

Product Brief

1200 V IGBT in TO-247PLUS 3pin

Up to 75 A 1200 V IGBT co-packed with diode with 20% lower $R_{th(jh)}$ and 4.25 mm extended C-E creepage package

Key requirements for new designs are high efficiency, high power density, easy thermal management, reduced paralleling and competitive bill of material (BOM) costs. The new TO-247PLUS is an answer to all of them.

Increased power density

Providing bigger active chip area, the TO-247PLUS allows up to 75 A 1200 V IGBT co-packed with 75 A diode in TO-247 footprint. Higher current allows for the upgrade of the available TO-247 3pin designs to higher power levels. Replacement of TO-247 3pin with same IGBT chip but in TO-247PLUS in B6 inverter configuration enables up to 0.1% efficiency improvement or up to 10% output power increase¹⁾.

Improved thermal management

Due to the absence of the screw mounting hole, the TO-247PLUS package has 35% bigger backside active thermal pad area that contributes to 20% lower $R_{th(jh)}$ of TO-247PLUS package comparing to TO-247. The lower $R_{th(jh)}$ improves the heat dissipation leading to lower junction temperature (T_j). With lower thermal stress on the device a smaller heatsink or less powerful cooling fan can be used. Thus more compact design at lower BOM cost can be achieved.

Reduced paralleling

To reach higher system currents often several discrete power switches are used in parallel. Paralleling complicates the control of the device, requires a more complex circuit layout as well as use of additional components.

Higher current handling capability of TO-247PLUS enables the reduction of the number of parallel switches, i.e. 3 pieces of 25 A IGBT can be replaced with 1 piece of 75 A.

Key features

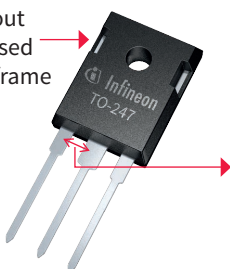
- > High power density – up to 75 A 1200 V IGBT co-packed with 75 A diode in TO-247 footprint
- > 20% lower $R_{th(jh)}$ compared to TO-247 3pin
- > Extended collector-emitter pin creepage of 4.25 mm
- > Extended clip creepage due to fully encapsulated front side of the package

Benefits

- > 15% better heat dissipation of TO-247PLUS vs TO-247
- > Improved thermal management, lower T_j
- > Upgrade of available designs for higher power
- > Reduced paralleling, simplified design
- > Lower BOM cost
- > Easy and fast clip mounting

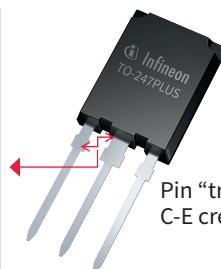
Package comparison TO-247 vs TO-247PLUS

Cut-out exposed leadframe



- > 88% $I_{c(nom)}$ increase 40 A duopack → 75 A duopack with same package footprint
- > 20% lower $R_{th(jh)}$ of TO-247PLUS vs TO-247
- > Increased C-E pin creepage of 4.25 mm

Cut-out extended clip-mounting creepage



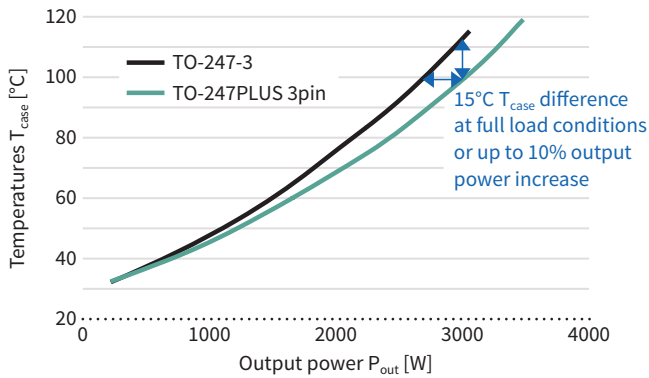
Pin “trousers” extend C-E creepage

1) Based on internal IFX application test



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TO-247PLUS 3pin product portfolio

I_c @ $T_c = 100^\circ\text{C}$	1200 V IGBT optimization	
	Low $V_{ce(sat)}$ @ $f_{sw} < 20$ kHz TRENCHSTOP™ 2	Low E_{ts} @ $f_{sw} > 20$ kHz HighSpeed 3
40 A	IKQ40N120CT2	IKQ40N120CH3
50 A	IKQ50N120CT2	IKQ50N120CH3
75 A	IKQ75N120CT2	IKQ75N120CH3

Comparing performance of the same IGBT chips in two different packages – TO-247 and TO-247PLUS on B6 inverter, the TO-247PLUS device shows 15°C lower case temperature T_{case} and 10% higher power output.

Main benefits of TO-247PLUS - higher current capability and lower junction temperature T_j

System nominal current I_c	Available solution	Alternative solution with TO-247PLUS	Replacement ratio	Benefits using TO-247PLUS 3pin
Increased power density – increasing power output				
40 A → 75 A	IKW40N120T2 IKW40N120H3	IKQ75N120CT2 IKQ75N120CH3	1:1 1:1	<ul style="list-style-type: none"> › Increase system current by > 40% › Easy upgrade of available TO-247 3pin design for > 40% higher power › Fast redesign time, low R&D cost
Reduced paralleling keeping the same system current				
25 A → 25 A	3x IKW25N120T2	1x IKQ75N120CT2	3:1	<ul style="list-style-type: none"> › Increased system power density › Smaller PCB footprint at same I_c › Easy IGBT control, higher reliability of design › Faster assembly time › Reduction in driver IC component count and BOM costs
25 A → 25 A	2x IKW25N120T2	1x IKQ50N120CT2	2:1	
40 A → 40 A	2x IKW40N120T2	1x IKQ75N120CT2	2:1	
Improved thermal management, T_j reduction				
40 A → 40 A	IKW40N120T2 IKW40N120H3	IKQ40N120CT2 IKQ40N120CH3	1:1 1:1	<ul style="list-style-type: none"> › Up to 10% output power increase › 15% improved heat dissipation › Lower T_c and T_j › Lower cooling requirements, smaller fan → lower BOM › Smaller heatsink → compact design

www.infineon.com/to-247plus

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