will continue to rise. With critical information (i.e. medical health records) now available in electronic form, professionals and individuals require their devices and networks to be secure and reliable. With this in mind, Renco Electronics has released its newest surface mount inductor, the RL-9580 Series. The RL-9580 features sturdy assembly and the capacity to work at extremely high temperatures, allowing for reliable functioning even in arduous environments. This surface mount also handles high transient current spikes without saturation. In addition, the RL-9580 can operate at high frequencies up to 5 MHz and it's composite construction allows for ultra low EMI.

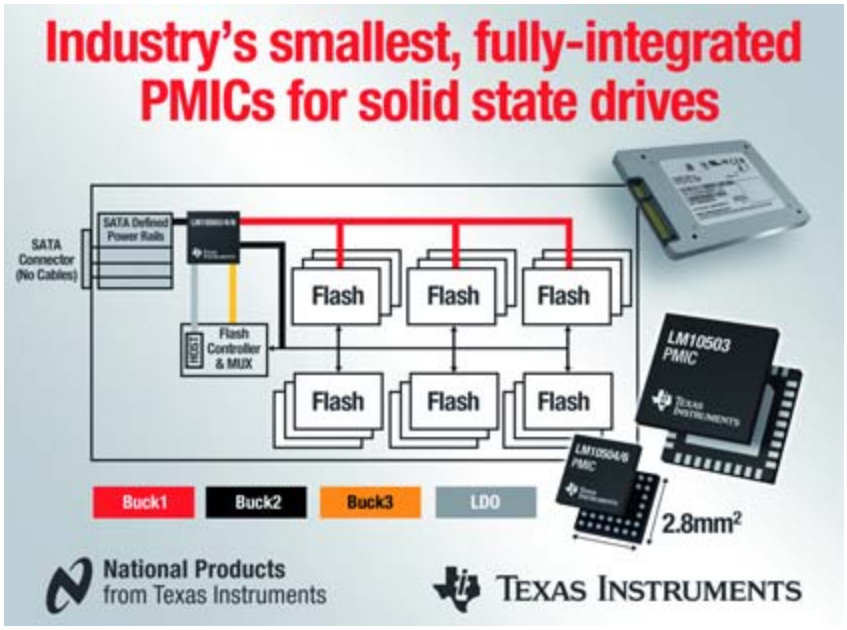
The RL-9580 Series is excellent for use in smart phones, desktop and notebook computers, server applications and high current power supplies. They run in an extremely broad temperature range of -40°C to +130°C and Renco provides shielded construction for added protection. The product comes in sets of 4,000 pieces packaged on tape and real and with a 1.2 MM profile, boasts the lowest height in this package footprint and lowest DCR/µh in this package size.

Renco has remained a leading electronics manufacturer for over half a century and can determine the best solution for meeting for diverse power needs. They know the importance of receiving the high quality products you need, when you need them. Regardless of quantity, Renco can rapidly fulfill all of your orders.

www.RencoUSA.com

Industry's Smallest Power Management ICs For Solid State Drives

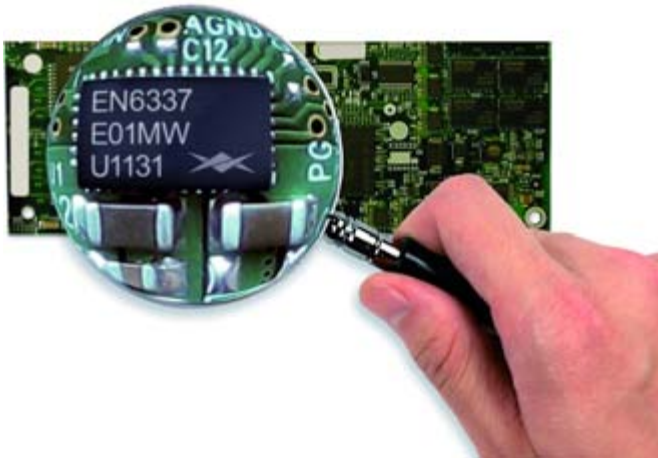
Texas Instruments Incorporated introduced a family of tiny, single-chip, power management integrated circuits (PMICs) for powering all the supply rails in solid state drives (SSDs), hybrid drives and other Flash memory management applications. The new LM10504, LM10503 and LM10506 PMICs improve reliability and reduce system cost and development time. Additional features include a power-saving deep sleep mode, built-in current limit and thermal protection, and power-down data protection. Watch a lab demonstration at www.ti.com/lm10504-v.



TI's new PMICs integrate three programmable 2.25-MHz DC/DC step-down converters with 95-percent peak efficiency that support core processor, memory and I/O voltages, along with a general-purpose, 3-V, 250-mA low-dropout (LDO) regulator for host controller reference. Each PMIC functions cooperatively with a controller IC to optimize the supply voltage for low power conditions and features a deep sleep mode option that lowers the core ASIC voltage and turns off the Flash and input/output rails to obtain maximum system efficiency. The LM10504 and LM10506 also include power-down data protection that ensures that the SSD controller completes the writing operation during unexpected power failure.

www.ti.com

Power System-on-Chip Solutions at embedded world 2012

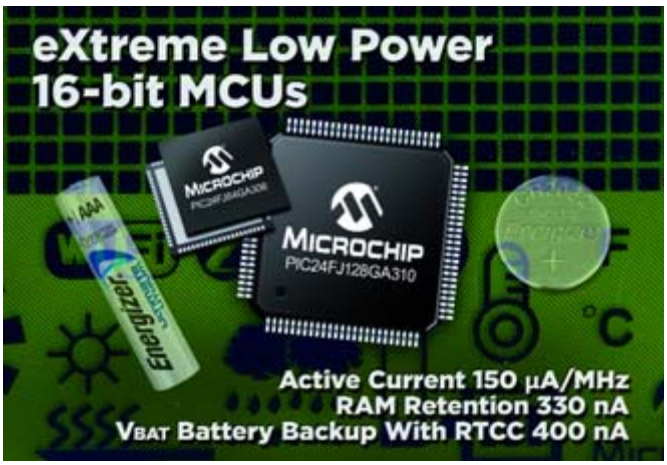


Booth Number 429, Hall 4 — Enpirion, the leading provider of integrated IC power management solutions, will exhibit its broad portfolio of world's highest-density DC-DC converters at embedded world 2012, at the Nuremberg Trade Fair in Nuremberg, Germany, from February 28 to March 1, 2012.
Enpirion power experts will be available at the embedded world booth to discuss how their turnkey solutions address specific embedded and industrial hardware engineering challenges and design complexity. Enpirion will display a range of real-world customer designs from leading European and Asian manufacturers that solve these issues.
Enpirion will also showcase its latest high-density PowerSoC family under microscopes to display the inner workings of Enpirion's technology, including miniaturized inductors, high-frequency FETs and next-generation packaging methodologies.

www.enpirion.com

MCU Portfolio with Industry's Lowest Active Current for 16-bit MCUs

Microchip announces the expansion of its eXtreme Low Power (XLP) microcontrollers (MCUs) with the PIC24F 'GA3' family, which features the industry's lowest active current for 16-bit Flash MCUs, as well as several flexible new low-power sleep modes. The PIC24F 'GA3' devices feature 150 microamperes/MHz active current, as well as six DMA channels, which allow a routine to be executed with less power consumption and increased throughput. The family demonstrates the continual advancement of Microchip's XLP technology and adds a new low-power sleep mode with RAM retention down to 330 nA. Additionally, these are the first PIC® MCUs with VBAT for battery backup of the on-chip Real-Time Clock Calendar. With these features, plus an integrated LCD driver and numerous other peripherals, the PIC24F 'GA3' devices enable more efficient, less expensive designs for consumer thermostats, door locks, and home automation; industrial products such as security, wired and wireless sensors, and controls; portable medical devices and medical diagnostic equipment; and metering products including e-Meters, energy monitoring, automated meter reading and meters for gas, water or heat; in addition to other applications.



www.microchip.com/get/0KJV

Bodo´s Power systems®

Your best choice to communicate!

Free subscription on www.bodospower.com

One World
One Magazine
On Time, Always

Partner with these events:

APEC
EMV Stuttgart
PCIM Europe
EPE European Power Electronics and Drives
PCIM China
Expo H2 Power Electronics
SMART Grids Summit
CarTec
Power Electronics
SEMICON West
www.battery university.eu
ECPE
SENSOR+TEST
Darnell Group
new energy
PRODUCTRONICA
electronica
SEMICON Europa
HUSUM WindEnergy
PEMD
inter solar
embedded world Exhibition&Conference

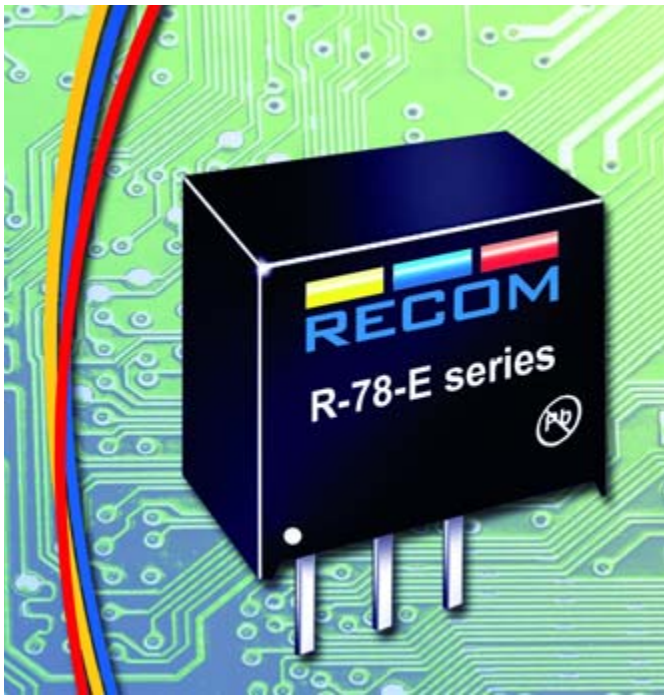
APEC 2012

February 5–9, 2012

Orlando, Florida

Bodo's Power Systems®

Low Cost Switching Regulator Module



RECOM's new R-78E low cost switching regulator module offers all the advantages of a switching regulator (high efficiency, wide input voltage range, accurate output voltage regulation) but at a price level below 1.60 EUR for production quantities. The R-78E offers a risk-free, pre-tested solution that makes designing your own switching regulator circuit redundant.
The R-78E exceeds all the most commonly requested specifications, yet makes no compromise when it comes to quality and reliability as it comes with a full 3 year RECOM warranty. The input voltage covers the 7VDC to 28VDC range which allows operation from both an industrial 24V bus or from either a 9V, 12V or 24V battery systems. The converter is fully protected against overload, short circuit and over-temperature conditions. Due to the R-78E's high efficiency of up to 92%, no heat-sink is required for operation over the full industrial temperature range of -40°C to +85°C (+70°C without derating). The compact SIP3 package, TO-220 compatible, measures only 11.6 x 8.5 x 10.4mm, so saving valuable board space.
The R-78E specification and performance makes it the most cost effective choice for a wide spectrum of applications. The R-78E will save significant engineering and development time and keeping BOM's under budget with this fully functional, fully tested and fully protected power supply solution.

www.recom-electronic.com

ADVERTISING INDEX

All the power you need...

...for highest reliability applications

Mitsubishi Electric offers a big variety of Power Semiconductors for a wide range of Industrial Motor Control applications from 0.4kW to several 100kW. Besides IGBT Modules also Intelligent Power Modules (IPM) and Dual Inline Package IPM (DIPIPM™) are available with extended voltage ratings.

The power modules feature state of the art CSTBT™ chip technology and new free wheel diode chips in a flexible package design as well as a high power cycling capability to ensure highest reliability and efficiency. With easy to use features, compact size and a high robustness they completely fulfill the markets needs.

PCIM

Stand 12-421

MITSUBISHI ELECTRIC

Changes for the Better

semis.info@meg.mee.com · www.mitsubishichips.eu

for a greener tomorrow eco Changes

Introducing 40 V – 250 V MOSFETs in High Current Package

Offering Optimized Performance and Cost for a Given Application

Standard Gate Drive

Part Number	Package	Voltage	Current	$R_{DS(on)}$ Max. @10V	Q_G Typ @10V
IRFH5004TRPBF	PQFN 5x6mm	40 V	100 A	2.6 mΩ	73 nC
IRFH5104TRPBF	PQFN 5x6mm	40 V	100 A	3.5 mΩ	53 nC
IRFH5204TRPBF	PQFN 5x6mm	40 V	100 A	4.3 mΩ	42 nC
IRFH5006TRPBF	PQFN 5x6mm	60 V	100 A	4.1 mΩ	67 nC
IRFH5106TRPBF	PQFN 5x6mm	60 V	100 A	5.6 mΩ	50 nC
IRFH5206TRPBF	PQFN 5x6mm	60 V	89 A	6.7 mΩ	40 nC
IRFH5406TRPBF	PQFN 5x6mm	60 V	40 A	14.4 mΩ	21 nC
IRFH5007TRPBF	PQFN 5x6mm	75 V	100 A	5.9 mΩ	65 nC
IRFH5207TRPBF	PQFN 5x6mm	75 V	7 A	9.6 mΩ	40 nC
IRFH5010TRPBF	PQFN 5x6mm	100 V	100 A	9.0 mΩ	67 nC
IRFH5110TRPBF	PQFN 5x6mm	100 V	63 A	12.4 mΩ	48 nC
IRFH5210TRPBF	PQFN 5x6mm	100 V	55 A	14.9 mΩ	40 nC
IRFH5015TRPBF	PQFN 5x6mm	150 V	56 A	31 mΩ	33 nC
IRFH5215TRPBF	PQFN 5x6mm	150 V	27 A	58 mΩ	20 nC
IRFH5020TRPBF	PQFN 5x6mm	200 V	43 A	55 mΩ	36 nC
IRFH5220TRPBF	PQFN 5x6mm	200 V	20 A	100 mΩ	20 nC
IRFH5025TRPBF	PQFN 5x6mm	250 V	32 A	100 mΩ	37 nC

Logic Level Gate Drive

Part Number	Package	Voltage	Current	$R_{DS(on)}$ Max. @4.5V	Q_G Typ @4.5V
IRLH5034TRPBF	PQFN 5x6mm	40 V	100A	3.2 mΩ	43 nC
IRLH5036TRPBF	PQFN 5x6mm	60 V	100A	5.5 mΩ	44 nC
IRLH5030TRPBF	PQFN 5x6mm	100 V	100A	9.9 mΩ	44 nC

Features

- Low thermal resistance to PCB (down to <0.5°C/W)
- High Current Package – up to 100A continuous
- 100% RG tested
- Low profile (<0.9 mm)
- Industry-standard pinout
- Compatible with existing surface mount techniques
- RoHS compliant containing no lead, no bromide and no halogen
- MSL1, industrial qualification

The IR Advantage

- Increased power density
- Increased reliability
- Multi-vendor compatibility
- Easier manufacturing
- Environmentally friendlier

For more information call +49 (0) 6102 884 311
or visit us at www.irf.com

International
IOR Rectifier
THE POWER MANAGEMENT LEADER