NEXT-GENERATION POWER SEMICONDUCTORS: MARKETS MATERIALS, TECHNOLOGIES

The emerging market for silicon carbide (SiC) and gallium nitride (GaN) power semiconductors is forecast to pass the $1 billion mark in five years, energized by demand from hybrid and electric vehicles, power supplies and photovoltaic (PV) inverters. Worldwide revenue from sales of SiC and GaN power semiconductors is projected to rise to nearly $1 million in 2018, up from just $210 million in 2015, according to The Information Network, a leading global source of critical information and insight. Market revenue is also expected to rise with double digit growth annually for the next decade.

SiC Schottky diodes have been on the market for more than 10 years, with SiC metal-oxide semiconductor field-effect transistors (MOSFET), junction-gate field-effect transistors (JFET) and bipolar junction transistors (BJT) appearing in recent years, according to the latest information from the latest IHS SiC & GaN Power Semiconductors Report. SiC MOSFETs are proving very popular among manufacturers, with several companies are already offering them, and more are expected to in the coming year. The introduction of 900 volt (V) SiC MOSFETs, priced to compete with silicon SuperJunction MOSFETs, as well as increased competition among suppliers, forced average prices to fall in 2015.

GaN power transistors and GaN modules have only just recently appeared in the market. GaN is a wide bandgap material offering similar performance benefits to SiC, but with greater cost-reduction potential. This price and performance advantage is possible, because GaN power devices can be grown on silicon substrates that are larger and less expensive than SiC. Although GaN transistors are now entering the market, the development of GaN Schottky diodes has virtually
By 2018, GaN-on-silicon (Si) devices are expected to achieve price parity with -- and the same superior performance as -- silicon MOSFETs and insulated-gate bipolar transistors (IGBTs). When this benchmark is reached, the GaN power market is expected to surpass $600 million in 2025. In contrast, the more established SiC power market -- mainly consisting of SiC power modules -- will hit $3 billion in the same time period.

Overall revenues for the power semiconductors market globally dropped slightly in 2015, due primarily to macroeconomic factors and application-specific issues.

The global market for power semiconductors fell 2.6% to US$34 billion in 2015. Discrete power semiconductor product revenues declined 10.1%, while power module revenues decreased by 11.4% and power integrated-circuit (IC) revenues increased by 4.5% overall.

Infineon Technologies was the leading power semiconductor manufacturer in 2015 with 12% of the market, followed by Texas Instruments with 11% and STMicroelectronics with 6%.

While Infineon's acquisition of International Rectifier was the largest acquisition last year, several other deals also changed the terrain of the power semiconductor market landscape. Key deals in 2015 included the following: MediaTek acquired RichTek; Microchip acquired Micrel; NXP Semiconductors acquired Freescale Semiconductor; NXP Semiconductors also created WeEn Semiconductors, a joint venture with Beijing JianGuang Asset Management (JAC Capital); CSR Times Electric merged with China CNR Corporation to form CRRC Times Electric; and ROHM Semiconductor acquired Powervation.
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