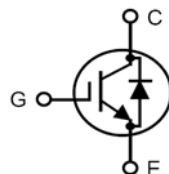


# 900V XPT™ IGBT GenX3™ w/ Diode

# IXYA8N90C3D1 IXYP8N90C3D1

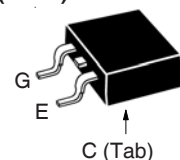
High-Speed IGBT  
for 20-50 kHz Switching



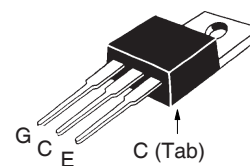
$V_{CES} = 900V$   
 $I_{C110} = 8A$   
 $V_{CE(sat)} \leq 3.0V$   
 $t_{fi(typ)} = 130ns$

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ C$ to $175^\circ C$	900	V
$V_{CGR}$	$T_J = 25^\circ C$ to $175^\circ C$ , $R_{GE} = 1M\Omega$	900	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$	20	A
$I_{C110}$	$T_C = 110^\circ C$	8	A
$I_{F110}$	$T_C = 110^\circ C$	12	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	48	A
$I_A$	$T_C = 25^\circ C$	4	A
$E_{AS}$	$T_C = 25^\circ C$	15	mJ
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 150^\circ C$ , $R_G = 30\Omega$ Clamped Inductive Load	$I_{CM} = 16$ @ $V_{CE} \leq V_{CES}$	A
$P_C$	$T_C = 25^\circ C$	125	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 (TO-220)	1.13/10	Nm/lb.in.
$F_C$	Mounting Force (TO-263)	10..65 / 2.2..14.6	N/lb.
<b>Weight</b>	TO-263	2.5	g
	TO-220	3.0	g

TO-263 AA (IXYA)



TO-220AB (IXYP)



G = Gate      C = Collector  
E = Emitter    Tab = Collector

## Features

- Optimized for Low Switching Losses
- Square RBSOA
- Positive Thermal Coefficient of  $V_{ce(sat)}$
- Anti-Parallel Ultra Fast Diode
- Avalanche Rated
- International Standard Packages

## Advantages

- High Power Density
- Low Gate Drive Requirement

## Applications

- High Frequency 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.
$BV_{CES}$	$I_C = 250\mu A$ , $V_{GE} = 0V$	950		V
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	3.5		6.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ $T_J = 125^\circ C$			60 $\mu A$ 400 $\mu A$
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 8A$ , $V_{GE} = 15V$ , Note 1 $T_J = 125^\circ C$	2.15 2.60		3.00 V V

Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 8A, V_{CE} = 10V, \text{Note 1}$	2.9	4.8	S
$C_{ies}$	$V_{CE} = 25V, V_{GE} = 0V, f = 1\text{MHz}$		400	pF
$C_{oes}$			30	pF
$C_{res}$			7.8	pF
$Q_{g(on)}$	$I_C = 8A, V_{GE} = 15V, V_{CE} = 0.5 \cdot V_{CES}$		13.3	nC
$Q_{ge}$			3.4	nC
$Q_{gc}$			5.8	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 8A, V_{GE} = 15V$ $V_{CE} = 0.5 \cdot V_{CES}, R_G = 30\Omega$ Note 2		16	ns
$t_{ri}$			20	ns
$E_{on}$			0.46	mJ
$t_{d(off)}$			40	ns
$t_{fi}$			130	ns
$E_{off}$		0.18	0.50	mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = 8A, V_{GE} = 15V$ $V_{CE} = 0.5 \cdot V_{CES}, R_G = 30\Omega$ Note 2		17	ns
$t_{ri}$			22	ns
$E_{on}$			1.00	mJ
$t_{d(off)}$			75	ns
$t_{fi}$			163	ns
$E_{off}$		0.22	mJ	
$R_{thJC}$	TO-220			1.2 $^\circ\text{C/W}$
$R_{thCS}$			0.50	$^\circ\text{C/W}$

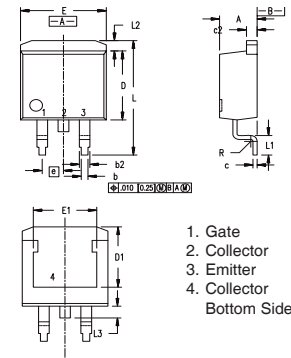
**Reverse Diode (FRED)**

Symbol Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)		Characteristic Value		
		Min.	Typ.	Max.
$V_F$	$I_F = 10A, V_{GE} = 0V, \text{Note 1}$			3.0 V
	$T_J = 150^\circ\text{C}$			2.0 V
$I_{RM}$	$I_F = 10A, V_{GE} = 0V, -di_F/dt = 200A/\mu\text{s}, T_J = 100^\circ\text{C}$		7.5	A
$t_{rr}$		$V_R = 600V, T_J = 100^\circ\text{C}$		114
$R_{thJC}$				2.5 $^\circ\text{C/W}$

**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  $R_G$ .

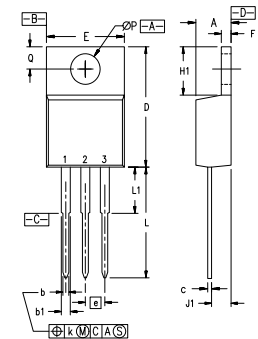
**TO-263 Outline**



1. Gate
  2. Collector
  3. Emitter
  4. Collector
- Bottom Side

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.06	4.83	.160	.190
b	0.51	0.99	.020	.039
b2	1.14	1.40	.045	.055
c	0.40	0.74	.016	.029
c2	1.14	1.40	.045	.055
D	8.64	9.65	.340	.380
D1	8.00	8.89	.280	.320
E	9.65	10.41	.380	.405
E1	6.22	8.13	.270	.320
e	2.54	BSC	.100	BSC
L	14.61	15.88	.575	.625
L1	2.29	2.79	.090	.110
L2	1.02	1.40	.040	.055
L3	1.27	1.78	.050	.070
L4	0	0.13	0	.005

**TO-220 Outline**



- Pins: 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	7,157,338B2
	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 @  $T_J = 25^\circ\text{C}$

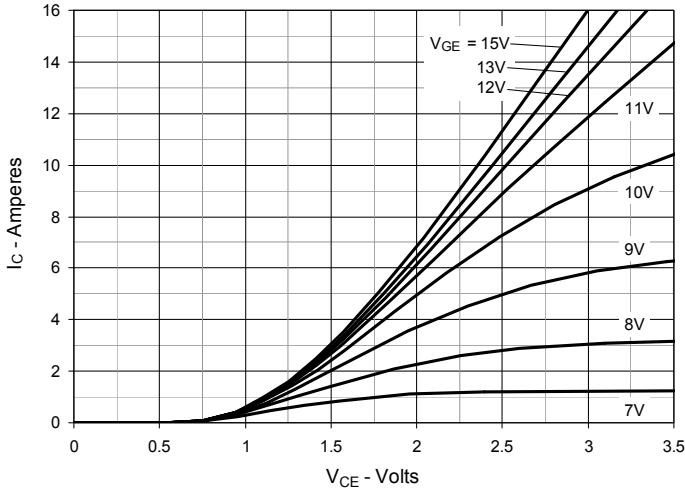


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

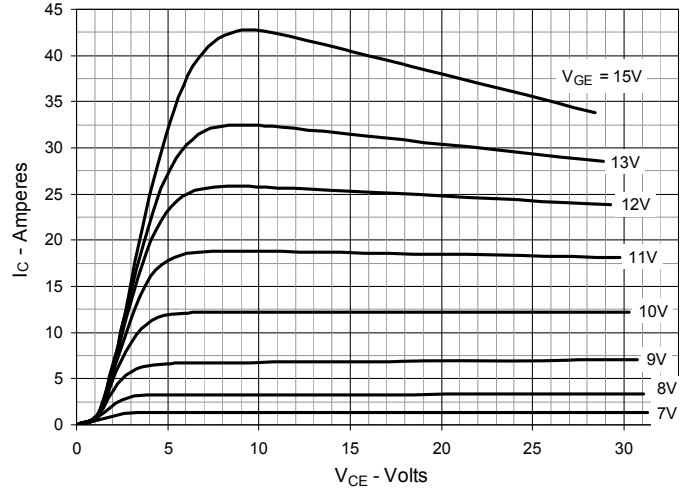


Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$

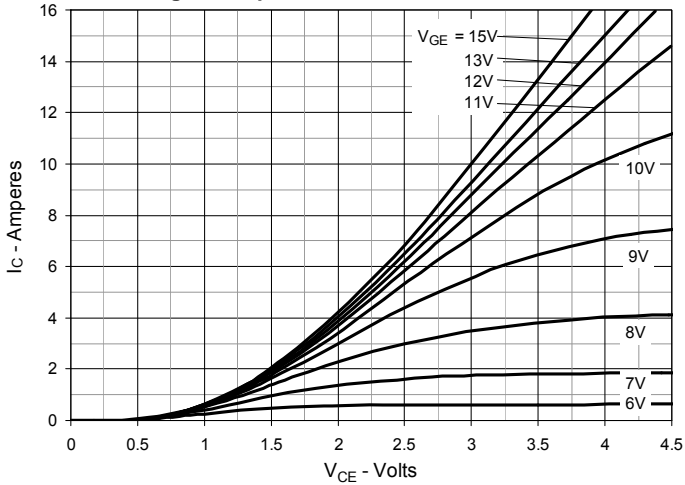


Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature

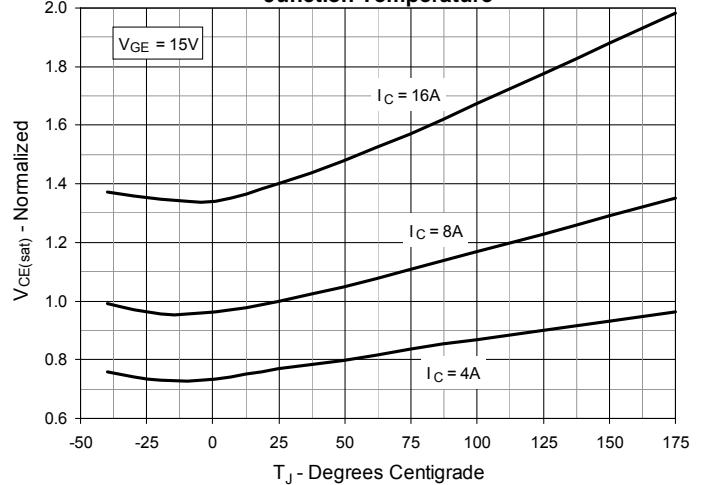


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

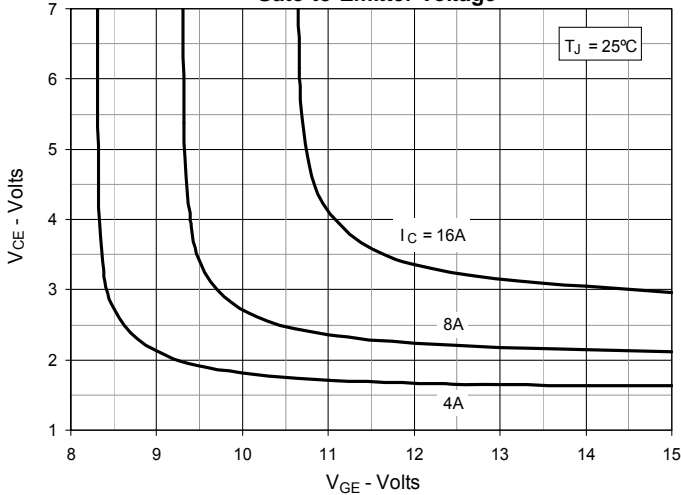


Fig. 6. Input Admittance

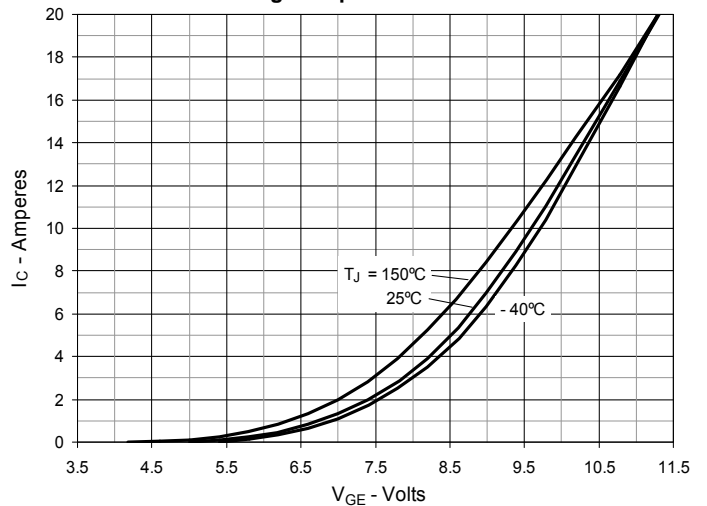


Fig. 7. Transconductance

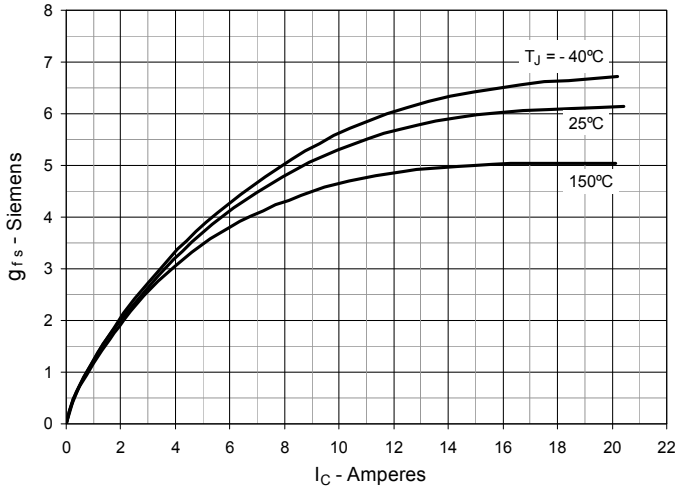


Fig. 8. Gate Charge

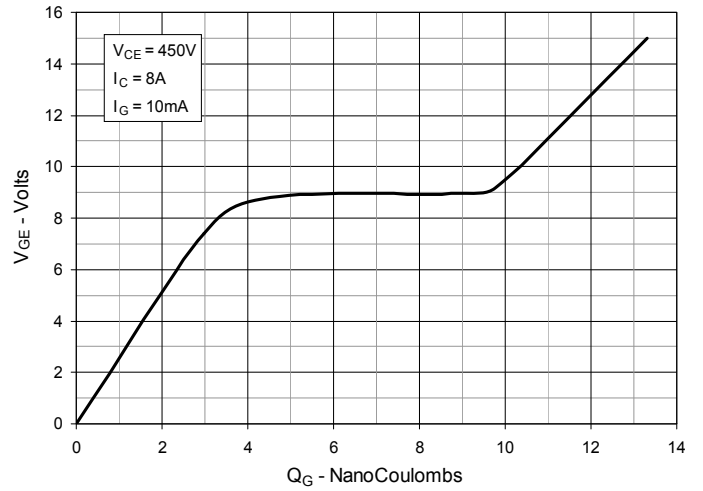


Fig. 9. Capacitance

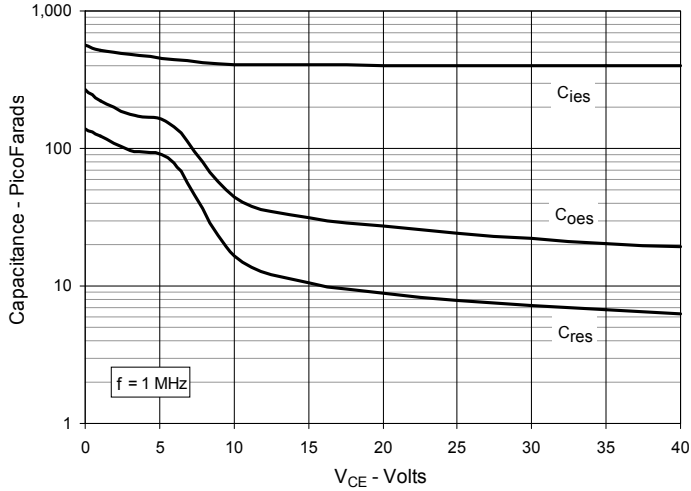


Fig. 10. Reverse-Bias Safe Operating Area

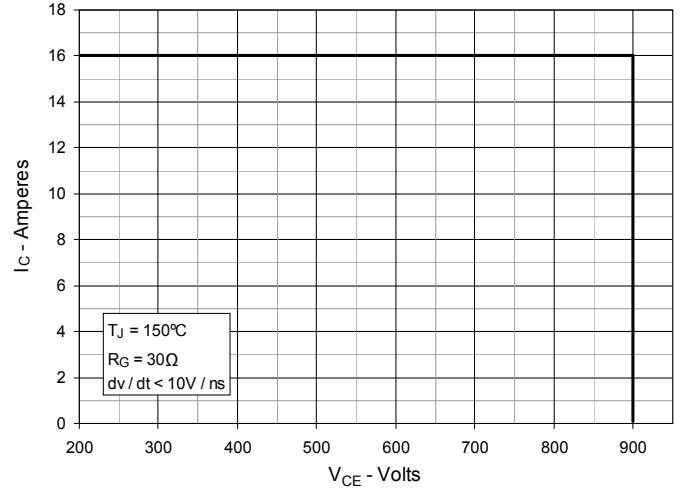
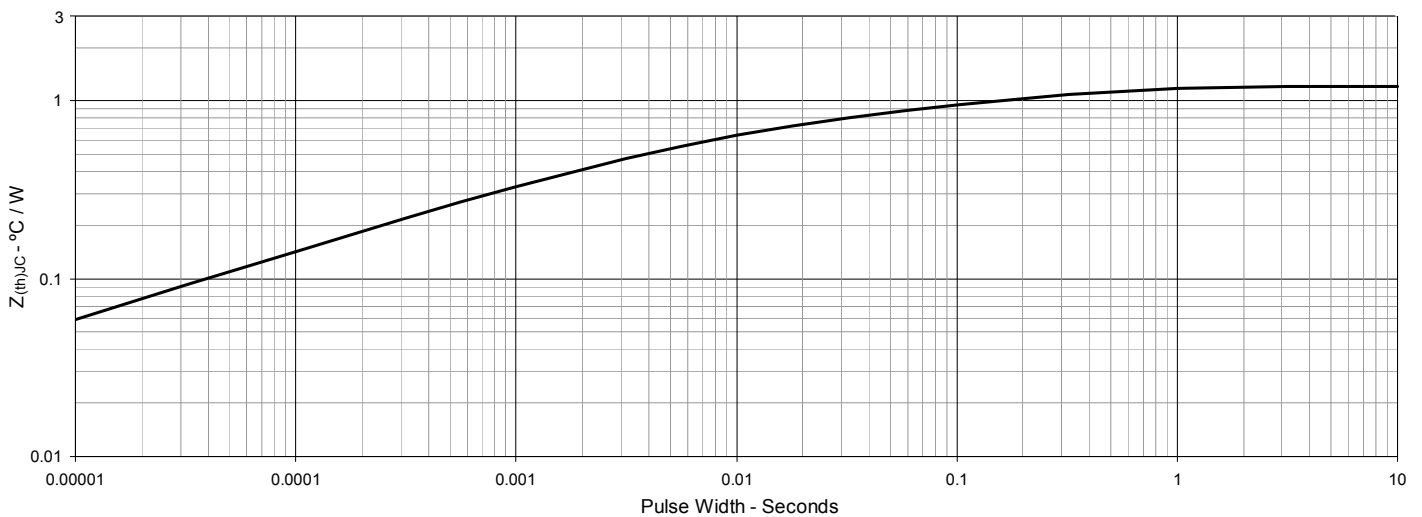
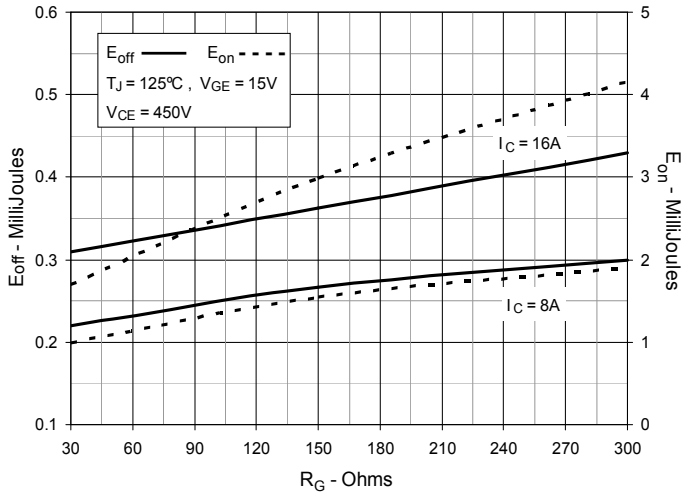


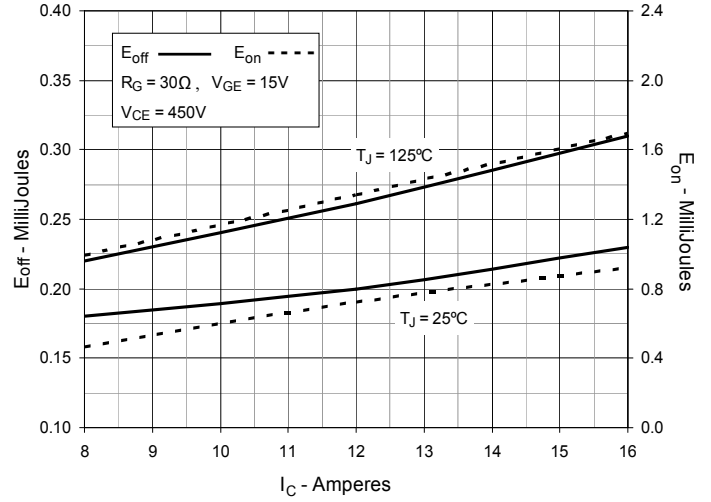
Fig. 11. Maximum Transient Thermal Impedance



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



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



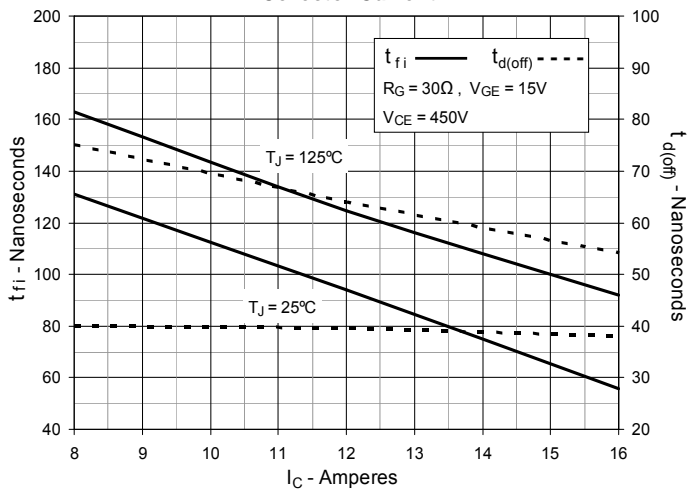
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



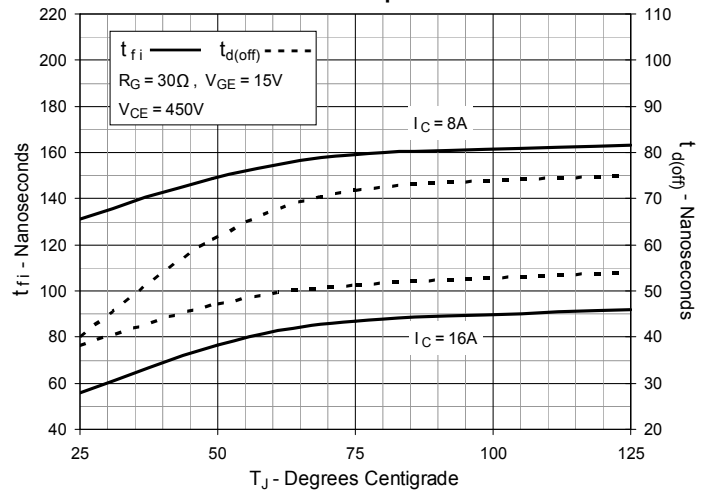
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



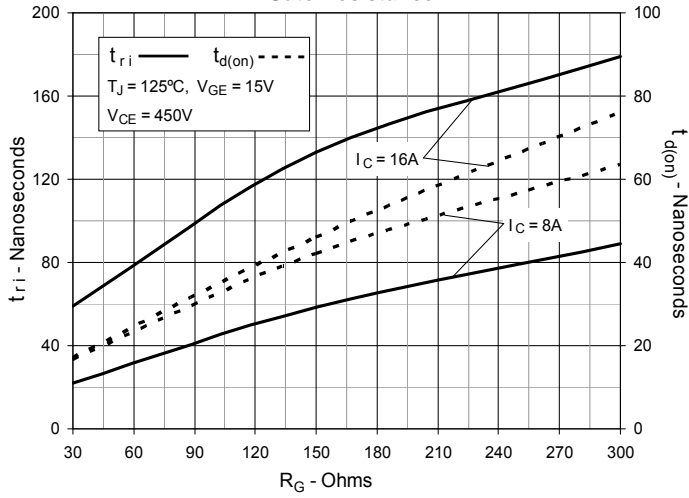
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



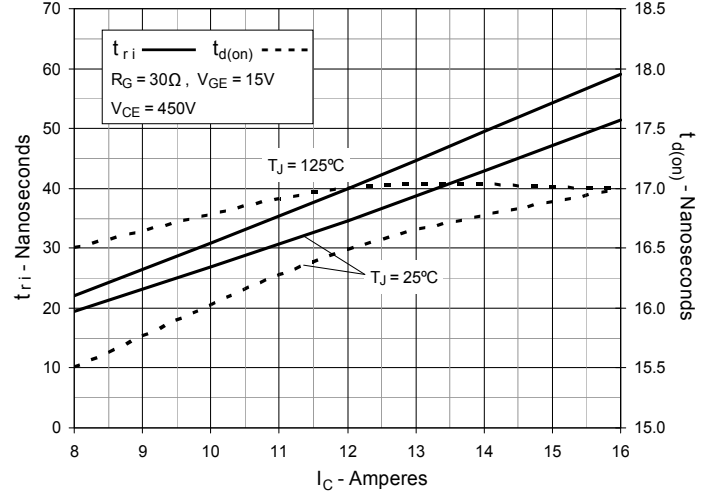
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



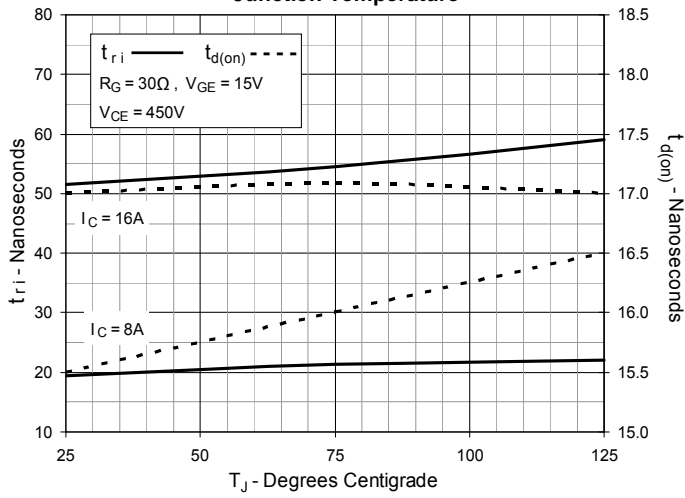
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



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



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



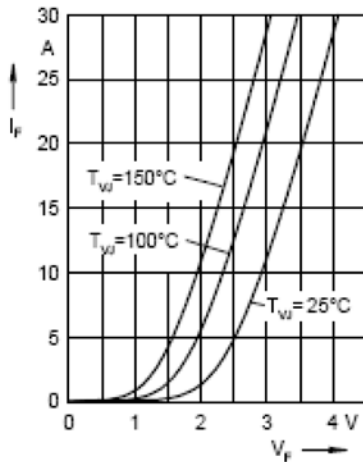


Fig. 21. Forward current  $I_F$  vs  $V_F$

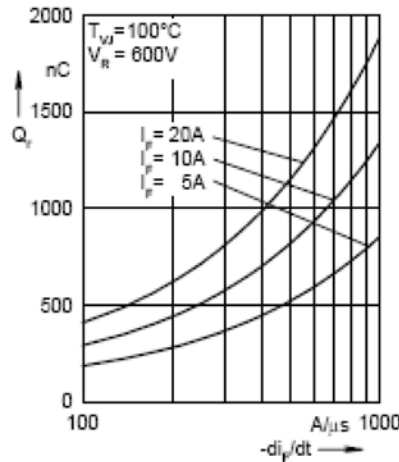


Fig. 22. Reverse recovery charge  $Q_r$  versus  $-di_F/dt$

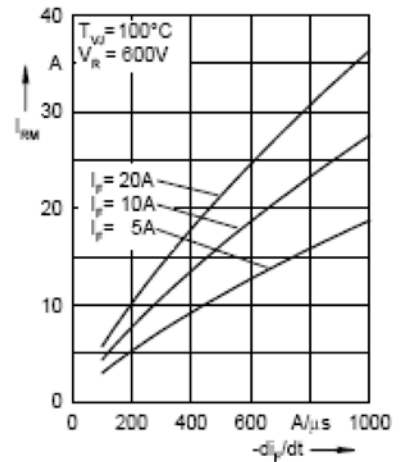


Fig. 23. Peak reverse current  $I_{RM}$  versus  $-di_F/dt$

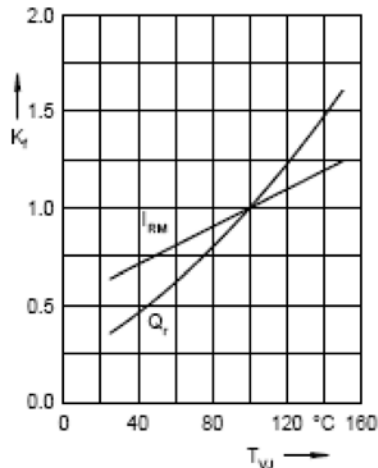


Fig. 24. Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{WJ}$

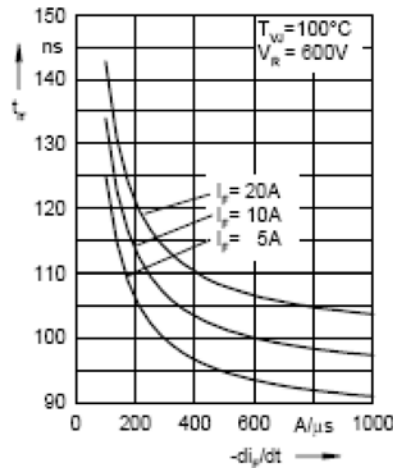


Fig. 25. Recovery time  $t_r$  versus  $-di_F/dt$

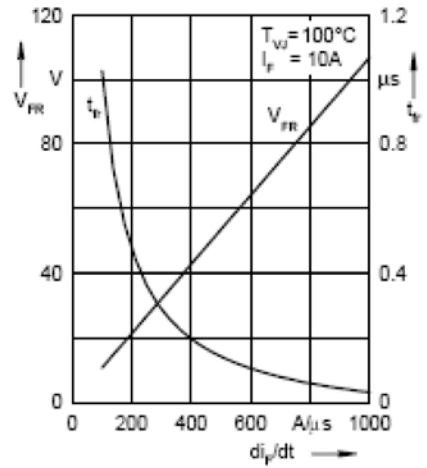


Fig. 26. Peak forward voltage  $V_{FR}$  and  $t_r$  versus  $di_F/dt$

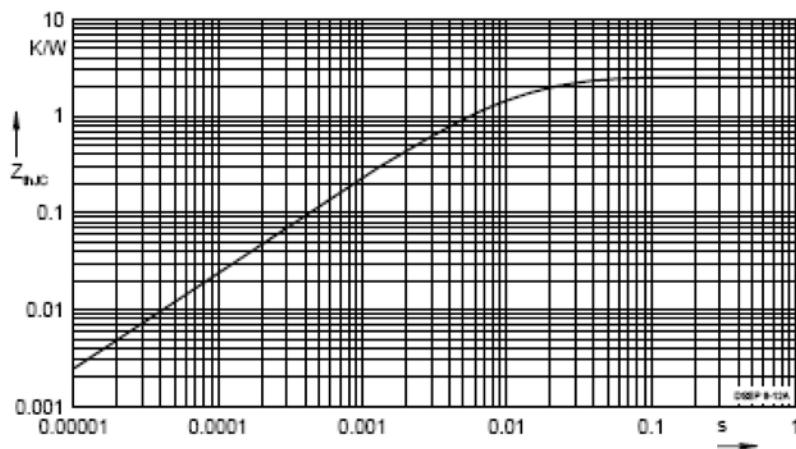


Fig. 27. Transient thermal resistance junction to case



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