

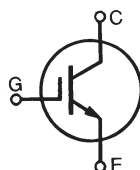
$V_{CES} = 600V$

$I_{C110} = 72A$

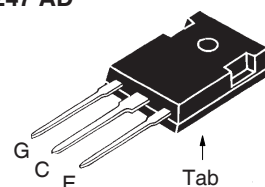
$V_{CE(sat)} \leq 2.5V$

$t_{fi} (typ) = 55ns$

**High-Speed PT IGBT for  
40-100kHz Switching**



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
$I_{C25}$	$T_C = 25^\circ C$ (Limited by Leads)	75	A
$I_{C110}$	$T_C = 110^\circ C$ (Chip Capability)	72	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	360	A
$I_A$	$T_C = 25^\circ C$	50	A
$E_{AS}$	$T_C = 25^\circ C$	500	mJ
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 2\Omega$ Clamped Inductive Load	$I_{CM} = 150$ $V_{CE} \leq V_{CES}$	A
$P_C$	$T_C = 25^\circ C$	540	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 (0.062in.) from Case for 10s	260	$^\circ C$
$M_d$	Mounting Torque	1.13/10	Nm/lb.in.
<b>Weight</b>		6	g

**TO-247 AD**


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

### Features

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

### Advantages

- High Power Density
- Low Gate Drive Requirement

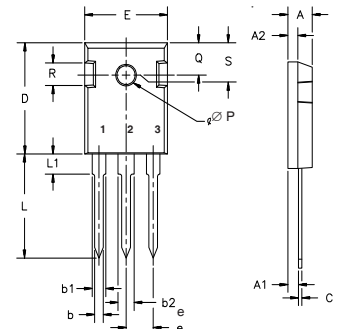
### Applications

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

Symbol	Test Conditions ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	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		V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ $T_J = 125^\circ C$			50 $\mu A$ 1 mA
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 50A$ , $V_{GE} = 15V$ $T_J = 125^\circ C$		2.10 1.65	2.50 V V

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 50\text{A}$ , $V_{CE} = 10\text{V}$ , Note 1	33	55	S
$C_{ies}$	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$		4780	pF
$C_{oes}$			330	pF
$C_{res}$			117	pF
$Q_g$	$I_C = 50\text{A}$ , $V_{GE} = 15\text{V}$ , $V_{CE} = 0.5 \cdot V_{CES}$		174	nC
$Q_{ge}$			33	nC
$Q_{gc}$			72	nC
$t_{d(on)}$	<b>Inductive Load, <math>T_J = 25^\circ\text{C}</math></b>		27	ns
$t_{ri}$			37	ns
$E_{on}$	$I_C = 50\text{A}$ , $V_{GE} = 15\text{V}$		1.03	mJ
$t_{d(off)}$	$V_{CE} = 480\text{V}$ , $R_G = 2\Omega$ , Note 2		77	ns
$t_{fi}$			55	ns
$E_{off}$			0.48	0.95 mJ
$t_{d(on)}$	<b>Inductive Load, <math>T_J = 125^\circ\text{C}</math></b>		26	ns
$t_{ri}$			36	ns
$E_{on}$	$I_C = 50\text{A}$ , $V_{GE} = 15\text{V}$		1.48	mJ
$t_{d(off)}$	$V_{CE} = 480\text{V}$ , $R_G = 2\Omega$ , Note 2		120	ns
$t_{fi}$			124	ns
$E_{off}$			0.93	mJ
$R_{thJC}$			0.23	$^\circ\text{C/W}$
$R_{thCK}$		0.21		$^\circ\text{C/W}$

### TO-247 (IXGH) Outline



Terminals: 1 - Gate      2 - Collector  
3 - Emitter      Tab - Collector

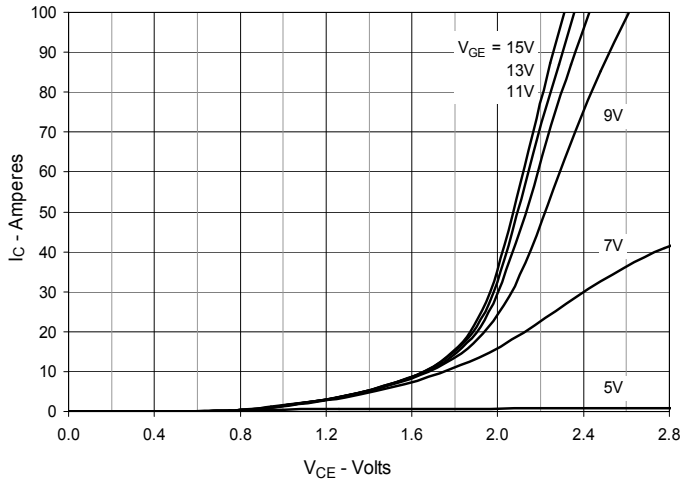
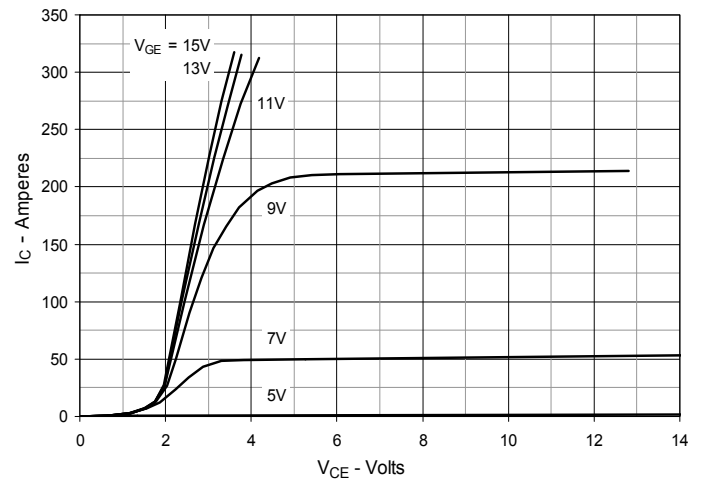
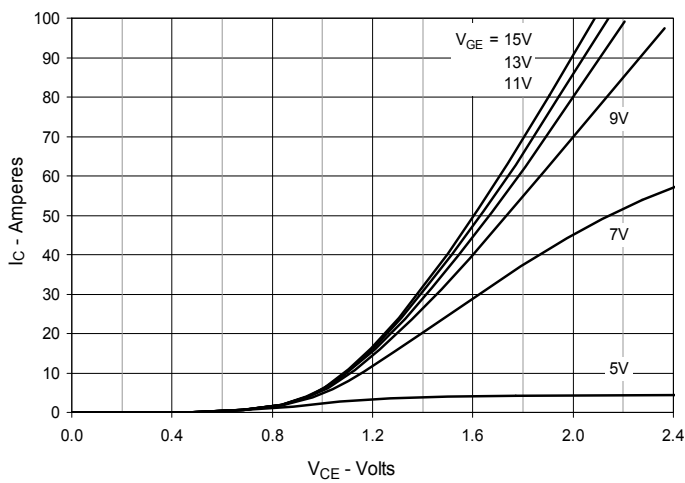
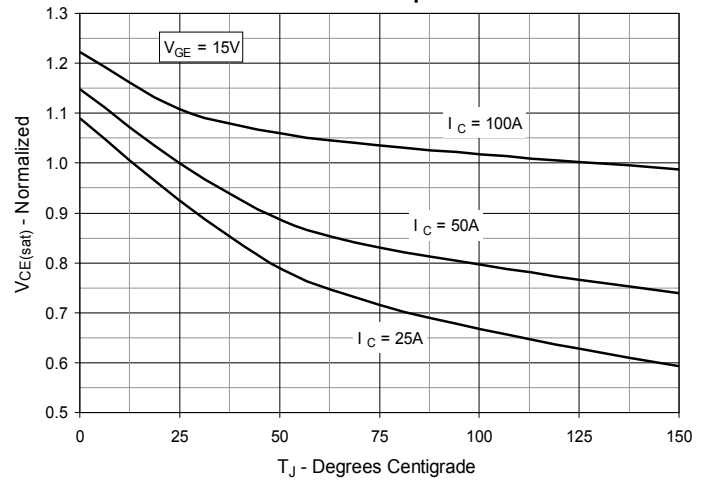
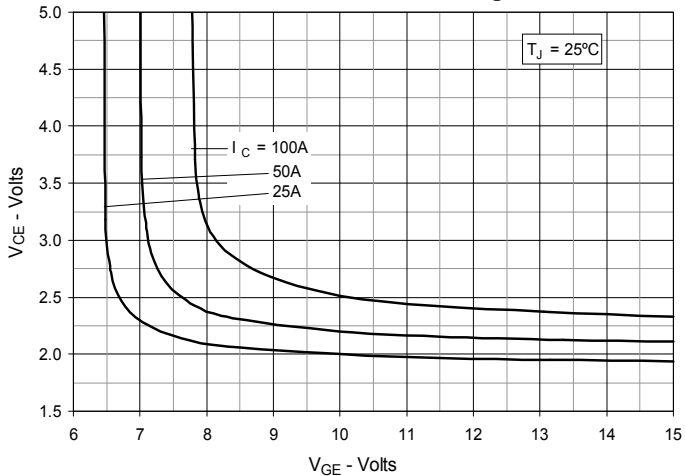
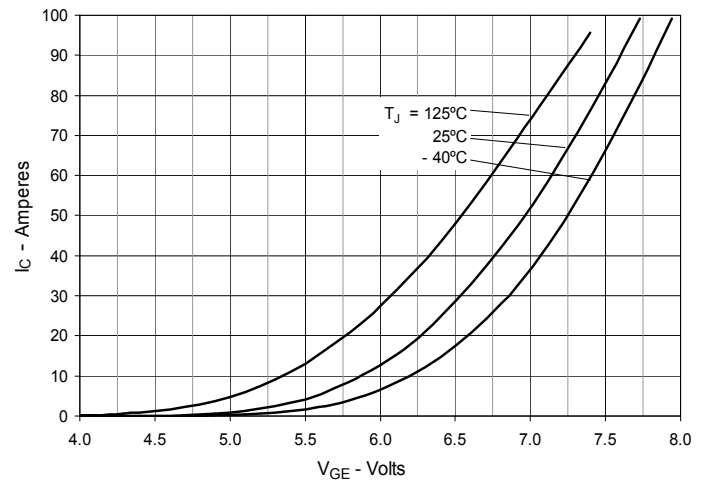
Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.7	5.3	.185	.209
A <sub>1</sub>	2.2	2.54	.087	.102
A <sub>2</sub>	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b <sub>1</sub>	1.65	2.13	.065	.084
b <sub>2</sub>	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	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

#### Notes:

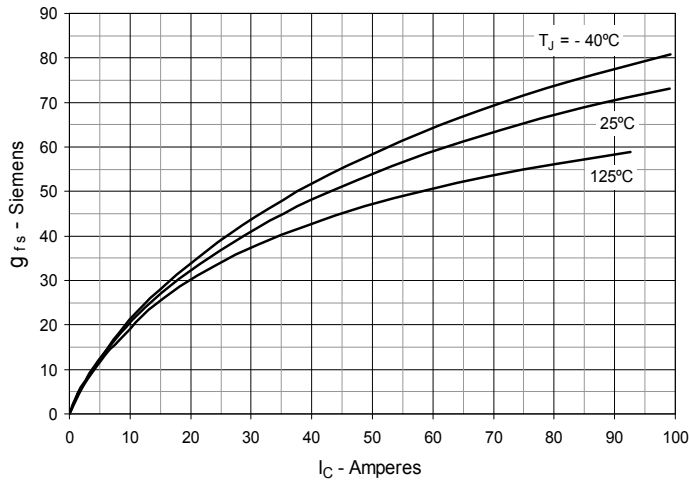
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Switching times & energy losses may increase for higher  $V_{CE}$  (Clamp),  $T_J$  or  $R_G$ .

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

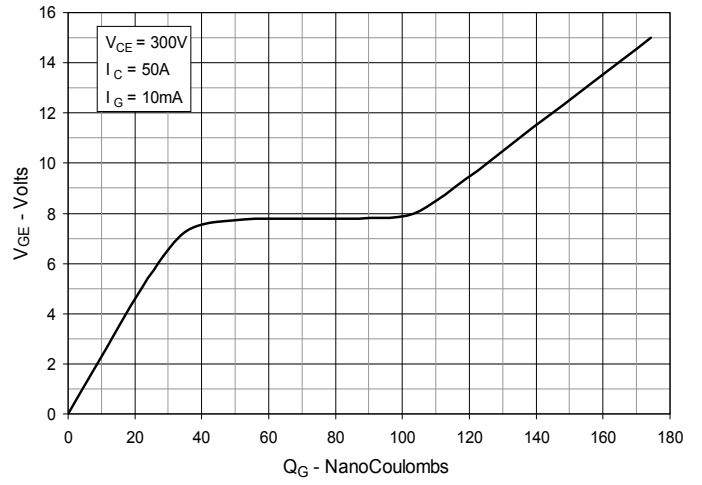
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	4,931,844	5,049,961	5,237,481	6,162,665	6,404,065 B1	6,683,344	6,727,585	7,005,734 B2	7,157,338B2
	4,850,072	5,017,508	5,063,307	5,381,025	6,259,123 B1	6,534,343	6,710,405 B2	6,759,692	7,063,975 B2	
	4,881,106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


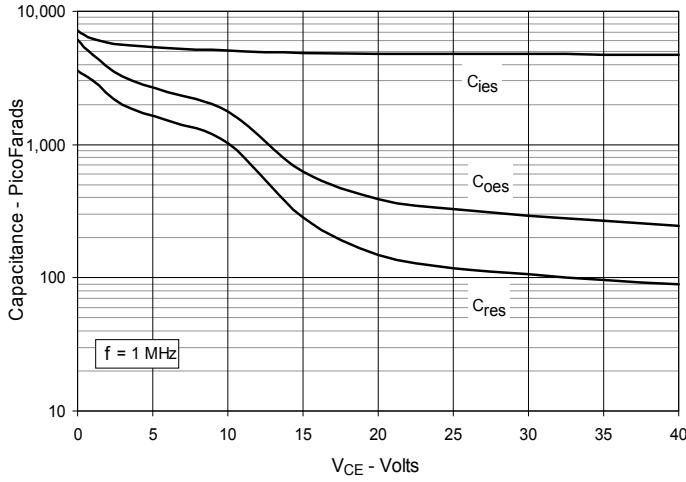
**Fig. 7. Transconductance**



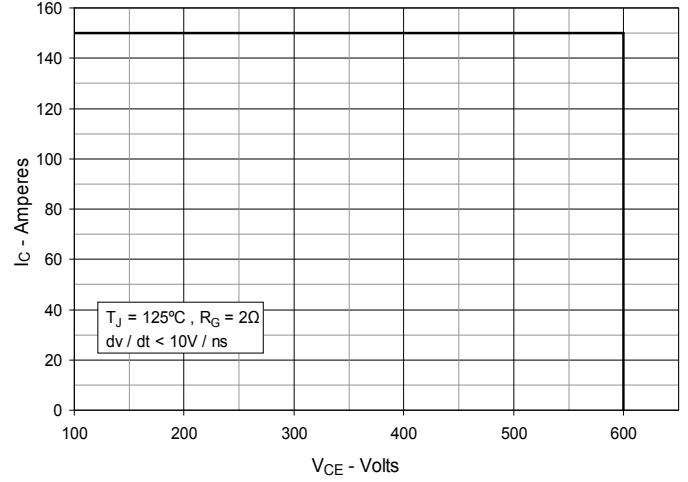
**Fig. 8. Gate Charge**



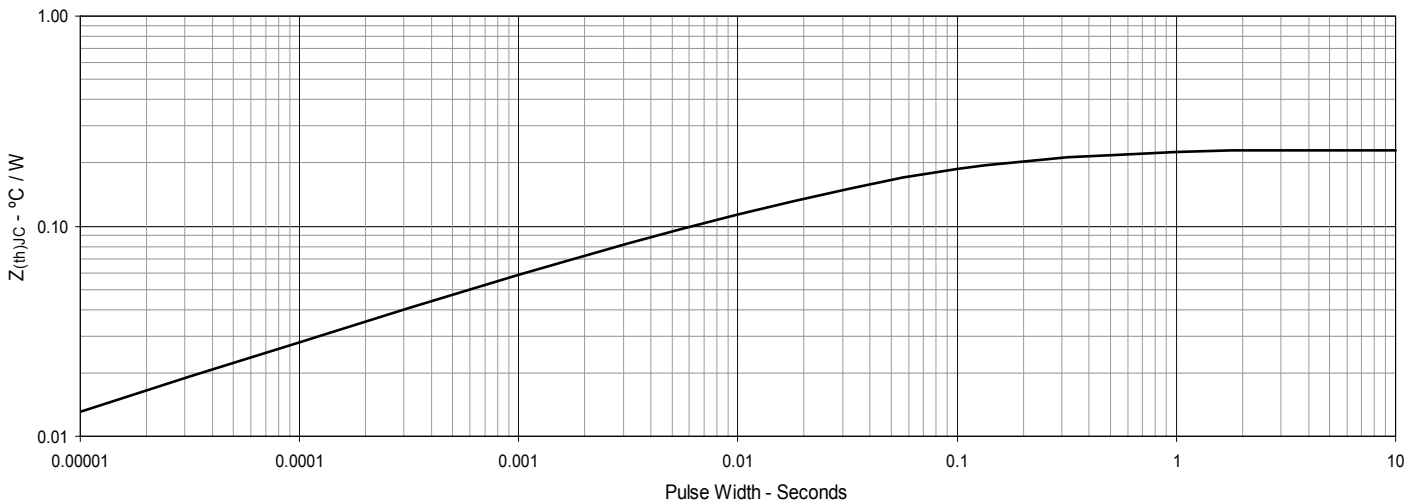
**Fig. 9. Capacitance**



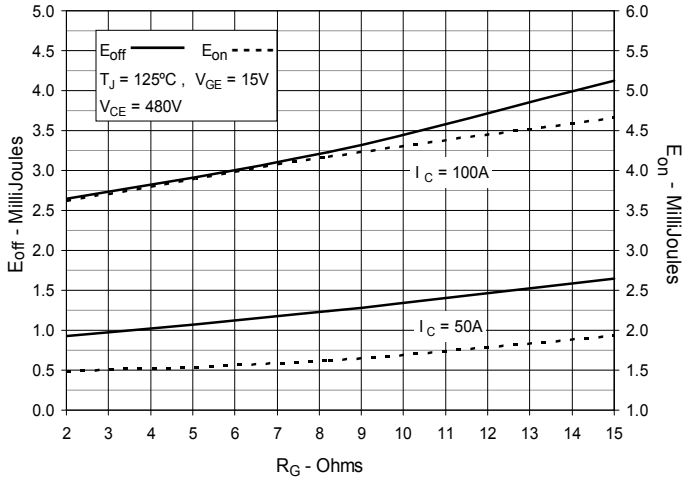
**Fig. 10. Reverse-Bias Safe Operating Area**



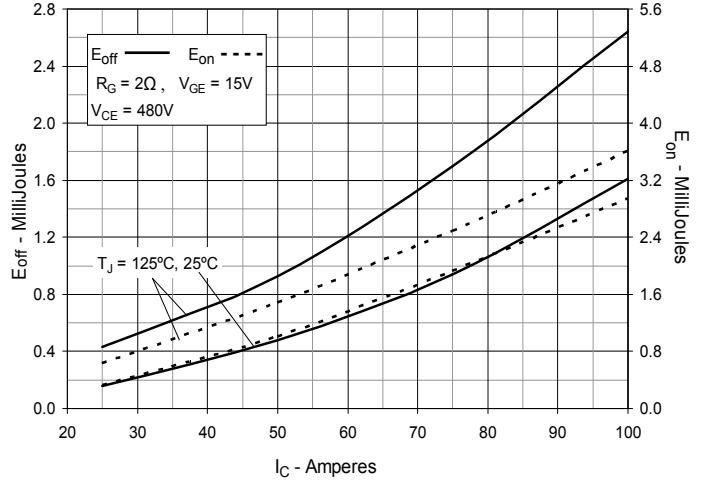
**Fig. 11. Maximum Transient Thermal Impedance**



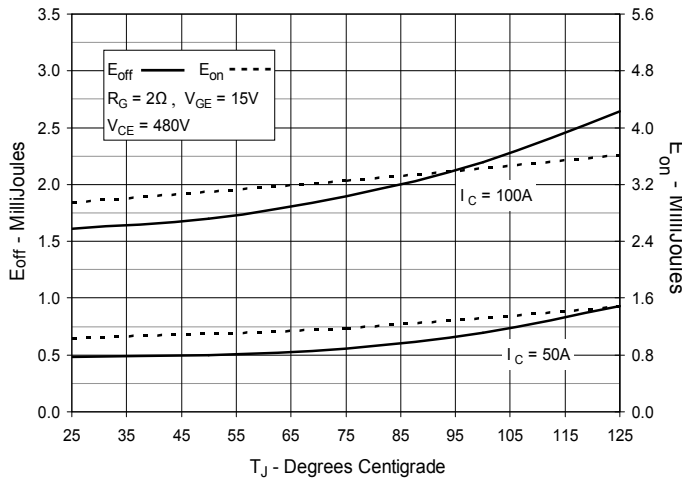
**Fig. 12. Inductive Switching  
Energy Loss vs. Gate Resistance**



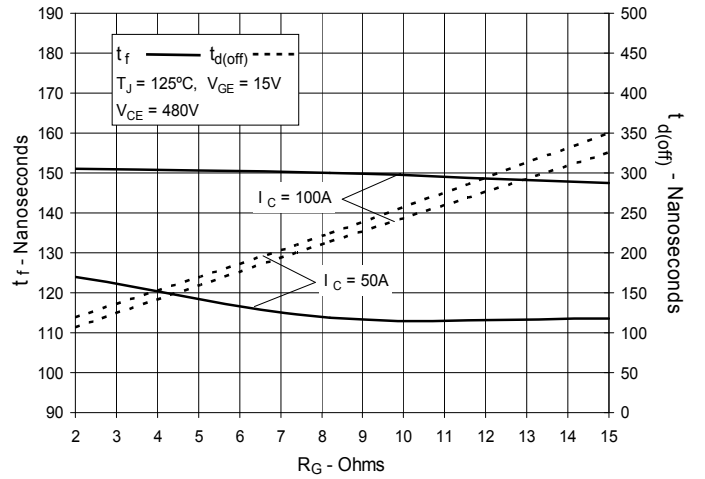
**Fig. 13. Inductive Switching  
Energy Loss vs. Collector Current**



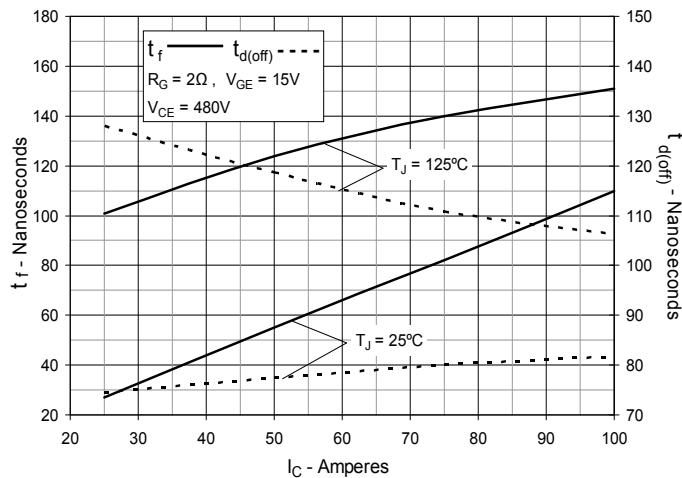
**Fig. 14. Inductive Switching  
Energy Loss vs. Junction Temperature**



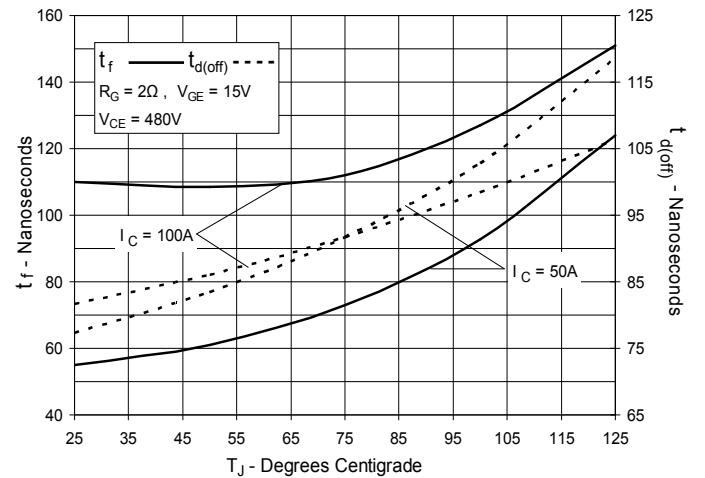
**Fig. 15. Inductive Turn-off  
Switching Times vs. Gate Resistance**



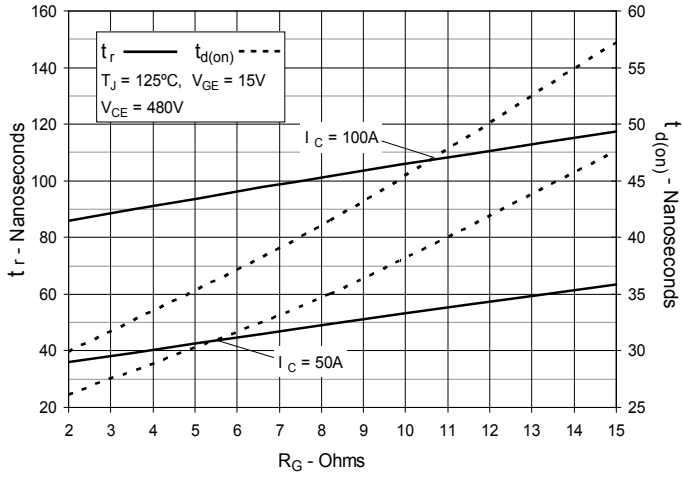
**Fig. 16. Inductive Turn-off  
Switching Times vs. Collector Current**



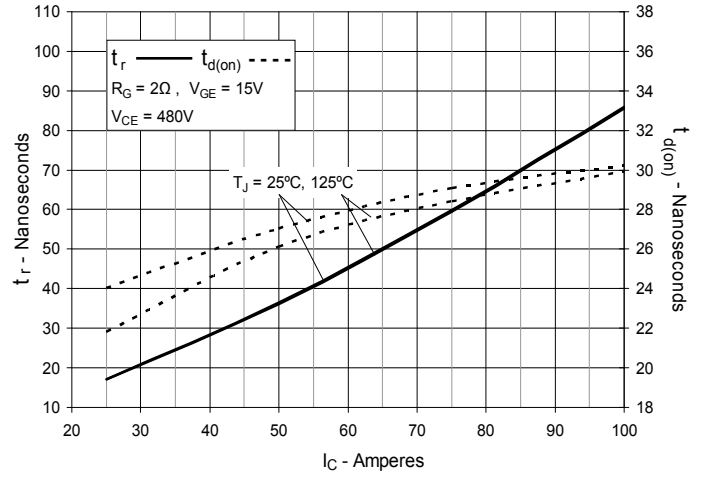
**Fig. 17. Inductive Turn-off  
Switching Times vs. Junction Temperature**



**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**

