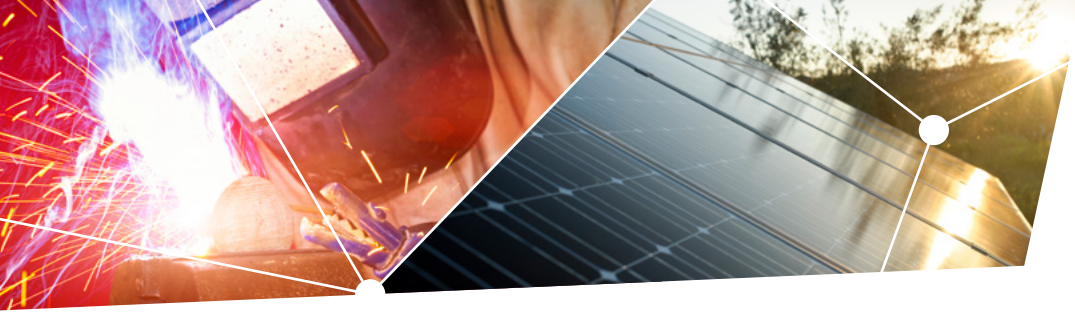


Product Brief

The new TRENCHSTOP™ 5 S5 IGBT

High speed, soft switching IGBT with full rated current diode

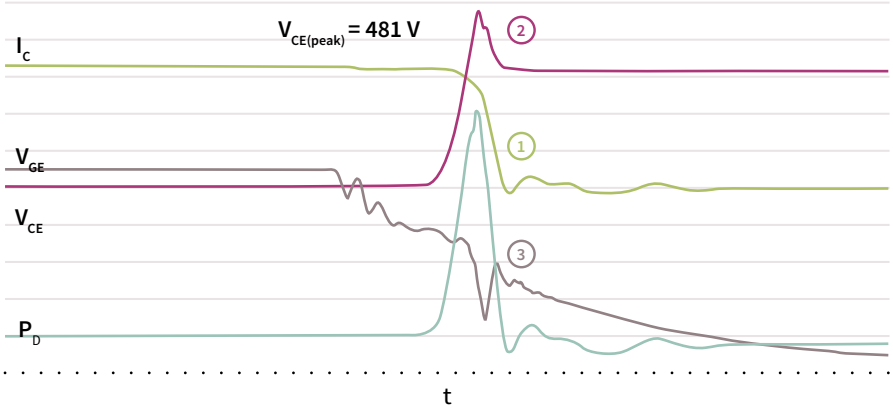
Developed with the customer in mind

TRENCHSTOP™ 5 S5 is the new IGBT family addressing applications switching between 10 kHz and 40 kHz to deliver high efficiency, faster time to market cycles, circuit design complexity reduction and PCB bill of material cost optimization.

Packed with features to help the designers achieve their goals without the need to increase circuit complexity

- Static behavior - mild positive temperature coefficient $V_{CE(sat)}$, meaning paralleling is no problem and efficiency isn't compromised during high temperature operation. At 175°C, typical $V_{CE(sat)}$ is a low 1.6 V.
- Dynamic behavior – single gate resistance selection for turn-on / turn-off due to the soft switching behavior. Clean gate signals, low dV/dt, low and very symmetrical voltage overshoot.

To highlight the dynamic behavior, TRENCHSTOP™ 5 S5 switching turn-off waveforms are added*



1. Soft current fall characteristic with no tail current
2. Symmetrical, low voltage overshoot
3. Gate voltage under control (no oscillation). No risk of unwanted turn-on of device and no need for gate clamping

*IKW40N65ES5 measured on in-house welding test bench with R_G=33 Ω, total loop parasitic inductance L_σ=90 nH, I_C=33 A.
I_C at 10 A/div, V_{CE} at 100 V/div, V_{GE} at 5 V/div, P_D (E_{off})=2 kW/div, t=20 ns/div

www.infineon.com/trenchstop5-s5

Main features

- Very low $V_{CE(sat)}$ of 1.35 V at 25°C, 20% lower than TRENCHSTOP™ 5 H5
- $I_{C(n)}$ = four times nominal current (100°C T_C)
- Soft current fall characteristic with no tail current
- Symmetrical, low voltage overshoot
- Gate voltage under control (no oscillation). No risk of unwanted turn-on of device and no need for gate clamping
- Maximum junction temperature T_{vj}=175°C
- Qualified according to JEDEC standards

Main benefits

- $V_{CE(peak)}$ clamping circuits not required
- Suitable for use with single turn-on / turn-off gate resistor
- No need for gate clamping components
- Gate drivers with Miller clamping not required
- Reduction in the EMI filtering needed
- Excellent for paralleling

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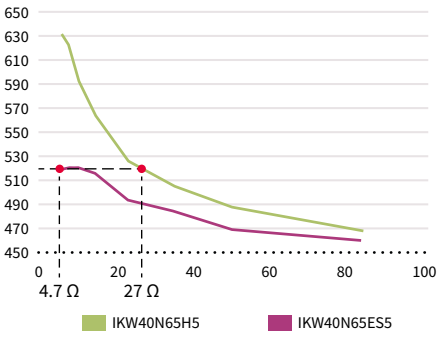
Single turn-on / turn-off gate resistor. Seriously? You bet!

The figures below show the advantage of taking a single gate resistor with the TRENCHSTOP™ 5 S5, when compared to the TRENCHSTOP™ 5 H5.

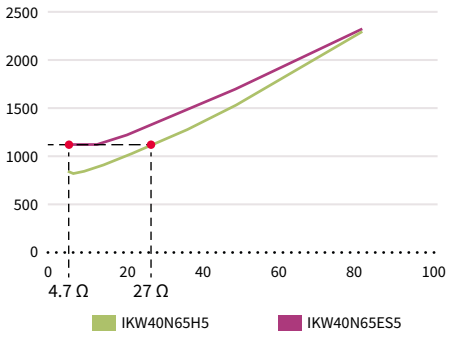
$V_{CE(max)}$ [V] vs. R_G [Ω]



S5 → R_G = 4.7 Ω at 80% V_{BRces}

H5 → R_G = 27 Ω at 80% V_{BRces}

E_{off} [µJ] vs. R_G [Ω]



S5 → E_{off} = 1.2 mJ

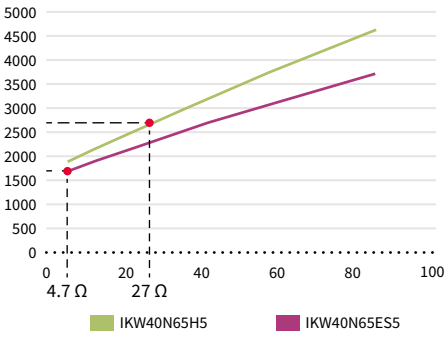
H5 → E_{off} = 1.3 mJ

Lower R_G value possible compared to TRENCHSTOP™ 5 H5, the TRENCHSTOP™ 5 S5 has:

› 8% lower E_{off}

› 18% lower $V_{CE(sat)}$

E_{on} [µJ] vs. R_G [Ω]



S5 → E_{on} =1.6 mJ

H5 → E_{on} =2.75 mJ

When using single gate resistor, compared to TRENCHSTOP™ 5 H5, the TRENCHSTOP™ 5 S5 has:

› 42% lower E_{on}

› 18% lower $V_{CE(sat)}$

Portfolio

Product part number	I_C @ 100°C [A]	$V_{CE(sat)}$ [V]	E_{on} [mJ]	E_{off} [mJ]	Q_G [nC]	I_F @ 100°C [A]	Q_{rr} [µC]
IKW30N65ES5	39.5	1.35	0.56	0.32	70	39.5	0.83
IKW40N65ES5	50	1.35	0.86	0.4	95	50	1.1
IKW50N65ES5	60.5	1.35	1.23	0.55	120	60.5	1.25
IKW75N65ES5	80	1.42	2.40	0.95	164	80	1.8

Specification details

Testing conditions:

$V_{CE(sat)}$: typ. values, 25°C, V_{GE}=15 V, I_C=$I_{C(nom)}$

E_{on} and E_{off}: typ. values, 25°C, V_{CC} = 400 V, I_C = $I_{C(nom)}$, V_{GE} = 0/15 V, R_G = $R_{G(nom)}$, L_σ = 30 nH, C_σ = 30 pF

Q_G: typ. values, 25°C, V_{CC} = 520 V, V_{GE} = 15 V, I_C = $I_{C(nom)}$

Q_{rr}: typ. values, 25°C, V_{CC} = 400 V, I_F = $I_{F(nom)}$, di_F/dt = -1.2 kA/µs for the 30 A and 50 A, = -0.8 kA/µs for the 40 A, = -1.5 A/ns for the 75 A

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