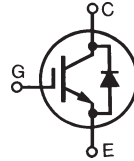


# GenX3™ 600V IGBT with Diode

# IXGH30N60C3D1 IXGT30N60C3D1

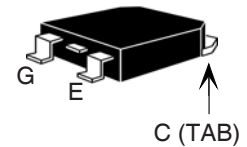
High speed PT IGBTs for  
40-100 kHz Switching



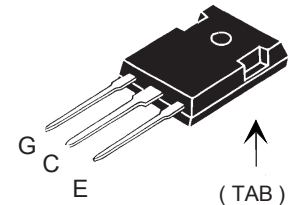
$V_{CES} = 600V$   
 $I_{C110} = 30A$   
 $V_{CE(sat)} \leq 3.0V$   
 $t_{fi(typ)} = 47ns$

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
$I_{C25}$	$T_C = 25^\circ C$	60	A
$I_{C110}$	$T_C = 110^\circ C$	30	A
$I_{D110}$	$T_C = 110^\circ C$	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 @ $V_{CE} \leq 600V$	$I_{CM} = 60$	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	$^\circ C$
$F_c$	Mounting torque (TO-247)	1.13/10	Nm/lb.in
<b>Weight</b>	TO-268	4	g
	TO-247	6	g

## TO-268 (IXGT)



## TO-247 (IXGH)



G = Gate      C = Collector  
 E = 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

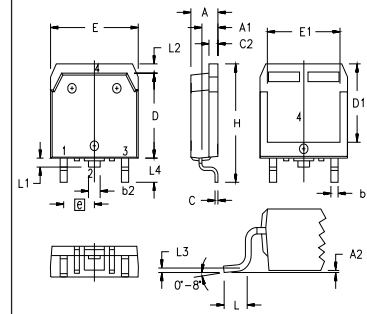
## Applications

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

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ C$ , unless otherwise specified)		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 250\mu A$ , $V_{GE} = 0V$	600		V
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	3.5		5.5 V
$I_{CES}$	$V_{CE} = V_{CES}$ $V_{GE} = 0V$ $T_J = 125^\circ C$			75 $\mu A$ 1 mA
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 20A$ , $V_{GE} = 15V$ , Note 1 $T_J = 125^\circ C$	2.6 1.8		3.0 V V

Symbol	Test Conditions	Characteristic Values			
		Min.	Typ.	Max.	
$g_{fs}$	$I_C = 20A, V_{CE} = 10V$ , Note 1	9	30	S	
$C_{ies}$ $C_{oes}$ $C_{res}$	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		915	pF	
			78	pF	
			32	pF	
$Q_g$ $Q_{ge}$ $Q_{gc}$	$I_C = 20A, V_{GE} = 15V, V_{CE} = 0.5 \cdot V_{CES}$		38	nC	
			8	nC	
			17	nC	
$t_{d(on)}$ $t_{ri}$ $E_{on}$ $t_{d(off)}$ $t_{fi}$ $E_{off}$	Inductive load, $T_J = 25^\circ C$ $I_C = 20A, V_{GE} = 15V$ $V_{CE} = 300V, R_G = 5\Omega$		16	ns	
			26	ns	
			0.27	mJ	
			42	75	ns
			47	ns	
			0.09	0.18	mJ
$t_{d(on)}$ $t_{ri}$ $E_{on}$ $t_{d(off)}$ $t_{fi}$ $E_{off}$	Inductive load, $T_J = 125^\circ C$ $I_C = 20A, V_{GE} = 15V$ $V_{CE} = 300V, R_G = 5\Omega$		17	ns	
			28	ns	
			0.44	mJ	
			70	ns	
			90	ns	
			0.33	mJ	
$R_{thJC}$ $R_{thCS}$	(TO-247)	0.21	0.56	$^\circ C/W$ $^\circ C/W$	

### TO-268 (IXGT) Outline



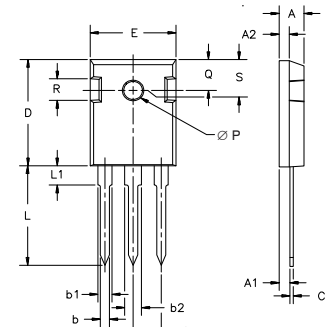
SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
A2	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
b2	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E1	.524	.535	13.30	13.60
e	.215 BSC		5.45 BSC	
H	.736	.752	18.70	19.10
L	.094	.106	2.40	2.70
L1	.047	.055	1.20	1.40
L2	.039	.045	1.00	1.15
L3	.010 BSC		0.25 BSC	
L4	.150	.161	3.80	4.10

### Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 30A, V_{GE} = 0V$ , Note 1 $T_J = 150^\circ C$		1.6	2.7 V
$I_{RM}$ $t_{rr}$	$I_F = 30A, V_{GE} = 0V, -di_F/dt = 100A/\mu s, T_J = 100^\circ C$ $V_R = 100V, T_J = 100^\circ C$ $I_F = 1A, -di/dt = 100A/\mu s, V_R = 30V$		100	4 A
			25	ns
$R_{thJC}$				0.9 $^\circ C/W$

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

### TO-247 AD Outline



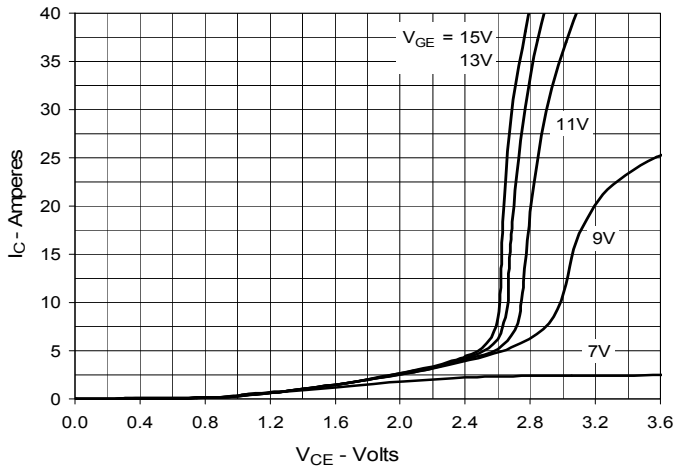
Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.7	5.3	.185	.209
A <sub>1</sub>	2.2	2.54	.087	.102
A <sub>2</sub>	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b <sub>1</sub>	1.65	2.13	.065	.084
b <sub>2</sub>	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L1		4.50		.177
∅P	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216

IXYS reserves the right to change limits, test conditions, and dimensions.

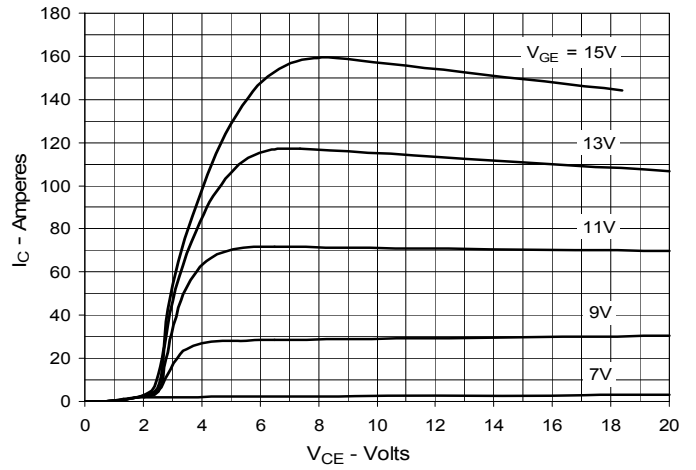
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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	

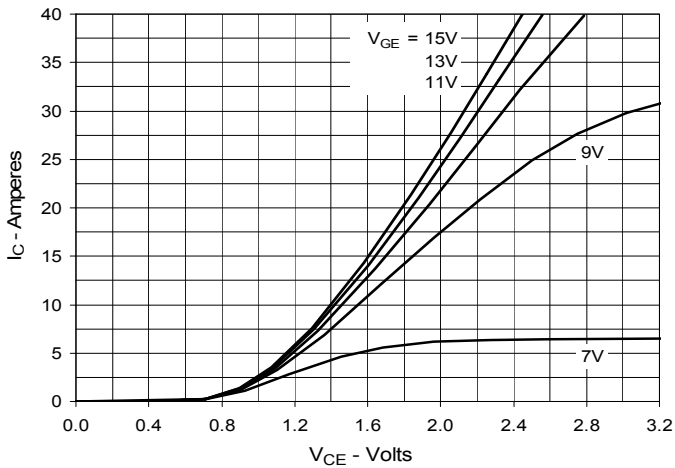
**Fig. 1. Output Characteristics  
@ 25°C**



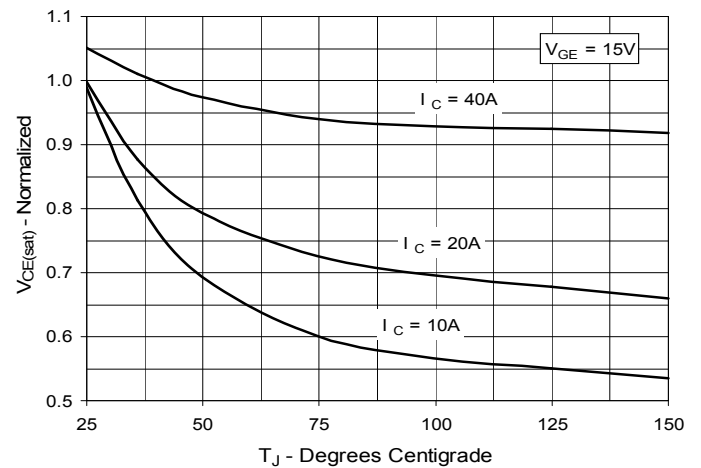
**Fig. 2. Extended Output Characteristics  
@ 25°C**



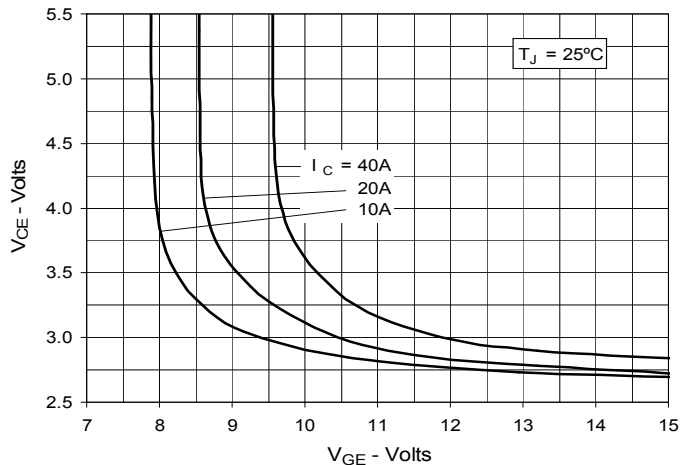
**Fig. 3. Output Characteristics  
@ 125°C**



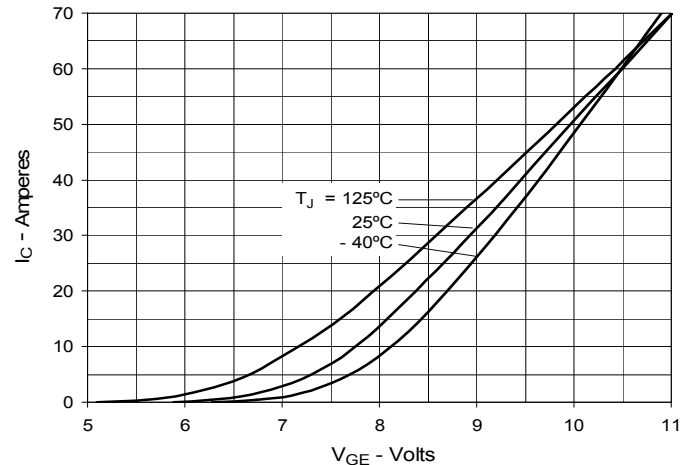
**Fig. 4. Dependence of VCE(sat) on  
Junction Temperature**



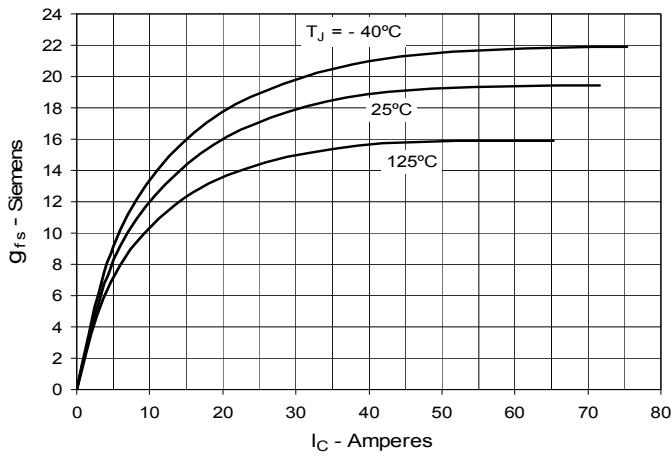
**Fig. 5. Collector-to-Emitter Voltage  
vs. Gate-to-Emitter Voltage**



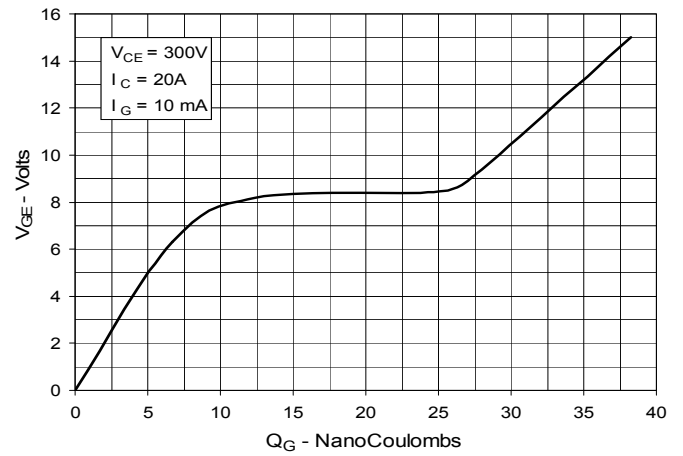
**Fig. 6. Input Admittance**



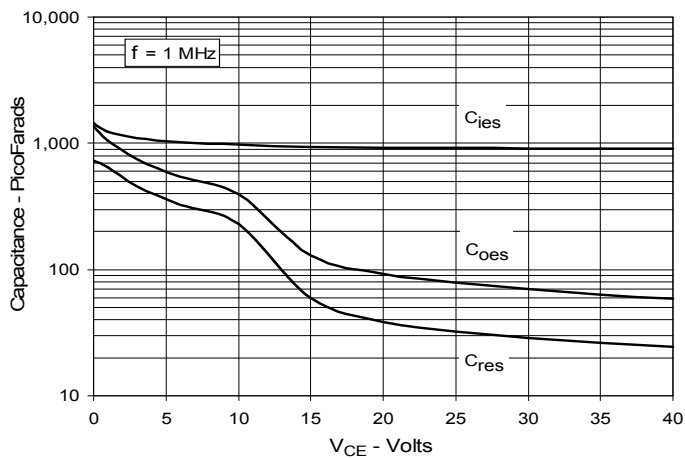
**Fig. 7. Transconductance**



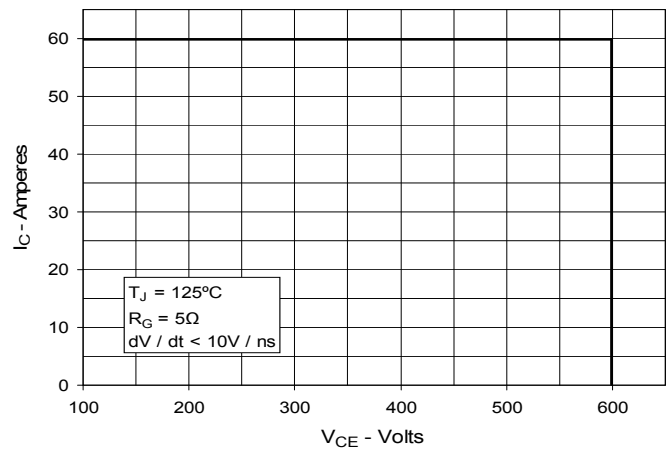
**Fig. 8. Gate Charge**



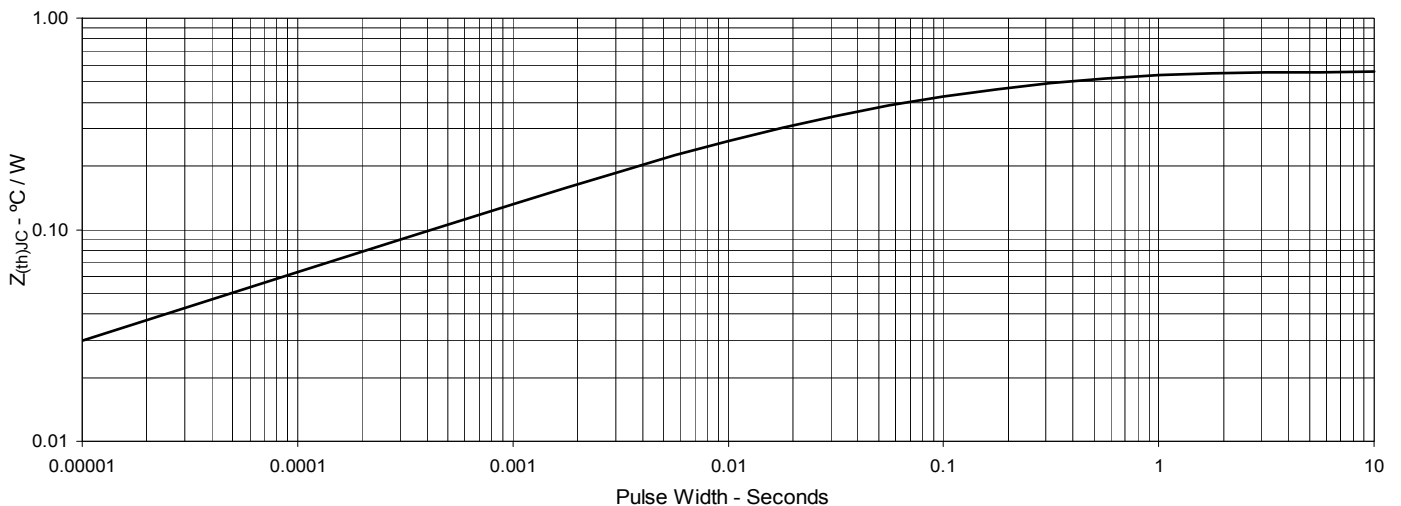
**Fig. 9. Capacitance**



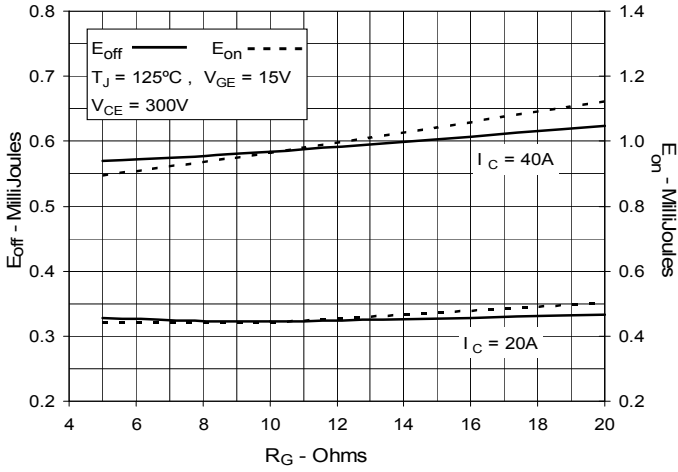
**Fig. 10. Reverse-Bias Safe Operating Area**



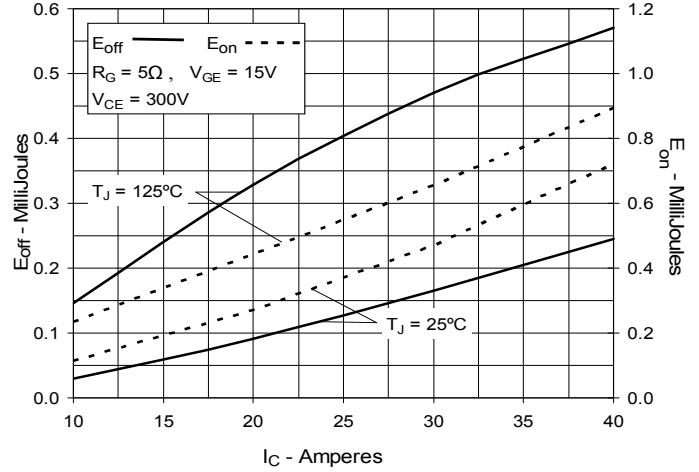
**Fig. 11. Maximum Transient Thermal Impedance**



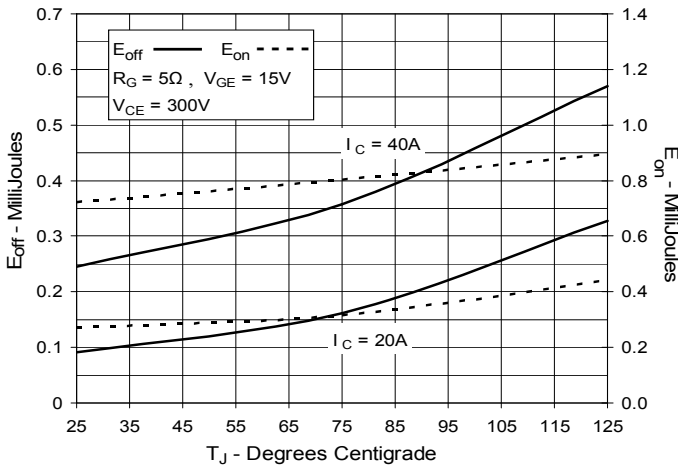
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



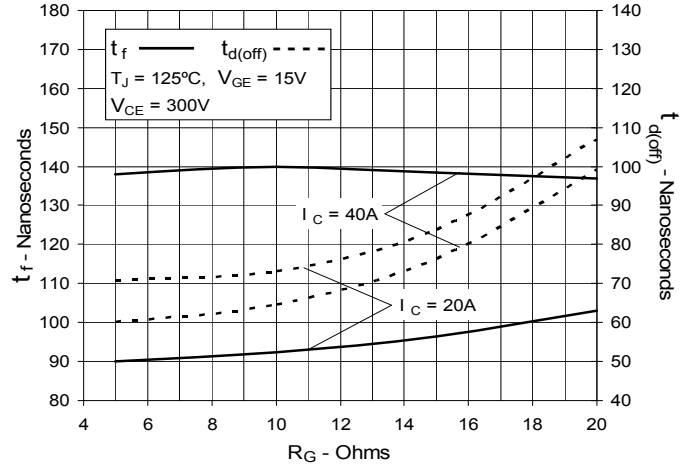
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



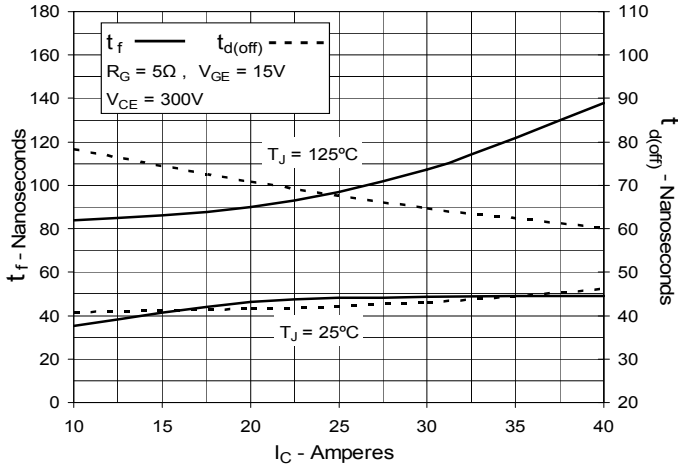
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



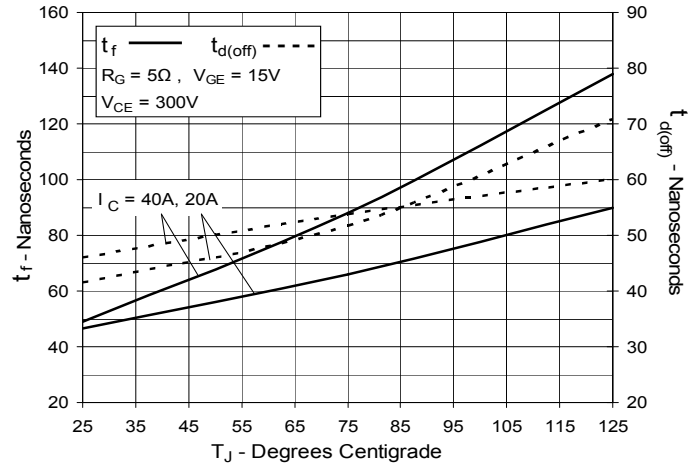
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



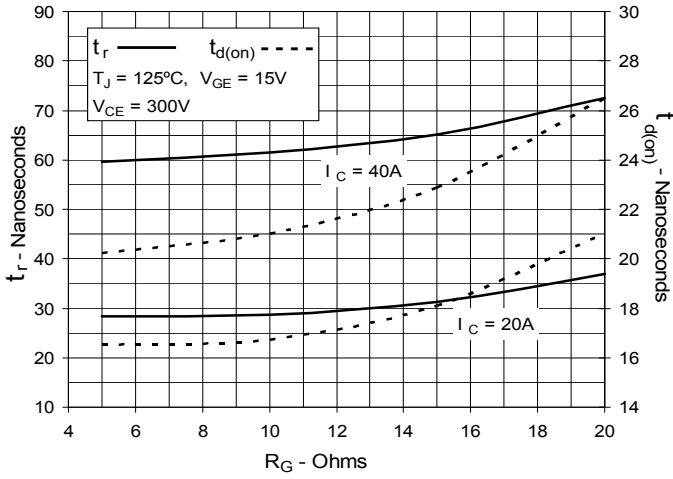
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



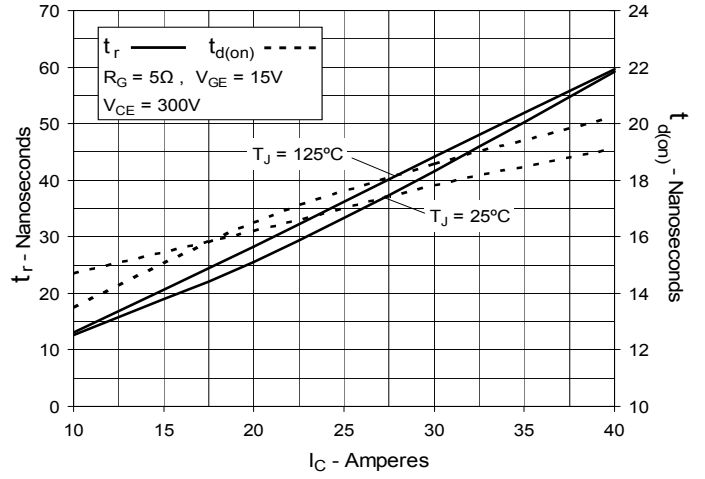
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



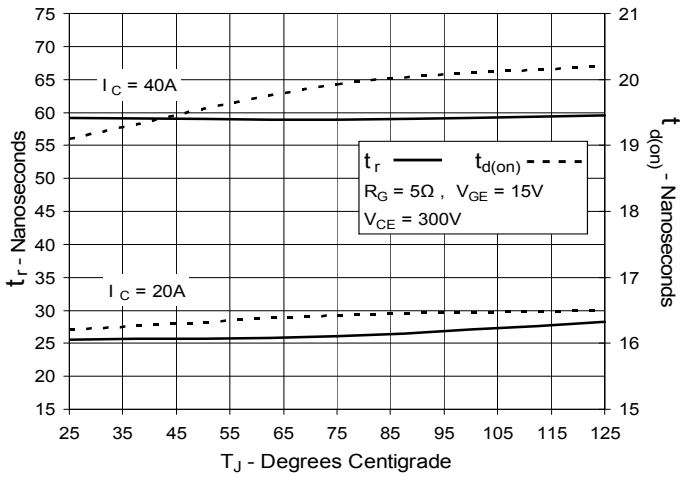
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**

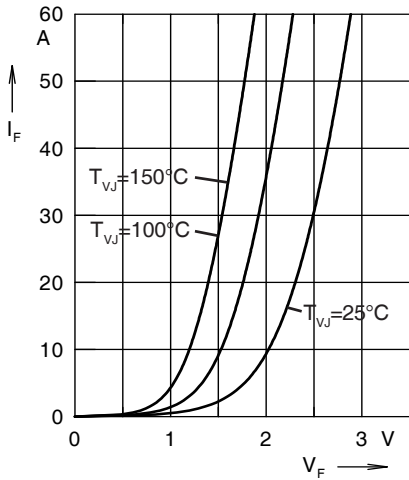


**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**

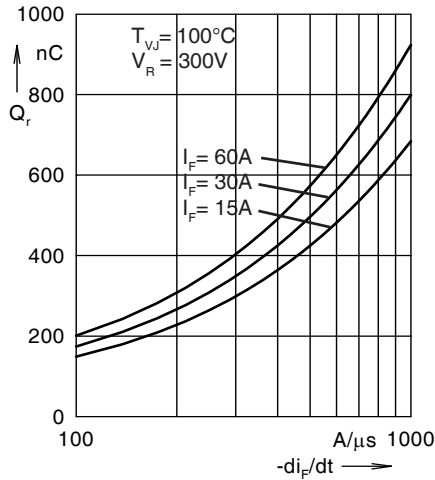


**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**

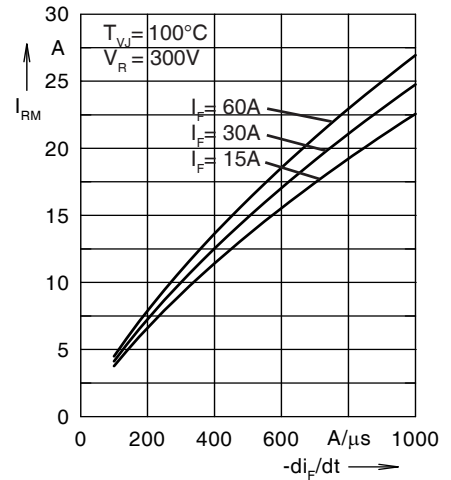




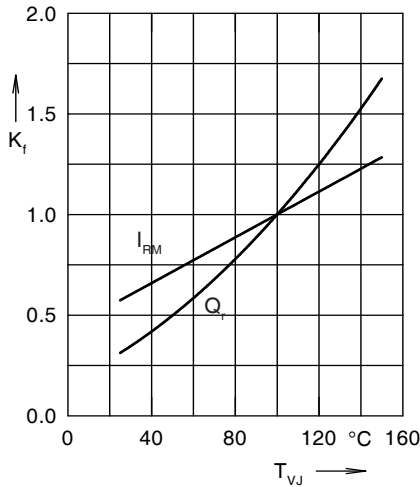
**Fig. 21. Forward current  $I_F$  versus  $V_F$**



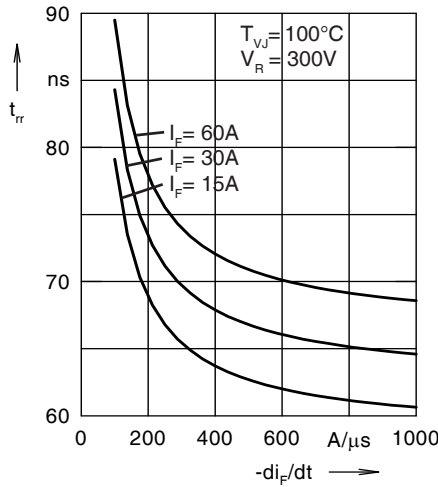
**Fig. 22. Reverse recovery charge  $Q_r$  versus  $-di_F/dt$**



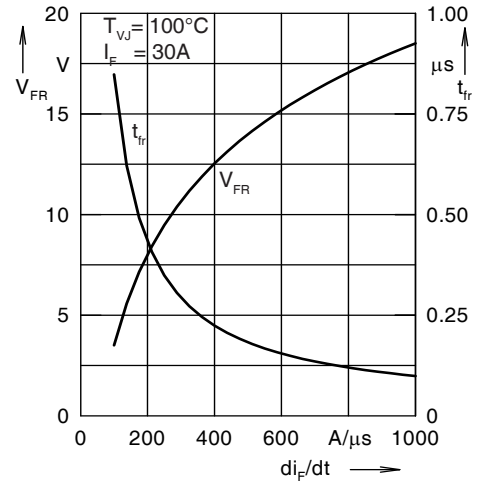
**Fig. 23. Peak reverse current  $I_{RM}$  versus  $-di_F/dt$**



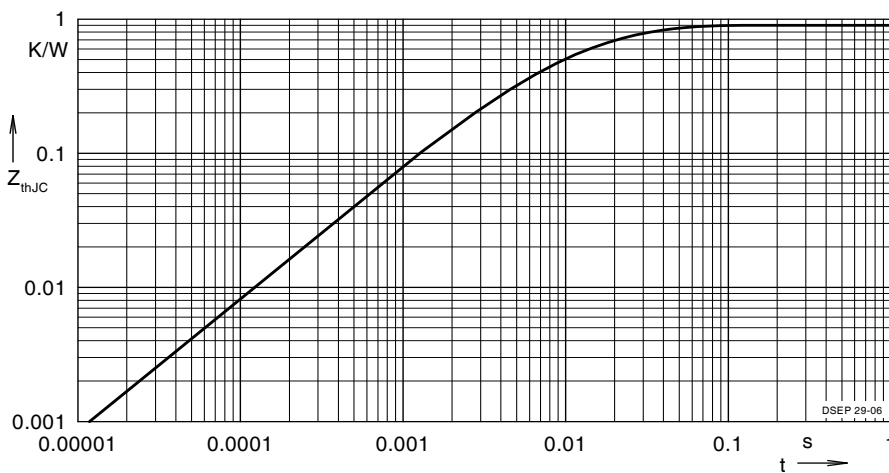
**Fig. 24. Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$**



**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. Transient thermal resistance junction to case**

Constants for  $Z_{thJC}$  calculation:

i	$R_{thi}$ (K/W)	$t_i$ (s)
1	0.502	0.0052
2	0.193	0.0003
3	0.205	0.0162