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# 600V GenX3™ IGBTs

NEXT GENERATION 600V IGBTs FOR POWER CONVERSION APPLICATIONS

JANUARY 2009

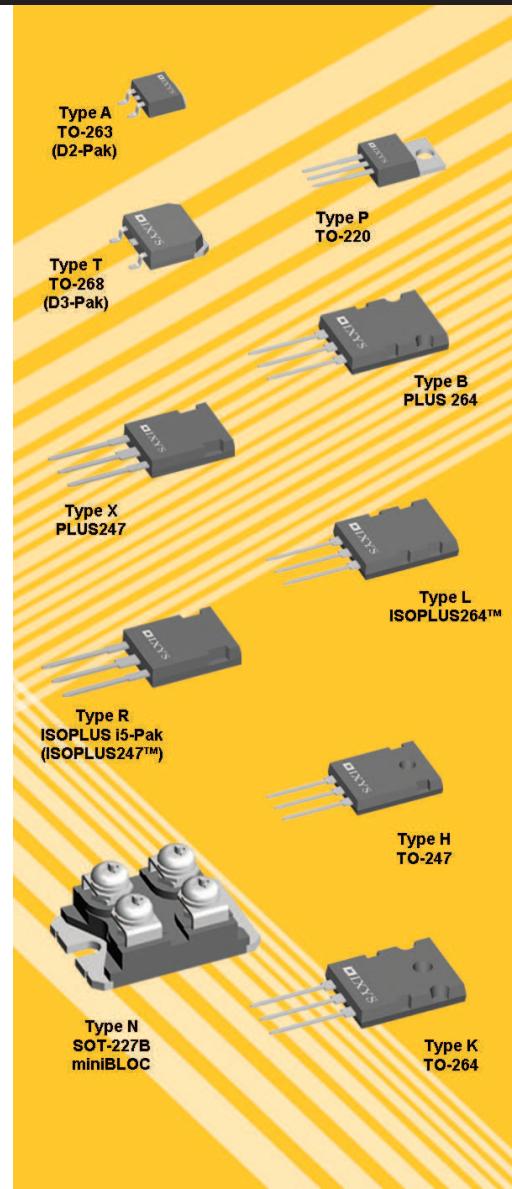
## OVERVIEW

IXYS extends its GenX3™ insulated gate bipolar transistor (IGBT) product line to 600 volts. These new IGBTs are manufactured using IXYS' state-of-the-art GenX3™ IGBT process and utilize IXYS' advanced Punch-Through (PT) technology, tailored to provide higher surge current capabilities, lower saturation voltages, and lower switching losses.

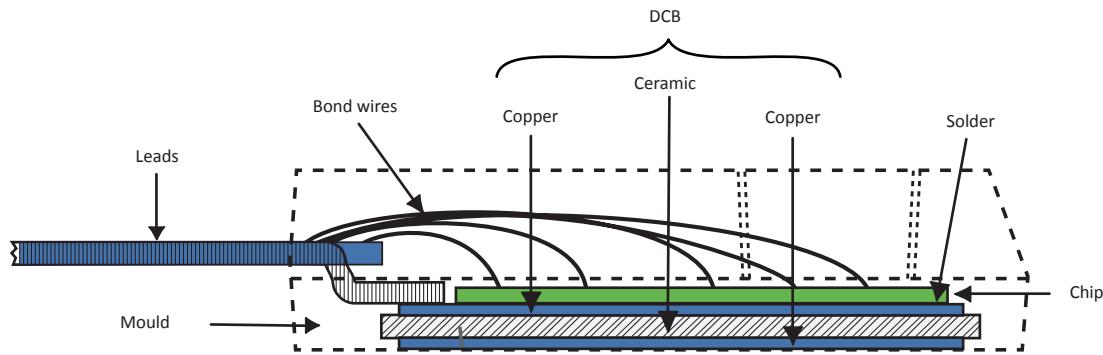
To accommodate optimum part selection, designers have a choice in selecting between three sub-classes denoted A3, B3, and C3. These classifications allow designers to "dial in" the best compromise between static (conduction) and dynamic (switching) losses, improving over-all system efficiency in a variety of power conversion applications by balancing critical requirements such as switching frequency, efficiency, and cost structure. The A3-Class are optimized for low saturation voltage  $V_{(sat)}$  and are well suited for applications requiring switching frequencies up to 5kHz. Similarly, the B3-Class offers low saturation voltages, but is optimized to accommodate applications that require "medium speed" switching operation from 5kHz to 40kHz. The C3-Class is optimized for "high speed" switching operation from 40kHz to 100kHz and resonant switching operation of up to 400kHz.

IXYS 600V GenX3™ IGBTs are offered in various standard packages, including the full gamut of surface mount and discrete packages with current ratings from 36 amperes to 210 amperes. Furthermore, some devices will be offered in PLUS and ISOPLUS isolated packages, featuring UL recognized 2500V isolation and superior thermal performance. Co-Packed variants of these new devices are available with IXYS' HiPerFRED™ ultra-fast recovery diodes providing exceptional fast recovery and soft switching characteristics.

These IGBTs are designed to achieve the optimal solution in applications such as power inverters, UPS, motor drives, SMPS, PFC, battery chargers, welding machines, lamp ballasts, inrush current protection circuits and DC choppers.



# ISOPLUS™ Packages with Internal Alumina DCB Isolation\*



- Provides 2500V, UL recognized isolation with superior thermal performance (E153432).
- Improves temperature and power cycling capability.
- Cost effective clip mounting.

\* IXYS Patented Packages, Patent No. 6,404,065

\* For information regarding IXYS ISOPLUS packages, visit <http://www.ixys.com/IXAN0022.pdf>

## 600V GenX3™ (A3) IGBTs Summary Table

A3-Class ■ Ultra low V(sat) IGBTs ■ Up to 5kHz

The switching and conduction losses for the A3-Class are optimized for sub-5kHz switching frequency applications.

Performance improvements for this classification include up to a 16% reduction in saturation voltage  $V_{ce(sat)}$  compared to prior generation product.

Part Number	$V_{ces}$ (V)	$I_c @ T_c = 110^\circ C$ (A)	$V_{ce} \text{ (sat) } T_c = 25^\circ C$ (V)	$t_{fi \text{ typ}}$ (ns)	$E_{off \text{ typ}}$ (mJ)	$R_{thJC}$ ( $^\circ C/W$ )	Package
IXGP36N60A3	600	36	1.4	325	3	0.56	TO-220
IXGH36N60A3	600	36	1.4	325	3	0.56	TO-247
IXGH36N60A3D4	600	36	1.4	325	3	0.56	TO-247
IXGA36N60A3	600	36	1.4	325	3	0.56	TO-263
IXGR64N60A3	600	47	1.35	222	3.28	0.62	ISOPLUS247
IXGP48N60A3	600	48	1.35	224	2.9	0.42	TO-220
IXGH48N60A3	600	48	1.35	224	2.9	0.42	TO-247
IXGH48N60A3D1	600	48	1.35	224	2.9	0.42	TO-247
IXGA48N60A3	600	48	1.35	224	2.9	0.42	TO-263
IXGR72N60A3	600	52	1.35	250	3.5	0.62	ISOPLUS247
IXGR72N60A3U1	600	52	1.35	250	3.5	0.62	ISOPLUS247
IXGH64N60A3	600	64	1.35	222	3.28	0.27	TO-247
IXGT64N60A3	600	64	1.35	222	3.28	0.27	TO-268
IXGH72N60A3	600	72	1.35	250	3.5	0.23	TO-247
IXGH72N60A3	600	72	1.35	250	3.5	0.23	TO-247
IXGT72N60A3	600	72	1.35	250	3.5	0.23	TO-268
IXGX120N60A3	600	120	1.35	260	6.6	0.16	PLUS247
IXGN120N60A3	600	120	1.35	260	6.6	0.21	SOT-227B
IXGN120N60A3D1	600	120	1.35	260	6.6	0.21	SOT-227B
IXGK120N60A3	600	120	1.35	260	6.6	0.16	TO-264
IXGN320N60A3	600	170	1.25	740	na	0.17	SOT-227B
IXGN400N60A3	600	190	1.25	270	na	0.15	SOT-227
IXGX320N60A3	600	210	1.25	740	na	0.125	PLUS247
IXGK320N60A3	600	210	1.25	740	na	0.125	TO-264

# 600V GenX3™ (B3) IGBTs Summary Table

B3-Class ■ Medium Speed IGBTs ■ Up to 40kHz

The switching and conduction losses for the B3-Class are optimized for up to 40kHz. Performance improvements were incorporated to yield up to 22% lower turn-off energy per pulse (Eoff) and 10% lower thermal resistance to improve power handling.

Part Number	Vces (V)	Ic @ Tc = 110°C (A)	Vce (sat) TJ = 25°C (V)	tfi typ (ns)	Eoff typ (mJ)	RthJC (°C/W)	Package
IXGR48N60B3	600	27	2.1	116	0.66	0.83	ISOPLUS247
IXGR48N60B3D1	600	27	2.1	116	0.66	0.83	ISOPLUS247
IXGH36N60B3D1	600	36	1.8	100	0.8	0.5	TO-247
IXGH36N60B3D4	600	36	1.8	100	0.8	0.5	TO-247
IXGP48N60B3	600	48	1.8	116	0.66	0.42	TO-220
IXGH48N60B3D1	600	48	1.8	116	0.66	0.42	TO-247
IXGH48N60B3	600	48	1.8	116	0.66	0.42	TO-247
IXGA48N60B3	600	48	1.8	116	0.66	0.42	TO-263
IXGH56N60B3D1	600	56	1.8	95	1.05	0.375	TO-247
IXGX64N60B3D1	600	64	1.8	88	1	0.27	PLUS247
IXGH64N60B3	600	64	1.8	88	1	0.27	TO-247
IXGK64N60B3D1	600	64	1.8	88	1	0.27	TO-264
IXGT64N60B3	600	64	1.8	88	1	0.27	TO-268
IXGX72N60B3H1	600	72	1.8	92	1	0.23	PLUS247
IXGH72N60B3	600	72	1.8	92	1	0.23	TO-247
IXGK72N60B3H1	600	72	1.8	92	1	0.23	TO-264
IXGT72N60B3	600	72	1.8	92	1	0.23	TO-268
IXGL200N60B3	600	90	1.5	183	2.9	0.31	ISOPLUS264
IXGH90N60B3	600	90	1.8	148	1.37	0.19	TO-247
IXGX120N60B3	600	120	1.8	145	3.5	0.16	PLUS247
IXGK120N60B3	600	120	1.8	145	3.5	0.16	TO-264 AA
IXGB200N60B3	600	200	1.5	183	2.9	0.1	PLUS264
IXGN200N60B3	600	200	1.5	183	2.9	0.15	SOT-227B

# 600V GenX3™ (C3) IGBTs Summary Table

C3-Class ■ High Speed IGBTs ■ Up to 100kHz

The switching and conduction losses for the C3-Class are optimized for switching frequencies up to 100khz. The C3-Class performance improvements include up to a 12% decrease in thermal resistance for improved power handling and also include up to 22% lower turn-off energy per pulse (Eoff) for significantly lower switching losses versus prior generation of high speed IGBTs.

Part Number	Vces (V)	Ic @ Tc = 110°C (A)	Vce (sat) TJ = 25°C (V)	tfi typ (ns)	Eoff typ (mJ)	RthJC (°C/W)	Package
IXGR48N60C3D1	600	26	2.7	38	0.23	1	ISOPLUS 247
IXGP30N60C3	600	30	3	47	0.09	0.56	TO-220
IXGH30N60C3D1	600	30	3	47	0.09	0.56	TO-247
IXGA30N60C3	600	30	3	47	0.09	0.56	TO-263
IXGR72N60C3D1	600	35	2.7	55	0.48	0.62	ISOPLUS 247
IXGP48N60C3	600	48	2.5	38	0.23	0.42	TO-220
IXGH48N60C3	600	48	2.5	38	0.23	0.42	TO-247
IXGH48N60C3D1	600	48	2.5	38	0.23	0.42	TO-247
IXGA48N60C3	600	48	2.5	38	0.23	0.42	TO-263
IXGH60N60C3	600	60	2.5	55	0.42	0.33	TO-247
IXGH60N60C3D1	600	60	2.5	55	0.42	0.33	TO-247
IXGX72N60C3H1	600	72	2.5	55	0.48	0.23	PLUS247
IXGH72N60C3	600	72	2.5	55	0.48	0.23	TO-247

## APPLICATIONS

- Power inverters
- Uninterruptible power supplies
- Motor drives
- Switch mode power supplies
- Power factor correction circuits
- Welding machines
- Lamp ballasts

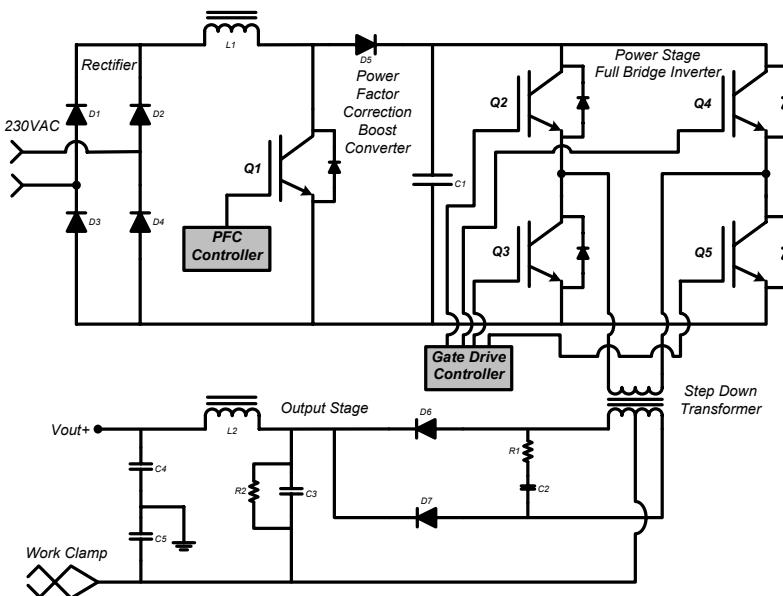
## FEATURES

- Optimized for low switching & conduction losses
- Square RBSOA
- High current handling capability
- International standard packages

## BENEFITS

- High power density
- Low gate drive requirement

## Multi-Process High Frequency Inverter Welder



The figure on the left illustrates a general circuit topology of an inverter welding power source. This circuit topology is composed of four stages: A) Rectifier stage, B) PFC & Boost stage, C) Power stage, and D) Output stage. Input power from a power grid enters the rectification stage to be rectified to a DC value and is processed via a power factor correction boost converter. From there it enters the power stage which employs a full bridge inverter to convert the voltage back to AC at high frequencies typically from 50Khz to 100Khz. The AC signal is then stepped down via T1 transformer which then gets rectified and smoothed out at the output stage.

## AC Motor Drive (Resonant DC Link Inverter)

The figure on the right illustrates an AC motor drive that utilizes a resonant DC link inverter. A resonant link ( $L_1$ ,  $C_2$ ) is affixed to the DC bus line of a pulse width modulation inverter. The resonant link is then 'excited' and maintains resonance through the control of the IGBTs in a way that the resonating dc voltage bus frequently reaches zero volts. The IGBTs are turned on and off at zero voltage and are synchronized to match the zero voltage crossings to achieve the desired low switching loss. An active clamp circuit ( $Q_7$ ,  $C_1$ ) is added to clamp down unwanted overshoot when the DC inverter current decreases abruptly caused by the switching behavior of the IGBTs.

