

# GenX3™ 600V IGBT

## MMIX1G320N60B3

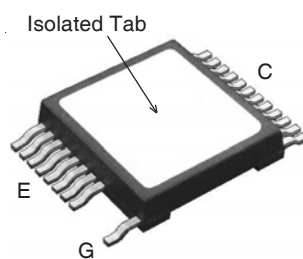
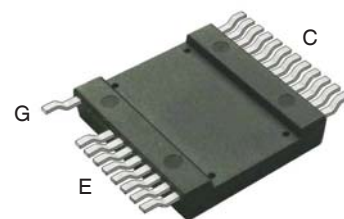
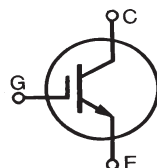
$$V_{CES} = 600V$$

$$I_{C25} = 400A$$

$$V_{CE(sat)} \leq 1.50V$$

(Electrically Isolated Tab)

Medium-Speed Low-Vsat PT  
IGBT for 5-40 kHz Switching



G = Gate                      E = Emitter  
C = Collector

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ C$ 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	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$	400	A
$I_{C110}$	$T_C = 110^\circ C$	180	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	1000	A
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 1\Omega$ Clamped Inductive Load	$I_{CM} = 320$ $V_{CE} \leq V_{CES}$	A V
$P_C$	$T_C = 25^\circ C$	1000	W
$T_J$		-55 ... +150	$^\circ C$
$T_{JM}$		150	$^\circ C$
$T_{stg}$		-55 ... +150	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ C$
$T_{SOLD}$	1.6 mm (0.062 in.) from Case for 10	260	$^\circ C$
$V_{ISOL}$	50/60Hz, 1 minute	2500	V~
$F_C$	Mounting Force	50..200/11..45	N/lb.
<b>Weight</b>		8	g

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Optimized for Low Conduction and Switching Losses
- Very High Current Capability
- Square RBSOA

### 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 ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$BV_{CES}$	$I_C = 1mA$ , $V_{GE} = 0V$	600		V
$V_{GE(th)}$	$I_C = 4mA$ , $V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ $T_J = 125^\circ C$			75 $\mu A$ 2 mA
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 400$ nA
$V_{CE(sat)}$	$I_C = 100A$ , $V_{GE} = 15V$ , Note 1 $I_C = 320A$	1.20 1.67	1.50	V V

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values			
		Min.	Typ.	Max.	
$g_{fs}$	$I_C = 60\text{A}, V_{CE} = 10\text{V}$ , Note 1	75	130	S	
$C_{ies}$ $C_{oes}$ $C_{res}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		18	nF	
			960	pF	
			130	pF	
$Q_g$ $Q_{ge}$ $Q_{gc}$	$I_C = 320\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		585	nC	
			105	nC	
			215	nC	
$t_{d(on)}$ $t_{ri}$ $E_{on}$ $t_{d(off)}$ $t_{fi}$ $E_{off}$	<b>Inductive Load, <math>T_J = 25^\circ\text{C}</math></b>  $I_C = 100\text{A}, V_{GE} = 15\text{V}$  $V_{CE} = 0.8 \cdot V_{CES}, R_G = 1\Omega$		44	ns	
				66	ns
				2.7	mJ
				250	ns
				165	ns
				3.5	5.0 mJ
$t_{d(on)}$ $t_{ri}$ $E_{on}$ $t_{d(off)}$ $t_{fi}$ $E_{off}$	<b>Inductive Load, <math>T_J = 125^\circ\text{C}</math></b>  $I_C = 100\text{A}, V_{GE} = 15\text{V}$  $V_{CE} = 0.8 \cdot V_{CES}, R_G = 1\Omega$		40	ns	
				67	ns
				3.5	mJ
				330	ns
				265	ns
				5.4	mJ
$R_{thJC}$ $R_{thCS}$			0.05	0.125 $^\circ\text{C/W}$ $^\circ\text{C/W}$	

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

### PRELIMINARY TECHNICAL INFORMATION

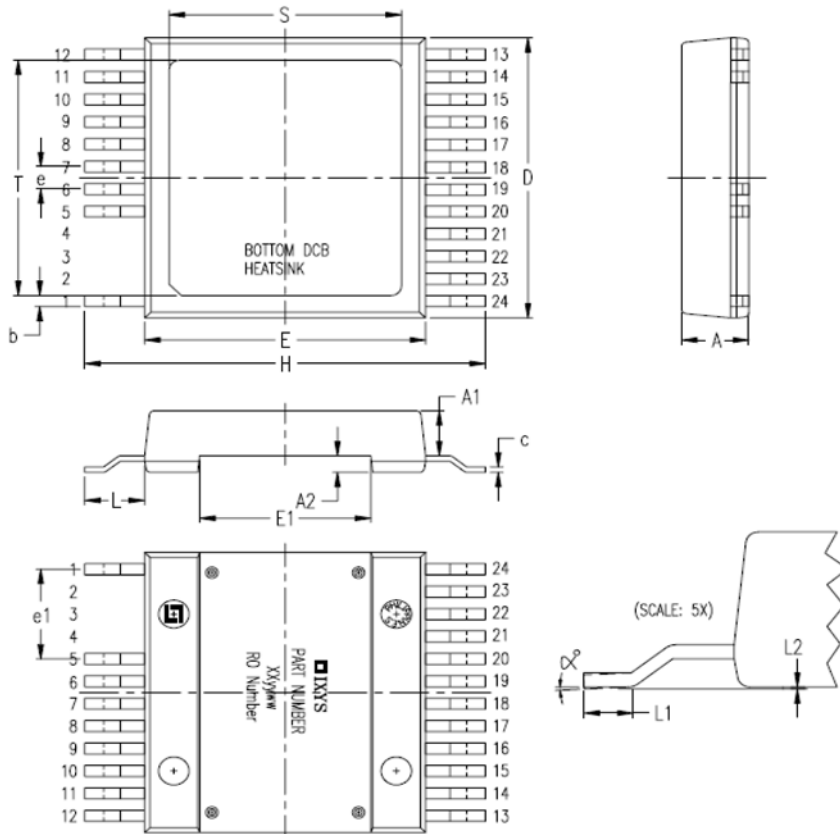
The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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

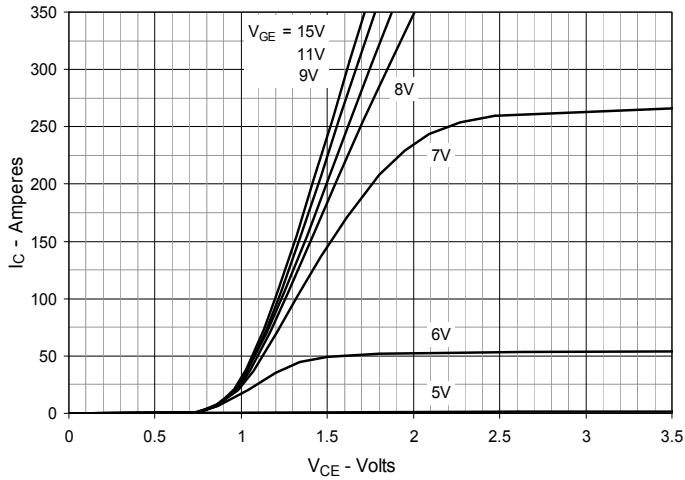
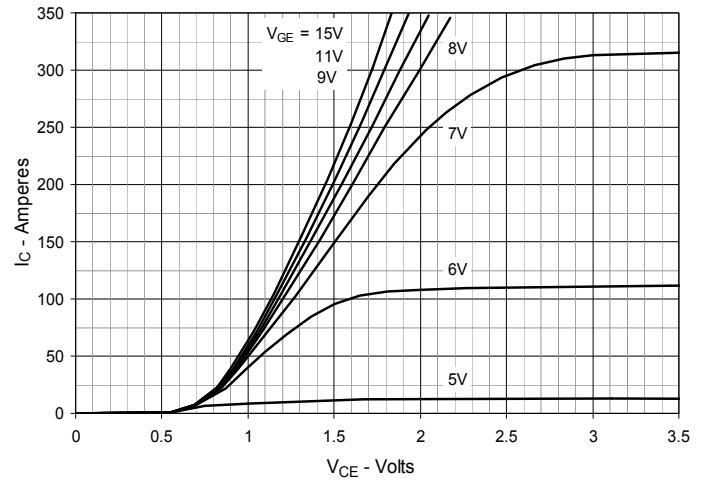
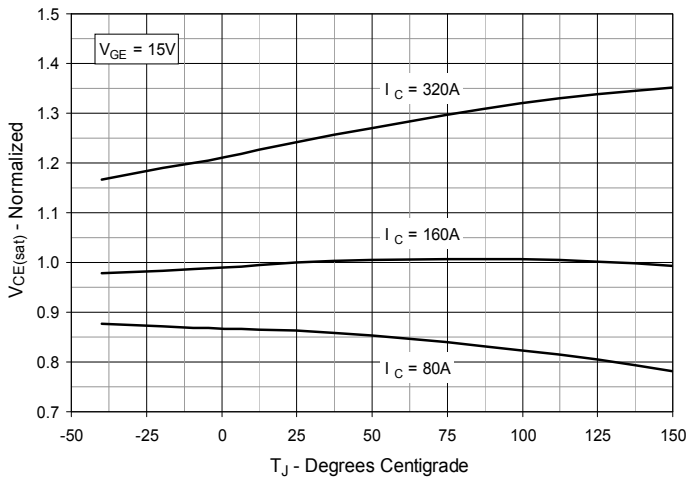
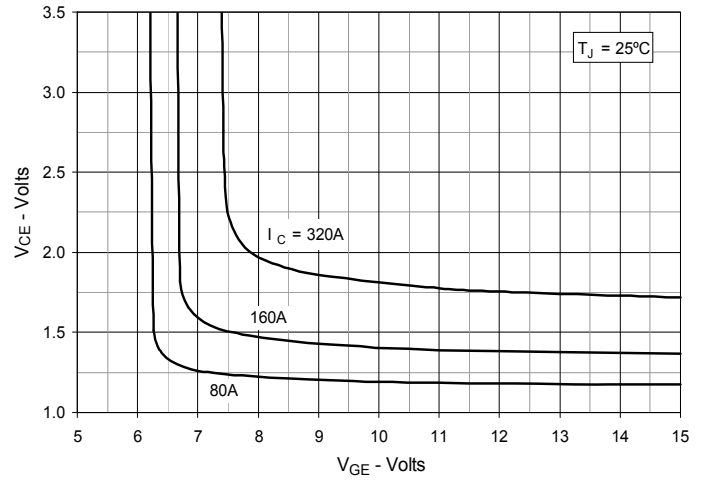
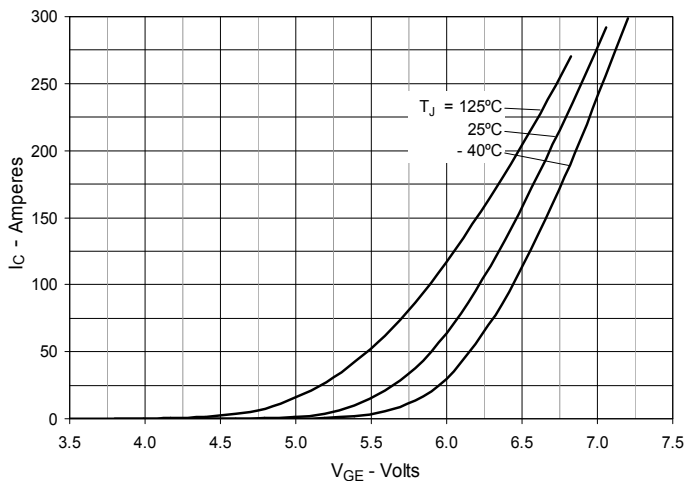
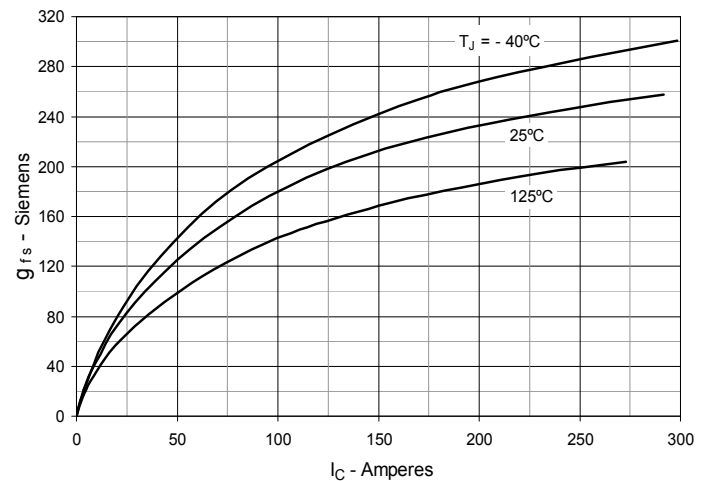
4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585	7,005,734 B2	7,157,338B2
4,850,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	6,759,692	7,063,975 B2	
4,881,106	5,034,796	5,187,117	5,486,715	6,306,728 B1	6,583,505	6,710,463	6,771,478 B2	7,071,537	

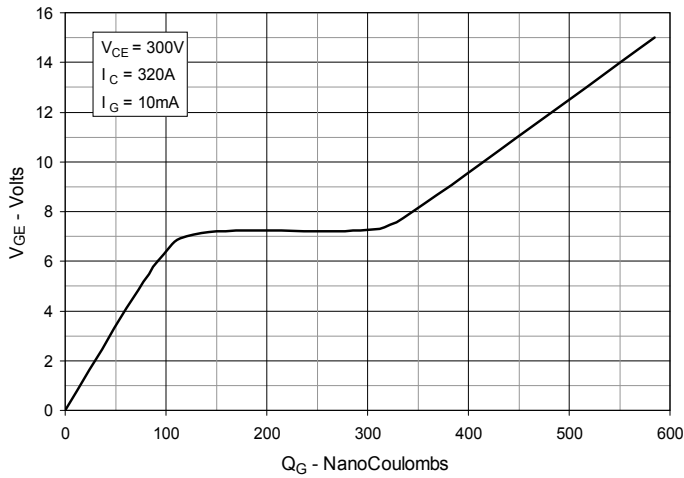
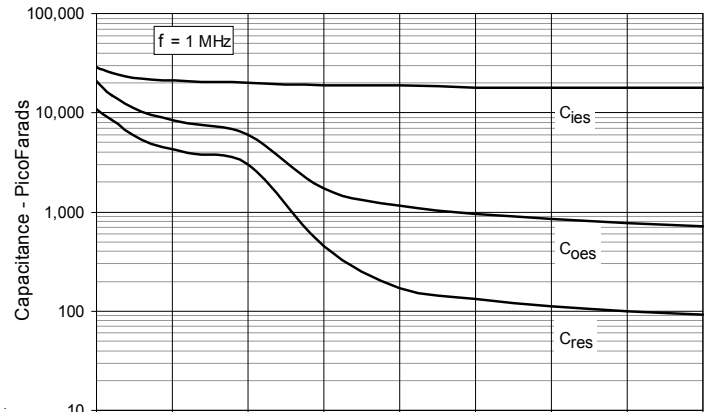
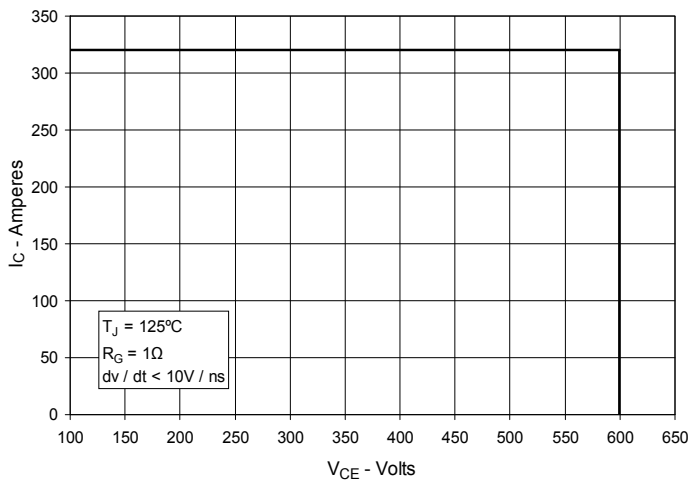
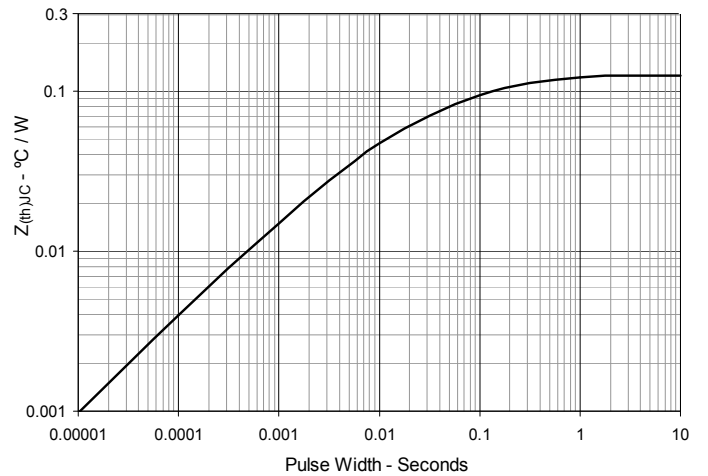
### Package Outline



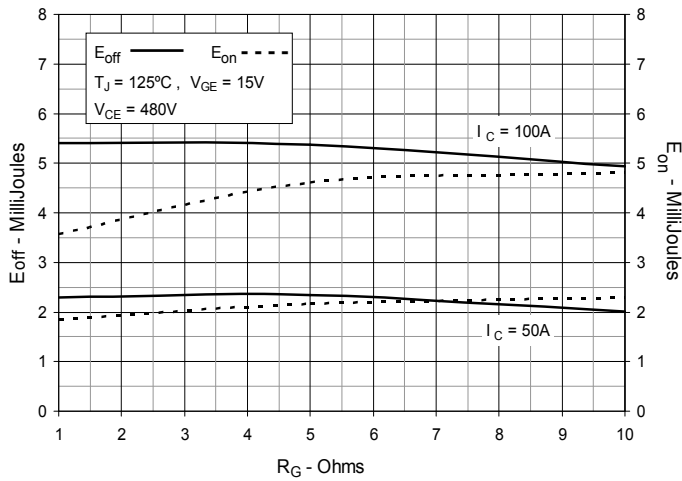
SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.209	.224	5.30	5.70
A1	.154	.161	3.90	4.10
A2	.055	.063	1.40	1.60
b	.035	.045	0.90	1.15
c	.018	.026	0.45	0.65
D	.976	.994	24.80	25.25
E	.898	.915	22.80	23.25
E1	.543	.559	13.80	14.20
e	.079 BSC		2.00 BSC	
e1	.315 BSC		8.00 BSC	
H	1.272	1.311	32.30	33.30
L	.181	.209	4.60	5.30
L1	.051	.067	1.30	1.70
L2	.000	.006	0.00	0.15
S	.736	.760	18.70	19.30
T	.815	.839	20.70	21.30
∞	0	4*	0	4*

**PIN: 1 = Gate**  
**5-12 = Emitter**  
**13-24 = Collector**

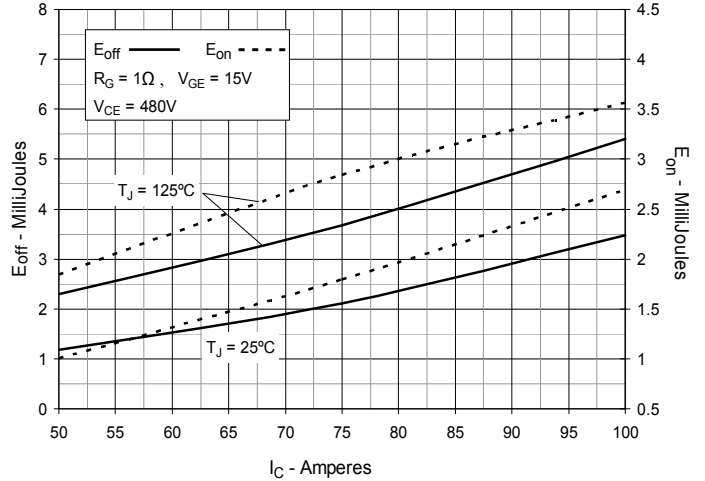
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 2. Output Characteristics @  $T_J = 125^\circ\text{C}$** 

**Fig. 3. Dependence of  $V_{CE(sat)}$  on Junction Temperature**

**Fig. 4. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

**Fig. 5. Input Admittance**

**Fig. 6. Transconductance**


**Fig. 7. Gate Charge**

**Fig. 8. Capacitance**

**Fig. 9. Reverse-Bias Safe Operating Area**

**Fig. 10. Maximum Transient Thermal Impedance**


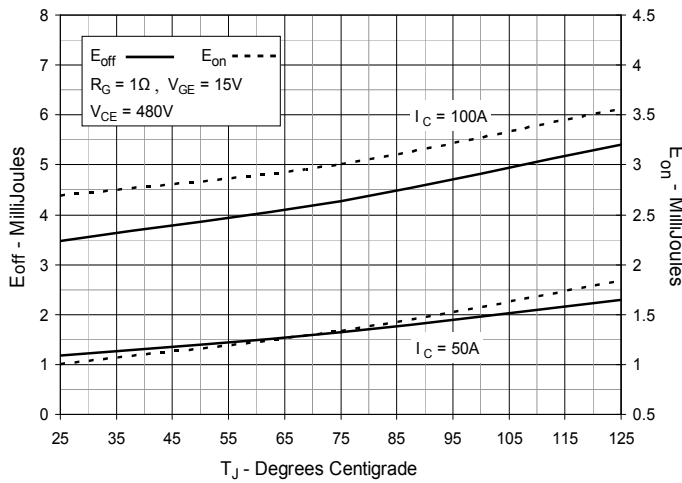
**Fig. 11. Inductive Switching Energy Loss vs. Gate Resistance**



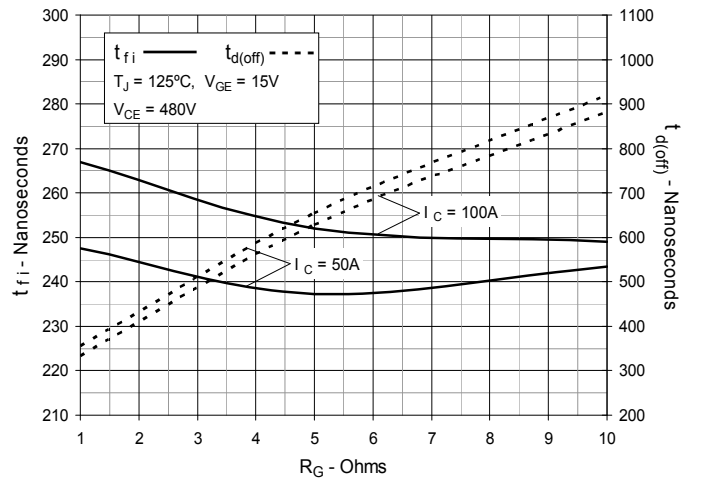
**Fig. 12. Inductive Switching Energy Loss vs. Collector Current**



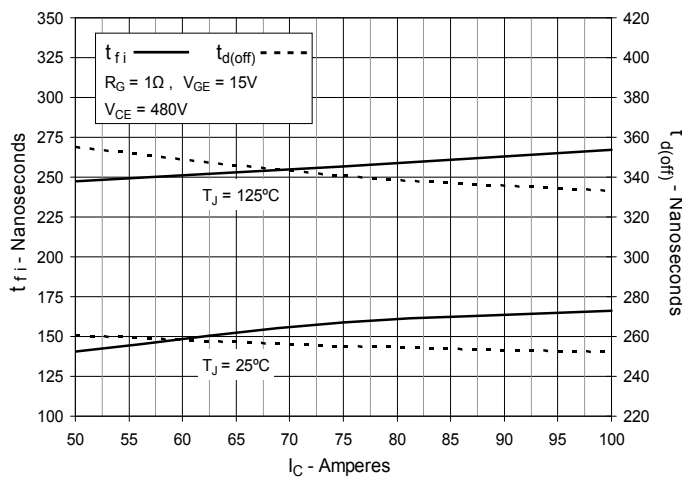
**Fig. 13. Inductive Switching Energy Loss vs. Junction Temperature**



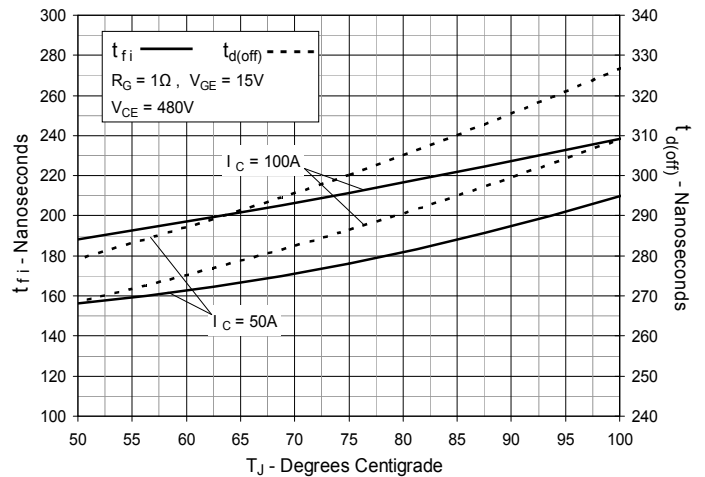
**Fig. 14. Inductive Turn-off Switching Times vs. Gate Resistance**



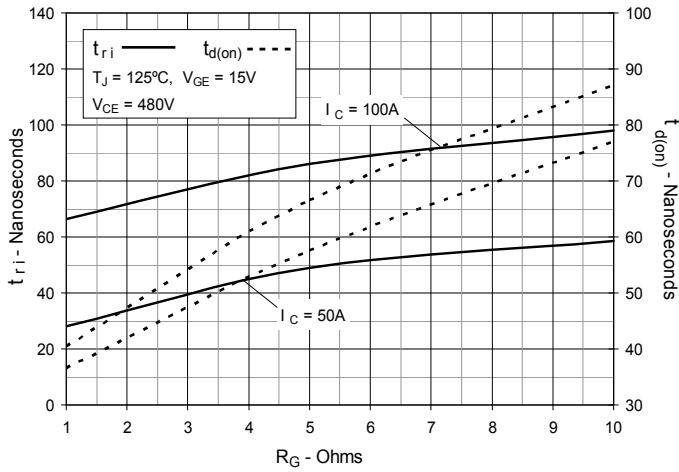
**Fig. 15. Inductive Turn-off Switching Times vs. Collector Current**



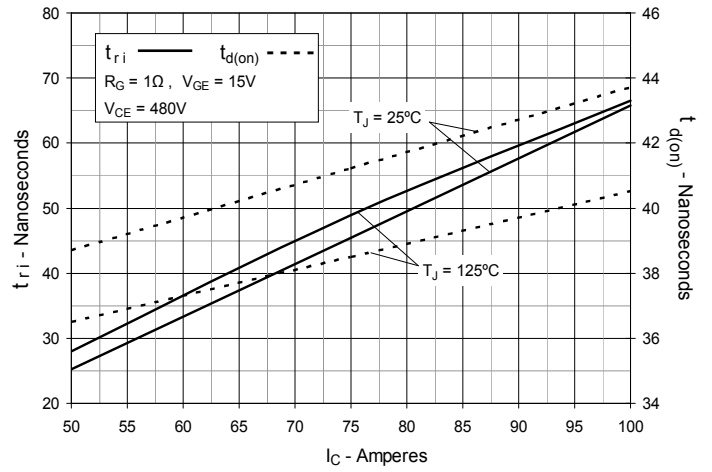
**Fig. 16. Inductive Turn-off Switching Times vs. Junction Temperature**



**Fig. 17. Inductive Turn-on  
Switching Times vs. Gate Resistance**



**Fig. 18. Inductive Turn-on  
Switching Times vs. Collector Current**



**Fig. 19. Inductive Turn-on  
Switching Times vs. Junction Temperature**

