

IGBT5 and  technology

The new Chip Generation and its innovative Interconnection Technology

PCIM 2014, Nuremberg

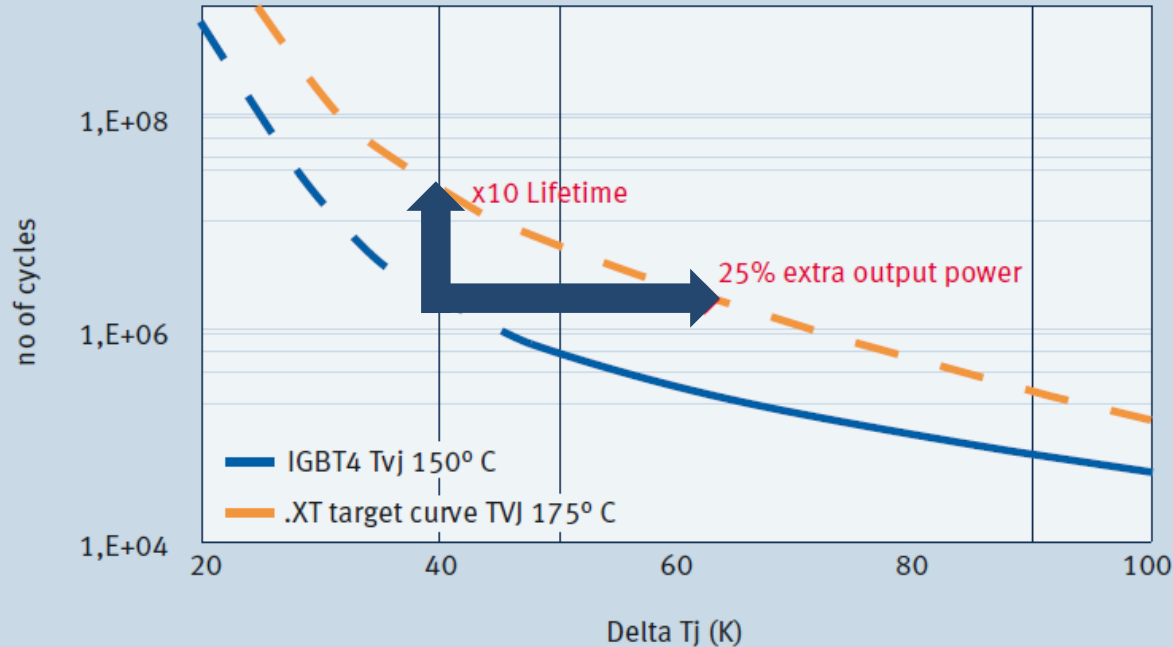


IGBT5 and .XT Technology offers

Key Features

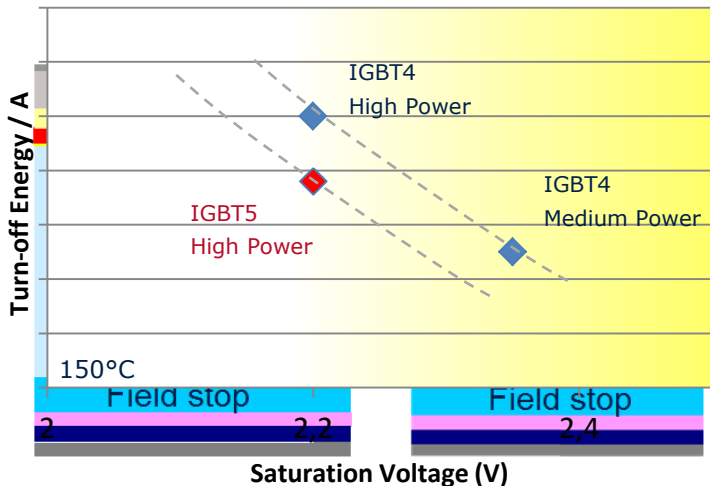
- Useable operation temperature up to $T_{vjop}=175^{\circ}\text{C}$
- Optimized switching behavior for various applications
- Robust design with Infineon's trench-field-stop concept
- Embedded within Infineon's .XT technology

IGBT5 and .XT Technology provide more Power and Lifetime



- Up to 10 times increased lifetime
- $T_{vjop} = 175^{\circ}\text{C}$ for more than 25% increased output power

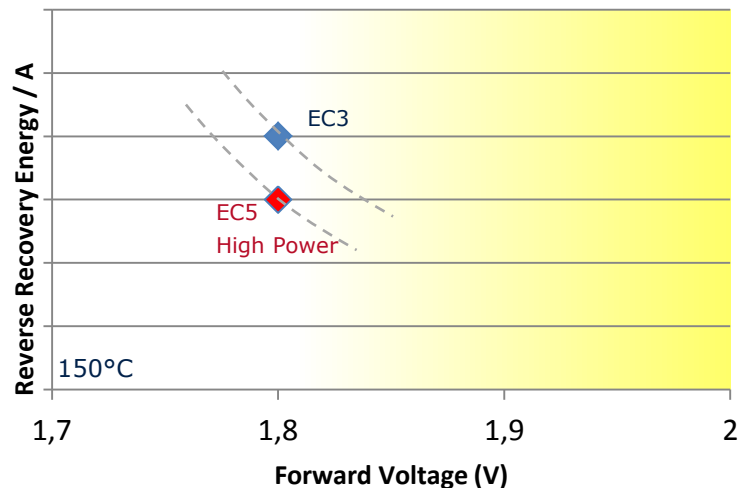
1700V IGBT5 Properties



IGBT	IGBT4 P4 @150°C	IGBT5 P5 @150°C	IGBT5 P5 @175°C
Current / PP3 footprint (%)	100%	130%	130%
T _{j,op,max} (°C)	150	175	175
VCEsat (V)	2.2	2.2	2.3
Esw/A (%)	100%	88%	95%

- Reduced Die thickness → Turn-off and On-state Voltage Trade-off is shifted to lower values
- IGBT 5 with improved softness compared to IGBT 4
- Copper Metallization → increase the Thermal Capacity: Short Circuit Capability up to 10μs

1700V Emitter Controlled 5 Diode Properties



Diode	3rd gen. @150°C	5th gen. @150°C	5th gen. @175°C
Current / PP3 footprint (%)	100%	130%	130%
Tj,op,max (°C)	150	175	175
Vf (V)	1.8	1.8	1.8
Erec/A (%)	100%	90%	100%

- Reduced Die thickness → Reverse Recovery Losses and Forward Voltage Trade-off is shifted to lower Values
- Same softness compared to Emitter Controlled 3 (EC3)
- Copper Metallization → increase the Thermal Capacity: Surge Current Capability is equal IGBT 4 although 175°C

IGBT5 and .XT Technology offers

Key Features

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Customer Benefits

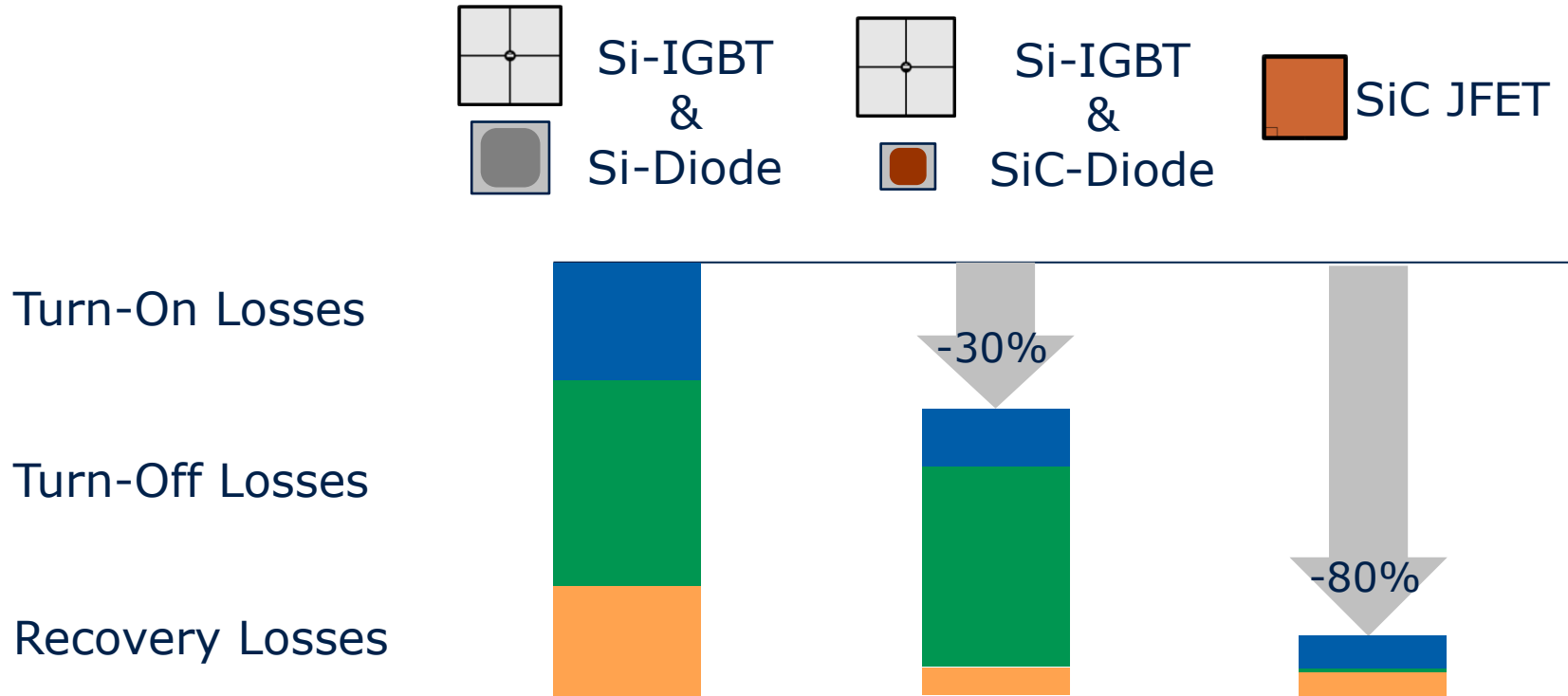
- 25% higher Power Density
- Increased lifetime by factor of 10
- Will be available for 1200V and 1700V Modules
- First Product PrimePACK™ 2 FF1200R12IE5D

Silicon Carbide Technology

PCIM 2014, Nuremberg



Silicon Carbide for High Efficiency – dynamic Loss Reduction



thinQ!™ SiC Diode

Key Features

- Best in Class switching behavior
- No reverse recovery
- Stable thermal behavior
- 5th gen. with optimized trade off V_F vs. Q_C
- 650V and 1200V discrete devices
- Up to 1700V in modules

Benefits

- System efficiency improvements
- Enabling high frequency designs
- Increased Power Density
- Lower System Costs
- Surge Current Capability outperforming competition

Products

- All standard packages available
 - DPAK
 - D²PAK
 - TO220
 - TO247
- New SMD Package – ThinPAK
- Several Power Module solutions



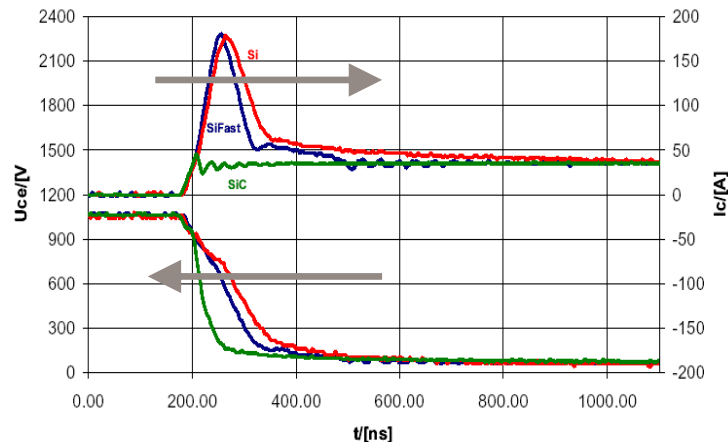
Silicon Carbide for High Efficiency

Hybrid Modules –
modern IGBT Technology combined with ultrafast SiC Diode



- No reverse recovery in freewheeling diode
- Strong reduction in IGBT turn on losses
- Possibility to increase the switching frequency while keeping or even improving efficiency
- Smaller filters
- Less cooling
- Longer Motor Life Time

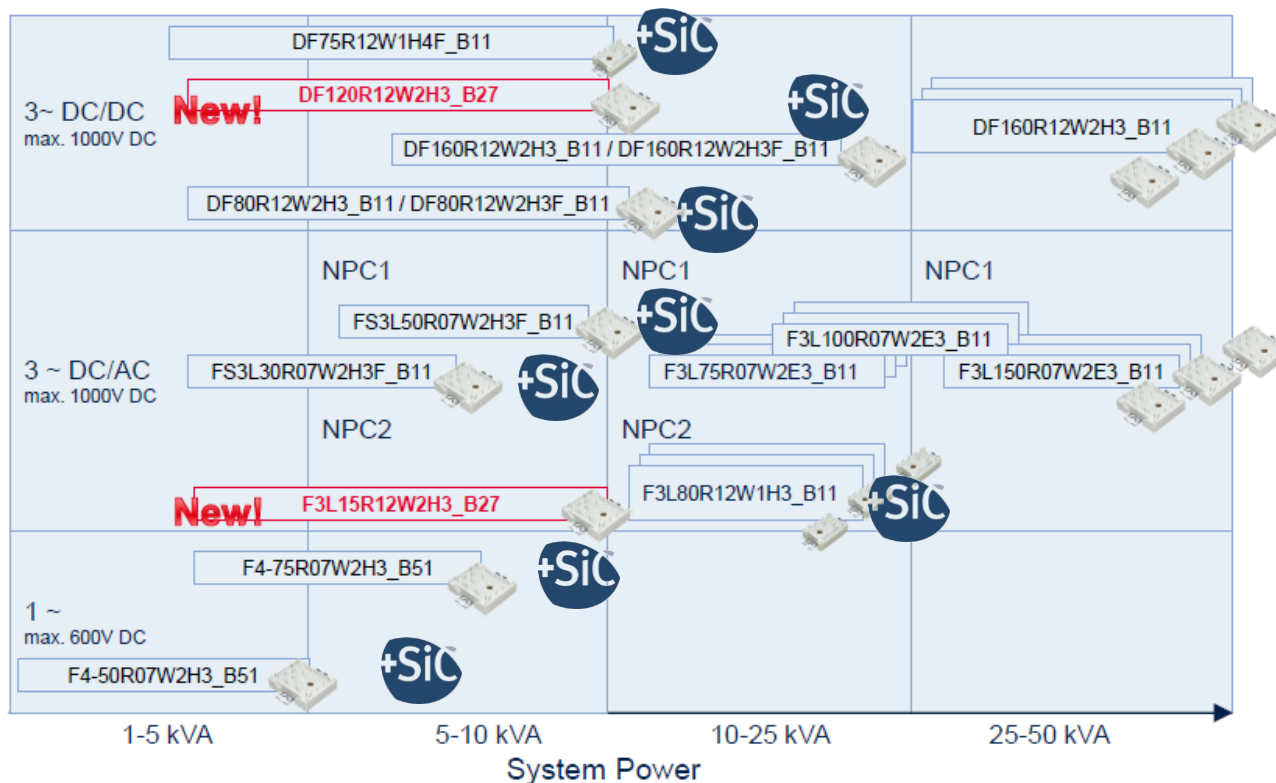
Turn on Behavior of an IGBT empowered by SiC Diodes



Power Modules with SiC – Solar Applications



Infineon is offering the broadest portfolio of Power Modules with SiC Chips worldwide

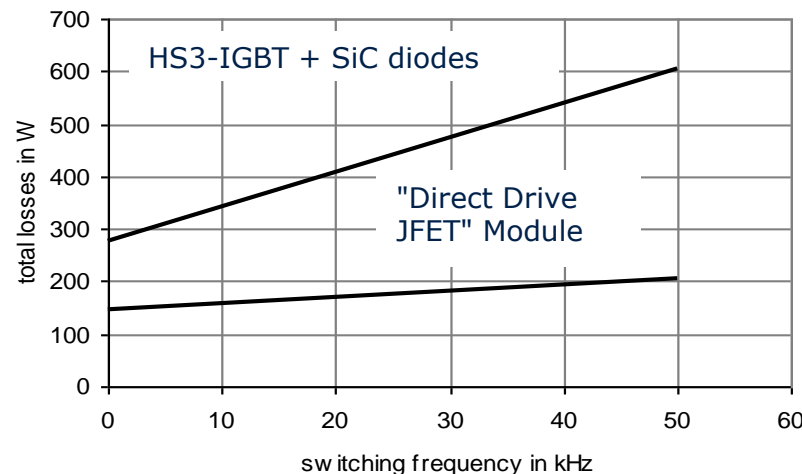


Full SiC Modules for fastest switching



- Low loss at partial load
- Temperature independent small dynamic losses
- Enabler for hard switching above 40kHz
- Small footprint by integrated diode

Loss Improvement with SiC JFET compared to hybrid IGBT-SiC Diode Setup*



*Calculated Semiconductor Losses of the Inverter Stage of a 22kVA 2-Level Converter ($V_{DC}=600V$, $\cos\phi=0.9$, $m=1$, $T_j=125^\circ C$)

CoolSiC™ – SiC JFET

Features

- Very low switching losses
- Low $R_{DS(on)} \bullet A$
- Internal Body Diode with SiC Schottky Diode like behavior
- Stable thermal behavior
- Ready for stable paralleling

Benefits

- Highest efficiency
- High Power Density
- Higher Output Power
- Anti-parallel diode can be omitted
- Reduction of System Cost
- Reduction of the total Cost of Ownership

Applicable for

- DC-AC Converter
- DC-DC Converter
- UPS
- Aux-Power Supply
- Solar Inverters

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ENERGY EFFICIENCY MOBILITY SECURITY

Innovative semiconductor solutions for energy efficiency, mobility and security.

