IXYS

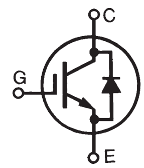
Preliminary Technical Information

GenX3™ C3-Class IGBT w/Diode

IXGH40N120C3D1

V_{CES} = 1200V
I_{C110} = 40A
$V_{CE(sat)}$ ≤ 4.4V
$t_{fi(typ)}$ = 57ns

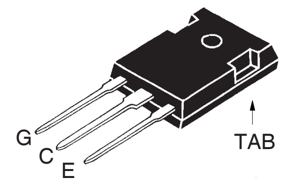
High Speed PT IGBT for 20 - 50 kHz Switching



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	1200	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	1200	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	40	A
I_{F110}	T_C = 110°C	25	A
I_{CM}	T_C = 25°C, 1ms	180	A
I_A	T_C = 25°C	30	A
E_{AS}	T_C = 25°C	500	mJ
SSOA	V_{GE}= 15V, T_J = 125°C, R_G = 3Ω	I_{CM} = 80	A
(RBSOA)	Clamped inductive load	@V_{CE} ≤1200	V
P_C	T_C = 25°C	380	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting Torque	1.13 / 10	Nm/lb.in.
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6mm (0.062 in.) from Case for 10s	260	°C
Weight		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			100	µA
	T_J = 125°C			3	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 30A, V_{GE} = 15V, Note 1			4.4	V
	T_J = 125°C		2.7		V

TO-247



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

Features

- Optimized for Low Conduction Losses
- Square RBSOA
- Avalanche Rated
- Anti-Parallel Ultra Fast Diode
- International Standard Package

Advantages

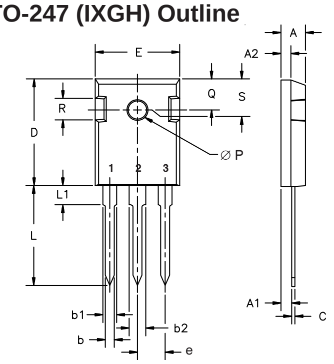
- High Power Density
- Low Gate Drive Requirement

Applications

- Switch-Mode and Resonant-Mode Power Supplies
- Uninterruptible Power Supplies (UPS)
- DC Choppers
- AC Motor Drives
- DC Servo and Robot Drives

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 30A, V_{CE} = 10V, Note 1	18	30		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		2930		pF
C_{oes}			240		pF
C_{res}			93		pF
Q_g	I_C = 40A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		142		nC
Q_{ge}			19		nC
Q_{gc}			62		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		17		ns
t_{ri}	I_C = 30A, V_{GE} = 15V		33		ns
E_{on}	V_{CE} = 600V, R_G = 3Ω		1.80		mJ
$t_{d(off)}$	Note 2		130		ns
t_{fi}			57	100	ns
E_{off}			0.55	1.00	mJ
$t_{d(on)}$	**Inductive load, T_J = 25°C**		17		ns
t_{ri}	I_C = 30A, V_{GE} = 15V		35		ns
E_{on}	V_{CE} = 600V, R_G = 3Ω		3.50		mJ
$t_{d(off)}$	Note 2		177		ns
t_{fi}			298		ns
E_{off}			1.60		mJ
R_{thJC}				0.33	°C/W
R_{thCK}			0.21		°C/W

TO-247 (IXGH) Outline



Terminals: 1 - Gate, 2 - Drain, 3 - Source, Tab - Drain

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)

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)		Characteristic Value 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, $-di_F/dt$ = 100A/μs,	T_J = 100°C			4	A
t_{rr}	V_R = 300V	T_J = 100°C		100		ns
R_{thJC}					0.9	°C/W

Note 1: Pulse Test, t ≤ 300μs, Duty Cycle, d ≤ 2%.
2. Switching Times may Increase for V_{CE} (Clamp) > 0.5 V_{CES}, Higher T_J or Increased R_G.

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.

Fig. 1. Output Characteristics @ 25ºC

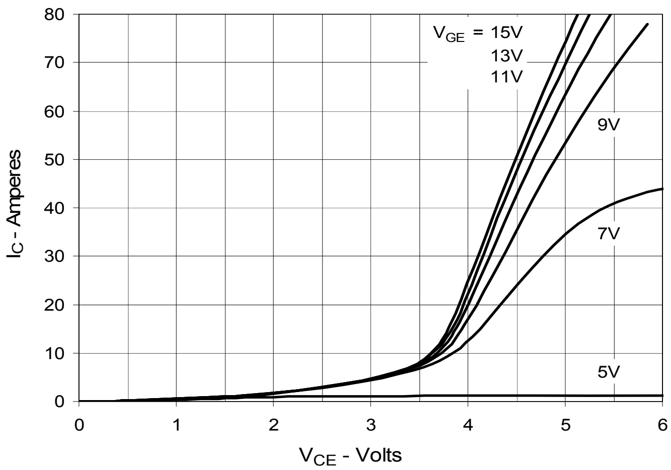


Fig. 2. Extended Output Characteristics @ 25ºC

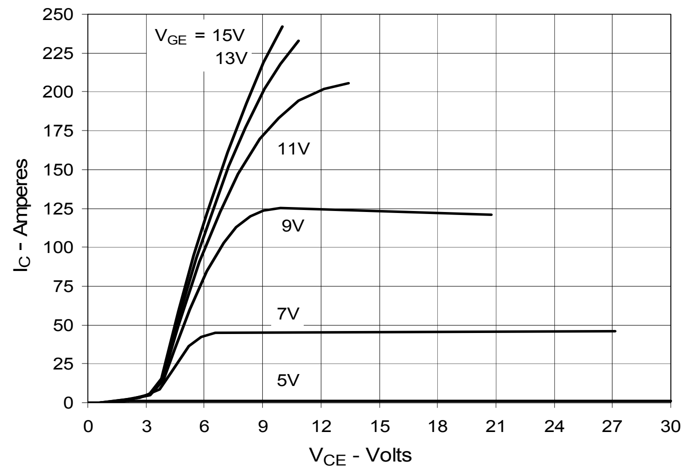


Fig. 3. Output Characteristics @ 125ºC

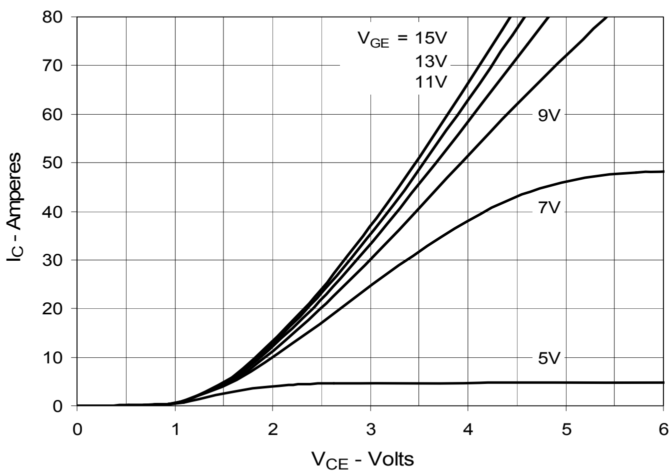


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

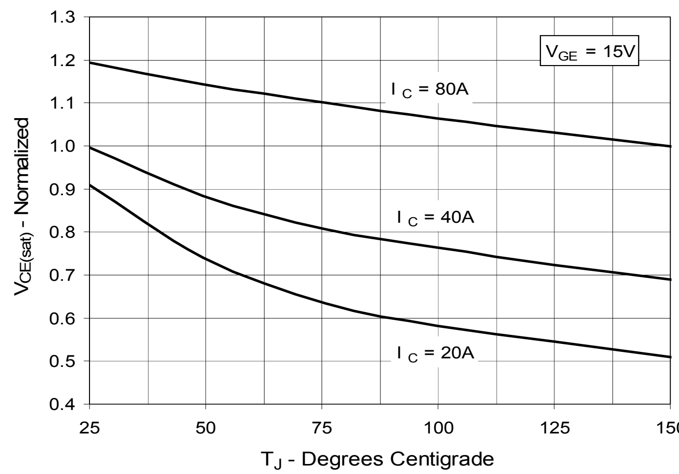


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

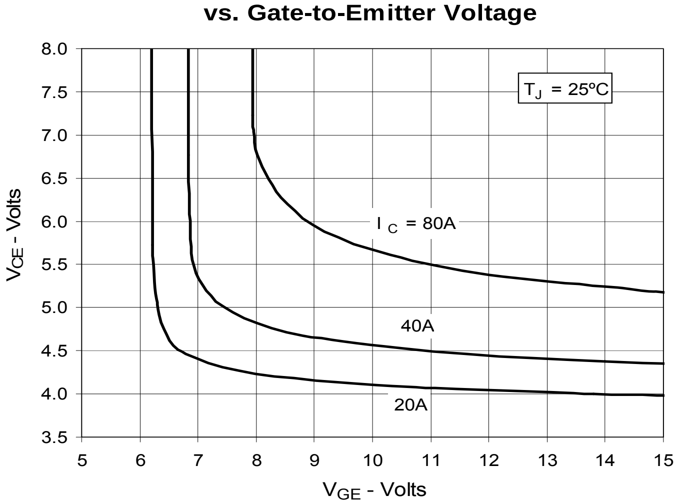


Fig. 6. Input Admittance

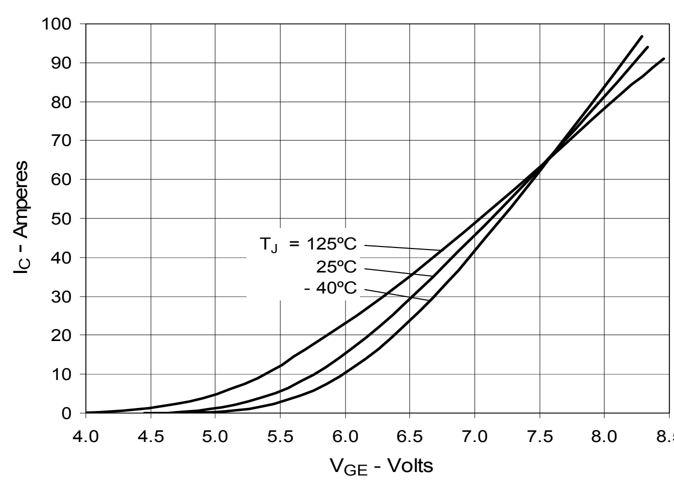


Fig. 7. Transconductance

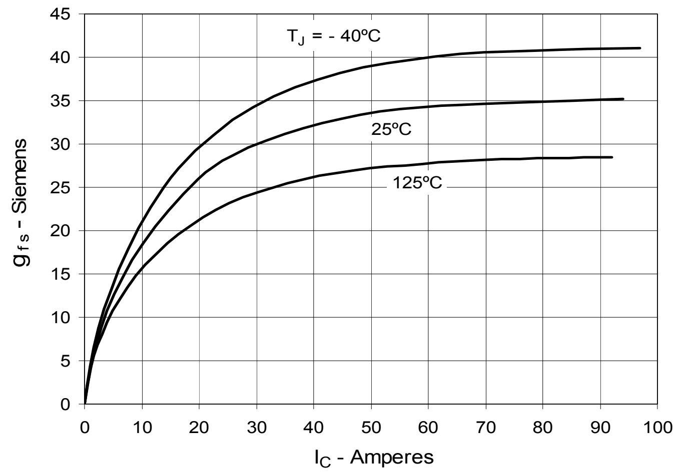


Fig. 8. Gate Charge

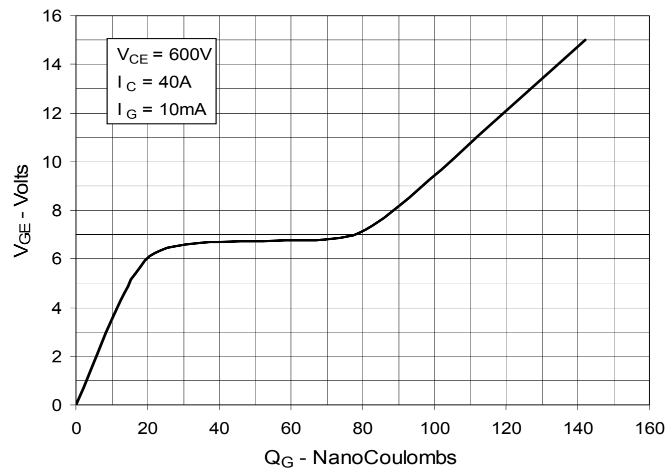


Fig. 9. Capacitance

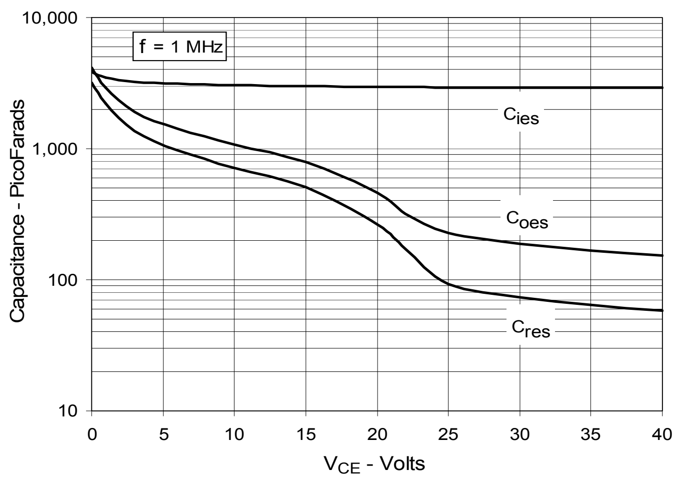


Fig. 10. Reverse-Bias Safe Operating Area

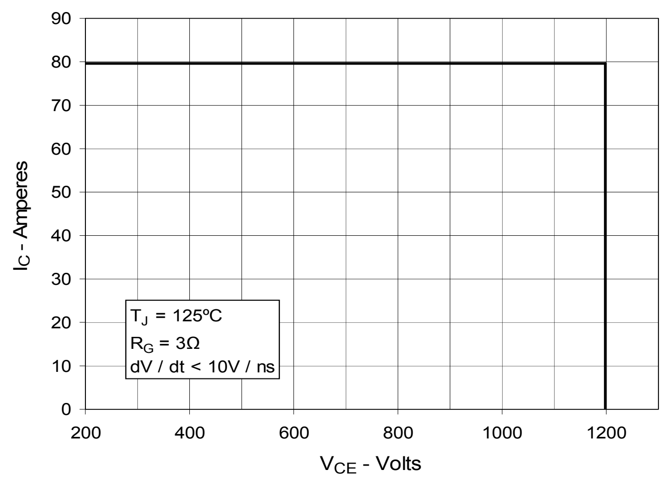
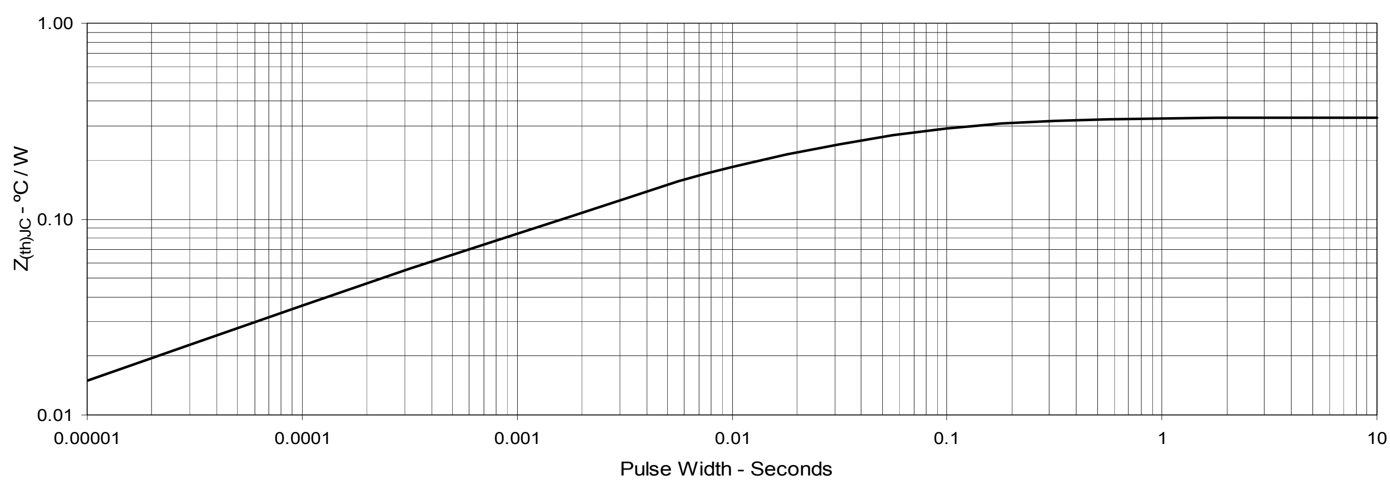


Fig. 11. Maximum Transient Thermal Impedance



IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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

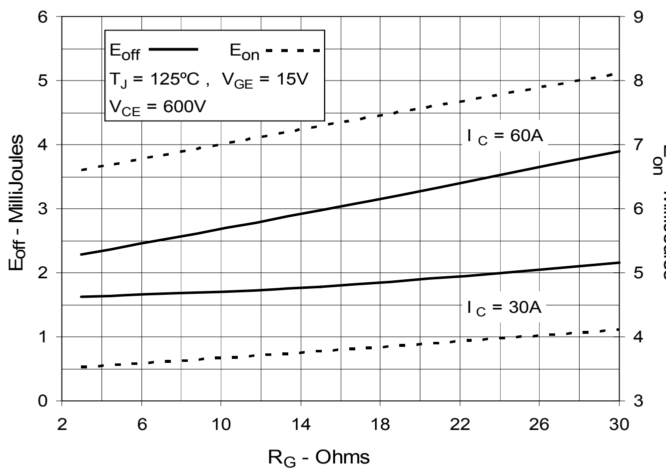


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

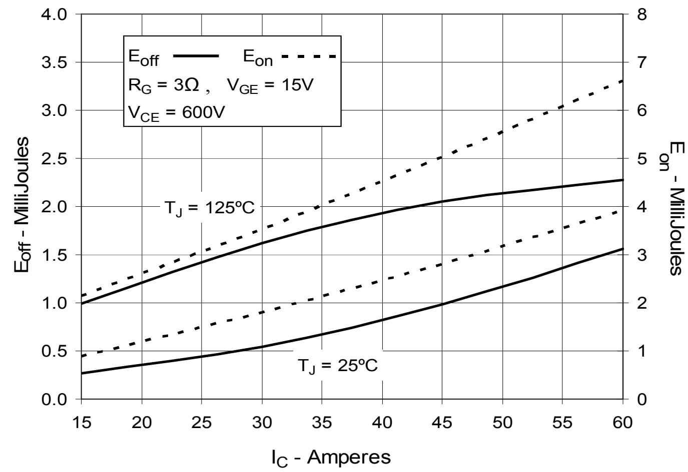


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

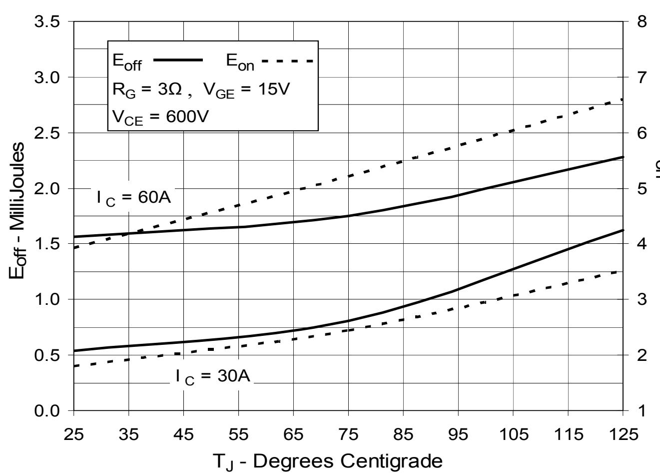


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

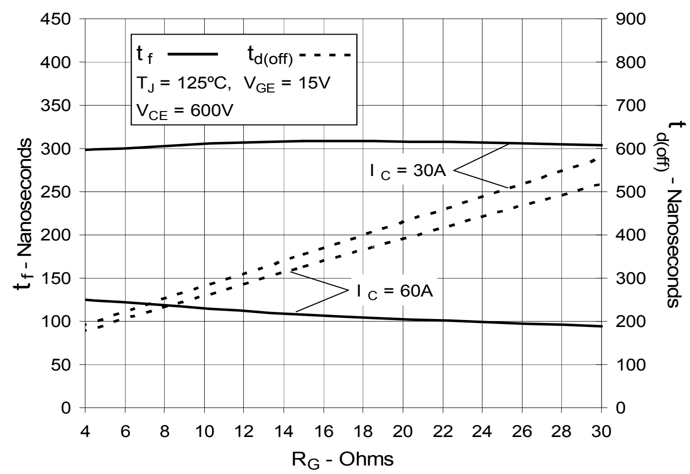


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

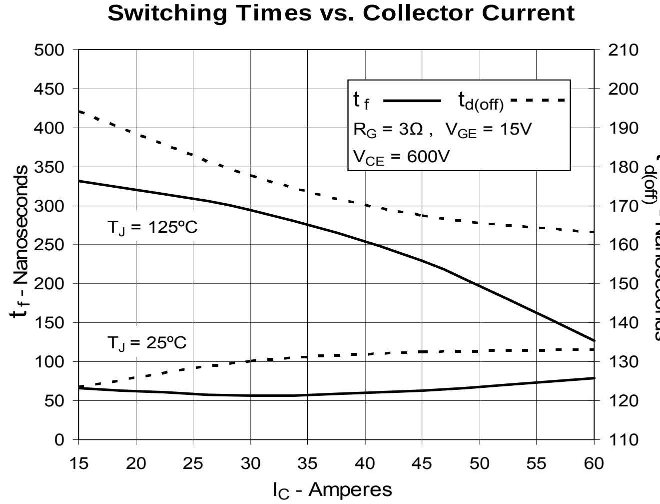


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

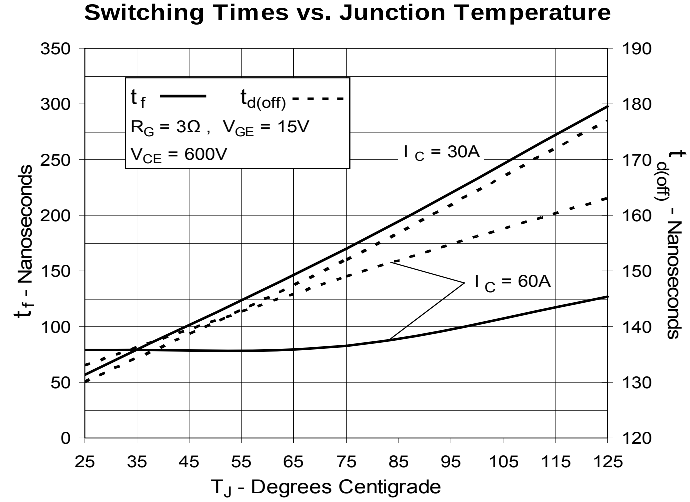


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

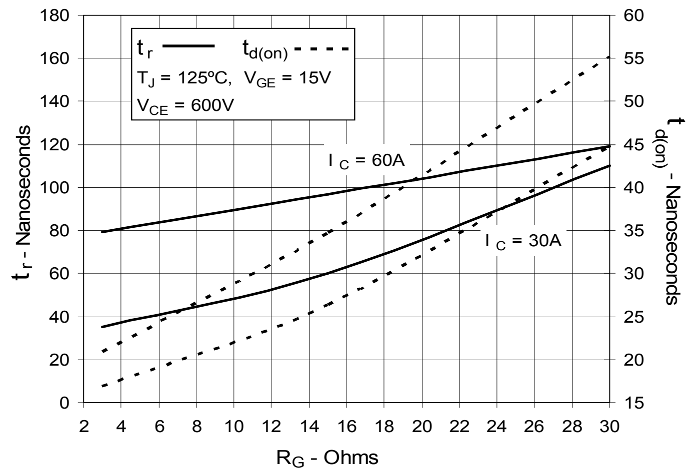


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

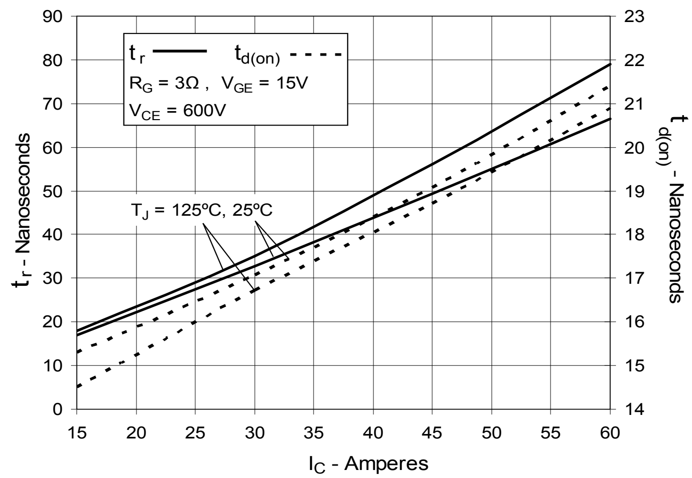
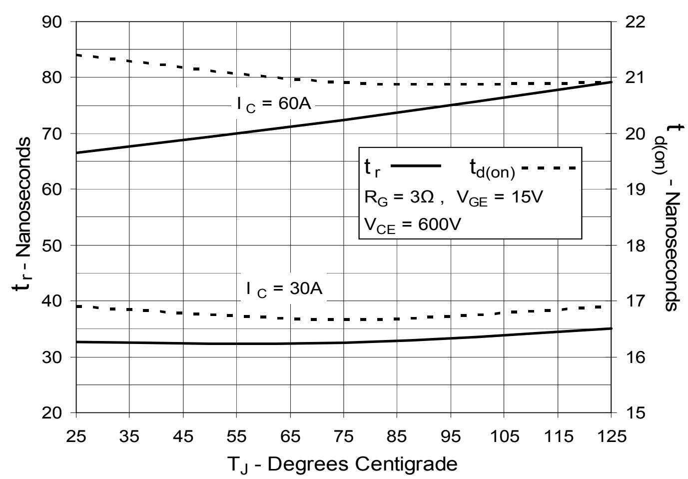


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



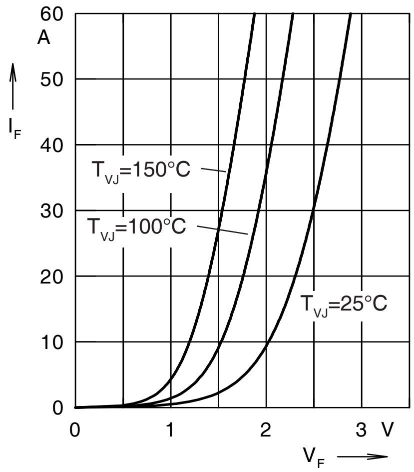


Fig. 21. Forward Current I_F Versus V_F

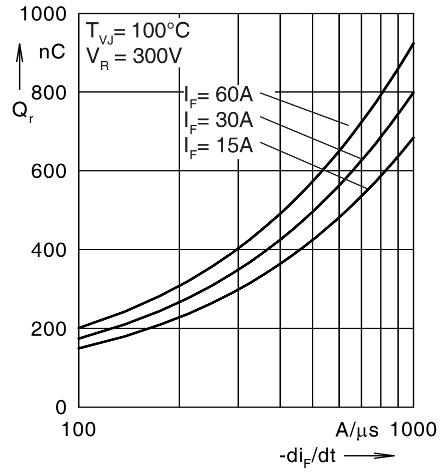


Fig. 22. Reverse Recovery Charge Q_r Versus $-di_F/dt$

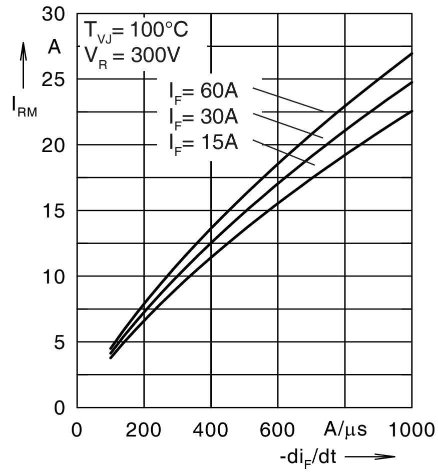


Fig. 23. Peak Reverse Current I_{RM} Versus $-di_F/dt$

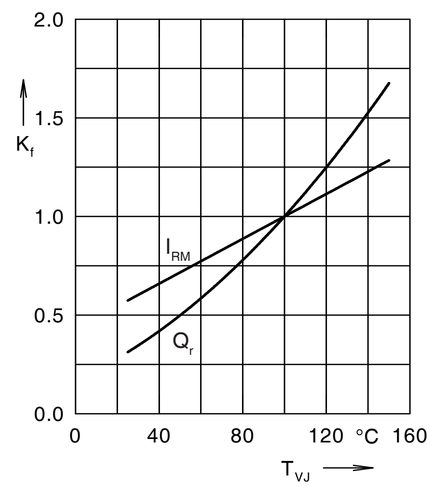


Fig. 24. Dynamic Parameters Q_r, I_{RM} Versus T_{VJ}

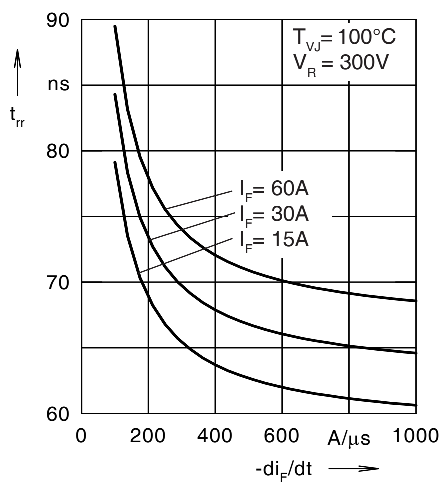


Fig. 25. Recovery Time t_{rr} Versus $-di_F/dt$

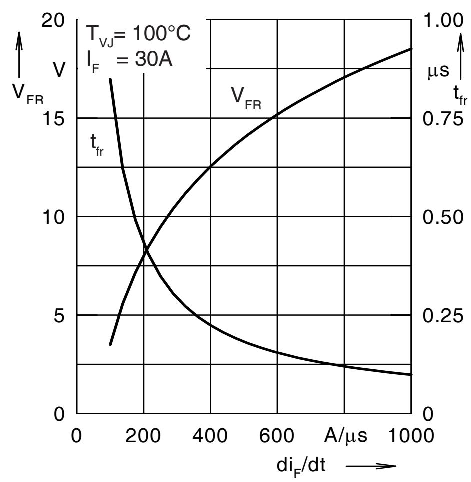


Fig. 26. Peak Forward Voltage V_{FR} and t_{fr} Versus di_F/dt

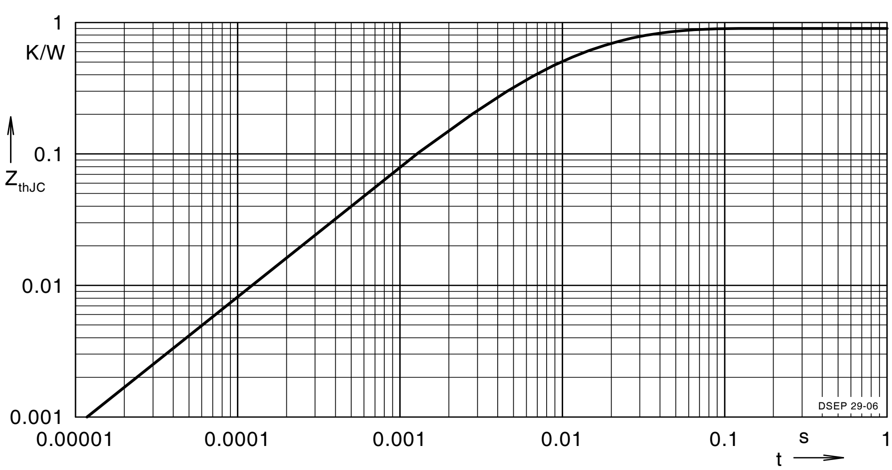


Fig. 27. Transient Thermal Resistance Junction to Case