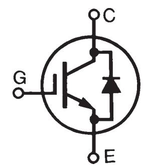
Advance Technical Information

GenX3™ 600V IGBT w/Diode

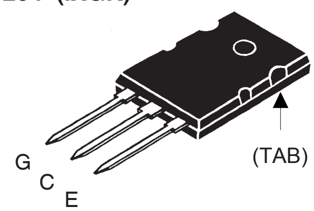
IXGK72N60A3H1
IXGX72N60A3H1

V_{CES} = 600V
I_{C110} = 72A
$V_{CE(sat)}$ ≤ 1.35V
$t_{fi(typ)}$ = 250ns

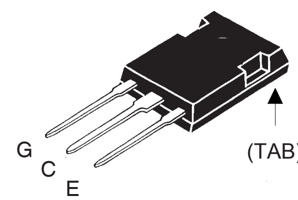
Ultra-Low Vsat PT IGBTs for up to 5kHz Switching



TO-264 (IXGK)



PLUS247 (IXGX)



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

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C (Limited by Leads)	75	A
I_{C110}	T_C = 110°C	72	A
I_{F110}	T_C = 110°C	68	A
I_{CM}	T_C = 25°C, 1ms	400	A
SSOA	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 3Ω	I_{CM} = 150	A
(RBSOA)	Clamped Inductive Load	@ V_{CE} ≤ 600	V
P_C	T_C = 25°C	540	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°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	°C
T_{SOLD}	1.6mm (0.062 in.) from Case for 10s	260	°C
Weight	TO-264	10	g
	PLUS247	6	g

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)		Characteristic Values Min.	Typ.	Max.	
$V_{GE(th)}$	I_C = 250μA, V_{CE} = V_{GE}		3.0		5.0	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V				300	μA
		T_J = 125°C			5	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V				±100	nA
$V_{CE(sat)}$	I_C = 60A, V_{GE} = 15V, Note 1				1.35	V

Features

- Optimized for Low Conduction 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
- Inrush Current Protection Circuits

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Min.	Typ.	Max.	
g_{fs}	I_C = 60A, V_{CE} = 10V, Note 1	48	75		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		6600		pF
C_{oes}			360		pF
C_{res}			80		pF
Q_g	I_C = 60A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		230		nC
Q_{ge}			40		nC
Q_{gc}			80		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		31		ns
t_{ri}	I_C = 50A, V_{GE} = 15V		34		ns
E_{on}	V_{CE} = 480V, R_G = 3Ω		1.4		mJ
$t_{d(off)}$			320		ns
t_{fi}			250		ns
E_{off}			3.5		mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		29		ns
t_{ri}	I_C = 50A, V_{GE} = 15V		34		ns
E_{on}	V_{CE} = 480V, R_G = 3Ω		2.6		mJ
$t_{d(off)}$			510		ns
t_{fi}			375		ns
E_{off}			6.5		mJ
R_{thJC}				0.23	°C/W
R_{thCS}			0.15		°C/W

Reverse Diode (FRED)

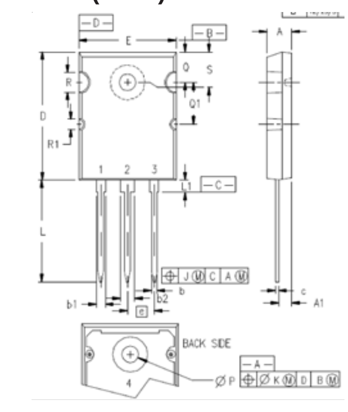
Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)		Min.	Typ.	Max.	
V_F	I_F = 60A, V_{GE} = 0V, Note 1			1.6	2.0	V
		T_J = 150°C		1.4	1.8	V
I_{RM}	I_F = 60A, V_{GE} = 0V,	T_J = 100°C		8.3		A
t_{rr}	I_F = 60A, -di/dt = 200A/μs, V_R = 300V			140		ns
R_{thJC}					0.3	°C/W

Note 1: Pulse Test, t ≤ 300μs, Duty Cycle, d ≤ 2%.

ADVANCE TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

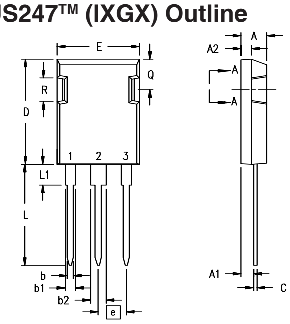
TO-264 (IXGK) Outline



1 – GATE
2, 4 – DRAIN (COLLECTOR)
3 – SOURCE (EMITTER)

DIM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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 3 - Source (Emitter)
2 - Drain (Collector) 4 - Drain (Collector)

Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.83	5.21	.190	.205
A_1	2.29	2.54	.090	.100
A_2	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b_1	1.91	2.13	.075	.084
b_2	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

Fig. 1. Output Characteristics @ 25ºC

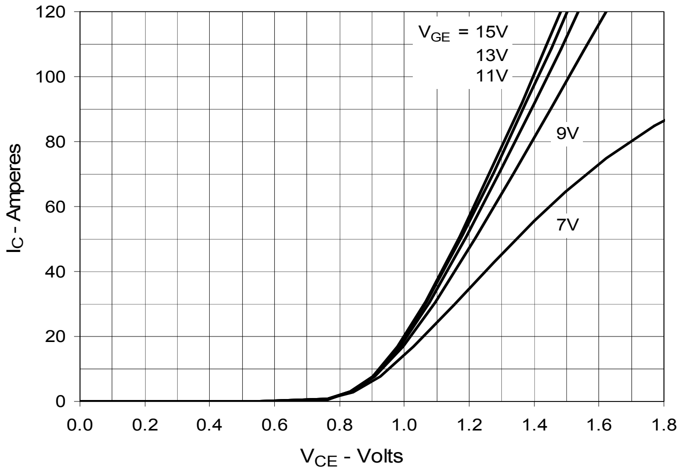


Fig. 2. Extended Output Characteristics @ 25ºC

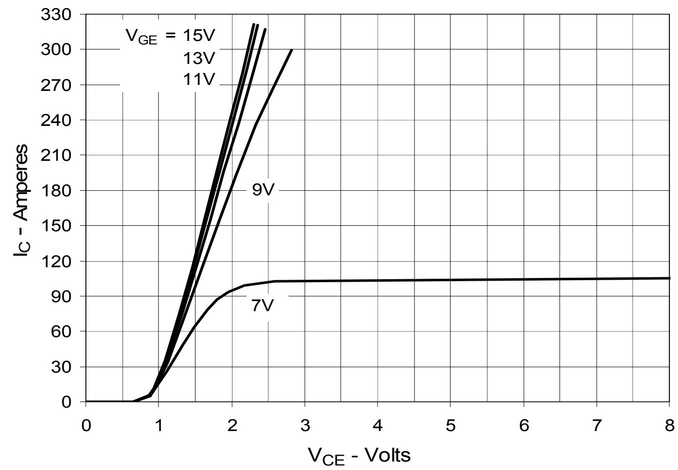


Fig. 3. Output Characteristics @ 125ºC

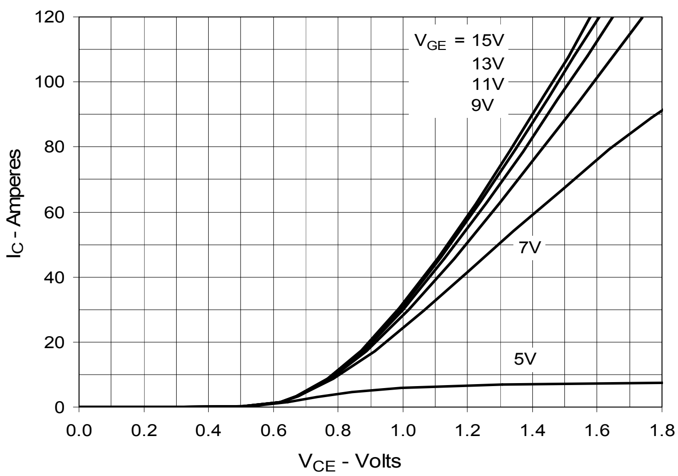


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

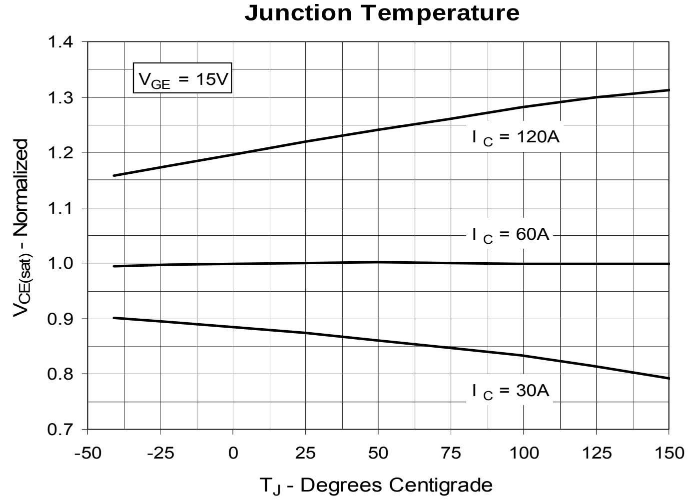


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

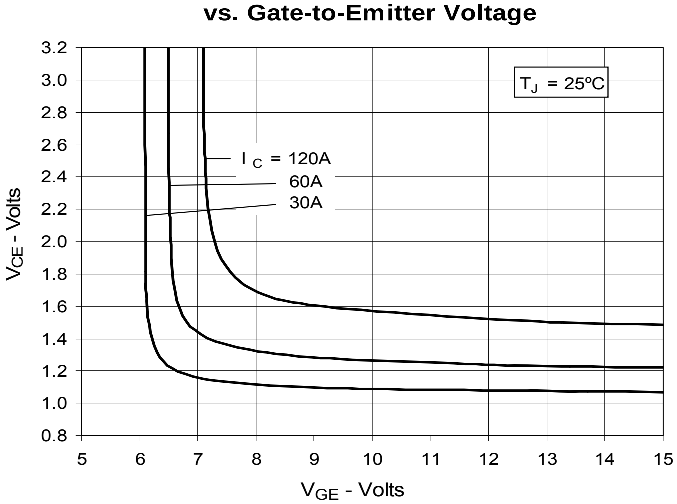


Fig. 6. Input Admittance

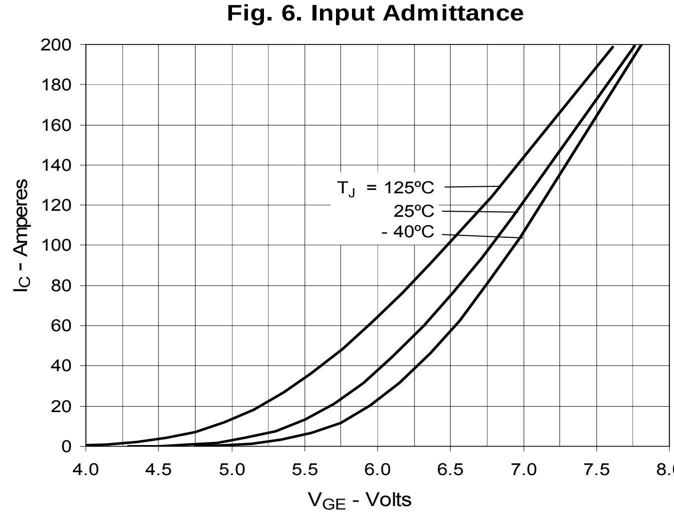


Fig. 7. Transconductance

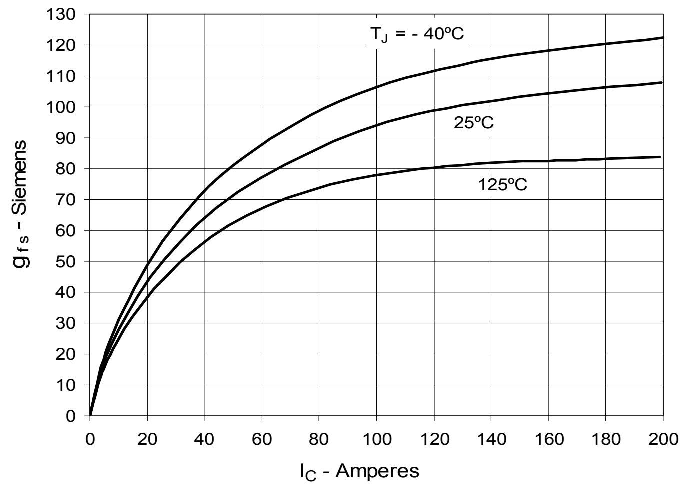


Fig. 8. Gate Charge

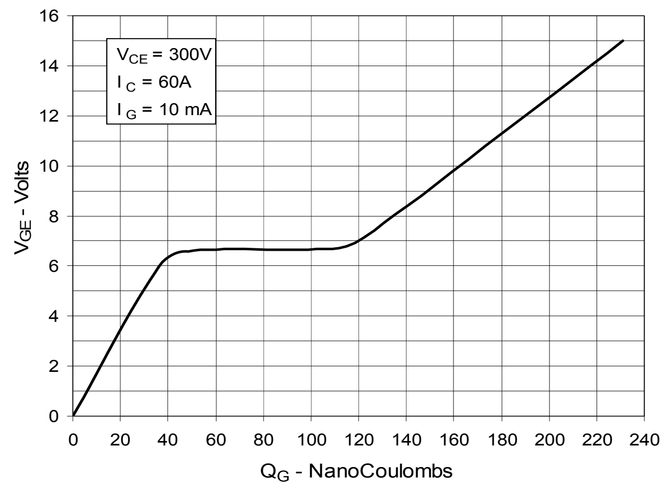


Fig. 9. Capacitance

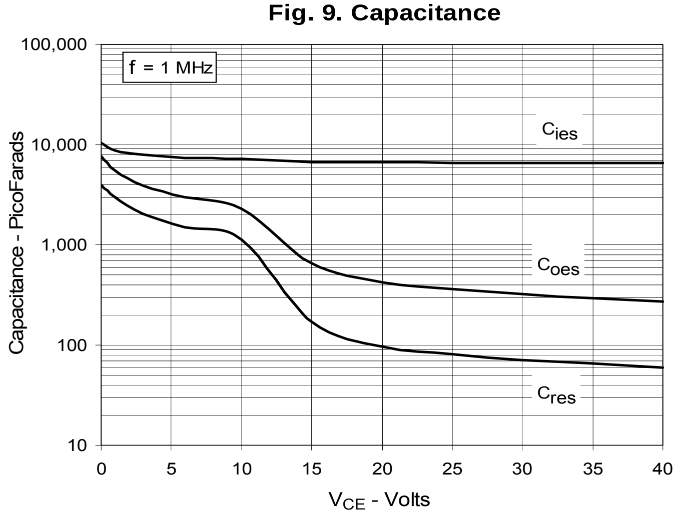


Fig. 10. Reverse-Bias Safe Operating Area

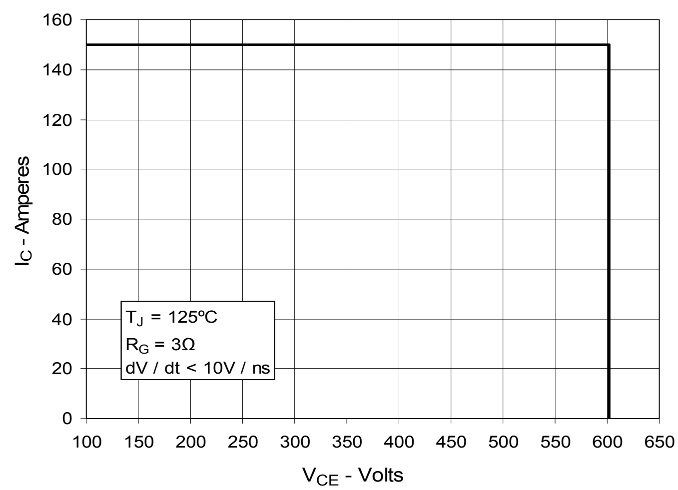


Fig. 11. Maximum Transient Thermal Impedance

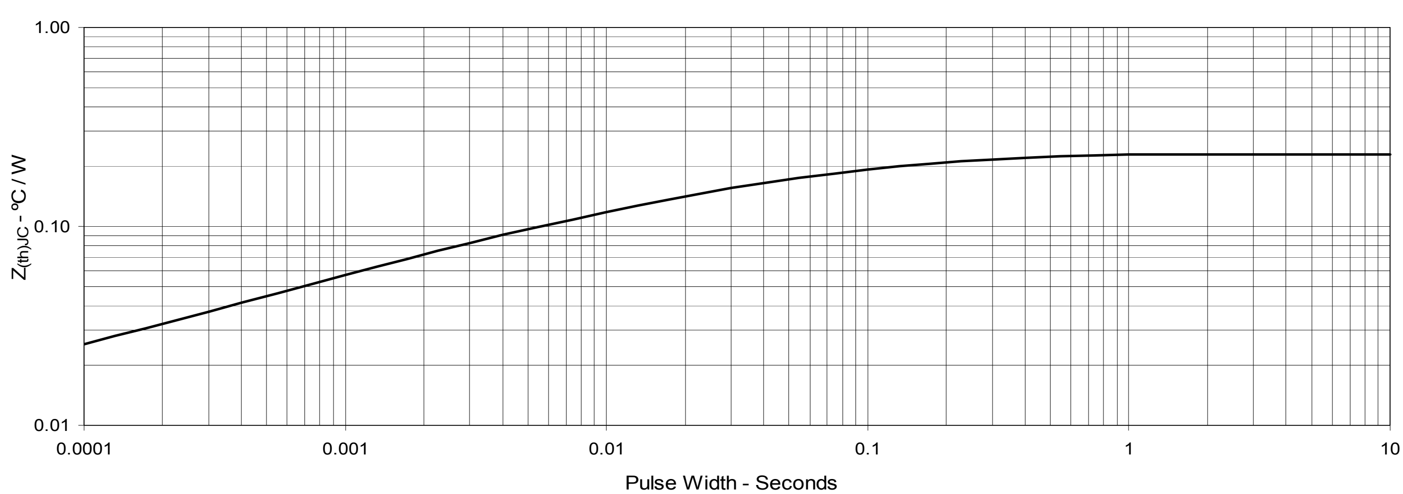


**Fig. 12. Inductive Switching
Energy Loss vs. Gate Resistance**

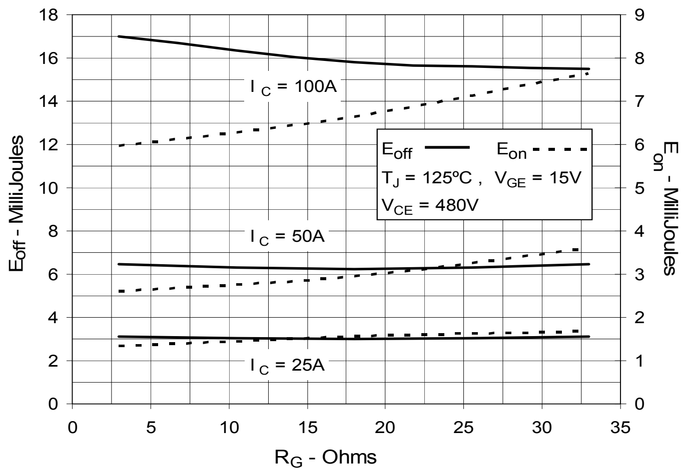


**Fig. 13. Inductive Switching
Energy Loss vs. Collector Current**

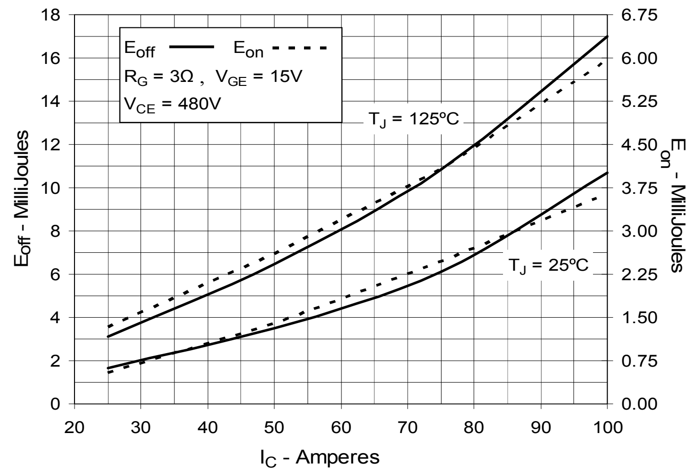


**Fig. 14. Inductive Switching
Energy Loss vs. Junction Temperature**

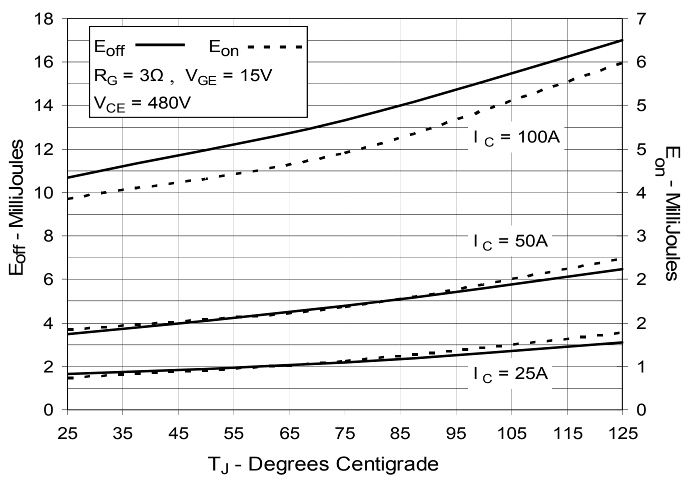


**Fig. 15. Inductive Turn-off
Switching Times vs. Gate Resistance**

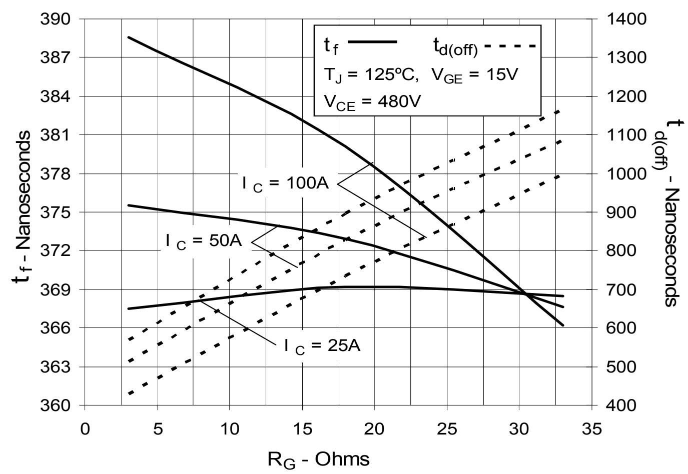


**Fig. 16. Inductive Turn-off
Switching Times vs. Collector Current**

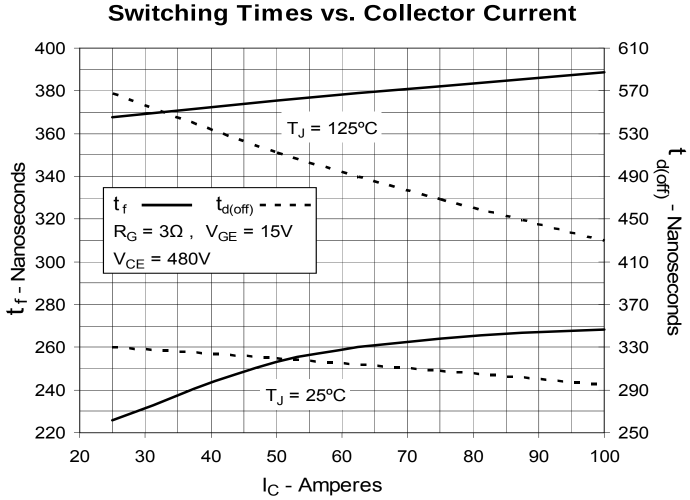


**Fig. 17. Inductive Turn-off
Switching Times vs. Junction Temperature**

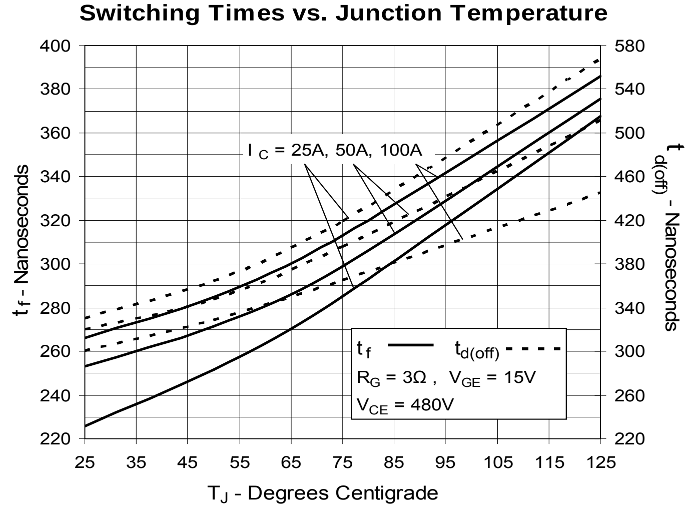


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

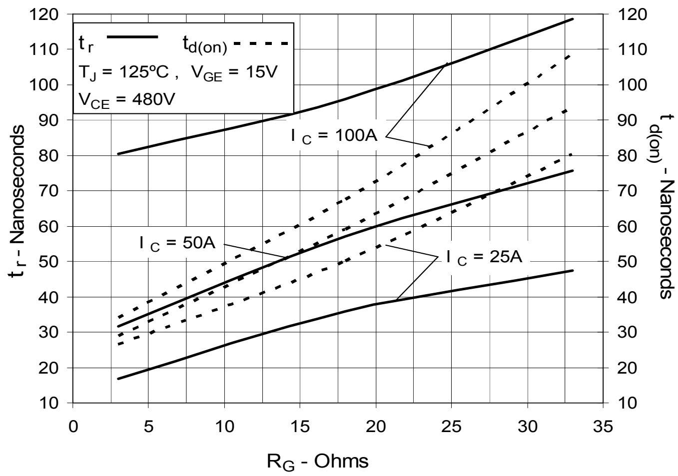


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

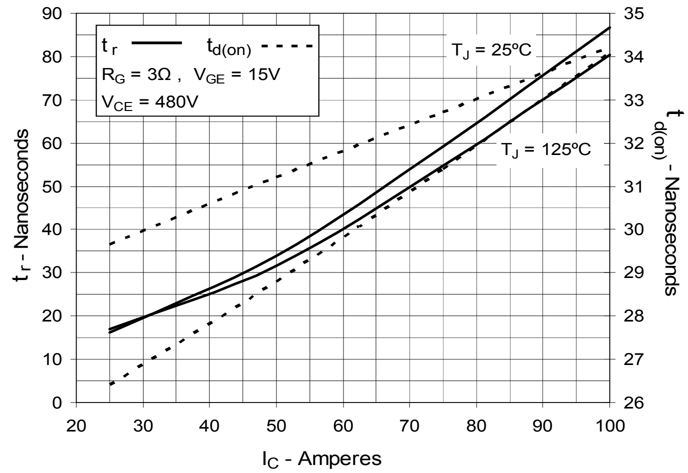
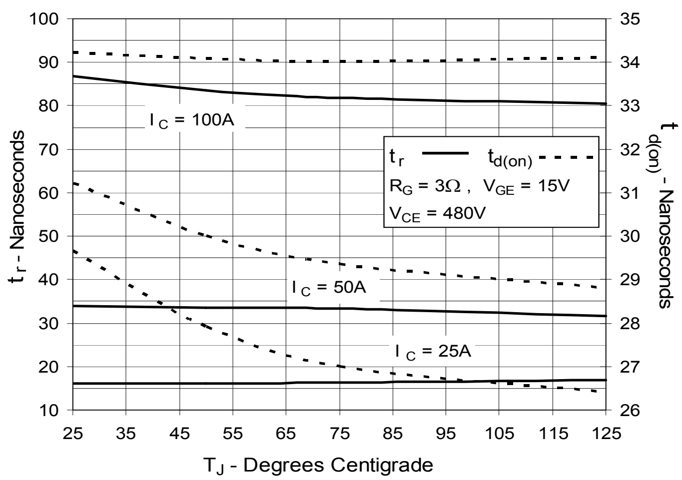


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



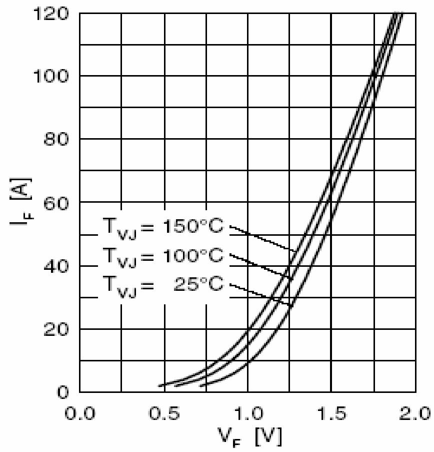


Fig. 21 Forward current I_F vs. V_F

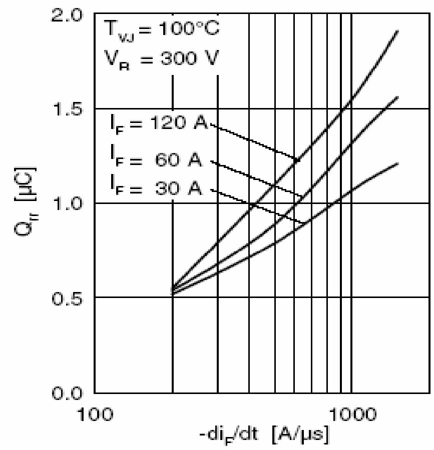


Fig. 22 Typ. reverse recovery charge Q_{rr}

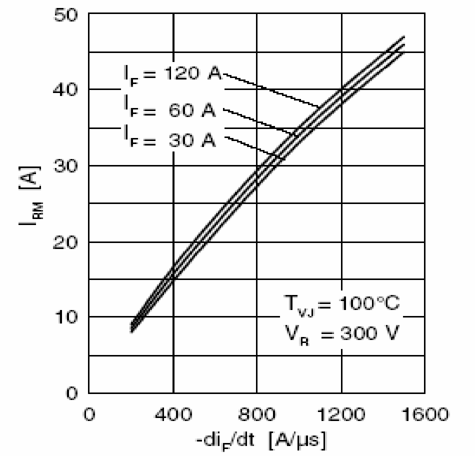


Fig. 23 Typ. peak reverse current I_{RM}

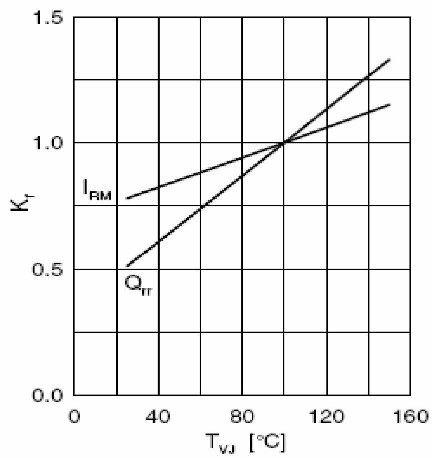


Fig. 24 Typ. dynamic parameters Q_{rr}, I_{RM}

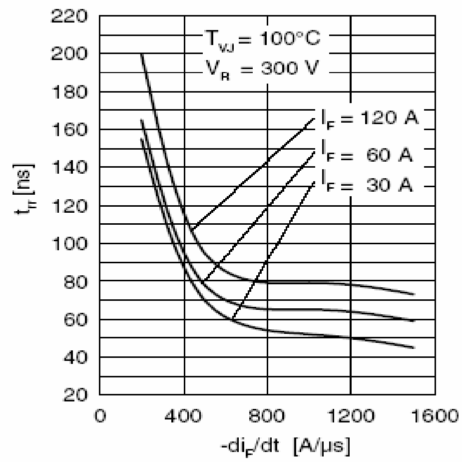


Fig. 25 Typ. recovery time t_{rr}

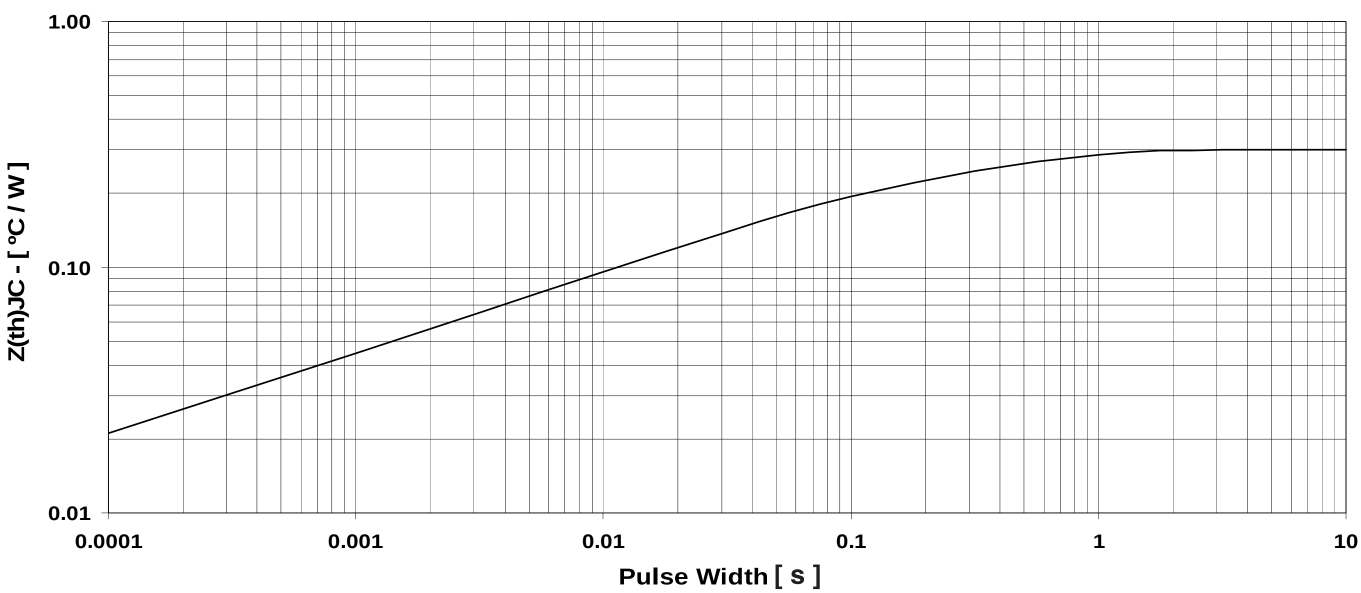


Fig. 26 Maximum transient thermal impedance junction to case (for diode)