

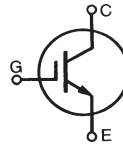
GenX3™ 600V IGBT

IXGA48N60B3

IXGP48N60B3

IXGH48N60B3

Medium speed low V_{sat} PT
IGBTs 5-40 kHz switching



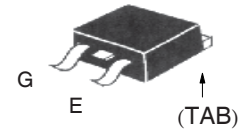
$$V_{CES} = 600V$$

$$I_{C110} = 48A$$

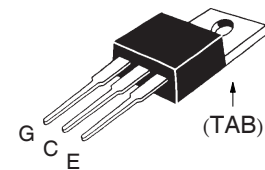
$$V_{CE(sat)} \leq 1.8V$$

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_C = 25^\circ C$ to $150^\circ C$	600	V
V_{CGR}	$T_J = 25^\circ C$ to $150^\circ C$, $R_{GE} = 1M\Omega$	600	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C110}	$T_C = 110^\circ C$	48	A
I_{CM}	$T_C = 25^\circ C$, 1ms	280	A
SSOA (RBSOA)	$V_{GE} = 15V$, $T_{VJ} = 125^\circ C$, $R_G = 5\Omega$ Clamped inductive load @ $\leq 600V$	$I_{CM} = 120$	A
P_C	$T_C = 25^\circ C$	300	W
T_J		-55 ... +150	$^\circ C$
T_{JM}		150	$^\circ C$
T_{stg}		-55 ... +150	$^\circ C$
T_L	1.6mm (0.062 in.) from case for 10s	300	$^\circ C$
T_{SOLD}	Plastic body for 10 seconds	260	$^\circ C$
M_d	Mounting torque (TO-247)(TO-220)	1.13/10	Nm/lb.in.
Weight	TO-263	2.5	g
	TO-220	3.0	g
	TO-247	6.0	g

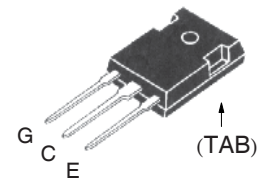
TO-263 (IXGA)



TO-220 (IXGP)



TO-247 (IXGH)



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

Features

- Optimized for low conduction and switching losses
- Square RBSOA
- International standard packages

Advantages

- High power density
- Low gate drive requirement

Applications

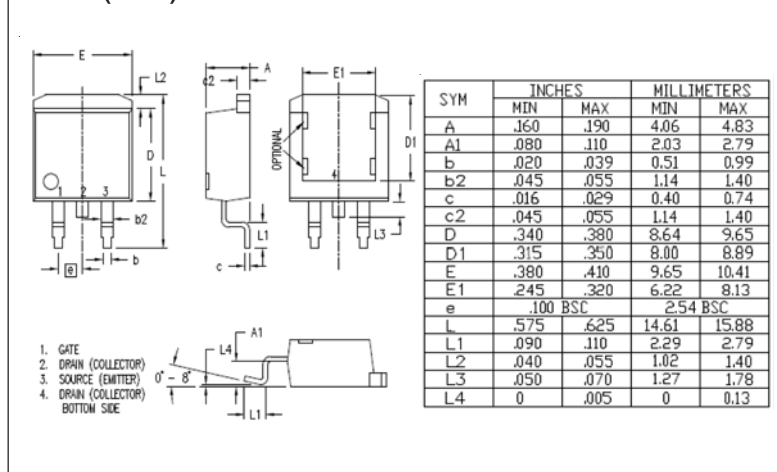
- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
BV_{CES}	$I_C = 250\mu A$, $V_{GE} = 0V$	600		V
$V_{GE(th)}$	$I_C = 250\mu A$, $V_{CE} = V_{GE}$	3.0		5.0 V
I_{CES}	$V_{CE} = V_{CES}$ $V_{GE} = 0V$ $T_J = 125^\circ C$			25 μA
				250 μA
I_{GES}	$V_{CE} = 0V$, $V_{GE} = \pm 20V$			± 100 nA
$V_{CE(sat)}$	$I_C = 32A$, $V_{GE} = 15V$, Note 1			1.8 V

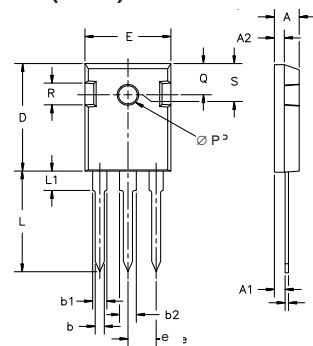
Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
$(T_J = 25^\circ\text{C unless otherwise specified})$				
g_{fs}	$I_C = 30\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$	28	46	S
C_{ies}	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		3980	pF
C_{oes}			170	pF
C_{res}			45	pF
Q_g	$I_C = 40\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		115	nC
Q_{ge}			21	nC
Q_{gc}			40	nC
$t_{d(on)}$	Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 30\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}, R_G = 5\Omega$		22	ns
t_{ri}			25	ns
E_{on}			0.84	mJ
$t_{d(off)}$			130	200 ns
t_{fi}			116	200 ns
E_{off}			0.66	1.20 mJ
$t_{d(on)}$	Inductive Load, $T_J = 125^\circ\text{C}$ $I_C = 30\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}, R_G = 5\Omega$		19	ns
t_{ri}			25	ns
E_{on}			1.71	mJ
$t_{d(off)}$			190	ns
t_{fi}			157	ns
E_{off}			1.30	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-263 (IXGA) Outline

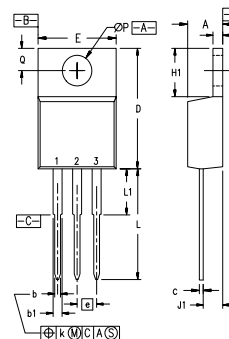


TO-247 (IXGH) Outline



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
∅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

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
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
∅P	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

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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

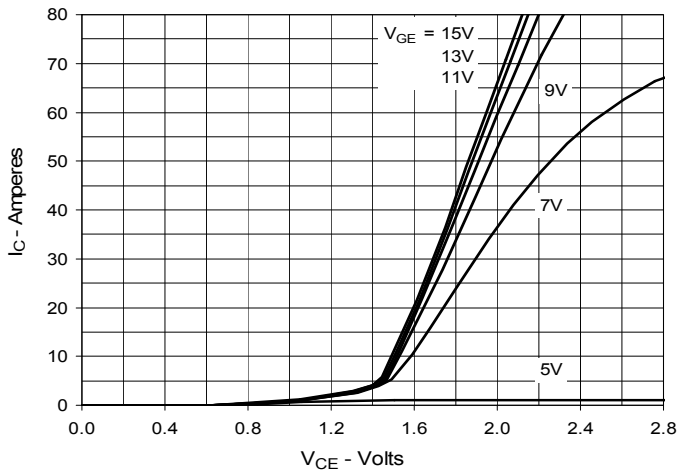


Fig. 2. Extended Output Characteristics @ 25°C

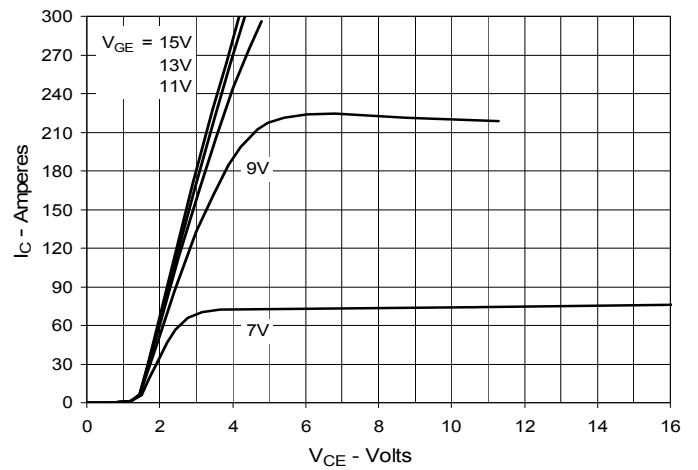


Fig. 3. Output Characteristics @ 125°C

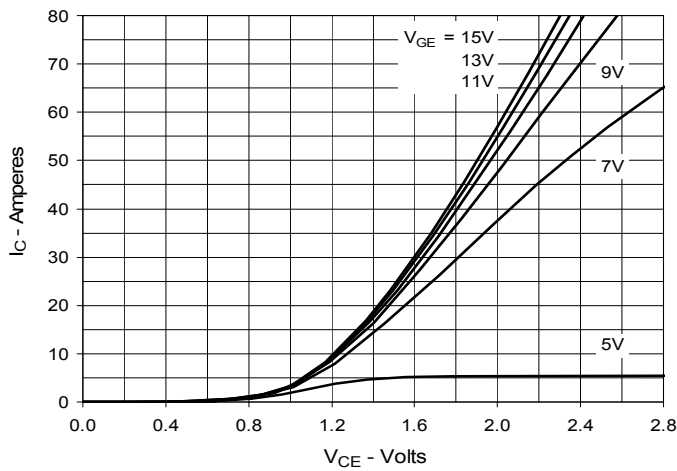


Fig. 4. Dependence of Vce(sat) on Junction Temperature

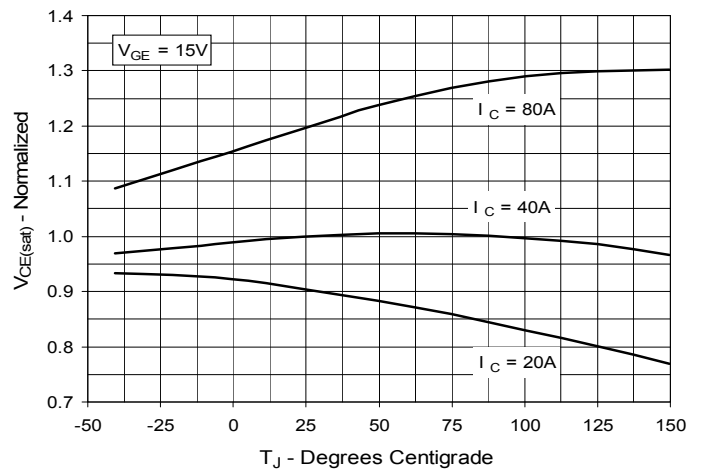


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

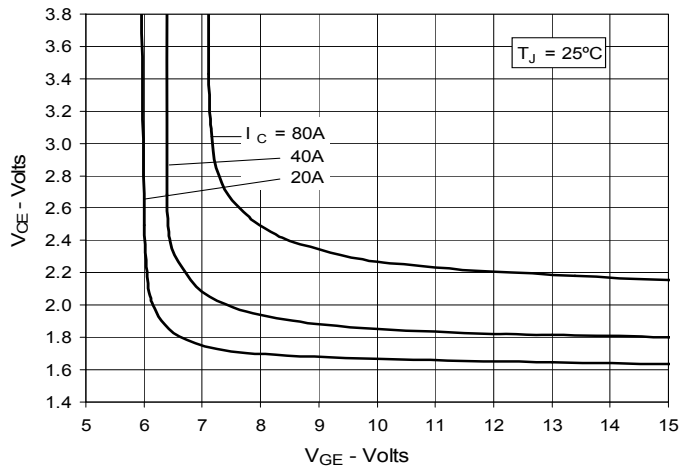


Fig. 6. Input Admittance

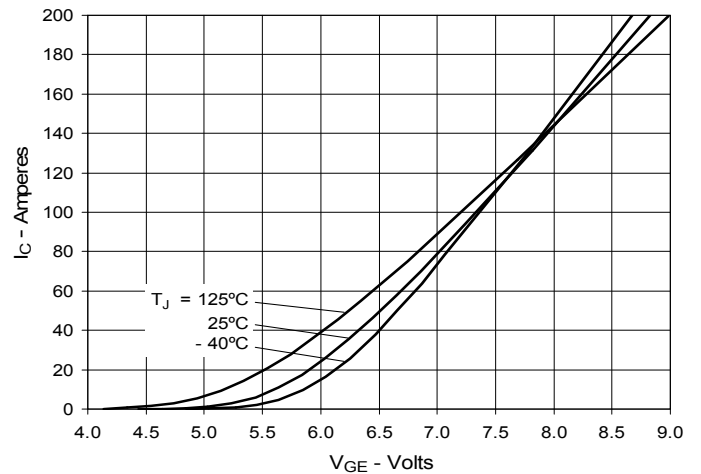


Fig. 7. Transconductance



Fig. 8. Gate Charge

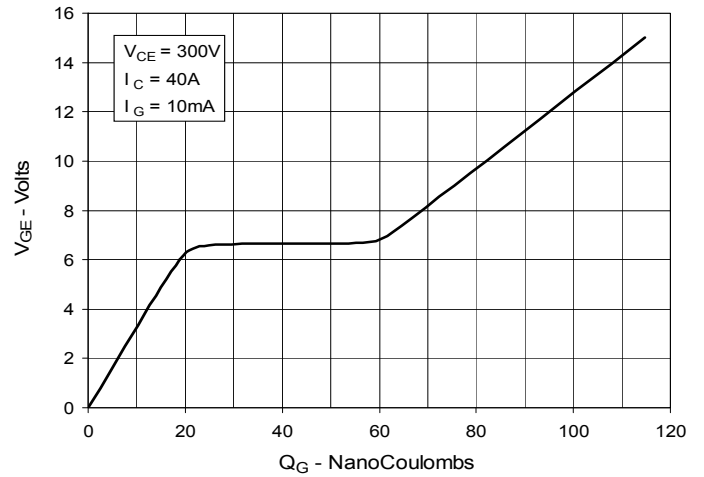


Fig. 9. Capacitance



Fig. 10. Reverse-Bias Safe Operating Area

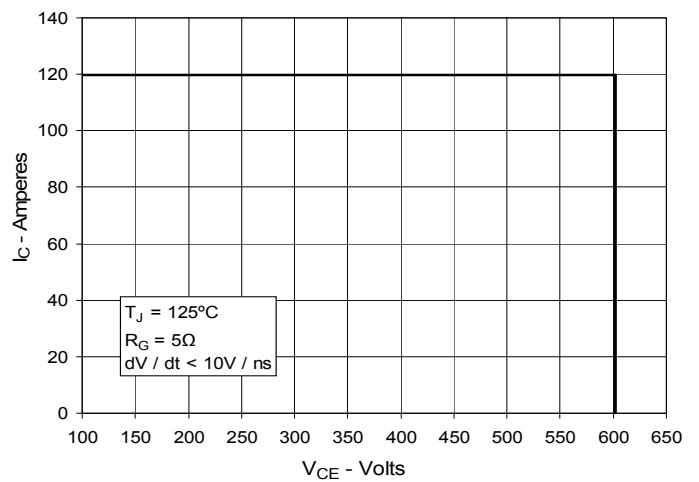
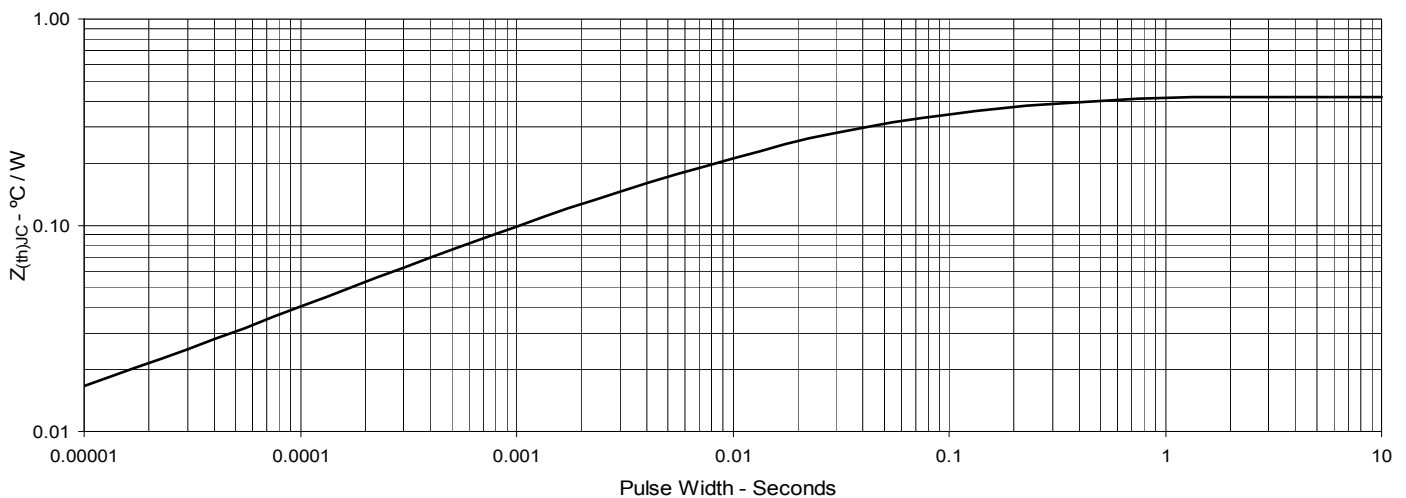


Fig. 11. Maximum Transient Thermal Impedance



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

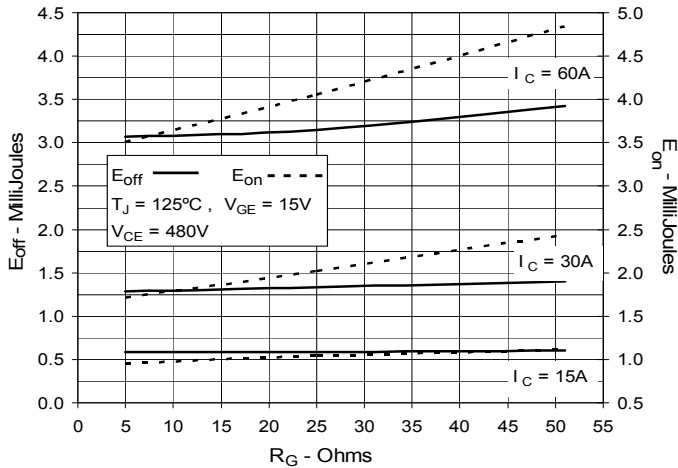


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

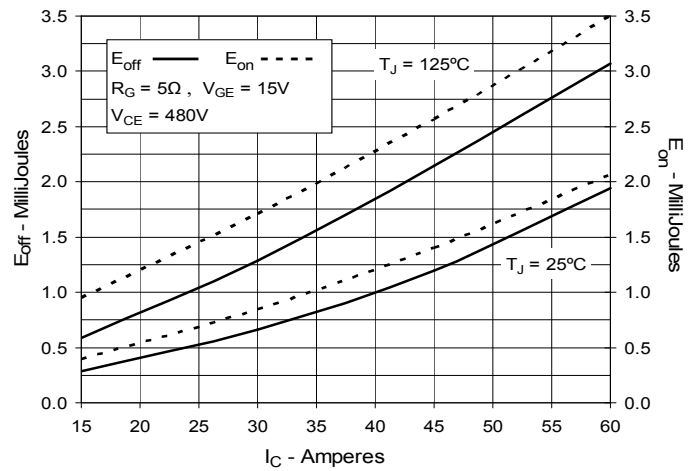


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

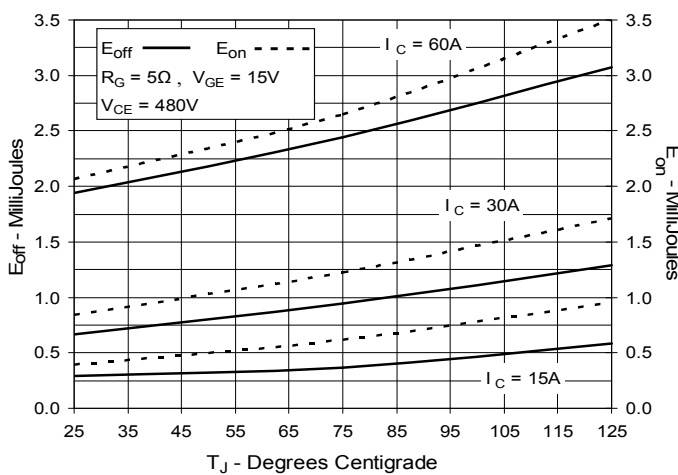


Fig. 15. Inductive Turn-off Switching Times vs. Junction Temperature

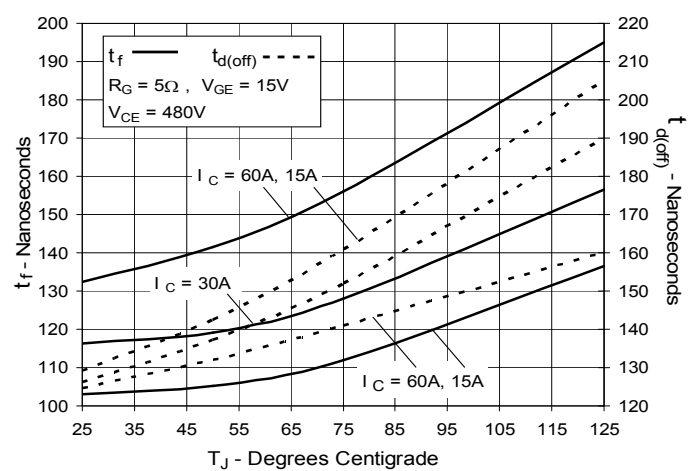


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

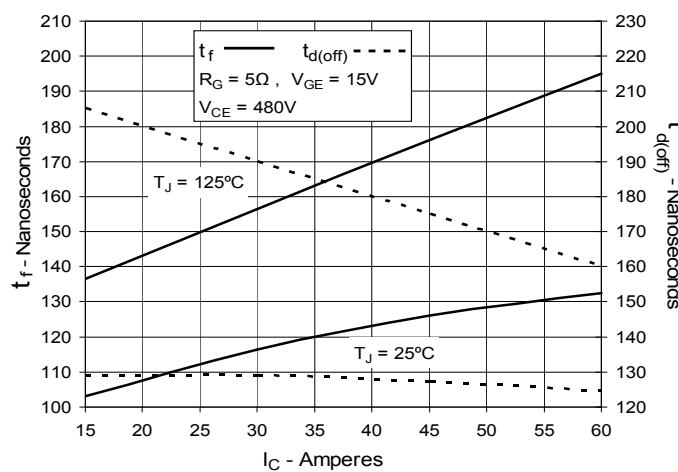
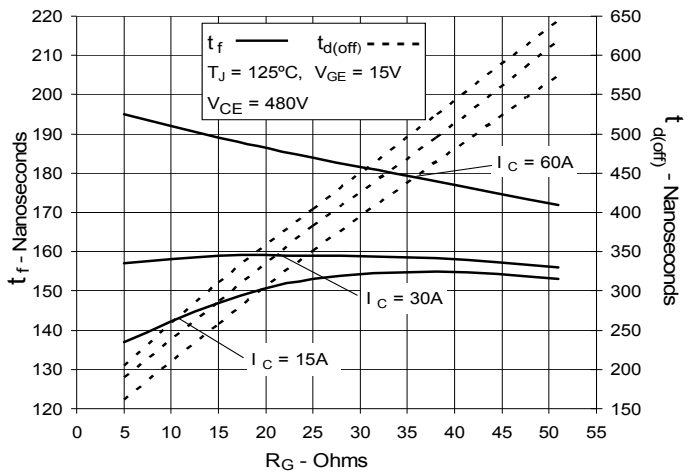
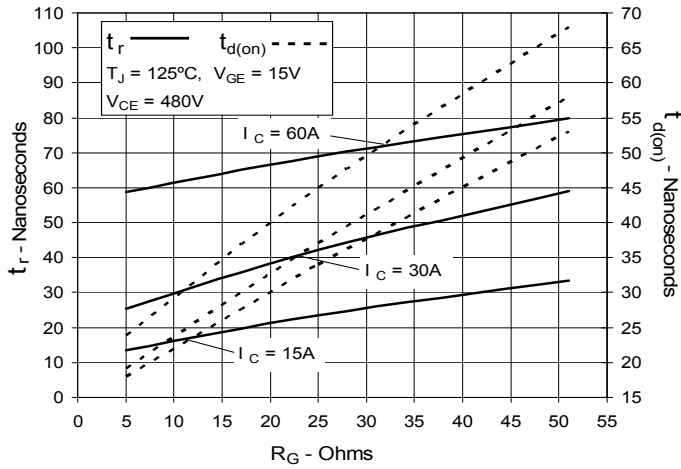


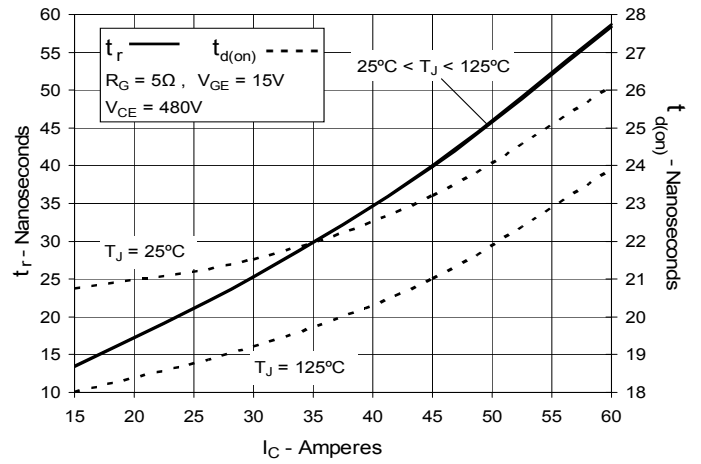
Fig. 17. Inductive Turn-off Switching Times vs. Gate Resistance



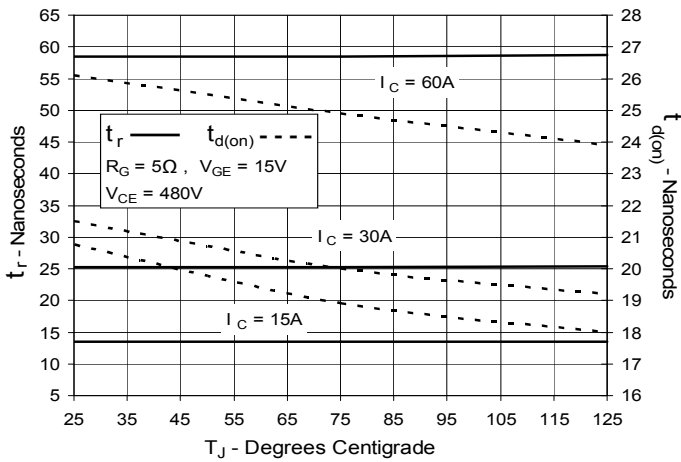
**Fig. 18. Inductive Turn-on
Switching Times vs. Gate Resistance**



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



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



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