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PSMA Publishes Its 2019 “Power Technology Roadmap”

Every two years, the Power Sources Manufacturers Association (PSMA) publishes its “Power Technology Roadmap” (PTR). The most recent roadmap report was formally released at the Applied Power Electronics Conference and Exposition (APEC) 2019 in Anaheim, California.

As power technology continues to emerge from the shadows to play a more central role in the next phase of the electronics industry revolution, the PTR provides many relevant pointers to current and future industry stakeholders. The power electronics industry continues to support the “smaller, faster, cheaper” progression of mainstream application technologies, such as computing, communications, and consumer electronics. In these fields, power electronics is still considered a peripheral technology and plays a responsive role. However, in many emerging fields such as electric vehicles, alternative energy converters, and energy-harvesting devices, power technology assumes a more central and driving role and the PTR captures how the industry is responding to play this role.

Report Methodology

The PTR report methodology has evolved over its 26 years of publica-

tion but has always tried to provide multidimensional perspectives on power technology growth and trends. While major product segments have been addressed from the beginning, the products themselves have changed. Commentaries on “Application Trends” and “Emerging Technologies” were added in 2011 and 2013, respectively. A webinar series was added during the development of the 2013 edition. These webinars, open to PSMA and non-PSMA members alike, offer timely information and facilitate interesting discussions between attendees of diverse backgrounds. The “Component Technologies” section was added in 2017 and has been expanded in this edition.

Also in this edition, a new section called “University Research in Power Electronics” has been included. The university research component provides a window into what products and technologies are in store for power electronics. Leading power electronics research universities were asked about their research areas and priorities, and their responses were analyzed to extract the most common, least common/missing, and unique research areas. These results were presented at the APEC plenary session by Robert

V. White (see the “White Hot” column in this issue, page 100), who expounds the barriers to industry/academia collaborations.

Other than the addition of “University Research,” this year’s PTR largely follows the format of and keeps the improvements made in the 2017 report. It offers a consolidated view of the latest

trends in power management, power control, and power delivery technologies by integrating the most recent inputs from webinars, surveys, analyses, and discussions.

Report Content

The bulk of the content is provided in five sections:

- “Application Trends”
- “Component Technologies”
- “University Research in Power Electronics”
- “Webinar Presentations”
- “Power Supply and Converter Trends.”

The “Application Trends” and “Component Technologies” sections begin with a similar, but loose, template with the intent of capturing the associated market drivers, key metrics, trends, and challenges. These sections are written by a diverse group of experts representing power supply manufacturers, semiconductor

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manufacturers, original equipment manufacturers (OEMs), and research institutes.

Section 1: “Application Trends”

The overviews for the “Application Trends” section cover automotive, battery charging, cloud computing, energy harvesting, lighting, motor control, and renewable energy/grid storage. In addition, an article about safety and compliance trends provides an overview of the ongoing changes in the safety requirements for the power electronics equipment. The “Application Trends” section has more contributions from OEM/end user companies, a welcome trend.

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Section 2: “Component Technologies”

The next section, “Component Technologies,” contains overviews of each component segment as applicable to power electronics. Component segments represented include silicon low-voltage and high-voltage MOSFETs, silicon carbide devices, gallium nitride devices, and gate drivers. The increased importance of packaging for semiconductors is captured through a dedicated article on packaging for high-power semiconductors. Representative articles cover magnetics and capacitor trends.

Section 3: “University Research in Power Electronics”

The “University Research in Power Electronics” section details responses from 14 leading universities in power electronics across the world (eight from the United States, four from

Europe, and two from Asia) to questions about their research programs in the field. Twenty-five universities were approached and asked to respond to four questions. One of the key questions was about their future research projects and direction. This question

was deliberately left open ended to provide a full scope to the universities to respond without the constraints of preordained topics or categories. The most common research areas related to renewable energy power electronics and the electrification of transportation. Additionally, applications of wide bandgap devices and advanced packaging and integration were also identified as leading research fields. Interestingly, areas such as digital power, cloud computing, robotics, and high-frequency power conversion were rarely (or never) mentioned. In some cases, this may mean that these areas are now part of the mainstream (e.g., digital power). In other areas, they may indicate an opportunity for enhanced coverage. Some unique research areas mentioned included very high voltage power electronics and the automation of power electronics design process.

Section 4: “Webinar Presentations”

“Webinar Presentations,” the next section, captures webinar content provided by industry experts. The webinars continue to expand their reach in terms of longer cycles and an increased number of webinars (17) and presenters (29). In addition to the presenters’ slide decks, a USB stick is included to provide the audio/video

recording of the presentations, along with the valuable question-and-answer sessions.

Section 5: “Power Supply and Converter Trends”

The final section, “Power Supply and Converter Trends,” dives deep into content with quantitative analysis about four different product types:

- ac-dc front-end power supplies (200–2,000 W)
- external ac-dc power supplies (up to 150 W, with data specific to 27 and 150 W)
- isolated dc-dc converters (with data specific to 100 W, regulated)
- nonisolated dc-dc converters (subdivided into the standard nonisolated dc-dc, Power Supply in Package, and Power Supply on Chip converters).

Detailed tables in this section capture performance and feature trend expectations that look ahead four or five years. These tables are a consolidation of the results of an online survey and the opinions of working groups of industry specialists who ensure that the survey results are reviewed, refined, and taken in context. The survey methodology was strengthened by ensuring better alignment between different segments, consolidation, and broader outreach (including the first-ever incorporation of Chinese language version). As a result, the segment leads were able to extract more meaningful trends from the survey results.

Obtaining a Copy of the PTR

The PTR is distributed to PSMA members as a membership benefit. Work on the next roadmap cycle will begin in early 2020. If you are interested in contributing to the report, please contact the PSMA office at power@psma.com.