

650V Ultra Junction X2-Class POWER MOSFETs

Ideal for Power Factor Correction (PFC) circuits and switching power supplies

AUGUST 2015

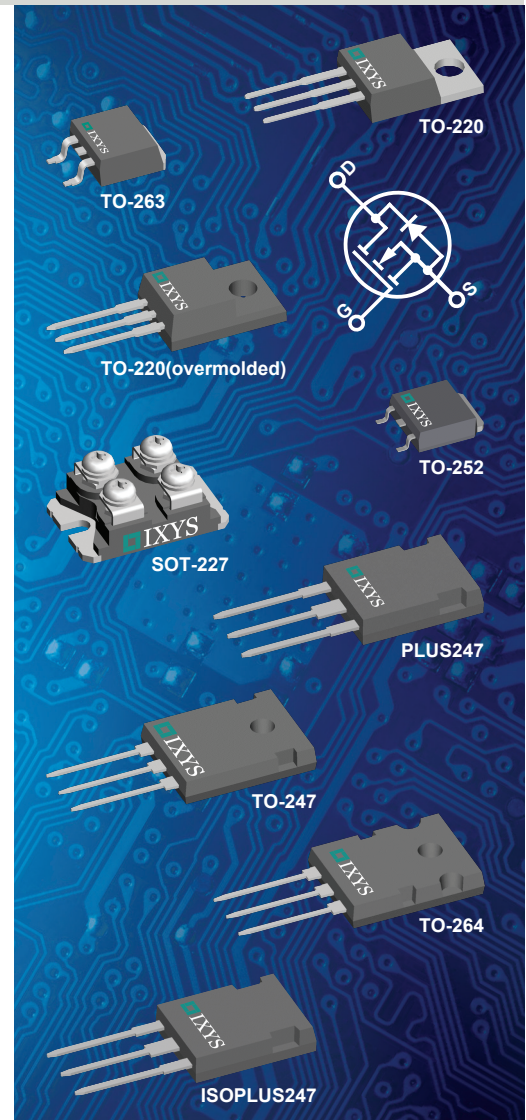
OVERVIEW

IXYS Corporation (NASDAQ: IXYS), a manufacturer of power semiconductors and integrated circuits for energy efficiency, power management, and motor control applications, announces a new power MOSFET product line: 650V Ultra Junction X2-Class Power MOSFETs. With current ratings ranging from 2A to 120A and on-resistance as low as 24 milliohms, they are well-suited for high-efficiency, high-speed power switching applications.

These devices are developed using a charge compensation principle and proprietary process technology, resulting in Power MOSFETs with significantly reduced resistance $R_{DS(on)}$ and gate charge Q_g . A low on-state resistance reduces the conduction losses; it also lowers the energy stored in the output capacitance, minimizing the switching losses. A low gate charge results in higher efficiency at light loads as well as lower gate drive requirements. In addition, these MOSFETs are avalanche rated and exhibit a superior dv/dt performance. Also due to the positive temperature coefficient of their on-state resistance, they can be operated in parallel to meet higher current requirements.

Designed for such applications as Power Factor Correction (PFC) circuits, switched-mode and resonant-mode power supplies, DC-DC converters, AC and DC motor drives, and robotic and servo control, these MOSFETs enable higher efficiency, along with high power density and cooler system performance.

The new 650V Ultra Junction Power MOSFETs are available in the following international standard size packages: TO-252, TO-220 (standard or overmolded), TO-263, SOT-227, TO-247, PLUS247, ISOPLUS247, and TO-264. Some example part numbers include IXTY2N65X2, IXTA4N65X2, IXTP8N65X2, and IXTK102N65X2, with drain current ratings of 2A, 4A, 8A, and 102A, respectively.



FEATURES

- Low $R_{DS(on)}$ and Q_g
- Avalanche rated
- Low package inductance
- International standard packages

ADVANTAGES

- High power density
- Easy to mount
- Space savings

APPLICATIONS

- Power Factor Correction (PFC) circuits
- Switched-mode and resonant mode power supplies
- DC-DC converters
- AC and DC motor drives
- Robotic and servo control
- Solar inverters
- Lighting control

Available Parts

Part Number	V _{DSS} (V)	I _{D25} T _c = 25°C (A)	R _{DS(on)} max T _j =25°C (Ω)	C _{iss} typ (pF)	Q _{sl(on)} typ (nC)	t _{rr} typ (ns)	R _{thjc} max (°C/W)	P _D max (W)	Package Type
IXTY2N65X2	650	2	2.3	180	4.3	137	2.27	55	TO-252
IxTP2N65X2	650	2	2.3	180	4.3	137	2.27	55	TO-220
IxTP4N65X2	650	4	0.85	455	8.3	160	1.56	80	TO-220
IxTP8N65X2M	650	4	0.55	800	12	200	3.9	32	TO-220 (overmolded)
IXTY4N65X2	650	4	0.85	455	8.3	160	1.56	80	TO-252
IXTA4N65X2	650	4	0.85	455	8.3	160	1.56	80	TO-263
IXTY8N65X2	650	8	0.5	800	12	200	0.83	150	TO-252
IXTA8N65X2	650	8	0.5	800	12	200	0.83	150	TO-263
IxTP8N65X2	650	8	0.5	800	12	200	0.83	150	TO-263
IXTA12N65X2	650	12	0.3	1100	17	220	0.69	180	TO-263
IXTH12N65X2	650	12	0.3	1100	17	220	0.69	180	TO-247
IxTP12N65X2	650	12	0.3	1100	17	220	0.69	180	TO-220
IXTH34N65X2	650	34	0.105	3120	53	400	0.22	540	TO-247
IXTH48N65X2	650	48	0.068	4420	77	400	0.19	660	TO-247
IXTR102N65X2	650	54	0.033	10900	152	450	0.38	330	ISOPLUS247
IXTH62N65X2	650	62	0.052	5940	104	420	0.16	780	TO-247
IXTN102N65X2	650	76	0.03	10900	152	450	0.21	595	SOT-227
IXTH80N65X2	650	80	0.04	7753	144	400	0.14	890	TO-247
IXTX102N65X2	650	102	0.03	10900	152	450	0.12	1040	PLUS247
IXTK102N65X2	650	102	0.03	10900	152	450	0.12	1040	TO-264
IXTX120N65X2	650	120	0.024	13600	240	410	0.1	1250	PLUS247
IXTK120N65X2	650	120	0.024	13600	240	410	0.1	1250	TO-264

Application Circuits

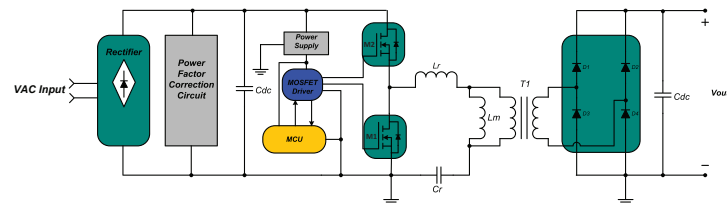


Figure 1: SMPS - Half-Bridge Resonant-Mode Converter

Figure 2 portrays 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. An X2-Class Power MOSFET, the IXTK102N65X2 (M1), is used as the main switching element to ensure an efficient and reliable power switching operation.

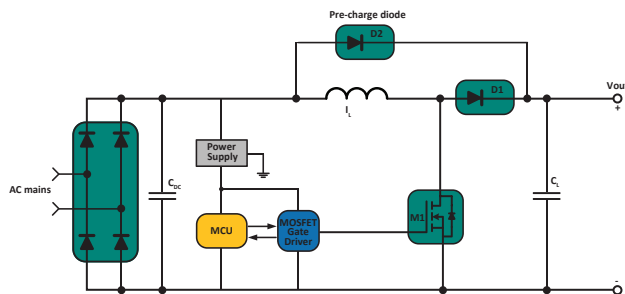


Figure 3: Power Factor Correction (PFC) circuit

Figure 1 illustrates a simplified SMPS circuit diagram that uses an LLC resonant converter as the primary power conversion element of the circuit. The indicated SMPS circuit consists of a primary rectifier, power factor correction circuit, control unit (power supply, MCU, and MOSFET Driver), LLC half-bridge resonant converter, isolation transformer, and secondary rectifier stage. Two Ultra Junction X2-Class Power MOSFETs (IXTN102N65X2) are paired to form the LLC half-bridge resonant converter stage to ensure a fast, space-saving, and energy-efficient power switching operation.

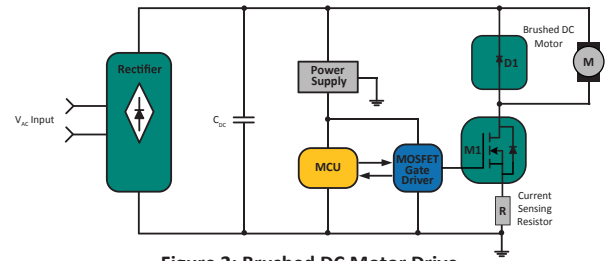


Figure 2: Brushed DC Motor Drive

Figure 3 depicts a Power Factor Correction (PFC) circuit— a boost converter topology. An AC power source is converted into a DC value via a bridge rectifier stage. This DC value is then processed by the PFC boost converter to keep the mains current and voltage in phase and provide a DC bus voltage which is higher than the rectified output. The IXTX102N65X2 (M1) is used as a switch to achieve high efficiency.