IXYS

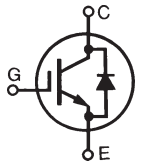
Advance Technical Information

# High Voltage, High Frequency, BiMOSFET™ Monolithic Bipolar MOS Transistor

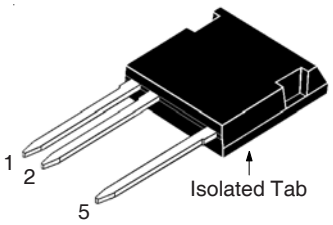
## (Electrically Isolated Tab)

# IXBF10N300C

$V_{CES}$ = 3000V
$I_{C110}$ = 10A
$V_{CE(sat)} \leq$ 6.0V




**ISOPLUS i4-Pak™**




1 = Gate 5 = Collector
2 = Emitter

| mbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_J$ = 25°C to 150°C | 3000 | V |
| $V_{CGR}$ | $T_J$ = 25°C to 150°C, $R_{GE}$ = 1MΩ | 3000 | V |
| $V_{GES}$ | Continuous | ± 20 | V |
| $V_{GEM}$ | Transient | ± 30 | V |
| $I_{C25}$ | $T_C$ = 25°C | 29 | A |
| $I_{C110}$ | $T_C$ = 110°C | 10 | A |
| $I_{CM}$ | $T_C$ = 25°C, 1ms | 240 | A |
| **SSOA (RBSOA)** | $V_{GE}$ = 15V, $T_{VJ}$ = 125°C, $R_G$ = 10Ω<br>Clamped Inductive Load | $I_{CM}$ = 80<br>$V_{CES} \leq$ 1500 | A<br>V |
| $t_{SC}$ (SCSOA) | $V_{GE}$ = 15V, $T_J$ = 125°C,<br>$R_G$ = 52Ω, $V_{CE}$ = 1500V, Non-Repetitive | 10 | μs |
| $P_C$ | $T_C$ = 25°C | 240 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering | 300 | °C |
| $T_{SOLD}$ | Plastic Body for 10s | 260 | °C |
| $F_C$ | Mounting Force | 20..120 / 4.5..27 | N/lb. |
| $V_{ISOL}$ | 50/60Hz, 5 Seconds | 4000 | V~ |
| **Weight** | | 5 | g |

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{CES}$ | $I_C$ = 250μA, $V_{GE}$ = 0V | 3000 | | | V |
| $V_{GE(th)}$ | $I_C$ = 250μA, $V_{CE}$ = $V_{GE}$ | 3.0 | | 5.0 | V |
| $I_{CES}$ | $V_{CE}$ = $V_{CES}$, $V_{GE}$ = 0V | | | 25 | μA |
| | Note 2, $T_J$ = 125°C | | | 3 | mA |
| $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ± 20V | | | ±200 | nA |
| $V_{CE(sat)}$ | $I_C$ = 10A, $V_{GE}$ = 15V, Note 1 | | 4.6 | 6.0 | V |
| | $T_J$ = 125°C | | 4.8 | | V |

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 4000V~ Electrical Isolation
- High Blocking Voltage
- High Frequency Operation

### Advantages

- Low Gate Drive Requirement
- High Power Density

### Applications

- Switch-Mode and Resonant-Mode Power Supplies

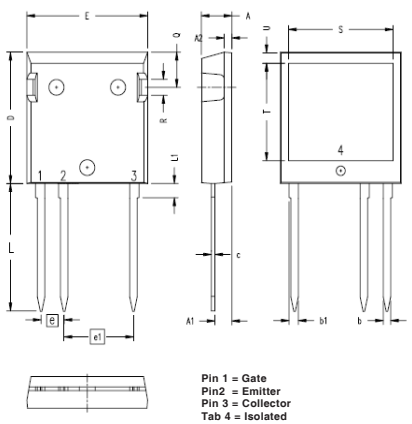
| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $I_C$ = 10A, $V_{CE}$ = 10V, Note 1 | 13 | 22 | | S |
| $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | | 4580 | | pF |
| $C_{oes}$ | | | 204 | | pF |
| $C_{res}$ | | | 75 | | pF |
| $Q_{g(on)}$ | $I_C$ = 10A, $V_{GE}$ = 15V, $V_{CE}$ = 1000V | | 208 | | nC |
| $Q_{ge}$ | | | 23 | | nC |
| $Q_{gc}$ | | | 80 | | nC |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 25°C** | | 32 | | ns |
| $t_{ri}$ | $I_C$ = 10A, $V_{GE}$ = 15V | | 10 | | ns |
| $E_{on}$ | $V_{CE}$ = 1500V, $R_G$ = 10Ω | | 7.20 | | mJ |
| $t_{d(off)}$ | Note 2 | | 390 | | ns |
| $t_{fi}$ | | | 84 | | ns |
| $E_{off}$ | | | 1.04 | | mJ |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 125°C** | | 28 | | ns |
| $t_{ri}$ | $I_C$ = 10A, $V_{GE}$ = 15V | | 16 | | ns |
| $E_{on}$ | $V_{CE}$ = 1500V, $R_G$ = 10Ω | | 6.15 | | mJ |
| $t_{d(off)}$ | Note 2 | | 450 | | ns |
| $t_{fi}$ | | | 165 | | ns |
| $E_{off}$ | | | 1.40 | | mJ |
| $R_{thJC}$ | | | | 0.52 | °C/W |
| $R_{thCS}$ | | | 0.15 | | °C/W |

**Reverse Diode**

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max | |
|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 10A, $V_{GE}$ = 0V, Note 1 | | | 5.0 | V |
| $t_{rr}$ | $I_F$ = 10A, $V_{GE}$ = 0V, $-di_F/dt$ = 100A/μs | | 700 | | ns |
| $I_{RM}$ | $V_R$ = 100V, $V_{GE}$ = 0V | | 21 | | A |
| $Q_{RM}$ | | | 7.4 | | μC |

Notes: 1. Pulse test, t < 300μs, duty cycle, d < 2%.
2. Device must be heatsunk for high-temperature leakage current measurements to avoid thermal runaway.

**ISOPLUS i4-Pak™ (HV) Outline**




Pin 1 = Gate
Pin2 = Emitter
Pin 3 = Collector
Tab 4 = Isolated

| SYM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS MAX |
|---|---|---|---|---|
| A | .190 | .205 | 4.83 | 5.21 |
| A1 | .102 | .118 | 2.59 | 3.00 |
| A2 | .046 | .085 | 1.17 | 2.16 |
| b | .045 | .055 | 1.14 | 1.40 |
| b1 | .058 | .068 | 1.47 | 1.73 |
| C | .020 | .029 | 0.51 | 0.74 |
| D | .819 | .840 | 20.80 | 21.34 |
| E | .770 | .799 | 19.56 | 20.29 |
| e | .150 BSC | | 3.81 BSC | |
| e1 | .450 BSC | | 11.43 BSC | |
| L | .780 | .840 | 19.81 | 21.34 |
| L1 | .083 | .102 | 2.11 | 2.59 |
| Q | .210 | .244 | 5.33 | 6.20 |
| R | .100 | .180 | 2.54 | 4.57 |
| S | .660 | .690 | 16.76 | 17.53 |
| T | .590 | .620 | 14.99 | 15.75 |
| U | .065 | .080 | 1.65 | 2.03 |

**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.

**Fig. 1. Output Characteristics @ $T_J$ = 25ºC**

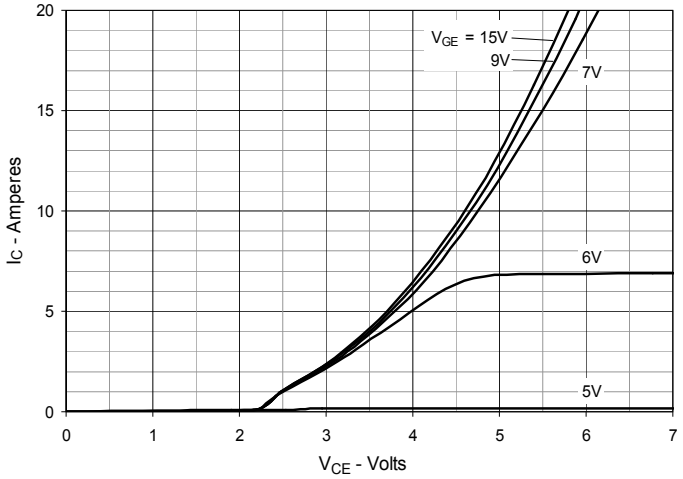



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

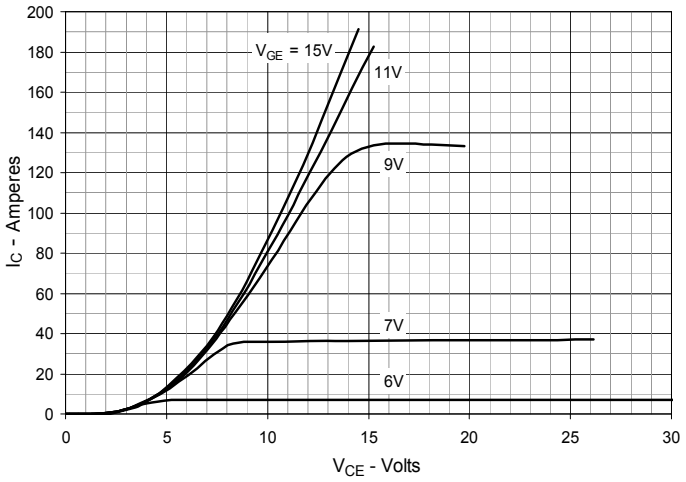



**Fig. 3. Output Characteristics @ $T_J$ = 125ºC**

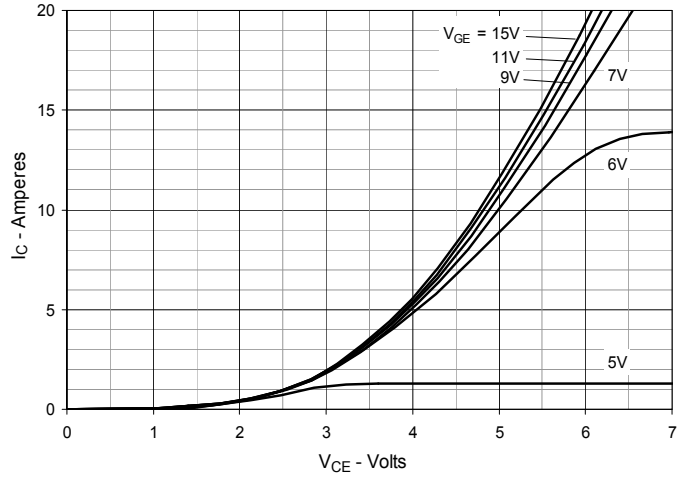



**Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature**

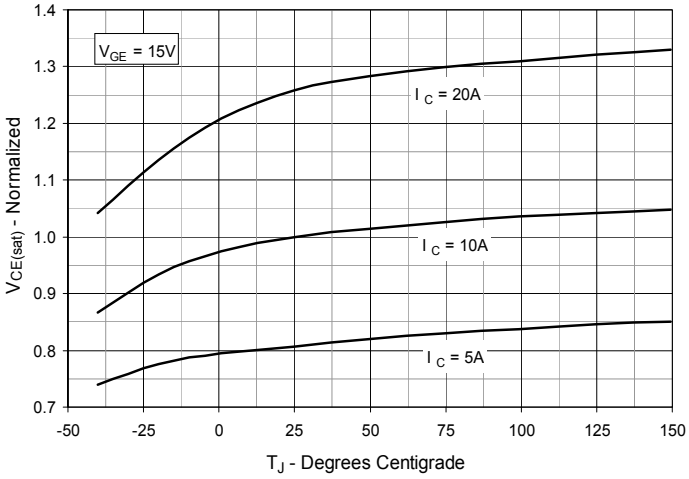



**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

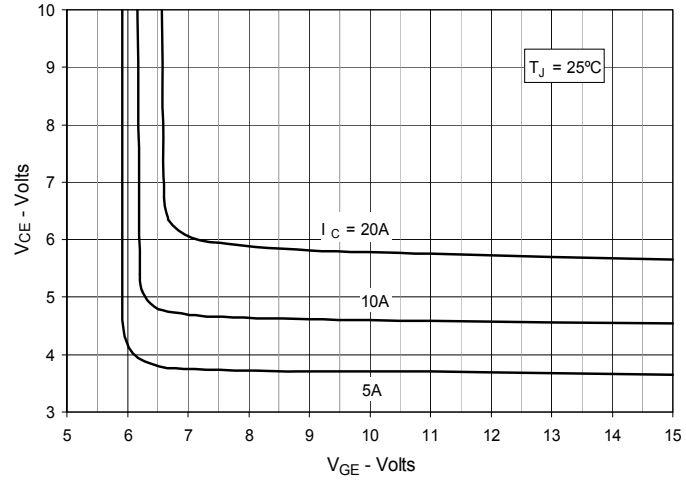



**Fig. 6. Input Admittance**

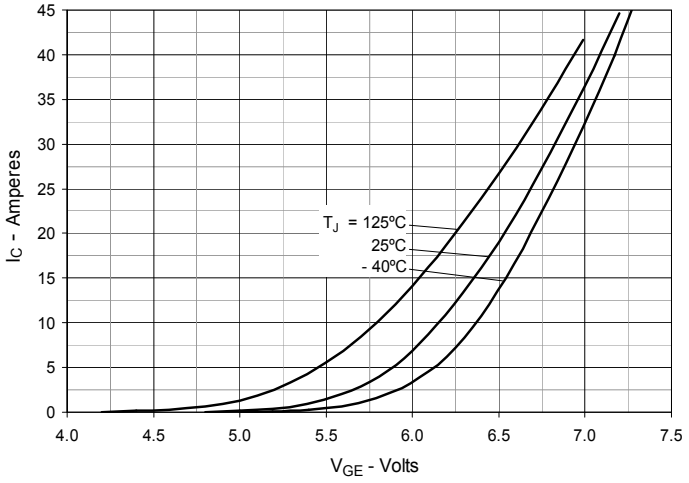


**Fig. 7. Transconductance**

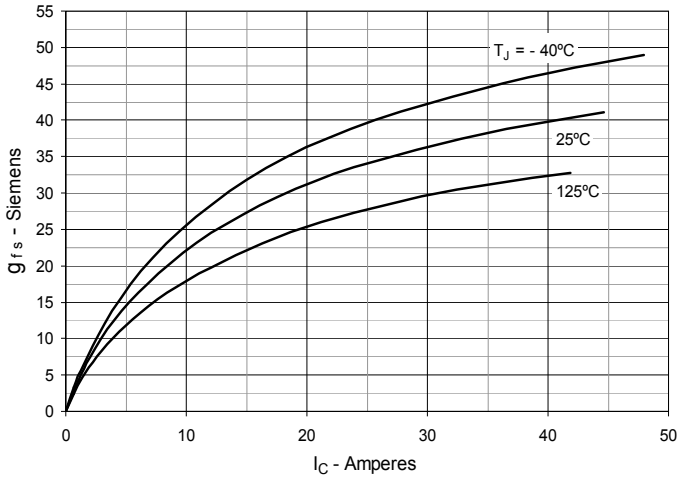



**Fig. 8. Gate Charge**

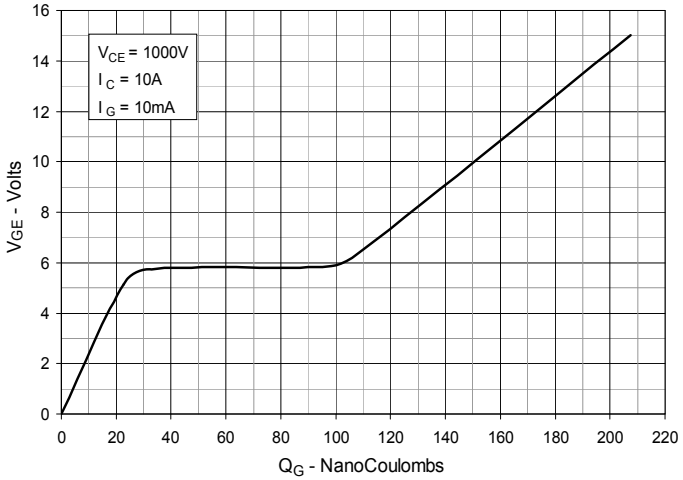



**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

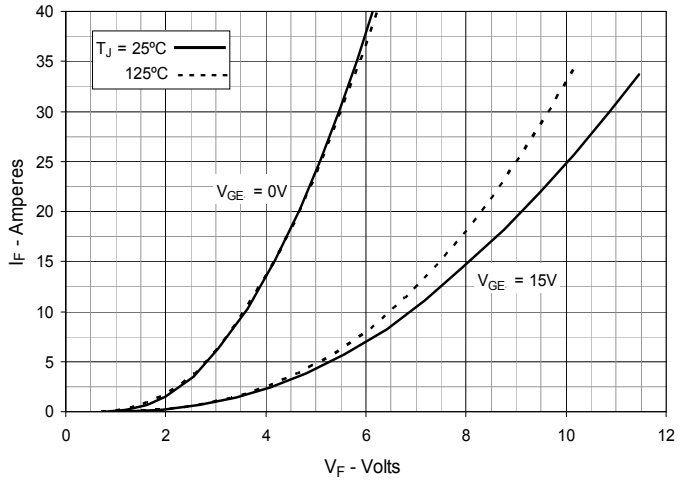



**Fig. 10. Capacitance**

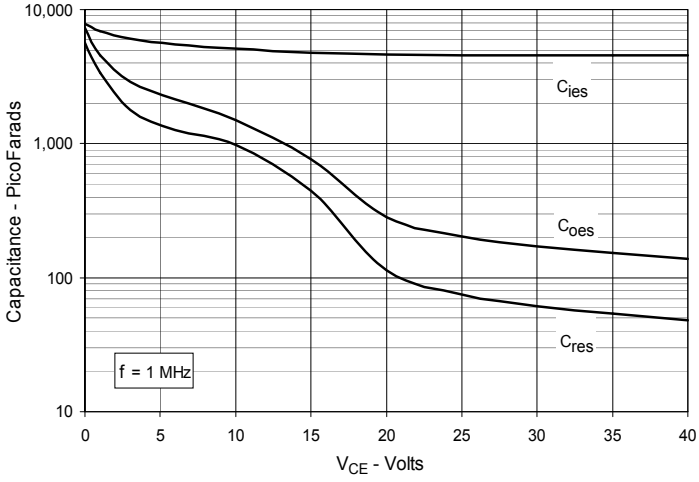



**Fig. 11. Reverse-Bias Safe Operating Area**

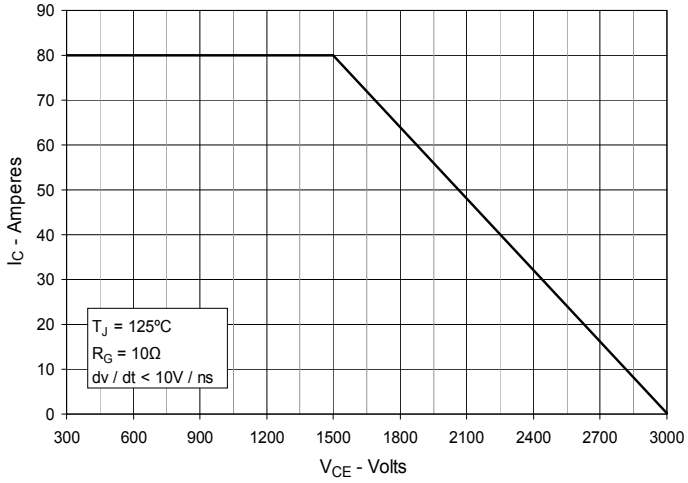



**Fig. 12. Maximum Transient Thermal Impedance**

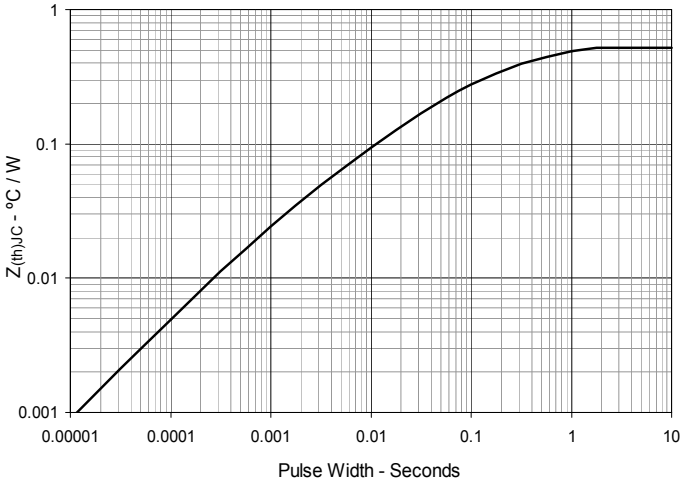


**Fig. 13. Forward-Bias Safe Operating Area @ $T_C$ = 25ºC**

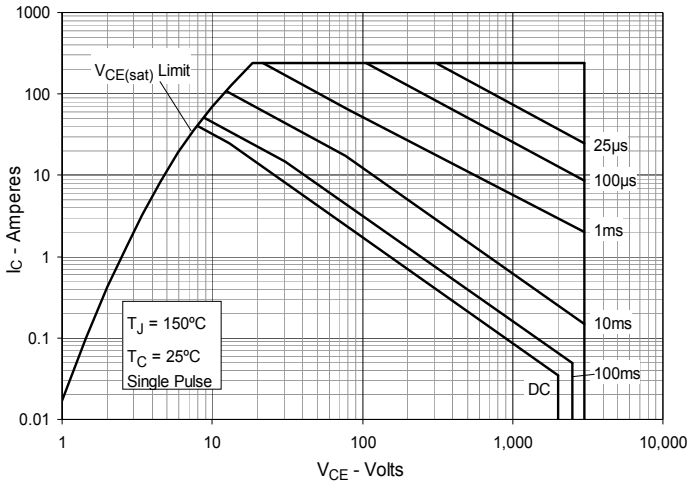



**Fig. 14. Forward-Bias Safe Operating Area @ $T_C$ = 75ºC**

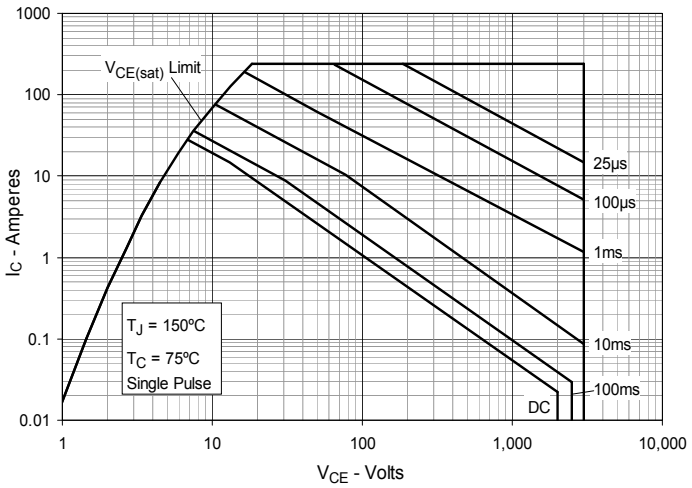



**Fig. 15. Inductive Switching Energy Loss vs. Gate Resistance**

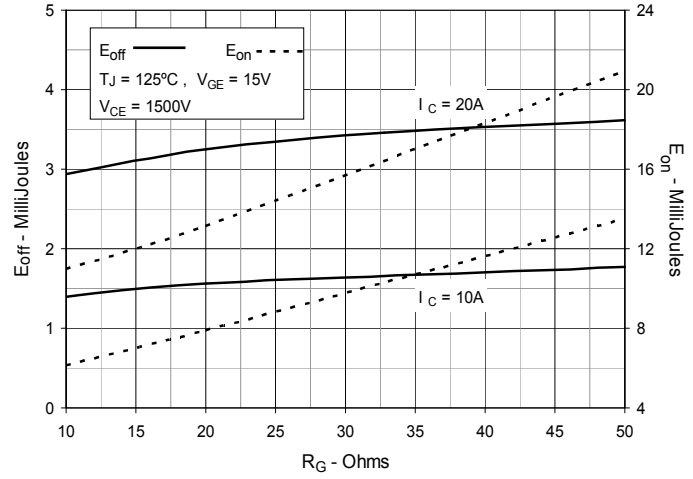



**Fig. 16. Inductive Switching Energy Loss vs. Collector Current**

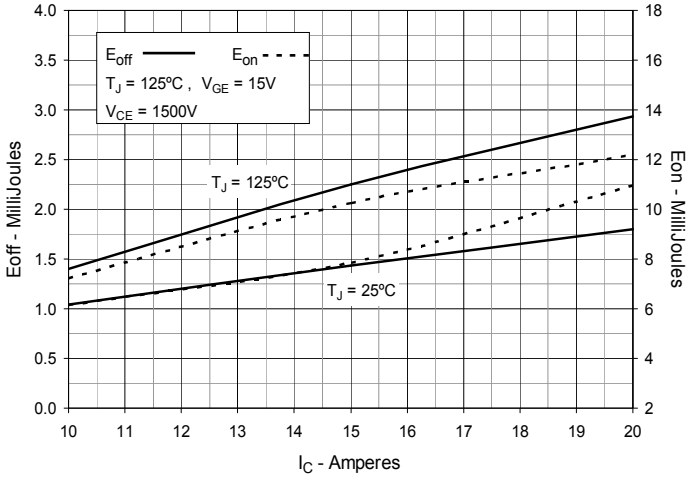



**Fig. 17. Inductive Switching Energy Loss vs. Junction Temperature**

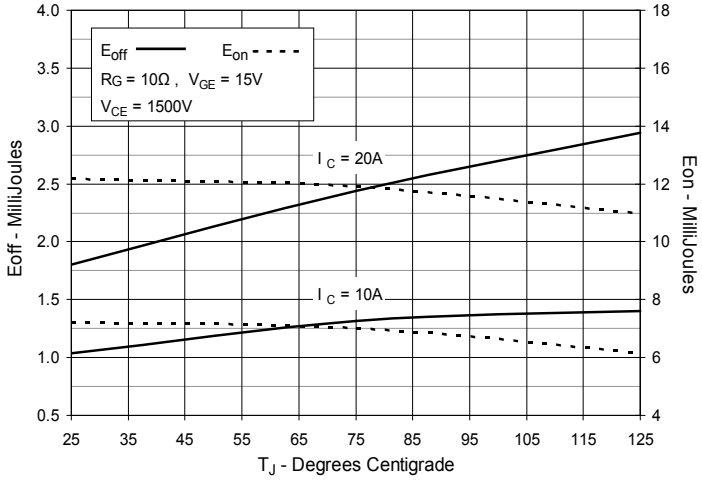



**Fig. 18. Inductive Turn-off Switching Times vs. Gate Resistance**

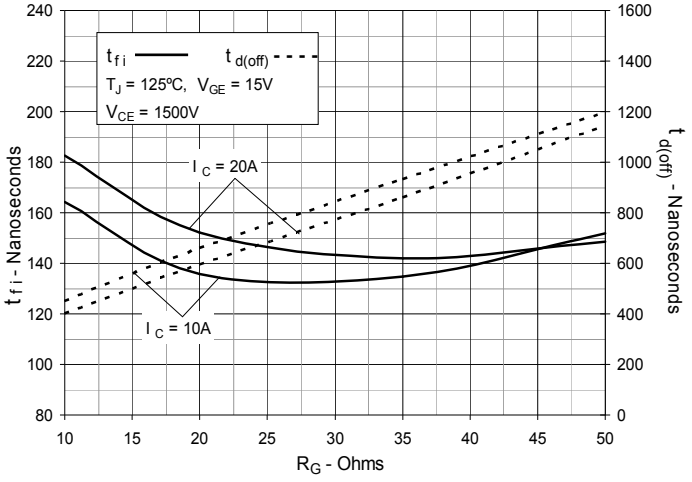


**Fig. 19. Inductive Turn-off Switching Times vs. Collector Current**

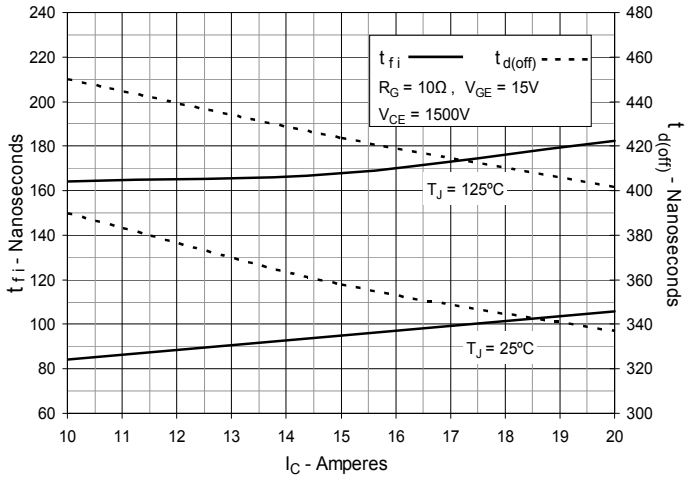



**Fig. 20. Inductive Turn-off Switching Times vs. Junction Temperature**

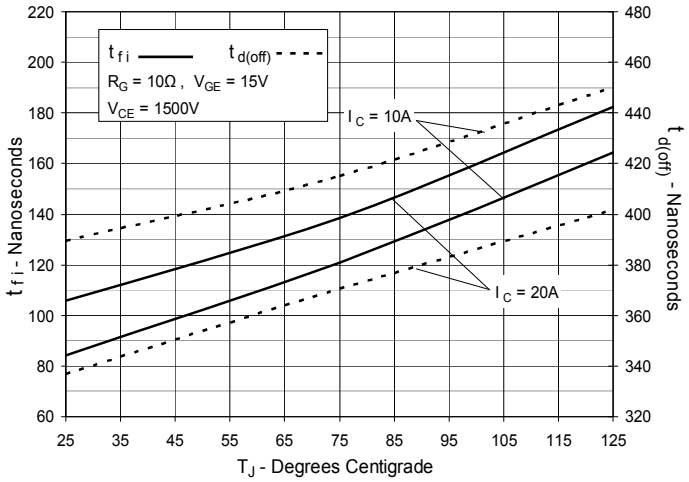



**Fig. 21. Inductive Turn-on Switching Times vs. Gate Resistance**

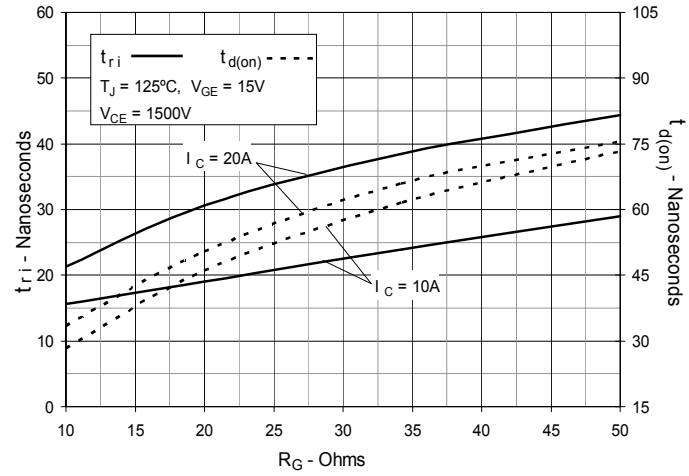



**Fig. 22. Inductive Turn-on Switching Times vs. Collector Current**

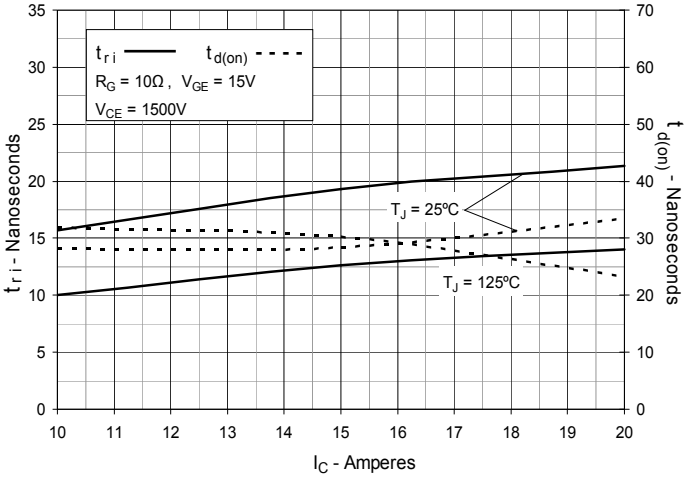



**Fig. 23. Inductive Turn-on Switching Times vs. Junction Temperature**