

High-Temperature Design Considerations for Silicon Based Automotive Inverters with 750V EDT HiT

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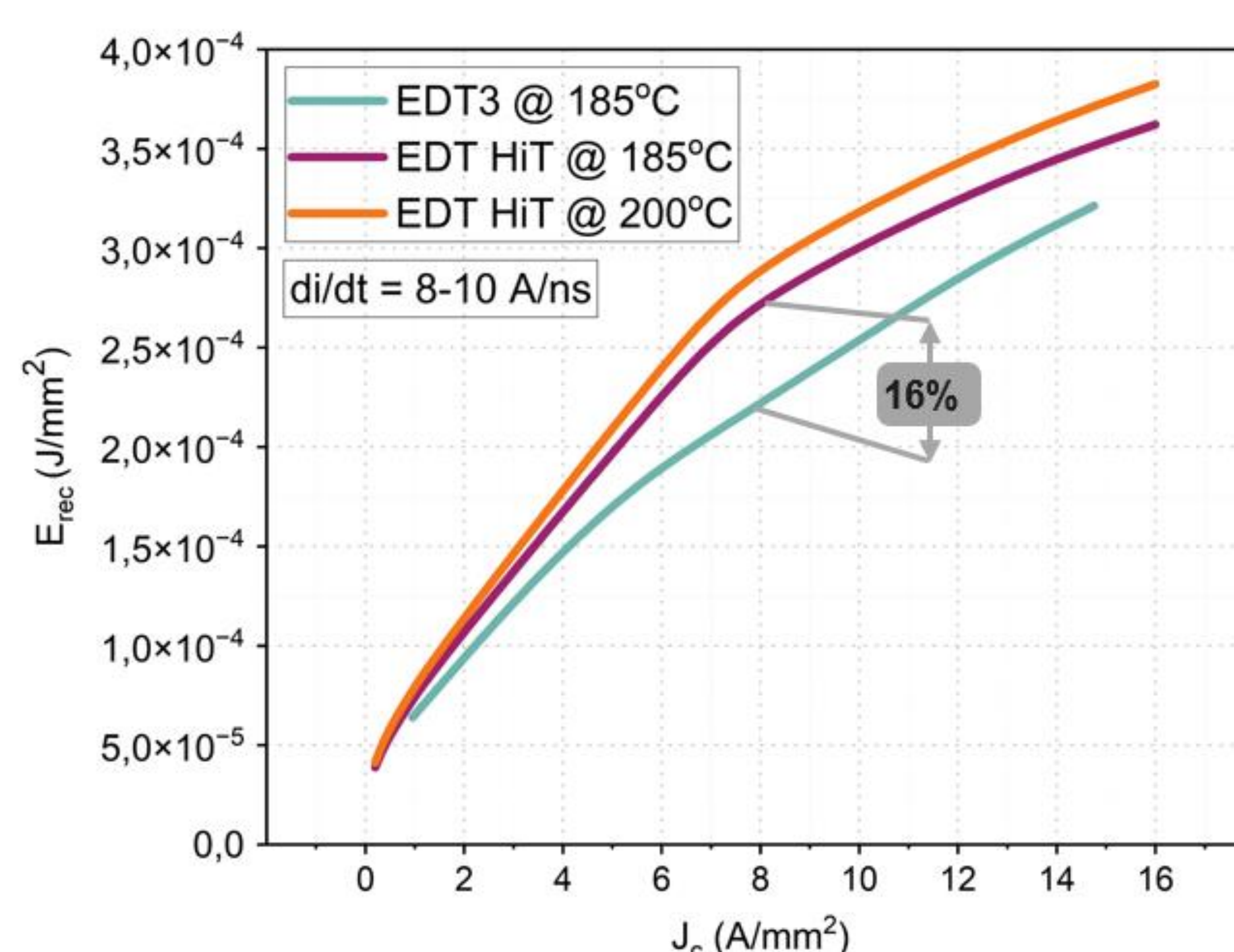
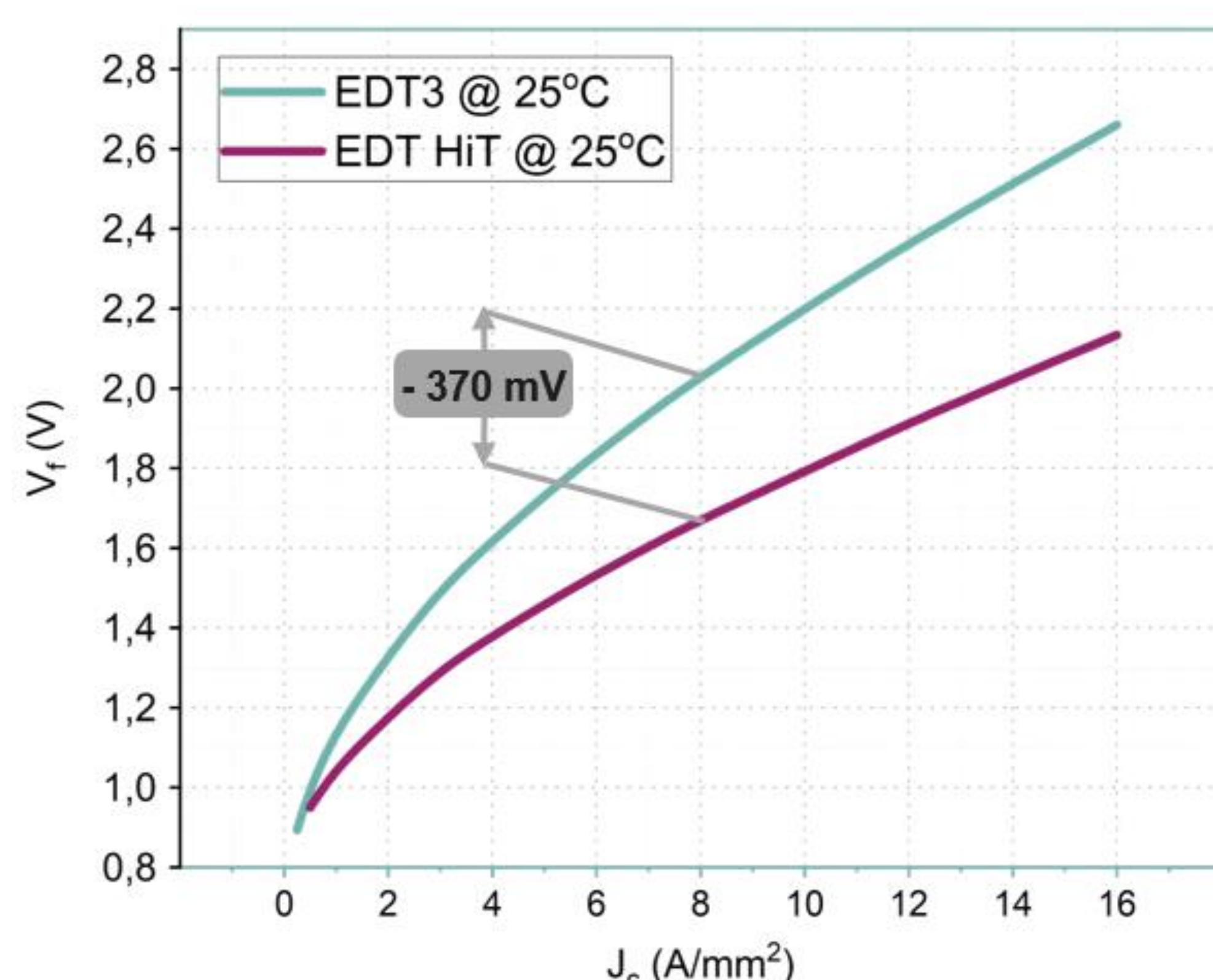
Introduction

Infineon's new 750V **EDT High Temperature (HiT) silicon technology** supports operation up to 200 °C with optimized losses, enabling up to 15% IGBT and 30% Diode chip shrink or, alternatively, higher output current at the same chip area. These gains are driven by a >370 mV reduction in Diode forward voltage at 25 °C and a 15°C increase in maximum junction temperature, combining compact design with improved electrical and thermal performance.

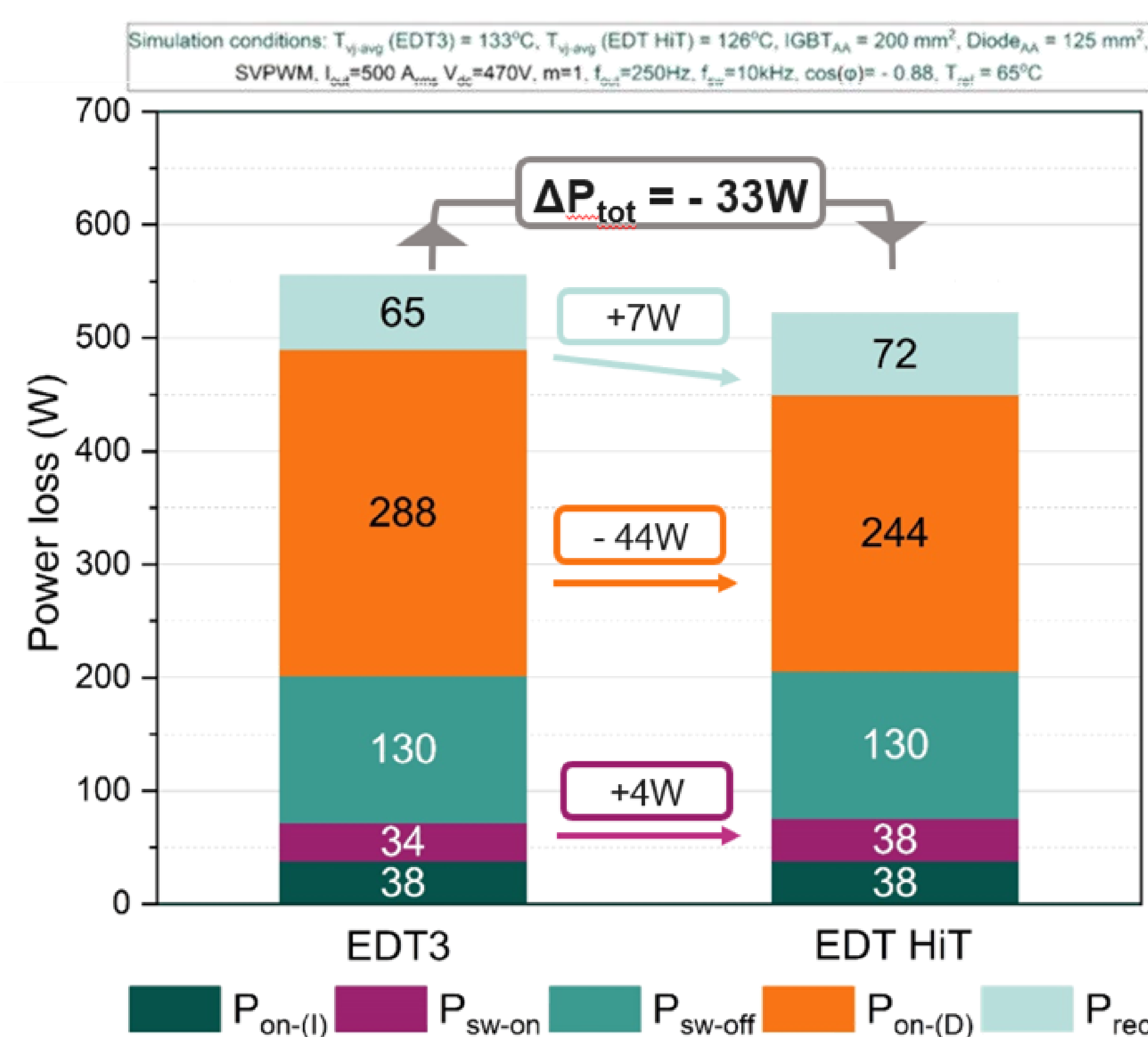
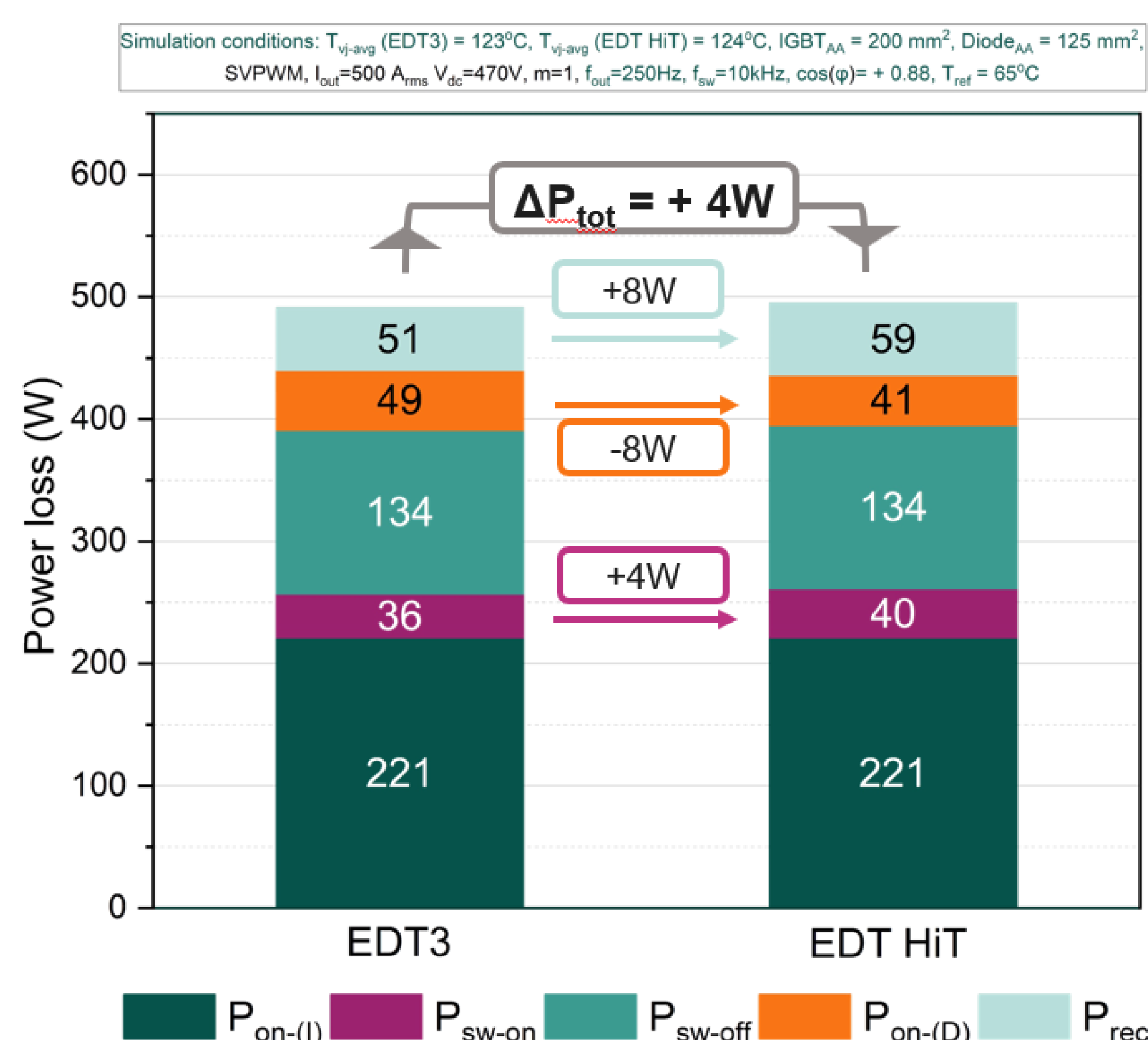
Static and switching characteristics

- Static Characteristic show a **significant improvement of diode V_f value**, for a marginal increase of the E_{rec} at similar switching speeds with EDT3.
- Inverter performance** improved in generative conditions with **>6% reduced losses** compared to EDT3, highly beneficial for energy recuperation in HEV.

Static and Switching Characteristics



Inverter Losses



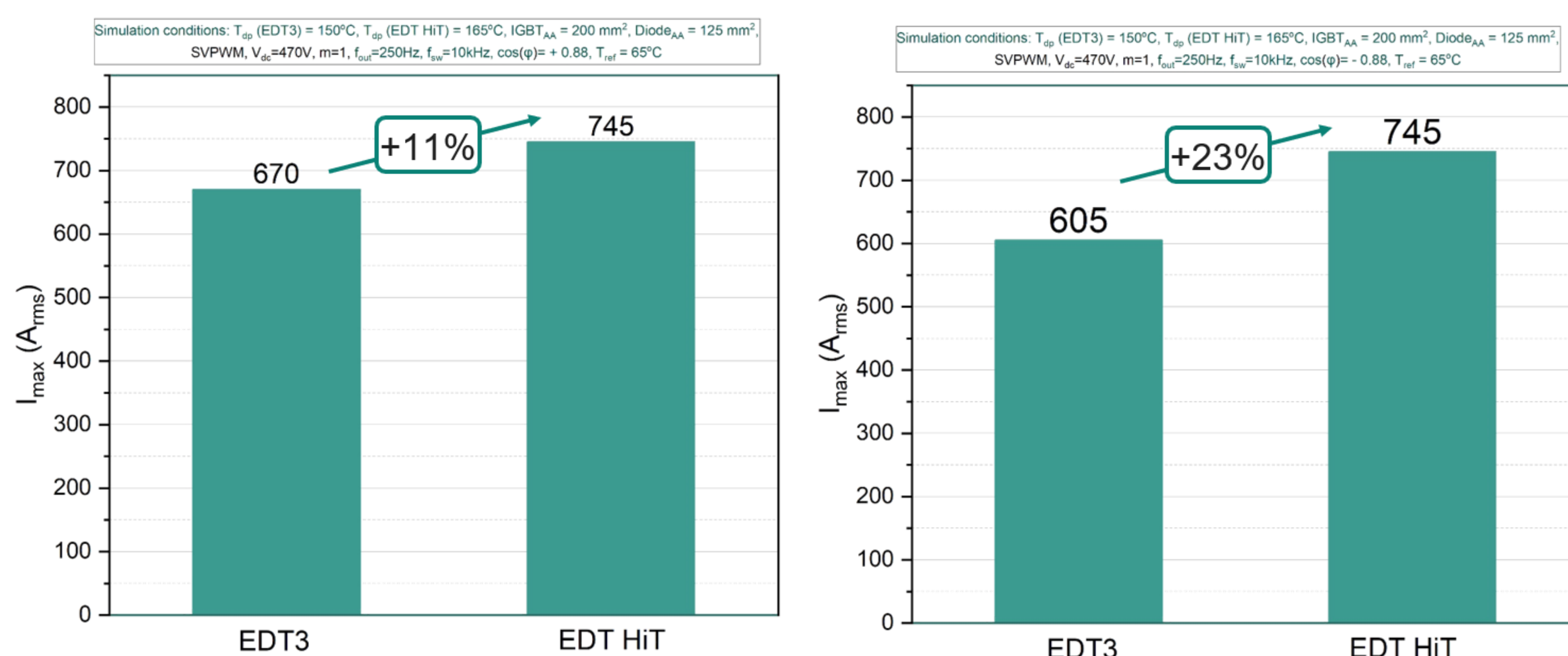
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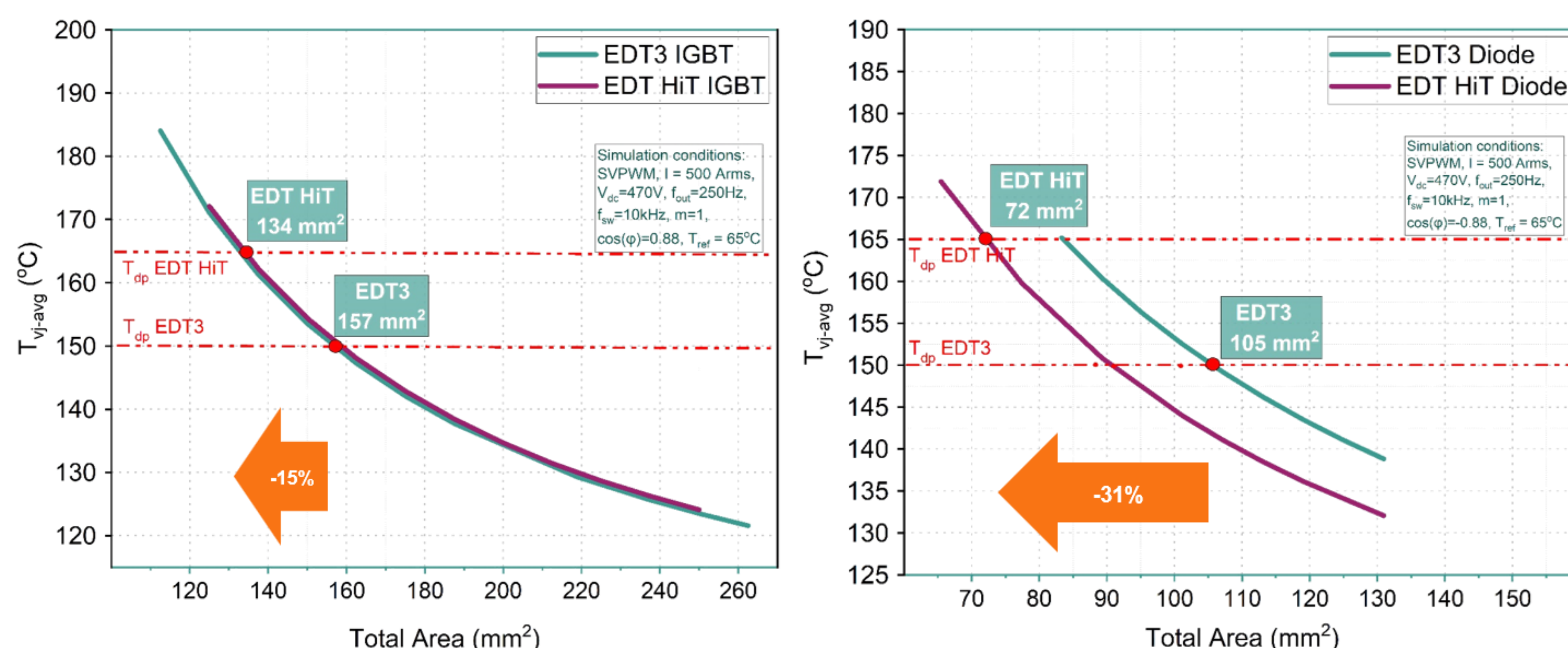
Inverter Design with 750V EDT HiT: Key Considerations and Trade-Offs

Inverter Output Current



- Considering a $T_{vj-max} = 200^\circ\text{C}$ and improved losses, motoric and generative **output current can be improved by 11% and 23%, respectively**

Chip Shrink Potential



- An IGBT chip shrink of **15%** and Diode shrink of **up to 31%** possible compared to EDT3

High Temp. Design Considerations

- 100h between 185-200°C as high temperature operational lifetime requirement (HTOL), based on the WLTP profile.
- Increased IGBT leakage currents at 200°C need to be considered during DPT testing and HTRB qualification
- Short-pulse testing methodology** needed for extracting switching losses at 200°C

