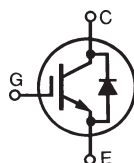


1200V XPT™ IGBT GenX3™ w/ Diode

IXYJ20N120C3D1

(Electrically Isolated Tab)

High-Speed IGBT
for 20-50 kHz Switching



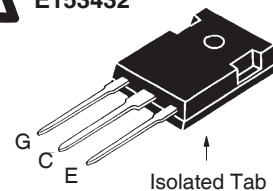
$$V_{CES} = 1200V$$

$$I_{C110} = 9A$$

$$V_{CE(sat)} \leq 3.4V$$

$$t_{fi(typ)} = 108ns$$

ISO TO-247™
E153432



G = Gate C = Collector
E = Emitter

| Symbol | Test Conditions | Maximum Ratings | |
|-------------------------------|--|--|------------|
| V_{CES} | $T_J = 25^\circ C$ to $150^\circ C$ | 1200 | V |
| V_{CGR} | $T_J = 25^\circ C$ to $150^\circ C$, $R_{GE} = 1M\Omega$ | 1200 | V |
| V_{GES} | Continuous | ± 20 | V |
| V_{GEM} | Transient | ± 30 | V |
| I_{C25} | $T_C = 25^\circ C$ | 21 | A |
| I_{C110} | $T_C = 110^\circ C$ | 9 | A |
| I_{F110} | $T_C = 110^\circ C$ | 15 | A |
| I_{CM} | $T_C = 25^\circ C$, 1ms | 84 | A |
| I_A | $T_C = 25^\circ C$ | 10 | A |
| E_{AS} | $T_C = 25^\circ C$ | 400 | mJ |
| SSOA (RBSOA) | $V_{GE} = 15V$, $T_{VJ} = 150^\circ C$, $R_G = 10\Omega$ Clamped Inductive Load | $I_{CM} = 40$ @ $V_{CE} \leq V_{CES}$ | A |
| P_C | $T_C = 25^\circ C$ | 105 | W |
| T_J | | -55 ... +150 | $^\circ C$ |
| T_{JM} | | 150 | $^\circ C$ |
| T_{stg} | | -55 ... +150 | $^\circ C$ |
| T_L | Maximum Lead Temperature for Soldering | 300 | $^\circ C$ |
| T_{SOLD} | 1.6 mm (0.062in.) from Case for 10s | 260 | $^\circ C$ |
| M_d | Mounting Torque | 1.13/10 | Nm/lb.in. |
| V_{ISOL} | 50/60 Hz, RM, t = 1min | 2500 | V~ |
| Weight | | 5 | g |

Features

- Optimized for Low Switching Losses
- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Square RBSOA
- Positive Thermal Coefficient of $V_{ce(sat)}$
- Anti-Parallel Ultra Fast Diode
- Avalanche Rated

Advantages

- High Power Density
- Low Gate Drive Requirement

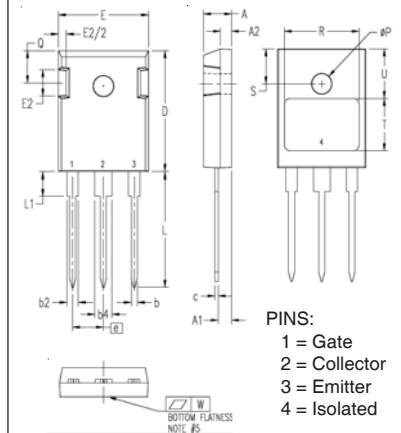
Applications

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

| Symbol | Test Conditions ($T_J = 25^\circ C$, Unless Otherwise Specified) | Characteristic Values | | |
|---------------|---|-----------------------|------|---------------------------|
| | | Min. | Typ. | Max. |
| BV_{CES} | $I_C = 250\mu A$, $V_{GE} = 0V$ | 1200 | | V |
| $V_{GE(th)}$ | $I_C = 250\mu A$, $V_{CE} = V_{GE}$ | 3.0 | | V |
| I_{CES} | $V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 125^\circ C$ | | | 25 μA 350 μA |
| I_{GES} | $V_{CE} = 0V$, $V_{GE} = \pm 20V$ | | | ± 100 nA |
| $V_{CE(sat)}$ | $I_C = 20A$, $V_{GE} = 15V$, Note 1 $T_J = 150^\circ C$ | | 4.0 | 3.4 V V |

| Symbol Test Conditions | | Characteristic Values | | |
|--|--|-----------------------|------|-----------|
| (T _J = 25°C Unless Otherwise Specified) | | Min. | Typ. | Max. |
| g_{fs} | I _C = 20A, V _{CE} = 10V, Note 1 | 7.0 | 11.5 | S |
| C_{ies} | V _{CE} = 25V, V _{GE} = 0V, f = 1MHz | | 1110 | pF |
| C_{oes} | | | 120 | pF |
| C_{res} | | | 27 | pF |
| Q_{g(on)} | I _C = 20A, V _{GE} = 15V, V _{CE} = 0.5 • V _{CES} | | 53 | nC |
| Q_{ge} | | | 9 | nC |
| Q_{gc} | | | 22 | nC |
| t_{d(on)} | Inductive load, T_J = 25°C I _C = 20A, V _{GE} = 15V V _{CE} = 0.5 • V _{CES} , R _G = 10Ω Note 2 | | 20 | ns |
| t_{ri} | | | 29 | ns |
| E_{on} | | | 1.3 | mJ |
| t_{d(off)} | | | 90 | ns |
| t_{fi} | | | 108 | ns |
| E_{off} | | | 0.5 | 1.0 |
| t_{d(on)} | Inductive load, T_J = 150°C I _C = 20A, V _{GE} = 15V V _{CE} = 0.5 • V _{CES} , R _G = 10Ω Note 2 | | 20 | ns |
| t_{ri} | | | 40 | ns |
| E_{on} | | | 3.7 | mJ |
| t_{d(off)} | | | 115 | ns |
| t_{fi} | | | 105 | ns |
| E_{off} | | | 0.7 | mJ |
| R_{thJC} | | | | 1.19 °C/W |
| R_{thCS} | | 0.15 | | °C/W |

ISO TO-247 (IXYJ) OUTLINE



| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .190 | .205 | 4.83 | 5.21 |
| A1 | .087 | .100 | 2.21 | 2.54 |
| A2 | .075 | .085 | 1.91 | 2.16 |
| b | .045 | .055 | 1.14 | 1.40 |
| b2 | .075 | .085 | 1.91 | 2.16 |
| b4 | .115 | .126 | 2.92 | 3.20 |
| c | .023 | .033 | 0.58 | 0.84 |
| D | .820 | .840 | 20.83 | 21.34 |
| E | .620 | .635 | 15.75 | 16.13 |
| E2 | .175 | .195 | 4.44 | 4.95 |
| e | .215 BSC | | 5.45 BSC | |
| L | .780 | .810 | 19.81 | 20.57 |
| L1 | .160 | .177 | 4.06 | 4.50 |
| Q | .220 | .240 | 5.59 | 6.10 |
| R | .520 | .540 | 13.21 | 13.72 |
| S | .242 BSC | | 6.15 BSC | |
| T | .355 | .375 | 9.02 | 9.53 |
| U | .345 | .370 | 8.76 | 9.40 |
| ØP | .140 | .144 | 3.55 | 3.66 |
| W | .000 | .004 | 0.00 | 0.10 |

Reverse Diode (FRED)

| (T _J = 25°C, Unless Otherwise Specified) | | Characteristic Value | | |
|---|---|------------------------|------|-----------|
| Symbol | Test Conditions | Min. | Typ. | Max. |
| V_F | I _F = 30A, V _{GE} = 0V, Note 1 | | | 3.00 V |
| | | T _J = 150°C | 1.75 | V |
| I_{RM} | I _F = 30A, V _{GE} = 0V, -di _F /dt = 100A/μs, V _R = 600V | T _J = 100°C | | 9 A |
| t_{rr} | | | 195 | ns |
| R_{thJC} | | | | 1.25 °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.

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

| | | | | | | | | | | |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: | 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665 | 6,404,065 B1 | 6,683,344 | 6,727,585 | 7,005,734 B2 | 7,157,338B2 |
| | 4,860,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343 | 6,710,405 B2 | 6,759,692 | 7,063,975 B2 | |
| | 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728 B1 | 6,583,505 | 6,710,463 | 6,771,478 B2 | 7,071,537 | |

Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$

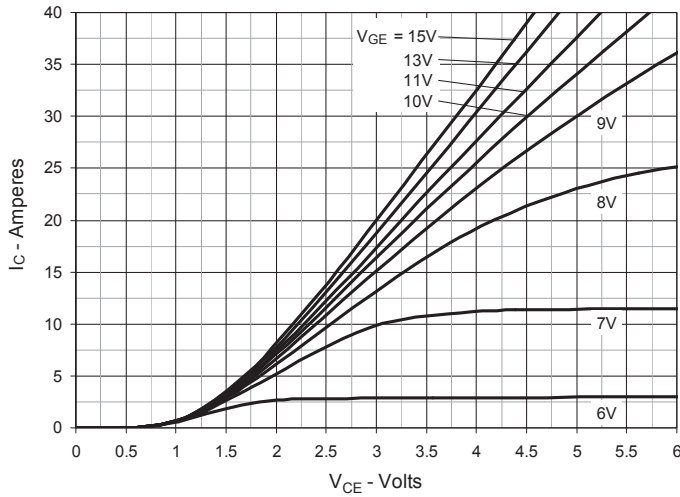


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

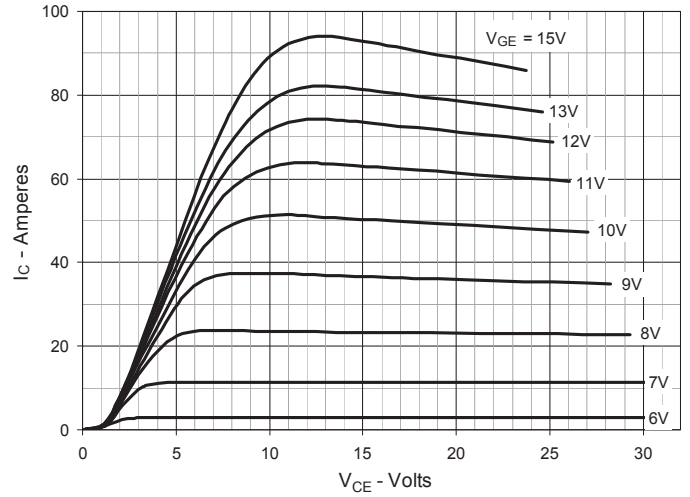


Fig. 3. Output Characteristics @ $T_J = 150^\circ\text{C}$

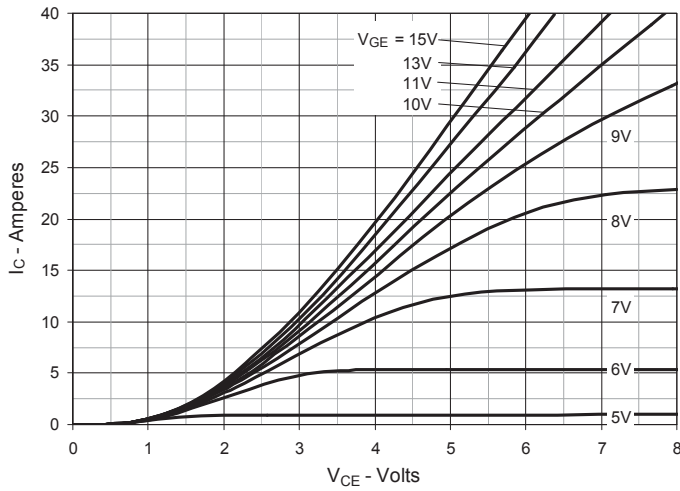


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

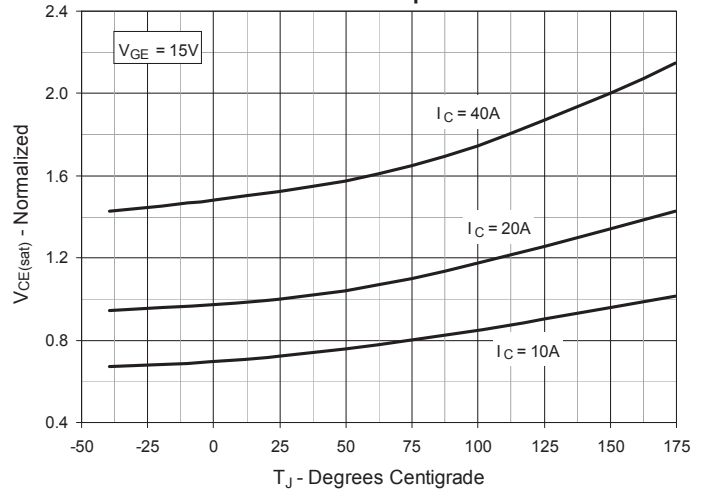


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

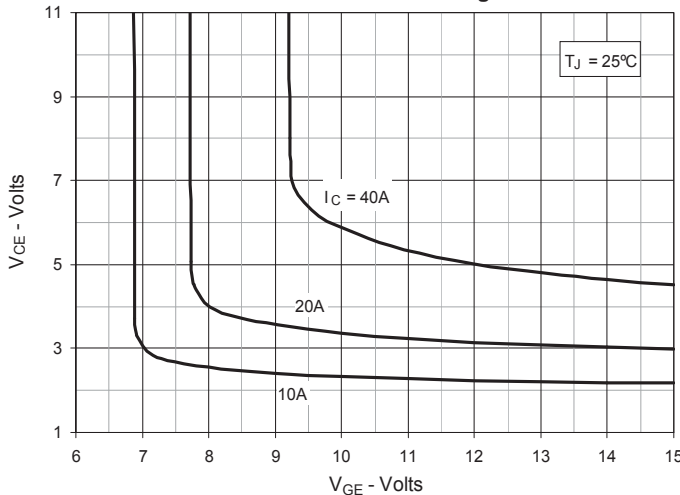


Fig. 6. Input Admittance

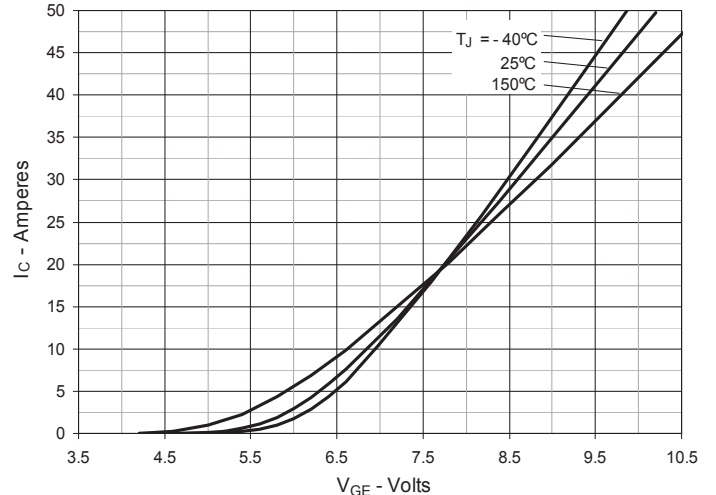


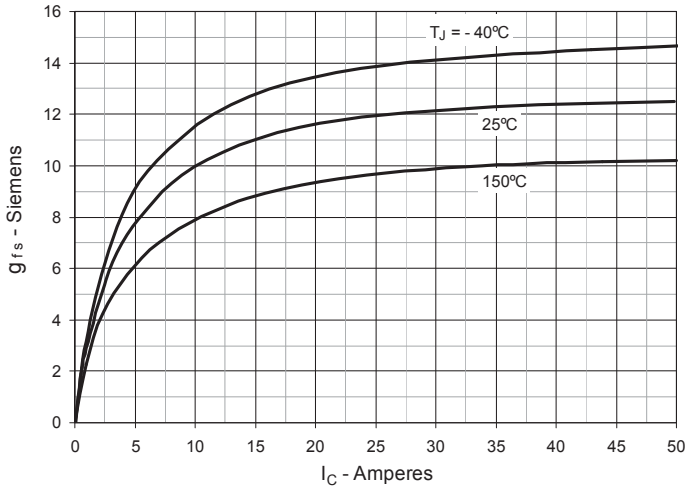
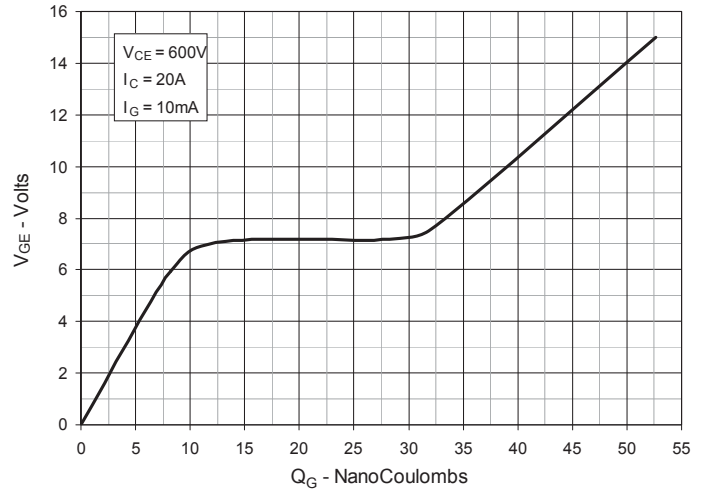
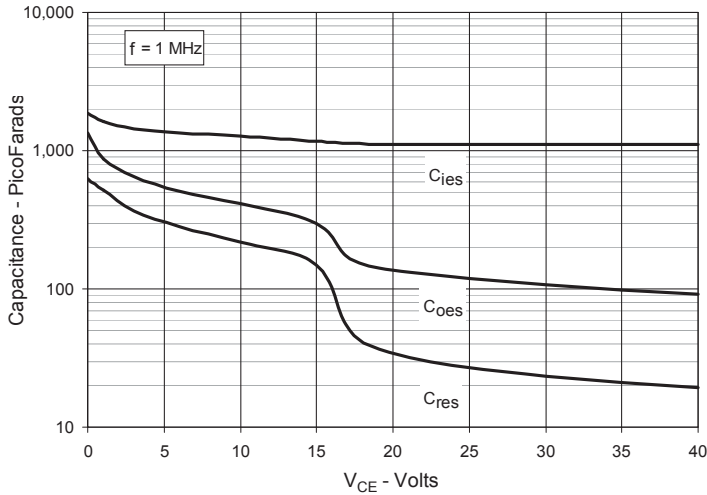
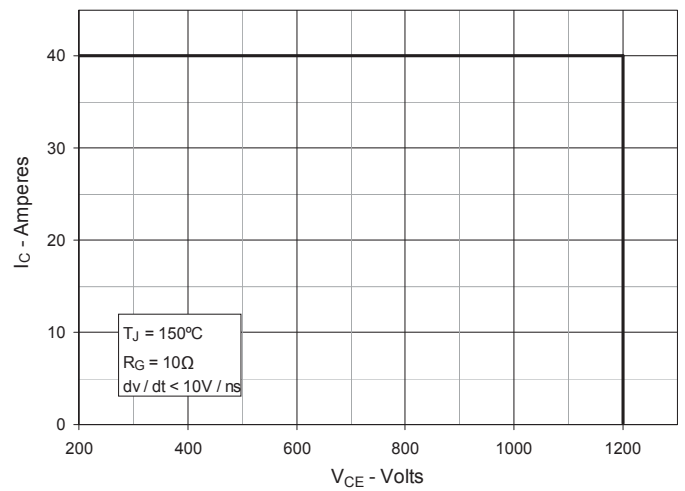
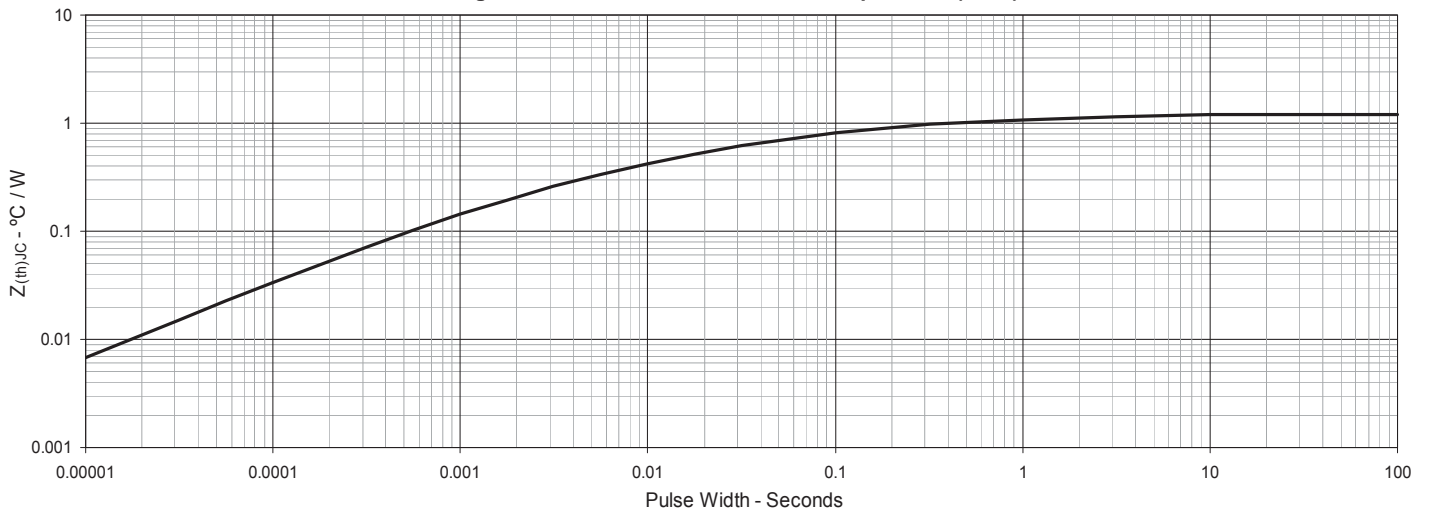
Fig. 7. Transconductance

Fig. 8. Gate Charge

Fig. 9. Capacitance

Fig. 10. Reverse-Bias Safe Operating Area

Fig. 11. Maximum Transient Thermal Impedance (IGBT)


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

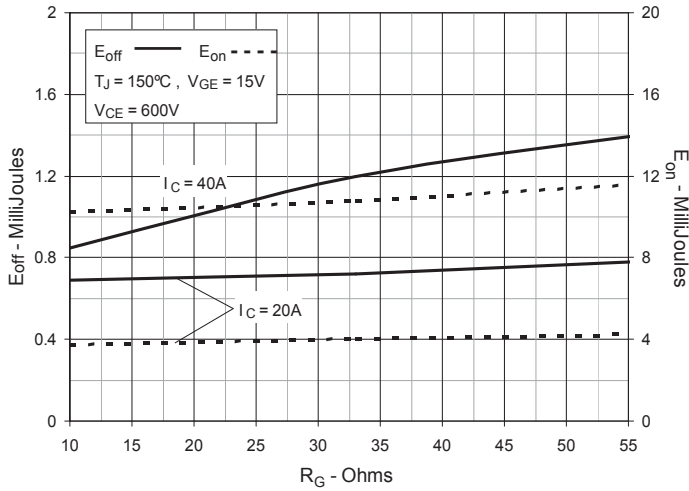


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

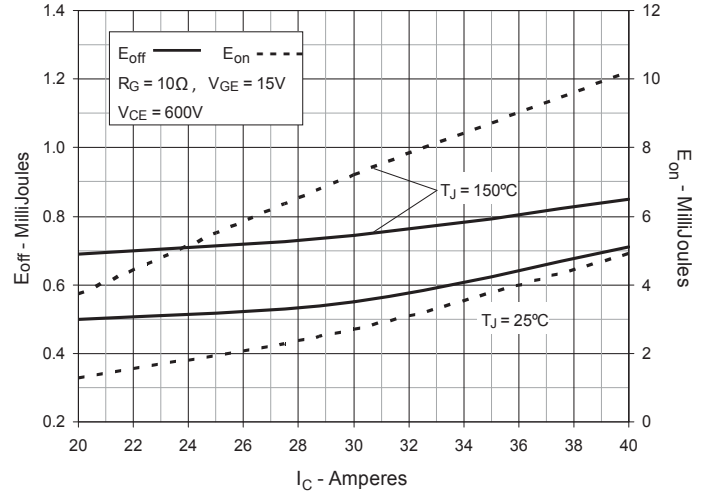


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

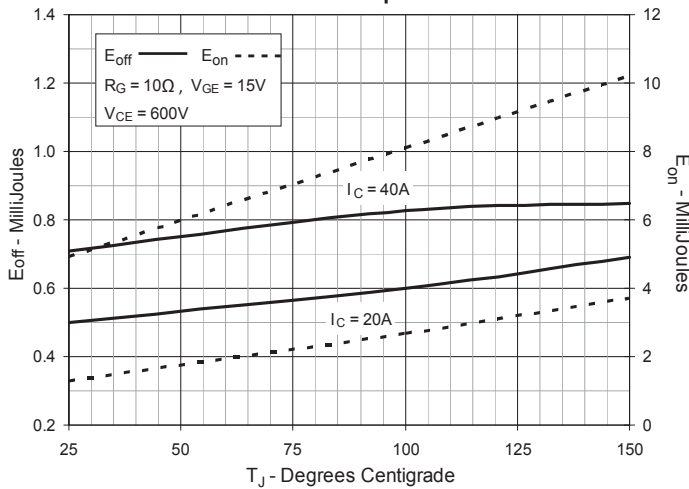


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

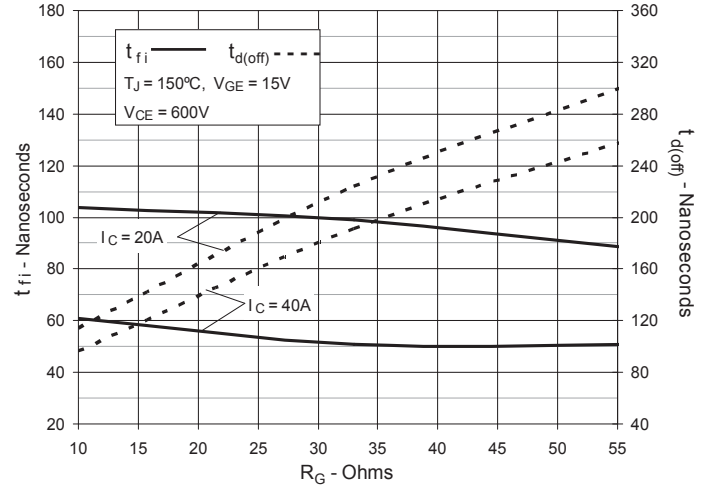


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

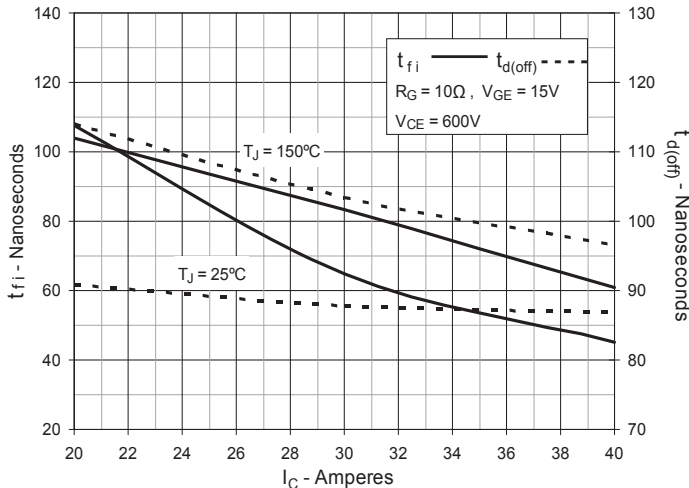


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

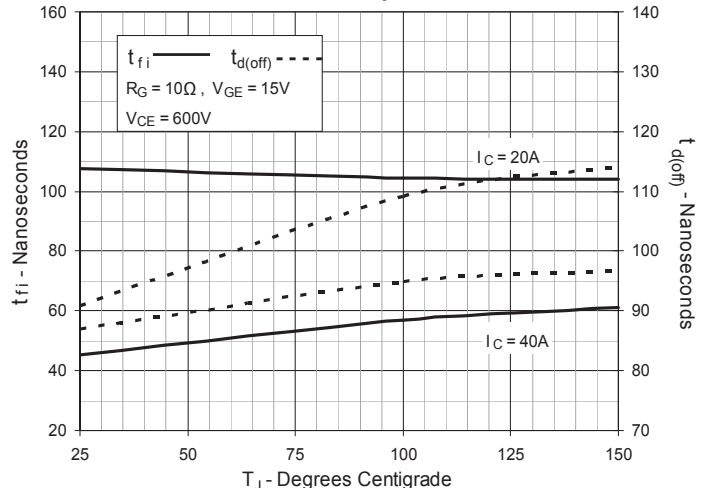


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

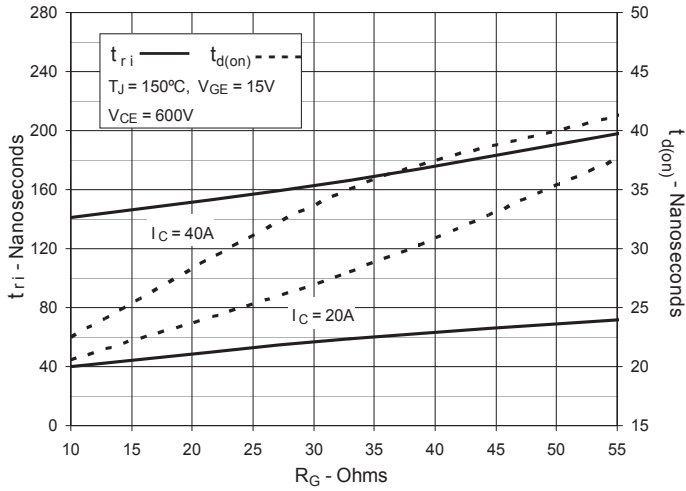


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

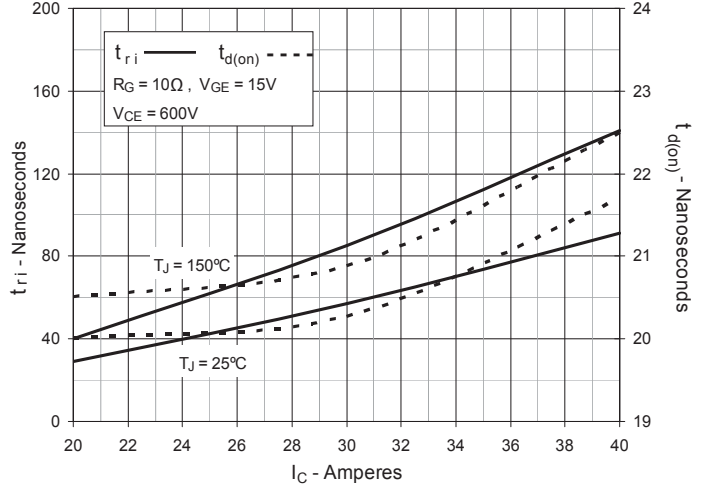


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

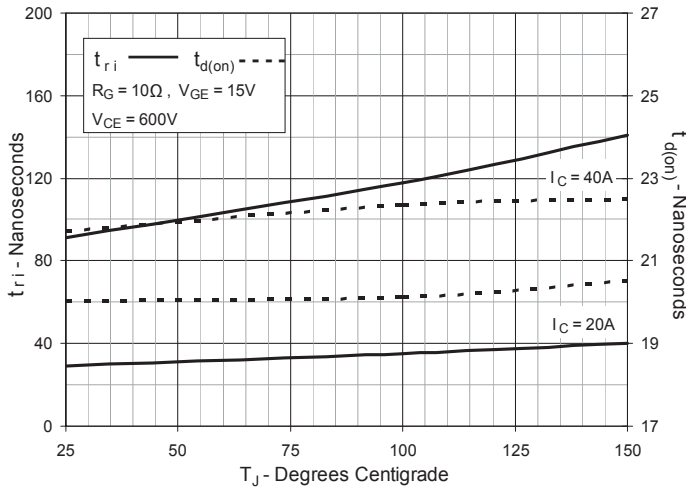


Fig. 21. Maximum Peak Load Current vs. Frequency

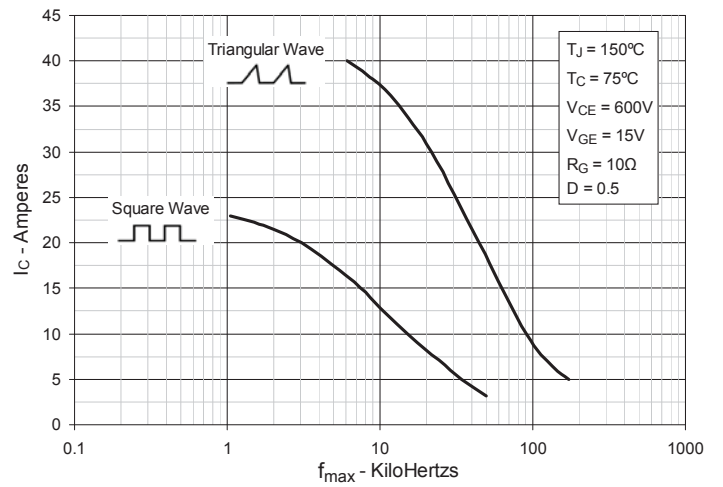


Fig. 22. Maximum Transient Thermal Impedance (Diode)

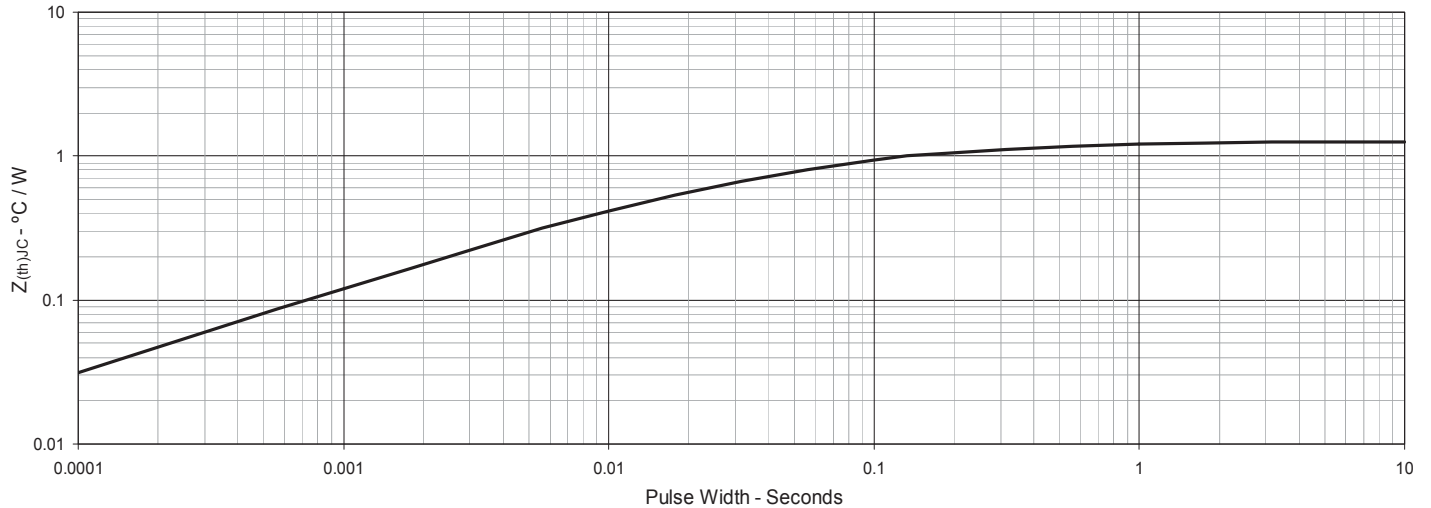


Fig. 23. Forward Current I_F vs V_F

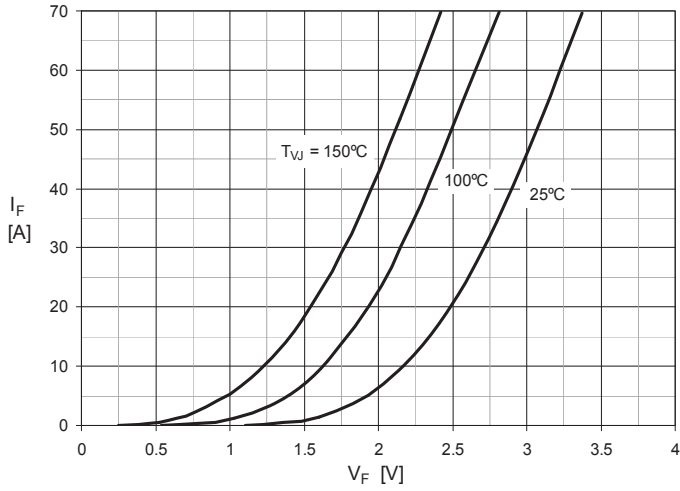


Fig. 24. Reverse Recovery Charge Q_{RM} vs. $-di_F/dt$

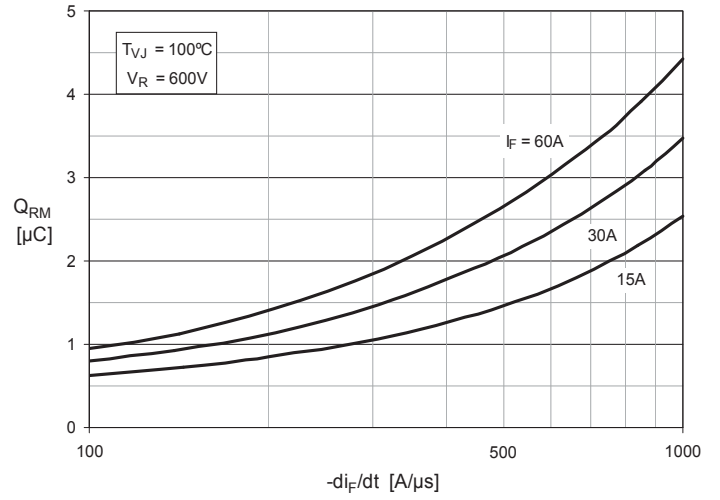


Fig. 25. Peak Reverse Current I_{RM} vs. $-di_F/dt$

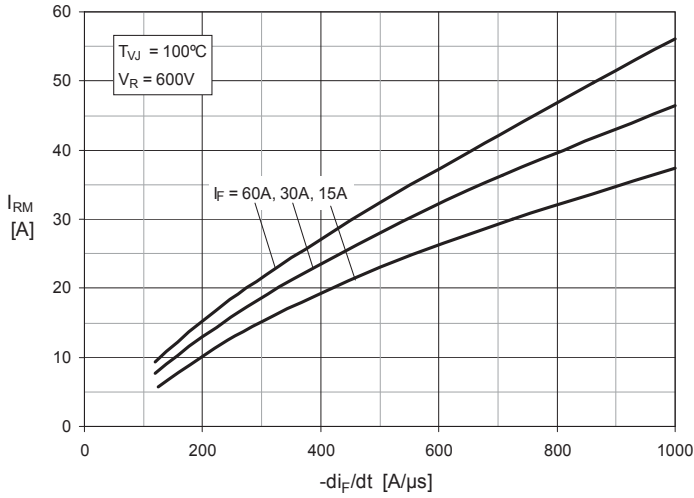


Fig. 26. Dynamic Parameters Q_{RM} , I_{RM} vs. T_{VJ}

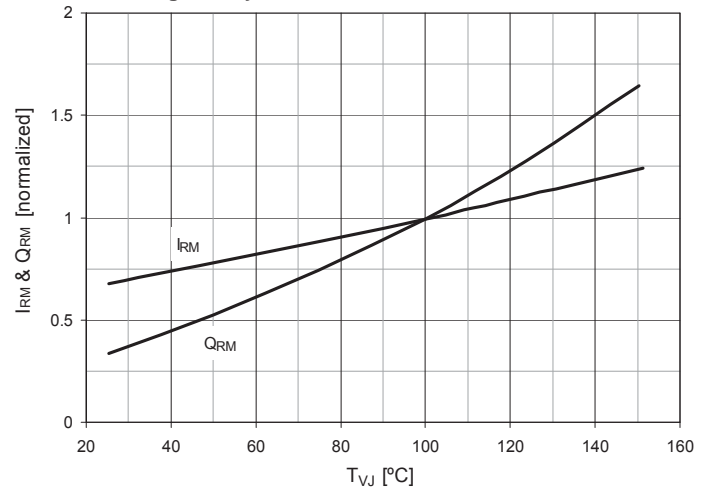


Fig. 27. Recovery Time t_{rr} vs. $-di_F/dt$

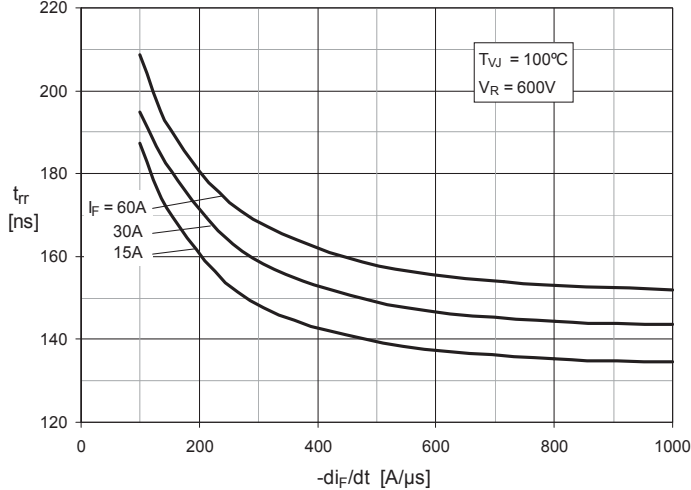


Fig. 28. Peak Forward Voltage V_{FR} , t_{rr} vs $-di_F/dt$

