news

2|16

ABB Semiconductors
June 2016

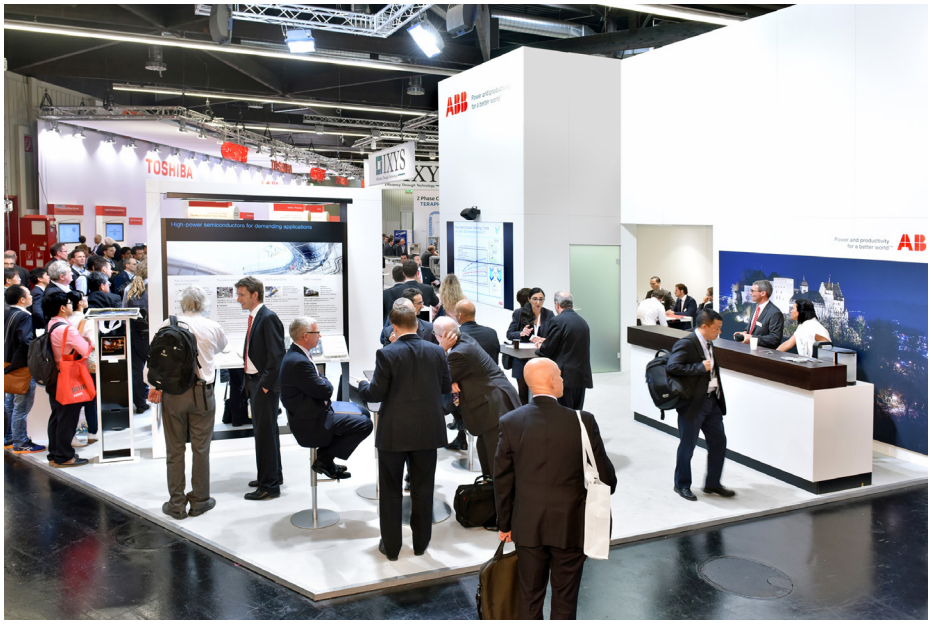


ABB Semiconductors at PCIM Europe 2016

The yearly held PCIM exhibition and technical conference in Nuremberg, Germany, is the largest and most comprehensive show in the power component and applications industry. In particular, the trade exhibition presents an unparalleled opportunity for power semiconductor manufacturers and users to exchange information and learn about the existing and latest products and solutions offered by the different companies. On the other hand, the technical conference is an important event where people from both industry and academia gather to present and discuss next generation technologies and systems for obtaining higher levels of performance for future applications. This year, all power semiconductor manufacturers were again strongly present at the PCIM 2016 exhibition while at the same time the conference technical program provided much food for thought on a wide range of power electronics related topics. Being one of the technology and market leaders in very high power semiconductors, ABB always ensures a strong presence at this important trade show by providing a powerful display at the exhibition booth while also presenting the latest technological breakthroughs at the technical conference. Therefore, the focus in this brief summary is on ABB`s contribution at both venues while highlighting the latest power semiconductor technologies and products presented by the company.
(continued on page 2)

Highlights

Editorial

Dear reader!

My first two months at ABB Semiconductors have flown by: We did not only have a successful Stand and Conference at PCIM Europe in Nuremberg but I was also introduced to the world of Semiconductors in Lenzburg. After graduating with a Masters in Materials Engineering at EPF Lausanne, I joined the ABB Swiss Trainee Program which included an assignment abroad in the US. I'm very excited to have been given the chance to take over Christoph's role in Marketing Communications as a permanent position.
While PCIM Europe is already a yearly tradition, we will also be at this year's PCIM Asia in Shanghai for the first time. Not only as exhibitors but also as participants at the conference. The detailed PCIM Asia program can be found on page 5. On the same page is also a summary of highlights of the Hannover Expo, where we participated with our colleagues on the ABB stand. Finally, to close the news on fairs, read on this page Munaf Rahimo's highlights report on the PCIM Europe.
Focusing on the product side, the release for mass production and future sales of the 62Pak is presented on page 6. Part 2 of our series of quality related activities can be found on page 3, this time presenting failure analysis techniques. An overview of BiMOs and bipolar products qualified and in the pipeline can be found on page 4. Don't forget to read about our new distributor in Poland also on page 4 and the distributor portrait on page 5. Last but not least, all of us here at ABB Semiconductors would like to thank Christoph for his great work and wish him all the best with his new role in Export Control!

Yours, Katja Fröhlich
Marketing Communications

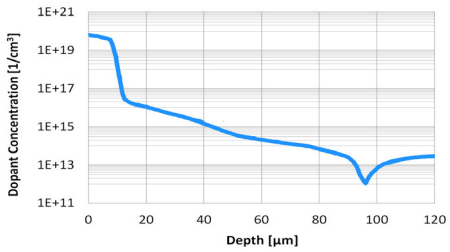
ABB Semiconductors at PCIM Europe 2016 (continued from cover page)

At the ABB booth, a number of new product launches took place:
- On the IGBT front, the new LinPak module standard employing ABB's SPT^{++} chips was exhibited with ratings of 1,700 V / 1,000 A and 3,300 V / 450 A. A highlight was the demonstration of the first parallel operation of the multiple LinPak modules to confirm the module capability for achieving higher power levels in future inverters. Other power semiconductor manufacturers such as Hitachi, Semikron and Fuji Electric also exhibited the LinPak footprint while providing a positive outlook for the LinPak standardization and market acceptance.
- ABB also launched its first BiGT based product in a StakPak package with high power ratings up to 4,500 V and 3,000 A. The new module provides IGBT and diode functionalities in a single component while utilizing the same chip active area in both operational modes.
- This year also witnessed the launch of the first of ABB's medium power segment products, namely the 1,700 V 62Pak range. The modules employ the well-proven SPT^{++} IGBT and diode chips, which are renowned for their low loss performance, high robustness and reliability. The follow up launch of the LoPak module range will be scheduled to take place in next year's PCIM.
Next generation technologies were also presented at the ABB booth. The company was keen to highlight in particular the next generation of TSPT^{+} IGBT performance targeting lower losses and higher power levels for a wide range of packages such as the HiPak and LinPak line-ups. To follow up, a new trench BiGT device was revealed while displaying even higher current ratings for a HiPak module as the next step beyond the TSPT^{+} generation. On the SiC development front, the demonstration of the first full SiC adapted LinPak module rated at 3,300 V and 450 A drew much interest while showing less than 10 % of the total switching losses when compared to existing IGBT solutions. The latest bipolar products were also shown including the low loss PCT range for grid and industrial applications, the 150 mm IGCT and the new bi-mode GCT or BGCT concept demonstrated in a 91 mm device size.
At the conference, ABB contributed with five articles covering IGBT, IGCT and thyristor technologies. Two oral presentations were given; the first provided the latest result on the enhanced-trench or TSPT^{+} IGBT and field charge extraction (FCE) diode employed in a HiPak2 module with rating up to 3,300 V and 1,800 A. The second presentation was in relation to the 1,700 V / 300 A 62Pak module. The talk covered the design aspects of the third generation SPT^{++} IGBT and field shielded anode (FSA) diode while presenting the module performance for a maximum junction temperature rating of 175 °C. Three additional papers were also displayed at the poster sessions. The new 1,700 V / 1,000 A and 3,300 V / 450 A LinPak results under nominal and SOA conditions were shown while also including more details of the module layout design and the inclusion of an integrated chip temperature sensor. The first demonstration and electrical results of the BGCT technology for a 91 mm 4,500 V device were also presented showing a maximum current turn-off capability exceeding 4 kA. Finally, improved performance of the next generation thyristors targeting mainly industrial applications was presented. The step in performance was achieved by optimizing the device carrier distribution for an improved trade-off relationship of the static versus dynamic losses. **(mr)**

Special:
Failure analysis techniques

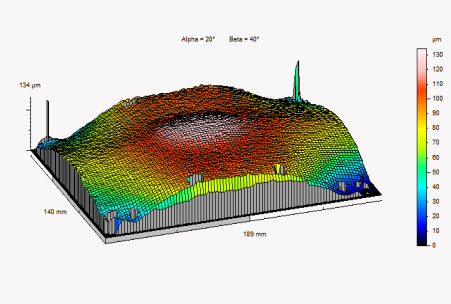
Following on from the information in the last Newsletter about the fields of application (incoming inspection, development and production support and customer returns) of failure analysis (FA), here we present some important analysis techniques that are available.

Spreading resistance profilometry
This method can be used to measure the dopant profile in silicon. The probe is polished to a very flat angle (typically 1-11° depending on the doping depth) to increase the number of measurement points. The two measurement probes are then placed on the surface of the sample and the resistance is measured. This is repeated at regular distance along the incline. The resistance is inversely proportional to the dopant concentration.



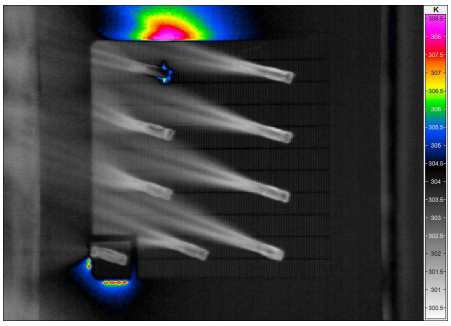
Spreading resistance profiling

Surface profilometry
In application our elements are often subject to large pressures, which are not always exactly uniform. The resulting deformation can be measured using the Talysurf Profilometer in contact or optical mode. For contact mode measurements the surface roughness data are also available on request. The following figure shows the deformation of a HiPak baseplate.



Surface profilometry

Hot spot measurement / Lock-in thermography
It is not always immediately possible to find the root cause of failure in the elements. In order to localize the error or failure, a voltage is applied which, due to the leakage current, causes localized heating at the position of the defect. This hot spot can then be detected using an infrared camera. In the example image below, an IGBT was investigated and showed a leakage current by a bond foot.



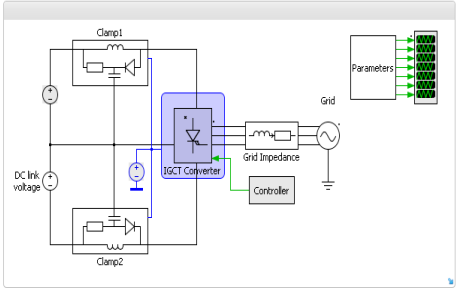
Infrared thermography

The next newsletter will focus on the scanning electron microscope, which is one of the most important and daily used techniques in failure analysis.
(cl, tg, an)

Application note
Applying IGCT - New revision

An updated version of the existing "Applying IGCTs" application note document is now available on ABB Semiconductors' website. The previously analyzed topics concerning the design rules and parameters the system designer must consider when applying the IGCT semiconductor element, have been extended. Additionally, a new section introduces ABB's online simulation tool SEMIS for IGCT based converter.
In this update, an HPT technology IGCT is referenced as an example to explain the data sheet definitions and the latest technologies in GCT and Integrated Gate unit characteristics are reflected. Moreover, further information is provided on the section dedicated to the IGCT protection during fault conditions. This is done by means of a more detailed description and schematic, which depicts all the parameters that need to be accounted when applying a protective firing control of the IGCTs on a 3 phase converter. With the ABB SEMIS online tool for calculating the IGCT thermal losses, a completely new section was added. The available topology of the 3 level neutral point clamped voltage source converter found at the ABB Semiconductors' website is introduced. The reader is guided through the features available on SEMIS which make the converter efficiency evaluation easier and serve as a very good IGCT product selection tool. The full application note is available for download on www.abb.com/semiconductors. **(vk)**

Three phase three-level VSC with IGCT



Products in the pipeline
BiMOS and bipolar

Part nr.	Voltage	Current	Description	Housing
5SED 0520S2240	2,200 V	520 A	dual diode module in 50 mm standard package	50Pak
5SED 0890T2240	2,200 V	889 A	dual diode module in 60 mm standard package	60Pak
5SED 0650T5040	5,000 V	651 A	dual diode module in 60 mm standard package	60Pak
5SED 0480T6040	6,000 V	481 A	dual diode module in 60 mm standard package	60Pak
5STP 27N8500	8,500 V	2,650 A	phase control thyristor	N
5STP 27Q8500	8,500 V	2, 900 A	phase control thyristor	Q
5STP 45Y8500	8,500 V	4,545 A	phase control thyristor	Y

Product features

2,200 V, 5,000 V and 6,000 V dual diode modules
Pressure contact technology modules with the highest reliability and quality in terms of power cycling capabilities. Insulated baseplate with aluminum nitride ceramic achieves excellent heat transfer and high insulation voltage.

8,500 V phase control thyristor
- Latest high performance thyristor generation, developed with focus on minimizing the losses and maximizing the power rating.
- Addressing demanding high-end industrial applications as pumped hydro, drives and SVC.

New qualified products
BiMOS and bipolar

Part nr.	Voltage	Current	Description	Housing
5SLZ 12F1700	1,700 V	75 A	SPT^{++}/FSA diode rated 175 °C	sawn/unsawn wafer die
5SNG 0150Q170300	1,700 V	2 x 150 A	phase leg medium-power IGBT with SPT^{++} chipset	62Pak
5SNG 0200Q170300	1,700 V	2 x 200 A	phase leg medium-power IGBT with SPT^{++} chipset	62Pak
5SNG 0300Q170300	1,700 V	2 x 300 A	phase leg medium-power IGBT with SPT^{++} chipset	62Pak
5STP 48Y7200	7,200 V	4,800 A	phase control thyristor	Y

Product features

1,700 V phase leg medium-power IGBT
- The industry standard 62Pak combines the well established copper baseplate technology for industrial applications with the well-known reliability and quality of the ABB HiPak IGBT modules.
- The 1,700 V SPT^{++} chipset offers lowest switching losses and operation temperature range up to 175 °C.
- The line-up consists of three module ratings: 2 x 300 A, 2 x 200 A and 2 x 150 A. Read more on page 6.

7,200 V phase control thyristor
- Latest high performance thyristor generation, developed with focus on minimizing the losses and maximizing the power rating.
- Addressing demanding high-end industrial applications as pumped hydro, drives and SVC.

Dacpol
New ABB Semiconductors' distributor in Poland

Dacpol has been specializing in distribution, service, manufacturing and export of power electronics components since 1991 and delivers components for power electronics, electrical engineering, electronics, power engineering and process automation. Dacpol's rich experience includes bipolar and BiMOS products as well as semiconductor stacks, assemblies and applications.
The family-owned company was identified as a potential distributor in Poland because of its market knowledge and good established relations to the end customers. The rapid development of the Polish market in recent years, as well as the proactive approach that Dacpol has demonstrated promoting ABB Semiconductors to Polish customers led us to the decision to sign a distributor contract in November 2015.
(dm)

Publications calendar

- Bodo's Power Systems, March 2016, "LinPak – the new standard phase leg module with exceptional low inductance"
- Power semiconductors product brochure, April 2016
- Power Semiconductors' product catalog in Chinese, April 2016
- Bodo's Power Systems Europe and China, May and June 2016 respectively, "Recent advancements in IGCT technologies for high power electronics applications"
- Bodo's Power Systems, July 2016 "LinPak, the new standard expands to 3,300 V and shows excellent parallel operation as well as SiC readiness"

All published publications are available for download on www.abb.com/semiconductors.

ABB Semiconductors exhibits at PCIM Asia 2016

ABB Semiconductors is happy to welcome you as an exhibitor at PCIM Asia 2016! Please visit us at our booth in **Hall 4, stand C39**.
We look forward to showing you our highlights and providing technical support and advice. Additionally, we actively participate in the conference with oral and poster sessions during the exhibition.

Conference presentations:

- Tue, 28.06.2016, 09:30, Oral Session, Room 2, “The next generation high voltage package and IGBT/diode technologies”, Raffael Schnell, ABB Switzerland
- Tue, 28.06.2016, 11:25, Oral Session, Room 11, “The 62Pak IGBT module range employing the next generation 1,700 V SPT^{++} chipset for 175 °C operation”, Sven Matthias, ABB Switzerland
- Tue, 28.06.2016, 11:25, Poster Session, Room 2, “StakPak 4,500 V / 3,000 A IGBT module for high power HVDC and DC-breaker application”, Makan Chen, ABB Switzerland
- Wed, 29.06.2016, 14:25, Oral Session, Room 2, “Thyristors with full-wave blocking capability for industrial applications”, Makan Chen, ABB Switzerland
- Thu, 30.06.2016, 09:30, Oral Session, Room 2, “Development and trend of power semiconductors for high power applications with reliability”, Makan Chen, ABB Switzerland **(kf)**

ABB Semiconductors at Hannover Messe 2016

The Hannover Messe, the worldwide most important and largest industry trade show, takes place every year in spring season. This year for the first time in the history of the fair, the United States was the Partner Country. As representative of the USA, none other than President Barack Obama, accompanied by German Chancellor Angela Merkel visited the fair and the ABB booth at the traditional exhibition opening tour on Monday morning.
ABB Semiconductors has attended the Hannover Messe 2016 as part of the ABB booth. We have presented the BiGT StakPak and the next generation high-end HVDC thyristor. These devices are the key elements of modern HVDC systems. The StakPak is applied in HVDC systems in voltage source converter technology known as HVDC Light. The new module has an increased utilization of the active area thanks to the integration of the IGBT and diode into the same chip. The next generation of thyristors is used in the classical HVDC topology and is characterized by high blocking voltage of 8,500 volts and extremely low conduction losses.
Both devices show clearly reduced losses compared to previous device generation which allows our customer to design more efficient converter systems and reduce power consumption.
The ABB Semiconductors’ frame presenting the next generation of high-end thyristors and the StakPak caught the visitor’s attention and was ranked based on interest, within the top 10 frames of the ABB Power Grids division. **(cw)**

Portrait: ZTS ELTOP spol. s r.o.

The company ZTS ELTOP was founded in 1994 by former EVU senior employees. The EVU (Electro-technical Research Institute) was established in 1968 in Dubnica nad Váhom and focused on development and production of industrial electronics.
Since its establishment 22 years ago, ZTS ELTOP was traditionally profiled in the field of power electronics such as frequency converters and power semiconductors.
Until recently, railway companies in the Slovak Republic and other companies operating in the engineering industry were the most important customers. Nowadays, the portfolio of customers is much wider and has expanded particularly to the field of companies which are committed to designing and producing new products for induction heating and transmission and distribution of electricity.
In 1996, the sales and distribution contract for the Slovak market was signed with the former power semiconductors producer ČKD POLOVODICE and later with POLOVODICE Praha. The cooperation continued after the acquisition of POLOVODICE by ABB in 2010.
ZTS ELTOP is very pleased that ABB has decided to take over the cooperation and that ZTS ELTOP can act today as a distributor of ABB Semiconductors‘ products in the Slovak Republic and in the Slovak market.
We would like to thank our colleagues at ABB for their support and cooperation.

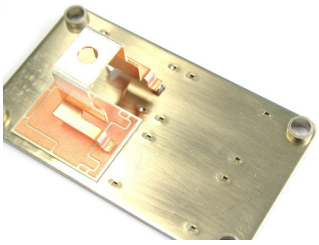
62Pak product release

The 62Pak is officially released for mass production and available for unlimited sales. End of April all qualification tests have been successfully finalized and ABB is proud to present a very competitive family of 62Pak modules. The 62Pak line-up consists of modules in the 1,700 voltage class. Three current ratings are available in a phase leg configuration: 2 x 300 A, 2 x 200 A and 2 x 150 A.

The ABB's 62Paks are designed to the highest standards with the same quality philosophy like the well-established HiPak modules.

The 62Pak modules feature the state of the art 1,700 V SPT^{++} IGBT / diode chipset that offers best in class performance in terms of lowest switching losses and highest ruggedness. The package offers a long lifetime in demanding applications thanks to high power cycling performance. This has been achieved by an optimized wire-bonding process and with stamped spacers in the baseplate and main terminals. With the help of the spacers, a homogenous solder layer thickness can be ensured that offers a significantly narrowed distribution and improved power cycling performance. In addition, the 1,700 V SPT^{++} chipset offers an operation temperature range that includes full switching performance up to 175 °C. This enables applications using ABB's 62Pak modules to benefit from higher over-load capability and/or improved safety margin to unexpected current surges.

ABB's 62Pak IGBT modules are well suited for most power electronic applications that include low-voltage as well as medium-voltage drives, static VAR compensators, uninterruptable power supplies, induction heating and traction auxiliary converters to mention just a few. **(rs)**



62Pak IGBT module (left). Spacers for homogenous solder thickness (right).

Product change notifications BiMOS and bipolar

PCN nr.	Part nr.	Subject	PCN issuing date
IGBT 16-01	5SNA 0600G650100 and adapted standards	improved HV HiPak housing	January 2016
IGBT 16-03	5SNA 1200G450300, 5SNA 1200G450350 and adapted standards	improved HV HiPak housing	March 2016
IGBT 16-04	5SNA 1200G330100 and adapted standards	improved HV HiPak housing	March 2016
IGBT 16-05	5SNA 0750G650300 and adapted standards	improved HV HiPak housing	March 2016
IGBT 16-06	Single IGBT J housing HiPaks and adapted standards	improved HV HiPak housing	March 2016
IGBT 16-07	Dual diode J housing HiPaks and adapted standards	improved HV HiPak housing	March 2016
PCT 16-01	5STP 07D1800, 5STP 18F1800	back end production line for PCTs	January 2016
PCT 16-03	5STP 04D5200	back end production line for PCTs	January 2016

Phased-out products BiMOS and bipolar

Material	Last deliveries
5SMX 12/76/86E1280	Sep 2016
5SMX 12/76/86H1280	Sep 2016
5SMX 12/76/86K1280	Sep 2016
5SMX 12/76/86L1280	Sep 2016

Impressum

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