

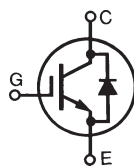
### GenX3™ B3-Class IGBT w/Diode

### IXGR72N60B3D1\*

\*Obsolete Part Number

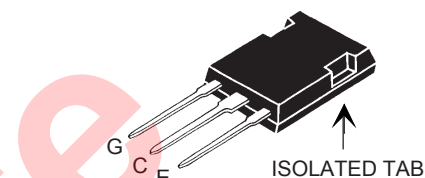
(Electrically Isolated Back Surface)

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



$V_{CES}$	=	<b>600V</b>
$I_{C110}$	=	<b>40A</b>
$V_{CE(sat)}$	≤	<b>1.80V</b>
$t_{fi(typ)}$	=	<b>90ns</b>

#### ISOPLUS 247™



G = Gate      C = Collector  
E = Emitter

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	600	V
$V_{CGR}$	$T_J = 25^\circ\text{C to } 150^\circ\text{C}, R_{GE} = 1\text{M}\Omega$	600	V
$V_{GES}$	Continuous	±20	V
$V_{GEM}$	Transient	±30	V
$I_{C25}$	$T_C = 25^\circ\text{C}$ (Limited by Leads)	75	A
$I_{C110}$	$T_C = 110^\circ\text{C}$	40	A
$I_{F110}$	$T_C = 110^\circ\text{C}$	36	A
$I_{CM}$	$T_C = 25^\circ\text{C}, 1\text{ms}$	360	A
$I_A$	$T_C = 25^\circ\text{C}$	20	A
$E_{AS}$	$T_C = 25^\circ\text{C}$	220	mJ
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15\text{V}, T_{VJ} = 125^\circ\text{C}, R_G = 3\Omega$ Clamped Inductive Load	$I_{CM} = 240$ $V_{CE} \leq 600$	A V
$P_C$	$T_C = 25^\circ\text{C}$	200	W
$T_J$		-55 ... +150	°C
$T_{JM}$		150	°C
$T_{stg}$		-55 ... +150	°C
$V_{ISOL}$	50/60 Hz, RMS, $t = 1\text{Minute}$ $I_{ISOL} < 1\text{mA}$ $t = 20\text{Seconds}$	2500 3000	V~ V~
$F_C$	Mounting Force	20..120/4.5..27	N/lb
$T_L$	Maximum Lead Temperature for Soldering	300	°C
$T_{SOLD}$	1.6mm (0.062 in.) from Case for 10s	260	°C
<b>Weight</b>		5	g

#### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- Avalanche Rated
- Anti-Parallel Ultra Fast Diode
- 2500V Electrical Isolation

#### 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 ( $T_J = 25^\circ\text{C}$ , Unless Otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 250\mu\text{A}, V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}, V_{GE} = 0\text{V}$ $T_J = 125^\circ\text{C}$			300 $\mu\text{A}$ 5 mA
$I_{GES}$	$V_{CE} = 0\text{V}, V_{GE} = \pm 20\text{V}$			±100 nA
$V_{CE(sat)}$	$I_C = 60\text{A}, V_{GE} = 15\text{V}$ , Note 1 $T_J = 125^\circ\text{C}$		1.50 1.75	V V

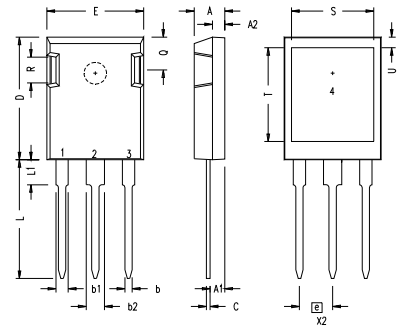
Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 60A, V_{CE} = 10V, \text{Note 1}$	50	83	S
$C_{ies}$ $C_{oes}$ $C_{res}$	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		6800	pF
			575	pF
			80	pF
$Q_g$ $Q_{ge}$ $Q_{gc}$	$I_C = 60A, V_{GE} = 15V, V_{CE} = 0.5 \cdot V_{CES}$		225	nC
			40	nC
			82	nC
$t_{d(on)}$ $t_{ri}$ $E_{on}$ $t_{d(off)}$ $t_{fi}$ $E_{off}$	Inductive load, $T_J = 25^\circ C$ $I_C = 50A, V_{GE} = 15V$ $V_{CE} = 480V, R_G = 3\Omega$		31	ns
			33	ns
			1.38	mJ
			150	330 ns
			90	160 ns
			1.05	2.20 mJ
$t_{d(on)}$ $t_{ri}$ $E_{on}$ $t_{d(off)}$ $t_{fi}$ $E_{off}$	Inductive load, $T_J = 125^\circ C$ $I_C = 50A, V_{GE} = 15V$ $V_{CE} = 480V, R_G = 3\Omega$		29	ns
			34	ns
			2.70	mJ
			228	ns
			142	ns
			2.20	mJ
$R_{thJC}$ $R_{thCS}$		0.15	0.62 °C/W	°C/W

### Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 60A, V_{GE} = 0V, \text{Note 1}$ $T_J = 150^\circ C$		1.4	2.1 V
$I_{RM}$	$I_F = 60A, V_{GE} = 0V,$ $-di_F/dt = 100A/\mu s, V_R = 100V$ $T_J = 100^\circ C$		8.3	A
$t_{rr}$	$I_F = 1A, -di/dt = 200A/\mu s, V_R = 30V$		35	ns
$R_{thJC}$			0.85	°C/W

Note 1. Pulse Test,  $t \leq 300\mu s$ ; Duty Cycle,  $d \leq 2\%$ .

### ISOPLUS247 (IXGR) 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
b1	.075	.084	1.91	2.13
b2	.115	.123	2.92	3.12
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
E	.620	.635	15.75	16.13
e	.215 BSC		5.45 BSC	
L	.780	.800	19.81	20.32
L1	.150	.170	3.81	4.32
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.520	.540	13.21	13.72
T	.620	.640	15.75	16.26
U	.065	.080	1.65	2.03

- 1 - GATE
- 2 - DRAIN (COLLECTOR)
- 3 - SOURCE (EMITTER)
- 4 - NO CONNECTION

NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.

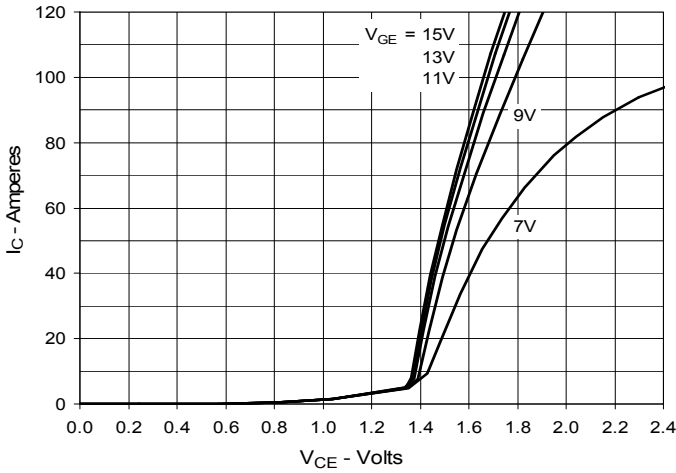
### PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

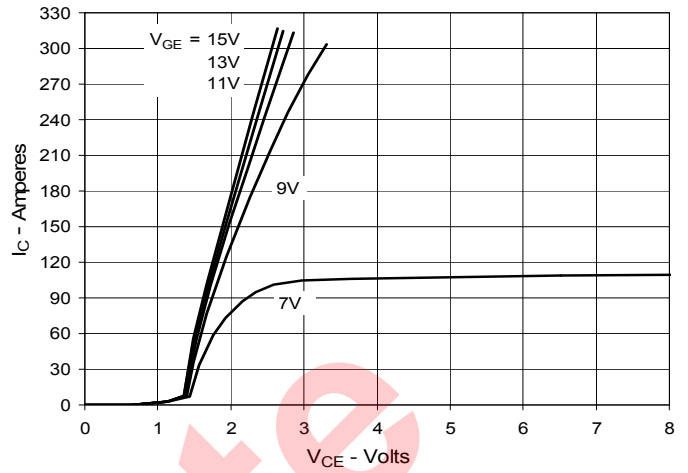
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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
	4,850,072	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	

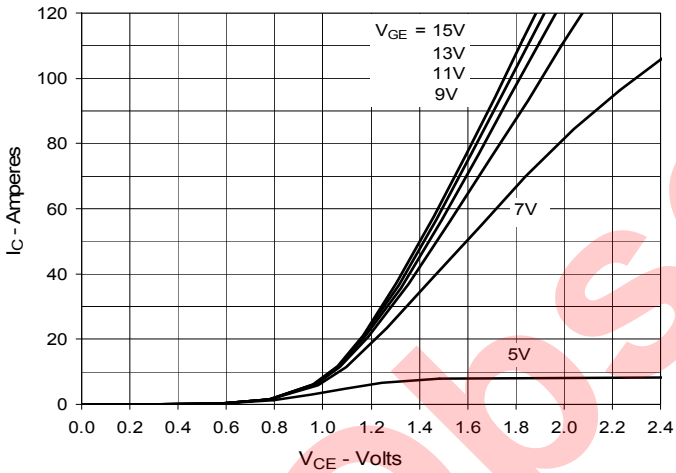
**Fig. 1. Output Characteristics @ 25°C**



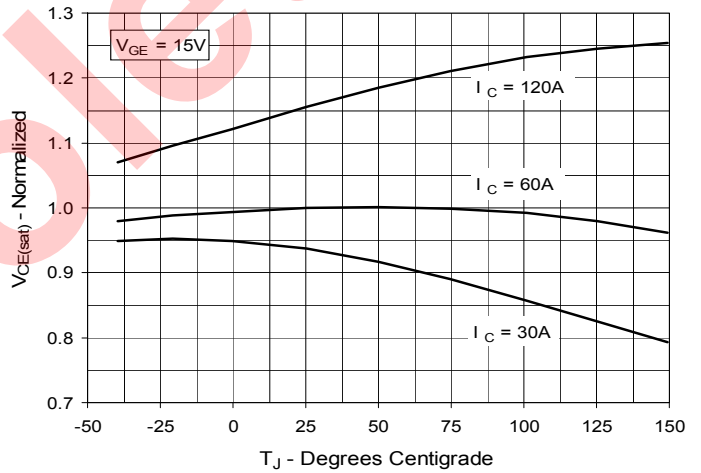
**Fig. 2. Extended Output Characteristics @ 25°C**



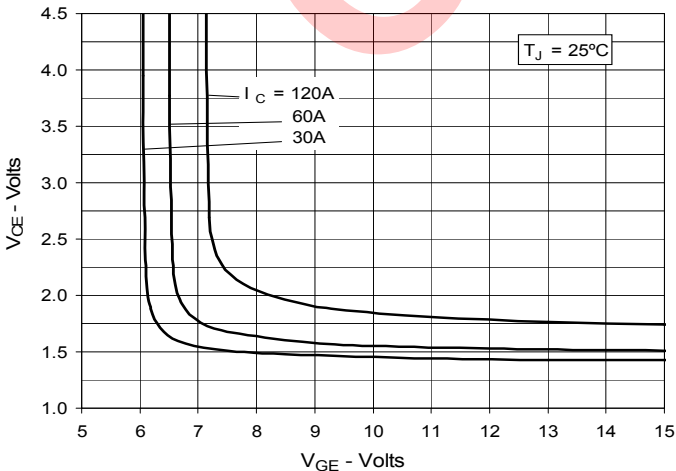
**Fig. 3. Output Characteristics @ 125°C**



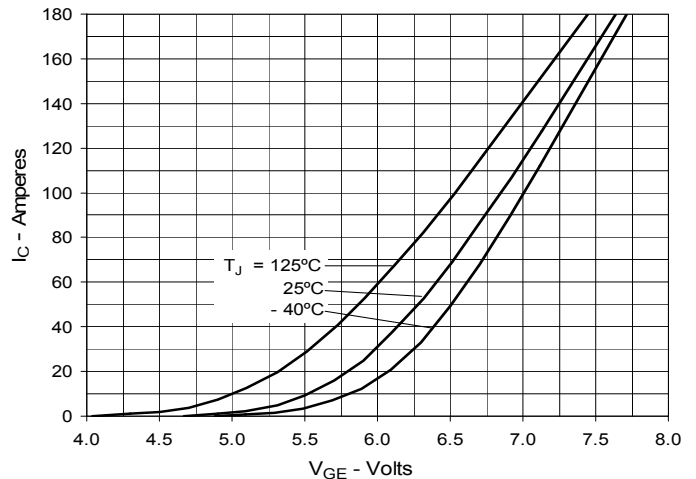
**Fig. 4. Dependence of Vce(sat) on Junction Temperature**



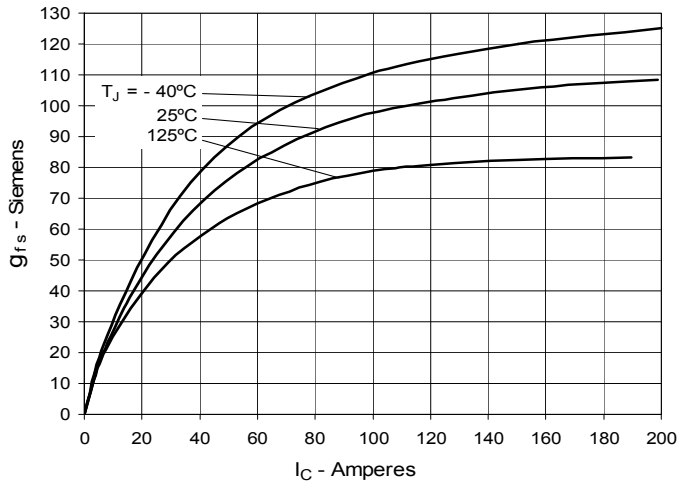
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



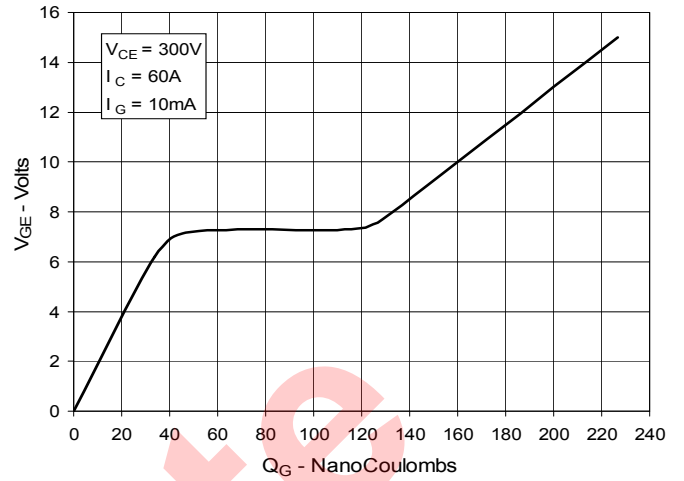
**Fig. 6. Input Admittance**



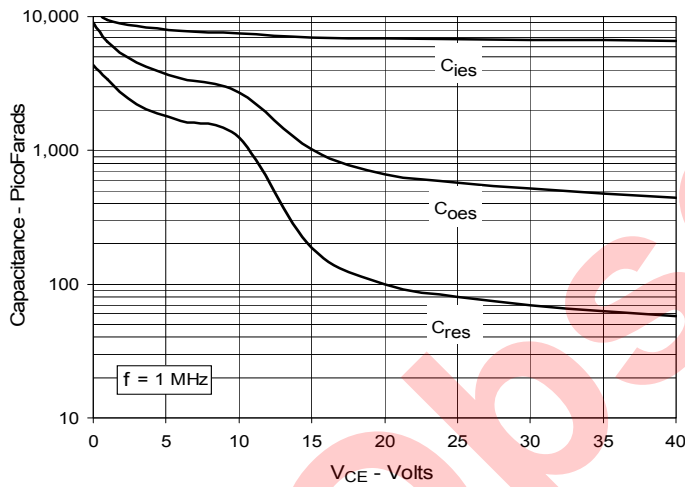
**Fig. 7. Transconductance**



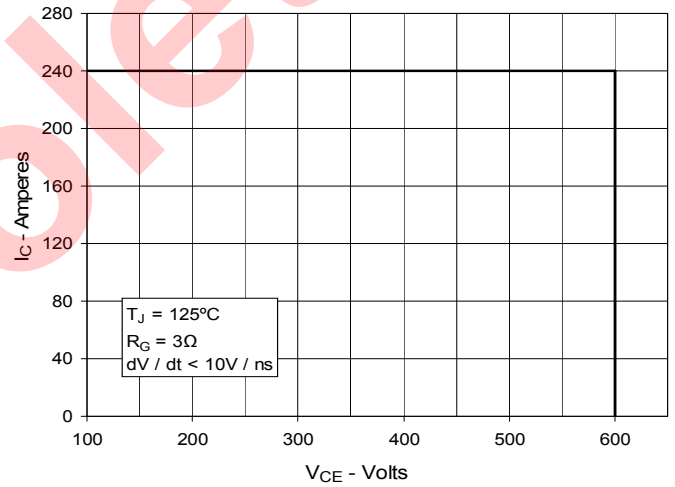
**Fig. 8. Gate Charge**



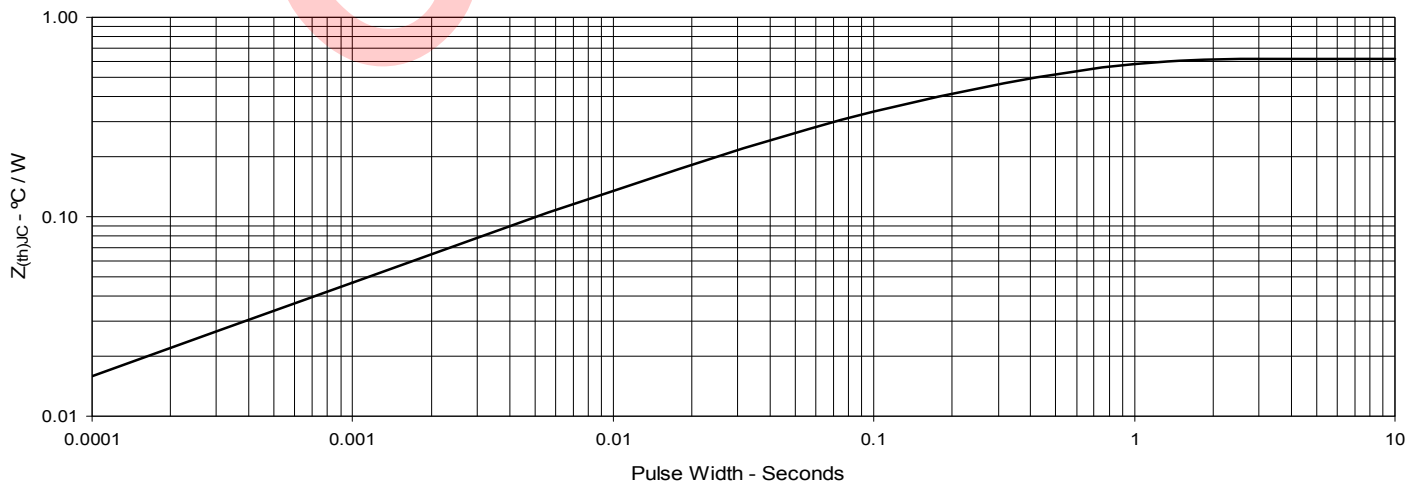
**Fig. 9. Capacitance**



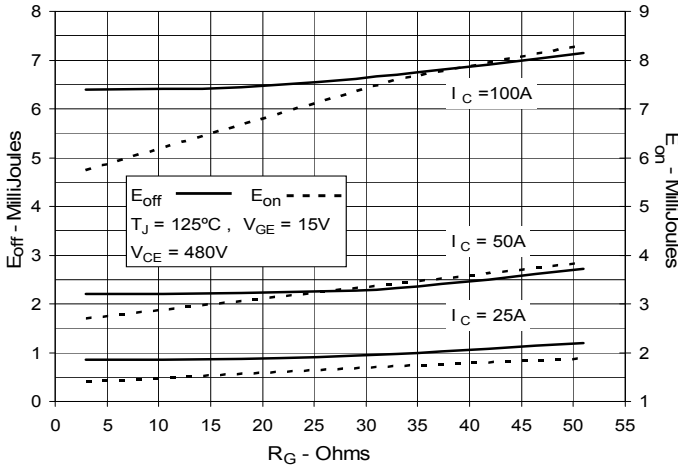
**Fig. 10. Reverse-Bias Safe Operating Area**



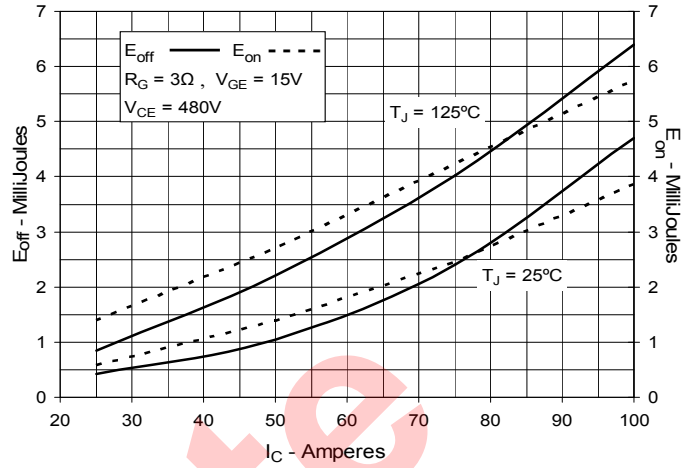
**Fig. 11. Maximum Transient Thermal Impedance**



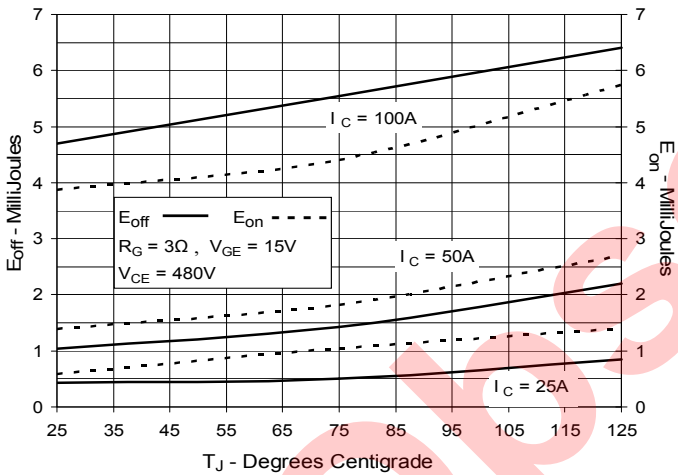
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



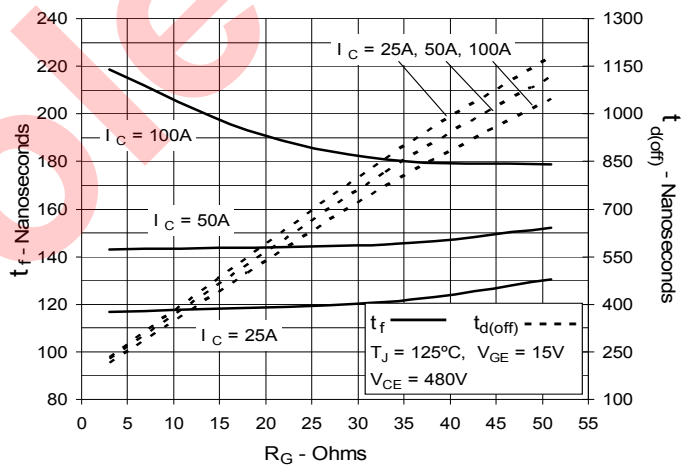
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



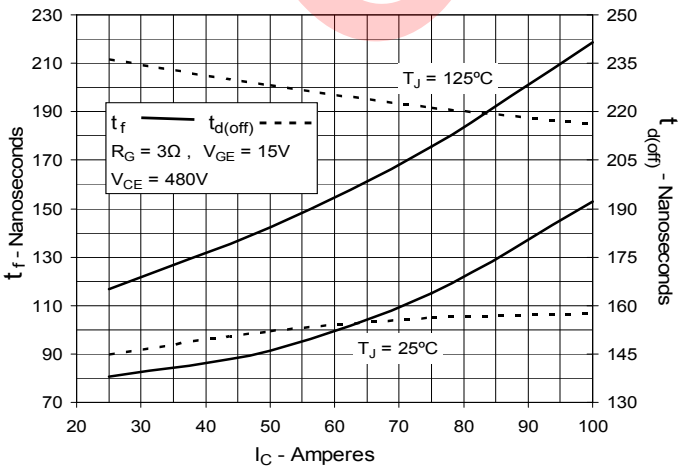
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



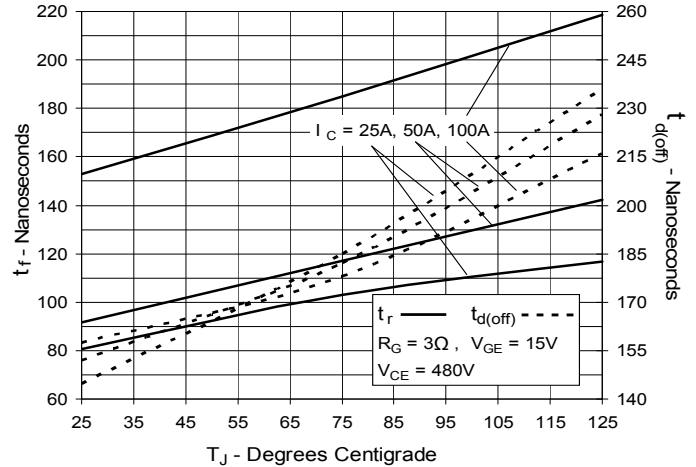
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



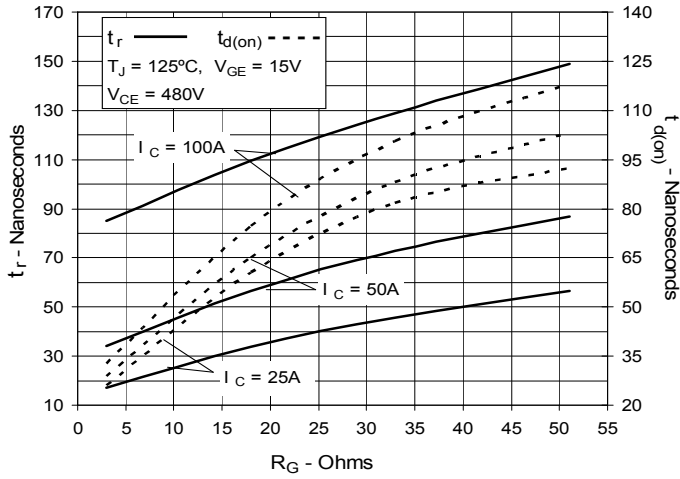
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



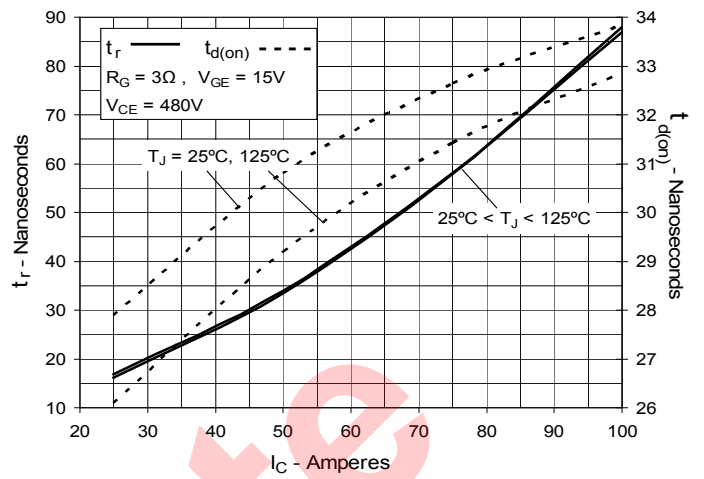
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



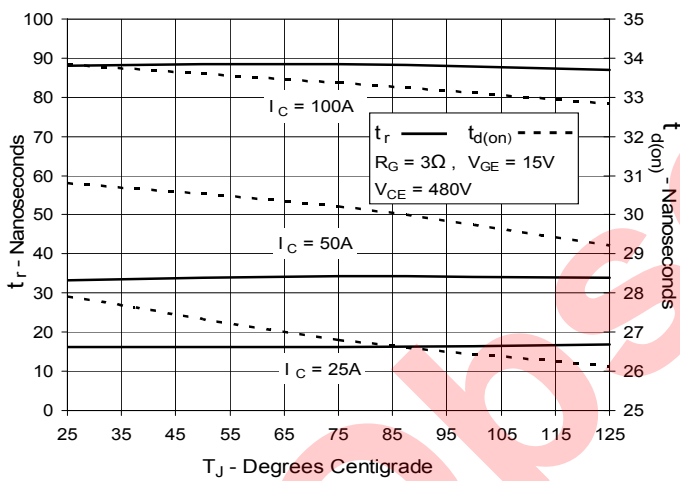
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



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



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



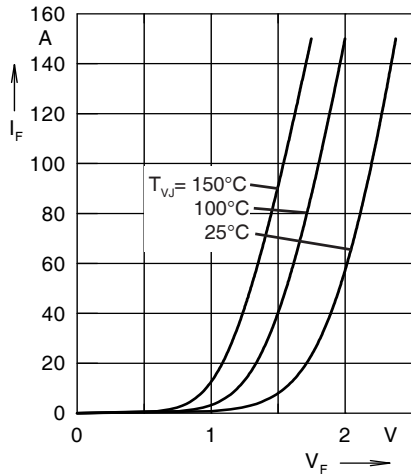


Fig. 21. Forward Current  $I_F$  Versus  $V_F$

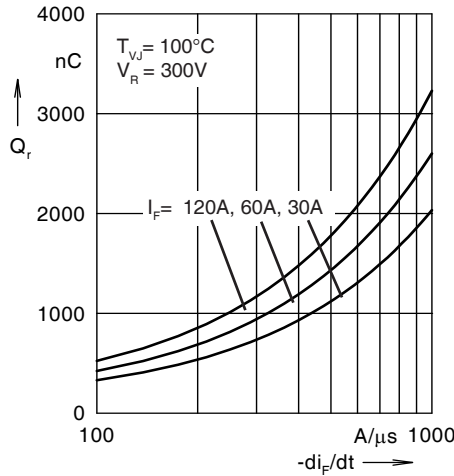


Fig. 22. Reverse Recovery Charge  $Q_r$  Versus  $-di_F/dt$

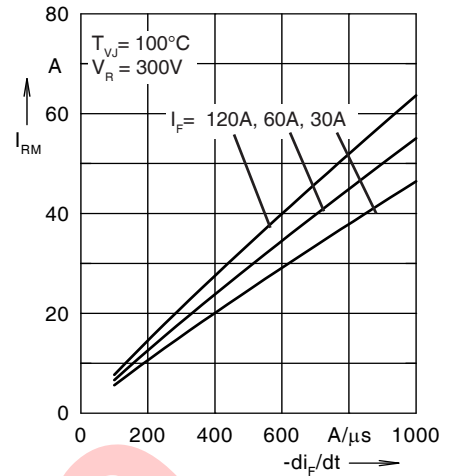


Fig. 23. Peak Reverse Current  $I_{RM}$  Versus  $-di_F/dt$

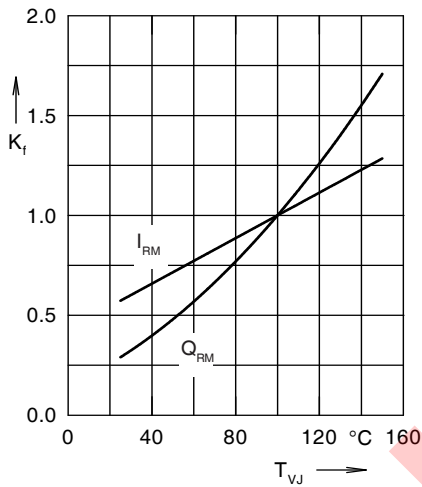


Fig. 24. Dynamic Parameters  $Q_r, I_{RM}$  Versus  $T_{VJ}$

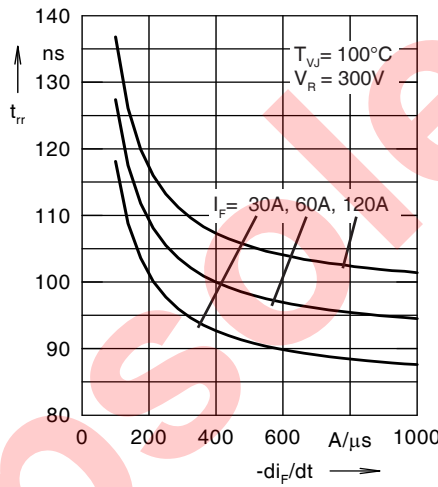


Fig. 25. Recovery Time  $t_{rr}$  Versus  $-di_F/dt$

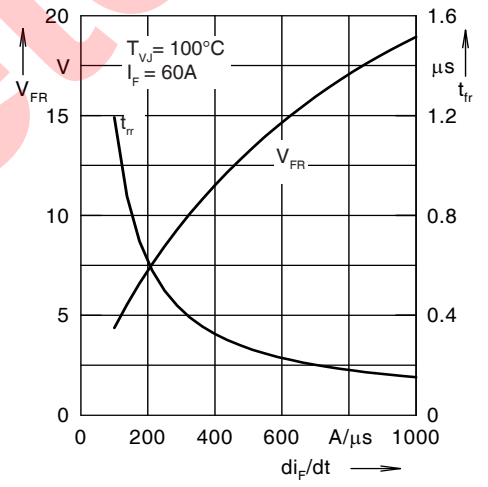


Fig. 26. Peak Forward Voltage  $V_{FR}$  and  $t_{rr}$  Versus  $-di_F/dt$

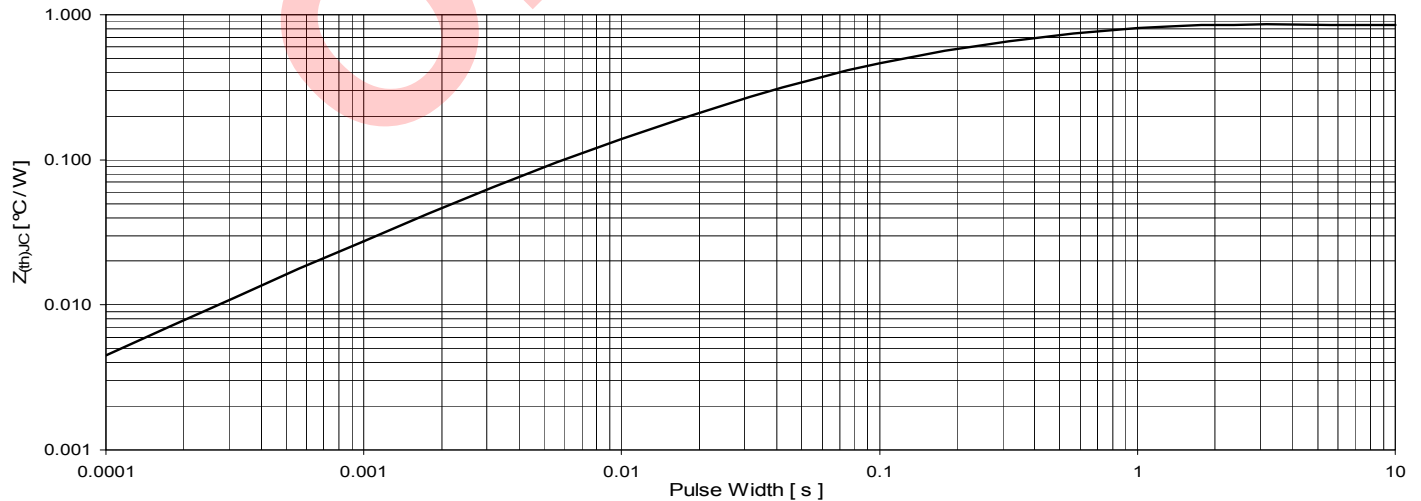


Fig. 27. Maximum Transient Thermal Impedance Junction to Case (for Diode)

Obsolete



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