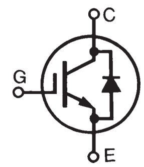
Advance Technical Information

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

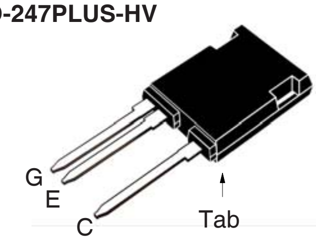
# IXBX50N360HV

$V_{CES}$ = 3600V
$I_{C110}$ = 50A
$V_{CE(sat)}$ ≤ 2.9V




| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_J$ = 25°C to 150°C | 3600 | V |
| $V_{CGR}$ | $T_J$ = 25°C to 150°C, $R_{GE}$ = 1MΩ | 3600 | V |
| $V_{GES}$ | Continuous | ± 20 | V |
| $V_{GEM}$ | Transient | ± 30 | V |
| $I_{C25}$ | $T_C$ = 25°C | 125 | A |
| $I_{C110}$ | $T_C$ = 110°C | 50 | A |
| $I_{CM}$ | $T_C$ = 25°C, 1ms | 420 | A |
| SSOA (RBSOA) | $V_{GE}$ = 15V, $T_{VJ}$ = 125°C, $R_G$ = 5Ω<br>Clamped Inductive Load | $I_{CM}$ = 200<br>0.8 • $V_{CES}$ | A<br>V |
| $T_{SC}$ (SCSOA) | $V_{GE}$ = 15V, $T_J$ = 125°C,<br>$R_G$ = 10Ω, $V_{CE}$ = 1500V, Non-Repetitive | 10 | µs |
| $P_C$ | $T_C$ = 25°C | 660 | 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 |
| Weight | | 6 | g |

TO-247PLUS-HV




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

### Features

- High Blocking Voltage
- High Voltage Package
- Low Conduction Losses

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- Uninterruptible Power Supplies (UPS)
- Switch-Mode and Resonant-Mode Power Supplies
- Capacitor Discharge Circuits
- Laser Generators

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{CES}$ | $I_C$ = 250µA, $V_{GE}$ = 0V | 3600 | | | V |
| $V_{GE(th)}$ | $I_C$ = 250µA, $V_{CE}$ = $V_{GE}$ | 3.0 | | 5.0 | V |
| $I_{CES}$ | $V_{CE}$ = 0.8 • $V_{CES}$, $V_{GE}$ = 0V | | | 25 | µA |
| | Note 2, $T_J$ = 125°C | | | 1 | mA |
| $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ± 20V | | | ±200 | nA |
| $V_{CE(SAT)}$ | $I_C$ = 50A, $V_{GE}$ = 15V, Note 1 | | 2.4 | 2.9 | V |
| | $T_J$ = 125°C | | 3.0 | | V |

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $I_C$ = 50A, $V_{CE}$ = 10V, Note 1 | 24 | 40 | | S |
| $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | | 3990 | | pF |
| $C_{oes}$ | | | 195 | | pF |
| $C_{res}$ | | | 100 | | pF |
| $Q_{g(on)}$ | $I_C$ = 50A, $V_{GE}$ = 15V, $V_{CE}$ = 1000V | | 210 | | nC |
| $Q_{ge}$ | | | 27 | | nC |
| $Q_{gc}$ | | | 77 | | nC |
| $t_{d(on)}$ | **Resistive load, $T_J$ = 25°C** $I_C$ = 50A, $V_{GE}$ = 15V $V_{CE}$ = 960V, $R_G$ = 5Ω | | 46 | | ns |
| $t_r$ | | | 420 | | ns |
| $t_{d(off)}$ | | | 205 | | ns |
| $t_f$ | | | 1750 | | ns |
| $t_{d(on)}$ | **Resistive load, $T_J$ = 125°C** $I_C$ = 50A, $V_{GE}$ = 15V $V_{CE}$ = 960V, $R_G$ = 5Ω | | 44 | | ns |
| $t_r$ | | | 845 | | ns |
| $t_{d(off)}$ | | | 210 | | ns |
| $t_f$ | | | 1670 | | ns |
| $R_{thJC}$ | | | | 0.19 | °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 | |
|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 50A, $V_{GE}$ = 0V, Note 1 | | | 3.0 | V |
| $t_{rr}$ | $I_F$ = 25A, $V_{GE}$ = 0V, -$di_F$/dt = 100A/μs $V_R$ = 100V, $V_{GE}$ = 0V | | 1.7 | | μs |
| $I_{RM}$ | | | 48 | | A |
| $Q_{RM}$ | | | 40 | | 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.

**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**

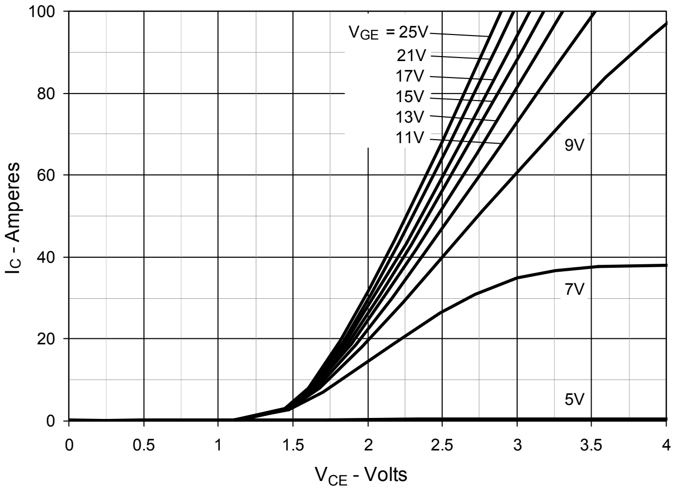



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

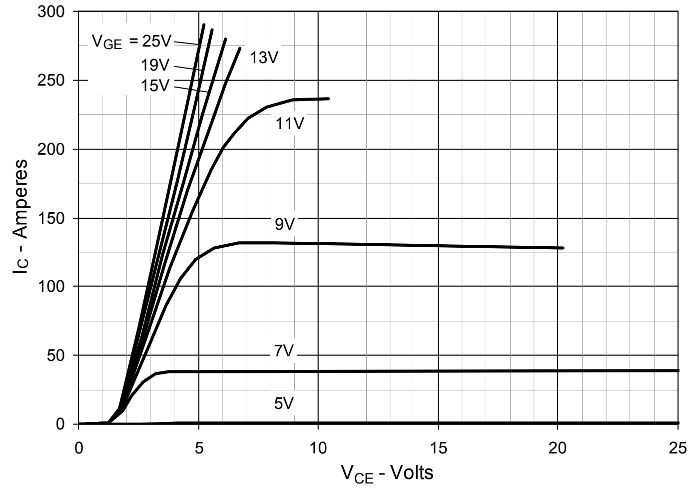



**Fig. 3. Output Characteristics @ $T_J$ = 125ºC**

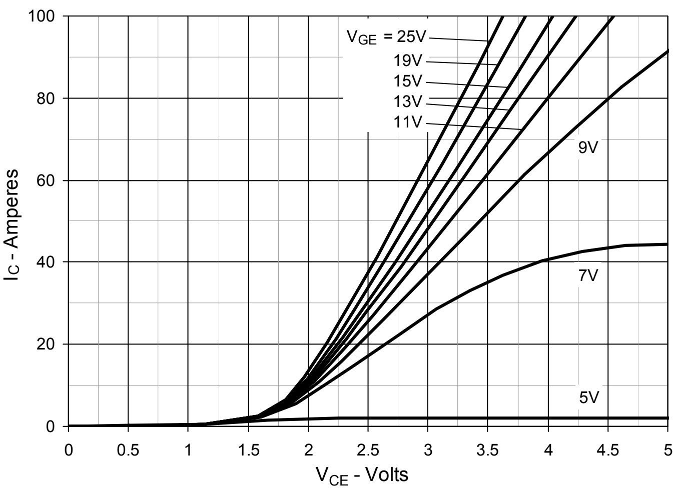



**Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature**

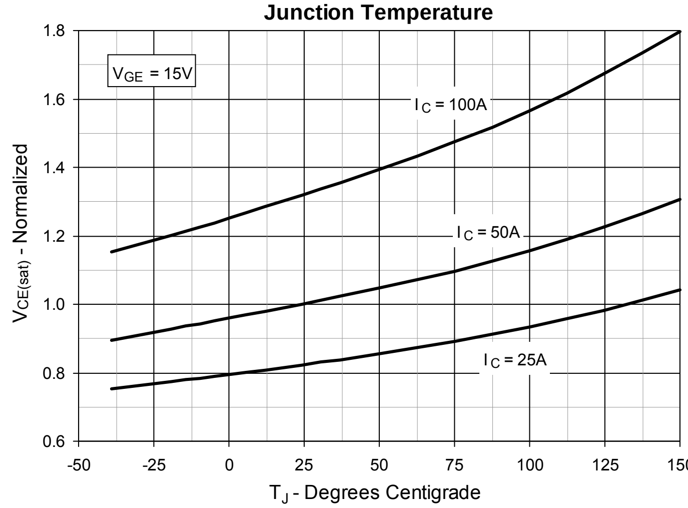



**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

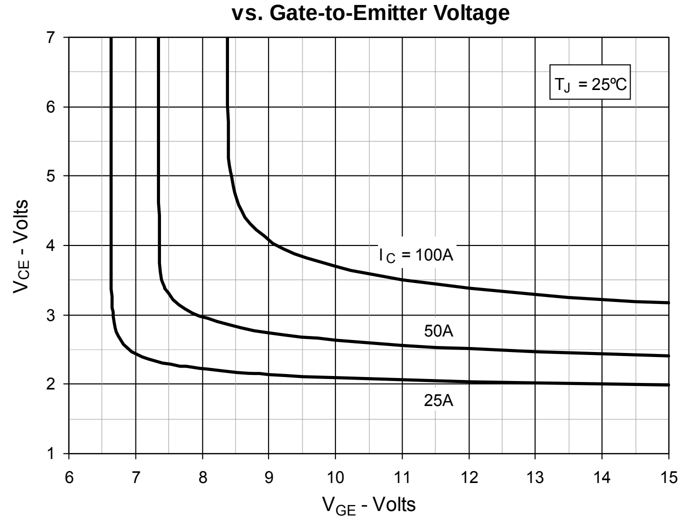



**Fig. 6. Input Admittance**

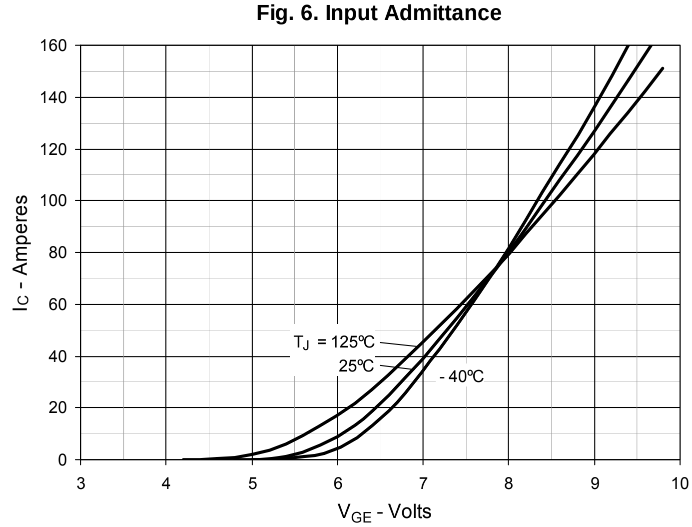


**Fig. 7. Transconductance**

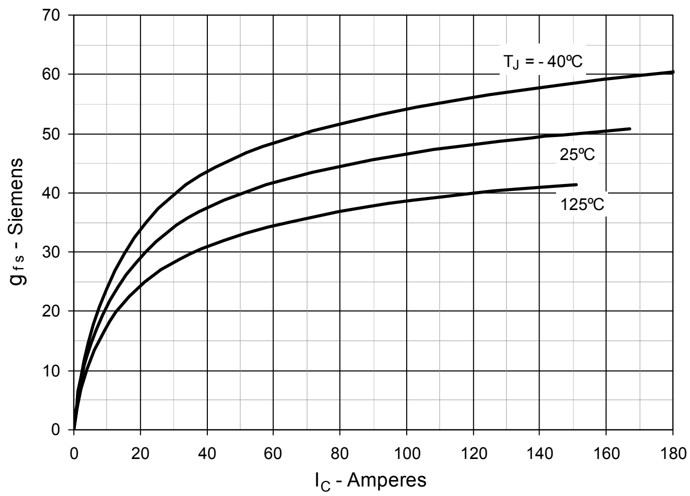



**Fig. 8. Gate Charge**

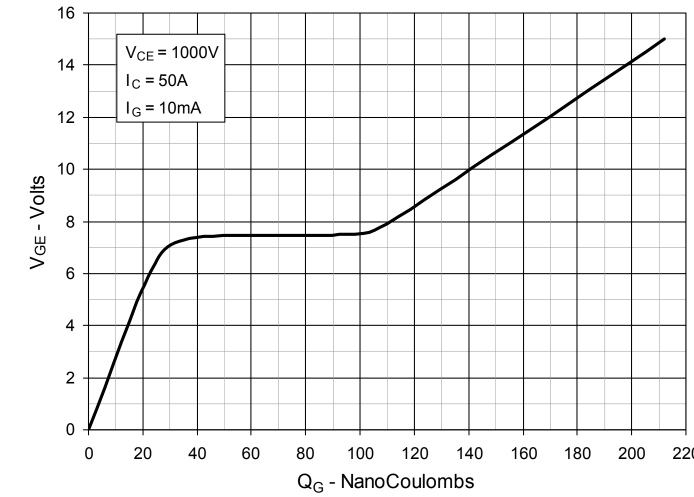



**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

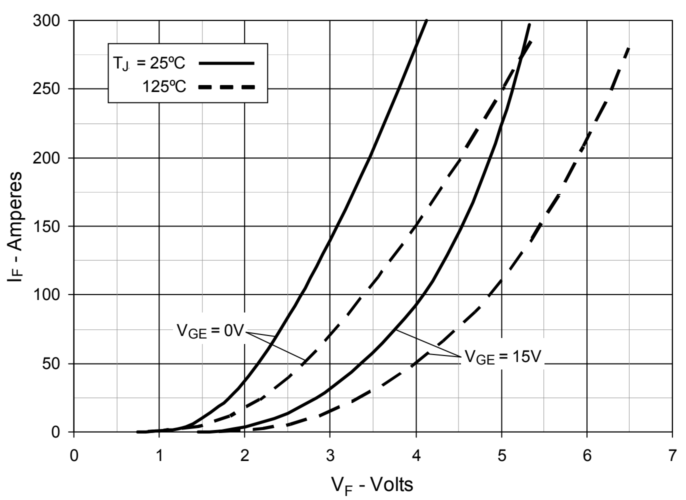



**Fig. 10. Capacitance**

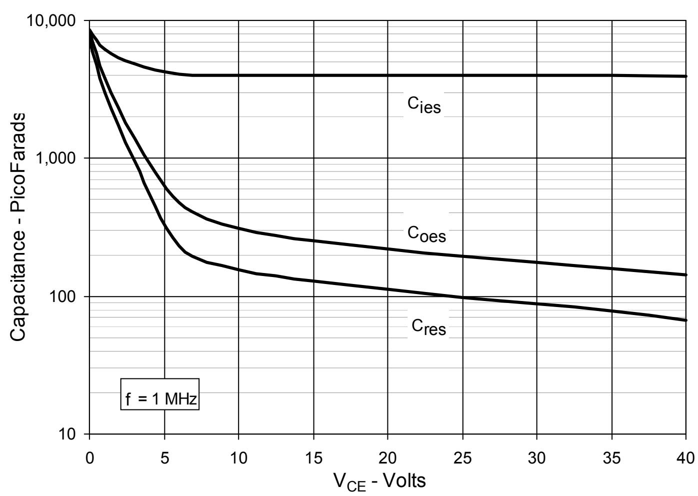



**Fig. 11. Reverse-Bias Safe Operating Area**

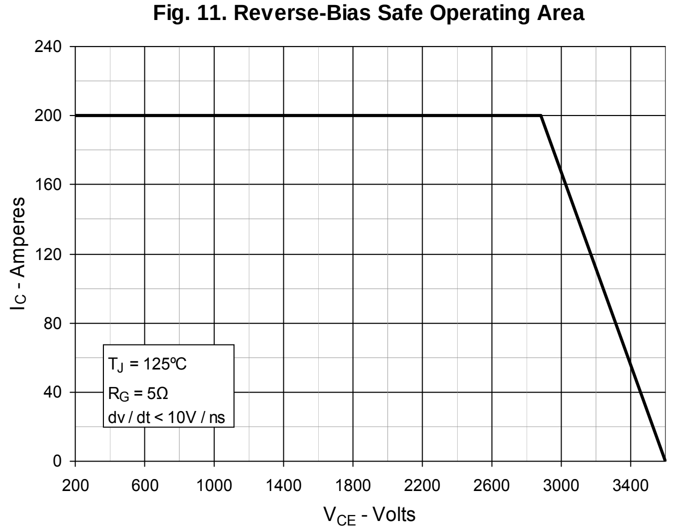
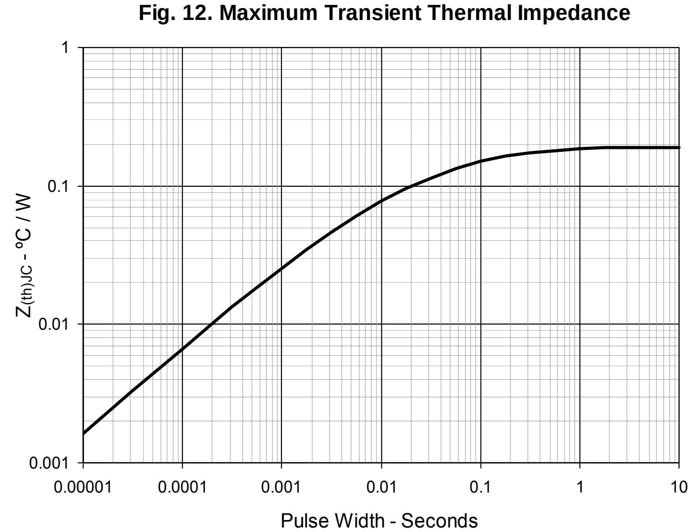



**Fig. 12. Maximum Transient Thermal Impedance**




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

**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**

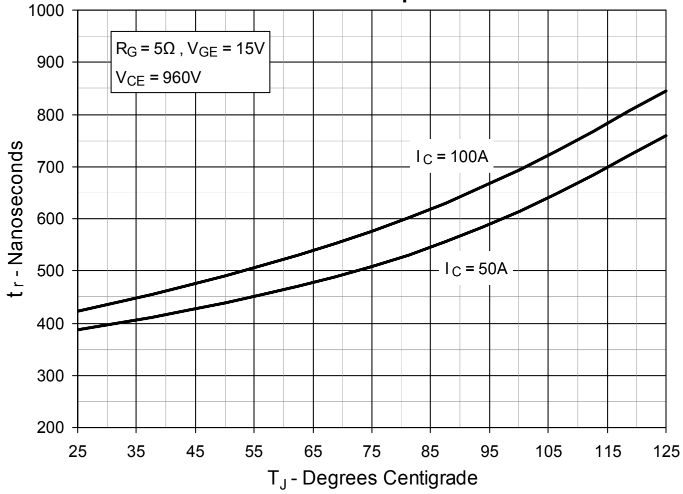



**Fig. 14. Resistive Turn-on Rise Time vs. Collector Current**

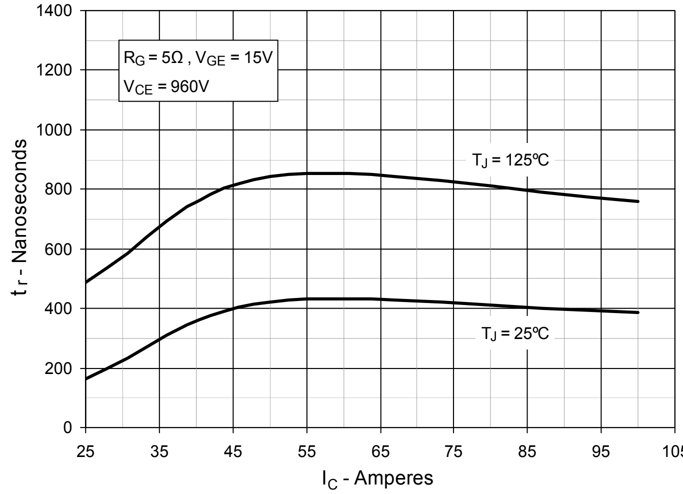



**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**

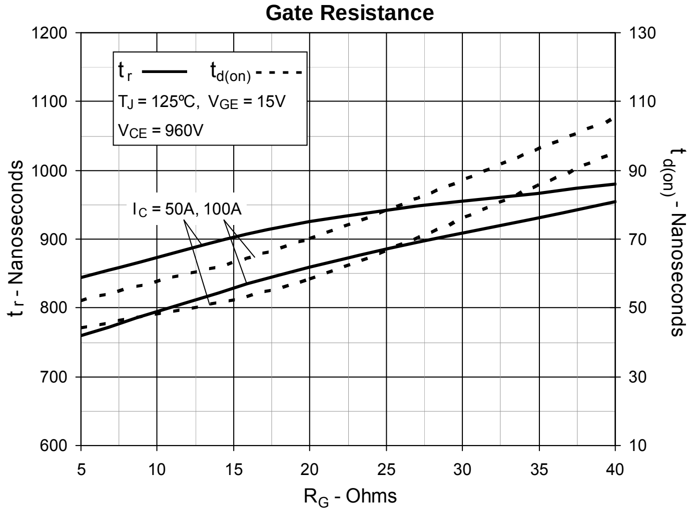



**Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature**

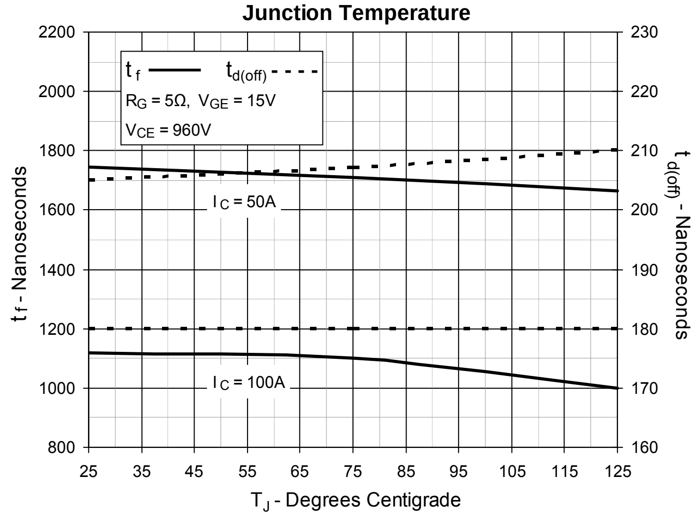



**Fig. 17. Resistive Turn-off Switching Times vs. Collector Current**

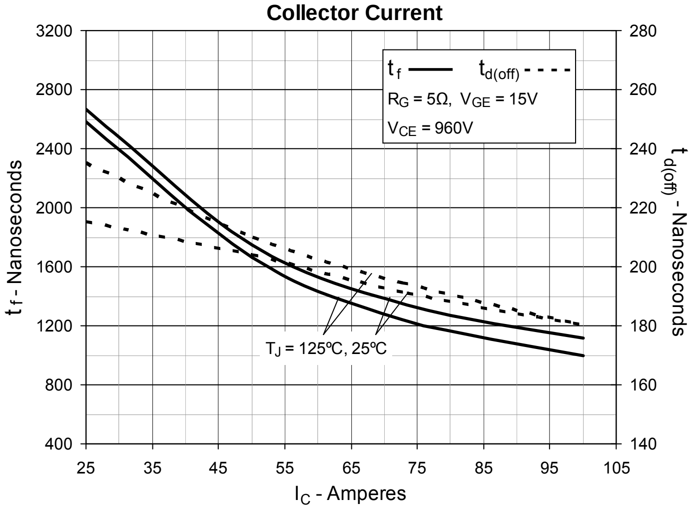



**Fig. 18. Resistive Turn-off Switching Times vs. Gate Resistance**

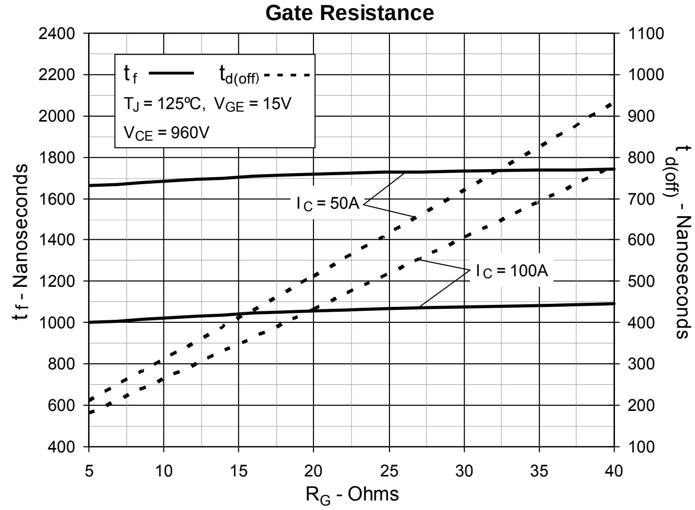


**Fig. 19. Forward-Bias Safe Operating Area @ $T_C$ = 25ºC**

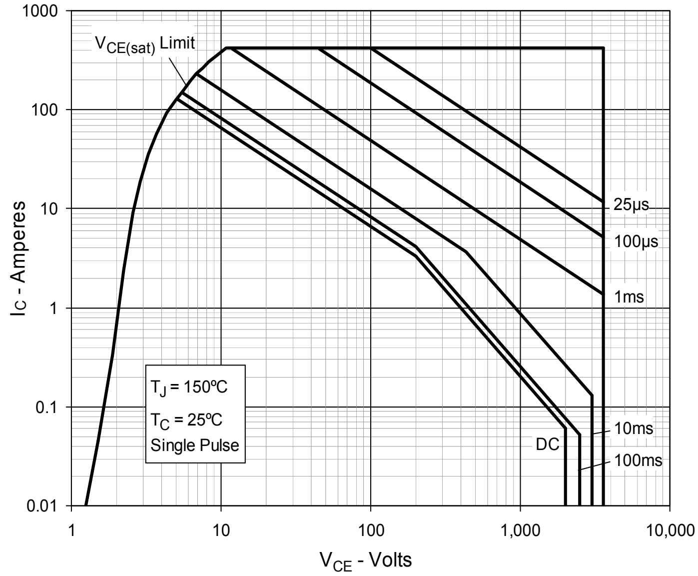
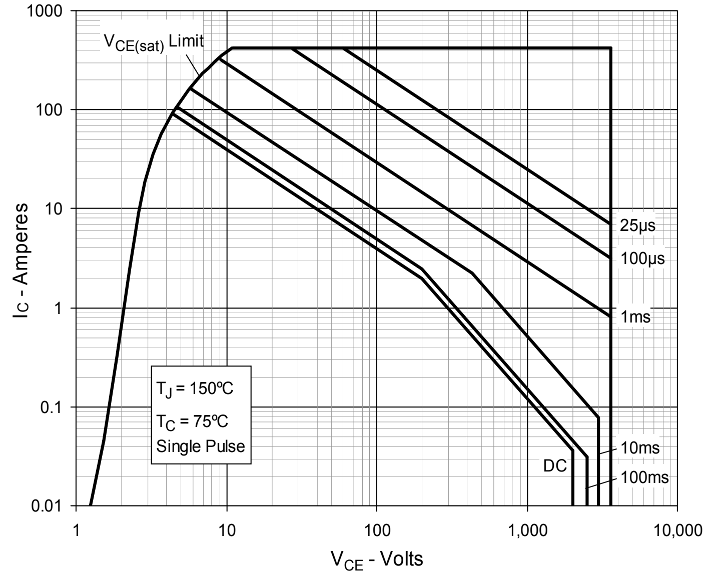
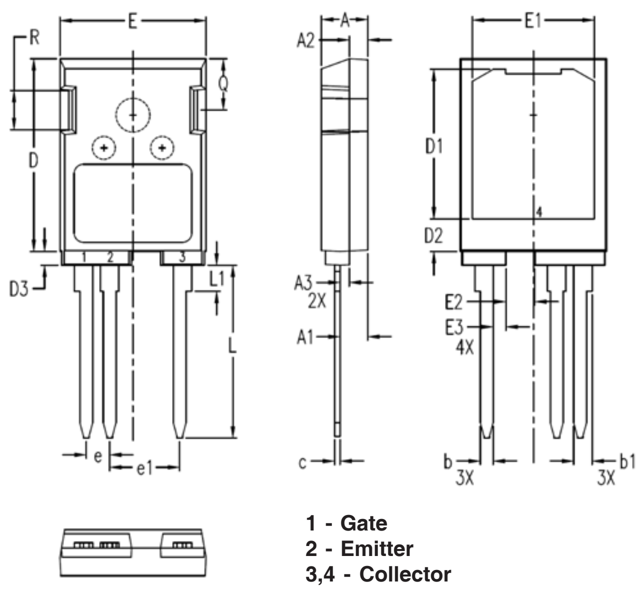



**Fig. 20. Forward-Bias Safe Operating Area @ $T_C$ = 75ºC**




**TO-247PLUS-HV Outline**




1 - Gate
2 - Emitter
3,4 - Collector

| SYM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .193 | .201 | 4.90 | 5.10 |
| A1 | .114 | .122 | 2.90 | 3.10 |
| A2 | .075 | .083 | 1.90 | 2.10 |
| A3 | .035 | .043 | 0.90 | 1.10 |
| b | .053 | .059 | 1.35 | 1.50 |
| b1 | .075 | .083 | 1.90 | 2.10 |
| c | .022 | .030 | 0.55 | 0.75 |
| D | .819 | .843 | 20.80 | 21.40 |
| D1 | .638 | .646 | 16.20 | 16.40 |
| D2 | .134 | .146 | 3.40 | 3.70 |
| D3 | .055 | .063 | 1.40 | 1.60 |
| E | .622 | .638 | 15.80 | 16.20 |
| E1 | .520 | .528 | 13.20 | 13.40 |
| E2 | .118 | .126 | 3.00 | 3.20 |
| E3 | .051 | .059 | 1.30 | 1.50 |
| e | .100 BSC | | 2.54 BSC | |
| e1 | .300 BSC | | 7.62 BSC | |
| L | .732 | .748 | 18.60 | 19.00 |
| L1 | .106 | .118 | 2.70 | 3.00 |
| Q | .216 | .224 | 5.50 | 5.70 |
| R | .165 | .169 | 4.20 | 4.30 |