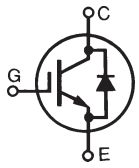
XPT™ 650V IGBT GenX4™ w/ Sonic Diode

IXXH80N65B4H1

V_{CES} = 650V
I_{C110} = 80A
$V_{CE(sat)}$ ≤ 2.1V
$t_{fi(typ)}$ = 52ns

Extreme Light Punch Through
IGBT for 5-30 kHz Switching



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 175°C	650	V
V_{CGR}	T_J = 25°C to 175°C, R_{GE} = 1MΩ	650	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C (Chip Capability)	160	A
I_{C110}	T_C = 110°C	80	A
I_{F110}	T_C = 110°C	62	A
I_{CM}	T_C = 25°C, 1ms	430	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 3Ω Clamped Inductive Load	I_{CM} = 160 @$V_{CE} \leq V_{CES}$	A
t_{sc} (SCSOA)	V_{GE} = 15V, V_{CE} = 360V, T_J = 150°C R_G = 82Ω, Non Repetitive	10	μs
P_C	T_C = 25°C	625	W
T_J		-55 ... +175	°C
T_{JM}		175	°C
T_{stg}		-55 ... +175	°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	650			V
$V_{GE(th)}$	I_C = 250μA, V_{CE} = V_{GE}	4.0		6.5	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			50	μA
	T_J = 150°C			4	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 80A, V_{GE} = 15V, Note 1		1.65	2.10	V
	T_J = 150°C		2.00		V

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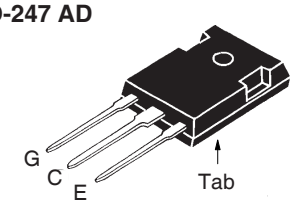


G = Gate C = Collector
E = Emitter Tab = Collector

Features

- Optimized for 5-30kHz Switching
- Square RBSOA
- Anti-Parallel Sonic Diode
- Short Circuit Capability
- International Standard Package

Advantages

- High Power Density
- Extremely Rugged
- Low Gate Drive Requirement

Applications

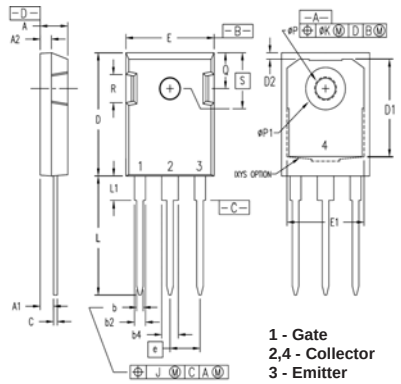
- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 60A, V_{CE} = 10V, Note 1	25	42		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		3860		pF
C_{oes}			395		pF
C_{res}			58		pF
$Q_{g(on)}$	I_C = 80A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		120		nC
Q_{ge}			32		nC
Q_{gc}			46		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		26		ns
t_{ri}	I_C = 80A, V_{GE} = 15V		103		ns
E_{on}	V_{CE} = 400V, R_G = 3Ω		4.0		mJ
$t_{d(off)}$	Note 2		122		ns
t_{fi}			52		ns
E_{off}			2.1		mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		23		ns
t_{ri}	I_C = 80A, V_{GE} = 15V		100		ns
E_{on}	V_{CE} = 400V, R_G = 3Ω		5.2		mJ
$t_{d(off)}$	Note 2		145		ns
t_{fi}			102		ns
E_{off}			3.1		mJ
R_{thJC}				0.24	°C/W
R_{thCS}			0.21		°C/W

Reverse Sonic Diode (FRD)

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
V_F	I_F = 50A, V_{GE} = 0V, Note 1			2.5	V
		T_J = 150°C	1.8		V
I_{RM}	I_F = 50A, V_{GE} = 0V, -di_F/dt = 900A/µs,	T_J = 150°C	45		A
t_{rr}	V_R = 300V	T_J = 150°C	150		ns
R_{thJC}				0.45	°C/W

TO-247 (IXXH) Outline



SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.087	1.91	2.20
b4	.115	.126	2.92	3.20
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
D1	.650	.690	16.51	17.53
D2	.035	.050	0.89	1.27
E	.620	.635	15.75	16.13
E1	.545	.565	13.84	14.35
e	.215 BSC		5.45 BSC	
J	--	.010	--	0.25
K	--	.025	--	0.64
L	.780	.810	19.81	20.57
L1	.150	.170	3.81	4.32
øP	.140	.144	3.55	3.65
øP1	.275	.290	6.99	7.37
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.242 BSC		6.15 BSC	

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

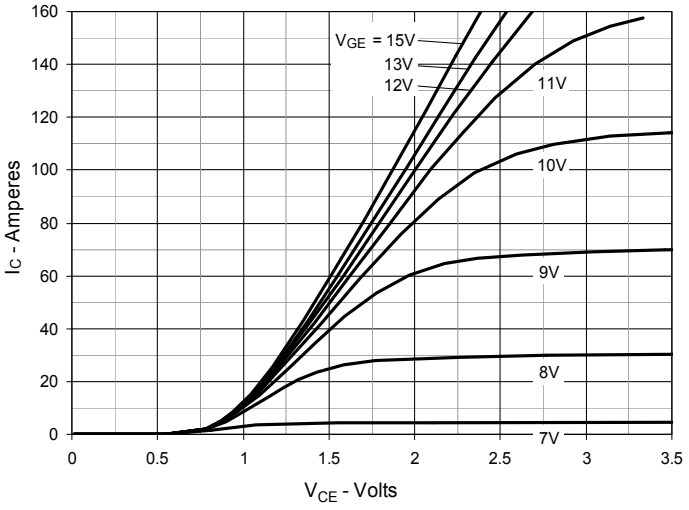


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

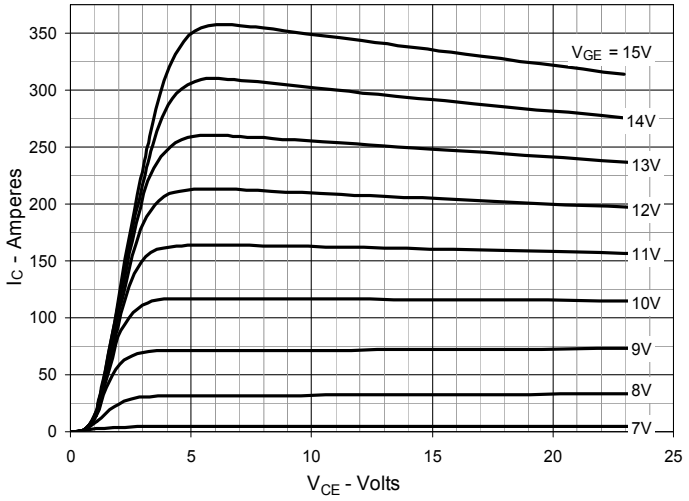


Fig. 3. Output Characteristics @ T_J = 150ºC

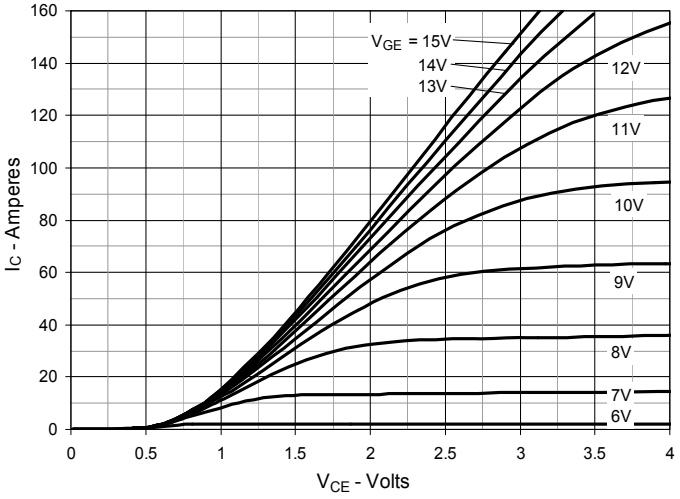


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

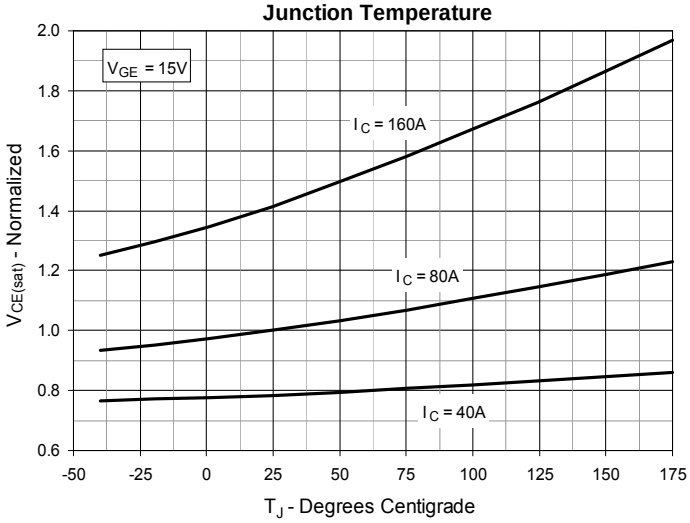


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

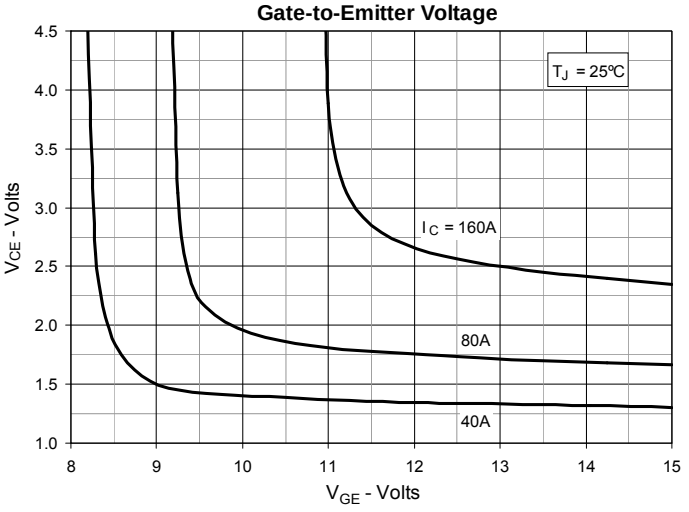


Fig. 6. Input Admittance

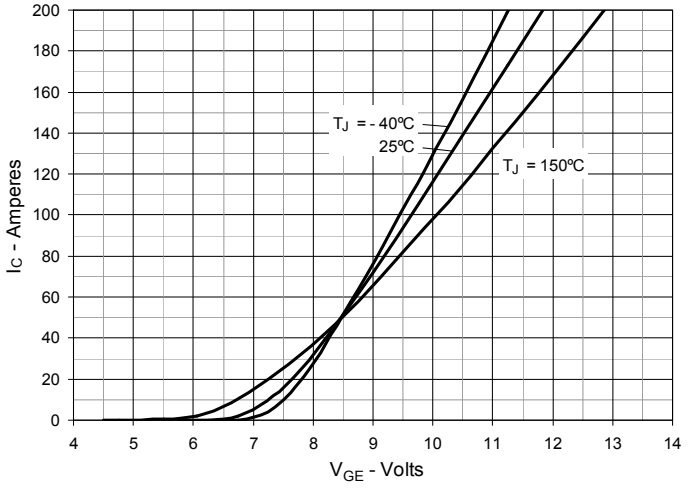


Fig. 7. Transconductance

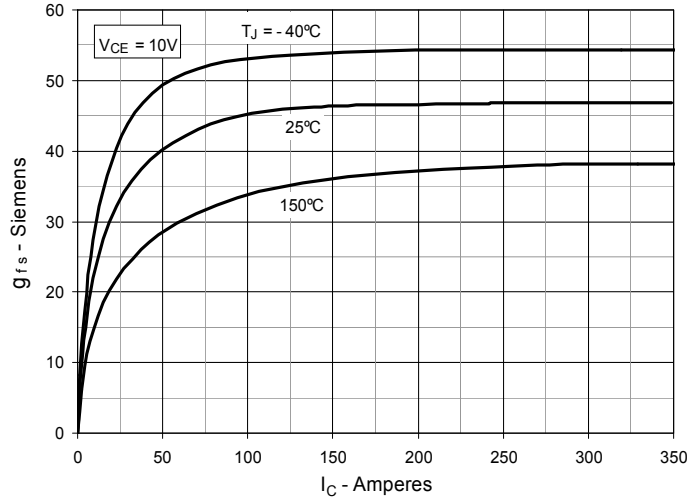


Fig. 8. Gate Charge

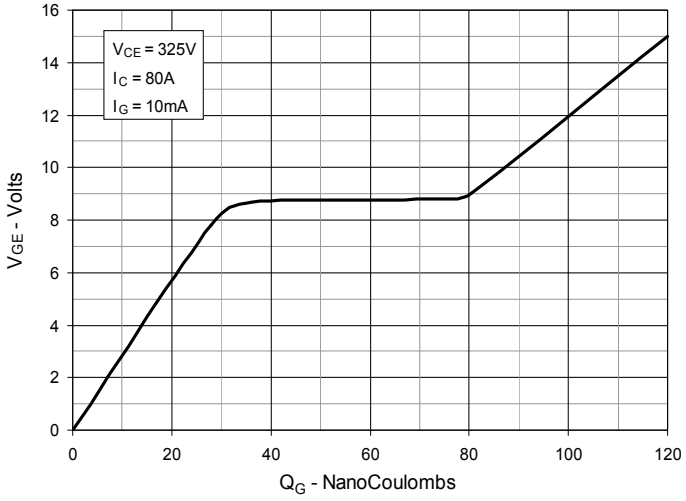


Fig. 9. Capacitance

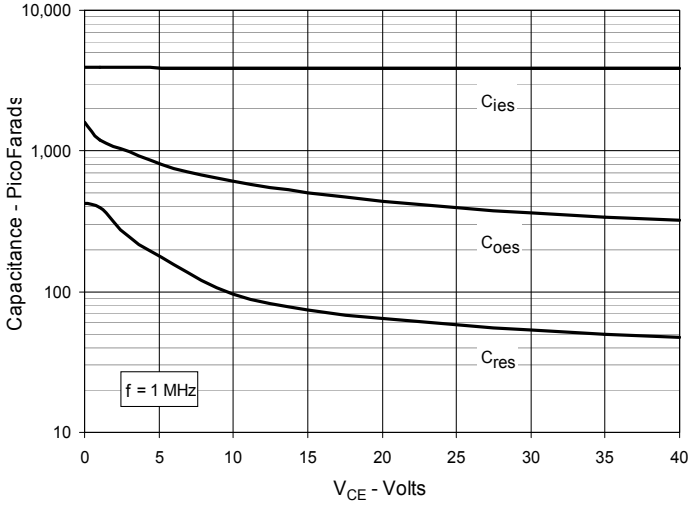


Fig. 10. Reverse-Bias Safe Operating Area

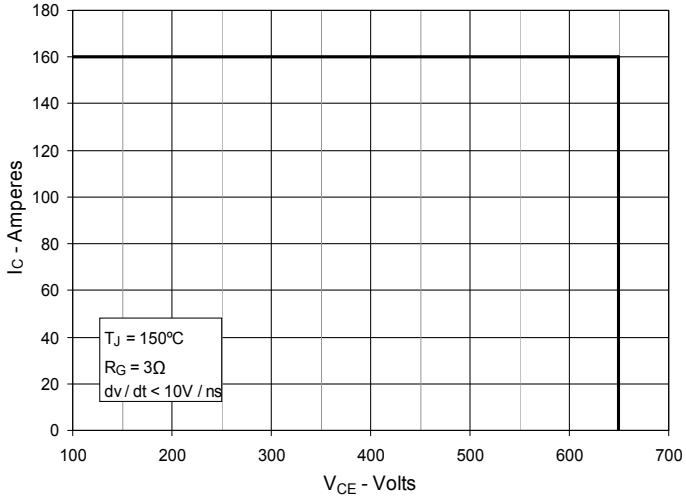


Fig. 11. Maximum Transient Thermal Impedance

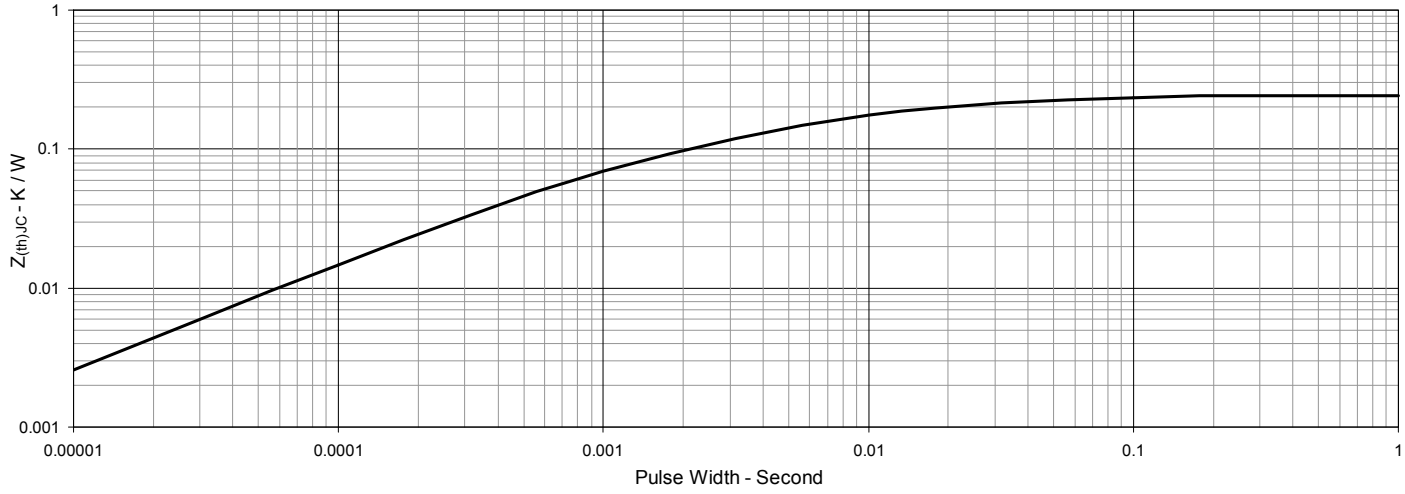


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

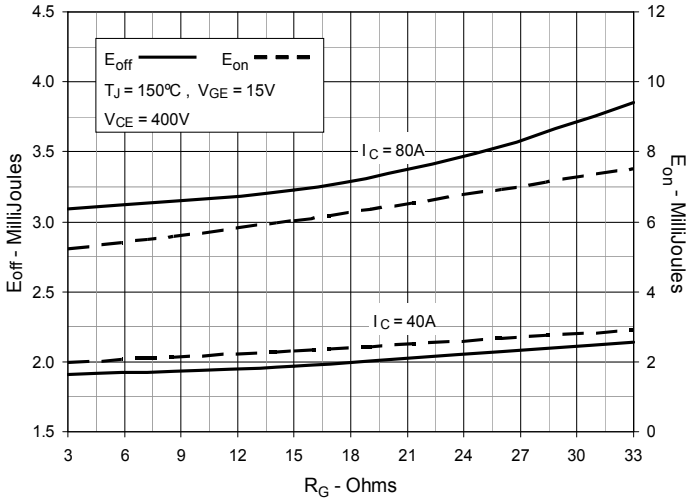


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

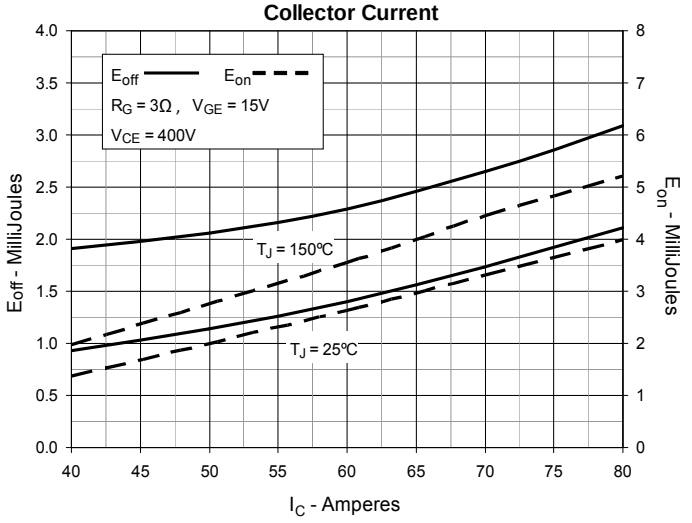


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

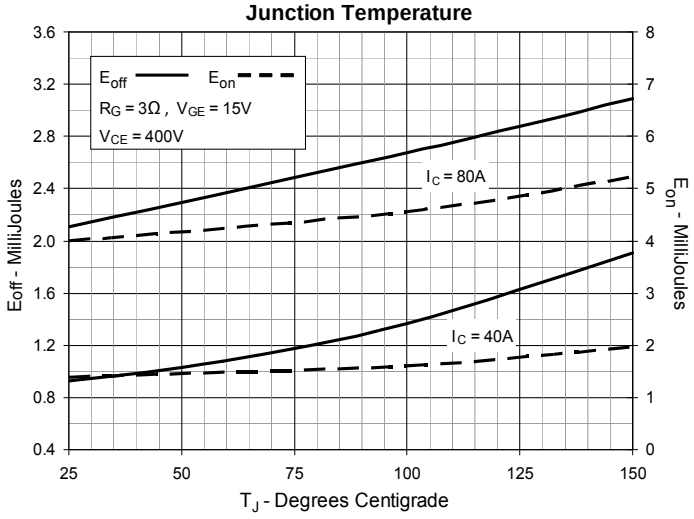


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

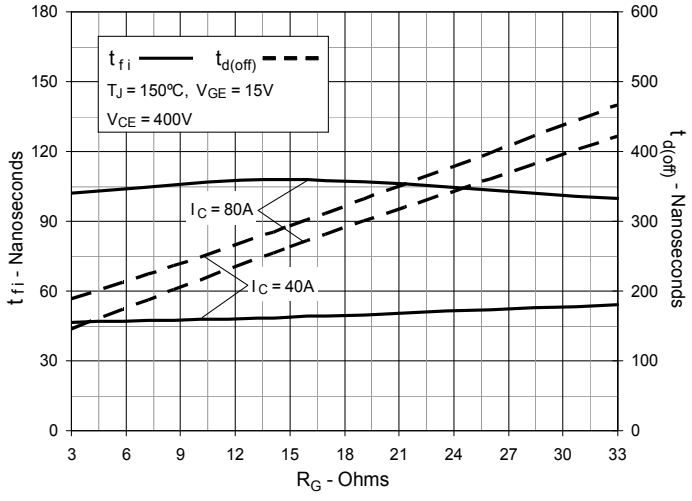


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

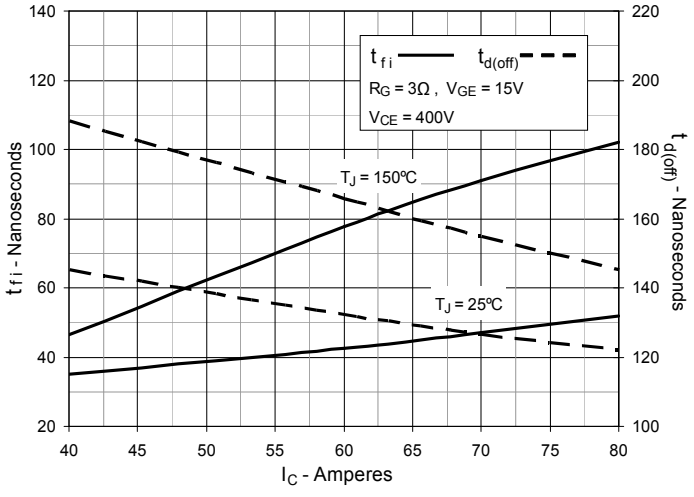


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

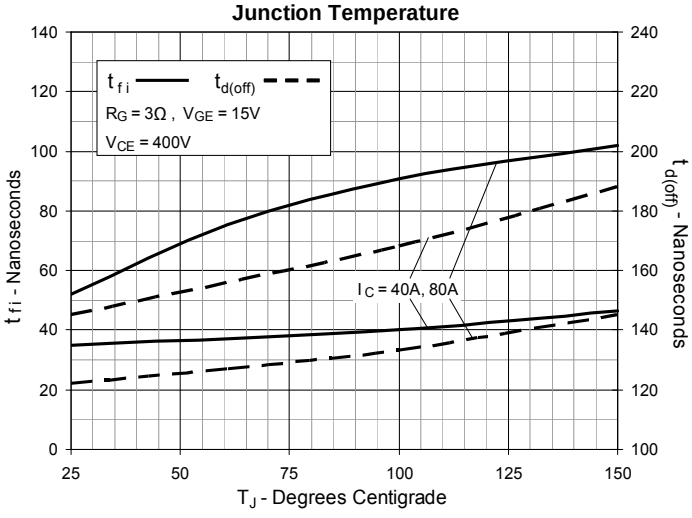


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

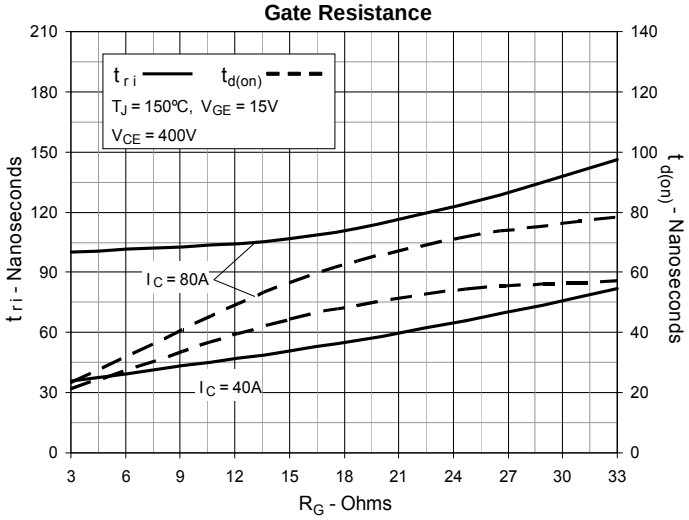


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

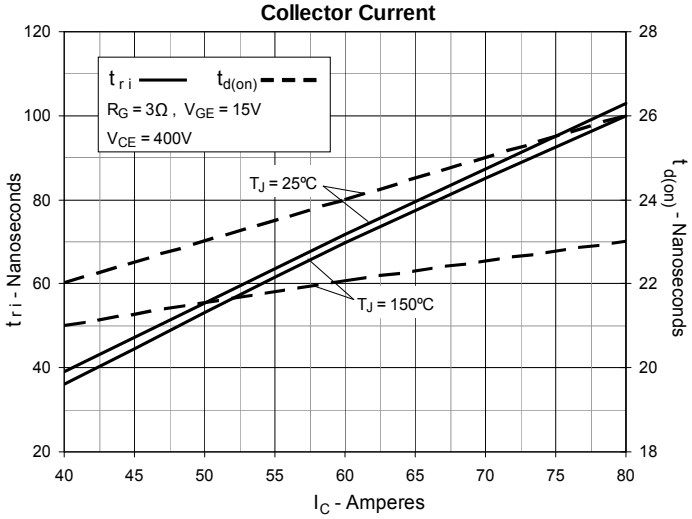


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

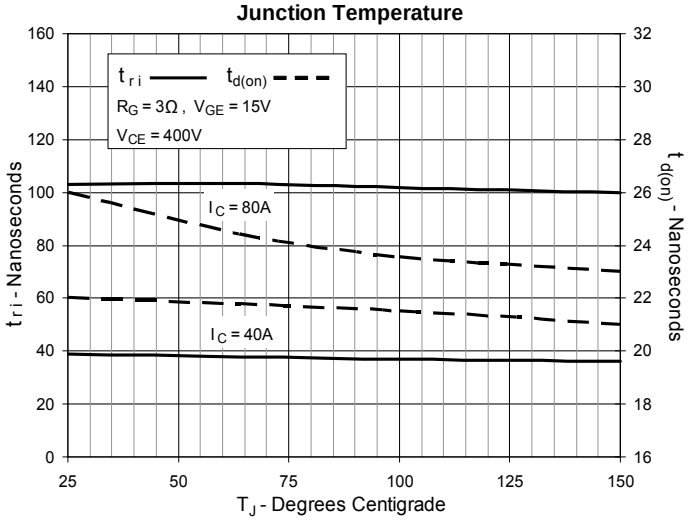


Fig. 21. Typ. Forward characteristics

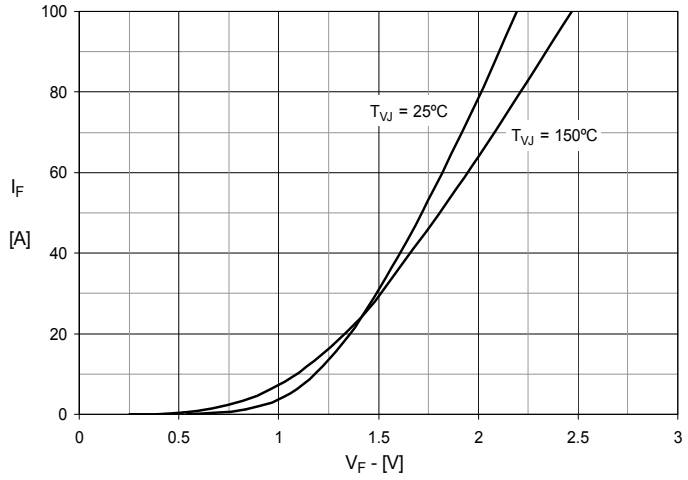


Fig. 22. Typ. Reverse Recovery Charge Q_{rr} vs. $-di_F/dt$

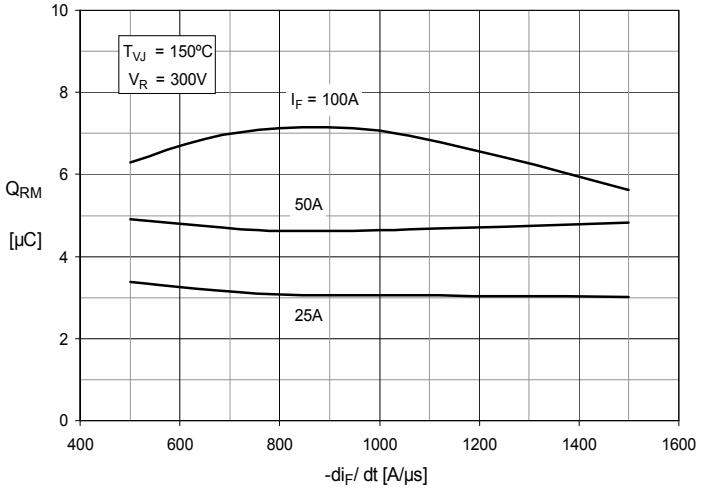


Fig. 23. Typ. Peak Reverse Current I_{RM} vs. $-di_F/dt$

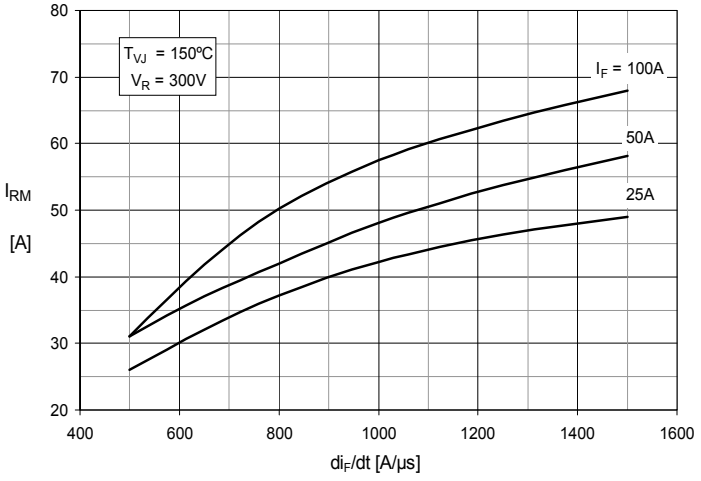


Fig. 24. Typ. Recovery Time t_{rr} vs. $-di_F/dt$

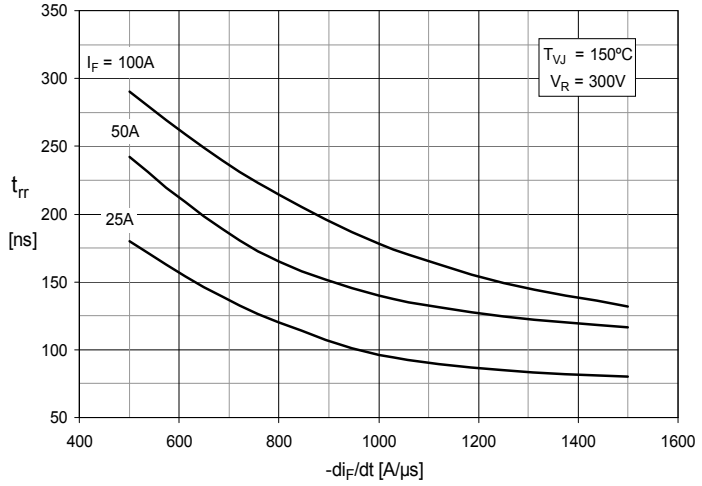


Fig. 25. Typ. Recovery Energy E_{rec} vs. $-di_F/dt$

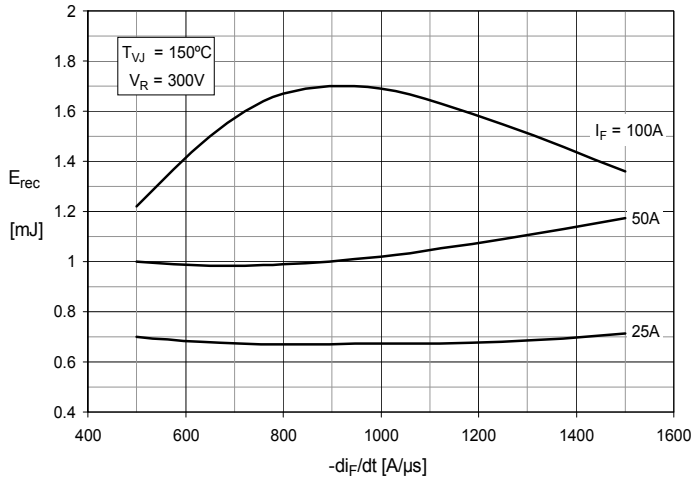


Fig. 26. Maximum Transient Thermal Impedance