

Product Brief

TRENCHSTOP™ advanced isolation

Fully isolated TO-247 package with industry leading IGBTs

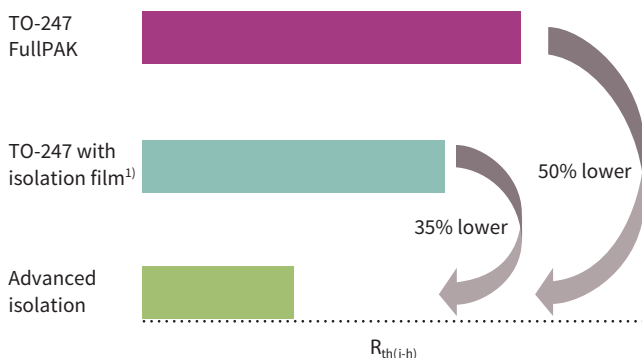
Power semiconductors are often mounted on a shared heatsink for cooling, but then require electrical isolation. Today's options, like fully insulated packages (FullPAKs) or standard TO packages used with isolation material, are expensive, difficult to handle and inadequate for the heat dissipation needs of the latest high power density IGBTs.

TRENCHSTOP™ advanced isolation solution breaks the limits reached by traditional packaging and isolation techniques. This new isolated package enables the highest power density, the best performance and the lowest cooling effort thanks to an effective and reliable thermal path from the IGBT die to the heatsink.

In addition to providing 100 percent electrical isolation, TRENCHSTOP™ advanced isolation also eliminates the need for thermal grease or thermal interface sheets. The new package delivers at least 35 percent lower thermal resistivity, helping designers to increase power density, as well as lower system complexity and assembling costs.

This new package solution allows industrial and home appliance designs to fully utilize the high performance of TRENCHSTOP™ IGBTs with no compromises for isolation and cooling.

Thermal resistivity of package & isolation types



1) Isolation material: standard polyimide based reinforced carrier insulator film with 152 µm thickness, 1.3 W/mK thermal conductivity

Key features

- > 2500 V_{RMS} electrical isolation, 50/60 Hz, t = 1 min
- > 100 percent tested isolated mounting surface
- > Lowest R_{th(j-h)}
- > Low coupling capacitance, 38 pF
- > No need for isolation film or thermal interface material

Key benefits

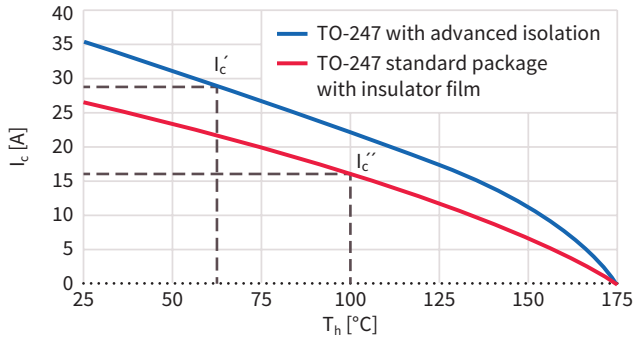
- > Up to 35 percent reduction in assembly time reduces manufacturing costs
- > Increased power density
- > Improved reliability from higher yield and no isolation film misalignment
- > Less EMI filter design effort
- > Decreased heatsink size



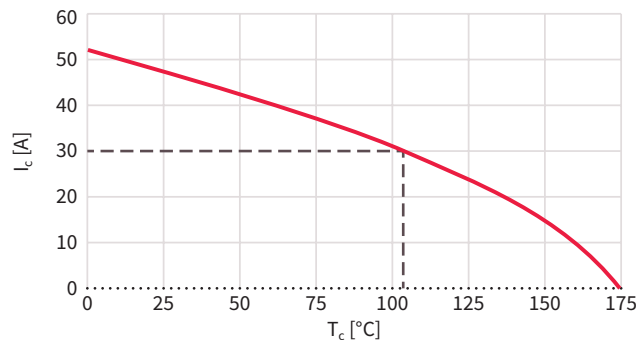
Improved power density with full isolation

The equivalent current represents the nominal current of the device needed in a non-isolated TO-247 package assembled on an isolation film to achieve the same performance as in the Advanced Isolation package. The thermal parameters and thickness of the isolation film are described below.

Collector current of IKFW40N60DH3E as a function of heatsink temperature ($V_{GE} \geq 15\text{ V}$, $T_j \leq 175^\circ\text{C}$, insulator film: $152\ \mu\text{m}$, 0.9 W/mK)



Collector current of a 30 A HighSpeed 3 IGBT as a function of case temperature ($V_{GE} \geq 15\text{ V}$, $T_j \leq 175^\circ\text{C}$)



The equivalent current rating of the IKFW40N60DH3E in comparison to HighSpeed 3 IGBT in a standard TO-247 at $T_h = 65^\circ\text{C}$ using reference insulation material ($152\ \mu\text{m}$, 0.9 W/mK , standard polyimide based reinforced carrier insulator film) can be calculated using the two curves above and the following formula:

$$I_c = \left(1 + \frac{I_c' - I_c''}{I_c''}\right) \times I_c \text{ nominal chip current at } 100^\circ\text{C} = \left(1 + \frac{28.9 - 15.6}{15.6}\right) \times 30\text{ A} = 44\text{ A @ } T_h = 65^\circ\text{C}$$

TRENCHSTOP™ Advanced Isolation offers a broad portfolio for specific application needs

Technology	Version and package	Part number	Equivalent current rating @ 65°C [A]	$R_{th(j-h)}$ [K/W]	V_{CEsat} [V] @ $T_{vj} = 25^\circ\text{C}$
TRENCHSTOP™ HighSpeed 3	Price/performance advanced isolation TO-247 ¹⁾	IKFW40N60DH3E	44	1.35	2.30
		IKFW50N60DH3E	60	1.15	2.20
		IKFW60N60DH3E	74	1.06	2.20
	Best-in-class advanced isolation TO-247 ²⁾	IKFW50N60DH3	60	1.03	1.85
		IKFW60N60EH3	63	0.91	1.85
		IKFW90N60EH3	95	0.84	1.85
TRENCHSTOP™	Best-in-class advanced isolation TO-247	IKFW50N60ET	64	0.91	1.50
		IKFW75N60ET	95	0.84	1.50
Technology	Version and package	Part number	Equivalent current rating @ 65°C [A]	$R_{th(j-h)}$ [K/W]	V_f [V]
Rapid 1 Diode	Price/performance advanced isolation TO-247	IDFW40E65D1E	35	1.92	1.70

- 1) Optimized to replace FullPAK packages or systems including TO-247 with medium performance insulator, standard polyimide based reinforced carrier insulator with $152\ \mu\text{m}$ thickness, 0.9 W/mK thermal conductivity.
- 2) Optimized to replace systems using TO-247 with high performance insulator, standard polyimide based reinforced carrier insulator with $152\ \mu\text{m}$ thickness, 1.3 W/mK thermal conductivity.

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