

## Report from Yole Développement

# “PowerSiC 06”: Status & forecasts silicon carbide devices for power electronics market

*“PFC will handle a \$75M devices market in 2012. Hybrid cars, solar & wind power and industry will then sustain the growth”*

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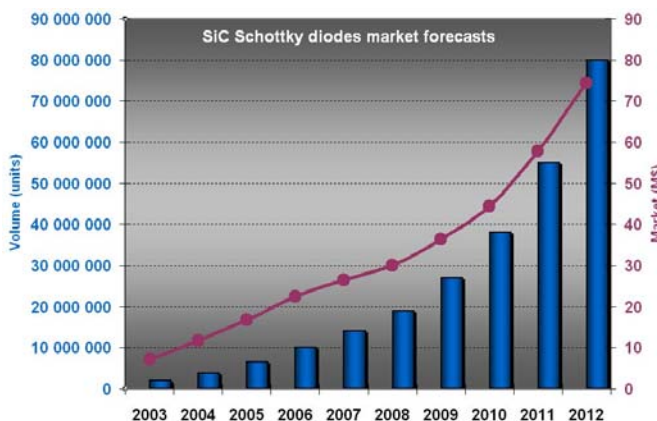
Recent developments in SiC MOSFETs and other switches open the door of new coming applications. With the latest Rohm announcement of  $R_{on} = 3.1 \text{ m}\Omega \cdot \text{cm}^2$ , MOSFETs are coming out the labs struggling with best silicon trench-MOS currently available. It is now possible to envisage full-SiC power modules. Others challengers on MOSFETs are Mitsubishi Electric, Denso, Philips, Semisouth, ...

This will go with the implementation of new SiC-based converters and inverters. SiC will allow a dramatic reduction in size and weight along with an improvement of power conversion. Electric motor drivers are the first seen applications in both the industry and the hybrid automotive fields. In 2016, 5 millions hybrid cars could benefit from SiC devices.

First power-module prototypes are going out of R&D labs, as shown by Kansai Electric and Cree or MELCO. Solar and wind power players are starting to look at these components as well.

2005 has seen the involvement of new players in SiC power devices business like Rohm, International Rectifier, ST Microelectronics, and Philips in collaboration with Chalmers University.

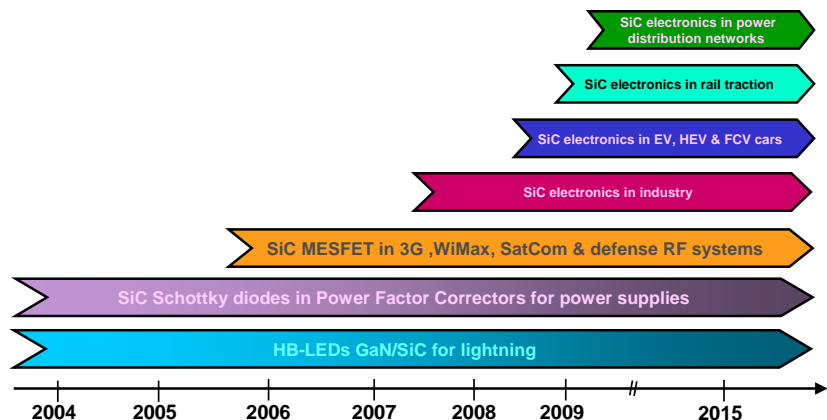
Even if SiC Schottky diodes are offering sharp improvements over silicon-based diodes, it deals with a complete re-design of the power supply.



Schottky devices market forecast

This leads to a slow market penetration, starting with high-end devices and now migrating to mid-end applications.

We forecast the devices market will reach about \$45M by 2010 for the Schottky business. The target price for such a component is expected to decrease down to 0.2\$/Amp but the current level is still laying at ~0.45\$/Amp. We forecast PFC will handle a ~\$75M SiC devices market in 2012.



Applications for SiC devices introduction roadmap

We expect that PFC manufacturers will then jump massively on this technique, marketing new SiC-based products. We set this high CAGR curve to start by 2009 targeting a total accessible market of 1.2 billion PFC units in 2006.

Apart from regular silicon diodes, few competing SiC materials exist today for these applications. However a GaN-based Schottky diode has been recently introduced. The learning curve for this product has to be kept into investigation but we are confident with SiC monopoly for the next 3-5 years.

The introduction of 4" wafers will help to reach this target, allowing the use of regular semiconductor capital equipment. 2007 should see the introduction of 4" SiC at production level. Coupled with the reduction of micropipes density, now close to 0, both parameters will impact positively the productivity of such a component.

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