

# TRENCHSTOP™ 5

**A breakthrough in IGBT innovation**

*Infineon Redefines „Best in class“ IGBT*

July 2020

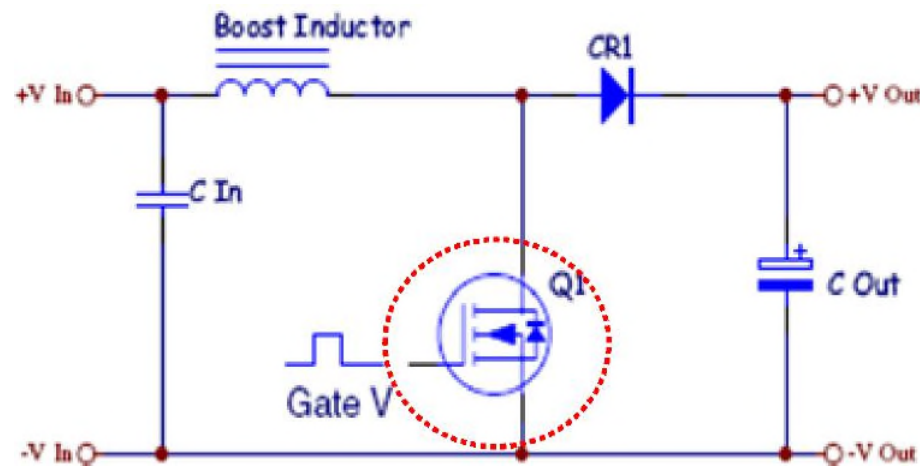
- restricted -



# TRENCHSTOP™ 5 Target applications



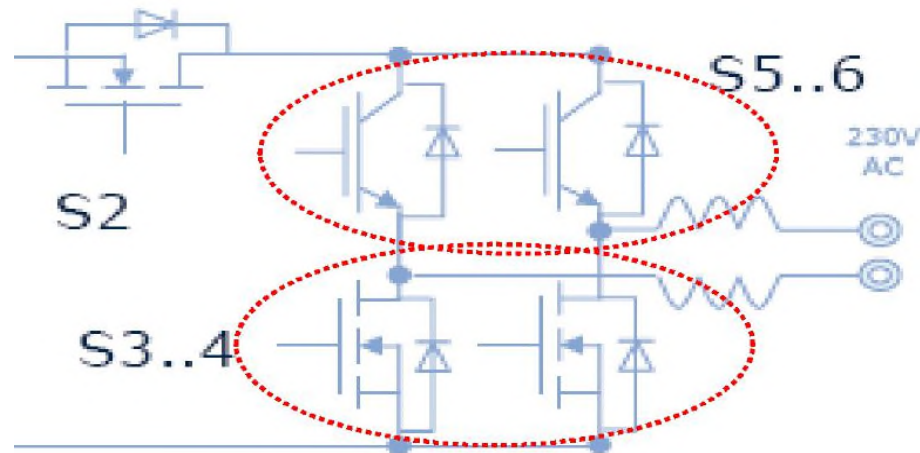
## Boost PFC



# TRENCHSTOP™ 5 Target applications



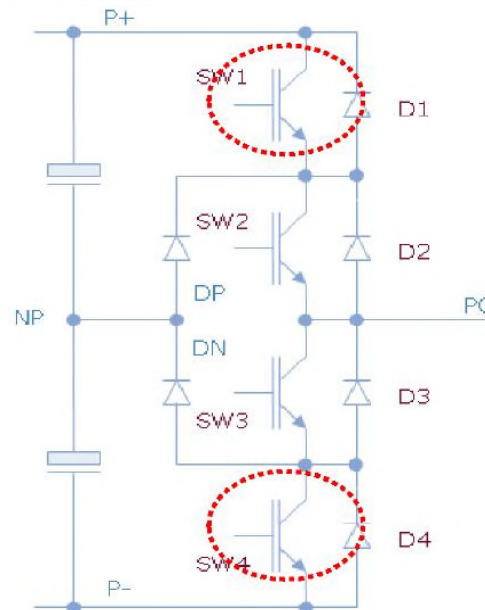
## H4 inverter



# TRENCHSTOP™ 5 Target applications



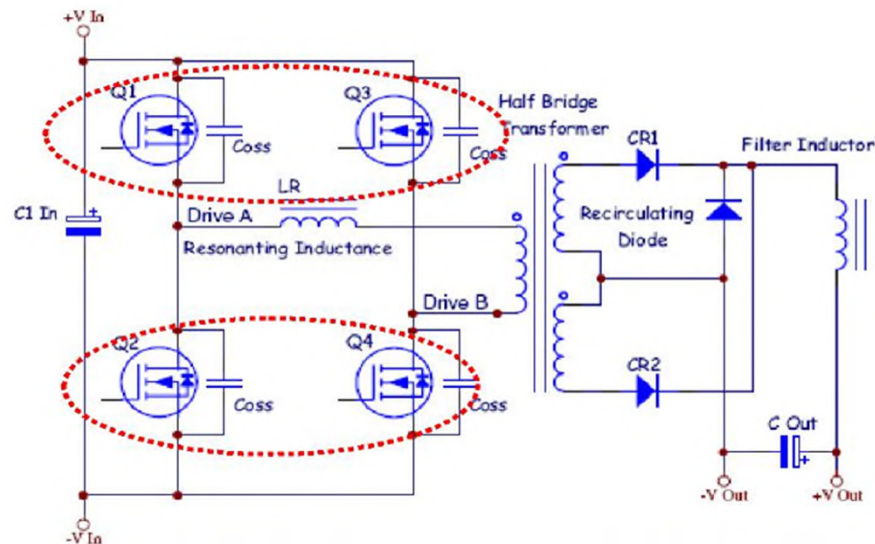
## 3-Level Inverter



# TRENCHSTOP™ 5 Target applications



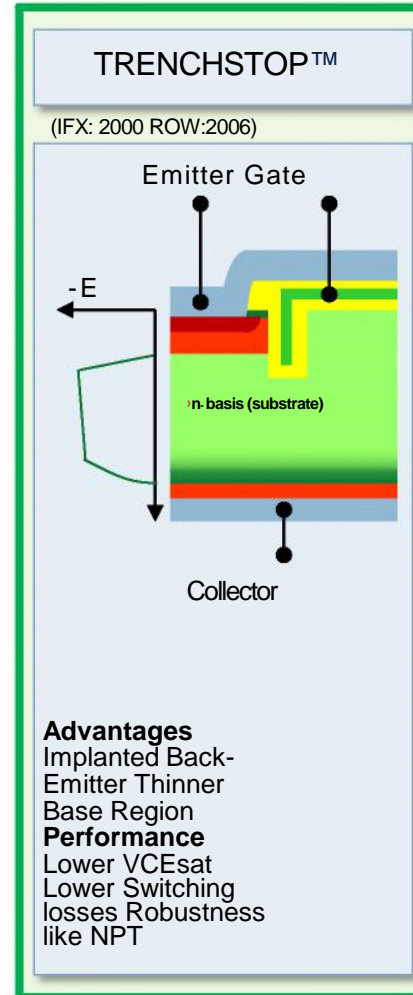
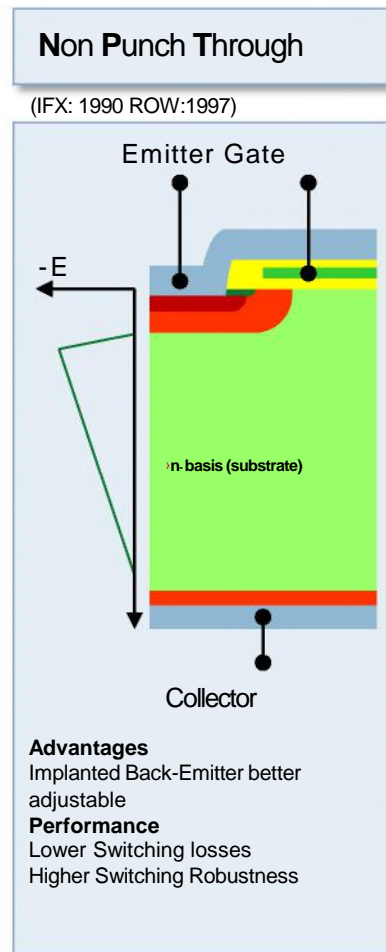
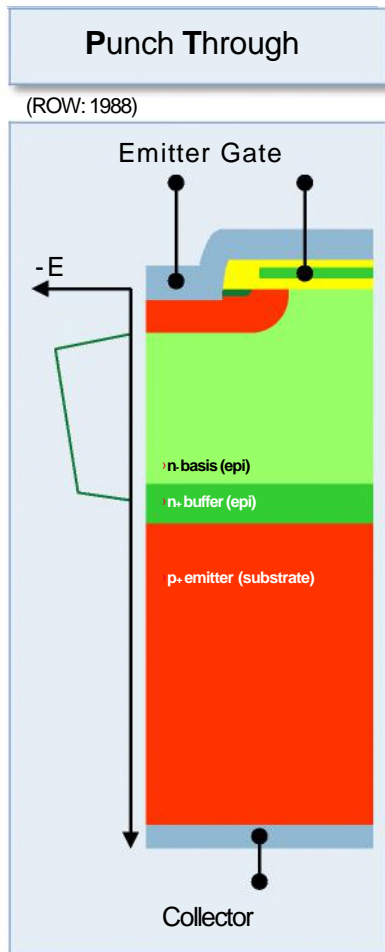
## Full Bridge ZVS resonant





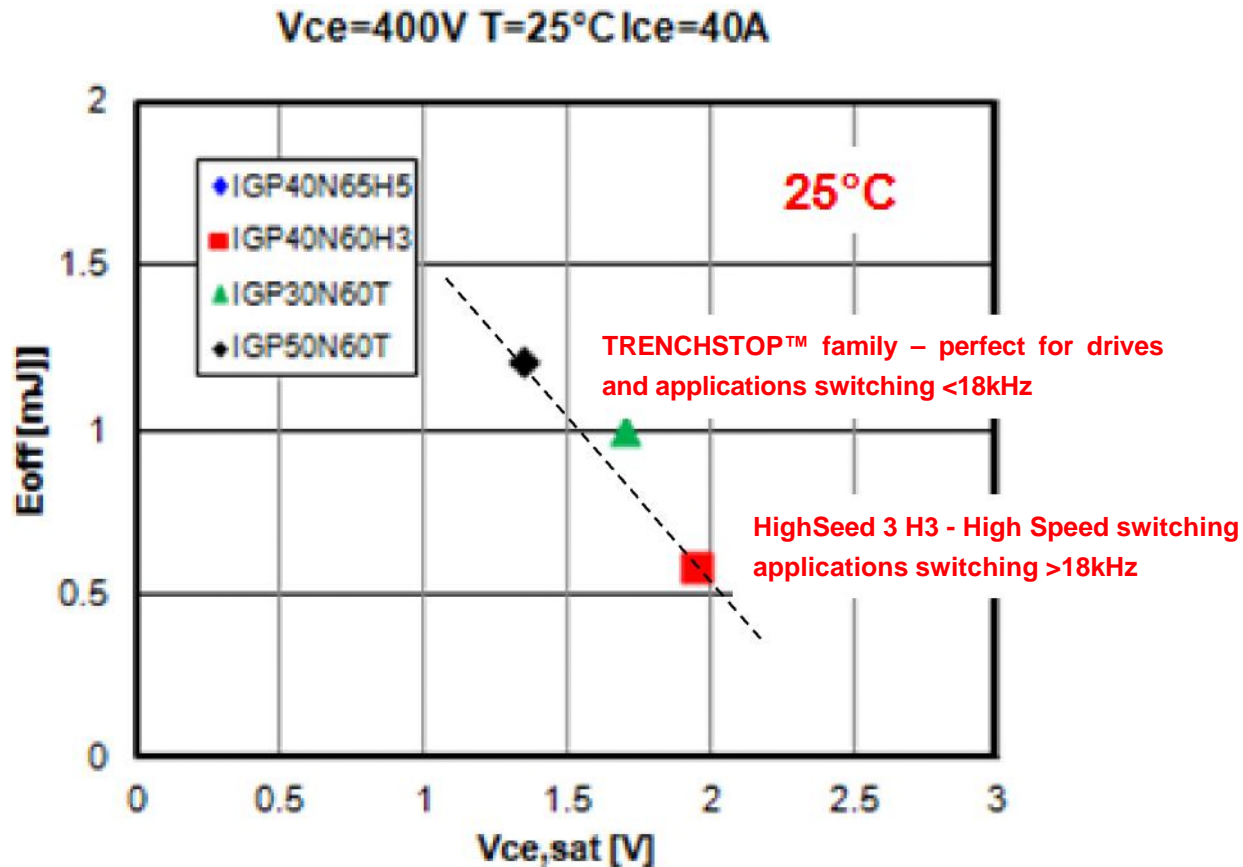
# Infineon is the IGBT Performance World Leader

- Coming from a solid history of IGBT innovation
- Infineon already provides the highest performance IGBTs



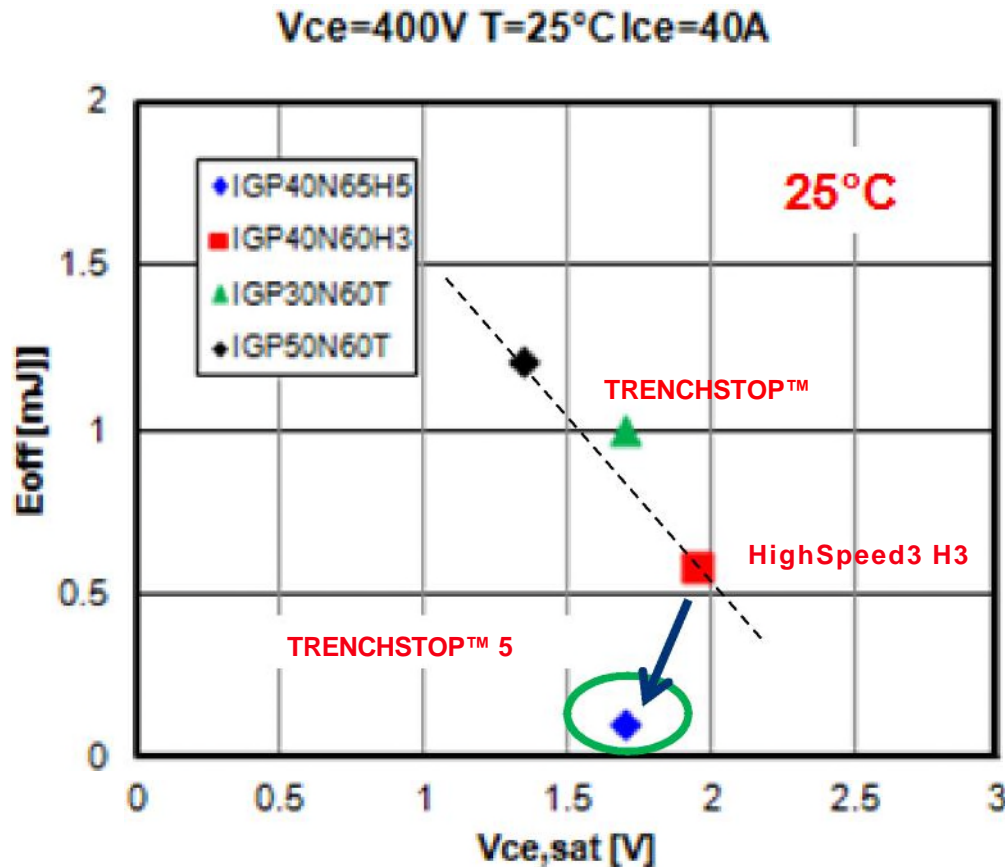
# TRENCHSTOP™ & HighSpeed 3 H3 - Trade-off curve

## $V_{ce(sat)}$ versus $E_{off}$ @25°C



- With the highest efficiency and quality, Infineon's current portfolio is defined to match target application requirements
- Groundbreaking innovation makes Infineon the worlds leading IGBT supplier

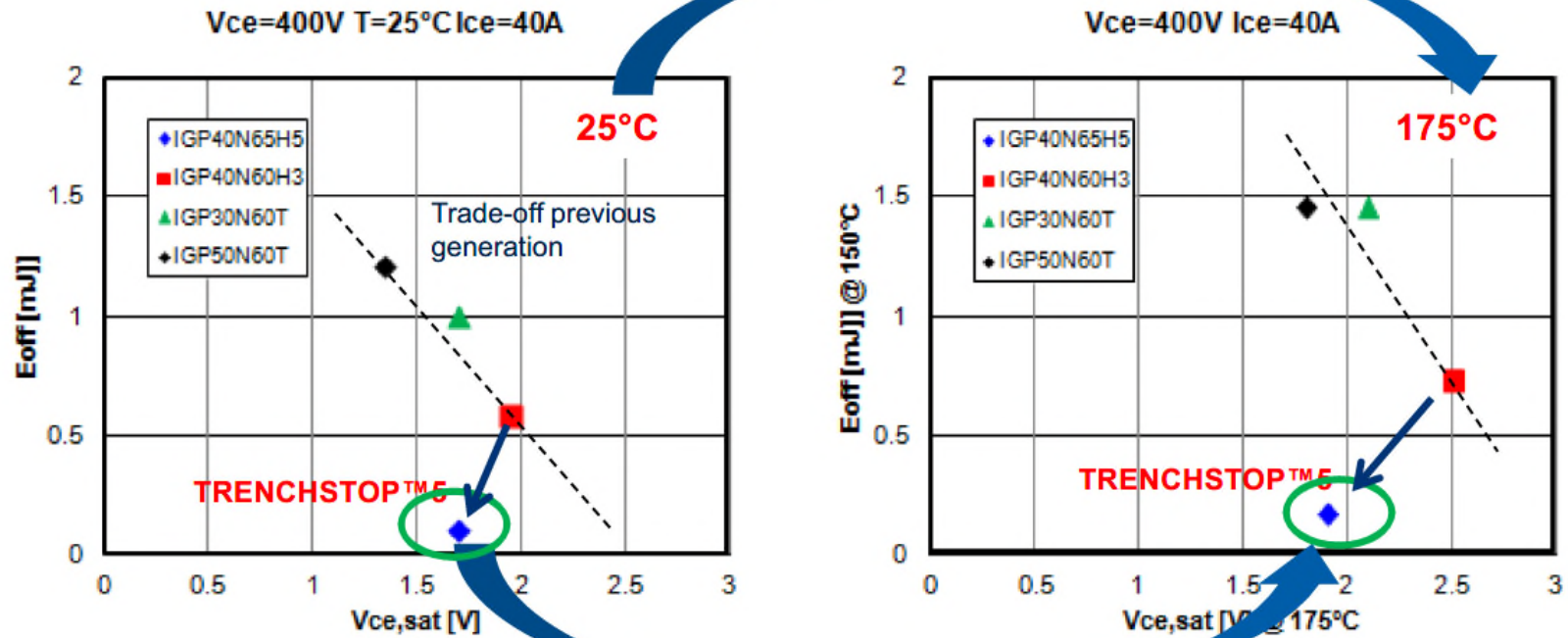
# TRENCHSTOP™ 5 - Trade-off curve $V_{ce(sat)}$ versus $E_{off}$ @25°C



- Compared to Infineon's HighSpeed 3, TRENCHSTOP™ 5 offers:
  - >60% lower switching losses
  - 10% lower conduction losses



# TRENCHSTOP™ 5 - Trade off Vcesat – Eoff Temperature stability



- At 175°C junction temperature the TRENCHSTOP™5 offers:
  - The same  $V_{ce}(sat)$  value at the TRENCHSTOP™ family
  - >75% lower switching losses than HighSpeed 3

# Portfolio introduction:

## TRENCHSTOP™ 5 IGBTs series



**H5, S5, L5 series**

Solar Inverter & Boost stage



**H5, S5, L5 series**

UPS



**H5 series**  
**WR5 series**

Welding Inverter



**WR5 series**

PFC



**F5 series**

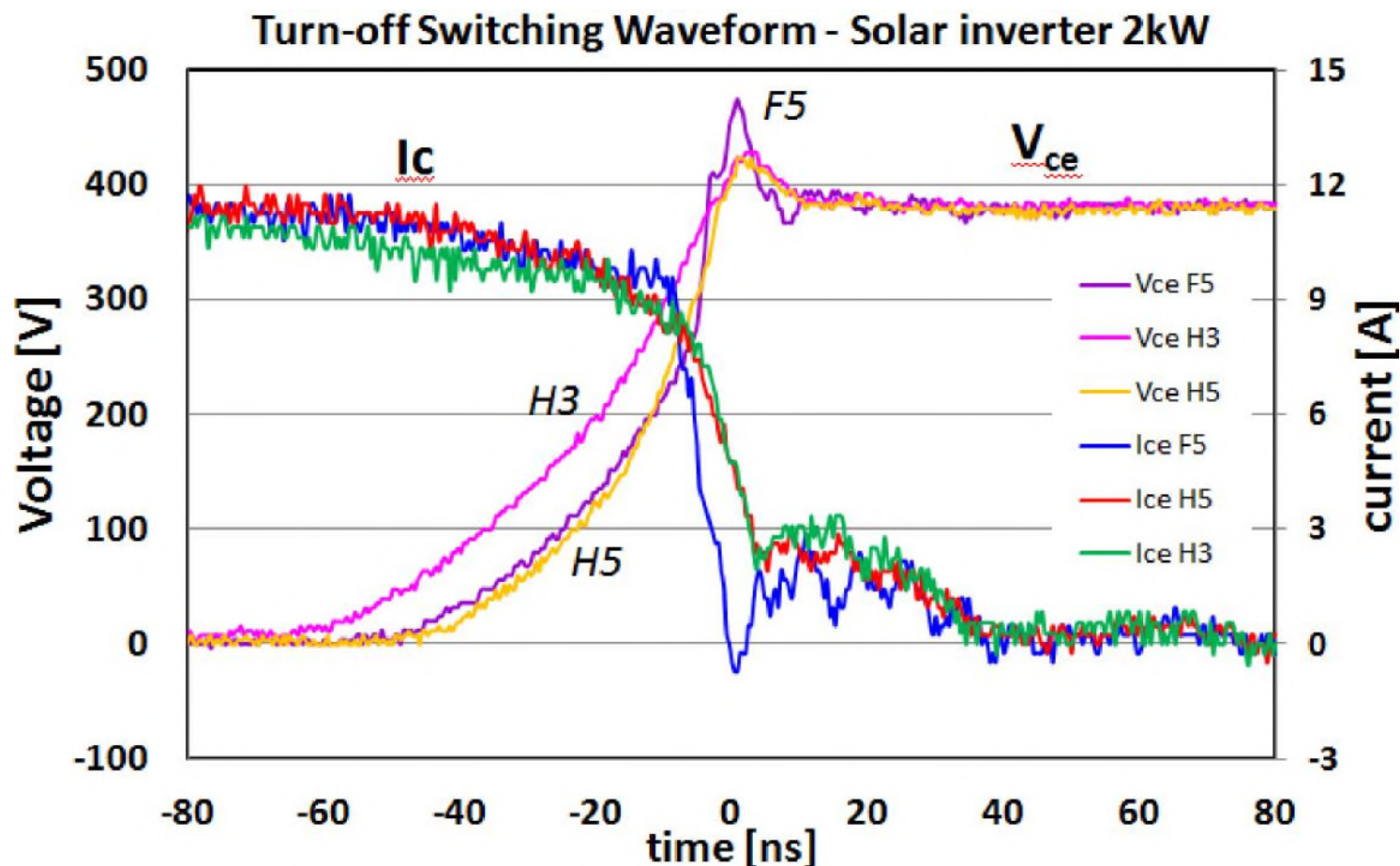
SMPS



The TRENCHSTOP™ 5 IGBT technology has been released in 5 different variants - H5, F5, L5, WR5, S5 – optimized according to the switching frequencies and the best trade-off between switching and conduction losses required to deliver the highest performance in target applications.

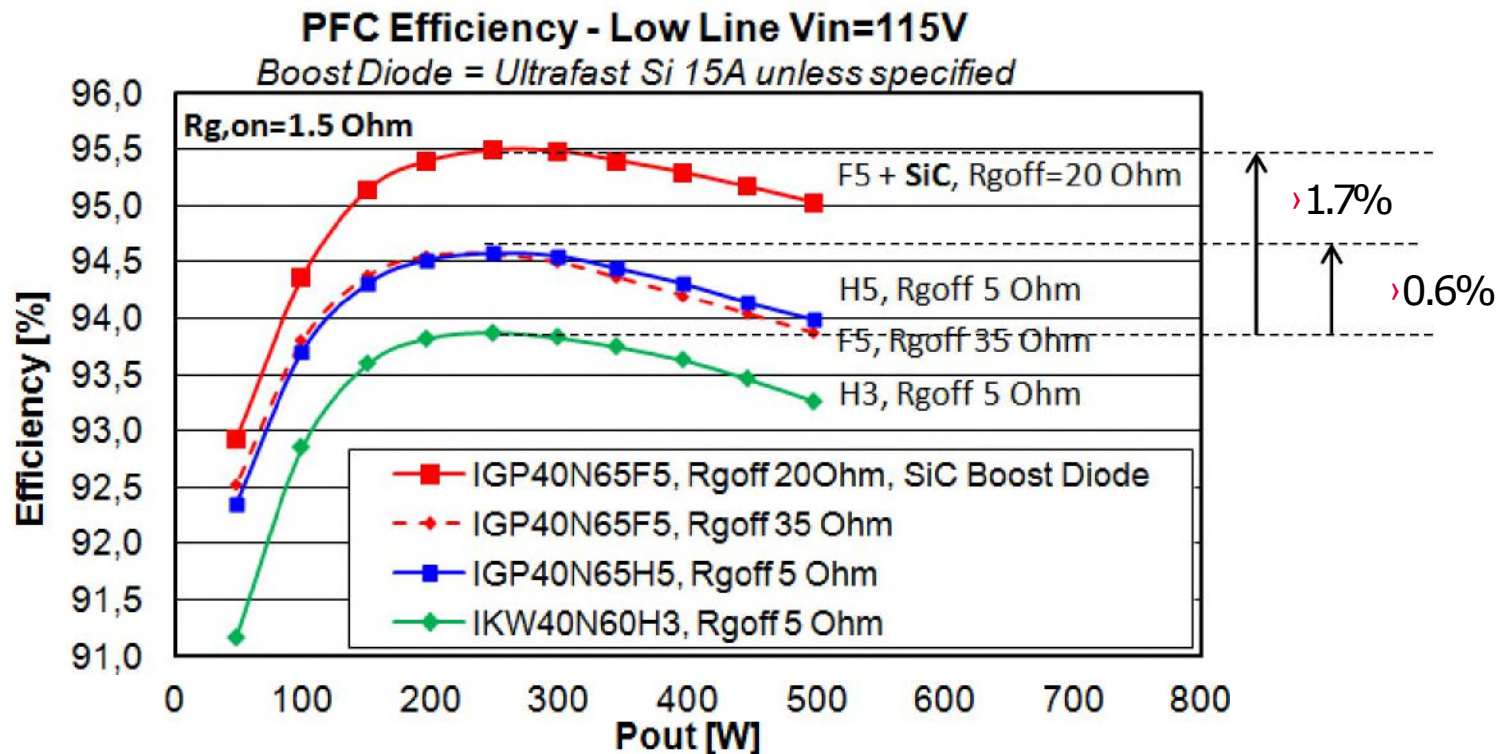
# Switching Waveforms

## TRENCHSTOP™ H5, F5 vs HighSpeed 3 H3



F5 shows steeper  $dI/dt$  and  $dV/dt$ , higher  $V_{ce,max}$ , lower turn-off losses than HighSpeed 3 H3 and H5!

# PFC 70 kHz: Device selection for best efficiency

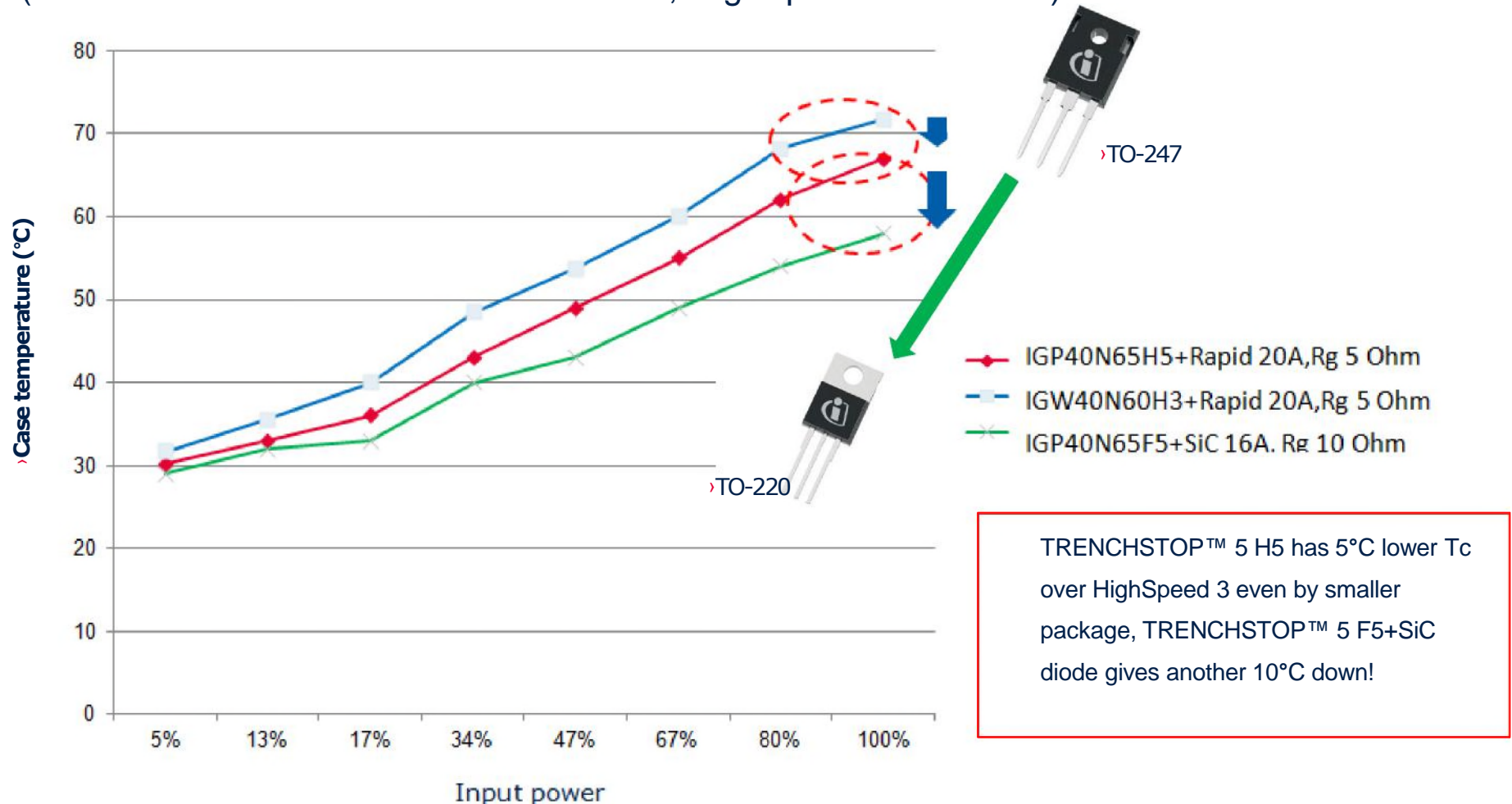


- TRENCHSTOP™ 5 F5 + SiC diode: High performance, need split  $R_g$
- TRENCHSTOP™ 5 H5 + Si Rapid Diode: Plug and Play,  $R_{gon}=R_{goff}$
- TRENCHSTOP™ 5 F5 + Si Rapid: best fit for low inductive design, still needs split  $R_g$

Just replacing the HighSpeed3 with H5 brings 0.6% efficiency improvement

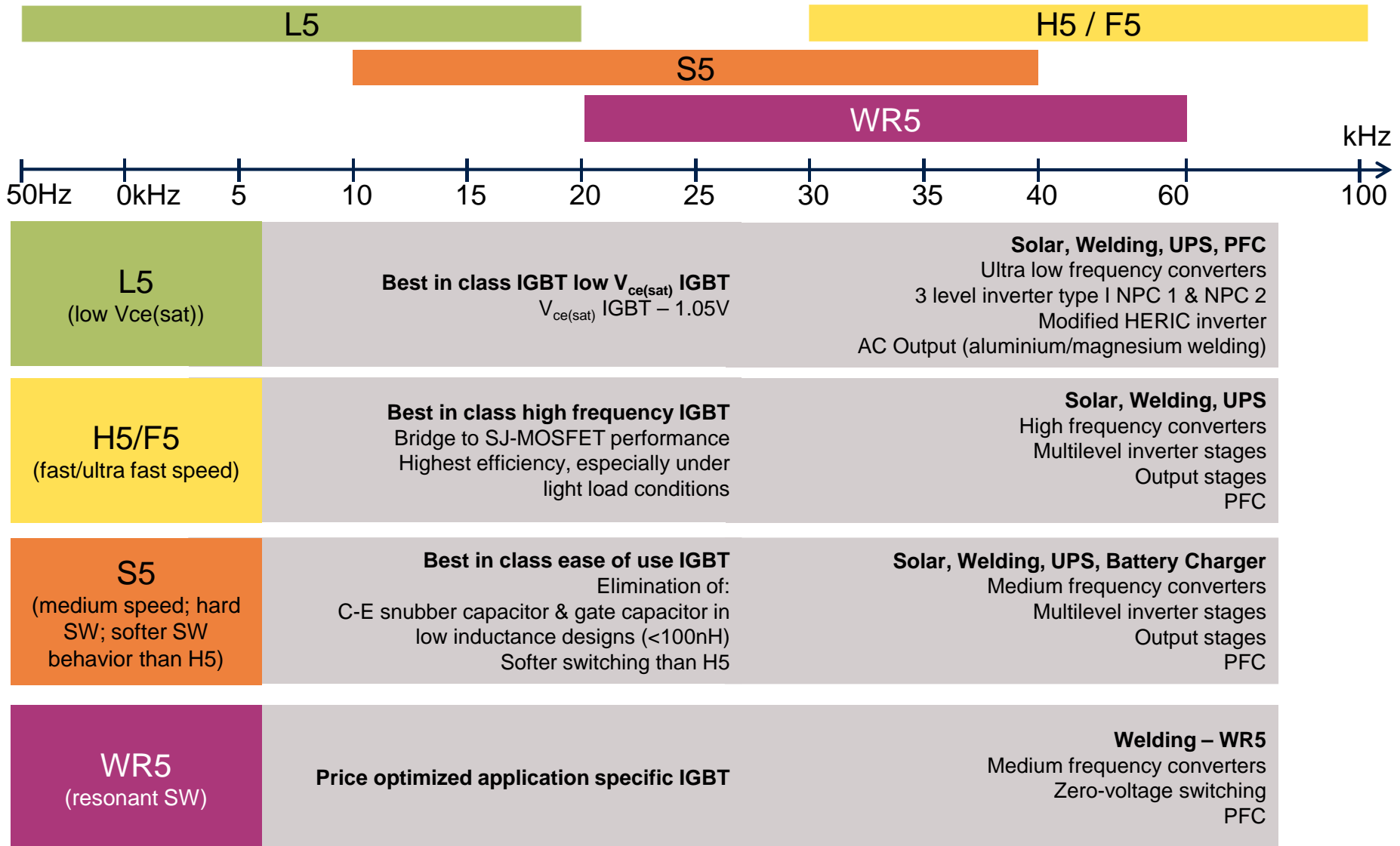
# Case temperature

Single IGBT + SiC / Si Rapid diode  
 (all TRENCHSTOP™ 5 devices in TO220, HighSpeed 3 in TO247)



Efficiency improvements bring significant heatsink size reduction

# TRENCHSTOP™ 5 IGBTs positioning

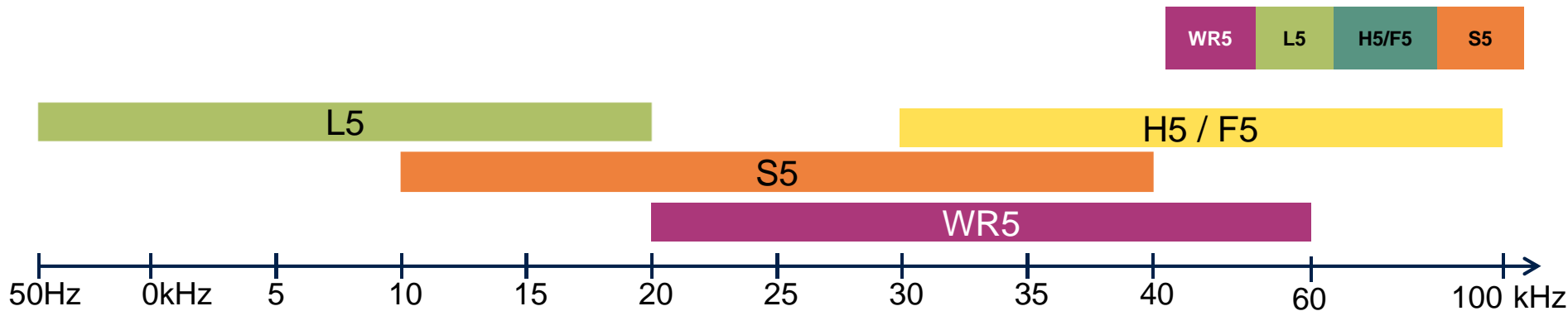




# TRENCHSTOP™ 5 IGBTs portfolio extension



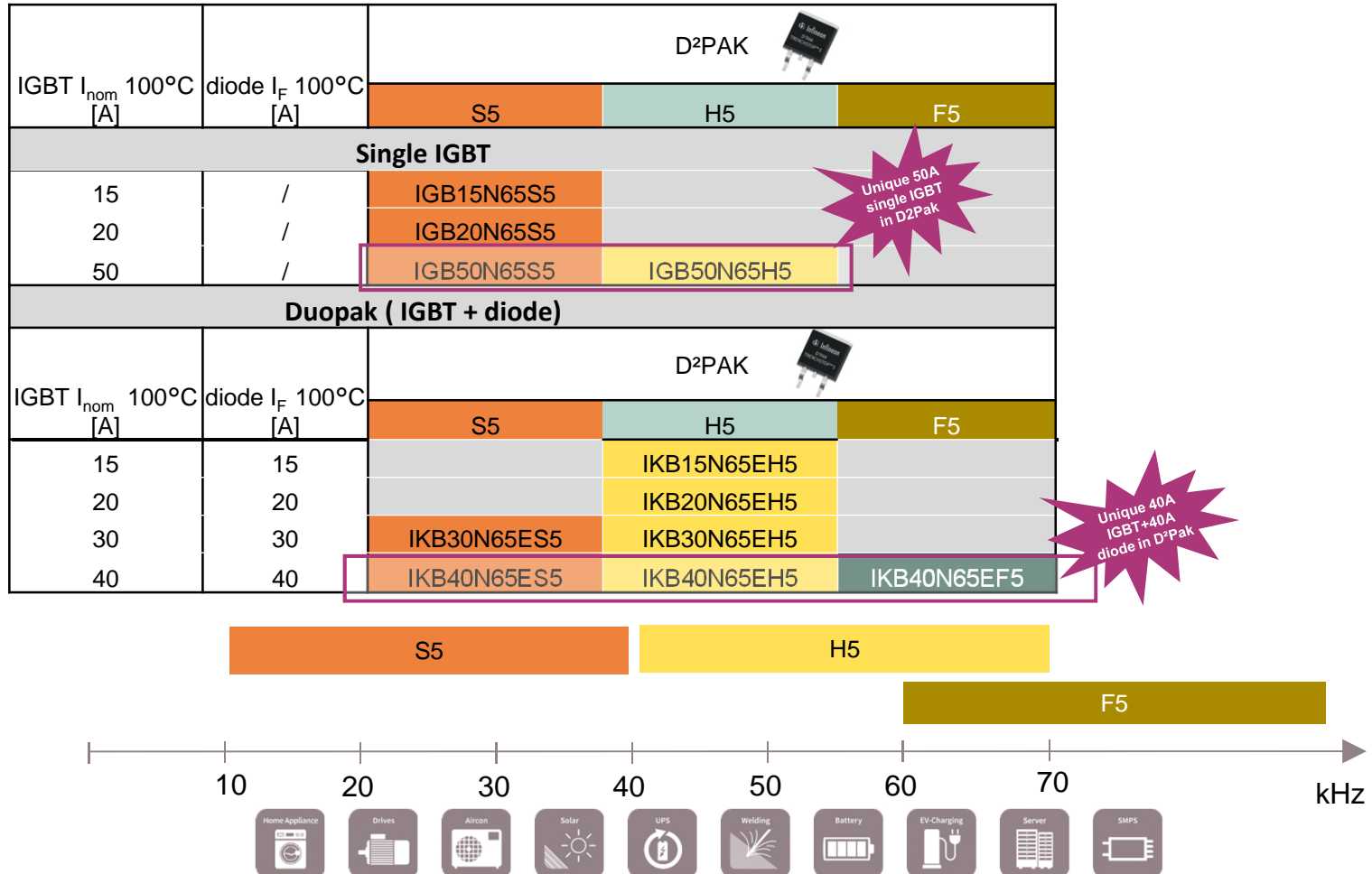
	TO-220		TO-220FP		TO-247-3							TO-247-4			
	H5	F5	H5	F5	EL5*	NL5**	ES5*	WR5	H5	EH5*	F5	EL5*	ES5*	EH5*	NH5**
8	x	x	x	x											
15	x	x	x	x											
20	x	x						x							
30	x	x			x	x	x		x		x				
40	x	x					x	x	x		x				
50							x	x	x	x	x		x	x	x
75					x		x			x		x	x	x	x



\* Full rated Rapid 1 diode

\*\* Full rated Rapid 2 diode. All other devices have ½ rated Rapid 1 diode

# TRENCHSTOP™ 5 IGBTs package extension – D<sup>2</sup>PAK



# Summary TRENCHSTOP™ 5 IGBT

- New benchmark in terms of switching losses for IGBT based technologies
- Technology platform available in two flavors
  - TRENCHSTOP™ 5 H5 plug & play replacement of previous IGBTs
    - Soft IGBT requiring low design in efforts
  - TRENCHSTOP™ 5 F5 requires low commutation loop inductance
    - best used in combination with SiC diodes
- 650V breakthrough voltage as standard
- $V_{ce(sat)}$  with mild positive temperature coefficient
- Temperature stable  $V_F$  value of the free wheeling diode
- 1.7% efficiency PFC efficiency improvement seen over previous best in class IGBT

Can you afford to wait for the competition to catch up?



Part of your life. Part of tomorrow.