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## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



# High Voltage IGBT

## IXGH 40N120A2

## IXGT 40N120A2

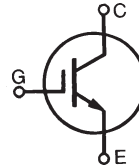
Low  $V_{CE(sat)}$

$$V_{CES} = 1200 \text{ V}$$

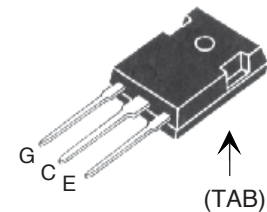
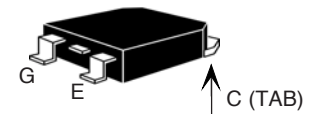
$$I_{C25} = 75 \text{ A}$$

$$V_{CE(sat)} \leq 2.0 \text{ V}$$

### Preliminary Data Sheet



Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	1200	V
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	1200	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	V
$I_{C25}$	$T_C = 25^\circ\text{C}$ , IGBT chip capability	75	A
$I_{C110}$	$T_C = 110^\circ\text{C}$	40	A
$I_{CM}$	$T_J \leq 150^\circ\text{C}$ , $t_p < 300 \mu\text{s}$	160	A
<b>SSOA</b>	$V_{GE} = 15 \text{ V}$ , $T_{VJ} = 150^\circ\text{C}$ , $R_G = 5 \Omega$	$I_{CM} = 80$	A
<b>(RBSOA)</b>	Clamped inductive load, $V_{CE} < 960 \text{ V}$		
$P_C$	$T_C = 25^\circ\text{C}$	360	W
$T_J$		-55 ... +150	$^\circ\text{C}$
$T_{JM}$		150	$^\circ\text{C}$
$T_{stg}$		-55 ... +150	$^\circ\text{C}$
$T_L$	Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 seconds	300	$^\circ\text{C}$
$T_{SOLD}$	Plastic body for 10 seconds	260	$^\circ\text{C}$
$M_d$	Mounting torque (ixgh)	1.3/10	Nm/lb.in.
<b>Weight</b>	(IXGH)	6.0	g
	(IXGT)	4.0	g

**TO-247 (IXFH)**

**TO-268 (IXGT)**


G = Gate      C = Collector  
E = Emitter    TAB = Collector

### Features

- International standard packages
- Low  $V_{CE(sat)}$ 
  - for minimum on-state conduction losses
- MOS Gate turn-on
  - drive simplicity

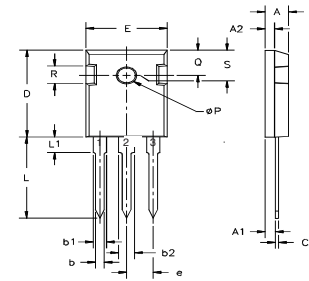
### Applications

- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies
- Capacitor discharge

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ unless otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 1 \text{ mA}$ , $V_{GE} = 0 \text{ V}$	1200		V
$V_{GE(th)}$	$I_C = 250 \mu\text{A}$ , $V_{CE} = V_{GE}$	3.0		5.0 V
$I_{CES}$	$V_{CE} = V_{CES}$ $V_{GE} = 0 \text{ V}$			50 $\mu\text{A}$ 1 mA $T_J = 125^\circ\text{C}$
$I_{GES}$	$V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C110}$ , $V_{GE} = 15 \text{ V}$			2.0 V

Symbol	Test Conditions ( $T_J = 25^\circ\text{C}$ unless otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = I_{C110}, V_{CE} = 10\text{ V}$	28	40	S
$I_{C(ON)}$	$V_{GE} = 10\text{ V}, V_{CE} = 10\text{ V}$		195	A
$C_{ies}$	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$		3150	pF
$C_{oes}$			165	pF
$C_{res}$			70	pF
$Q_g$	$I_C = I_{C110}, V_{GE} = 15\text{ V}, V_{CE} = 0.5 V_{CES}$		136	nC
$Q_{ge}$			19	nC
$Q_{gc}$			54	nC
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$		22	ns
$t_{ri}$	$I_C = I_{C110}, V_{GE} = 15\text{ V}$		41	ns
$t_{d(off)}$	$V_{CE} = 0.8 V_{CES}, R_G = 2\ \Omega$	420	800	ns
$t_{fi}$		800	1200	ns
$E_{off}$		15	25	mJ
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$		19	ns
$t_{ri}$	$I_C = I_{C110}, V_{GE} = 15\text{ V}$		36	ns
$E_{on}$	$V_{CE} = 0.8 V_{CES}, R_G = 2\ \Omega$		3.5	mJ
$t_{d(off)}$			730	ns
$t_{fi}$			1570	ns
$E_{off}$			35	mJ
$R_{thJC}$			0.35	K/W
$R_{thCS}$	(TO-247)		0.25	K/W

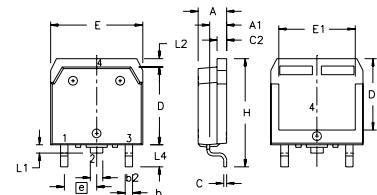
### TO-247 AD Outline



Terminals: 1 - Gate 2 - Drain  
3 - Source Tab - Drain

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
L <sub>1</sub>		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

### TO-268 Outline (IXGT)



Terminals: 1 - Gate 2 - Drain  
3 - Source Tab - Drain

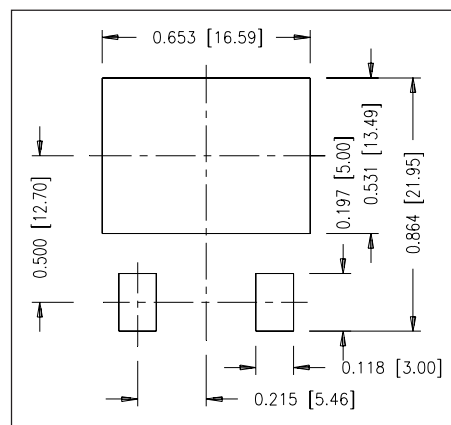
SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.193	.201	4.90	5.10
A <sub>1</sub>	.106	.114	2.70	2.90
A <sub>2</sub>	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
b <sub>2</sub>	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C <sub>2</sub>	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D <sub>1</sub>	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E <sub>1</sub>	.524	.535	13.30	13.60
e		.215 BSC		5.45 BSC
H	.736	.752	18.70	19.10
L	.094	.106	2.40	2.70
L <sub>1</sub>	.047	.055	1.20	1.40
L <sub>2</sub>	.039	.045	1.00	1.15
L <sub>3</sub>		.010 BSC		0.25 BSC
L <sub>4</sub>	.150	.161	3.80	4.10

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

### 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 subjective pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

### TO-268: Min. Recommended Footprint

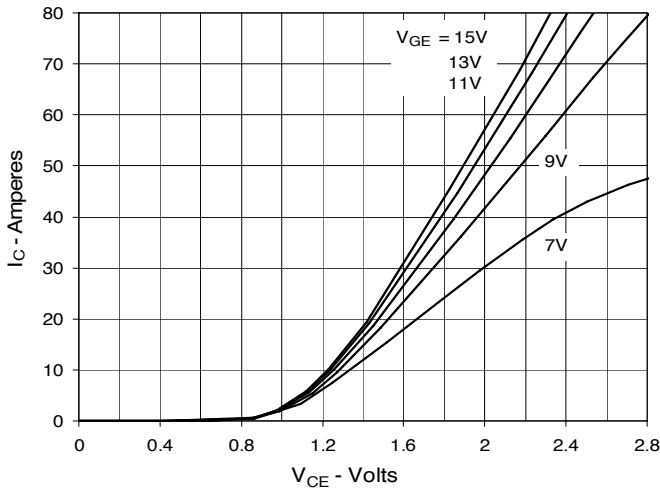


IXYS reserves the right to change limits, test conditions and dimensions.

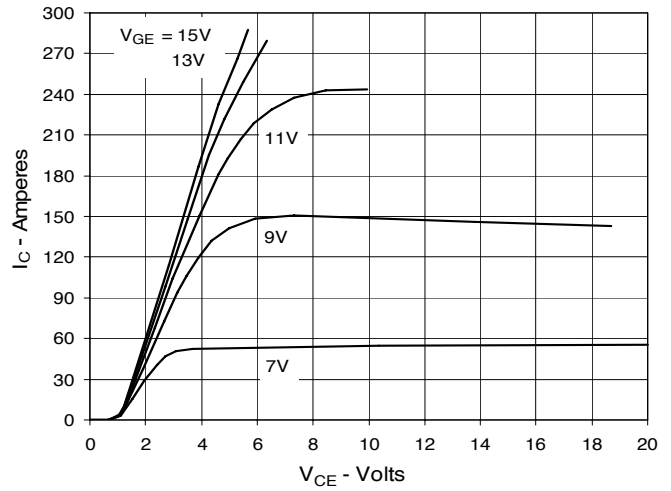
IXYS MOSFETs and IGBTs are covered by 4,835,592 4,931,844 5,049,961 5,237,481 6,162,665 6,404,065 B1 6,683,344 6,727,585  
one or more of the following U.S. patents: 4,850,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405B2 6,759,692  
4,881,106 5,034,796 5,187,117 5,486,715 6,306,728 B1 6,583,505 6,710,463



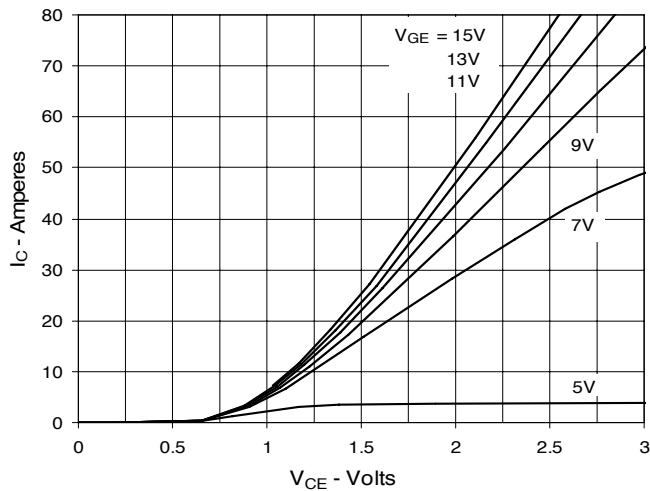
**Fig. 1. Output Characteristics**  
@ 25°C



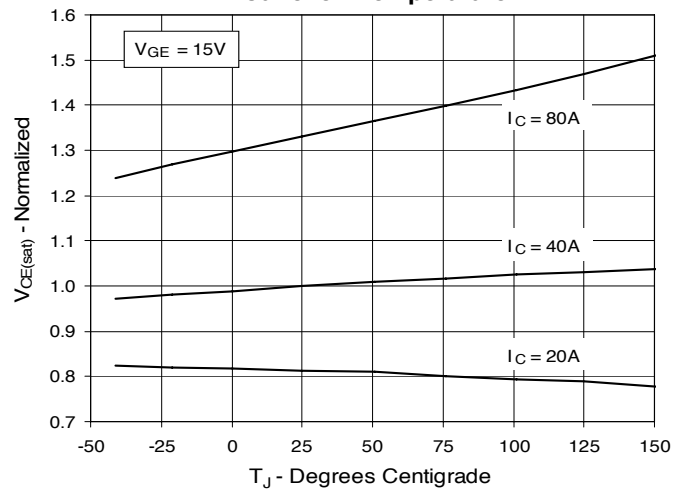
**Fig. 2. Extended Output Characteristics**  
@ 25°C



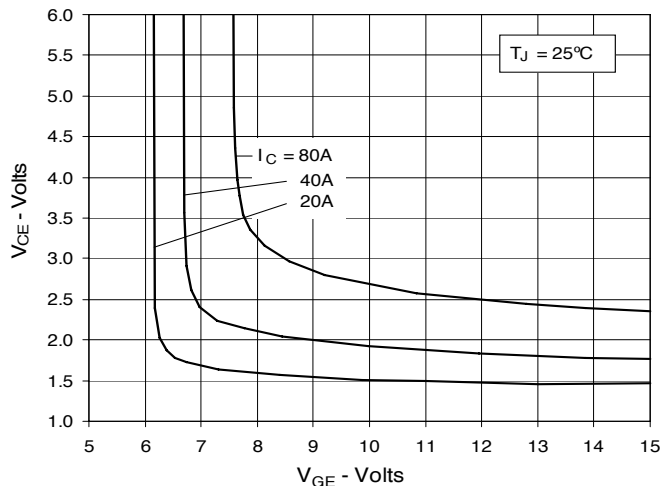
**Fig. 3. Output Characteristics**  
@ 125°C



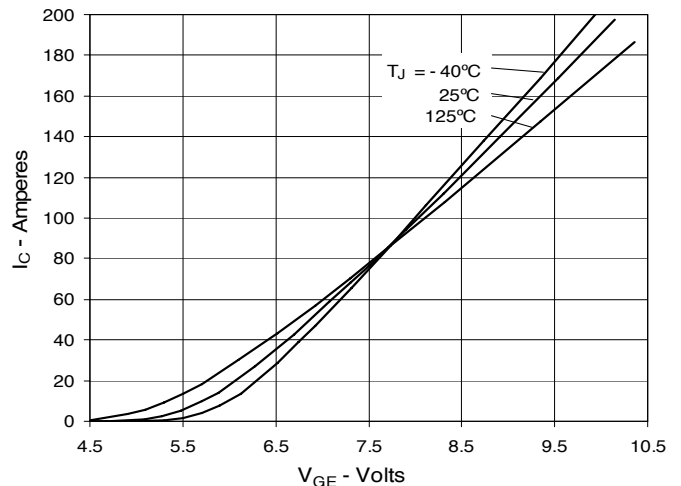
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



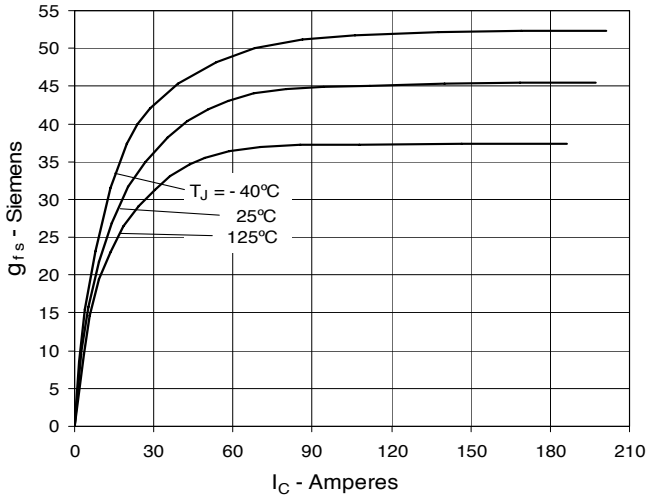
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



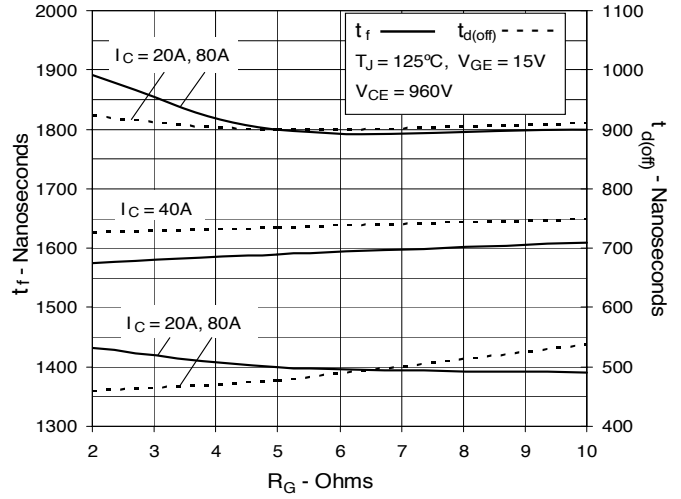
**Fig. 6. Input Admittance**



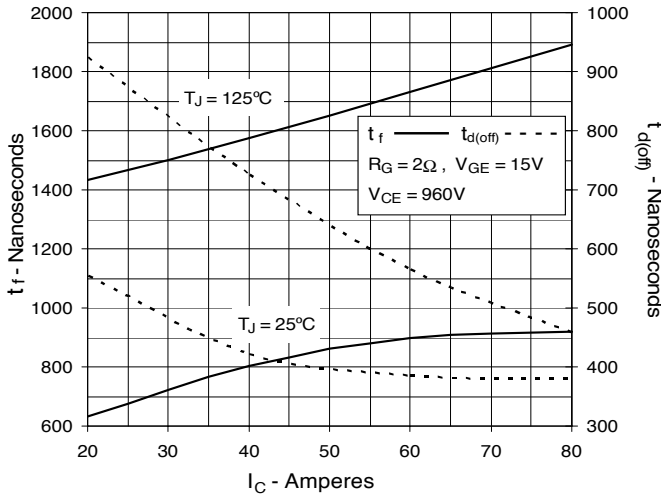
**Fig. 7. Transconductance**



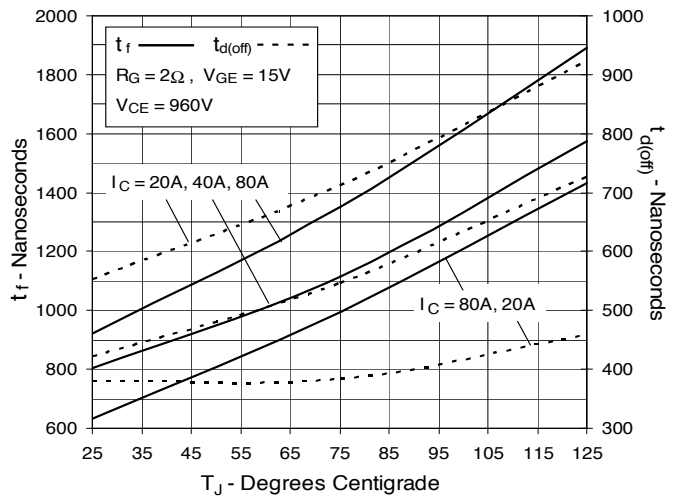
**Fig. 8. Inductive Turn-off Switching Times vs. Gate Resistance**



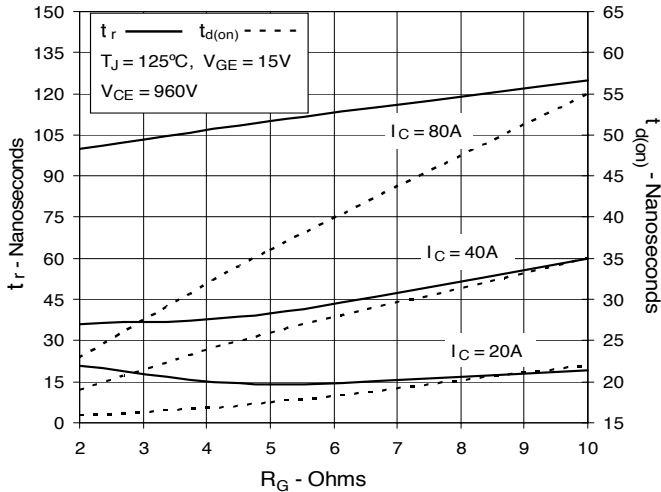
**Fig. 9. Inductive Turn-off Switching Times vs. Collector Current**



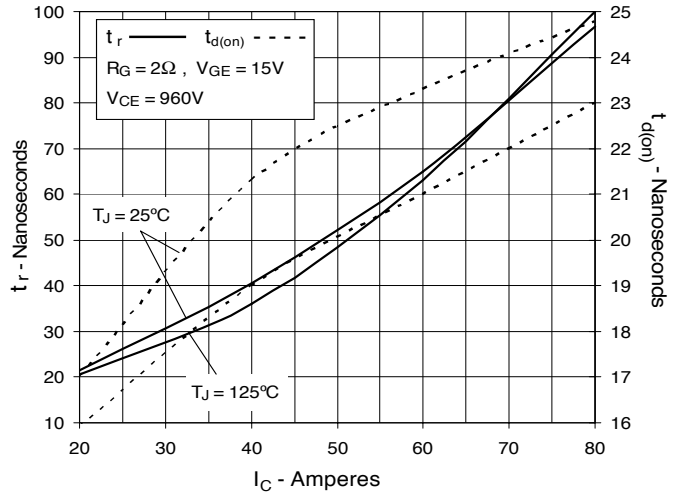
**Fig. 10. Inductive Turn-off Switching Times vs. Junction Temperature**



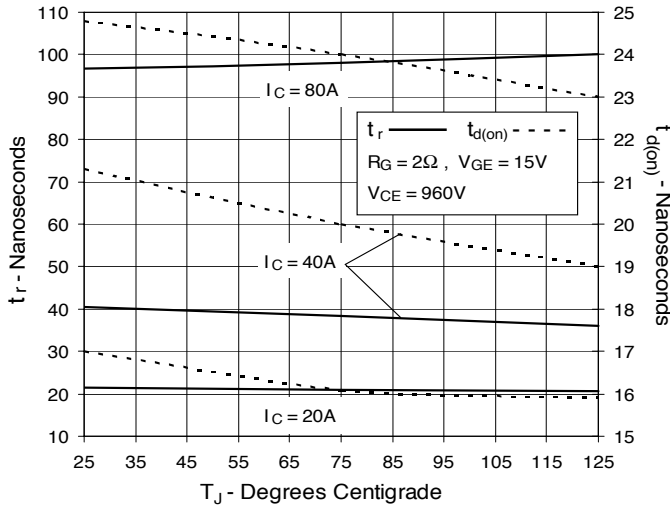
**Fig. 11. Inductive Turn-on Switching Times vs. Gate Resistance**



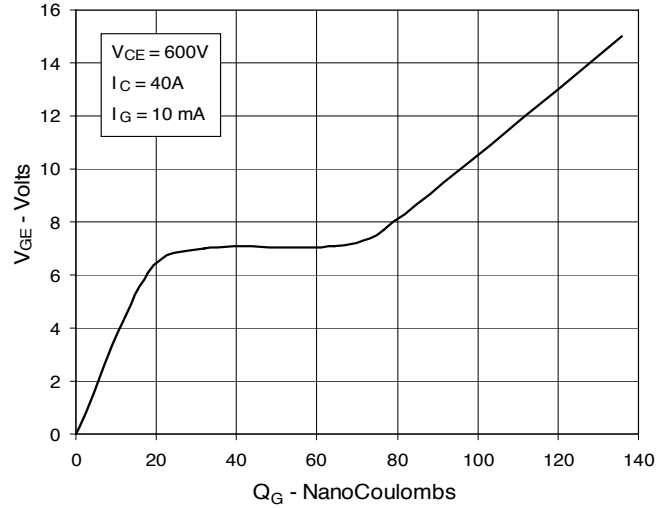
**Fig. 12. Inductive Turn-on Switching Times vs. Collector Current**



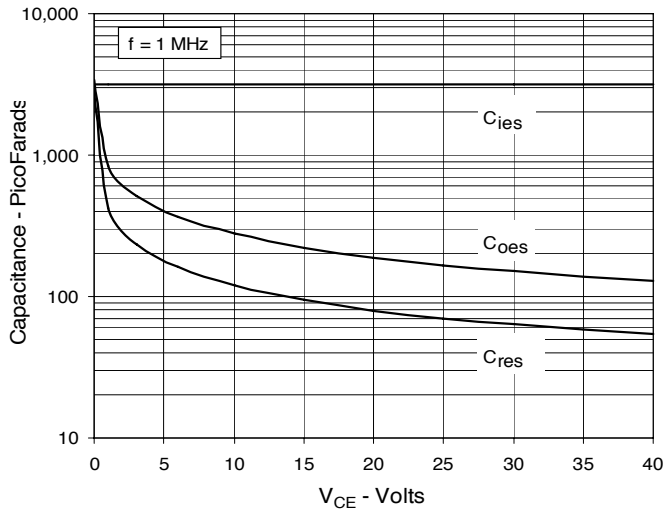
**Fig. 13. Inductive Turn-on Switching Times vs. Junction Temperature**



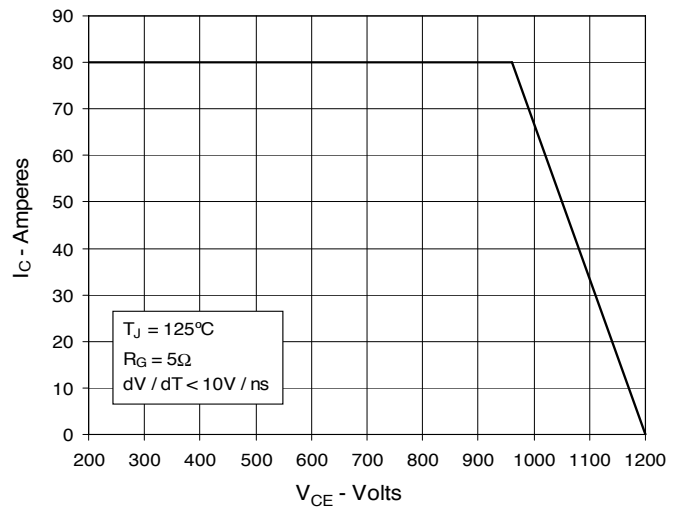
**Fig. 14. Gate Charge**



**Fig. 15. Capacitance**



**Fig. 16. Reverse-Bias Safe Operating Area**



**Fig. 17. Maximum Transient Thermal Resistance**

