

# 200V Ultra-Junction X3-Class HiPerFET™ Power MOSFETs

With low-noise fast recovery body diodes and lowest on-resistances

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## DESCRIPTION

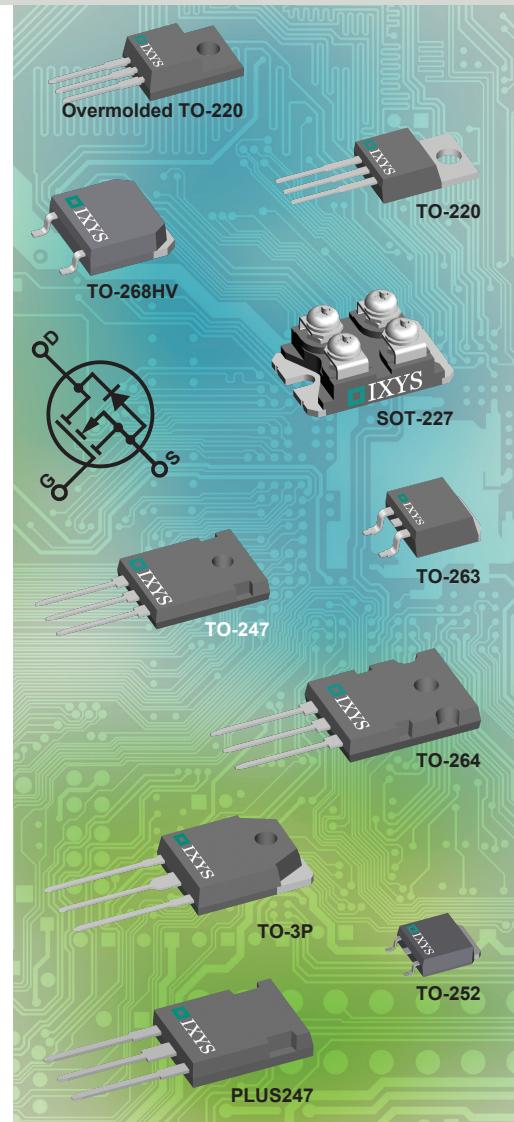
IXYS Corporation (NASDAQ: IXYS), a global manufacturer of power semiconductors and integrated circuits (ICs) for energy efficiency, power management, transportation, medical, and motor control applications, has released a new power semiconductor product line: 200V Ultra-Junction X3-Class HiPerFET™ Power MOSFETs. The current ratings range from 36A to 300A; a broad selection of devices are available in a number of international standard packages.

Fabricated using a charge compensation principle and IXYS' own process technology, these new MOSFETs exhibit the lowest on-state resistances in the industry (3.5 milliohms in the SOT-227 package and 4 milliohms in the TO-264, for example). Along with gate charges as low as 21 nanocoulombs, these devices enable highest power densities and energy efficiencies in a wide variety of high-speed power conversion applications.

The fast body diodes of the devices are optimized and have low reverse recovery charge and time, thereby suppressing transients and enabling low-noise, high-efficiency power switching. In addition, these new MOSFETs are avalanche capable and exhibit a superior dv/dt performance (up to 20V/ns).

Targeted applications include synchronous rectification, battery chargers for light electric vehicles (LEVs), motor control (48V-110V systems), DC-DC converters, uninterruptible power supplies, electric forklifts, inverters, power solid state relays, and Class-D audio amplifiers.

The new 200V X3-Class Power MOSFETs with HiPerFET™ body diodes are available in the following international standard size packages: TO-3P, TO-220 (overmolded or standard), TO-247, PLUS247, TO-252, TO-263, TO-264, TO-268HV, SOT-227. Some example part numbers include IXFP36N20X3, IXFA72N20X3, IXFH90N20X3 and IXFN300N20X3, with current ratings of 36A, 72A, 90A, and 300A, respectively.



## FEATURES

- Lowest on-resistance  $R_{DS(ON)}$
- Ultra-low gate charge  $Q_g$
- Low-noise fast recovery body diode
- dv/dt ruggedness
- Superior avalanche capability
- International standard packages

## ADVANTAGES

- High efficiency
- High power density
- Easy to design in

## APPLICATIONS

- Battery chargers for light electric vehicles (LEVs)
- Synchronous rectification
- Electric forklifts
- Motor control (48V-110V systems)
- DC-DC converters
- Class-D audio amplifiers
- Inverters
- Power solid-state relays

# Available Parts

Part Number	V <sub>DSS</sub> (V)	I <sub>D25</sub> T <sub>c</sub> = 25°C (A)	R <sub>D(on)</sub> max T <sub>j</sub> = 25°C (mΩ)	Q <sub>g(on)</sub> typ (nC)	C <sub>iss</sub> typ (pF)	t <sub>rr</sub> typ (ns)	R <sub>thJC</sub> max (°C/W)	P <sub>D</sub> max (W)	Package Type
IXFA36N20X3	200	36	45	21	1425	75	0.71	176	TO-263
IXFP36N20X3	200	36	45	21	1425	75	0.71	176	TO-220
IXFP36N20X3M	200	36	45	21	1425	75	3.5	36	OVERMOLDED TO-220
IXFY36N20X3	200	36	45	21	1425	75	0.71	176	TO-252
IXFA72N20X3	200	72	20	55	3780	84	0.39	320	TO-263
IXFP72N20X3	200	72	20	55	3780	84	0.39	320	TO-220AB
IXFP72N20X3M	200	72	20	55	3780	84	3.5	36	OVERMOLDED TO-220
IXFQ72N20X3	200	72	20	55	3780	84	0.39	320	TO-3P
IXFA90N20X3	200	90	12.8	78	5420	85	0.32	390	TO-263
IXFH90N20X3	200	90	12.8	78	5420	85	0.32	390	TO-247
IXFP90N20X3	200	90	12.8	78	5420	85	0.32	390	TO-220
IXFP90N20X3M	200	90	12.8	78	5420	85	3.5	36	OVERMOLDED TO-220
IXFQ90N20X3	200	90	12.8	78	5420	85	0.32	390	TO-3P
IXFH140N20X3	200	140	9.6	127	7660	90	0.24	520	TO-247
IXFQ140N20X3	200	140	9.6	127	7660	90	0.24	520	TO-3P
IXFT140N20X3HV	200	140	9.6	127	7660	90	0.24	520	TO-268HV
IXFN220N20X3	200	160	6.2	204	13600	116	0.32	390	SOT-227
IXFH180N20X3	200	180	7.5	154	10300	94	0.16	780	TO-247
IXFT180N20X3HV	200	180	7.5	154	10300	94	0.16	780	TO-268HV
IXFH220N20X3	200	220	6.2	204	13600	116	0.13	960	TO-247
IXFK220N20X3	200	220	6.2	204	13600	116	0.13	960	TO-264
IXFT220N20X3HV	200	220	6.2	204	13600	116	0.13	960	TO-268HV
IXFK300N20X3	200	300	4	375	23800	170	0.1	1250	TO-264
IXFN300N20X3	200	300	3.5	375	23800	170	0.18	695	SOT-227
IXFX300N20X3	200	300	4	375	23800	170	0.1	1250	PLUS247

## Application Examples

### Application Circuits Legend

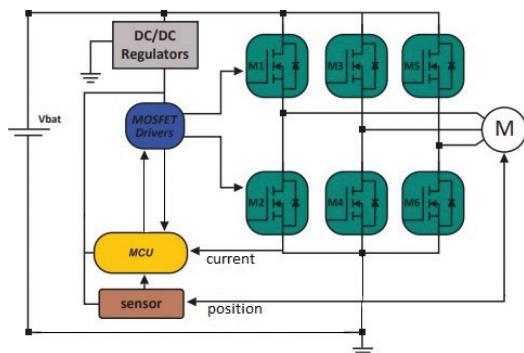


Figure 1: Brushless DC motor (BLDC) – E-bikes

Figure 2 illustrates a simplified two-stage solar micro-inverter. The full-bridge (M1, M2, M3, and M4) generates a square-wave signal that is then transmitted through a transformer to the bridge rectifiers (D1, D2, D3, and D4). The DC voltage coming out of the rectifiers is then converted to an AC voltage. The full-bridge can be constructed using the 200V Ultra Junction X3-Class device **IXFT220N20X3HV**.

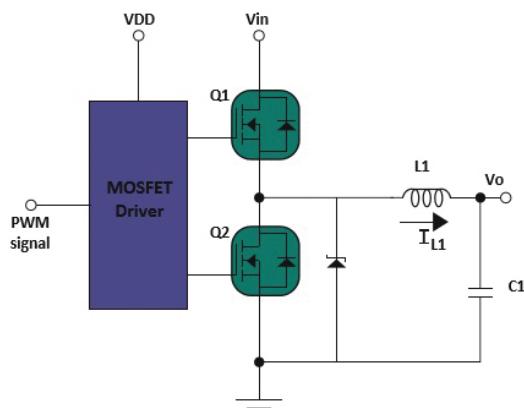


Figure 3: Synchronous rectification in a buck converter

Figure 1 demonstrates a brushless DC (BLDC) motor drive generally used in E-bikes and Light Electric Vehicles (LEV). Six **IXFH220N20X3** Ultra Junction MOSFETs (M1, M2, M3, M4, M5, and M6) are utilized to form a 3-phase inverter stage that drives a brushless DC motor. These avalanche capable MOSFETs ensure the ruggedness of the system.

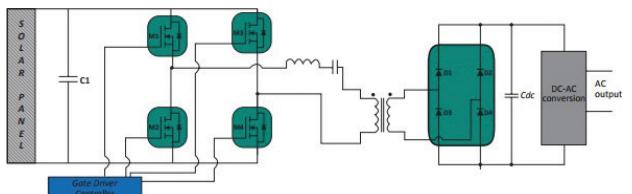


Figure 2: Solar micro-inverter

Figure 3 represents a DC-DC synchronous buck converter circuit which makes use of the **IXFX300N20X3** (Q1 and Q2). Q1 functions as the high-side switch and Q2 the low-side synchronous switch in place of a diode. With an  $R_{D(on)}$  of just 4mΩ, the **IXFX300N20X3** enables the converter to achieve a higher efficiency and power density.



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