

### GenX3™ 600V IGBTs

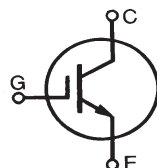
### IXGK320N60B3 IXGX320N60B3

$$V_{CES} = 600V$$

$$I_{C90} = 320A$$

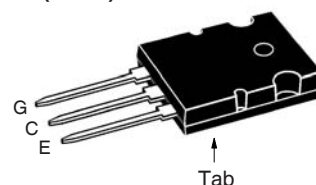
$$V_{CE(sat)} \leq 1.6V$$

Medium-Speed Low-V<sub>sat</sub> PT  
IGBTs for 5-40 kHz Switching

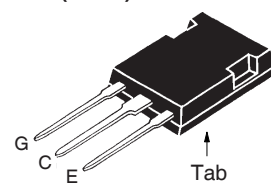


| Symbol         | Test Conditions   | Maximum Ratings       |            |
|----------------|---|-----------------------|------------|
| $V_{CES}$      | $T_J = 25^\circ C$ to $150^\circ C$                       | 600                   | V          |
| $V_{CGR}$      | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$ | 600                   | V          |
| $V_{GES}$      | Continuous  | $\pm 20$              | V          |
| $V_{GEM}$      | Transient   | $\pm 30$              | V          |
| $I_{C25}$      | $T_C = 25^\circ C$ ( Chip Capability )                    | 500                   | A          |
| $I_{C90}$      | $T_C = 90^\circ C$  | 320                   | A          |
| $I_{LRMS}$     | Terminal Current Limit                                    | 160                   | A          |
| $I_{CM}$       | $T_C = 25^\circ C$ , 1ms                                  | 1200                  | A          |
| <b>SSOA</b>    | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 1\Omega$ | $I_{CM} = 320$        | A          |
| <b>(RBSOA)</b> | Clamped Inductive Load                                    | $V_{CE} \leq V_{CES}$ | V          |
| $P_C$          | $T_C = 25^\circ C$  | 1700                  | W          |
| $T_J$          |   | -55 ... +150          | $^\circ C$ |
| $T_{JM}$       |   | 150                   | $^\circ C$ |
| $T_{stg}$      |   | -55 ... +150          | $^\circ C$ |
| $T_L$          | Maximum Lead Temperature for Soldering                    | 300                   | $^\circ C$ |
| $T_{SOLD}$     | 1.6 mm (0.062 in.) from Case for 10                       | 260                   | $^\circ C$ |
| $M_d$          | Mounting Torque ( IXGK )                                  | 1.13/10               | Nm/lb.in.  |
| $F_C$          | Mounting Force ( IXGX )                                   | 20..120/4.5..27       | N/lb.      |
| <b>Weight</b>  | TO-264  | 10                    | g          |
|                | PLUS247   | 6                     | g          |

TO-264 (IXGK)



PLUS247 (IXGX)



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

### Features

- Optimized for Low Conduction and Switching Losses
- High Current Capability
- Square RBSOA

### Advantages

- High Power Density
- Low Gate Drive Requirement

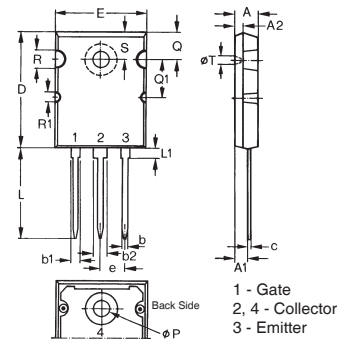
### Applications

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

| Symbol        | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |            |                    |
|---------------|---|-----------------------|------------|--------------------|
|               |   | Min.                  | Typ.       | Max.               |
| $BV_{CES}$    | $I_C = 1mA$ , $V_{GE} = 0V$   | 600                   |            | V                  |
| $V_{GE(th)}$  | $I_C = 4mA$ , $V_{CE} = V_{GE}$                                       | 3.0                   |            | 5.0 V              |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 125^\circ C$             |                       |            | 75 $\mu A$<br>2 mA |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                    |                       |            | $\pm 400$ nA       |
| $V_{CE(sat)}$ | $I_C = 100A$ , $V_{GE} = 15V$ , Note 1<br>$I_C = 320A$                |                       | 1.4<br>2.0 | 1.6 V<br>V         |

| Symbol   | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)  | Characteristic Values |       |  |
|--|--|-----------------------|-------|--|
|  |  | Min.                  | Typ.  | Max.                                     |
| $g_{fs}$   | $I_C = 60\text{A}, V_{CE} = 10\text{V}$ , Note 1   | 70                    | 125   | S  |
| $C_{ies}$<br>$C_{oes}$<br>$C_{res}$  | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$   |                       | 18    | nF                                       |
|  |  |                       | 960   | pF                                       |
|  |  |                       | 130   | pF                                       |
| $Q_g$<br>$Q_{ge}$<br>$Q_{gc}$  | $I_C = 320\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$   |                       | 585   | nC                                       |
|  |  |                       | 105   | nC                                       |
|  |  |                       | 215   | nC                                       |
| $t_{d(on)}$<br>$t_{ri}$<br>$E_{on}$<br>$t_{d(off)}$<br>$t_{fi}$<br>$E_{off}$ | <b>Inductive Load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 100\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 0.8 \cdot V_{CES}, R_G = 1\Omega$  |                       | 44    | ns                                       |
|  |  |                       | 66    | ns                                       |
|  |  |                       | 2.7   | mJ                                       |
|  |  |                       | 250   | ns                                       |
|  |  |                       | 165   | ns                                       |
|  |  |                       | 3.5   | 5.0                                      |
| $t_{d(on)}$<br>$t_{ri}$<br>$E_{on}$<br>$t_{d(off)}$<br>$t_{fi}$<br>$E_{off}$ | <b>Inductive Load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 100\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 0.8 \cdot V_{CES}, R_G = 1\Omega$ |                       | 40    | ns                                       |
|  |  |                       | 67    | ns                                       |
|  |  |                       | 3.5   | mJ                                       |
|  |  |                       | 330   | ns                                       |
|  |  |                       | 265   | ns                                       |
|  |  |                       | 5.4   | mJ                                       |
| $R_{thJC}$<br>$R_{thCS}$   |  | 0.15                  | 0.073 | $^\circ\text{C/W}$<br>$^\circ\text{C/W}$ |

### TO-264 AA (IXGK) Outline



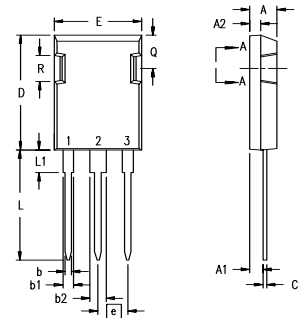
| Dim. | Millimeter |       | Inches   |       |
|------|------------|-------|----------|-------|
|      | Min.       | Max.  | Min.     | Max.  |
| A    | 4.82       | 5.13  | .190     | .202  |
| A1   | 2.54       | 2.89  | .100     | .114  |
| A2   | 2.00       | 2.10  | .079     | .083  |
| b    | 1.12       | 1.42  | .044     | .056  |
| b1   | 2.39       | 2.69  | .094     | .106  |
| b2   | 2.90       | 3.09  | .114     | .122  |
| c    | 0.53       | 0.83  | .021     | .033  |
| D    | 25.91      | 26.16 | 1.020    | 1.030 |
| E    | 19.81      | 19.96 | .780     | .786  |
| e    | 5.46 BSC   |       | .215 BSC |       |
| J    | 0.00       | 0.25  | .000     | .010  |
| K    | 0.00       | 0.25  | .000     | .010  |
| L    | 20.32      | 20.83 | .800     | .820  |
| L1   | 2.29       | 2.59  | .090     | .102  |
| P    | 3.17       | 3.66  | .125     | .144  |
| Q    | 6.07       | 6.27  | .239     | .247  |
| Q1   | 8.38       | 8.69  | .330     | .342  |
| R    | 3.81       | 4.32  | .150     | .170  |
| R1   | 1.78       | 2.29  | .070     | .090  |
| S    | 6.04       | 6.30  | .238     | .248  |
| T    | 1.57       | 1.83  | .062     | .072  |

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

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

### PLUS247™ (IXGX) Outline

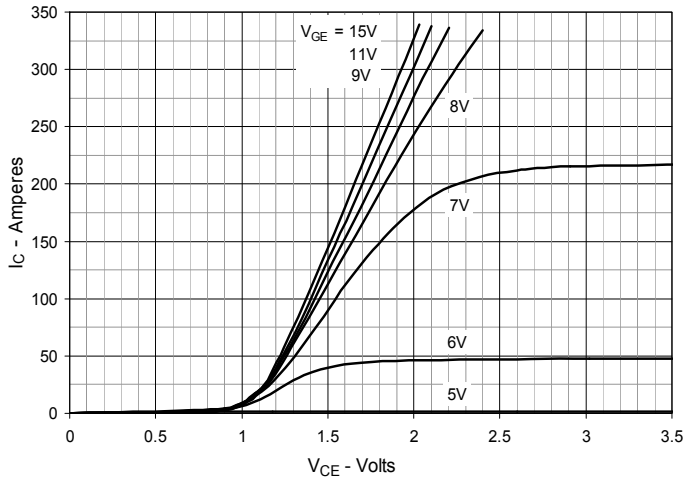


Terminals: 1 - Gate  
2 - Collector  
3 - Emitter

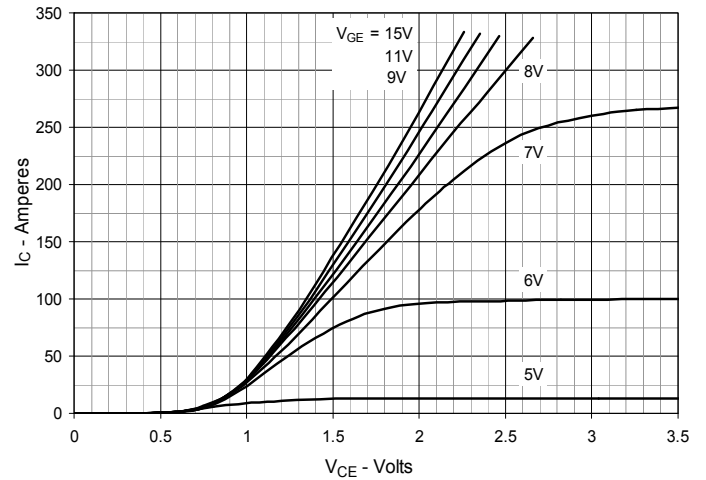
| Dim.           | Millimeter |       | Inches   |       |
|----------------|------------|-------|----------|-------|
|                | Min.       | Max.  | Min.     | Max.  |
| A              | 4.83       | 5.21  | .190     | .205  |
| A <sub>1</sub> | 2.29       | 2.54  | .090     | .100  |
| A <sub>2</sub> | 1.91       | 2.16  | .075     | .085  |
| b              | 1.14       | 1.40  | .045     | .055  |
| b <sub>1</sub> | 1.91       | 2.13  | .075     | .084  |
| b <sub>2</sub> | 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.

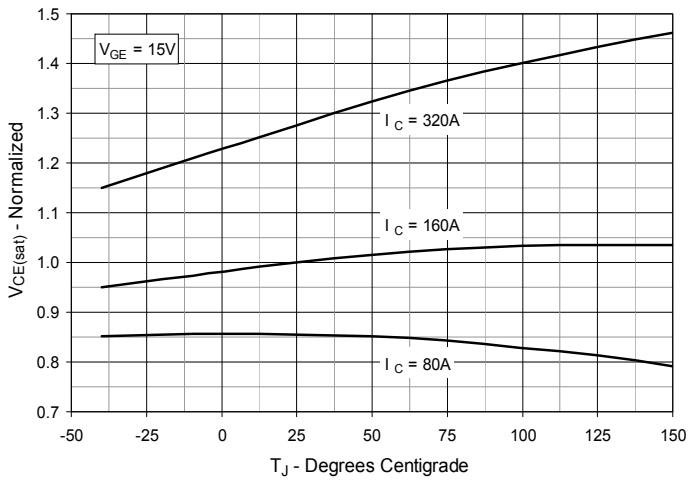
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



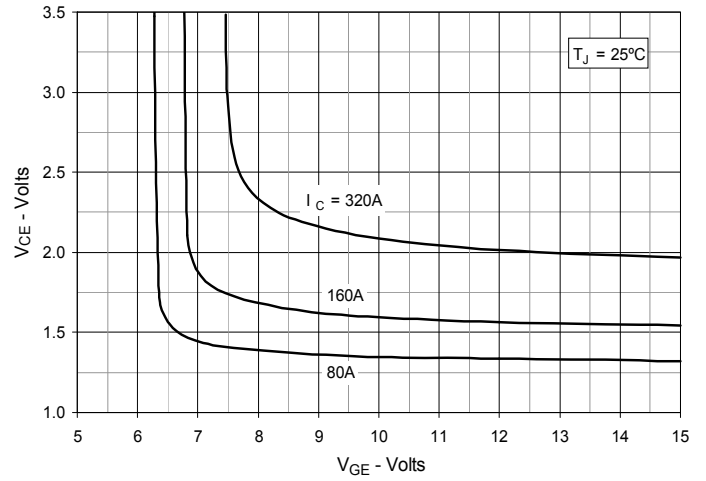
**Fig. 2. Output Characteristics @  $T_J = 125^\circ\text{C}$**



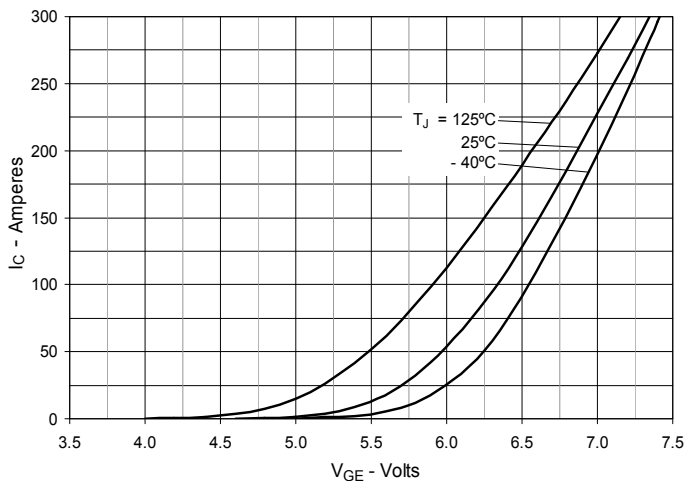
**Fig. 3. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



**Fig. 4. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



**Fig. 5. Input Admittance**



**Fig. 6. Transconductance**

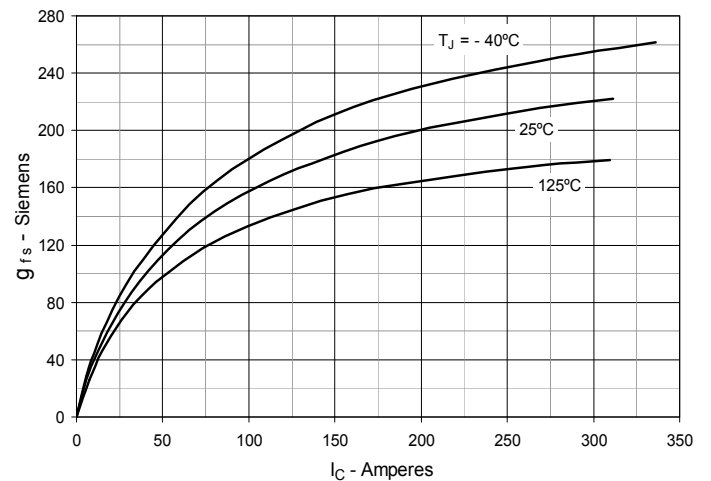


Fig. 7. Gate Charge

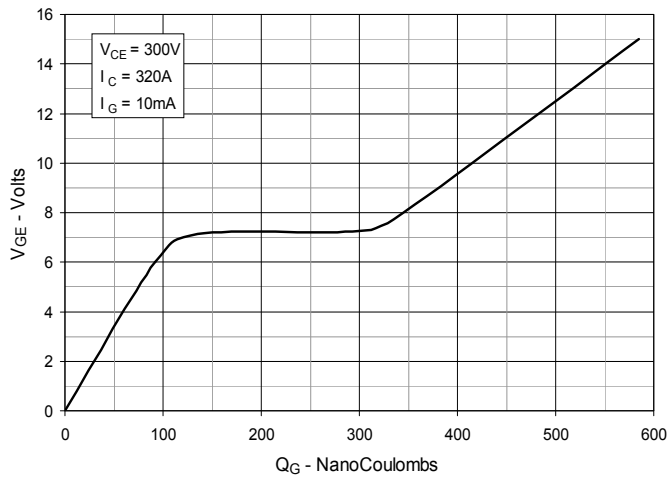


Fig. 8. Capacitance

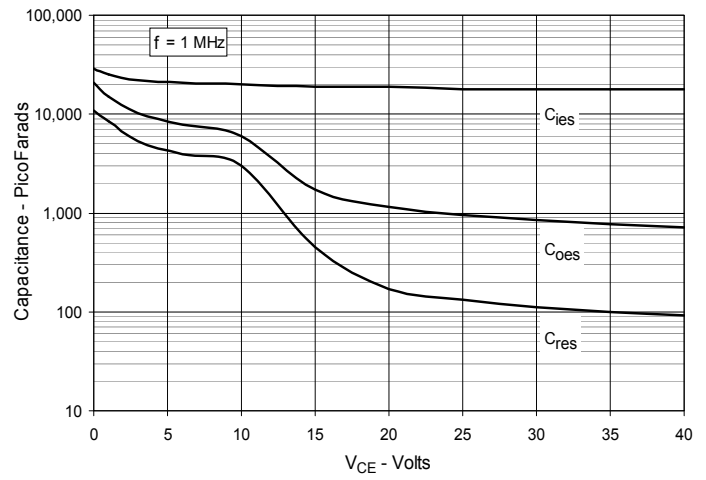


Fig. 9. Reverse-Bias Safe Operating Area

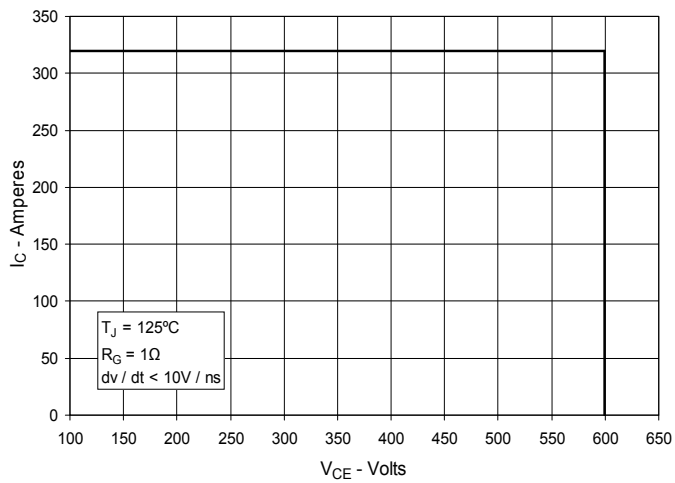
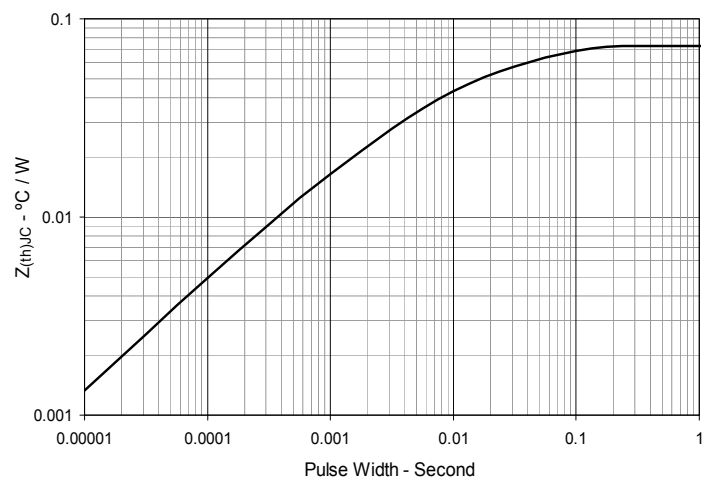
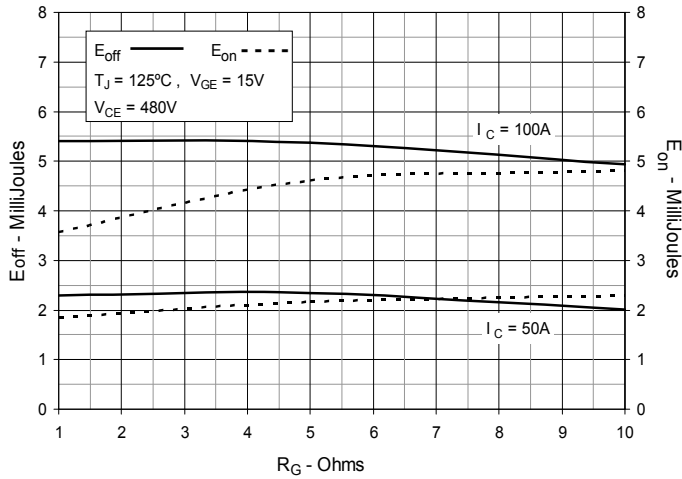


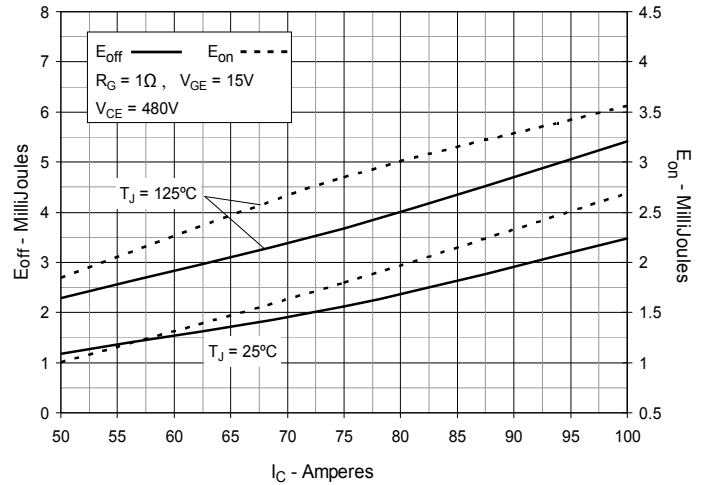
Fig. 10. Maximum Transient Thermal Impedance



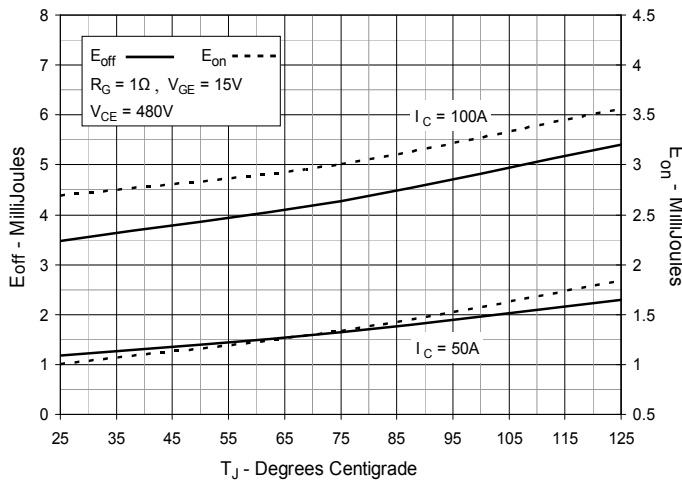
**Fig. 11. Inductive Switching Energy Loss vs. Gate Resistance**



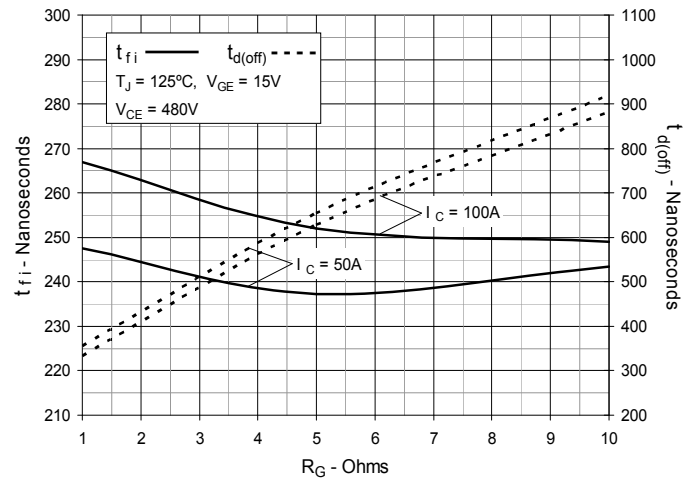
**Fig. 12. Inductive Switching Energy Loss vs. Collector Current**



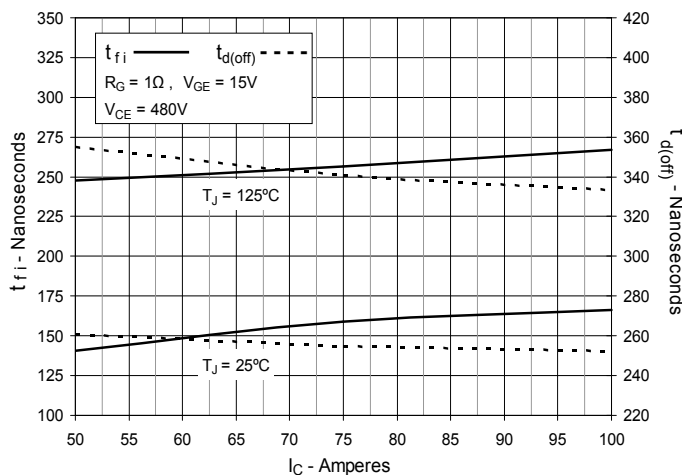
**Fig. 13. Inductive Switching Energy Loss vs. Junction Temperature**



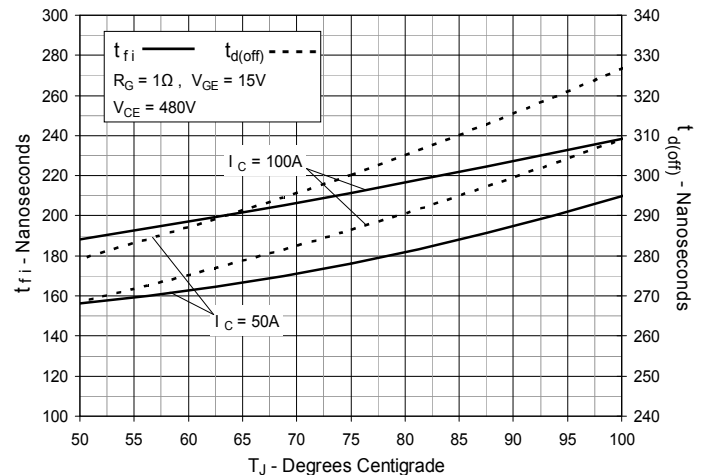
**Fig. 14. Inductive Turn-off Switching Times vs. Gate Resistance**



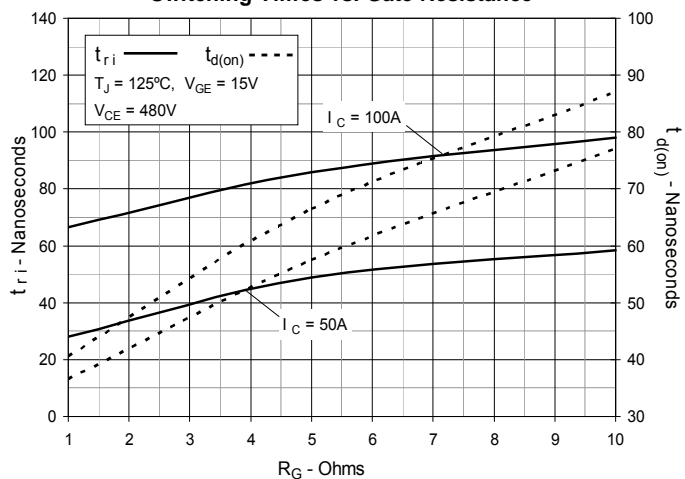
**Fig. 15. Inductive Turn-off Switching Times vs. Collector Current**



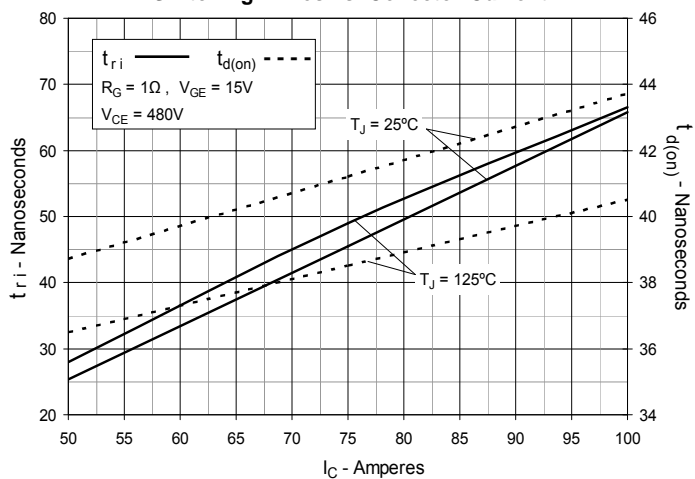
**Fig. 16. Inductive Turn-off Switching Times vs. Junction Temperature**



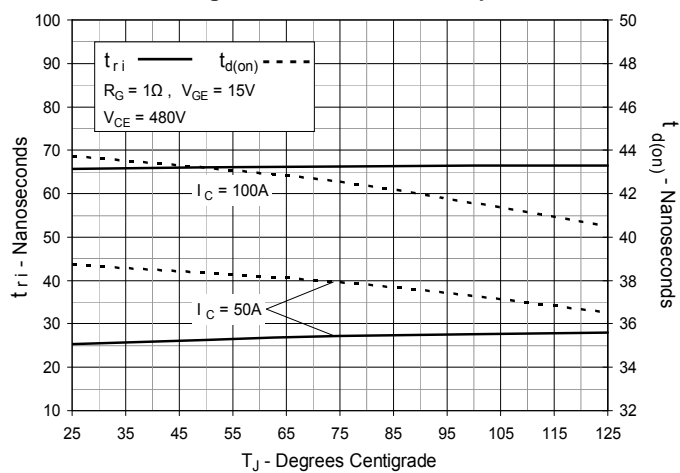
**Fig. 17. Inductive Turn-on**  
**Switching Times vs. Gate Resistance**



**Fig. 18. Inductive Turn-on**  
**Switching Times vs. Collector Current**



**Fig. 19. Inductive Turn-on**  
**Switching Times vs. Junction Temperature**





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