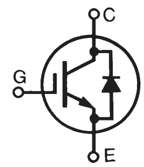
Advance Technical Information

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

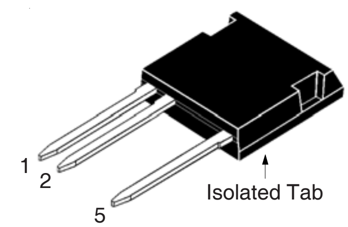
# IXBF15N300C

(Electrically Isolated Tab)

$V_{CES}$ = 3000V
$I_{C110}$ = 15A
$V_{CE(sat)}$ ≤ 6.0V




**ISOPLUS i4-Pak™**




1 = Gate 5 = Collector
2 = Emitter

| Symbol | 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 | 37 | A |
| $I_{C110}$ | $T_C$ = 110°C | 15 | A |
| $I_{CM}$ | $T_C$ = 25°C, 1ms | 300 | A |
| SSOA (RBSOA) | $V_{GE}$ = 15V, $T_{VJ}$ = 125°C, $R_G$ = 10Ω<br>Clamped Inductive Load | $I_{CM}$ = 120<br>$V_{CES}$ ≤ 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 | 300 | 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<br>($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values<br>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 | | | 5 | mA |
| $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ± 20V | | | ±200 | nA |
| $V_{CE(sat)}$ | $I_C$ = 15A, $V_{GE}$ = 15V, Note 1 | | 4.7 | 6.0 | V |
| | $T_J$ = 125°C | | 5.0 | | V |

**Features**

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

**Advantages**

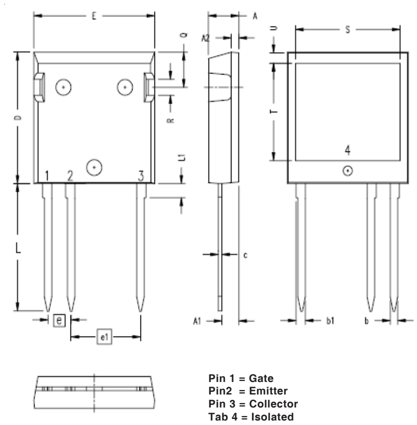
- Low Gate Drive Requirement
- High Power Density

**Applications**

- Switch-Mode and Resonant-Mode Power Supplies

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $I_C$ = 15A, $V_{CE}$ = 10V, Note 1 | 18 | 30 | | S |
| $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | | 6230 | | pF |
| $C_{oes}$ | | | 260 | | pF |
| $C_{res}$ | | | 93 | | pF |
| $Q_{g(on)}$ | $I_C$ = 15A, $V_{GE}$ = 15V, $V_{CE}$ = 1000V | | 267 | | nC |
| $Q_{ge}$ | | | 33 | | nC |
| $Q_{gc}$ | | | 99 | | nC |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 25°C** | | 40 | | ns |
| $t_{ri}$ | $I_C$ = 15A, $V_{GE}$ = 15V | | 23 | | ns |
| $E_{on}$ | $V_{CE}$ = 1500V, $R_G$ = 10Ω | | 9.15 | | mJ |
| $t_{d(off)}$ | Note 3 | | 455 | | ns |
| $t_{fi}$ | | | 90 | | ns |
| $E_{off}$ | | | 1.40 | | mJ |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 125°C** | | 38 | | ns |
| $t_{ri}$ | $I_C$ = 15A, $V_{GE}$ = 15V | | 20 | | ns |
| $E_{on}$ | $V_{CE}$ = 1500V, $R_G$ = 10Ω | | 9.15 | | mJ |
| $t_{d(off)}$ | Note 3 | | 515 | | ns |
| $t_{fi}$ | | | 150 | | ns |
| $E_{off}$ | | | 2.75 | | mJ |
| $R_{thJC}$ | | | | 0.42 | °C/W |
| $R_{thCS}$ | | | 0.15 | | °C/W |

### ISOPLUS i4-Pak™ (HV) Outline




| 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 | .450BSC | | 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 |

### Reverse Diode

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max | |
|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 15A, $V_{GE}$ = 0V, Note 1 | | | 5.0 | V |
| $t_{rr}$ | $I_F$ = 15A, $V_{GE}$ = 0V, -$di_F$/dt = 100A/μs | | 706 | | ns |
| $I_{RM}$ | $V_R$ = 100V, $V_{GE}$ = 0V | | 26 | | A |
| $Q_{RM}$ | | | 9.2 | | 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.
3. Switching times & energy losses may increase for higher $V_{CE}$(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.

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

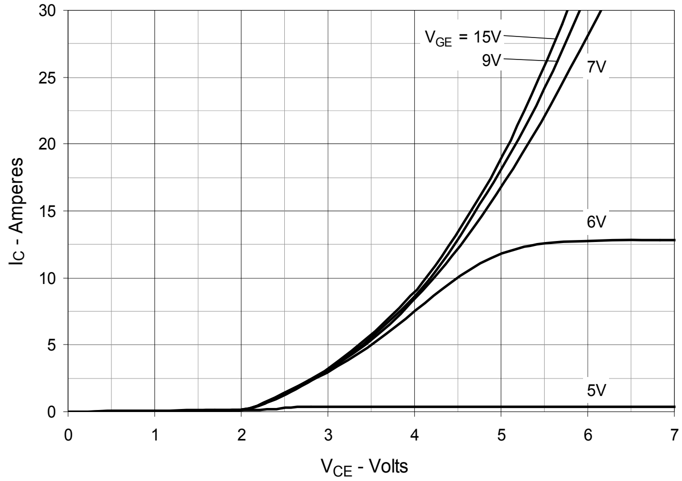



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

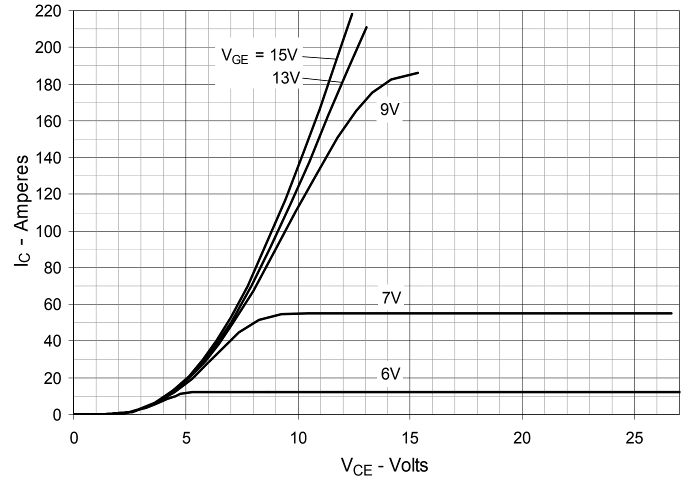



**Fig. 3. Output Characteristics @ $T_J$ = 125ºC**

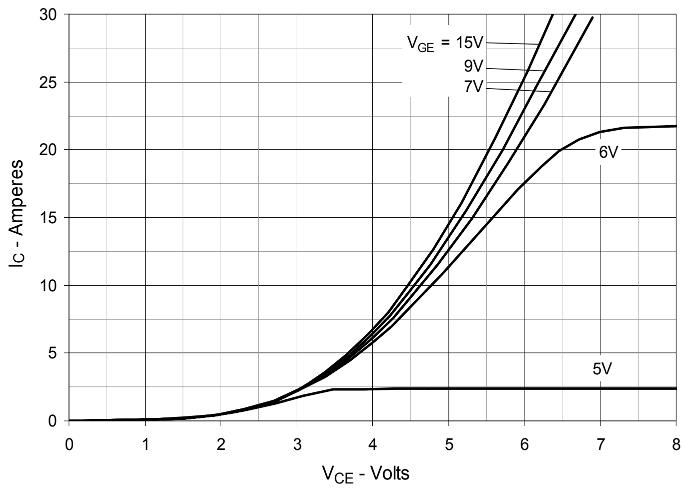



**Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature**

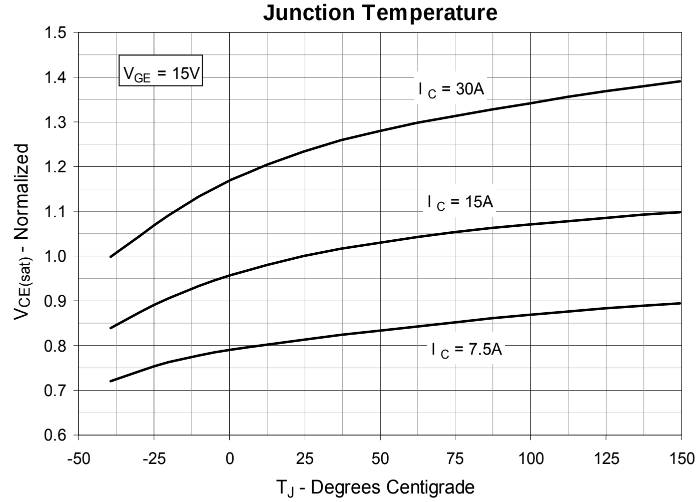



**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

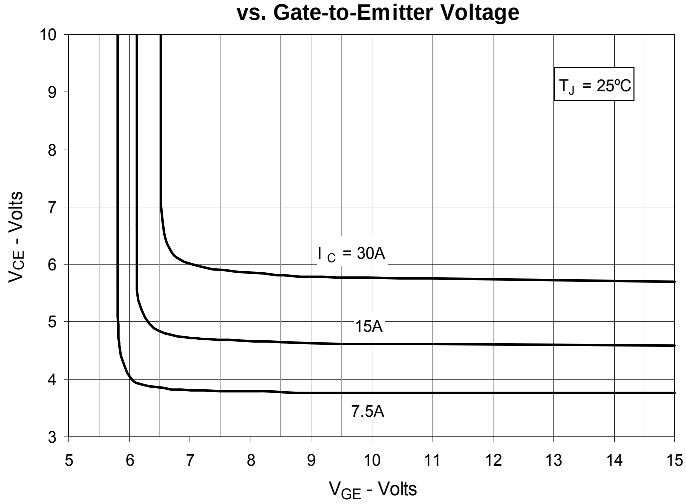



**Fig. 6. Input Admittance**

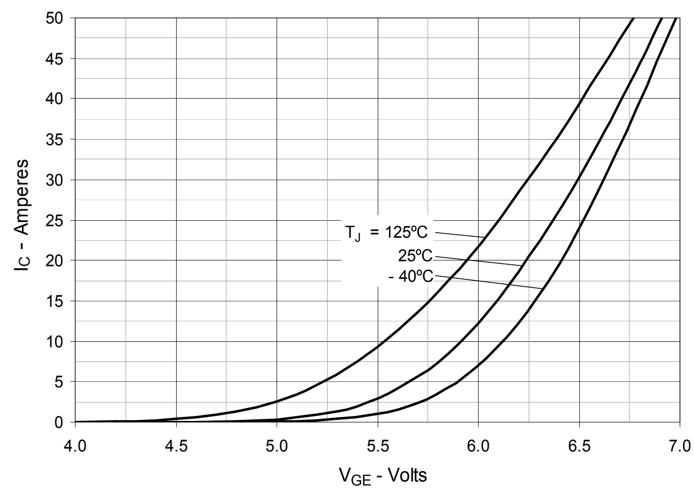


Fig. 7. Transconductance

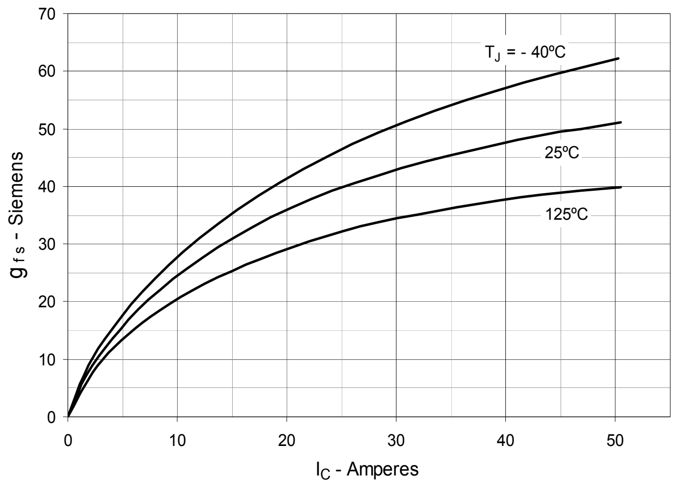



Fig. 8. Gate Charge

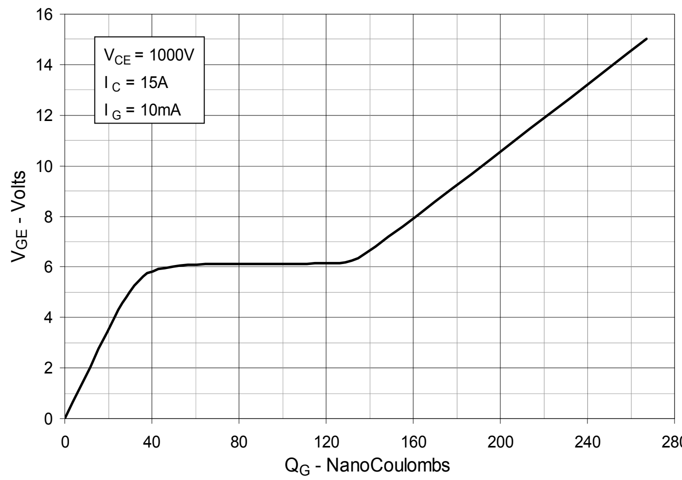



Fig. 9. Forward Voltage Drop of Intrinsic Diode

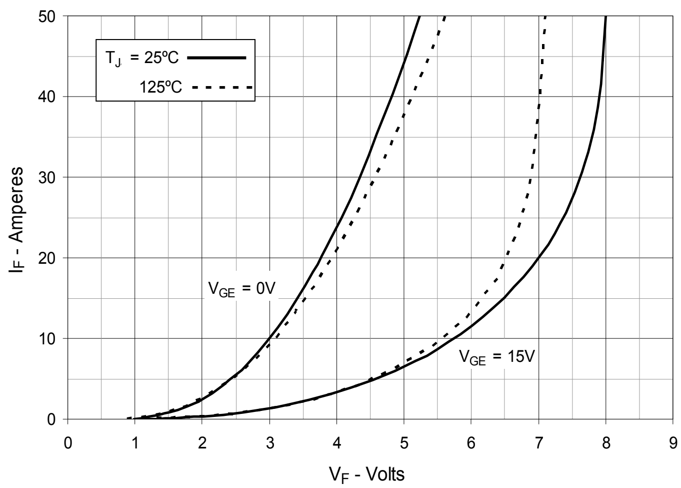



Fig. 10. Capacitance

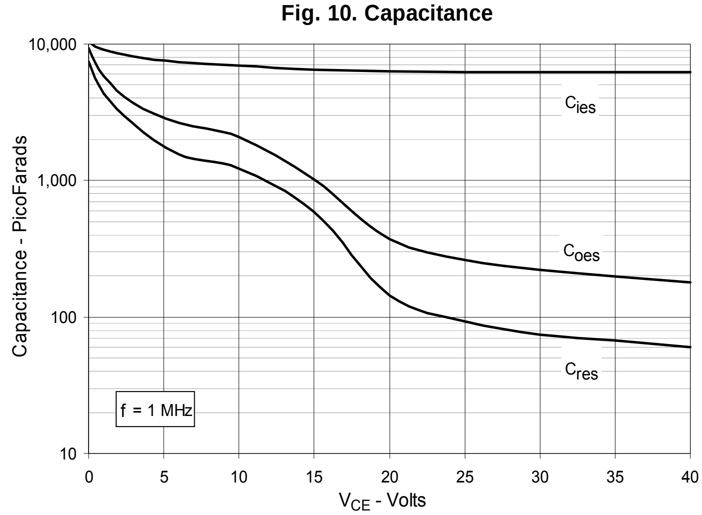



Fig. 11. Reverse-Bias Safe Operating Area

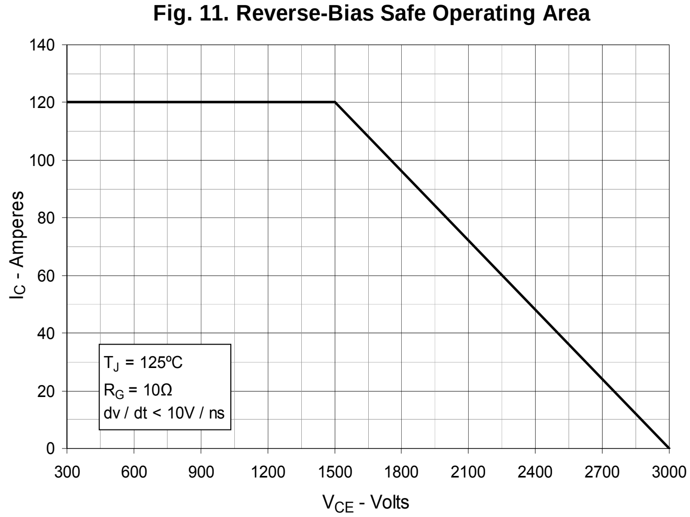



Fig. 12. Maximum Transient Thermal Impedance

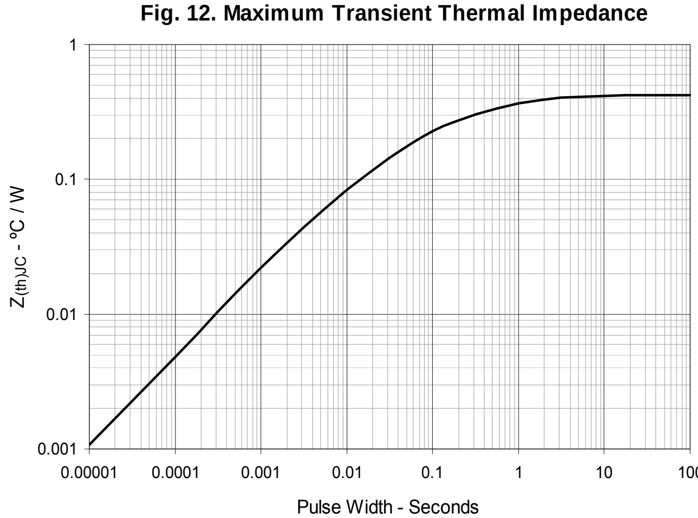


Fig. 13. Forward-Bias Safe Operating Area @ $T_C$ = 25ºC

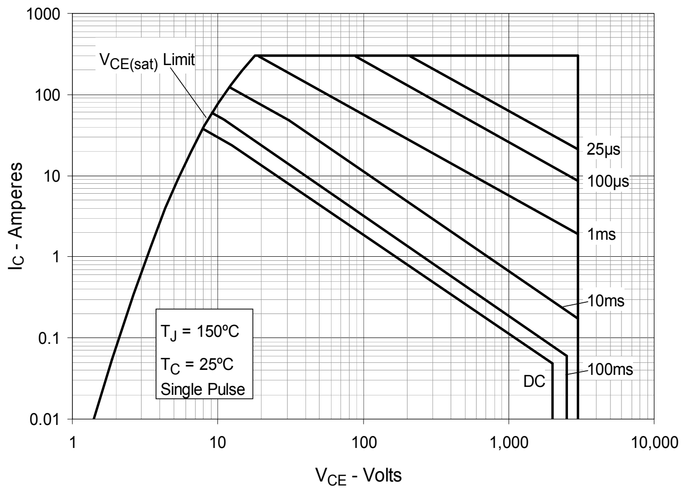



Fig. 14. Forward-Bias Safe Operating Area @ $T_C$ = 75ºC

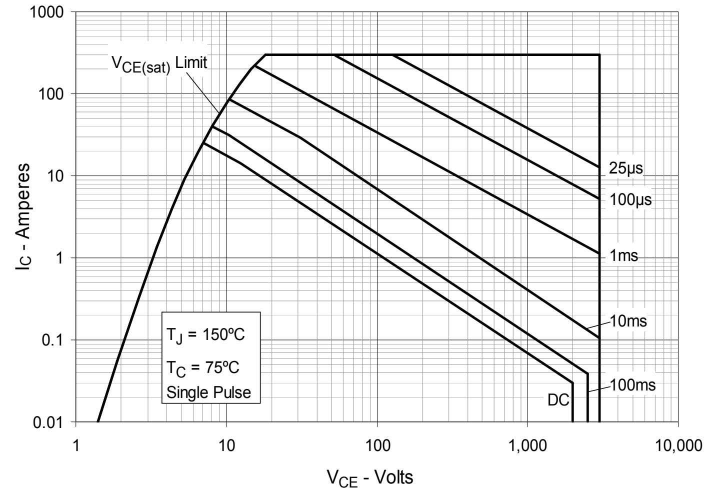



Fig. 15. Inductive Switching Energy Loss vs. Gate Resistance

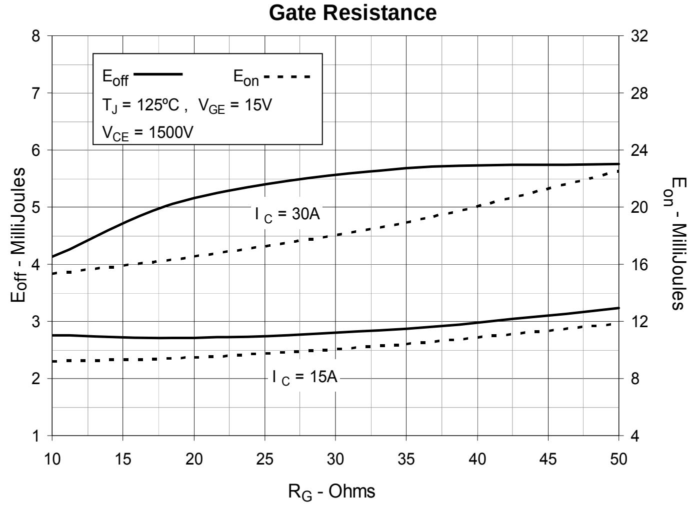



Fig. 16. Inductive Switching Energy Loss vs. Collector Current

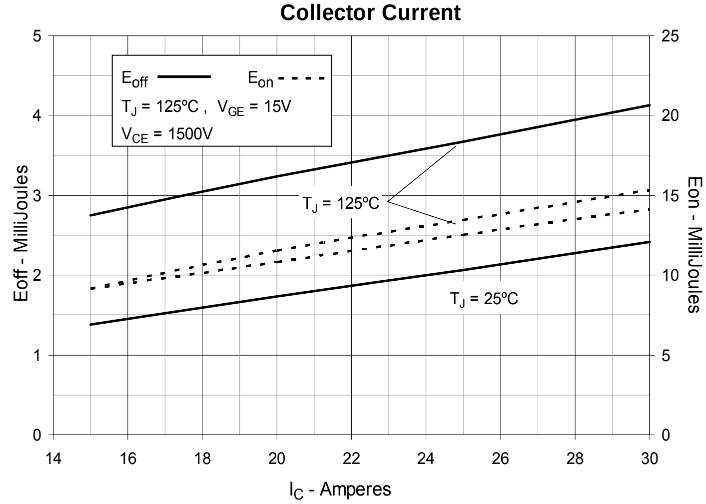



Fig. 17. Inductive Switching Energy Loss vs. Junction Temperature

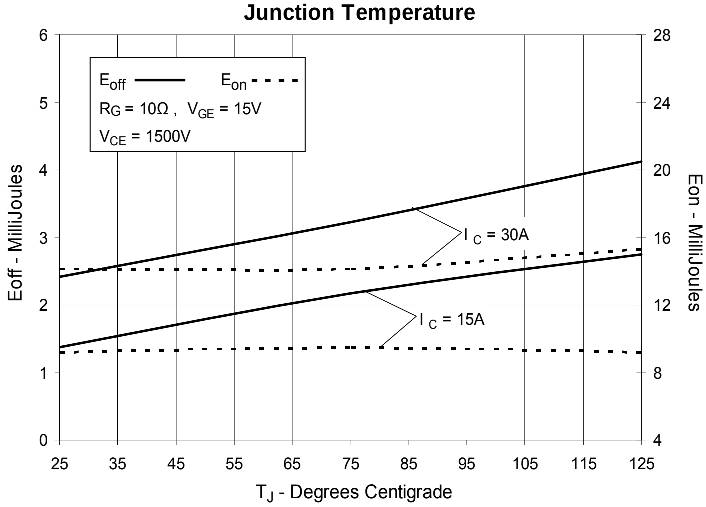



Fig. 18. Inductive Turn-off Switching Times vs. Gate Resistance

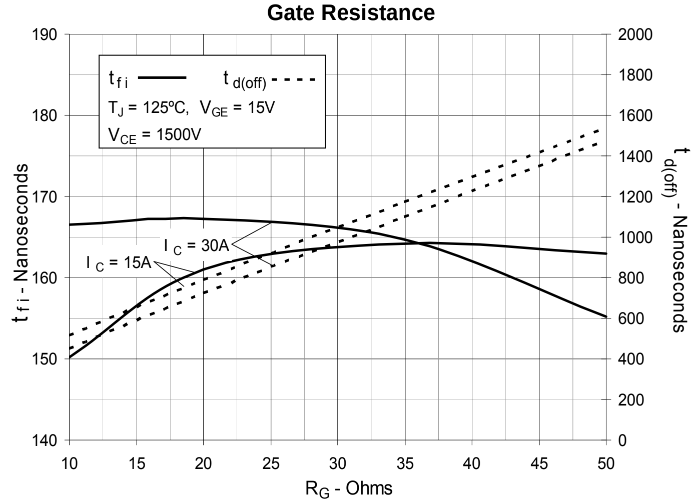


**Fig. 19. Inductive Turn-off Switching Times vs. Collector Current**

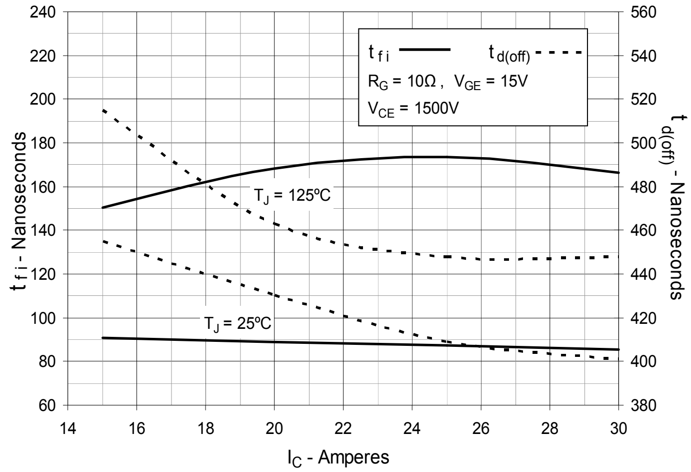



**Fig. 20. Inductive Turn-off Switching Times vs. Junction Temperature**

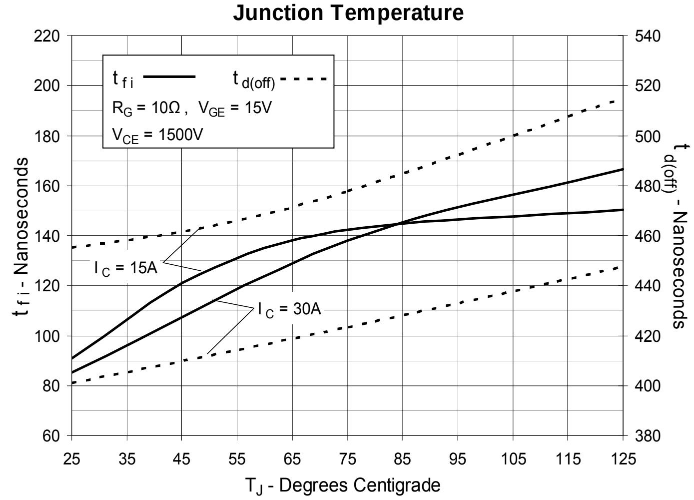



**Fig. 21. Inductive Turn-on Switching Times vs. Gate Resistance**

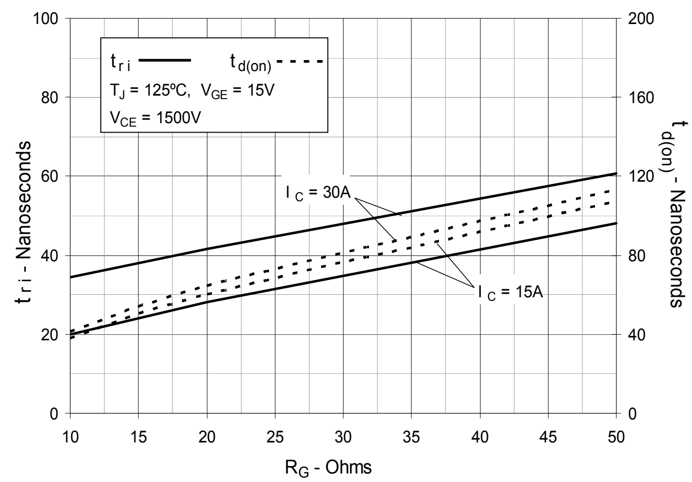



**Fig. 22. Inductive Turn-on Switching Times vs. Collector Current**

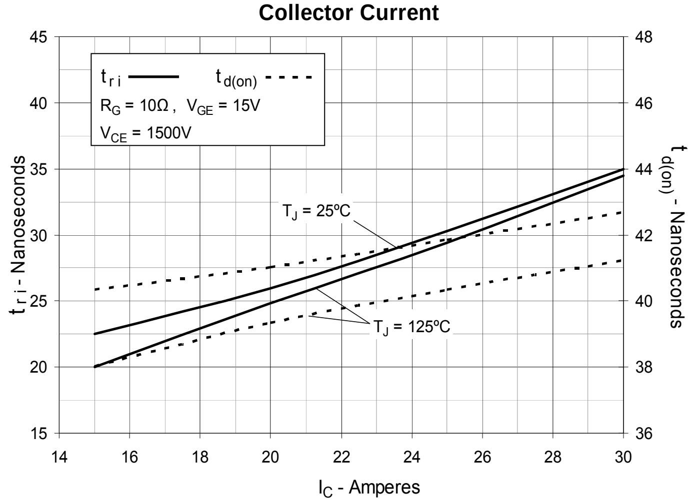



**Fig. 23. Inductive Turn-on Switching Times vs. Junction Temperature**