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PRODUCT BRIEF

300V Ultra-Junction X3-Class HiPerFET™ Power MOSFETs

Featuring benchmark Figure of Merit (on-resistance x gate charge)

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DESCRIPTION

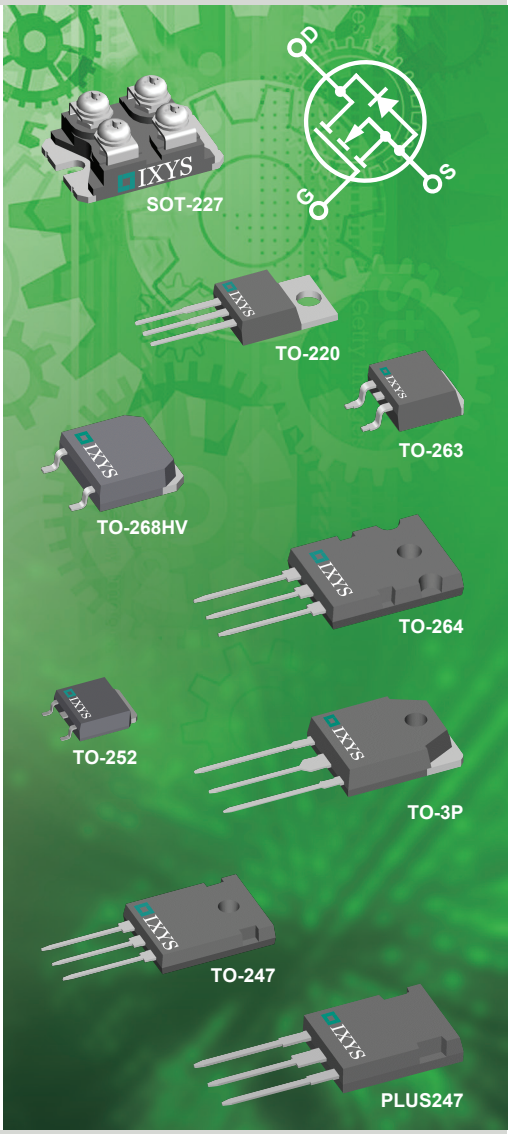
IXYS LLC, now part of Littelfuse, Inc. (NASDAQ: LFUS), a global manufacturer of power semiconductors and integrated circuits (ICs) for energy efficiency, power management, transportation, medical, and motor control applications, has released a new power semiconductor product line: 300V Ultra-Junction X3-Class HiPerFET™ Power MOSFETs. With on-resistances and gate charges as low as 4.6 milliohms and 22 nanocoulombs, respectively, they are optimized for both hard and soft switching power conversion applications.

Like other Ultra Junction products from IXYS, these new devices have been developed using a charge compensation principle and proprietary process technology, resulting in Power MOSFETs with the best-in-class Figure of Merit (on-resistance times gate charge). They exhibit the lowest on-state resistances in the industry (5.5 milliohms in the TO-264 package and 4.6 milliohms in the SOT-227, for instance), enabling the highest power densities and energy efficiencies in power systems.

With ultra-low reverse recovery charge and time, the fast body diodes are capable of removing all leftover energies during high-speed switching to avoid device failure and achieve high efficiency. Additionally, the new MOSFETs display a superior dv/dt performance (up to 20V/ns) and are avalanche capable. As such, these rugged devices require fewer snubbers and can be used in hard-switching or resonant power converters.

Targeted applications include synchronous rectification for telecom power supplies, motor control (48V-110V systems), uninterruptible power supplies, high performance Class-D audio amplifiers, DC-DC converters, solar inverters, and multilevel inverters.

With 25 parts currently available, this is the broadest 300V Ultra-Junction MOSFET product line in the industry. They are housed 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 IXFY26N30X3, IXFA38N30X3, IXFT150N30X3HV and IXFN210N30X3, with current ratings of 26A, 38A, 150A, and 210A, respectively.



FEATURES

- Best-in-class on-resistance $R_{DS(on)}$ and gate charge Q_g Figure of Merit
- Fast recovery body diodes
- dv/dt and avalanche ruggedness
- International standard packages

ADVANTAGES

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

APPLICATIONS

- Synchronous rectification for telecom power supplies
- Motor control (48V-110V systems)
- Uninterruptible Power Supplies (UPSs)
- High performance Class-D audio amplifiers
- DC-DC converters
- Solar inverters
- Multilevel interters

Available Parts

Part Number	V_{DSS} (V)	I_{D25} T_C = 25°C (A)	$R_{DS(on)}$ max T_J=25°C (mΩ)	$Q_{g(on)}$ typ (nC)	C_{iss} typ (pF)	t_{rr} typ (ns)	R_{thJC} max (°C/W)	P_D max (W)	Package Type
IXFA26N30X3	300	26	66	22	1465	105	0.73	170	TO-263
IXFP26N30X3	300	26	66	22	1465	105	0.73	170	TO-220
IXFY26N30X3	300	26	66	22	1465	105	0.73	170	TO-252
IXFA38N30X3	300	38	50	35	2240	90	0.52	240	TO-263
IXFP38N30X3	300	38	50	35	2240	90	0.52	240	TO-220
IXFP38N30X3M	300	38	50	35	2440	90	3.7	34	OVERMOLDED TO-220
IXFA56N30X3	300	56	27	56	3750	115	0.39	320	TO-263
IXFH56N30X3	300	56	27	56	3750	115	0.39	320	TO-247
IXFP56N30X3	300	56	27	56	3750	115	0.39	320	TO-220
IXFP56N30X3M	300	56	27	56	3750	115	3.5	36	OVERMOLDED TO-220
IXFA72N30X3	300	72	19	82	5400	100	0.32	390	TO-263
IXFH72N30X3	300	72	19	82	5400	100	0.32	390	TO-247
IXFP72N30X3	300	72	19	82	5400	100	0.32	390	TO-220
IXFP72N30X3M	300	72	19	82	5400	100	3.5	36	OVERMOLDED TO-220
IXFQ72N30X3	300	72	19	82	5400	100	0.32	390	TO-3P
IXFH100N30X3	300	100	13.5	122	7660	130	0.26	48	TO-247
IXFT100N30X3HV	300	100	13.5	122	7660	130	0.26	480	TO-268HV
IXFH120N30X3	300	120	11	170	10500	145	0.17	735	TO-247
IXFT120N30X3HV	300	120	11	170	10500	145	0.17	735	TO-268HV
IXFH150N30X3	300	150	8.3	254	13100	167	0.14	890	TO-247
IXFK150N30X3	300	150	8.3	254	13100	167	0.14	890	TO-264
IXFT150N30X3HV	300	150	8.3	254	13100	167	0.14	890	TO-268HV
IXFK210N30X3	300	210	5.5	375	24200	190	0.1	1250	TO-264
IXFX210N30X3	300	210	5.5	375	24200	190	0.1	1250	PLUS247
IXFN210N30X3	300	210	4.6	375	24.2	190	0.18	695	SOT-227

Application Examples

Application Circuits Legend

IXYSPOWER | zilog | IXYS

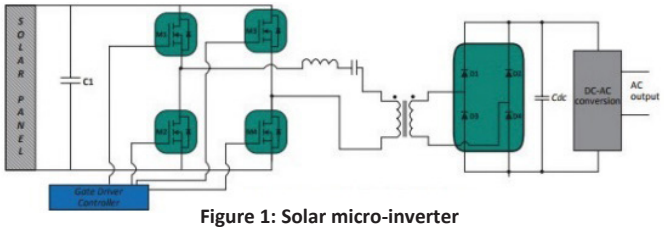


Figure 1: Solar micro-inverter

Figure 1 Figure 1 depicts 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 300V Ultra Junction X3-Class device **IXFP72N30X3**.

Figure 2 illustrates a simplified low-side brushed DC motor drive circuit. A rectified voltage is applied across the brushed DC motor which varies according to a Pulse Width Modulation (PWM) signal at an inaudible switching frequency (typically higher than 20 kHz). A DC supply provides a smooth current operation, reducing (acoustic) motor noise and improving motor efficiency. A 300V X3-Class Power MOSFET, the **IXFA56N30X3** (M1), is used as the main switching element to ensure an efficient and reliable power switching operation.

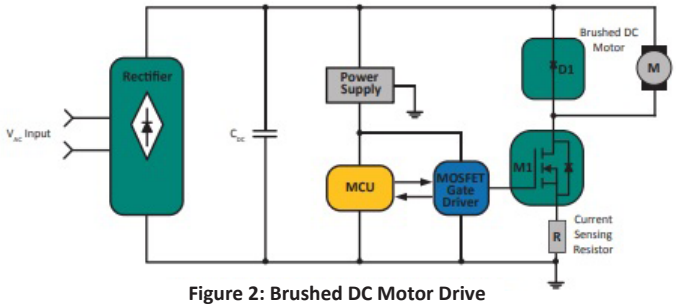


Figure 2: Brushed DC Motor Drive

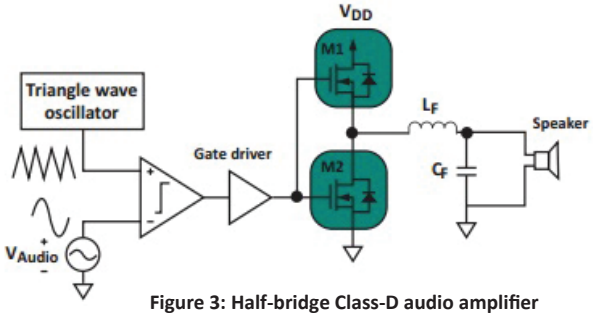


Figure 3: Half-bridge Class-D audio amplifier

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 **IXFK210N30X3** X3-Class MOSFETs (M1, M2).