

## Excellent Integrated System Limited

Stocking Distributor

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[IXYS Corporation](#)

[IXGH48N60A3](#)

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# IXYS

## GenX3™ 600V IGBTs

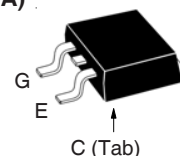
**IXGA48N60A3**  
**IXGP48N60A3**  
**IXGH48N60A3**

**V<sub>CES</sub> = 600V**  
**I<sub>C110</sub> = 48A**  
**V<sub>CE(sat)</sub> ≤ 1.35V**

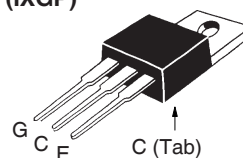
Ultra Low V<sub>sat</sub> PT IGBTs for up to 5kHz switching

Symbol	Test Conditions	Maximum Ratings	
V <sub>CES</sub>	T <sub>J</sub> = 25°C to 150°C	600	V
V <sub>CGR</sub>	T <sub>J</sub> = 25°C to 150°C, R <sub>GE</sub> = 1MΩ	600	V
V <sub>GES</sub>	Continuous	±20	V
V <sub>GEM</sub>	Transient	±30	V
I <sub>C25</sub>	T <sub>C</sub> = 25°C	120	A
I <sub>C110</sub>	T <sub>C</sub> = 110°C	48	A
I <sub>CM</sub>	T <sub>C</sub> = 25°C, 1ms	300	A
SSOA (RBSOA)	V <sub>GE</sub> = 15V, T <sub>VJ</sub> = 125°C, R <sub>G</sub> = 5Ω Clamped Inductive Load	I <sub>CM</sub> = 96 V <sub>CE</sub> ≤ V <sub>CES</sub>	A
P <sub>C</sub>	T <sub>C</sub> = 25°C	300	W
T <sub>J</sub>		-55 ... +150	°C
T <sub>JM</sub>		150	°C
T <sub>stg</sub>		-55 ... +150	°C
T <sub>L</sub>	Maximum Lead Temperature for Soldering	300	°C
T <sub>SOLD</sub>	1.6 mm (0.062in.) from Case for 10s	260	°C
F <sub>C</sub>	Mounting Force (TO-263)	10..65 / 2.2..14.6	N/lb.
M <sub>d</sub>	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

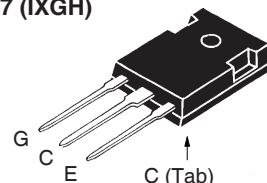
TO-263 (IXGA)



TO-220 (IXGP)



TO-247 (IXGH)



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

### Features

- Optimized for Low Conduction Losses
- Square RBSOA
- High Current Handling Capability
- International Standard Packages

### Advantages

- High Power Density
- Low Gate Drive Requirement

### Applications

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

Symbol	Test Conditions (T <sub>J</sub> = 25°C unless otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
BV <sub>CES</sub>	I <sub>C</sub> = 250μA, V <sub>GE</sub> = 0V	600		V
V <sub>GE(th)</sub>	I <sub>C</sub> = 250μA, V <sub>CE</sub> = V <sub>GE</sub>	3.0		5.5 V
I <sub>CES</sub>	V <sub>CE</sub> = V <sub>CES</sub> , V <sub>GE</sub> = 0V T <sub>J</sub> = 125°C			25 μA 250 μA
I <sub>GES</sub>	V <sub>CE</sub> = 0V, V <sub>GE</sub> = ± 20V			±100 nA
V <sub>CE(sat)</sub>	I <sub>C</sub> = 32A, V <sub>GE</sub> = 15V, Note 1	1.18		1.35 V

# IXYS

## IXGA48N60A3 IXGP48N60A3 IXGH48N60A3

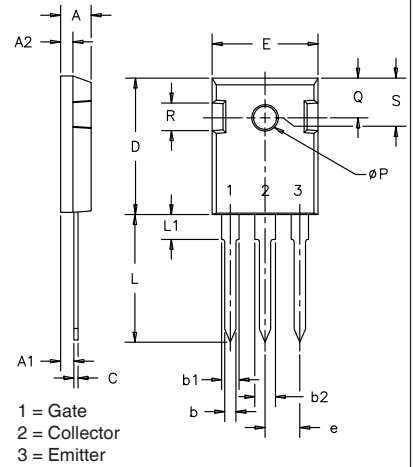
### Symbol Test Conditions

( $T_J = 25^\circ\text{C}$  unless otherwise specified)

### Characteristic Values

Symbol	Test Conditions	Characteristic Values			Units
		Min.	Typ.	Max.	
$g_{fs}$	$I_C = 32\text{A}, V_{CE} = 10\text{V}$ , Note 1	30	48		S
$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		3190		pF
$C_{oes}$			175		pF
$C_{res}$			43		pF
$Q_g$	$I_C = 32\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		110		nC
$Q_{ge}$			21		nC
$Q_{gc}$			42		nC
$t_{d(on)}$	<b>Inductive Load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 32\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}, R_G = 5\Omega$ Note 2		25		ns
$t_{ri}$			30		ns
$E_{on}$			0.95		mJ
$t_{d(off)}$			334		ns
$t_{fi}$			224		ns
$E_{off}$			2.9		mJ
$t_{d(on)}$	<b>Inductive Load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = 32\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}, R_G = 5\Omega$ Note 2		24		ns
$t_{ri}$			30		ns
$E_{on}$			1.97		mJ
$t_{d(off)}$			545		ns
$t_{fi}$			380		ns
$E_{off}$			5.6		mJ
$R_{thJC}$				0.42	$^\circ\text{C/W}$
$R_{thCK}$	TO-220		0.50		$^\circ\text{C/W}$
	TO-247		0.21		$^\circ\text{C/W}$

### TO-247 Outline

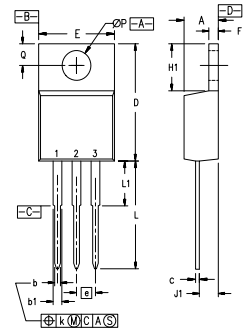


SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.185	.209	4.7	5.3
A1	.087	.102	2.2	2.54
A2	.059	.098	2.2	2.6
b	.040	.055	1.0	1.4
b1	.065	.084	1.65	2.13
b2	.113	.123	2.87	3.12
C	.016	.031	.4	.8
D	.819	.845	20.80	21.46
E	.610	.640	15.75	16.26
e	.215 BSC		5.45 BSC	
L	.780	.800	19.81	20.32
L1		.177		4.50
ØP	.140	.144	3.55	3.65
Q	.212	.244	5.4	6.2
R	.170	.216	4.32	5.49
S	.242 BSC		6.15 BSC	

### Notes:

1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Switching times & energy losses may increase for higher  $V_{CE}$  (clamp),  $T_J$  or  $R_G$ .

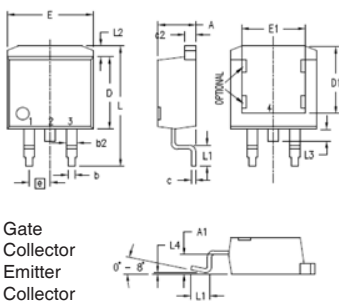
### TO-220 Outline



Pins: 1 - Gate 2 - Collector  
3 - Emitter

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	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-263 Outline



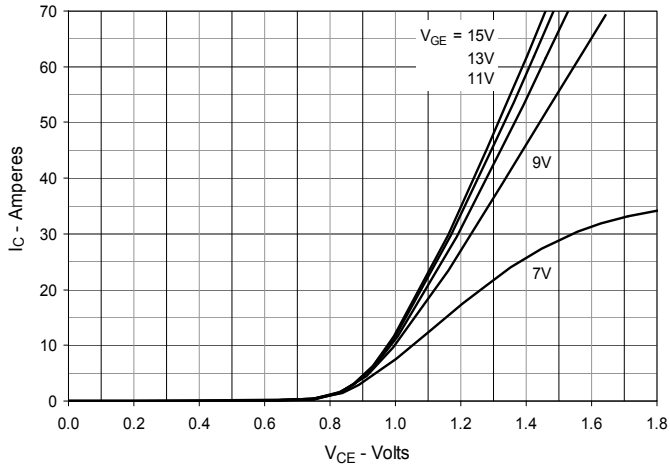
SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.160	.190	4.06	4.83
A1	.080	.110	2.03	2.79
b	.020	.039	0.51	0.99
b2	.045	.055	1.14	1.40
c	.016	.029	0.40	0.74
c2	.045	.055	1.14	1.40
D	.340	.380	8.64	9.65
D1	.315	.350	8.00	8.89
E	.380	.410	9.65	10.41
E1	.245	.320	6.22	8.13
e	.100 BSC		2.54 BSC	
L	.575	.625	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

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

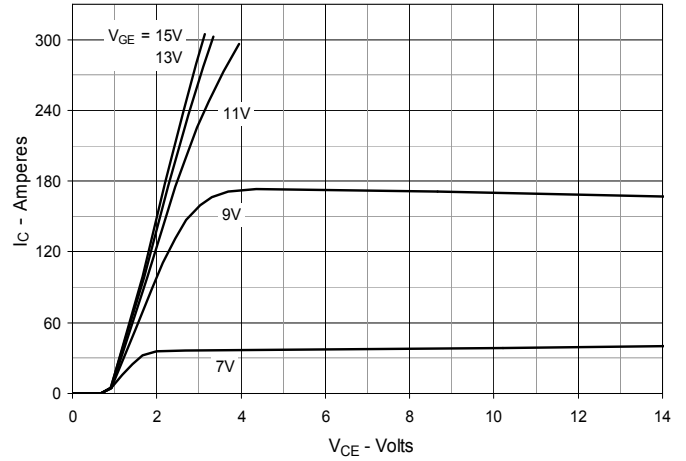
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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	7,157,338B2
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	

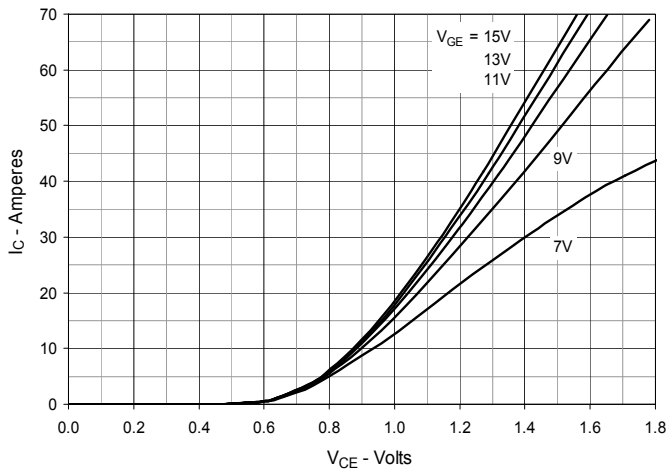
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



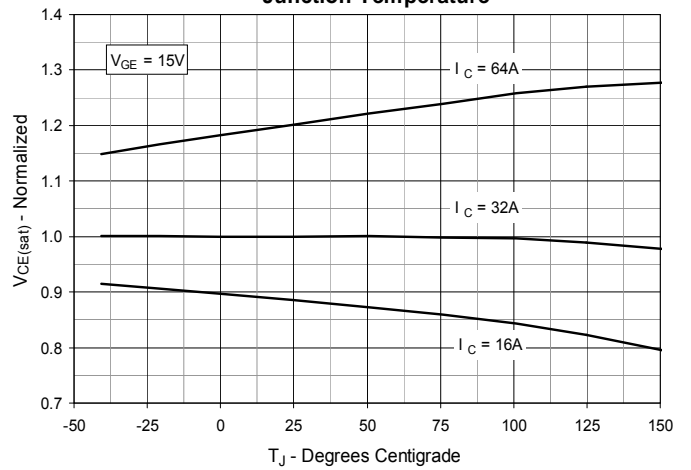
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



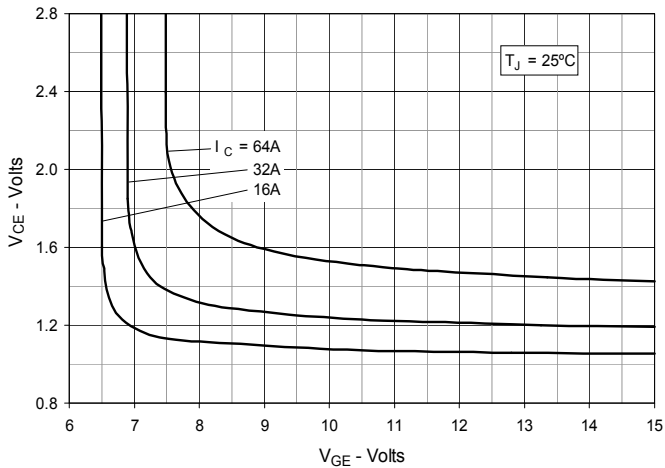
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



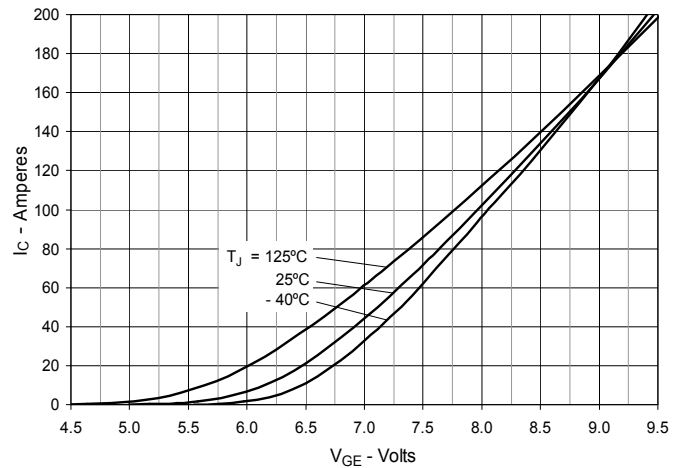
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



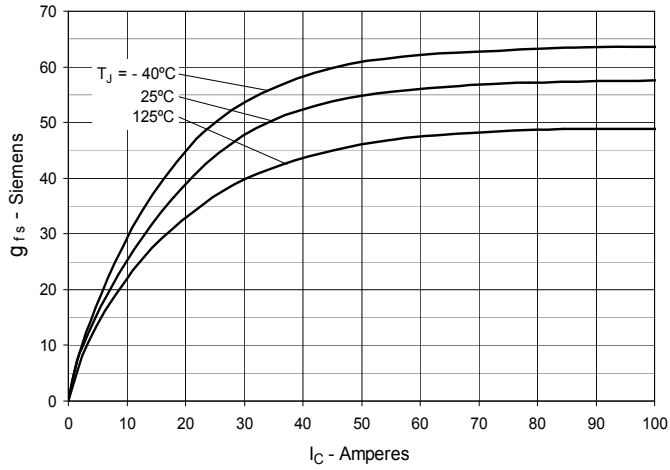
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



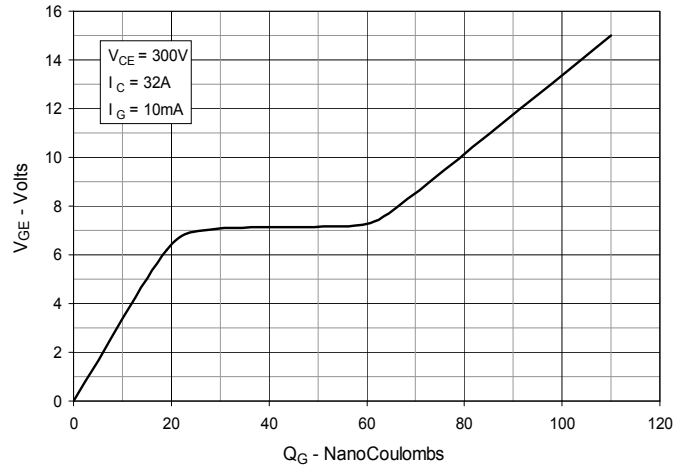
**Fig. 6. Input Admittance**



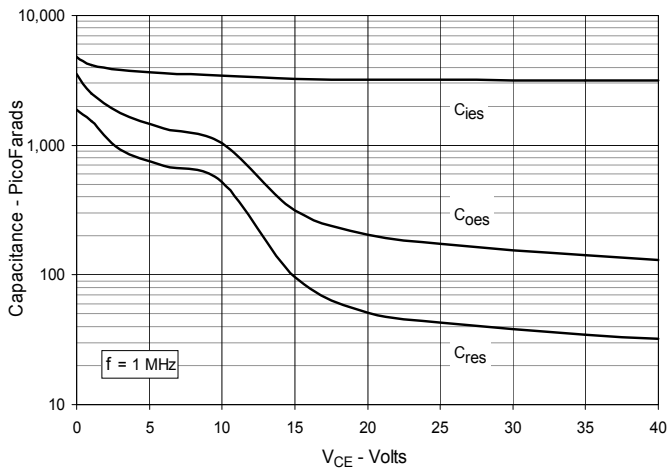
**Fig. 7. Transconductance**



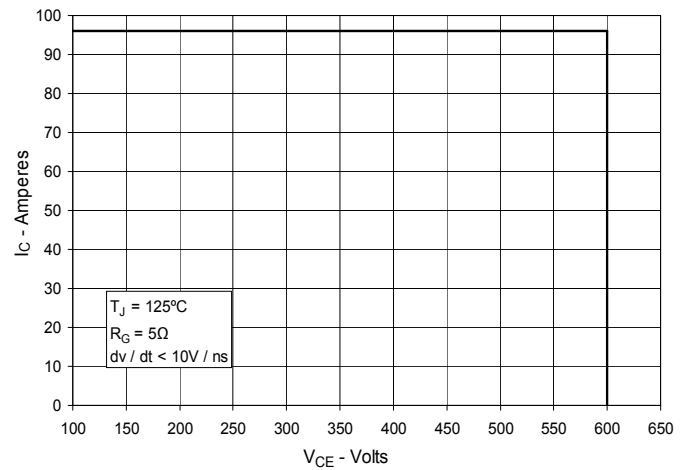
**Fig. 8. Gate Charge**



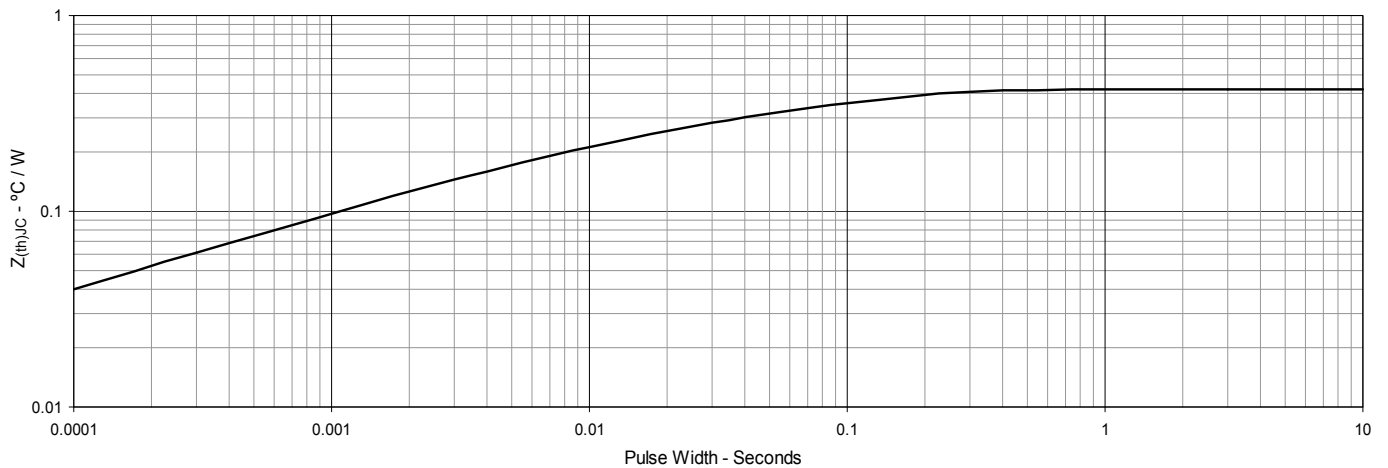
**Fig. 9. Capacitance**



**Fig. 10. Reverse-Bias Safe Operating Area**



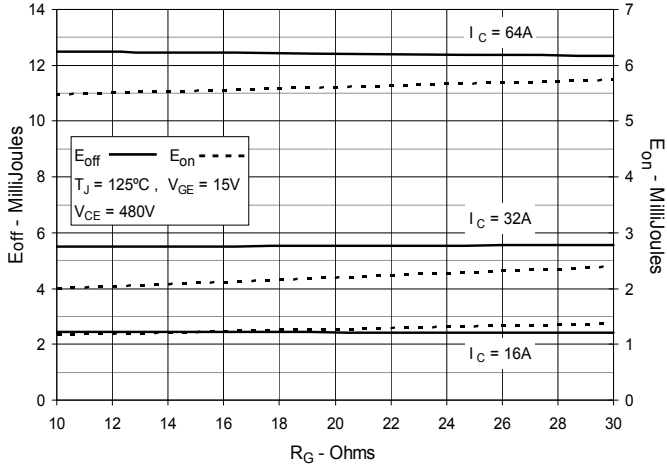
**Fig. 11. Maximum Transient Thermal Impedance**



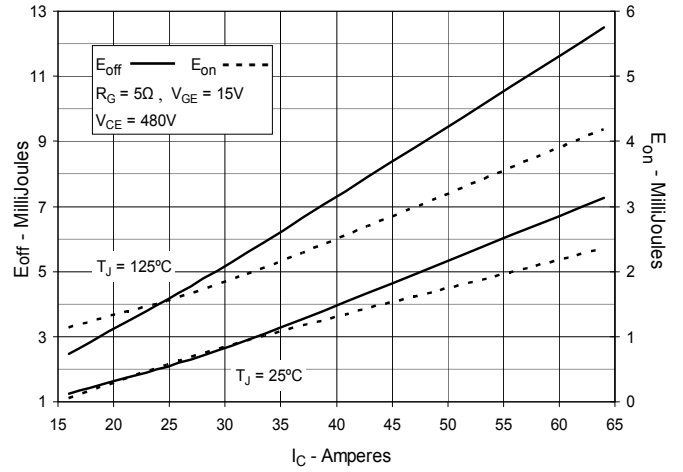


**IXGA48N60A3 IXGP48N60A3  
IXGH48N60A3**

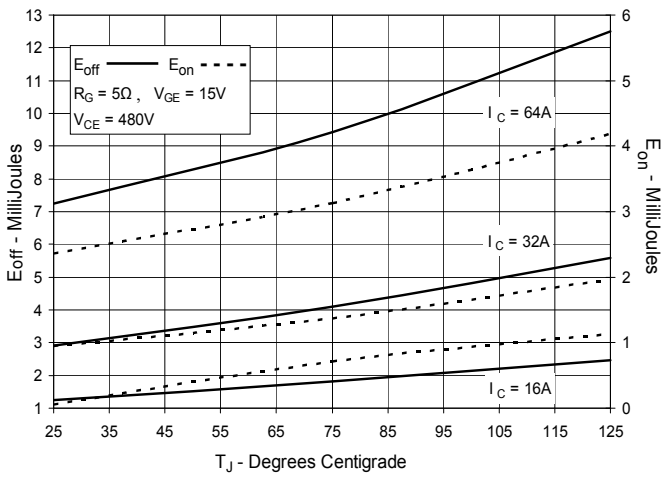
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



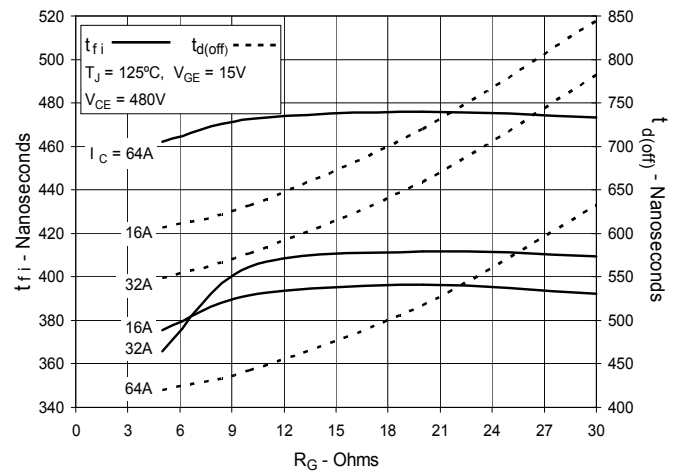
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



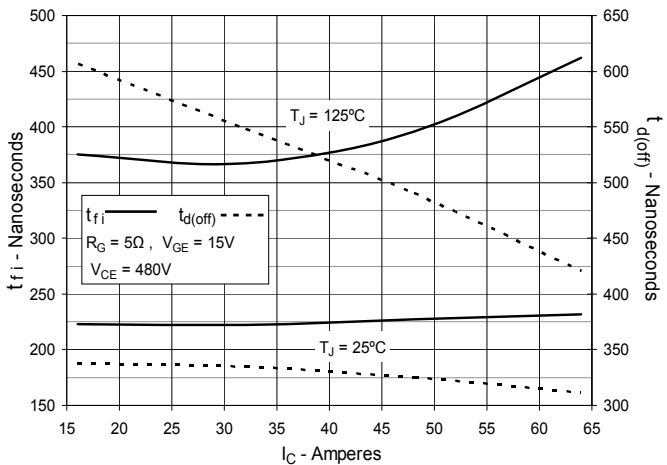
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



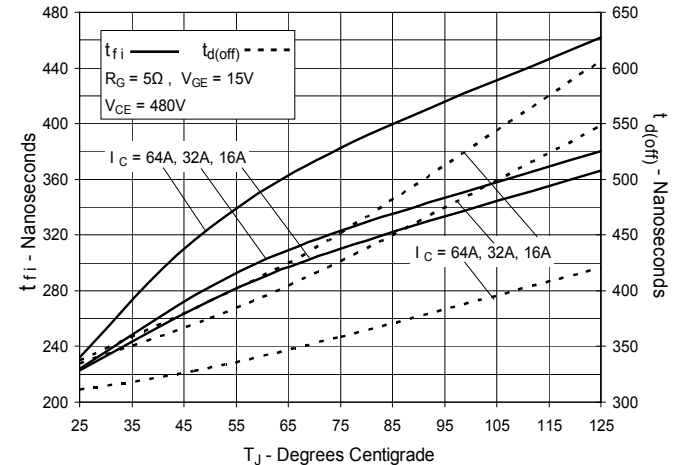
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



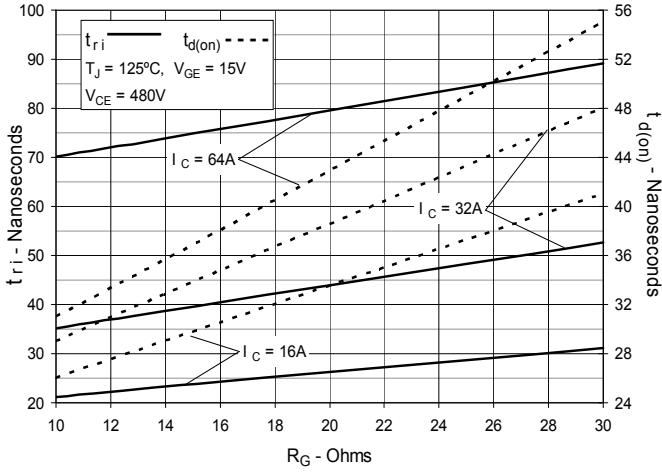
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



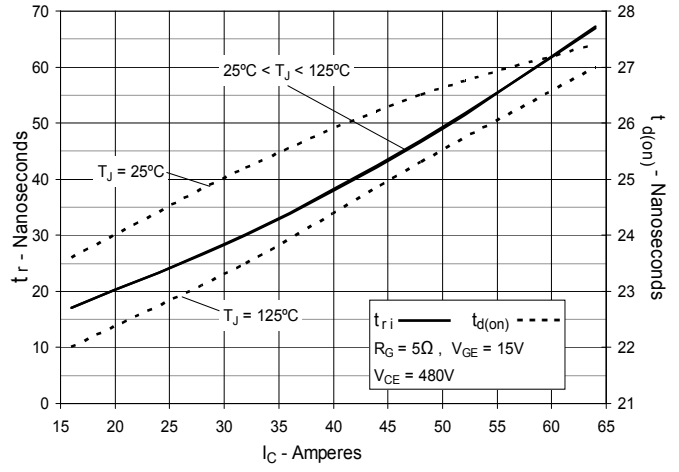
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



**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**

