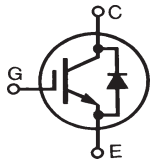
IXYS

GenX3™ 600V IGBT IXGH56N60B3D1

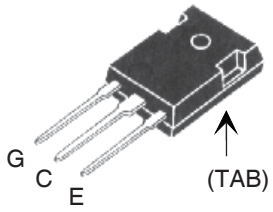
V_{CES} = 600V
I_{C110} = 56A
$V_{CE(sat)} \leq$ 1.8V

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	56	A
I_{CM}	T_C = 25°C, 1ms	350	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 5Ω Clamped inductive load @ ≤ 600V	I_{CM} = 150	A
P_d	T_C = 25°C	330	W
T_J		- 55 ... +150	°C
T_{JM}		150	°C
T_{stg}		- 40 ... +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

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

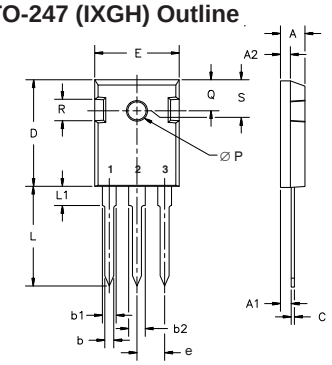
Applications

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

Symbol	Test Conditions (T_J = 25°C unless otherwise specified)	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}			300	μA
	V_{GE} = 0V, T_J = 125°C			2	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ± 20V			±100	nA
$V_{CE(sat)}$	I_C = 44A, V_{GE} = 15V, Note 1		1.49	1.80	V
	T_J = 125°C		1.47		

Symbol	Test Conditions (T_J = 25°C unless otherwise specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 44A, V_{CE} = 10V, Note 1	36	60		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		3950		pF
C_{oes}			220		pF
C_{res}			56		pF
Q_g	I_C = 40A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		138		nC
Q_{ge}			25		nC
Q_{gc}			47		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C** I_C = 44A, V_{GE} = 15V V_{CE} = 480V, R_G = 5Ω		26		ns
t_{ri}			41		ns
E_{on}			1.30		mJ
$t_{d(off)}$			155	335	ns
t_{fi}			95	165	ns
E_{off}			1.05	2.0	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C** I_C = 44A, V_{GE} = 15V V_{CE} = 480V, R_G = 5Ω		26		ns
t_{ri}			37		ns
E_{on}			2.34		mJ
$t_{d(off)}$			220		ns
t_{fi}			165		ns
E_{off}			2.20		mJ
R_{thJC}				0.375	°C/W
R_{thCS}			0.21		°C/W

TO-247 (IXGH) Outline



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

Dim.	Millimeter Min.	Max.	Inches Min.	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
ØP	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 Values 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

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

Fig. 1. Output Characteristics @ 25ºC

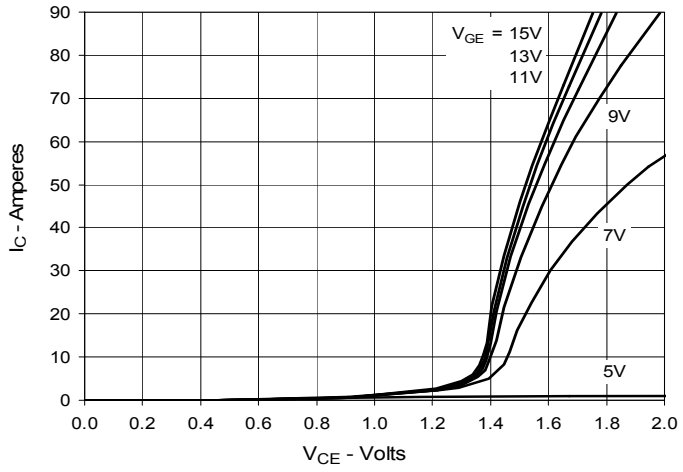


Fig. 2. Extended Output Characteristics @ 25ºC

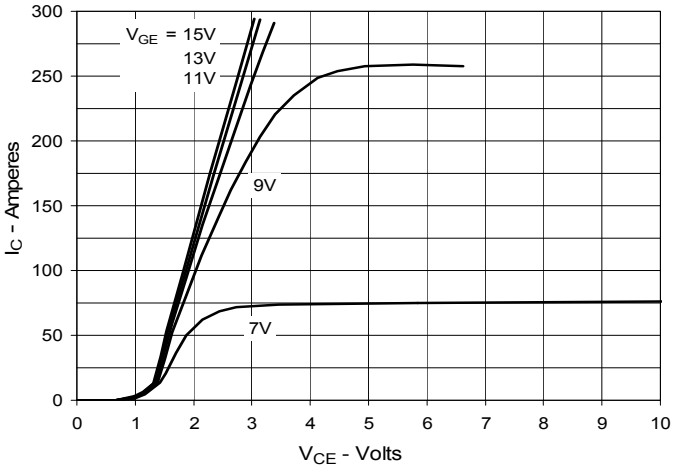


Fig. 3. Output Characteristics @ 125ºC

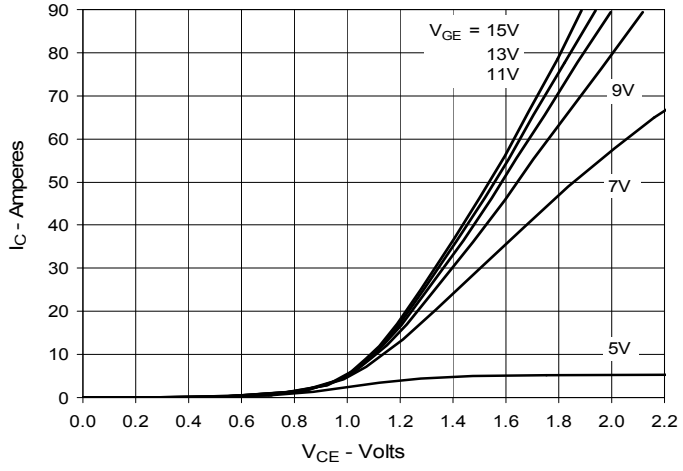


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

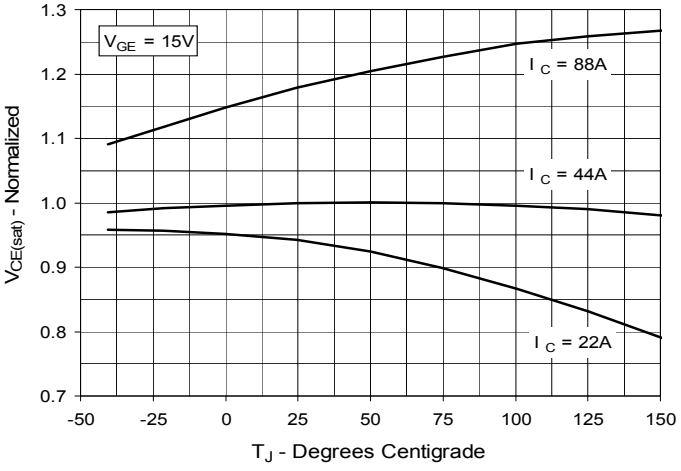


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

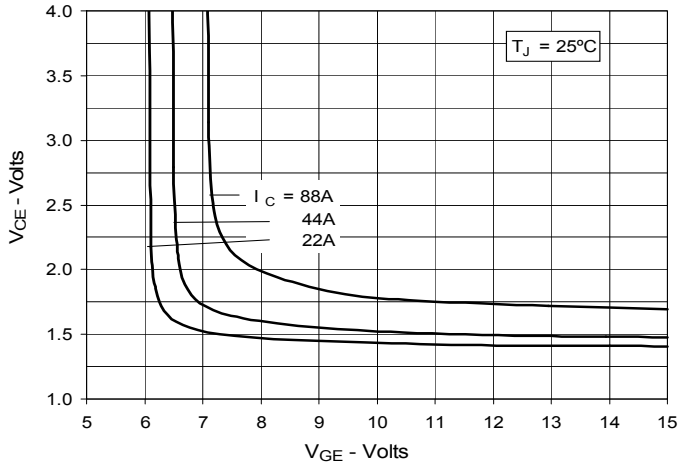


Fig. 6. Input Admittance

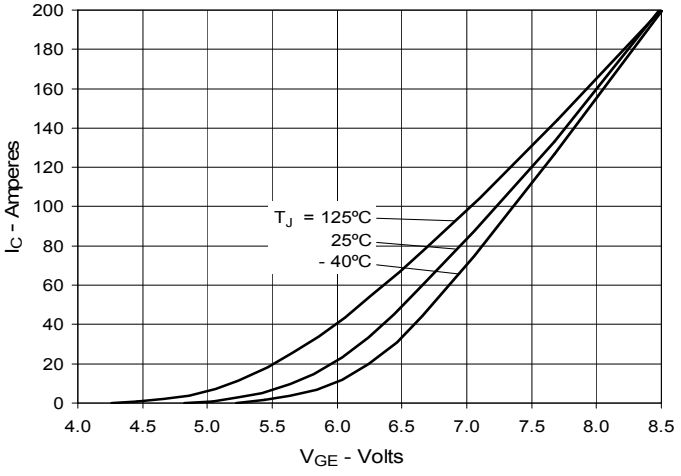


Fig. 7. Transconductance

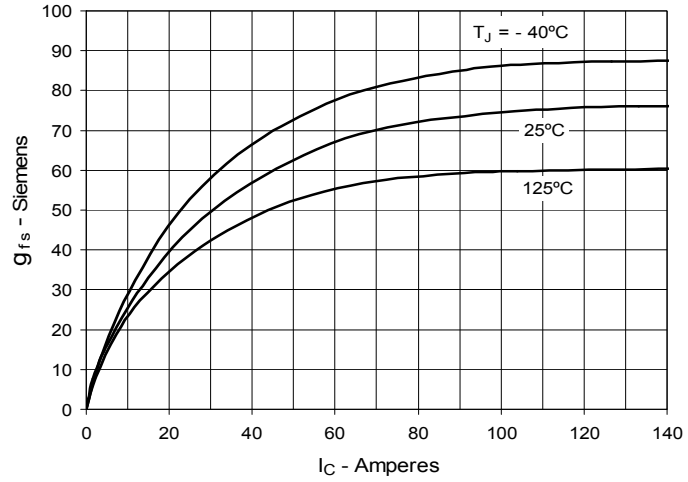


Fig. 8. Gate Charge

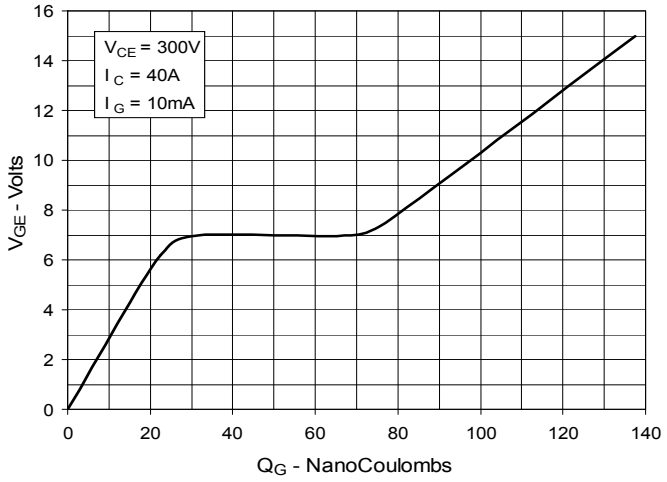


Fig. 9. Capacitance

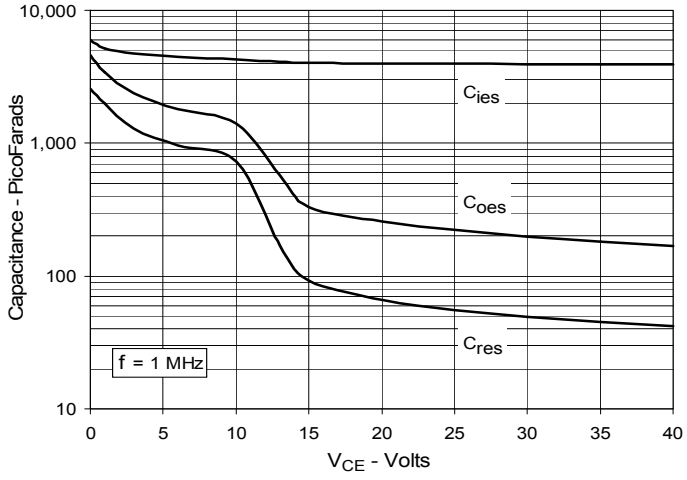


Fig. 10. Reverse-Bias Safe Operating Area

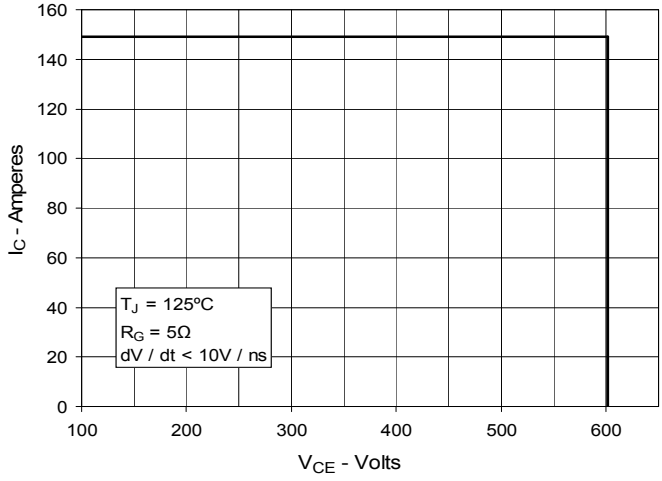
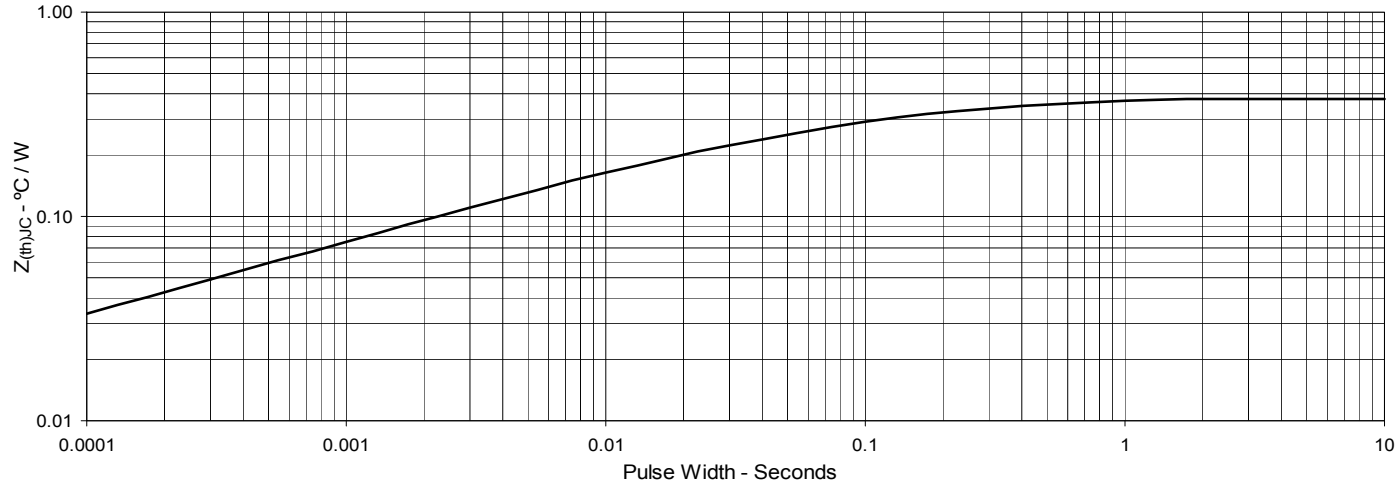


Fig. 11. Maximum Transient Thermal Impedance



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

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

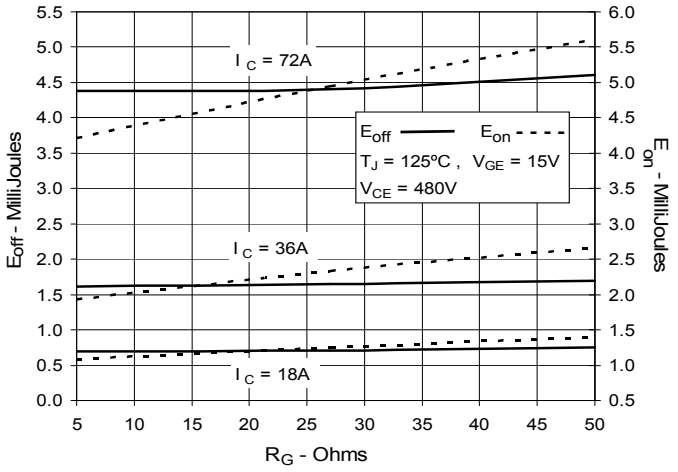


Fig. 13. Inductive Swiching Energy Loss vs. Collector Current

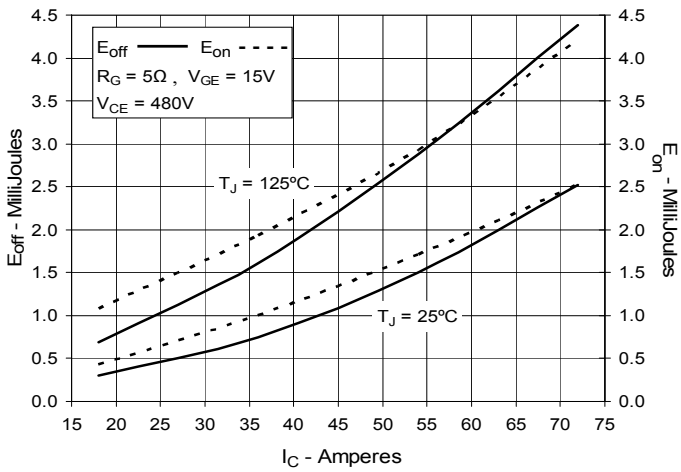


Fig. 14. Inductive Swiching Energy Loss vs. Junction Temperature

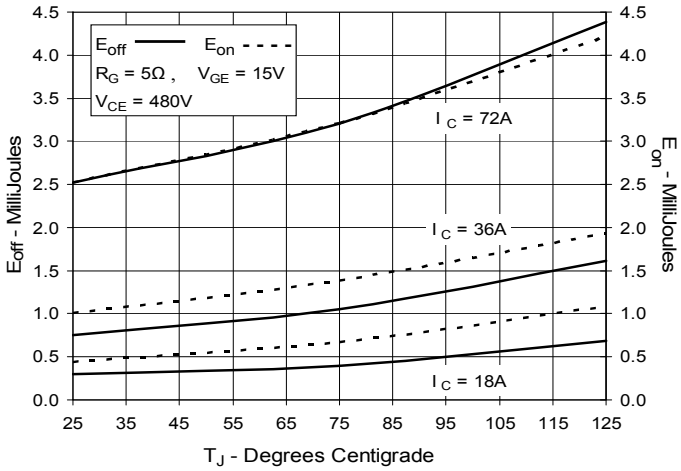


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

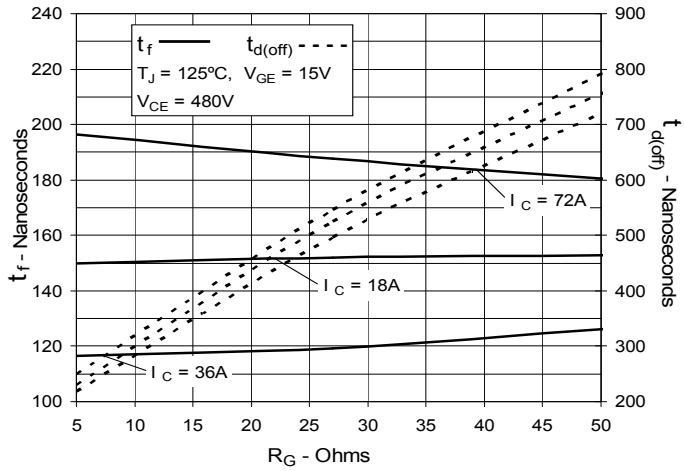


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

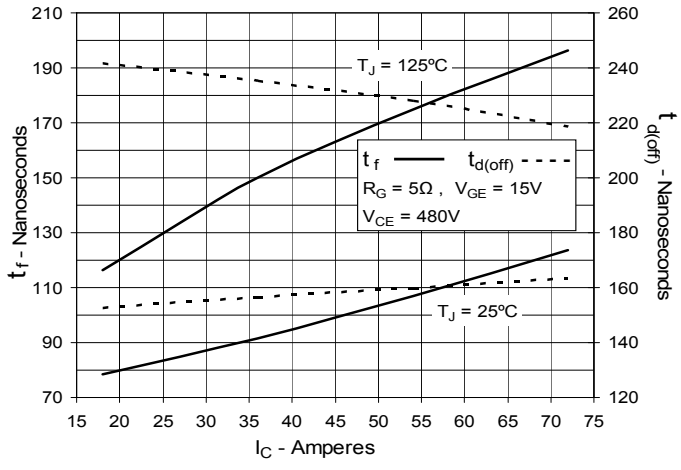


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

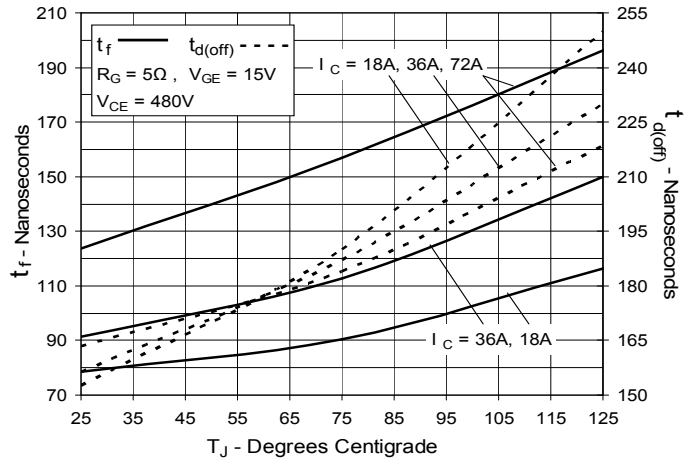


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

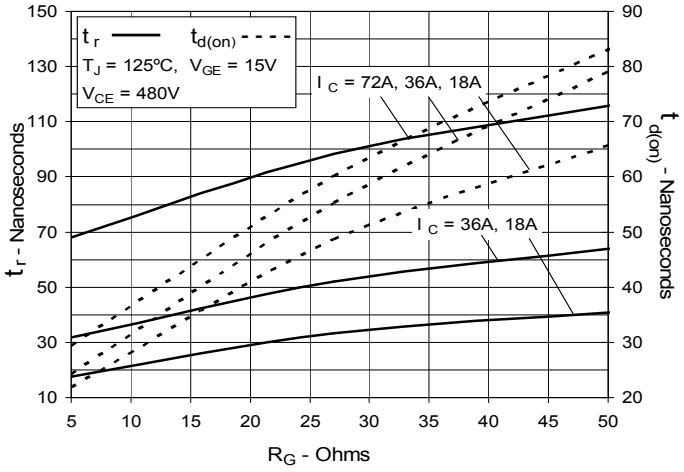


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

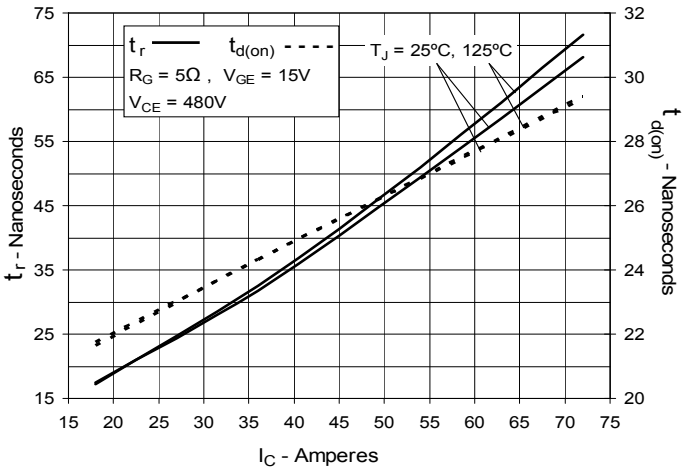
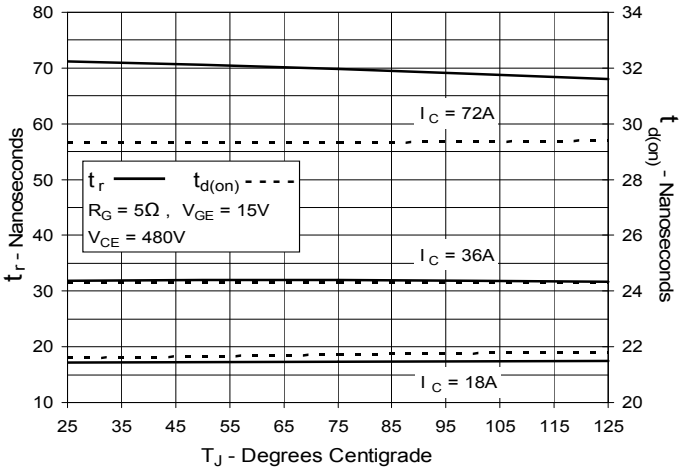


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



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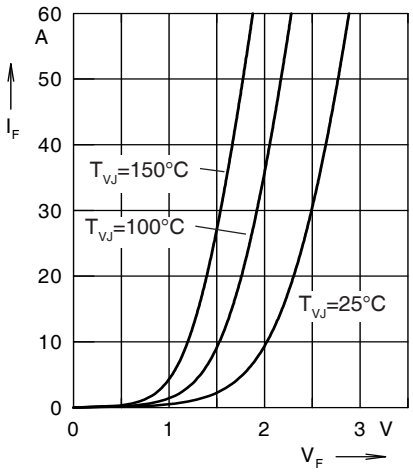

Fig. 21. Forward current I_F versus V_F

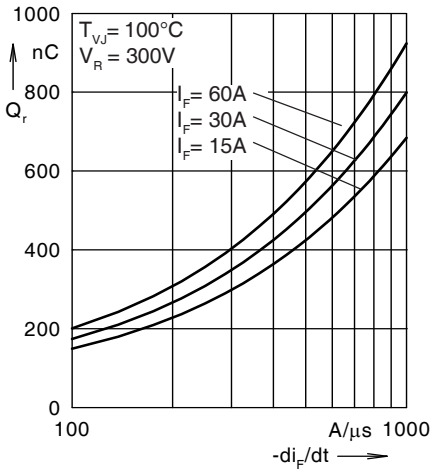

Fig. 22. Reverse recovery charge Q_r versus -di_F/dt

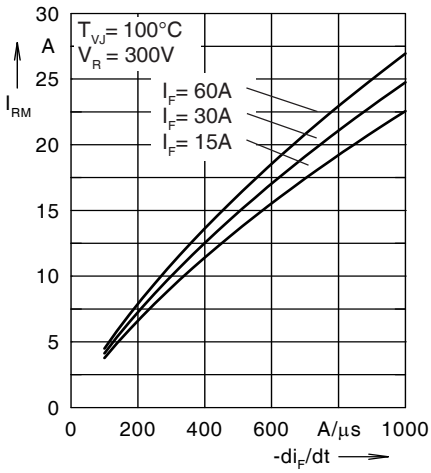

Fig. 23. Peak reverse current I_{RM} versus -di_F/dt

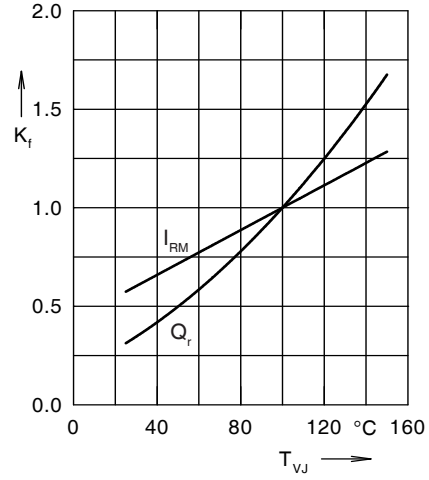

Fig. 24. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

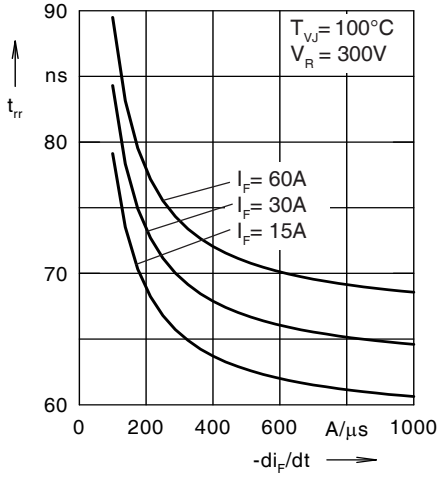

Fig. 25. Recovery time t_{rr} versus -di_F/dt

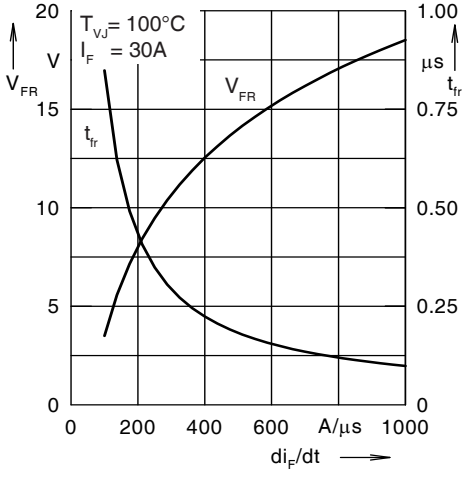

Fig. 26. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

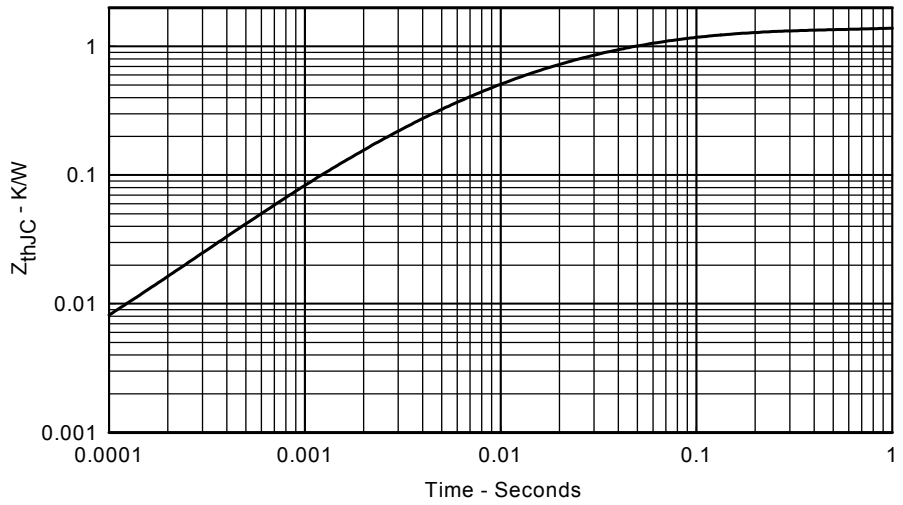

Fig. 27. Transient thermal resistance junction to case