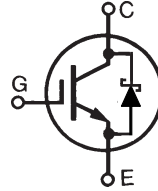


## GenX3™ 600V IGBTs w/ SiC Anti-Parallel Diode

**IXGA30N60C3C1\***  
**IXGP30N60C3C1**  
**IXGH30N60C3C1**

\*Obsolete Part Number



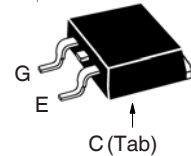
High-Speed PT IGBTs for  
40 - 100kHz Switching

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_C = 25^\circ\text{C}$ to $150^\circ\text{C}$	600	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GE} = 1\text{M}\Omega$	600	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$	60	A
$I_{C110}$	$T_C = 110^\circ\text{C}$	30	A
$I_{F110}$	$T_C = 110^\circ\text{C}$	13	A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1ms	150	A
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15\text{V}$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 5\Omega$ Clamped Inductive Load	$I_{CM} = 60$ @ $\leq V_{CES}$	A
$P_C$	$T_C = 25^\circ\text{C}$	220	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$T_L$	1.6mm (0.062 in.) from Case for 10s	300	$^\circ\text{C}$
$T_{SOLD}$	Plastic Body for 10 seconds	260	$^\circ\text{C}$
$M_d$	Mounting Torque (TO-220 & TO-247)	1.13/10	Nm/lb.in.
<b>Weight</b>	TO-263	2.5	g
	TO-220	3.0	g
	TO-247	6.0	g

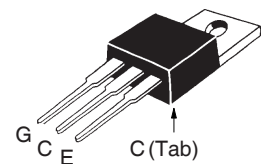
Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 250\mu\text{A}$ , $V_{CE} = V_{GE}$	3.0		5.5 V
$I_{CES}$	$V_{CE} = V_{CES}$ , $V_{GE} = 0\text{V}$ $T_J = 125^\circ\text{C}$			25 $\mu\text{A}$ 300 $\mu\text{A}$
$I_{GES}$	$V_{CE} = 0\text{V}$ , $V_{GE} = \pm 20\text{V}$			$\pm 100$ nA
$V_{CE(sat)}$	$I_C = 20\text{A}$ , $V_{GE} = 15\text{V}$ , Note 1 $T_J = 125^\circ\text{C}$		2.6 1.8	V V

$V_{CES} = 600\text{V}$   
 $I_{C110} = 30\text{A}$   
 $V_{CE(sat)} \leq 3.0\text{V}$   
 $t_{fi(typ)} = 47\text{ns}$

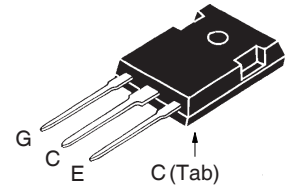
TO-263 AA (IXGA)



TO-220AB (IXGP)



TO-247 (IXGH)



G = Gate      D = Collector  
S = Emitter    Tab = Collector

### Features

- Optimized for Low Switching Losses
- Square RBSOA
- Anti-Parallel Schottky Diode
- International Standard Packages

### 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 ( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 20\text{A}, V_{CE} = 10\text{V}$ , Note 1	9	16	S
$C_{ies}$	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		1075	pF
$C_{oes}$			196	pF
$C_{res}$			29	pF
$Q_g$	$I_C = 20\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		38	nC
$Q_{ge}$			8	nC
$Q_{gc}$			17	nC
$t_{d(on)}$	<b>Inductive Load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 20\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 300\text{V}, R_G = 5\Omega$ Note 2		17	ns
$t_{ri}$			20	ns
$E_{on}$			0.12	mJ
$t_{d(off)}$			42	75 ns
$t_{fi}$			47	ns
$E_{off}$			0.09	0.18 mJ
$t_{d(on)}$	<b>Inductive Load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = 20\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 300\text{V}, R_G = 5\Omega$ Note 2		16	ns
$t_{ri}$			21	ns
$E_{on}$			0.16	mJ
$t_{d(off)}$			70	ns
$t_{fi}$			90	ns
$E_{off}$			0.33	mJ
$R_{thJC}$			0.56	$^\circ\text{C/W}$
$R_{thCS}$	TO-220	0.50		$^\circ\text{C/W}$
	TO-247	0.21		$^\circ\text{C/W}$

### Reverse Diode (SiC)

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 $T_J = 125^\circ\text{C}$		1.65 1.80	V V
$R_{thJC}$				1.10 $^\circ\text{C/W}$

### Notes

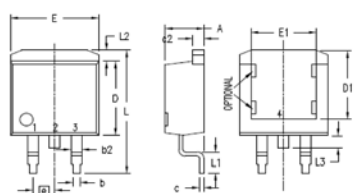
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Switching times & energy losses may increase for higher  $V_{CE}(\text{Clamp})$ ,  $T_J$  or  $R_G$ .

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

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	7,157,338 B2
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	

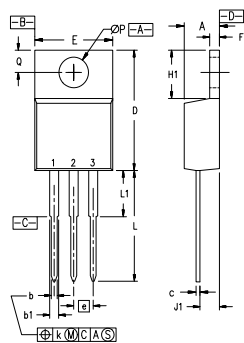
## TO-263 (IXGA) Outline



Pins:  
1 - Gate  
2, 4 - Collector  
3 - Emitter

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.160	.190	4.06	4.83
A1	.080	.110	2.03	2.79
b	.020	.039	0.51	0.99
b2	.045	.055	1.14	1.40
c	.016	.029	0.40	0.74
c2	.045	.055	1.14	1.40
D	.340	.380	8.64	9.65
D1	.315	.350	8.00	8.89
E	.380	.410	9.65	10.41
E1	.245	.320	6.22	8.13
e	.100 BSC		2.54 BSC	
L	.575	.625	14.61	15.88
L1	.090	.110	2.29	2.79
L2	.040	.055	1.02	1.40
L3	.050	.070	1.27	1.78
L4	0	.005	0	0.13

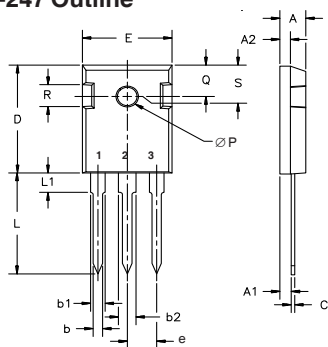
## TO-220 (IXGP) Outline



Pins: 1 - Gate  
2, 4 - Collector  
3 - Emitter

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
ØP	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

## TO-247 Outline



Pins: 1 - Gate  
2 - Collector  
3 - Emitter

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
ØP	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216

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

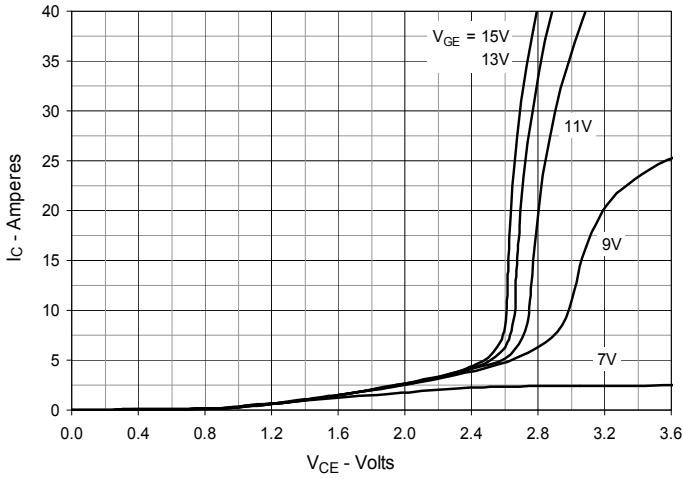


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

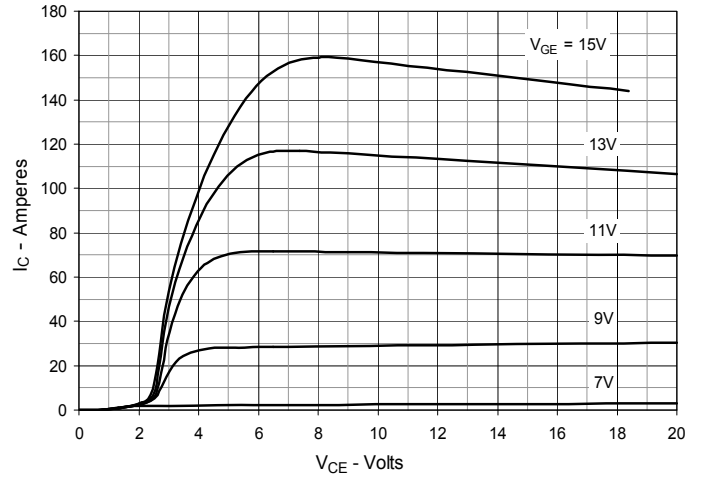


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

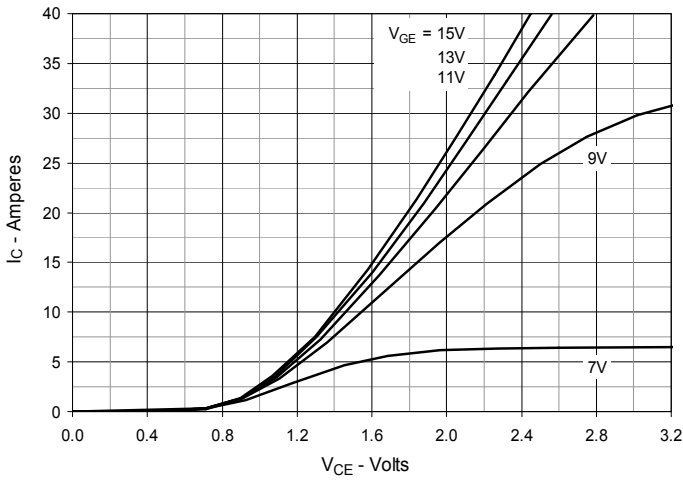


Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature

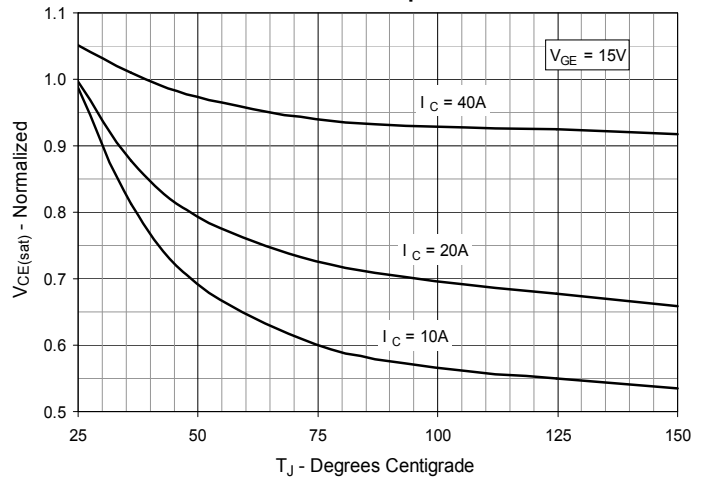


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

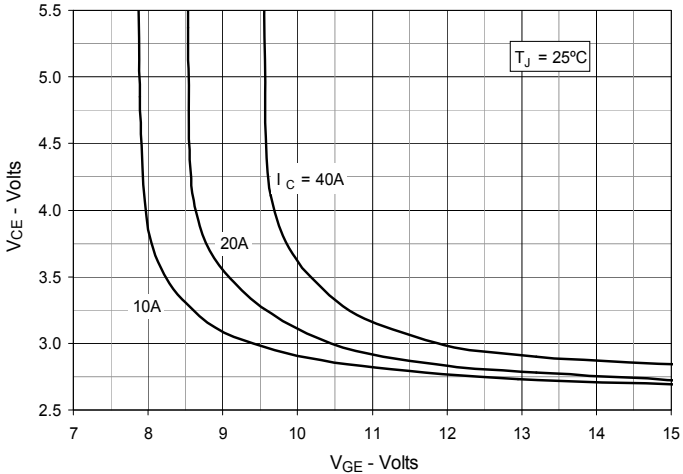
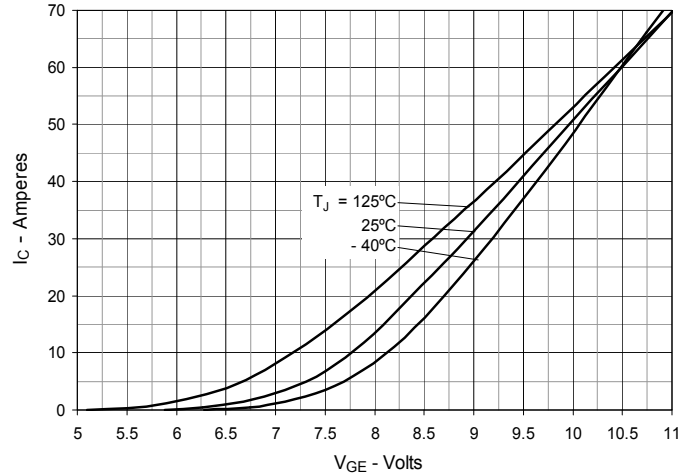
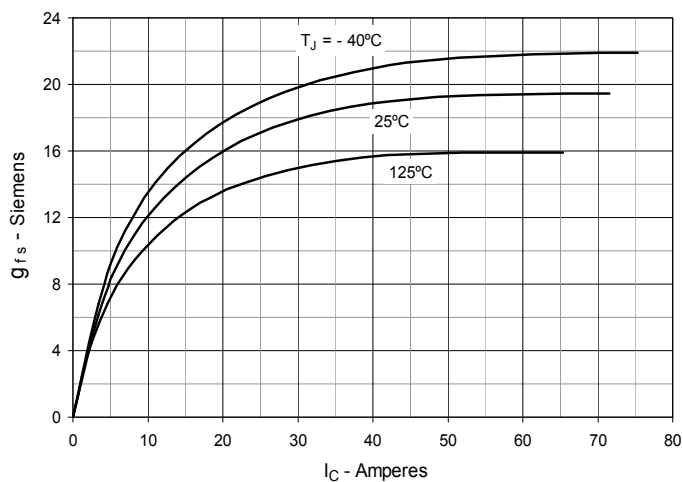


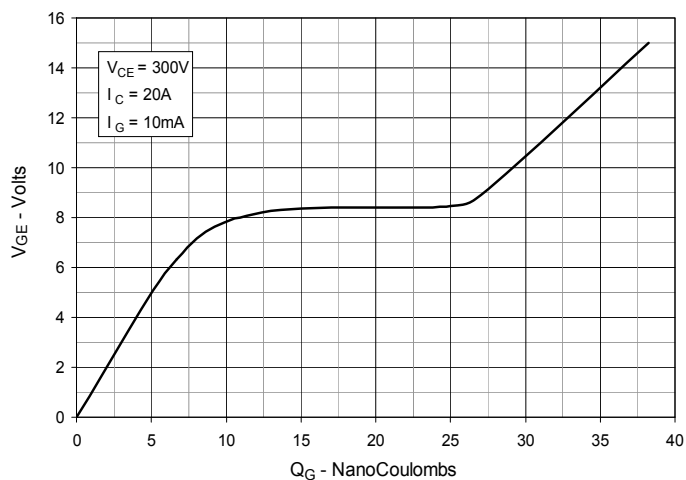
Fig. 6. Input Admittance



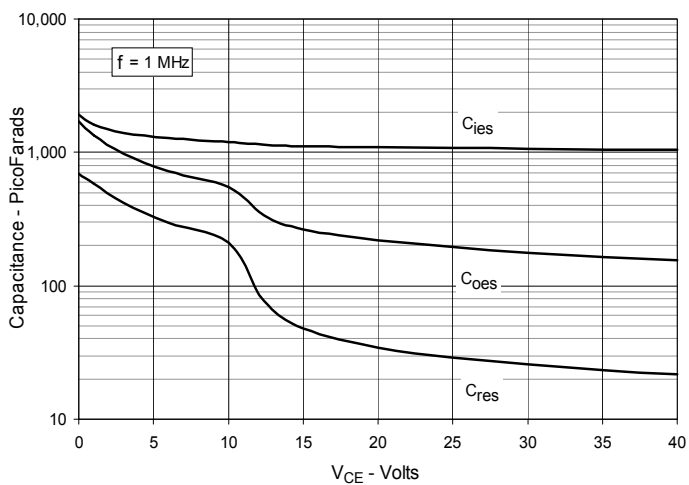
**Fig. 7. Transconductance**



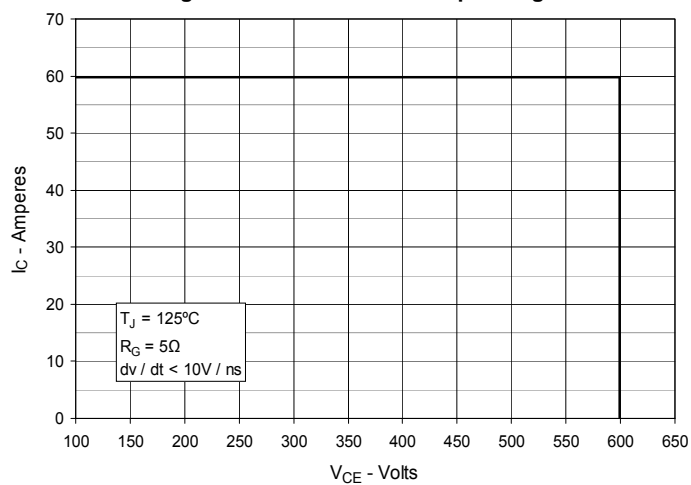
**Fig. 8. Gate Charge**



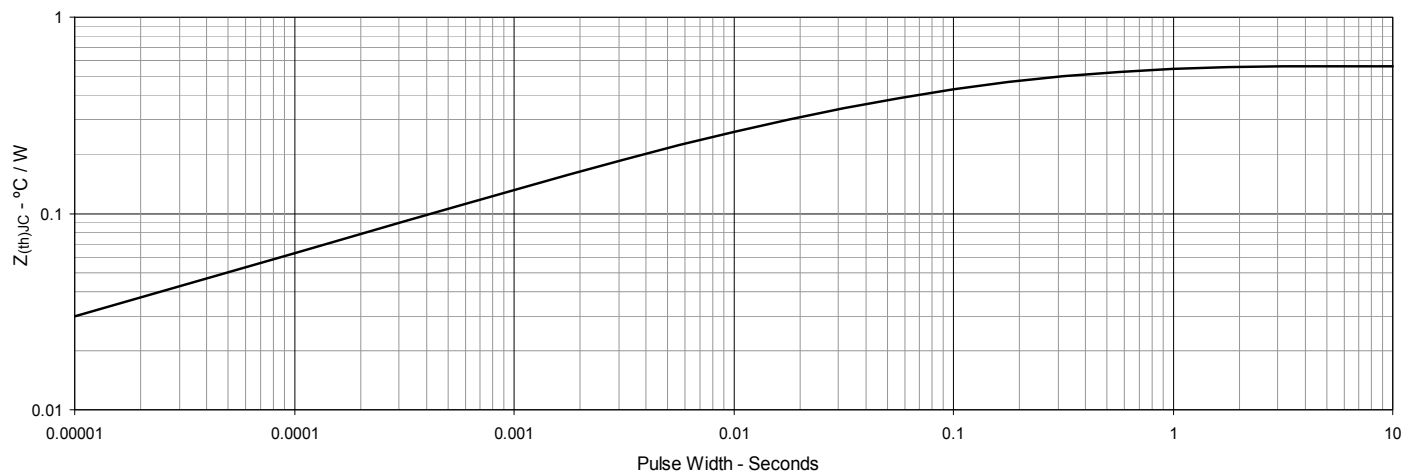
**Fig. 9. Capacitance**



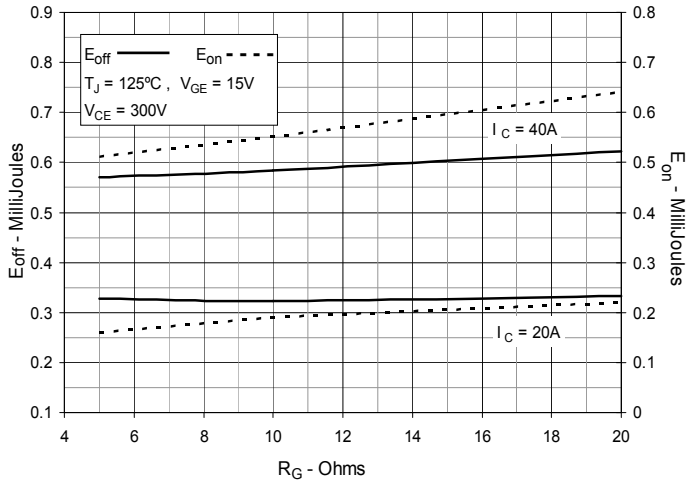
**Fig. 10. Reverse-Bias Safe Operating Area**



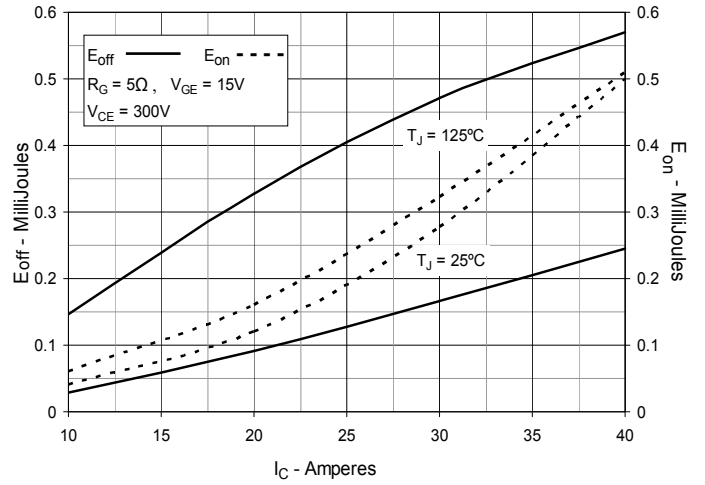
**Fig. 11. Maximum Transient Thermal Impedance for IGBT**



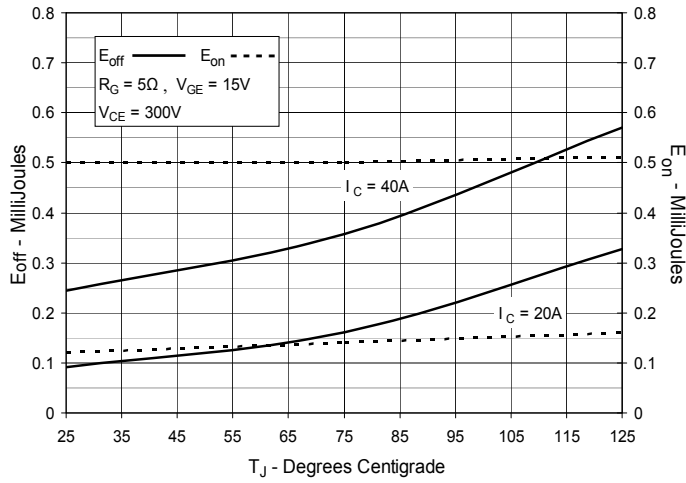
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



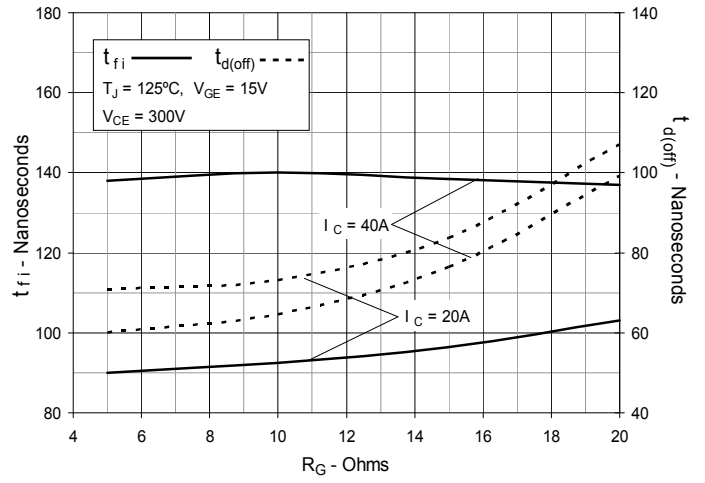
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



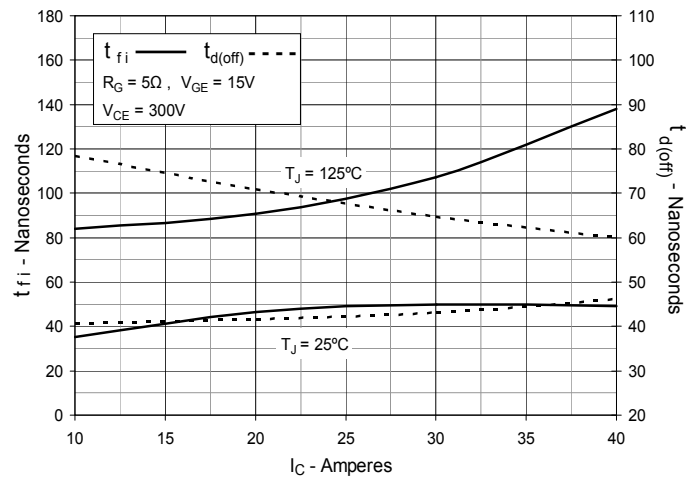
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



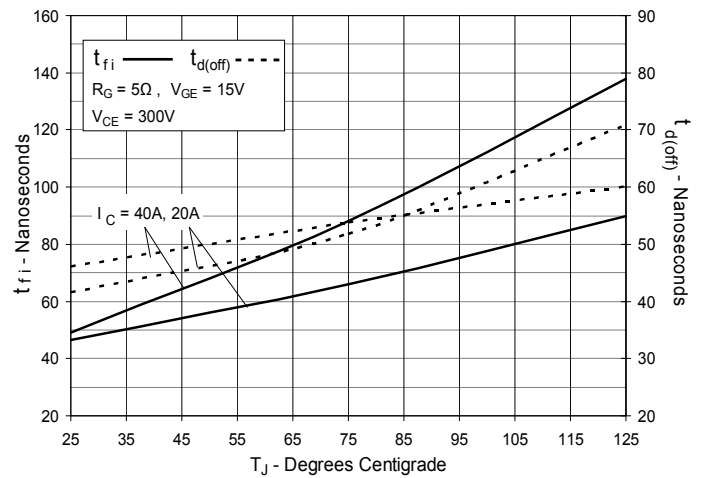
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



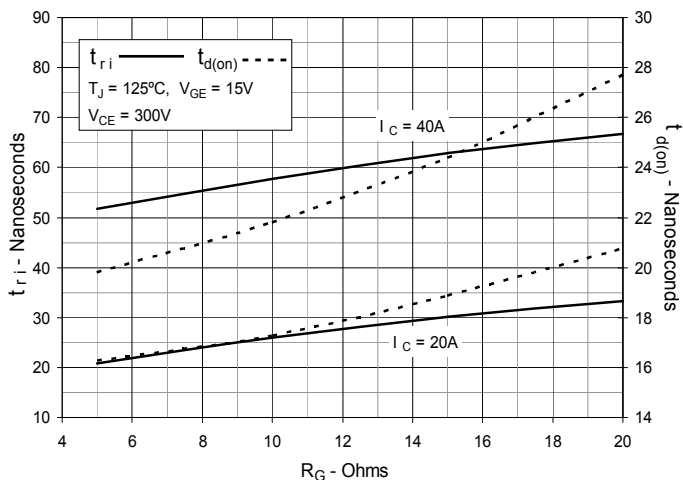
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



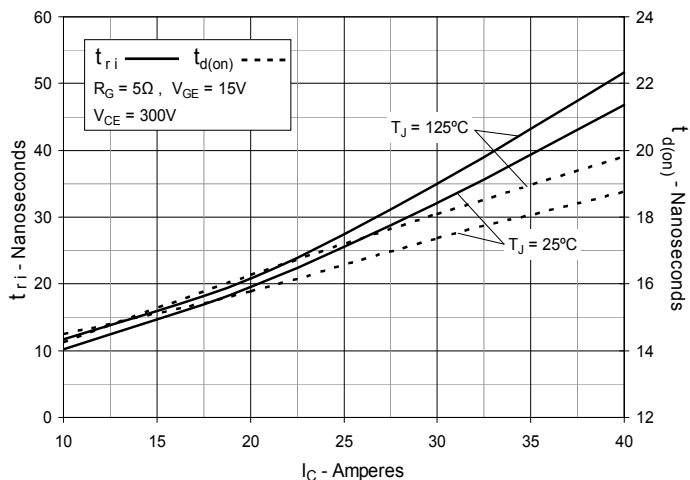
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



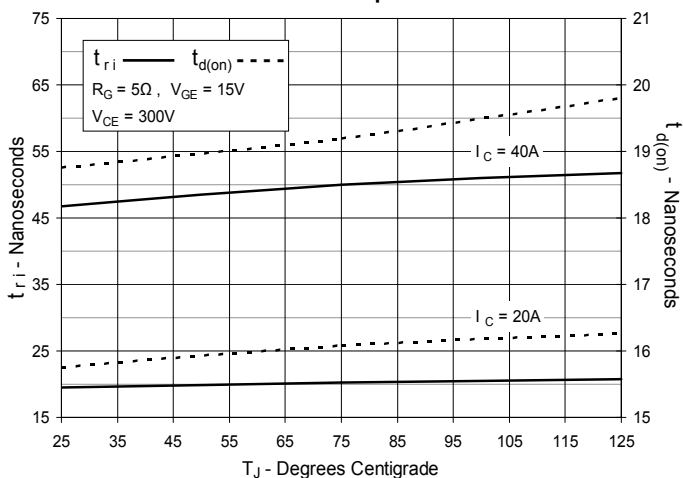
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



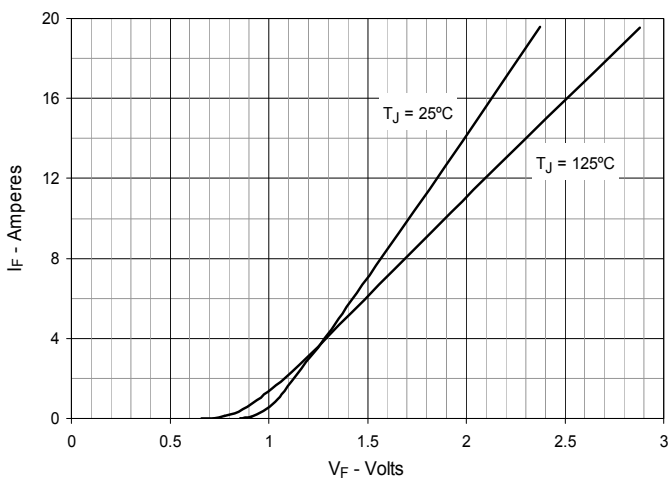
**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**



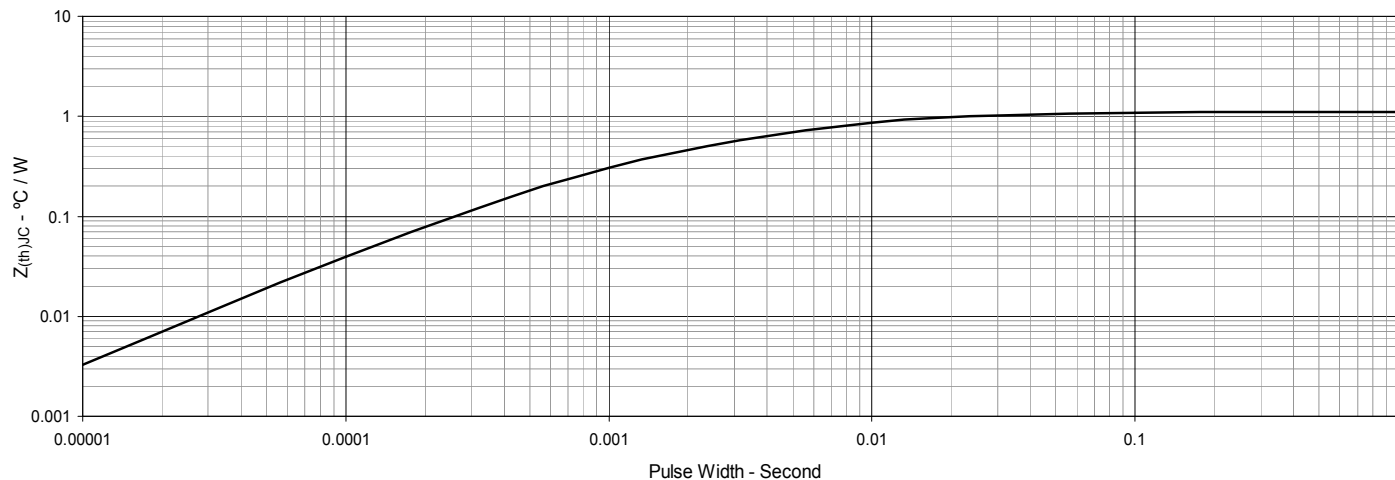
**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**



**Fig. 21. Forward Current vs. Forward Voltage**



**Fig. 22. Maximum Transient Thermal Impedance for Diode**





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