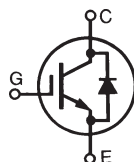


### GenX3™ 1200V IGBTs w/ Diode

### IXGK50N120C3H1 IXGX50N120C3H1

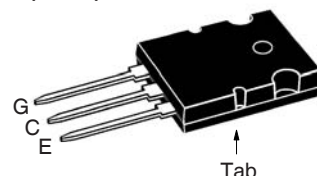
### High-Speed PT IGBTs for 20 - 50 kHz Switching



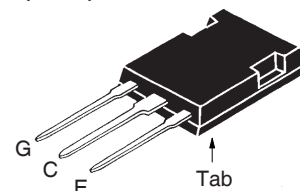
$$\begin{aligned} V_{CES} &= 1200V \\ I_{C100} &= 50A \\ V_{CE(sat)} &\leq 4.2V \\ t_{fi(typ)} &= 64ns \end{aligned}$$

| Symbol                        | Test Conditions                                                                        | Maximum Ratings                         |                  |
|-------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------|------------------|
| $V_{CES}$                     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                        | 1200                                    | V                |
| $V_{CGR}$                     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GE} = 1M\Omega$                  | 1200                                    | V                |
| $V_{GES}$                     | Continuous                                                                             | $\pm 20$                                | V                |
| $V_{GEM}$                     | Transient                                                                              | $\pm 30$                                | V                |
| $I_{C25}$                     | $T_C = 25^\circ\text{C}$ ( Chip Capability )                                           | 95                                      | A                |
| $I_{C100}$                    | $T_C = 100^\circ\text{C}$                                                              | 50                                      | A                |
| $I_{F110}$                    | $T_C = 110^\circ\text{C}$                                                              | 58                                      | A                |
| $I_{CM}$                      | $T_C = 25^\circ\text{C}$ , 1ms                                                         | 240                                     | A                |
| $I_A$                         | $T_C = 25^\circ\text{C}$                                                               | 40                                      | A                |
| $E_{AS}$                      | $T_C = 25^\circ\text{C}$                                                               | 750                                     | mJ               |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_J = 125^\circ\text{C}$ , $R_G = 3\Omega$<br>Clamped Inductive Load | $I_{CM} = 100$<br>$V_{CE} \leq V_{CES}$ | A                |
| $P_C$                         | $T_C = 25^\circ\text{C}$                                                               | 460                                     | 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                                                 | 300                                     | $^\circ\text{C}$ |
| $T_{SOLD}$                    | 1.6 mm (0.062 in.) from Case for 10                                                    | 260                                     | $^\circ\text{C}$ |
| $M_d$                         | Mounting Torque ( IXGK )                                                               | 1.13/10                                 | Nm/lb.in.        |
| $F_C$                         | Mounting Force ( IXGX )                                                                | 20..120/4.5..14.6                       | N/lb.            |
| <b>Weight</b>                 | TO-264                                                                                 | 10                                      | g                |
|                               | PLUS247                                                                                | 6                                       | g                |

TO-264 (IXGK)



PLUS247 (IXGX)



G = Gate  
C = Collector

E = Emitter  
Tab = Collector

### Features

- Optimized for Low Switching Losses
- Square RBSOA
- High Avalanche Capability
- Avalanche Rated
- Anti-Parallel Ultra Fast Diode
- International Standard Packages

### Advantages

- High Power Density
- Low Gate Drive Requirement

### Applications

- High Frequency Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

| Symbol        | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                            |
|---------------|-----------------------------------------------------------------------------|-----------------------|------|----------------------------|
|               |                                                                             | Min.                  | Typ. | Max.                       |
| $V_{GE(th)}$  | $I_C = 250\mu\text{A}$ , $V_{CE} = V_{GE}$                                  | 3.0                   |      | 5.0 V                      |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0V$<br>Note 1, $T_J = 125^\circ\text{C}$     |                       |      | 250 $\mu\text{A}$<br>14 mA |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                          |                       |      | $\pm 100$ nA               |
| $V_{CE(sat)}$ | $I_C = 40A$ , $V_{GE} = 15V$ , Note 2<br>$T_J = 125^\circ\text{C}$          |                       | 2.6  | 4.2 V<br>V                 |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                         | Characteristic Values |      |                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              |                                                                                                                                                     | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $I_C = 40\text{A}$ , $V_{CE} = 10\text{V}$ , Note 2                                                                                                 | 24                    | 40   | S                       |
| $C_{ies}$    | $V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$                                                                                    |                       | 4250 | pF                      |
| $C_{oes}$    |                                                                                                                                                     |                       | 455  | pF                      |
| $C_{res}$    |                                                                                                                                                     |                       | 120  | pF                      |
| $Q_g$        | $I_C = 50\text{A}$ , $V_{GE} = 15\text{V}$ , $V_{CE} = 0.5 \cdot V_{CES}$                                                                           |                       | 196  | nC                      |
| $Q_{ge}$     |                                                                                                                                                     |                       | 24   | nC                      |
| $Q_{gc}$     |                                                                                                                                                     |                       | 84   | nC                      |
| $t_{d(on)}$  | Inductive load, $T_J = 25^\circ\text{C}$<br>$I_C = 40\text{A}$ , $V_{GE} = 15\text{V}$<br>$V_{CE} = 0.5 \cdot V_{CES}$ , $R_G = 2\Omega$<br>Note 3  |                       | 31   | ns                      |
| $t_{ri}$     |                                                                                                                                                     |                       | 36   | ns                      |
| $E_{on}$     |                                                                                                                                                     |                       | 2.0  | mJ                      |
| $t_{d(off)}$ |                                                                                                                                                     |                       | 123  | ns                      |
| $t_{fi}$     |                                                                                                                                                     |                       | 64   | ns                      |
| $E_{off}$    |                                                                                                                                                     |                       | 0.63 | mJ                      |
| $t_{d(on)}$  | Inductive load, $T_J = 125^\circ\text{C}$<br>$I_C = 40\text{A}$ , $V_{GE} = 15\text{V}$<br>$V_{CE} = 0.5 \cdot V_{CES}$ , $R_G = 2\Omega$<br>Note 3 |                       | 23   | ns                      |
| $t_{ri}$     |                                                                                                                                                     |                       | 37   | ns                      |
| $E_{on}$     |                                                                                                                                                     |                       | 3.0  | mJ                      |
| $t_{d(off)}$ |                                                                                                                                                     |                       | 170  | ns                      |
| $t_{fi}$     |                                                                                                                                                     |                       | 315  | ns                      |
| $E_{off}$    |                                                                                                                                                     |                       | 2.1  | mJ                      |
| $R_{thJC}$   |                                                                                                                                                     |                       |      | 0.27 $^\circ\text{C/W}$ |
| $R_{thCK}$   |                                                                                                                                                     |                       | 0.15 | $^\circ\text{C/W}$      |

### Reverse Diode (SONIC-FRD)

| Symbol     | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                | Characteristic Values |      |                         |
|------------|------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|            |                                                                                                            | Min.                  | Typ. | Max.                    |
| $V_F$      | $I_F = 50\text{A}$ , $V_{GE} = 0\text{V}$ , Note 1<br>$T_J = 125^\circ\text{C}$                            |                       | 2.1  | 2.4 V<br>2.3 V          |
| $I_{RM}$   | $I_F = 50\text{A}$ , $V_{GE} = 0\text{V}$ ,<br>$-di_F/dt = 2500\text{A}/\mu\text{s}$ , $V_R = 800\text{V}$ |                       | 50   | A                       |
| $t_{rr}$   |                                                                                                            |                       | 75   | ns                      |
| $R_{thJC}$ |                                                                                                            |                       |      | 0.30 $^\circ\text{C/W}$ |

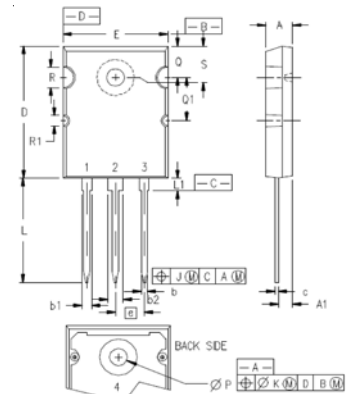
### Notes:

1. Part must be heatsunk for high-temp  $I_{CES}$  measurement.
2. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
3. Switching times & energy losses may increase for higher  $V_{CE}$  (Clamp),  $T_J$  or  $R_G$ .

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

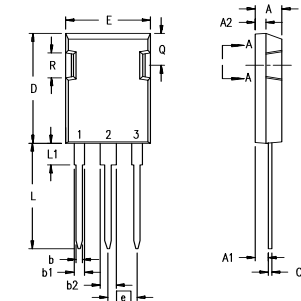
### TO-264 Outline



Terminals: 1 = Gate  
2,4 = Collector  
3 = Emitter

| SYM | INCHES   |       | MILLIMETERS |       |
|-----|----------|-------|-------------|-------|
|     | MIN      | MAX   | MIN         | MAX   |
| A   | .185     | .209  | 4.70        | 5.31  |
| A1  | .102     | .118  | 2.59        | 3.00  |
| b   | .037     | .055  | 0.94        | 1.40  |
| b1  | .087     | .102  | 2.21        | 2.59  |
| b2  | .110     | .126  | 2.79        | 3.20  |
| c   | .017     | .029  | 0.43        | 0.74  |
| D   | 1.007    | 1.047 | 25.58       | 26.59 |
| E   | .760     | .799  | 19.30       | 20.29 |
| e   | .215 BSC |       | 5.46 BSC    |       |
| J   | .000     | .010  | 0.00        | 0.25  |
| K   | .000     | .010  | 0.00        | 0.25  |
| L   | .779     | .842  | 19.79       | 21.39 |
| L1  | .087     | .102  | 2.21        | 2.59  |
| Q   | .122     | .138  | 3.10        | 3.51  |
| Q1  | .240     | .256  | 6.10        | 6.50  |
| Q2  | .330     | .346  | 8.38        | 8.79  |
| Q3  | .155     | .187  | 3.94        | 4.75  |
| Q4  | .085     | .093  | 2.16        | 2.36  |
| S   | .243     | .253  | 6.17        | 6.43  |

### PLUS247™ Outline



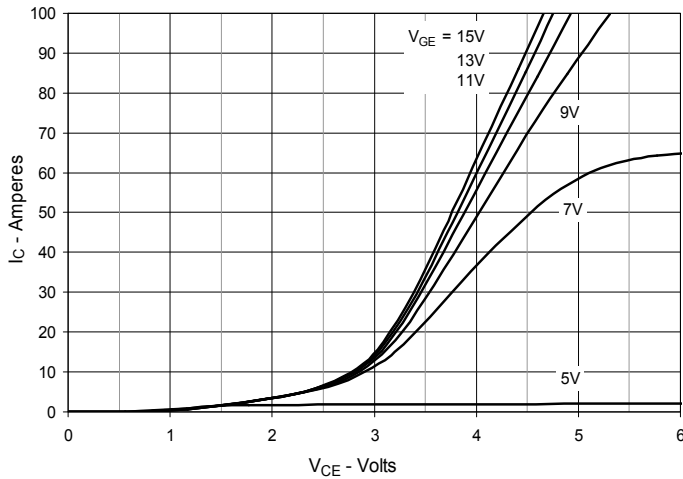
Terminals: 1 - Gate  
2 - Collector  
3 - Emitter

| Dim. | Millimeter |       | Inches   |       |
|------|------------|-------|----------|-------|
|      | Min.       | Max.  | Min.     | Max.  |
| A    | 4.83       | 5.21  | .190     | .205  |
| A1   | 2.29       | 2.54  | .090     | .100  |
| A2   | 1.91       | 2.16  | .075     | .085  |
| b    | 1.14       | 1.40  | .045     | .055  |
| b1   | 1.91       | 2.13  | .075     | .084  |
| b2   | 2.92       | 3.12  | .115     | .123  |
| C    | 0.61       | 0.80  | .024     | .031  |
| D    | 20.80      | 21.34 | .819     | .840  |
| E    | 15.75      | 16.13 | .620     | .635  |
| e    | 5.45 BSC   |       | .215 BSC |       |
| L    | 19.81      | 20.32 | .780     | .800  |
| L1   | 3.81       | 4.32  | .150     | .170  |
| Q    | 5.59       | 6.20  | .220     | 0.244 |
| R    | 4.32       | 4.83  | .170     | .190  |

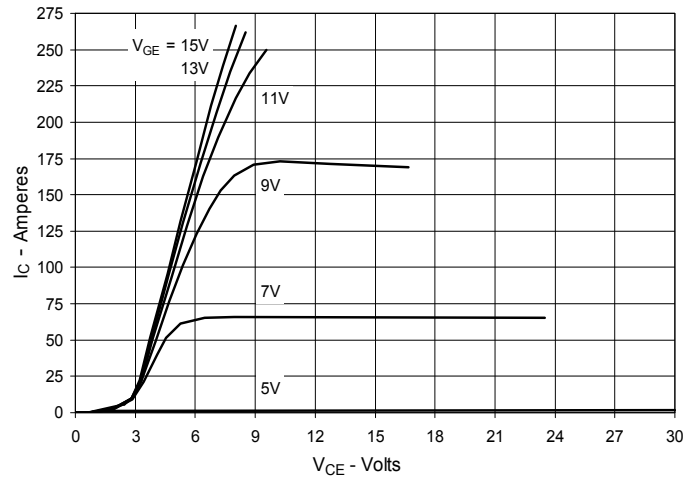
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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    |             |

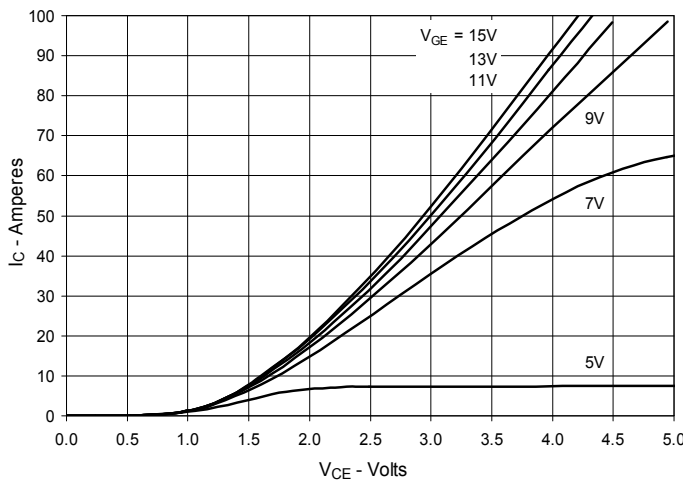
**Fig. 1. Output Characteristics**  
**@ 25°C**



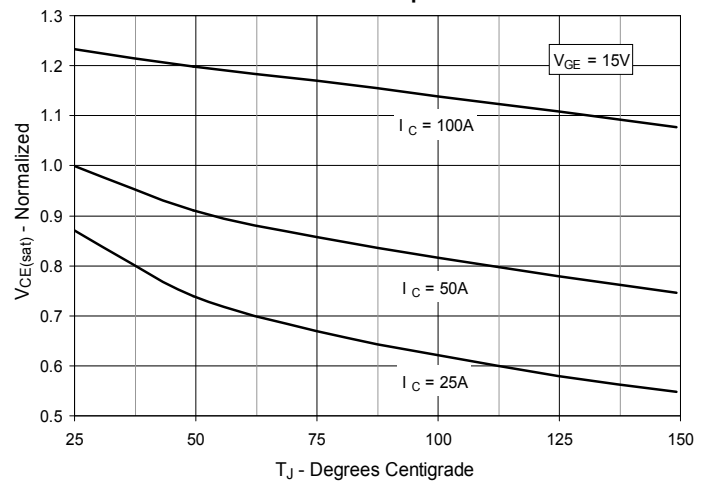
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



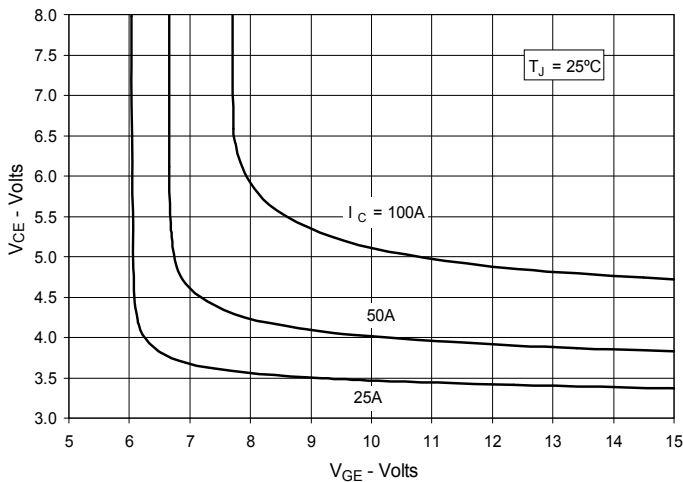
**Fig. 3. Output Characteristics**  
**@ 125°C**



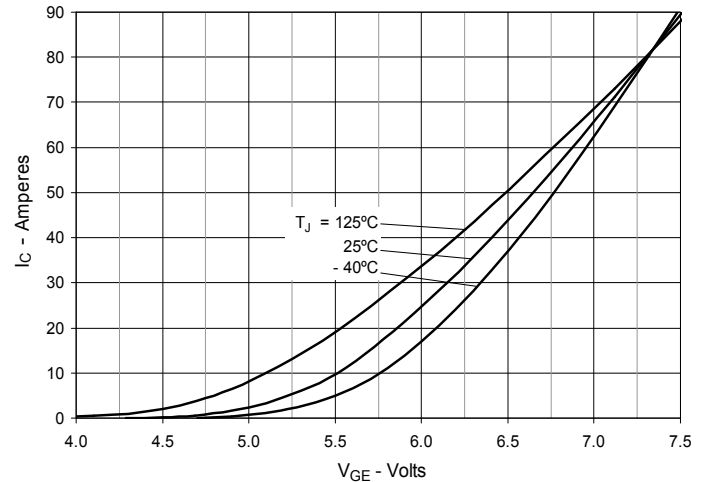
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



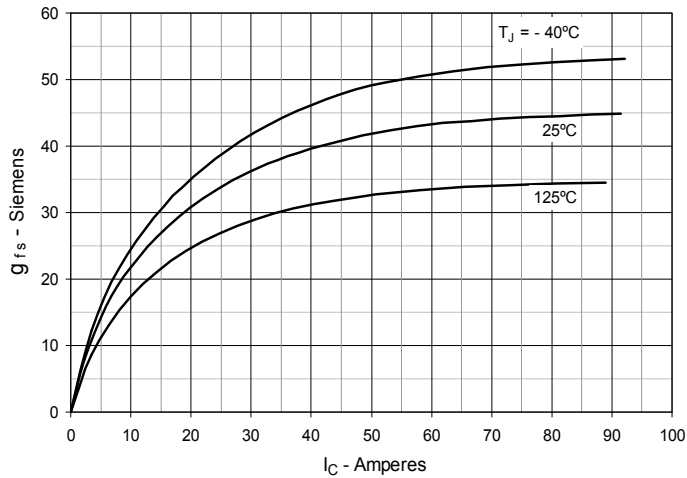
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



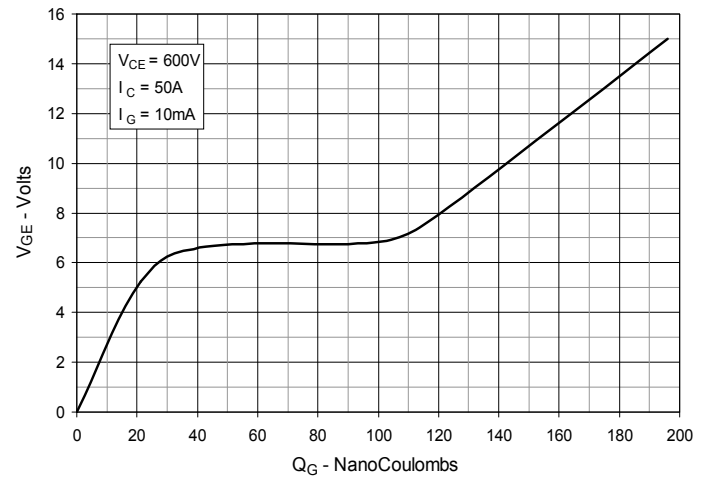
**Fig. 6. Input Admittance**



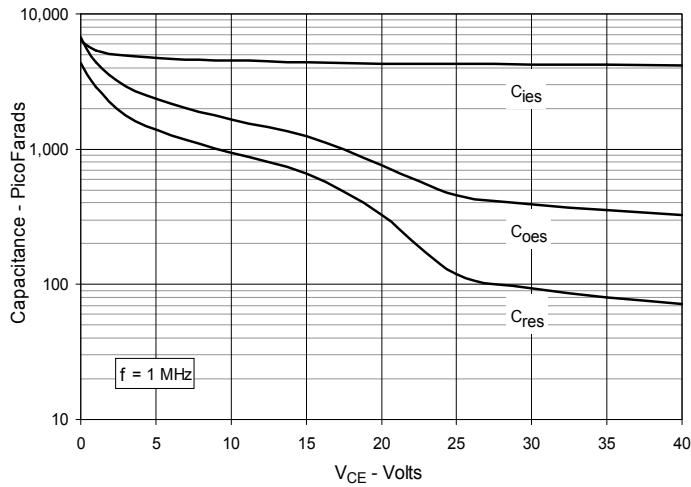
**Fig. 7. Transconductance**



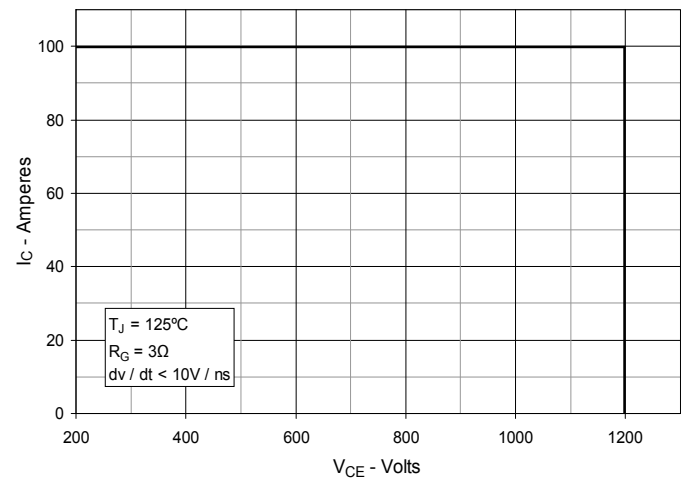
**Fig. 8. Gate Charge**



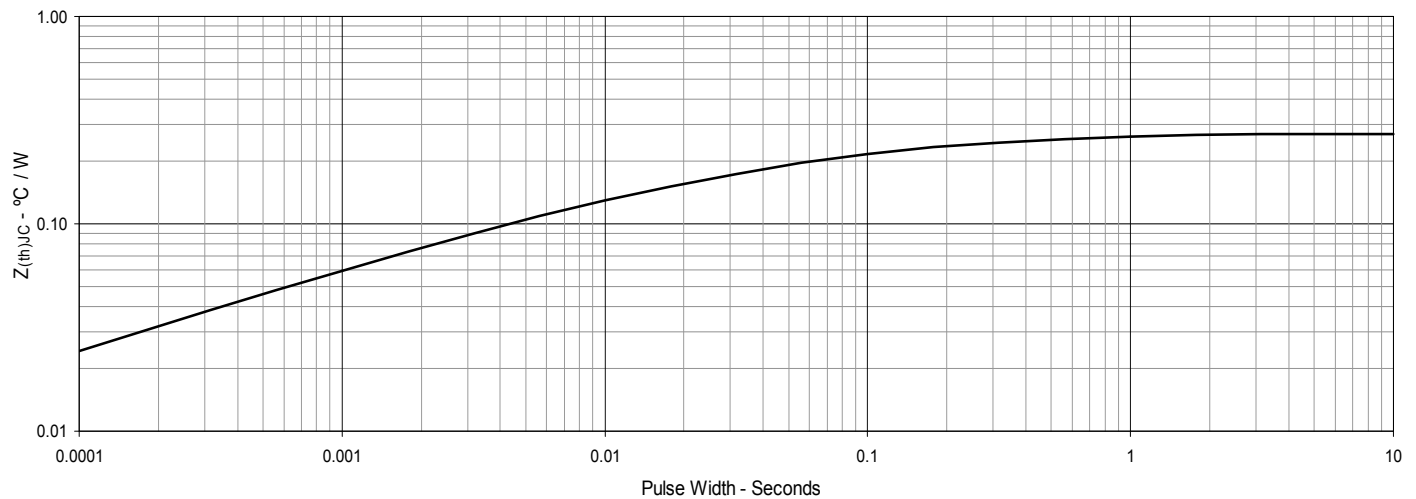
**Fig. 9. Capacitance**



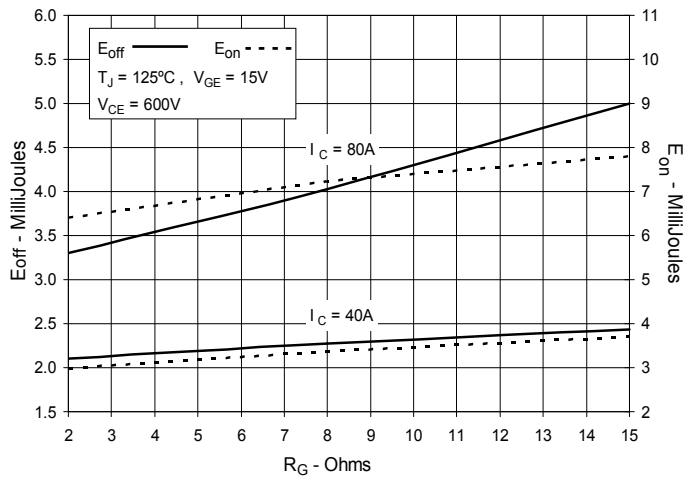
**Fig. 10. Reverse-Bias Safe Operating Area**



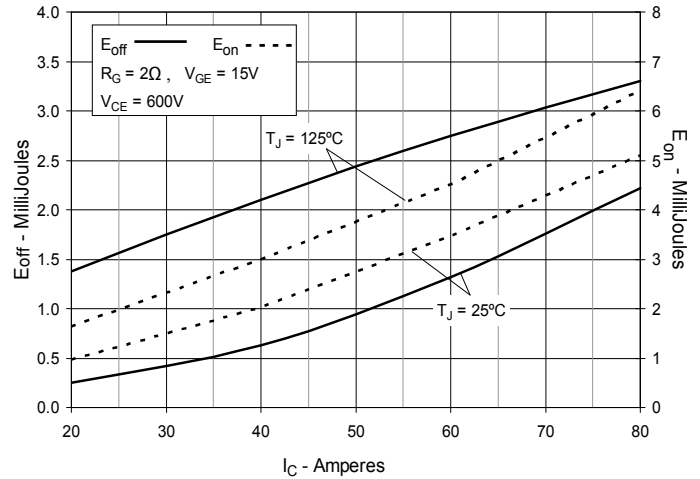
**Fig. 11. Maximum Transient Thermal Impedance**



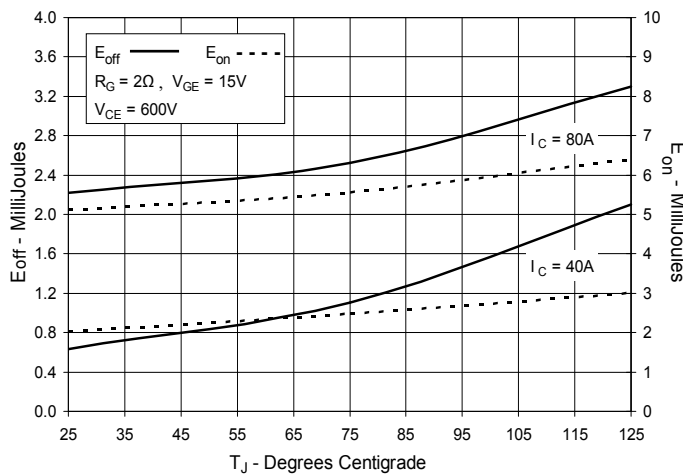
**Fig. 12. Inductive Switching  
Energy Loss vs. Gate Resistance**



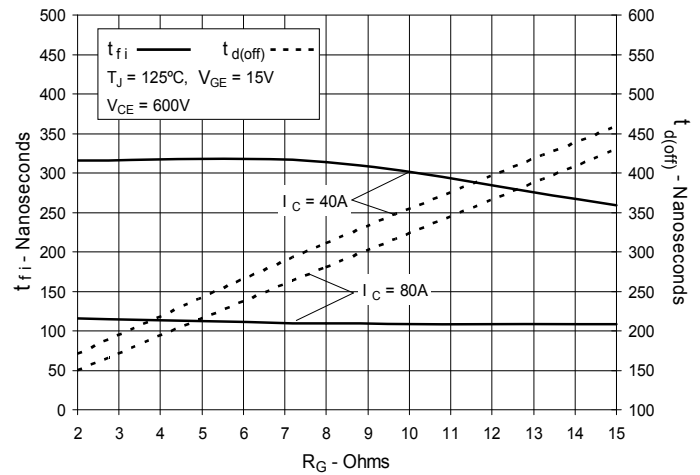
**Fig. 13. Inductive Switching  
Energy Loss vs. Collector Current**



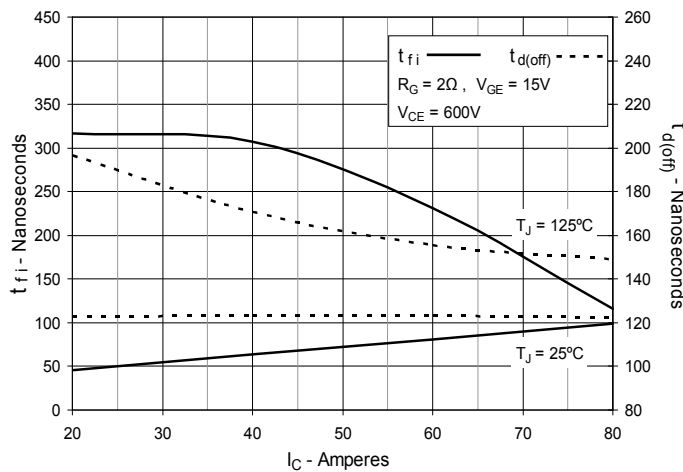
**Fig. 14. Inductive Switching  
Energy Loss vs. Junction Temperature**



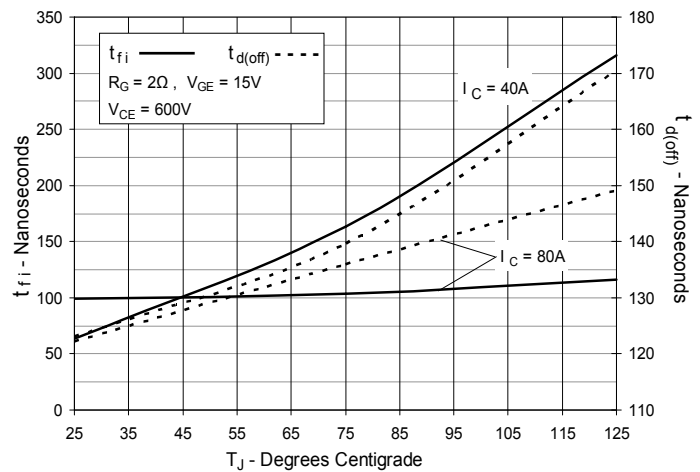
**Fig. 15. Inductive Turn-off  
Switching Times vs. Gate Resistance**



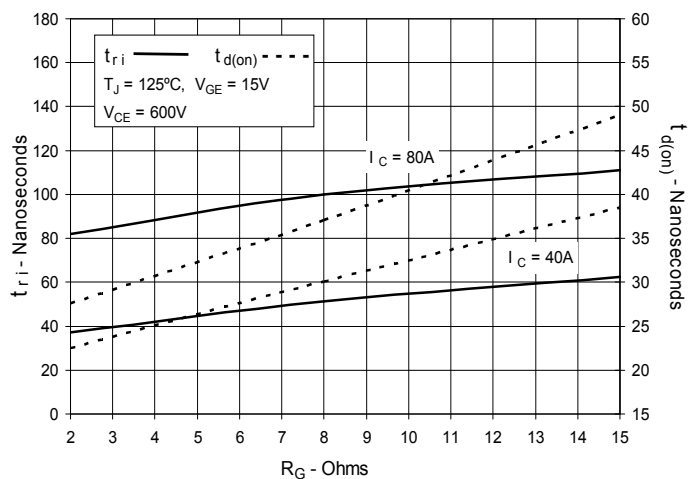
**Fig. 16. Inductive Turn-off  
Switching Times vs. Collector Current**



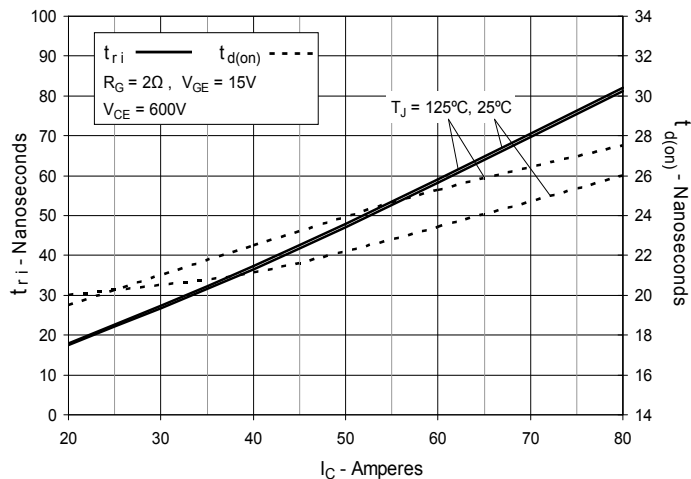
**Fig. 17. Inductive Turn-off  
Switching Times vs. Junction Temperature**



**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**

