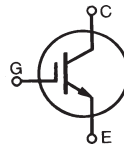


## GenX3™ 600V IGBT

**IXGH72N60A3**  
**IXGT72N60A3**

Ultra Low V<sub>sat</sub> PT IGBT for  
up to 5kHz switching



$$V_{CES} = 600V$$

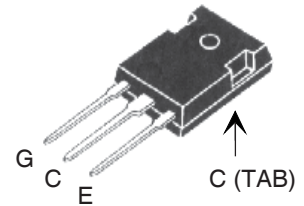
$$I_{C110} = 72A$$

$$V_{CE(sat)} \leq 1.35V$$

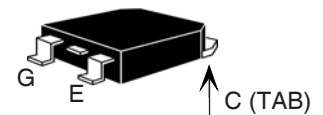
$$t_{fi(typ)} = 250ns$$

| Symbol                        | Test Conditions                                                                                    | Maximum Ratings |             |
|-------------------------------|----------------------------------------------------------------------------------------------------|-----------------|-------------|
| $V_{CES}$                     | $T_C = 25^{\circ}C$ to $150^{\circ}C$                                                              | 600             | V           |
| $V_{CGR}$                     | $T_J = 25^{\circ}C$ to $150^{\circ}C$ , $R_{GE} = 1M\Omega$                                        | 600             | V           |
| $V_{GES}$                     | Continuous                                                                                         | $\pm 20$        | V           |
| $V_{GEM}$                     | Transient                                                                                          | $\pm 30$        | V           |
| $I_{C25}$                     | $T_C = 25^{\circ}C$ (limited by leads)                                                             | 75              | A           |
| $I_{C110}$                    | $T_C = 110^{\circ}C$                                                                               | 72              | A           |
| $I_{CM}$                      | $T_C = 25^{\circ}C$ , 1ms                                                                          | 400             | A           |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_{VJ} = 125^{\circ}C$ , $R_G = 3\Omega$<br>Clamped inductive load @ $\leq 600V$ | $I_{CM} = 150$  | A           |
| $P_C$                         | $T_C = 25^{\circ}C$                                                                                | 540             | W           |
| $T_J$                         |                                                                                                    | -55 ... +150    | $^{\circ}C$ |
| $T_{JM}$                      |                                                                                                    | 150             | $^{\circ}C$ |
| $T_{stg}$                     |                                                                                                    | -55 ... +150    | $^{\circ}C$ |
| $T_L$                         | 1.6mm (0.062 in.) from case for 10s                                                                | 300             | $^{\circ}C$ |
| $T_{SOLD}$                    | Plastic body for 10 seconds                                                                        | 260             | $^{\circ}C$ |
| $M_d$                         | Mounting torque (TO-247)                                                                           | 1.13/10         | Nm/lb.in.   |
| <b>Weight</b>                 | TO-247                                                                                             | 6               | g           |
|                               | TO-268                                                                                             | 4               | g           |

TO-247 (IXGH)



TO-268 (IXGT)



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

### Features

- Optimized for low conduction losses
- Square RBSOA
- International standard packages

### Advantages

- High power density
- Low gate drive requirement

### Applications

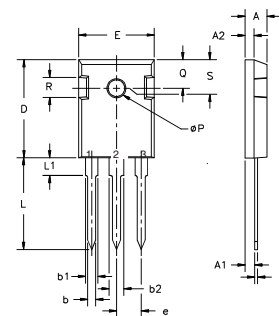
- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts
- Inrush Current Protection Circuits

| Symbol        | Test Conditions<br>( $T_J = 25^{\circ}C$ unless otherwise specified) | Characteristic Values |      |                           |
|---------------|----------------------------------------------------------------------|-----------------------|------|---------------------------|
|               |                                                                      | Min.                  | Typ. | Max.                      |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                                     | 600                   |      | V                         |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                 | 3.0                   |      | 5.0 V                     |
| $I_{CES}$     | $V_{CE} = V_{CES}$<br>$V_{GE} = 0V$ $T_J = 125^{\circ}C$             |                       |      | 75 $\mu A$<br>750 $\mu A$ |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                   |                       |      | $\pm 100$ nA              |
| $V_{CE(sat)}$ | $I_C = 60A$ , $V_{GE} = 15V$ , Note 1                                |                       |      | 1.35 V                    |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified)                                                           | Characteristic Values |      |                    |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|--------------------|
|              |                                                                                                                                     | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $I_C = 60\text{A}$ , $V_{CE} = 10\text{V}$ , Note 1                                                                                 | 48                    | 76   | S                  |
| $C_{ies}$    | $V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$                                                                    |                       | 6600 | pF                 |
| $C_{oes}$    |                                                                                                                                     |                       | 360  | pF                 |
| $C_{res}$    |                                                                                                                                     |                       | 80   | pF                 |
| $Q_g$        | $I_C = I_{C110}$ , $V_{GE} = 15\text{V}$ , $V_{CE} = 0.5 \cdot V_{CES}$                                                             |                       | 230  | nC                 |
| $Q_{ge}$     |                                                                                                                                     |                       | 40   | nC                 |
| $Q_{gc}$     |                                                                                                                                     |                       | 78   | nC                 |
| $t_{d(on)}$  | Inductive load, $T_J = 25^\circ\text{C}$<br>$I_C = 50\text{A}$ , $V_{GE} = 15\text{V}$<br>$V_{CE} = 480\text{V}$ , $R_G = 3\Omega$  |                       | 31   | ns                 |
| $t_{ri}$     |                                                                                                                                     |                       | 34   | ns                 |
| $E_{on}$     |                                                                                                                                     | 1.38                  |      | mJ                 |
| $t_{d(off)}$ |                                                                                                                                     |                       | 320  | ns                 |
| $t_{fi}$     |                                                                                                                                     |                       | 250  | ns                 |
| $E_{off}$    |                                                                                                                                     |                       | 3.5  | mJ                 |
| $t_{d(on)}$  | Inductive load, $T_J = 125^\circ\text{C}$<br>$I_C = 50\text{A}$ , $V_{GE} = 15\text{V}$<br>$V_{CE} = 480\text{V}$ , $R_G = 3\Omega$ |                       | 29   | ns                 |
| $t_{ri}$     |                                                                                                                                     |                       | 32   | ns                 |
| $E_{on}$     |                                                                                                                                     | 2.6                   |      | mJ                 |
| $t_{d(off)}$ |                                                                                                                                     |                       | 510  | ns                 |
| $t_{fi}$     |                                                                                                                                     |                       | 375  | ns                 |
| $E_{off}$    |                                                                                                                                     |                       | 6.5  | mJ                 |
| $R_{thJC}$   |                                                                                                                                     |                       | 0.23 | $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                     | 0.15                  |      | $^\circ\text{C/W}$ |

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

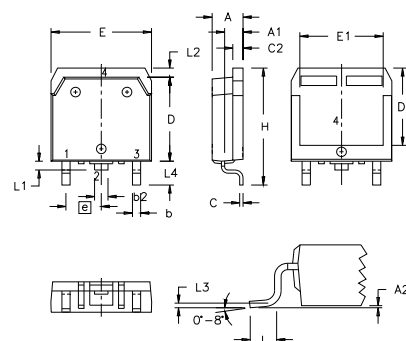
## TO-247 AD Outline



Terminals: 1 - Gate 2 - 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  |
| ØP             | 3.55       | 3.65  | .140   | .144  |
| Q              | 5.89       | 6.40  | 0.232  | 0.252 |
| R              | 4.32       | 5.49  | .170   | .216  |

## TO-268 Outline



Terminals: 1 - Gate 2 - Drain

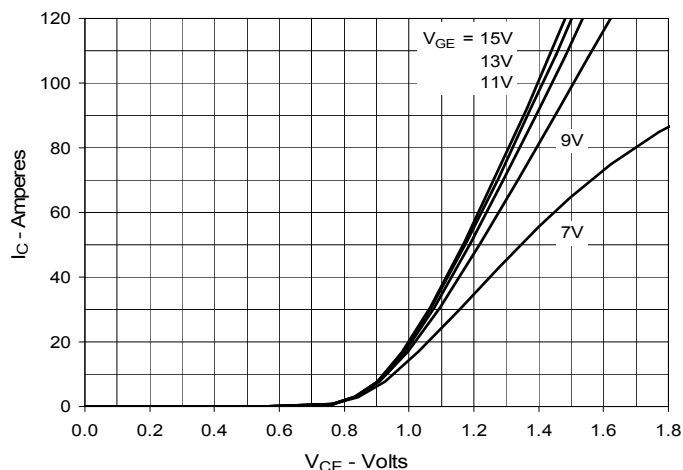
| SYM            | INCHES   |      | MILLIMETERS |       |
|----------------|----------|------|-------------|-------|
|                | MIN      | MAX  | MIN         | MAX   |
| A              | .193     | .201 | 4.90        | 5.10  |
| A <sub>1</sub> | .106     | .114 | 2.70        | 2.90  |
| A <sub>2</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.

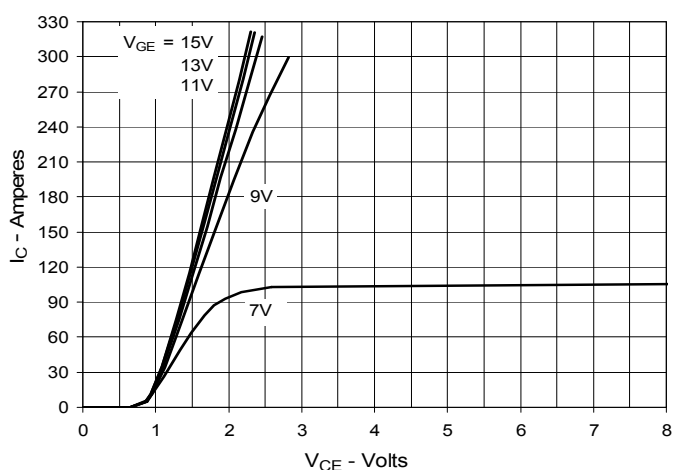
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |              |             |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 | 7,157,338B2 |
| 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    |             |

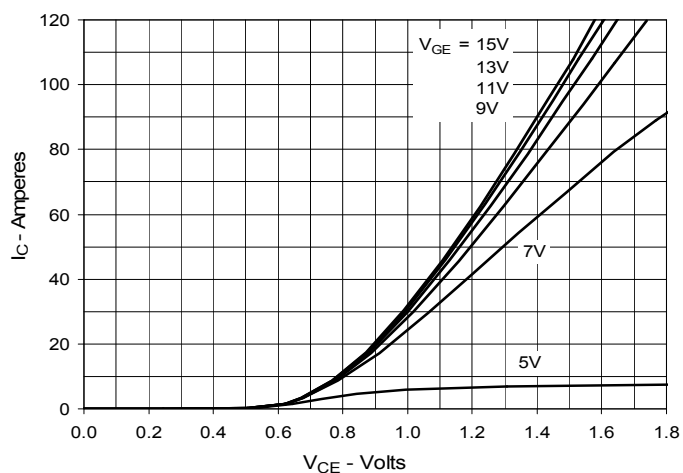
**Fig. 1. Output Characteristics**  
**@ 25°C**



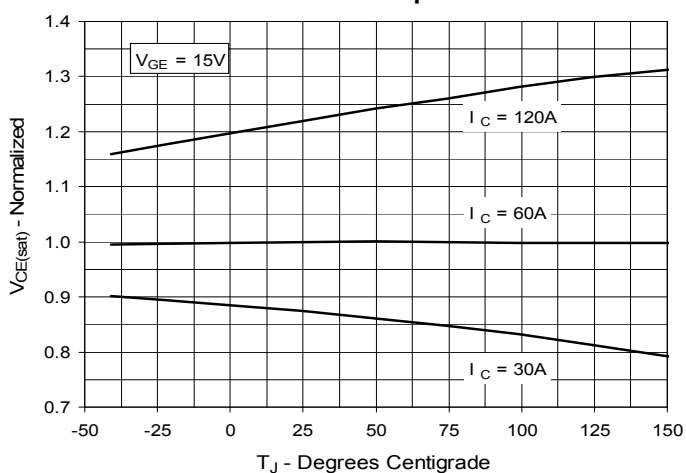
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



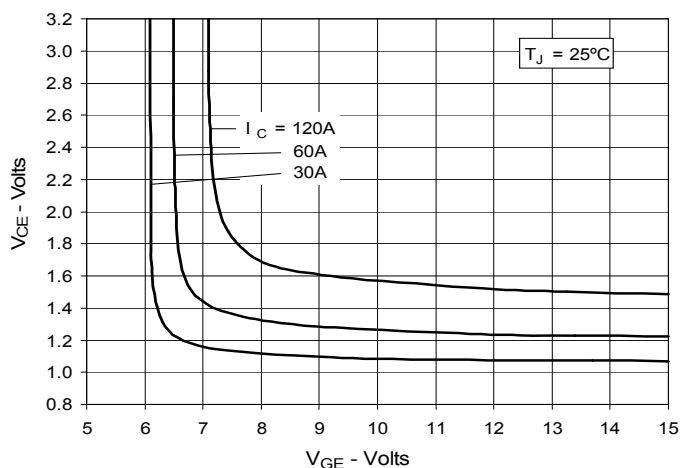
**Fig. 3. Output Characteristics**  
**@ 125°C**



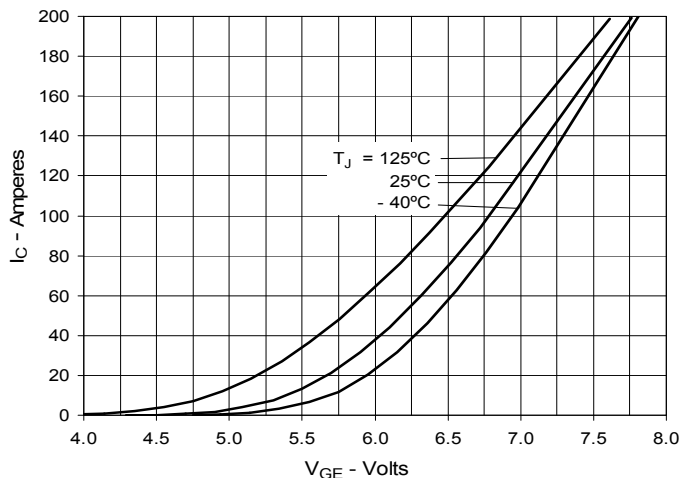
**Fig. 4. Dependence of VCE(sat) on**  
**Junction Temperature**



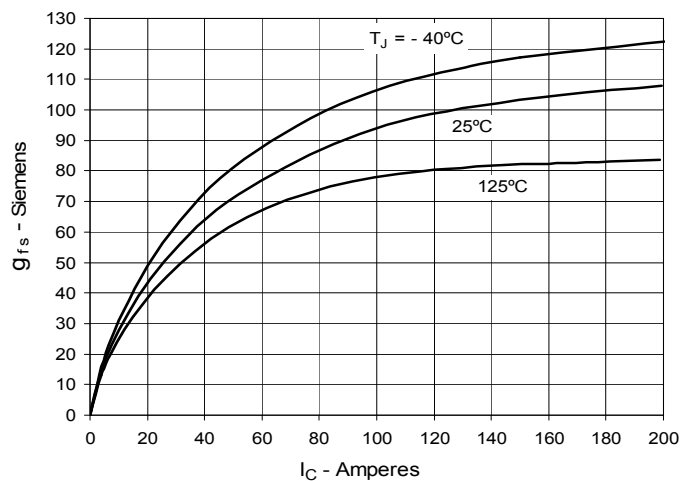
**Fig. 5. Collector-to-Emitter Voltage**  
**vs. Gate-to-Emitter Voltage**



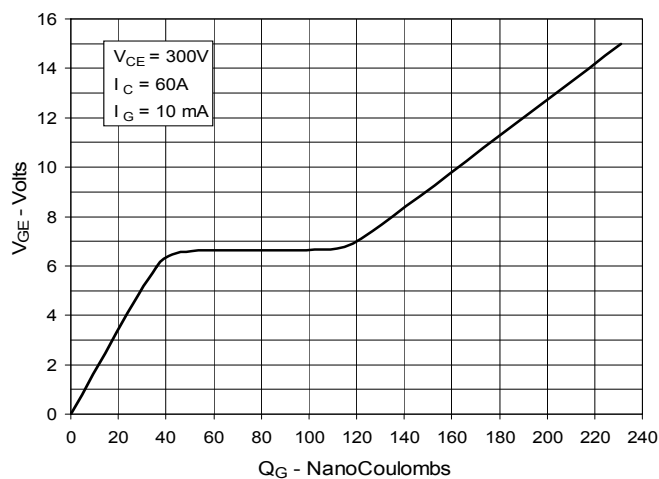
**Fig. 6. Input Admittance**



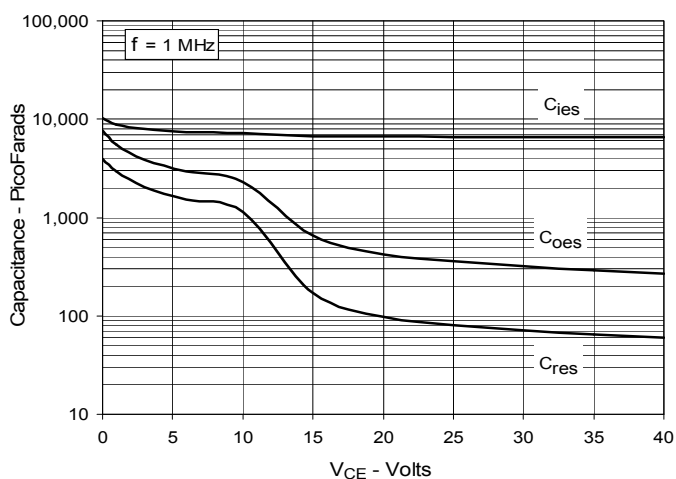
**Fig. 7. Transconductance**



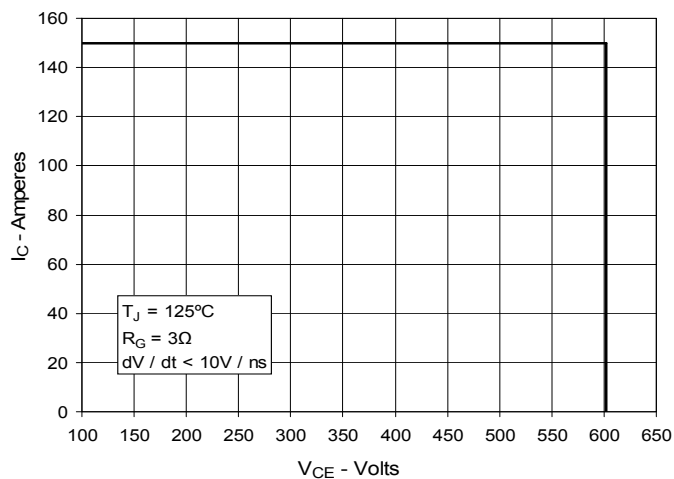
**Fig. 8. Gate Charge**



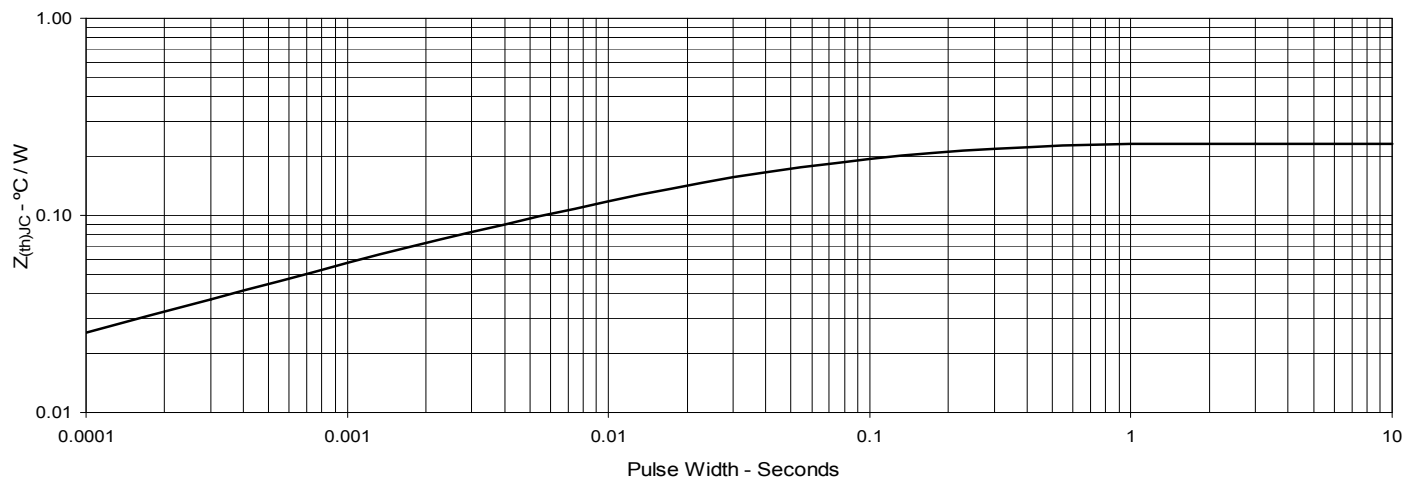
**Fig. 9. Capacitance**



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

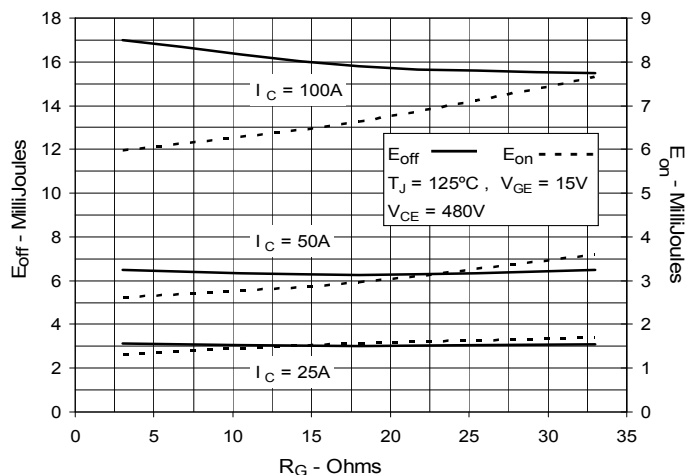


**Fig. 11. Maximum Transient Thermal Impedance**

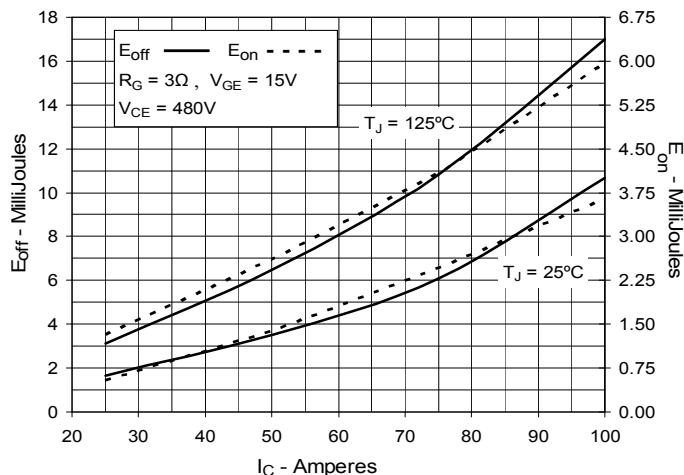


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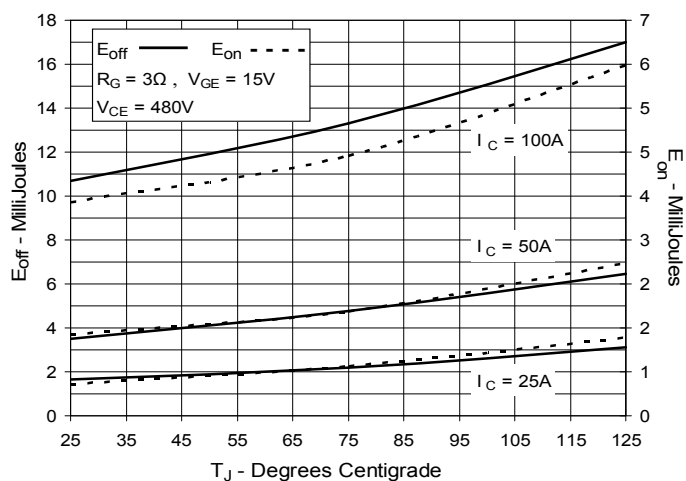
**Fig. 12. Inductive Switching  
Energy Loss vs. Gate Resistance**



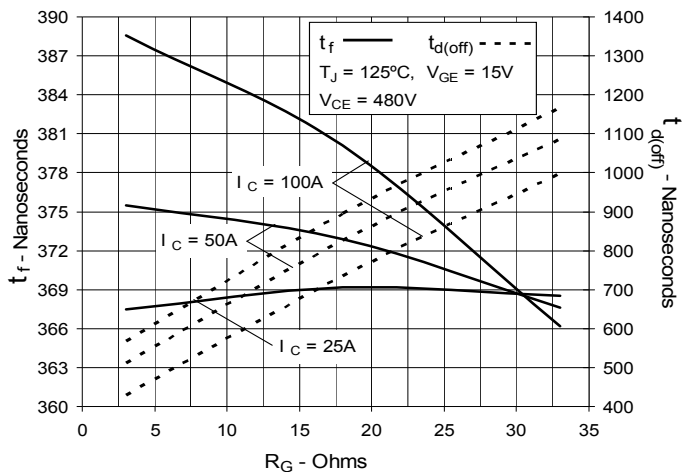
**Fig. 13. Inductive Switching  
Energy Loss vs. Collector Current**



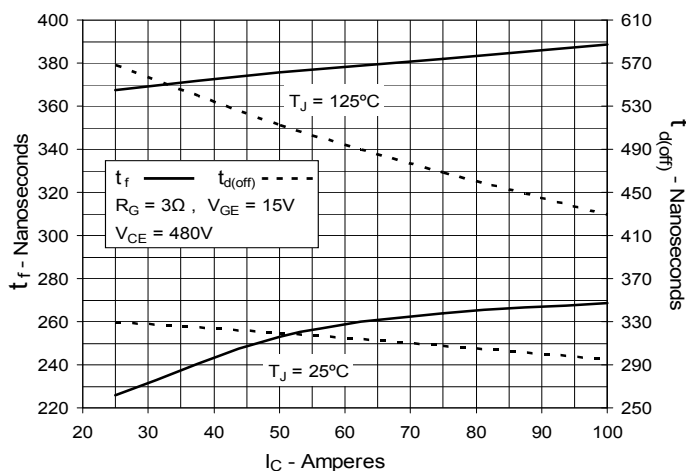
**Fig. 14. Inductive Switching  
Energy Loss vs. Junction Temperature**



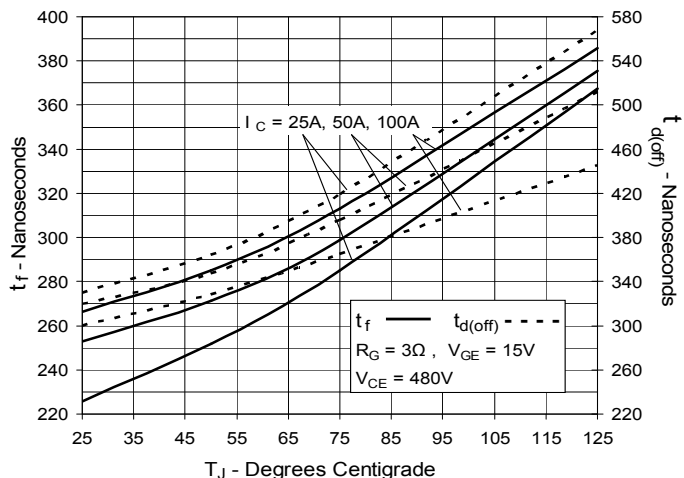
**Fig. 15. Inductive Turn-off  
Switching Times vs. Gate Resistance**



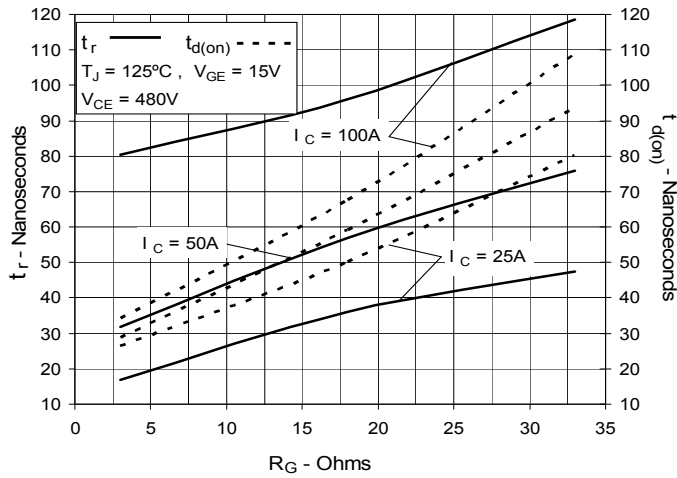
**Fig. 16. Inductive Turn-off  
Switching Times vs. Collector Current**



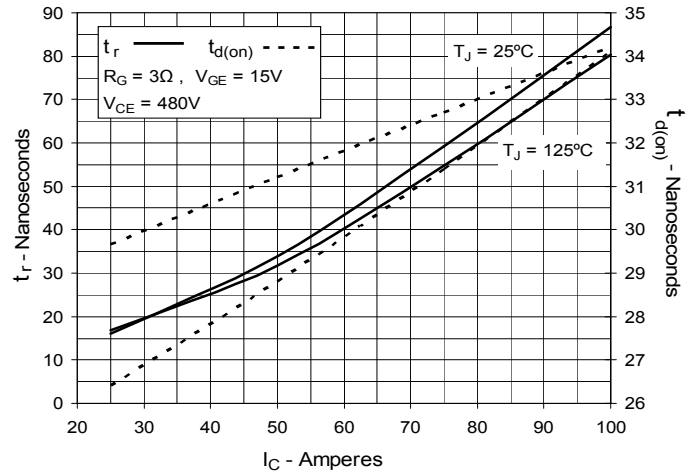
**Fig. 17. Inductive Turn-off  
Switching Times vs. Junction Temperature**



**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**

