

# TrenchMV™ Power MOSFETs

NEXT GENERATION POWER MOSFETs FROM 55V TO 100V

OCTOBER 2006

IXYS has developed a new platform of Power MOSFETs called TrenchMV™. TrenchMV covers the 55V to 100V range with currents ranging from 44A to 280A. These new devices utilize IXYS unique Trench MOSFET technology to provide extremely low power dissipation with ultra-low  $R_{DS(on)}$  and an optimized intrinsic reverse diode. This new platform of Power MOSFETs is a part of IXYS growing product line aimed at low voltage power conversion applications.

TrenchMV Power MOSFETs find use in many applications. These devices are designed to withstand even the most robust operating conditions required by the automotive market, as well as the industrial sector. Other applications include DC/DC converters, battery chargers, motor drives and others. Additional Trench products and package options are in process, including options for lower and higher voltages.

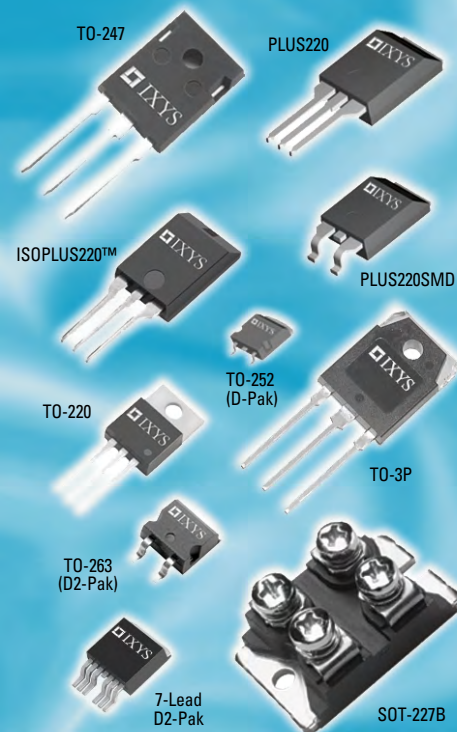
IXYS offers a full range of standard packages and a full range of surface mount and discrete packages... TO-220, TO-252, SOT-227B, etc. In addition, versions are offered in IXYS proprietary ISOPLUS™ packages, providing UL recognized 2500V isolation with superior thermal performance. Electrically isolated tabbed packages include the ISOPLUS220™, ISOPLUS i4-Pak™ and ISOPLUS i5-Pak™.

## FEATURES:

- Very low  $R_{DS(on)}$
- High power density
- Low package inductance
- Unclamped Inductive Switching (UIS) rated
- UL recognized isolated ISOPLUS™ packages

## BENEFITS:

- Rugged operation
- Easy to drive and protect
- Cost-effective
- Space saving
- Easy to mount



## POWER DEVICES

- >>> Power MOSFET Discretes
- RF Power MOSFETs
- IGBT Discretes
- IGBT Modules
- Ultra Fast Rectifiers
- Silicon Schottky Rectifiers
- GaAs Schottky Rectifiers
- SCRs and Thyristors
- Rectifiers Bridges

## ICS AND GATE DRIVERS

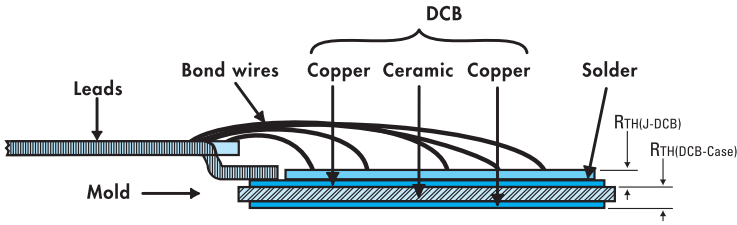
- MOSFET and IGBT Gate Drivers
- Half Bridge Gate Drivers
- PWM Controllers

## FUNCTIONAL SOLUTIONS

- PFC Modules
- Converter/Brake/Inverter Modules
- Boost & Buck Power Modules

# The ISOPLUS™ Advantage

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 (up to 2500V), improve creepage distance and dramatically reduce total thermal resistance. Additionally, the ceramic alumina substrates used also dramatically enhance device reliability by greatly improving thermal and power cycling. The DCB can be patterned like a printed circuit board, which enables the unique integration capabilities of IXYS ISOPLUS packages. Kunze high performance phase change materials can be used to further enhance ISOPLUS package thermal performance.



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

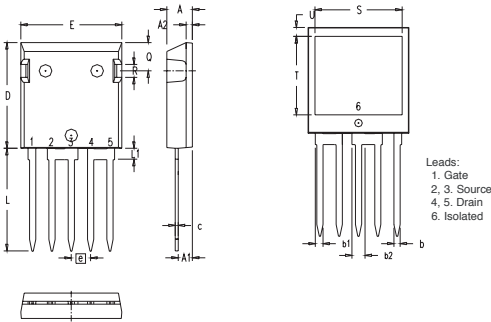
\* IXYS Patented Packages, Patent No. 6,404,065

Example Part + Isolation Medium	$R_{TH(J-C)}$	$R_{TH(C-S)}$	$R_{TH(J-S)}$
IXFP14N60P with SIL-PAD 2000™	0.42 C/W	2.37 C/W	2.79 C/W
IXFC14N60P (ISOPLUS247™ with Internal DCB Isolation)	$R_{TH(J-DCB)}$ 0.75 C/W	$R_{TH(DCB-Case)}$ 0.50 C/W	0.21 C/W 1.46 C/W

– Denotes Inclusion of Isolation Boundary.

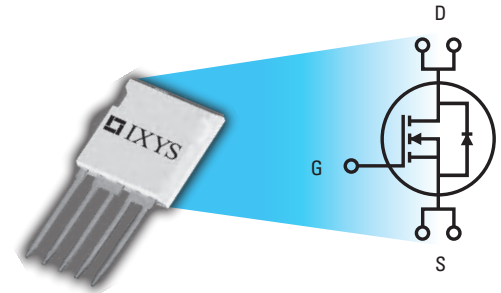
## TrenchMV™ Power MOSFETs in 5-lead ISOPLUS i4-Paks™

The principal feature of this subset of TrenchMV Power MOSFETs arises from the high power handling capability and special lead configuration found in the IXYS discrete ISOPLUS i4-Pak. Silicon current handling has outpaced the ability of most traditional discrete packaging, which typically limits steady state current to 75A. The powerful ISOPLUS i4-Pak is used to full effect in this instance by combining its superior isolation, thermal and power cycling capabilities and flexible configuration. In this case, the ISOPLUS i4-Pak is configured with 5 heavy-gage leads to provide a high current drain and source paired lead set with joined copper webs and backside heat sinking, all of which conservatively improve the lead current rating to 150A.



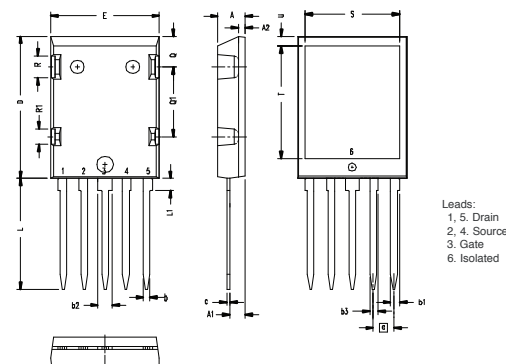
SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.102	.118	2.59	3.00
A2	.046	.085	1.17	2.16
b	.045	.055	1.14	1.40
b1	.058	.068	1.47	1.73
b2	.100	.110	2.54	2.79
C	.020	.029	0.51	0.74
D	.819	.840	20.80	21.34
E	.770	.799	19.56	20.29
e	.150	BSC	3.81	BSC
L	.780	.840	19.81	21.34
L1	.083	.102	2.11	2.59
Q	.210	.244	5.33	6.20
R	.100	.180	2.54	4.57
S	.660	.690	16.76	17.53
T	.590	.620	14.99	15.75
U	.065	.080	1.65	2.03

All leads and tabs are tin plated



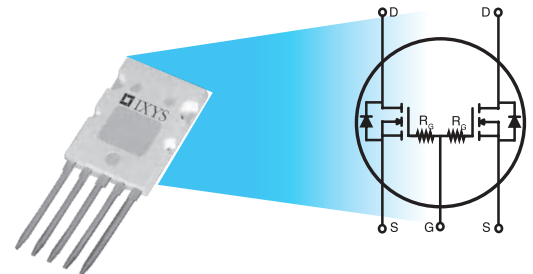
## TrenchMV™ Power MOSFETs in 5-lead ISOPLUS i5-Paks™

The principal feature of this subset of TrenchMV Power MOSFETs arises from the high power handling and integration capabilities found in the IXYS discrete ISOPLUS i5-Pak. Standard discrete through-hole packages (i.e. TO-247 or TO-264) are only capable of housing one die due to their inherent spatial, thermal, and structural limitations. The powerful ISOPLUS i5-Pak is used to full effect in this instance by combining its superior isolation, thermal and power cycling capabilities and flexible configuration. In this case, the flexible DCB substrate of the ISOPLUS i5-Pak is patterned to accommodate two common-gate high current TrenchMV dice, allowing users to harness up to 150A out of the device with two parallel-connected die. The use of two parallel die provides for lower on-state losses due to improved thermal distribution.



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.102	.118	2.59	3.00
A2	.046	.055	1.17	1.40
b	.045	.055	1.14	1.40
b1	.063	.072	1.60	1.83
b2	.100	.110	2.54	2.79
b3	.058	.068	1.47	1.73
c	.020	.029	0.51	0.74
D	1.020	1.040	25.91	26.42
E	.770	.799	19.56	20.29
e	.150	BSC	3.81	BSC
L	.780	.820	19.81	20.83
L1	.080	.102	2.03	2.59
Q	.210	.235	5.33	5.97
Q1	.490	.513	12.45	13.03
R	.150	.180	3.81	4.57
R1	.100	.130	2.54	3.30
S	.668	.690	16.97	17.53
T	.601	.621	15.24	15.85
U	.065	.080	1.65	2.03

All leads and tabs are tin plated



# TrenchM<sup>TM</sup> (55V-100V) Power MOSFETs

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 (mΩ)	C <sub>iss</sub> Typ (pF)	Q <sub>g</sub> Typ (nC)	t <sub>rr</sub> Typ (ns)	R <sub>thJC</sub> Max (°C/W)	Pd (W)	Package Type
IXTP64N055T	55	64	13.0	1420	37	80	1.15	130	TO-220
IXTY64N055T	55	64	13.0	1420	37	80	1.15	130	TO-252
IXTA90N055T	55	90	8.8	2500	61	70	0.85	176	TO-263
IXTP90N055T	55	90	8.8	2500	61	70	0.85	176	TO-220
IXTA110N055T	55	110	7.0	3080	67	70	0.65	230	TO-263
IXTA110N055T7	55	110	7.0	3080	67	70	0.65	230	7-Lead D2-Pak
IXTC110N055T	55	78	9.0	3080	67	70	1.50	100	ISOPLUS220
IXTP110N055T	55	110	7.0	3080	67	70	0.65	230	TO-220
IXTA182N055T	55	182	5.0	4850	114	70	0.42	360	TO-263
IXTA182N055T7	55	182	5.0	4850	114	70	0.42	360	7-Lead D2-Pak
IXTH182N055T	55	182	5.0	4850	114	70	0.42	360	TO-247
IXTP182N055T	55	182	5.0	4850	114	70	0.42	360	TO-220
IXTQ182N055T	55	182	5.0	4850	114	70	0.42	360	TO-3P
IXTA220N055T	55	220	4.0	7200	158	70	0.35	430	TO-263
IXTA220N055T7	55	220	4.0	7200	158	70	0.35	430	7-Lead D2-Pak
IXTC220N055T	55	130	4.4	7200	158	70	1.00	150	ISOPLUS220
IXTH220N055T	55	220	4.0	7200	158	70	0.35	430	TO-247
IXTP220N055T	55	220	4.0	7200	158	70	0.35	430	TO-220
IXTQ220N055T	55	220	4.0	7200	158	70	0.35	430	TO-3P
IXTA240N055T	55	240	3.6	7600	170	70	0.31	480	TO-263
IXTA240N055T7	55	240	3.6	7600	170	70	0.31	480	7-Lead D2-Pak
IXTC240N055T	55	144	4.0	7600	170	70	1.00	150	ISOPLUS220
IXTH240N055T	55	240	3.6	7600	170	70	0.31	480	TO-247
IXTP240N055T	55	240	3.6	7600	170	70	0.31	480	TO-220
IXTQ240N055T	55	240	3.6	7600	170	70	0.31	480	TO-3P
IXTC280N055T	55	145	3.6	9800	200	70	0.96	160	ISOPLUS220
IXTF280N055T	55	150	3.5	9800	200	70	0.90	167	ISOPLUS i4-Pak
IXTH280N055T	55	280	3.2	9800	200	70	0.27	550	TO-247
IXTQ280N055T	55	280	3.2	9800	200	70	0.27	550	TO-3P
IXTV280N055T	55	280	3.2	9800	200	70	0.27	550	PLUS220
IXTV280N055TS	55	280	3.2	9800	200	70	0.27	550	PLUS220SMD
IXTL2x240N055T	55	2x150	4.0	7600	170	80	0.90	170	ISOPLUS i5-Pak
IXTP55N075T	75	55	19.5	1400	33	85	1.15	130	TO-220
IXTY55N075T	75	55	19.5	1400	33	85	1.15	130	TO-252
IXTA76N075T	75	76	12.0	2580	57	80	0.85	176	TO-263
IXTP76N075T	75	76	12.0	2580	57	80	0.85	176	TO-220
IXTA98N075T	75	98	10.0	3100	80	100	0.75	200	TO-263
IXTA98N075T7	75	98	10.0	3100	80	100	0.75	200	7-Lead D2-Pak
IXTP98N075T	75	98	10.0	3100	80	100	0.75	200	TO-220
IXTA160N075T	75	160	6.0	4950	112	80	0.42	360	TO-263
IXTA160N075T7	75	160	6.0	4950	112	80	0.42	360	7-Lead D2-Pak
IXTH160N075T	75	160	6.0	4950	112	80	0.42	360	TO-247
IXTP160N075T	75	160	6.0	4950	112	80	0.42	360	TO-220
IXTQ160N075T	75	160	6.0	4950	112	80	0.42	360	TO-3P
IXTA200N075T	75	200	5.0	6800	160	80	0.35	430	TO-263
IXTA200N075T7	75	200	5.0	6800	160	80	0.35	430	7-Lead D2-Pak
IXTC200N075T	75	110	5.5	6800	160	80	1.00	150	ISOPLUS220
IXTH200N075T	75	200	5.0	6800	160	80	0.35	430	TO-247
IXTP200N075T	75	200	5.0	6800	160	80	0.35	430	TO-220
IXTQ200N075T	75	200	5.0	6800	160	80	0.35	430	TO-3P
IXTA220N075T	75	220	4.5	7700	165	80	0.31	480	TO-263
IXTA220N075T7	75	220	4.5	7700	165	80	0.31	480	7-Lead D2-Pak
IXTC220N075T	75	115	5.0	7700	165	80	1.00	150	ISOPLUS220
IXTH220N075T	75	220	4.5	7700	165	80	0.31	480	TO-247
IXTP220N075T	75	220	4.5	7700	165	80	0.31	480	TO-220
IXTQ220N075T	75	220	4.5	7700	165	80	0.31	480	TO-3P
IXTC250N075T	75	128	4.4	9900	200	90	0.96	160	ISOPLUS220
IXTF250N075T	75	130	4.4	9900	200	80	0.90	167	ISOPLUS i4-Pak
IXTH250N075T	75	250	4.0	9900	200	80	0.27	550	TO-247
IXTQ250N075T	75	250	4.0	9900	200	80	0.27	550	TO-3P
IXTV250N075T	75	250	4.0	9900	200	80	0.27	550	PLUS220
IXTV250N075TS	75	250	4.0	9900	200	80	0.27	550	PLUS220SMD
IXTL2x220N075T	75	2x125	5.0	7700	165	80	0.90	170	ISOPLUS i5-Pak

**Type A**  
TO-263  
(D2-Pak)



**Type A ...7**  
7-Lead D2-Pak



**Type F**  
ISOPLUS i4-Pak<sup>TM</sup>



**Type H**  
TO-247



**Type L**  
ISOPLUS264<sup>TM</sup>  
(ISOPLUS i5-Pak<sup>TM</sup>)



**Type N**  
SOT-227B miniBLOC



# TrenchMV™ (55V-100V) Power MOSFETs (cont.)

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 (mΩ)	C <sub>iss</sub> Typ (pF)	Q <sub>g</sub> Typ (nC)	t <sub>rr</sub> Typ (ns)	R <sub>thJC</sub> Max (°C/W)	Pd (W)	Package Type
IXTP50N085T	85	50	23.0	1460	34	90	1.15	130	TO-220
IXTY50N085T	85	50	23.0	1460	34	90	1.15	130	TO-252
IXTA70N085T	85	70	13.5	2570	59	90	0.85	176	TO-263
IXTP70N085T	85	70	13.5	2570	59	90	0.85	176	TO-220
IXTA88N085T	85	88	11.0	3140	69	90	0.65	230	TO-263
IXTA88N085T7	85	88	11.0	3140	69	90	0.65	230	7-Lead D2-Pak
IXTP88N085T	85	88	11.0	3140	69	90	0.65	230	TO-220
IXTA152N085T	85	152	7.0	5500	114	90	0.42	360	TO-263
IXTA152N085T7	85	152	7.0	5500	114	90	0.42	360	7-Lead D2-Pak
IXTH152N085T	85	152	7.0	5500	114	90	0.42	360	TO-247
IXTP152N085T	85	152	7.0	5500	114	90	0.42	360	TO-220
IXTQ152N085T	85	152	7.0	5500	114	90	0.42	360	TO-3P
IXTA180N085T	85	180	5.5	7500	170	90	0.35	430	TO-263
IXTA180N085T7	85	180	5.5	7500	170	90	0.35	430	7-Lead D2-Pak
IXTC180N085T	85	102	6.1	7500	170	90	1.00	150	ISOPLUS220
IXTH180N085T	85	180	5.5	7500	170	90	0.35	430	TO-247
IXTP180N085T	85	180	5.5	7500	170	90	0.35	430	TO-220
IXTQ180N085T	85	180	5.5	7500	170	90	0.35	430	TO-3P
IXTA200N085T	85	200	5.0	7500	160	90	0.31	480	TO-263
IXTA200N085T7	85	200	5.0	7500	160	90	0.31	480	7-Lead D2-Pak
IXTC200N085T	85	107	5.5	7600	160	90	1.00	150	ISOPLUS220
IXTH200N085T	85	200	5.0	7600	160	90	0.31	480	TO-247
IXTP200N085T	85	200	5.0	7600	160	90	0.31	480	TO-3P
IXTQ200N085T	85	200	5.0	7600	160	90	0.31	480	TO-220
IXTC230N085T	85	120	4.6	9900	187	90	0.96	160	ISOPLUS220
IXTF230N085T	85	125	4.9	9900	187	90	0.90	167	ISOPLUS i4-Pak
IXTH230N085T	85	230	4.4	9900	187	90	0.27	550	TO-247
IXTQ230N085T	85	230	4.4	9900	187	90	0.27	550	TO-3P
IXTV230N085T	85	230	4.4	9900	187	90	0.27	550	PLUS220
IXTV230N85TS	85	230	4.4	9900	187	90	0.27	550	PLUS220SMD
IXTL2x200N085T	85	2x112	5.5	7600	160	90	0.90	170	ISOPLUS i5-Pak
IXTP44N10T	100	44	30.0	1262	33	100	1.15	130	TO-220
IXTY44N10T	100	44	30.0	1262	33	100	1.15	130	TO-252
IXTA60N10T	100	60	18.0	2520	49	100	0.85	176	TO-263
IXTP60N10T	100	60	18.0	2520	49	100	0.85	176	TO-220
IXTA80N10T	100	80	14.0	3040	60	100	0.65	230	TO-263
IXTA80N10T7	100	80	14.0	3040	60	100	0.65	230	7-Lead D2-Pak
IXTP80N10T	100	80	14.0	3040	60	100	0.65	230	TO-220
IXTA130N10T	100	130	9.0	4800	104	100	0.42	360	TO-263
IXTA130N10T7	100	130	9.0	4800	104	100	0.42	360	7-Lead D2-Pak
IXTH130N10T	100	130	9.0	4800	104	100	0.42	360	TO-247
IXTP130N10T	100	130	9.0	4800	104	100	0.42	360	TO-220
IXTQ130N10T	100	130	9.0	4800	104	100	0.42	360	TO-3P
IXTA160N10T	100	160	7.0	6600	132	100	0.35	430	TO-263
IXTA160N10T7	100	160	7.0	6600	132	100	0.35	430	7-Lead D2-Pak
IXTC160N10T	100	86	7.7	6600	132	100	1.00	150	ISOPLUS220
IXTH160N10T	100	160	7.0	6600	132	100	0.35	430	TO-247
IXTP160N10T	100	160	7.0	6600	132	100	0.35	430	TO-220
IXTQ160N10T	100	160	7.0	6600	132	100	0.35	430	TO-3P
IXTA180N10T	100	180	6.4	6900	151	100	0.31	480	TO-263
IXTA180N10T7	100	180	6.4	6900	151	100	0.31	480	7-Lead D2-Pak
IXTC180N10T	100	90	7.0	6900	151	100	1.00	150	ISOPLUS220
IXTH180N10T	100	180	6.4	6900	151	100	0.31	480	TO-247
IXTP180N10T	100	180	6.4	6900	151	100	0.31	480	TO-220
IXTQ180N10T	100	180	6.4	6900	151	100	0.31	480	TO-3P
IXTC200N10T	100	101	6.0	7200	220	130	0.96	160	ISOPLUS220
IXTF200N10T	100	103	6.0	8500	152	100	0.96	167	ISOPLUS i4-Pak
IXTH200N10T	100	200	5.5	8500	152	100	0.27	550	TO-247
IXTN200N10T	100	200	5.4	7200	220	130	0.30	500	SOT-227B
IXTQ200N10T	100	200	5.5	8500	152	100	0.27	550	TO-3P
IXTV200N10T	100	200	5.5	7200	220	130	0.30	500	PLUS220
IXTV200N10TS	100	200	5.5	7200	220	130	0.30	500	PLUS220SMD
IXTL2x180N10T	100	2x100	7.0	6900	151	100	0.90	170	ISOPLUS i5-Pak

Type P  
TO-220



Type P ...M  
Overmolded TO-220



Type Q  
TO-3P



Types V, C  
PLUS220  
ISOPLUS220™



Type V ...S  
PLUS220SMD



Type Y  
TO-252  
(D-Pak)

