news

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ABB Semiconductors
March 2012

High Power Semiconductor Testers made by ABB

ABB Semiconductors designs, produces and markets a wide range of Bipolar and BiMOS high power semiconductors. These high quality devices are produced using state-of-the-art production facilities (see Newsletter 1/11). Prior to shipment, all semiconductors are tested statically and dynamically, at hot and cold temperatures and also undergo single-pulse and multi-pulse tests. These tests include standardized tests for production control & improvement as well as final tests according to standard or customer specifications. So ABB Semiconductors' devices are capable to switch more than 5000A and to block up to 10000V, you can imagine that test equipment capable of handling such high power is not commercially available. Therefore, we have a group of highly trained engineers who design and build test equipment for our demanding needs (see the interview on page 5 with Rudy Veitz, VP Manufacturing Network, Testers).

Highlights

Power and productivity
for a better world™

Editorial

Here it is: the second issue of our quarterly marketing newsletter and the first in 2012. Thank you for the good feedback we received from many of you regarding our very first issue (1/11). It seems you greatly appreciate being informed on what's going on at ABB Semiconductors.

In every issue, we provide important product information updates: products in the pipeline, new qualified products, phased-out products as well as obsolete products. Additionally, we focus on one particular application. This time the focus is on Soft Starters, an application using phase-controlled thyristors (PCT) and which is potentially well-suited for bi-directional thyristors (BCT). So, it's no wonder that the product focus this time is on BCTs. In the column "Technology in Trend" we highlight Low-Temperature-Bonding (LTB), a technology which achieves higher surge currents on larger devices.

The first devices to benefit from this technology trend are fast recovery diodes with wafer diameters of 72mm and 91mm. After highlighting the inauguration of the expanded Bipolar factory in Lenzburg in our first issue, the cover story here is on testers. Also read the related interview with Rudy Veitz. As in every issue, we ask one of our worldwide distributors to introduce and present his company. After PowerParts in Switzerland, the spotlight is on 5S Components Inc. from the United States.

We look forward to seeing you soon at PCIM in Nuremberg (May 8-10th) and welcoming you at our new location in Hall 11, Stand 203!

Yours, Christoph Holtmann

Christoph Holtmann,
Head of Marketing & Product Management

Technology Trends Bipolar
Low Temperature Bonding (LTB)

For certain power semiconductor parameters, as the surge current, it is beneficial to have a direct metal contact between the silicon disc and a molybdenum disc. Traditionally, this contact has been accomplished by using high temperature alloying techniques. This works well on smaller devices but is, due to mechanical reasons, limited to silicon diameters of about 75 mm. To get the same benefits on larger devices the so called Low Temperature Bonding (LTB) technology has been developed. Using a silver paste and high pressure it is possible to sinter the Silicon to the Molybdenum at a comparably low temperature thus avoiding the stresses that limit the use of high temperature alloying on large devices. This technology is being rolled out on ABB power semiconductors with fast recovery diodes (FRD) 5SDF 28L4520 and 20L4520 being the first ABB products with large diameter, 91 mm, using this technology.

Publications Calendar

- Bodo's Power Systems, March 2012 "The Next Generation Chipset Technologies for Higher Operating Temperatures"

- Bodo's Power Systems, May 2012 (PCIM Issue) "Fast recovery diodes for demanding IGCT applications"

- Updated Product Flyers, to be released by end of April 2012

Products in the pipeline
BiMOS and Bipolar

Part Nr.	Voltage	Current	Configuration	Housing	Samples
5SLY 76/86M1202	1200V	300A	Diode Dies	WD, SWD	Available
5SMY 76/86G-K1721	1700V	50A - 100A	IGBT Dies	WD, SWD	Available
5SLY 76/86E-J1700	1700V	50A - 150A	Diode Dies	WD, SWD	Available
5SNA 1500E250300	2500V	1500A	Single IGBT	HiPak2	Available
5SNG 0250P330305	3300V	2x250A	Half Bridge	HiPak0	Available
5SDF 20L4520	4500V	2010A	Fast Recovery Diode	L Housing	Available
5SDF 28L4520	4500V	2750A	Fast Recovery Diode	L Housing	Available

Product features

1.7kV IGBT and Diodes set :
- Higher Tvj(op) up to 150°C possible
- Suitable applications : Low Voltage Drives, Wind Power

2.5kV IGBT :
- Higher Tvj(op) up to 150°C possible
- More current up to 1500A
- Suitable applications : Diesel Locomotives, Wind Power

3.3kV IGBT :
- Higher Tvj (op) up to 150°C possible
- In Hipak2 and Hipak1 sizes together with Dual Diode modules
- Suitable applications: Electric Locomotives, Highspeed Trains, EMUs and Medium Voltage Drives

New qualified products
BiMOS and Bipolar

Part Nr.	Voltage	Current	Configuration	Housing
5SLA 2000J170300	1700V	2000A	Single Diode	HiPak1
5SNA 2000J170300	1700V	2000A	Single IGBT	HiPak1
5SDD 0105Z0400	400V	10502A	Welding diode	Housing-less
5SDF 11H4505	4500V	1576A	Fast Recovery Diode	H Housing
5SHY 50L5500	5500V	3600A	HPT-IGCT	L Housing

Product features

1.7kV HiPak IGBT and Diode modules:
- 2kA single IGBT and Diode modules
- High isolation packages
- Equipped with the 150°C Tvj operation rating
- Suitable applications: Ideal for multi-level applications

400V Welding Diode:
- 56 mm housing-less welding diode
- Extremely low thermal resistance and excellent forward and surge characteristics
- Average forward current 10.5kA, peak surge current 70kA, temperature range from -40 to 180 °C.
- Suitable applications: Welding

4.5kV Fast Recovery Diode:
- Enhanced Safe Operating Area (SOA) and excellent soft characteristics
- Reverse repetitive voltage 4.5kV, average forward current 1340A, SOA (5kA, 2800V, 1000A/µs)
- Temperature range from -40 to 140°C.
- Suitable applications: Medium Voltage Drives

5.5kV HPT IGCT:
- 3.6kA L housing IGCT
- Suitable applications: Medium Voltage Drives

ABB Distributor portrait:
5S Components

5S Components Inc was founded in 2005 as the result of a management buyout of ABB Semiconductors Inc. In 1991, ABB's High Power Semiconductor sales operation was formed, John Siefken was hired to lead the operation and the office moved to Pittsburgh, PA. Due to the success of major projects with General Electric, Bombardier and Siemens, the operation was expanded. In 1993, ABB entered into the IGBT business with International Rectifier in California and ABB Semiconductors Inc was formed. In 1994, the ABB High Power Semiconductor operation was merged into this new organization. In 1995, the ABB Semiconductors Inc headquarters was moved to Pittsburgh. A management buyout was concluded in December 2005, and the company was renamed 5S Components Inc. 5S serves customers in the industrial, traction and pulsed power markets in the USA and Canada.

In addition to offering high power semiconductors from Lenzburg, 5S Components has expanded its portfolio, adding sensors from ABB France, GTO gate drivers from ABB Power Electronics in Turgi, IGBT Gate drivers from Concept CT Technology, and ICAR Power Film Capacitors. Sales have grown significantly and the company now employs seven people. Kenny Stephenson joined the company in 1999, Andy Camardo in 2007 and Gary Jones in 2010.

High power semiconductors are critical to the future growth and success of 5S Components and we want to thank all the team members who support us. Keep up the good work!

Process change notifications

PCN Nr.	Part Nr.	Subject	Deadline for acceptance
PCT 12-04	5STP 12F4200	Data sheet revision	End of March 2012
IGBT 12-01	HiPak 1.7kV	Data sheet revision	End of March 2012

Phased-out products
BiMOS and Bipolar

Material	Last Deliveries
5SMX 76H1264	June 2012
5SMX 76K1264	June 2012
5SMX 76L1264	June 2012
5SMX 76M1274	June 2012
5SMX 86H1264	June 2012
5SMX 86H1274	June 2012
5SMX 86K1264	June 2012
5SMX 86K1274	June 2012
5SMX 86L1264	June 2012
5SMX 86L1274	June 2012
5SMX 86M1274	June 2012

Obsolete products
BiMOS and Bipolar

Material	Replaced by
5SMX 76D1264	na
5SMX 76E1264	5SMX 76E1280
5SMX 86E1264	5SMX 86E1280
5SMX 86E1274	5SMX 86E1280
5SMY 12M6500	5SMY 12M6501
5SMY 12N4500	5SMY 12M4501

Application in focus
Soft Starters

To protect power quality and to minimize mechanical wear and torque peaks on motors, the use of soft starters is becoming increasingly common in process industries and for motor sizes up to 50MW.

Soft starters work by reducing the motor voltage during the starting process, resulting in reduced torque from the motor. During the starting process, the soft starter progressively increases the motor voltage so that the motor becomes strong enough to accelerate the load to rated speed without causing any torque or current peaks. Common applications for soft starters include pumps, fans, conveyor systems and compressors.

One of the benefits of using soft starters is the possibility to adjust the torque to the exact need, whether the application is loaded or not. In principle, the full starting torque is available, but with the big difference that the starting procedure is more gentle to the driven machinery, resulting in lower maintenance costs. Another feature of the soft starter is the soft-stop function, which is very useful for stopping pumps when the problem of water-hammering occurs in the pipe system at direct stop or for stopping conveyor belts to prevent material from being damaged when the belts stop suddenly.

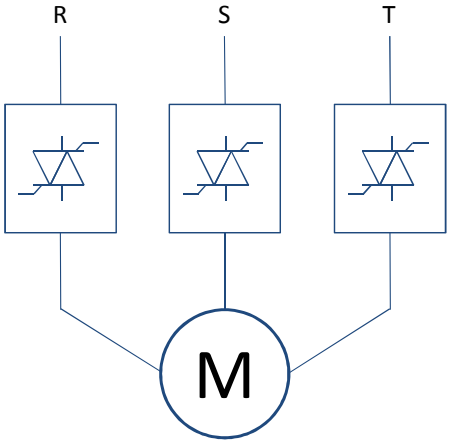
The power semiconductors used in a soft starter are six anti-parallel-connected thyristors (PCTs). Medium voltage soft starters mostly use 4.2kV and 6.5kV thyristors with current ratings ranging from 300A to 4200A. ABB also offers bi-directionally controlled thyristors (BCTs) where two anti-parallel thyristors are integrated onto one single Si-wafer and are assembled into one housing (see article on the right). This feature enables designers of soft starters to meet higher demands concerning size, reliability and cost of end product.

BCT
Status and short-term outlook

Since many medium and high voltage applications use anti-parallel connected thyristors such as Soft Starters, ABB has introduced the Bi-directionally Controlled Thyristor (BCT) which consists of two monolithically integrated anti-parallel thyristor functions on one silicon wafer. The two thyristor halves are individually triggered and have a separation region enabling the design of high voltage devices with the dynamic capability and reliability of discrete devices.

The BCT is designed, manufactured and tested using the same philosophy, technology and equipment as the well-established PCT. This enables manufacturers of equipment for applications such soft starters to reduce part count and equipment size without jeopardizing reliability and performance by introducing one BCT instead of two conventional PCTs. Examples show volume improvements and part count reductions for equipment with BCTs of approximately 25% compared with equally rated PCT-solutions.

The maximum junction temperature of the N- and Q-housing BCTs is 125°C. The U-housing BCTs will be available with 125°C maximum junction temperature in 2H12 (today they are still rated 110°C). You can find the current BCT product range in the Short Form Catalogue 2012, page 21.



Circuit diagram of a Soft Starter that takes advantage of BCTs.

Lead Time Indicator

We will be sending you a detailed Lead Time Indicator (LTI) with lead time estimates for all products listed in the Short Form Catalogue 2012. This Excel list will be updated quarterly and distributed a few weeks prior to the newsletter. A short summary will be then published in our Newsletter.
Some of you may still not know that lead times for Bipolar products are back to normal again. Typical lead times for quantities of up to 200 pieces are 6 to 8 weeks. Regarding lead times for HiPak modules we hope to deliver sample quantities for new design-ins within 6-8 weeks. Lead times for IGBT dies and Diode Dies are available on request.

- Bipolar products 6-8 weeks
- HiPaks On request (6-8 weeks for sample quantities)
- IGBT & Diode Dies On request

Please note that the above lead times are not guaranteed and may vary from part number to part number. For exact lead times, please contact us.
Lead times for products produced in Prague (e.g. Welding Diodes) are available on request due to the temporary factory shutdown from May to August 2012.

Interview with Rudy Veitz
Vice Pres. Manufacturing Network & Testers

Christoph Holtmann: Mr. Veitz, CHSEM designs and builds their own high power semiconductor testing equipment with a dedicated group of highly trained engineers. Why doesn't CHSEM buy the testers on the open market?
Rudy Veitz: Our motivation to design and build our own testers is two-fold. On one side, testing equipment capable of testing high power semiconductors in our power range is simply not available on the market. In addition, it allows us to train specialized staff and engineers and introduce them to the field of high power semiconductors, measurement techniques and related applications.
CH: How do you make sure that your testers provide correct data and do not drift?
Rudy Veitz: We use special calibration devices to make sure that different testers provide the same test results. The calibration of the testers, as well as the reproducibility of the measurements, is monitored and reassessed weekly by means of Statistical Process Control (SPC). This helps to ensure long-term stability.
CH: What happens if a tester breaks down at 2am?
Rudy Veitz: In addition to maintenance & service contracts with our sub-suppliers, the production line has its own service personnel providing technical support around the clock. In most cases, however, minor malfunctions can be resolved by the operators themselves. The tester group engineers are called-in if further support is required.
CH: Does CHSEM build testers for their own use only or do you also sell testers?
Rudy Veitz: On occasion, we sell testers to customers and suppliers as well.
CH: In your opinion, what are the current challenges facing the tester group?
Rudy Veitz: There are several challenges. With close to 300 different thyristors in our portfolio, switching currents from 300A to more than 5000A and blocking 1600V up to 8500V, it is a huge challenge to build testers which can cover this wide range. Further, we have testers operating in different places. Testers in Lenzburg must provide the same test results as the testers in Prague. Also, the testers are designed to test semi-finished wafers, finished wafers and finished products. Another challenge is the on-going capacity expansion in Lenzburg and Prague. Doubling the capacity requires additional new, reliable and fully-automated testers.
CH: Mr. Veitz, thank you for this interesting view into CHSEM's world of testers.

ABB at PCIM Europe
New at Hall 11, Stand 203

PCIM
EUROPE

Nuremberg, 8 - 10 May 2012

8th May 2012, 15:30, Foyer Ground Floor
- "Introducing the 5.5kV, 5kA HPT IGCT", Tobias Wikström.
- "New concept of low-loss, hard switching (LHS)", Silvan Geissmann

9th May 2012, 12:00, Room Paris
- "Opportunities and Challenges for Wide Bandgap Power - Devices in Megawatt PE Applications", Iulian Nestor

9th May 2012, 14:30, Room Paris
- "Bond wire lifetime model, based on temperature dependent yield strength", Samuel Hartmann

10th May 2012, 14:30, Room Amsterdam
- "StakPak IGBT Press-packs for the industrial market", Franc Dugal

10th May 2012, 12:30, in the Forum
- "ABB Semiconductors' complete familiy of IGCTs and Diodes for Medium Voltage Drives beyond 10MW", Christoph Holtmann

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