

# High Voltage IGBT

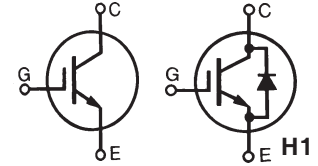
IXGH 16N170A  
IXGT 16N170A  
IXGH 16N170AH1  
IXGT 16N170AH1

$V_{CES} = 1700 \text{ V}$   
 $I_{C25} = 16 \text{ A}$   
 $V_{CE(sat)} = 5.0 \text{ V}$   
 $t_{fi(typ)} = 70 \text{ ns}$

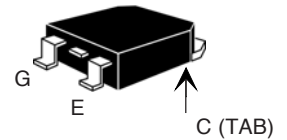
## Preliminary Data Sheet

Symbol	Test Conditions	Maximum Ratings
$V_{CES}$	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	1700 V
$V_{CGR}$	$T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$	1700 V
$V_{GES}$	Continuous	$\pm 20 \text{ V}$
$V_{GEM}$	Transient	$\pm 30 \text{ V}$
$I_{C25}$	$T_C = 25^\circ\text{C}$	16 A
$I_{C90}$	$T_C = 90^\circ\text{C}$	11 A
$I_{F90}$	$T_C = 90^\circ\text{C}$ , Diode	17 A
$I_{CM}$	$T_C = 25^\circ\text{C}$ , 1 ms	40 A
<b>SSOA (RBSOA)</b>	$V_{GE} = 15 \text{ V}$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 10\Omega$ Clamped inductive load	$I_{CM} = 40 \text{ A}$ @ $0.8 V_{CES}$
$t_{sc}$	$T_J = 125^\circ\text{C}$ , $V_{CE} = 1200 \text{ V}$ ; $V_{GE} = 15 \text{ V}$ , $R_G = 22\Omega$	10 $\mu\text{s}$
$P_C$	$T_C = 25^\circ\text{C}$	190 W
$T_J$		-55 ... +150 $^\circ\text{C}$
$T_{JM}$		150 $^\circ\text{C}$
$T_{stg}$		-55 ... +150 $^\circ\text{C}$
$M_d$	Mounting torque (M3)	TO-247 1.13/10Nm/lb.in.
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300 $^\circ\text{C}$
Plastic body for 10s		260 $^\circ\text{C}$
<b>Weight</b>		TO-247 6 g TO-268 4 g

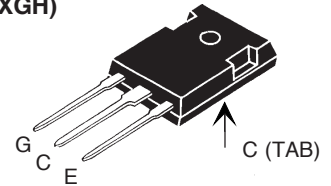
Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$BV_{CES}$	$I_C = 250 \mu\text{A}$ , $V_{GE} = 0 \text{ V}$	1700		V
$V_{GE(th)}$	$I_C = 250 \mu\text{A}$ , $V_{CE} = V_{GE}$	3.0		V
$I_{CES}$	$V_{CE} = 0.8 \cdot V_{CES}$ $V_{GE} = 0 \text{ V}$ , Note 1 $T_J = 125^\circ\text{C}$	16N170A		50 $\mu\text{A}$
		16N170AH1		100 $\mu\text{A}$
		16N170A		750 $\mu\text{A}$
		16N170AH1		1.5 mA
$I_{GES}$	$V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C90}$ , $V_{GE} = 15 \text{ V}$ $T_J = 125^\circ\text{C}$	4.0		V
		4.8		V



TO-268 (IXGT)



TO-247 (IXGH)



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

### Features

- High blocking voltage
- High current handling capability
- MOS Gate turn-on - drive simplicity
- Rugged NPT structure
- Molding epoxies meet UL 94 V-0 flammability classification
- SONIC-FRD™ fast recovery copack diode
- International standard packages JEDEC TO-268 and JEDEC TO-247 AD

### Applications

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

### Advantages

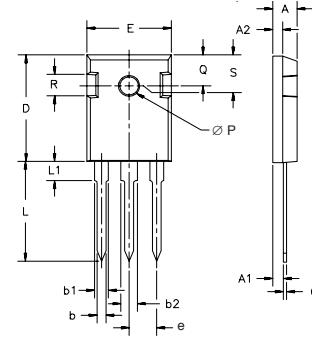
- High power density
- Suitable for surface mounting
- Easy to mount with 1 screw, (isolated mounting screw hole)

Symbol	Test Conditions	Characteristic Values		
		(T <sub>J</sub> = 25°C unless otherwise specified)		
		min.	typ.	max.
<b>g<sub>fs</sub></b>	I <sub>C</sub> = I <sub>C25'</sub> , V <sub>CE</sub> = 10 V Note 2	7	13	S
<b>C<sub>ies</sub></b>			1620	pF
<b>C<sub>oes</sub></b>	V <sub>CE</sub> = 25 V, V <sub>GE</sub> = 0 V, f = 1 MHz	16N170A 16N170AH1	83 110	pF pF
<b>C<sub>res</sub></b>			31	pF
<b>Q<sub>g</sub></b>			83	nC
<b>Q<sub>ge</sub></b>	I <sub>C</sub> = I <sub>C90'</sub> , V <sub>GE</sub> = 15 V, V <sub>CE</sub> = 0.5 V <sub>CES</sub>		10	nC
<b>Q<sub>gc</sub></b>			31	nC
<b>t<sub>d(on)</sub></b>	<b>Inductive load, T<sub>J</sub> = 25°C</b>		36	ns
<b>t<sub>ri</sub></b>	I <sub>C</sub> = I <sub>C25'</sub> , V <sub>GE</sub> = 15 V, R <sub>G</sub> = 10 Ω		57	ns
<b>t<sub>d(off)</sub></b>	V <sub>CE</sub> = 0.5 V <sub>CES</sub> , Note 3		160	300 ns
<b>t<sub>fi</sub></b>			70	150 ns
<b>E<sub>off</sub></b>			0.85	1.5 mJ
<b>t<sub>d(on)</sub></b>	<b>Inductive load, T<sub>J</sub> = 125°C</b>		38	ns
<b>t<sub>ri</sub></b>	I <sub>C</sub> = I <sub>C25'</sub> , V <sub>GE</sub> = 15 V, R <sub>G</sub> = 10 Ω		59	ns
<b>E<sub>on</sub></b>	V <sub>CE</sub> = 0.5 V <sub>CES</sub> , Note 3	16N170A 16N170AH1	1.5 2.5	mJ mJ
<b>t<sub>d(off)</sub></b>			175	ns
<b>t<sub>fi</sub></b>			155	ns
<b>E<sub>off</sub></b>			2.0	mJ
<b>R<sub>thJC</sub></b>				0.65 K/W
<b>R<sub>thCK</sub></b>	(TO-247)		0.25	K/W

Symbol	Test Conditions	Characteristic Values		
		(T <sub>J</sub> = 25°C unless otherwise specified)		
		min.	typ.	max.
<b>V<sub>F</sub></b>	I <sub>F</sub> = 20A, V <sub>GE</sub> = 0 V, Note 2		2.5	2.9 V
		T <sub>J</sub> = 125°C	2.5	V
<b>t<sub>rr</sub></b>	I <sub>F</sub> = 20A, V <sub>GE</sub> = 0 V, -di <sub>F</sub> /dt = 450 A/μs		230	ns
	V <sub>R</sub> = 1200 V	T <sub>J</sub> = 125°C	400	ns
<b>I<sub>RM</sub></b>			23	A
		T <sub>J</sub> = 125°C	27	A
<b>R<sub>thJC</sub></b>				0.9 K/W

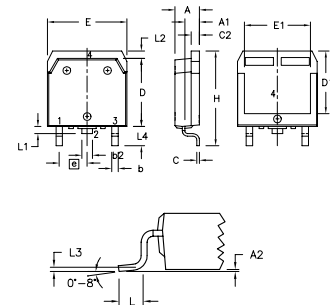
- Notes: 1. Device must be heatsunk for high temperature leakage current measurements to avoid thermal runaway.  
 2. Pulse test, t ≤ 300 μs, duty cycle ≤ 2 %  
 3. Switching times may increase for V<sub>CE</sub> (Clamp) > 0.8 • V<sub>CES</sub>, higher T<sub>J</sub> or increased R<sub>G</sub>.

### TO-247 AD Outline



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
ØP	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

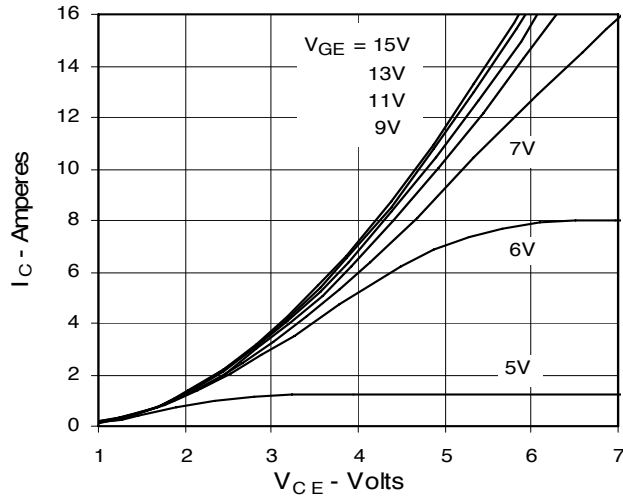


Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.9	5.1	.193	.201
A <sub>1</sub>	2.7	2.9	.106	.114
A <sub>2</sub>	.02	.25	.001	.010
b	1.15	1.45	.045	.057
b <sub>2</sub>	1.9	2.1	.075	.83
C	.4	.65	.016	.026
D	13.80	14.00	.543	.551
E	15.85	16.05	.624	.632
E <sub>1</sub>	13.3	13.6	.524	.535
e	5.45	BSC	.215	BSC
H	18.70	19.10	.736	.752
L	2.40	2.70	.094	.106
L <sub>1</sub>	1.20	1.40	.047	.055
L <sub>2</sub>	1.00	1.15	.039	.045
L <sub>3</sub>		0.25 BSC		.010 BSC
L <sub>4</sub>	3.80	4.10	.150	.161

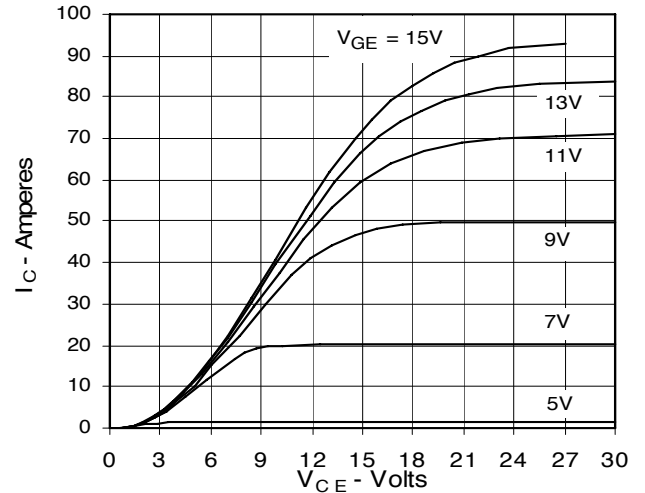
IXYS reserves the right to change limits, test conditions, and dimensions.

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
	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
	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

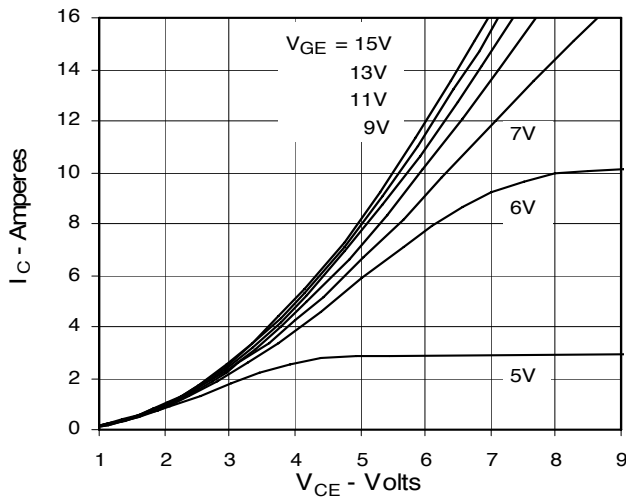
**Fig. 1. Output Characteristics**  
**@ 25 °C**



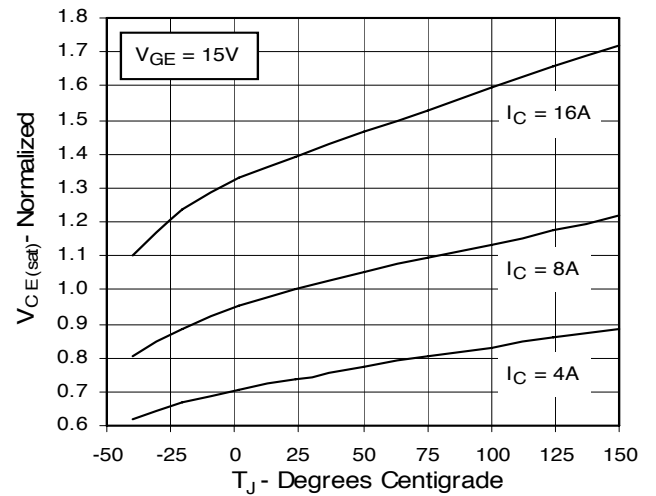
**Fig. 2. Extended Output Characteristics**  
**@ 25 °C**



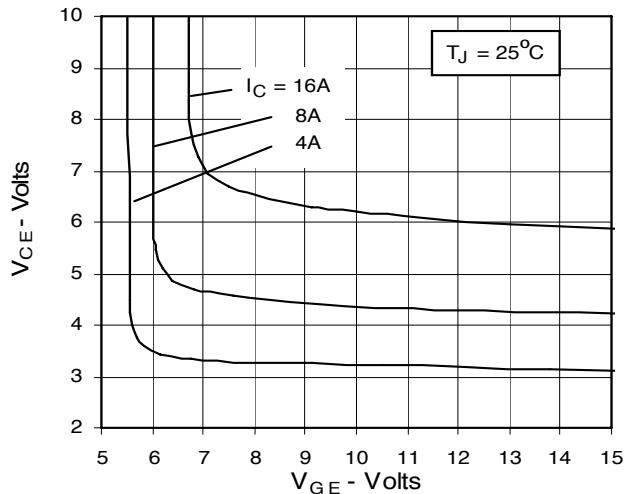
**Fig. 3. Output Characteristics**  
**@ 125 °C**



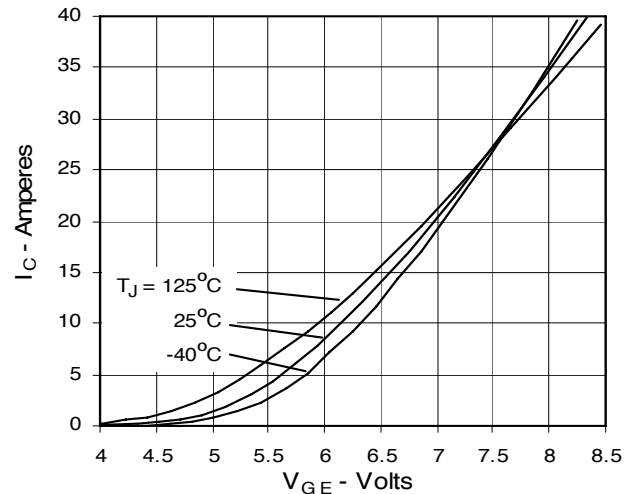
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Temperature**



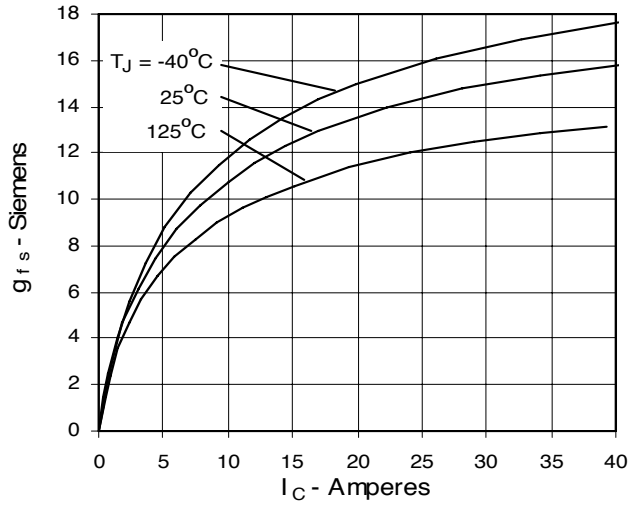
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage**



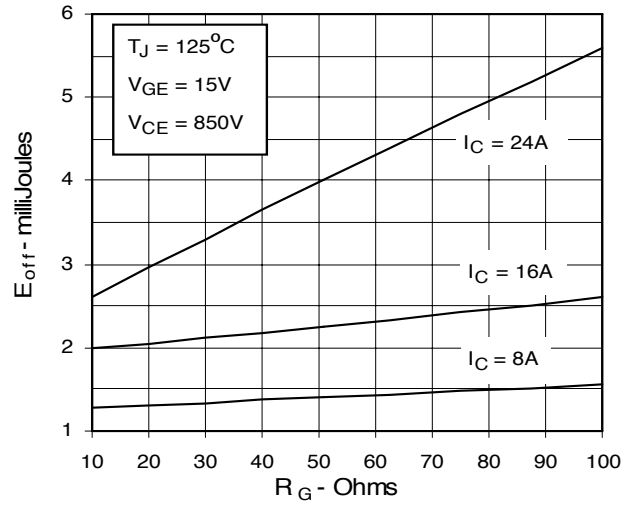
**Fig. 6. Input Admittance**



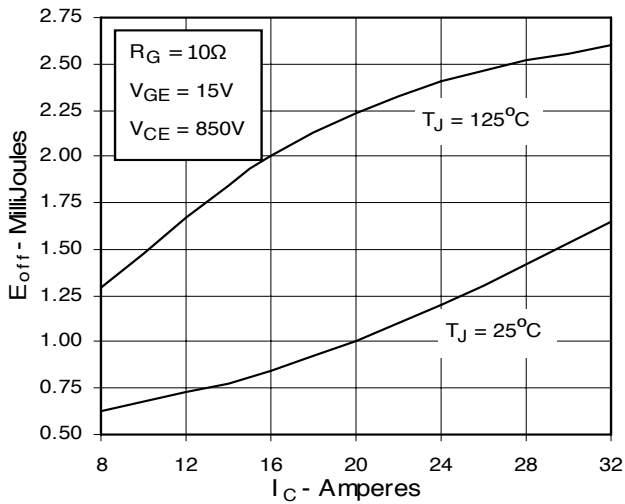
**Fig. 7. Transconductance**



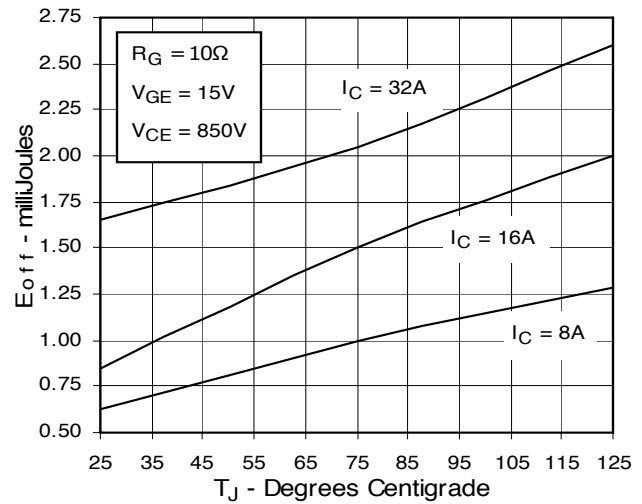
**Fig. 8. Dependence of Turn-off Energy Loss on  $R_G$**



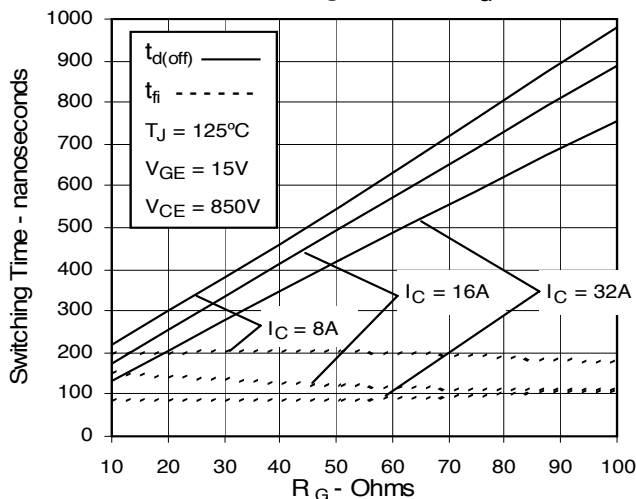
**Fig. 9. Dependence of Turn-Off Energy Loss on  $I_C$**



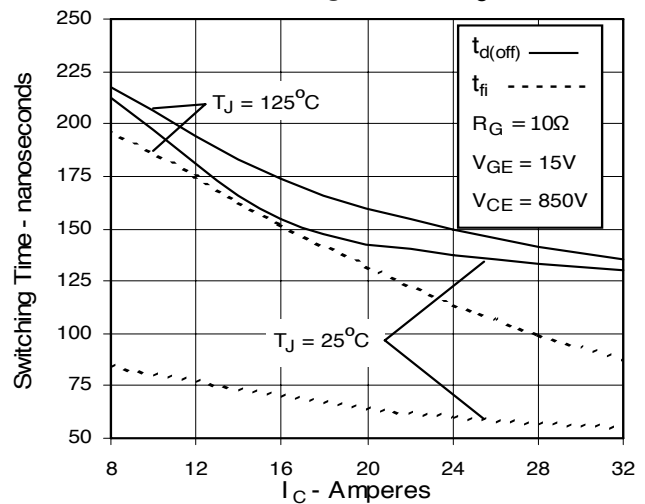
**Fig. 10. Dependence of Turn-off Energy Loss on Temperature**



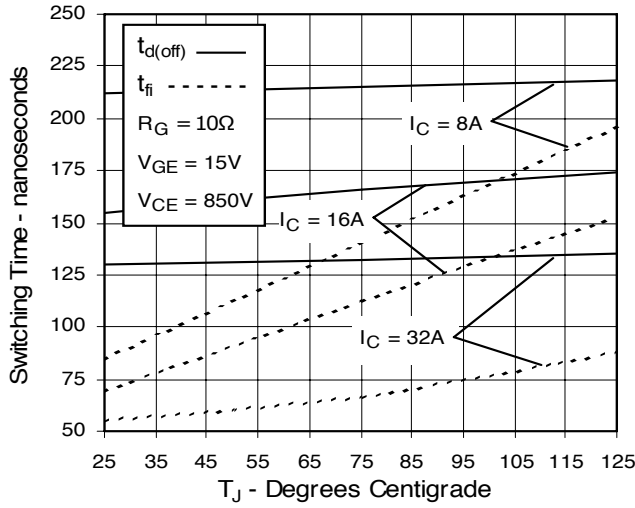
**Fig. 11. Dependence of Turn-off Switching Time on  $R_G$**



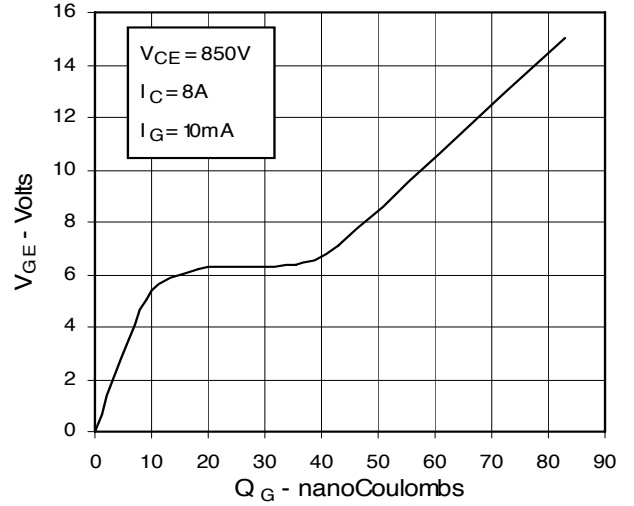
**Fig. 12. Dependence of Turn-off Switching Time on  $I_C$**



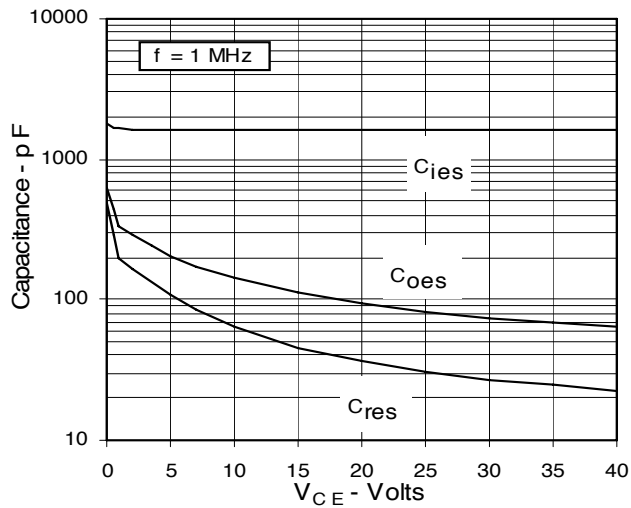
**Fig. 13. Dependence of Turn-off Switching Time on Temperature**



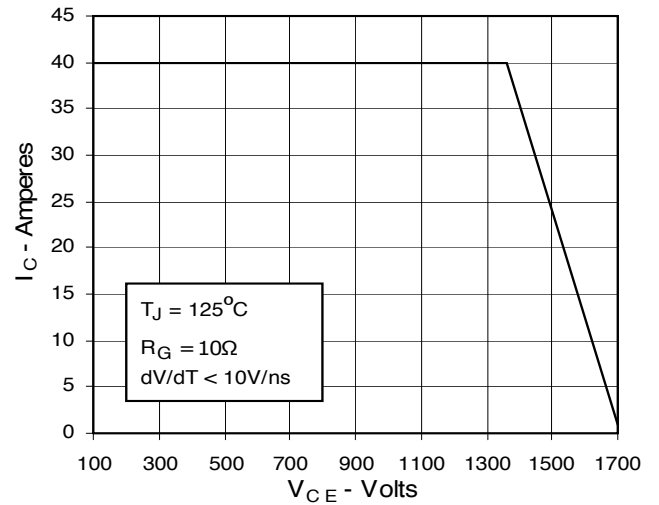
**Fig. 14. Gate Charge**



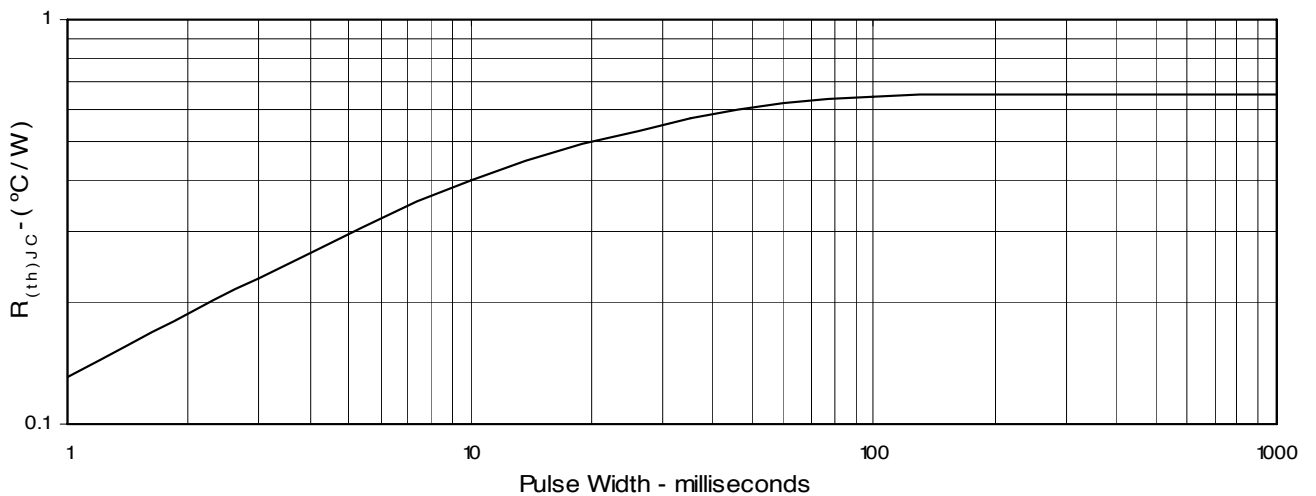
**Fig. 15. Capacitance**



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



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



**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.