

# High Current PolarHT™/HV™ HiPerFET™ Power MOSFETs

SIMPLIFY DESIGN, REDUCE COST AND IMPROVE RELIABILITY FOR HIGH CURRENT/HIGH POWER APPLICATIONS

July 2006

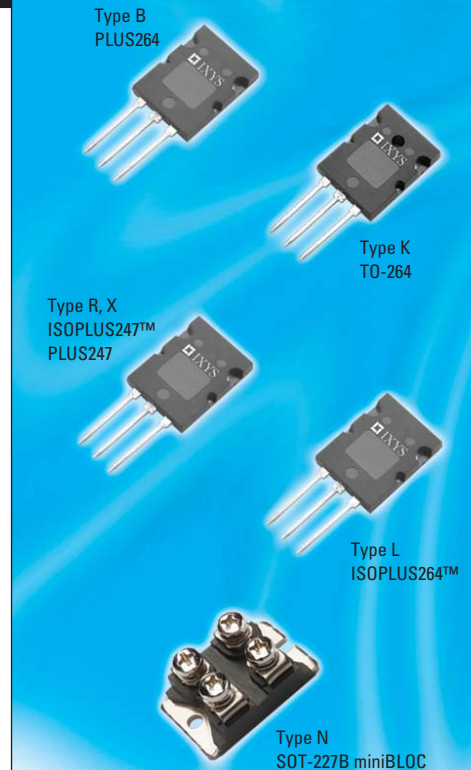
## Description

IXYS' New High Current PolarHT™ and PolarHV™ Power MOSFETs bring many benefits to the design picture. These High Current MOSFETs provide much higher current handling capability (up to 140A), eliminating the need for multiple components, such as when paralleling lower current MOSFETs for high power applications. This reduces the quantity of switching devices, as well as the number of balancing and drive components. The value of these High Current MOSFETs is further enhanced by the fact that they are competitively priced, without the cost premium traditionally associated with large MOSFETs.

These High Current MOSFETs support applications requiring voltage ratings from 300V to 800V and are offered as HiPerFET™s. IXYS' PolarHT MOSFETs find use in a broad spectrum of consumer, industrial, and automotive markets. These devices provide significantly improved ruggedness and safe operating area as compared to Trench Power MOSFETs. PolarHV applications include SMPS, small DC motor control, PFC circuits and other general purpose high power applications. These higher voltage products bring the same benefits of enhanced performance and cost-effectiveness to core market requirements in the middle-voltage range.

IXYS' proven HiPerFET process yields Power MOSFETs with a fast intrinsic body diode for low  $Q_{rr}$  and enhanced  $dV/dt$  ruggedness. IXYS' HiPerFETs are targeted at hard switching inverter and power supply applications. They are used in demanding and high reliability IT and telecom infrastructure applications that require efficient switching and energy conversion in tight enclosures, as well as products where reduced size and weight are important features.

The High Current MOSFETs are offered in a number of different packages, including the standard TO-264, as well as high performance ISOPLUS™ packages. All IXYS ISOPLUS™ packages are manufactured with an internal Direct-Copper-Bonded (DCB) isolated substrate, are UL certified, and provide integral backside case isolation. These packages provide high isolation capability (2500V), improve creepage distance and reduce total thermal resistance by more than a factor of 2 versus competing isolated solutions. The Nexus Program was created for customers looking for semi-custom turnkey packaging solutions for ICs and power semiconductors. Centered around IXYS' patented ISOPLUS™ packages, customers are able to tailor much of their forming, fitting, and functional needs. Designers can now choose from a wide variety of IXYS semiconductors and ISOPLUS™ packages to define an integrated discrete package solution that IXYS can rapidly deliver with minimal upfront costs.



## Features

- Up to 30% Lower  $R_{DS(on)}$  and  $Q_G$
- Lower thermal impedance and increased power handling
- Excellent ruggedness and  $dV/dt$  capability
- Incorporates fast intrinsic body diodes with very low  $Q_{rr}$  and  $T_{rr}$
- Cost-effective
- ISOPLUS™ friendly

## Applications

- Switch Mode Power Supplies (SMPSs)
- Motor Control
- Power Factor Correction (PFC circuits)

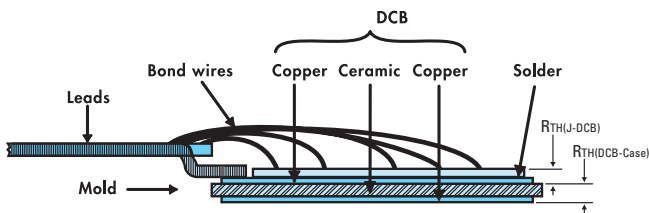
## Benefits

- Increased current handling capability
- Maximized package efficiency
- Reduced component count
- Reduced circuit complexity

SUMMARY TABLE

Part Number	V <sub>DSS</sub> max (V)	I <sub>D</sub> (cont) T <sub>C</sub> =25°C (A)	R <sub>DS(on)</sub> max T <sub>C</sub> =25°C (Ω)	C <sub>iss</sub> typ (pF)	Q <sub>g</sub> typ (nC)	t <sub>rr</sub> max (ns)	R <sub>thJC</sub> max (°C/W)	Pd (W)	Package Type
IXFK140N30P	300	140.0	0.024	14000	185.0	200	0.12	1040	TO-264
IXFN140N30P	300	110.0	0.024	14000	185.0	200	0.18	700	SOT-227
IXFR140N30P	300	70.0	0.026	14000	185.0	200	0.42	360	ISOPLUS247™
IXFX140N30P	300	140.0	0.024	14000	185.0	200	0.12	1040	PLUS247
IXFK80N50P	500	80.0	0.065	12700	197.0	200	0.12	1040	TO-264
IXFN80N50P	500	66.0	0.065	12700	195.0	200	0.18	700	SOT-227
IXFR80N50P	500	45.0	0.072	12700	197.0	200	0.35	360	ISOPLUS247™
IXFX80N50P	500	80.0	0.065	12700	197.0	200	0.12	1040	PLUS247
IXFB100N50P	500	100.0	0.049	20000	240.0	200	0.10	1250	TO-264
IXFL100N50P	500	70.0	0.052	20000	240.0	200	0.20	625	ISOPLUS264™
IXFN100N50P	500	90.0	0.049	20000	240.0	200	0.12	1040	SOT-227
IXFK64N60P	600	64.0	0.096	12000	200.0	200	0.12	1040	TO-264
IXFN64N60P	600	50.0	0.096	12000	200.0	200	0.18	700	SOT-227
IXFR64N60P	600	36.0	0.105	12000	200.0	200	0.35	360	ISOPLUS247™
IXFX64N60P	600	64.0	0.096	12000	200.0	200	0.12	1040	PLUS247
IXFB82N60P	600	82.0	0.075	23000	240.0	200	0.10	1250	TO-264
IXFL82N60P	600	82.0	0.078	23000	240.0	200	0.20	625	ISOPLUS264™
IXFN82N60P	600	82.0	0.075	23000	240.0	200	0.12	1040	SOT-227
IXFK44N80P	800	44.0	0.190	12000	198.0	250	0.12	1040	TO-264
IXFN44N80P	800	39.0	0.190	12000	200.0	250	0.18	694	SOT-227
IXFR44N80P	800	25.0	0.200	12000	200.0	250	0.42	300	ISOPLUS247™
IXFX44N80P	800	44.0	0.190	12000	198.0	250	0.12	1040	PLUS247
IXFB60N80P	800	60.0	0.140	18000	250.0	250	0.10	1250	TO-264
IXFL60N80P	800	40.0	0.150	18000	250.0	250	0.20	625	ISOPLUS264™
IXFN60N80P	800	53.0	0.140	18000	250.0	250	0.12	1040	SOT-227

ISOPLUS™ Packages with Internal Alumina DCB Isolation\*



Example Part + Isolation Medium	R <sub>th(J-C)</sub>	R <sub>th(C-S)</sub>	R <sub>th(J-S)</sub>
IXFX55N50 + SIL-PAD 2000™	0.22 K/W	1.02 K/W	1.24 K/W
IXFR55N50 (ISOPLUS247™ with Internal DCB Isolation)	R <sub>th(J-DCB)</sub> 0.22 K/W	R <sub>th(DCB-Case)</sub> 0.15 K/W	0.15 K/W

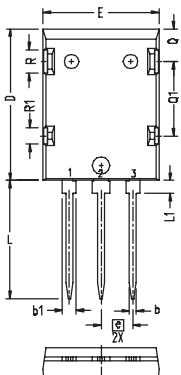
□ – Denotes Inclusion of Isolation Boundary.

- Provides 2500V, UL recognized isolation with superior thermal performance (E153432).
- Improves temperature cycling and power cycling capability.
- Cost effective clip mounting.

\* IXYS Patented Packages, Patent No. 6,404,065  
SIL-PAD is a trademark of Berquist Co.  
ISOPLUS is a trademark of IXYS Corporation

ISOPLUS™ Package Outline Drawings

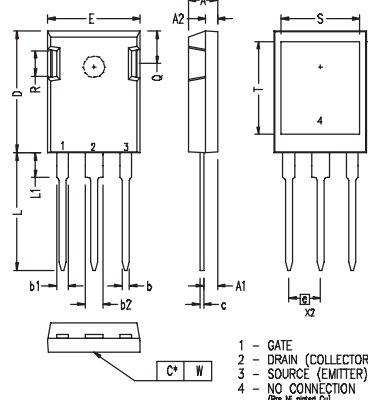
ISOPLUS264™



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.180	.205	4.83	5.21
A1	.102	.118	2.59	3.00
A2	.048	.055	1.17	1.40
b	.045	.055	1.14	1.40
b1	.087	.102	2.21	2.59
b2	.111	.126	2.82	3.20
c	.020	.029	0.51	0.74
D	1.020	1.040	25.91	26.42
E	.770	.789	19.56	20.29
e	.215 BSC		5.46 BSC	
L	.780	.820	19.81	20.83
L1	.080	.102	2.03	2.59
Q	.210	.235	5.33	5.97
R	.490	.513	12.45	13.03
R1	.150	.180	3.81	4.57
R	.100	.130	2.54	3.30
S	.868	.890	16.97	17.53
T	.801	.821	20.34	20.85
U	.085	.080	1.85	2.03

NOTE: Bottom heatsink meets 2500Vrms isolation to the other pins.

ISOPLUS247™



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b1	.075	.085	1.91	2.15
b2	.115	.126	2.92	3.20
C	.024	.033	0.61	0.83
D	.819	.840	20.80	21.34
E	.620	.635	15.75	16.13
e	.215 BSC		5.45 BSC	
L	.780	.811	19.81	20.60
L1	.150	.172	3.81	4.38
Q	.220	.244	5.59	6.20
R	.170	.191	4.32	4.85
S	.520	.540	13.21	13.72
T	.620	.640	15.75	16.26
U	.065	.080	1.65	2.03
W	0	.004	0	0.10

NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.  
C\* – Convex bow of substrate is typ<0.04mm over plastic surface level of device bottom side.  
LEAD FINISH – External leads are Pb free solder dip.

