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Frequently Asked Questions

4th Generation IGBT Technology
PCIM Europe 2015
May 19th, 2015

What is Fairchild announcing?
Fairchild is revealing Field Stop IGBT technology enhancements for its 4th generation (FS4) of 650V and 1200V IGBTs.

What are the advantages of the new FS4 technology?
The new technology delivers industry-leading levels of performance with excellent low saturation voltage (Vce(sat) = ~ 1.65V) and low switching loss (Eoff = 5µJ/A) trade off characteristics for customers to achieve higher system efficiency. Compared to FS3, the new generation most notably delivers a 30 percent reduction in switching losses along with very strong latch up immunity.

How will customers benefit from the new technology?
Dramatically lower switching losses enable customers to improve the power efficiency of their products by increasing switching frequency with lower conduction losses. This also enables manufacturers to reduce the number of passive components in their designs, thereby lowering their bill-of-materials (BOM). The strong latch up immunity improves overall ruggedness and end product reliability.

What is unique about how Fairchild approached the design of its FS4 IGBTs?
The new approach involves extremely high electron injection efficiency that is enhanced by a very fine cell pitch design and hole carrier injection restricted by a new buffer structure, thus achieving remarkably better trade off performance as well as strong latch up immunity.

A self-balancing cell build using a novel self-aligned contact technology was also applied, which proved to be very effective in optimizing the critical dimension of active cell design for the enhanced on-state performance, as well as to maximize the latch up current capability.

Additionally, multiple buffer layers were adopted for the anode side of the IGBT in order to effectively control the minority carrier injection during the on state, and to completely block the electric field during the off state.

What is a self-balancing cell build?
Fairchild's design team developed this concept after characterizing the limitations of existing IGBTs to improve ruggedness in hard switching applications such as motion or uninterruptible power supply. Up until recently, no IGBT manufacturer was actually limited by lithography equipment, hence most device failures where considered a consequence of defects or other process variations.

Fairchild explored the limits of its process tools and hence novel technologies were applied in which the contact alignment process was the critical factor behind delivering better performance. Unlike competitors who invested heavily in new equipment to get similar results, Fairchild can deliver low saturation voltage and low switching loss trade off characteristics without the investment in new equipment that would subsequently drive up wafer costs.

For more detail, please see the White Paper "4th-Generation Field Stop IGBT with High-Performance and Enhanced Latch-up Immunity" included with the press kit.

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What impact will FS4 IGBTs have on Fairchild's market position?
FS4 IGBTs will enable Fairchild to further strengthen its presence in the markets for discreet IGBTs and modules that include IGBTs.

What markets will 4th generation IGBTs target?
Three-level inverter topology that manufacturers are increasingly using in their latest product designs to achieve higher system efficiency. The new generation will be ideal for applications requiring the highest levels of efficiency, ranging from electric vehicles and solar systems, to highly-efficient HVAC applications and industrial inverters.

FS4 will be a key technology for customers building motion control applications including automotive (traction) inverters; three level inverters for solar; uninterrupted power supplies (UPS); high-end commercial heating; ventilation and air-conditioner systems; and industrial inverters.

When will Fairchild's 4th generation IGBTs be available?
Fairchild is planning to make the new generation of FS IGBTs available in Q4 of 2015.

Does Fairchild have a roadmap for silicon carbide (SiC) and gallium nitrade (GaN)?
Yes. Wideband gap technology is an important part of Fairchild's roadmap and we are fully committed to SiC. Development of SiC devices is underway and we expect to have our first SiC-based diode shipping by end of this year, with our first FET to follow.

GaN is also important part of our wideband gap technology roadmap, particularly for high voltage applications. As we engage with customers we realize that GaN technology is in its infancy, but that will change as applications demanding high power density, higher efficiency and smaller form factor continue to evolve.

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