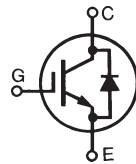


# GenX3™ 600V IGBT with Diode

## IXGK64N60B3D1 IXGX64N60B3D1

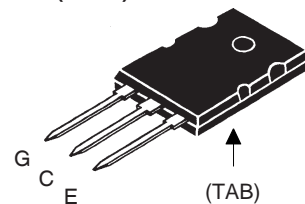
Medium speed low V<sub>sat</sub> PT IGBTs 5-40 kHz switching



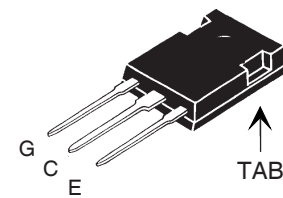
$V_{CES} = 600V$   
 $I_{C110} = 64A$   
 $V_{CE(sat)} \leq 1.8V$   
 $t_{fi(typ)} = 88ns$

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
$I_{C110}$	$T_C = 110^\circ C$	64	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	400	A
<b>SSOA</b>	$V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 3\Omega$	$I_{CM} = 200$	A
<b>(RBSOA)</b>	Clamped inductive load @ $V_{CE} \leq 600V$		
$P_c$	$T_C = 25^\circ C$	460	W
$T_J$		-55 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		-55 ... +150	$^\circ C$
$M_d$	Mounting torque (TO-264)	1.13 / 10	Nm/lb.in.
$F_c$	Mounting force (PLUS247)	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>	TO-264	10	g
	PLUS247	6	g

### TO-264 (IXGK)



### PLUS247 (IXGX)



G = Gate      C = Collector  
 E = Emitter    TAB = Collector

### Features

- Optimized for low conduction and 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

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ $V_{GE} = 0V$ $T_J = 125^\circ C$			700 $\mu A$ 2.5 mA
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 50A$ , $V_{GE} = 15V$ , Note 1	1.59	1.80	V

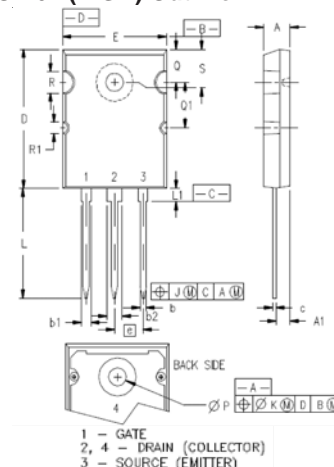
Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 50A, V_{CE} = 10V$ , Note 1	38	64	S
$C_{ies}$	$V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$		4750	pF
$C_{oes}$			260	pF
$C_{res}$			65	pF
$Q_g$	$I_C = 50A, V_{GE} = 15V, V_{CE} = 0.5 \cdot V_{CES}$		168	nC
$Q_{ge}$			28	nC
$Q_{gc}$			61	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ C</math></b> $I_C = 50A, V_{GE} = 15V$ $V_{CE} = 480V, R_G = 3\Omega$		25	ns
$t_{ri}$			41	ns
$E_{on}$			1.5	mJ
$t_{d(off)}$			138	ns
$t_{fi}$			88	150 ns
$E_{off}$			1.0	1.9 mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ C</math></b> $I_C = 50A, V_{GE} = 15V$ $V_{CE} = 480V, R_G = 3\Omega$		24	ns
$t_{ri}$			40	ns
$E_{on}$			2.70	mJ
$t_{d(off)}$			195	ns
$t_{fi}$			131	ns
$E_{off}$			1.95	mJ
$R_{thJC}$				0.27 °C/W
$R_{thCS}$		0.15		°C/W

### Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 60A, V_{GE} = 0V$ , 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
$R_{thJC}$				1.35 °C/W

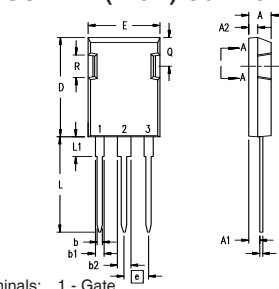
Note 1: Pulse test,  $t \leq 300\mu s$ ; duty cycle,  $d \leq 2\%$ .

### TO-264 (IXGK) Outline



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.185	0.209	4.70	5.31
A1	0.102	0.118	2.59	3.00
b	0.037	0.055	0.94	1.40
b1	0.087	0.102	2.21	2.59
b2	0.110	0.126	2.79	3.20
c	0.017	0.029	0.43	0.74
D	1.007	1.047	25.58	26.59
E	0.760	0.799	19.30	20.29
e	.215 BSC		5.46 BSC	
J	0.000	0.010	0.00	0.25
K	0.000	0.010	0.00	0.25
L	0.779	0.842	19.79	21.39
L1	0.087	0.102	2.21	2.59
ØP	0.122	0.138	3.10	3.51
Q	0.240	0.256	6.10	6.50
Q1	0.330	0.346	8.38	8.79
ØR	0.155	0.187	3.94	4.75
ØR1	0.085	0.093	2.16	2.36
S	0.243	0.253	6.17	6.43

### PLUS247™ (IXGX) Outline



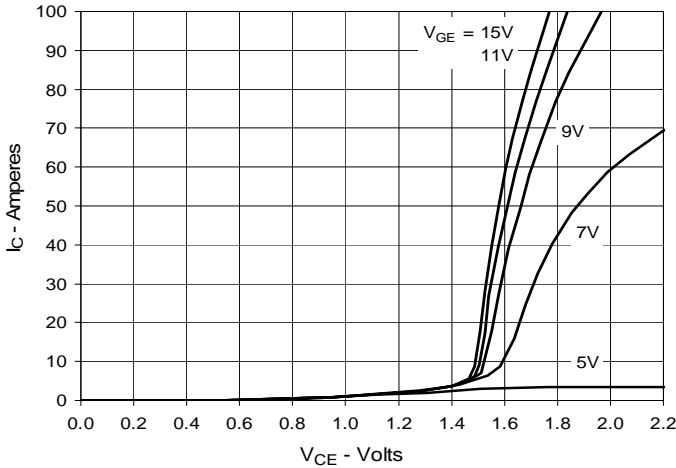
Terminals: 1 - Gate  
2 - Drain (Collector)  
3 - Source (Emitter)  
4 - Drain (Collector)

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	.190	.205
A <sub>1</sub>	2.29	2.54	.090	.100
A <sub>2</sub>	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b <sub>1</sub>	1.91	2.13	.075	.084
b <sub>2</sub>	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	0.244
R	4.32	4.83	.170	.190

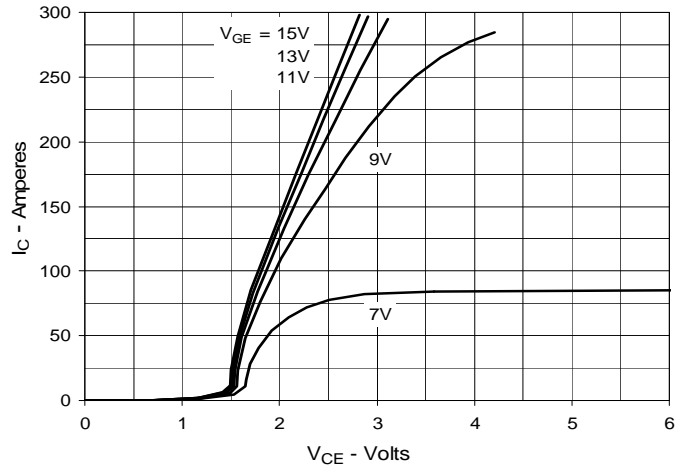
IXYS reserves the right to change limits, test conditions, and dimensions.

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	

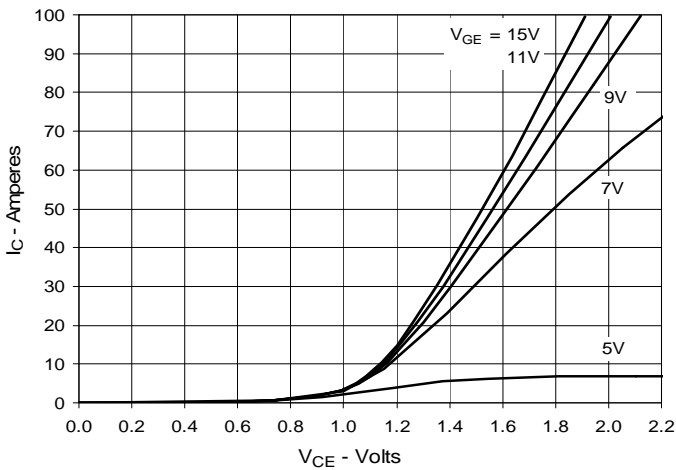
**Fig. 1. Output Characteristics**  
@ 25°C



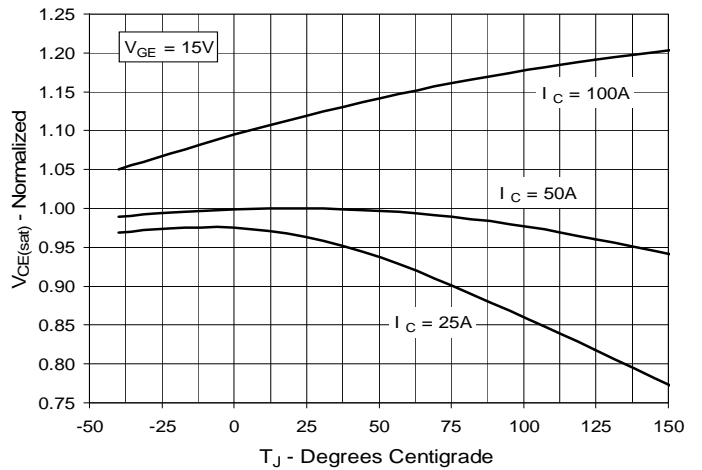
**Fig. 2. Extended Output Characteristics**  
@ 25°C



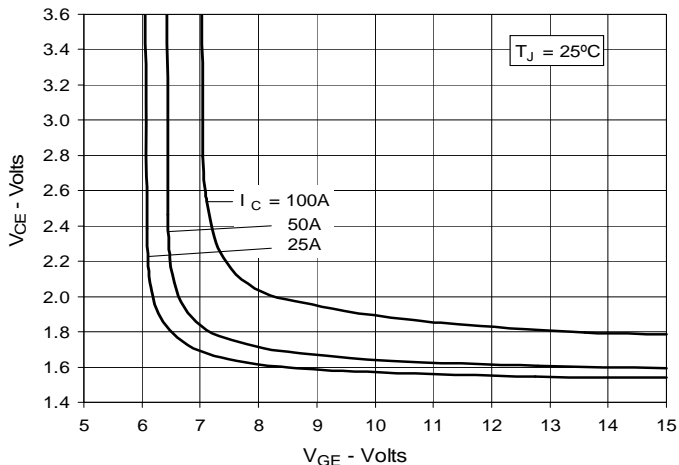
**Fig. 3. Output Characteristics**  
@ 125°C



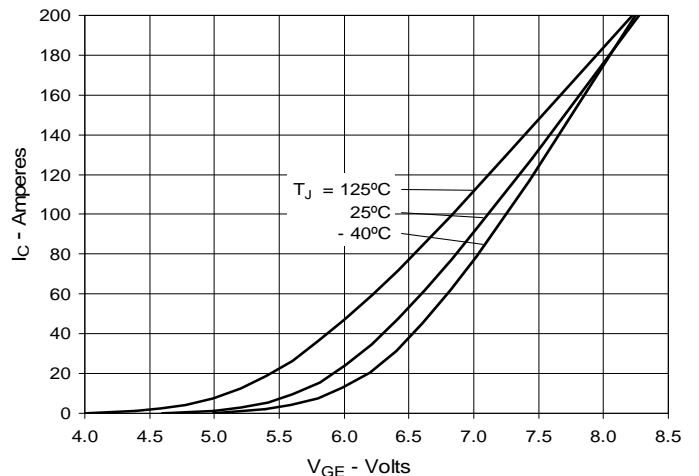
**Fig. 4. Dependence of VCE(sat) on Junction Temperature**



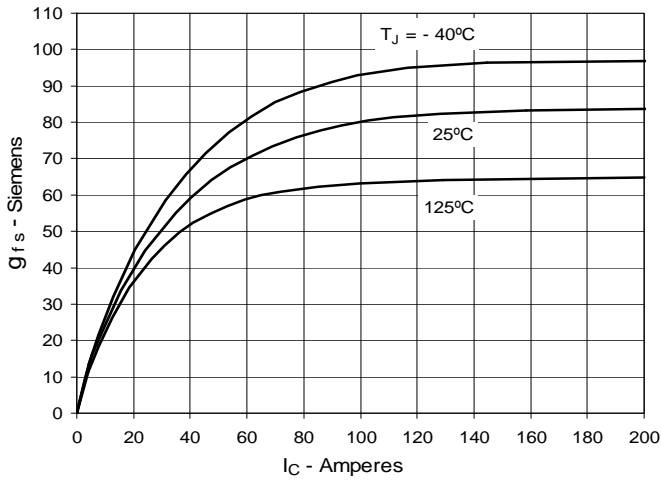
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



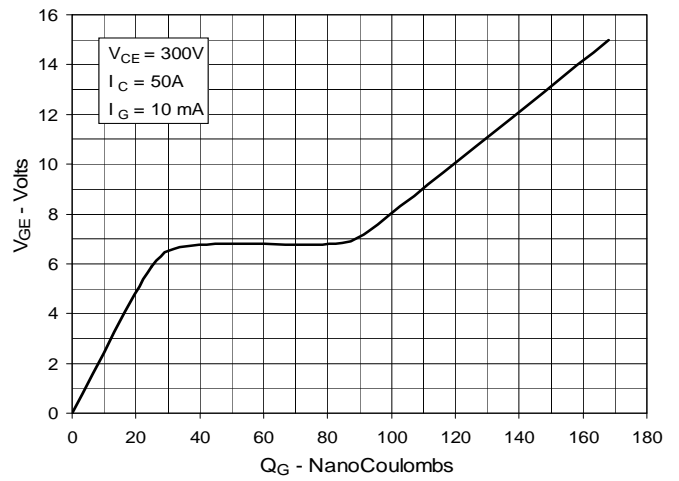
**Fig. 6. Input Admittance**



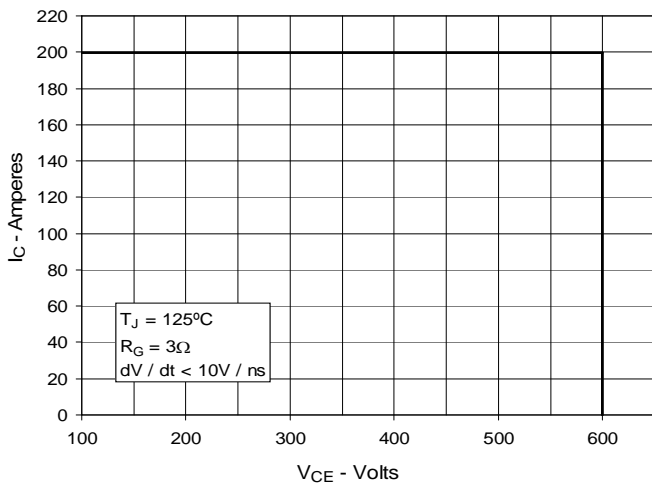
**Fig. 7. Transconductance**



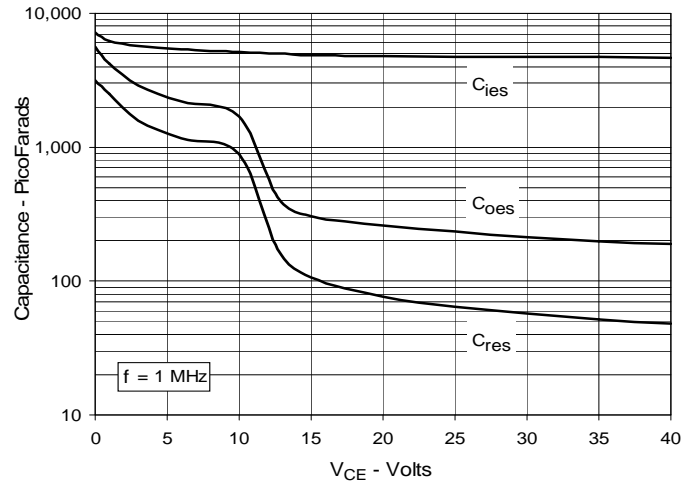
**Fig. 8. Gate Charge**



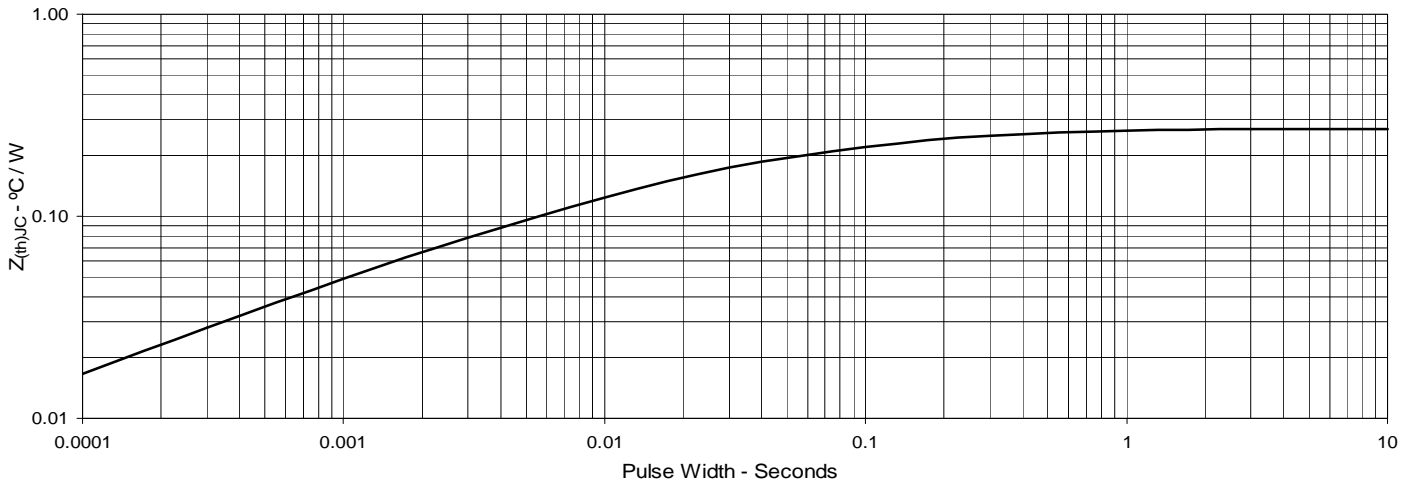
**Fig. 9. Reverse-Bias Safe Operating Area**



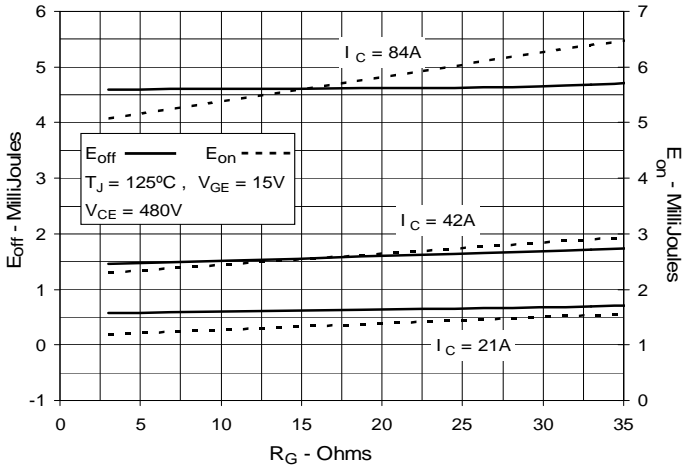
**Fig. 10. Capacitance**



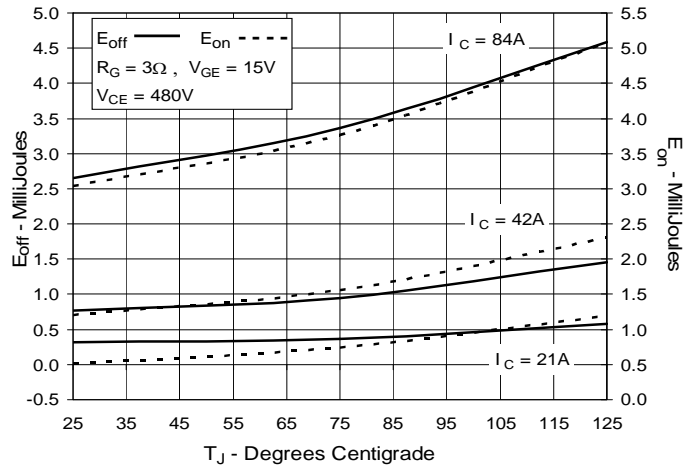
**Fig. 11. Maximum Transient Thermal Impedance**



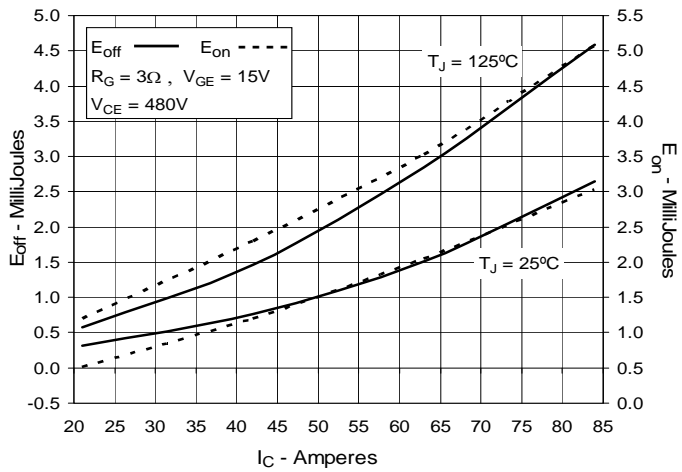
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



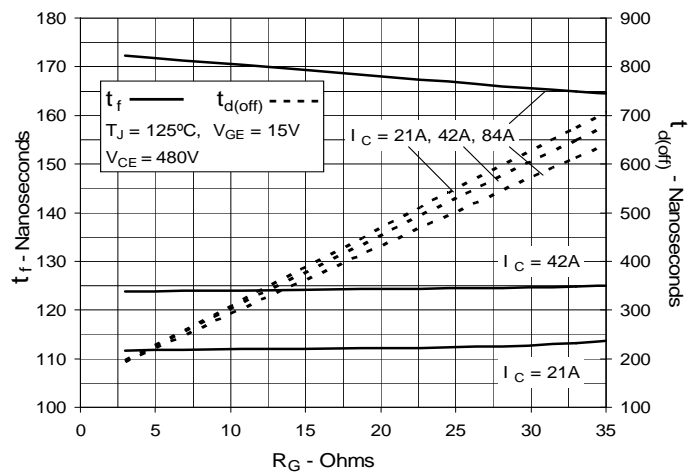
**Fig. 13. Inductive Switching Energy Loss vs. Junction Temperature**



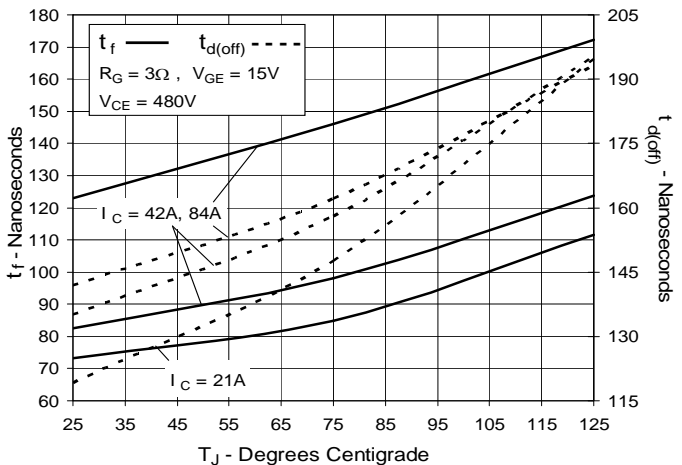
**Fig. 14. Inductive Switching Energy Loss vs. Collector Current**



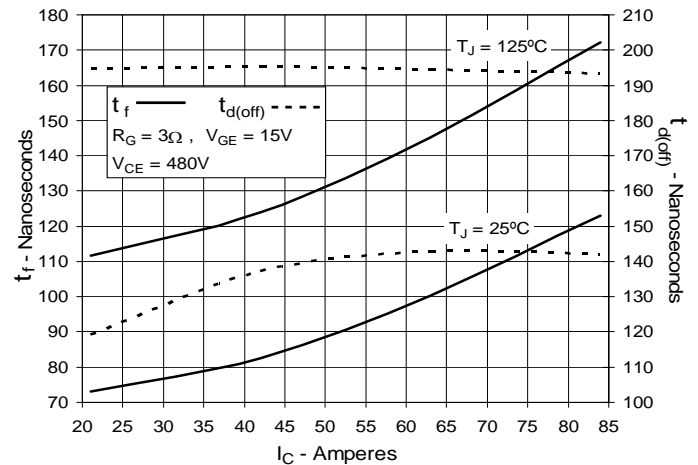
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



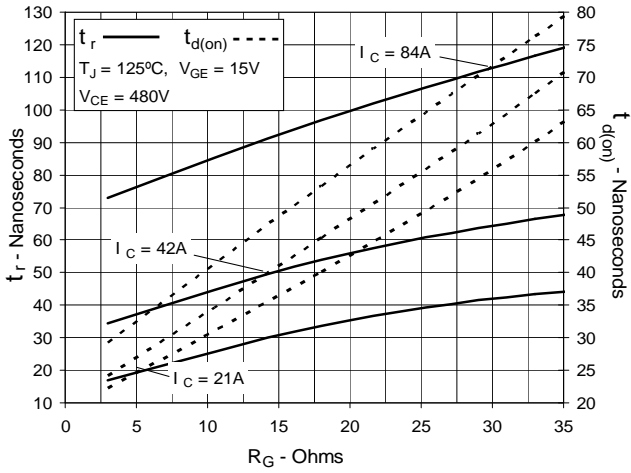
**Fig. 16. Inductive Turn-off Switching Times vs. Junction Temperature**



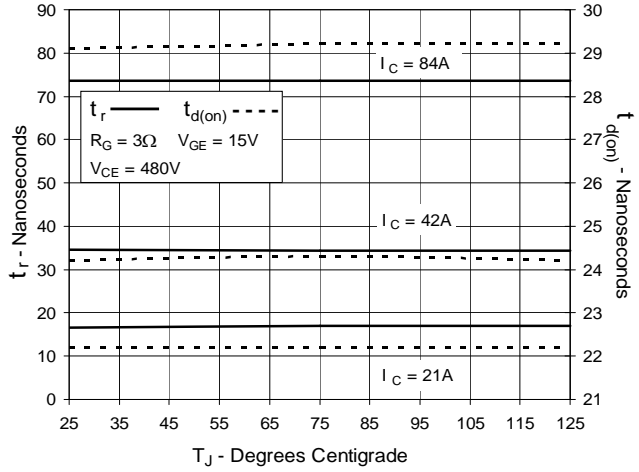
**Fig. 17. Inductive Turn-off Switching Times vs. Collector Current**



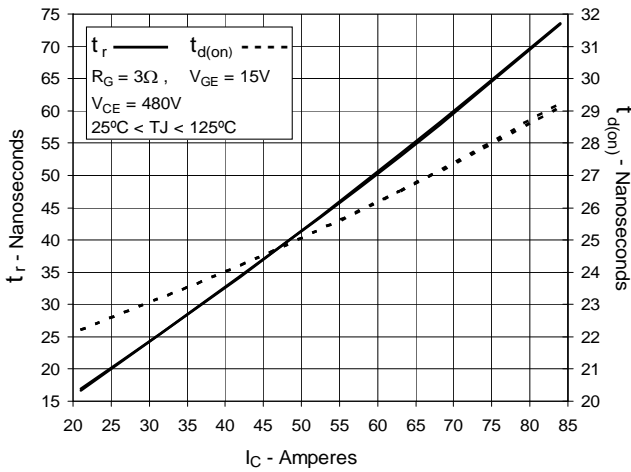
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



**Fig. 19. Inductive Turn-on Switching Times vs. Junction Temperature**



**Fig. 20. Inductive Turn-on Switching Times vs. Collector Current**



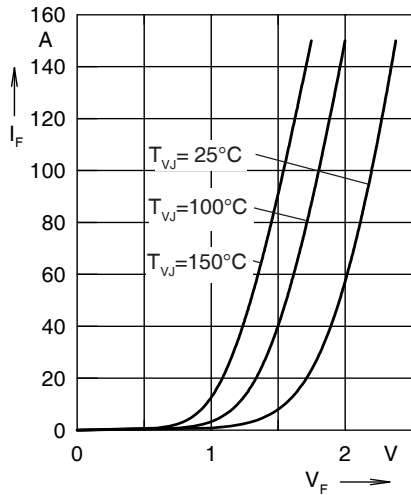


Fig. 21. Forward current  $I_F$  versus  $V_F$

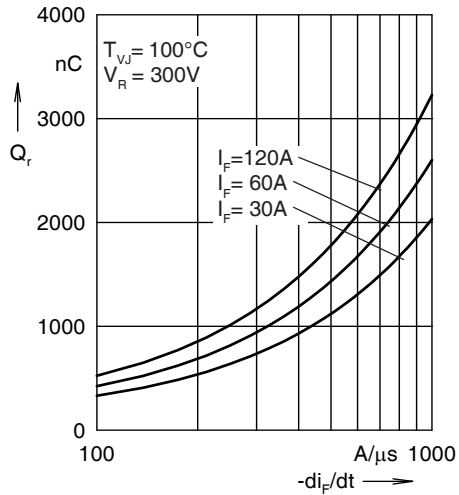


Fig. 22. Reverse recovery charge  $Q_r$  versus  $-di_F/dt$

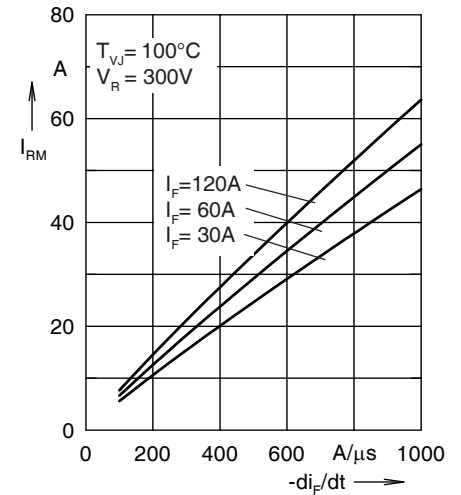


Fig. 23. Peak reverse current  $I_{RM}$  versus  $-di_F/dt$

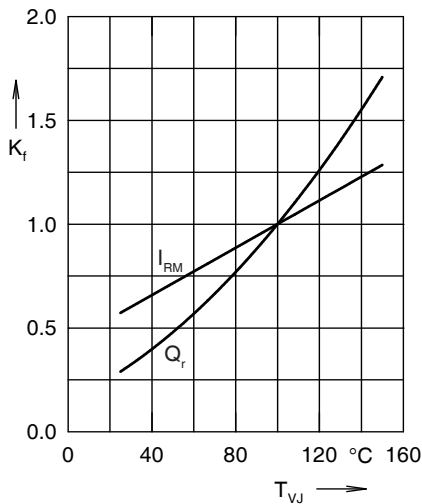


Fig. 24. Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

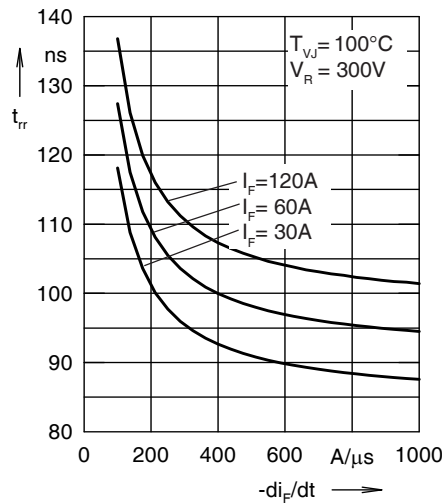


Fig. 25. Recovery time  $t_{tr}$  versus  $-di_F/dt$

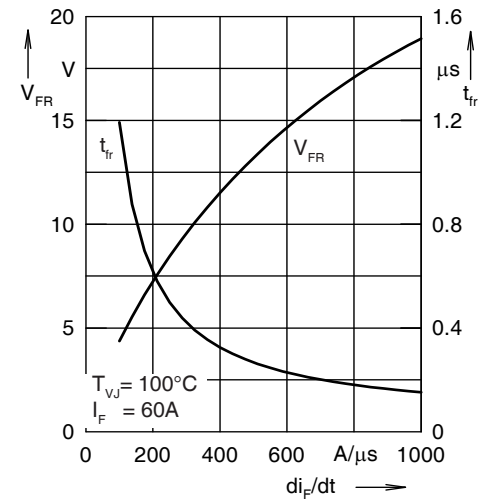


Fig. 26. Peak forward voltage  $V_{FR}$  and  $t_{tr}$  versus  $di_F/dt$

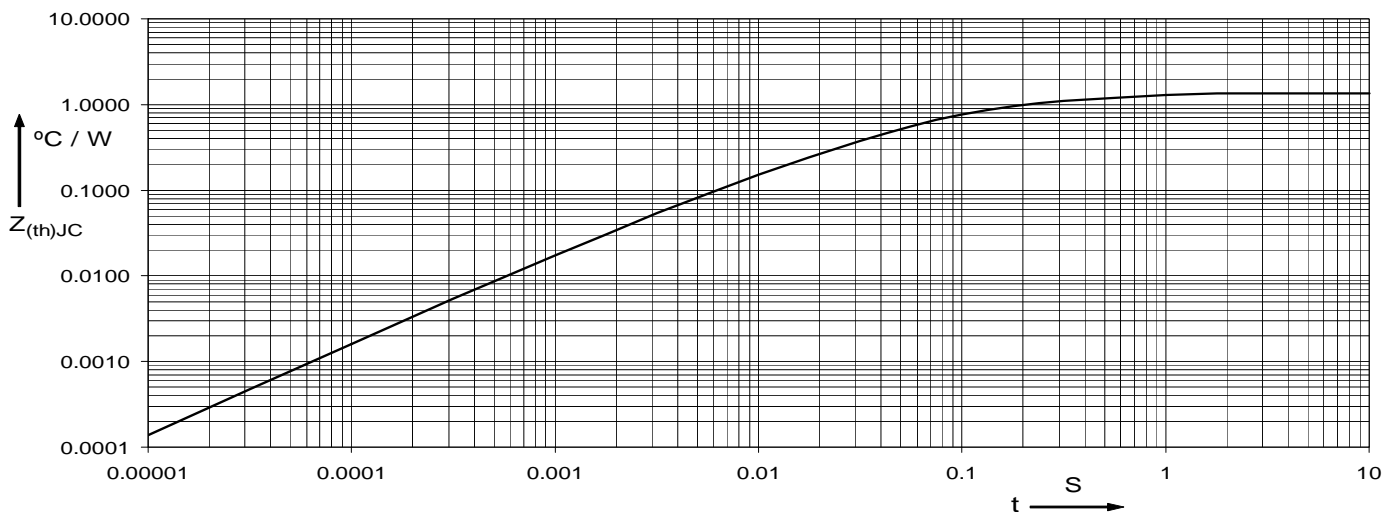


Fig. 27. Maximum transient thermal impedance junction to case (for diode)



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