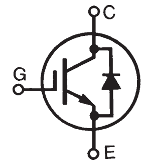
IXYS

1200V XPT™ IGBT GenX3™ w/ Diode

IXYH40N120C3D1

V_{CES} = 1200V
I_{C90} = 40A
$V_{CE(sat)}$ ≤ 4.0V
$t_{fi(typ)}$ = 38ns

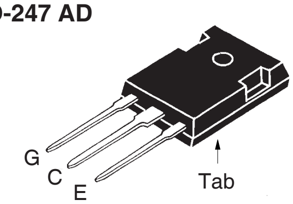
High-Speed IGBT
for 20-50 kHz Switching



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 (Chip Capability)	64	A
I_{C90}	T_C = 90°C	40	A
I_{F110}	T_C = 110°C	25	A
I_{CM}	T_C = 25°C, 1ms	105	A
I_A	T_C = 25°C	20	A
E_{AS}	T_C = 25°C	400	mJ
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 10Ω Clamped Inductive Load	I_{CM} = 80 @$V_{CE} \le V_{CES}$	A
P_C	T_C = 25°C	480	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	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	1200			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			50	µA
	T_J = 125°C			500	µA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 40A, V_{GE} = 15V, Note 1			4.0	V
	T_J = 125°C		4.8		V

TO-247 AD



G = Gate   C = Collector
E = Emitter   Tab = Collector

Features

- Optimized for Low Switching Losses
- Square RBSOA
- Positive Thermal Coefficient of Vce(sat)
- Anti-Parallel Ultra Fast Diode
- Avalanche Rated
- High Current Handling Capability
- International Standard Package

Advantages

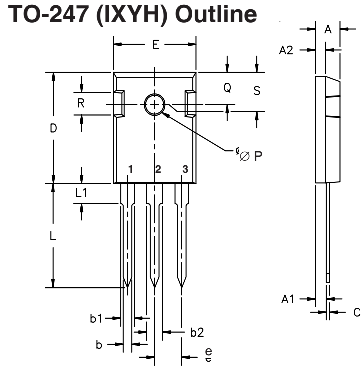
- High Power Density
- Low Gate Drive Requirement

Applications

- High Frequency 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.	
g_{fs}	I_C = 40A, V_{CE} = 10V, Note 1	12	20		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		1880		pF
C_{oes}			225		pF
C_{res}			40		pF
$Q_{g(on)}$	I_C = 40A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		85		nC
Q_{ge}			14		nC
Q_{gc}			38		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		24		ns
t_{ri}	I_C = 40A, V_{GE} = 15V		60		ns
E_{on}	V_{CE} = 0.5 • V_{CES}, R_G = 10Ω		3.90		mJ
$t_{d(off)}$	Note 2		125		ns
t_{fi}			38		ns
E_{off}			0.66	1.15	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		27		ns
t_{ri}	I_C = 40A, V_{GE} = 15V		72		ns
E_{on}	V_{CE} = 0.5 • V_{CES}, R_G = 10Ω		8.20		mJ
$t_{d(off)}$	Note 2		140		ns
t_{fi}			38		ns
E_{off}			0.70		mJ
R_{thJC}				0.26	°C/W
R_{thCS}			0.21		°C/W

TO-247 (IXYH) Outline



Terminals: 1 - Gate 2 - Collector
3 - Emitter

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
∅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				3.00	V
		T_J = 150°C		1.75		V
I_{RM}	I_F = 30A,V_{GE} = 0V, -di_F/dt = 100A/μs,	T_J = 100°C			9	A
t_{rr}	V_R = 600V	T_J = 100°C		195		ns
R_{thJC}					0.90	°C/W

Notes:

1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. Switching times & energy losses may increase for higher V_{CE}(clamp), T_J or R_G.

Fig. 1. Output Characteristics @ T_J = 25ºC

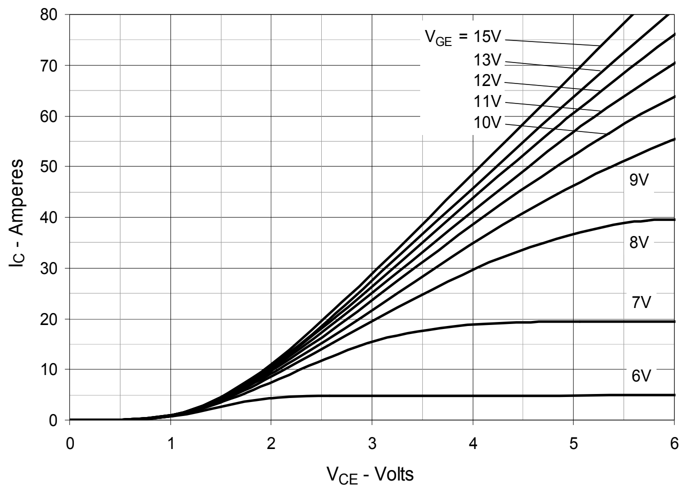


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

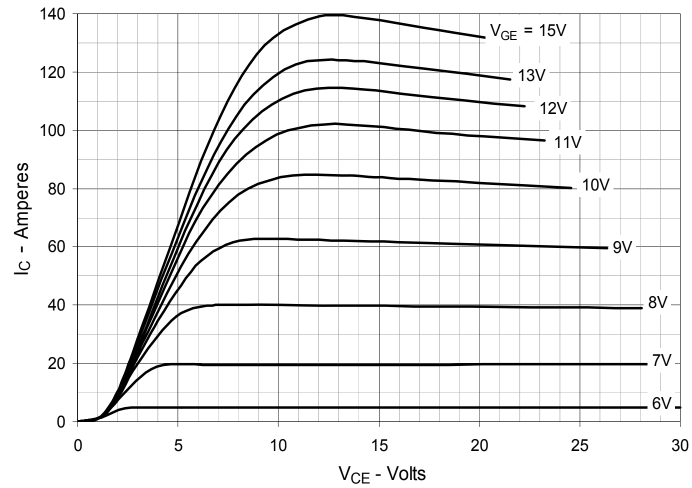


Fig. 3. Output Characteristics @ T_J = 150ºC

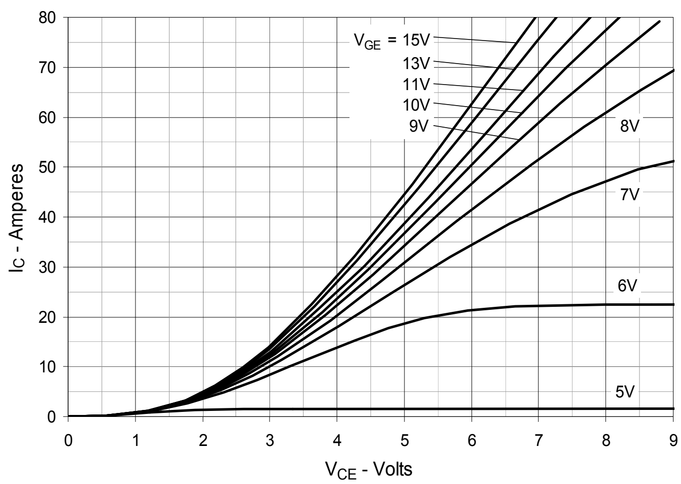


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

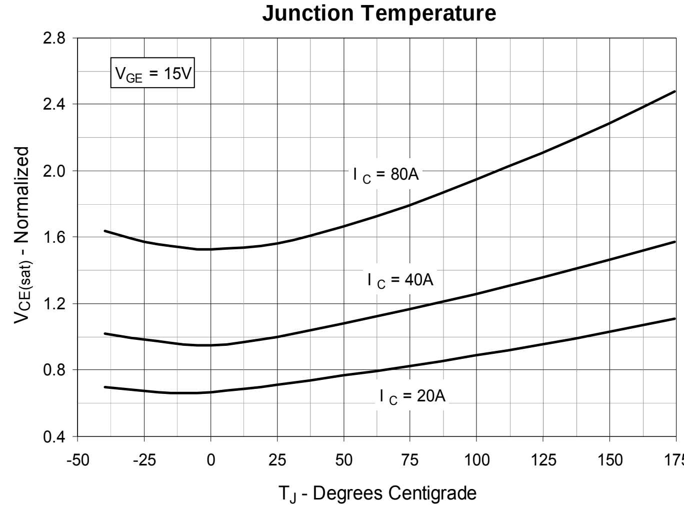


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

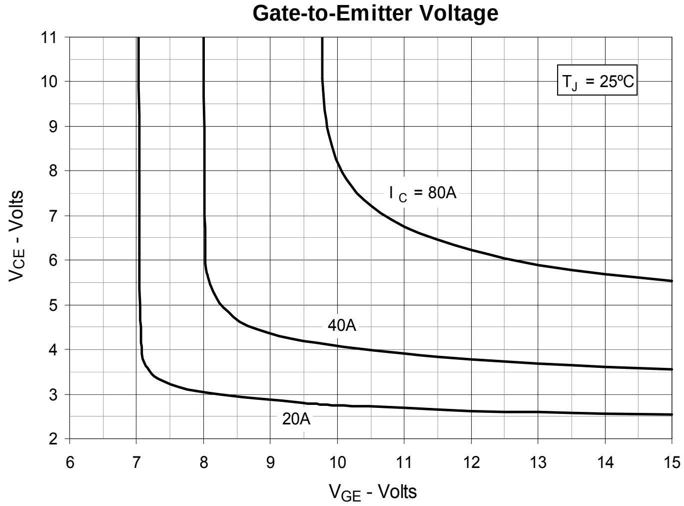
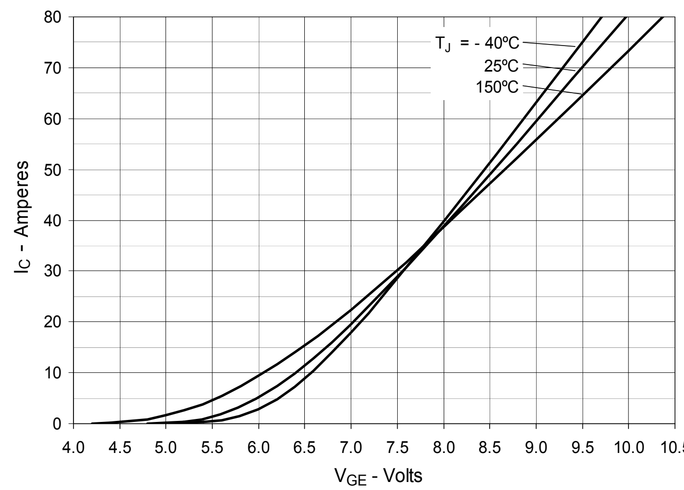


Fig. 6. Input Admittance



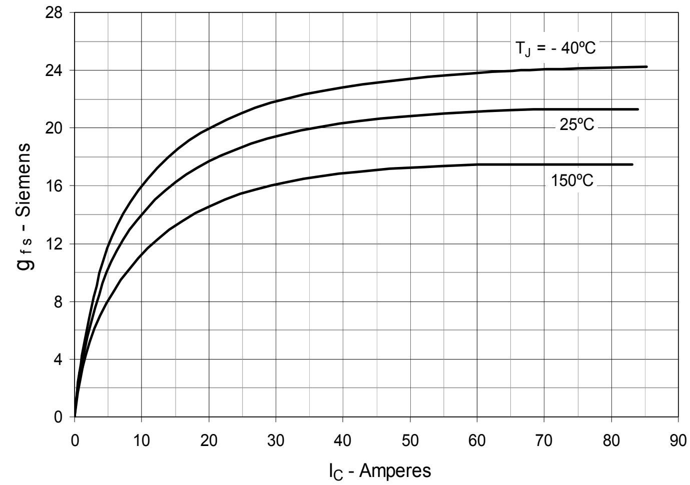


Fig. 7. Transconductance

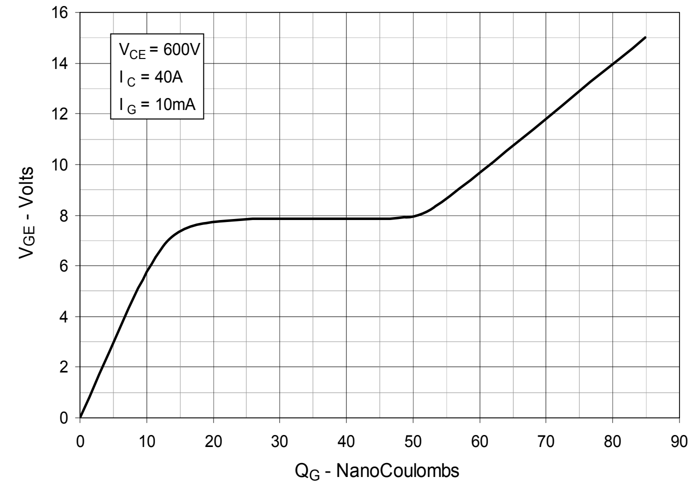


Fig. 8. Gate Charge

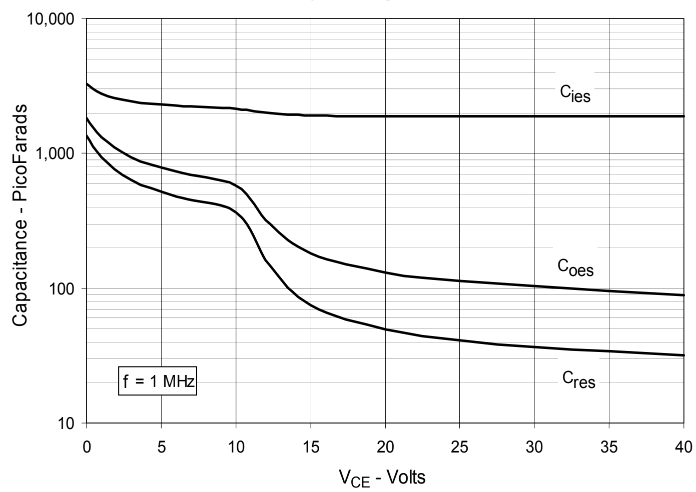


Fig. 9. Capacitance

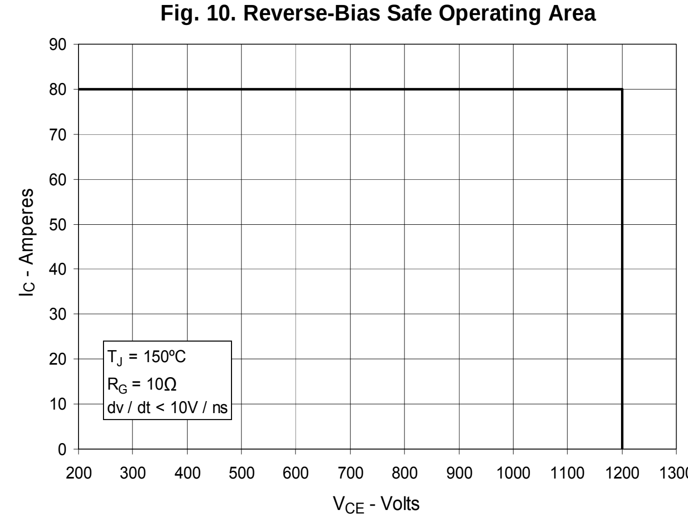


Fig. 10. Reverse-Bias Safe Operating Area

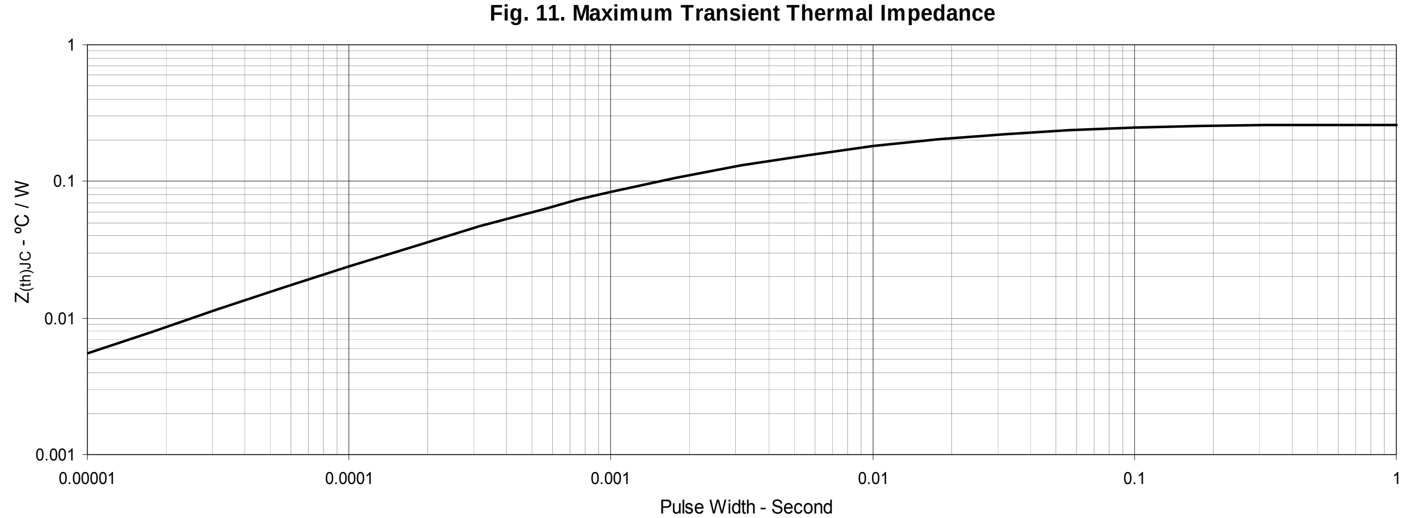


Fig. 11. Maximum Transient Thermal Impedance

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

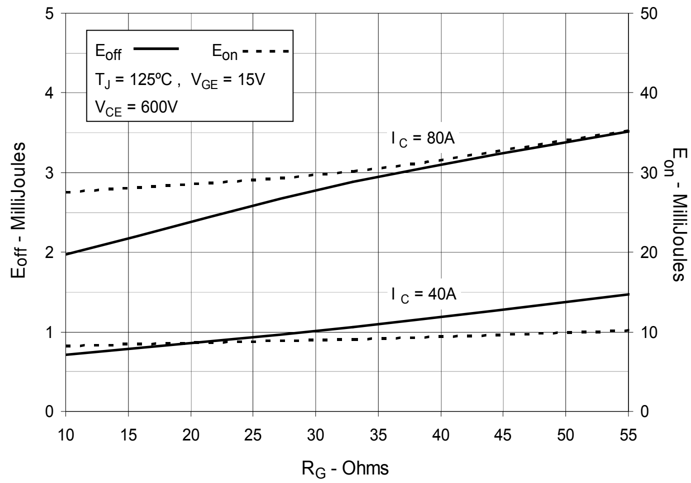


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

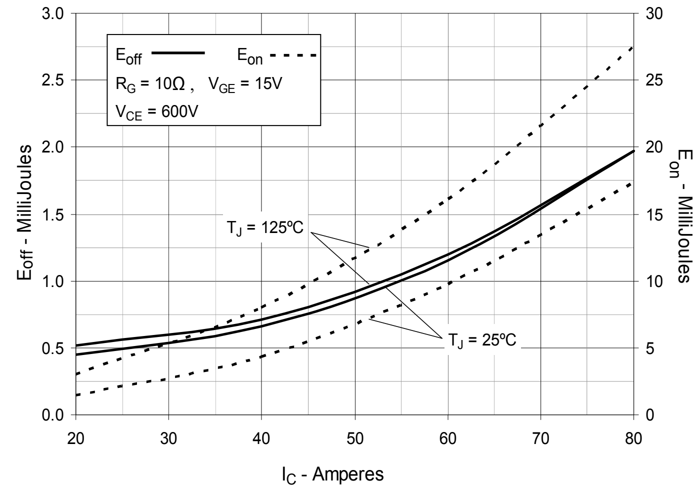


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

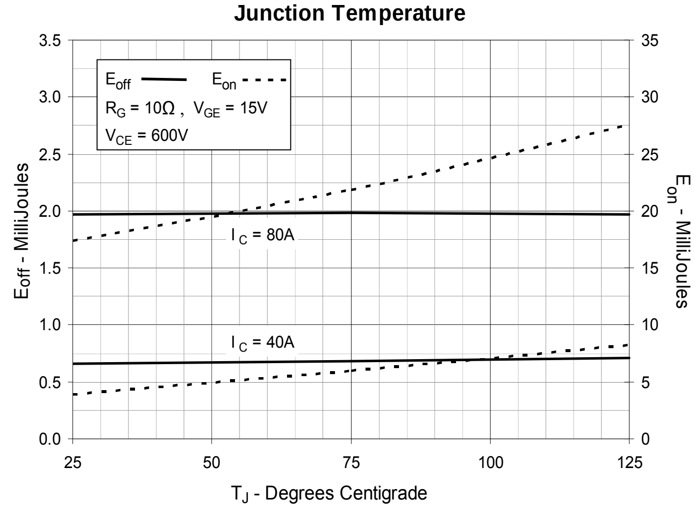


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

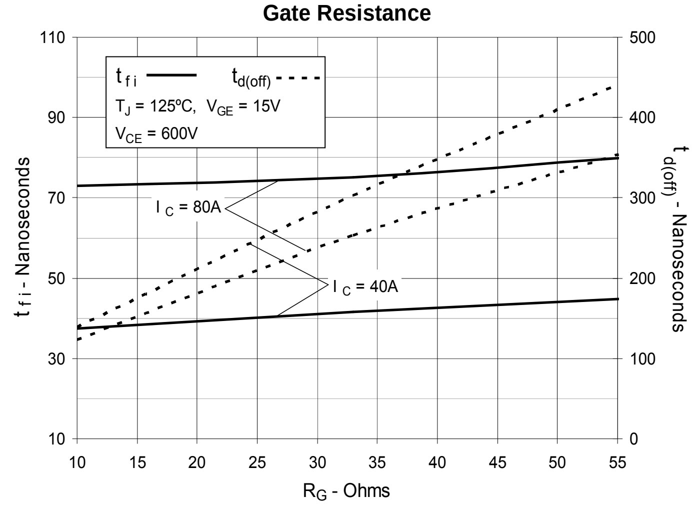


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

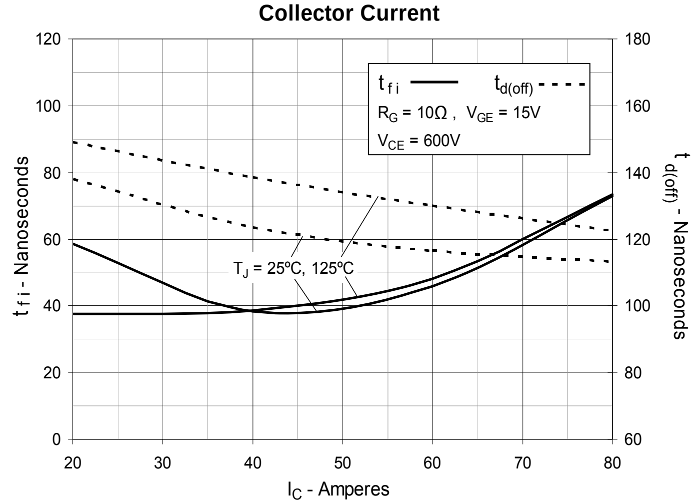


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

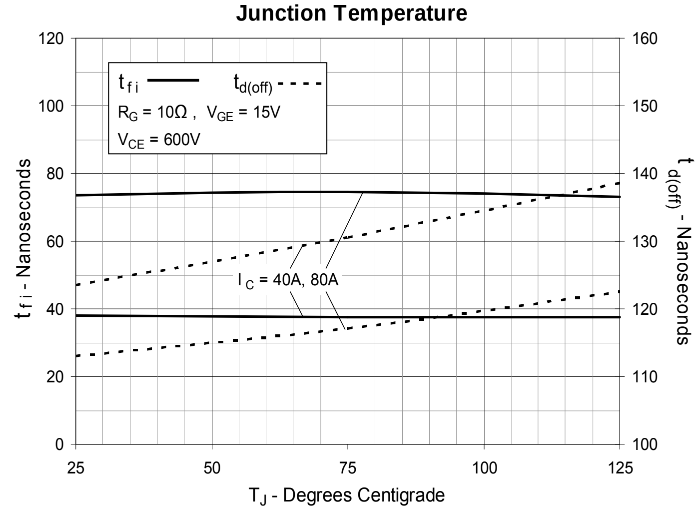


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

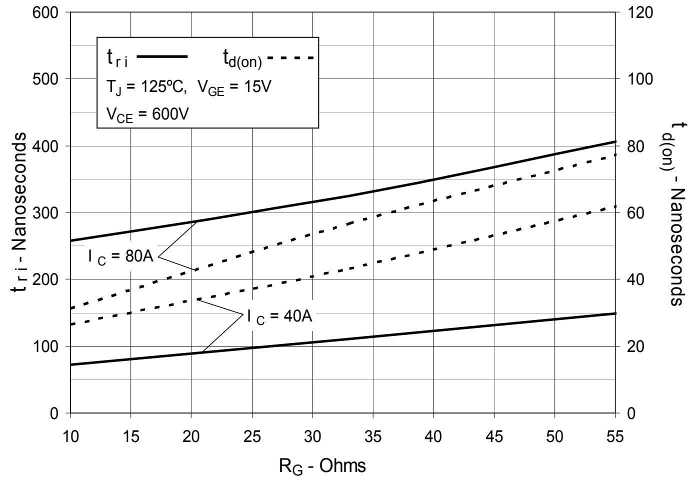


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

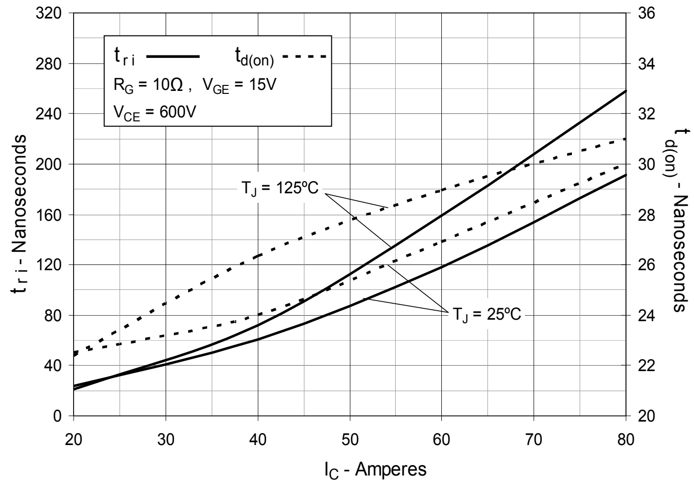


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

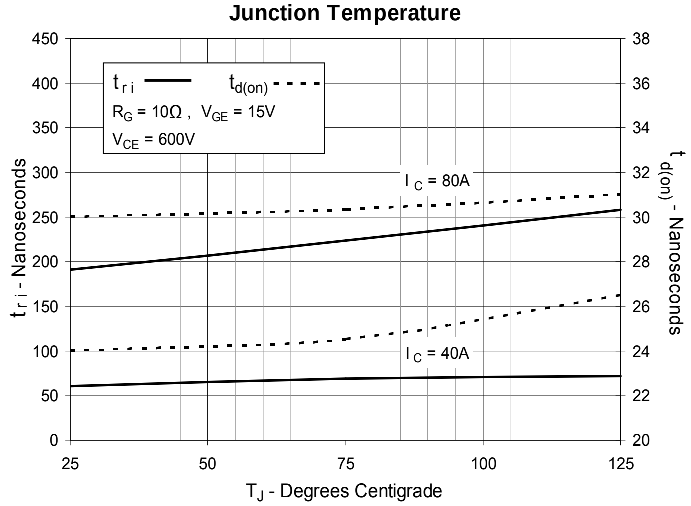


Fig. 21. Maximum Transient Thermal Impedance (Diode)

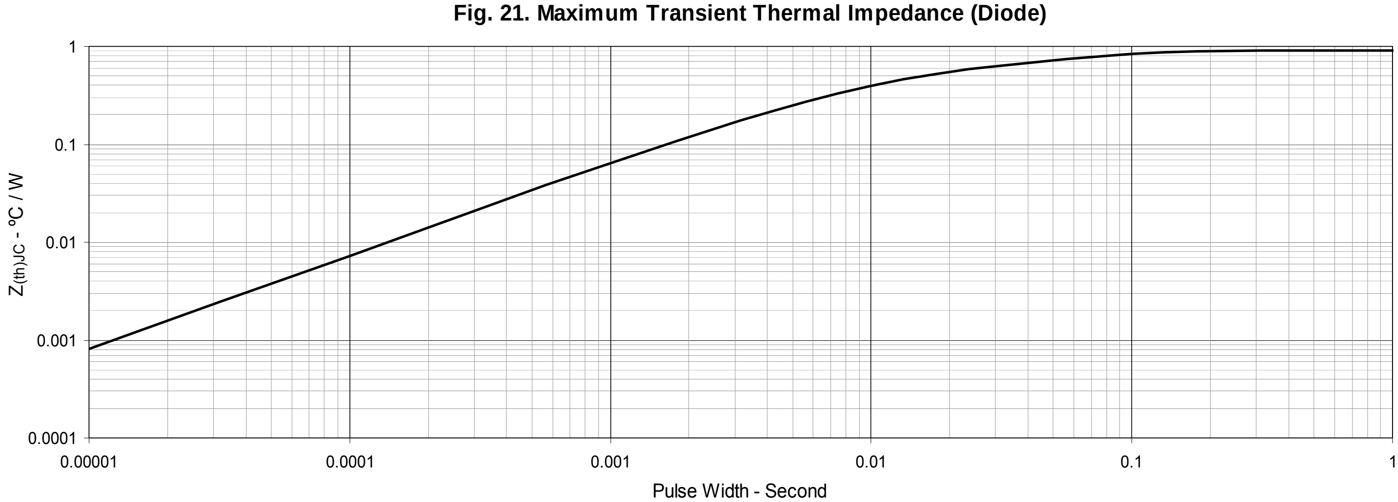


Fig. 22. Forward Current I_F vs V_F

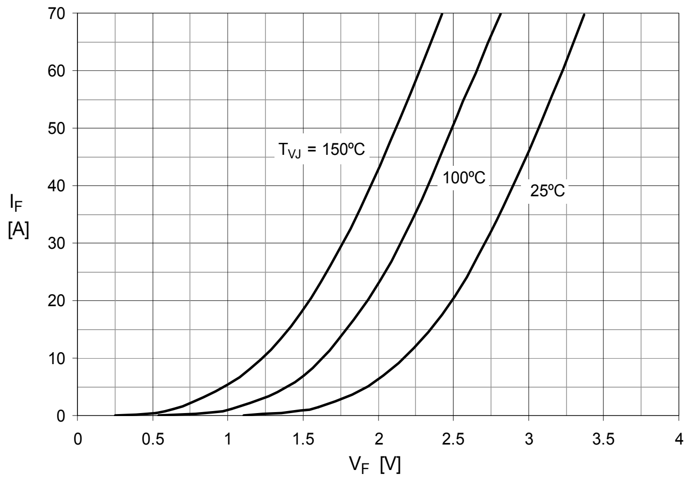


Fig. 23. Reverse Recovery Charge Q_{RM} vs. $-di_F/dt$

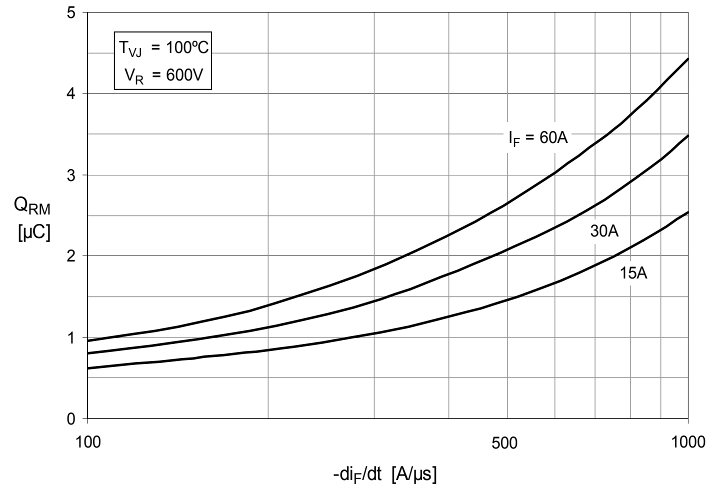


Fig. 24. Peak Reverse Current I_{RM} vs. $-di_F/dt$

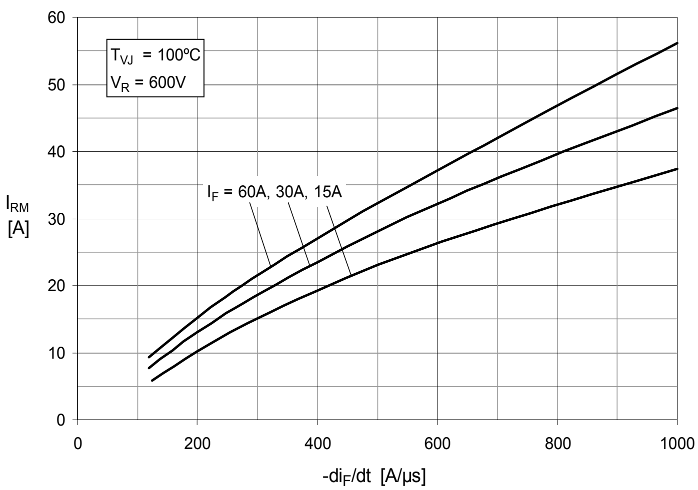


Fig. 25. Dynamic Parameters Q_{RM}, I_{RM} vs. T_{VJ}

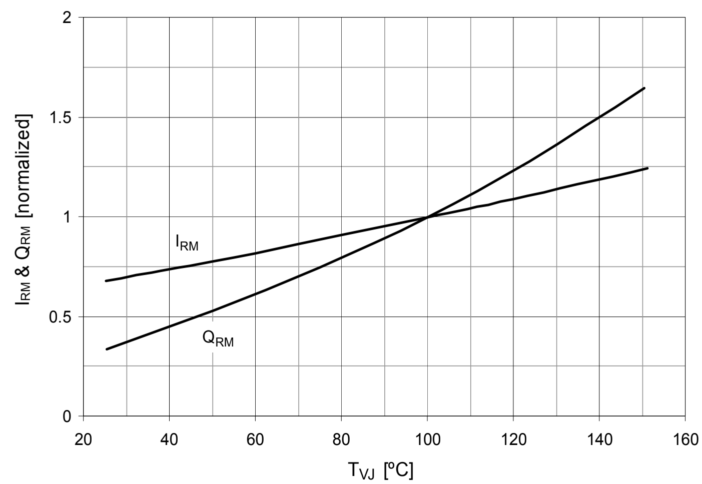


Fig. 26. Recovery Time t_{rr} vs. $-di_F/dt$

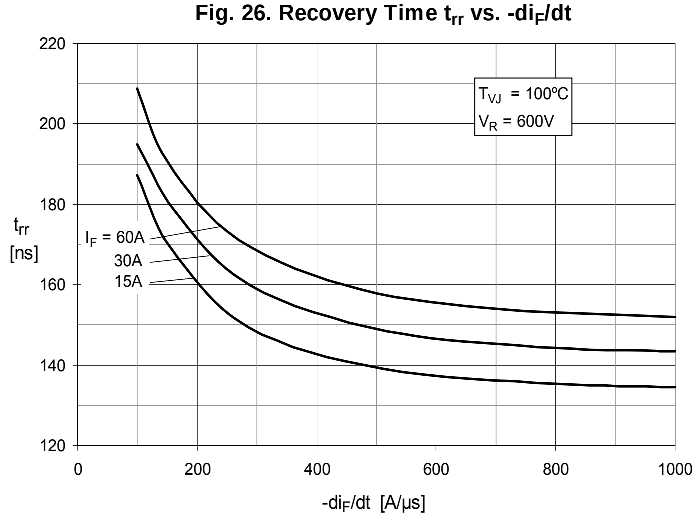


Fig. 27. Peak Forward Voltage V_{FR}, trr vs $-di_F/dt$