

# High Voltage IGBT

## IXGH 40N120A2

## IXGT 40N120A2

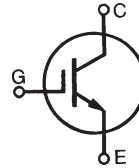
Low  $V_{CE(sat)}$

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

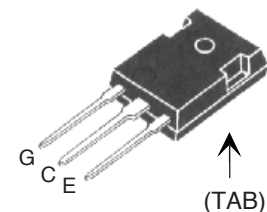
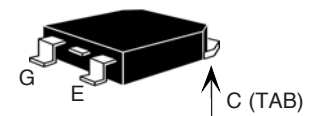
$$I_{C25} = 75 \text{ A}$$

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

### 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<br>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  
E = Emitter  
C = Collector  
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                                      | 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                    |
| $I_{CES}$     | $V_{CE} = V_{CES}$<br>$V_{GE} = 0 \text{ V}$         |                       |      | 50 $\mu\text{A}$<br>1 mA |
| $I_{GES}$     | $V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$ |                       |      | $\pm 100 \text{ nA}$     |
| $V_{CE(sat)}$ | $I_C = I_{C110}$ , $V_{GE} = 15 \text{ V}$           |                       |      | 2.0 V                    |

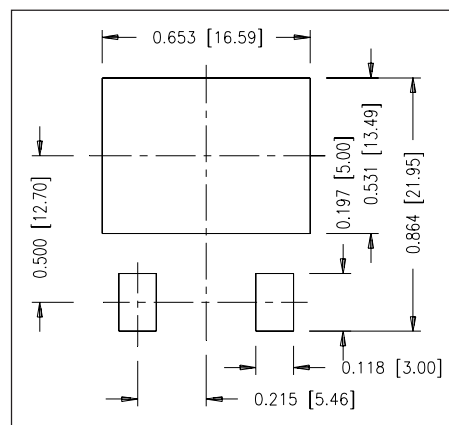
| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified) | Characteristic Values |      |      |
|--------------|---|-----------------------|------|------|
|              |   | Min.                  | Typ. | Max. |
| $g_{fs}$     | $I_C = I_{C110}, V_{CE} = 10\text{ V}$                                    | 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  |

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

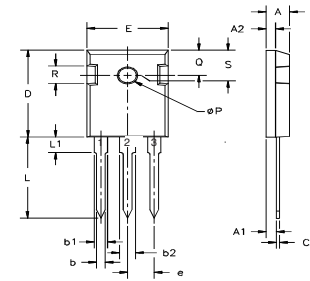
### PRELIMINARY TECHNICAL INFORMATION

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



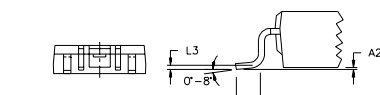
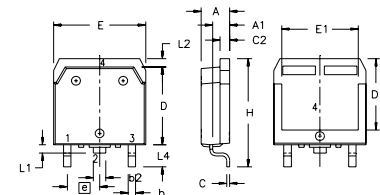
### TO-247 AD Outline



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)

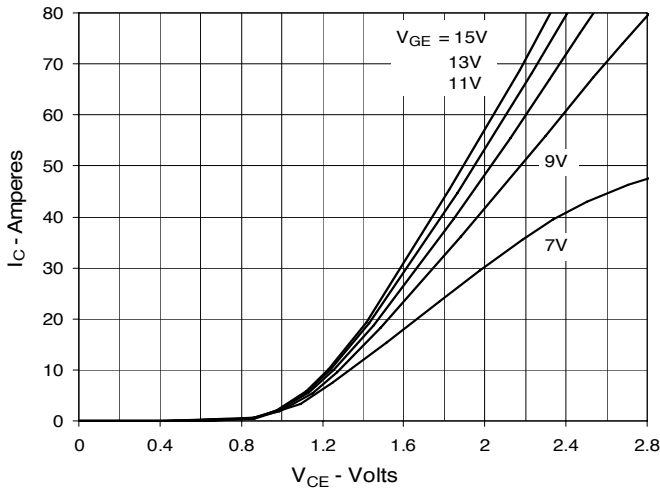


Terminals: 1 - Gate 2 - Drain  
3 - Source Tab - Drain

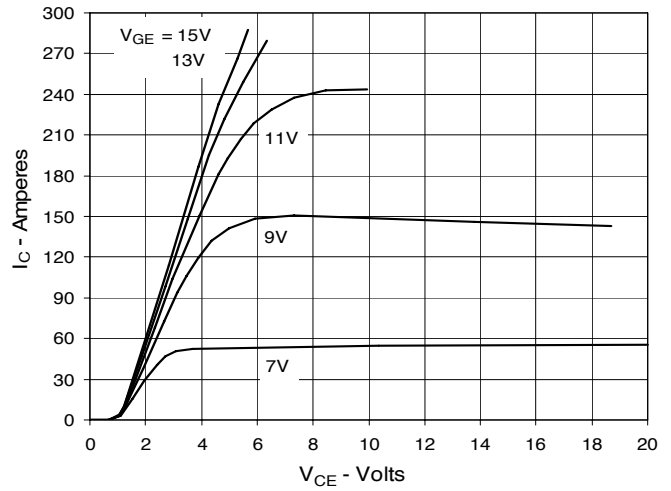
| SYM            | INCHES |          | MILLIMETERS |          |
|----------------|--------|----------|-------------|----------|
|                | MIN    | MAX      | MIN         | MAX      |
| A              | .193   | .201     | 4.90        | 5.10     |
| A <sub>1</sub> | .106   | .114     | 2.70        | 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     |

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

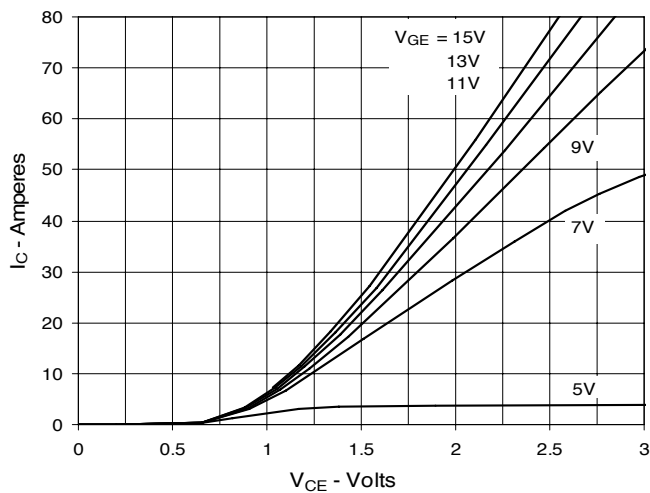
**Fig. 1. Output Characteristics**  
@ 25°C



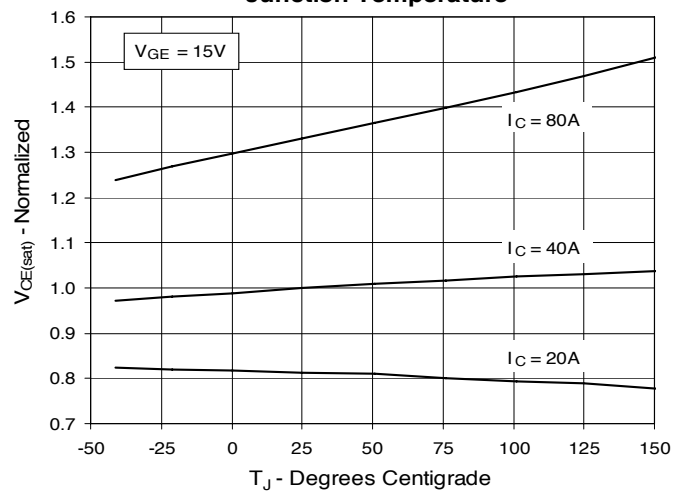
**Fig. 2. Extended Output Characteristics**  
@ 25°C



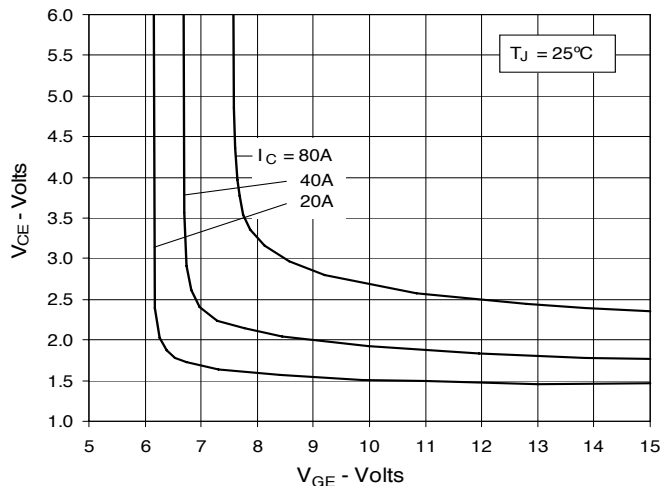
**Fig. 3. Output Characteristics**  
@ 125°C



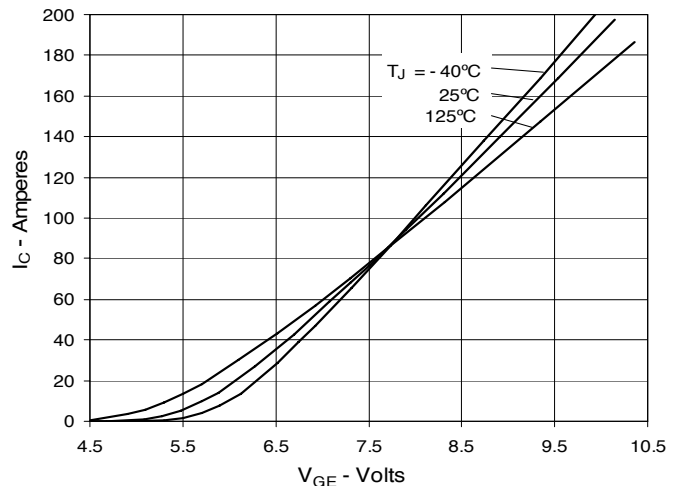
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



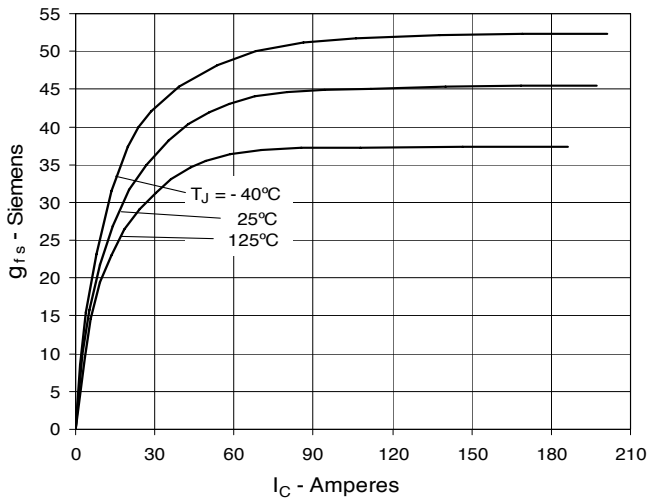
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



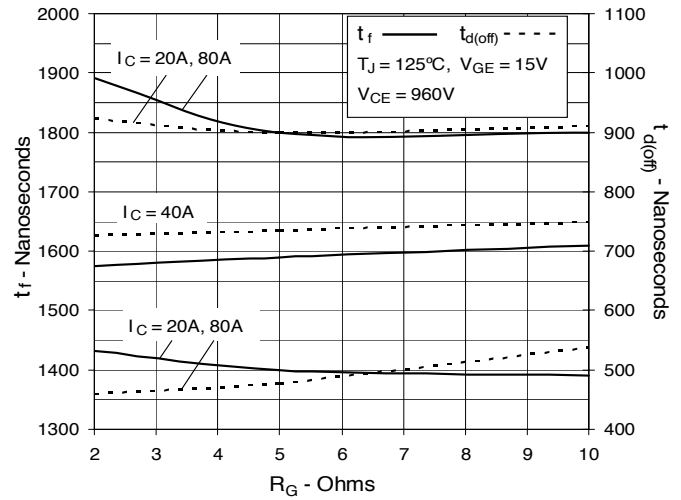
**Fig. 6. Input Admittance**



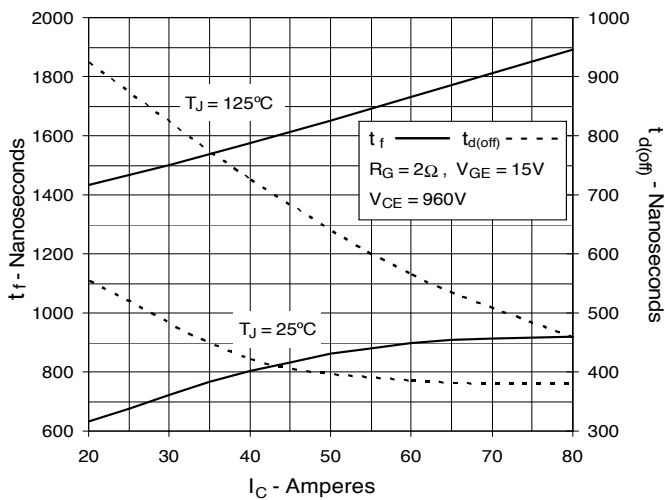
**Fig. 7. Transconductance**



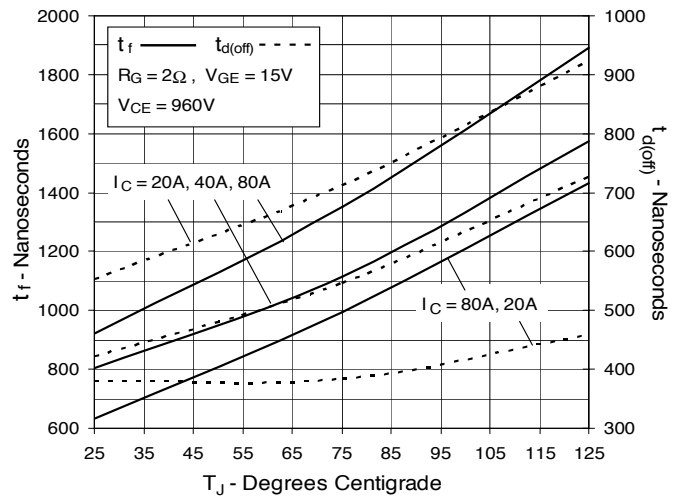
**Fig. 8. Inductive Turn-off Switching Times vs. Gate Resistance**



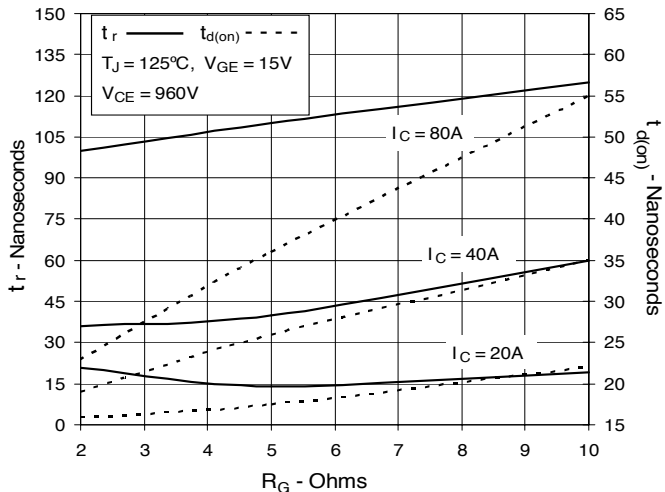
**Fig. 9. Inductive Turn-off Switching Times vs. Collector Current**



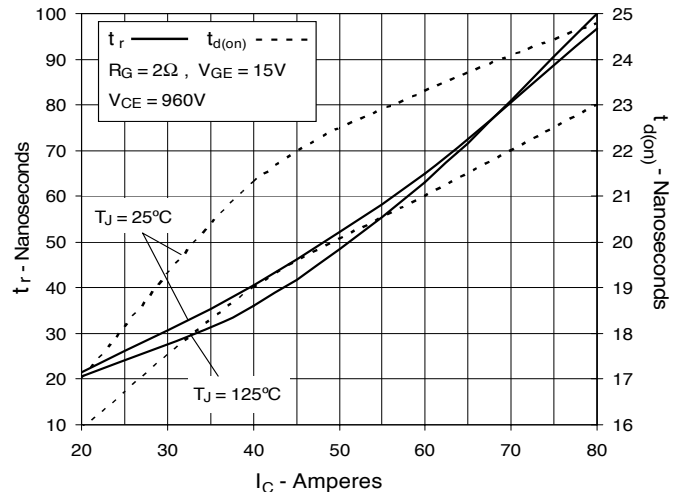
**Fig. 10. Inductive Turn-off Switching Times vs. Junction Temperature**



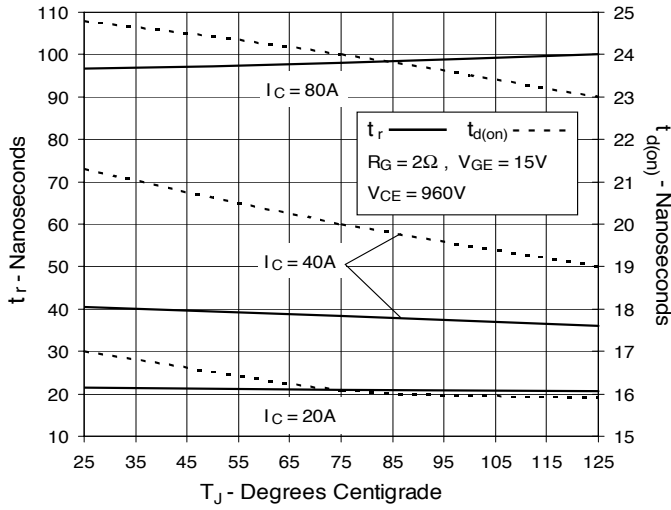
**Fig. 11. Inductive Turn-on Switching Times vs. Gate Resistance**



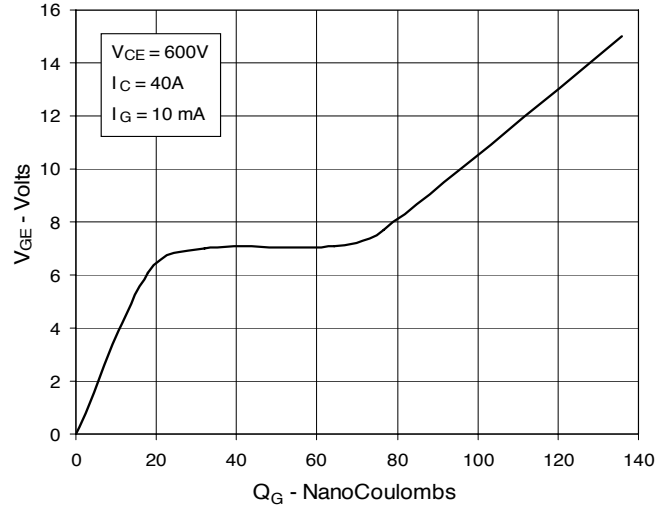
**Fig. 12. Inductive Turn-on Switching Times vs. Collector Current**



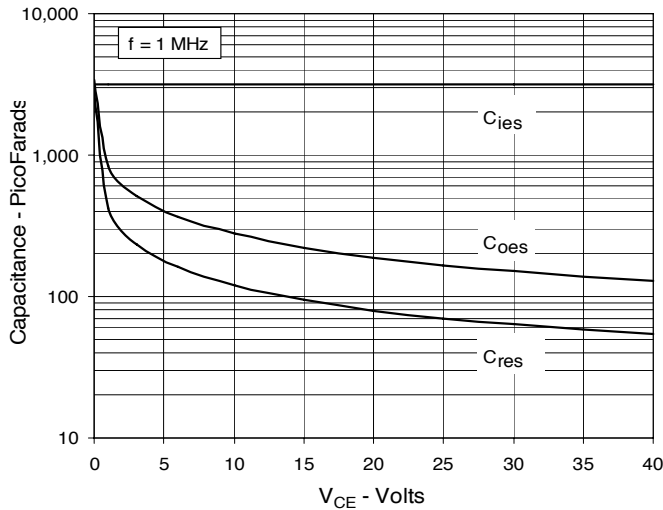
**Fig. 13. Inductive Turn-on Switching Times vs. Junction Temperature**



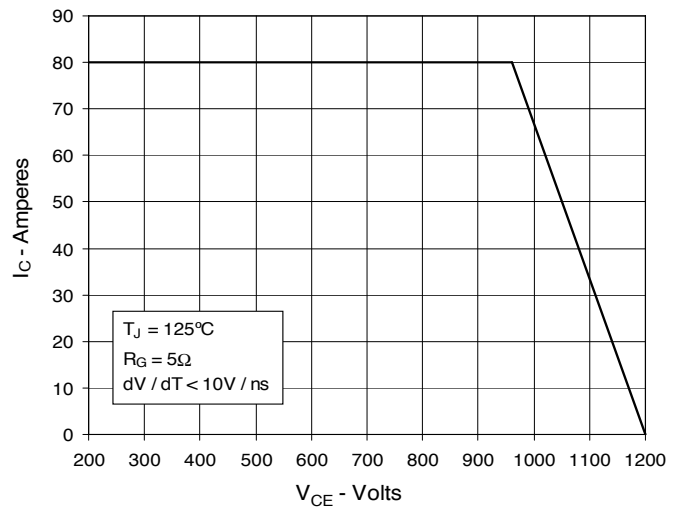
**Fig. 14. Gate Charge**



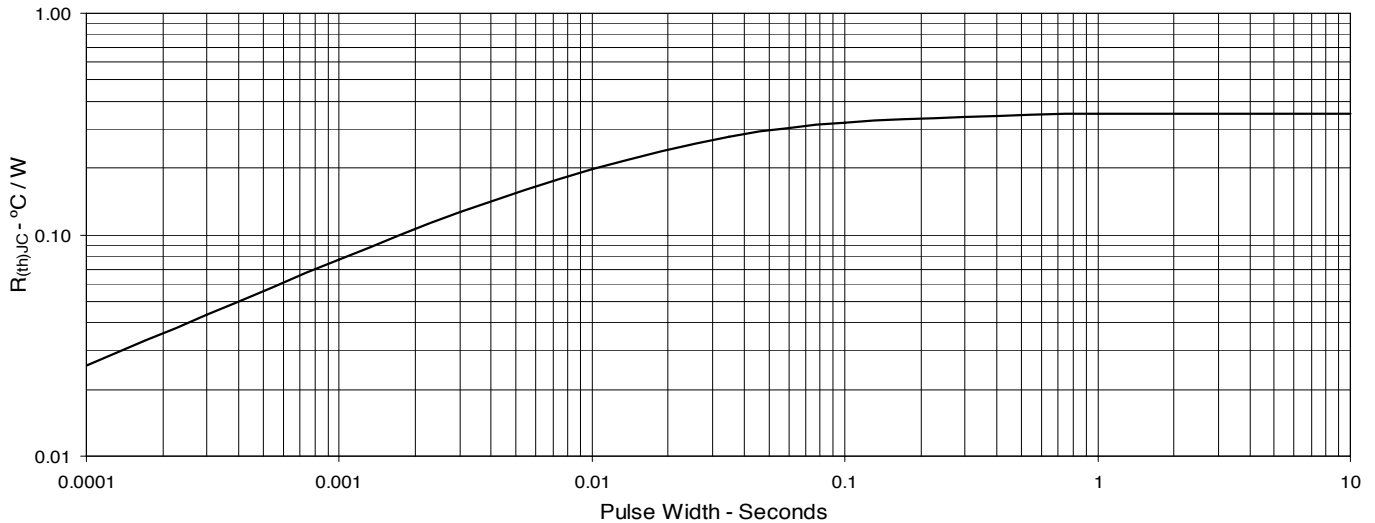
**Fig. 15. Capacitance**



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



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





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