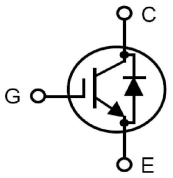
XPT™ 600V IGBT GenX3™ w/ Diode

IXXH50N60C3D1

V_{CES} = 600V
I_{C110} = 50A
$V_{CE(sat)}$ ≤ 2.30V
$t_{fi(typ)}$ = 42ns

Extreme Light Punch Through
IGBT for 20-60 kHz Switching



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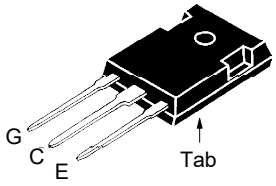


G = Gate C = Collector
E = Emitter Tab = Collector

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 175°C	600	V
V_{CGR}	T_J = 25°C to 175°C, R_{GE} = 1MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C (Chip Capability)	100	A
I_{C110}	T_C = 110°C	50	A
I_{F110}	T_C = 110°C	30	A
I_{CM}	T_C = 25°C, 1ms	200	A
I_A	T_C = 25°C	25	A
E_{AS}	T_C = 25°C	200	mJ
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 5Ω Clamped Inductive Load	I_{CM} = 100 @ ≤ V_{CES}	A
t_{sc} **(SCSOA)**	V_{GE} = 15V, V_{CE} = 360V, T_J = 150°C R_G = 22Ω, Non Repetitive	10	μs
P_C	T_C = 25°C	600	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

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			25	μA
	T_J = 150°C			3	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 36A, V_{GE} = 15V, Note 1		1.95	2.30	V
	T_J = 150°C		2.45		V

Features

- Optimized for 20-60kHz Switching
- Square RBSOA
- Anti-Parallel Ultra Fast Diode
- Avalanche Capability
- Short Circuit Capability
- International Standard Package

Advantages

- High Power Density
- 175°C Rated
- 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 = 36A, V_{CE} = 10V, Note 1	11	18		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		2320		pF
C_{oes}			138		pF
C_{res}			42		pF
Q_g	I_C = 36A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		64		nC
Q_{ge}			18		nC
Q_{gc}			25		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		24		ns
t_{ri}	I_C = 36A, V_{GE} = 15V		40		ns
E_{on}	V_{CE} = 360V, R_G = 5Ω		0.72		mJ
$t_{d(off)}$	Note 2		62	100	ns
t_{fi}			42		ns
E_{off}			0.33	0.55	mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		25		ns
t_{ri}	I_C = 36A, V_{GE} = 15V		44		ns
E_{on}	V_{CE} = 360V, R_G = 5Ω		1.46		mJ
$t_{d(off)}$	Note 2		80		ns
t_{fi}			90		ns
E_{off}			0.48		mJ
R_{thJC}				0.25	°C/W
R_{thCS}			0.21		°C/W

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			2.7	V
	T_J = 150°C		1.6		V
I_{RM}	I_F = 30A, V_{GE} = 0V, -di$_F$/dt = 100A/µs, T_J = 100°C			4	A
t_{rr}	V_R = 100V, T_J = 100°C		100		ns
	I_F = 1A, V_{GE} = 0V, -di$_F$/dt = 100A/µs, V_R = 30V		25		ns
R_{thJC}				0.9	°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

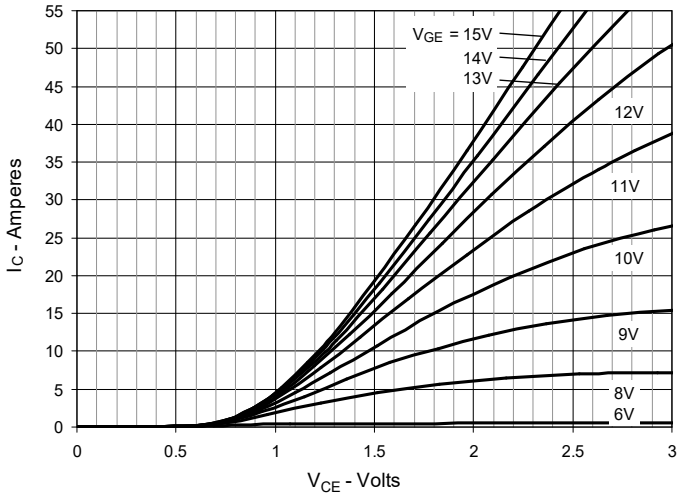


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

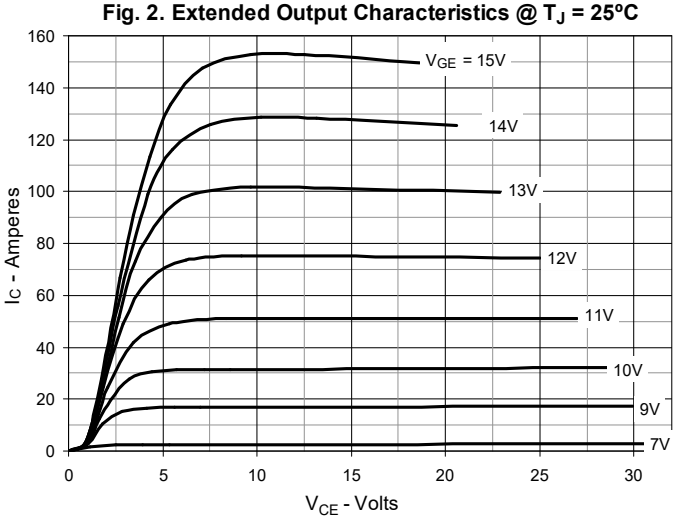


Fig. 3. Output Characteristics @ T_J = 150ºC

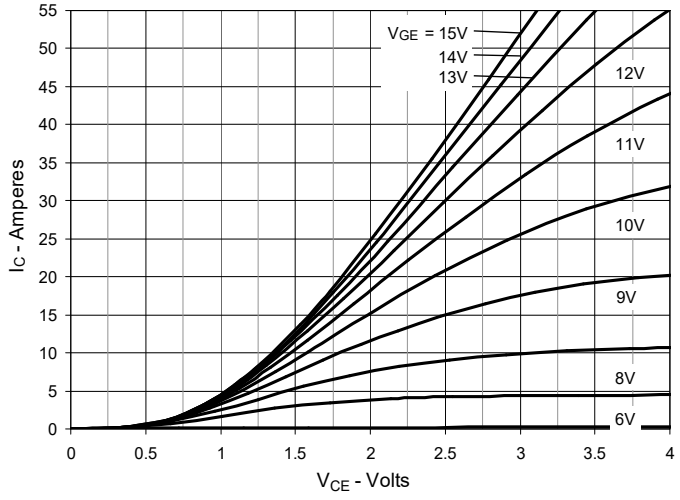


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

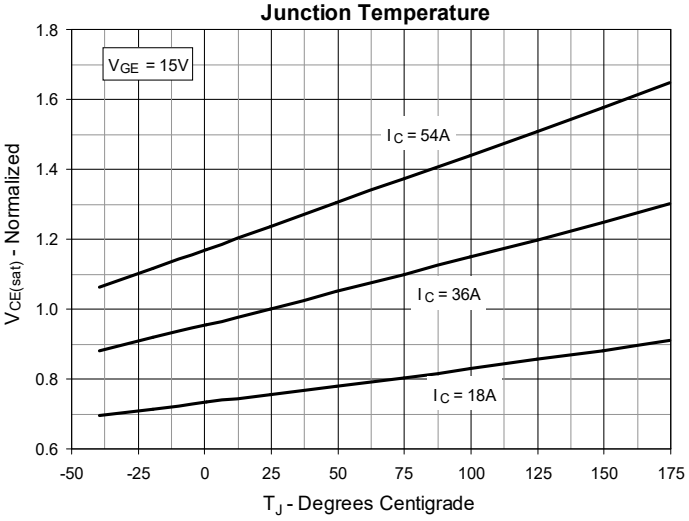


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

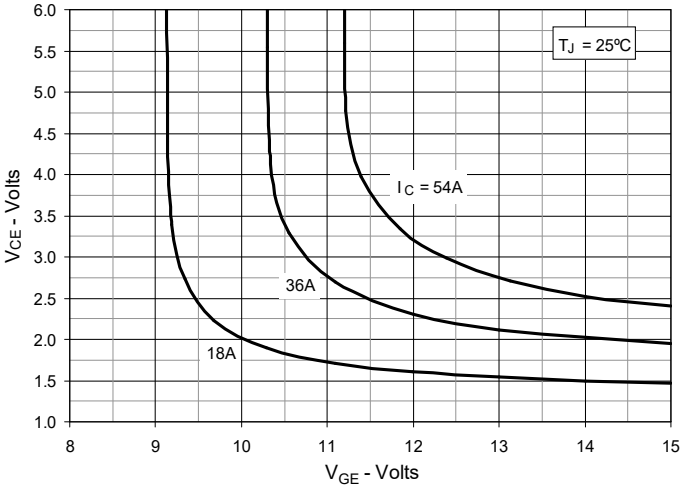


Fig. 6. Input Admittance

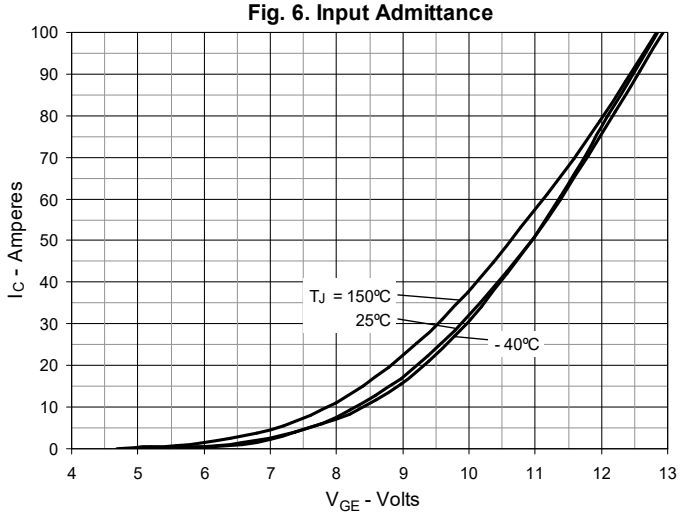


Fig. 7. Transconductance

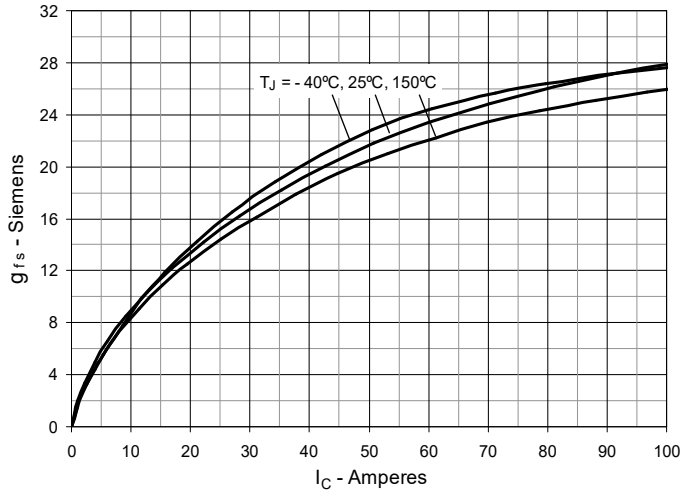


Fig. 8. Gate Charge

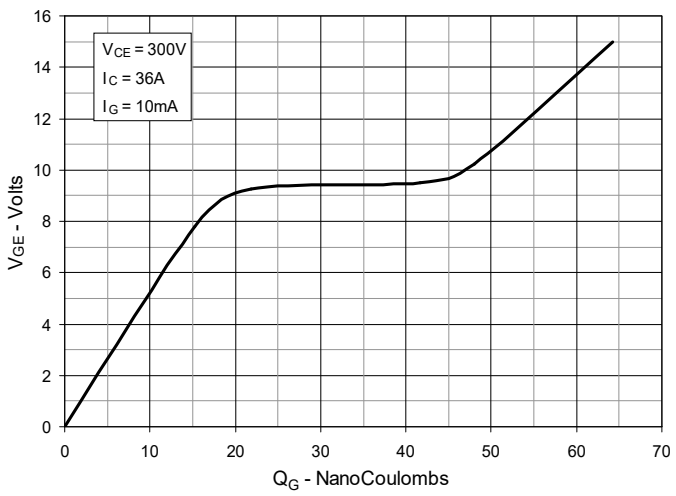


Fig. 9. Capacitance

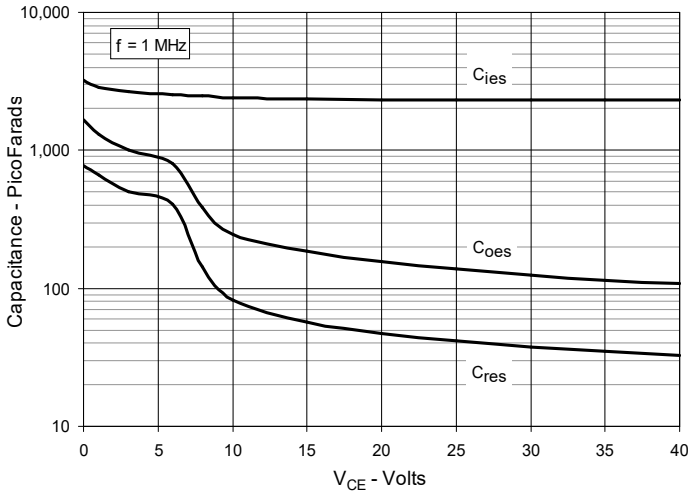


Fig. 10. Reverse-Bias Safe Operating Area

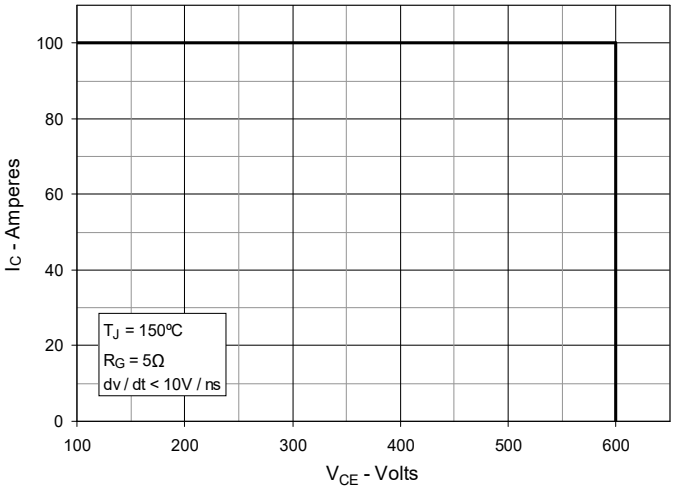


Fig. 11. Forward-Bias Safe Operating Area

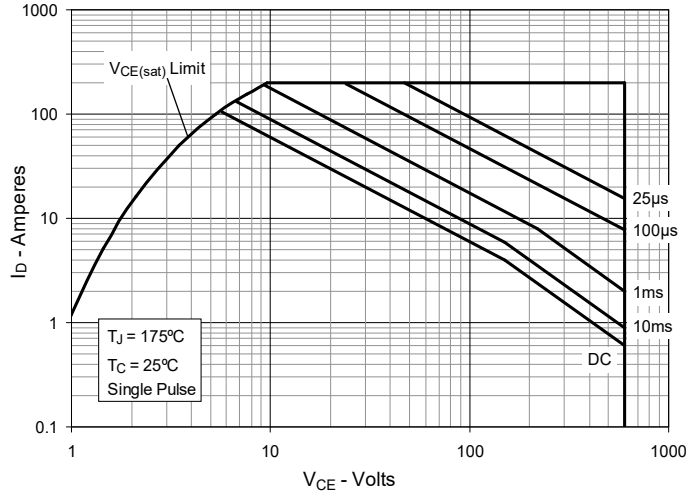


Fig. 12. Maximum Transient Thermal Impedance

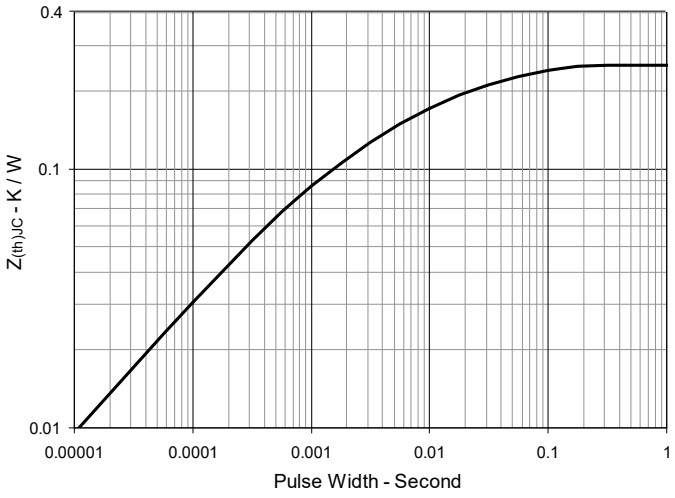


Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

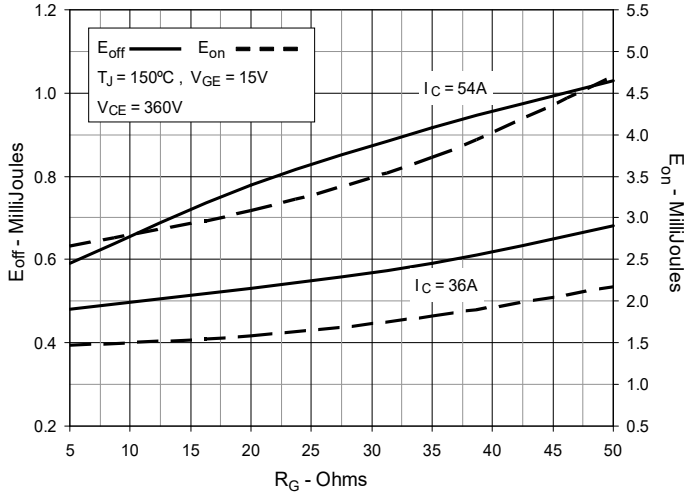


Fig. 14. Inductive Switching Energy Loss vs. Collector Current

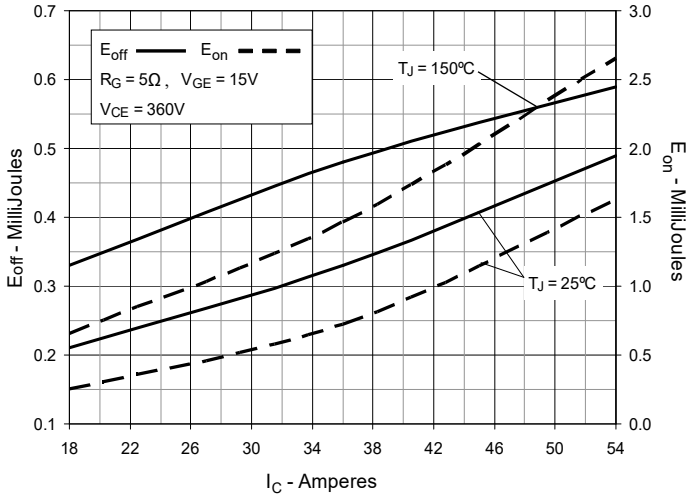


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

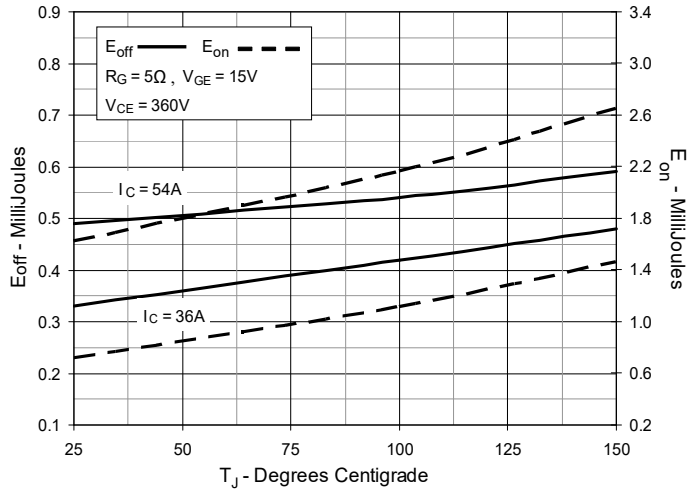


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

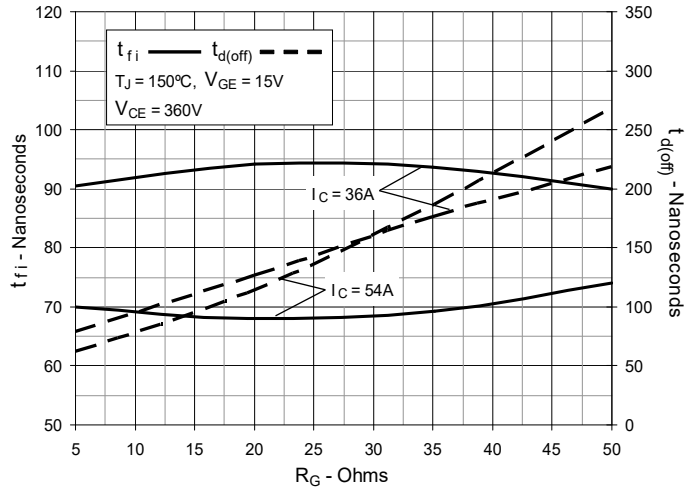


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

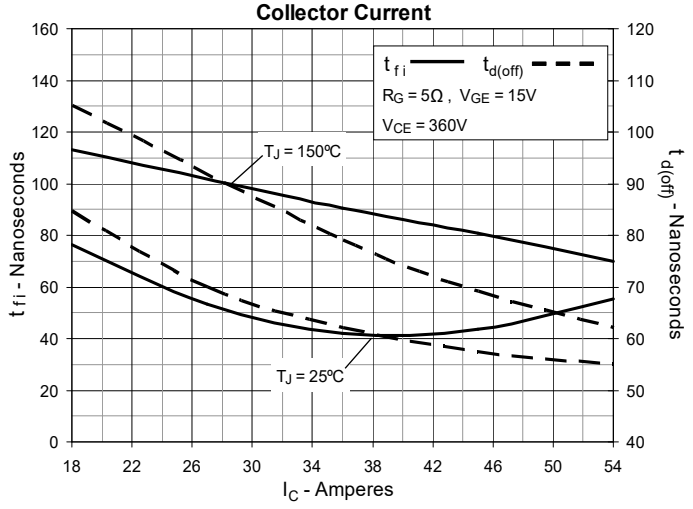


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature

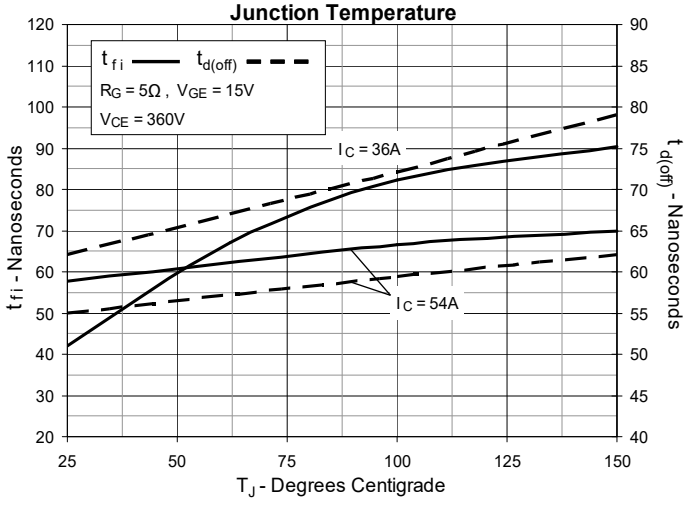


Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

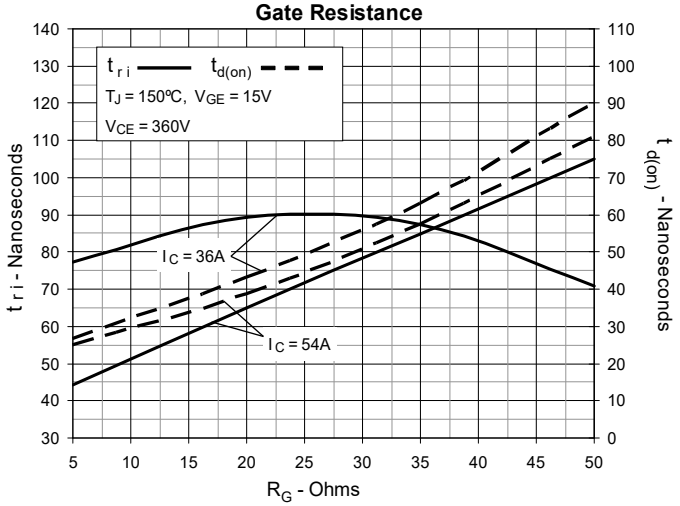


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

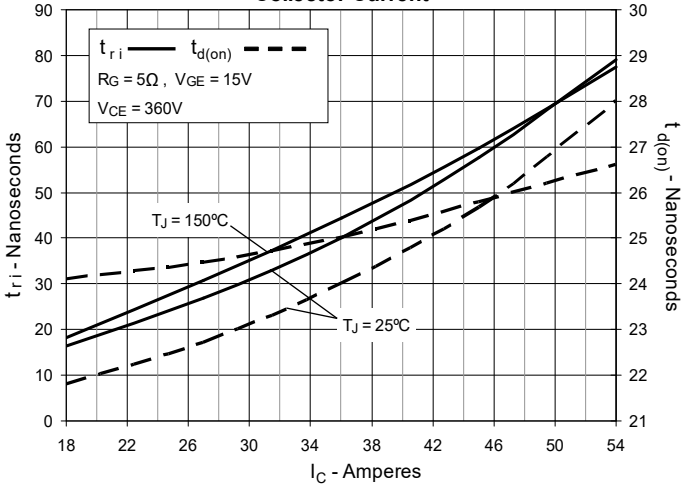
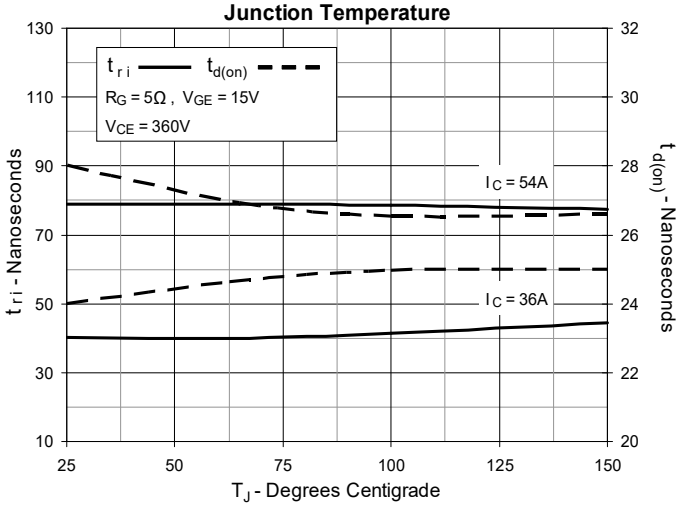


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature



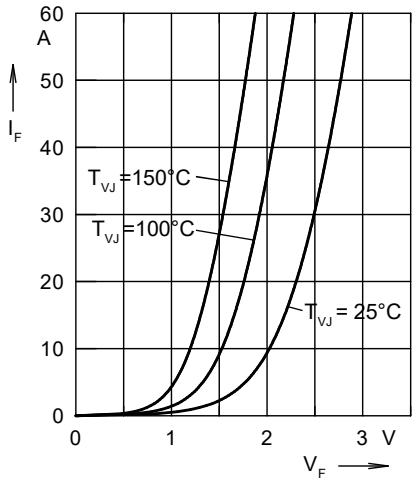


Fig. 22. Forward Current I_F Versus V_F

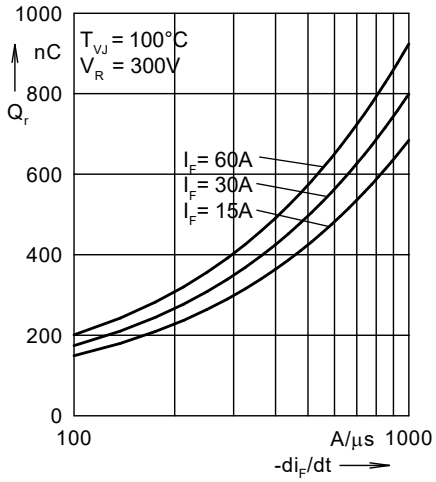


Fig. 23. Reverse Recovery Charge Q_r Versus $-di_F/dt$

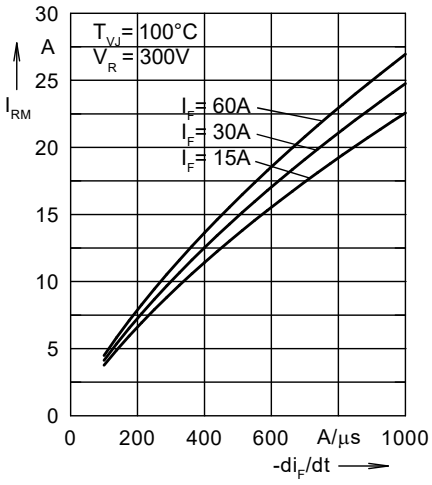


Fig. 24. Peak Reverse Current I_{RM} Versus $-di_F/dt$

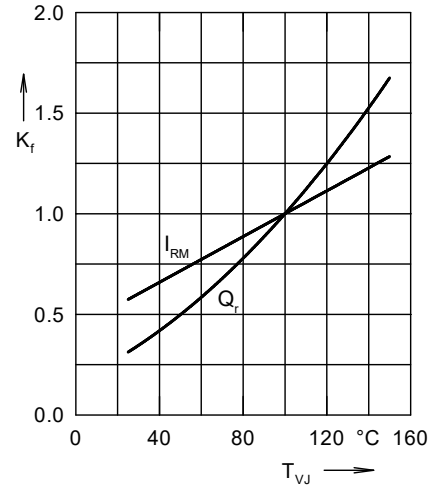


Fig. 25. Dynamic Parameters Q_r, I_{RM} Versus T_{VJ}

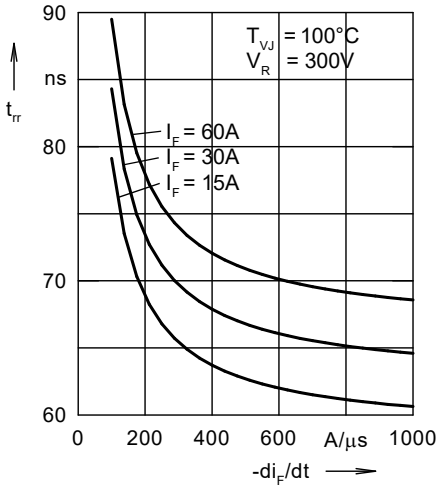


Fig. 26. Recovery Time t_{rr} Versus $-di_F/dt$

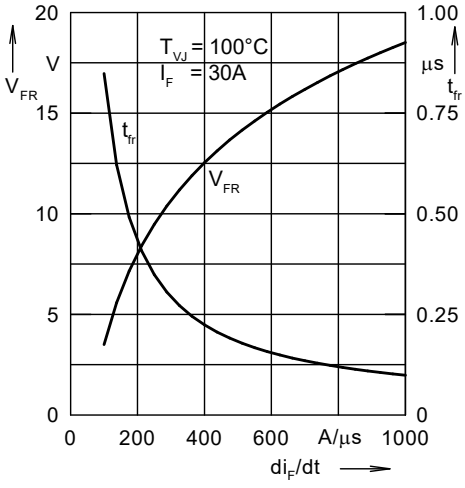


Fig. 27. Peak Forward Voltage V_{FR} and t_{fr} Versus di_F/dt

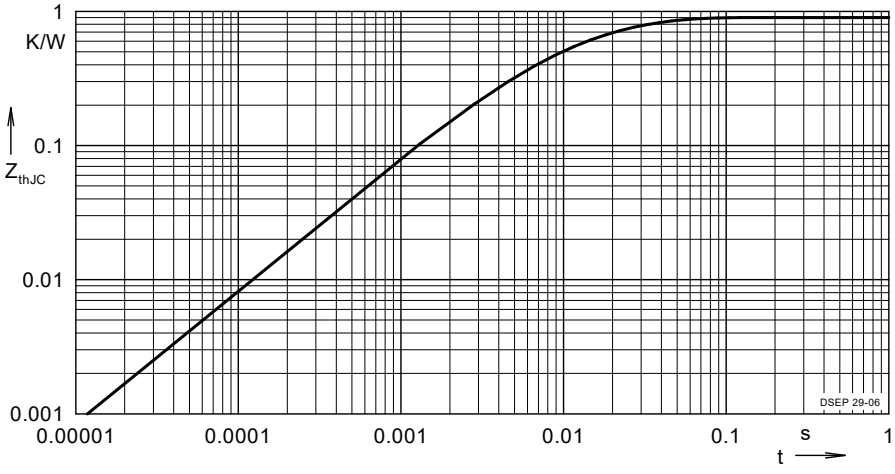
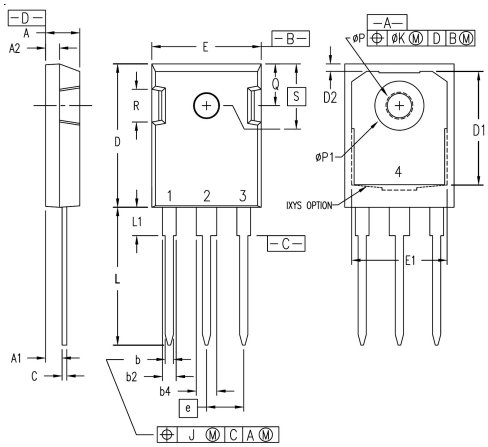


Fig. 28. Transient Thermal Resistance Junction to Case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.502	0.0052
2	0.193	0.0003
3	0.205	0.0162

TO-247 Outline



1 - Gate
2,4 - Collector
3 -Emitter

SYM	INCHES		INCHES	
	MIN	MAX	MIN	MAX
A	0.190	0.205	4.83	5.21
A1	0.090	0.100	2.29	2.54
A2	0.075	0.085	1.91	2.16
b	0.045	0.055	1.14	1.40
b2	0.075	0.087	1.91	2.20
b4	0.115	0.126	2.92	3.20
C	0.024	0.031	0.61	0.80
D	0.819	0.840	20.80	21.34
D1	0.650	0.690	16.51	17.53
D2	0.035	0.050	0.89	1.27
E	0.620	0.635	15.57	16.13
E1	0.545	0.565	13.84	14.35
e	0.215 BSC		5.45 BSC	
J	--	0.010	--	0.250
K	--	0.025	--	0.640
L	0.780	0.810	19.81	20.57
L1	0.150	0.170	3.81	4.32
ØP	0.140	0.144	3.55	3.65
ØP1	0.275	0.290	6.99	7.37
Q	0.220	0.244	5.59	6.20
R	0.170	0.190	4.32	4.83
S	0.242 BSC		6.15 BSC	

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