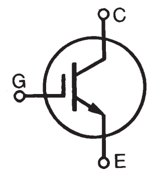
IXYS

XPT™ 600V IGBTs GenX3™

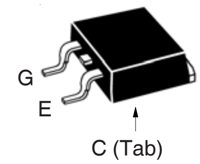
IXXA50N60B3
IXXP50N60B3
IXXH50N60B3

V_{CES} = 600V
I_{C110} = 50A
$V_{CE(sat)} \leq$ 1.80V

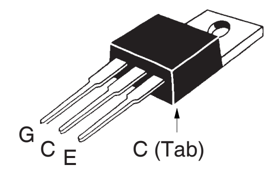
Extreme Light Punch Through IGBT for 5-30 kHz Switching



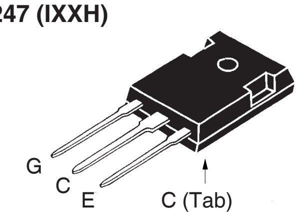
TO-263 (IXXA)



TO-220 (IXXP)



TO-247 (IXXH)



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	120	A
I_{C110}	T_C = 110°C	50	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 @$V_{CE} \leq V_{CES}$	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	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
F_C	Mounting Force (TO-263)	10..65 / 2.2..14.6	N/lb.
M_d	Mounting Torque (TO-220 & TO-247)	1.13 / 10	Nm/lb.in.
Weight	TO-263	2.5	g
	TO-220	3.0	g
	TO-247	6.0	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}		3.5		6.0	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 = 36A, V_{GE} = 15V, Note 1			1.55	1.80	V
		T_J = 150°C		1.80		V

Features

- Optimized for 5-30kHz Switching
- Square RBSOA
- Avalanche Capability
- Short Circuit Capability
- International Standard Packages

Advantages

- High Power Density
- 175°C Rated
- Extremely Rugged
- Low Gate Drive Requirement
- Easy to Parallel

Applications

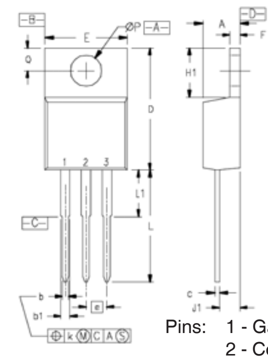
- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

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	12	19		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		2230		pF
C_{oes}			195		pF
C_{res}			44		pF
$Q_{g(on)}$	I_C = 36A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		70		nC
Q_{ge}			16		nC
Q_{gc}			29		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		27		ns
t_{ri}	I_C = 36A, V_{GE} = 15V		40		ns
E_{on}	V_{CE} = 360V, R_G = 5Ω		0.67		mJ
$t_{d(off)}$	Note 2		100	150	ns
t_{fi}			135		ns
E_{off}			0.74	1.20	mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		30		ns
t_{ri}	I_C = 36A, V_{GE} = 15V		45		ns
E_{on}	V_{CE} = 360V, R_G = 5Ω		1.40		mJ
$t_{d(off)}$	Note 2		130		ns
t_{fi}			190		ns
E_{off}			1.20		mJ
R_{thJC}				0.25	°C/W
R_{thCS}	TO-247		0.21		°C/W
	TO-220		0.50		°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.

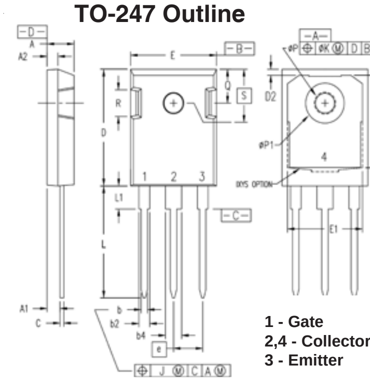
TO-220 Outline



Pins: 1 - Gate
2 - Collector
3 - Emitter

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.170	.190	4.32	4.83
b	.025	.040	0.64	1.02
b1	.045	.065	1.15	1.65
c	.014	.022	0.35	0.56
D	.580	.630	14.73	16.00
E	.390	.420	9.91	10.66
e	.100 BSC		2.54 BSC	
F	.045	.055	1.14	1.40
H1	.230	.270	5.85	6.85
J1	.090	.110	2.29	2.79
k	0	.015	0	0.38
L	.500	.550	12.70	13.97
L1	.110	.230	2.79	5.84
ØP	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

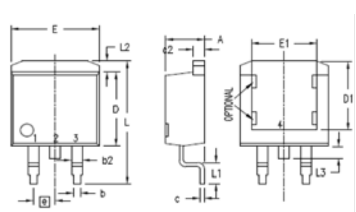
TO-247 Outline



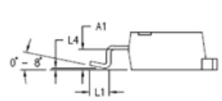
1 - Gate
2,4 - Collector
3 - Emitter

Dim.	Millimeter min	Millimeter max	Inches min	Inches max
A	4.70	5.30	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.39	0.065	0.094
b4	2.59	3.43	0.102	0.135
c	0.38	0.89	0.015	0.035
D	20.79	21.45	0.819	0.845
D1	13.07	-	0.515	-
D2	0.51	1.35	0.020	0.053
E	15.48	16.24	0.610	0.640
E1	13.45	-	0.53	-
E2	4.31	5.48	0.170	0.216
e	5.45 BSC		0.215 BSC	
L	19.80	20.30	0.078	0.800
L1	-	4.49	-	0.177
Ø P	3.55	3.65	0.140	0.144
Ø P1	-	7.39	-	0.290
Q	5.38	6.19	0.212	0.244
S	6.14 BSC		0.242 BSC	

TO-263 Outline



1 = Gate
2,4 = Collector
3 = Emitter



SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.160	.190	4.06	4.83
A1	.080	.110	2.03	2.79
b	.020	.039	0.51	0.99
b2	.045	.055	1.14	1.40
c	.016	.029	0.40	0.74
c2	.045	.055	1.14	1.40
D	.340	.380	8.64	9.65
D1	.315	.350	8.00	8.89
E	.380	.410	9.65	10.41
E1	.245	.320	6.22	8.13
e	.100 BSC		2.54 BSC	
L	.575	.625	14.61	15.88
L1	.090	.110	2.29	2.79
L2	.040	.055	1.02	1.40
L3	.050	.070	1.27	1.78
L4	0	.005	0	0.13

Fig. 1. Output Characteristics @ T_J = 25ºC

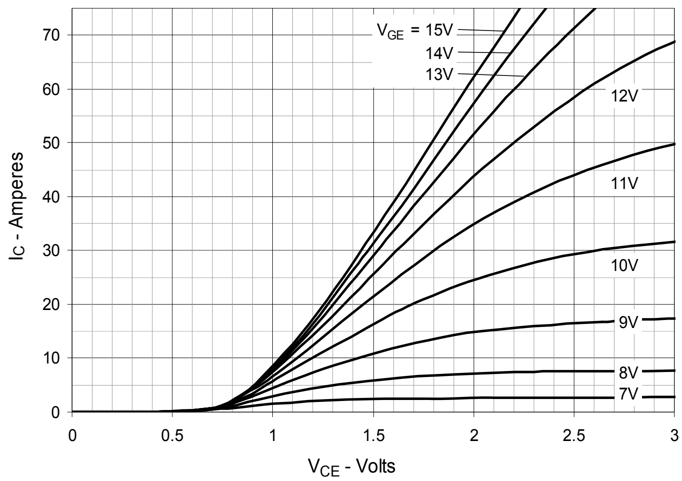


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

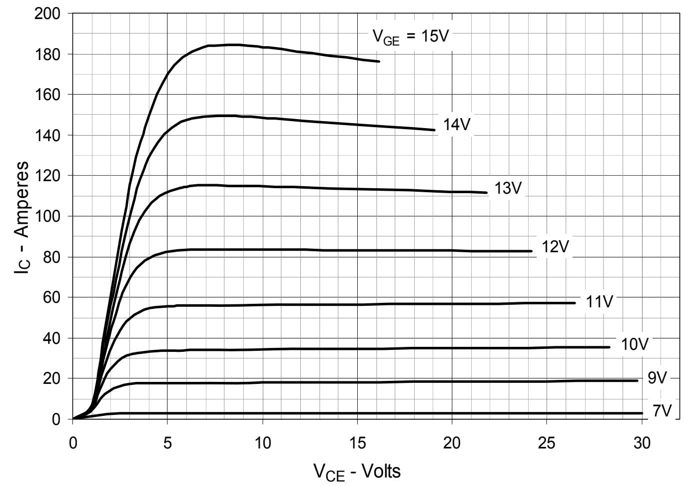


Fig. 3. Output Characteristics @ T_J = 150ºC

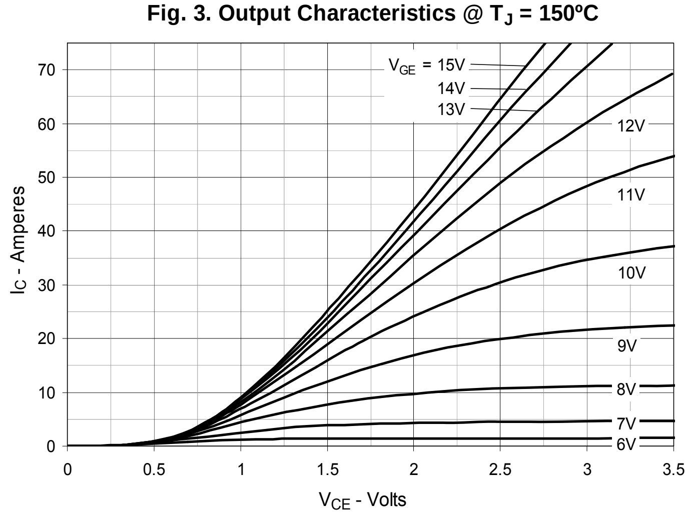


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

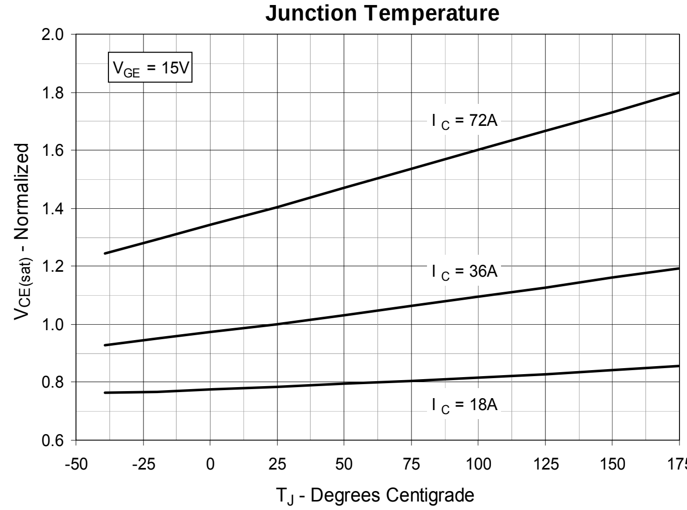


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

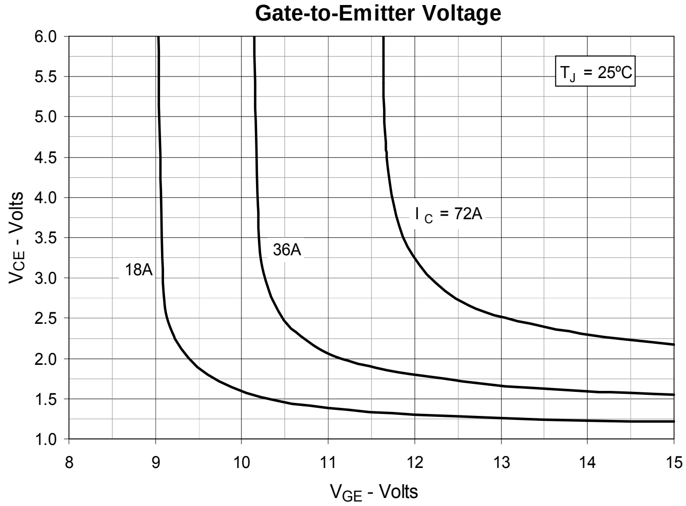


Fig. 6. Input Admittance

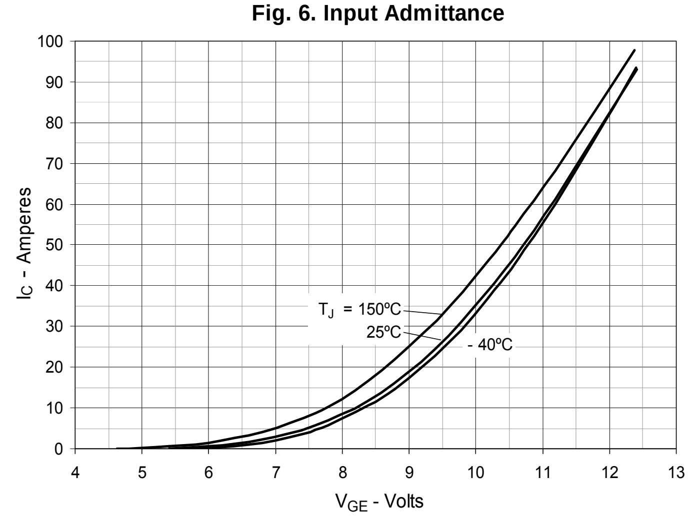


Fig. 7. Transconductance

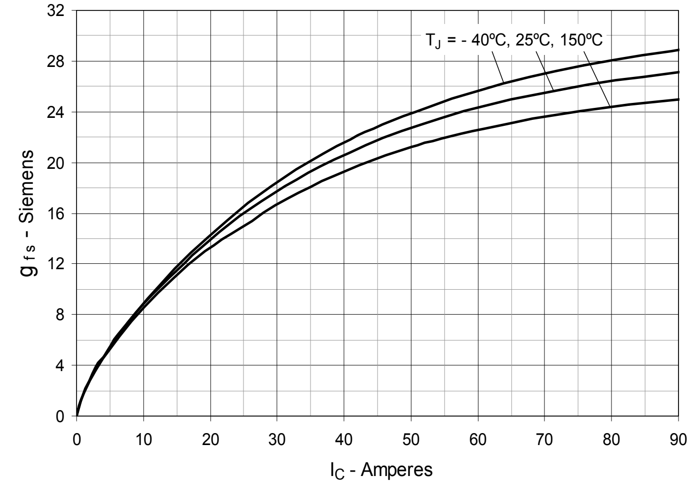


Fig. 8. Gate Charge

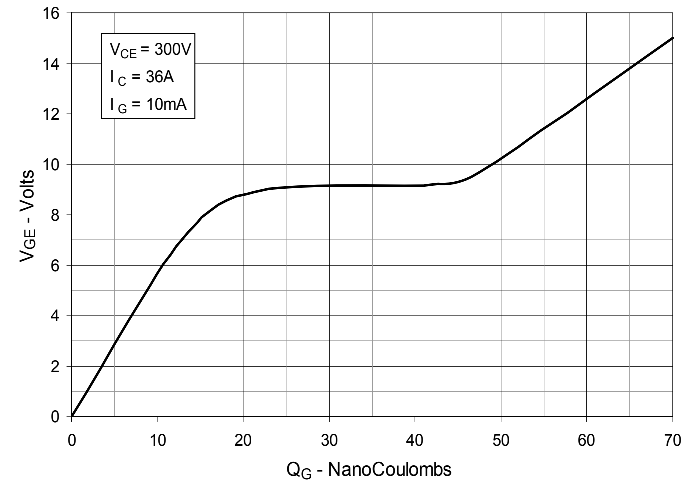


Fig. 9. Capacitance

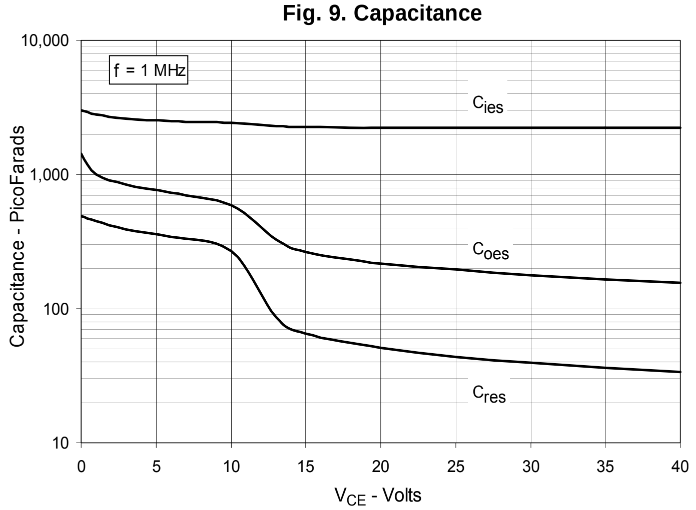


Fig. 10. Reverse-Bias Safe Operating Area

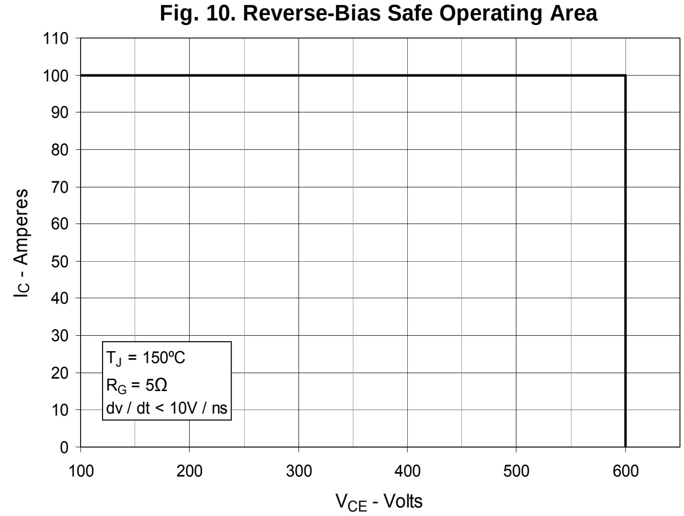


Fig. 11. Forward-Bias Safe Operating Area

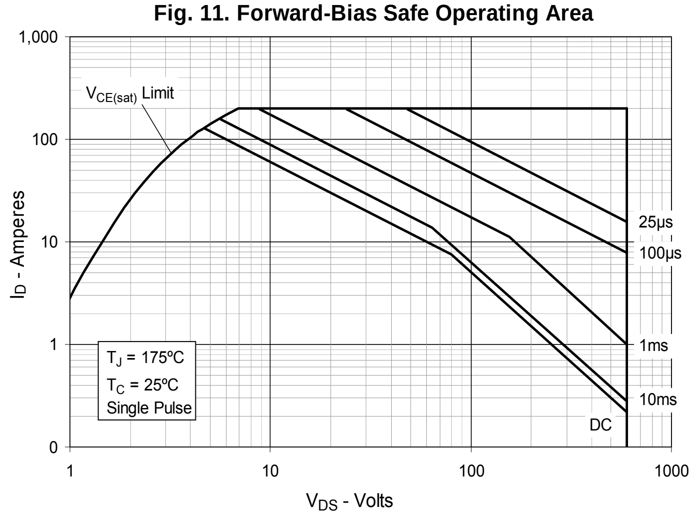


Fig. 12. Maximum Transient Thermal Impedance

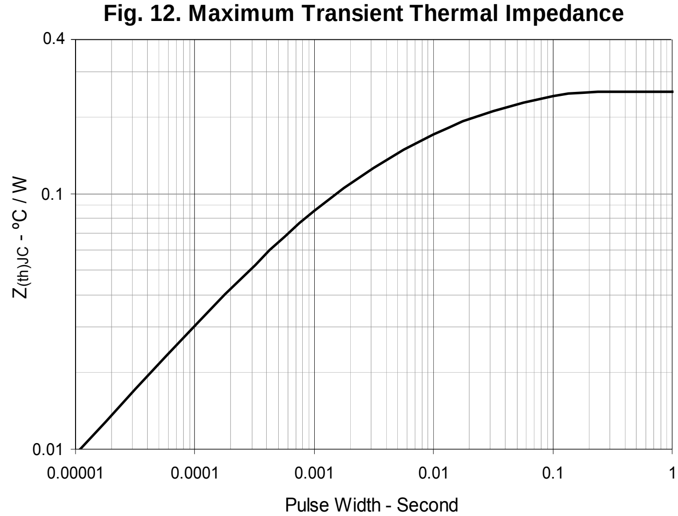


Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

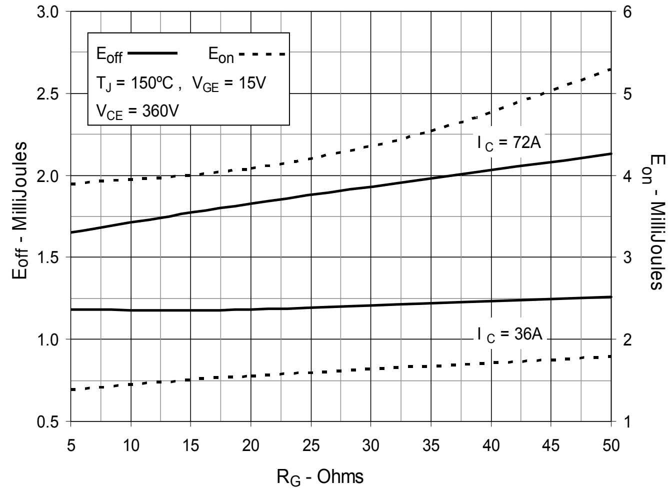


Fig. 14. Inductive Switching Energy Loss vs. Collector Current

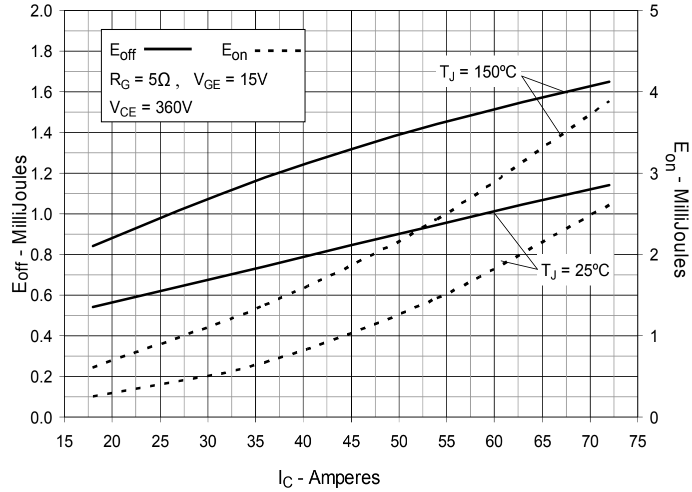


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

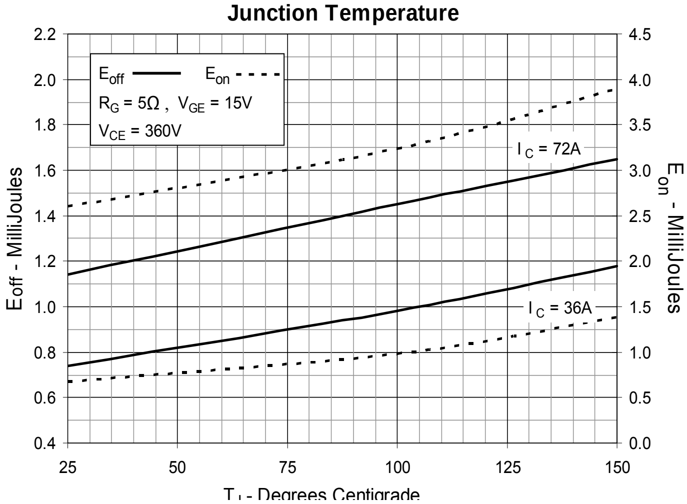


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

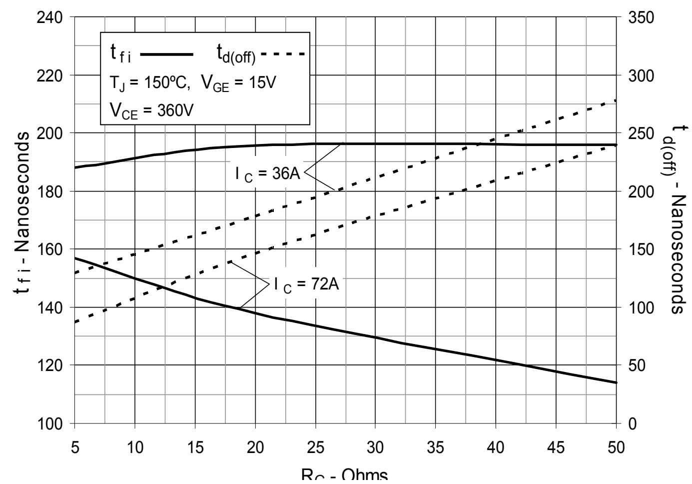


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

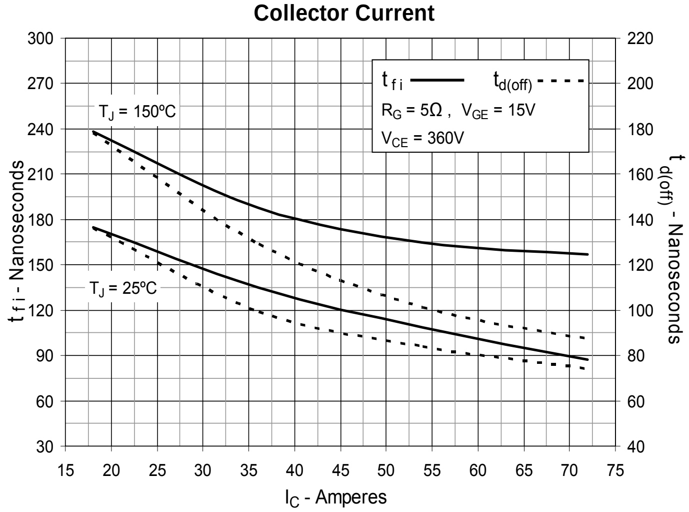


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature

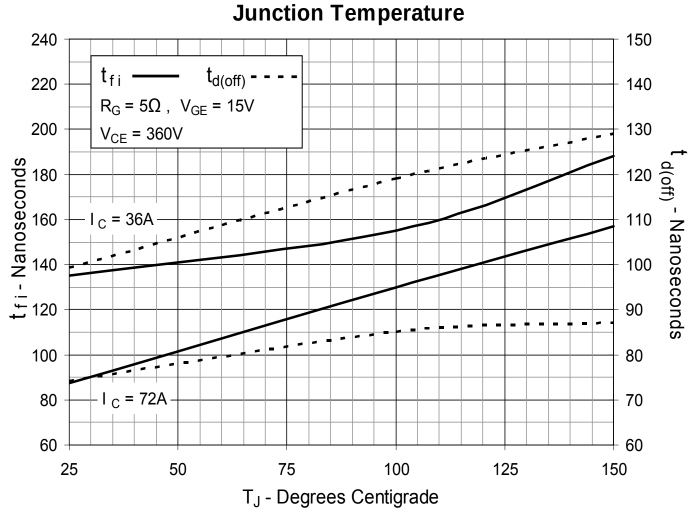


Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

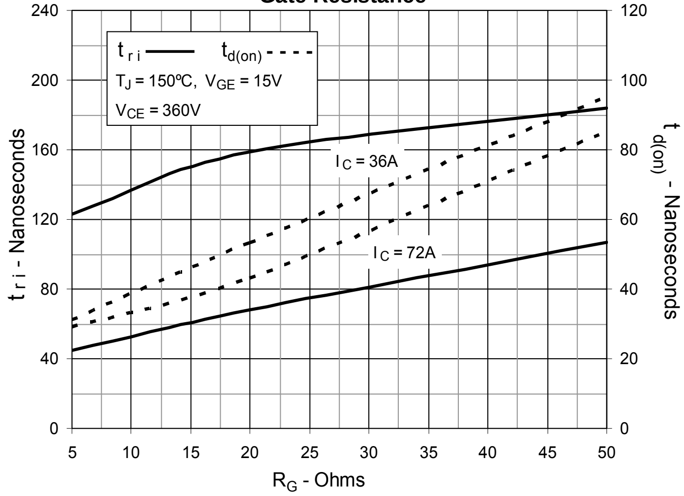


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

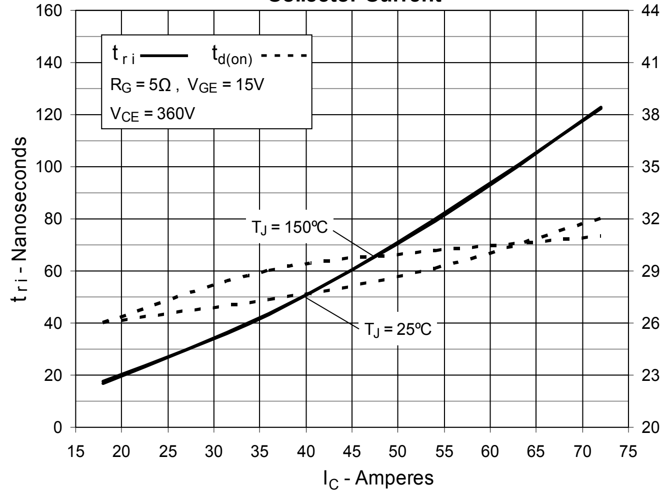


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature