

# XPT™ 650V IGBT GenX3™ w/ Sonic Diode

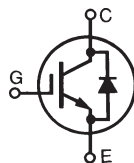
## IXYH75N65C3H1

$$V_{CES} = 650V$$

$$I_{C110} = 75A$$

$$V_{CE(sat)} \leq 2.3V$$

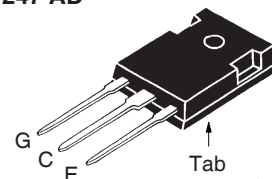
$$t_{fi(typ)} = 50ns$$



Extreme Light Punch through  
IGBT for 20-60kHz 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)	170	A
$I_{LRMS}$	Terminal Current Limit	160	A
$I_{C110}$	$T_C = 110^\circ C$	75	A
$I_{F110}$	$T_C = 110^\circ C$	62	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	360	A
$I_A$	$T_C = 25^\circ C$	30	A
$E_{AS}$	$T_C = 25^\circ C$	300	mJ
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 150^\circ C$ , $R_G = 3\Omega$ Clamped Inductive Load	$I_{CM} = 150$ $V_{CE} \leq V_{CES}$	A
$t_{sc}$ <b>(SCSOA)</b>	$V_{GE} = 15V$ , $V_{CE} = 360V$ , $T_J = 150^\circ C$ $R_G = 82\Omega$ , Non Repetitive	8	$\mu s$
$P_C$	$T_C = 25^\circ C$	750	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

- International Standard Package
- Optimized for 20-60kHz Switching
- Square RBSOA
- Avalanche Rated
- Short Circuit Capability
- High Current Handling Capability
- Anti-Parallel Sonic Diode

### Advantages

- High Power Density
- 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
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	3.5		6.0 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
$V_{CE(sat)}$	$I_C = 60A$ , $V_{GE} = 15V$ , Note 1 $T_J = 150^\circ C$		1.8 2.2	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	25	42	S
$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		3450	pF
$C_{oes}$			307	pF
$C_{res}$			70	pF
$Q_{g(on)}$	$I_C = 75\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		123	nC
$Q_{ge}$			24	nC
$Q_{gc}$			60	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 60\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 3\Omega$ Note 2		27	ns
$t_{ri}$			67	ns
$E_{on}$			2.8	mJ
$t_{d(off)}$			93	ns
$t_{fi}$			50	ns
$E_{off}$			1.0	mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 150^\circ\text{C}</math></b> $I_C = 60\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 3$ Note 2		26	ns
$t_{ri}$			57	ns
$E_{on}$			3.3	mJ
$t_{d(off)}$			108	ns
$t_{fi}$			58	ns
$E_{off}$			1.3	mJ
$R_{thJC}$				0.20 $^\circ\text{C}/\text{W}$
$R_{thCS}$		0.21		$^\circ\text{C}/\text{W}$

### Reverse Sonic Diode (FRD)

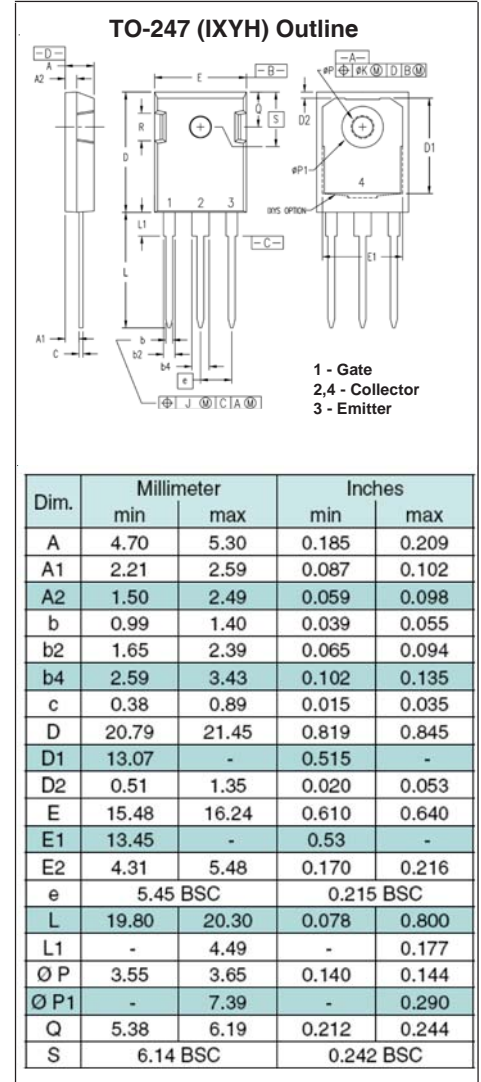
Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 50\text{A}, V_{GE} = 0\text{V}$ , Note 1			2.5 V
		$T_J = 150^\circ\text{C}$	1.8	V
$I_{RM}$	$I_F = 50\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 900\text{A}/\mu\text{s},$ $V_R = 300\text{V}$	$T_J = 150^\circ\text{C}$	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  $V_{CE}(\text{clamp})$ ,  $T_J$  or  $R_G$ .

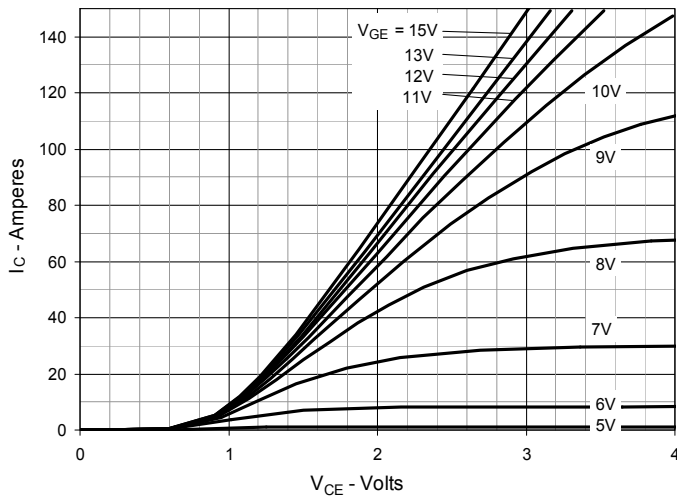
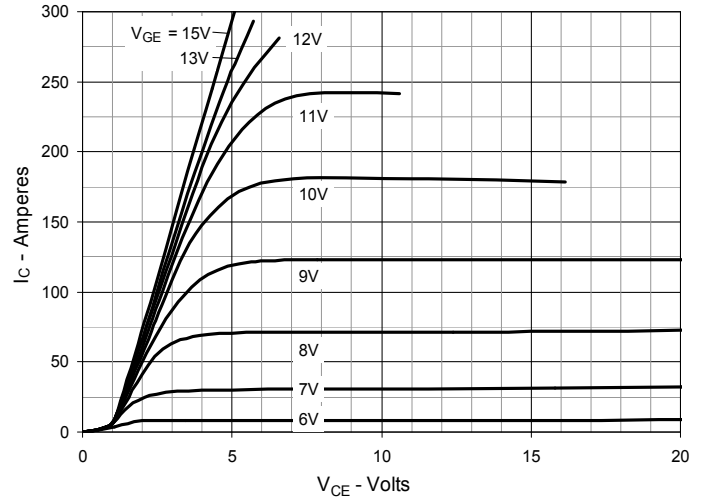
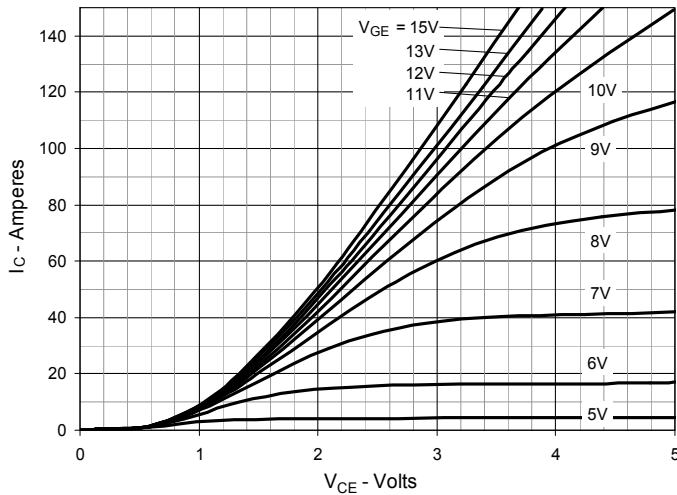
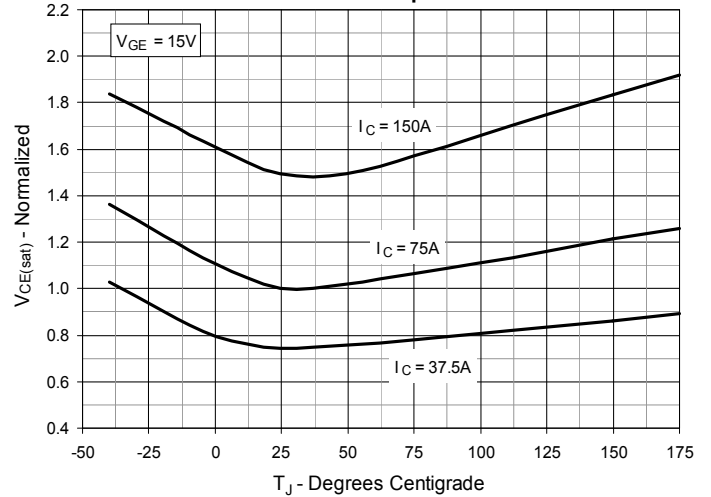
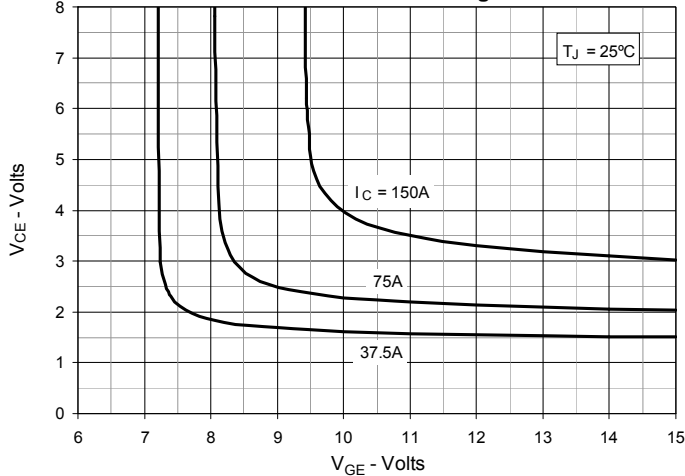
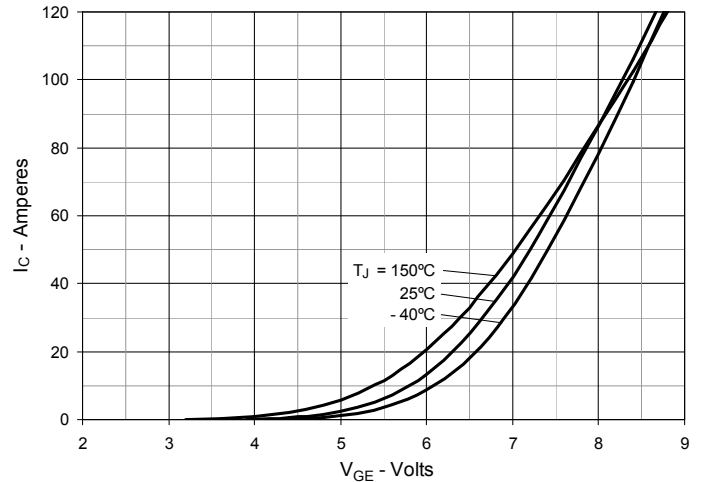
### PRELIMINARY TECHNICAL INFORMATION

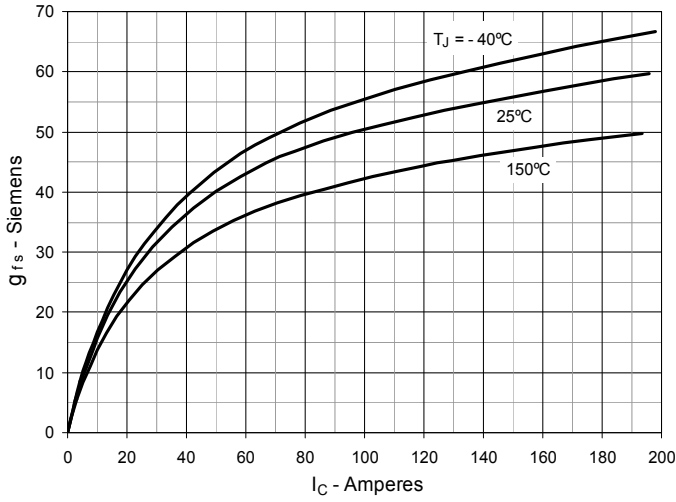
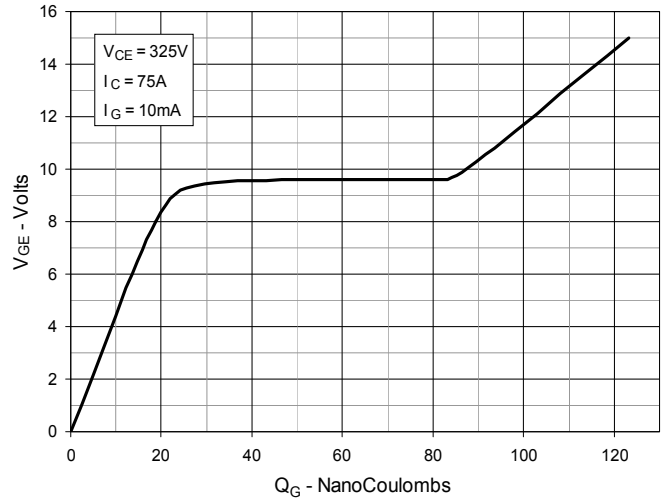
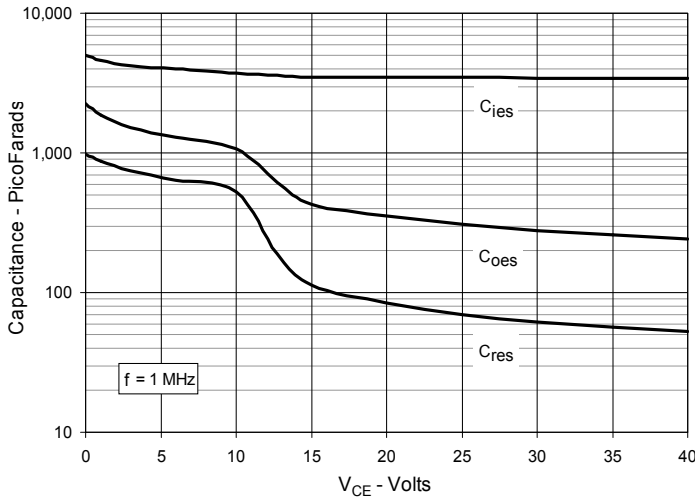
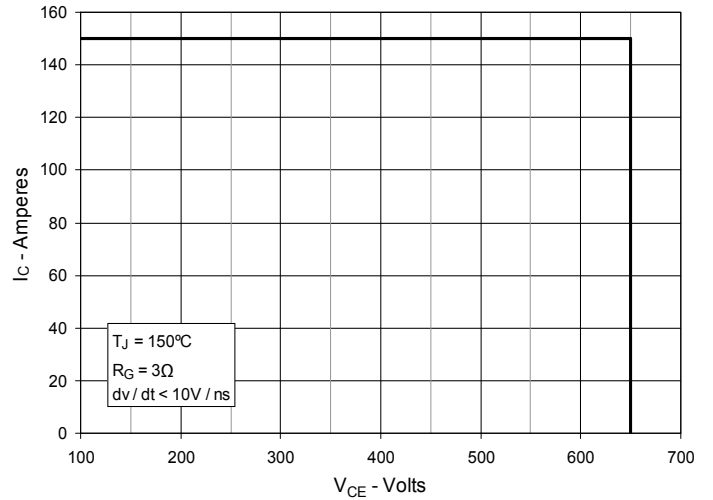
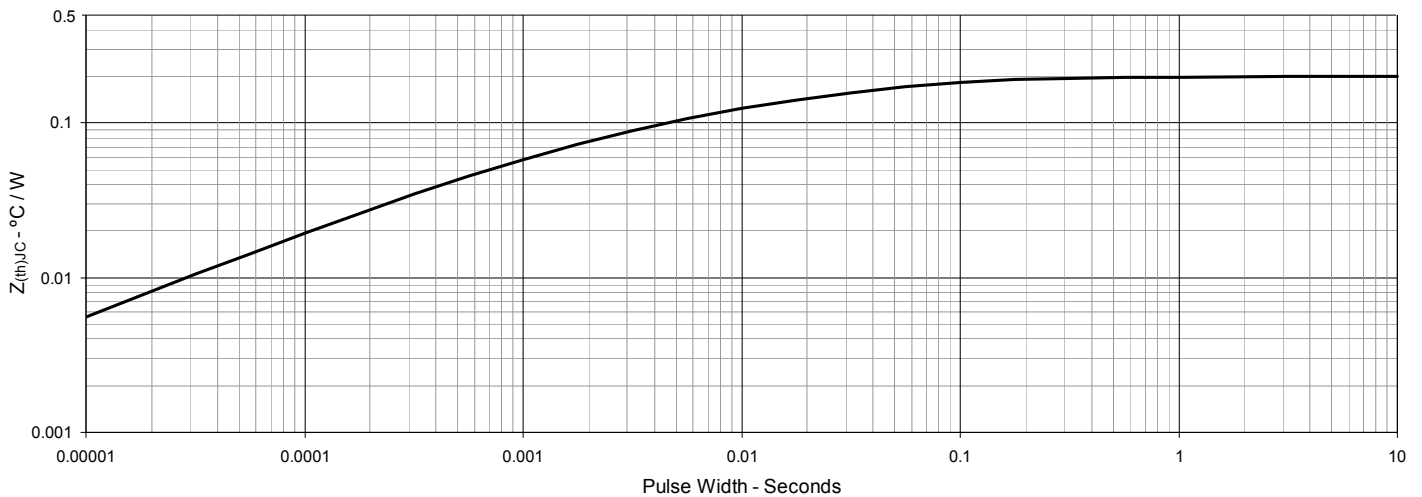
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test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

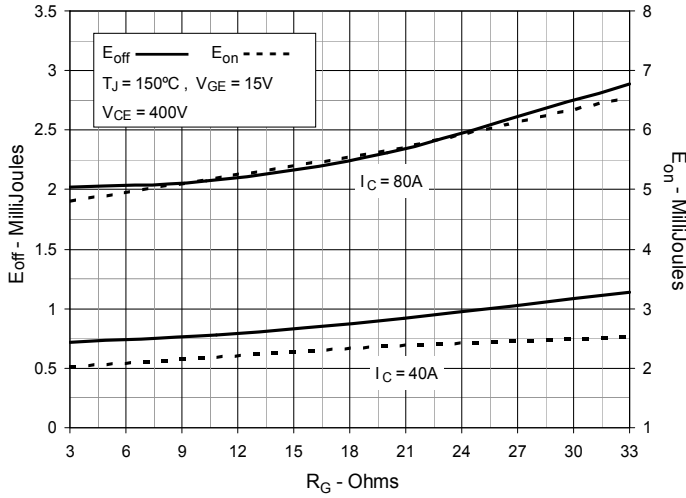
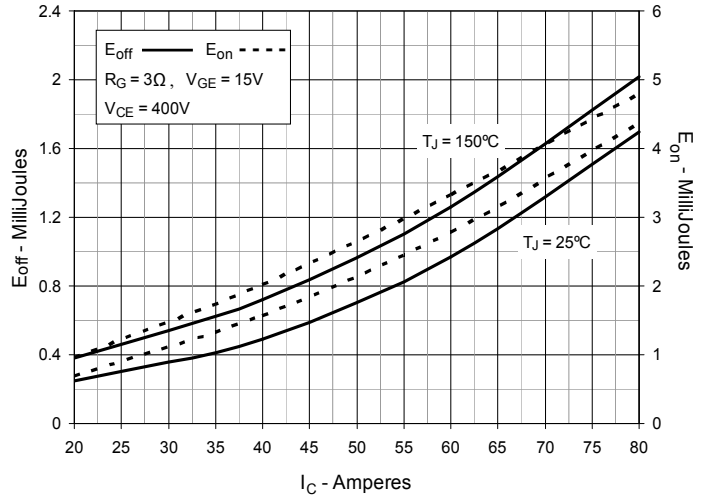
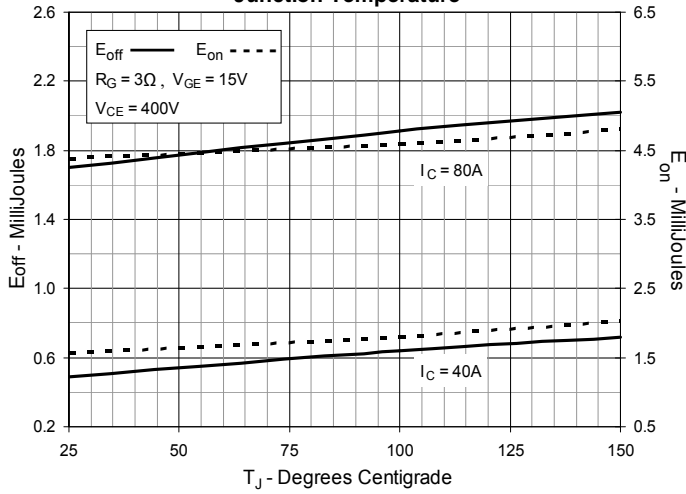
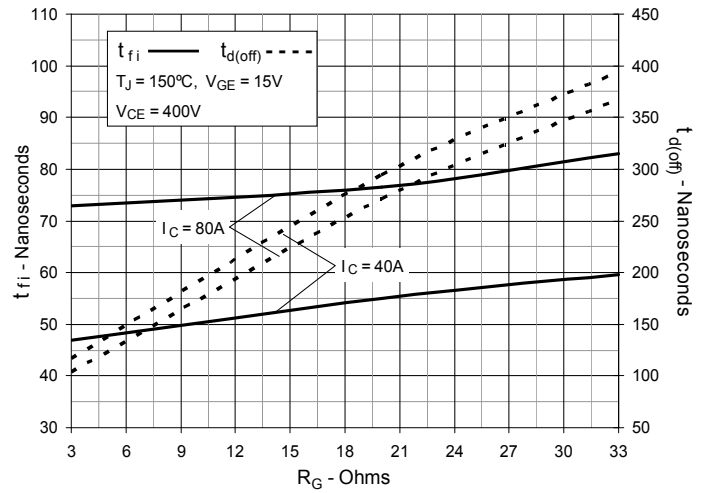
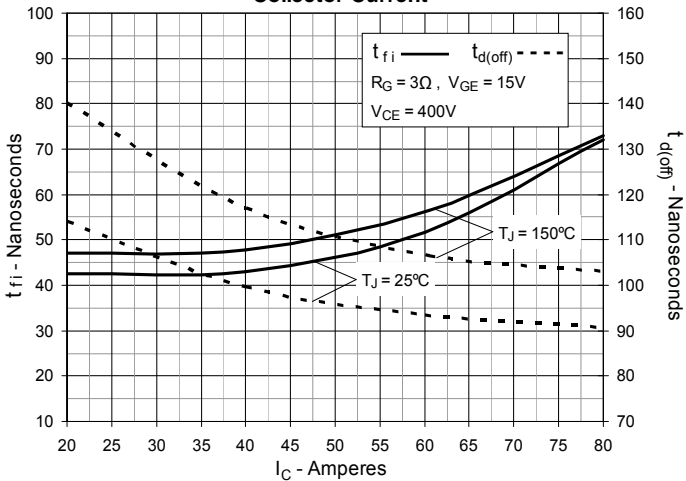
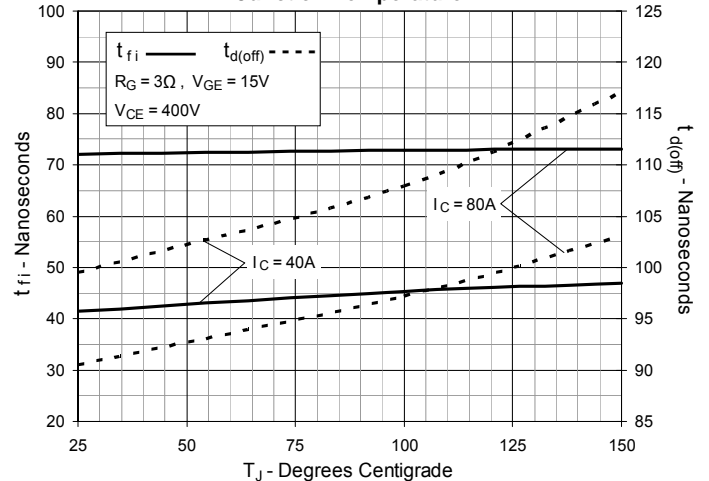


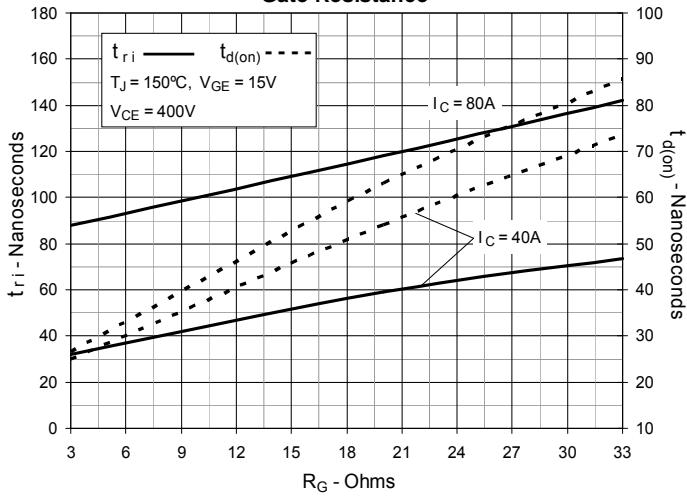
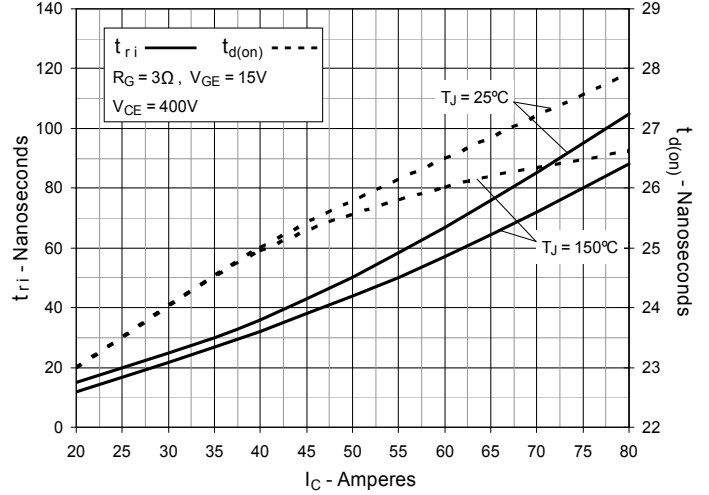
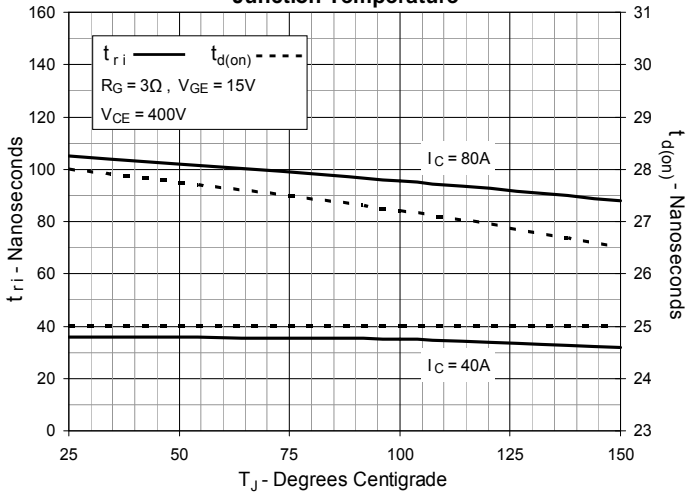
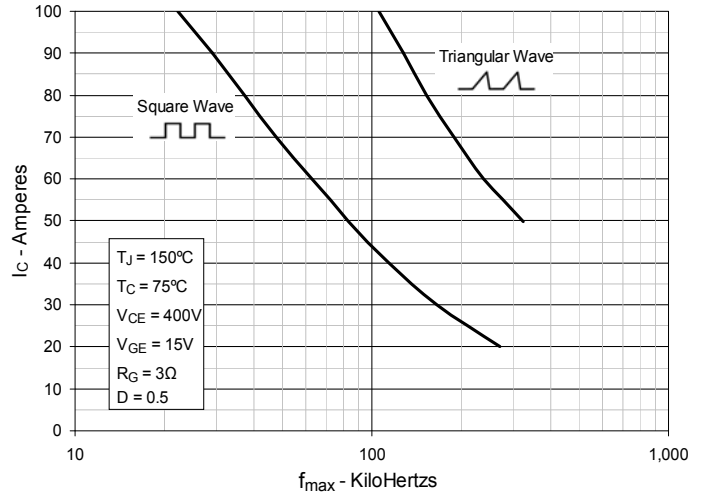
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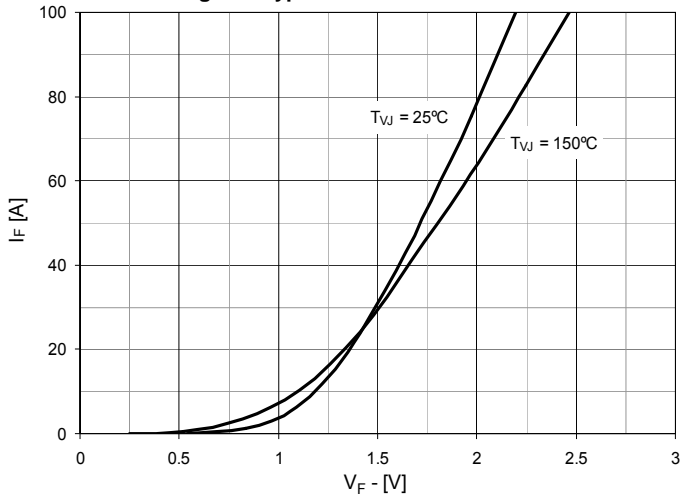
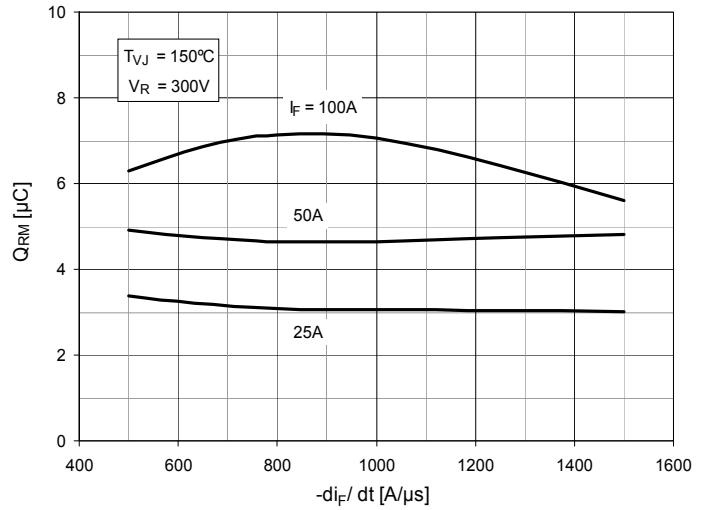
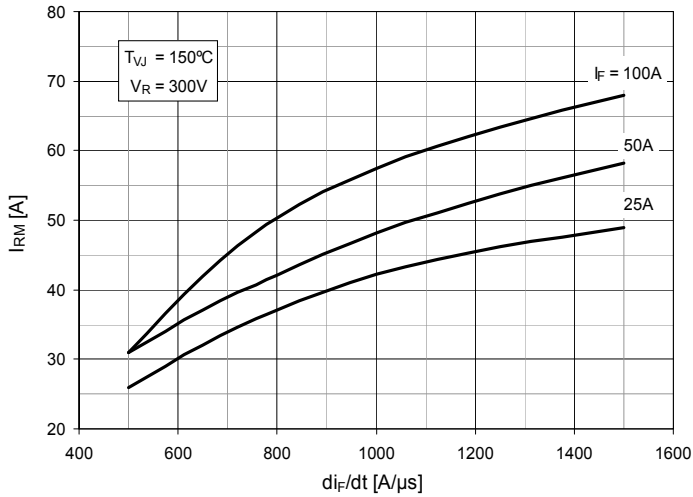
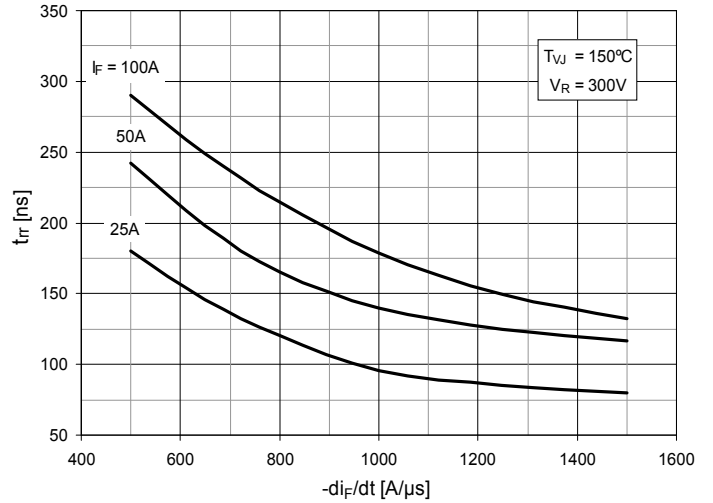
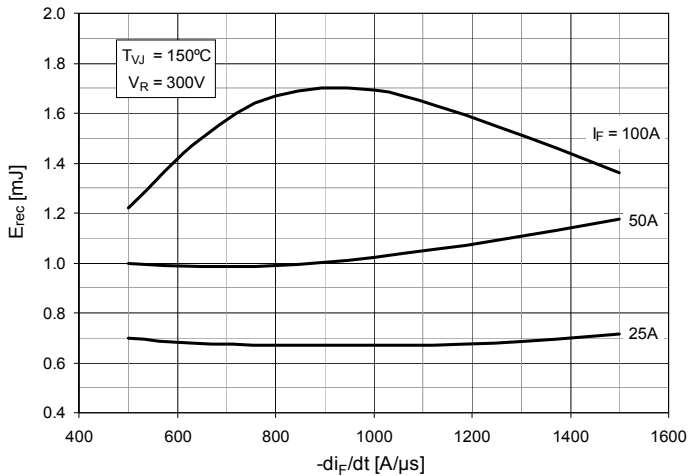
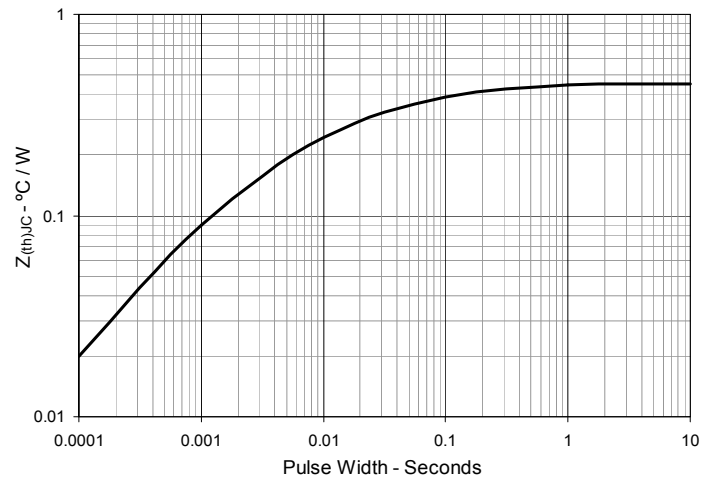
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585	7,005,734 B2	7,157,338B2
	4,860,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	6,759,692	7,063,975 B2	
	4,881,106	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. Maximum Peak Load Current vs. Frequency**


**Fig. 22. Typ. Forward characteristics**

**Fig. 23. Typ. Reverse Recovery Charge  $Q_{rr}$  vs.  $-di_F/dt$** 

**Fig. 24. Typ. Peak Reverse Current  $I_{RM}$  vs.  $-di_F/dt$** 

**Fig. 25. Typ. Recovery Time  $t_{rr}$  vs.  $-di_F/dt$** 

**Fig. 26. Typ. Recovery Energy  $E_{rec}$  vs.  $-di_F/dt$** 

**Fig. 27. Maximum Transient Thermal Impedance**




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