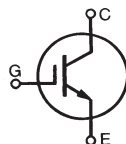


GenX3™ 600V IGBT

High Speed PT IGBTs for
40-100kHz switching

IXGA48N60C3
IXGH48N60C3
IXGP48N60C3

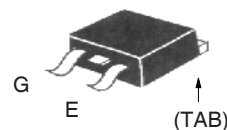


$$\begin{aligned} V_{CES} &= 600V \\ I_{C110} &= 48A \\ V_{CE(sat)} &\leq 2.5V \\ t_{fi(typ)} &= 38ns \end{aligned}$$

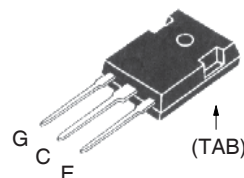
Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_C = 25^\circ\text{C}$ to 150°C	600	V
V_{CGR}	$T_J = 25^\circ\text{C}$ to 150°C , $R_{GE} = 1M\Omega$	600	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$ (Limited by Leads)	75	A
I_{C110}	$T_C = 110^\circ\text{C}$	48	A
I_{CM}	$T_C = 25^\circ\text{C}$, 1ms	250	A
I_A	$T_C = 25^\circ\text{C}$	30	A
E_{AS}	$T_C = 25^\circ\text{C}$	300	mJ
SSOA (RBSOA)	$V_{GE} = 15V$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 3\Omega$ Clamped Inductive Load @ $\leq 600V$	$I_{CM} = 100$	A
P_C	$T_C = 25^\circ\text{C}$	300	W
T_J		-55 ... +150	$^\circ\text{C}$
T_{JM}		150	$^\circ\text{C}$
T_{stg}		-55 ... +150	$^\circ\text{C}$
T_L	1.6mm (0.062 in.) from Case for 10s	300	$^\circ\text{C}$
T_{SOLD}	Plastic Body for 10 Seconds	260	$^\circ\text{C}$
M_d	Mounting Torque (TO-247&TO-220)	1.13/10	Nm/lb.in.
Weight	TO-247	6.0	g
	TO-220	3.0	g
	TO-263	2.5	g

Symbol	Test Conditions ($T_J = 25^\circ\text{C}$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
BV_{CES}	$I_C = 250\mu\text{A}$, $V_{GE} = 0V$	600		V
$V_{GE(th)}$	$I_C = 250\mu\text{A}$, $V_{CE} = V_{GE}$	3.0		5.5 V
I_{CES}	$V_{CE} = V_{CES}$			25 μA
	$V_{GE} = 0V$ $T_J = 125^\circ\text{C}$			250 μA
I_{GES}	$V_{CE} = 0V$, $V_{GE} = \pm 20V$			± 100 nA
$V_{CE(sat)}$	$I_C = 30A$, $V_{GE} = 15V$, Note 1 $T_J = 125^\circ\text{C}$	2.3	2.5	V
		1.8		V

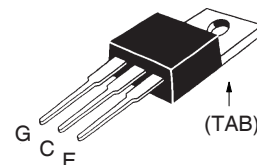
TO-263 (IXGA)



TO-247 (IXGH)



TO-220 (IXGP)



G = Gate C = Collector
E = Emitter TAB = Collector

Features

- Optimized for Low Switching Losses
- Square RBSOA
- Avalanche Rated
- Fast Switching
- International Standard Packages

Advantages

- High Power Density
- Low Gate Drive Requirement

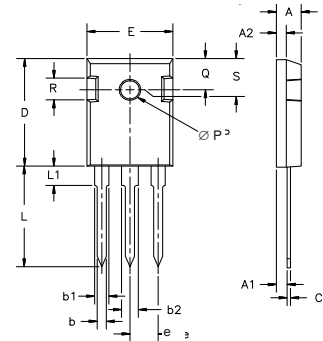
Applications

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

Symbol	Test Conditions	Characteristic Values		
$(T_J = 25^\circ\text{C}$ Unless Otherwise Specified)		Min.	Typ.	Max.
g_{fs}	$I_C = 30\text{A}$, $V_{CE} = 10\text{V}$, Note 1	20	30	S
C_{ies}	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$		1960	pF
C_{oes}			207	pF
C_{res}			66	pF
Q_g	$I_C = 30\text{A}$, $V_{GE} = 15\text{V}$, $V_{CE} = 0.5 \cdot V_{CES}$		77	nC
Q_{ge}			16	nC
Q_{gc}			32	nC
$t_{d(on)}$	Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 30\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}$, $R_G = 3\Omega$		19	ns
t_{ri}			26	ns
E_{on}			0.41	mJ
$t_{d(off)}$			60	ns
t_{fi}			38	ns
E_{off}			0.23	mJ
$t_{d(on)}$	Inductive Load, $T_J = 125^\circ\text{C}$ $I_C = 30\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}$, $R_G = 3\Omega$		19	ns
t_{ri}			26	ns
E_{on}			0.65	mJ
$t_{d(off)}$			92	ns
t_{fi}			95	ns
E_{off}			0.57	mJ
R_{thJC}			0.42	$^\circ\text{C/W}$
R_{thCS}	(TO-247)	0.21	$^\circ\text{C/W}$	
	(TO-220)	0.50	$^\circ\text{C/W}$	

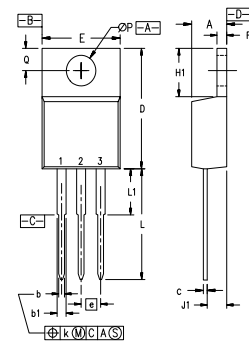
Note 1: Pulse Test, $t \leq 300\mu\text{s}$; Duty Cycle, $d \leq 2\%$.

TO-247 (IXGH) Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	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
ØP	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

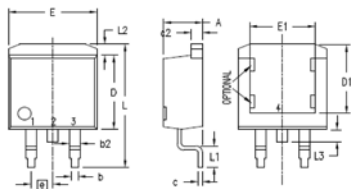
TO-220 (IXGP) Outline



Pins: 1 - Gate 2 - Drain
3 - Source 4 - Drain

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.170	.190	4.32	4.83
b	.025	.040	0.64	1.02
b ₁	.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-263 (IXGA) Outline



1. GATE (COLLECTOR)
2. DRAIN (COLLECTOR)
3. SOURCE (EMITTER)
4. DRAIN (COLLECTOR) BOTTOM SIDE

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.160	.190	4.06	4.83
A ₁	.080	.110	2.03	2.79
b	.020	.039	0.51	0.99
b ₂	.045	.055	1.14	1.40
c	.016	.029	0.40	0.74
c ₂	.045	.055	1.14	1.40
D	.340	.380	8.64	9.65
D ₁	.315	.350	8.00	8.89
E	.380	.410	9.65	10.41
E ₁	.245	.320	6.22	8.13
e	.100 BSC		2.54 BSC	
L	.575	.625	14.61	15.88
L ₁	.090	.110	2.29	2.79
L ₂	.040	.055	1.02	1.40
L ₃	.050	.070	1.27	1.78
L ₄	0	.005	0	0.13

IXYS reserves the right to change limits, test conditions and dimensions.

IXYS MOSFETs and IGBTs are covered 4,835,592 4,931,844 5,049,961 5,237,481 6,162,665 6,404,065 B1 6,683,344 6,727,585 7,005,734 B2 7,157,338 B2
by one or more of the following U.S. patents: 4,850,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405 B2 6,759,692 7,063,975 B2
4,881,106 5,034,796 5,187,117 5,486,715 6,306,728 B1 6,583,505 6,710,463 6,771,478 B2 7,071,537

Fig. 1. Output Characteristics
@ 25°C

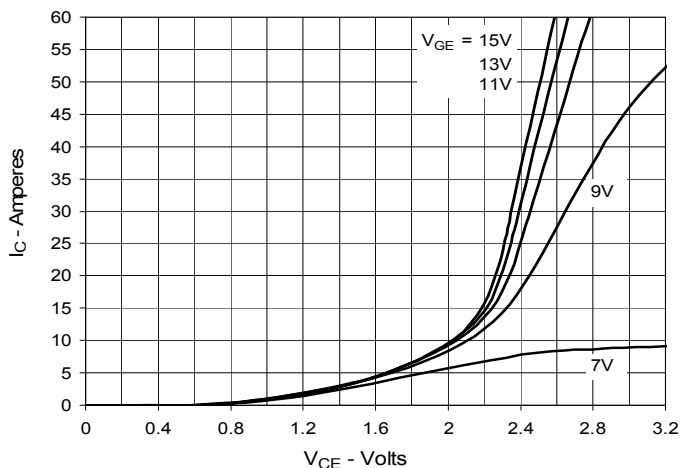


Fig. 2. Extended Output Characteristics
@ 25°C

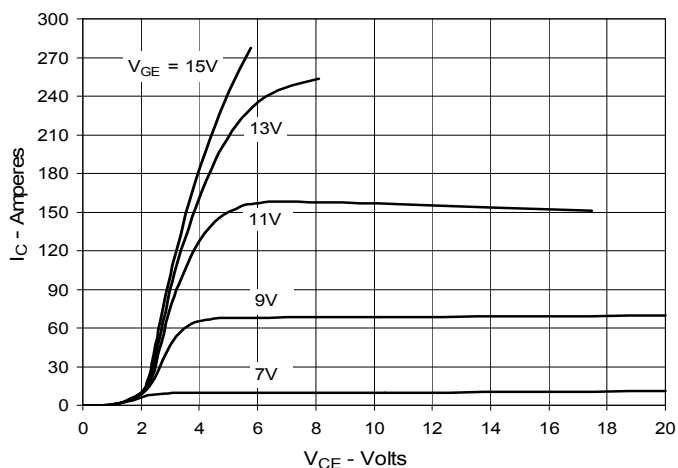


Fig. 3. Output Characteristics
@ 125°C

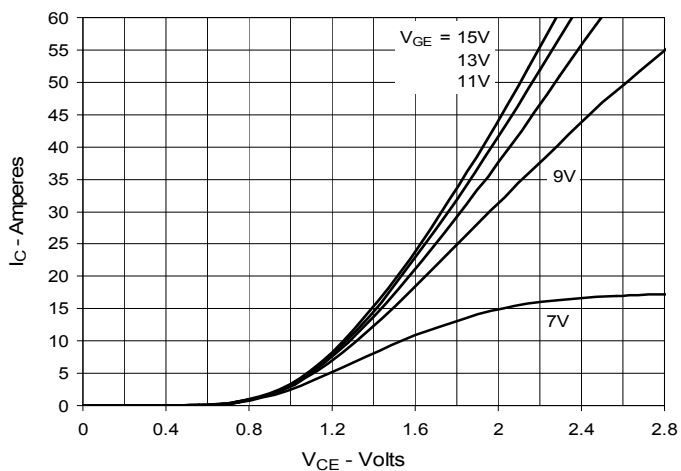


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

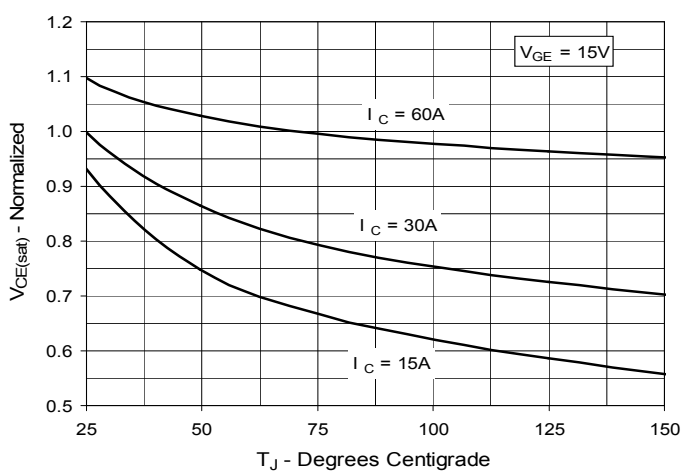


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

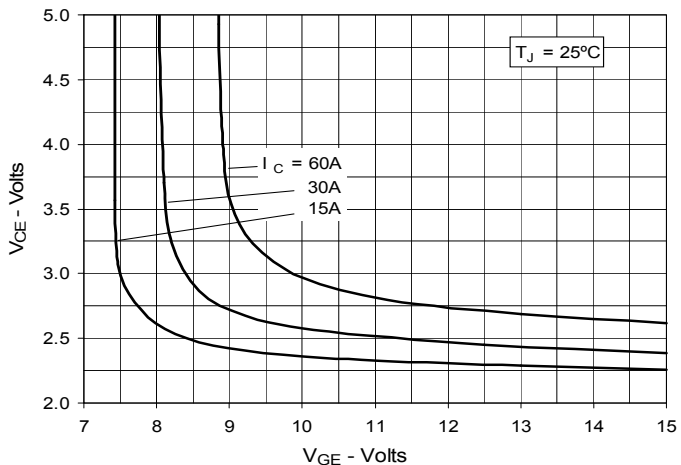


Fig. 6. Input Admittance

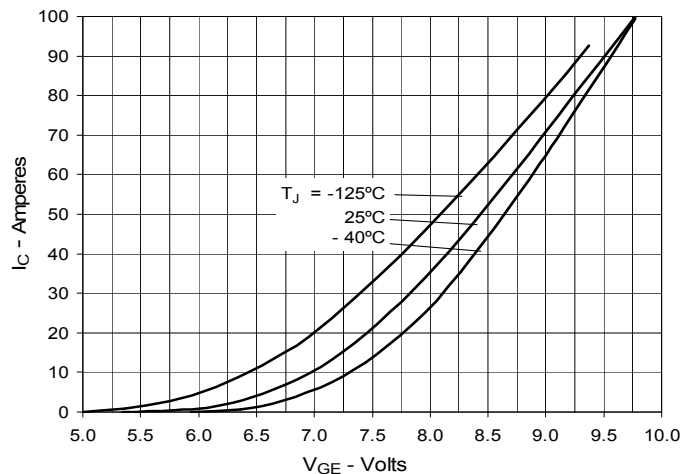


Fig. 7. Transconductance

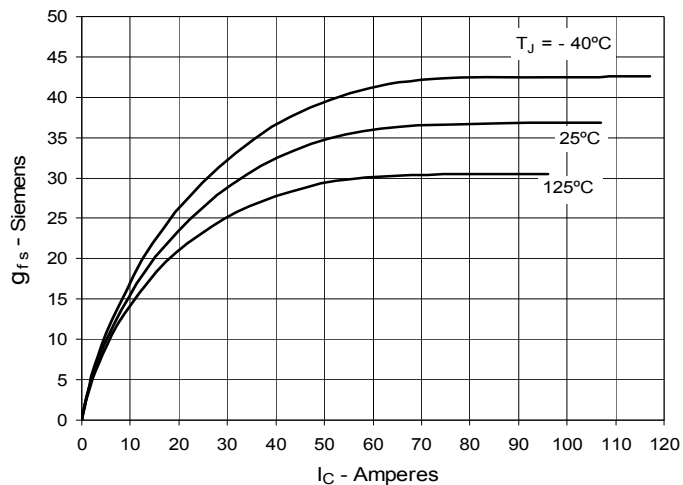


Fig. 8. Gate Charge

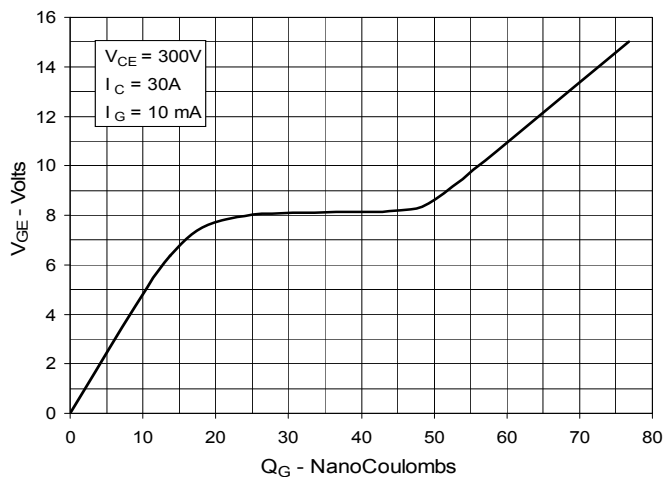


Fig. 9. Capacitance

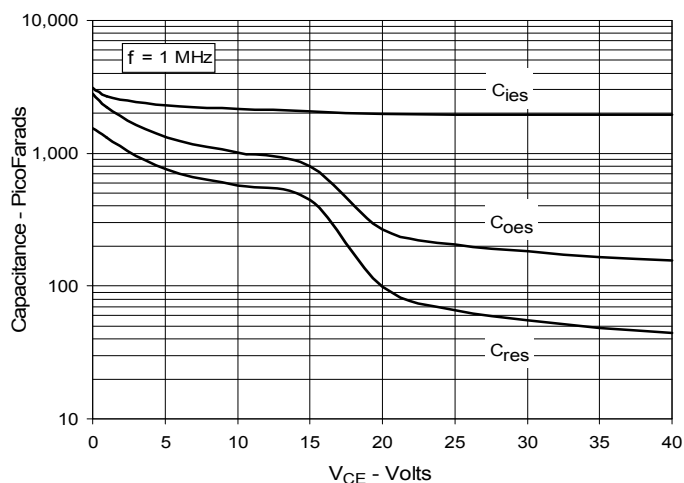


Fig. 10. Reverse-Bias Safe Operating Area

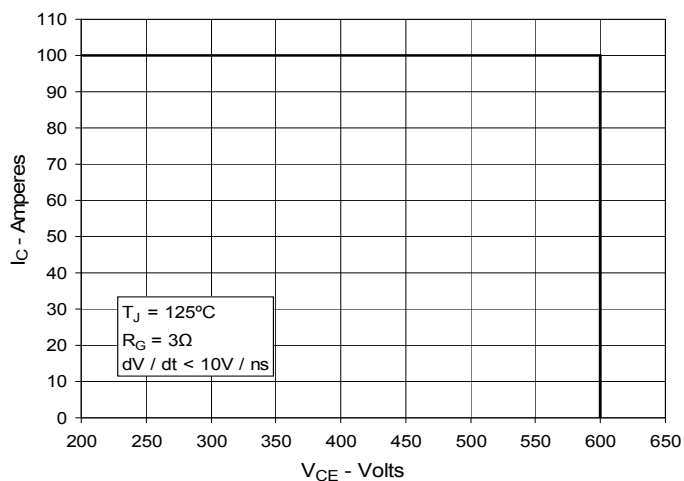
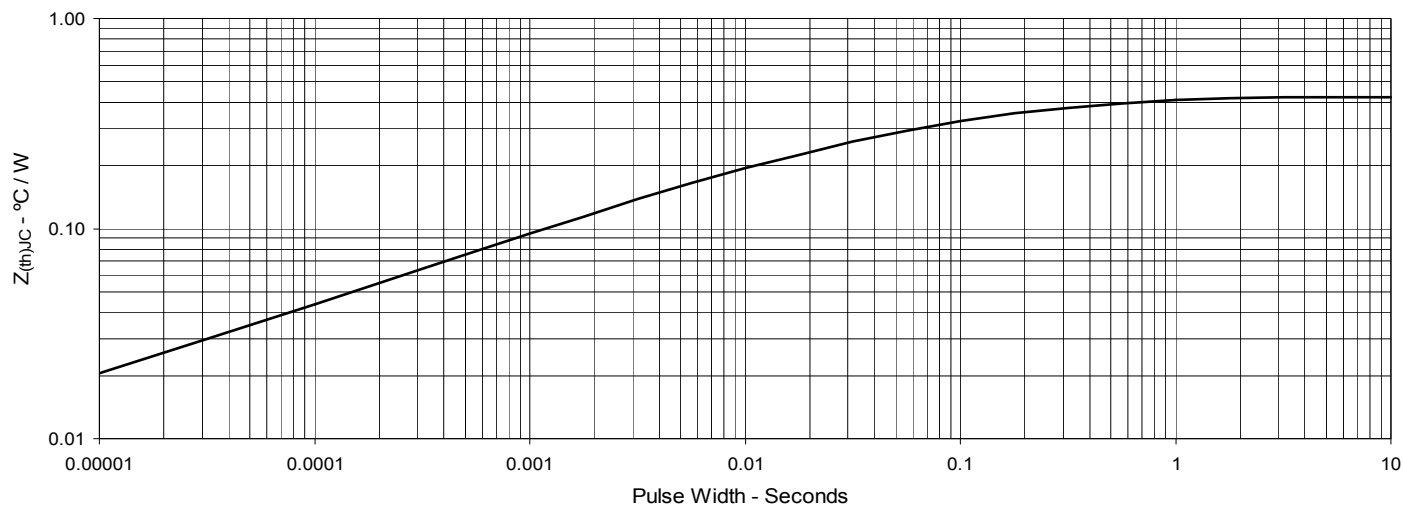
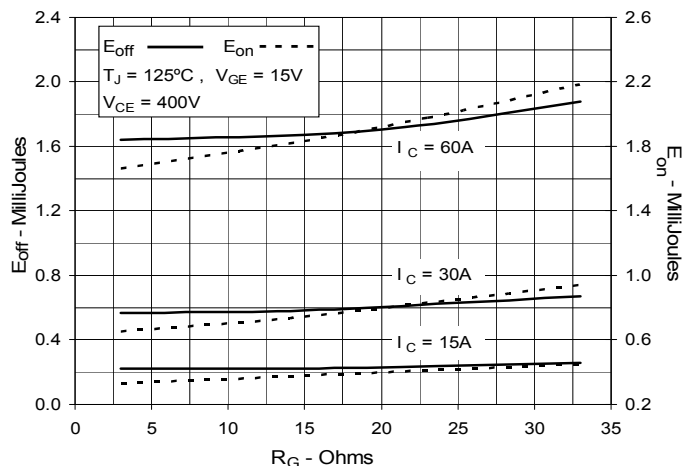


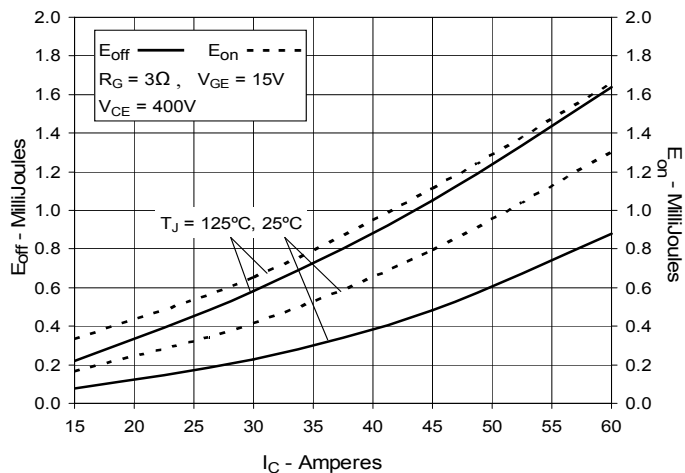
Fig. 11. Maximum Transient Thermal Impedance



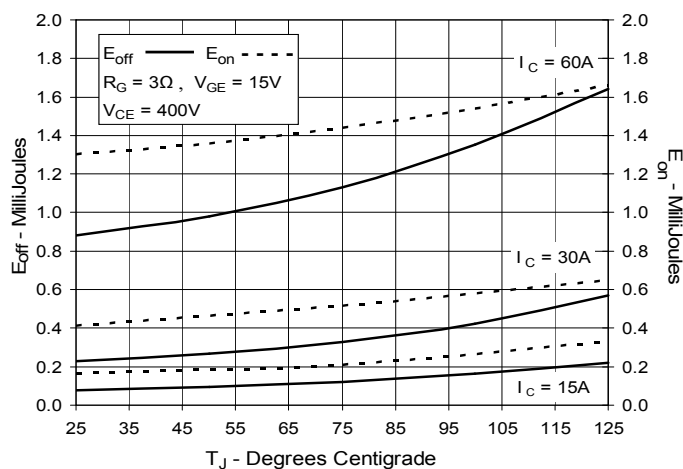
**Fig. 12. Inductive Switching
Energy Loss vs. Gate Resistance**



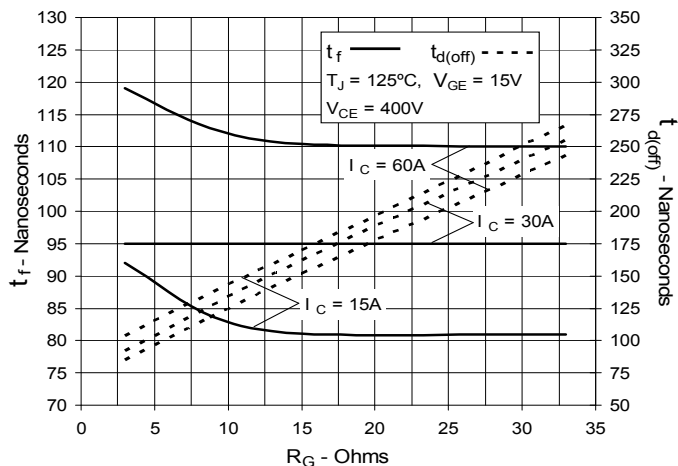
**Fig. 13. Inductive Switching
Energy Loss vs. Collector Current**



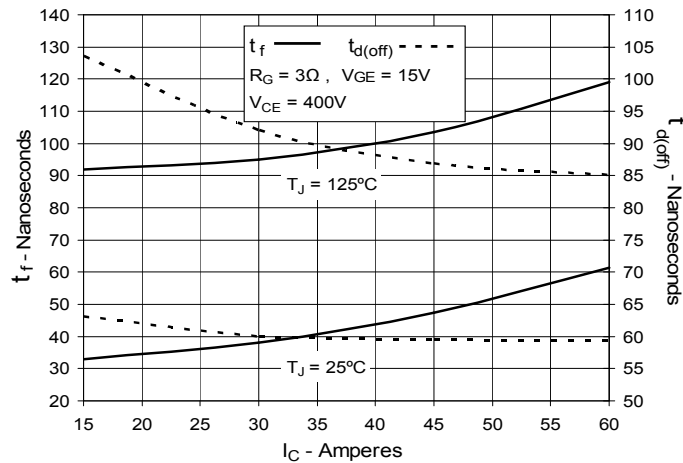
**Fig. 14. Inductive Switching
Energy Loss vs. Junction Temperature**



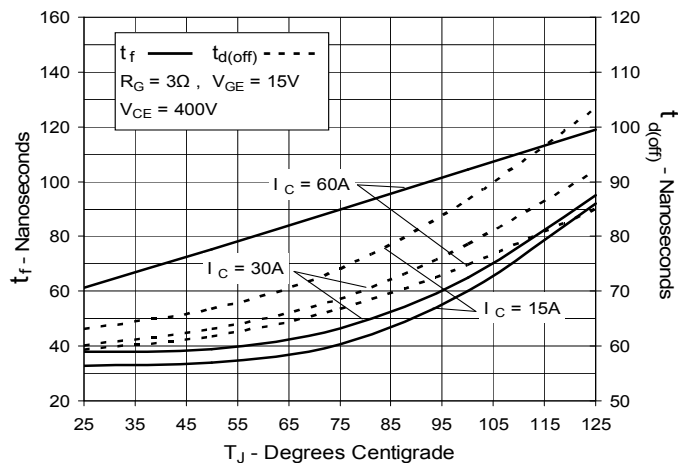
**Fig. 15. Inductive Turn-off
Switching Times vs. Gate Resistance**



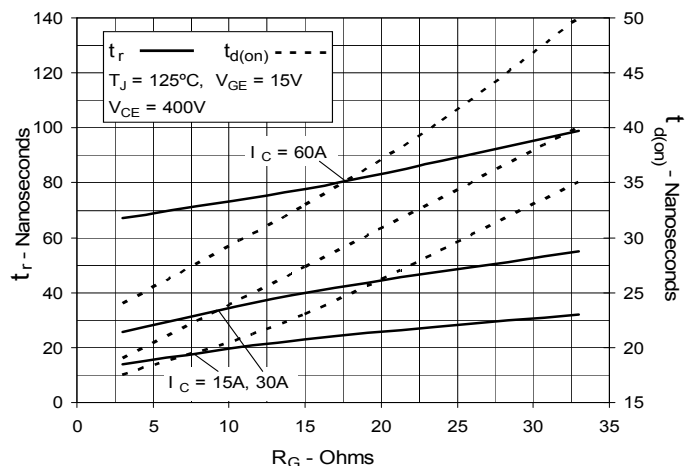
**Fig. 16. Inductive Turn-off
Switching Times vs. Collector Current**



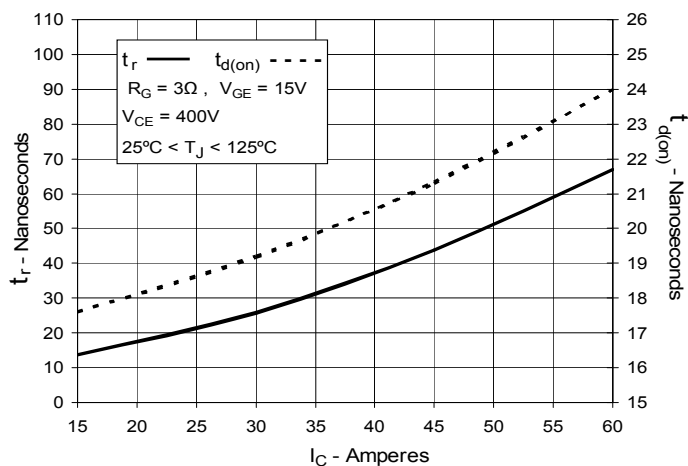
**Fig. 17. Inductive Turn-off
Switching Times vs. Junction Temperature**



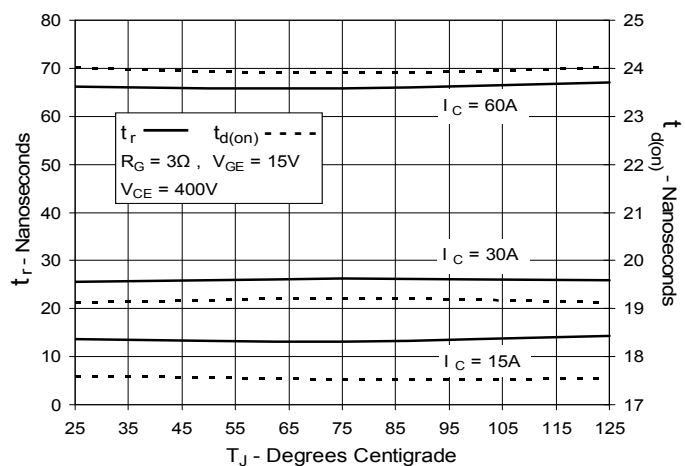
**Fig. 18. Inductive Turn-on
Switching Times vs. Gate Resistance**



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



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



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