

# High Voltage IGBT

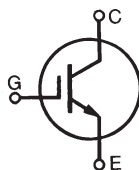
## IXGT6N170AHV

$$V_{CES} = 1700V$$

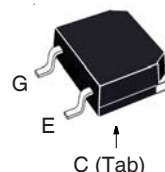
$$I_{C25} = 6A$$

$$V_{CE(sat)} \leq 7.0V$$

$$t_{fi(typ)} = 32ns$$



TO-268



G = Gate      C = Collector  
E = Emitter    Tab = Collector

| Symbol                     | Test Conditions  | Maximum Ratings     |            |
|----------------------------|--|---------------------|------------|
| $V_{CES}$                  | $T_J = 25^\circ C$ to $150^\circ C$  | 1700                | V          |
| $V_{CGR}$                  | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$                                    | 1700                | V          |
| $V_{GES}$                  | Continuous   | $\pm 20$            | V          |
| $V_{GEM}$                  | Transient  | $\pm 30$            | V          |
| $I_{C25}$                  | $T_C = 25^\circ C$   | 6                   | A          |
| $I_{C110}$                 | $T_C = 110^\circ C$  | 3                   | A          |
| $I_{CM}$                   | $T_C = 25^\circ C$ , 1ms   | 14                  | A          |
| <b>SSOA</b>                | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 33\Omega$                                   | $I_{CM} = 12$       | A          |
| <b>(RBSOA)</b>             | Clamped Inductive Load   | $0.8 \cdot V_{CES}$ |            |
| $t_{sc}$<br><b>(SCSOA)</b> | $V_{GE} = 15V$ , $V_{CE} = 1200V$ , $T_J = 125^\circ C$<br>$R_G = 33\Omega$ , Non Repetitive | 10                  | $\mu s$    |
| $P_C$                      | $T_C = 25^\circ C$   | 75                  | 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                 | $^\circ C$ |
| <b>Weight</b>              |  | 4                   | g          |

### Features

- High Blocking Voltage
- High Voltage Package

### Advantages

- High Power Density
- Easy to Mount

### Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Welding Machines

| Symbol        | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                           |
|---------------|---|-----------------------|------|---------------------------|
|               |   | Min.                  | Typ. | Max.                      |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                                      | 1700                  |      | V                         |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                  | 3.0                   |      | 5.0 V                     |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 125^\circ C$   |                       |      | 10 $\mu A$<br>500 $\mu A$ |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                    |                       |      | $\pm 100$ nA              |
| $V_{CE(sat)}$ | $I_C = 3A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ C$           |                       | 5.4  | 7.0 V<br>V                |

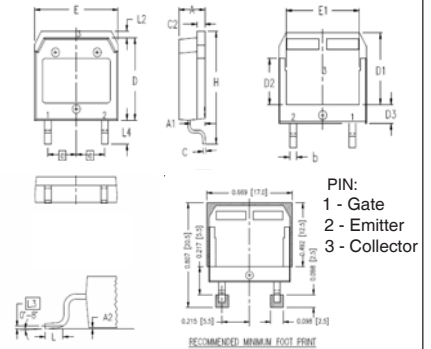
### Symbol Test Conditions

( $T_J = 25^\circ\text{C}$  Unless Otherwise Specified)

### Characteristic Values

|              |   | Min. | Typ. | Max. |                    |
|--------------|---|------|------|------|--------------------|
| $g_{fs}$     | $I_C = 6\text{A}, V_{CE} = 20\text{V}$ , Note 1   | 2.0  | 3.5  |      | S                  |
| $C_{ies}$    | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$  |      | 390  |      | pF                 |
| $C_{oes}$    |   |      | 20   |      | pF                 |
| $C_{res}$    |   |      | 7    |      | pF                 |
| $Q_{g(on)}$  | $I_C = 6\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$  |      | 18.5 |      | nC                 |
| $Q_{ge}$     |   |      | 2.8  |      | nC                 |
| $Q_{gc}$     |   |      | 8.2  |      | nC                 |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 6\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 0.5 \cdot V_{CES}, R_G = 33\Omega$<br>Note 2  |      | 46   |      | ns                 |
| $t_{ri}$     |   |      | 40   |      | ns                 |
| $E_{on}$     |   |      | 0.59 |      | mJ                 |
| $t_{d(off)}$ |   |      | 220  | 400  | ns                 |
| $t_{fi}$     |   |      | 32   |      | ns                 |
| $E_{off}$    |   |      | 0.18 | 0.36 | mJ                 |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 6\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 0.5 \cdot V_{CES}, R_G = 33\Omega$<br>Note 2 |      | 48   |      | ns                 |
| $t_{ri}$     |   |      | 43   |      | ns                 |
| $E_{on}$     |   |      | 0.62 |      | mJ                 |
| $t_{d(off)}$ |   |      | 230  |      | ns                 |
| $t_{fi}$     |   |      | 41   |      | ns                 |
| $E_{off}$    |   |      | 0.25 |      | mJ                 |
| $R_{thJC}$   |   |      |      | 1.65 | $^\circ\text{C/W}$ |

### TO-268 (VHV) Outline



| SYM | INCHES   |      | MILLIMETER |       |
|-----|----------|------|------------|-------|
|     | MIN      | MAX  | MIN        | MAX   |
| A   | .193     | .201 | 4.90       | 5.10  |
| A1  | .106     | .114 | 2.70       | 2.90  |
| A2  | .001     | .010 | 0.02       | 0.25  |
| b   | .045     | .057 | 1.15       | 1.45  |
| C   | .016     | .026 | 0.40       | 0.65  |
| C2  | .057     | .063 | 1.45       | 1.60  |
| D   | .543     | .551 | 13.80      | 14.00 |
| D1  | .465     | .476 | 11.80      | 12.10 |
| D2  | .295     | .307 | 7.50       | 7.80  |
| D3  | .114     | .126 | 2.90       | 3.20  |
| E   | .624     | .632 | 15.85      | 16.05 |
| E1  | .524     | .535 | 13.30      | 13.60 |
| E   | .215 BSC |      | 5.45 BSC   |       |
| H   | .736     | .752 | 18.70      | 19.10 |
| L   | .067     | .079 | 1.70       | 2.00  |
| L2  | .039     | .045 | 1.00       | 1.15  |
| L3  | .010 BSC |      | 0.25 BSC   |       |
| L4  | .150     | .161 | 3.80       | 4.10  |

### 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  $R_G$ .

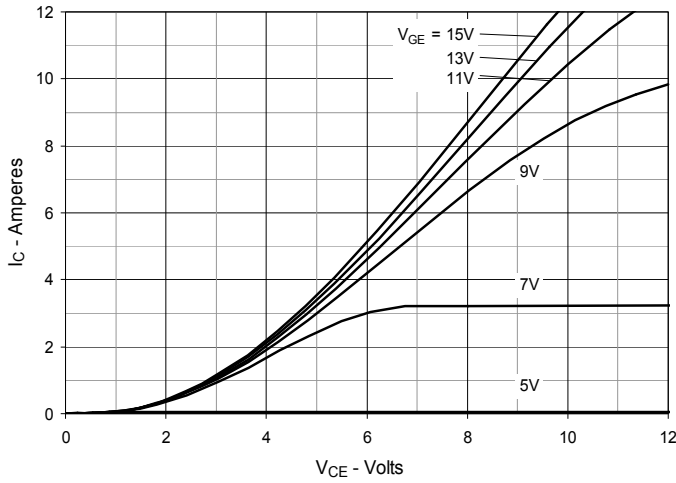
### ADVANCE TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

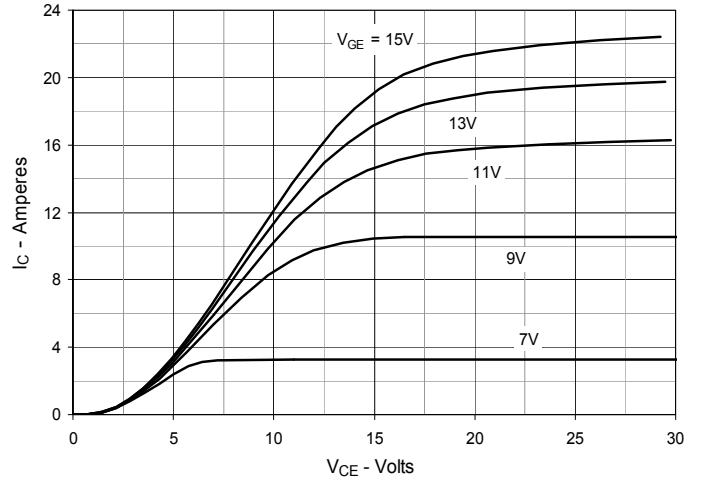
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|  |           |           |           |           |              |              |              |              |              |             |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 |
|  | 4,860,072 | 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    |             |

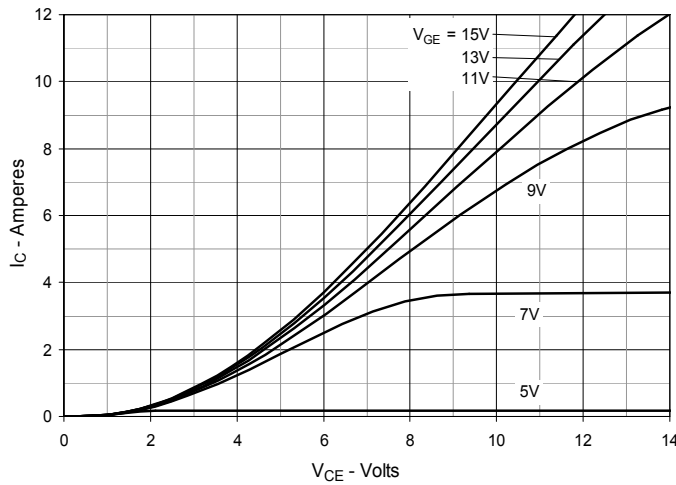
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



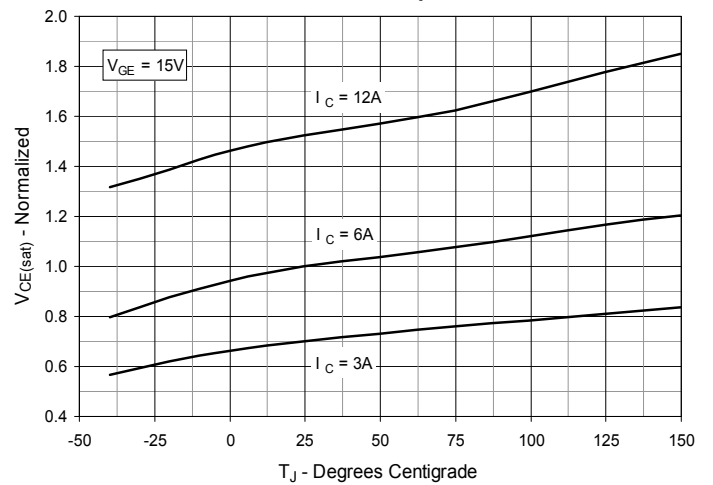
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



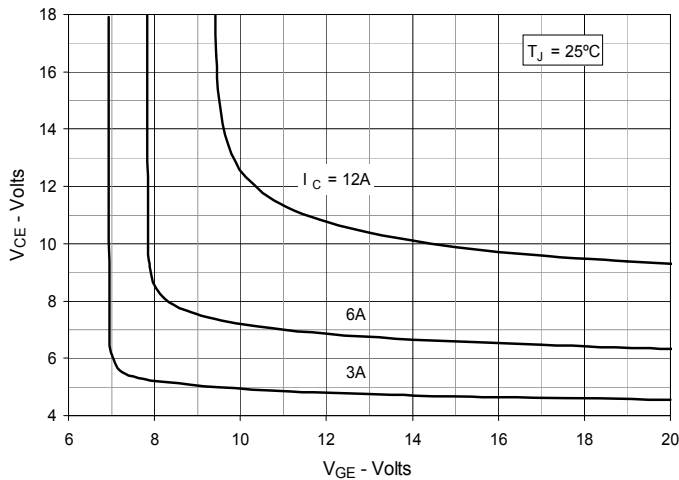
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



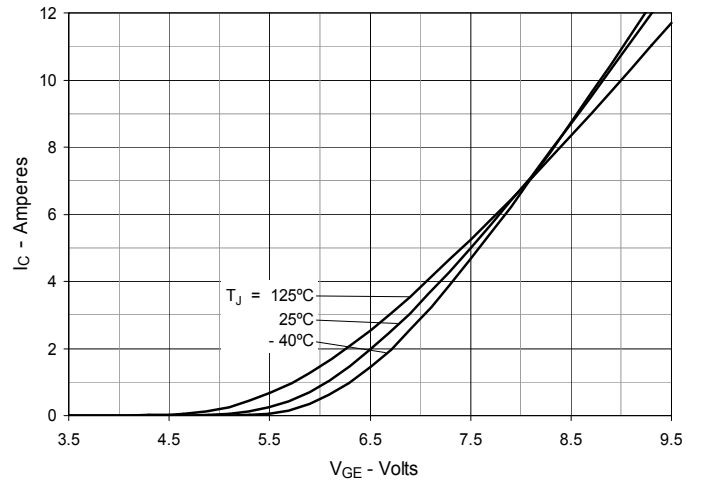
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



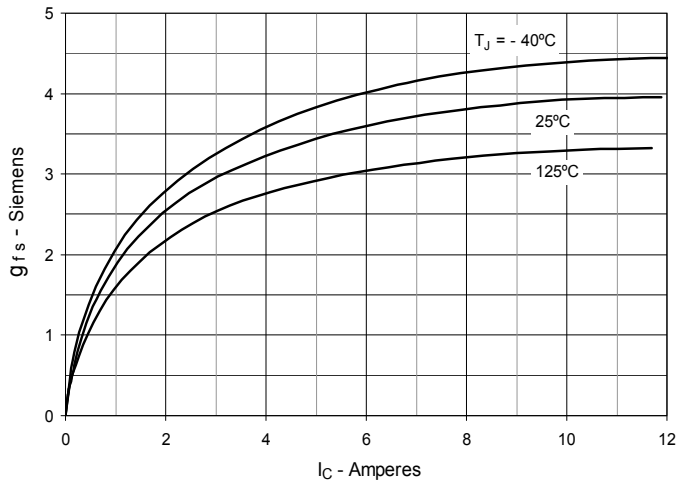
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



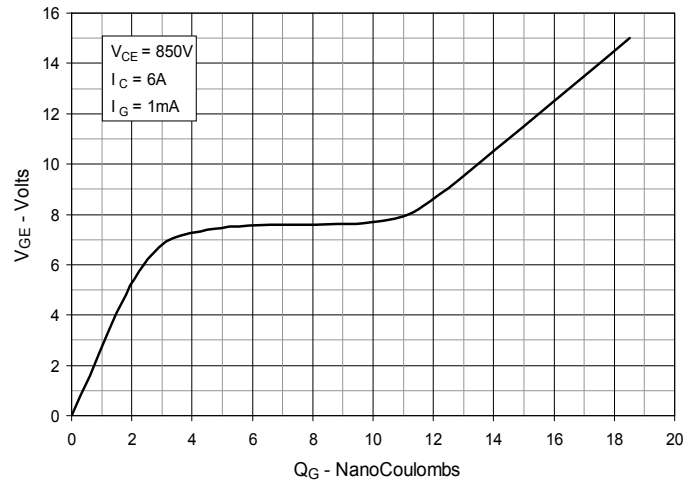
**Fig. 6. Input Admittance**



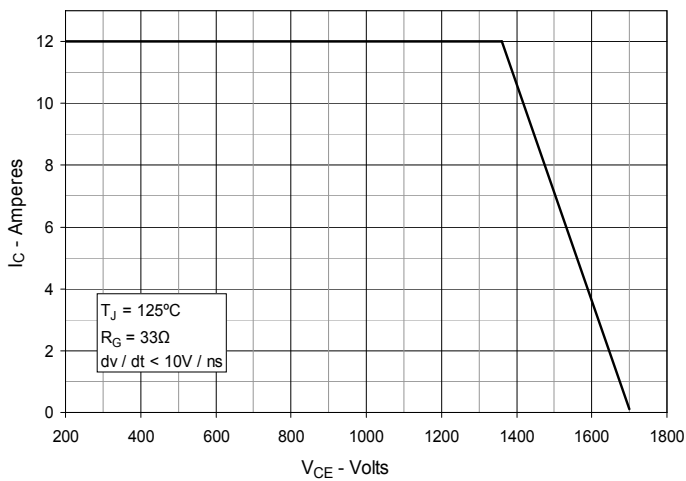
**Fig. 7. Transconductance**



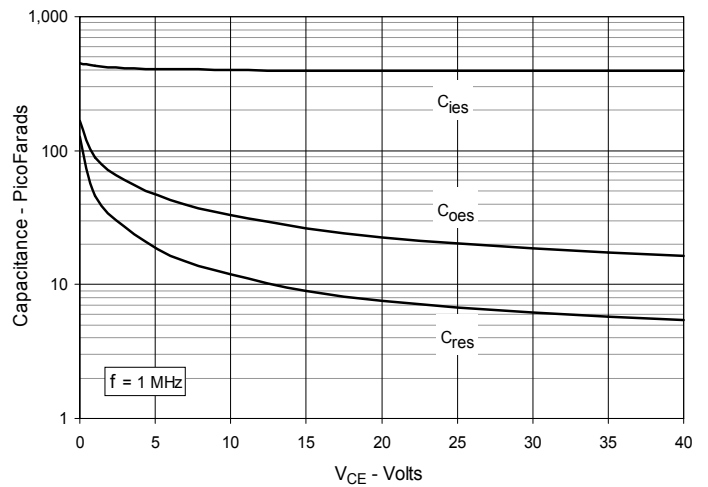
**Fig. 8. Gate Charge**



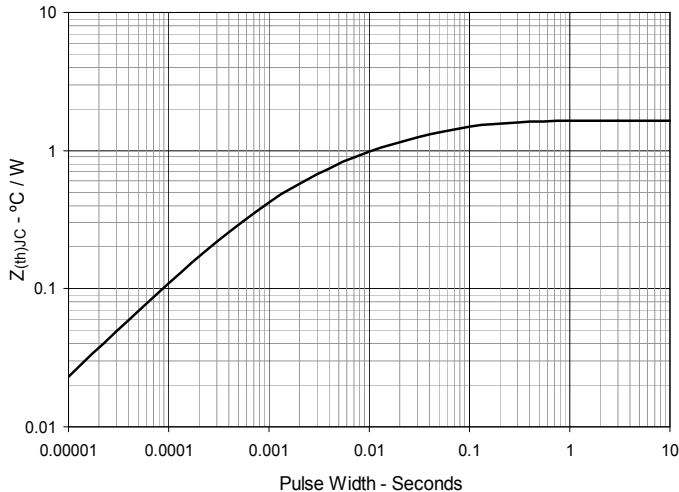
**Fig. 9. Reverse-Bias Safe Operating Area**



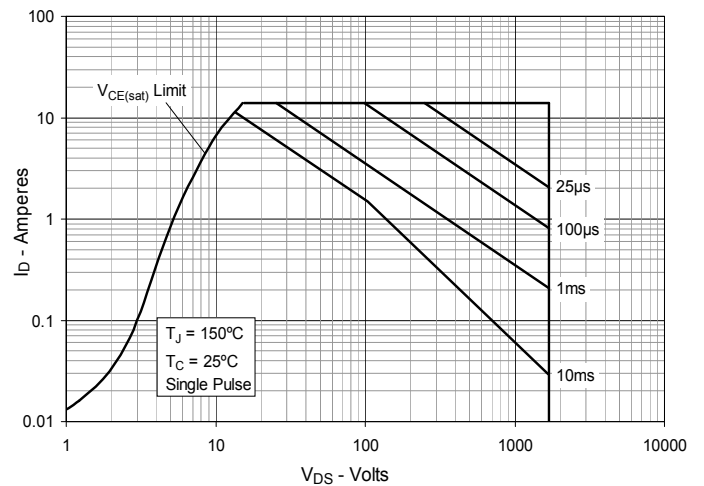
**Fig. 10. Capacitance**



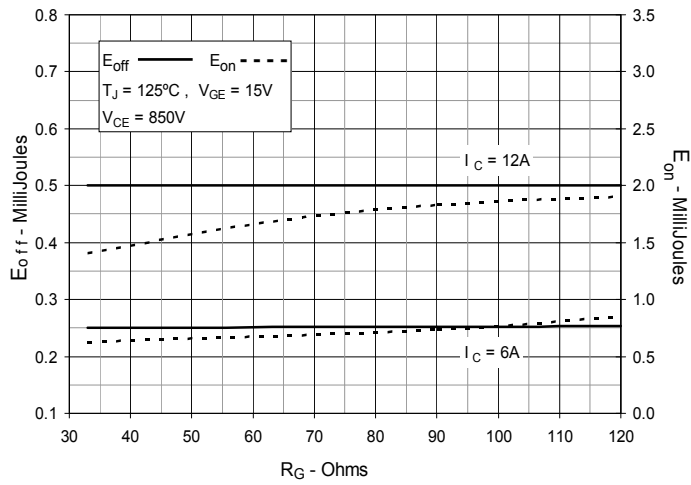
**Fig. 11. Maximum Transient Thermal Impedance**



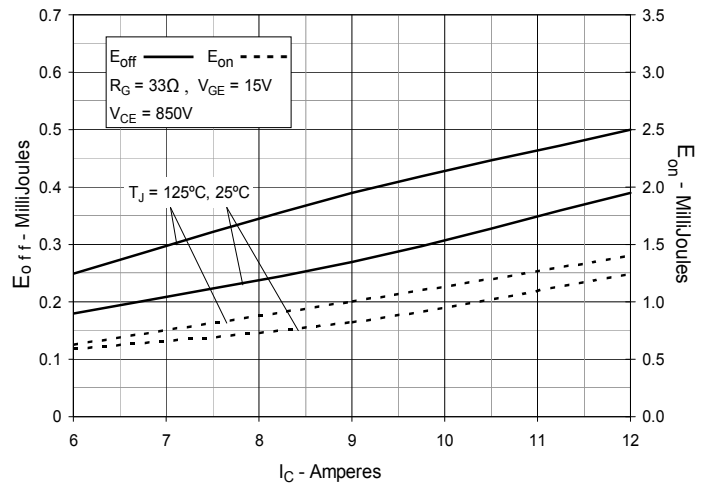
**Fig. 12. Forward-Bias Safe Operating Area**



**Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance**



**Fig. 14. Inductive Switching Energy Loss vs. Collector Current**



**Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature**

