

# 250V Ultra-Junction X3-Class HiPerFET™ Power MOSFETs

Offering best-in-class on-state resistance and gate charge Figure of Merit

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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: 250V Ultra-Junction X3-Class HiPerFET™ Power MOSFETs. With on-resistances and gate charges as low as 4.5 milliohms and 21 nanocoulombs, respectively, these devices enable highest power densities and energy efficiencies in a wide variety of high-speed power conversion applications.

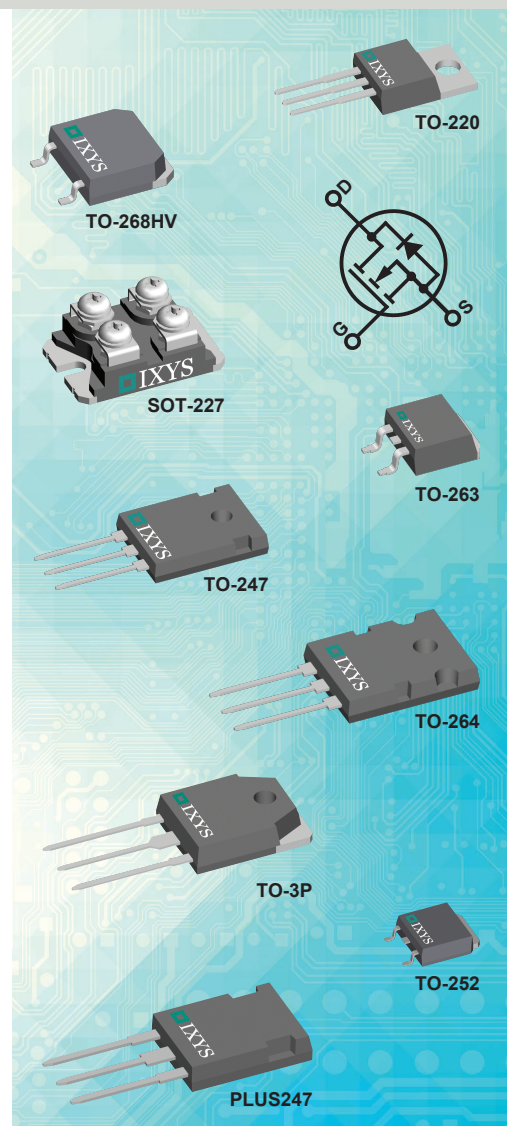
Developed using a charge compensation principle and proprietary process technology, the new MOSFETs provide the best-in-class Figure of Merit (on-resistance times gate charge), which translates into lowest conduction and switching losses. They exhibit the lowest on-state resistances in the industry (5 milliohms in the TO-264 package and 4.5 milliohms in the SOT-227, for instance).

The fast intrinsic body diodes HiPerFETs™ of the MOSFETs display very soft recovery characteristics, minimizing voltage overshoots and electromagnetic interference (EMI), especially in half or full-bridge topologies. With low reverse recovery charge and time, the diodes are capable of removing all the leftover energies during high-speed switching to avoid device failure and achieve high efficiency.

Moreover, these new devices are avalanche capable and exhibit a superior dv/dt performance as well. They are robust against device failure caused by voltage spikes and accidental turn-on of parasitic bipolar transistors inherent in the MOSFET structure. As such these rugged devices require fewer snubbers and can be used in both hard and soft switching power converters.

Well-suited applications include battery chargers for light electric vehicles (LEVs), synchronous rectification in switching power supplies, motor control, DC-DC converters, uninterruptible power supplies, electric forklifts, Class-D audio amplifiers, and telecom systems.

The new 250V 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 IXFA60N25X3, IXFP80N25X3, IXFT170N25X3HV and IXFK240N25X3, with current ratings of 60A, 80A, 170A, and 240A, respectively.



## FEATURES

- Lowest on-resistance  $R_{DS(ON)}$  and gate charge  $Q_g$
- Fast soft recovery body diode
- dv/dt ruggedness
- Superior avalanche capability
- International standard packages

## ADVANTAGES

- High efficiency
- High power density
- Improved system reliability
- Easy to design in

## APPLICATIONS

- Battery chargers for light electric vehicles
- Synchronous rectification in switching power supplies
- Motor control
- DC-DC converters
- Uninterruptible power supplies
- Electric forklifts
- Class-D audio amplifiers
- Telecom systems

## Available Parts

Part Number	$V_{DS}$ (V)	$I_{D25}$ $T_c = 25^\circ\text{C}$ (A)	$R_{DS(on)}$ max $T_j = 25^\circ\text{C}$ (m $\Omega$ )	$Q_{g(on)}$ typ (nC)	$C_{iss}$ typ (pF)	$t_{rr}$ typ (ns)	$R_{thJC}$ max ( $^\circ\text{C}/\text{W}$ )	$P_D$ max (W)	Package Type
IXFA30N25X3	250	30	60	21	1450	72	0.71	176	TO-263
IXFP30N25X3	250	30	60	21	1450	72	0.71	176	TO-220
IXFP30N25X3M	250	30	60	21	1450	72	3.5	36	OVERMOLDED TO-220
IXFY30N25X3	250	30	60	21	1450	72	0.71	176	TO-252
IXFA60N25X3	250	60	23	50	3610	84	0.39	320	TO-263
IXFP60N25X3	250	60	23	50	3610	84	0.39	320	TO-220
IXFP60N25X3M	250	60	23	50	3610	84	3.5	36	OVERMOLDED TO-220
IXFQ60N25X3	250	60	23	50	3610	84	0.39	320	TO-3P
IXFA80N25X3	250	80	16	83	5430	105	0.32	390	TO-263
IXFH80N25X3	250	80	16	83	5430	105	0.32	390	TO-247
IXFP80N25X3	250	80	16	83	5430	105	0.32	390	TO-220
IXFQ80N25X3	250	80	16	83	5430	105	0.32	390	TO-3P
IXFH120N25X3	250	120	12	122	7870	116	0.24	520	TO-247
IXFQ120N25X3	250	120	12	122	7870	116	0.24	520	TO-3P
IXFT120N25X3HV	250	120	12	122	7870	116	0.24	520	TO-268HV
IXFH150N25X3	250	150	9	154	10400	134	0.16	780	TO-247
IXFT150N25X3HV	250	150	9	154	10400	134	0.16	780	TO-268HV
IXFH170N25X3	250	170	7.4	190	13500	135	0.13	960	TO-247
IXFK170N25X3	250	170	7.4	190	13500	135	0.13	960	TO-264
IXFN170N25X3	250	170	7.4	190	13500	135	0.32	390	SOT-227
IXFT170N25X3HV	250	170	7.4	190	13500	135	0.13	960	TO-268HV
IXFK240N25X3	250	240	5	345	23800	165	0.1	1250	TO-264
IXFX240N25X3	250	240	5	345	23800	165	0.1	1250	PLUS247
IXFN240N25X3	250	240	4.5	345	23800	165	0.18	695	SOT-227

## Application Examples

Application Circuits Legend			
			

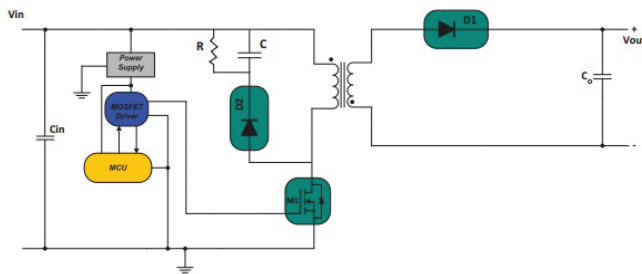


Figure 1: Flyback converter for telecom power supplies

Figure 2 represents a DC-DC synchronous buck converter circuit which makes use of the X3-Class HiPerFET™ **IXFK170N25X3** (Q1 and Q2). Q1 functions as the high-side switch and Q2 the low-side synchronous switch in place of a diode. With an  $R_{DS(on)}$  of 5m $\Omega$ , the MOSFET enables the converter to achieve a very high efficiency.

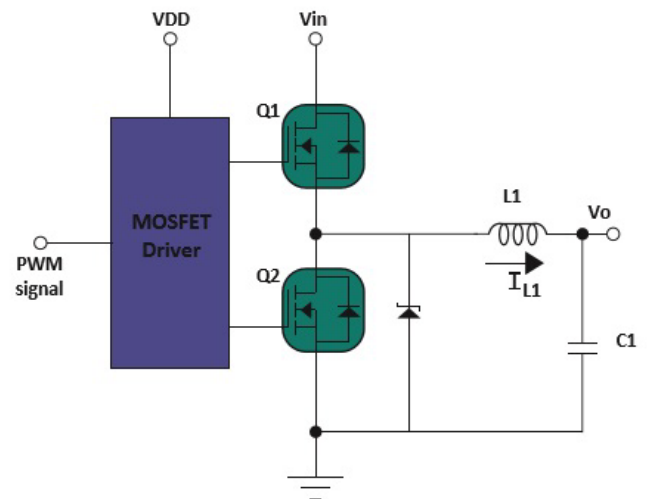


Figure 2: Synchronous rectification in a buck converter

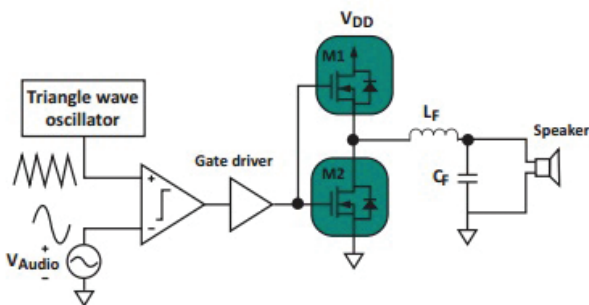


Figure 3: Half-bridge Class-D audio amplifier

Figure 3 demonstrates a simplified block diagram of a Class D audio amplifier. The audio signal is compared with a triangle wave, and a corresponding PWM (Pulse Width Modulation) signal is generated, which drives the half-bridge stage through a gate driver. The output is then low-pass filtered and reconstructed for the speaker. The half-bridge is constructed with two **IXFX240N25X3** X3-Class MOSFETs (M1, M2).



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