Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!


## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
Email & Skype: info@chipsmall.com Web: www.chipsmall.com
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

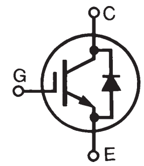
Preliminary Technical Information

# XPT™ 650V IGBT GenX3™ w/ Sonic Diode

# IXYH50N65C3H1

$V_{CES}$ = 650V
$I_{C110}$ = 50A
$V_{CE(sat)}$ ≤ 2.10V
$t_{fi(typ)}$ = 27ns

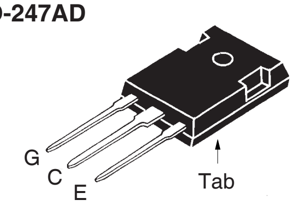
Extreme Light Punch Through IGBT for 20-60kHz Switching




| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_J$ = 25°C to 175°C | 650 | V |
| $V_{CGR}$ | $T_J$ = 25°C to 175°C, $R_{GE}$ = 1MΩ | 650 | V |
| $V_{GES}$ | Continuous | ±20 | V |
| $V_{GEM}$ | Transient | ±30 | V |
| $I_{C25}$ | $T_C$ = 25°C | 130 | A |
| $I_{C110}$ | $T_C$ = 110°C | 50 | A |
| $I_{F110}$ | $T_C$ = 110°C | 40 | A |
| $I_{CM}$ | $T_C$ = 25°C, 1ms | 250 | A |
| $I_A$ | $T_C$ = 25°C | 20 | A |
| $E_{AS}$ | $T_C$ = 25°C | 300 | mJ |
| SSOA (RBSOA) | $V_{GE}$ = 15V, $T_{VJ}$ = 150°C, $R_G$ = 5Ω<br>Clamped Inductive Load | $I_{CM}$ = 100<br>$V_{CE} \leq V_{CES}$ | A |
| $t_{sc}$ (SCSOA) | $V_{GE}$ = 15V, $V_{CE}$ = 360V, $T_J$ = 150°C<br>$R_G$ = 82Ω, Non Repetitive | 8 | µs |
| $P_C$ | $T_C$ = 25°C | 600 | W |
| $T_J$ | | -55 ... +175 | °C |
| $T_{JM}$ | | 175 | °C |
| $T_{stg}$ | | -55 ... +175 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering | 300 | °C |
| $T_{SOLD}$ | 1.6 mm (0.062in.) from Case for 10s | 260 | °C |
| $M_d$ | Mounting Torque | 1.13/10 | Nm/lb.in |
| Weight | | 6 | 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 | 650 | | | V |
| $V_{GE(th)}$ | $I_C$ = 250µA, $V_{CE}$ = $V_{GE}$ | 3.5 | | 6.0 | V |
| $I_{CES}$ | $V_{CE}$ = $V_{CES}$, $V_{GE}$ = 0V | | | 50 | µA |
| | $T_J$ = 150°C | | | 3 | mA |
| $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ±20V | | | ±100 | nA |
| $V_{CE(sat)}$ | $I_C$ = 36A, $V_{GE}$ = 15V, Note 1 | | 1.74 | 2.10 | V |
| | $T_J$ = 150°C | | 2.00 | | V |

TO-247AD




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

## Features

- Optimized for 20-60kHz Switching
- Square RBSOA
- Avalanche Rated
- Short Circuit Capability
- International Standard Package

## Advantages

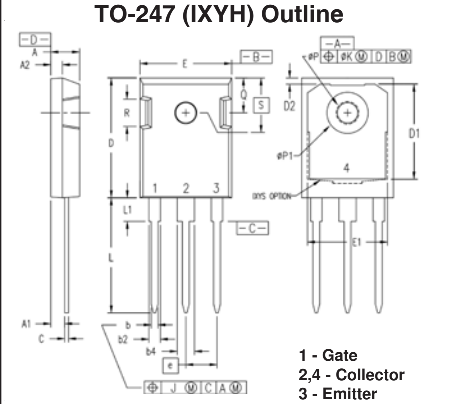
- High Power Density
- Extremely Rugged
- Low Gate Drive Requirement

## Applications

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

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $I_C$ = 36A, $V_{CE}$ = 10V, Note 1 | 19 | 28 | | S |
| $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | | 2346 | | pF |
| $C_{oes}$ | | | 230 | | pF |
| $C_{res}$ | | | 50 | | pF |
| $Q_{g(on)}$ | $I_C$ = 36A, $V_{GE}$ = 15V, $V_{CE}$ = 0.5 • $V_{CES}$ | | 80 | | nC |
| $Q_{ge}$ | | | 15 | | nC |
| $Q_{gc}$ | | | 40 | | nC |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 25°C** | | 22 | | ns |
| $t_{ri}$ | $I_C$ = 36A, $V_{GE}$ = 15V | | 35 | | ns |
| $E_{on}$ | $V_{CE}$ = 400V, $R_G$ = 5Ω | | 1.30 | | mJ |
| $t_{d(off)}$ | Note 2 | | 80 | | ns |
| $t_{fi}$ | | | 27 | | ns |
| $E_{off}$ | | | 0.37 | | mJ |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 150°C** | | 23 | | ns |
| $t_{ri}$ | $I_C$ = 36A, $V_{GE}$ = 15V | | 33 | | ns |
| $E_{on}$ | $V_{CE}$ = 400V, $R_G$ = 5Ω | | 1.70 | | mJ |
| $t_{d(off)}$ | Note 2 | | 100 | | ns |
| $t_{fi}$ | | | 42 | | ns |
| $E_{off}$ | | | 0.56 | | mJ |
| $R_{thJC}$ | | | | 0.25 | °C/W |
| $R_{thCS}$ | | | 0.21 | | °C/W |

**TO-247 (IXYH) Outline**




| Dim. | Millimeter min | Millimeter max | Inches min | Inches max |
|---|---|---|---|---|
| A | 4.70 | 5.30 | 0.185 | 0.209 |
| A1 | 2.21 | 2.59 | 0.087 | 0.102 |
| A2 | 1.50 | 2.49 | 0.059 | 0.098 |
| b | 0.99 | 1.40 | 0.039 | 0.055 |
| b2 | 1.65 | 2.39 | 0.065 | 0.094 |
| b4 | 2.59 | 3.43 | 0.102 | 0.135 |
| c | 0.38 | 0.89 | 0.015 | 0.035 |
| D | 20.79 | 21.45 | 0.819 | 0.845 |
| D1 | 13.07 | - | 0.515 | - |
| D2 | 0.51 | 1.35 | 0.020 | 0.053 |
| E | 15.48 | 16.24 | 0.610 | 0.640 |
| E1 | 13.45 | - | 0.53 | - |
| E2 | 4.31 | 5.48 | 0.170 | 0.216 |
| e | 5.45 BSC | | 0.215 BSC | |
| L | 19.80 | 20.30 | 0.078 | 0.800 |
| L1 | - | 4.49 | - | 0.177 |
| Ø P | 3.55 | 3.65 | 0.140 | 0.144 |
| Ø P1 | - | 7.39 | - | 0.290 |
| Q | 5.38 | 6.19 | 0.212 | 0.244 |
| S | 6.14 BSC | | 0.242 BSC | |

**Reverse Sonic Diode (FRD)**

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 30A, $V_{GE}$ = 0V, Note 1 | | | | 2.5 | V |
| | | $T_J$ = 150°C | | 2.15 | | V |
| $I_{RM}$ | $I_F$ = 30A, $V_{GE}$ = 0V, | $T_J$ = 150°C | | 25 | | A |
| $t_{rr}$ | $-di_F/dt$ = 500A/µs, $V_R$ = 300V | $T_J$ = 150°C | | 120 | | ns |
| $R_{thJC}$ | | | | | 0.60 | °C/W |

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 $R_G$.

**PRELIMANARY 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**

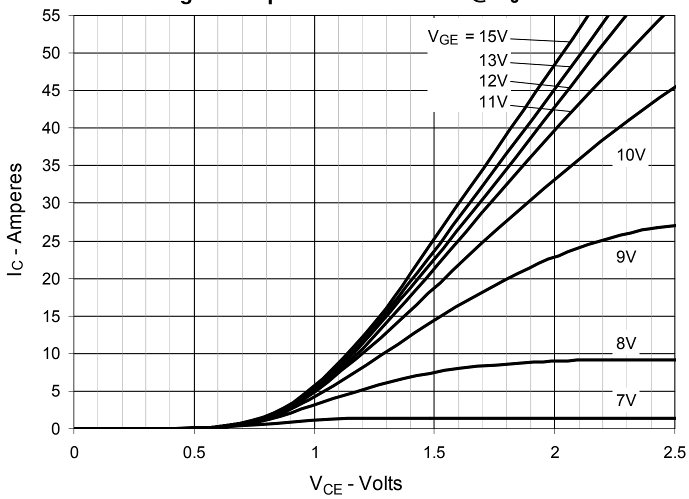



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

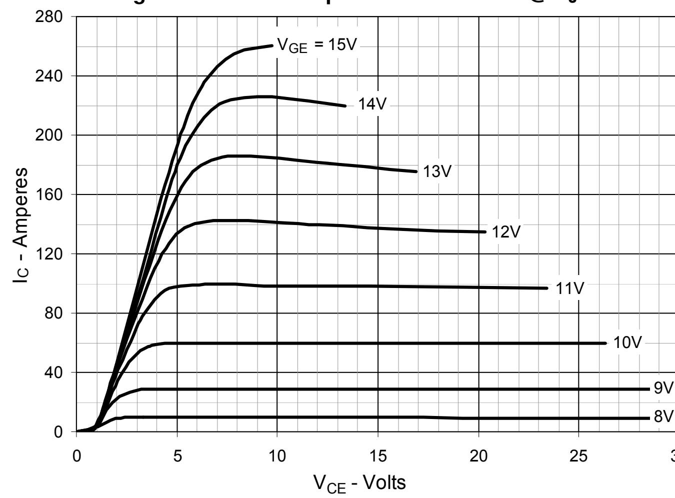



**Fig. 3. Output Characteristics @ $T_J$ = 150ºC**

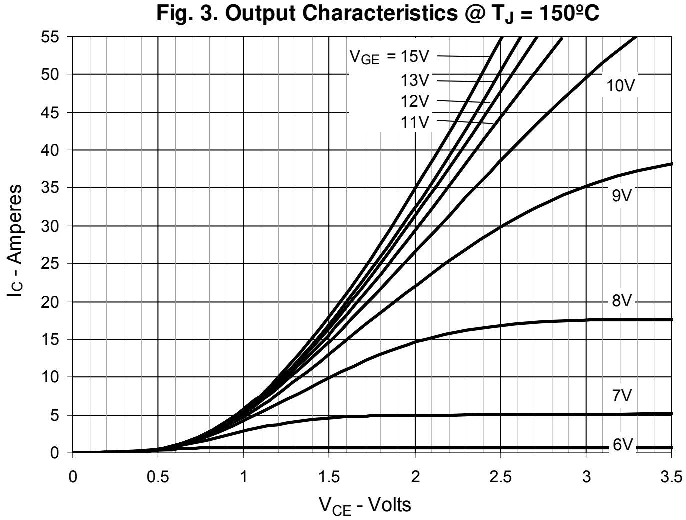



**Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature**

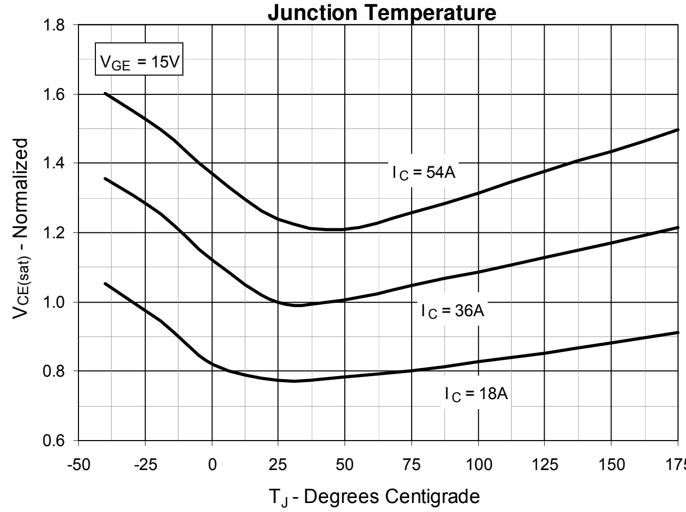



**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

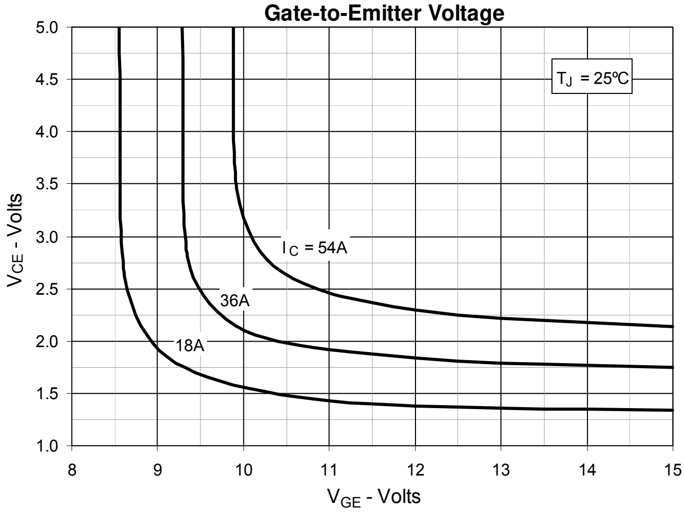



**Fig. 6. Input Admittance**

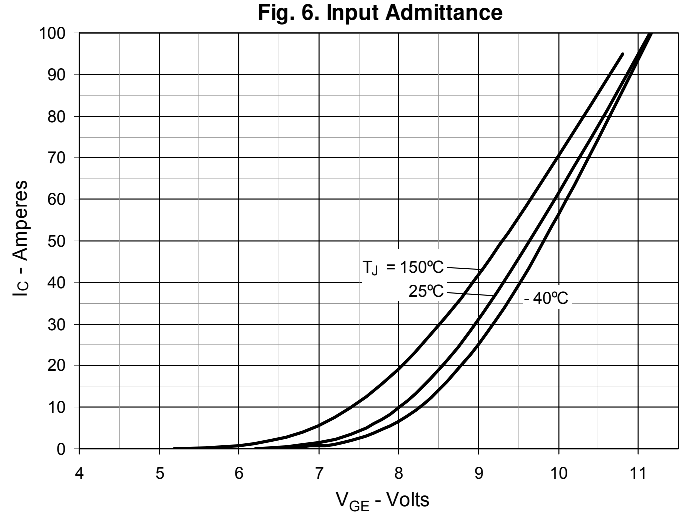


Fig. 7. Transconductance

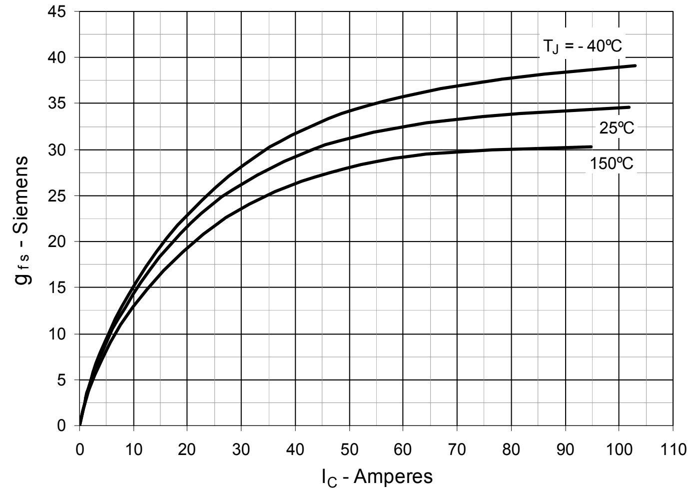



Fig. 8. Gate Charge

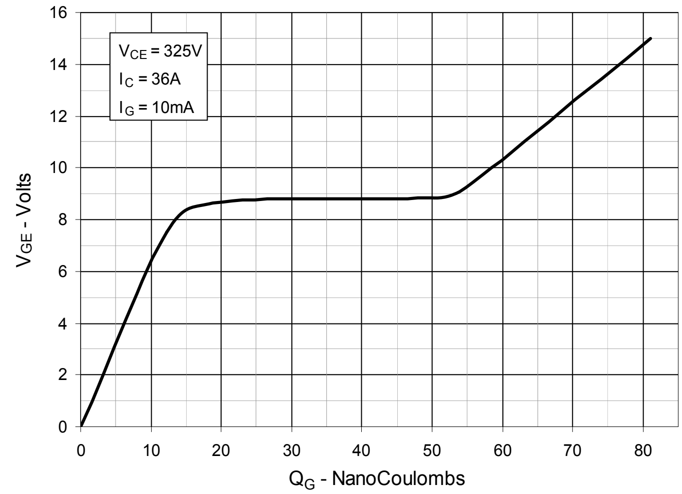



Fig. 9. Capacitance

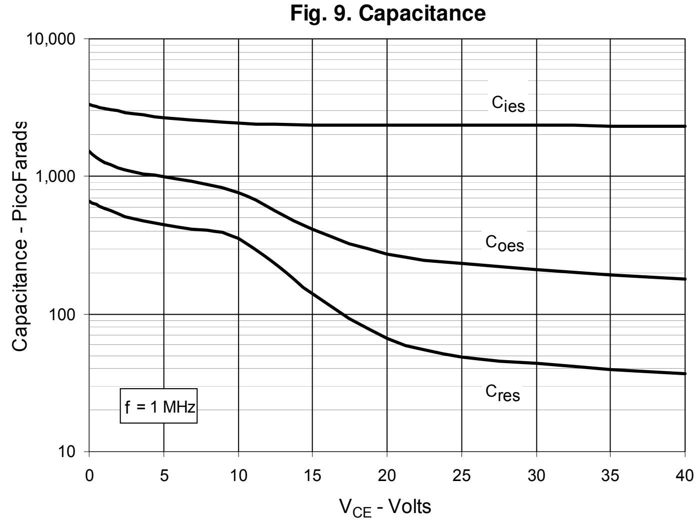



Fig. 10. Reverse-Bias Safe Operating Area

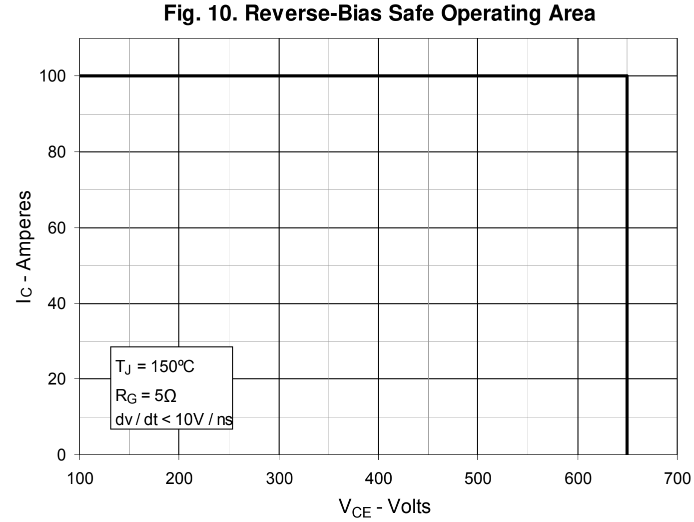



Fig. 11. Forward-Bias Safe Operating Area

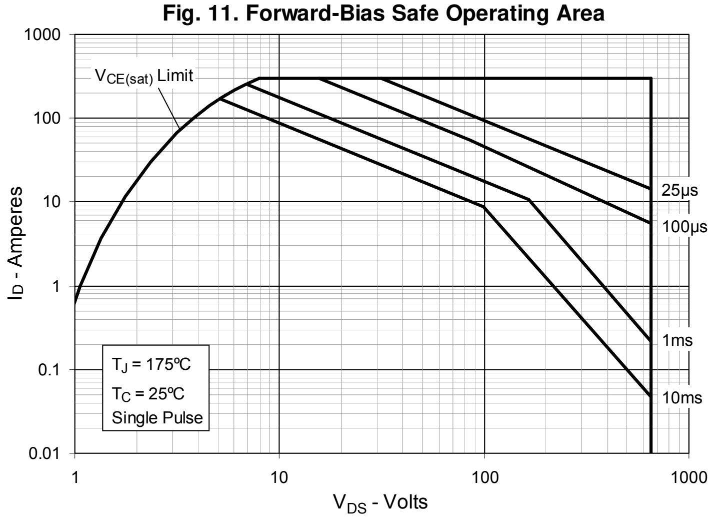



Fig. 12. Maximum Transient Thermal Impedance

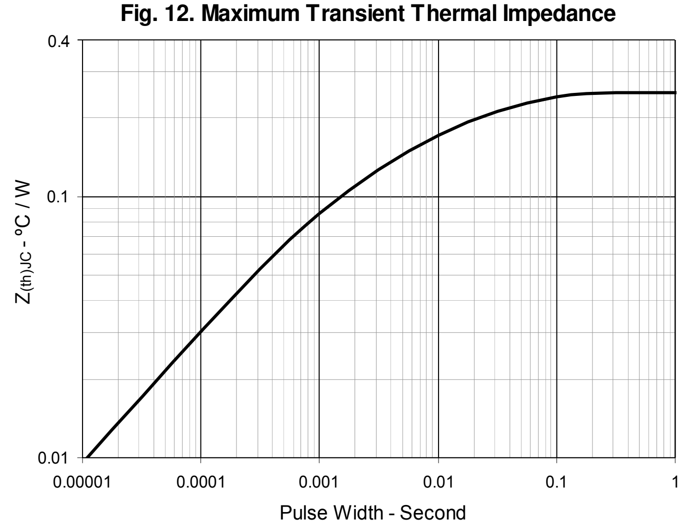


**Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance**

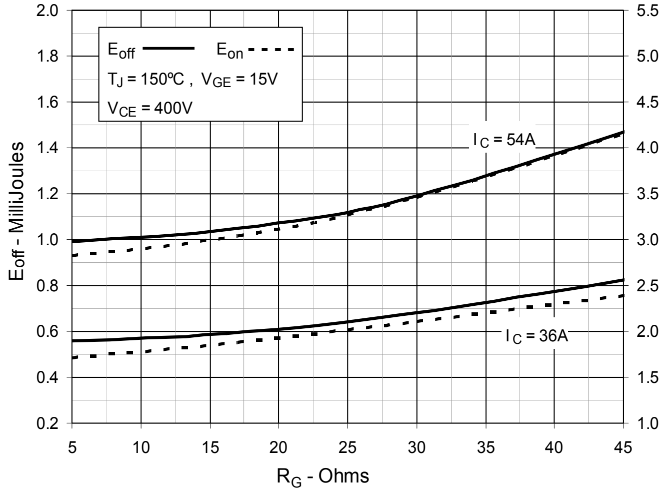



**Fig. 14. Inductive Switching Energy Loss vs. Collector Current**

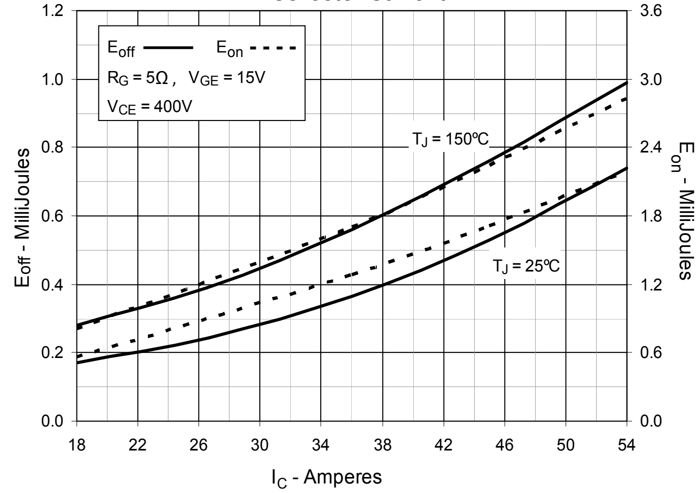



**Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature**

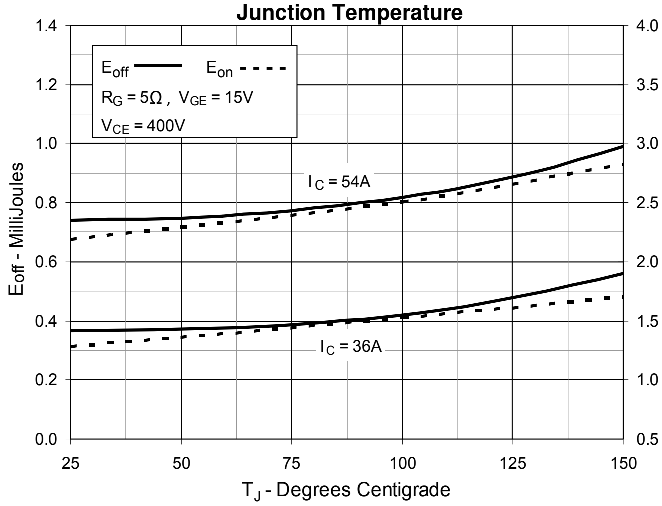



**Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance**

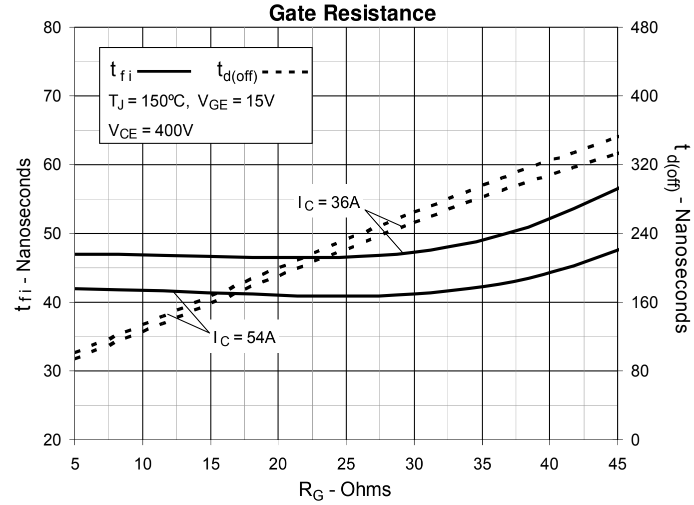



**Fig. 17. Inductive Turn-off Switching Times vs. Collector Current**

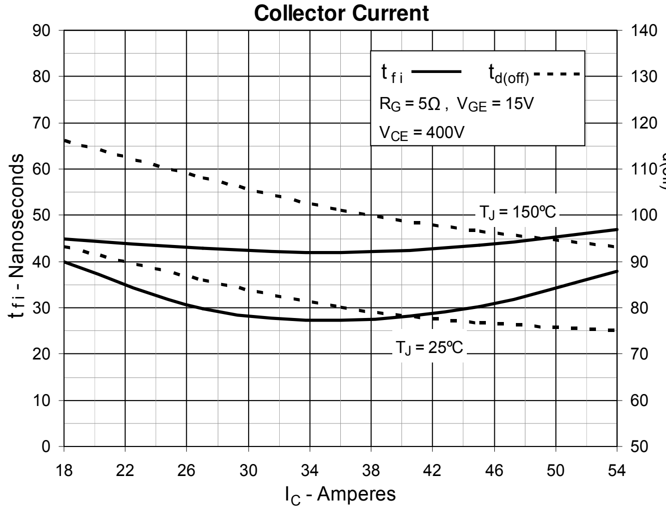



**Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature**

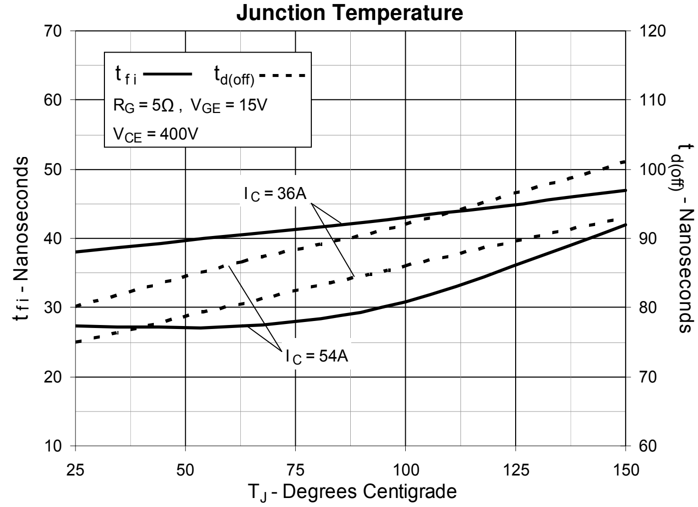


**Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance**

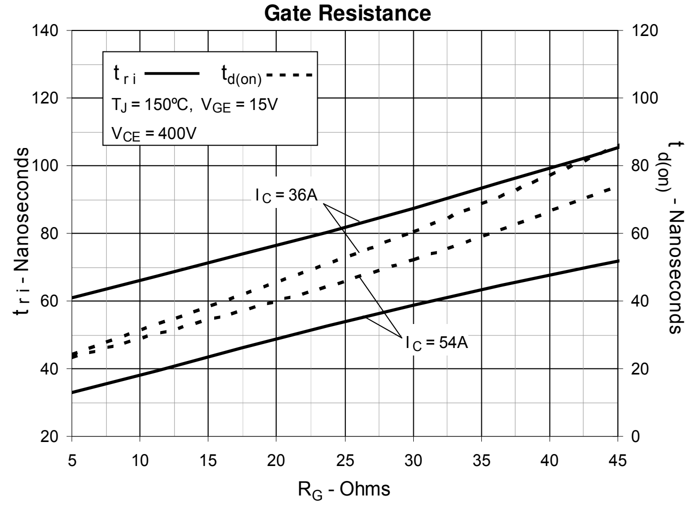



**Fig. 20. Inductive Turn-on Switching Times vs. Collector Current**

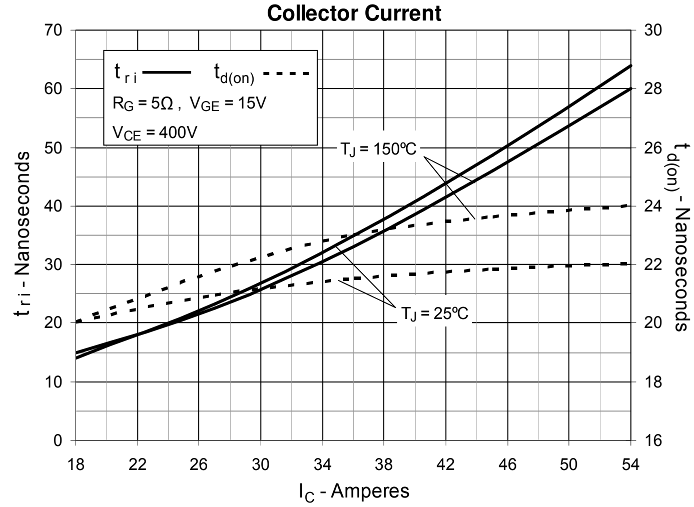



**Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature**

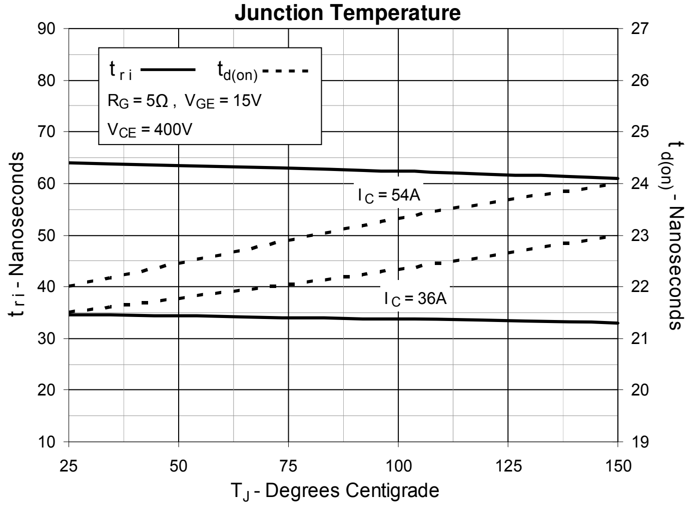



**Fig. 22. Maximum Peak Load Current vs. Frequency**

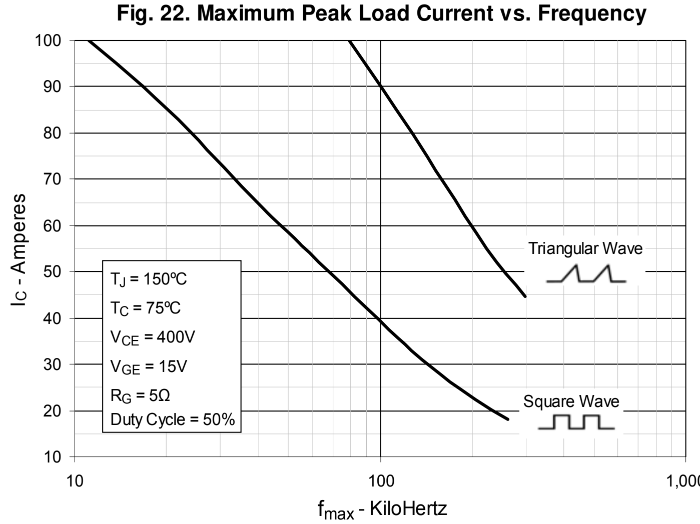


**Fig. 23. Forward Current vs. Forward Voltage**

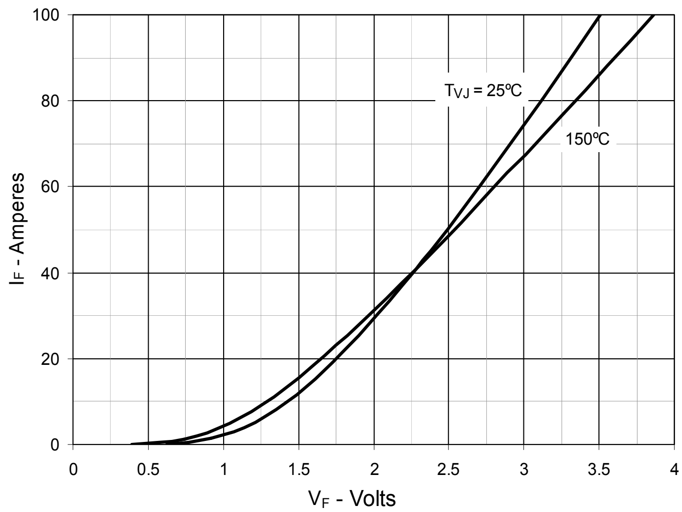



**Fig. 24. Reverse Recovery Charge $Q_{RR}$ vs. $-di_F/dt$**

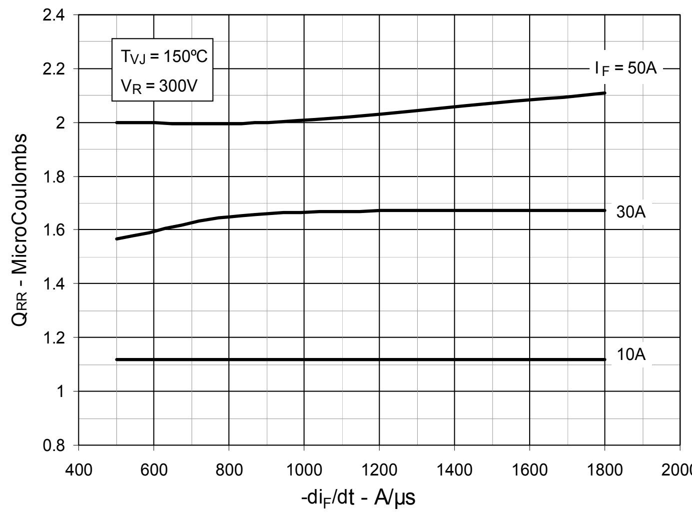



**Fig. 25. Peak Reverse Current $I_{RM}$ vs. $-di_F/dt$**

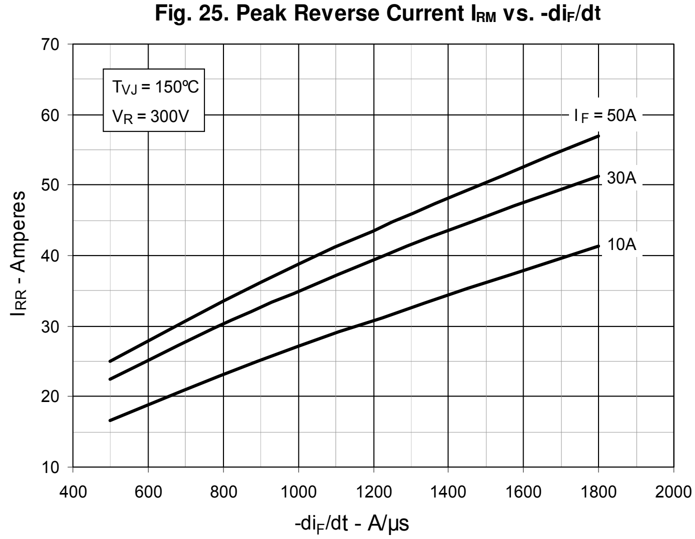



**Fig. 26. Recover Time $t_{RR}$ vs. $-di_F/dt$**

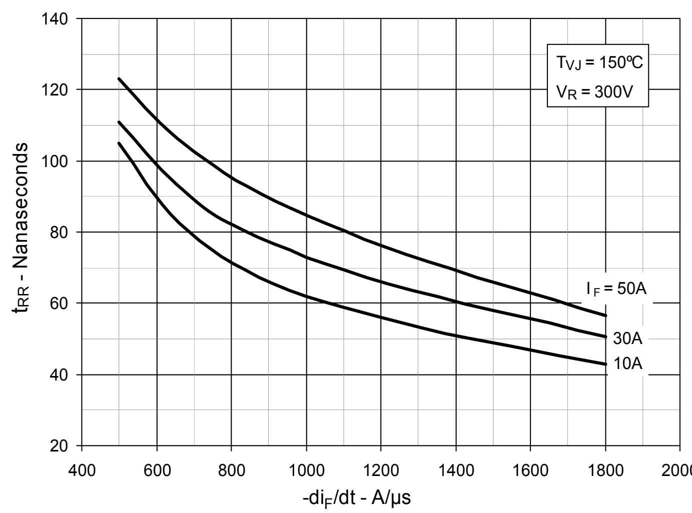



**Fig. 27. Recovery Energy $E_{REC}$ vs. $-di_F/dt$**

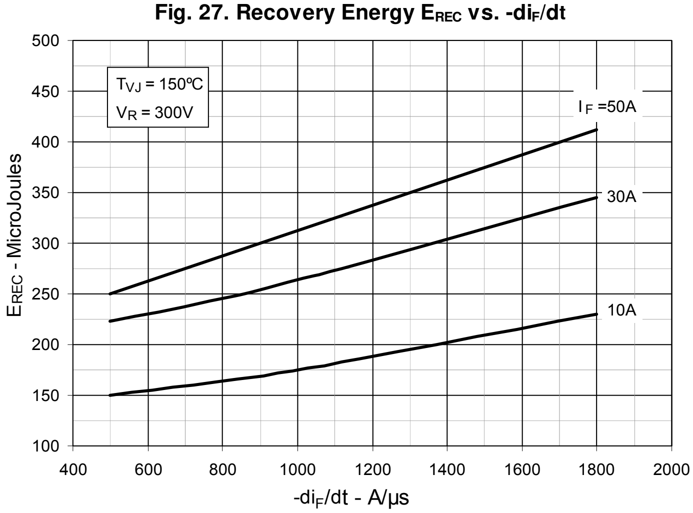



**Fig. 28. Dynamic Parameters $Q_{RR}$, $I_{RM}$ vs. Virtual Junction Temperature $T_{VJ}$**

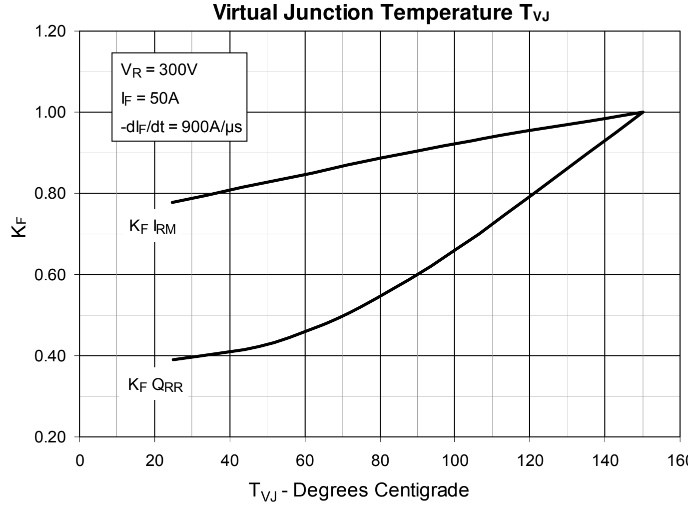


**Fig. 29. Maximum Transient Thermal Impedance (Diode)**