

New ISOPLUS247™ Power Package Features 2500V Internal Isolation Revolutionary Approach Improves Thermal Conductance and Reliability

IXYS Corporation has introduced a new, isolated plastic encapsulated package for all types of discrete power semiconductors, one which promises to change the way power devices are attached to heatsinks. The new ISOPLUS247™ has an internally isolated mounting tab with a 2500V(RMS)

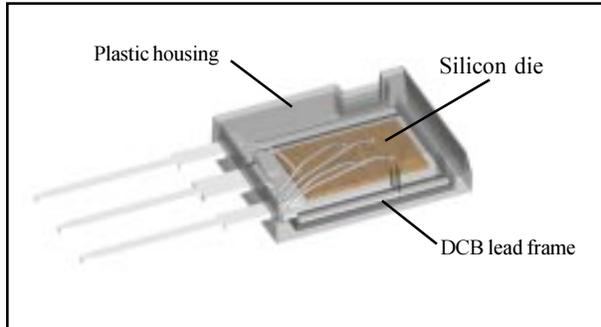


Figure 1: Cut-away view of the ISOPLUS247 package

isolation voltage rating. The package meets the standard JEDEC TO-247 outline and is intended for pressure mounting applications since there is no mounting screw hole. As can be seen in Figure 1, the usual copper lead frame has been replaced by a direct-copper-bonded (DCB) alumina substrate possessing both high thermal conductance and high electrical isolation (2500V).

There are multiple advantages to this isolated and hole-less packaging concept.

1. The dielectric breakdown voltage of the DCB is 6,000V although the package is only rated to 2500V(RMS) due to the creep and strike distances of the TO-247 outline;
2. The electrical insulation barrier is plastic encapsulated and therefore protected from the environment;
3. Very low, isolated thermal resistance junction-to-heatsink due to the use of DCB and only one non-soldered interface between the silicon chip and the heatsink;
4. Ease of assembly due to pressure mounting (no screws) and no additional isolation interface material required for mounting to a heatsink;
5. Increased temperature and power cycling ca-

pability because the thermal expansion coefficient of the silicon die matches that of the DCB;

6. Small chip-to-heatsink stray capacitance for reduced EMI/RFI emissions;

7. The DCB substrate can be etched like a PC board allowing for more circuit configurations than normally found in a non-isolated TO-247, e.g. epitaxial ultra-fast recovery diodes and Schottky connected common anode or in series, multiple diodes in series, MOSFET connected in series with a Schottky diode with or without an antiparallel diode.

The primary advantage of ISOPLUS247 packaging is the very low thermal resistance achievable in a rugged, high voltage, isolated mounting system. Table 1 compares the thermal resistance of a 55A/500V MOSFET chip in the ISOPLUS247 package (IXFR55N50) to the hole-less TO-247 version (IXFX55N50) when isolated with various interface material. Figure 2 shows the allowable current handling capabilities of the various mounting conditions.

Inspection of this table shows that depending upon the mounting technique, allowable output current can be increased by about 50% for the same junction temperature. Conversely, the chip can run up to 29°C cooler for the same operating conditions that translates into more reliable operation. Because there is such a potentially large decrease in junction-to-case thermal resistance, it may be possible to use a smaller chip for the same current, which would more than cover for the extra price (approximately \$0.50 in production volumes) for the internal isolation.

IXYS plans on introducing over 100 new part types in this revolutionary package during 1999. Initial product will consist of high power MOSFETs offering the industry's lowest on-resistance for this package outline. Future product will include IGBTs, IGBTs co-packaged with diodes, and ultra-fast and Schottky diodes.

For more information, contact Mr. Ralph Locher at (408) 982-4384.

© 1999 IXYS Corporation

Table: Performance Comparison of ISOPLUS247 IXFR55N50 to IXFX55N50 Mounted Using Various Interface Materials

Part Type	Isolation	Thickness	Isolation	R(th)js	Pd@ Tj=150C	Id @ Tj=150C	Tj @ Idc=15A
	Material		Voltage		Ts = 80C	Ts = 80C	Ts = 80C
		(mm)	(kV)	(K/W)	(W)	(A)	(C)
IXFR55N50	(Internal alumina DCB)	0.63	2.5	0.52	135	28.1	96
IXFX55N50	External alumina DCB	0.63	2.5	0.68	103	24.6	102
IXFX55N50	Kapton	0.05	4.5	0.96	73	20.7	112
IXFX55N50	IMS	0.13	6	0.78	90	23.0	105
IXFX55N50	SIL-PAD 2000(TM)	0.38	4	1.24	56	18.2	125
IXFX55N50	Softface(TM)	0.127	0	0.61	115	26.0	125

SIL-PAD is a trademark of Bergquist Co.

Figure 2: Graphical comparison showing the current handling capability of the ISOPLUS247 IXFR55N50 MOSFET vs the IXFX55N50 MOSFET as a function of heatsink mounting conditions.

