

# GenX3™ 600V IGBTs w/ Diode

## IXGA30N60C3D4\*

## IXGP30N60C3D4

\*Obsolete Part Number

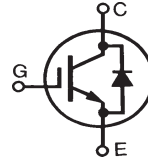
$V_{CES} = 600V$

$I_{C110} = 30A$

$V_{CE(sat)} \leq 3.0V$

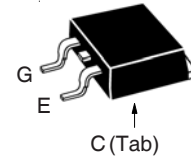
$t_{fi(typ)} = 47ns$

High-Speed PT IGBTs for  
40-100kHz Switching

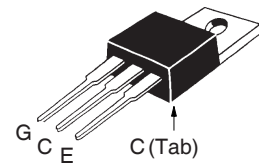


Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_C = 25^\circ C$ to $150^\circ C$	600	V
$V_{CGR}$	$T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$	600	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$	60	A
$I_{C110}$	$T_C = 110^\circ C$	30	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	150	A
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 5\Omega$ Clamped Inductive Load	$I_{CM} = 60$ @ $\leq V_{CES}$	A
$P_C$	$T_C = 25^\circ C$	220	W
$T_J$		-55 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		-55 ... +150	$^\circ C$
$T_L$	1.6mm (0.062 in.) from Case for 10s	300	$^\circ C$
$T_{SOLD}$	Plastic Body for 10 seconds	260	$^\circ C$
$M_d$	Mounting Torque (TO-220)	1.13/10	Nm/lb.in.
<b>Weight</b>	TO-220	2.5	g
	TO-263	3.0	g

TO-263 AA (IXGA)



TO-220AB (IXGP)



G = Gate      D = Collector  
S = Emitter    Tab = Collector

### Features

- Optimized for Low Switching Losses
- Square RBSOA
- Anti-Parallel Ultra Fast Diode
- International Standard Packages

### Advantages

- High Power Density
- Low Gate Drive Requirement

### Applications

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

Symbol	Test Conditions ( $T_J = 25^\circ C$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 250\mu A$ , $V_{GE} = 0V$	600		V
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	4.0		5.5 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ $T_J = 125^\circ C$			75 $\mu A$
				500 $\mu A$
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 20A$ , $V_{GE} = 15V$ , Note 1 $T_J = 125^\circ C$	2.6		3.0 V
		1.8		V

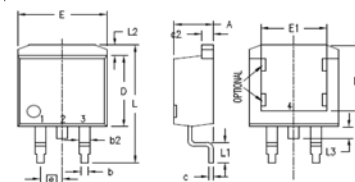
Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 20\text{A}, V_{CE} = 10\text{V}$ , Note 1	9	16	S
$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		915	pF
$C_{oes}$			78	pF
$C_{res}$			32	pF
$Q_g$	$I_C = 20\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		38	nC
$Q_{ge}$			8	nC
$Q_{gc}$			17	nC
$t_{d(on)}$	<b>Inductive Load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 20\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 300\text{V}, R_G = 5\Omega$		16	ns
$t_{ri}$			26	ns
$E_{on}$			0.27	mJ
$t_{d(off)}$			42	75 ns
$t_{hi}$			47	ns
$E_{off}$			0.09	0.18 mJ
$t_{d(on)}$	<b>Inductive Load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = 20\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 300\text{V}, R_G = 5\Omega$		17	ns
$t_{ri}$			28	ns
$E_{on}$			0.44	mJ
$t_{d(off)}$			70	ns
$t_{hi}$			90	ns
$E_{off}$			0.33	mJ
$R_{thJC}$				0.56 $^\circ\text{C/W}$
$R_{thCS}$	TO-220	0.50		$^\circ\text{C/W}$

### Reverse Diode (FRED)

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values			
		Min.	Typ.	Max.	
$V_F$	$I_F = 10\text{A}, V_{GE} = 0\text{V}$ , Note 1 $T_J = 150^\circ\text{C}$		1.7	3.0 V	
$t_{rr}$	$I_F = 10\text{A}, -di_F/dt = 200\text{A}/\mu\text{s}$ $V_R = 300\text{V}$	$T_J = 100^\circ\text{C}$	60	ns	
$I_{RM}$		$T_J = 25^\circ\text{C}$		3	A
		$T_J = 100^\circ\text{C}$		4	A
$R_{thJC}$				2.5 $^\circ\text{C/W}$	

Note 1: Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

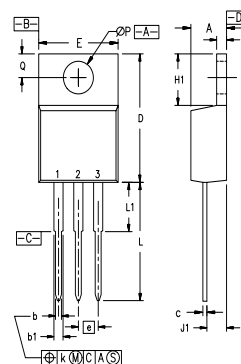
### TO-263 Outline



- 1 = Gate
- 2 = Collector
- 3 = Emitter
- 4 = Collector

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.160	.190	4.06	4.83
A1	.080	.110	2.03	2.79
b	.020	.039	0.51	0.99
b2	.045	.055	1.14	1.40
c	.016	.029	0.40	0.74
c2	.045	.055	1.14	1.40
D	.340	.380	8.64	9.65
D1	.315	.350	8.00	8.89
E	.380	.410	9.65	10.41
E1	.245	.320	6.22	8.13
e	.100 BSC		2.54 BSC	
L	.575	.625	14.61	15.88
L1	.090	.110	2.29	2.79
L2	.040	.055	1.02	1.40
L3	.050	.070	1.27	1.78
L4	0	.005	0	0.13

### TO-220 Outline



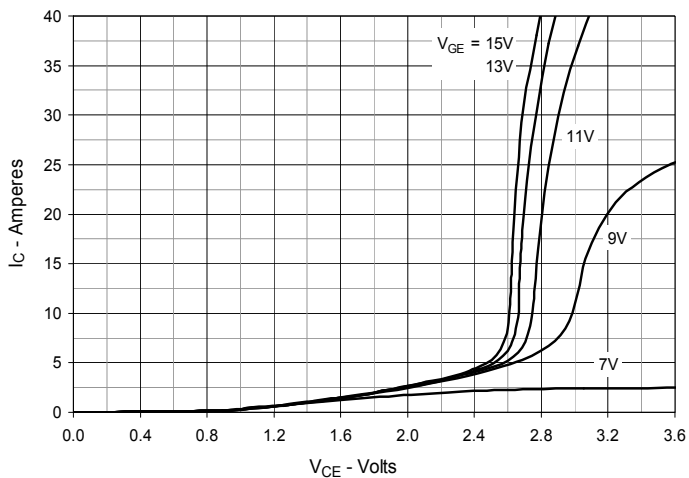
- 1 = Gate
- 2 = Collector
- 3 = Emitter

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.170	.190	4.32	4.83
b	.025	.040	0.64	1.02
b1	.045	.065	1.15	1.65
c	.014	.022	0.35	0.56
D	.580	.630	14.73	16.00
E	.390	.420	9.91	10.66
e	.100 BSC		2.54 BSC	
F	.045	.055	1.14	1.40
H1	.230	.270	5.85	6.85
J1	.090	.110	2.29	2.79
k	0	.015	0	0.38
L	.500	.550	12.70	13.97
L1	.110	.230	2.79	5.84
ØP	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

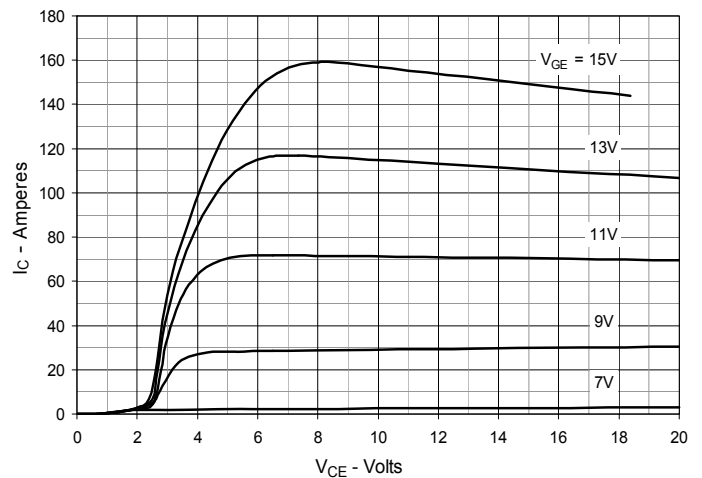
IXYS Reserves the Right to Change Limits, Test Conditions and Dimensions.

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	7,157,338 B2
	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	

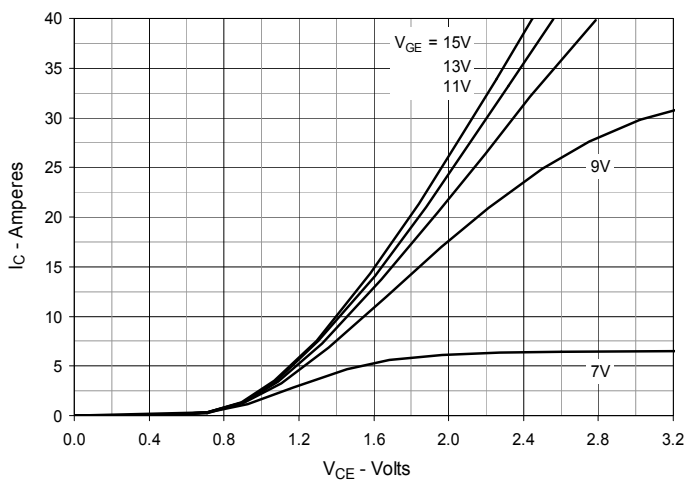
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



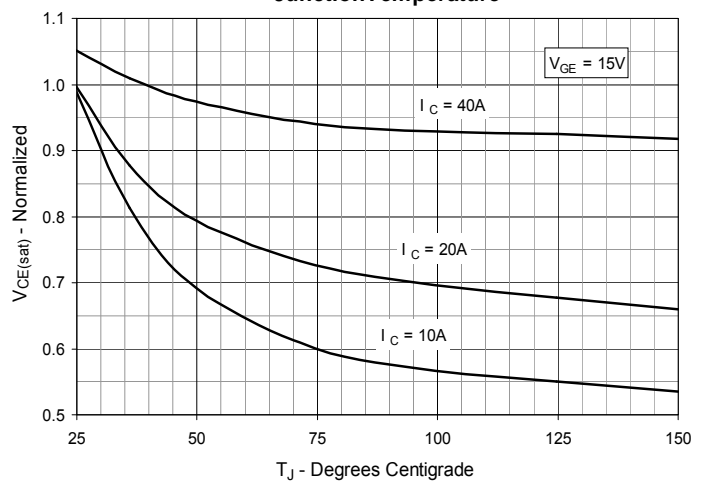
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



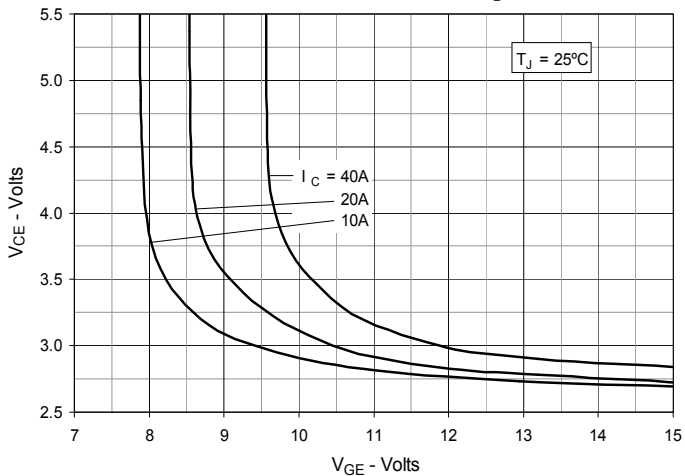
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



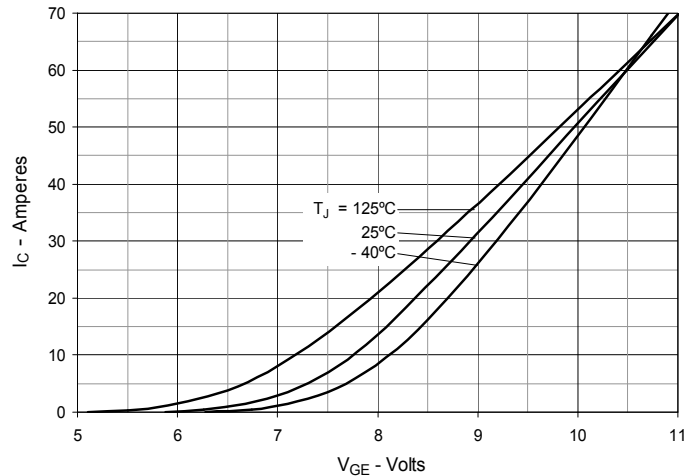
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



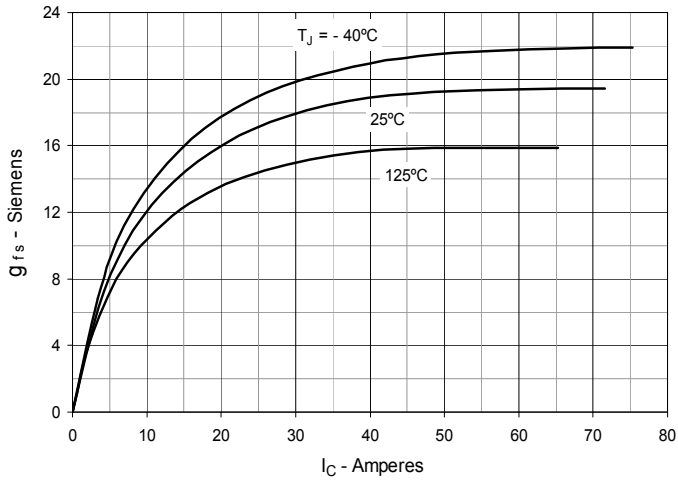
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



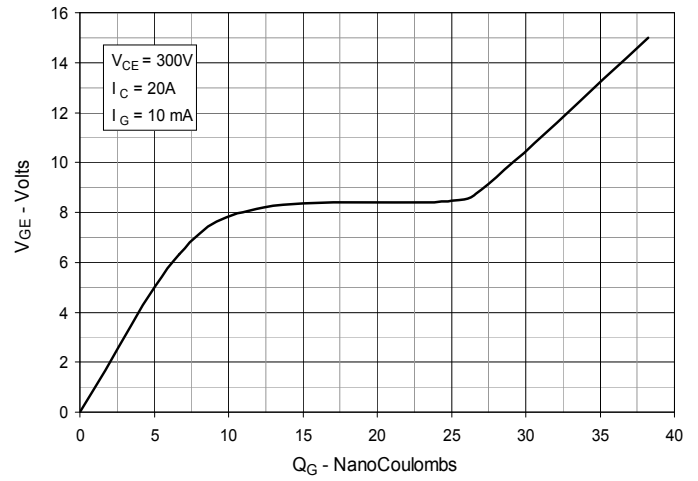
**Fig. 6. Input Admittance**



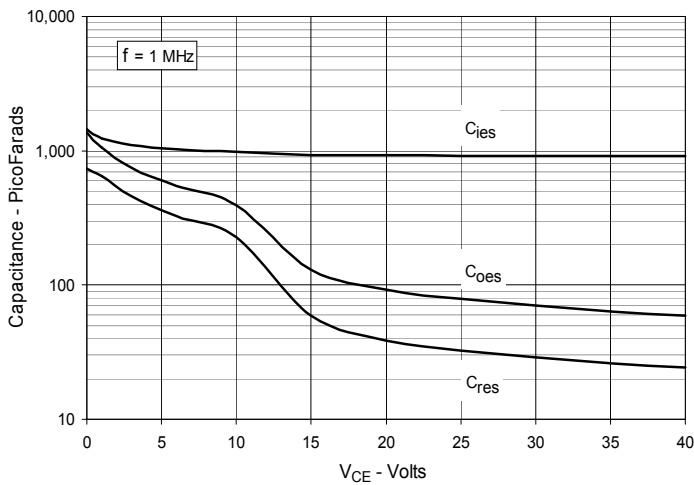
**Fig. 7. Transconductance**



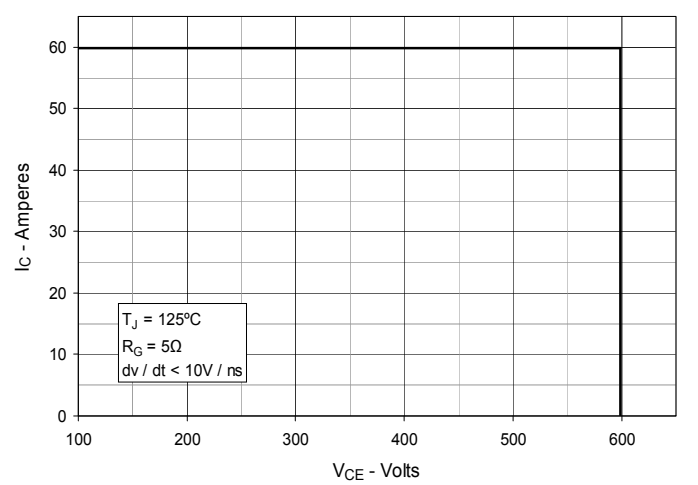
**Fig. 8. Gate Charge**



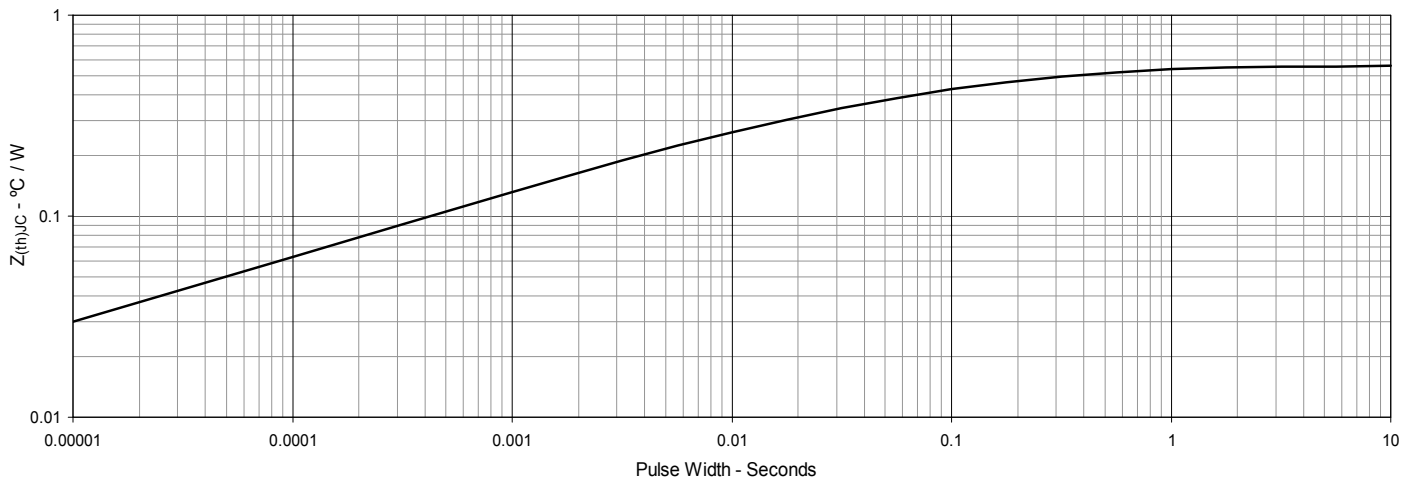
**Fig. 9. Capacitance**



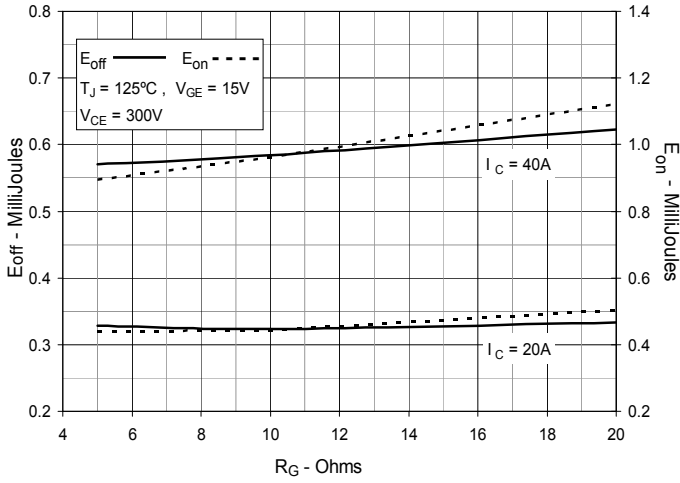
**Fig. 10. Reverse-Bias Safe Operating Area**



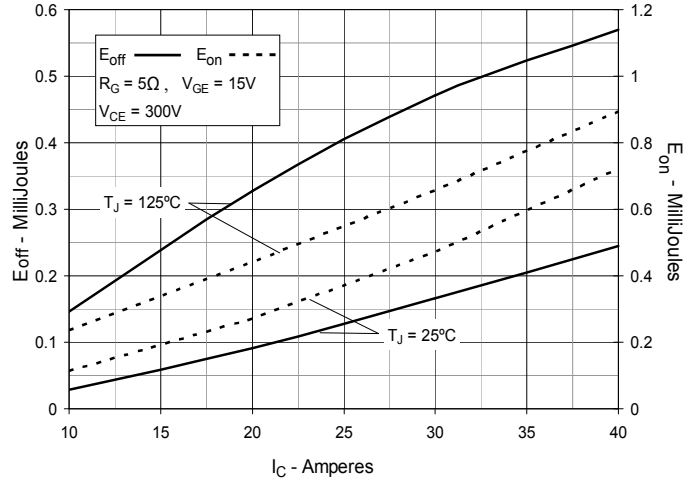
**Fig. 11. Maximum Transient Thermal Impedance**



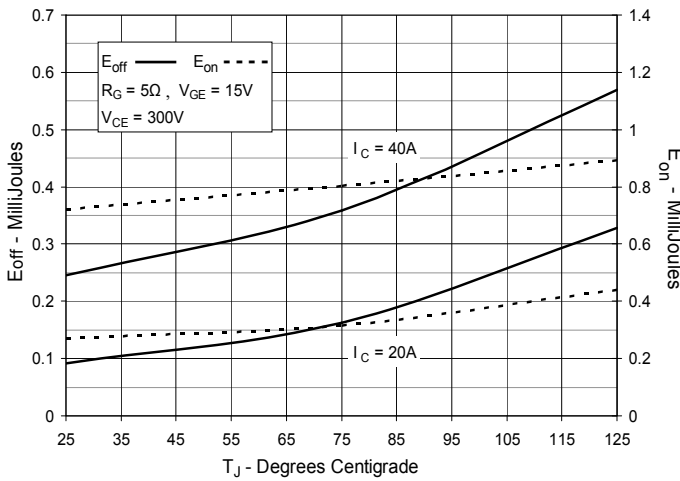
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



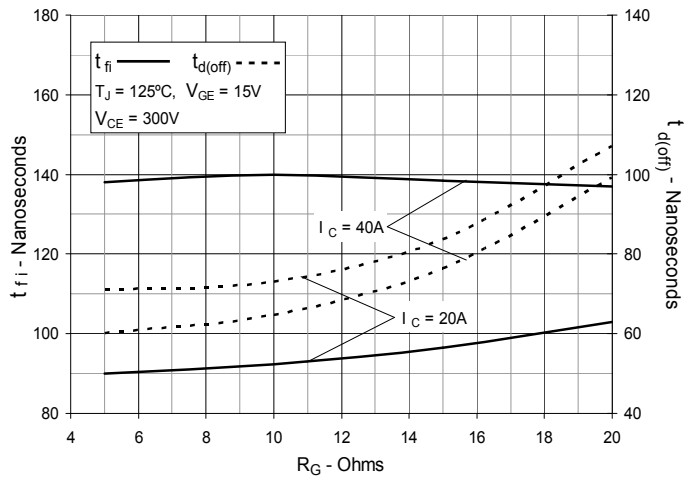
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



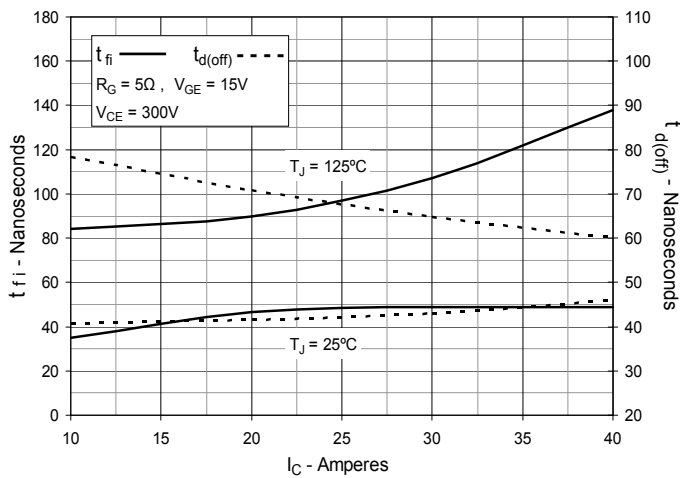
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



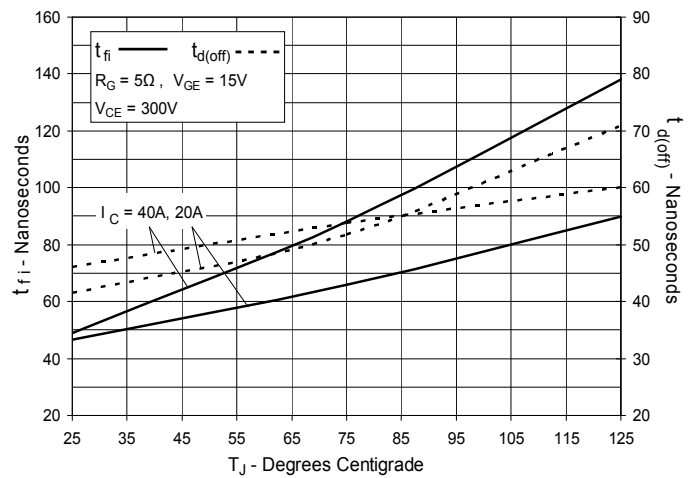
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



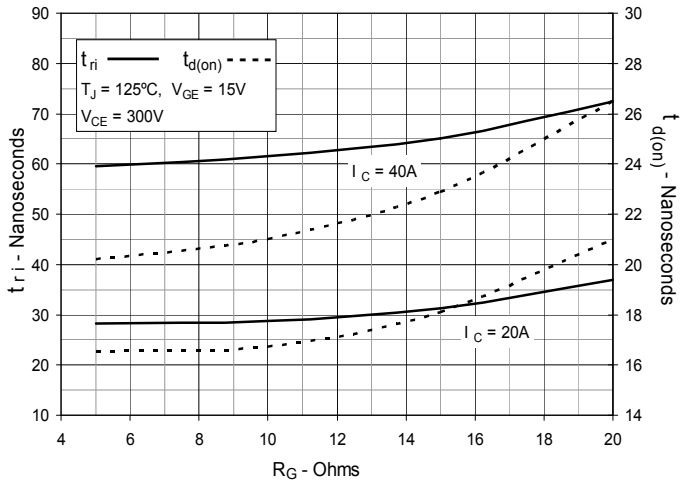
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



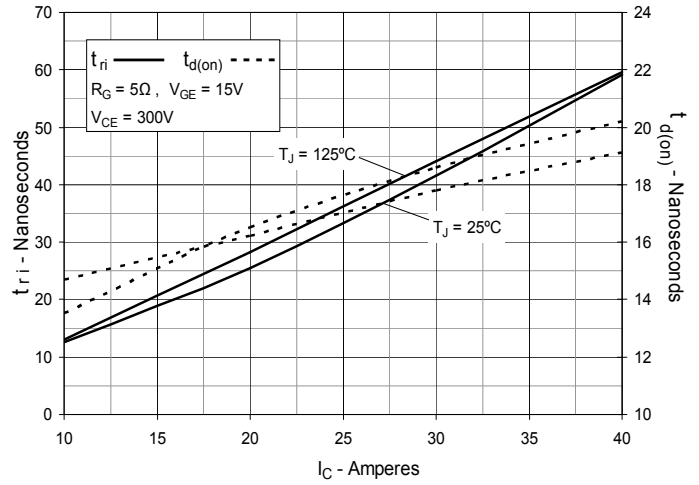
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



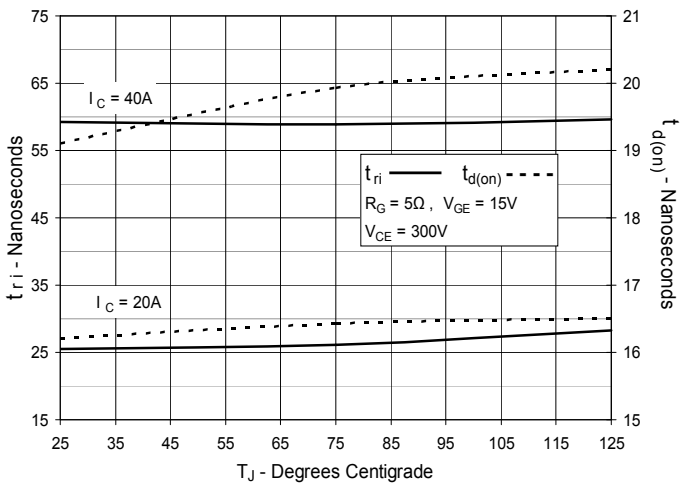
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



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



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



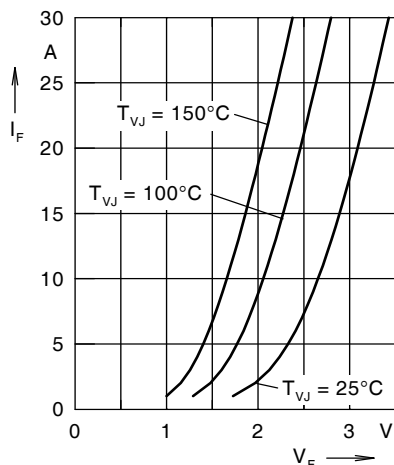


Fig. 21. Forward current  $I_F$  versus  $V_F$

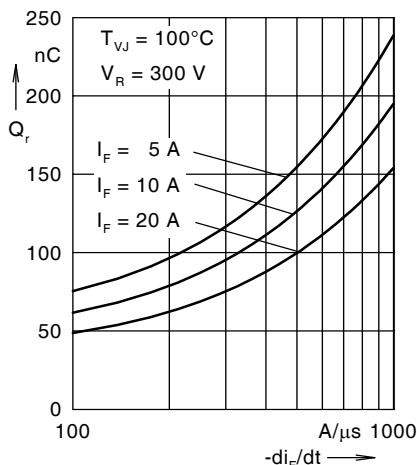


Fig. 22. Reverse recovery charge  $Q_r$

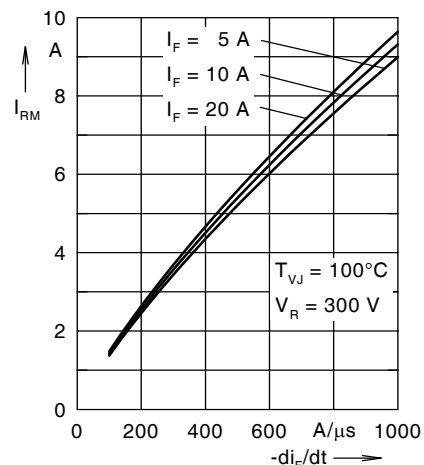


Fig. 23. Peak reverse current  $I_{RM}$

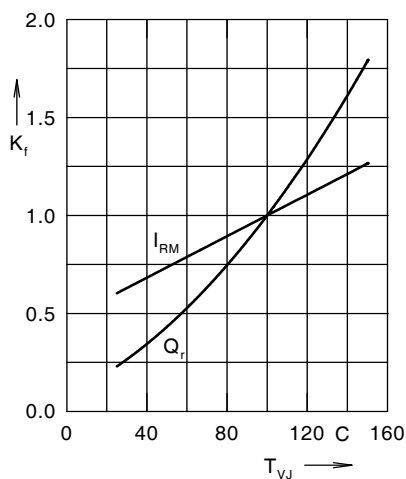


Fig. 24. Dynamic parameters  $Q_r$ ,  $I_{RM}$

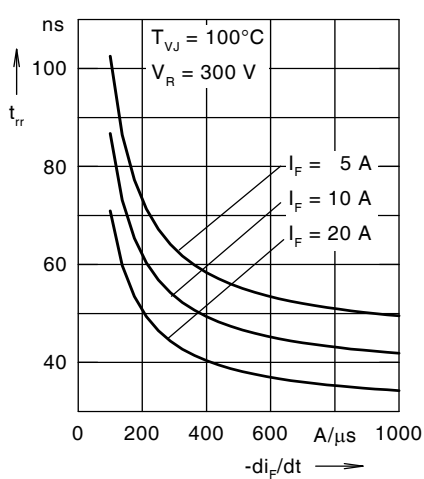


Fig. 25. Recovery time  $t_{rr}$  versus  $-di_F/dt$

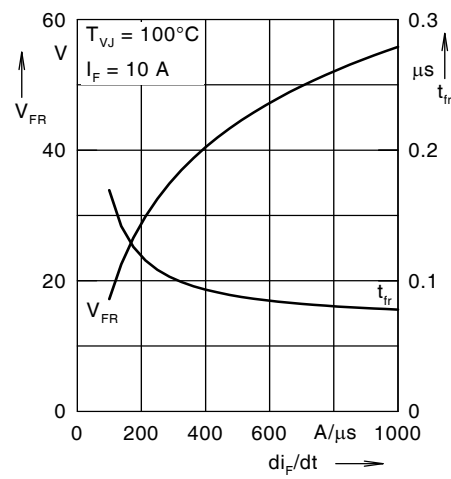


Fig. 26. Peak forward voltage  $V_{FR}$  and  $t_{rr}$

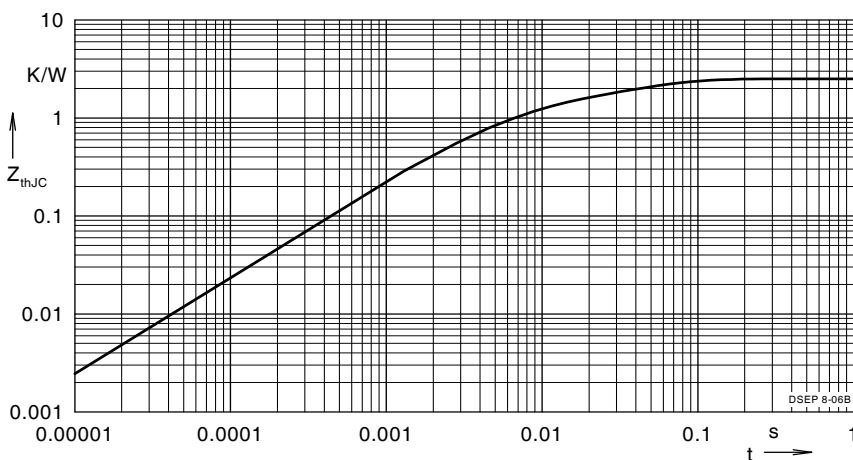


Fig. 27. Transient thermal resistance junction-to-case

NOTE: Fig. 2 to Fig. 6 shows typical values



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