

1700 V EconoDUAL™ 3 modules with TRENCHSTOP™ IGBT7

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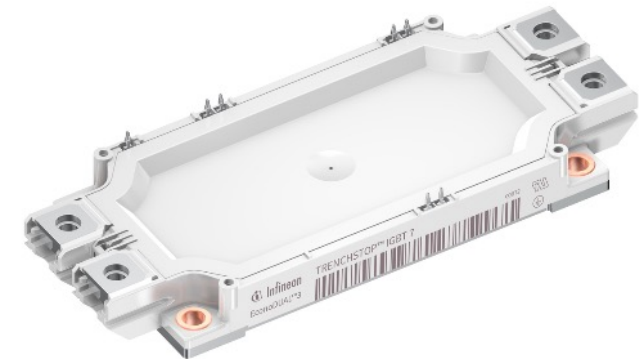


EconoDUAL™ 3 addresses a broad range of applications including Wind, Drives, Solar and CAV

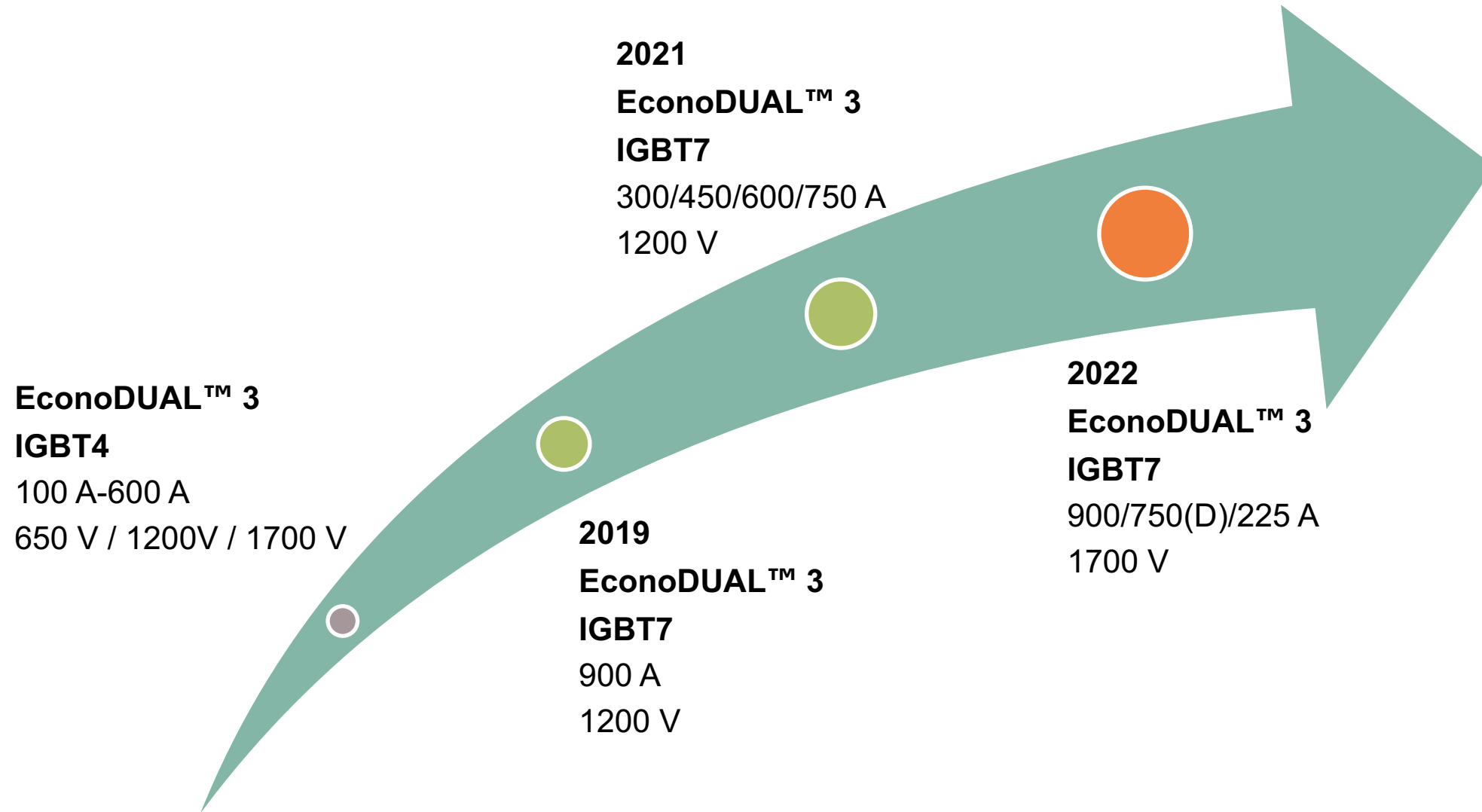


Highlights

- › Versatile and popular package
- › Broad product portfolio with proven IGBT4 and IGBT7 technology
- › Available with TIM and PressFIT
- › Customized products



EconoDUAL™ 3 portfolio is further growing – current extension to 900 A now also available in 1700 V voltage class

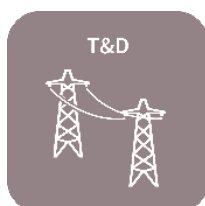
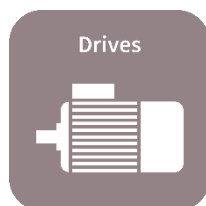
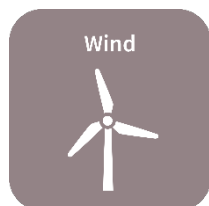


EconoDUAL™ 3 with TRENCHSTOP™ IGBT7

Key Features

- › 900 A 1700 V best-in-class EconoDUAL™ 3
- › 750 A 1700 V EconoDUAL™ 3 with enlarged diode as best fit for Wind and SVG applications
- › TRENCHSTOP™ IGBT7 technology
- › Improved EconoDUAL™ 3 housing
- › Lower conduction and switching losses
- › Higher inverter output current for the same frame size
- › Reduced system costs by avoiding paralleling of the modules

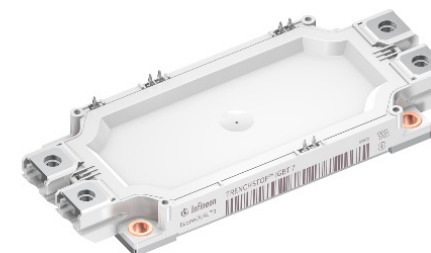
Typical Applications



Target Product Portfolio	
IC [A]	1700 V
900	FF900R17ME7_B11*
750	FF750R17ME7_B11 FF750R17ME7D_B11**
600	FF600R17ME7_B11
450	FF450R17ME7_B11
300	FF300R17ME7_B11
225	FF225R17ME7_B11*

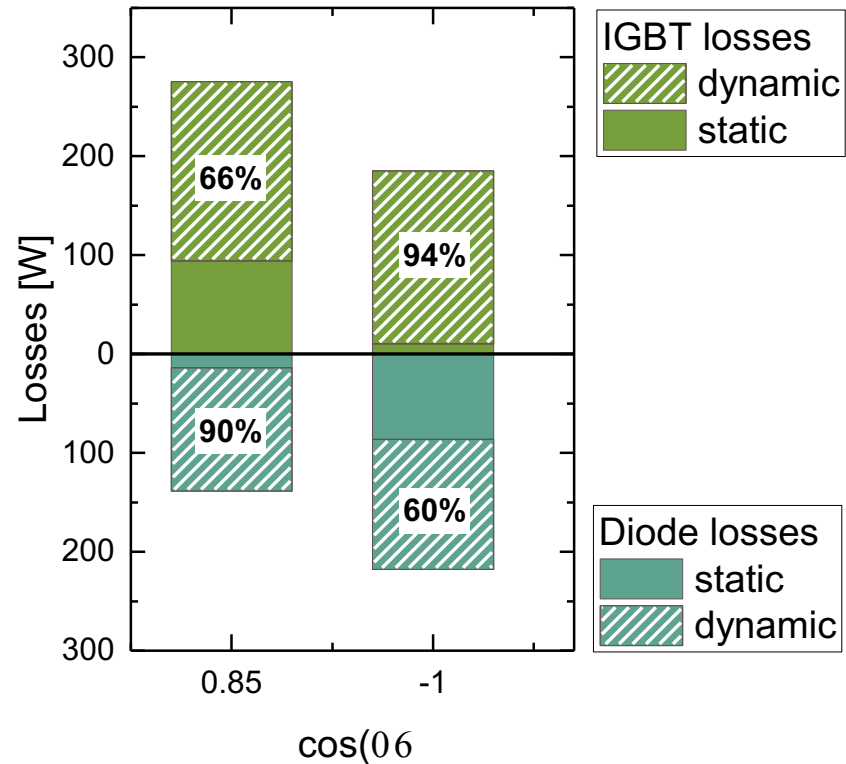
* already available

** with enlarged diode
optionally available with TIM



Typical application conditions for 1700 V IGBT modules

Dynamic losses are dominating



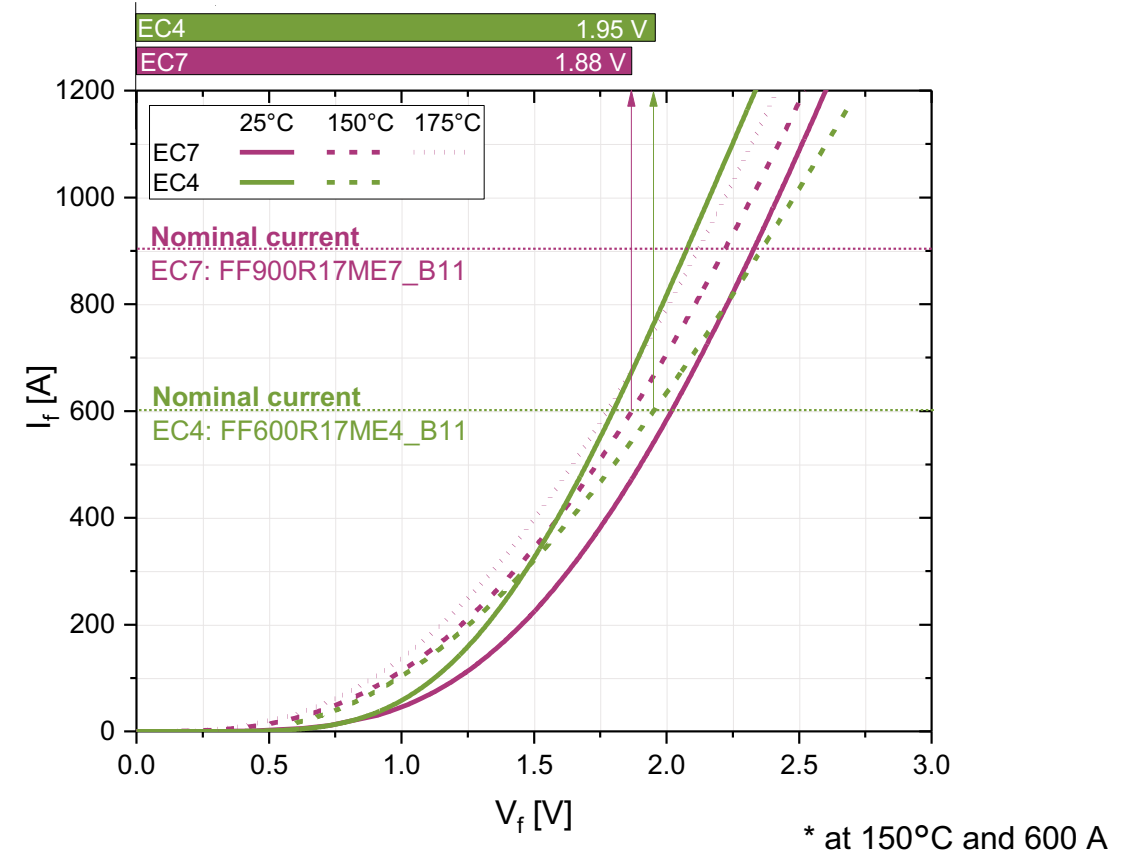
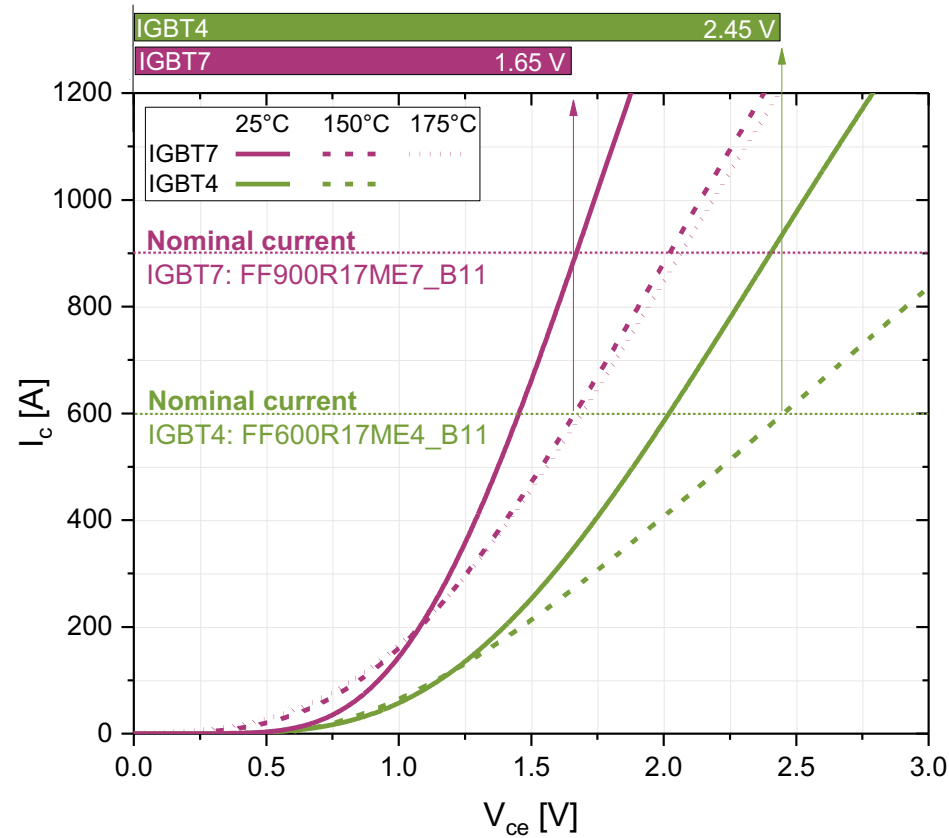
Power losses ratio for the FF600R17ME4_B11 under the following conditions:

- › $f_{sw} = 2.5 \text{ kHz}$
- › $I_{rms} = 175 \text{ A}$
- › $\cos(\varphi) = 0.85 / -1$
- › $m = 1$
- › $f_{out} = 50 \text{ Hz}$
- › $V_{dc} = 1150 \text{ V}$
- › forced air cooling

- › Dynamic losses have a major share at both $\cos(\varphi) = 0.85$ and $\cos(\varphi) = -1$
- › To optimize the electrical performance it is crucial to reduce switching losses
- › Well-balanced switching and static parameters of the IGBT and the diode should not be neglected

Static losses comparison

Significantly reduced IGBT static loss compared to former generation

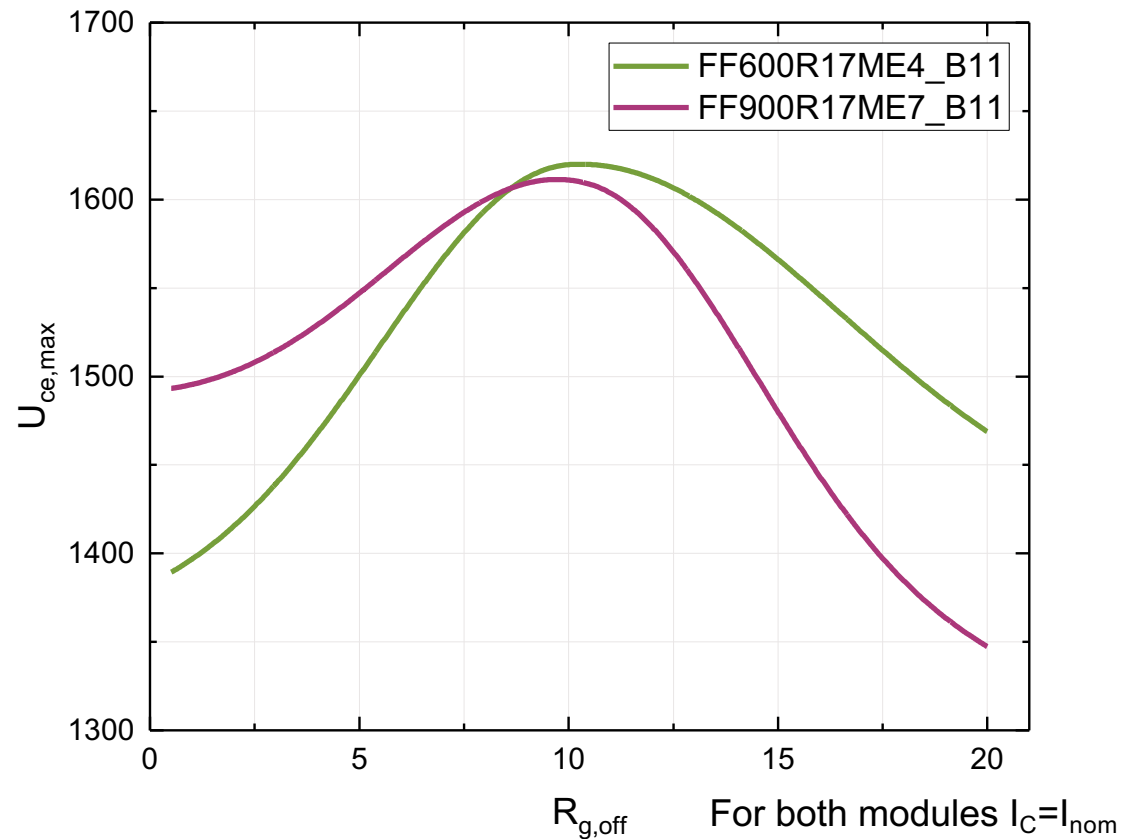
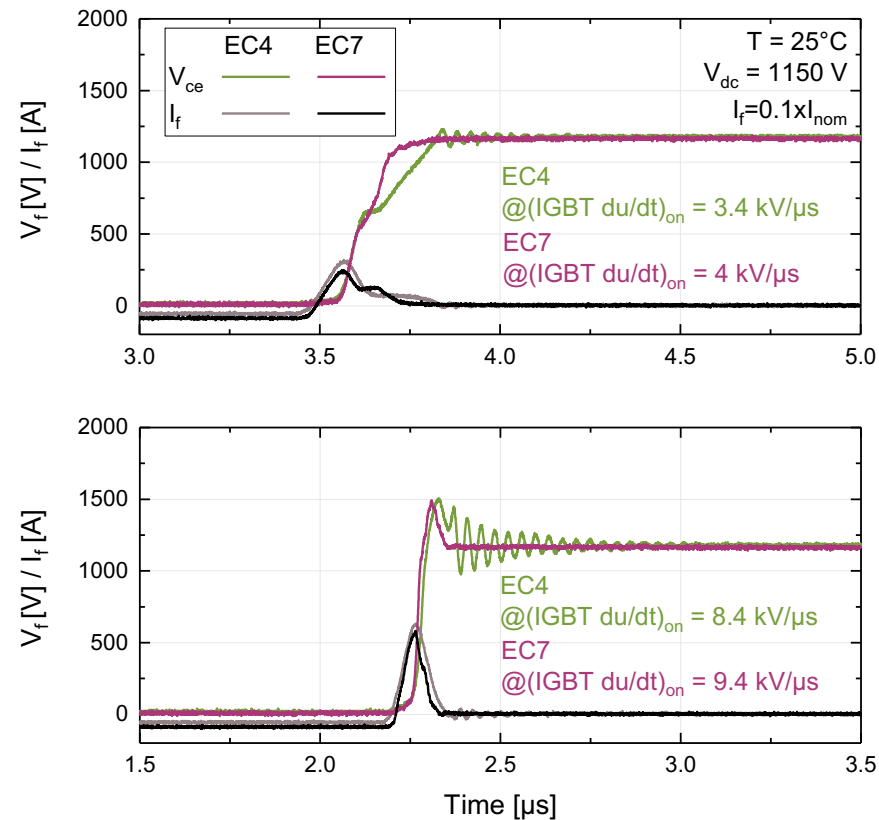


FF900R17ME7_B11 with TRENCHSTOP™ IGBT7 1700 V shows:

- > **33%** lower IGBT static losses*
- > **4%** lower diode static losses*

Diode softness and IGBT overvoltage at turn-off

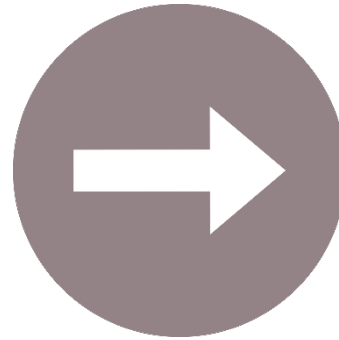
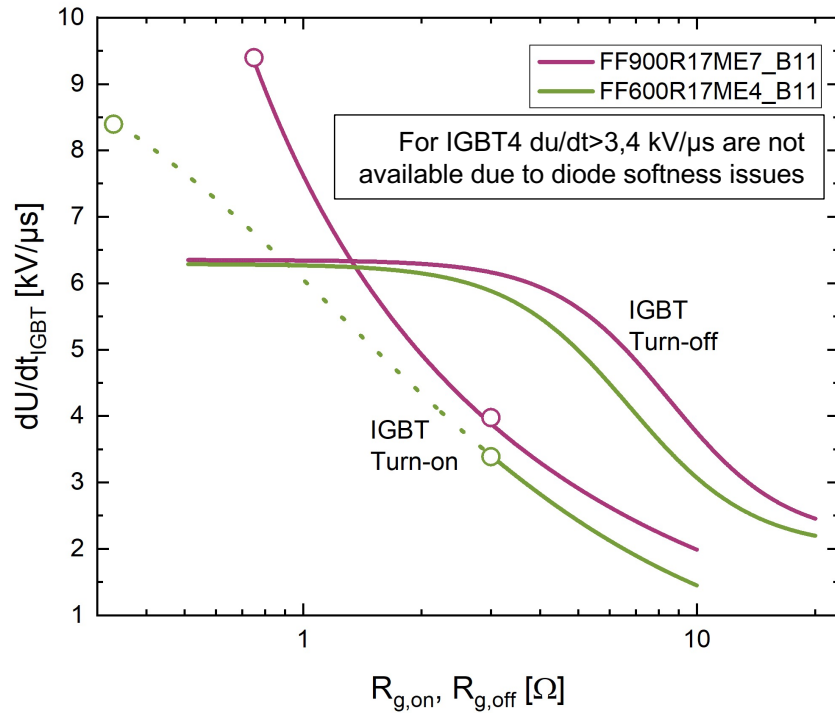
Safe and smooth switching over a wide operating range



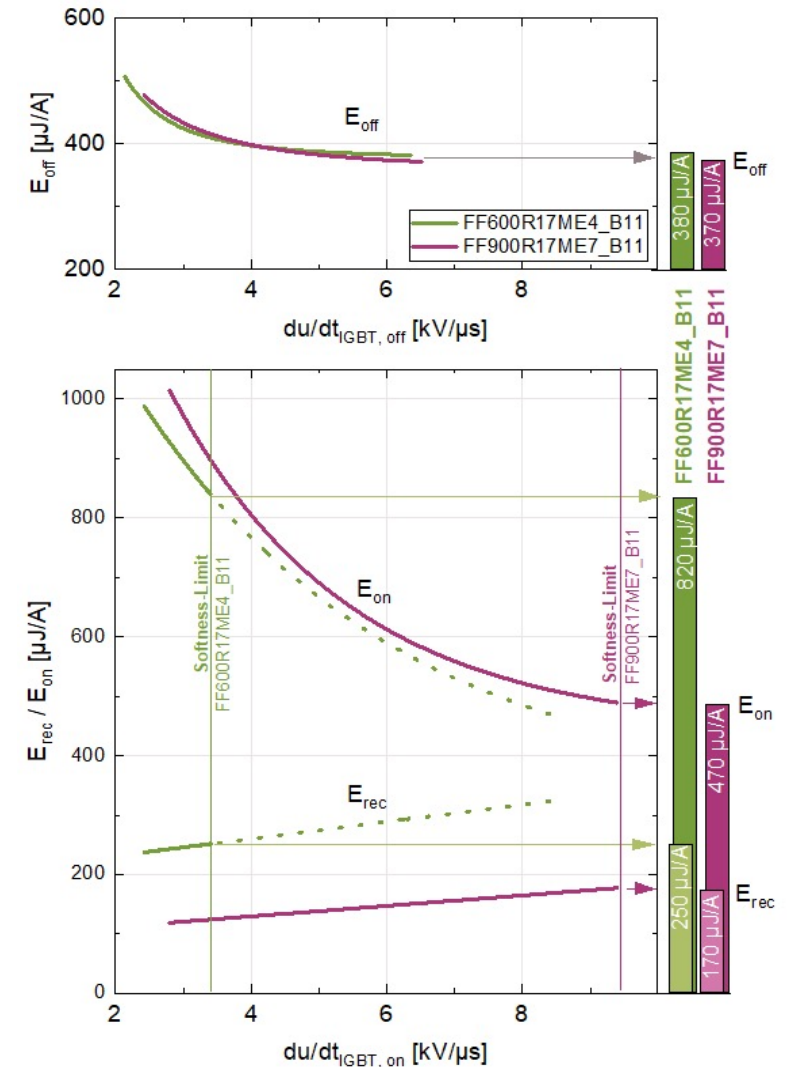
- › Improved softness of EC7 diode allows clean switching even at high du/dt
- › IGBT7 is able to turn-off **50%** higher current with the same $U_{ce,max}$ level

du/dt controllability and dynamic losses

Improved switching losses for both IGBT and diode

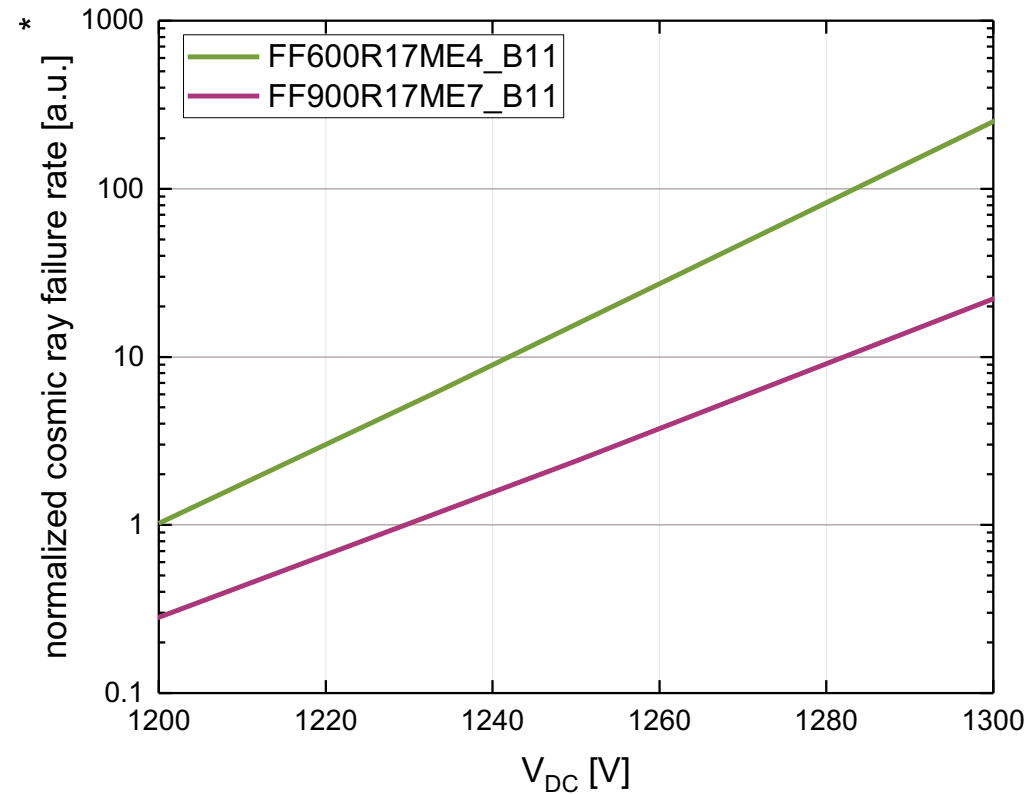


- › Wider du/dt range leads to more than **40%** lower turn-on losses IGBT7 vs IGBT4
- › The new EC7 diode shows **50%** E_{rec} reduction when switching at the same du/dt



Cosmic ray induced FIT rate

Up to one order of magnitude CR FIT improvement

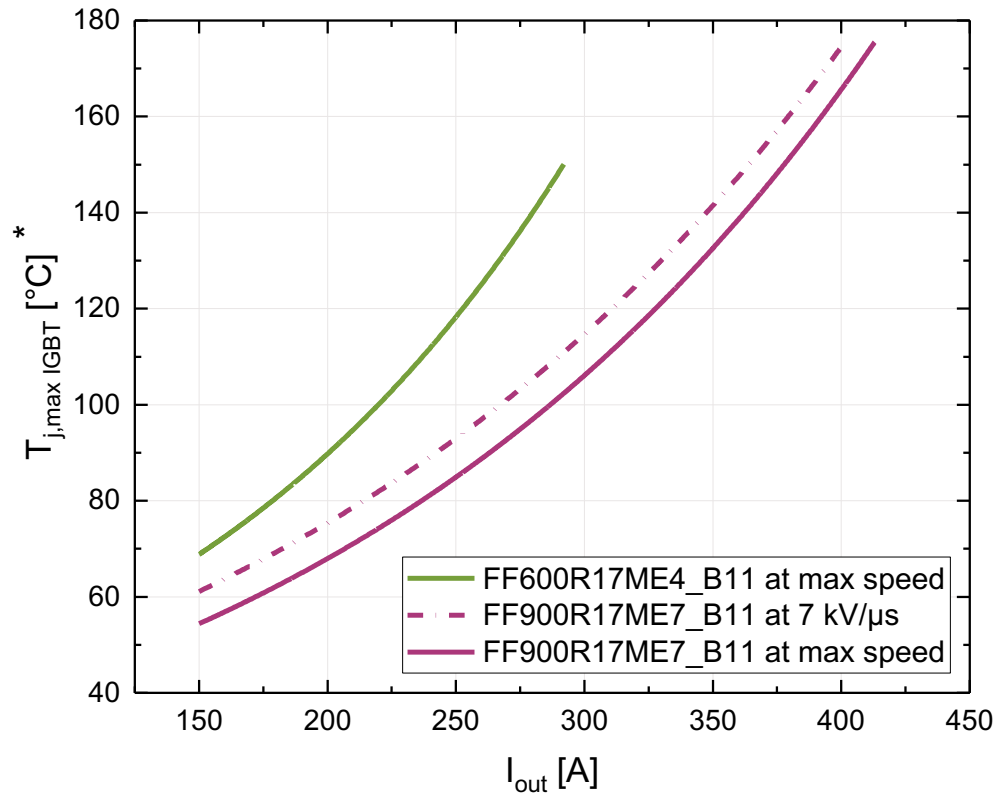


* at 25°C

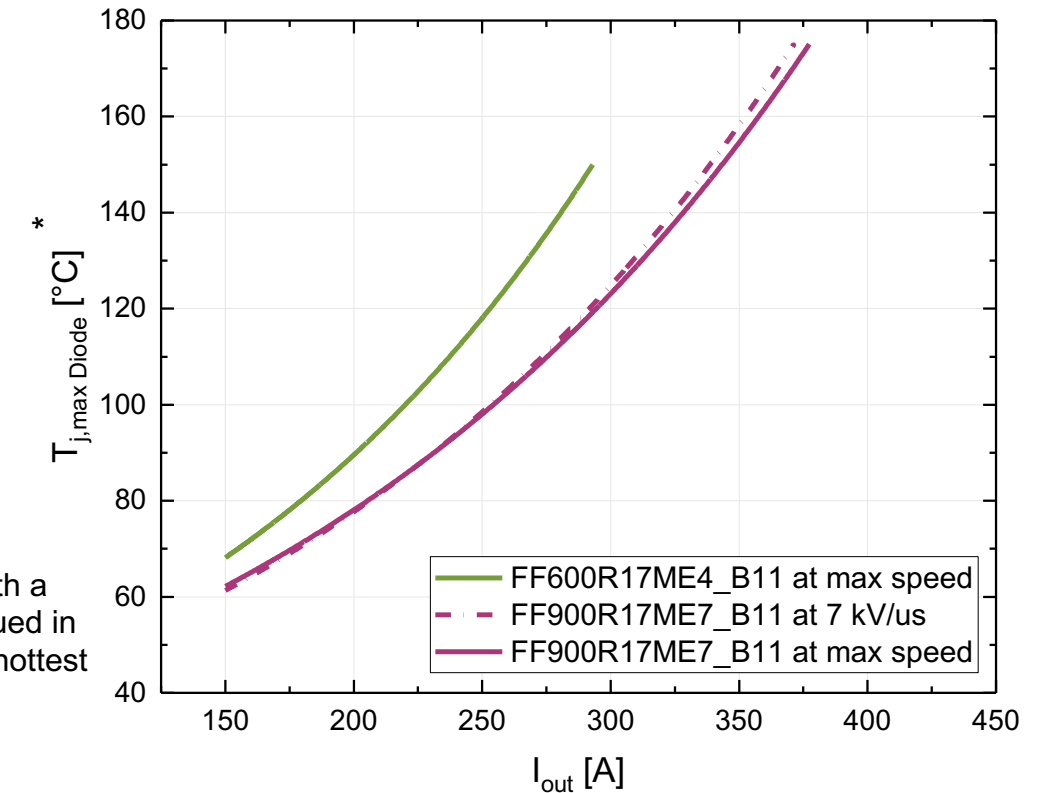
- › **Factor of 3** CR FIT improvement at 1200 V
- › **One order of magnitude** reduced CR FIT at 1300 V

Application test results: drives and AFE

Higher current densities with IGBT7



$\cos(\varphi) = 0.85$, $V_{dc} = 1150 V$, $f_{sw} = 2.5 kHz$, $f_{out} = 50 Hz$

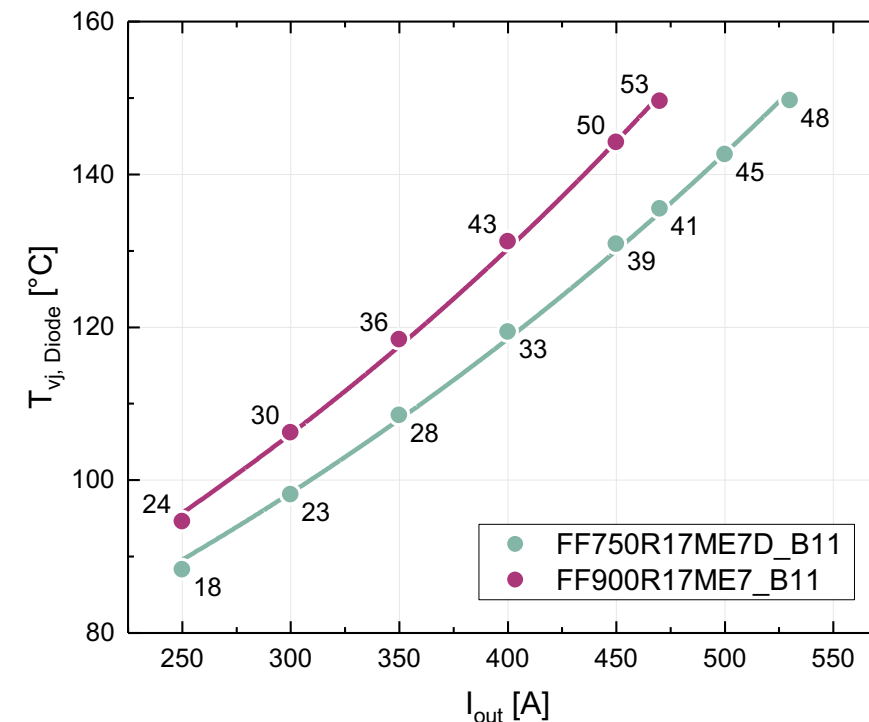
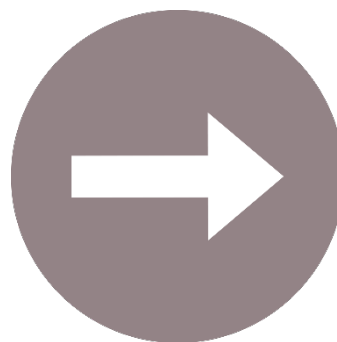
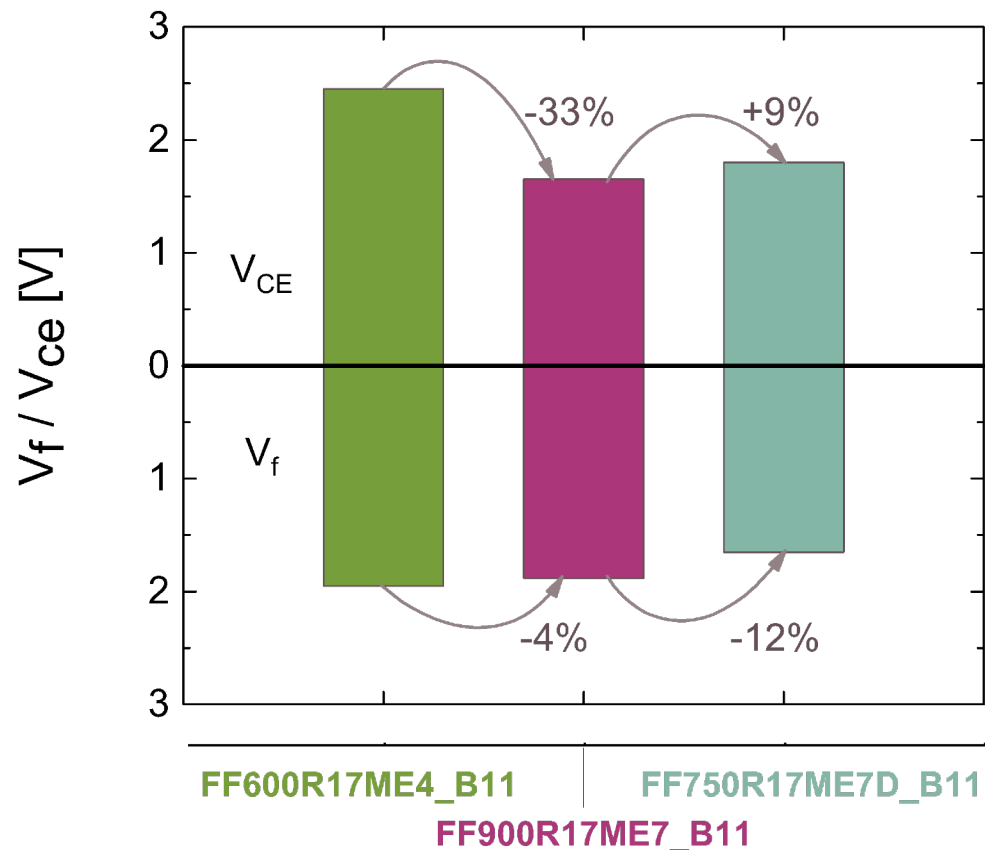


$\cos(\varphi) = -1$, $V_{dc} = 1150 V$, $f_{sw} = 2.5 kHz$, $f_{out} = 50 Hz$

FF900R17ME7_B11 with TRENCHSTOP™ IGBT7 1700 V shows:

- > **up to 41%** higher output current at $\cos(\varphi) = 0.85$
- > **up to 30%** higher output current at $\cos(\varphi) = -1$

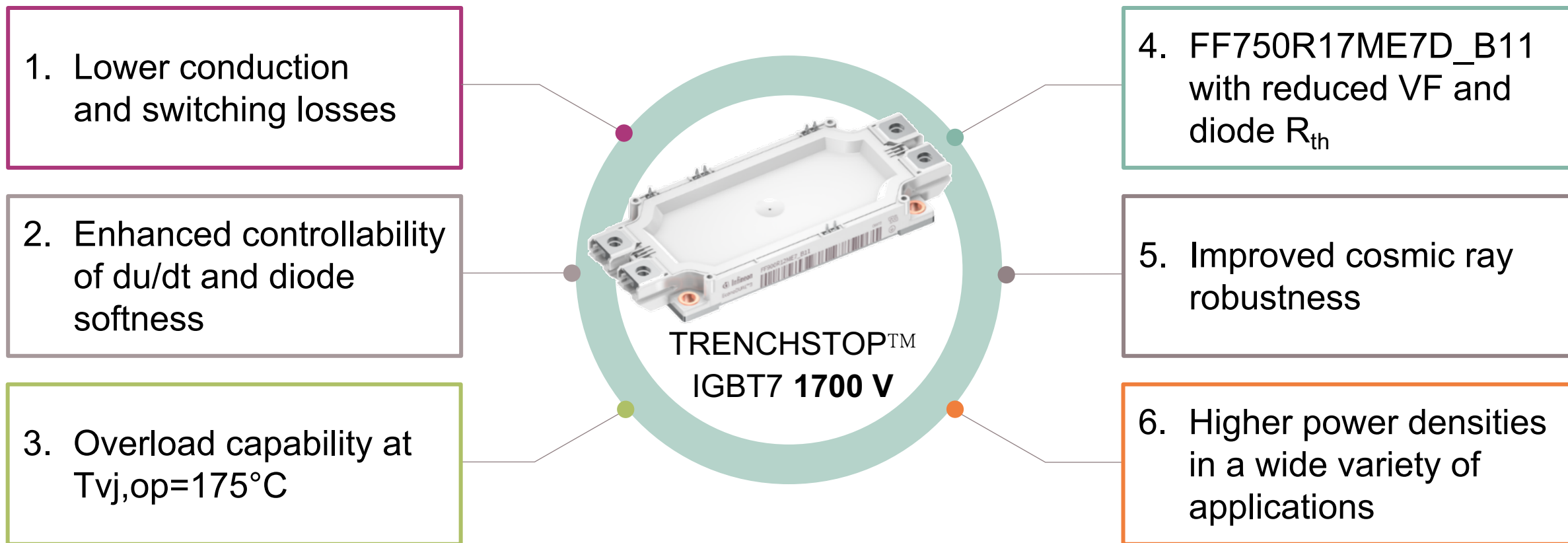
FF750R17ME7D_B11 with enlarged diode: performance gain in V_F -demanding applications



$V_{dc} = 1850$ V, $f_{sw} = 1.5$ kHz, $f_{out} = 7$ Hz, $\cos(\varphi) = -0.75$, ANPC,
the values of $\Delta T_{vj, DIODE}$ are given as data labels.
Based on datasheet values.

- > **12%** lower V_F and **16%** lower $R_{thJC, DIODE}$ compared to the FF900R17ME7_B11 translate into:
- > **13%** higher output current in rotor-side converter with DFIG
- > **4,6 times** higher quantity of turn-on/off cycles at same $I_{out} = 470$ A

TRENCHSTOP™ IGBT7 1700 V in EconoDUAL™ 3 at a glance





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