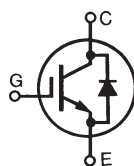


# XPT™ 650V IGBT GenX4™ w/ Sonic Diode

## IXXH80N65B4H1

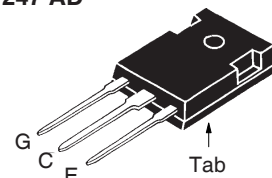
$V_{CES} = 650V$   
 $I_{C110} = 80A$   
 $V_{CE(sat)} \leq 2.1V$   
 $t_{fi(typ)} = 52ns$



Extreme Light Punch Through  
IGBT for 5-30 kHz Switching

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ C$ to $175^\circ C$	650	V
$V_{CGR}$	$T_J = 25^\circ C$ to $175^\circ C$ , $R_{GE} = 1M\Omega$	650	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$ (Chip Capability)	160	A
$I_{C110}$	$T_C = 110^\circ C$	80	A
$I_{F110}$	$T_C = 110^\circ C$	62	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	430	A
<b>SSOA</b>	$V_{GE} = 15V$ , $T_{VJ} = 150^\circ C$ , $R_G = 3\Omega$	$I_{CM} = 160$	A
<b>(RBSOA)</b>	Clamped Inductive Load	@ $V_{CE} \leq V_{CES}$	
$t_{sc}$	$V_{GE} = 15V$ , $V_{CE} = 360V$ , $T_J = 150^\circ C$	10	$\mu s$
<b>(SCSOA)</b>	$R_G = 82\Omega$ , Non Repetitive		
$P_C$	$T_C = 25^\circ C$	625	W
$T_J$		-55 ... +175	$^\circ C$
$T_{JM}$		175	$^\circ C$
$T_{stg}$		-55 ... +175	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ C$
$T_{SOLD}$	1.6 mm (0.062in.) from Case for 10s	260	$^\circ C$
$M_d$	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 ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 250\mu A$ , $V_{GE} = 0V$	650		V
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	4.0		6.5 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ $T_J = 150^\circ C$			50 $\mu A$ 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 $T_J = 150^\circ C$	1.65 2.00		2.10 V V

Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 60\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$	25	42	S
$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		3860	pF
$C_{oes}$			395	pF
$C_{res}$			58	pF
$Q_{g(on)}$	$I_C = 80\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		120	nC
$Q_{ge}$			32	nC
$Q_{gc}$			46	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		26	ns
$t_{ri}$			103	ns
$E_{on}$			4.0	mJ
$t_{d(off)}$			122	ns
$t_{fi}$			52	ns
$E_{off}$			2.1	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		23	ns
$t_{ri}$			100	ns
$E_{on}$			5.2	mJ
$t_{d(off)}$			145	ns
$t_{fi}$			102	ns
$E_{off}$			3.1	mJ
$R_{thJC}$			0.24	$^\circ\text{C}/\text{W}$
$R_{thCS}$		0.21		$^\circ\text{C}/\text{W}$

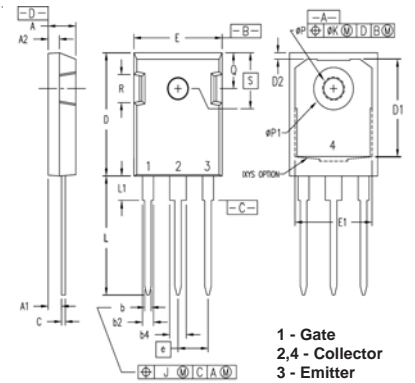
### Reverse Sonic Diode (FRD)

Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 50\text{A}, V_{GE} = 0\text{V}, \text{Note 1}$	$T_J = 150^\circ\text{C}$	1.8	2.5 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  $R_G$ .

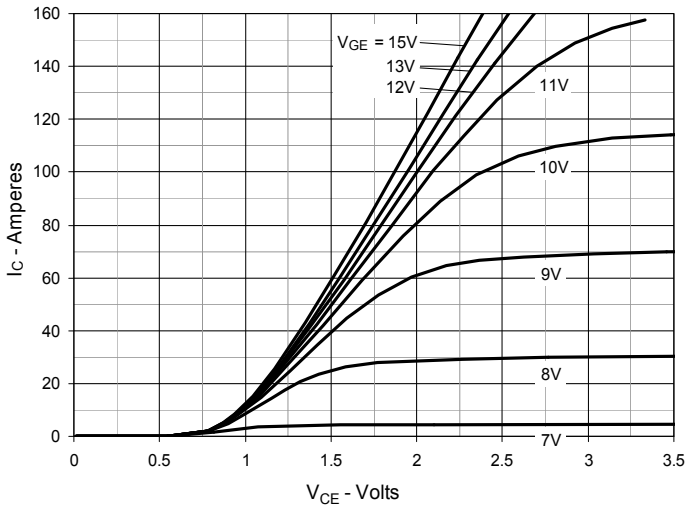
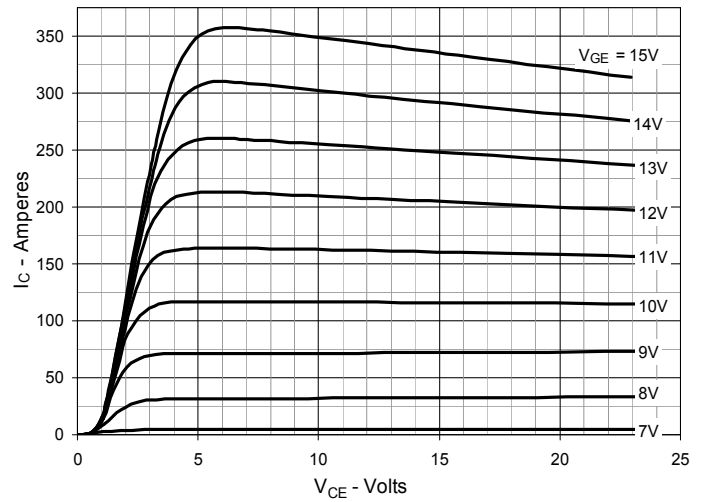
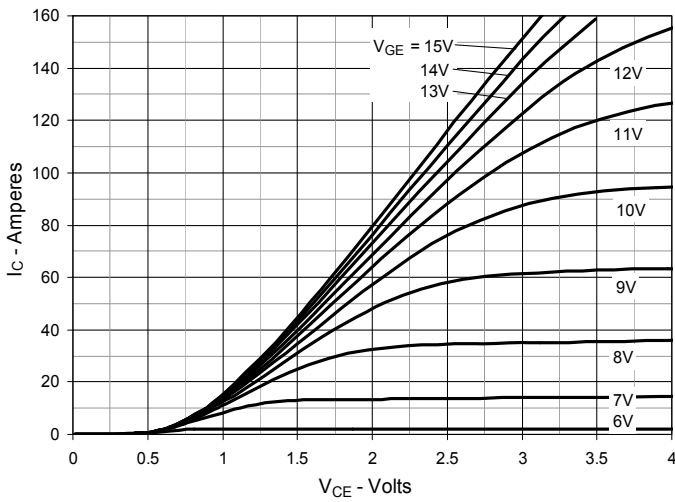
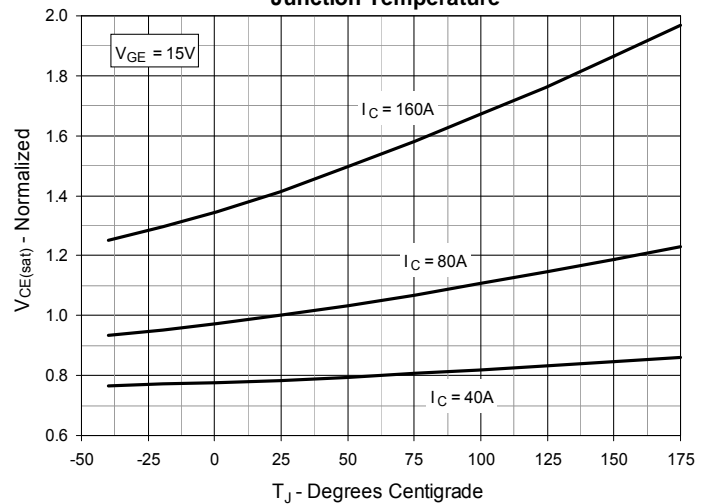
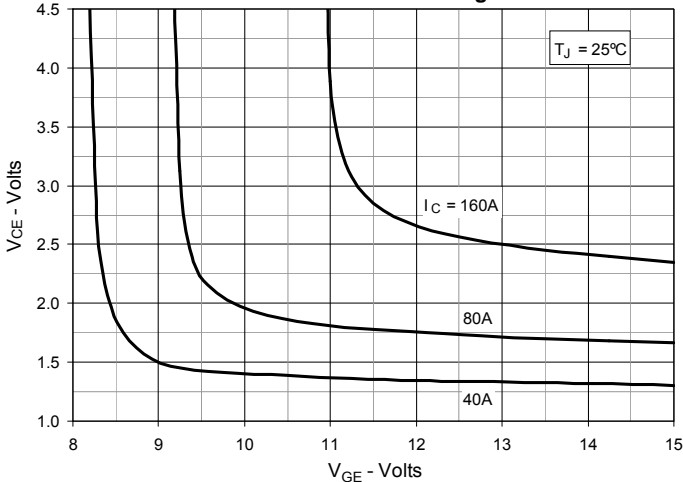
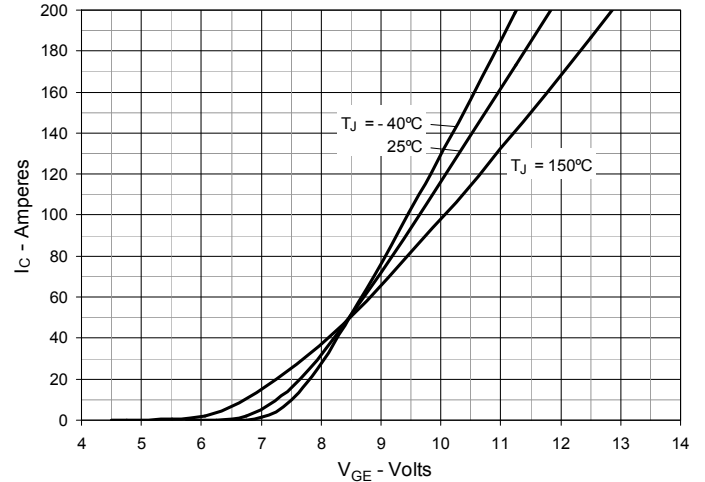
### TO-247 (IXXH) Outline

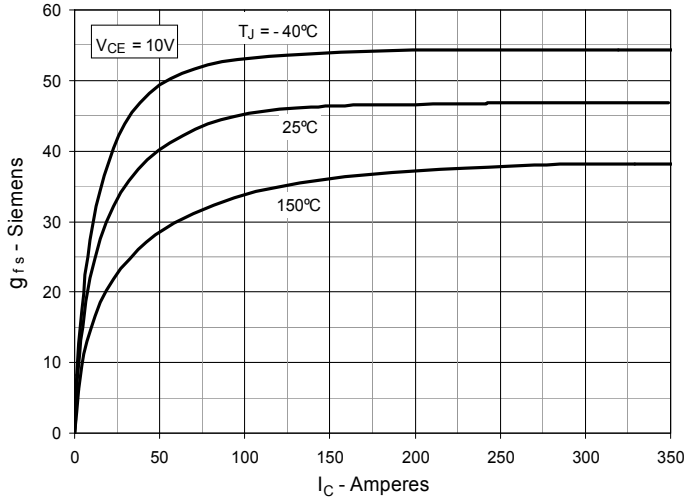
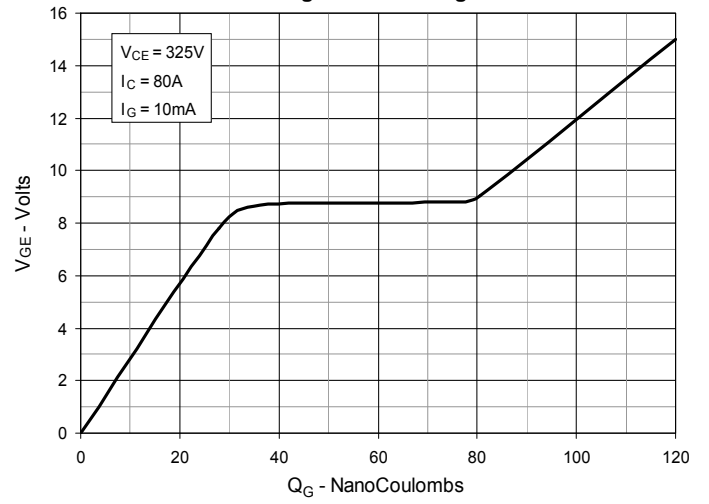
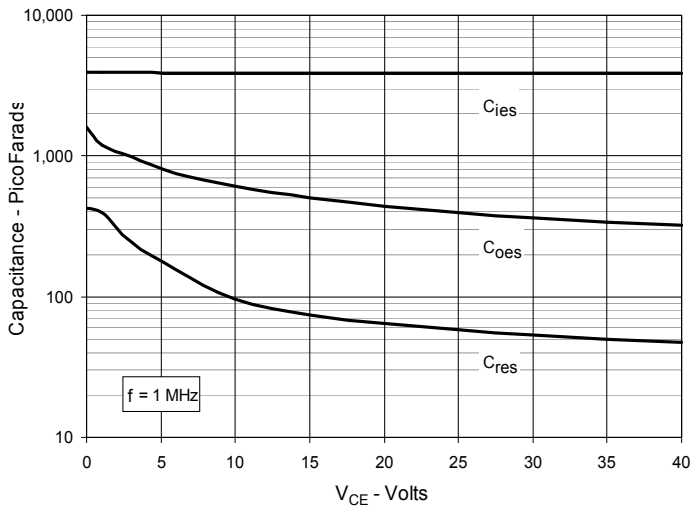
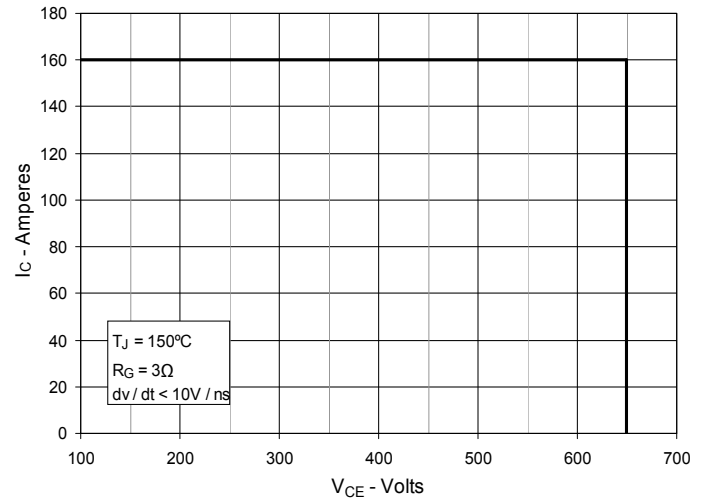
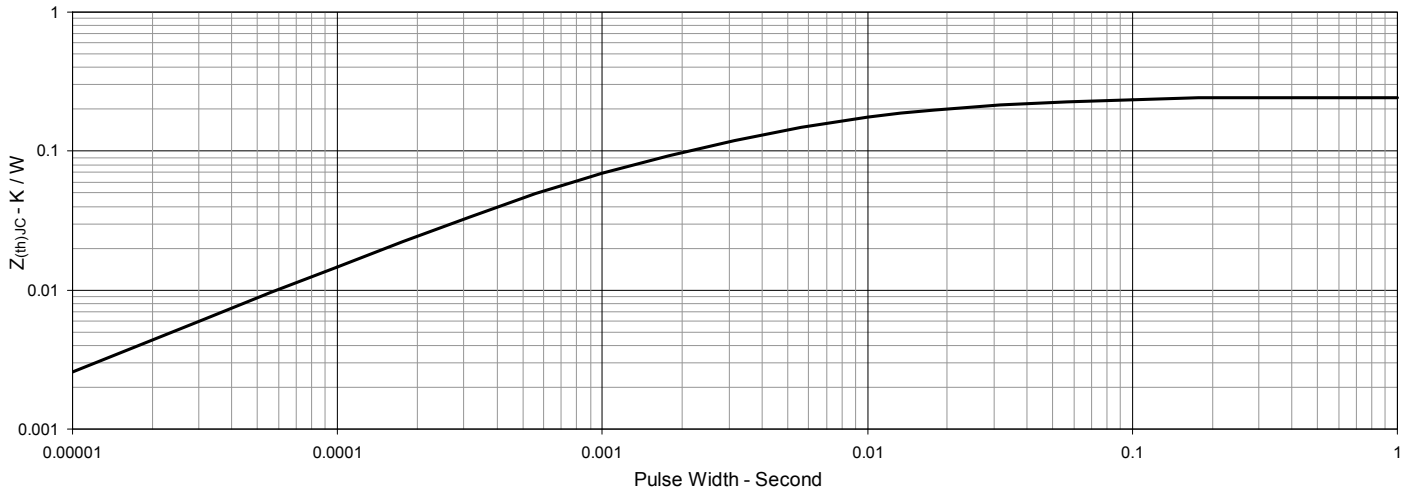


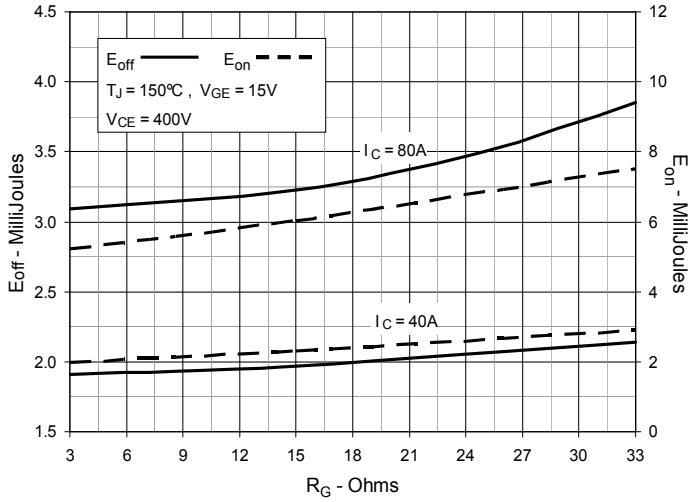
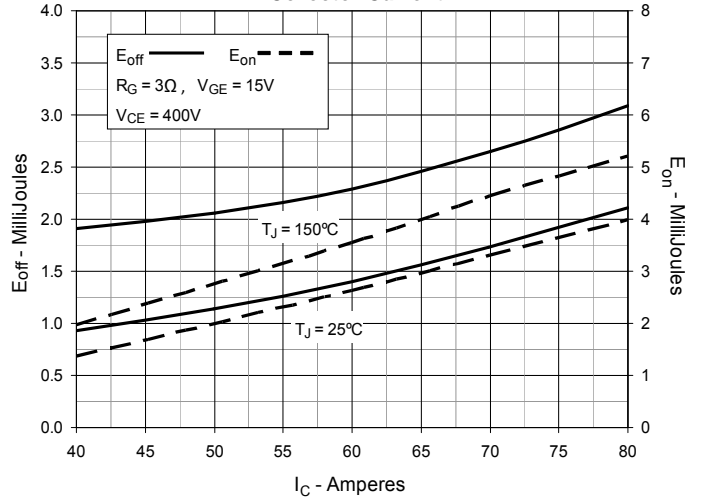
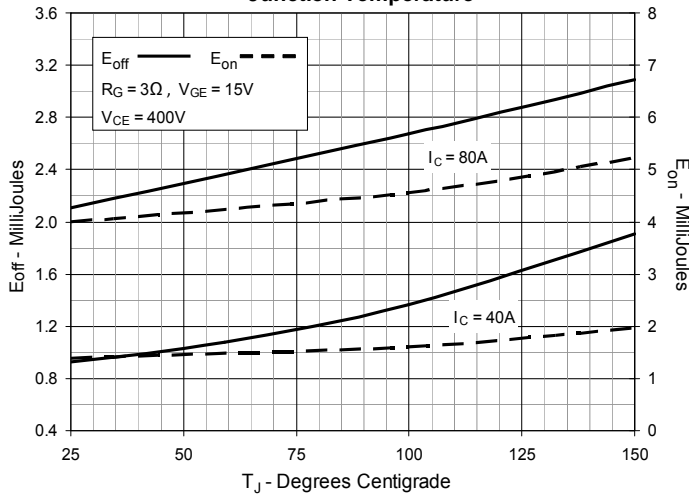
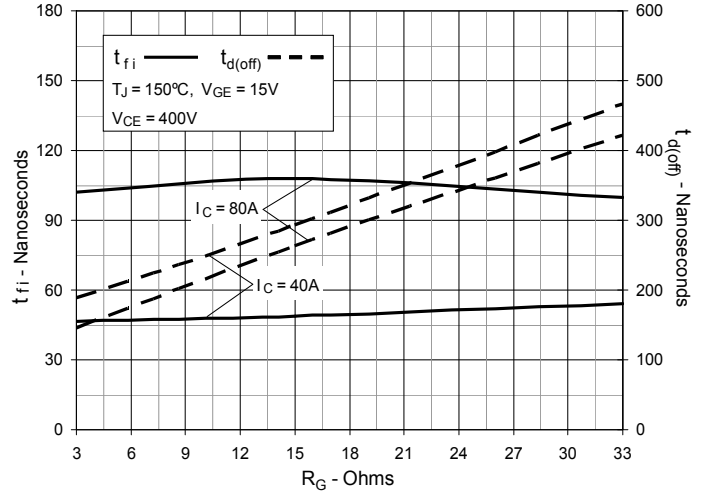
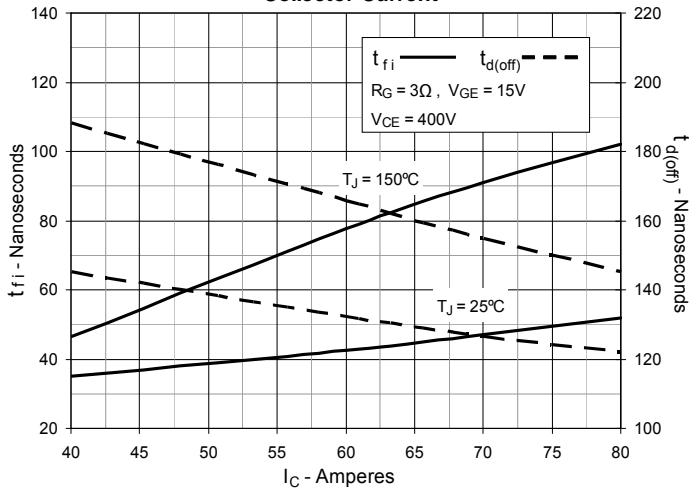
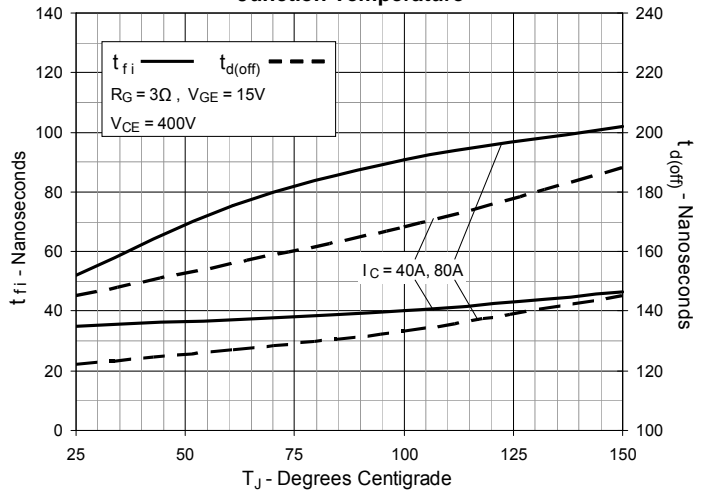
SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.087	1.91	2.20
b4	.115	.126	2.92	3.20
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
D1	.650	.690	16.51	17.53
D2	.035	.050	0.89	1.27
E	.620	.635	15.75	16.13
E1	.545	.565	13.84	14.35
e	.215 BSC		5.45 BSC	
J	--	.010	--	0.25
K	--	.025	--	0.64
L	.780	.810	19.81	20.57
L1	.150	.170	3.81	4.32
$\phi P$	.140	.144	3.55	3.65
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.242 BSC		6.15 BSC	

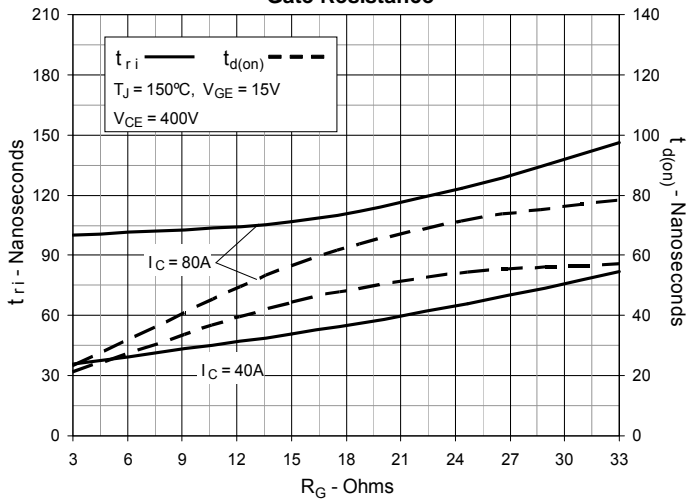
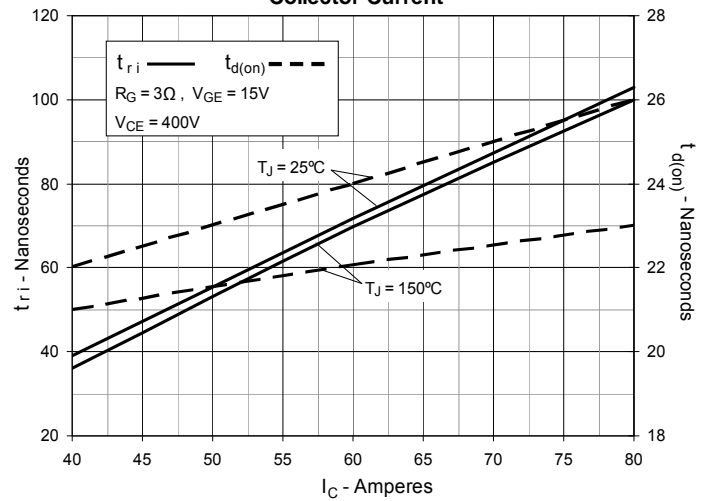
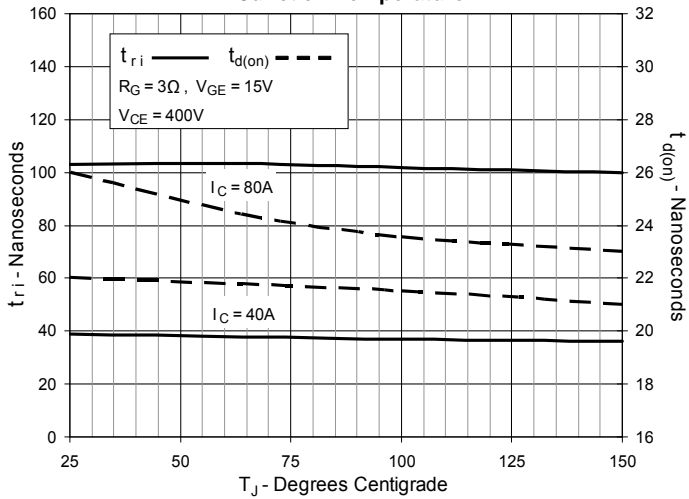
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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	

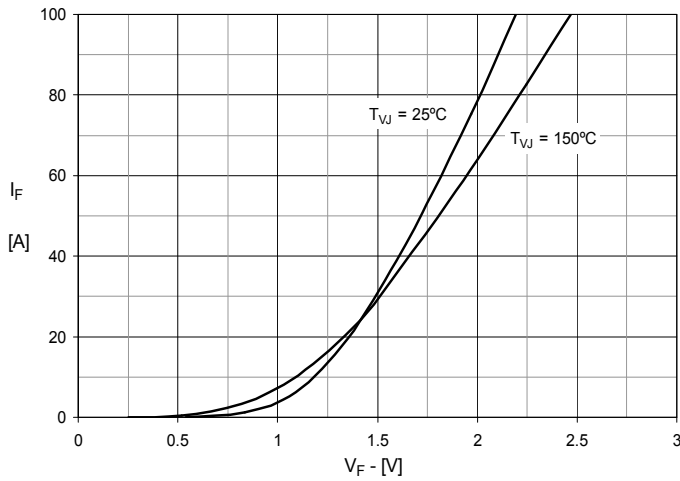
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**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**


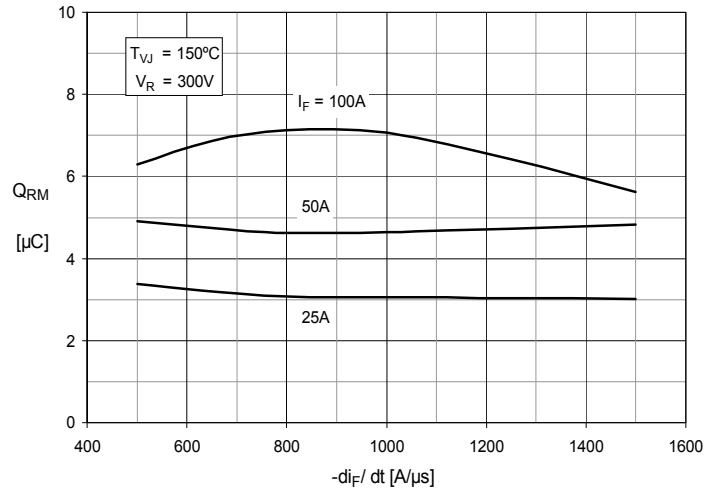
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**

**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**


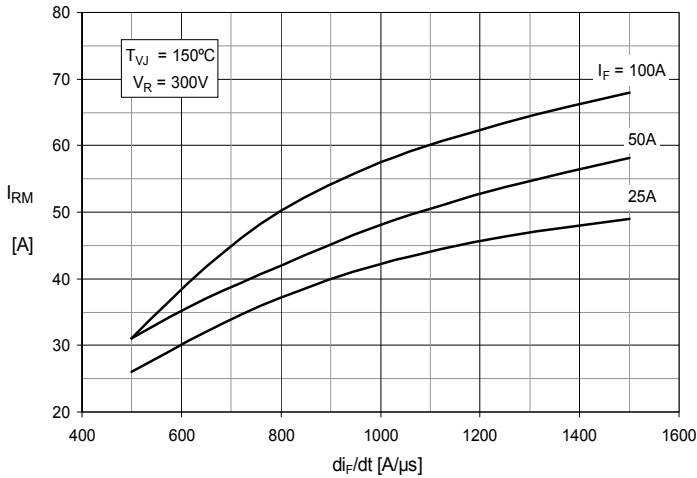
**Fig. 21. Typ. Forward characteristics**



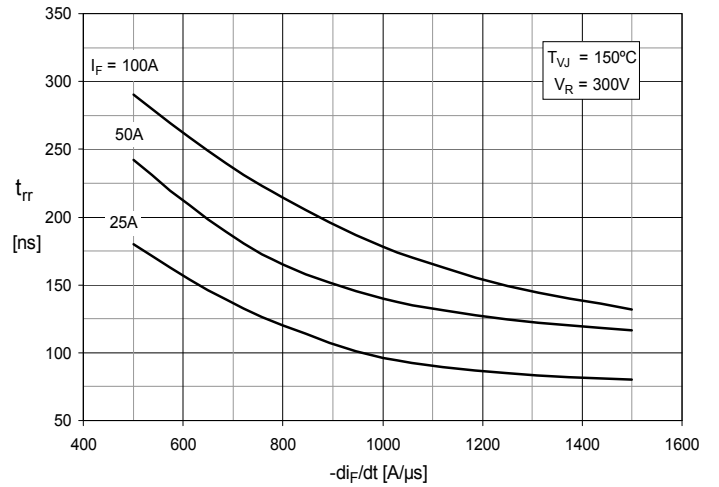
**Fig. 22. Typ. Reverse Recovery Charge  $Q_{rr}$  vs.  $-di_F/dt$**



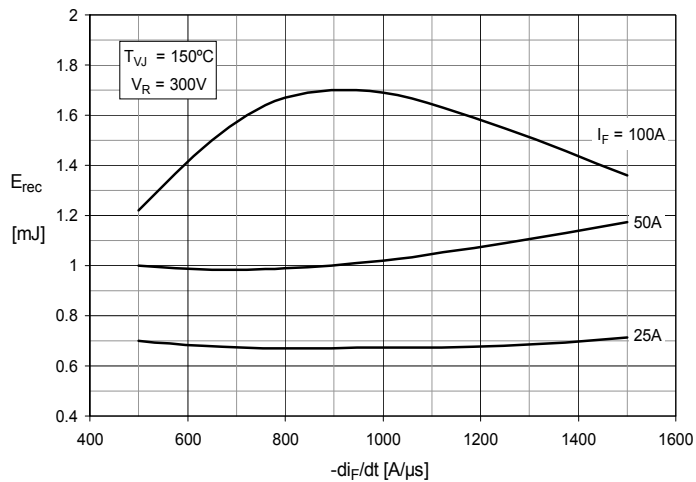
**Fig. 23. Typ. Peak Reverse Current  $I_{RM}$  vs.  $-di_F/dt$**



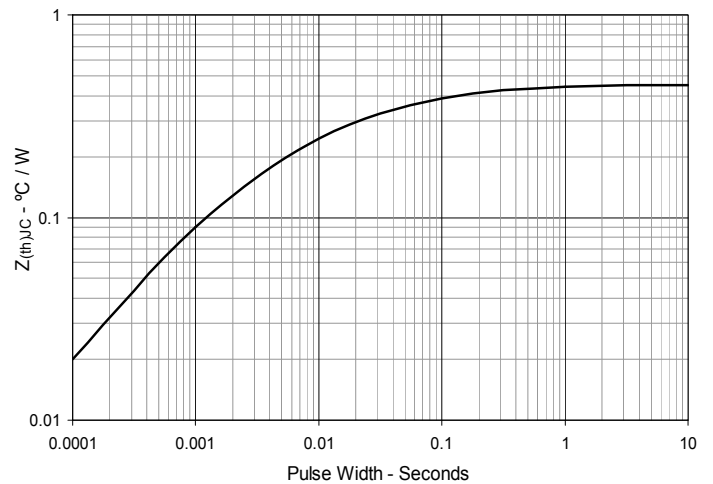
**Fig. 24. Typ. Recovery Time  $t_{rr}$  vs.  $-di_F/dt$**



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



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





---

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).