IXYS

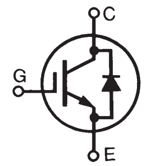
# GenX3™ 600V IGBT w/ Diode

# IXGR72N60B3H1

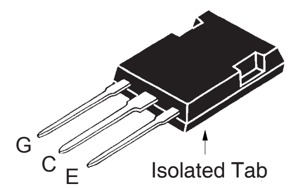
(Electrically Isolated Tab)

**Medium Speed Low Vsat PT IGBT for 5-40 kHz Switching**

| | | |
|---|---|---|
| $V_{CES}$ | = | 600V |
| $I_{C110}$ | = | 40A |
| $V_{CE(sat)}$ | ≤ | 1.80V |
| $t_{fi(typ)}$ | = | 92ns |




**ISOPLUS247™**




G = Gate C = Collector
E = Emitter

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_J$ = 25°C to 150°C | 600 | V |
| $V_{CGR}$ | $T_J$ = 25°C to 150°C, $R_{GE}$ = 1MΩ | 600 | V |
| $V_{GES}$ | Continuous | ±20 | V |
| $V_{GEM}$ | Transient | ±30 | V |
| $I_{C25}$ | $T_C$ = 25°C | 80 | A |
| $I_{C110}$ | $T_C$ = 110°C | 40 | A |
| $I_{F110}$ | $T_C$ = 110°C | 34 | A |
| $I_{CM}$ | $T_C$ = 25°C, 1ms | 450 | A |
| **SSOA (RBSOA)** | $V_{GE}$ = 15V, $T_{VJ}$ = 125°C, $R_G$ = 3Ω<br>Clamped Inductive Load | $I_{CM}$ = 240<br>$V_{CE} \leq V_{CES}$ | A |
| $P_C$ | $T_C$ = 25°C | 200 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $V_{ISOL}$ | 50/60 Hz, 1 Minute | 2500 | V~ |
| $F_C$ | Mounting Force | 20..120/4.5..27 | N/lb |
| $T_L$ | Maximum Lead Temperature for Soldering | 300 | °C |
| $T_{SOLD}$ | 1.6mm (0.062 in.) from Case for 10s | 260 | °C |
| **Weight** | | 5 | g |

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $V_{GE(th)}$ | $I_C$ = 250μA, $V_{CE}$ = $V_{GE}$ | 3.0 | | 5.0 | V |
| $I_{CES}$ | $V_{CE}$ = $V_{CES}$, $V_{GE}$ = 0V | | | 300 | μA |
| | $T_J$ = 125°C | | | 5 | mA |
| $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ±20V | | | ±100 | nA |
| $V_{CE(sat)}$ | $I_C$ = 60A, $V_{GE}$ = 15V, Note 1 | | 1.50 | 1.80 | V |
| | $I_C$ = 120A | | 1.75 | | V |

## Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface Optimized for Low Conduction and Switching Losses
- 2500V~ Electrical Isolation
- Square RBSOA
- Anti-Parallel Ultra Fast Diode

## Advantages

- High Power Density
- Low Gate Drive Requirement

## Applications

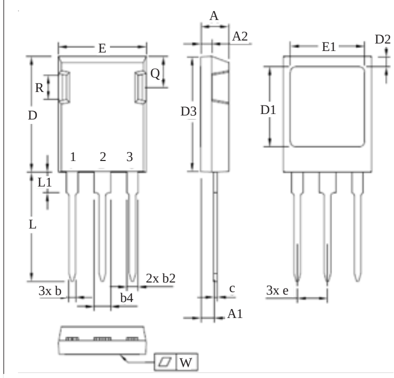
- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $I_C$ = 50A, $V_{CE}$ = 10V, Note 1 | 45 | 76 | | S |
| $C_{ies}$ | $V_{CE}$= 25V, $V_{GE}$ = 0V, f = 1MHz | | 6800 | | pF |
| $C_{oes}$ | | | 576 | | pF |
| $C_{res}$ | | | 80 | | pF |
| $Q_g$ | $I_C$ = 60A, $V_{GE}$ = 15V, $V_{CE}$ = 0.5 • $V_{CES}$ | | 225 | | nC |
| $Q_{ge}$ | | | 40 | | nC |
| $Q_{gc}$ | | | 82 | | nC |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 25°C** | | 31 | | ns |
| $t_{ri}$ | $I_C$ = 50A, $V_{GE}$ = 15V | | 33 | | ns |
| $E_{on}$ | $V_{CE}$ = 480V, $R_G$ = 3Ω | | 1.4 | | mJ |
| $t_{d(off)}$ | Note 2 | | 152 | 240 | ns |
| $t_{fi}$ | | | 92 | 150 | ns |
| $E_{off}$ | | | 1.0 | 2.0 | mJ |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 125°C** | | 29 | | ns |
| $t_{ri}$ | $I_C$ = 50A, $V_{GE}$ = 15V | | 34 | | ns |
| $E_{on}$ | $V_{CE}$ = 480V, $R_G$ = 3Ω | | 2.7 | | mJ |
| $t_{d(off)}$ | Note 2 | | 228 | | ns |
| $t_{fi}$ | | | 142 | | ns |
| $E_{off}$ | | | 2.2 | | mJ |
| $R_{thJC}$ | | | | 0.62 | °C/W |
| $R_{thCS}$ | | | 0.15 | | °C/W |

**Reverse Diode (FRED)**

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 60A, $V_{GE}$ = 0V, Note 1 | | | 2.45 | V |
| | $T_J$ = 150°C | | 1.40 | 1.80 | V |
| $I_{RM}$ | $I_F$ = 60A, $V_{GE}$ = 0V, -$di_F/dt$ = 200A/μs, $V_R$ = 300V, $T_J$ = 100°C | | 8.3 | | A |
| $t_{rr}$ | $I_F$ = 60A, -di/dt = 200A/μs, $V_R$ = 300V, $T_J$ = 100°C | | 140 | | ns |
| $R_{thJC}$ | | | | 0.80 | °C/W |

**ISOPLUS247 (IXGR) Outline**




1 - Gate
2 - Collector
3 - Emitter

| Dim. | Millimeter min | Millimeter max | Inches min | Inches max |
|---|---|---|---|---|
| A | 4.83 | 5.21 | 0.190 | 0.205 |
| A1 | 2.29 | 2.54 | 0.090 | 0.100 |
| A2 | 1.91 | 2.16 | 0.075 | 0.085 |
| b | 1.14 | 1.40 | 0.045 | 0.055 |
| b2 | 1.91 | 2.20 | 0.075 | 0.087 |
| b4 | 2.92 | 3.24 | 0.115 | 0.128 |
| c | 0.61 | 0.83 | 0.024 | 0.033 |
| D | 20.80 | 21.34 | 0.819 | 0.840 |
| D1 | 15.75 | 16.26 | 0.620 | 0.640 |
| D2 | 1.65 | 2.15 | 0.065 | 0.085 |
| D3 | 20.30 | 20.70 | 0.799 | 0.815 |
| E | 15.75 | 16.13 | 0.620 | 0.635 |
| E1 | 13.21 | 13.72 | 0.520 | 0.540 |
| e | 5.45 BSC | | 0.215 BSC | |
| L | 19.81 | 20.60 | 0.780 | 0.811 |
| L1 | 3.81 | 4.38 | 0.150 | 0.172 |
| Q | 5.59 | 6.20 | 0.220 | 0.244 |
| R | 4.25 | 5.50 | 0.167 | 0.217 |
| W | - | 0.10 | - | 0.004 |

Notes:
1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. Switching times & energy losses may increase for higher $V_{CE}$(Clamp), $T_J$ or $R_G$.

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

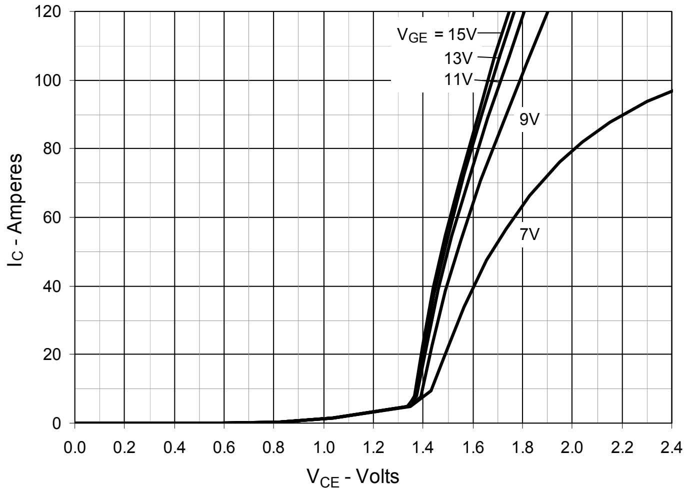



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

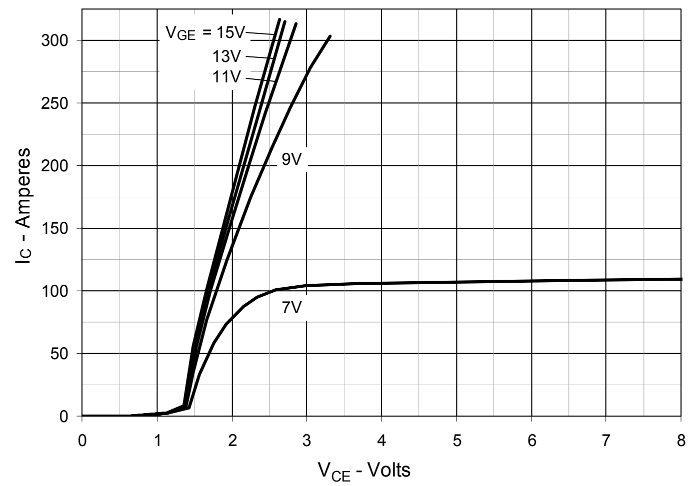



**Fig. 3. Output Characteristics @ $T_J$ = 125ºC**

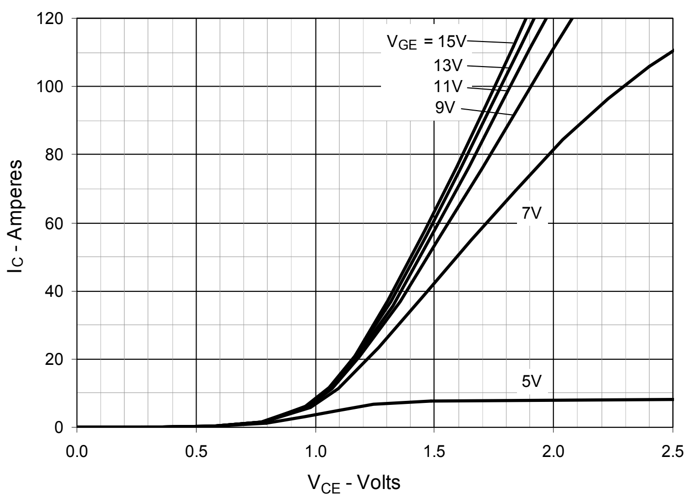



**Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature**

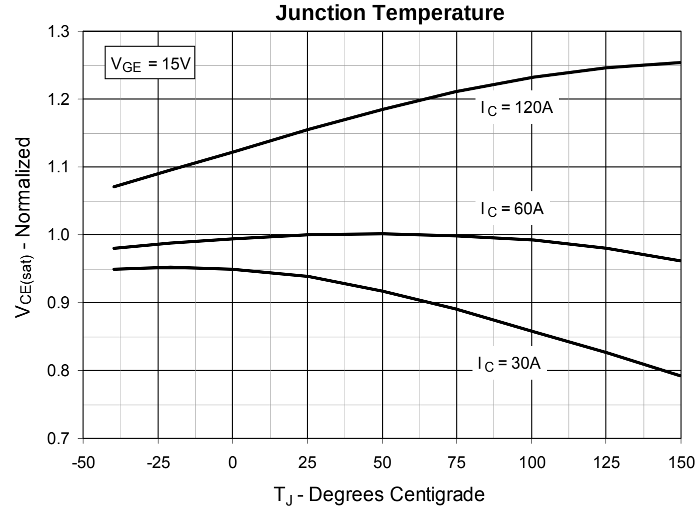



**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

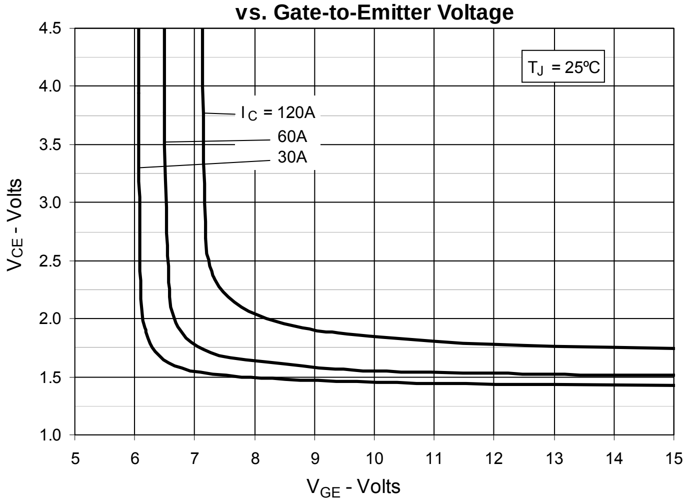
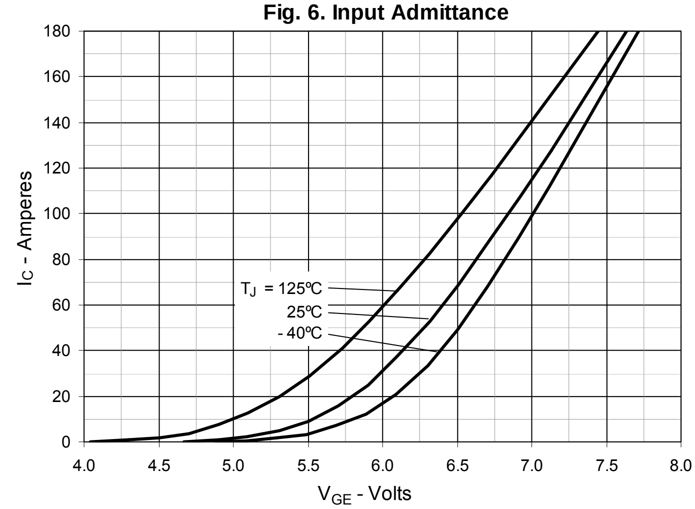
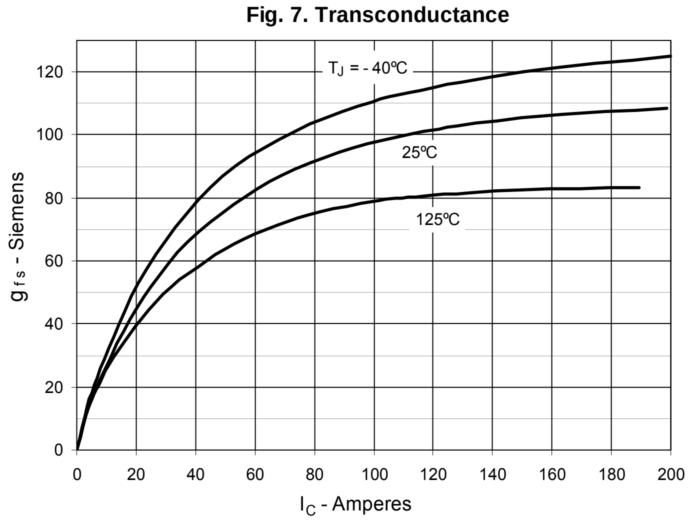
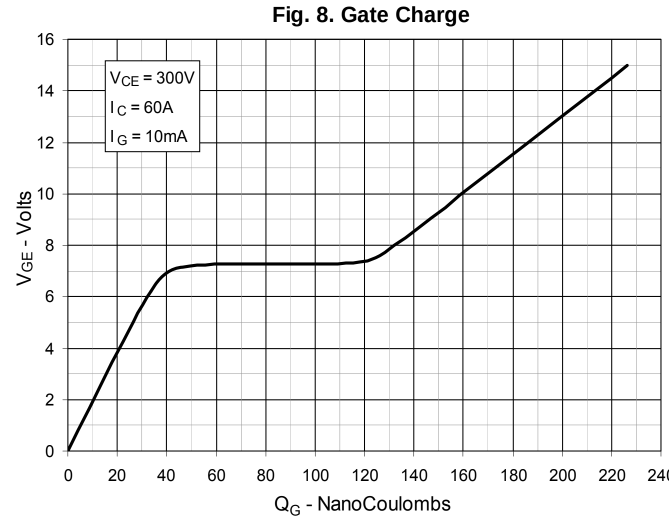
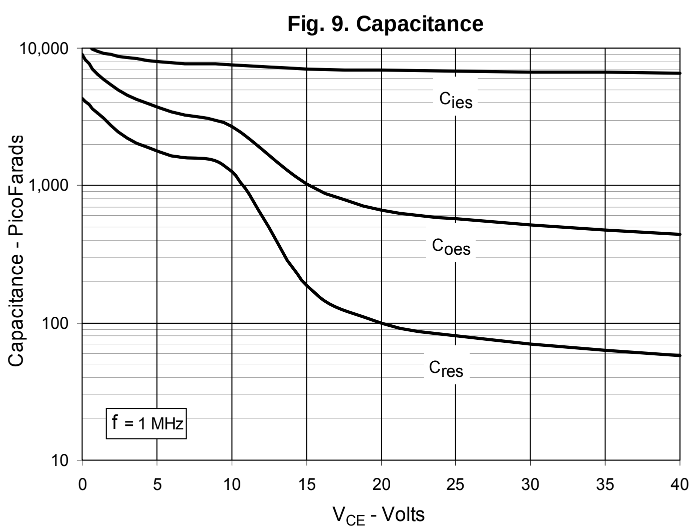


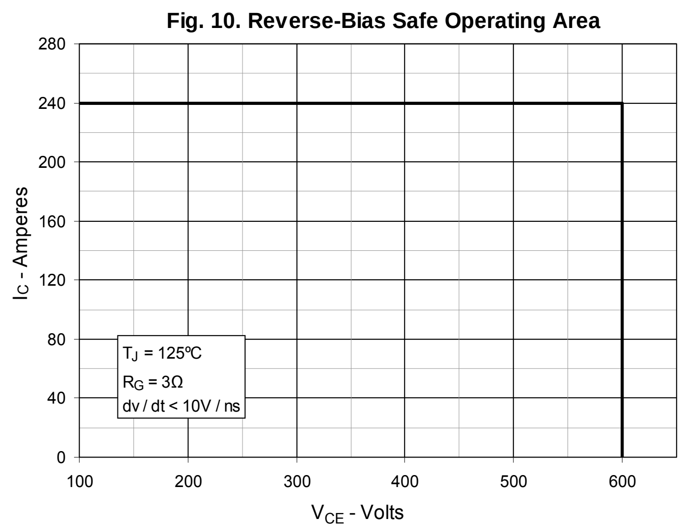

**Fig. 6. Input Admittance**

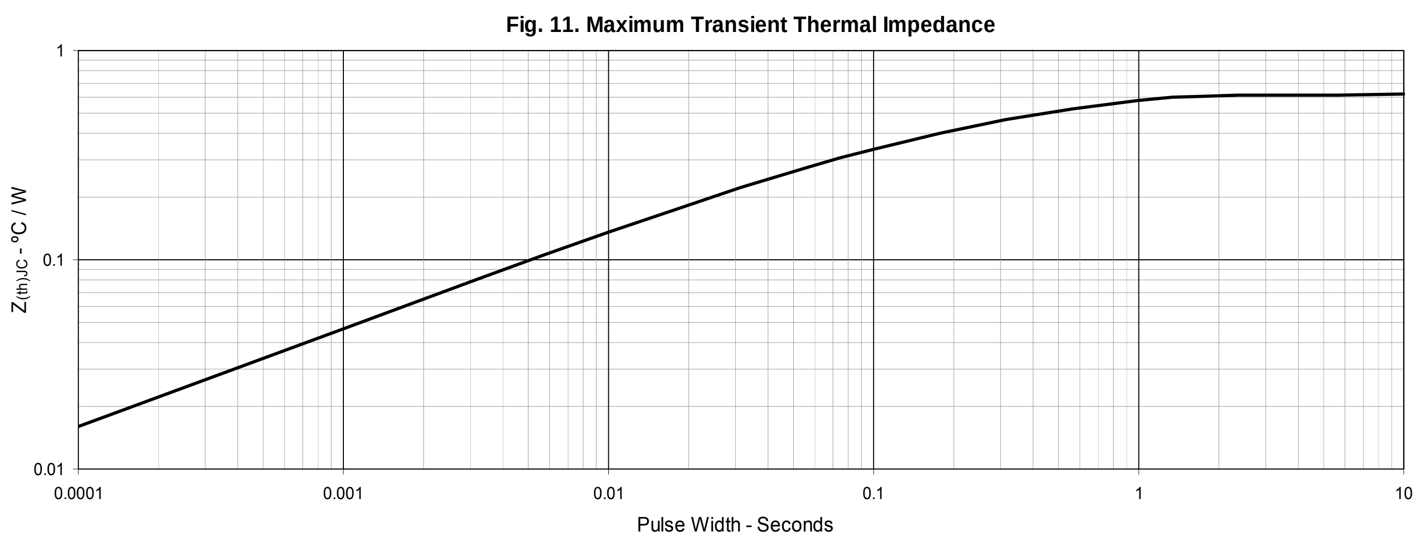





IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

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

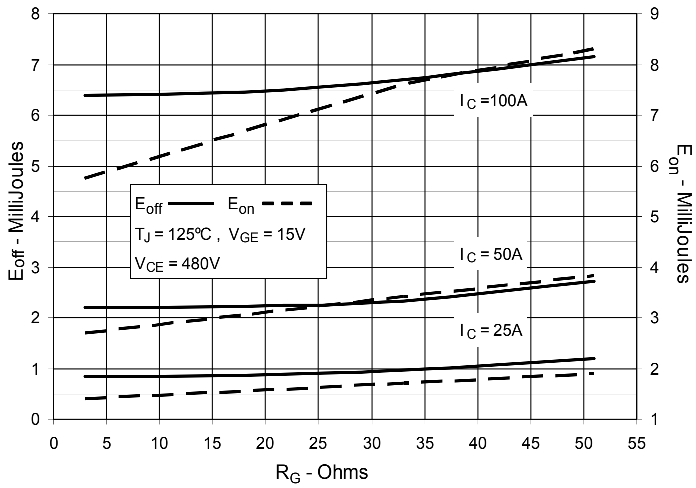



**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**

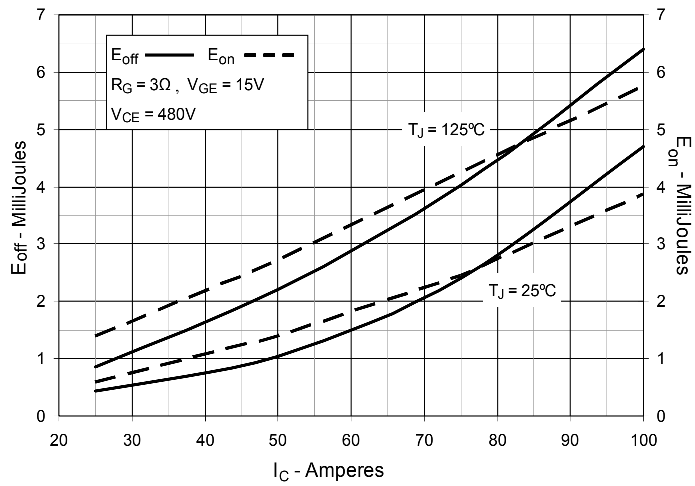



**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**

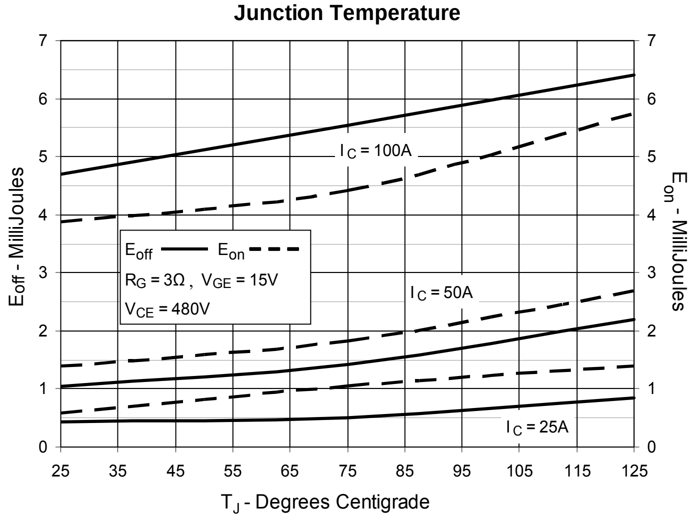



**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**

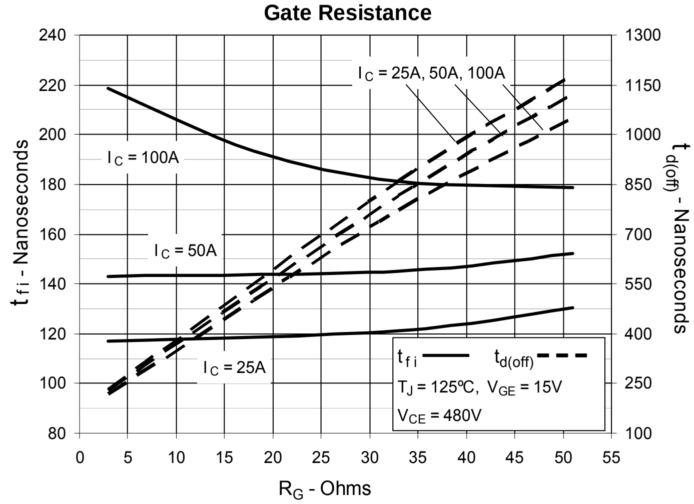



**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**

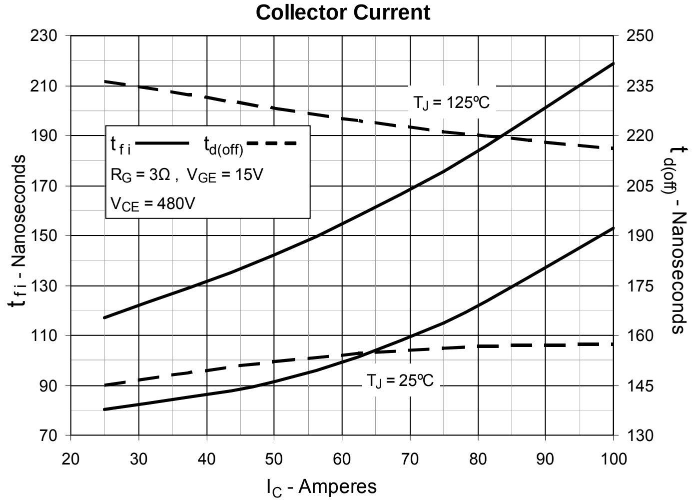



**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**

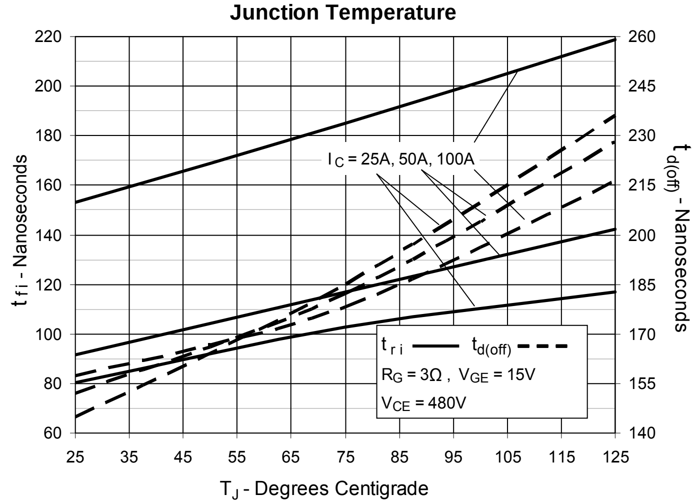


**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**

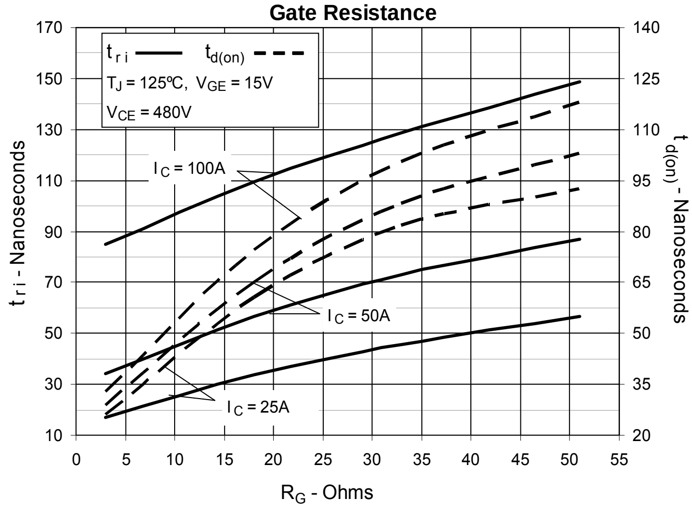



**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**

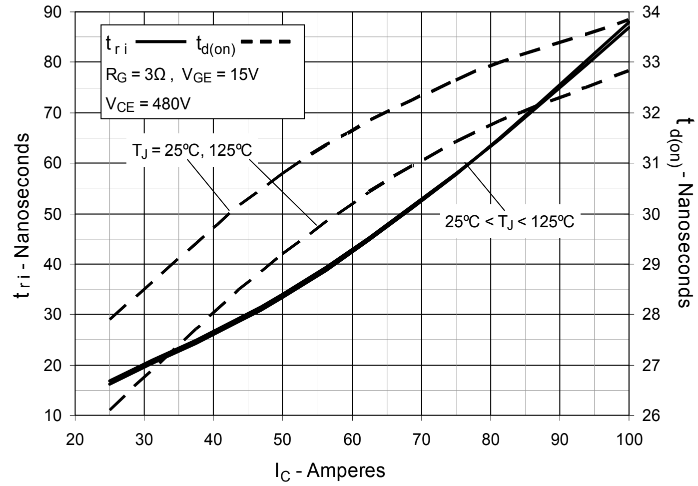
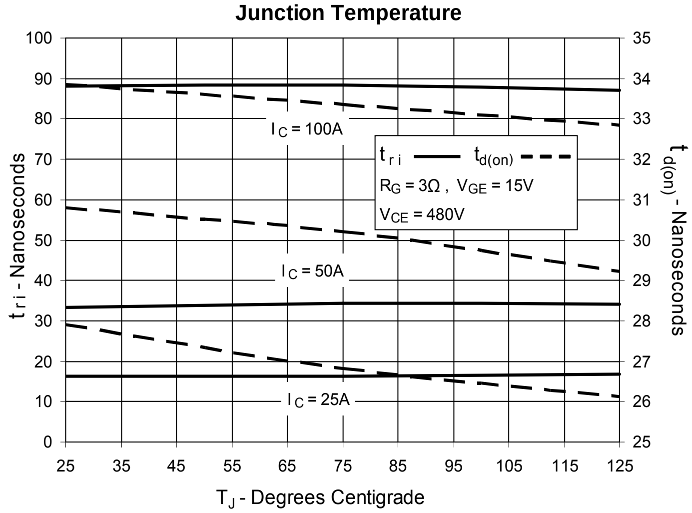



**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**



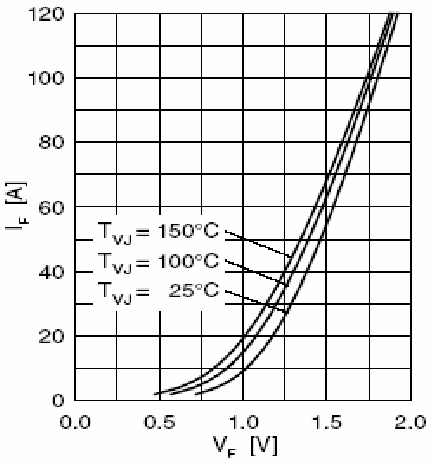



Fig. 21 Forward Current $I_F$ vs. $V_F$

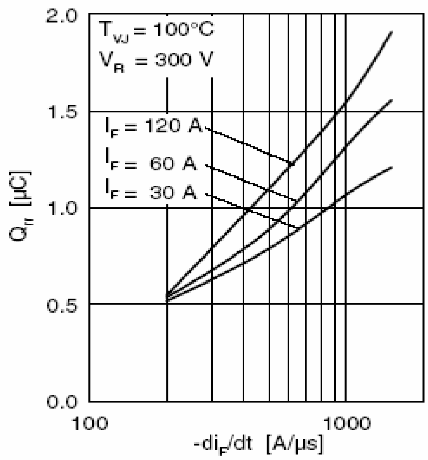



Fig. 22 Typ. Reverse Recovery Charge $Q_{rr}$

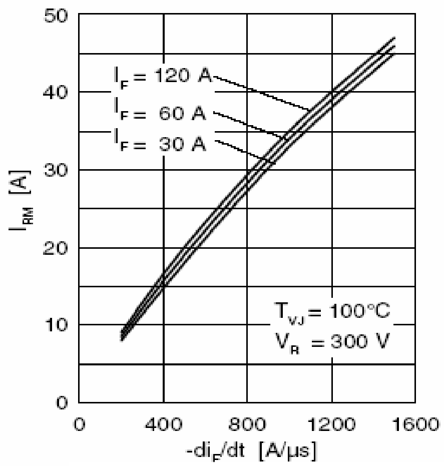



Fig. 23 Typ. Peak Reverse Current $I_{RM}$

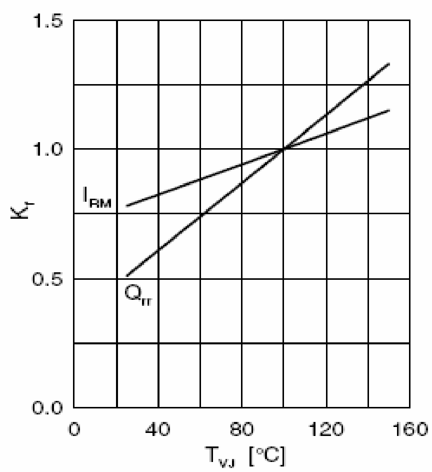



Fig. 24 Typ. Dynamic Parameters $Q_{rr}$, $I_{RM}$

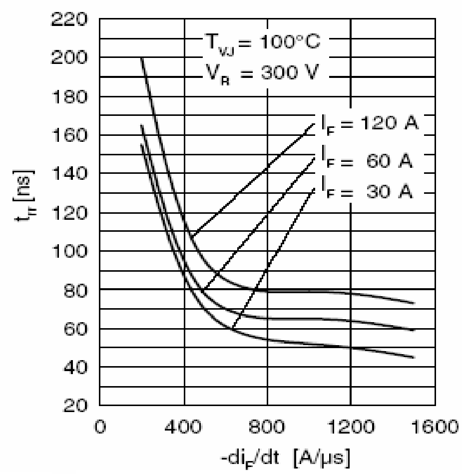



Fig. 25 Typ Recovery Time $t_{rr}$

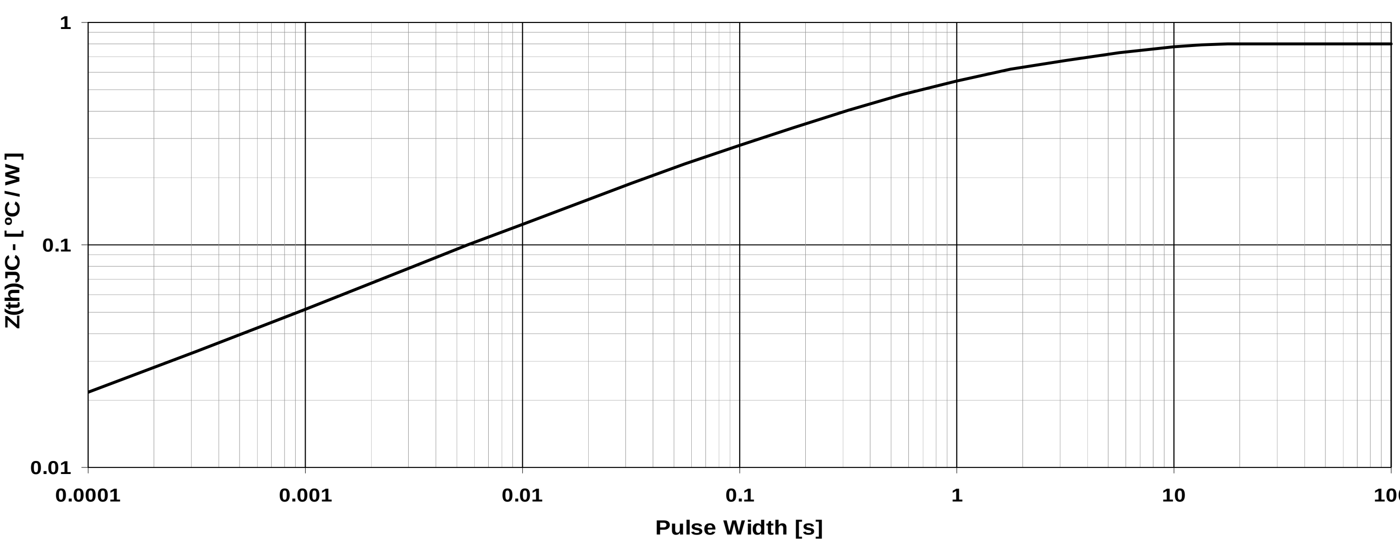



Fig. 26 Maximum Transient Thermal Impedance Junction to Case (for Diode)