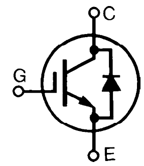
IXYS

XPT™ 650V IGBT GenX4™ w/ Diode

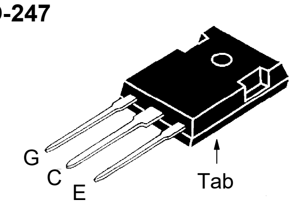
IXXH80N65B4D1

V_{CES} = 650V
I_{C110} = 80A
$V_{CE(sat)}$ ≤ 2.1V
$t_{fi(typ)}$ = 53ns

Extreme Light Punch Through IGBT for 5-30 kHz Switching



TO-247



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

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)	180	A
I_{C110}	T_C = 110°C	80	A
I_{F110}	T_C = 110°C	65	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 @$V_{CE} \le V_{CES}$	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 1.6 mm (0.062 in.) from Case for 10s	300	°C
M_d	Mounting Torque	1.13/10	Nm/lb.in.
Weight		6	g

Features

- Optimized for 5-30kHz Switching
- Square RBSOA
- Anti-Parallel 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.	
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			25	µA
	T_J = 150°C			2	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

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Min.	Typ.	Max.	Unit
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** I_C = 80A, V_{GE} = 15V V_{CE} = 400V, R_G = 3Ω Note 2		26		ns
t_{ri}			100		ns
E_{on}			3.36		mJ
$t_{d(off)}$			112		ns
t_{fi}			53		ns
E_{off}			1.83		mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C** I_C = 80A, V_{GE} = 15V V_{CE} = 400V, R_G = 3Ω Note 2		23		ns
t_{ri}			102		ns
E_{on}			5.50		mJ
$t_{d(off)}$			128		ns
t_{fi}			94		ns
E_{off}			2.70		mJ
R_{thJC}				0.24	°C/W
R_{thCS}			0.21		°C/W

Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Min.	Typ.	Max.	Unit
V_F	I_F = 50A, V_{GE} = 0V, Note 1			2.5	V
	T_J = 150°C		1.35		V
I_{RM}	I_F = 50A, V_{GE} = 0V, $-di_F/dt$ = 500A/μs, V_R = 400V		26		A
t_{rr}			140		ns
R_{thJC}				0.47	°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

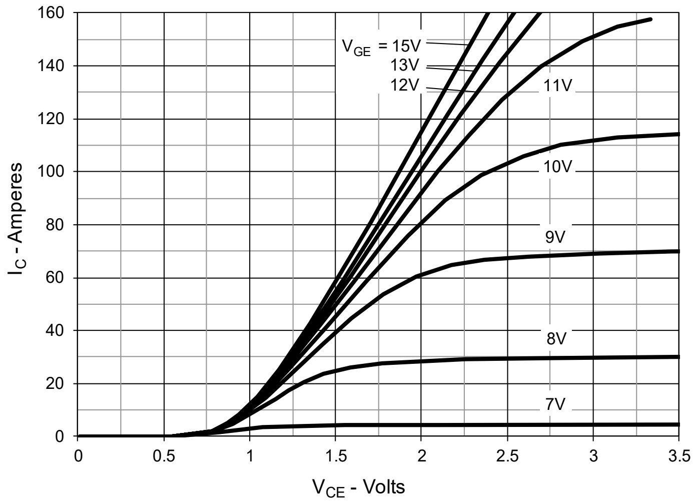


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

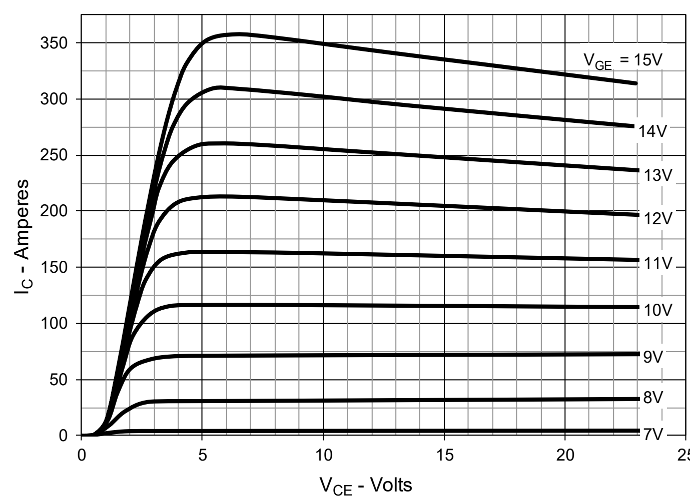


Fig. 3. Output Characteristics @ T_J = 150ºC

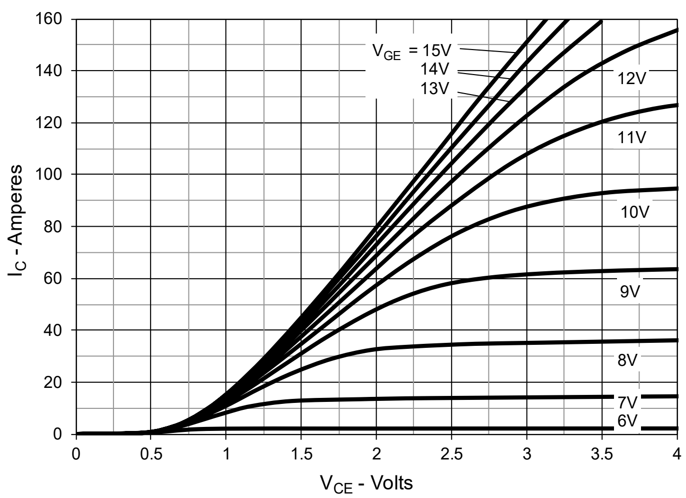


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

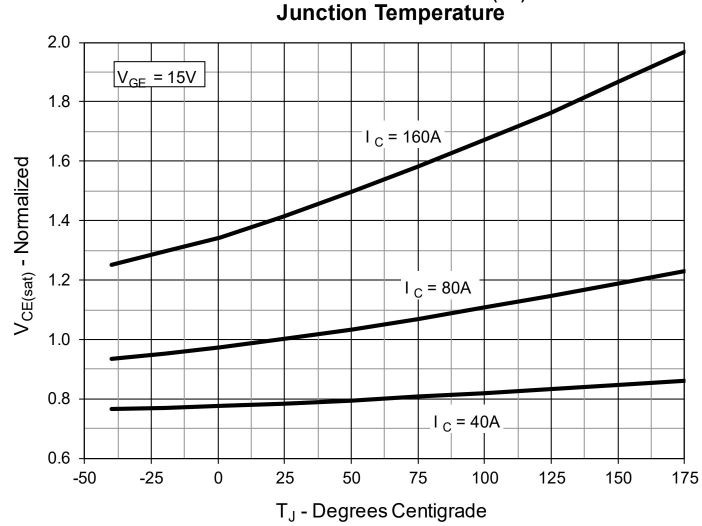


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

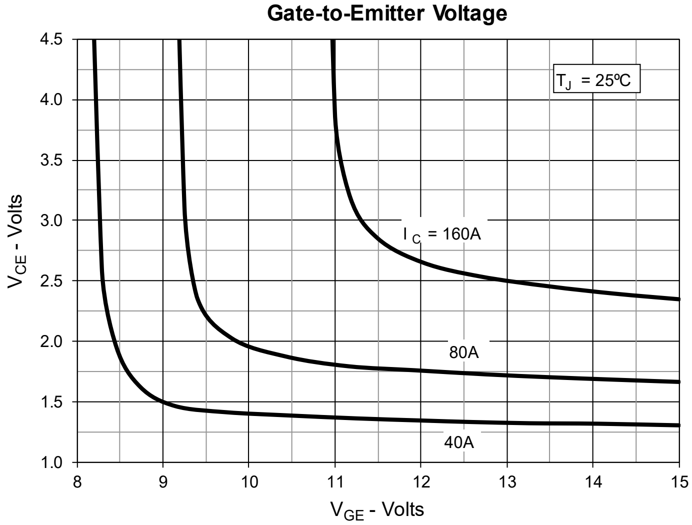


Fig. 6. Input Admittance

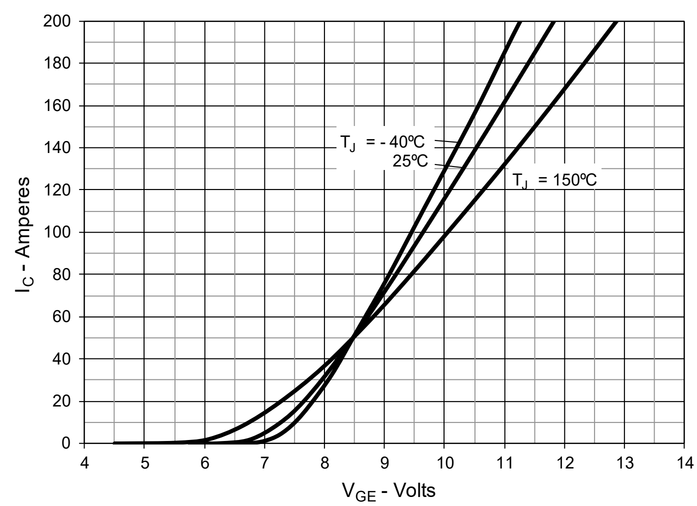


Fig. 7. Transconductance

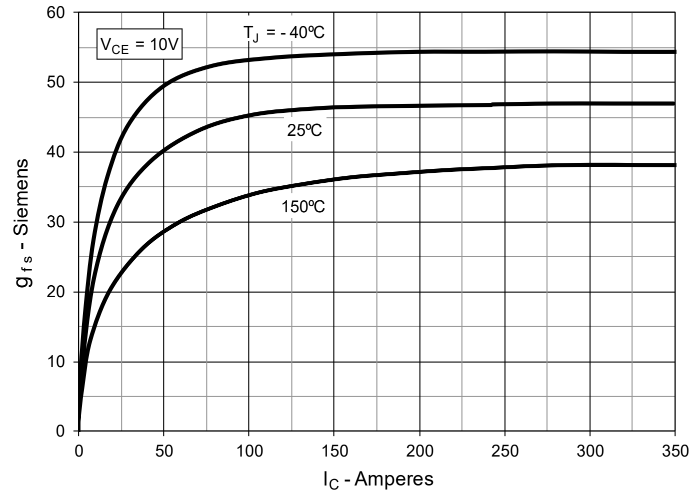


Fig. 8. Gate Charge

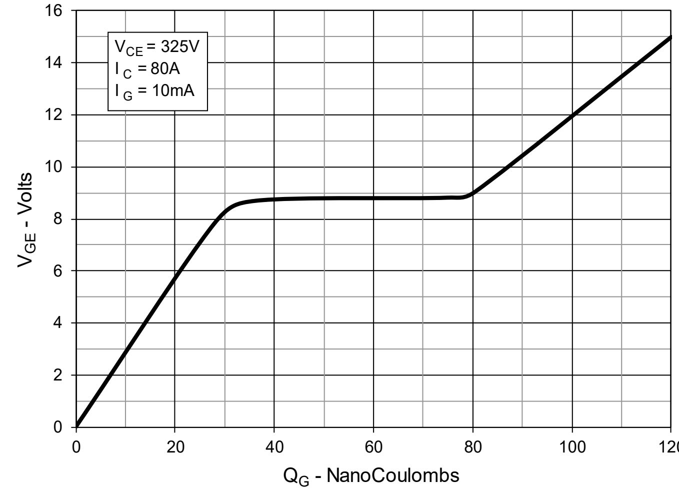


Fig. 9. Capacitance

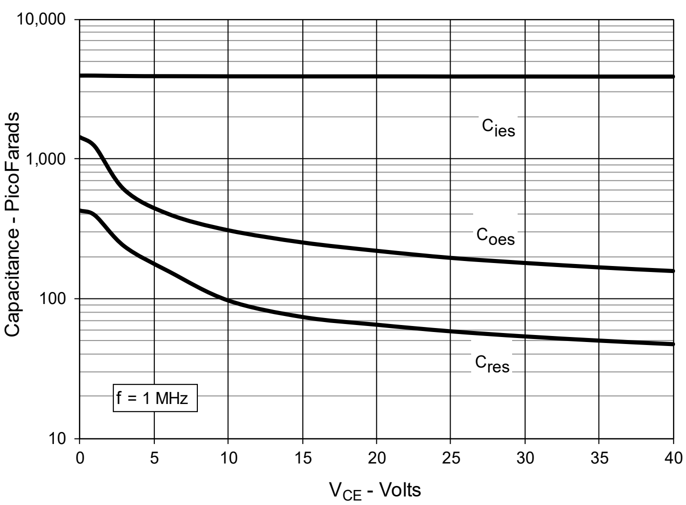


Fig. 10. Reverse-Bias Safe Operating Area

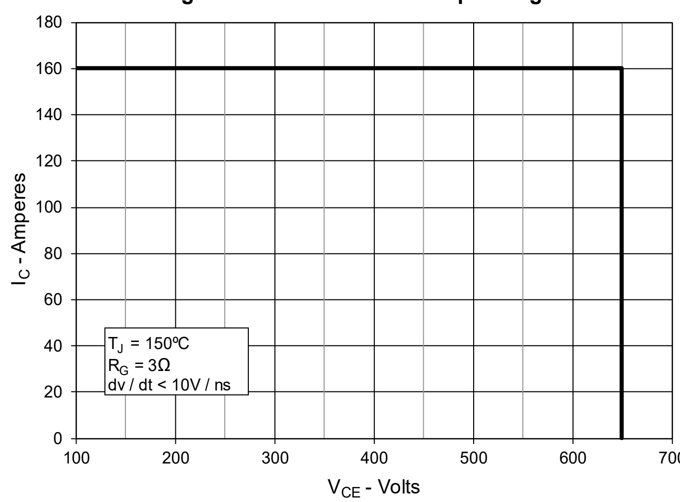


Fig. 11. Maximum Transient Thermal Impedance (IGBT)

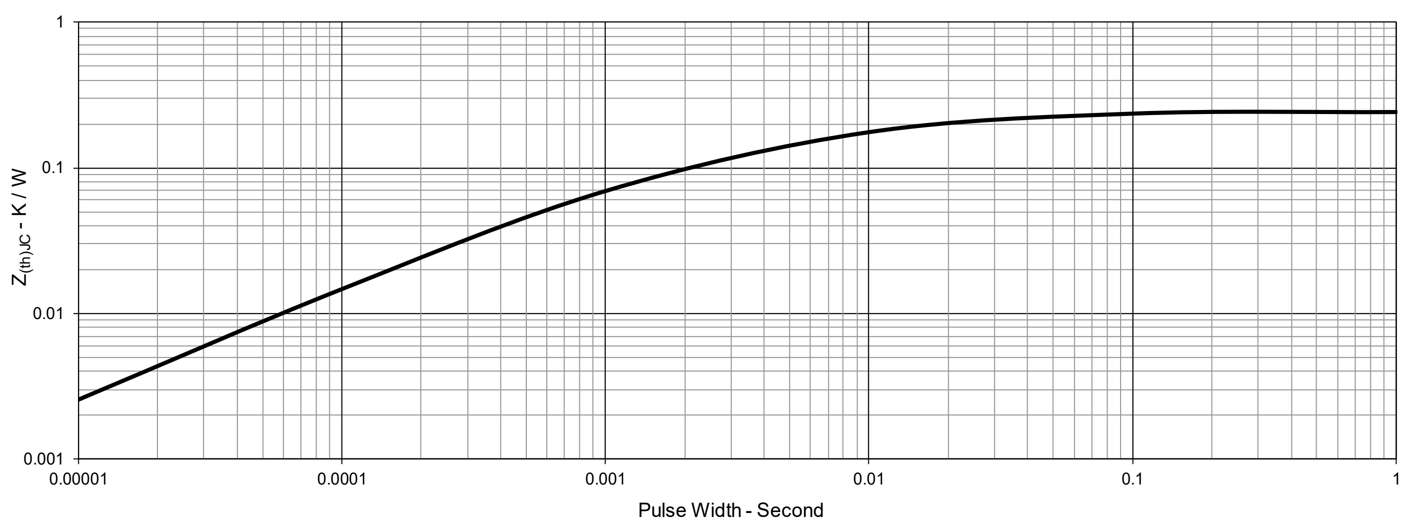


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

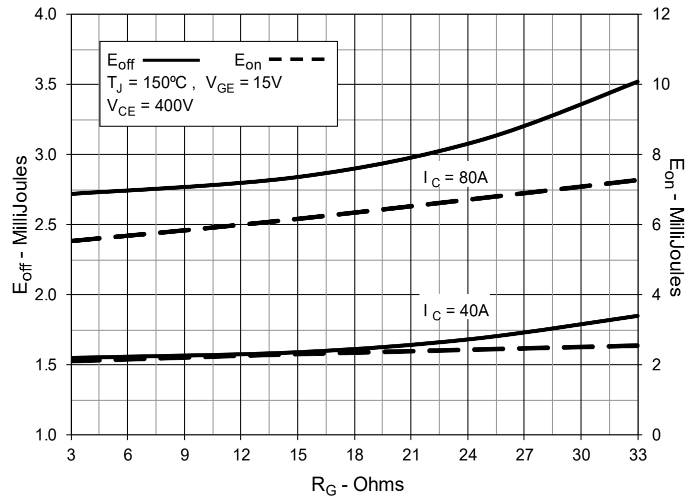


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

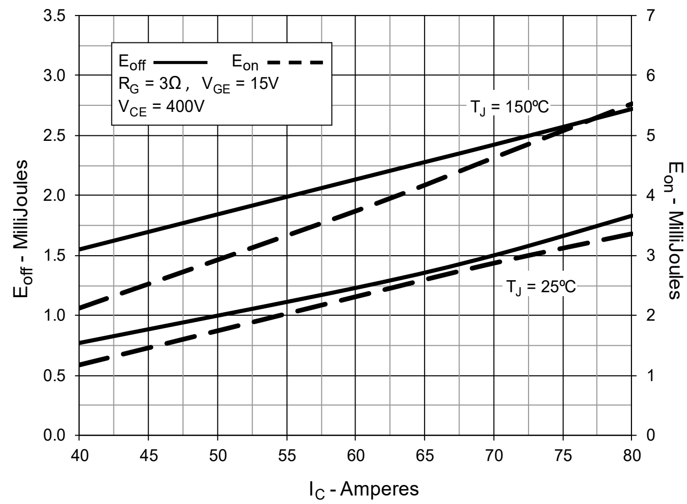


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

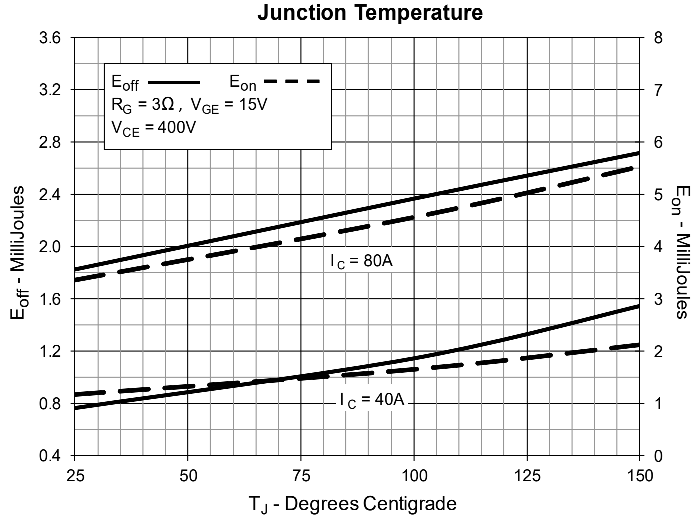


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

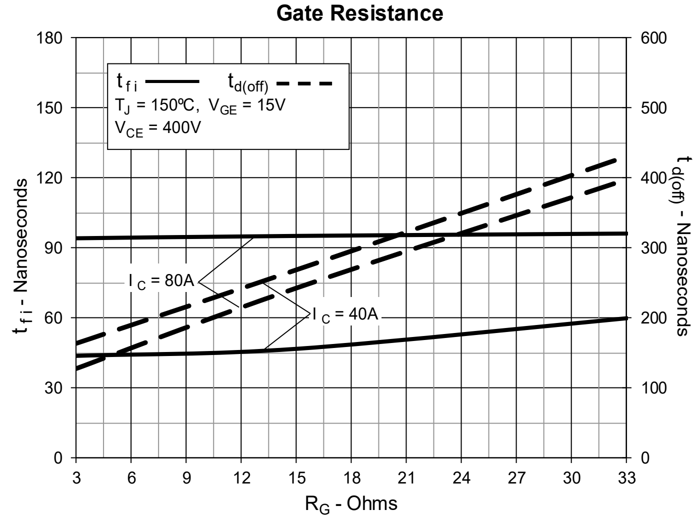


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

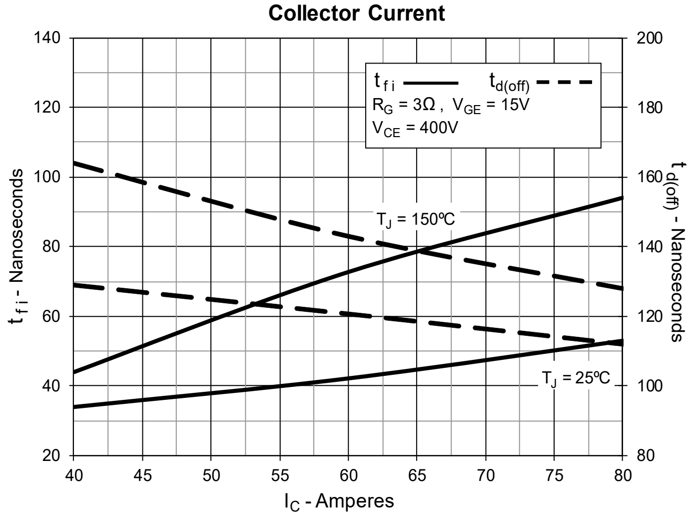


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

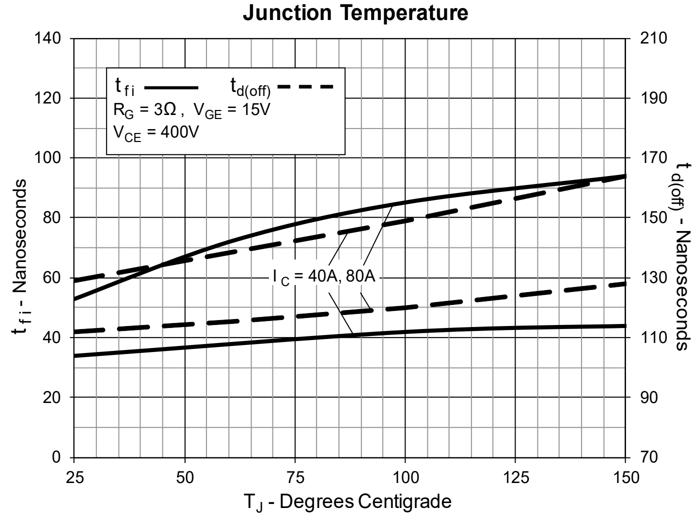


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

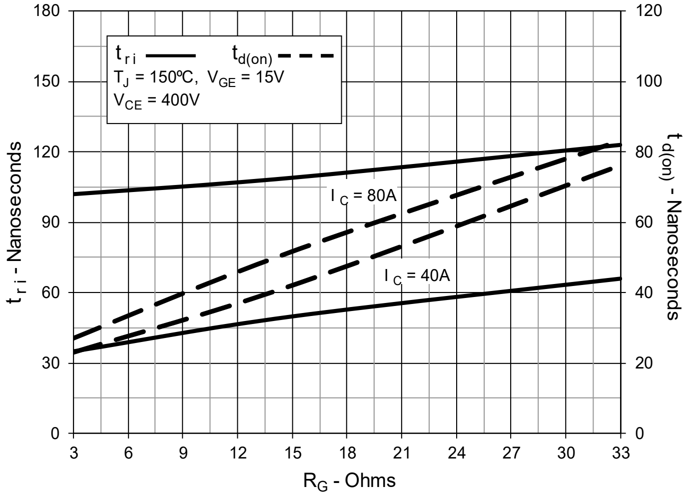


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

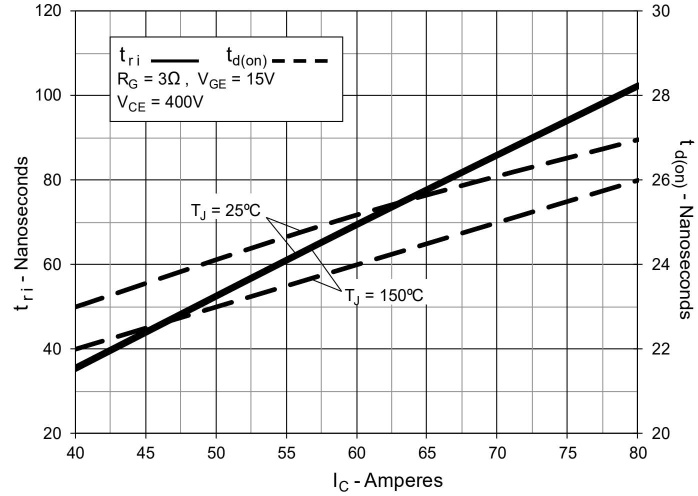


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

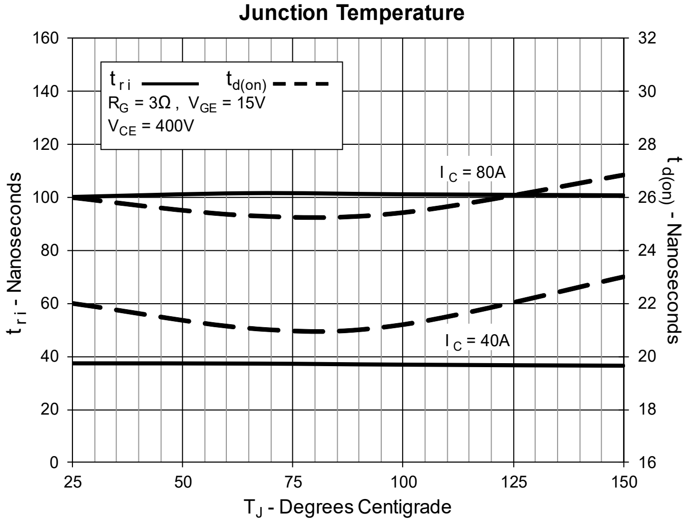


Fig. 21. Diode Forward Characteristics

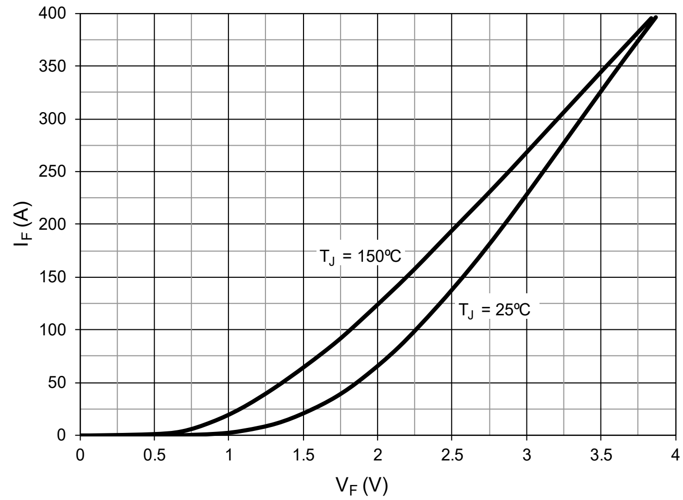


Fig. 22. Reverse Recovery Charge vs. $-di_F/dt$

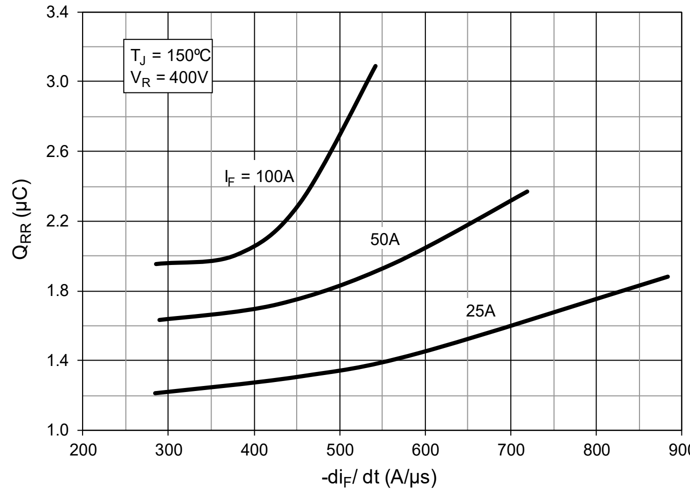


Fig. 23 Reverse Recovery Current vs. $-di_F/dt$

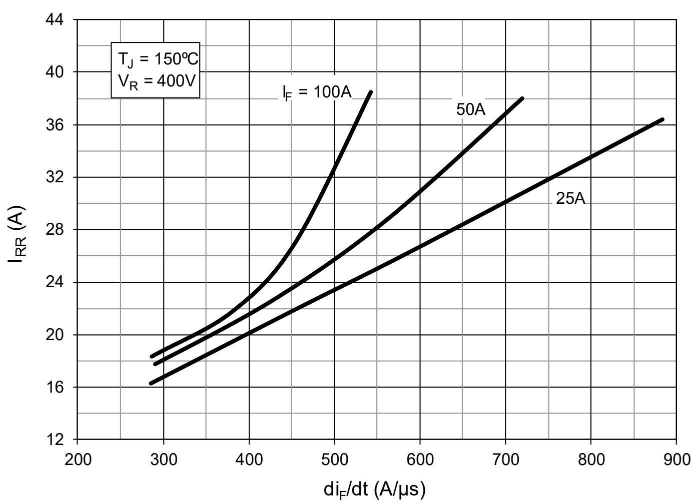


Fig. 24. Reverse Recovery Time vs. $-di_F/dt$

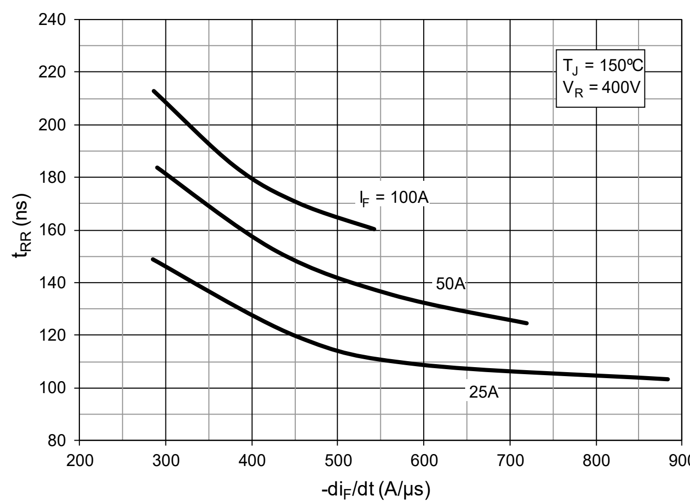


Fig. 25. Dynamic Parameters Q_{RR}, I_{RR} vs. Junction Temperature

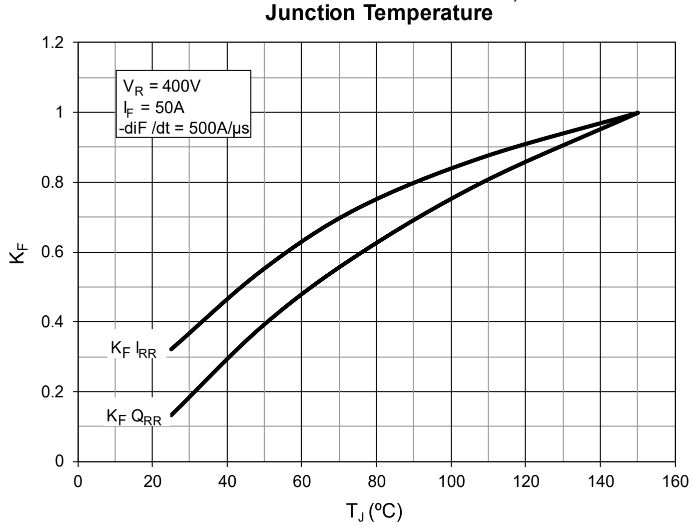
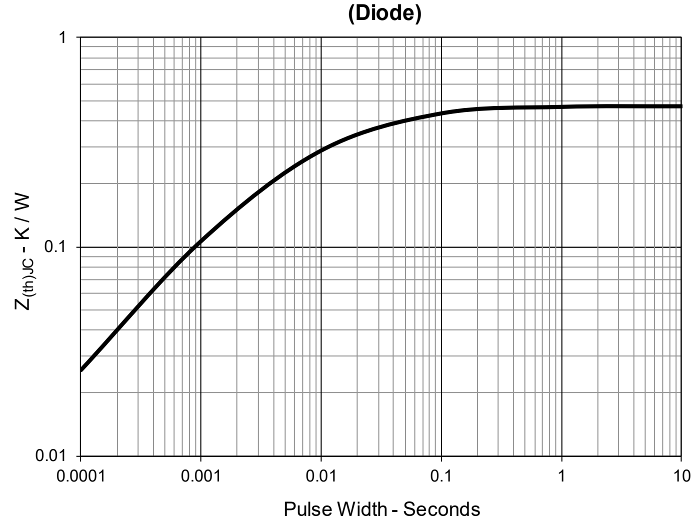
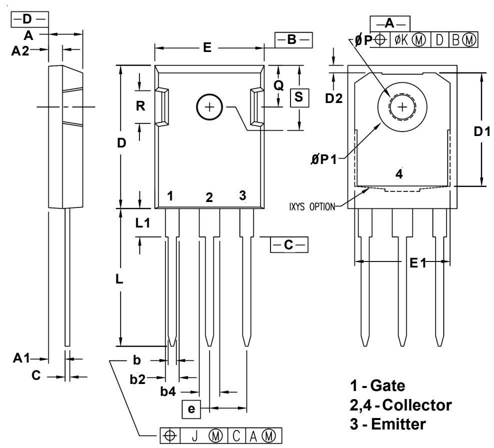


Fig. 26. Maximum Transient Thermal Impedance (Diode)



TO-247 Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	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	

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