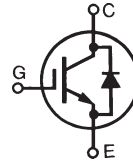


**HiPerFAST™ IGBTs**  
**C2-Class High Speed**  
**w/ Diode**

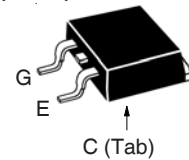
**IXGA16N60C2D1**  
**IXGP16N60C2D1**  
**IXGH16N60C2D1**

**V<sub>CES</sub> = 600V**  
**I<sub>C110</sub> = 16A**  
**V<sub>CE(sat)</sub> ≤ 3.0V**  
**t<sub>fi(typ)</sub> = 33ns**

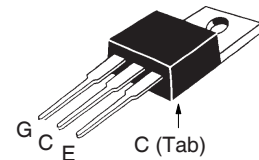


Symbol	Test Conditions	Maximum Ratings	
V <sub>CES</sub>	T <sub>J</sub> = 25°C to 150°C	600	V
V <sub>CGR</sub>	T <sub>J</sub> = 25°C to 150°C, R <sub>GE</sub> = 1MΩ	600	V
V <sub>GES</sub>	Continuous	±20	V
V <sub>GEM</sub>	Transient	±30	V
I <sub>C25</sub>	T <sub>C</sub> = 25°C	40	A
I <sub>C110</sub>	T <sub>C</sub> = 110°C	16	A
I <sub>F110</sub>	T <sub>C</sub> = 110°C	11	A
I <sub>CM</sub>	T <sub>C</sub> = 25°C, 1ms	100	A
<b>SSOA</b> <b>(RBSOA)</b>	V <sub>GE</sub> = 15V, T <sub>J</sub> = 125°C, R <sub>G</sub> = 22Ω Clamped Inductive load	I <sub>CM</sub> = 32 V <sub>CE</sub> ≤ V <sub>CES</sub>	A
P <sub>C</sub>	T <sub>C</sub> = 25°C	150	W
T <sub>J</sub>		-55 ... +150	°C
T <sub>JM</sub>		150	°C
T <sub>stg</sub>		-55 ... +150	°C
M <sub>d</sub>	Mounting Torque (TO-220 & TO-247)	1.13/10	Nm/lb.in.
F <sub>C</sub>	Mounting Force (TO-263)	10..65 / 2.2..14.6	N/lb.
T <sub>L</sub>	Maximum Lead Temperature for Soldering	300	°C
T <sub>SOLD</sub>	1.6mm (0.062 in.) from Case for 10s	260	°C
<b>Weight</b>	TO-263	2.5	g
	TO-220	3.0	g
	TO-247	6.0	g

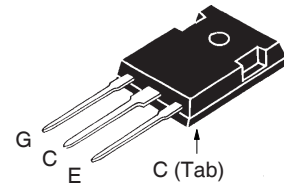
**TO-263 AA (IXGA)**



**TO-220AB (IXGP)**



**TO-247 (IXGH)**



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

**Features**

- Optimized for Low Switching Losses
- Square RBSOA
- Anti-Parallel Ultra Fast Diode
- 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 (T <sub>J</sub> = 25°C, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
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 1 mA
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> = 12A, V <sub>GE</sub> = 15V, Note1 T <sub>J</sub> = 125°C		1.8	3.0 V V

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 12\text{A}, V_{CE} = 10\text{V}$ , Note 1	8		S
$C_{ies}$ $C_{oes}$ $C_{res}$	} $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		657	pF
			72	pF
			22	pF
$Q_{g(on)}$ $Q_{ge}$ $Q_{gc}$	} $I_C = 12\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		25	nC
			5	nC
			13	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> $I_C = 12\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 22\Omega$ Note 2		16	ns
			17	ns
			0.16	mJ
			75	ns
			33	ns
			0.09	0.16 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> $I_C = 12\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 22\Omega$ Note 2		16	ns
			18	ns
			0.27	mJ
			115	ns
			100	ns
			0.27	mJ
$R_{thJC}$ $R_{thCK}$	TO-220 TO-247		0.83 $^\circ\text{C/W}$ 0.50 $^\circ\text{C/W}$ 0.21 $^\circ\text{C/W}$	

**Reverse Diode (FRED)**

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 10\text{A}, V_{GE} = 0\text{V}$ , Note 1 $T_J = 125^\circ\text{C}$		1.7	3.0 V V
$I_{RM}$ $t_{rr}$ $t_{rr}$	} $I_F = 12\text{A}, V_{GE} = 0\text{V}$ , $-di_F/dt = 100\text{A}/\mu\text{s}, V_R = 100\text{V}, T_J = 125^\circ\text{C}$		2.5	A
		$I_F = 1\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 100\text{A}/\mu\text{s}, V_R = 30\text{V}$		110
			30	ns
$R_{thJC}$				2.5 $^\circ\text{C/W}$

**Notes:**

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

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



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

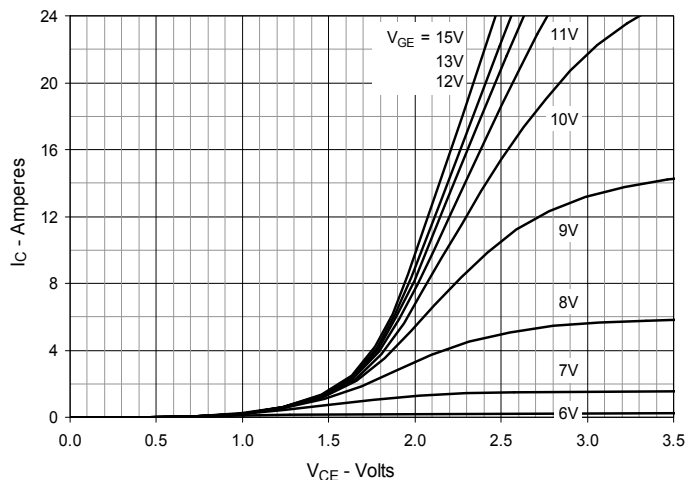


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

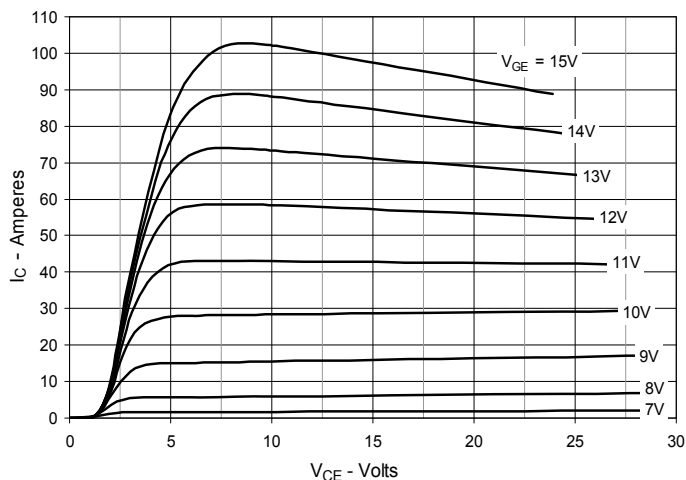


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

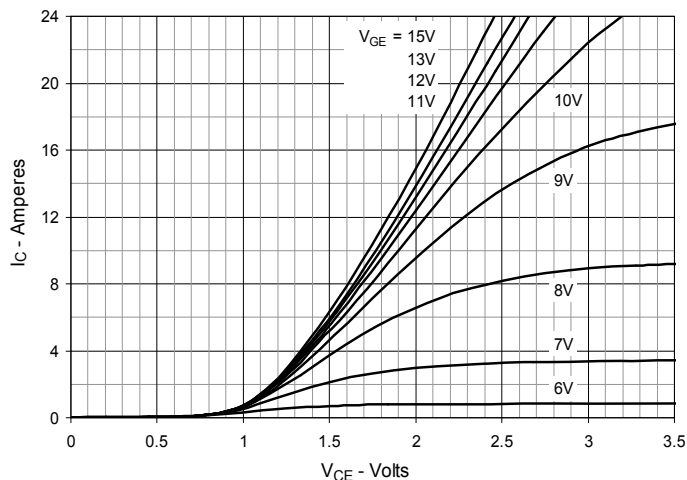


Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature

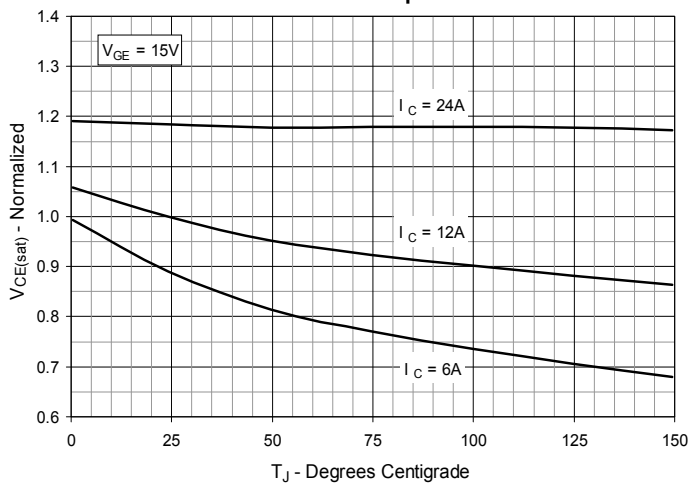


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

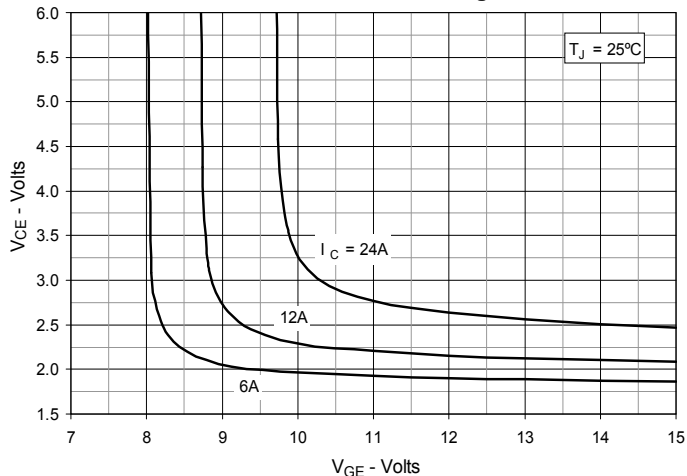


Fig. 6. Input Admittance

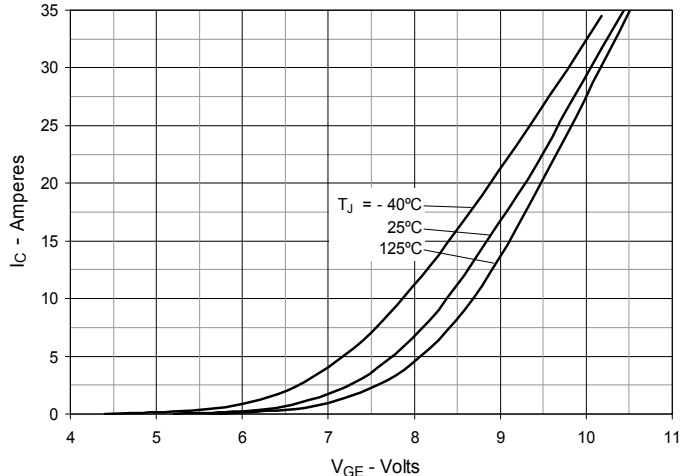


Fig. 7. Transconductance

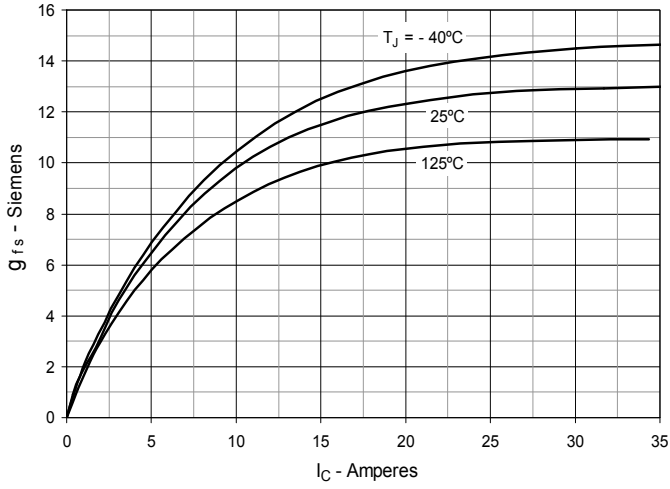


Fig. 8. Gate Charge

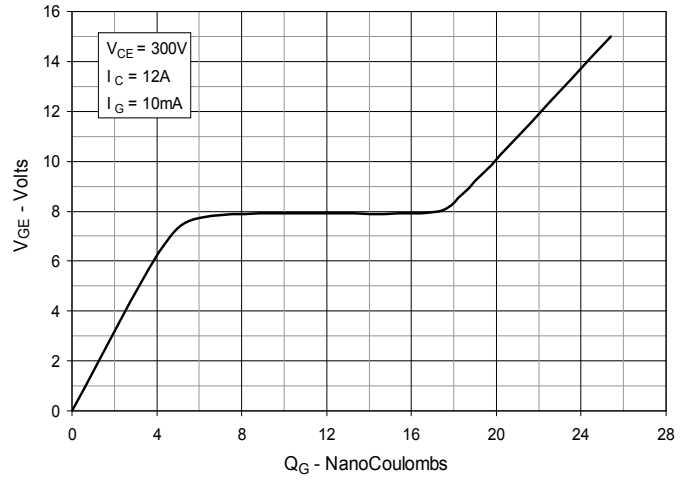


Fig. 9. Capacitance

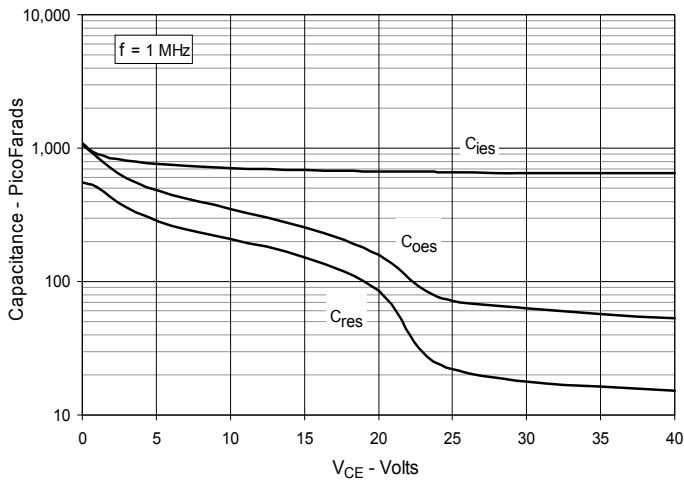


Fig. 10. Reverse-Bias Safe Operating Area

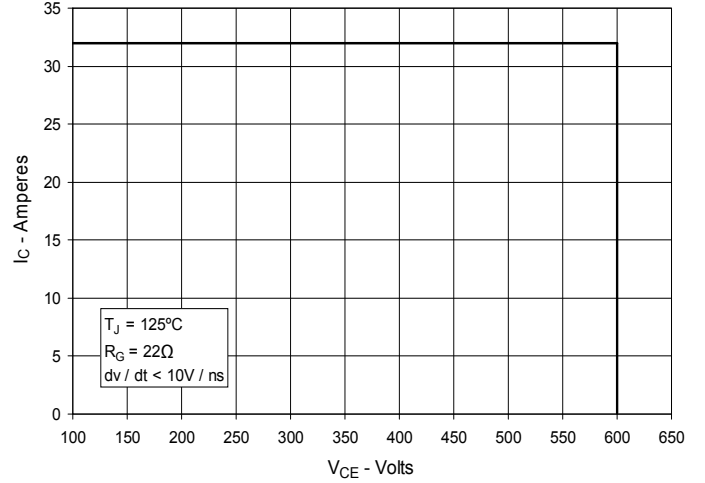
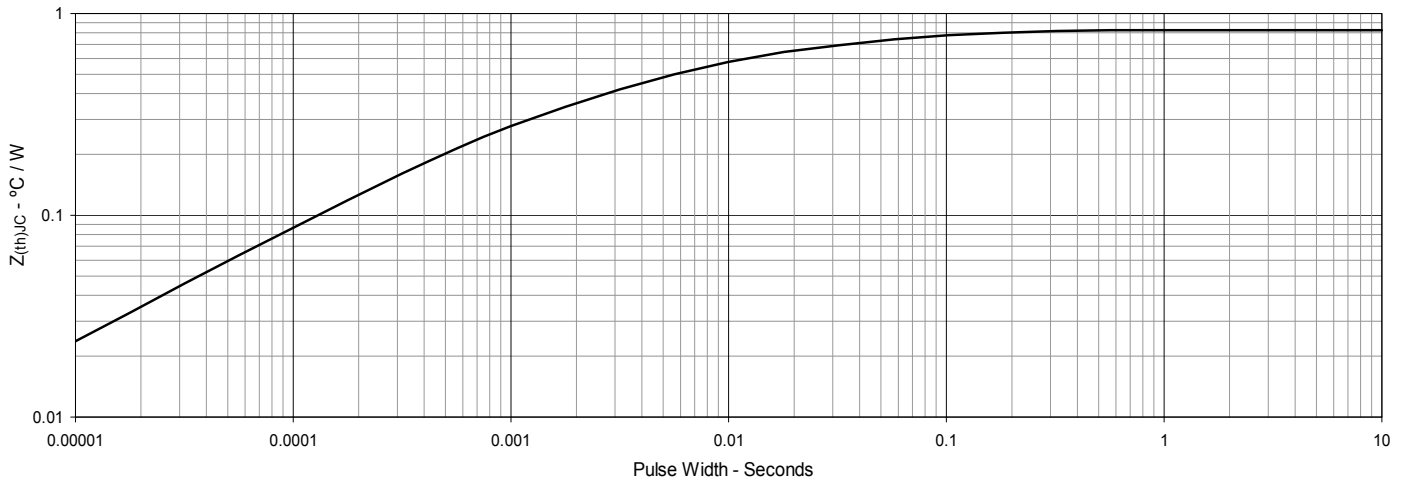
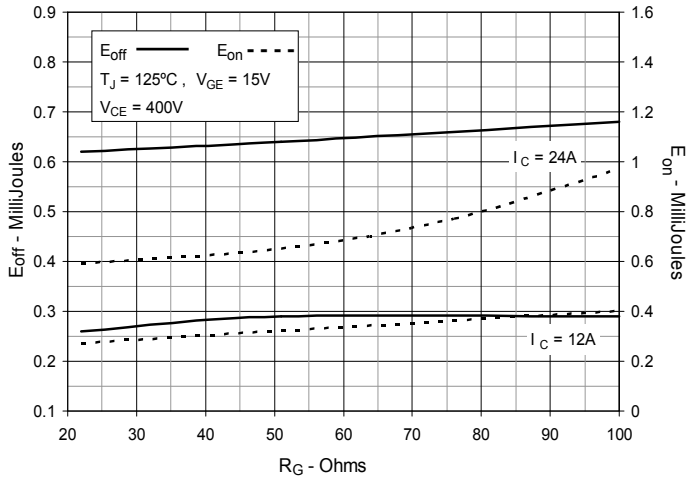


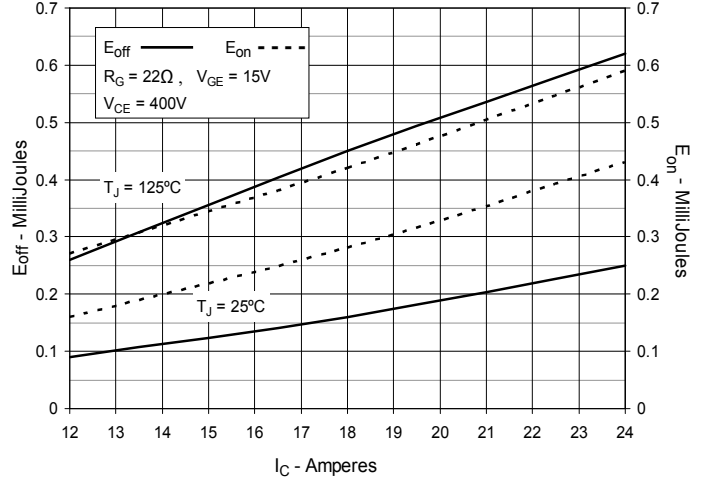
Fig. 11. Maximum Transient Thermal Impedance



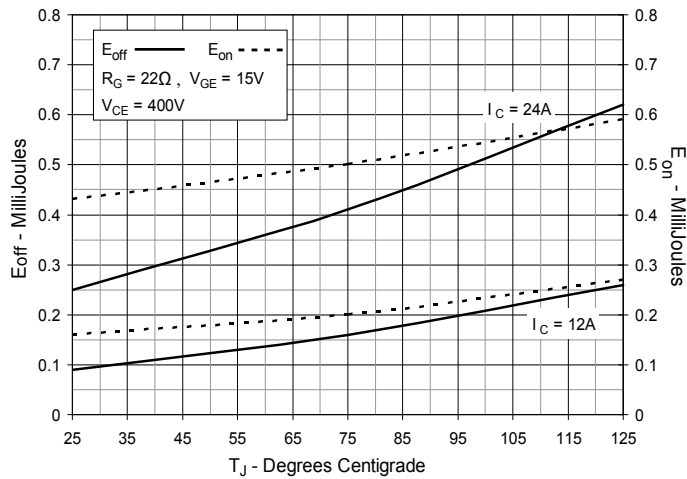
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



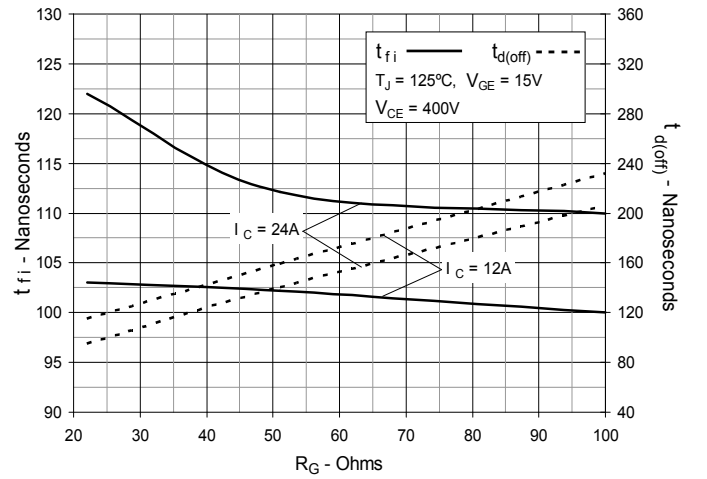
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



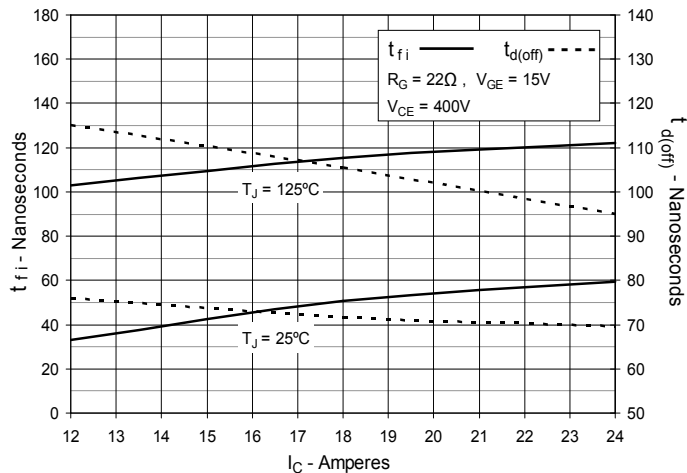
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



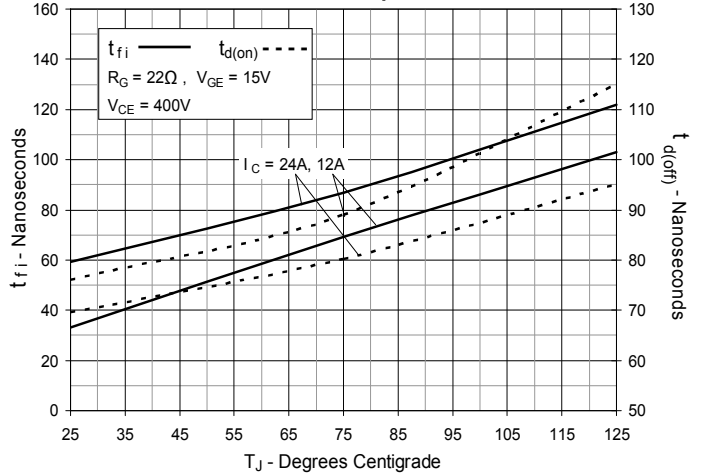
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



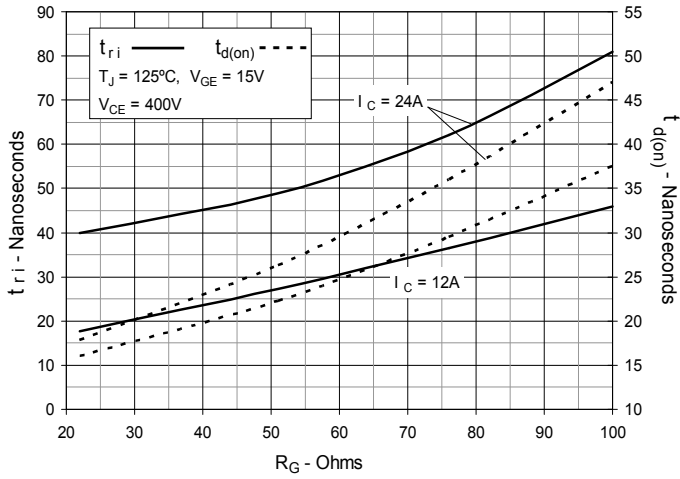
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



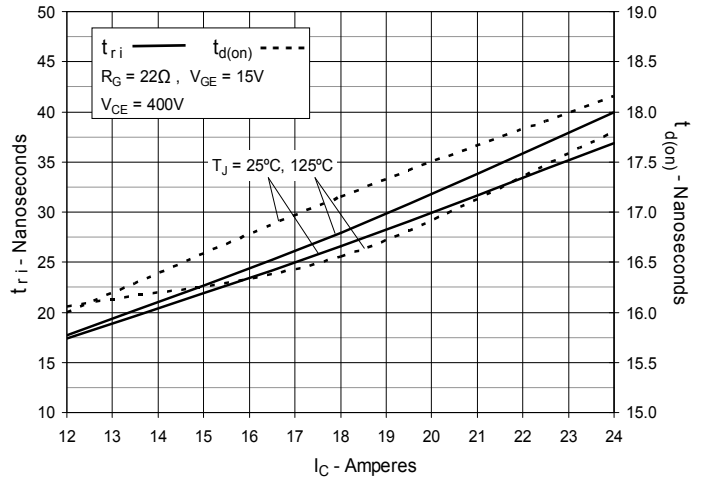
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



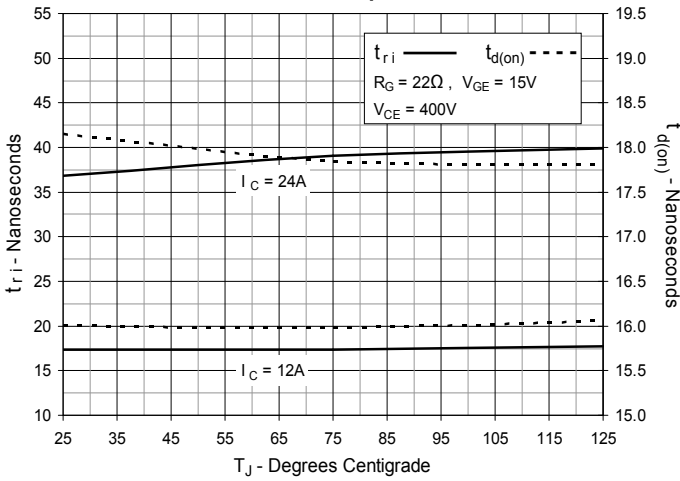
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



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



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





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