![IXYS]

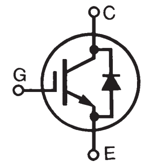
XPT™ 600V IGBT GenX3™ w/ Diode

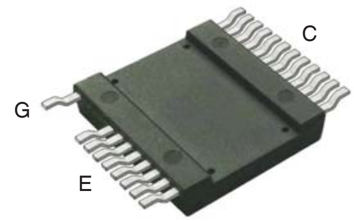
MMIX1X100N60B3H1

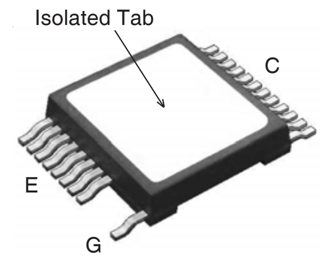
V_{CES} = 600V
I_{C110} = 68A
$V_{CE(sat)}$ ≤ 1.80V

(Electrically Isolated Tab)

Extreme Light Punch Through
IGBT for 10-30kHz Switching







G = Gate
C = Collector
E = Emitter

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 (Chip Capability)	145	A
I_{C110}	T_C = 110°C	68	A
I_{F90}	T_C = 90°C	54	A
I_{CM}	T_C = 25°C, 1ms	440	A
I_A	T_C = 25°C	50	A
E_{AS}	T_C = 25°C	600	mJ
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 2Ω Clamped Inductive Load	I_{CM} = 200 $V_{CE} \leq V_{CES}$	A
t_{sc} (SCSOA)	V_{GE} = 15V, V_{CE} = 360V, T_J = 150°C R_G = 10Ω, Non Repetitive	10	μs
P_C	T_C = 25°C	400	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 (0.062 in.) from Case for 10s	260	°C
V_{ISOL}	50/60Hz, 1 minute	2500	V~
F_C	Mounting Force	50..200/11..45	N/lb.
Weight		8	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		5.5	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			50	μA
	T_J = 125°C			4	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ± 20V			±100	nA
$V_{CE(sat)}$	I_C = 70A, V_{GE} = 15V, Note 1		1.50	1.80	V
	T_J = 150°C		1.77		V

Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Optimized for 10-30kHz Switching
- Square RBSOA
- FBSOA
- Avalanche Rated
- Short Circuit Capability
- Anti-Parallel Ultra Fast Diode
- High Current Handling Capability

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 = 60A, V_{CE} = 10V, Note 1	22	40		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		4860		pF
C_{oes}			475		pF
C_{res}			83		pF
$Q_{g(on)}$	I_C = 70A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		143		nC
Q_{ge}			37		nC
Q_{gc}			60		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C** I_C = 70A, V_{GE} = 15V V_{CE} = 360V, R_G = 2Ω Note 2		30		ns
t_{ri}			70		ns
E_{on}			1.9		mJ
$t_{d(off)}$			120		ns
t_{fi}			150		ns
E_{off}			2.0	2.8	mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C** I_C = 70A, V_{GE} = 15V V_{CE} = 360V, R_G = 2Ω Note 2		32		ns
t_{ri}			60		ns
E_{on}			2.3		mJ
$t_{d(off)}$			150		ns
t_{fi}			200		ns
E_{off}			2.8		mJ
R_{thJC}				0.31	°C/W
R_{thCS}			0.05		°C/W

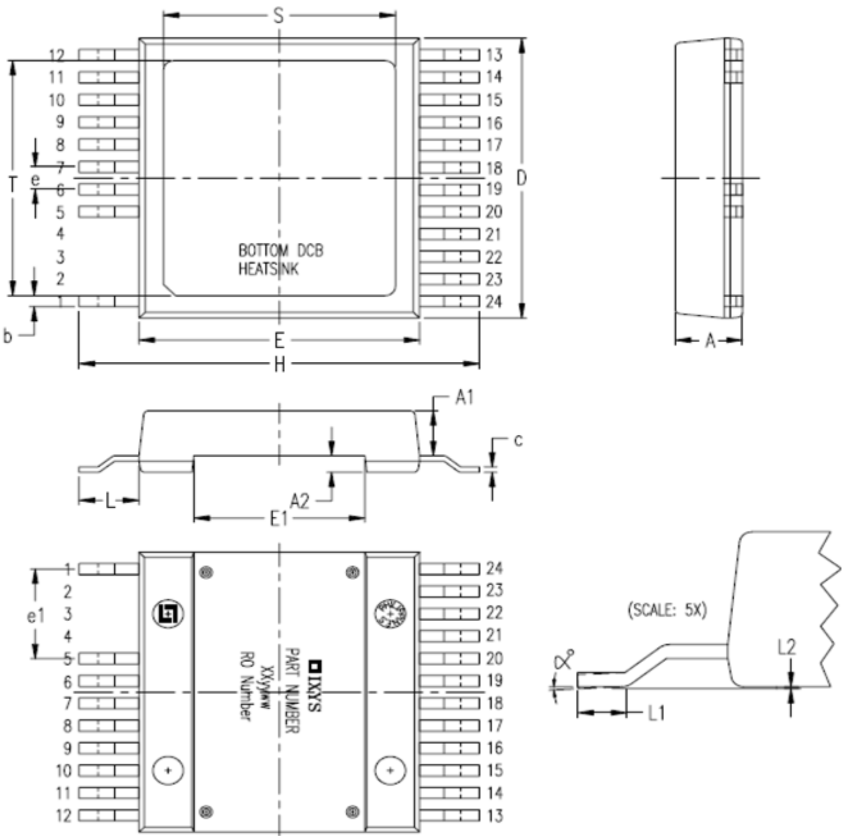
Reverse Diode (FRED)

Symbol	Test Conditions (TJ = 25°C Unless Otherwise Specified)		Min.	Typ.	Max.	
V_F	I_F = 60A, V_{GE} = 0V, Note 1			1.6	2.5	V
		T_J = 150°C		1.4	1.8	V
I_{RM}	I_F = 60A, V_{GE} = 0V, $-di_F/dt$ = 200A/μs, V_R = 300V	T_J = 100°C		8.3		A
t_{rr}				140		ns
R_{thJC}					0.62	°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.

Package Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.209	.224	5.30	5.70
A1	.154	.161	3.90	4.10
A2	.055	.063	1.40	1.60
b	.035	.045	0.90	1.15
c	.018	.026	0.45	0.65
D	.976	.994	24.80	25.25
E	.898	.915	22.80	23.25
E1	.543	.559	13.80	14.20
e	.079 BSC		2.00 BSC	
e1	.315 BSC		8.00 BSC	
H	1.272	1.311	32.30	33.30
L	.181	.209	4.60	5.30
L1	.051	.067	1.30	1.70
L2	.000	.006	0.00	0.15
S	.736	.760	18.70	19.30
T	.815	.839	20.70	21.30
α	0	4°	0	4°

PIN: 1 = Gate
5-12 = Emitter
13-24 = Collector

Fig. 1. Output Characteristics @ T_J = 25ºC

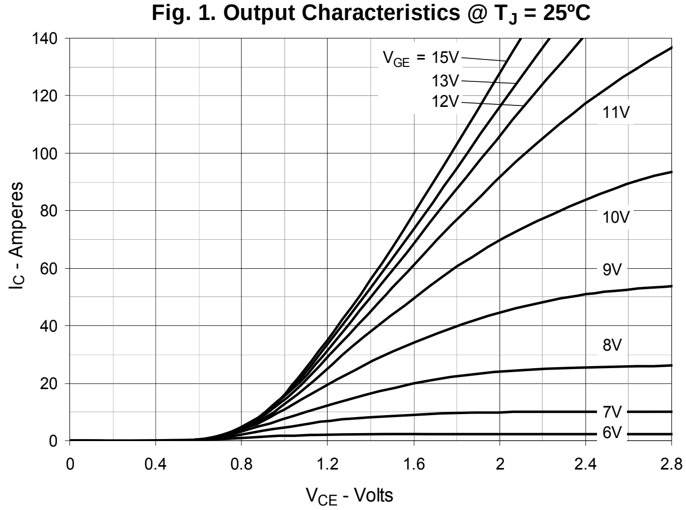


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

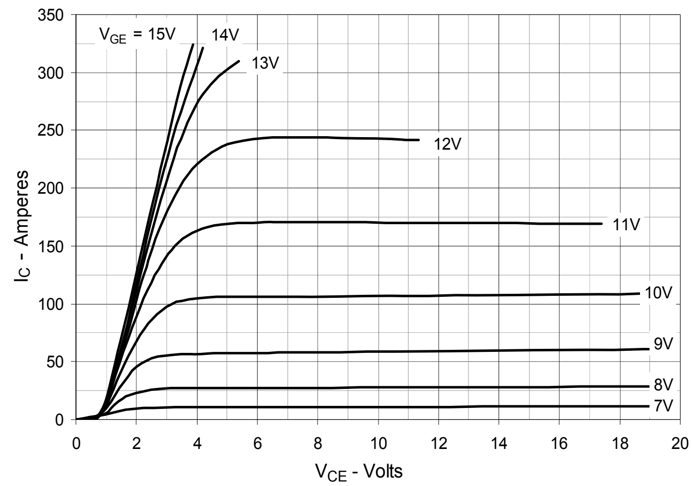


Fig. 3. Output Characteristics @ T_J = 150ºC

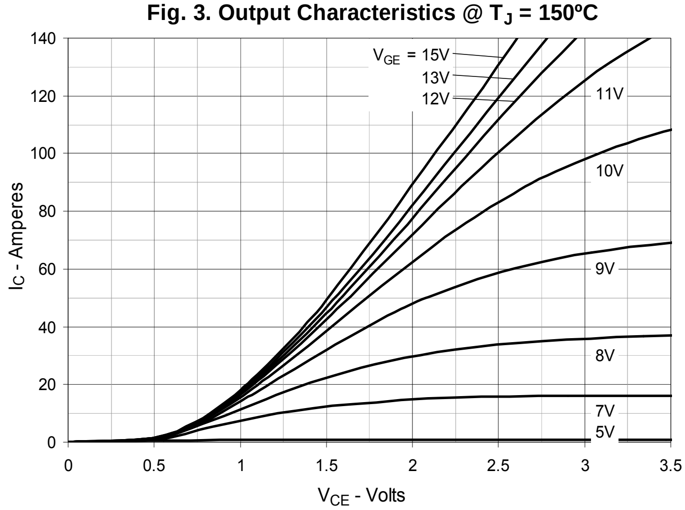


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

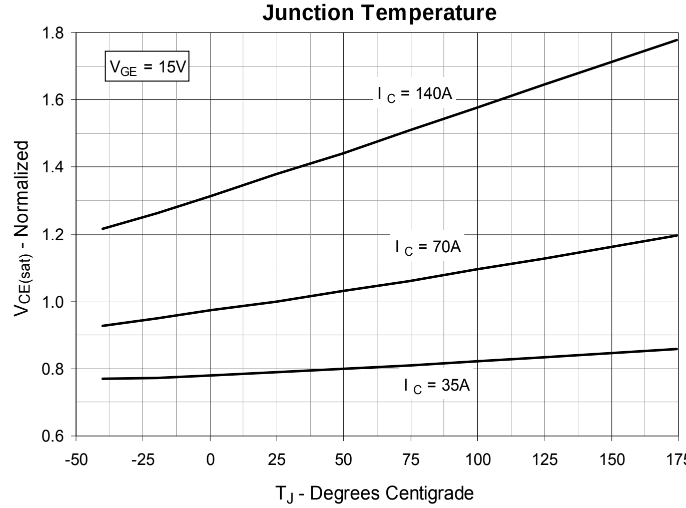


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

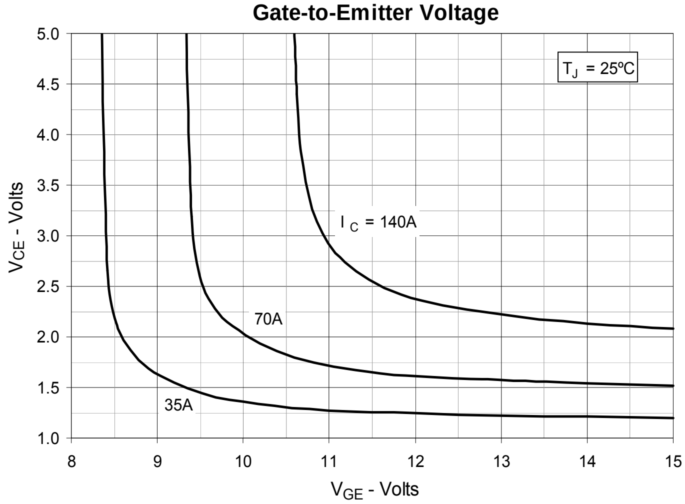


Fig. 6. Input Admittance

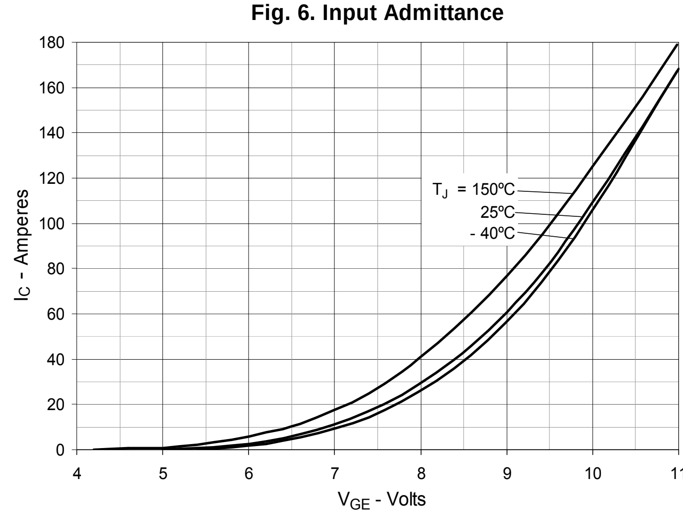


Fig. 7. Transconductance

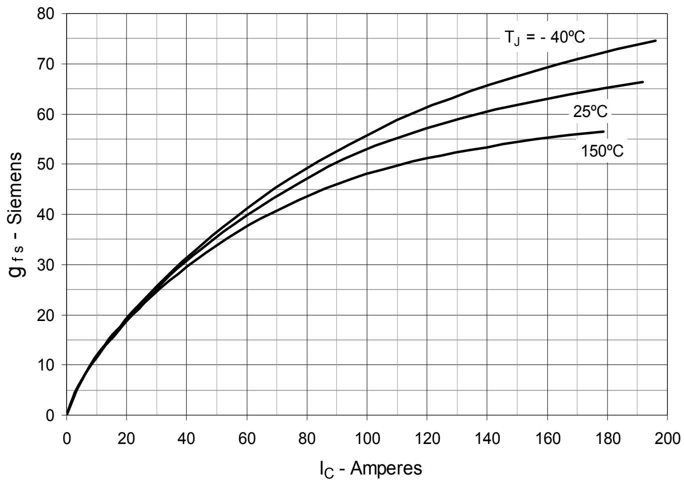


Fig. 8. Gate Charge

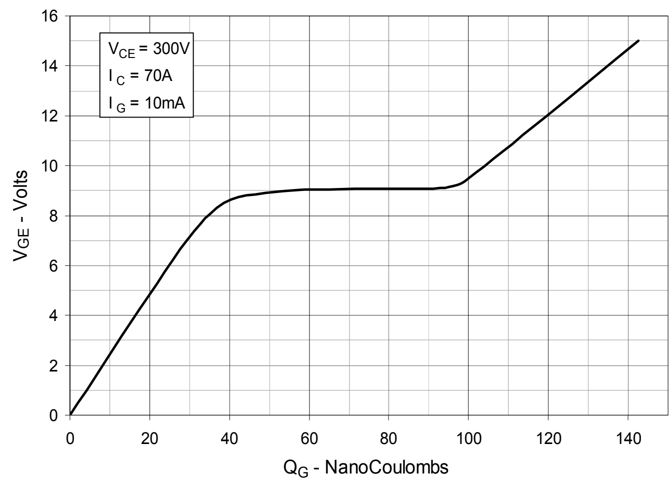


Fig. 9. Capacitance

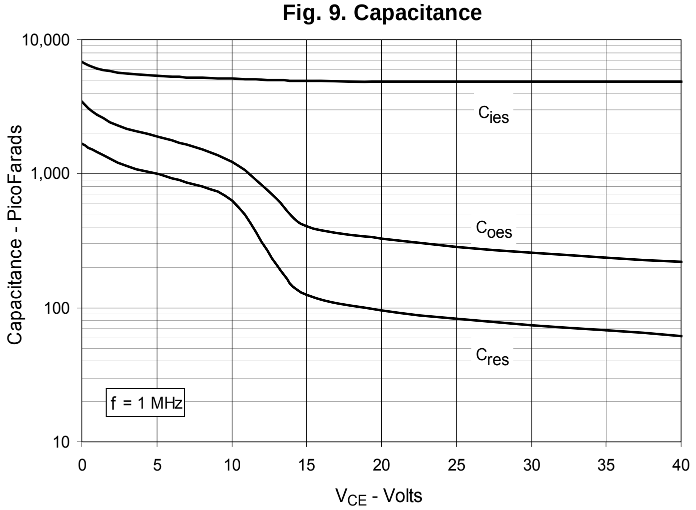


Fig. 10. Reverse-Bias Safe Operating Area

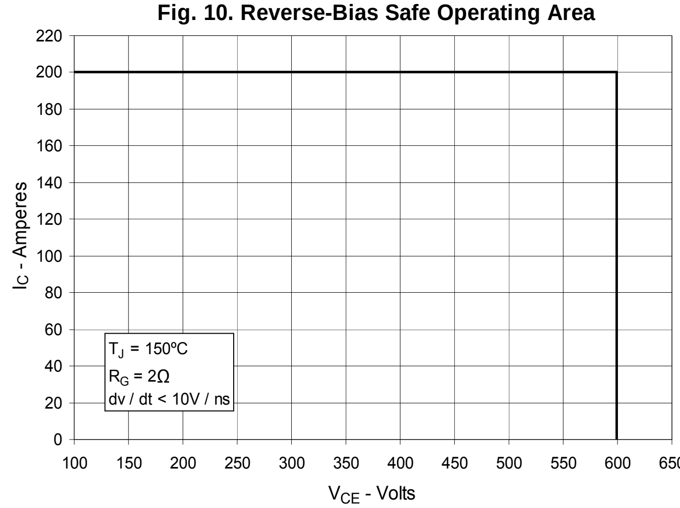


Fig. 11. Forward-Bias Safe Operating Area

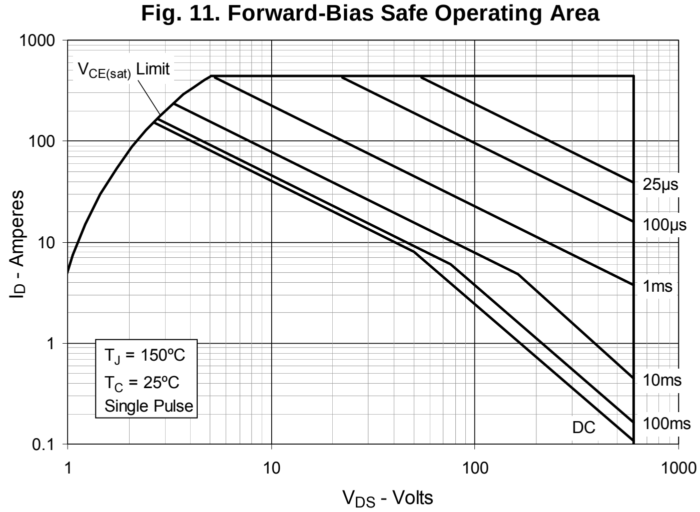
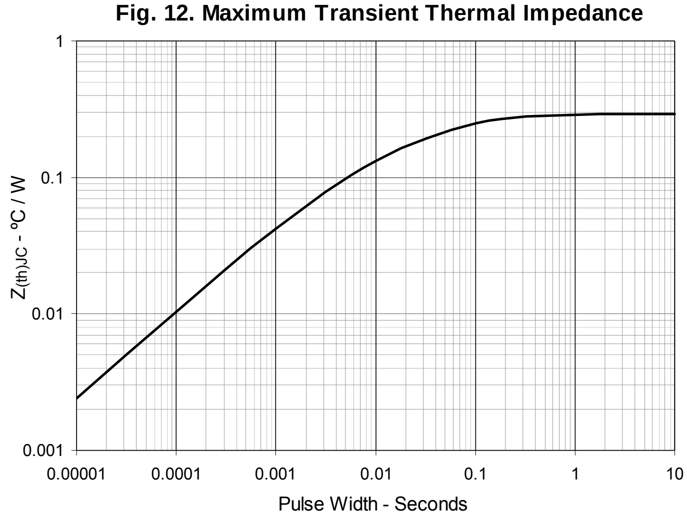


Fig. 12. Maximum Transient Thermal Impedance



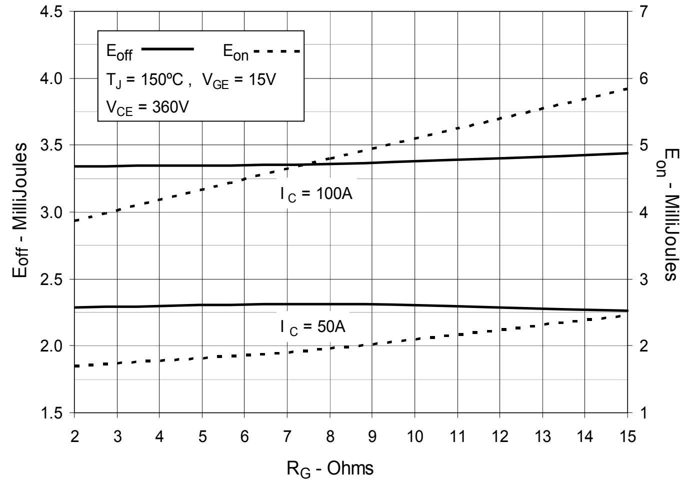


Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

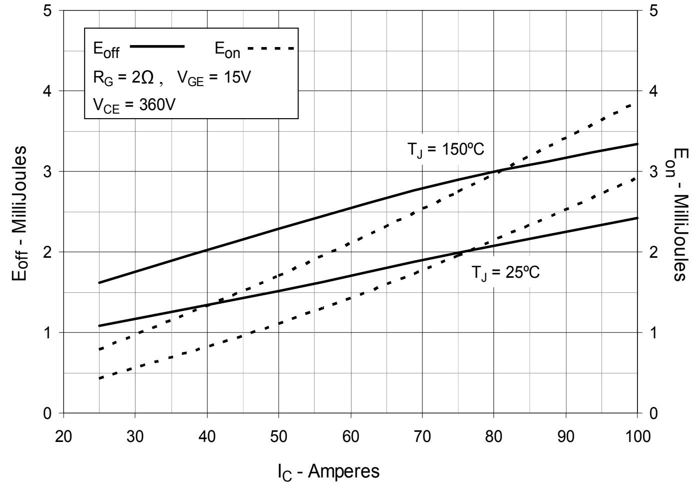


Fig. 14. Inductive Switching Energy Loss vs. Collector Current

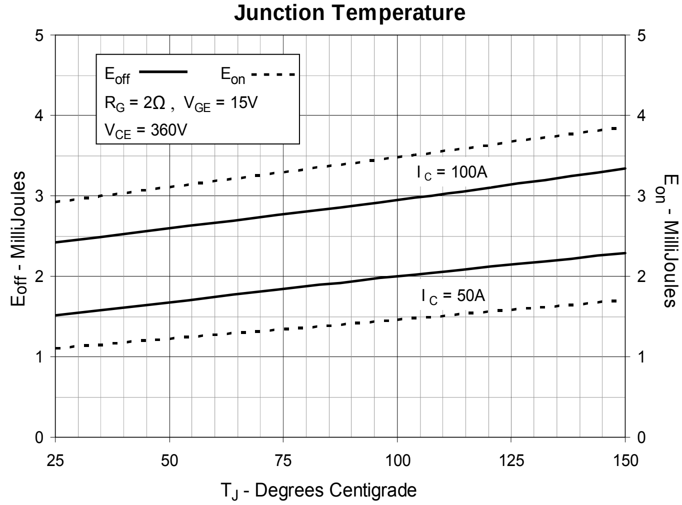


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

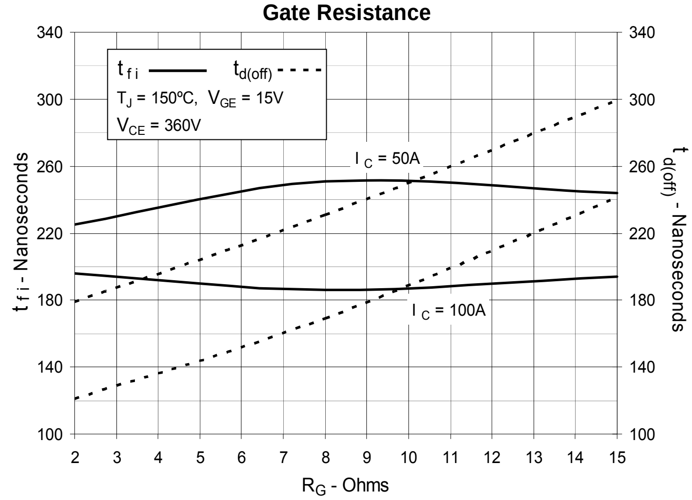


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

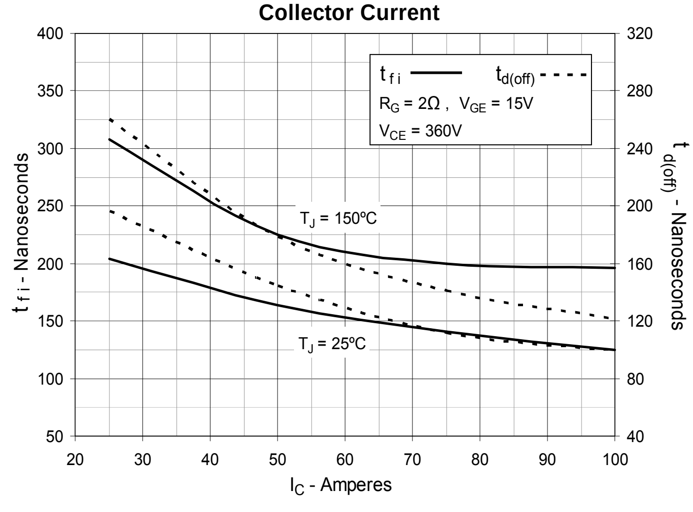


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

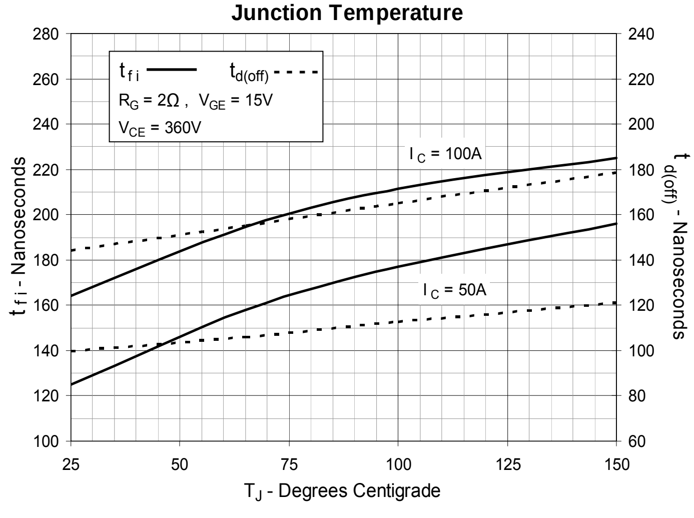


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature

Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

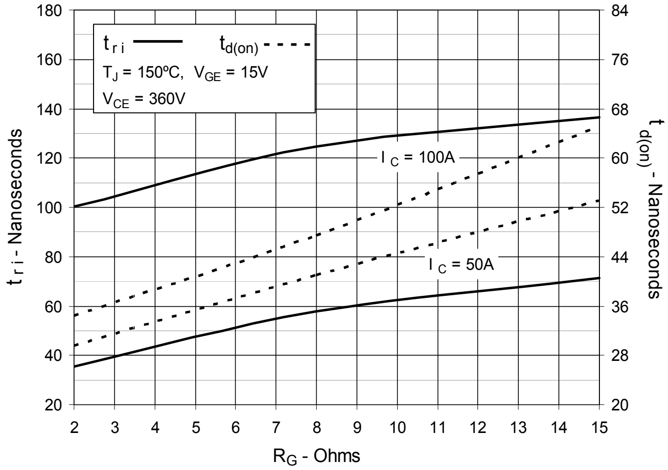


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

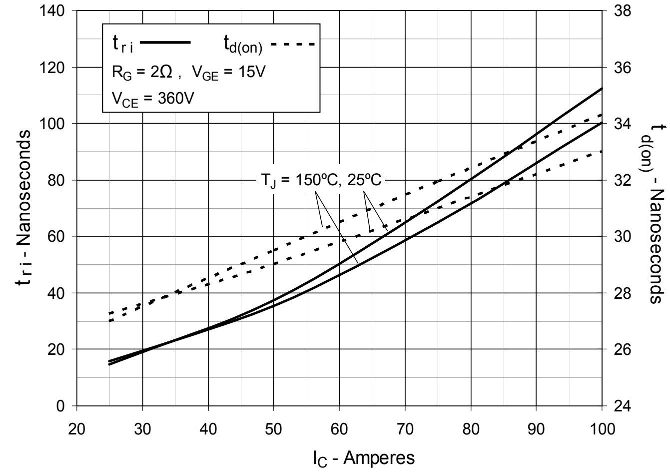
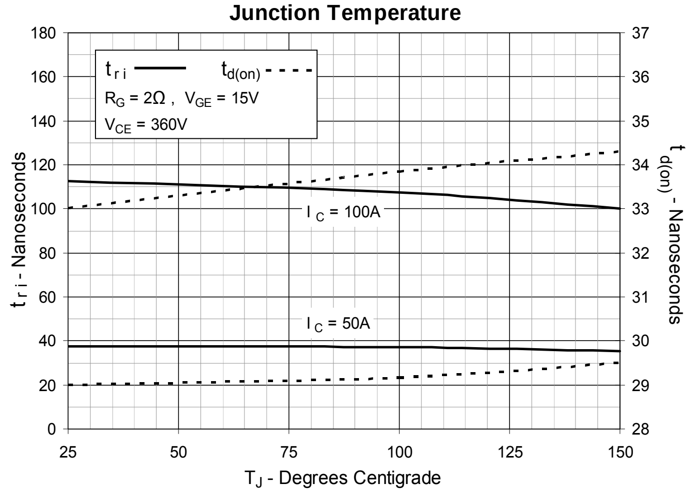


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature



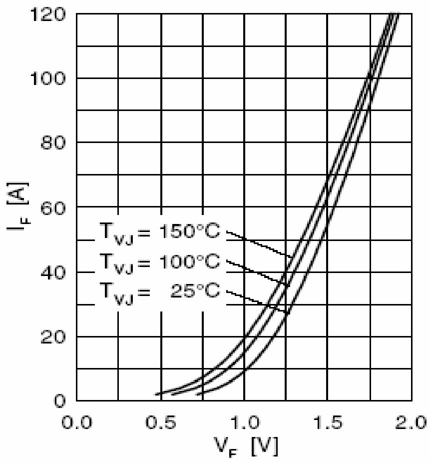


Fig. 22 Forward Current I_F vs. V_F

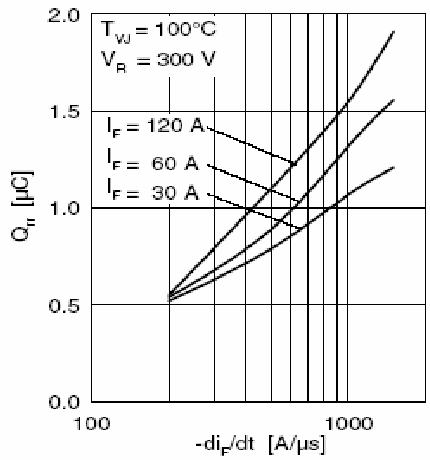


Fig. 23 Typ. Reverse Recovery Charge Q_{rr}

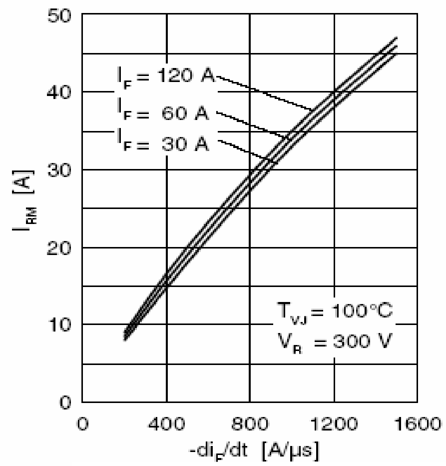


Fig. 24 Typ. Peak Reverse Current I_{RM}

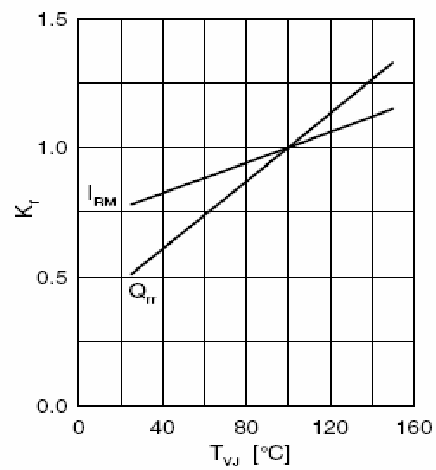


Fig. 25 Typ. Dynamic Parameters Q_{rr}, I_{RM}

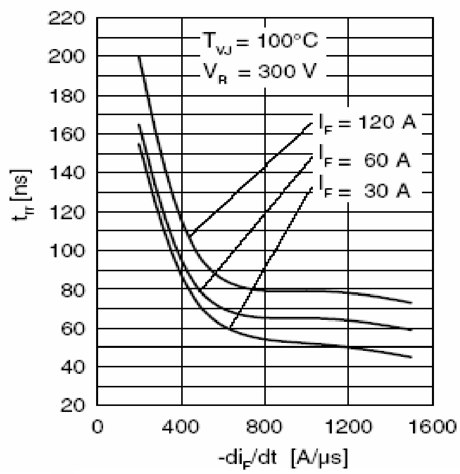


Fig. 26 Typ Recovery Time t_{rr}

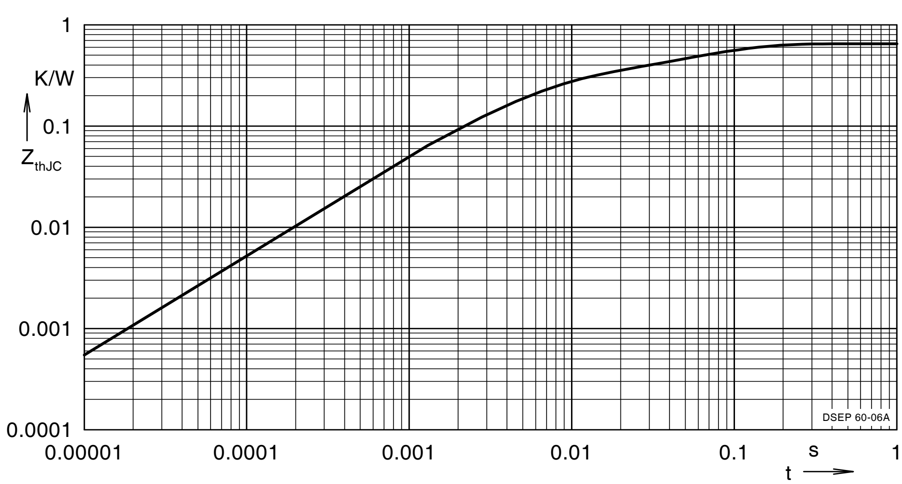


Fig. 27. Maximum Transient Thermal Impedance