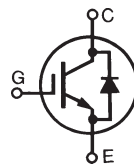


# GenX3™ 1400V IGBTs w/ Diode

**IXGH28N140B3H1**  
**IXGX28N140B3H1**  
**IXGK28N140B3H1**

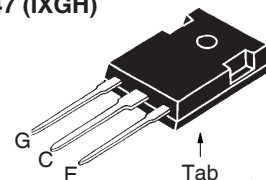
**$V_{CES} = 1400V$**   
 **$I_{C110} = 28A$**   
 **$V_{CE(sat)} \leq 3.60V$**

Avalanche Rated

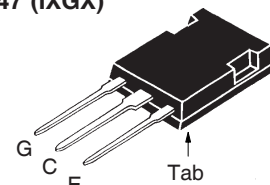


Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ C$ to $150^\circ C$	1400	V
$V_{CGR}$	$T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$	1400	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ C$	60	A
$I_{C110}$	$T_C = 110^\circ C$	28	A
$I_{F110}$	$T_C = 110^\circ C$	15	A
$I_{CM}$	$T_C = 25^\circ C$ , 1ms	150	A
$I_A$	$T_C = 25^\circ C$	28	A
$E_{AS}$	$T_C = 25^\circ C$	360	mJ
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 5\Omega$ Clamped Inductive Load	$I_{CM} = 120$ @ $V_{CES} < V_{CE}$	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	$^\circ C$
$T_L$	Maximum Lead Temperature for Soldering	300	$^\circ C$
$T_{SOLD}$	1.6 mm (0.062 in.) from Case for 10	260	$^\circ C$
$M_d$	Mounting Torque (IXGH & IXGK)	1.13/10	Nm/lb.in.
$F_C$	Mounting Force (IXGX)	20..120/4.5..27	N/lb.
<b>Weight</b>	TO-247 & PLUS247	6	g
	TO-264	10	g

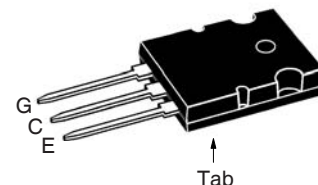
TO-247 (IXGH)



PLUS247 (IXGX)



TO-264 (IXGK)



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

## Features

- Optimized for Low Conduction and Switching Losses
- Square RBSOA
- Avalanche Rated
- Anti-Parallel Ultra Fast Diode
- High Current Handling Capability

## Advantages

- High Power Density
- Low Gate Drive Requirement

## Applications

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

Symbol	Test Conditions ( $T_J = 25^\circ C$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 250\mu A$ , $V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0V$ Note 2, $T_J = 125^\circ C$			50 $\mu A$ 1 mA
$I_{GES}$	$V_{CE} = 0V$ , $V_{GE} = \pm 20V$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = I_{C110}$ , $V_{GE} = 15V$ , Note 1 $T_J = 125^\circ C$		3.00 3.05	3.60 V

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = I_{C110}, V_{CE} = 10\text{V}$ , Note 1	12	19	S
$C_{ies}$	$V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{ MHz}$		1830	pF
$C_{oes}$			163	pF
$C_{res}$			46	pF
$Q_{g(on)}$	$I_C = I_{C110}, V_{GE} = 15\text{V}$ , $V_{CE} = 0.5 \cdot V_{CES}$		88	nC
$Q_{ge}$			12	nC
$Q_{gc}$			38	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = I_{C110}, V_{GE} = 15\text{V}$ $V_{CE} = 960\text{V}$ , $R_G = 5\Omega$ Note 3		16	ns
$t_{ri}$			36	ns
$E_{on}$			3.6	mJ
$t_{d(off)}$			190	400 ns
$t_{fi}$			360	ns
$E_{off}$			3.9	6.5 J
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = I_{C110}, V_{GE} = 15\text{V}$ $V_{CE} = 960\text{V}$ , $R_G = 5\Omega$ Note 3		16	ns
$t_{ri}$			50	ns
$E_{on}$			7.3	mJ
$t_{d(off)}$			215	ns
$t_{fi}$			700	ns
$E_{off}$			6.5	mJ
$R_{thJC}$			0.42	$^\circ\text{C/W}$
$R_{thCs}$		0.21		$^\circ\text{C/W}$
		0.15		$^\circ\text{C/W}$

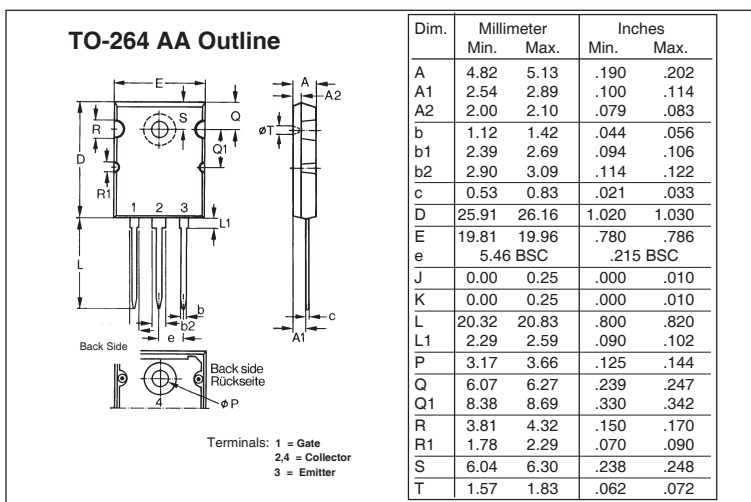
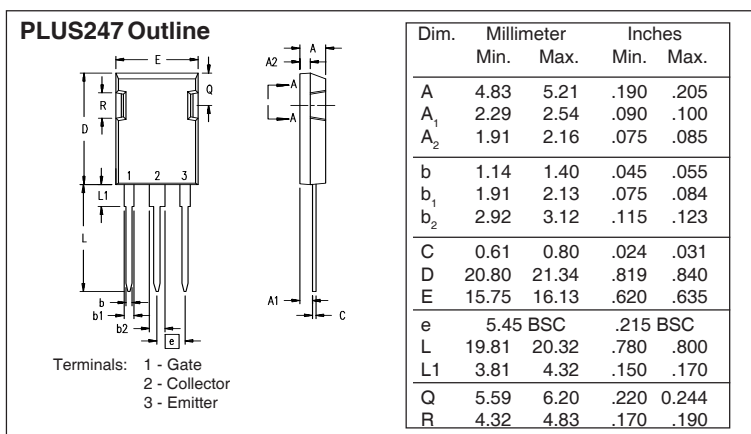
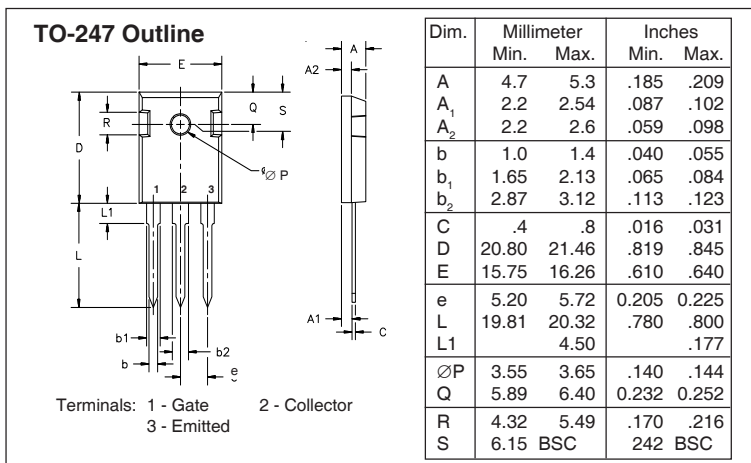
**Reverse Diode (FRED)**

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_F$	$I_F = 20\text{A}$ , $V_{GE} = 0\text{V}$ , Note 1 $T_J = 150^\circ\text{C}$		2.65	3.0 V V
$t_{rr}$	$I_F = 20\text{A}$ , $V_{GE} = 0\text{V}$ , $-di_F/dt = -200\text{A}/\mu\text{s}$ , $V_R = 1200\text{V}$ , $T_J = 125^\circ\text{C}$		350	ns
$I_{RM}$			18.5	A
$R_{thJC}$				0.90 $^\circ\text{C/W}$

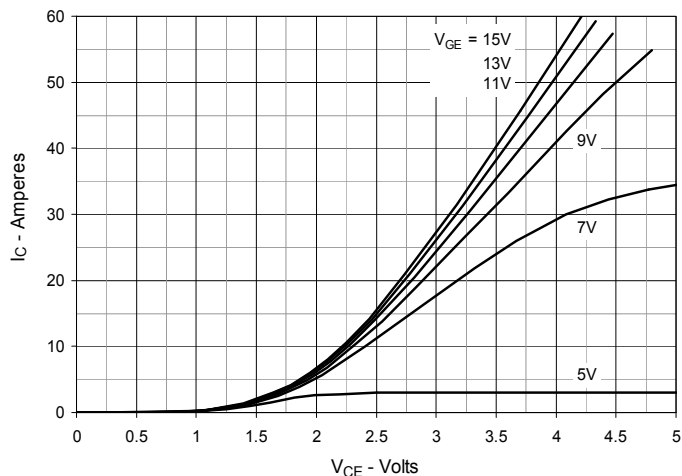
**Notes:**

1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Part must be heatsunk for high-temp  $I_{ces}$  measurement.
3. Switching times & energy losses may increase for higher  $V_{CE}$  (Clamp),  $T_J$  or  $R_G$ .

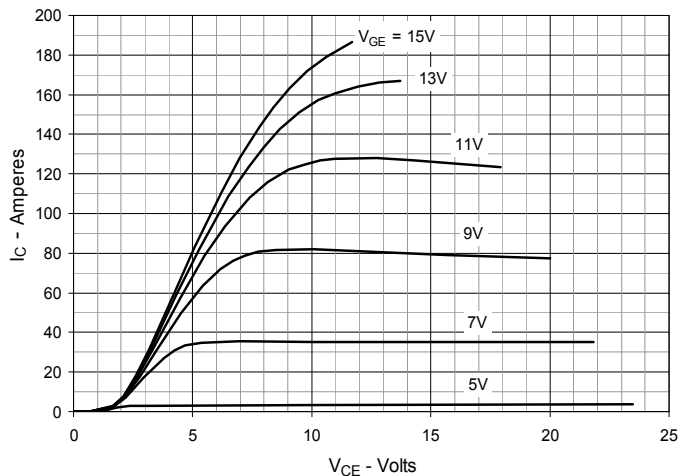
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.



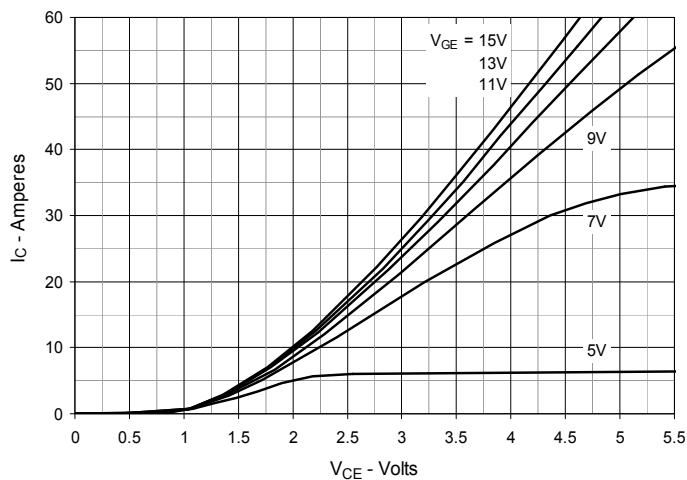
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



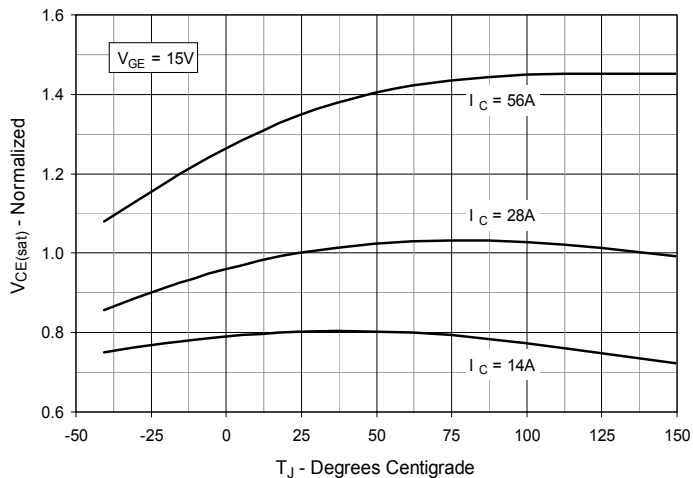
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



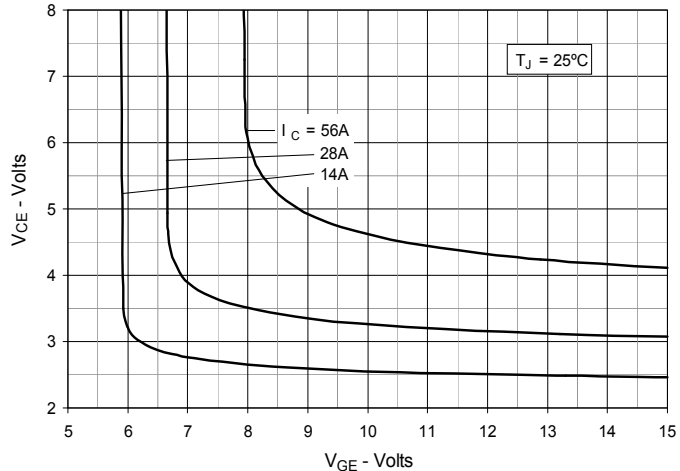
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



**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**

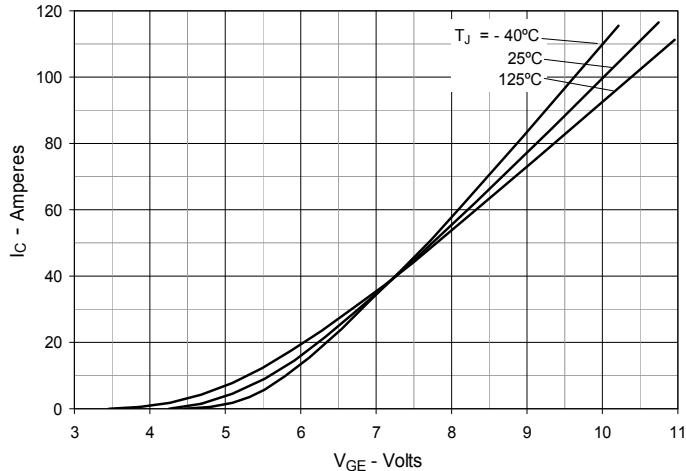


Fig. 7. Transconductance

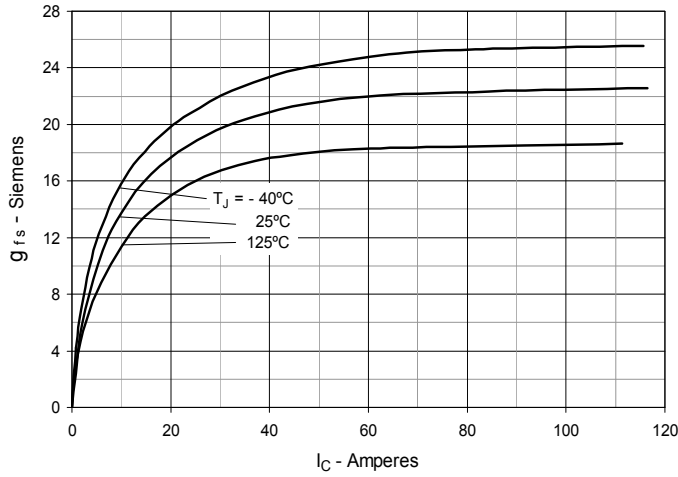


Fig. 8. Gate Charge

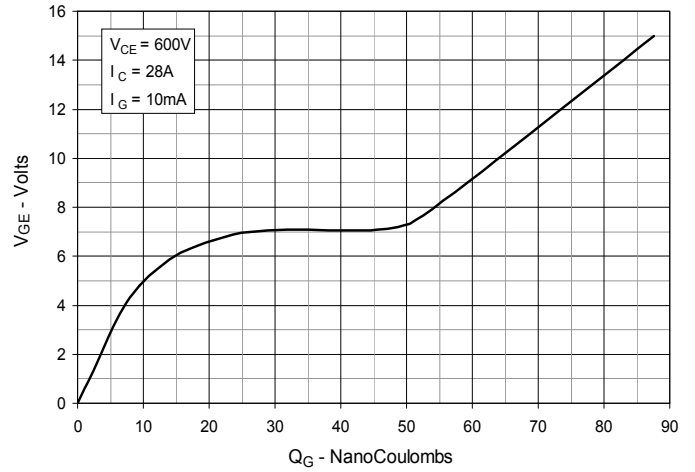


Fig. 9. Capacitance

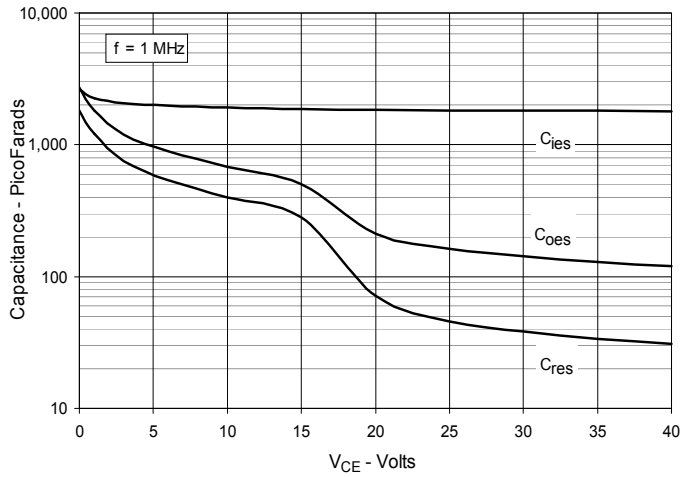


Fig. 10. Reverse-Bias Safe Operating Area

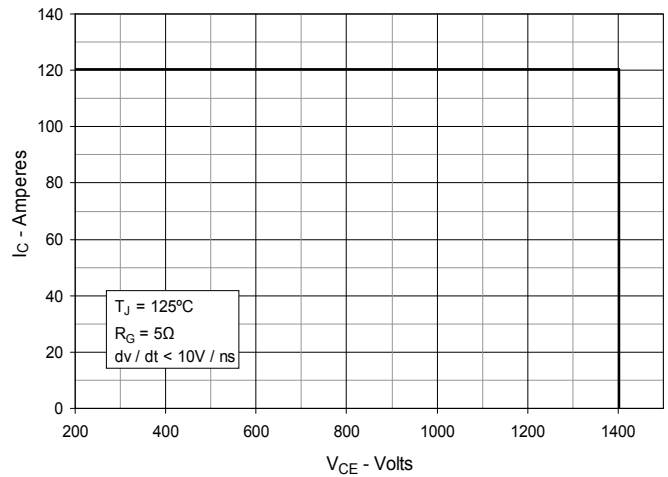
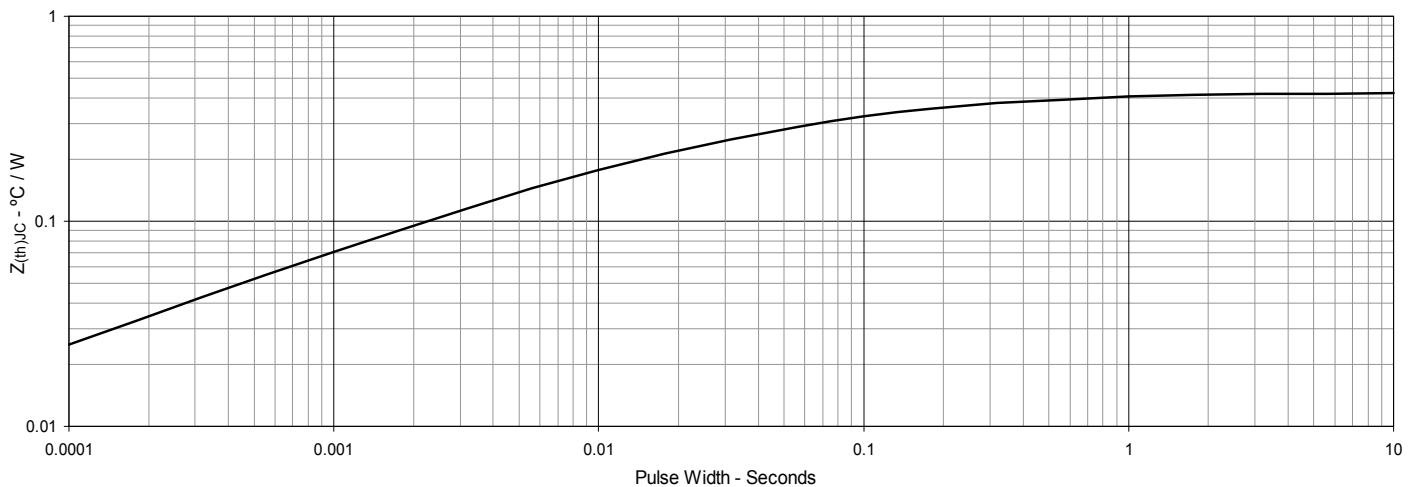
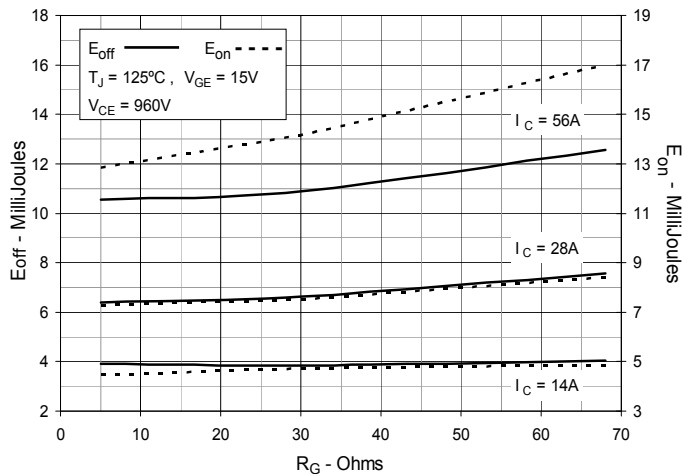


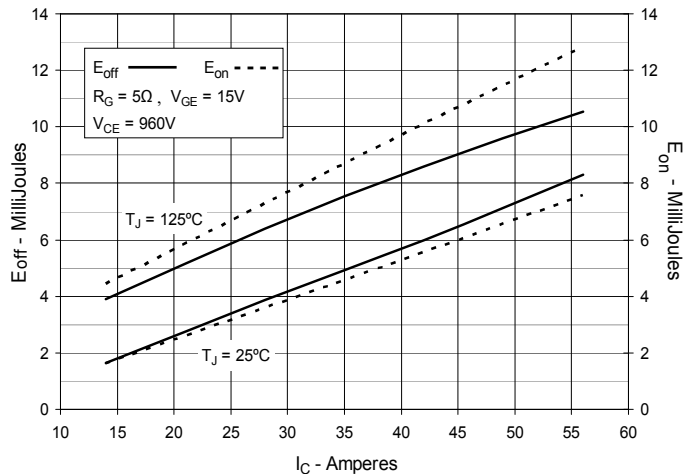
Fig. 11. Maximum Transient Thermal Impedance



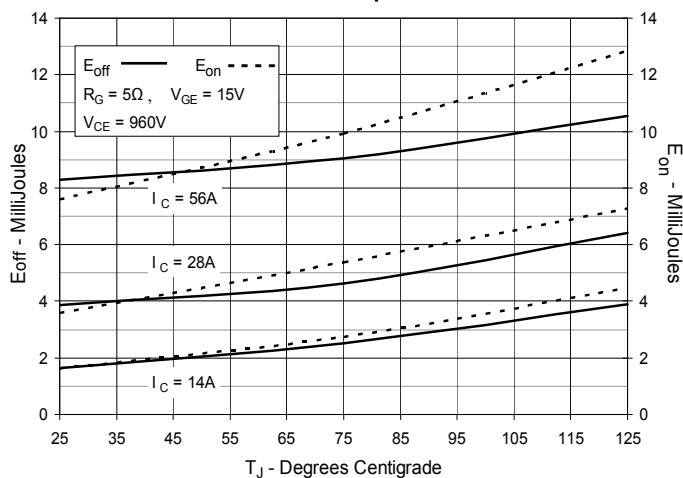
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



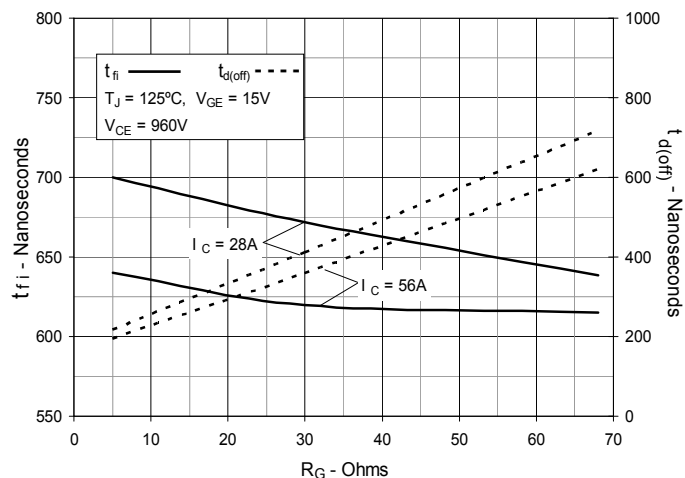
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



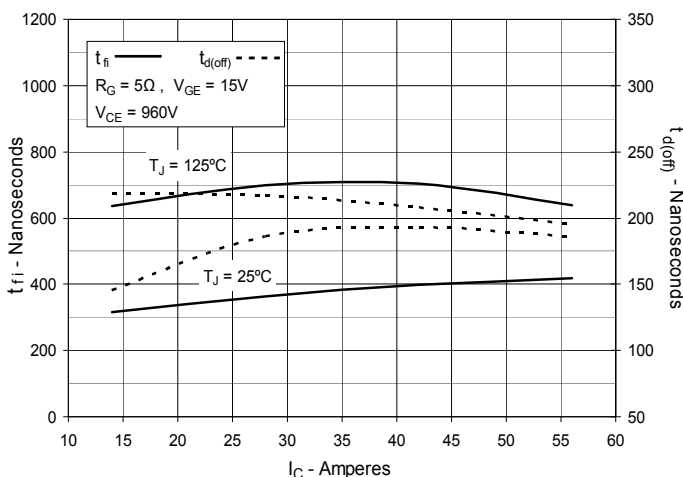
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



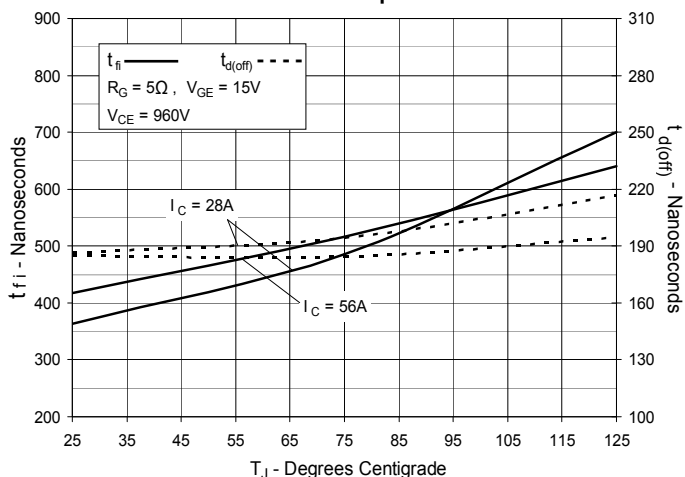
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



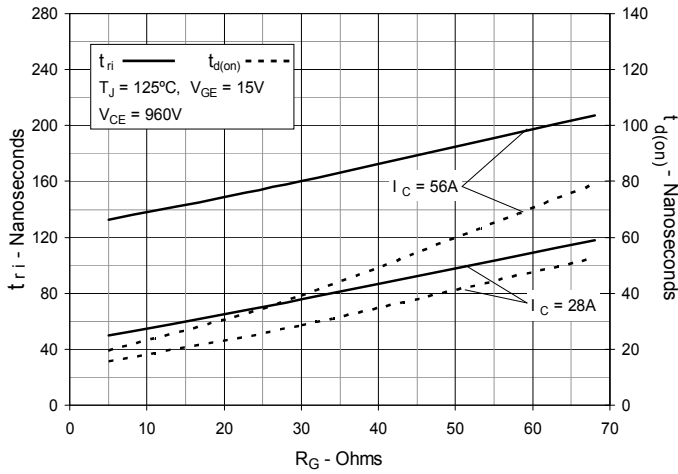
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



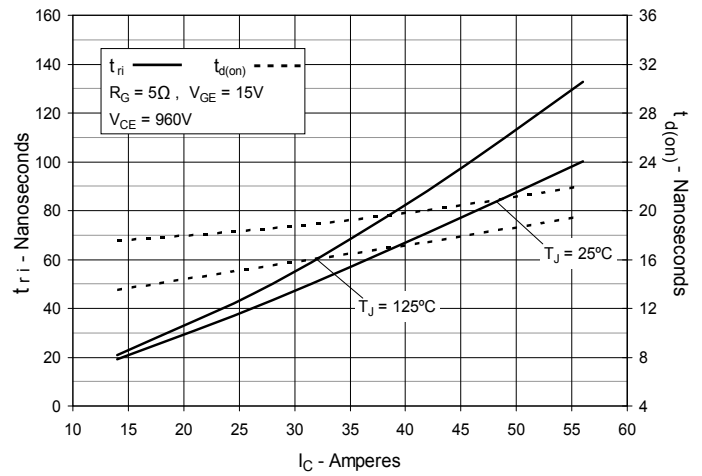
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



**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**

