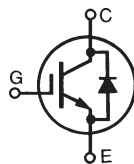


# GenX3™ 600V IGBT w/ Diode

## IXGR72N60B3H1

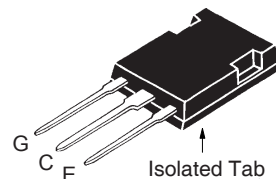
(Electrically Isolated Tab)

Medium Speed Low V<sub>sat</sub> PT IGBT  
for 5-40 kHz Switching



$V_{CES} = 600V$   
 $I_{C110} = 40A$   
 $V_{CE(sat)} \leq 1.80V$   
 $t_{fi(typ)} = 92ns$

ISOPLUS247™



G = Gate      C = Collector  
E = Emitter

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ C$ to $150^\circ C$	600	V
$V_{CGR}$	$T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$	600	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$ (Limited by Leads)	75	A
$I_{C110}$	$T_C = 110^\circ C$	40	A
$I_{F110}$	$T_C = 110^\circ C$	34	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	450	A
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 3\Omega$ Clamped Inductive Load	$I_{CM} = 240$ $V_{CE} \leq V_{CES}$	A
$P_C$	$T_C = 25^\circ C$	200	W
$T_J$		-55 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		-55 ... +150	$^\circ C$
$V_{ISOL}$	50/60 Hz, 1 Minute	2500	V~
$F_C$	Mounting Force	20..120/4.5..27	N/lb
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ C$
$T_{SOLD}$	1.6mm (0.062 in.) from Case for 10s	260	$^\circ C$
<b>Weight</b>		5	g

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface Optimized for Low Conduction and Switching Losses
- 2500V~ Electrical Isolation
- Square RBSOA
- Anti-Parallel Ultra Fast Diode

### Advantages

- High Power Density
- Low Gate Drive Requirement

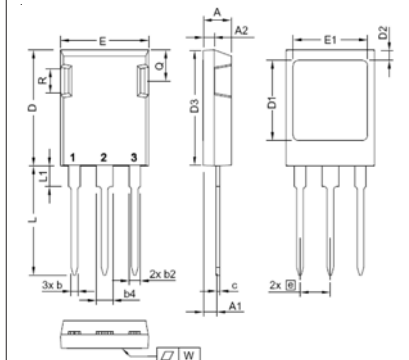
### Applications

- 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.
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ $T_J = 125^\circ C$			300 $\mu A$ 5 mA
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 60A$ , $V_{GE} = 15V$ , Note 1 $I_C = 120A$		1.50 1.75	V V

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 50\text{A}$ , $V_{CE} = 10\text{V}$ , Note 1	45	76	S
$C_{ies}$	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$		6800	pF
$C_{oes}$			576	pF
$C_{res}$			80	pF
$Q_g$	$I_C = 60\text{A}$ , $V_{GE} = 15\text{V}$ , $V_{CE} = 0.5 \cdot V_{CES}$		225	nC
$Q_{ge}$			40	nC
$Q_{gc}$			82	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 50\text{A}$ , $V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}$ , $R_G = 3\Omega$ Note 2		31	ns
$t_{ri}$			33	ns
$E_{on}$			1.4	mJ
$t_{d(off)}$			152	240 ns
$t_{fi}$			92	150 ns
$E_{off}$			1.0	2.0 mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = 50\text{A}$ , $V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}$ , $R_G = 3\Omega$ Note 2		29	ns
$t_{ri}$			34	ns
$E_{on}$			2.7	mJ
$t_{d(off)}$			228	ns
$t_{fi}$			142	ns
$E_{off}$			2.2	mJ
$R_{thJC}$			0.62	$^\circ\text{C/W}$
$R_{thCS}$		0.15		$^\circ\text{C/W}$

### ISOPLUS247 (IXGR) Outline



- 1 - Gate
- 2 - Collector
- 3 - Emitter

Dim.	Millimeter		Inches	
	min	max	min	max
A	4.83	5.21	0.190	0.205
A1	2.29	2.54	0.090	0.100
A2	1.91	2.16	0.075	0.085
b	1.14	1.40	0.045	0.055
b2	1.91	2.20	0.075	0.087
b4	2.92	3.24	0.115	0.128
c	0.61	0.83	0.024	0.033
D	20.80	21.34	0.819	0.840
D1	15.75	16.26	0.620	0.640
D2	1.65	2.15	0.065	0.085
D3	20.30	20.70	0.799	0.815
E	15.75	16.13	0.620	0.635
E1	13.21	13.72	0.520	0.540
e	5.45 BSC		0.215 BSC	
L	19.81	20.60	0.780	0.811
L1	3.81	4.38	0.150	0.172
Q	5.59	6.20	0.220	0.244
R	4.25	5.50	0.167	0.217
W	-	0.10	-	0.004

### Reverse Diode (FRED)

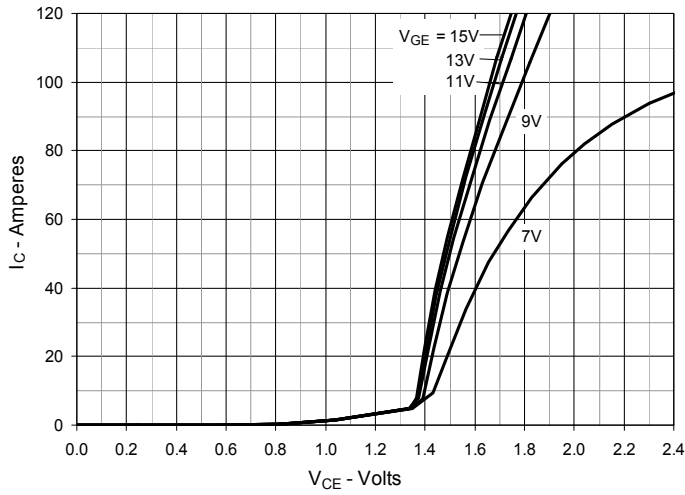
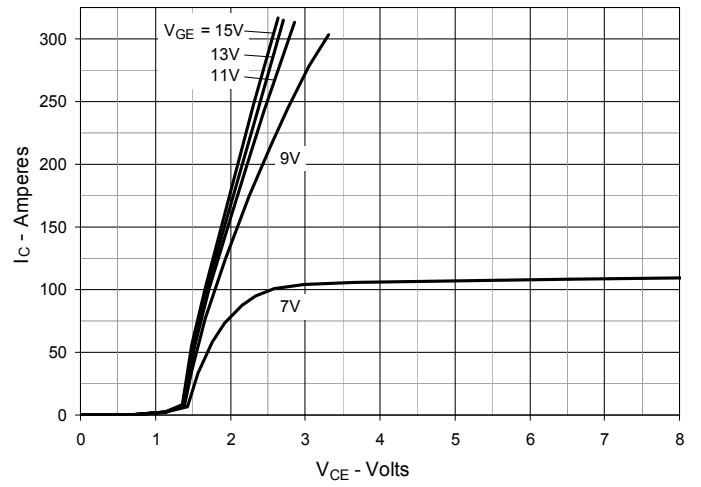
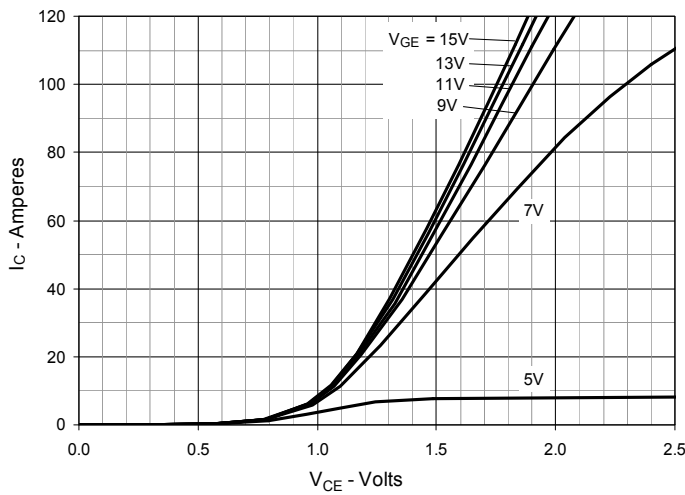
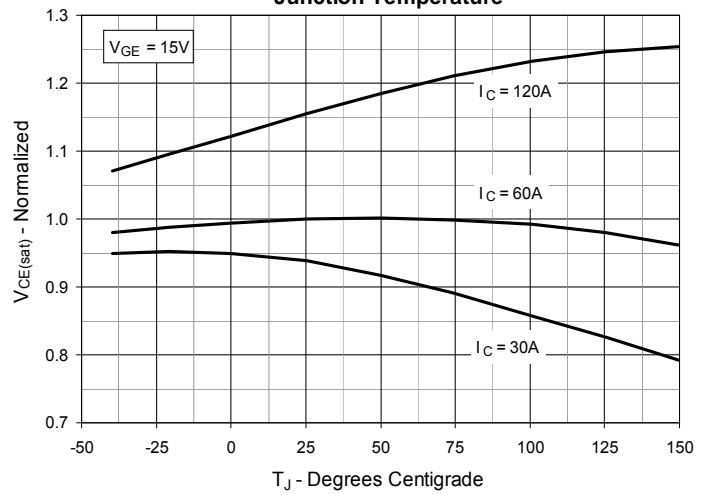
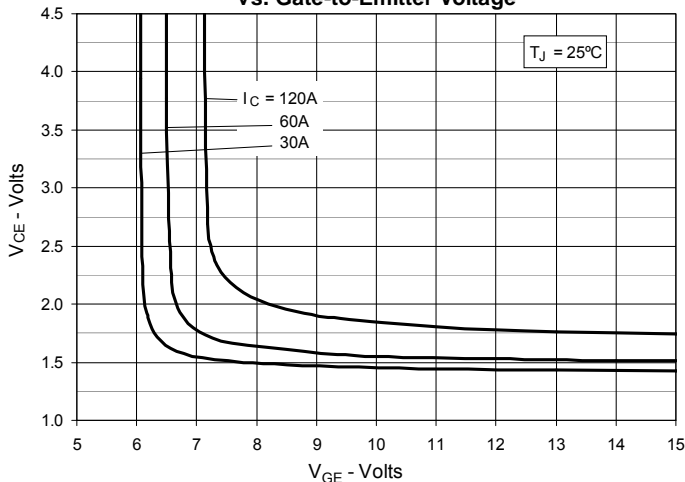
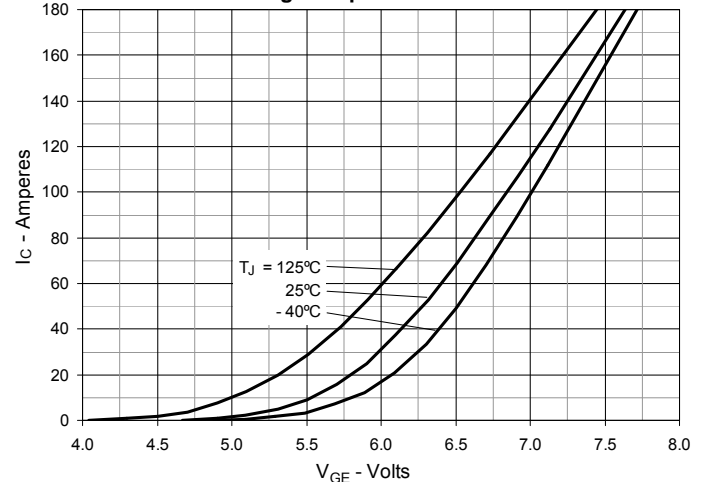
(Symbol)	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 60\text{A}$ , $V_{GE} = 0\text{V}$ , Note 1 $T_J = 150^\circ\text{C}$		1.6 1.4	2.3 V 1.8 V
$I_{RM}$	$I_F = 60\text{A}$ , $V_{GE} = 0\text{V}$ , $-di_F/dt = 200\text{A}/\mu\text{s}$ , $V_R = 300\text{V}$ $T_J = 100^\circ\text{C}$		8.3	A
$t_{rr}$	$I_F = 60\text{A}$ , $-di/dt = 200\text{A}/\mu\text{s}$ , $V_R = 300\text{V}$ , $T_J = 100^\circ\text{C}$		140	ns
$R_{thJC}$				0.80 $^\circ\text{C/W}$

### Notes:

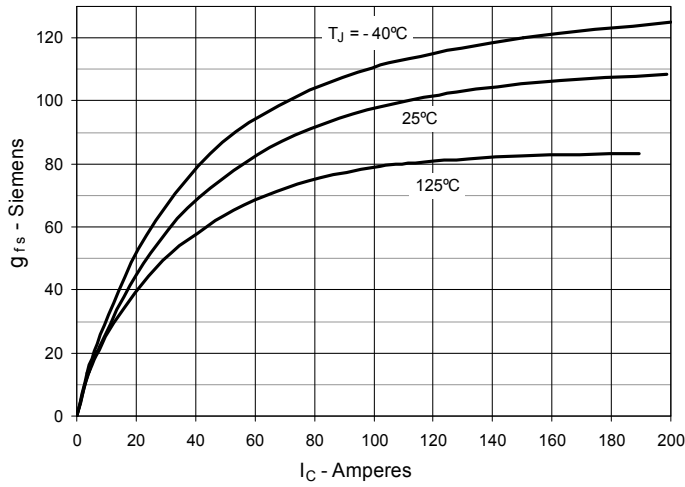
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Switching times & energy losses may increase for higher  $V_{CE}$  (Clamp),  $T_J$  or  $R_G$ .

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

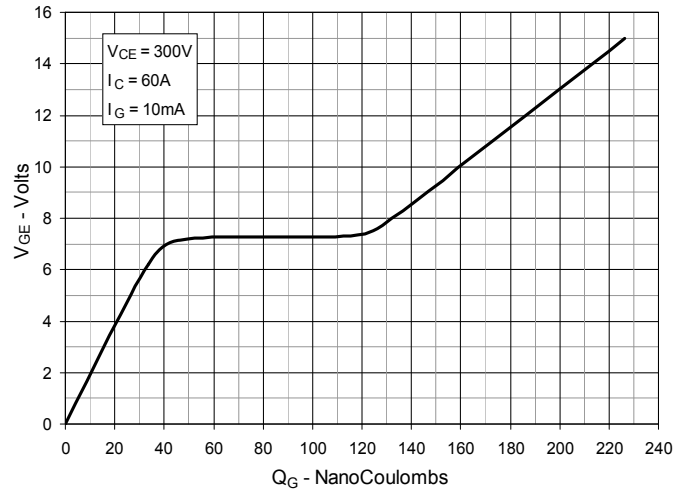
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585	7,005,734 B2	7,157,338B2
	4,860,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	6,759,692	7,063,975 B2	
	4,881,106	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 @  $T_J = 125^\circ\text{C}$** 

**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**


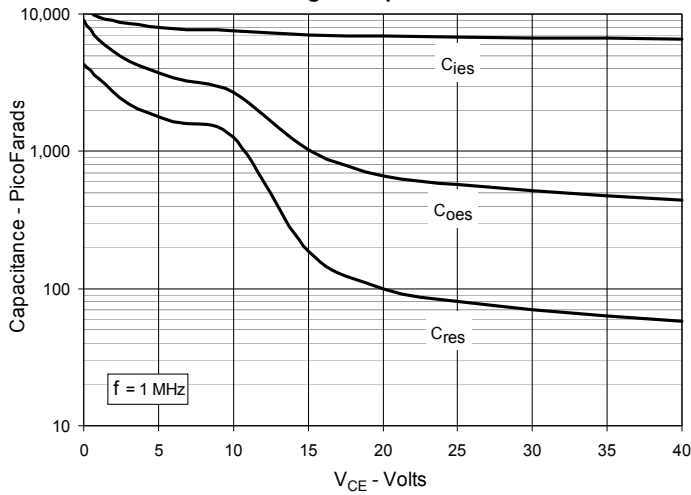
**Fig. 7. Transconductance**



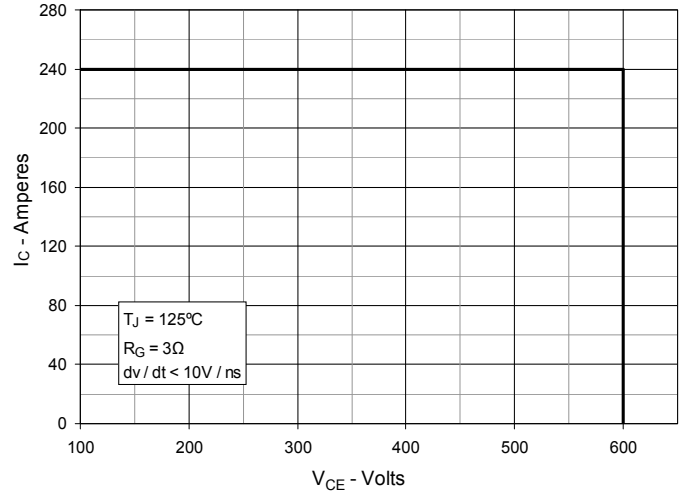
**Fig. 8. Gate Charge**



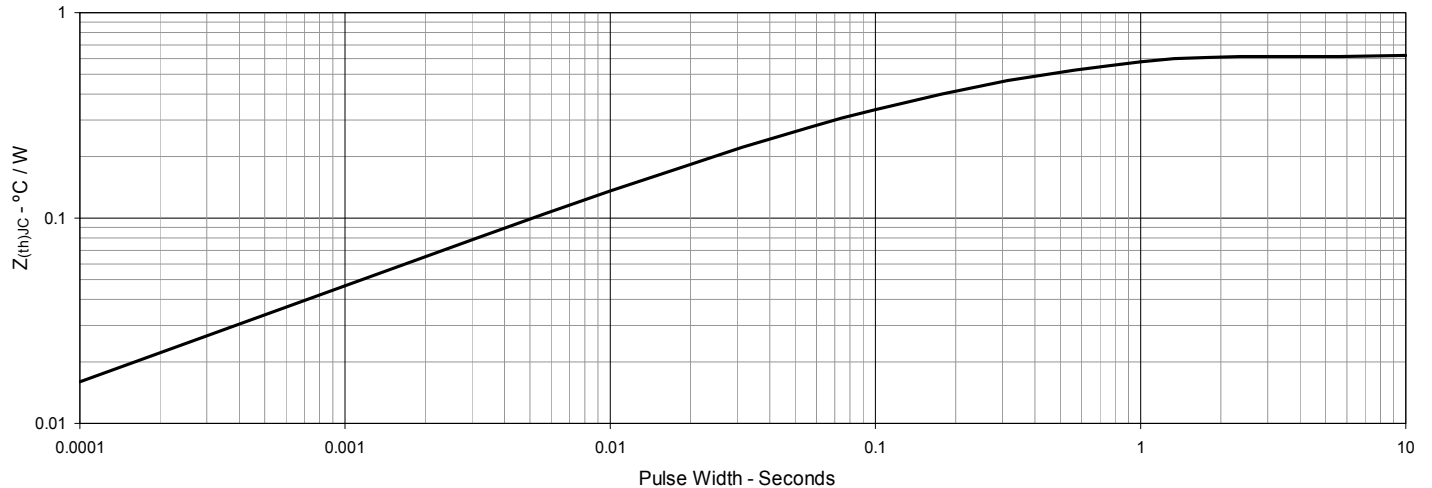
**Fig. 9. Capacitance**



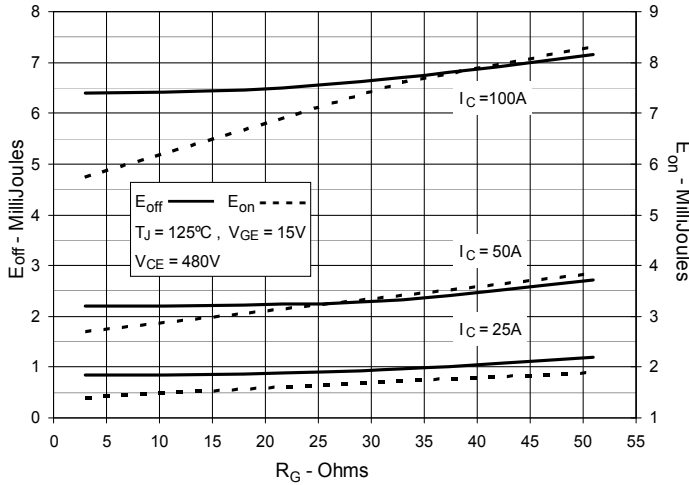
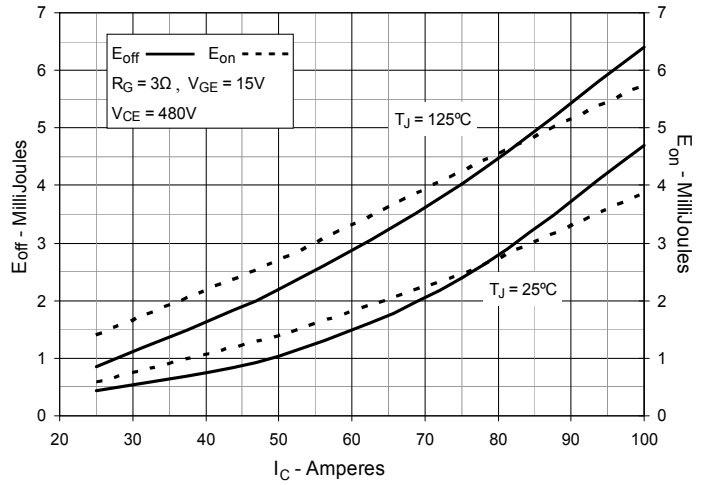
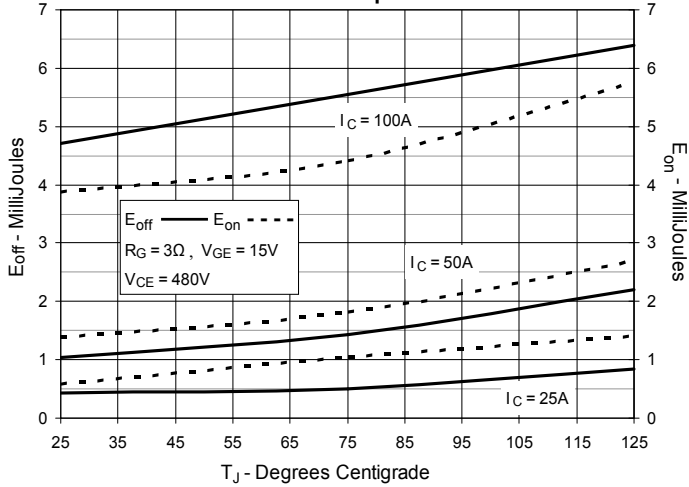
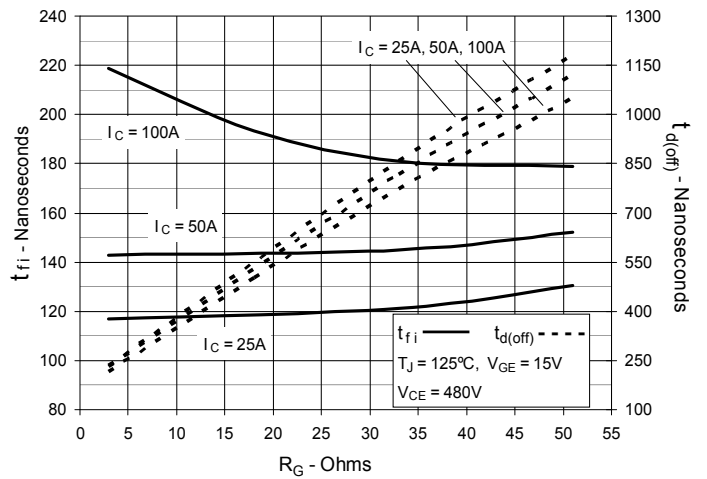
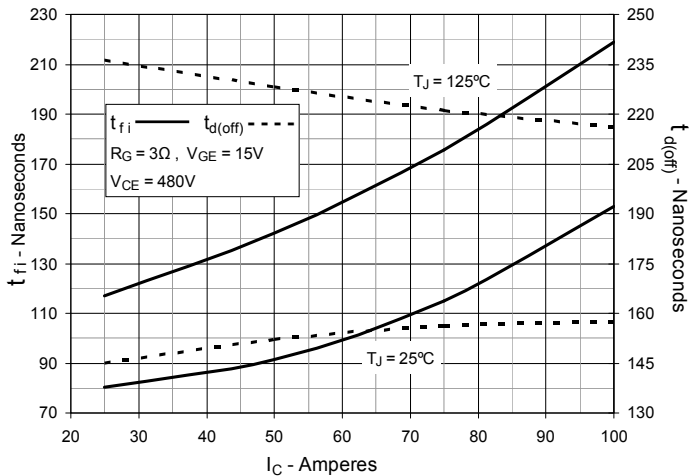
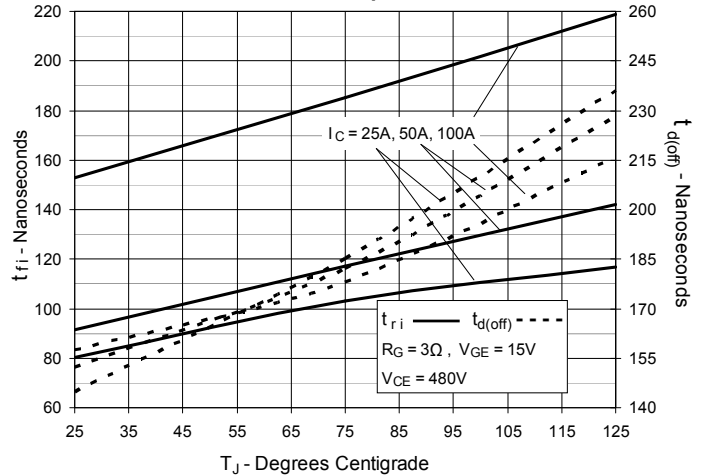
**Fig. 10. Reverse-Bias Safe Operating Area**



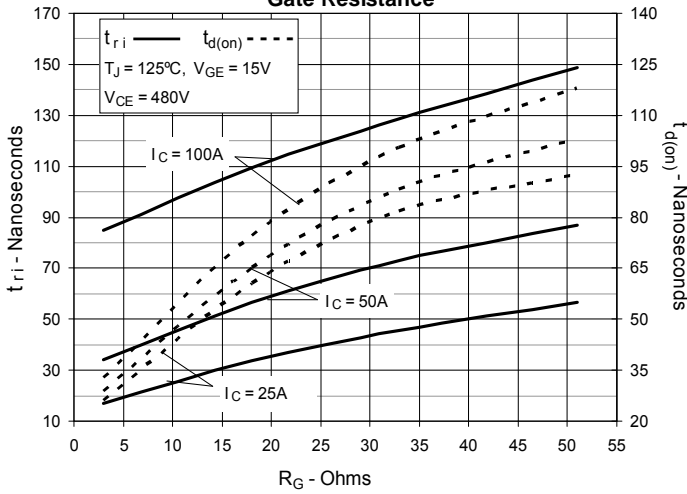
**Fig. 11. Maximum Transient Thermal Impedance**



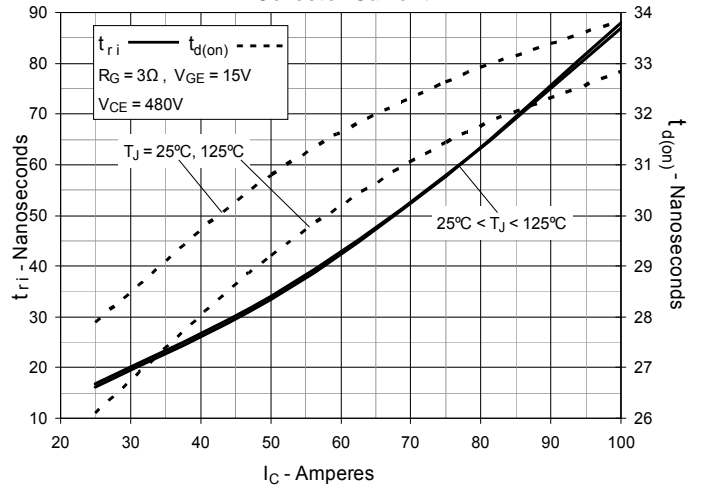
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

**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**


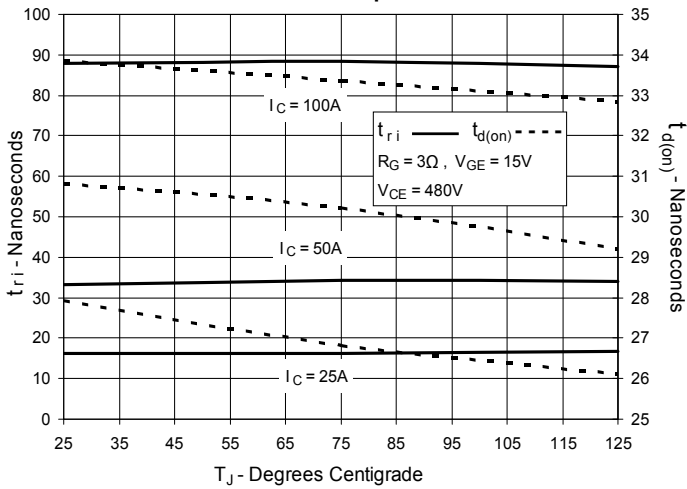
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



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



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



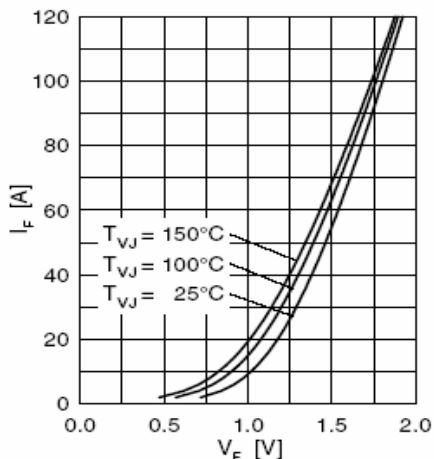


Fig. 21 Forward Current  $I_F$  vs.  $V_F$

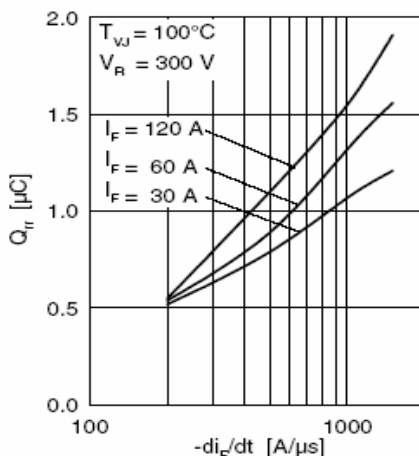


Fig. 22 Typ. Reverse Recovery Charge  $Q_{rr}$

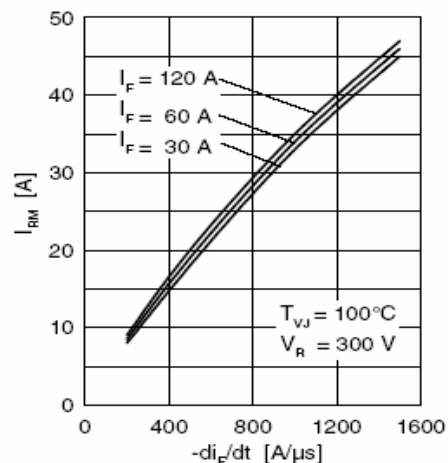


Fig. 23 Typ. Peak Reverse Current  $I_{RM}$

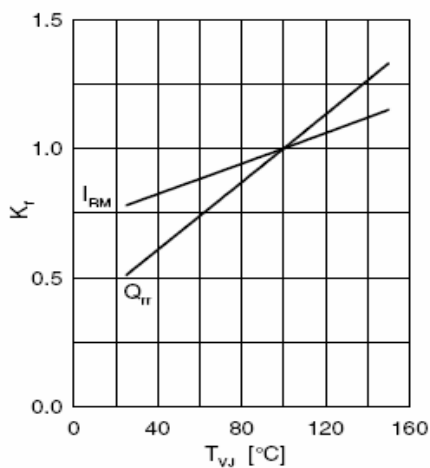


Fig. 24 Typ. Dynamic Parameters  $Q_{rr}$ ,  $I_{RM}$

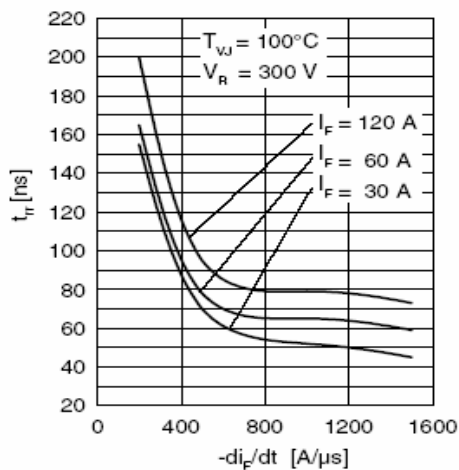


Fig. 25 Typ Recovery Time  $t_{rr}$



Fig. 26 Maximum Transient Thermal Impedance Junction to Case (for Diode)