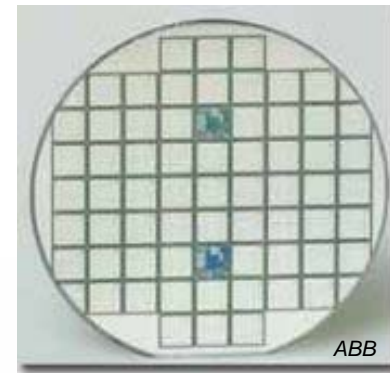
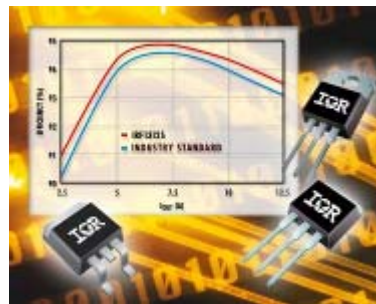


PowerD'06

New emerging materials & technologies for Power Devices: a 2003-2009 market analysis

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Y O L E D É V E L O P P E M E N T

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 - Thyristors: SRC, TRIAC, GTO, MTO ...
 - Rectifiers

Executive summary

Power Devices is representing ~10% of the total IC business

• Market Overview

- PD 2005 market was \$22.6B and is forecasted to reach \$29.5B by 2008
- After a light slow-down in 2006, the market should benefit from a 2-digits CAGR in 2007 and 2008
- In 2008, IPM will be more than 50% of PD market share over discretes components
- Discretes market is dominated by MOSFETs and BJTs where voltage regulators dominates the IPM market
- The related capital equipment market for PD manufacturing was in the range of \$2.6B in 2004. It is characterized by a large use of retrofitted and second-hand equipments coming from the “old” mainstream IC fabs
- Production of PD is geographically well-balanced between US, Europe and Asia

Executive summary

New emerging materials & technologies

- **Use of new materials**
 - **SOI wafers**
 - Plasma display drivers is the major market for thick SOI
 - **Partial SOI wafers are in development** for integrating vertical/lateral power devices (LAAS, Berkeley ...)
 - More than 350,000 x 6” SOI wafers expected 2009
 - **Thin wafers**
 - Mainly used for NPT IGBTs
 - 85 µm thick wafers are used in production
 - **65 µm thick wafers are in development**
 - **Silicon Carbide: SiC**
 - High power density & high frequency capabilities
 - Only Schottky diodes today in production
 - **4” emerging will strongly help the market to grow**
 - Automotive and industry will be the next “killer apps” for SiC

Executive summary

New emerging materials & technologies

- **Use of new process technologies:**

- **Deep etch**

- **Deep Trench Isolation (DTI)**

- Used for electrical isolation (power MOS, IGBTs, IPMs)
- Reduce chip size (**up to 80% in R&D**, source Purdue University)
- Maximum aspect ratio: 40:1 (80 μm depth, as narrow as possible: **2 μm width in 2004 in R&D**)

- **Deep Trench Super Junction**

- Used for high voltage/high speed applications
- Competing Infineon's CoolMOS technology
- SJ deep trenches: 20 to 80 μm depth
- Aspect ratio 30:1 (in R&D at Vishay/FhG)
- **First industrial product:** SJ DTMOS from Toshiba (April 2005)
- **DRIE Bosch process** in evaluation at Vishay

- **Trench gate**

- Used for < 200 V applications
- Aspect ratio: 1.5 to 3.3 (**3.6 in development at FhG/Vishay**)
- RIE is used

Executive summary

Emerging technologies roadmap for Power Devices production

