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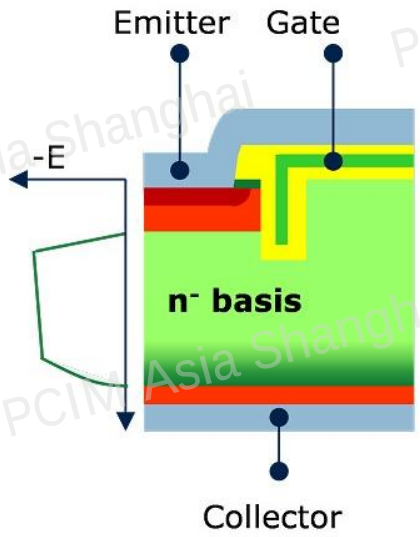
Next Generation 1200V IGBT and Diode Technology for Automotive Drivetrain Applications

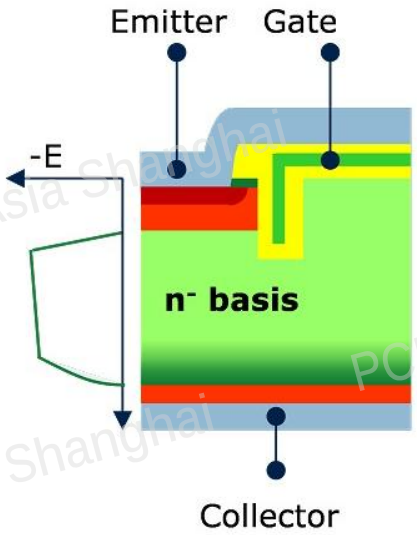
Jiong Wu, Infineon Technologies AG

EDT3 / RC-IGBT 1200V
New Generation 1200V IGBT and Diode Technology

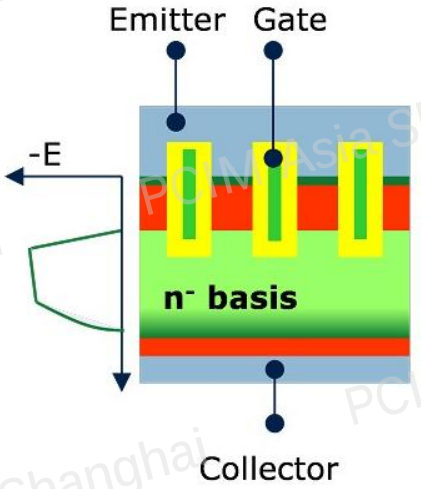
IGBT4
Trench Field-Stop
2012



EDT 1200V
Trench Field-Stop
2020

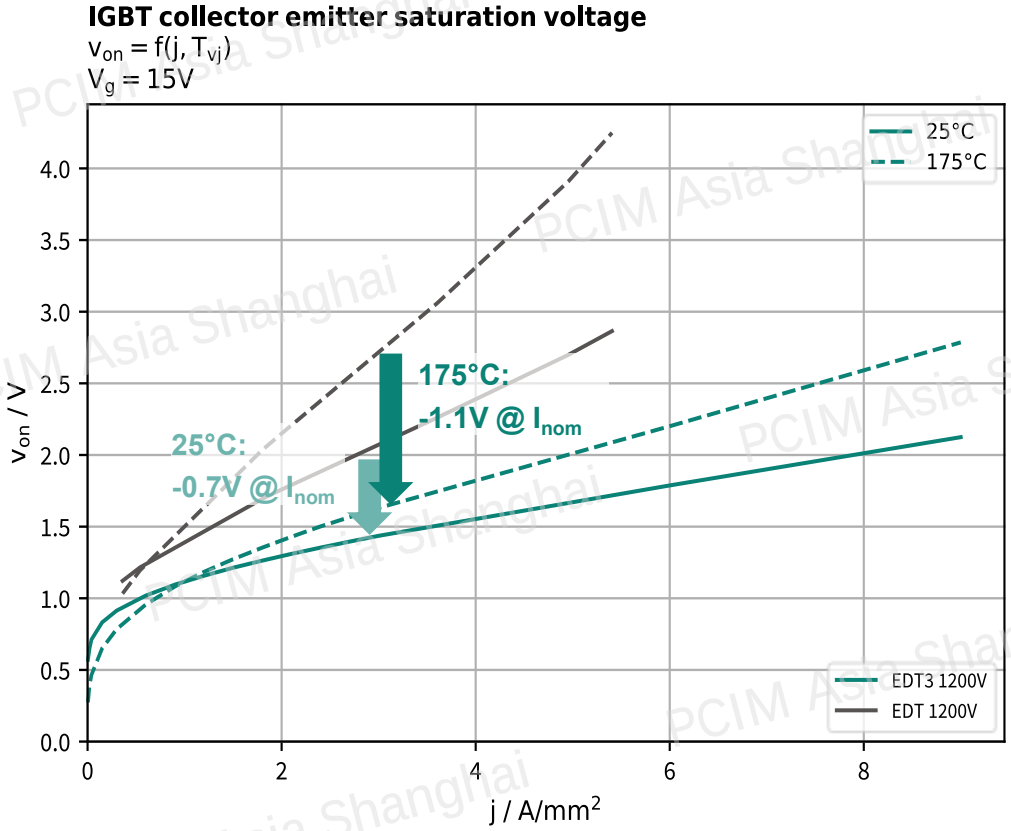


EDT3 1200V
RC-IGBT 1200V
Micro Pattern Trench
2025

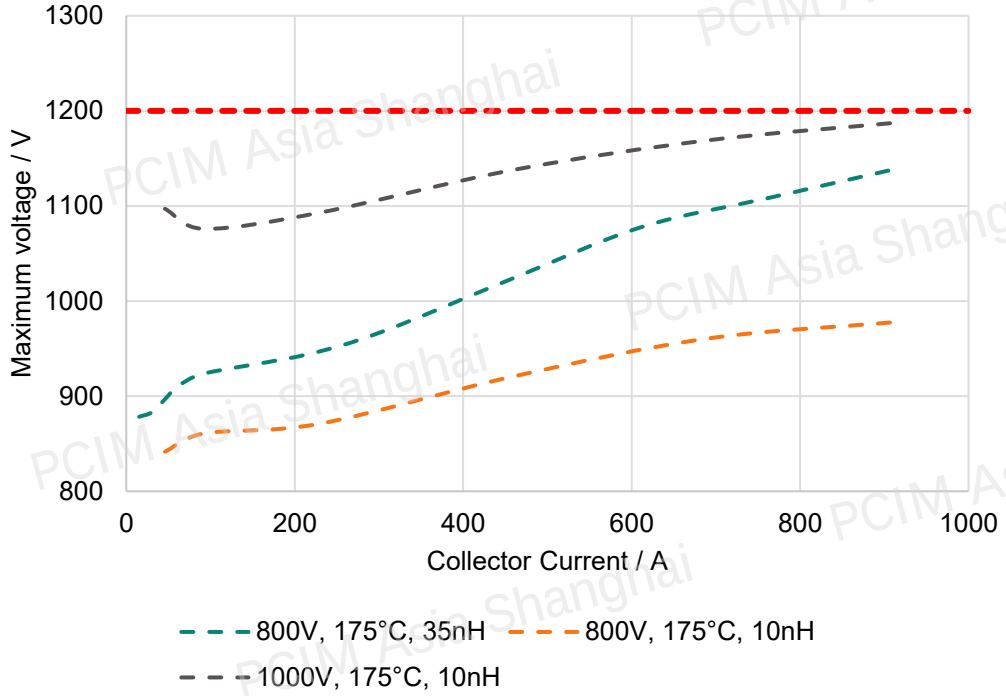


EDT3 1200V IGBT Performance

- Significant improvement of conduction loss compared to the previous generation

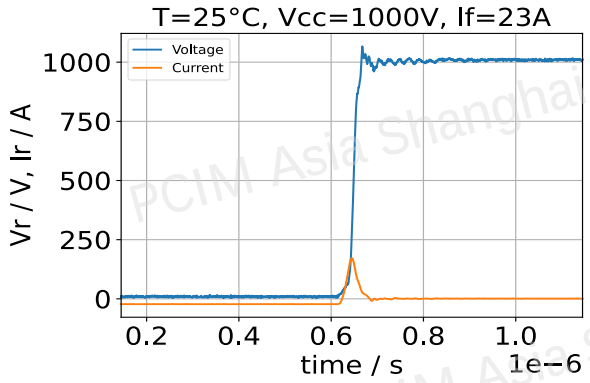


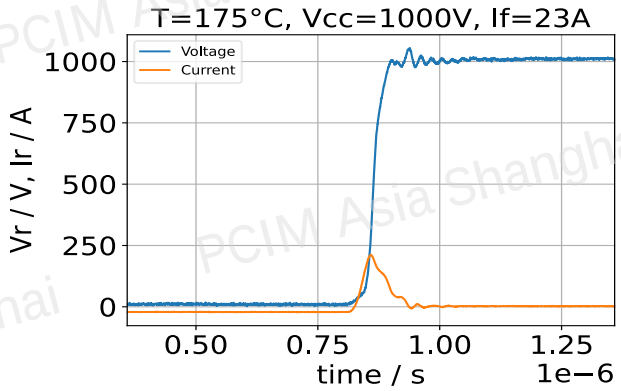
- Low overvoltage during switch-off
  - Self-controlled switching is usable
  - Enabling operation at DC link voltage up to 1000V

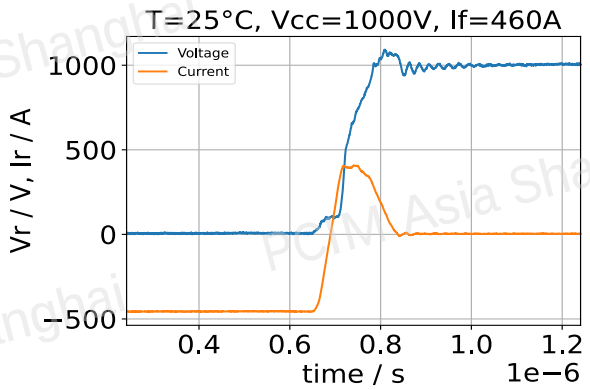


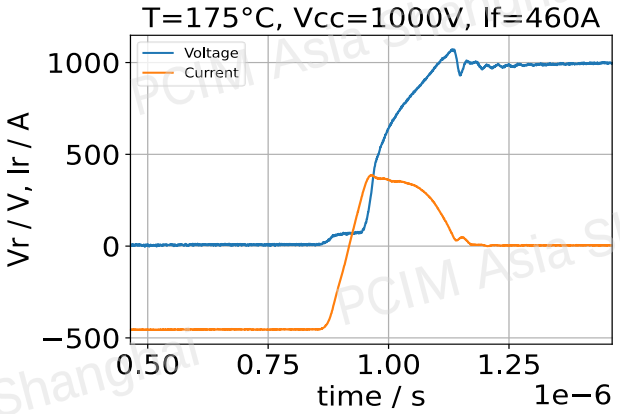
EDT3 1200V Diode Performance

- The EDT3 1200V diode is specifically designed to complement the EDT3 IGBT.
- Soft diode reverse recovery performance enables faster swichting, resulting to lower IGBT turn-on losses.



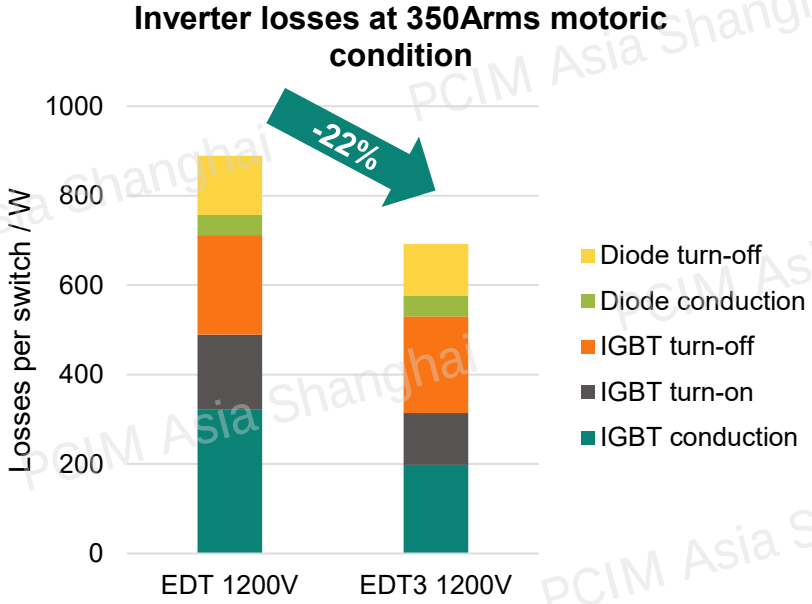






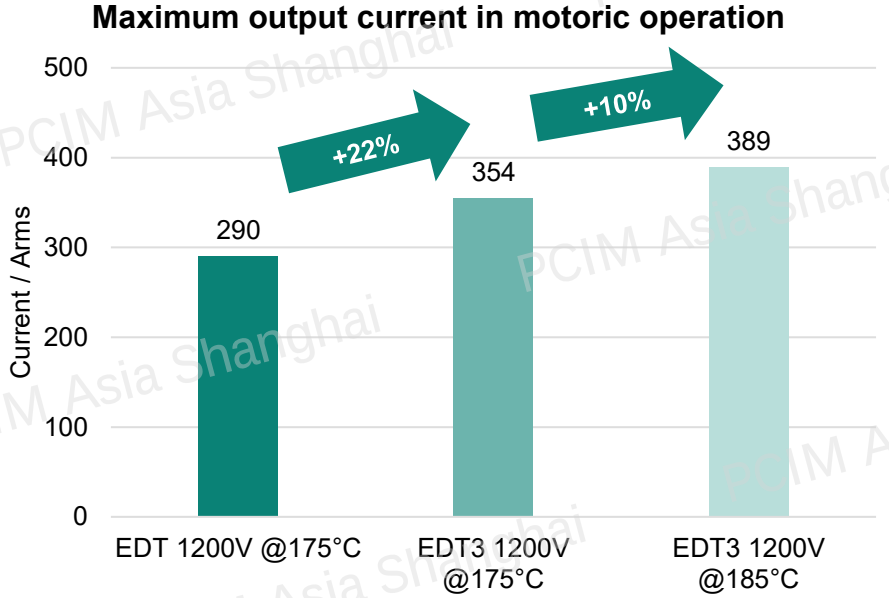
Benefit of EDT3 1200V in Inverter Application

- EDT3 1200V technology achieves 22% reduction of total inverter losses, under high load motoric conditions.



Simulated inverter losses in motoric operation
(350Arms, V_{DC}=800V, cos(φ)=0.85, M=1, f_{sw}=10kHz,T_{ref}=65°C).

- EDT3 1200V delivers a 22% increase in output current from the same chip area, maintaining $T_{vj,max}$ at 175°C.
- A total increase of 34% can be achieved compared to the previous generation, utilizing the increase of $T_{vj,max}$ to 185°C.

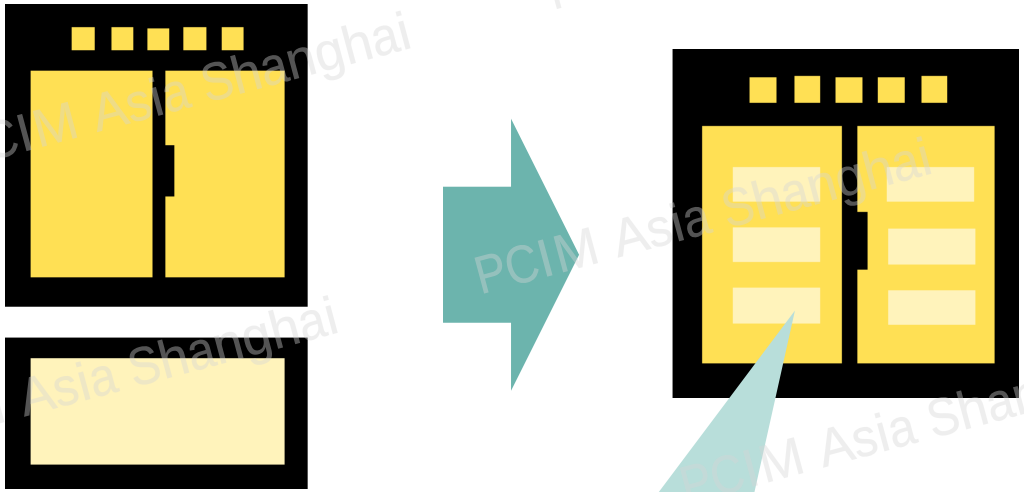


Simulated output current in motoric operation
(V_{DC}=800V, cos(φ)=0.85, M=1, f_{sw}=10kHz, T_{ref}=65°C)

RC-IGBT 1200V

IGBT + Diode

RC-IGBT



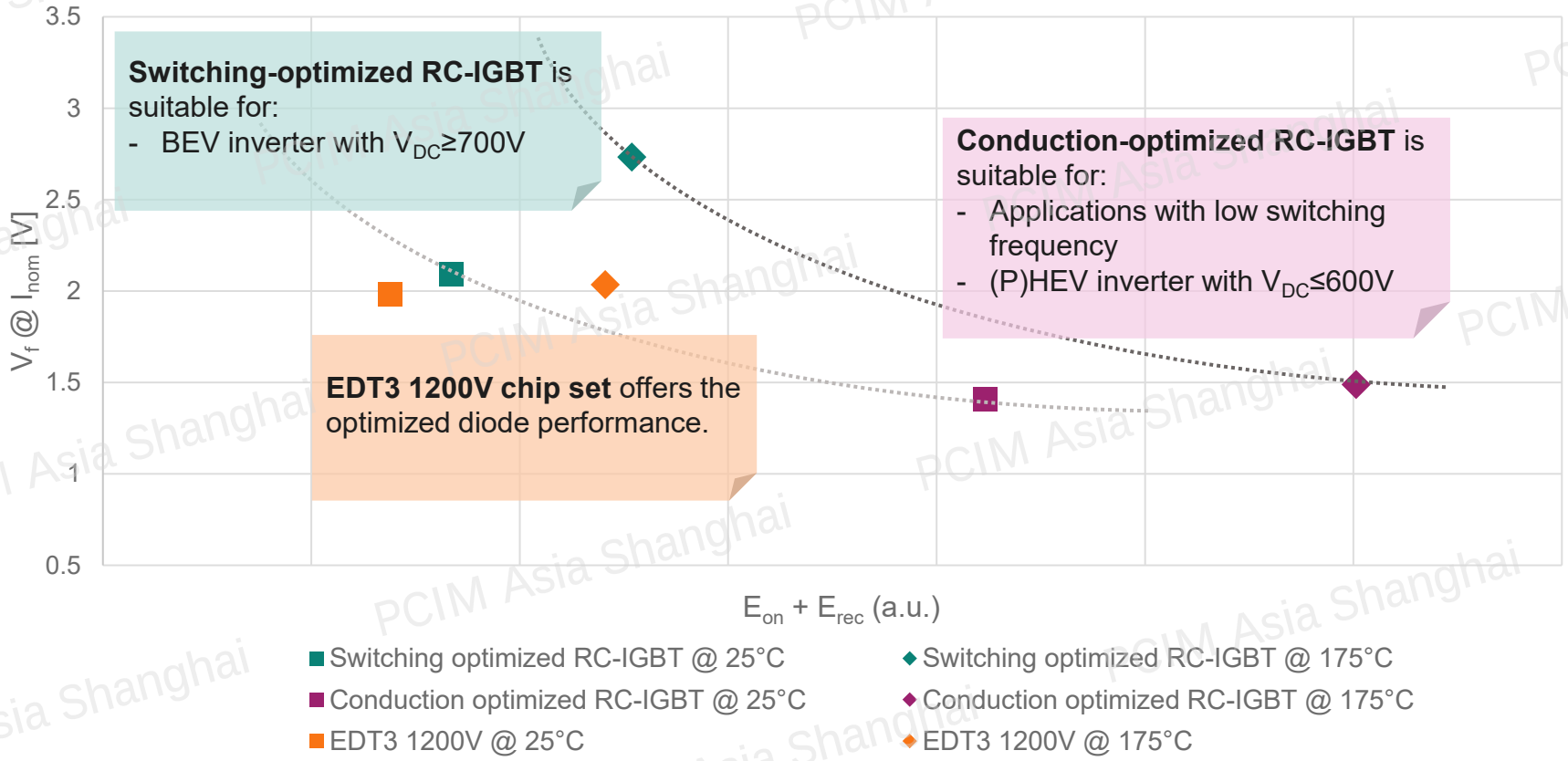
The freewheeling diode is integrated on the same die of the IGBT

Advantages of RC-IGBT

- Approx. 20% thermal resistance reduction of IGBT enhances the IGBT's performance in motoric operation.
- Reduced temperature ripple increases power cycling lifetime of the power module.
- Increased chip active area within the same module footprint, thanks to reduced edge termination structures and the elimination of gaps between the IGBT and diode.
- Simplified module assembly with fewer parts.

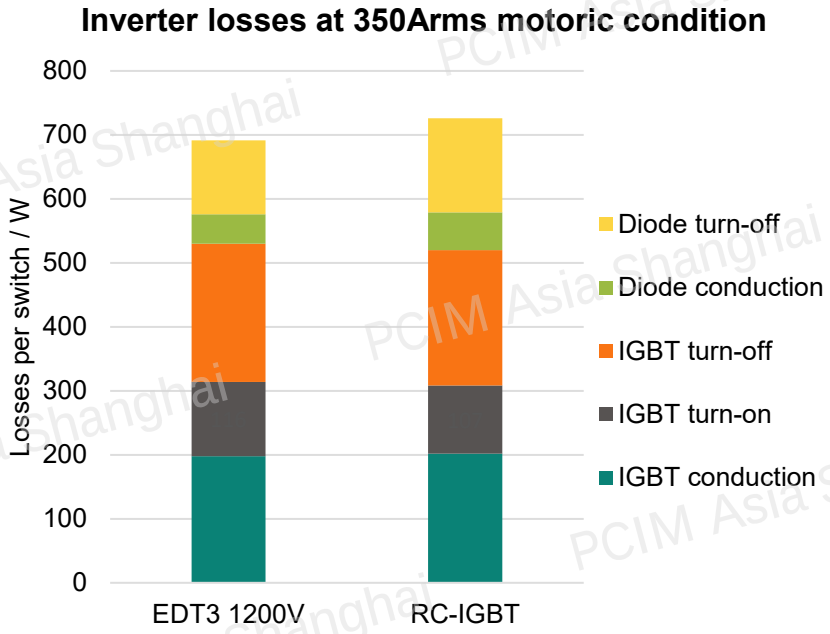
RC-IGBT 1200V Flavors

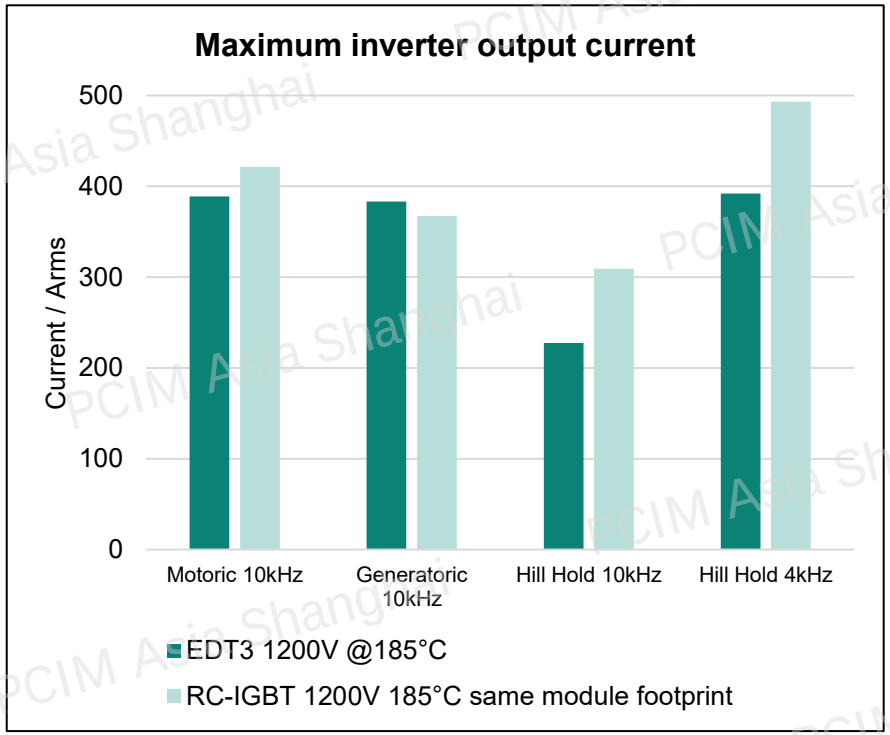
- The 2 flavors of RC-IGBT technology together with the EDT3 1200V compose the new generation of Infineon's 1200V IGBT / diode portfolio for automotive drivetrain applications



Comparison EDT3 1200V Chipset vs. RC-IGBT *)

*) Switching-optimized flavor





- IGBT losses are almost identical
- RC-IGBT‘s diode losses are slightly higher

- RC-IGBT yields higher inverter output current in motoric and hill hold operations

Summary

- Infineon's new EDT3 1200V IGBT + Diode technology exhibits a 22% reduction in losses in motoric operation.
- This loss reduction, combined with the increased maximum junction temperature of 185°C, enables a 34% increase in output current compared to the previous generation.
- Infineon also offers reverse conducting (RC-)IGBT in two different trade-offs: The switching optimized RC-IGBT and the conduction optimized RC-IGBT.
- The availability of both, IGBT + diode as well as RC-IGBT provides module designers the flexibility to choose the best match for their specific requirements, enabling the development of more efficient and compact power conversion systems.

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Thank you for your attention!

Any Questions?