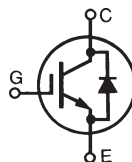


# XPT™ 650V IGBT GenX4™ w/ Sonic Diode

## IXXH80N65B4H1

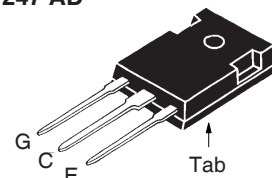
$$\begin{aligned} V_{CES} &= 650V \\ I_{C110} &= 80A \\ V_{CE(sat)} &\leq 2.0V \\ t_{fi(typ)} &= 63ns \end{aligned}$$



Extreme Light Punch Through  
IGBT for 5-30 kHz Switching

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$	650	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GE} = 1M\Omega$	650	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	160	A
$I_{C110}$	$T_C = 110^\circ\text{C}$	80	A
$I_{F110}$	$T_C = 110^\circ\text{C}$	62	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1ms	430	A
<b>SSOA</b>	$V_{GE} = 15V$ , $T_{VJ} = 150^\circ\text{C}$ , $R_G = 3\Omega$	$I_{CM} = 160$	A
<b>(RBSOA)</b>	Clamped Inductive Load	@ $V_{CE} \leq V_{CES}$	
$t_{sc}$	$V_{GE} = 15V$ , $V_{CE} = 360V$ , $T_J = 150^\circ\text{C}$	10	$\mu\text{s}$
<b>(SCSOA)</b>	$R_G = 82\Omega$ , Non Repetitive		
$P_C$	$T_C = 25^\circ\text{C}$	625	W
$T_J$		-55 ... +175	$^\circ\text{C}$
$T_{JM}$		175	$^\circ\text{C}$
$T_{stg}$		-55 ... +175	$^\circ\text{C}$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ\text{C}$
$T_{SOLD}$	1.6 mm (0.062in.) from Case for 10s	260	$^\circ\text{C}$
$M_d$	Mounting Torque	1.13/10	Nm/lb.in.
<b>Weight</b>		6	g

### TO-247 AD



G = Gate      C = Collector  
E = Emitter    Tab = Collector

### Features

- Optimized for 5-30kHz Switching
- Square RBSOA
- Anti-Parallel Sonic Diode
- Short Circuit Capability
- International Standard Package

### Advantages

- High Power Density
- Extremely Rugged
- Low Gate Drive Requirement

### Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 250\mu\text{A}$ , $V_{GE} = 0V$	650		V
$V_{GE(th)}$	$I_C = 250\mu\text{A}$ , $V_{CE} = V_{GE}$	4.0		6.5 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ $T_J = 150^\circ\text{C}$			50 $\mu\text{A}$ 4 mA
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 80A$ , $V_{GE} = 15V$ , Note 1 $T_J = 150^\circ\text{C}$	1.65 2.00		V V

Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 60\text{A}, V_{CE} = 10\text{V}$ , Note 1	19	31	S
$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		2686	pF
$C_{oes}$			296	pF
$C_{res}$			98	pF
$Q_{g(on)}$	$I_C = 80\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		120	nC
$Q_{ge}$			22	nC
$Q_{gc}$			57	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 80\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 3\Omega$ Note 2		38	ns
$t_{ri}$			90	ns
$E_{on}$			3.77	mJ
$t_{d(off)}$			120	ns
$t_{fi}$			63	ns
$E_{off}$			1.20	1.80 mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 150^\circ\text{C}</math></b> $I_C = 80\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 3\Omega$ Note 2		30	ns
$t_{ri}$			127	ns
$E_{on}$			4.80	mJ
$t_{d(off)}$			86	ns
$t_{fi}$			65	ns
$E_{off}$			1.65	mJ
$R_{thJC}$			0.24	$^\circ\text{C}/\text{W}$
$R_{thCS}$		0.21		$^\circ\text{C}/\text{W}$

TO-247 (IXXH) Outline



Terminals: 1 - Gate 2 - Collector  
3 - Emitted

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.7	5.3	.185	.209
A <sub>1</sub>	2.2	2.54	.087	.102
A <sub>2</sub>	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b <sub>1</sub>	1.65	2.13	.065	.084
b <sub>2</sub>	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L1		4.50		.177
∅P	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216
S	6.15	BSC	242	BSC

### Reverse Sonic Diode (FRD)

Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 50\text{A}, V_{GE} = 0\text{V}$ , Note 1		1.8	2.0 V
$I_{RM}$	$I_F = 50\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 900\text{A}/\mu\text{s}$ $V_R = 300\text{V}$	$T_J = 150^\circ\text{C}$	45	A
$t_{rr}$		$T_J = 150^\circ\text{C}$	150	ns
$R_{thJC}$				0.45 $^\circ\text{C}/\text{W}$

Notes:

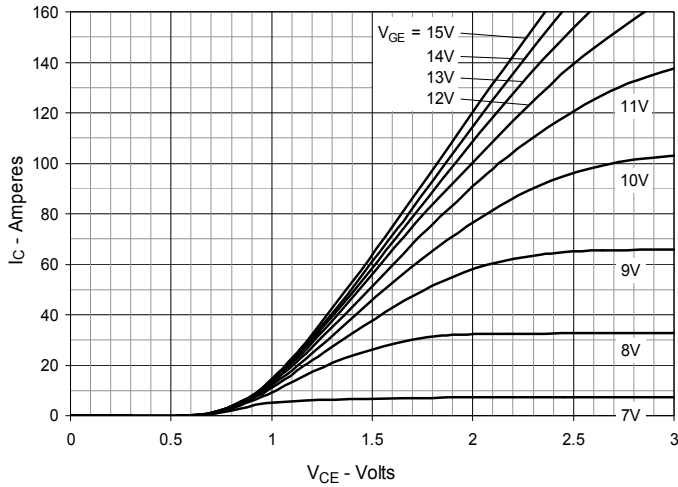
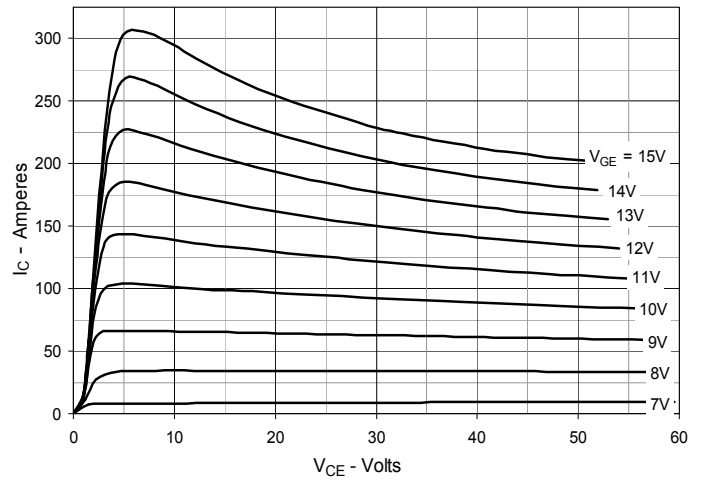
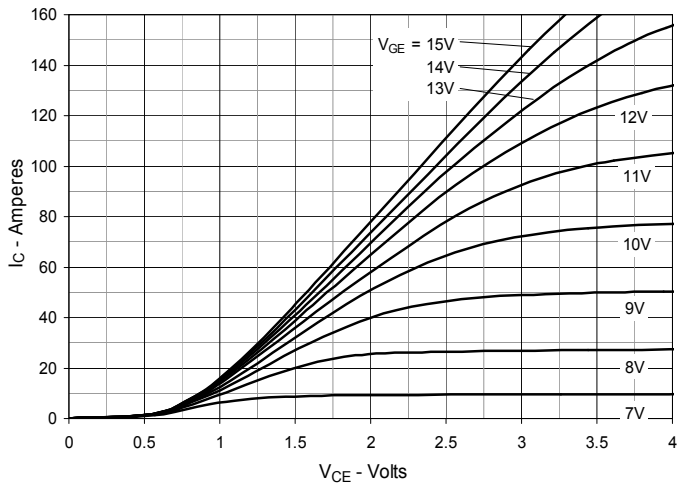
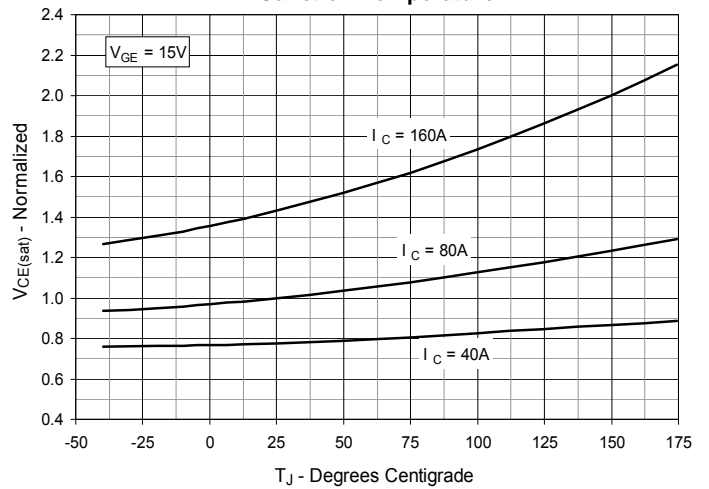
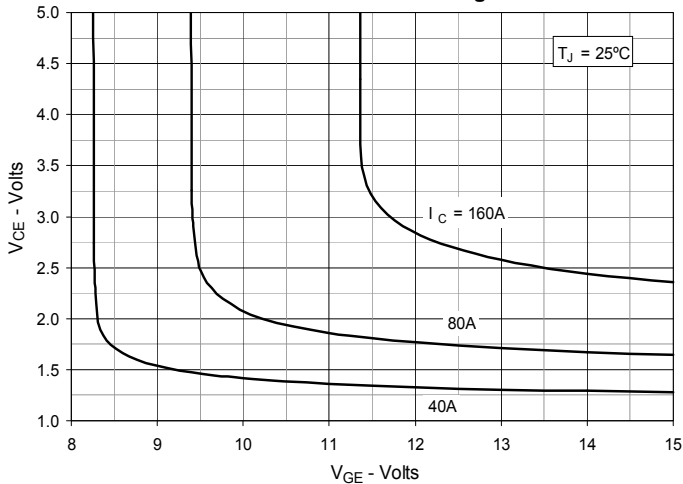
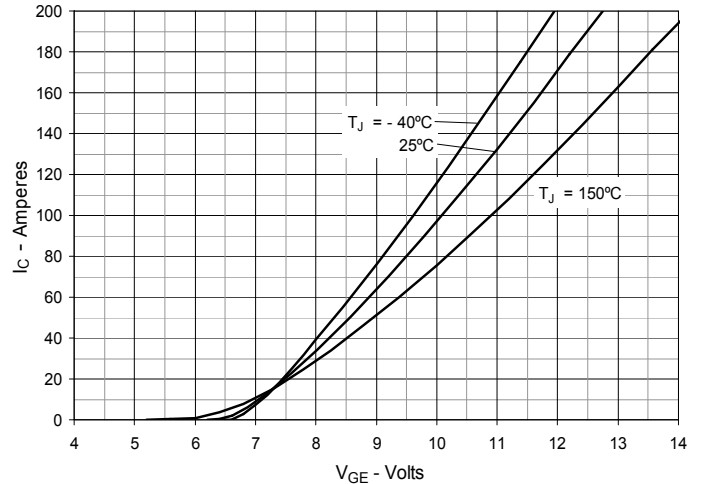
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Switching times & energy losses may increase for higher  $V_{CE}$  (clamp),  $T_J$  or  $R_G$ .

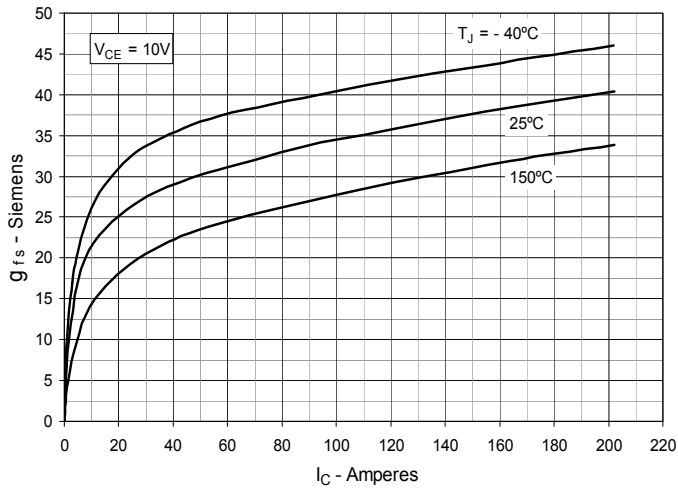
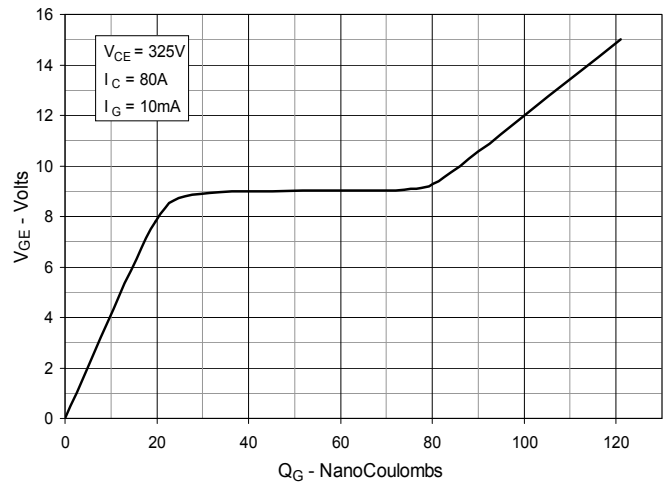
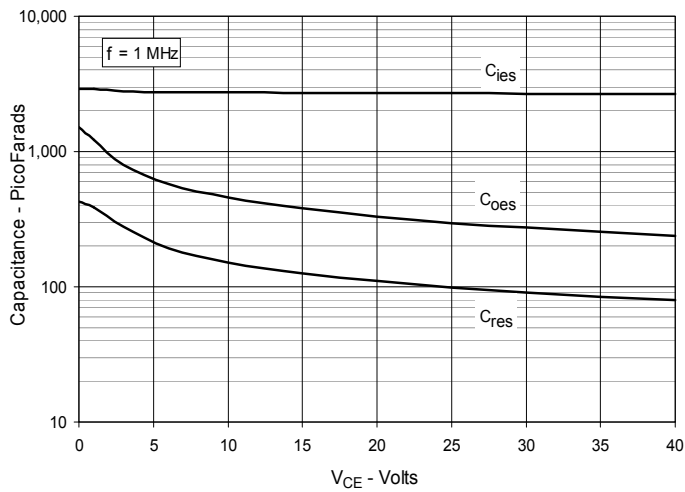
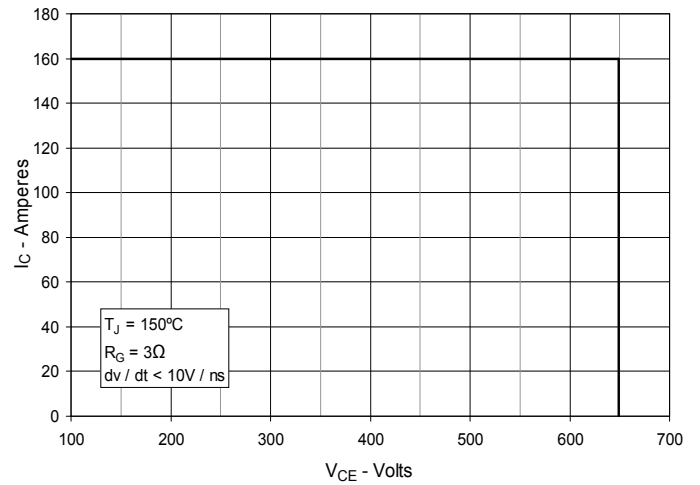
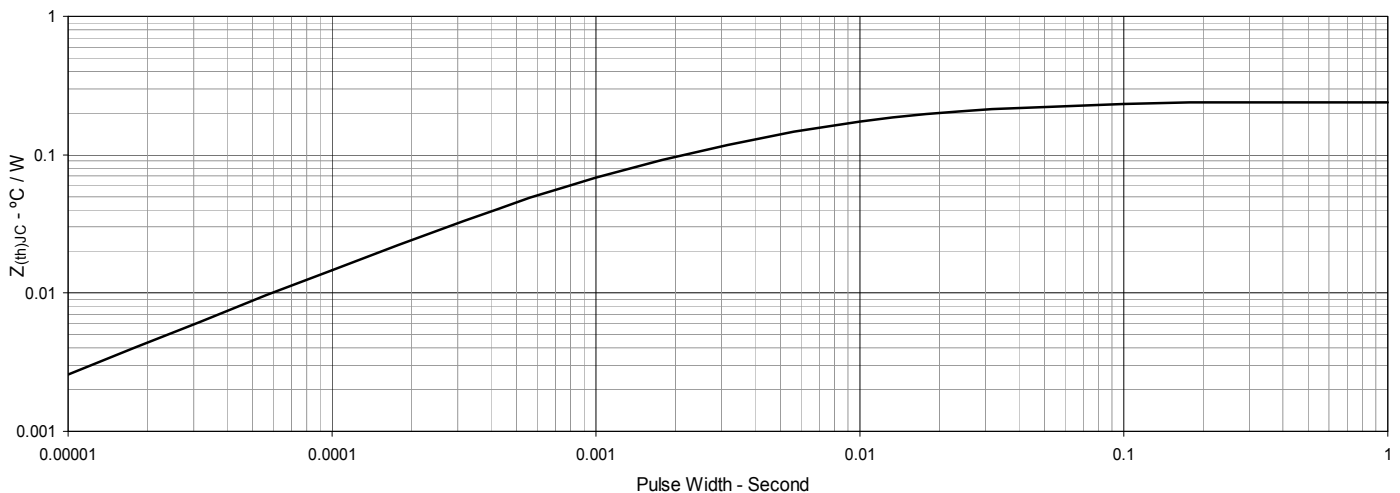
### ADVANCE TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

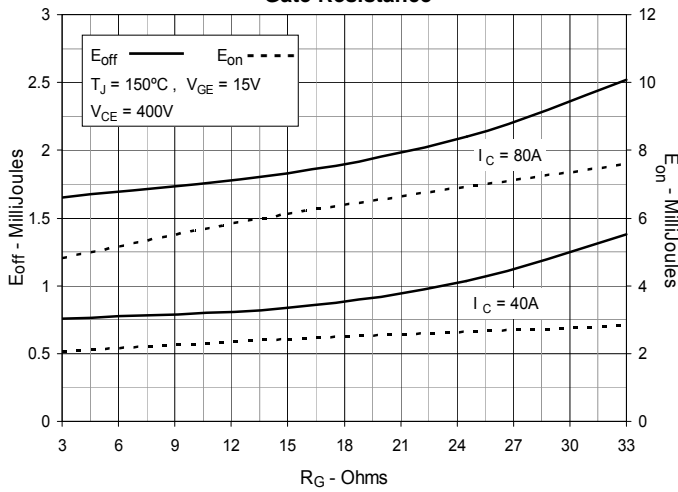
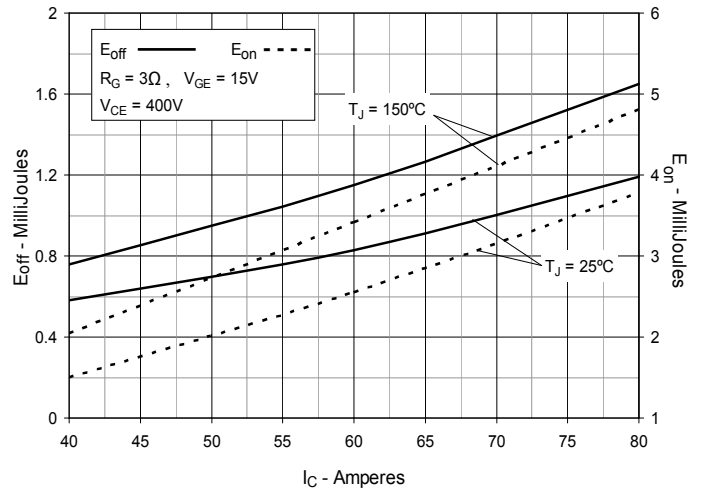
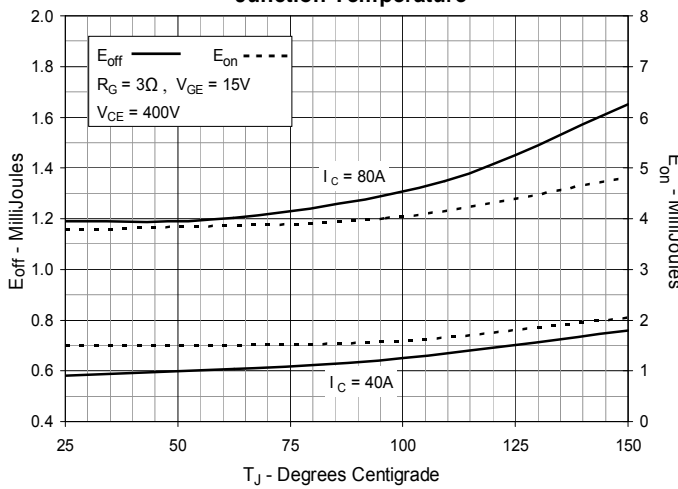
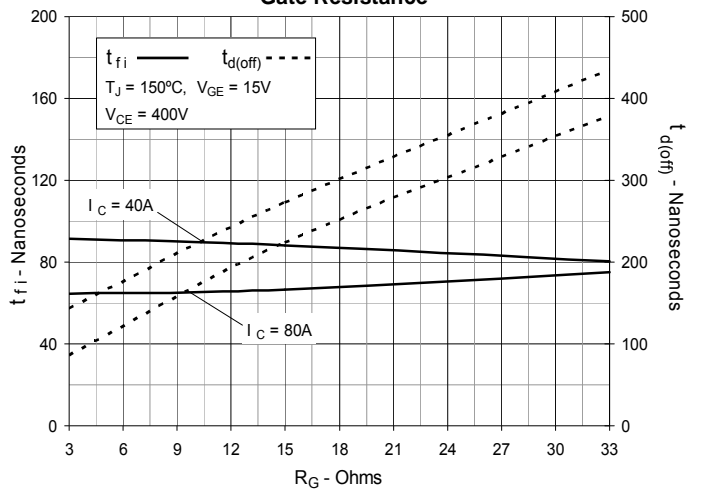
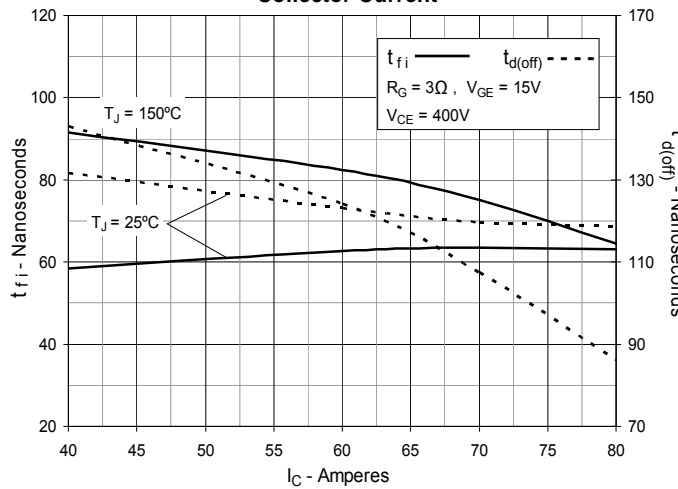
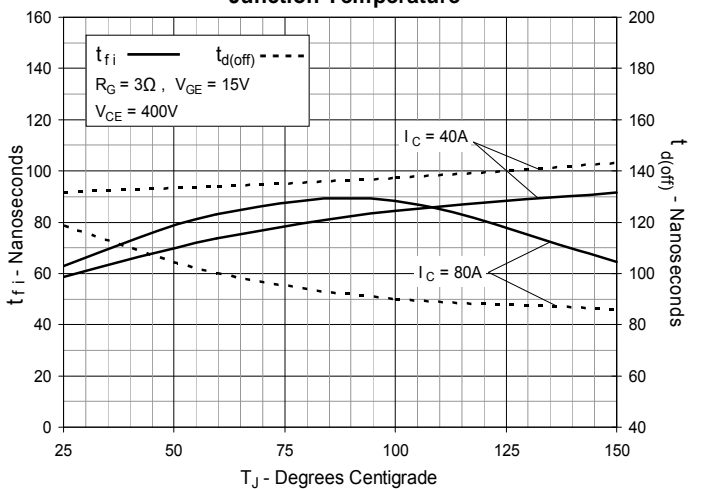
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

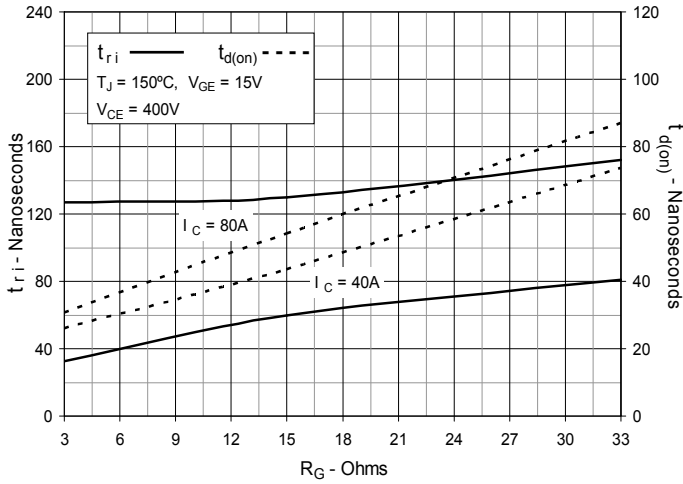
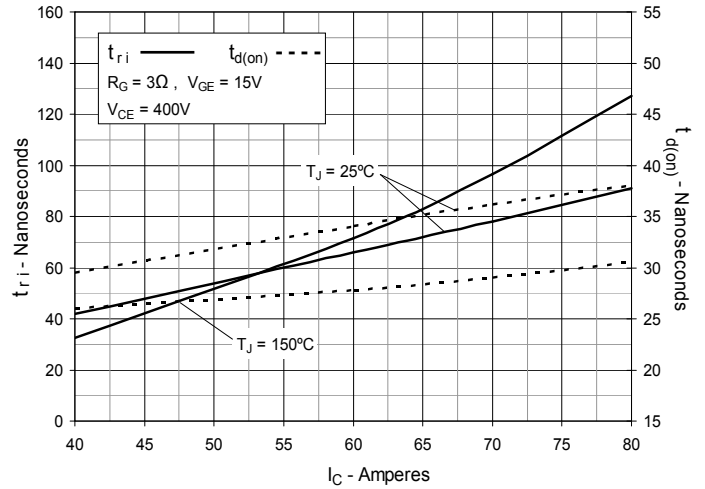
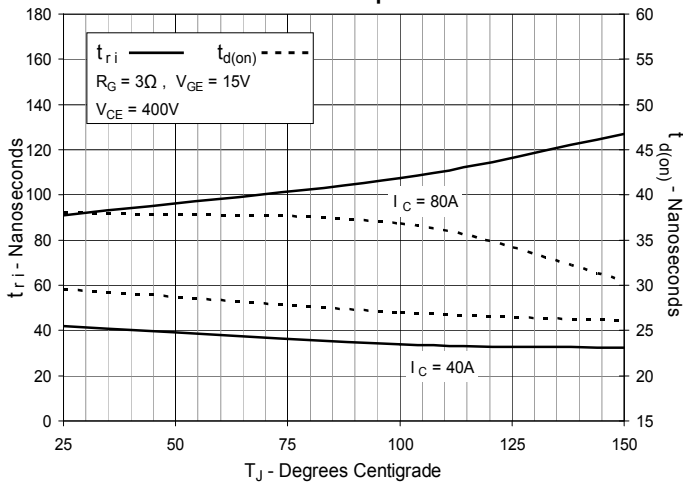
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585	7,005,734 B2	7,157,338B2
	4,860,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	6,759,692	7,063,975 B2	
	4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	6,771,478 B2	7,071,537	

**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$** 

**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**

**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

**Fig. 6. Input Admittance**


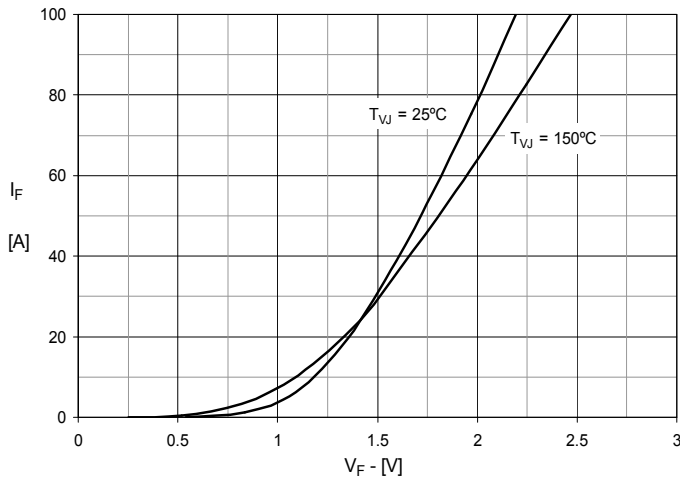
**Fig. 7. Transconductance**

**Fig. 8. Gate Charge**

**Fig. 9. Capacitance**

**Fig. 10. Reverse-Bias Safe Operating Area**

**Fig. 11. Maximum Transient Thermal Impedance**


IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

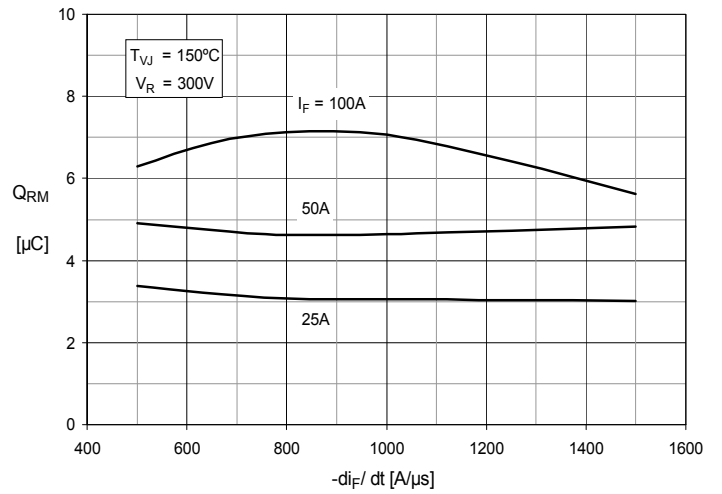
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**

**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**

**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**

**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**

**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**

**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**


**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**

**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**

**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**


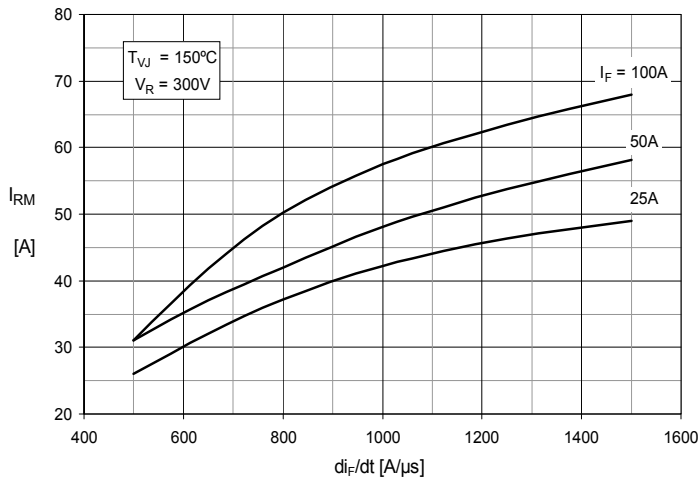
**Fig. 21. Typ. Forward characteristics**



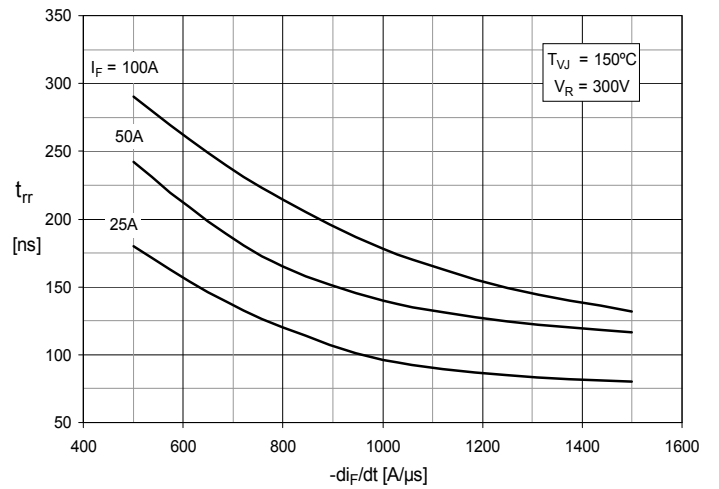
**Fig. 22. Typ. Reverse Recovery Charge  $Q_{rr}$  vs.  $-di_F/dt$**



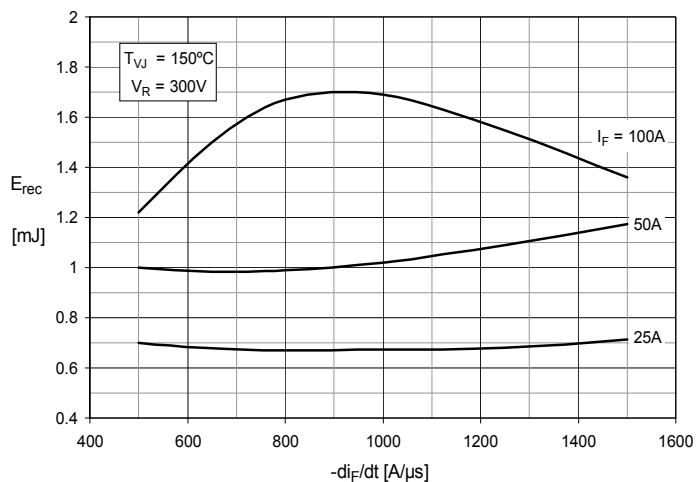
**Fig. 23. Typ. Peak Reverse Current  $I_{RM}$  vs.  $-di_F/dt$**



**Fig. 24. Typ. Recovery Time  $t_{rr}$  vs.  $-di_F/dt$**



**Fig. 25. Typ. Recovery Energy  $E_{rec}$  vs.  $-di_F/dt$**



**Fig. 26. Maximum Transient Thermal Impedance**

