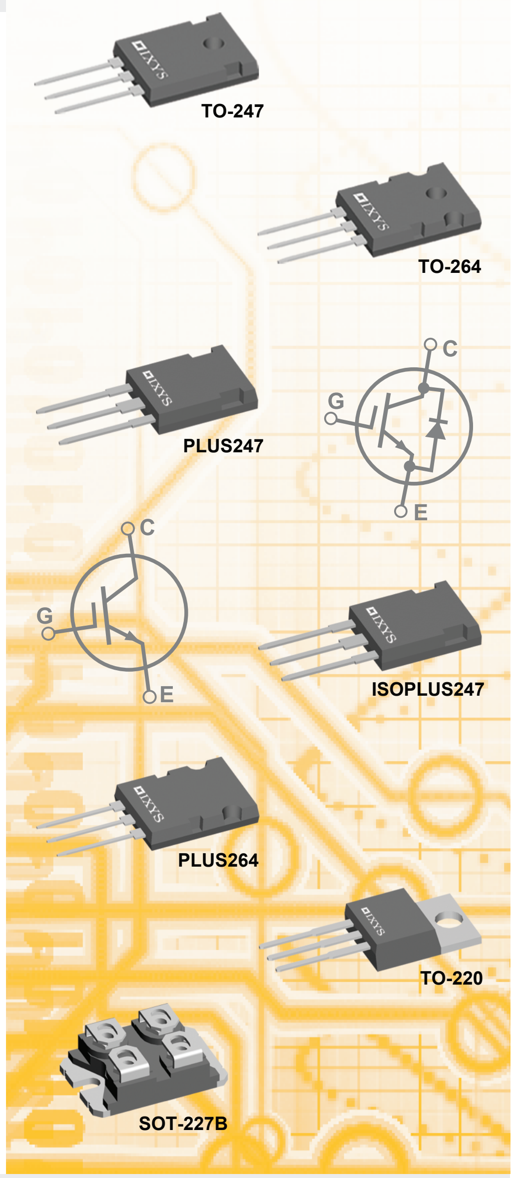
IXYSPOWER
Efficiency Through Technology

NEW PRODUCT BRIEF

1200V XPT™ IGBTs

Extreme-Light Punch-Through IGBTs for High-Speed Hard-Switching Applications

October 2012



OVERVIEW

IXYS Corporation expands its 1200V XPT™ IGBT product line. With current ratings of up to 220A, these new devices are designed to minimize switching losses in high-voltage, hard-switching applications. The high-speed switching capabilities (up to 50 kHz) of these IGBTs allow designers to use smaller and lighter components in their systems. For those IXYS customers who need to lower turn-off losses and/or remove snubbers/clamps from their designs, IGBTs with co-packed ultra-fast recovery diodes in Sonic-FRD™ or HiPerFRED™ Technology are available.

Manufactured through the state-of-the-art GenX3™ IGBT process and an extreme-light Punch-Through (XPT™) design platform, these devices feature high-current handling capabilities, high-speed switching abilities, low total energy losses, and low current fall times. They have a positive collector-to-emitter voltage temperature coefficient, making it possible for designers to use multiple devices in parallel to meet high current requirements. Their low gate charges also help reduce gate drive requirements and switching losses. In addition to being avalanche rated, these devices have square Reverse Bias Safe Operating Areas (RBSOA) up to the breakdown voltage of 1200V – a necessary ruggedness in snubberless hard-switching applications.

The new 1200V XPT™ devices with co-packed anti-parallel Sonic-FRD™ or HiPerFRED™ diodes are optimized to reduce turn-off losses and suppress ringing oscillations, thereby producing smooth switching waveforms and significantly lowering electromagnetic interference (EMI) in the process. Furthermore, due to the soft recovery characteristics of the diodes, the IGBTs can be switched on at very high rates of change in current (di/dt), even in low current and temperature conditions.

There are various high-voltage and high-speed applications that the new IGBTs are well-suited for. Among these are power inverters, uninterruptible power supplies, motor drives, switch-mode power supplies, power factor correction circuits, battery chargers, welding machines, and lamp ballasts.

These 1200V XPT™ IGBTs are available in the following industry standard packages: TO-220, TO-247, ISO TO-247™, TO-264, SOT-227B, SOT-227B, PLUS247, PLUS264™ and ISOPLUS247™.

FEATURES

- Optimized for high-speed switching (up to 50kHz)
- Square RBSOA
- Positive thermal coefficient of $V_{CE(sat)}$
- Anti-parallel ultra-fast diodes
- Avalanche rated
- International standard packages

ADVANTAGES

- Hard-switching capabilities
- High power densities
- Low gate drive requirements

APPLICATIONS

- Power inverters
- Uninterruptible Power Supplies (UPS)
- Motor drives
- Switch-mode power supplies
- Power Factor Correction (PFC) circuits
- Battery chargers
- Welding machines
- Lamp ballasts

1200V XPT™ IGBT Summary Table

Part Number	V_{CES} (V)	I_{C25} T_C=25°C (A)	I_{C110} T_C=110°C (A)	$V_{CE(sat)}$ max T_J=25°C (V)	t_{fi} typ T_J=125°C (ns)	E_{off} typ T_J=125°C (mJ)	R_{thJC} max IGBT (°C/W)	Configuration	Package Style
IXYJ20N120C3D1	1200	16	7	4	105(T_J =150 °C)	0.7(T_J =150 °C)	1.78	Copacked (FRED)	ISO TO-247
IXYH20N120C3D1	1200	36	17	4	105(T_J =150 °C)	0.7(T_J =150 °C)	0.54	Copacked (FRED)	TO-247
IXYH20N120C3	1200	40	20	4	105(T_J =150 °C)	0.7(T_J =150 °C)	0.54	Single	TO-247
IXYP20N120C3	1200	40	20	4	105(T_J =150 °C)	0.7(T_J =150 °C)	0.54	Single	TO-220
IXYH30N120C3	1200	66	30	4	88	0.9	0.3	Single	TO-247
IXYH30N120C3D1	1200	66	30	4	88	0.9	0.3	Copacked (FRED)	TO-247
IXYP30N120C3	1200	66	30	4	88	0.9	0.3	Single	TO-220
IXYR50N120C3D1	1200	56	32 (T_C=90°C)	4	60(T_J=150 °C)	1.4 (T_J=150 °C)	0.43	Copacked (FRED)	ISOPLUS247
IXYH40N120B3	1200	96	40	2.9	206	2.05	0.26	Single	TO-247
IXYH40N120B3D1	1200	86	40	2.9	206	2.05	0.26	Copacked (FRED)	TO-247
IXYH40N120C3	1200	70	40	4	38	0.7	0.26	Single	TO-247
IXYH40N120C3D1	1200	64	40	4	38	0.7	0.26	Copacked (FRED)	TO-247
IXYN82N120C3	1200	105	46	3.2	95	3.7	0.25	Single	SOT-227B
IXYN82N120C3H1	1200	105	46	3.2	95	3.7	0.25	Copacked (FRED)	SOT-227B
IXYH50N120C3	1200	100	50	3.5	60(T_J=150 °C)	1.4	0.2	Single	TO-247
IXYH50N120C3D1	1200	90	50	4	60(T_J=150 °C)	1.4 (T_J=150 °C)	0.2	Copacked (FRED)	TO-247
IXYR100N120C3	1200	104	58	3.5	125	3.55	0.32	Single	ISOPLUS247
IXYN100N120C3H1	1200	134	62	3.5	125	3.55	0.18	Copacked (FRED)	SOT-227B
IXYB82N120C3H1	1200	160	82	3.2	95	3.7	0.12	Copacked (FRED)	PLUS264
IXYH82N120C3	1200	160	82	3.2	95	3.7	0.12	Single	TO-247
IXYN100N120C3	1200	152	86	3.5	125	3.55	0.18	Single	SOT-227B
IXYK100N120C3	1200	188	100	3.5	125	3.55	0.13	Single	TO-264
IXYX100N120C3	1200	188	100	3.5	125	3.55	0.13	Single	PLUS247
IXYK120N120C3	1200	220	120	3.5	120(T_J=150 °C)	5.3 (T_J=150 °C)	0.1	Single	TO-264
IXYX120N120C3	1200	220	120	3.5	120(T_J=150 °C)	5.3 (T_J=150 °C)	0.1	Single	PLUS247

Application Circuits

Application Circuits Legend

IXYSPOWER Efficiency Through Technology | zilog Embedded in Life An IXYS Company | IXYS Integrated Circuits Division

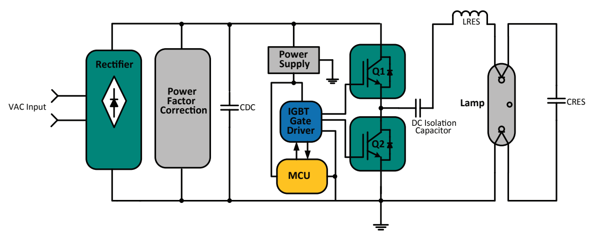


Figure 1: Electronic Lamp Ballast

Figure 1 illustrates a simplified electronic lamp ballast circuit. It consists of a primary rectifier, power factor correction circuit, control unit (Power supply, MCU, and IGBT Gate Driver), half-bridge inverter and resonant output stage. Two IXYH50N120C3D1 XPT™ IGBTs (Q1 & Q2) are paired to form the half-bridge power inverter stage used to facilitate the ignition and sustain the nominal running AC voltage across the resonant output stage of the lamp.

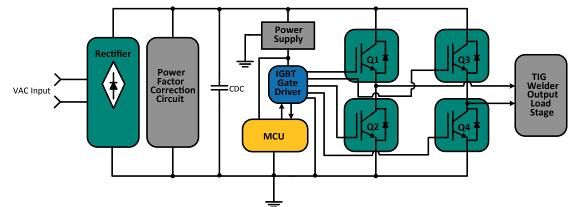


Figure 2: TIG Welding Inverter

Figure 2 shows a general circuit diagram of a high-current TIG welding inverter. This topology is comprised of a rectification stage, power factor correction (PFC) stage, control stage (Power supply, MCU, and IGBT Gate Driver), and power-inverter stage. An AC input (185VAC-265VAC) from the power grid is applied to the rectification stage to be converted into a DC value. This DC value then goes through the PFC circuit where its distorted current is reshaped into a waveform in phase with the input voltage. The DC output of the PFC circuit next enters the power-inverter stage, which is a full-bridge inverter and made up of four IXYB82N120C3H1 XPT™ IGBTs (Q1, Q2, Q3, Q4), to be converted back to an AC voltage that has a higher frequency (typically ranging from 30kHz to 50kHz). This AC voltage signal is applied to the output stage of the TIG welder.

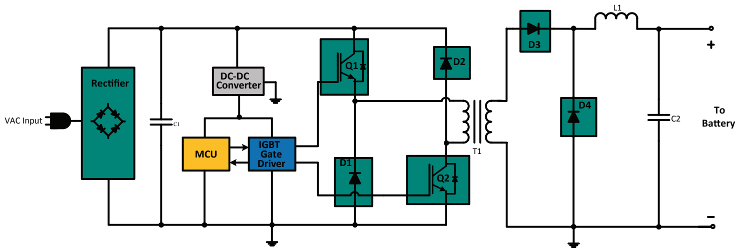


Figure 3: Battery Charger Circuit

Figure 3 illustrates a battery charger circuit that utilizes a half-bridge asymmetrical forward converter topology. Commonly implemented on the primary side of 220VAC offline switch-mode power supplies, it consists of a primary rectifier, a control unit (DC-DC converter, MCU, IGBT Gate Driver), and a half-bridge asymmetrical forward converter. Two XPT™ IGBT devices, IXYH40N120B3D1 (Q1 & Q2), form the forward converter stage of the circuit, providing a reliable and energy-efficient power conversion.