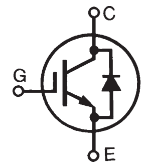
IXYS

High-Gain IGBTs w/ Diode

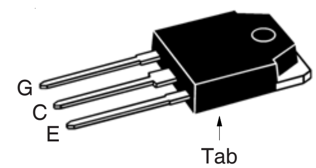
IXGQ50N60C4D1
IXGH50N60C4D1

V_{CES} = 600V
I_{C110} = 46A
$V_{CE(sat)}$ ≤ 2.3V

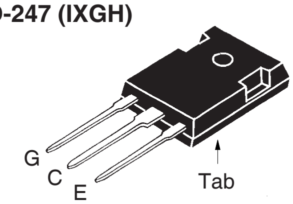
High-Speed PT Trench IGBTs



TO-3P (IXGQ)



TO-247 (IXGH)



G = Gate　　C = Collector
E = Emitter　　Tab = 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	90	A
I_{C110}	T_C = 110°C	46	A
I_{F110}	T_C = 110°C	18	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	300	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°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	TO-3P	5.5	g
	TO-247	6.0	g

Features

- Optimized for Low Switching Losses
- 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.	
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		1.9	2.3	V
	T_J = 125°C		1.6		V

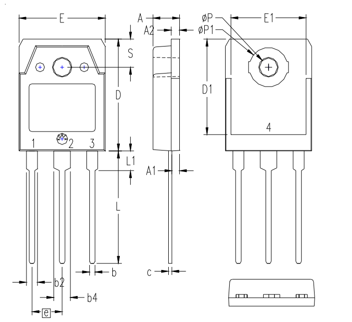
Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 36A, V_{CE} = 10V, Note 1	20	30		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		1900		pF
C_{oes}			100		pF
C_{res}			60		pF
Q_g	$I_C = I_{C110}$, V_{GE} = 15V, $V_{CE} = 0.5 \bullet V_{CES}$		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}				0.42	°C/W
R_{thCS}			0.25		°C/W

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}					1.6	°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.

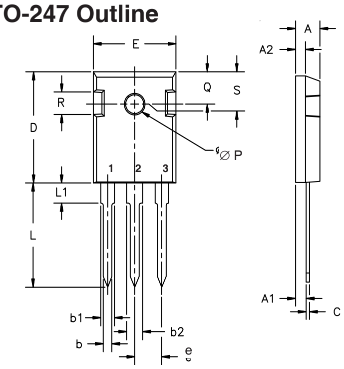
TO-3P Outline



1 = Gate　　2,4 = Collector
3 = Emitter

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.185	.193	4.70	4.90
A1	.051	.059	1.30	1.50
A2	.057	.065	1.45	1.65
b	.035	.045	0.90	1.15
b2	.075	.087	1.90	2.20
b4	.114	.126	2.90	3.20
c	.022	.031	0.55	0.80
D	.780	.799	19.80	20.30
D1	.665	.677	16.90	17.20
E	.610	.622	15.50	15.80
E1	.531	.539	13.50	13.70
e	.215 BSC		5.45 BSC	
L	.779	.795	19.80	20.20
L1	.134	.142	3.40	3.60
øP	.126	.134	3.20	3.40
øP1	.272	.280	6.90	7.10
S	.193	.201	4.90	5.10

TO-247 Outline



Terminals: 1 - Gate　　2 - Collector
3 - Emitter

Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.7	5.3	.185	.209
A_1	2.2	2.54	.087	.102
A_2	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b_1	1.65	2.13	.065	.084
b_2	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L1		4.50		.177
∅P	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216
S	6.15 BSC		242 BSC	

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

Fig. 1. Output Characteristics @ T_J = 25ºC

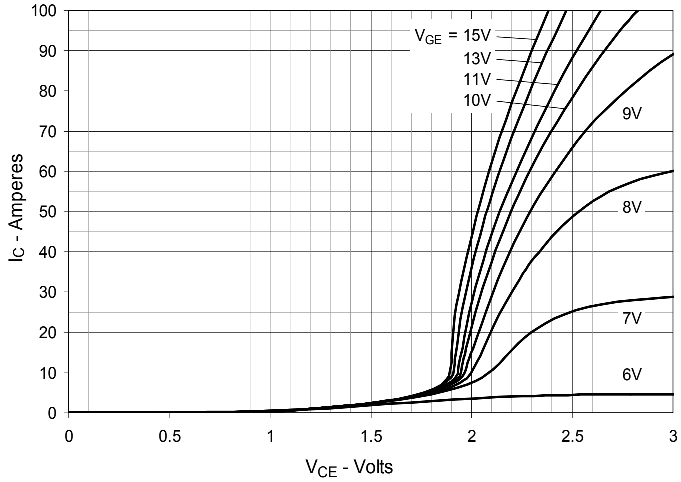


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

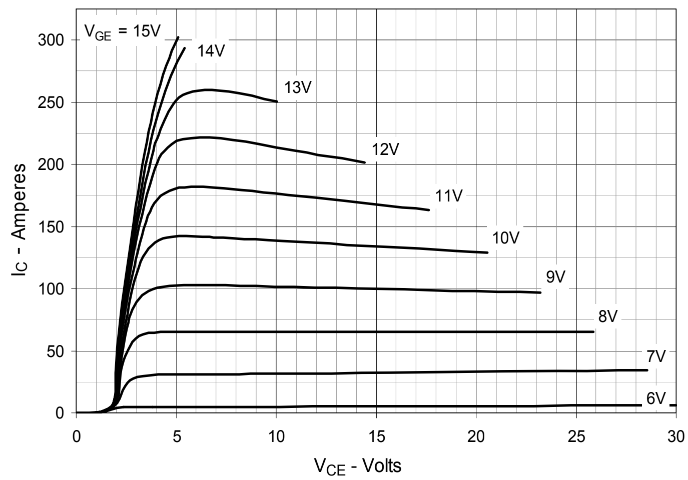


Fig. 3. Output Characteristics @ T_J = 125ºC

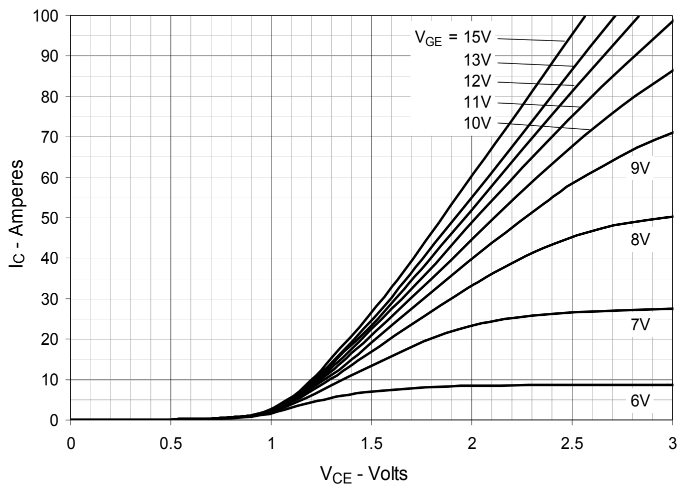


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

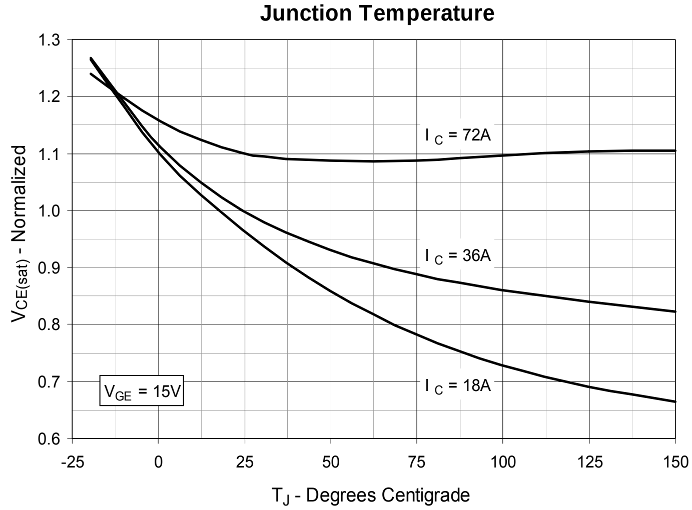


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

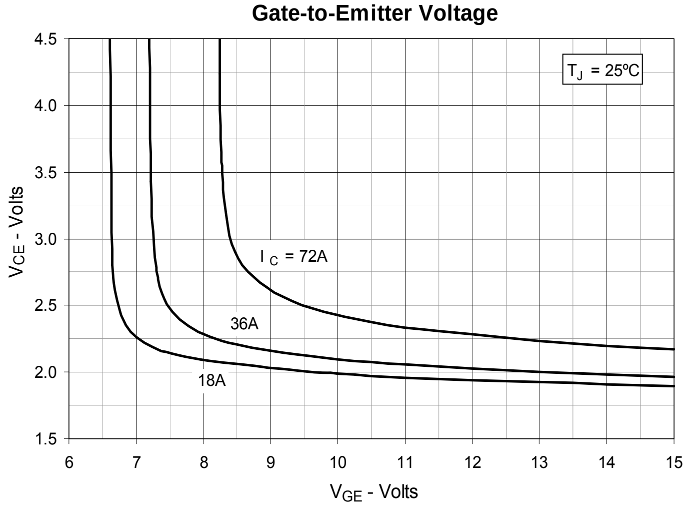


Fig. 6. Input Admittance

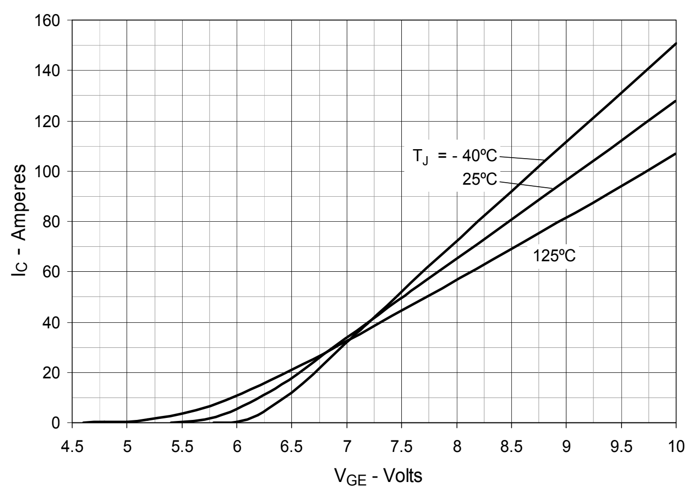


Fig. 7. Transconductance

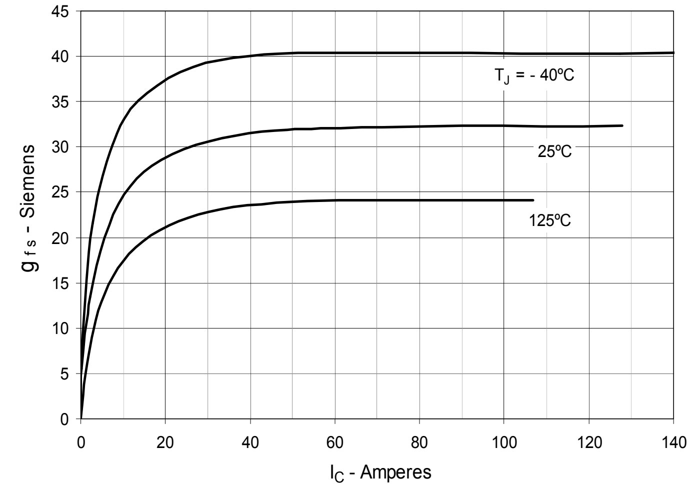


Fig. 8. Gate Charge

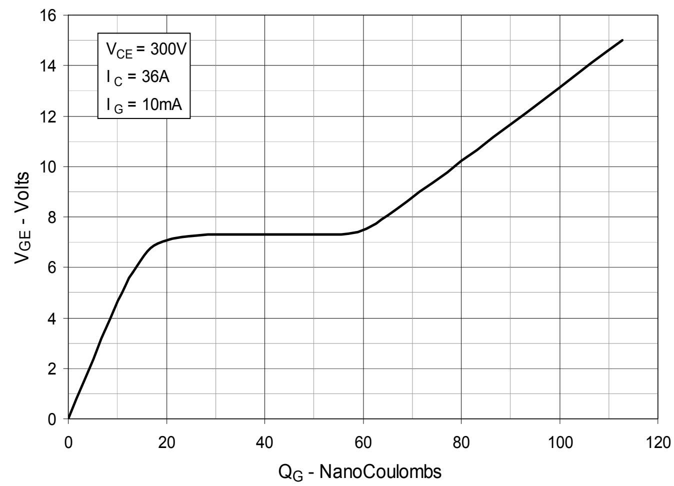


Fig. 9. Capacitance

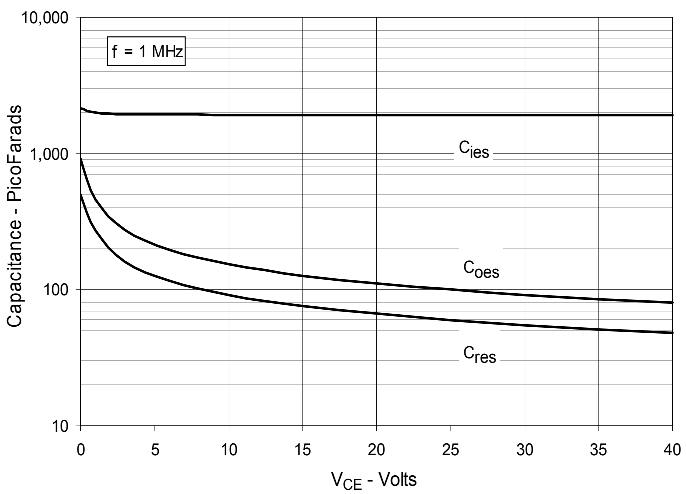


Fig. 10. Reverse-Bias Safe Operating Area

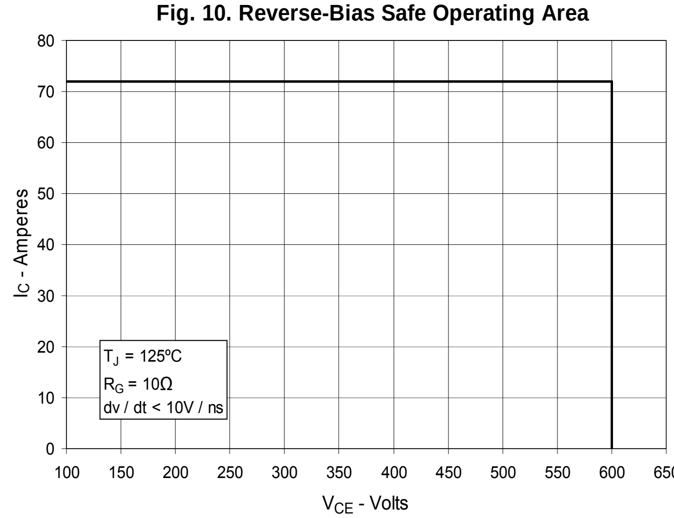


Fig. 11. Maximum Transient Thermal Impedance

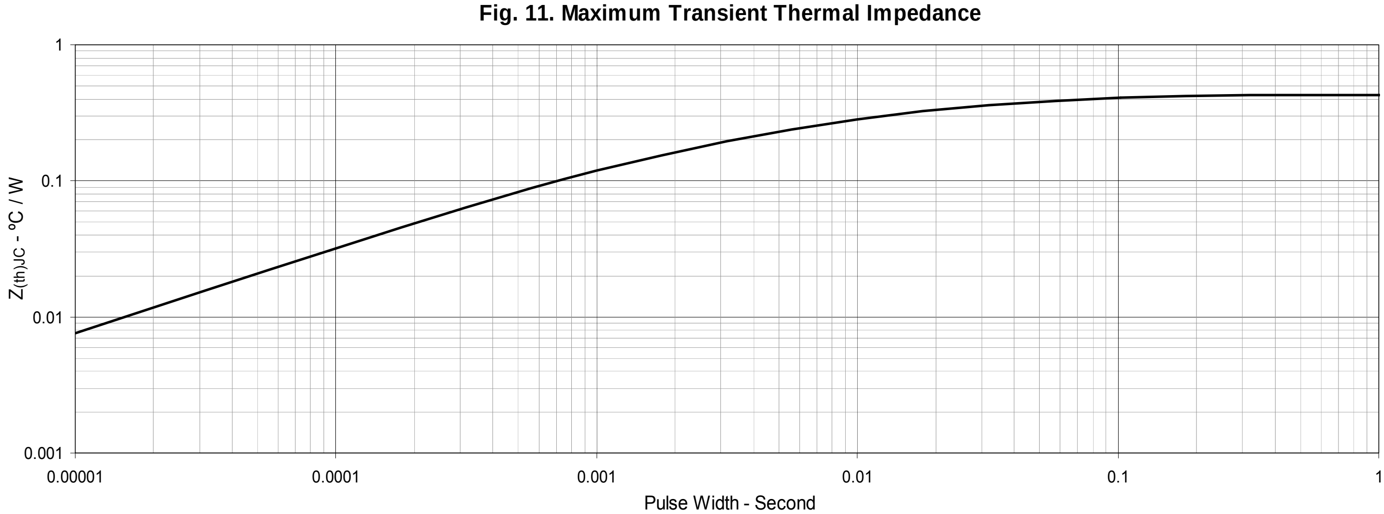


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

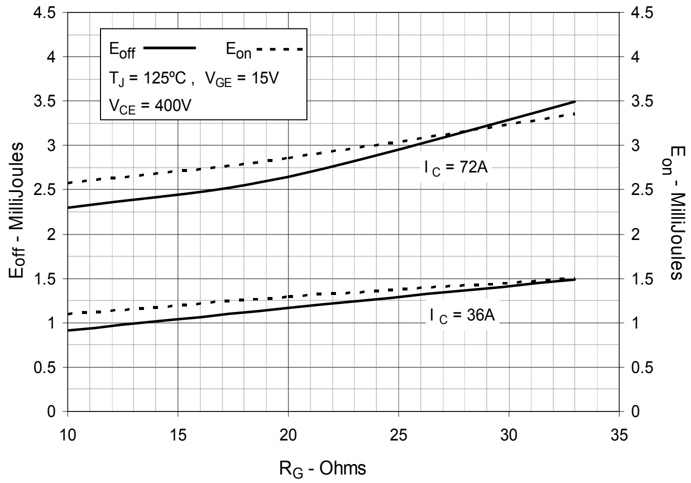


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

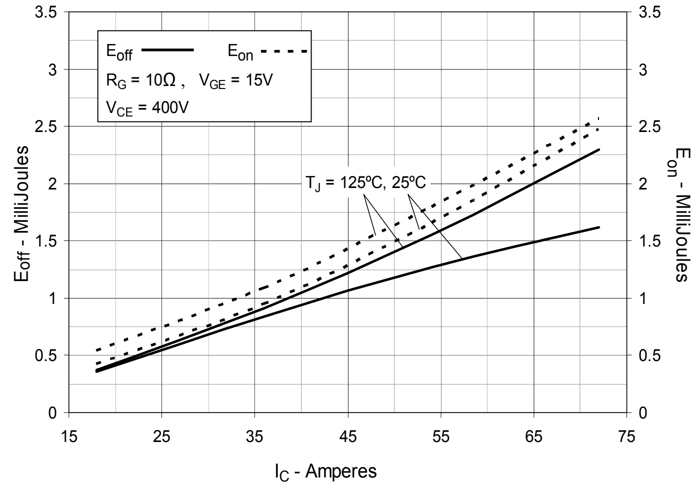


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

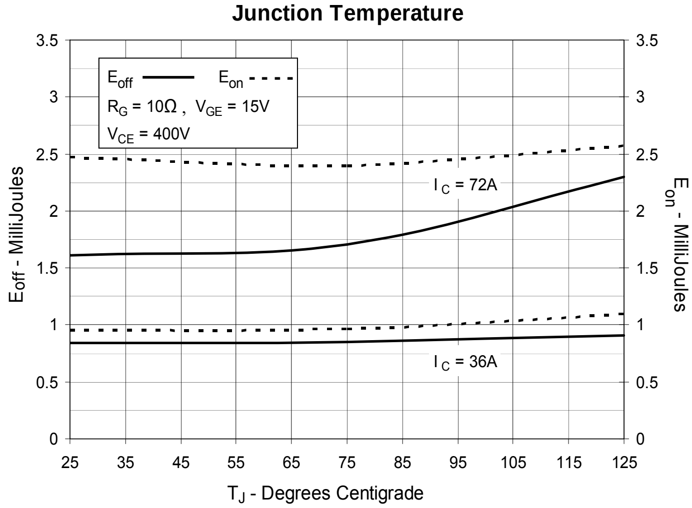


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

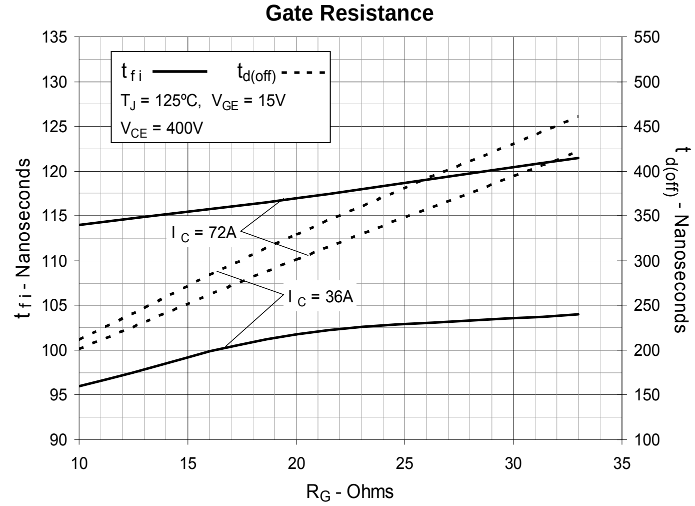


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

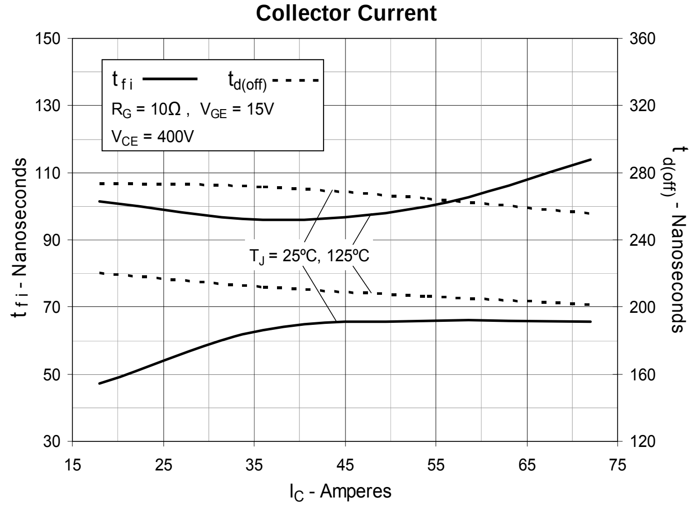


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

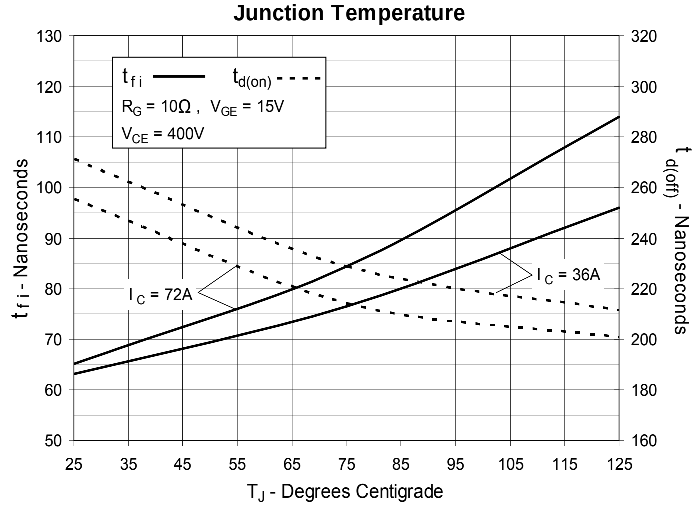


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

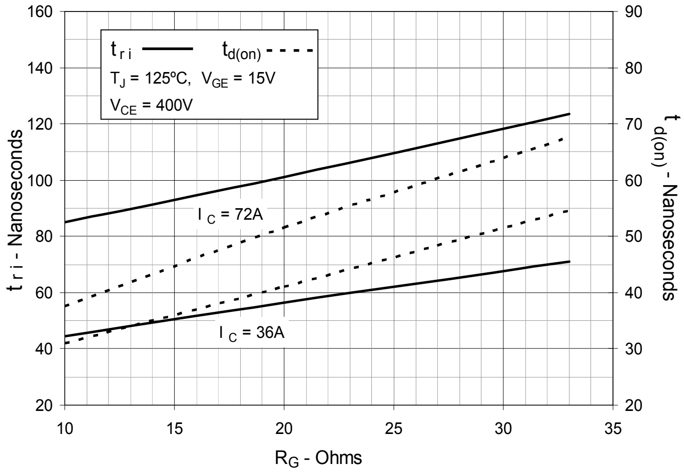


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

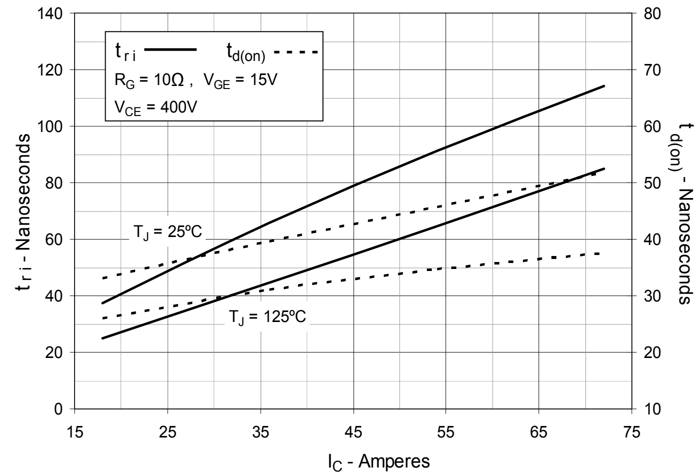


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

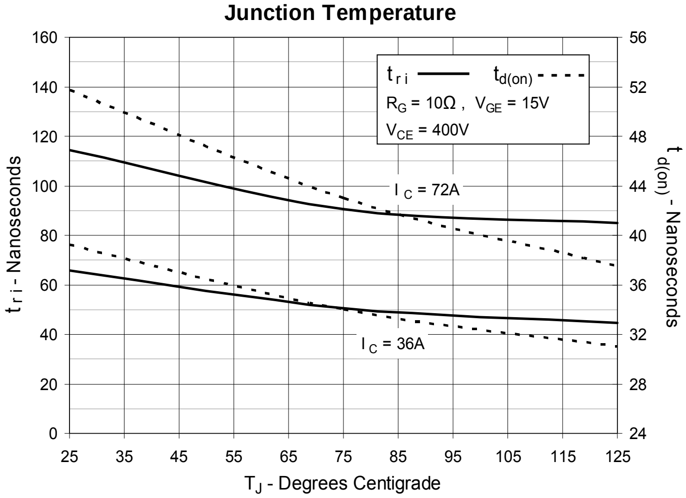


Fig. 21. Forward Voltage vs. Forward Current

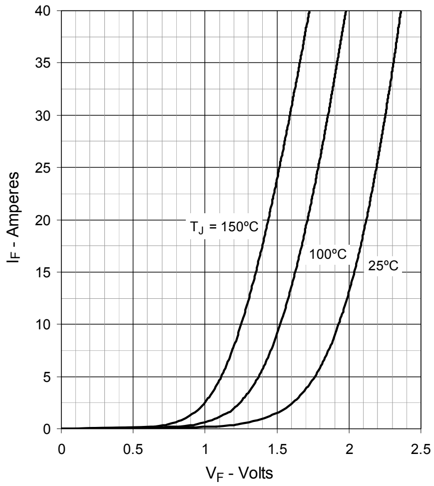


Fig. 22. Reverse Recovery Charge vs. - di_F/dt

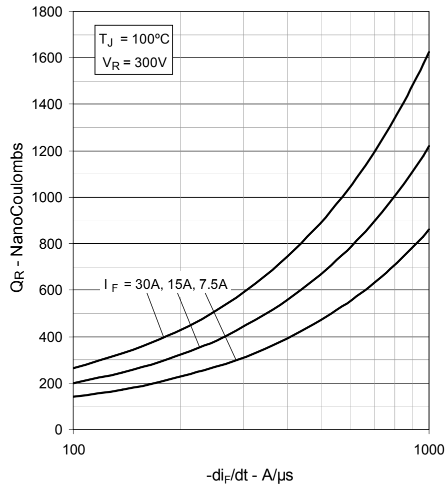


Fig. 23. Peak Reverse Current vs. - di_F/dt

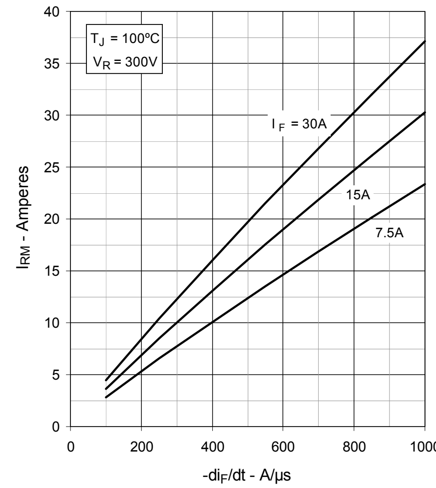


Fig. 24. Dynamic Parameter vs. Junction Temperature

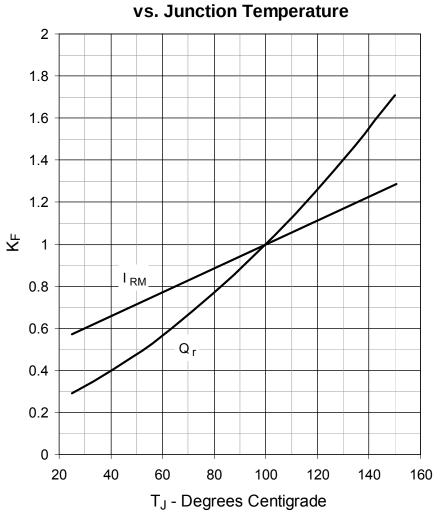


Fig. 25. Reverse Recovery Time vs. - di_F/dt

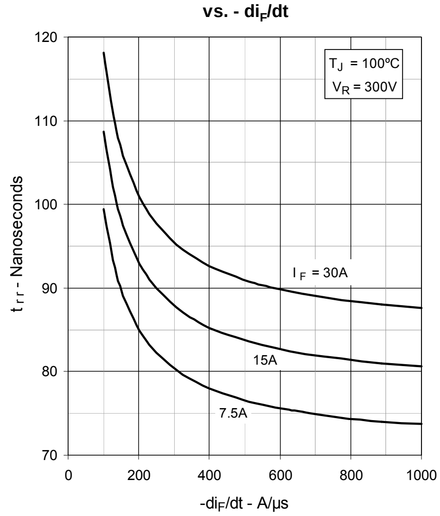


Fig. 26. Peak Forward Voltage & Forward Recovery Time vs. di_F/dt

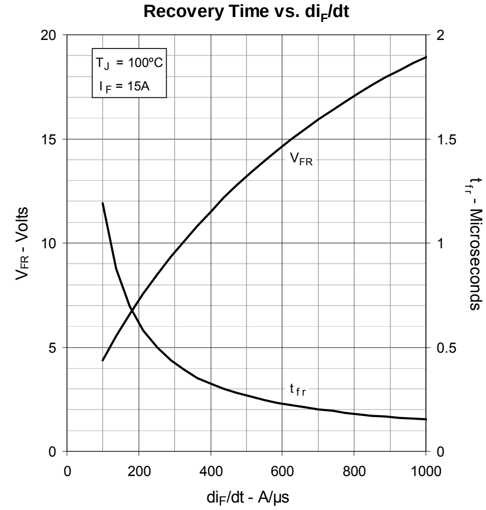


Fig. 27. Maximum Transient Thermal Impedance (for Diode)