IXYS

Preliminary Technical Information

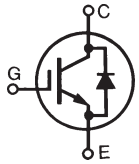
High-Gain IGBT w/ Diode

IXGJ50N60C4D1

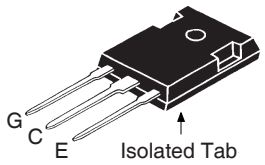
V_{CES} = 600V
I_{C110} = 21A
$V_{CE(sat)}$ ≤ 2.50V

(Electrically Isolated Tab)

High-Speed PT Trench IGBT



ISO TO-247™
E153432



G = Gate E = Emitter
C = Collector

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	52	A
I_{C110}	T_C = 110°C	21	A
I_{F110}	T_C = 110°C	12	A
I_{CM}	T_C = 25°C, 1ms	220	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 10Ω Clamped Inductive Load	I_{CM} = 72 $V_{CE} \leq V_{CES}$	A
P_C	T_C = 25°C	125	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	1.6mm (0.062 in.) from Case for 10s	300	°C
T_{SOLD}	Plastic Body for 10 seconds	260	°C
F_C	Mounting Force	20..120 / 4.5..27	N/lb.
V_{ISOL}	50/60 Hz, RM, t = 1min	2500	V~
Weight		4.0	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}	4.0		6.5	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			50	μA
	T_J = 125°C			2.5	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 36A, V_{GE} = 15V, Note 1		1.95	2.50	V
	T_J = 125°C		1.65		V

Features

- Optimized for Low Switching Losses
- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Anti-Parallel Ultra Fast Diode
- Square RBSOA

Advantages

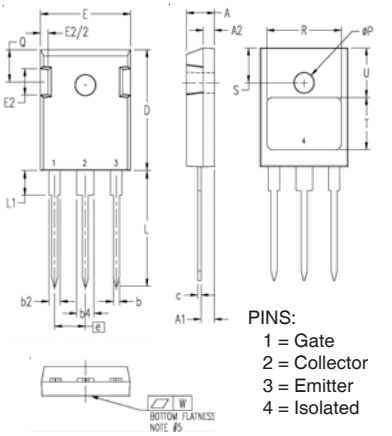
- Easy to Mount
- Space Savings

Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- 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	20	30		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		1900		pF
C_{oes}			100		pF
C_{res}			60		pF
Q_g	I_C = 36A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		113		nC
Q_{ge}			13		nC
Q_{gc}			44		nC
$t_{d(on)}$	**Inductive Load, T_J = 25°C**		40		ns
t_{ri}	I_C = 36A, V_{GE} = 15V		66		ns
E_{on}	V_{CE} = 400V, R_G = 10Ω		0.95		mJ
$t_{d(off)}$	Note 2		270		ns
t_{fi}			63		ns
E_{off}			0.84	1.55	mJ
$t_{d(on)}$	**Inductive Load, T_J = 125°C**		30		ns
t_{ri}	I_C = 36A, V_{GE} = 15V		45		ns
E_{on}	V_{CE} = 400V, R_G = 10Ω		1.10		mJ
$t_{d(off)}$	Note 2		210		ns
t_{fi}			96		ns
E_{off}			0.90		mJ
R_{thJC}				1.00	°C/W
R_{thCS}			0.30		°C/W

ISO TO-247 (IXGJ) OUTLINE



PINS:
1 = Gate
2 = Collector
3 = Emitter
4 = Isolated

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.190	.205	4.83	5.21
A1	.087	.100	2.21	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.085	1.91	2.16
b4	.115	.126	2.92	3.20
c	.023	.033	0.58	0.84
D	.820	.840	20.83	21.34
E	.620	.635	15.75	16.13
E2	.175	.195	4.44	4.95
e	.215 BSC		5.45 BSC	
L	.780	.810	19.81	20.57
L1	.160	.177	4.06	4.50
Q	.220	.240	5.59	6.10
R	.520	.540	13.21	13.72
S	.242 BSC		6.15 BSC	
T	.355	.375	9.02	9.53
U	.345	.370	8.76	9.40
øP	.140	.144	3.55	3.66
W	.000	.004	0.00	0.10

Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
V_F	I_F = 15A, V_{GE} = 0V, Note 1			2.7	V
	T_J = 150°C		1.6		V
I_{RM}	I_F = 15A, V_{GE} = 0V, -di_F/dt = 100A/µs, T_J = 100°C			2.6	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}				2.0	°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.

PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

Fig. 1. Output Characteristics @ T_J = 25ºC

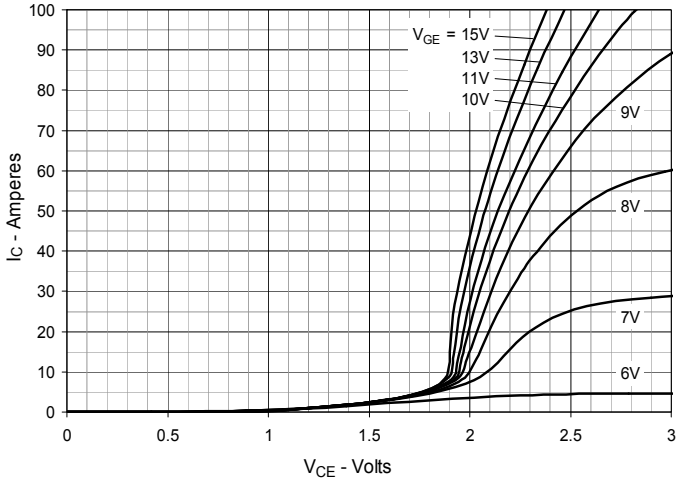


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

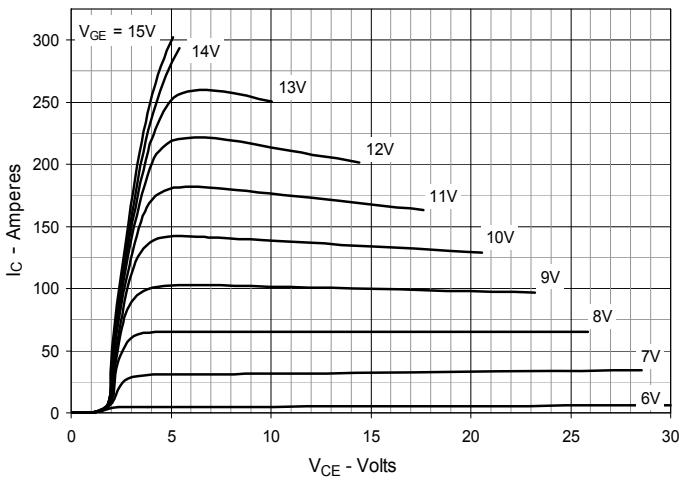


Fig. 3. Output Characteristics @ T_J = 125ºC

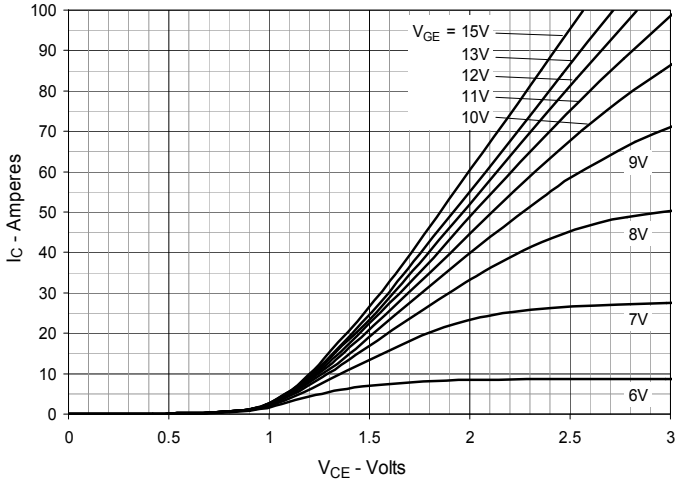


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

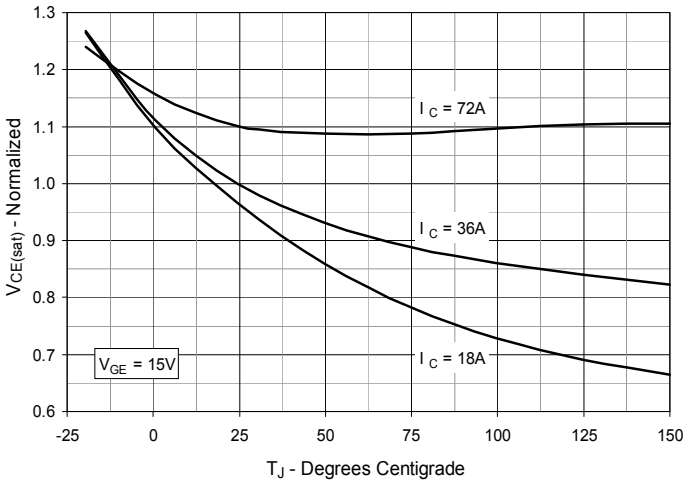


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

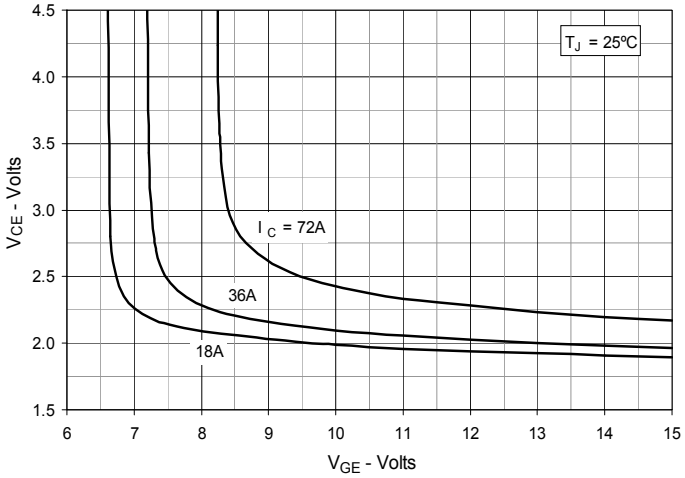


Fig. 6. Input Admittance

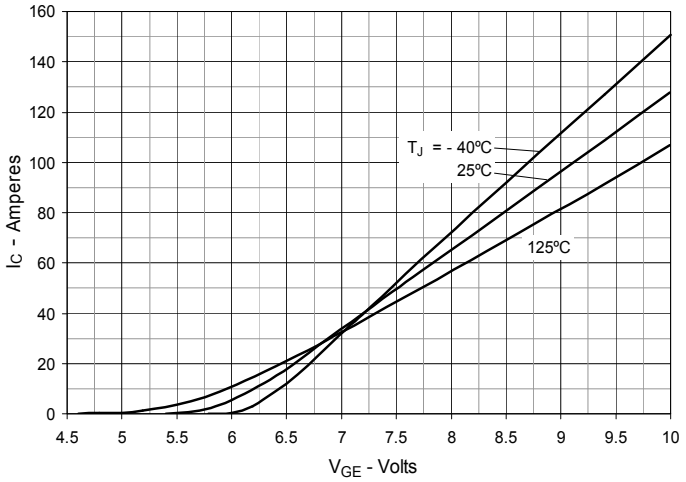


Fig. 7. Transconductance

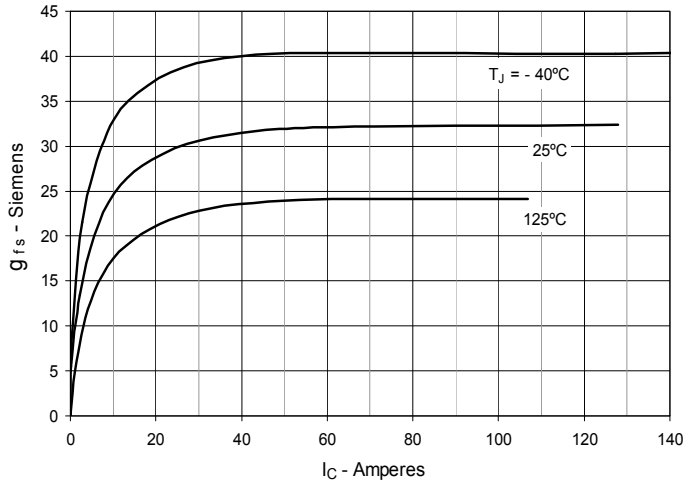


Fig. 8. Gate Charge

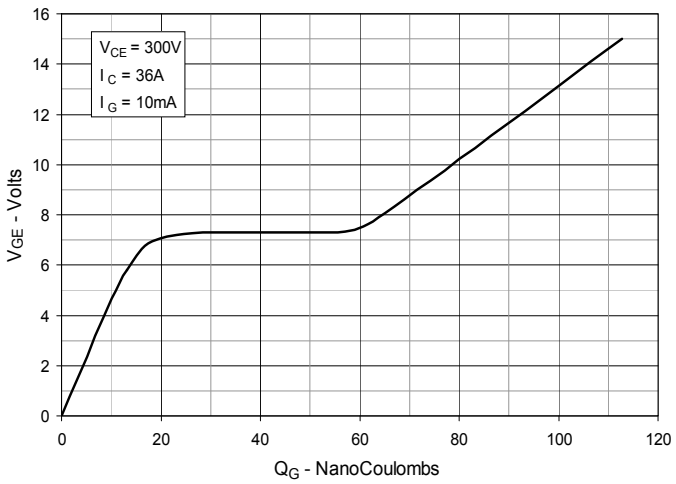


Fig. 9. Capacitance

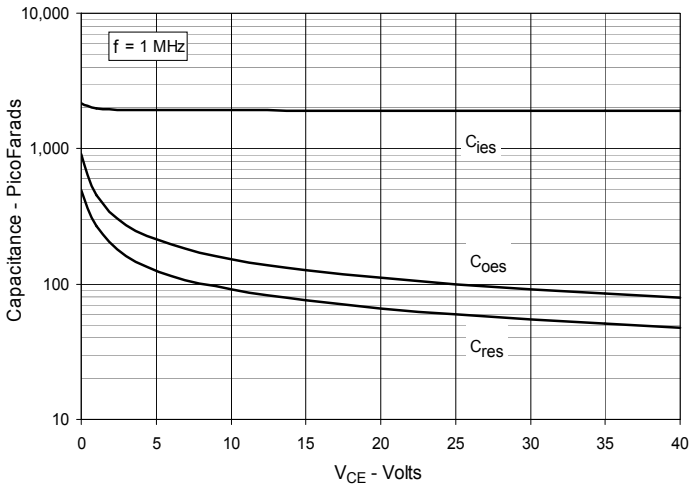


Fig. 10. Reverse-Bias Safe Operating Area

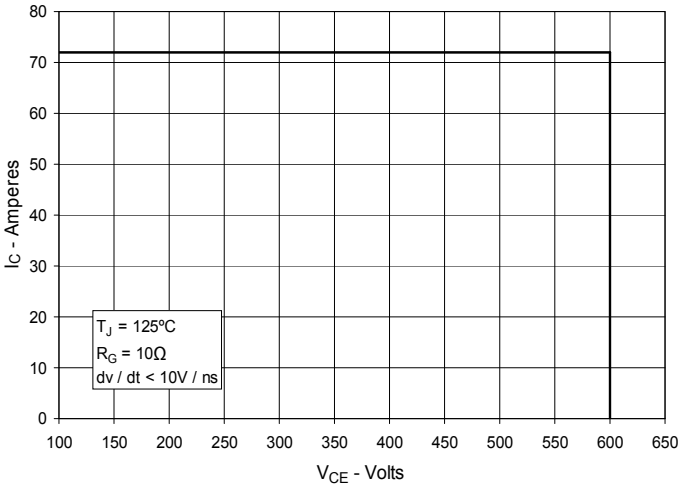


Fig. 11. Maximum Transient Thermal Impedance

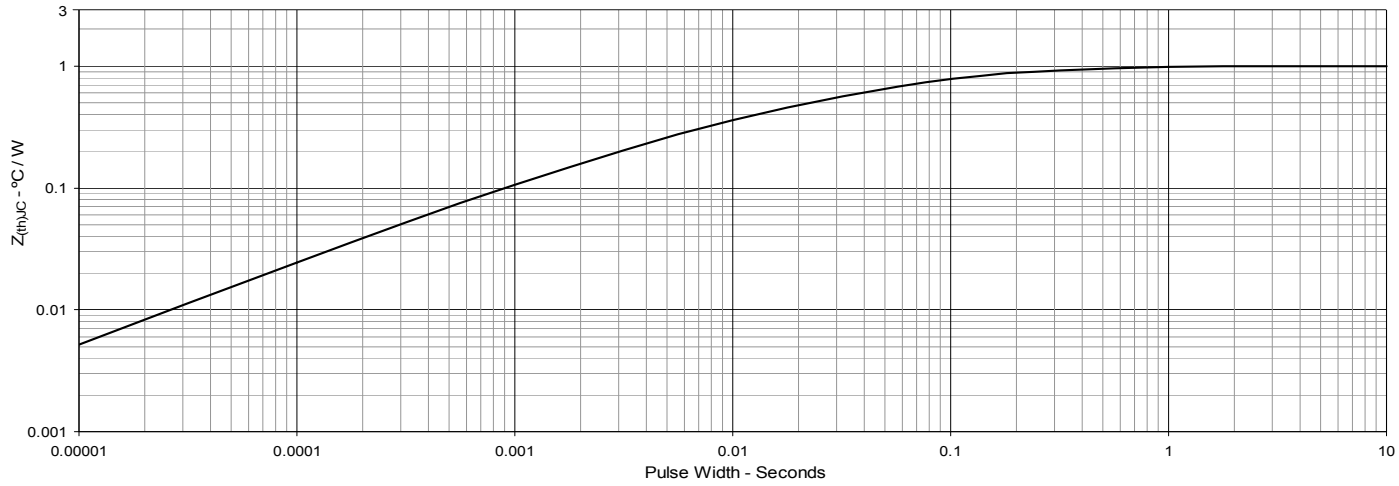


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

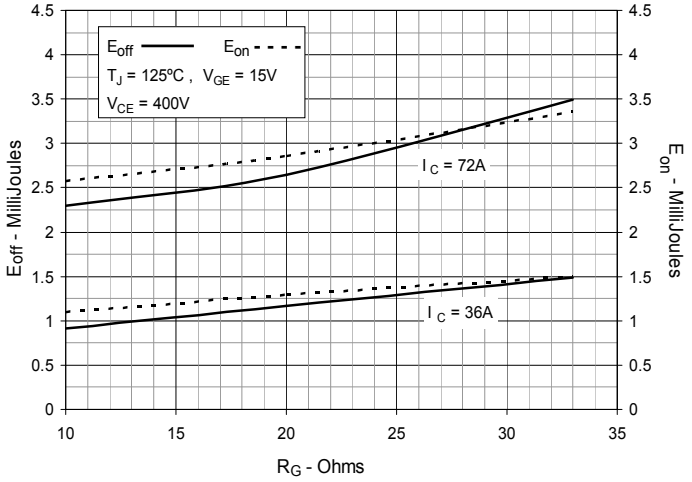


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

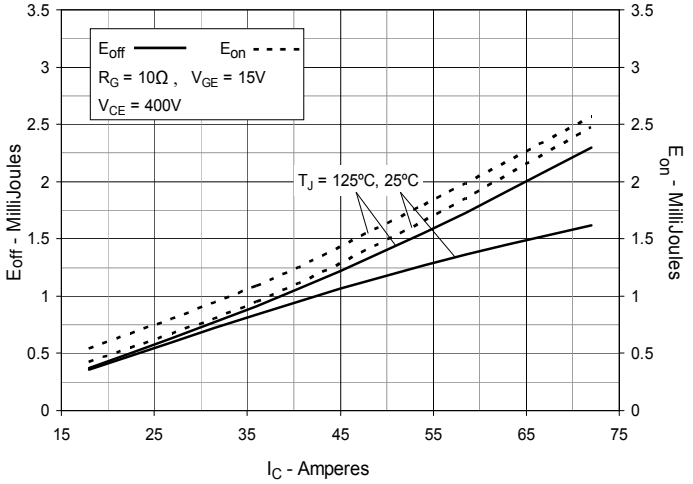


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

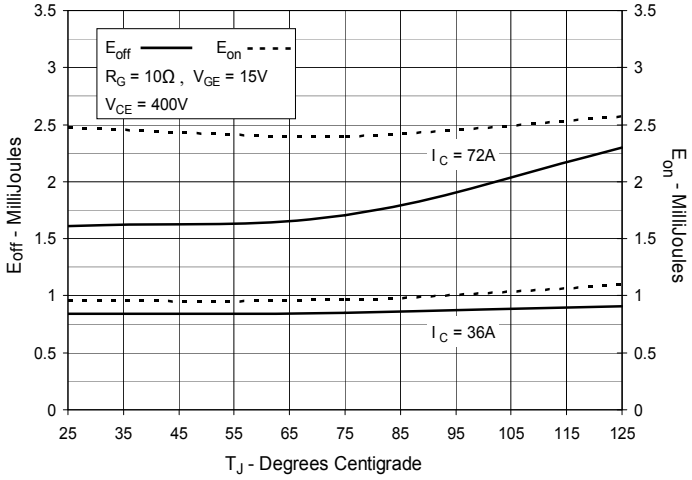


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

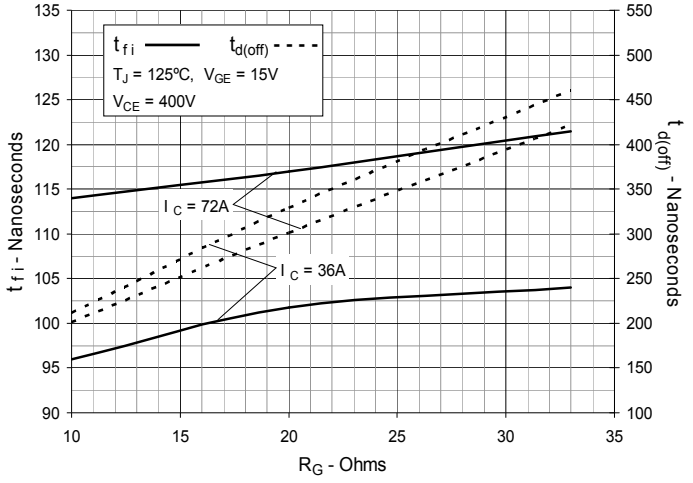


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

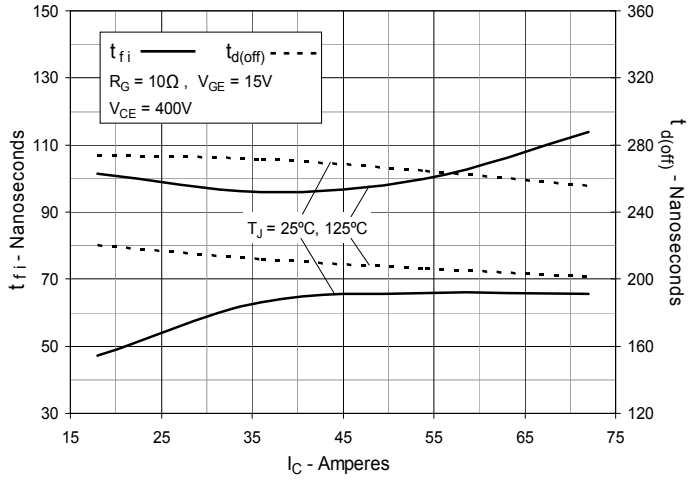


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

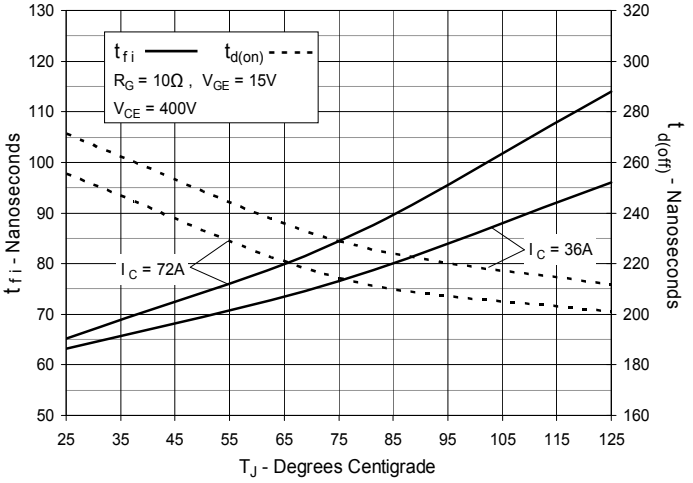


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

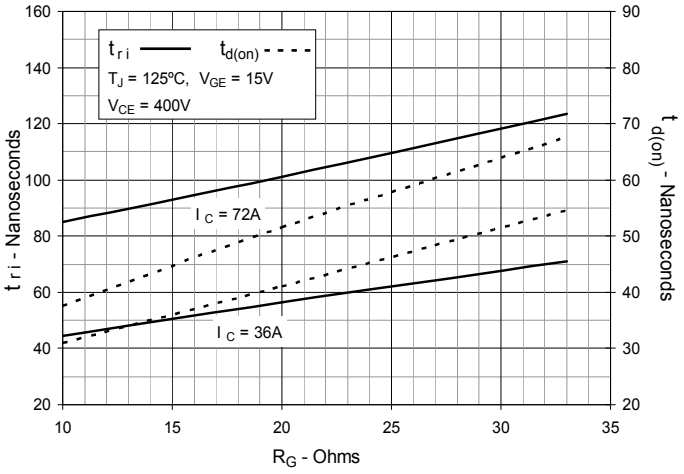


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

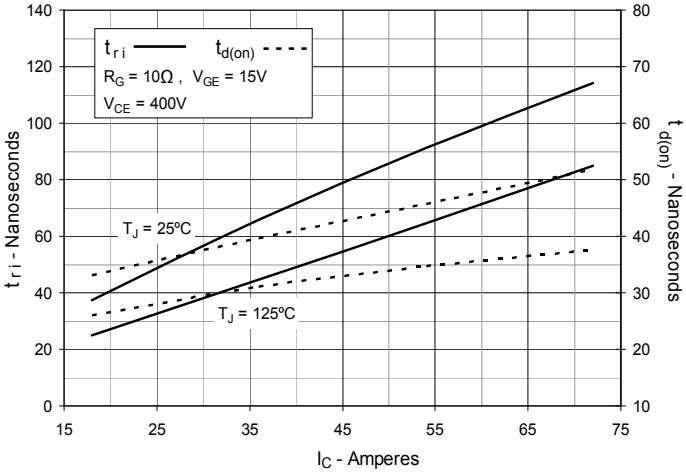
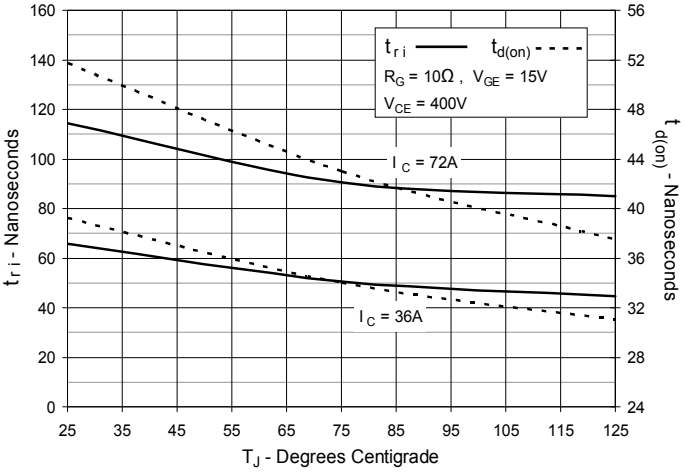


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



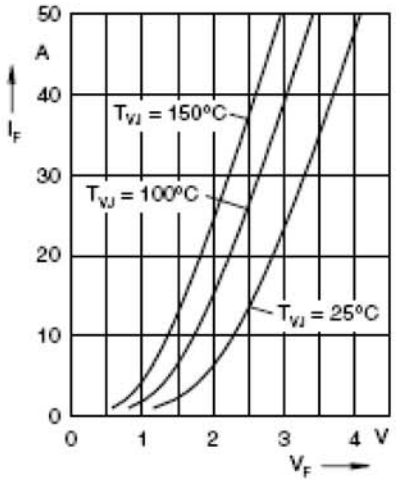


Fig. 21. Foward Current I_F vs V_F

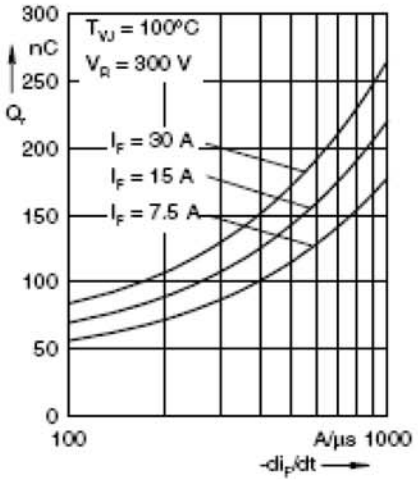


Fig. 22. Reverse Recovery Change Q_r vs $-di_F/dt$

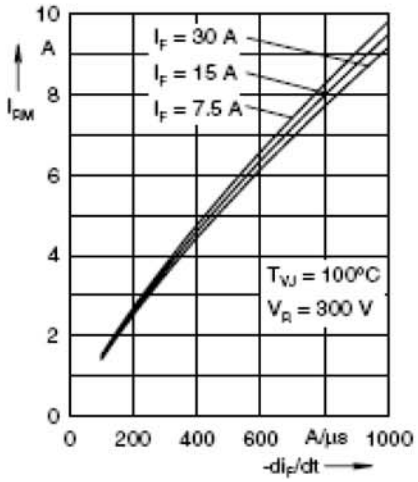


Fig. 23. Peak Reverse Current I_{RM} vs $-di_F/dt$

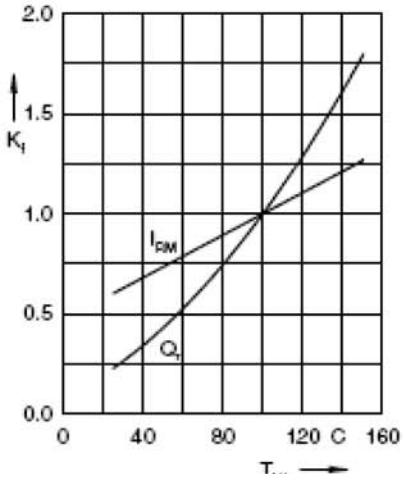


Fig. 24. Dynamic Parameters Q_r, I_{RM} vs T_{VJ}

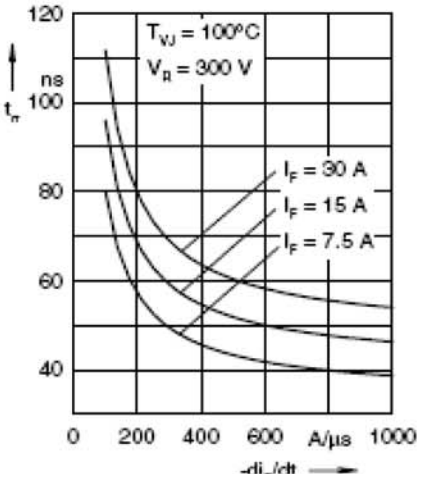


Fig. 25. Recovery Time t_{rr} vs $-di_F/dt$

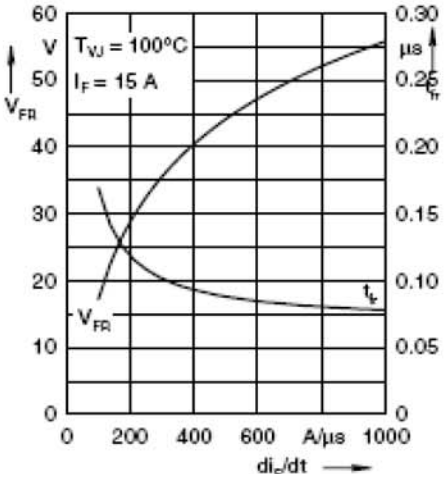


Fig. 26. Peak Forward Voltage V_{FR} and t_r vs $-di_F/dt$

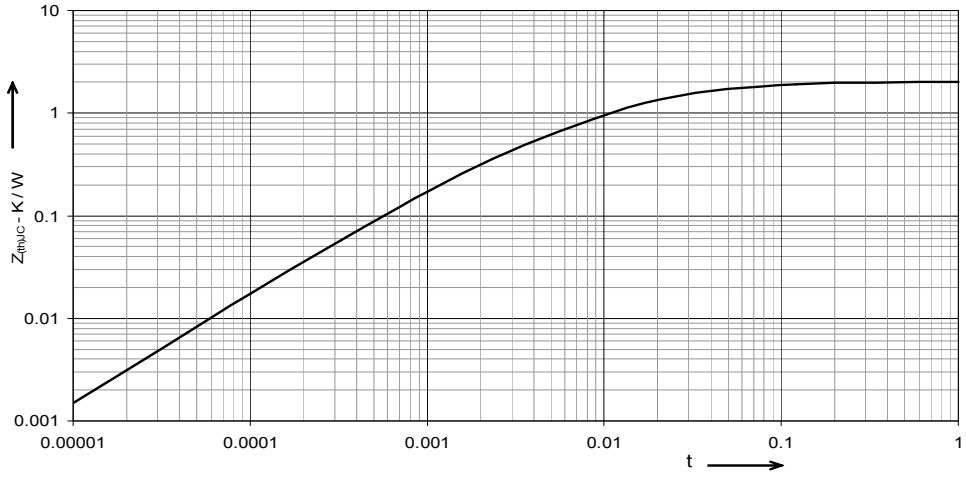


Fig. 27 Maximum Transient Thermal Impedance for Diode