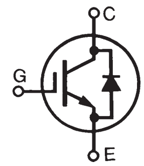
IXYS Preliminary Technical Information

GenX3™ 600V IGBT with Diode

IXGH48N60B3D1

V_{CES} = 600V
I_{C110} = 48A
$V_{CE(sat)}$ ≤ 1.8V

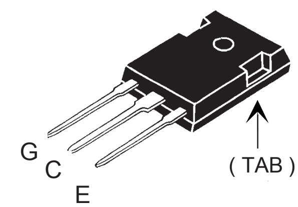
Medium speed low Vsat PT IGBTs 5-40 kHz switching



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_C = 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_{C110}	T_C = 110°C	48	A
I_{D110}	T_C = 110°C	30	A
I_{CM}	T_C = 25°C, 1ms	280	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 5Ω Clamped inductive load @ ≤ 600V	I_{CM} = 120	A
P_C	T_C = 25°C	300	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	1.6mm (0.062 in.) from case for 10s	300	°C
T_{SOLD}	Plastic body for 10 seconds	260	°C
M_d	Mounting torque	1.13/10	Nm/lb.in.
Weight		6	g

Symbol	Test Conditions (T_J = 25°C unless otherwise specified)	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 250µA, V_{GE} = 0V	600			V
$V_{GE(th)}$	I_C = 250µA, V_{CE} = V_{GE}	3.0		5.0	V
I_{CES}	V_{CE} = V_{CES} V_{GE} = 0V T_J = 125°C			300 1.75	µA mA
I_{GES}	V_{CE} = 0V, V_{GE} = ± 20V			±100	nA
$V_{CE(sat)}$	I_C = 32A, V_{GE} = 15V, Note 1			1.8	V

TO-247(IXGH)



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 package

Advantages

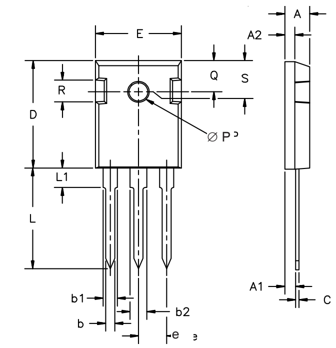
- High power density
- Low gate drive requirement

Applications

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

Symbol	Test Conditions (T_J = 25°C unless otherwise specified)	Min.	Typ.	Max.	
g_{fs}	I_C = 30A, V_{CE} = 10V, Note 1	28	46		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		3980		pF
C_{oes}			190		pF
C_{res}			45		pF
Q_g	I_C = 40A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		115		nC
Q_{ge}			21		nC
Q_{gc}			40		nC
$t_{d(on)}$	**Inductive Load, T_J = 25°C**		22		ns
t_{ri}	I_C = 30A, V_{GE} = 15V		25		ns
E_{on}	V_{CE} = 480V, R_G = 5Ω		0.84		mJ
$t_{d(off)}$			130	200	ns
t_{fi}			116	200	ns
E_{off}			0.66	1.20	mJ
$t_{d(on)}$	**Inductive Load, T_J = 125°C**		19		ns
t_{ri}	I_C = 30A, V_{GE} = 15V		25		ns
E_{on}	V_{CE} = 480V, R_G = 5Ω		1.71		mJ
$t_{d(off)}$			190		ns
t_{fi}			157		ns
E_{off}			1.30		mJ
R_{thJC}				0.42	°C/W
R_{thCS}			0.21		°C/W

TO-247 (IXGH) Outline



Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.7	5.3	.185	.209
A_1	2.2	2.54	.087	.102
A_2	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b_1	1.65	2.13	.065	.084
b_2	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
S	6.15	BSC	242	BSC

Reverse Diode (FRED) (D1 Version ONLY)

Symbol	Test Conditions (Characteristic Values, T_J = 25°C, unless otherwise specified)	Min.	Typ.	Max.	
V_F	I_F = 30A, V_{GE} = 0V, Note 1			2.8	V
	T_J = 150°C		1.6		V
I_{RM}	I_F= 30A, V_{GE} = 0V, V_R= 100V -di_F/dt =100A/μs		4		A
t_{rr}	I_F = 1A; -di/dt = 100A/μs, V_R = 30V T_J = 100°C		100		ns
R_{thJC}				1.5	°C/W
R_{thCS}			1.5		°C/W

Note 1: Pulse test, t ≤ 300μs; duty cycle, d ≤ 2%.

PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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Fig. 1. Output Characteristics @ 25ºC

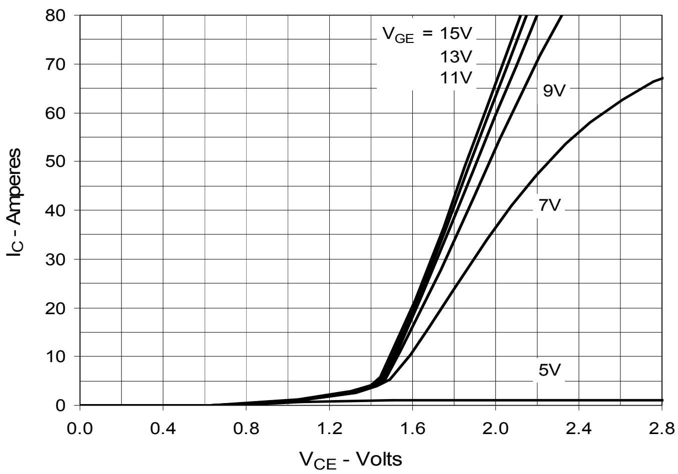


Fig. 2. Extended Output Characteristics @ 25ºC

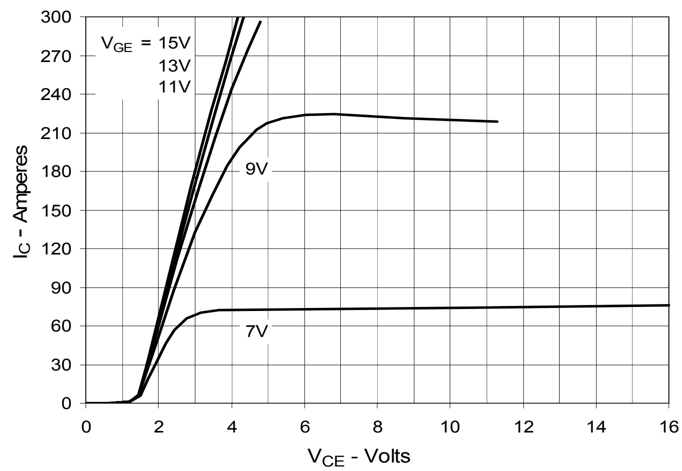


Fig. 3. Output Characteristics @ 125ºC

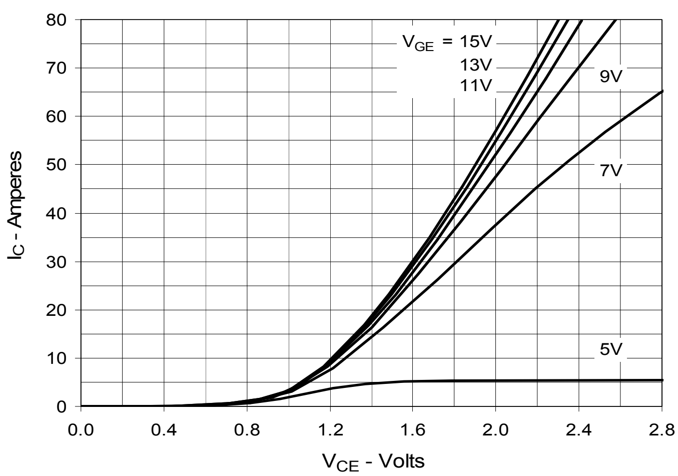


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

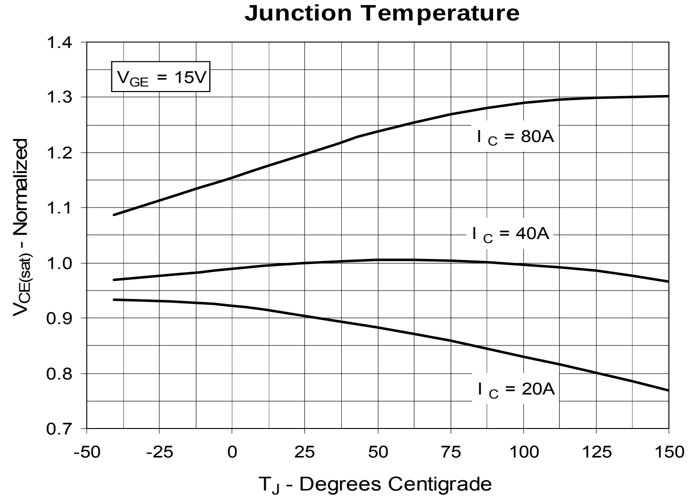


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

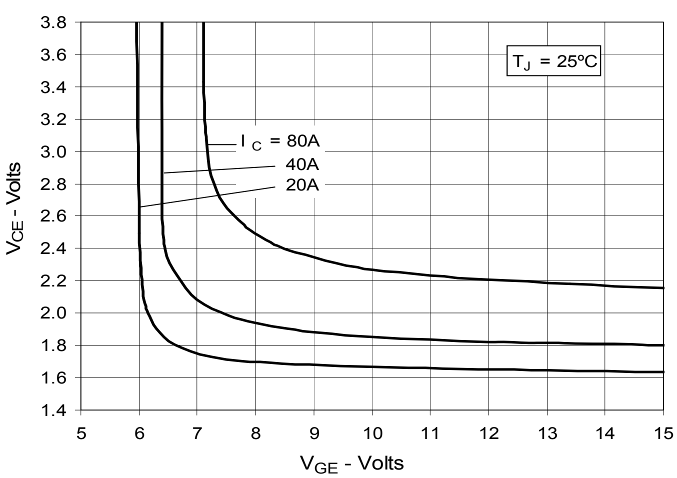


Fig. 6. Input Admittance

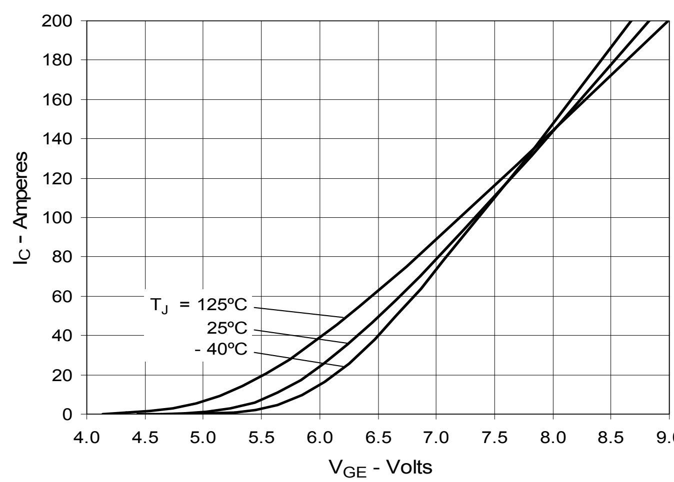


Fig. 7. Transconductance

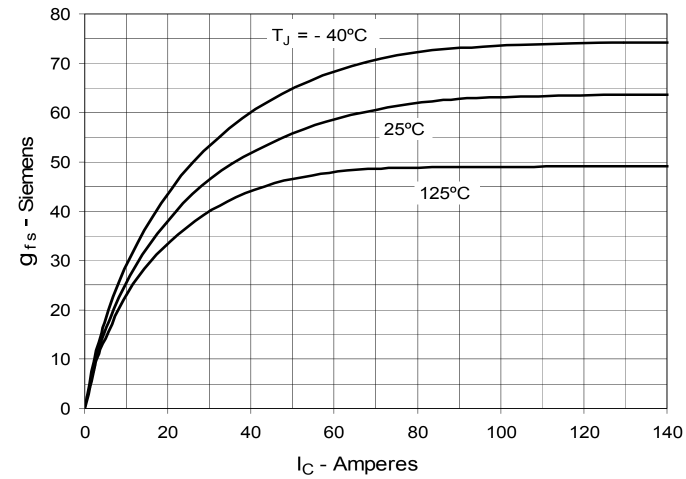


Fig. 8. Gate Charge

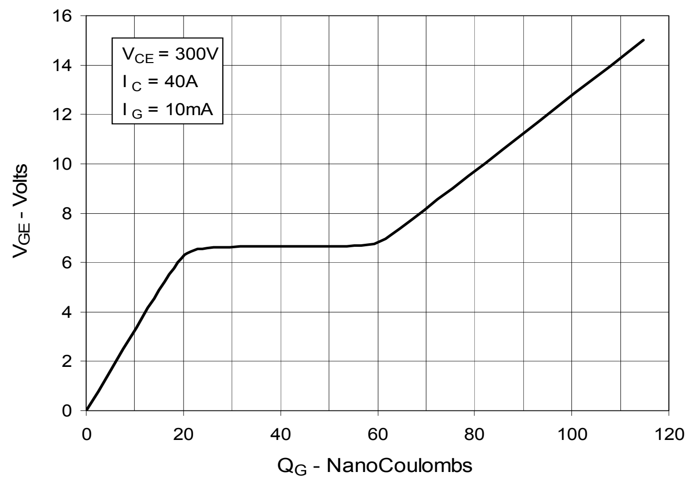


Fig. 9. Capacitance

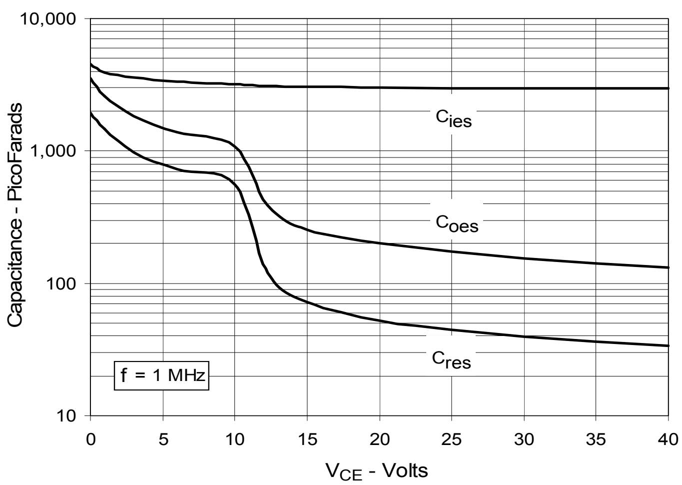


Fig. 10. Reverse-Bias Safe Operating Area

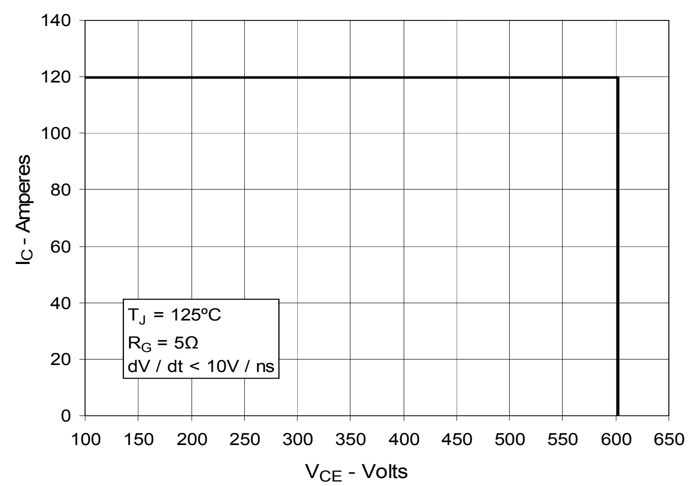
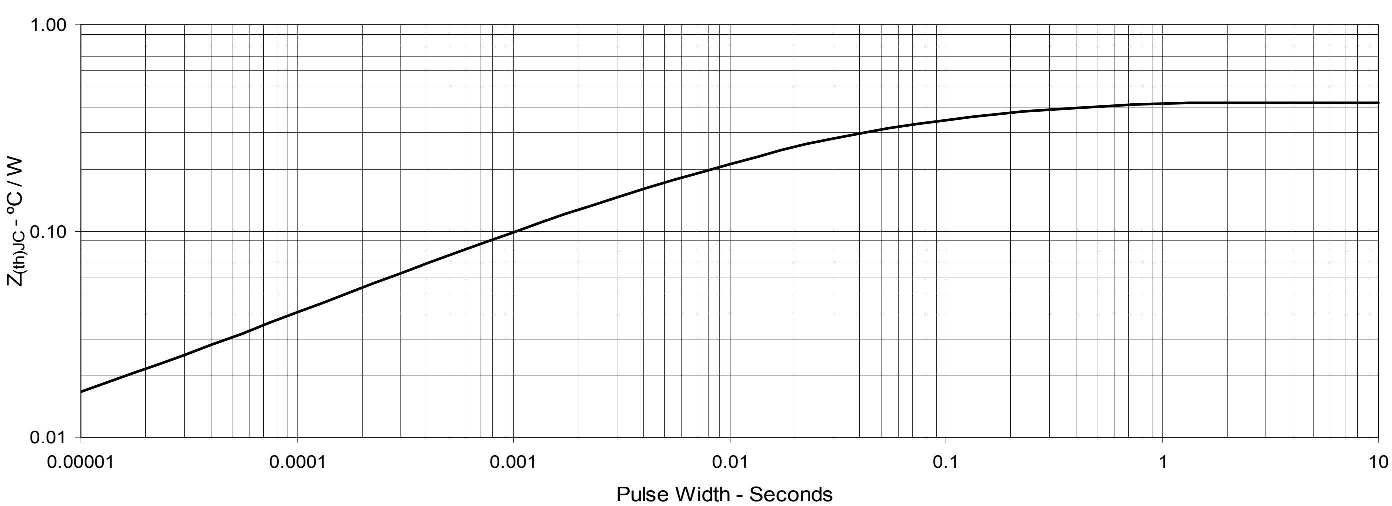


Fig. 11. Maximum Transient Thermal Impedance



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

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

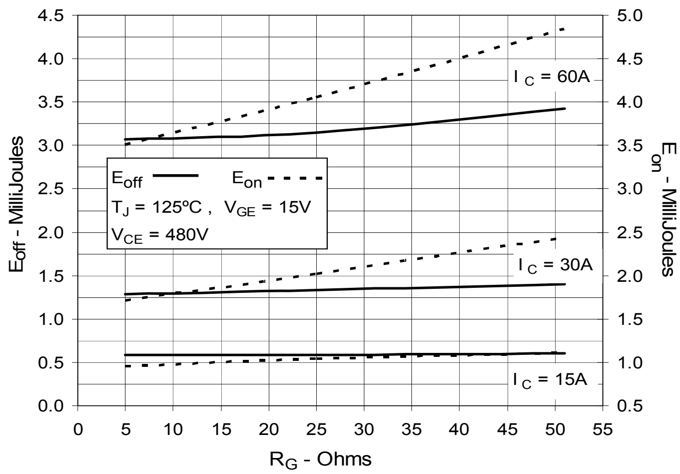


**Fig. 13. Inductive Switching
Energy Loss vs. Collector Current**

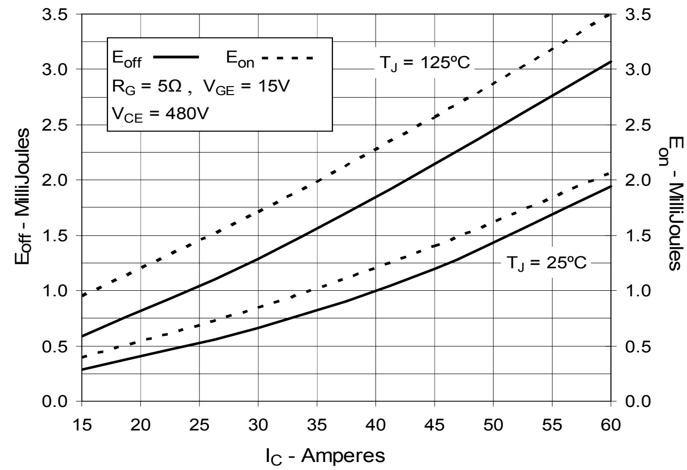


**Fig. 14. Inductive Switching
Energy Loss vs. Junction Temperature**

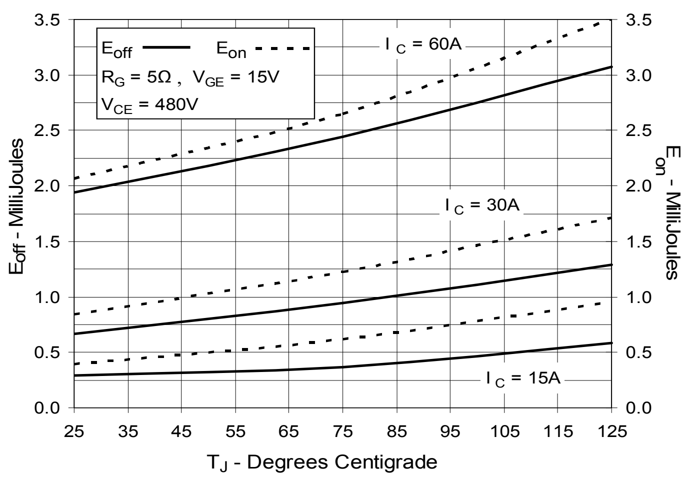


**Fig. 15. Inductive Turn-off
Switching Times vs. Junction Temperature**

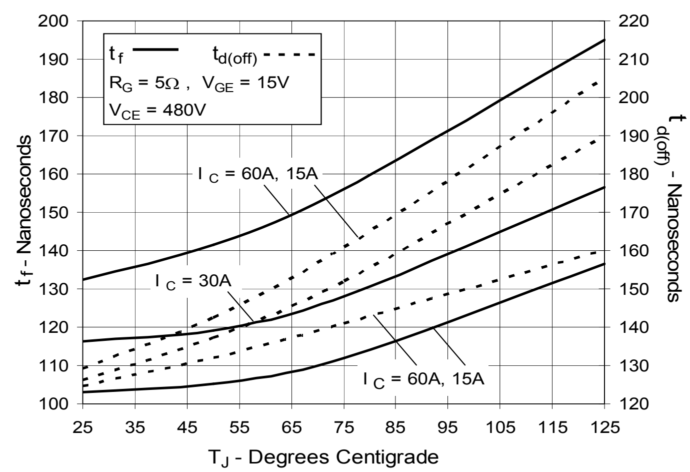


**Fig. 16. Inductive Turn-off
Switching Times vs. Collector Current**

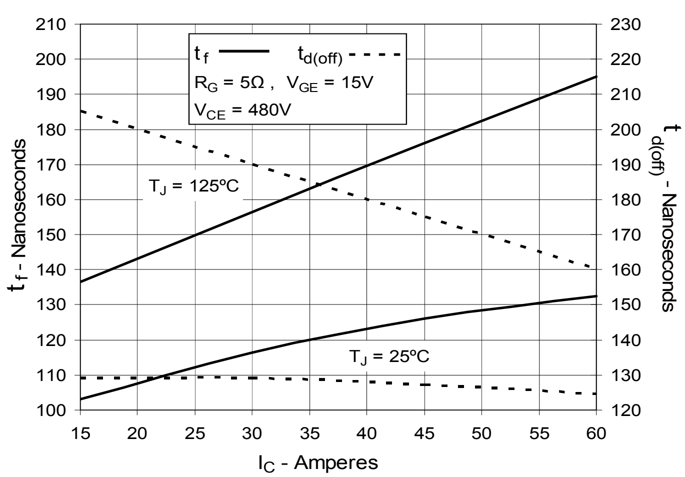


**Fig. 17. Inductive Turn-off
Switching Times vs. Gate Resistance**

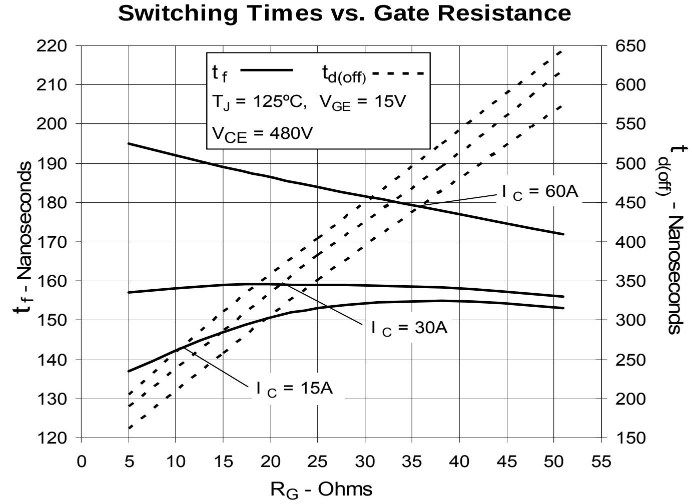


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

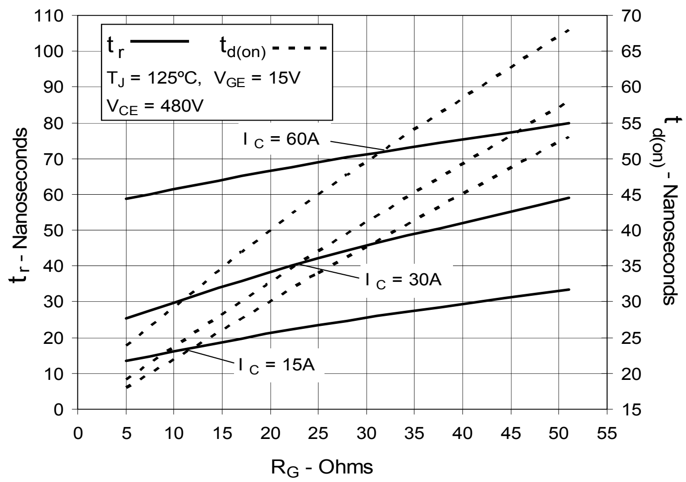


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

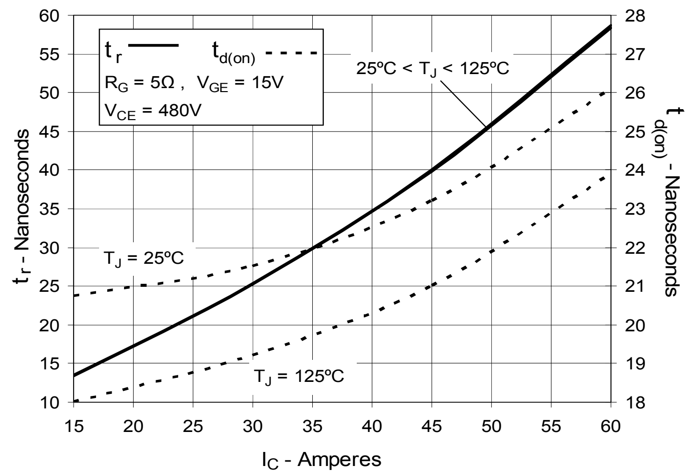
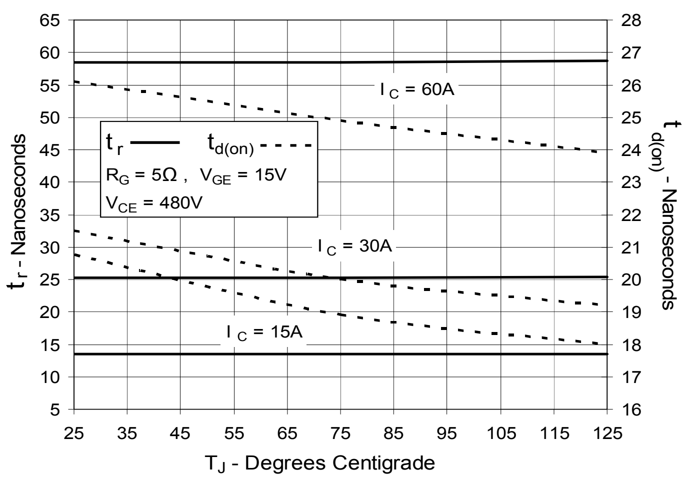


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



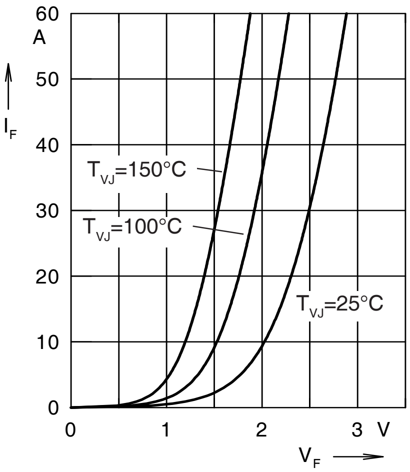


Fig. 21. Forward current I_F versus V_F

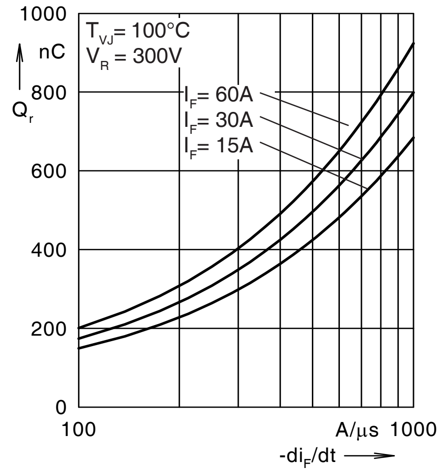


Fig. 22. Reverse recovery charge Q_r versus $-di_F/dt$

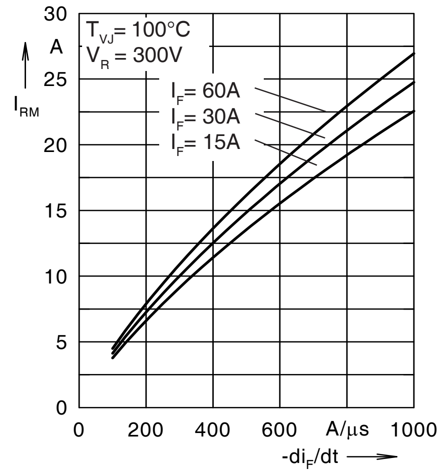


Fig. 23. Peak reverse current I_{RM} versus $-di_F/dt$

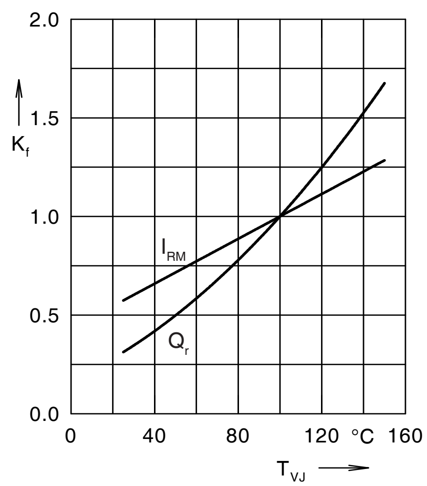


Fig. 24. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

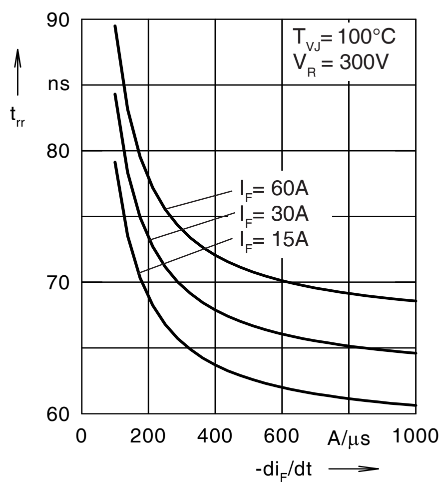


Fig. 25. Recovery time t_{rr} versus $-di_F/dt$

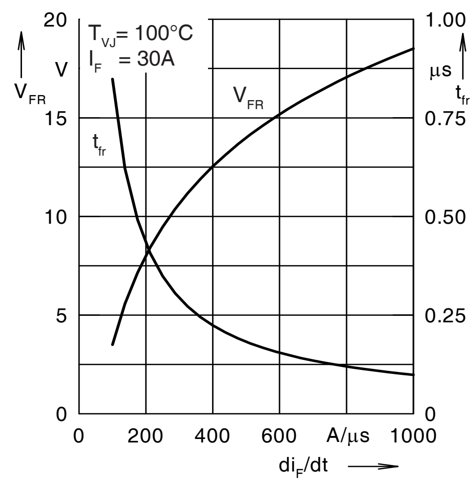


Fig. 26. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

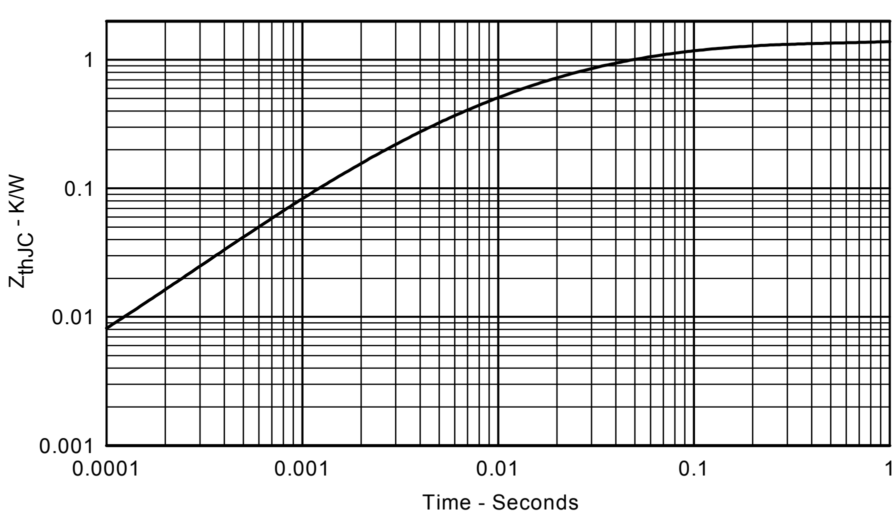


Fig. 27. Transient thermal resistance junction to case