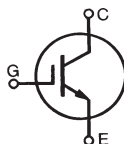


GenX3™ 600V IGBT

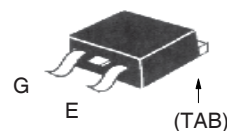
Ultra Low V_{sat} PT IGBT for
up to 5kHz switching

IXGA48N60A3
IXGH48N60A3
IXGP48N60A3

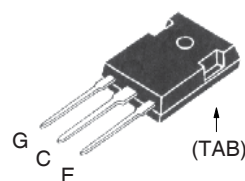


$$\begin{aligned} V_{CES} &= 600V \\ I_{C110} &= 48A \\ V_{CE(sat)} &\leq 1.35V \end{aligned}$$

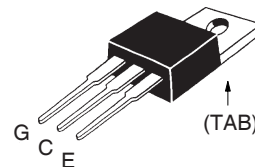
TO-263 (IXGA)



TO-247 (IXGH)



TO-220 (IXGP)



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

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_{C110}	$T_C = 110^\circ\text{C}$	48	A
I_{CM}	$T_C = 25^\circ\text{C}$, 1ms	300	A
SSOA (RBSOA)	$V_{GE} = 15V$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 5\Omega$ Clamped inductive load @ $\leq 600V$	$I_{CM} = 96$	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		5.0 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
$V_{CE(sat)}$	$I_C = 32A$, $V_{GE} = 15V$, Note 1	1.18	1.35	V

Features

- Optimized for low conduction losses
- International standard packages

Advantages

- High power density
- Low gate drive requirement

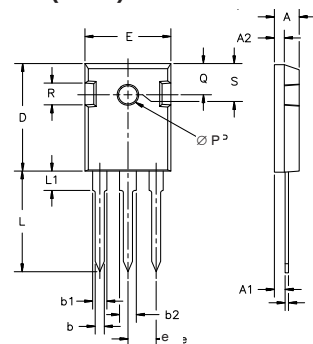
Applications

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

Symbol	Test Conditions	Characteristic Values		
$(T_J = 25^\circ\text{C unless otherwise specified})$		Min.	Typ.	Max.
g_{fs}	$I_C = 32\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$	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
$t_{d(on)}$	Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 32\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}, R_G = 5\Omega$		25	ns
t_{ri}			30	ns
E_{on}			0.95	mJ
$t_{d(off)}$			334	ns
t_{fi}			224	ns
E_{off}			2.90	mJ
$t_{d(on)}$	Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 32\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}, R_G = 5\Omega$		24	ns
t_{ri}			30	ns
E_{on}			1.97	mJ
$t_{d(off)}$			545	ns
t_{fi}			380	ns
E_{off}			5.60	mJ
R_{thJC}				0.42 $^\circ\text{C/W}$
R_{thCS}	(TO-247)	0.25		$^\circ\text{C/W}$
	(TO-220)	0.50		$^\circ\text{C/W}$

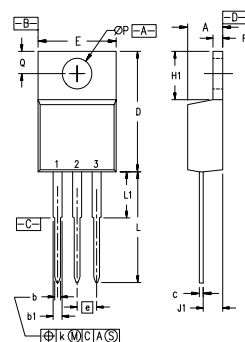
Note 1: Pulse test, $t \leq 300\mu\text{s}$; duty cycle, $d \leq 2\%$.

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

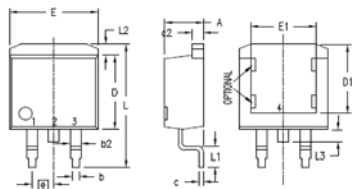
TO-220 (IXGP) Outline



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



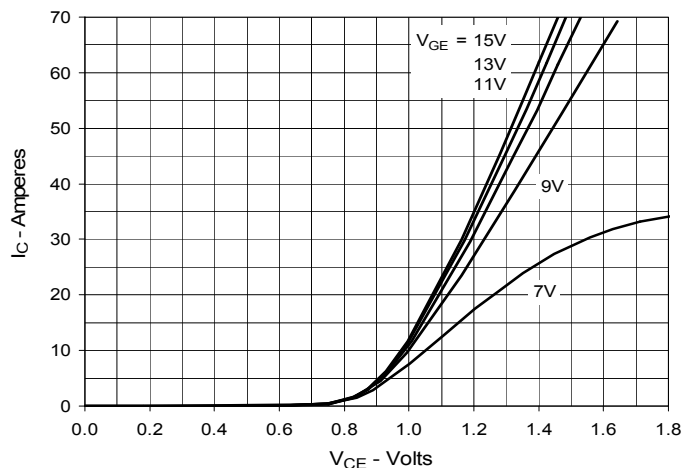
1. GATE (COLLECTOR)
2. DRAIN (COLLECTOR)
3. SOURCE (EMITTER)
4. DRAIN (COLLECTOR) BOTTOM SIDE

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

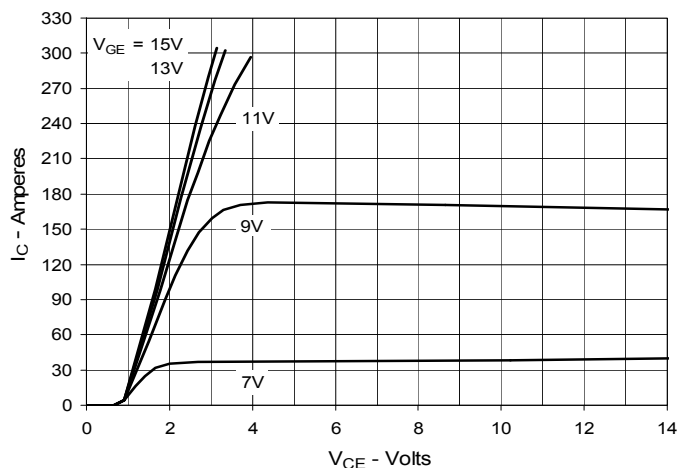
IXYS reserves the right to change limits, test conditions and dimensions.

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 7,157,338B2
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

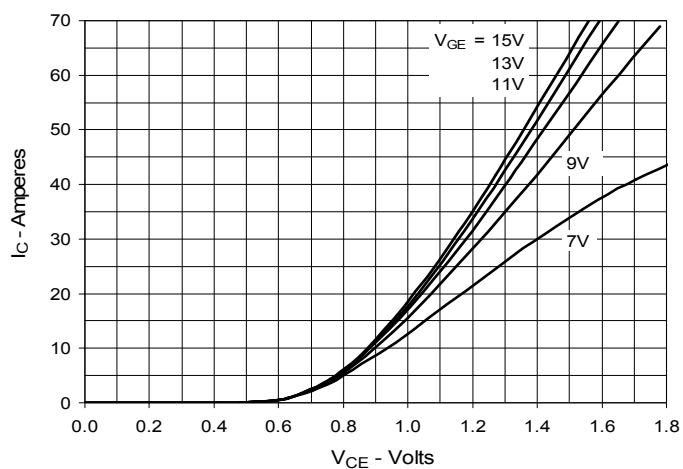
**Fig. 1. Output Characteristics
@ 25°C**



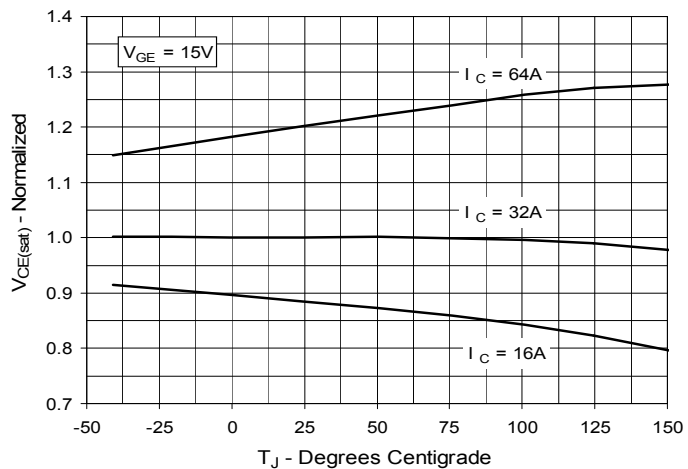
**Fig. 2. Extended Output Characteristics
@ 25°C**



**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**

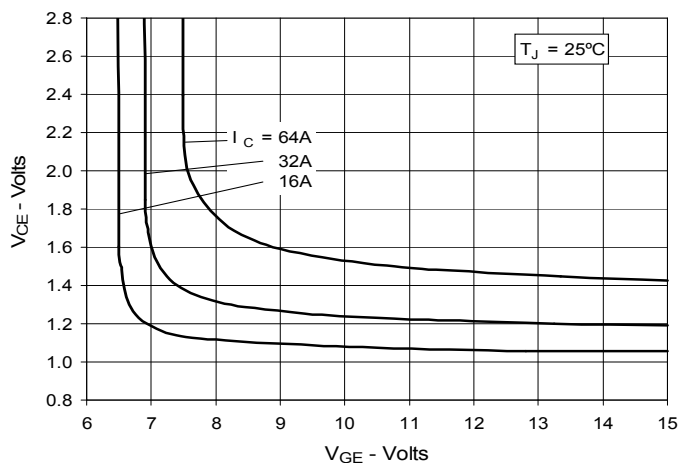


Fig. 6. Input Admittance

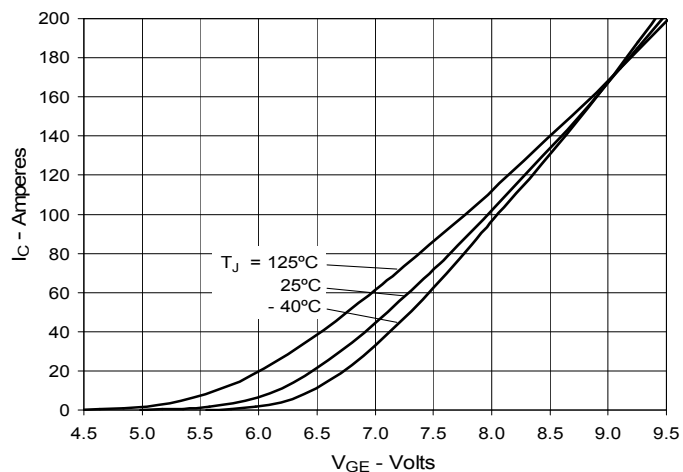


Fig. 7. Transconductance

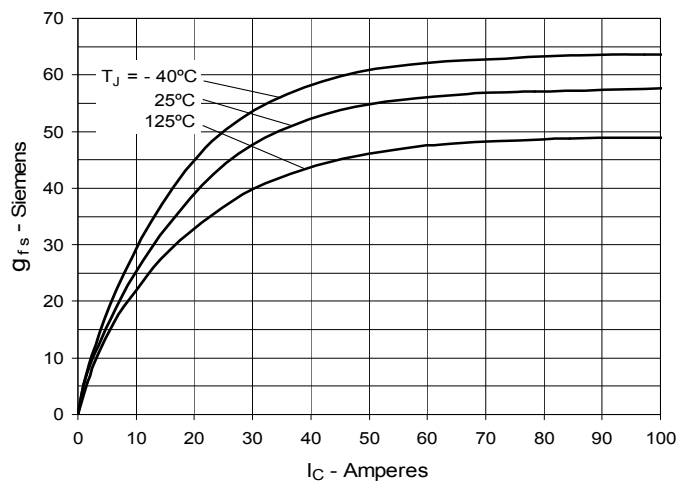


Fig. 8. Gate Charge

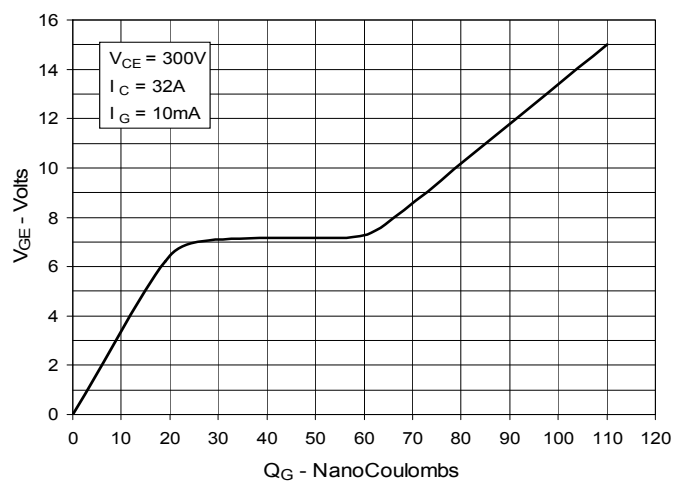


Fig. 9. Capacitance

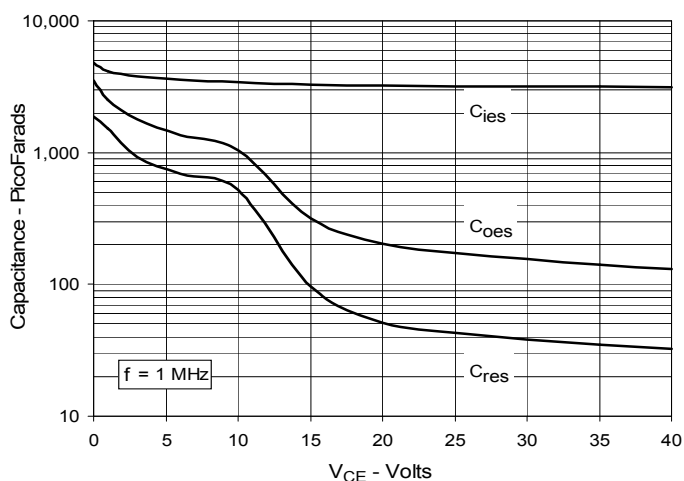


Fig. 10. Reverse-Bias Safe Operating Area

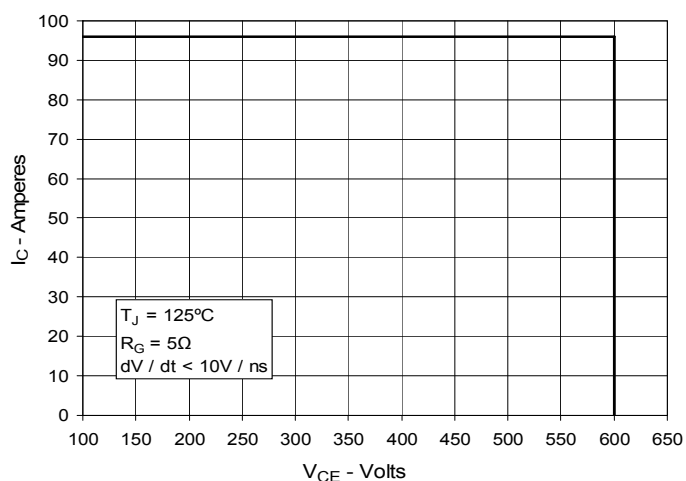


Fig. 11. Maximum Transient Thermal Impedance

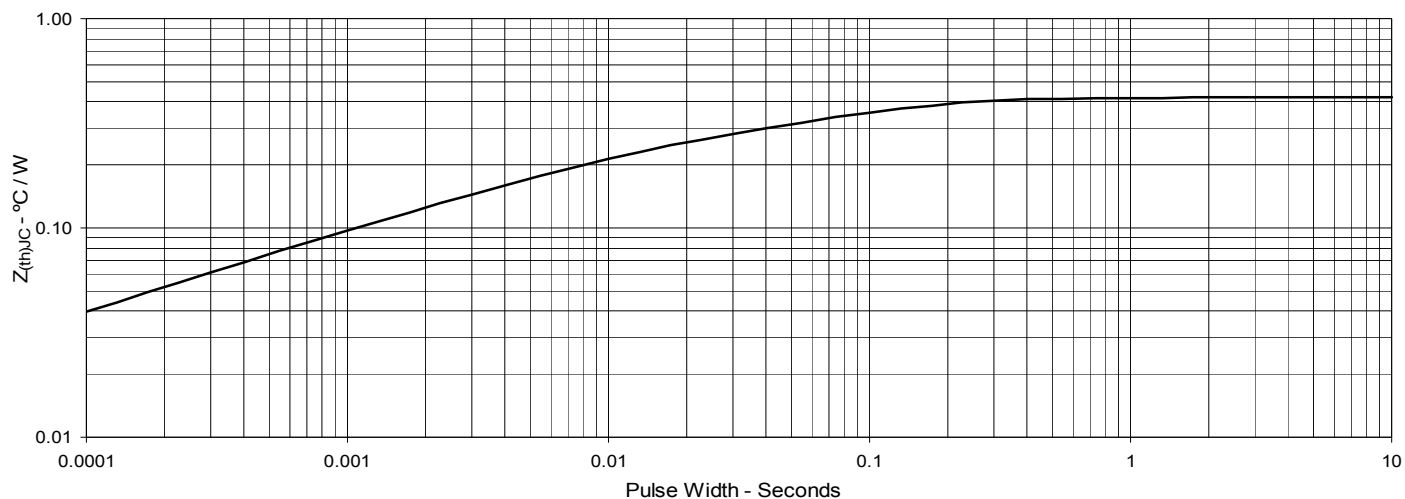


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

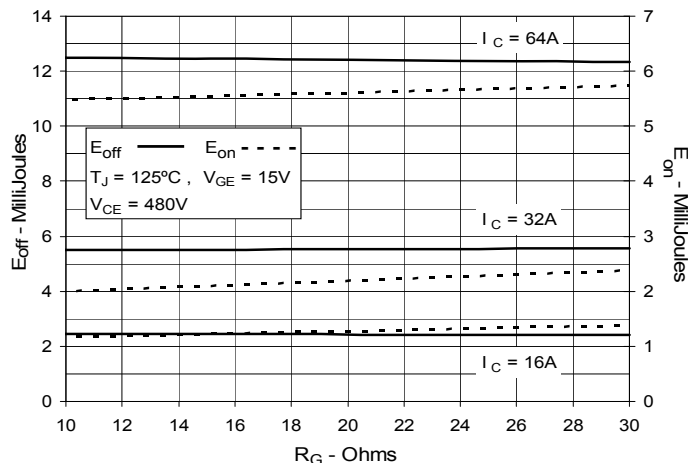


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

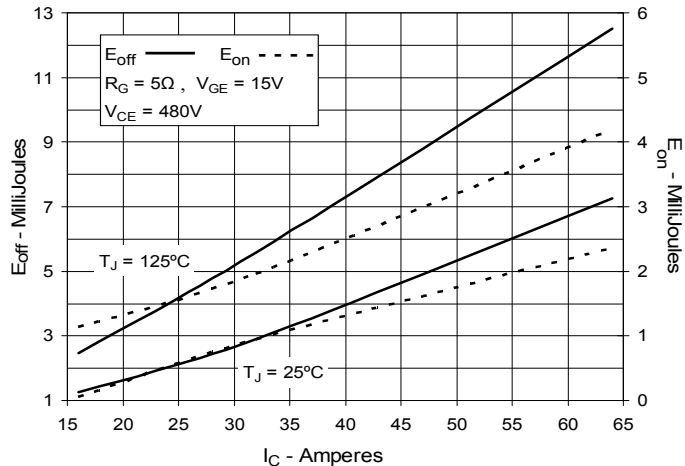


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

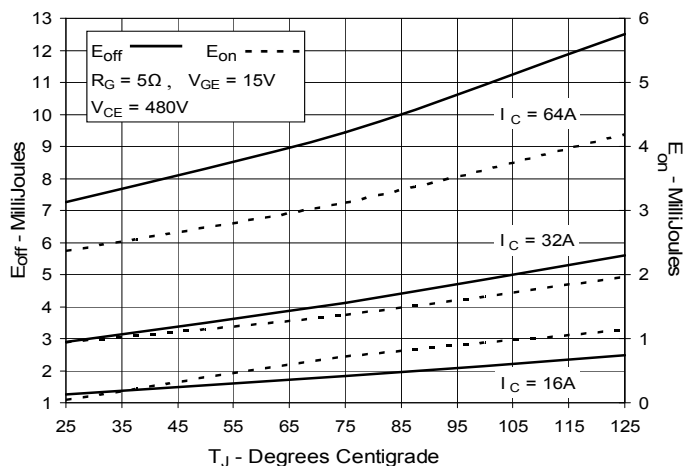


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

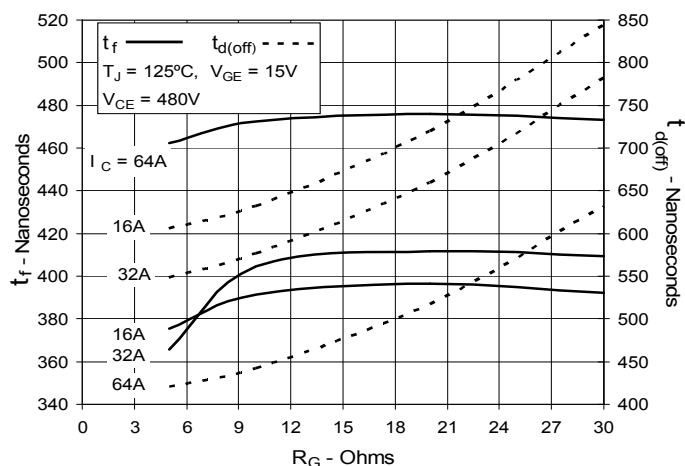


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

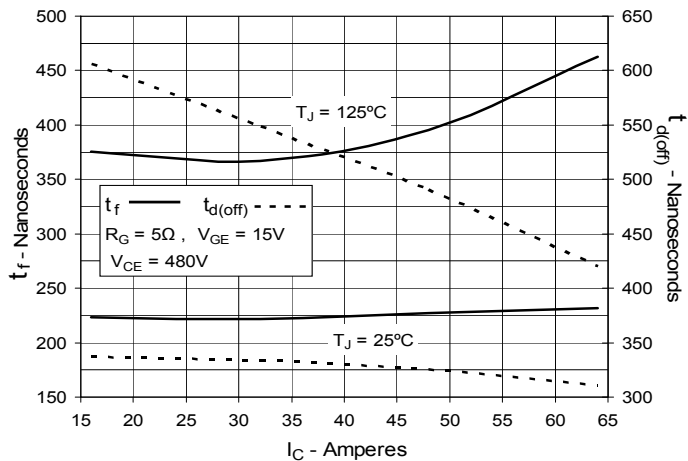
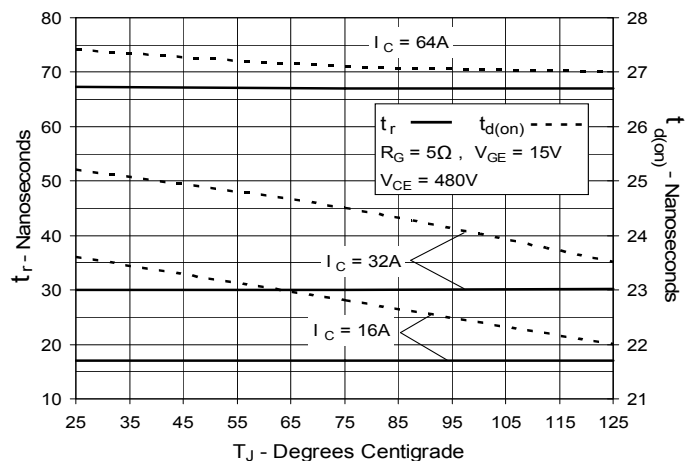
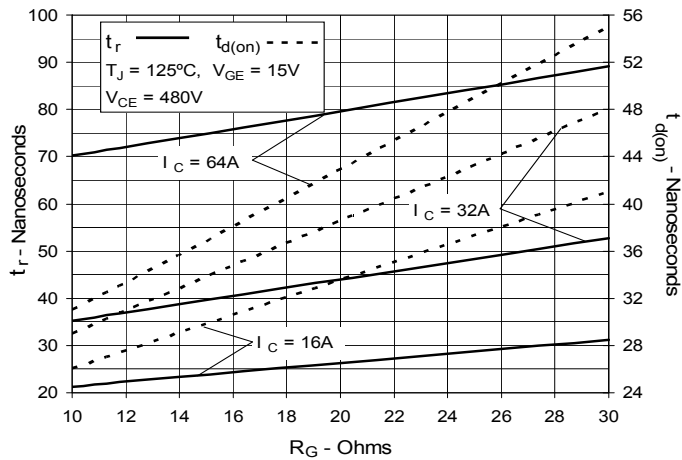


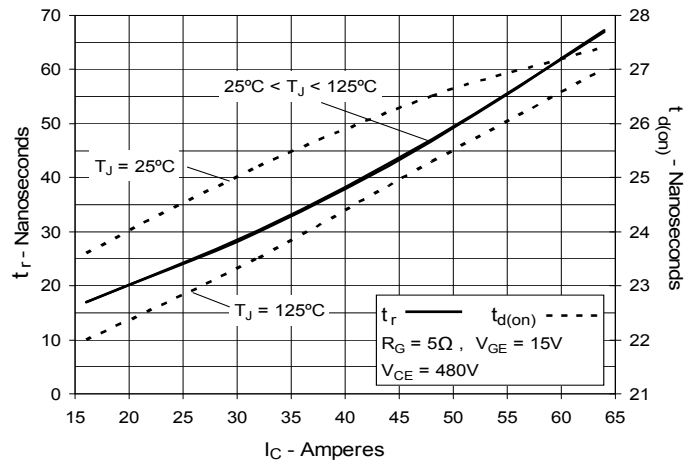
Fig. 17. Inductive Turn-on Switching Times vs. Junction Temperature



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



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



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

