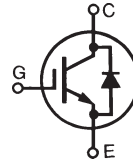


XPT™ 600V IGBT GenX3™ w/ Diode

MMIX1X100N60B3H1

(Electrically Isolated Tab)

Extreme Light Punch Through
IGBT for 10-30kHz Switching

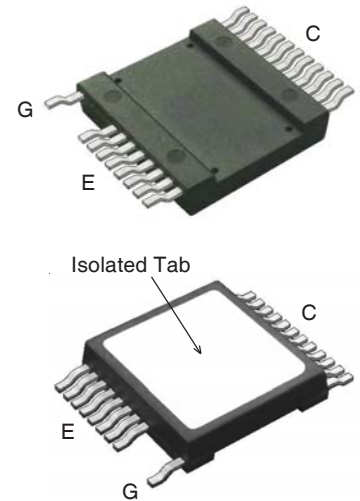


$$V_{CES} = 600V$$

$$I_{C110} = 68A$$

$$V_{CE(sat)} \leq 1.80V$$

| Symbol | Test Conditions | Maximum Ratings | |
|----------------|---|-----------------------|------------|
| V_{CES} | $T_J = 25^\circ C$ to $150^\circ C$ | 600 | V |
| V_{CGR} | $T_J = 25^\circ C$ to $150^\circ C$, $R_{GE} = 1M\Omega$ | 600 | V |
| V_{GES} | Continuous | ± 20 | V |
| V_{GEM} | Transient | ± 30 | V |
| I_{C25} | $T_C = 25^\circ C$ (Chip Capability) | 145 | A |
| I_{C110} | $T_C = 110^\circ C$ | 68 | A |
| I_{F90} | $T_C = 90^\circ C$ | 54 | A |
| I_{CM} | $T_C = 25^\circ C$, 1ms | 440 | A |
| I_A | $T_C = 25^\circ C$ | 50 | A |
| E_{AS} | $T_C = 25^\circ C$ | 600 | mJ |
| SSOA | $V_{GE} = 15V$, $T_{VJ} = 150^\circ C$, $R_G = 2\Omega$ | $I_{CM} = 200$ | A |
| (RBSOA) | Clamped Inductive Load | $V_{CE} \leq V_{CES}$ | |
| t_{sc} | $V_{GE} = 15V$, $V_{CE} = 360V$, $T_J = 150^\circ C$ | 10 | μs |
| (SCSOA) | $R_G = 10\Omega$, Non Repetitive | | |
| P_C | $T_C = 25^\circ C$ | 400 | 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 (0.062 in.) from Case for 10s | 260 | $^\circ C$ |
| V_{ISOL} | 50/60Hz, 1 minute | 2500 | V~ |
| F_C | Mounting Force | 50..200/11..45 | N/lb. |
| Weight | | 8 | g |



G = Gate E = Emitter
C = Collector

Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Optimized for 10-30kHz Switching
- Square RBSOA
- FBSOA
- Avalanche Rated
- Short Circuit Capability
- Anti-Parallel Ultra Fast Diode
- High Current Handling Capability

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 ($T_J = 25^\circ C$, Unless Otherwise Specified) | Characteristic Values | | |
|---------------|---|-----------------------|--------------|--------------------|
| | | Min. | Typ. | Max. |
| BV_{CES} | $I_C = 250\mu A$, $V_{GE} = 0V$ | 600 | | V |
| $V_{GE(th)}$ | $I_C = 250\mu A$, $V_{CE} = V_{GE}$ | 3.0 | | 5.5 V |
| I_{CES} | $V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 125^\circ C$ | | | 50 μA 4 mA |
| I_{GES} | $V_{CE} = 0V$, $V_{GE} = \pm 20V$ | | | ± 100 nA |
| $V_{CE(sat)}$ | $I_C = 70A$, $V_{GE} = 15V$, Note 1 $T_J = 150^\circ C$ | | 1.50 1.77 | 1.80 V V |

| Symbol Test Conditions ($T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | | Characteristic Values | | |
|--|---|-----------------------|------|--------------------|
| | | Min. | Typ. | Max. |
| g_{fs} | $I_C = 60\text{A}, V_{CE} = 10\text{V}$, Note 1 | 22 | 40 | S |
| C_{ies} | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$ | | 4860 | pF |
| C_{oes} | | | 475 | pF |
| C_{res} | | | 83 | pF |
| $Q_{g(on)}$ | $I_C = 70\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$ | | 143 | nC |
| Q_{ge} | | | 37 | nC |
| Q_{gc} | | | 60 | nC |
| $t_{d(on)}$ | Inductive load, $T_J = 25^\circ\text{C}$ $I_C = 70\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 360\text{V}, R_G = 2\Omega$ Note 2 | | 30 | ns |
| t_{ri} | | | 70 | ns |
| E_{on} | | | 1.9 | mJ |
| $t_{d(off)}$ | | | 120 | ns |
| t_{fi} | | | 150 | ns |
| E_{off} | | | 2.0 | 2.8 mJ |
| $t_{d(on)}$ | Inductive load, $T_J = 150^\circ\text{C}$ $I_C = 70\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 360\text{V}, R_G = 2\Omega$ Note 2 | | 32 | ns |
| t_{ri} | | | 60 | ns |
| E_{on} | | | 2.3 | mJ |
| $t_{d(off)}$ | | | 150 | ns |
| t_{fi} | | | 200 | ns |
| E_{off} | | | 2.8 | mJ |
| R_{thJC} | | | 0.31 | $^\circ\text{C/W}$ |
| R_{thCS} | | 0.05 | | $^\circ\text{C/W}$ |

Reverse Diode (FRED)

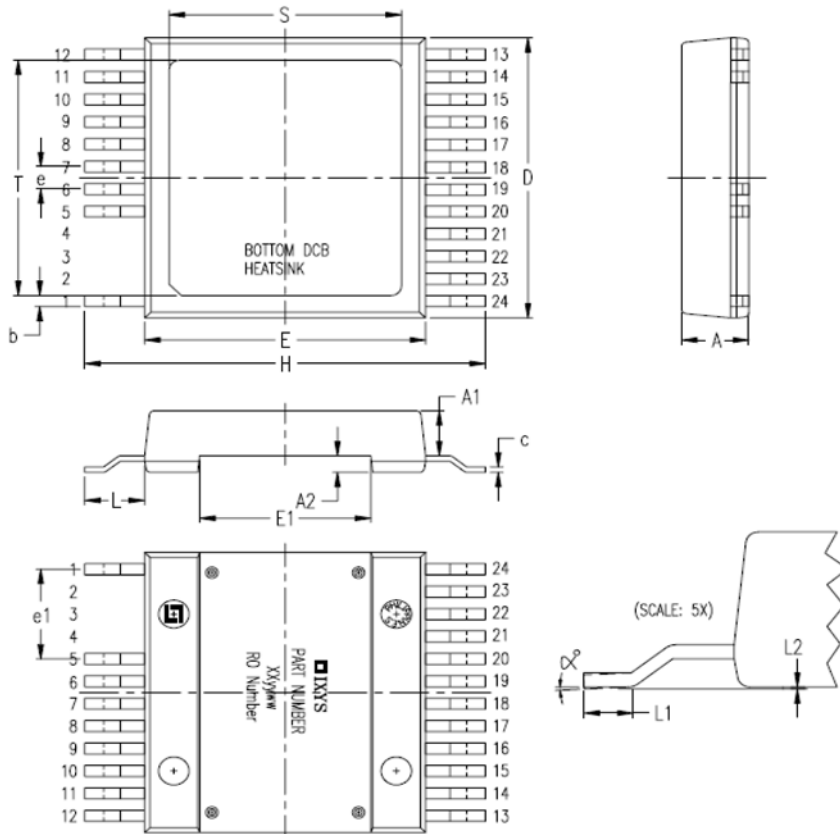
| Symbol Test Conditions ($T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | | Characteristic Values | | |
|--|--|-----------------------|------|--------------------|
| | | Min. | Typ. | Max. |
| V_F | $I_F = 60\text{A}, V_{GE} = 0\text{V}$, Note 1 $T_J = 150^\circ\text{C}$ | | 1.6 | 2.5 V |
| | | | 1.4 | 1.8 V |
| I_{RM} | $I_F = 60\text{A}, V_{GE} = 0\text{V}, T_J = 100^\circ\text{C}$ $-di_F/dt = 200\text{A}/\mu\text{s}, V_R = 300\text{V}$ | | 8.3 | A |
| t_{rr} | | | 140 | ns |
| R_{thJC} | | | 0.62 | $^\circ\text{C/W}$ |

Notes:

1. Pulse test, $t \leq 300\mu\text{s}$, duty cycle, $d \leq 2\%$.
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.

Package Outline



| SYM | INCHES | | MILLIMETERS | |
|-----|----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .209 | .224 | 5.30 | 5.70 |
| A1 | .154 | .161 | 3.90 | 4.10 |
| A2 | .055 | .063 | 1.40 | 1.60 |
| b | .035 | .045 | 0.90 | 1.15 |
| c | .018 | .026 | 0.45 | 0.65 |
| D | .976 | .994 | 24.80 | 25.25 |
| E | .898 | .915 | 22.80 | 23.25 |
| E1 | .543 | .559 | 13.80 | 14.20 |
| e | .079 BSC | | 2.00 BSC | |
| e1 | .315 BSC | | 8.00 BSC | |
| H | 1.272 | 1.311 | 32.30 | 33.30 |
| L | .181 | .209 | 4.60 | 5.30 |
| L1 | .051 | .067 | 1.30 | 1.70 |
| L2 | .000 | .006 | 0.00 | 0.15 |
| S | .736 | .760 | 18.70 | 19.30 |
| T | .815 | .839 | 20.70 | 21.30 |
| ∞ | 0 | 4* | 0 | 4* |

PIN: 1 = Gate
5-12 = Emitter
13-24 = Collector

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

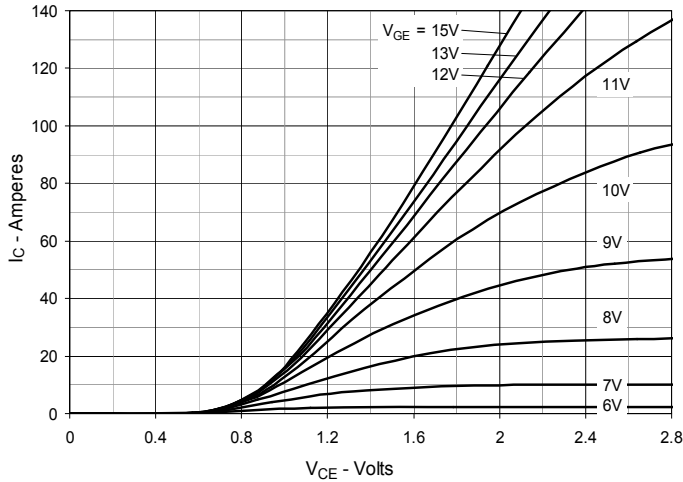


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

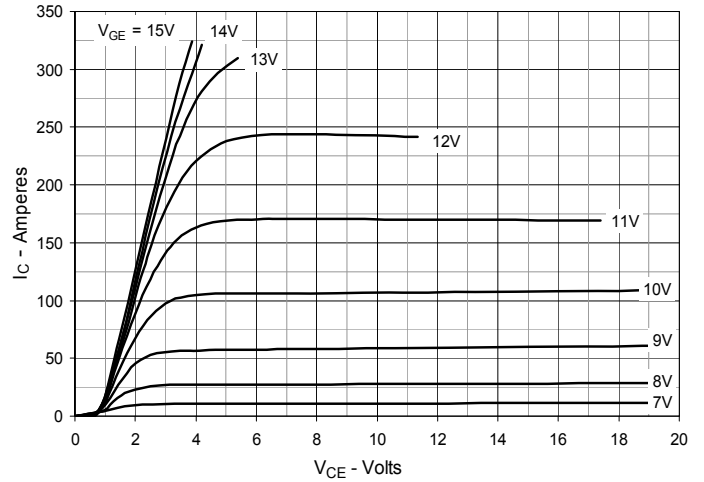


Fig. 3. Output Characteristics @ $T_J = 150^\circ\text{C}$

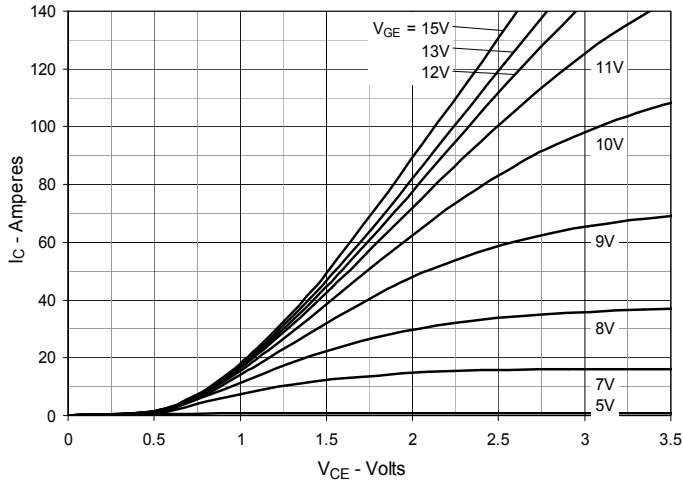


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

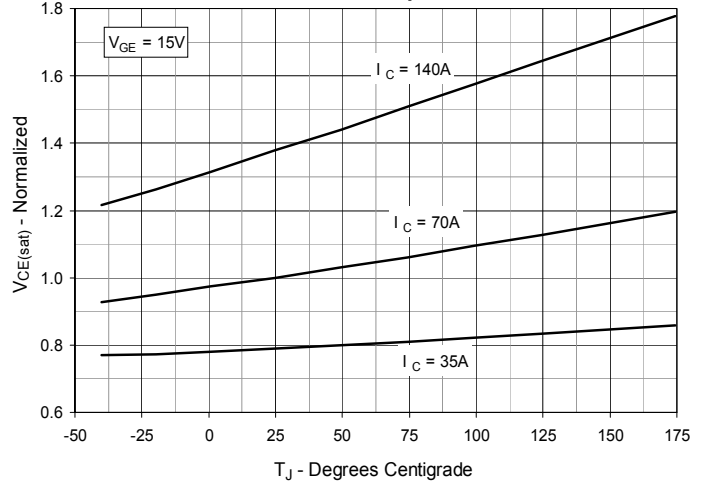


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

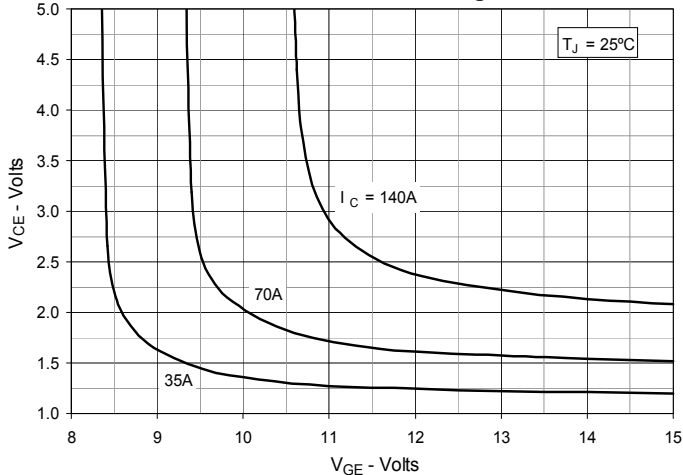


Fig. 6. Input Admittance

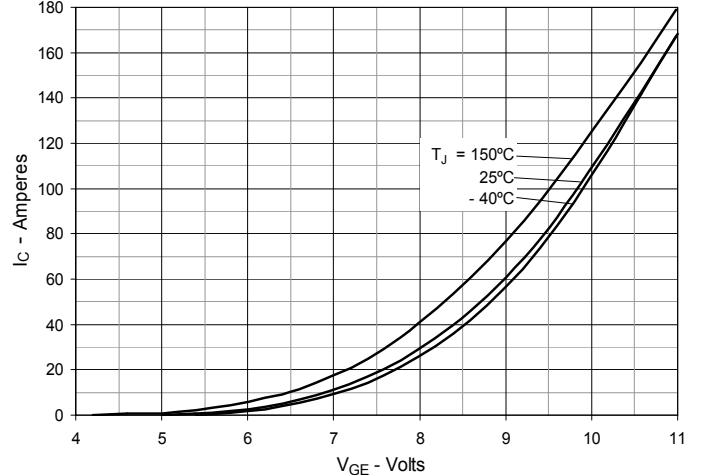


Fig. 7. Transconductance

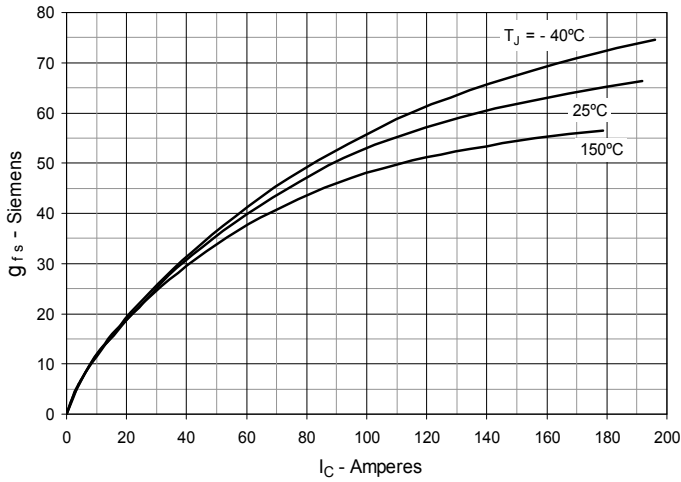


Fig. 8. Gate Charge

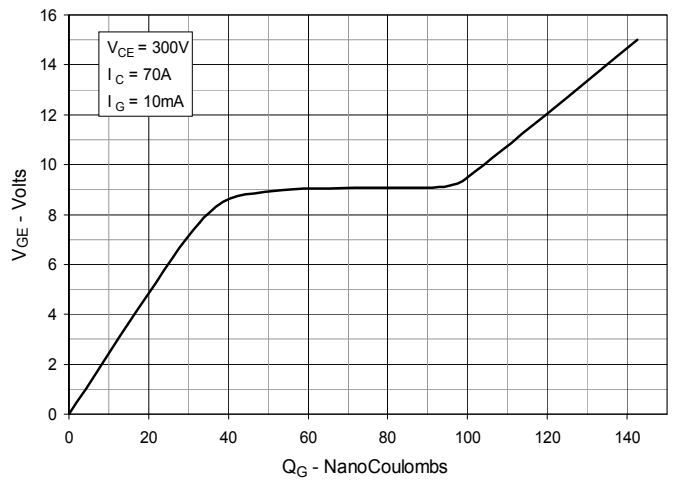


Fig. 9. Capacitance

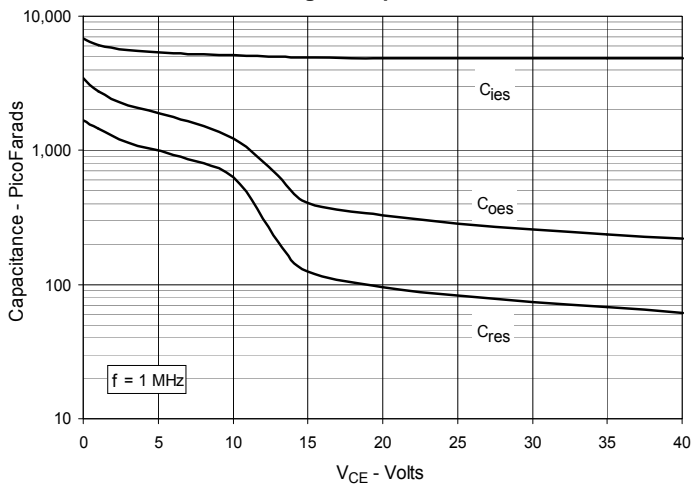


Fig. 10. Reverse-Bias Safe Operating Area

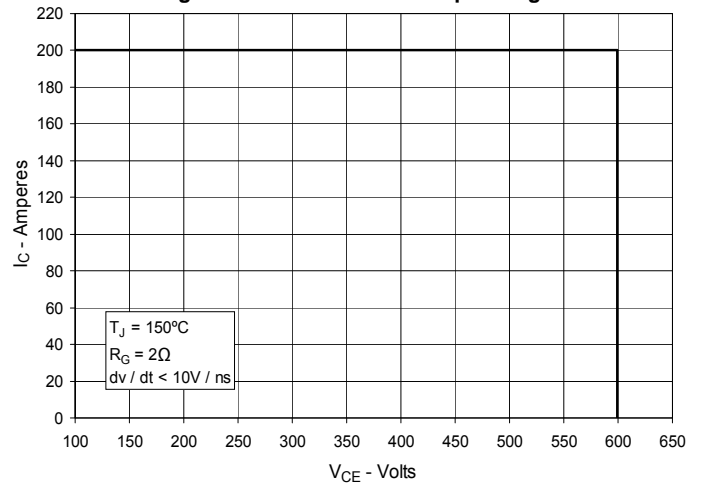


Fig. 11. Forward-Bias Safe Operating Area

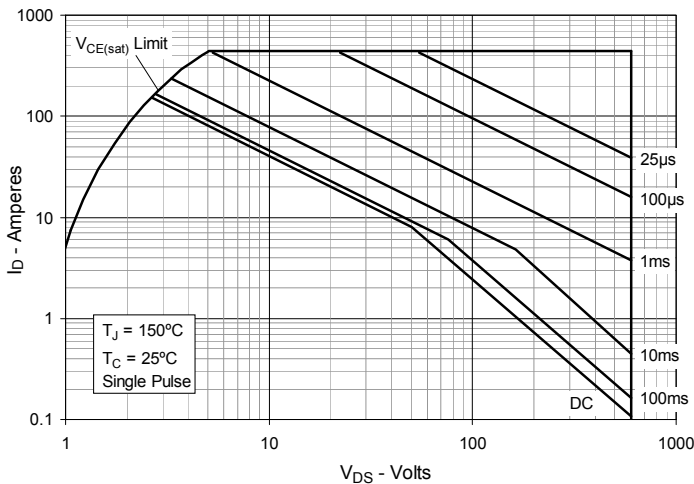


Fig. 12. Maximum Transient Thermal Impedance

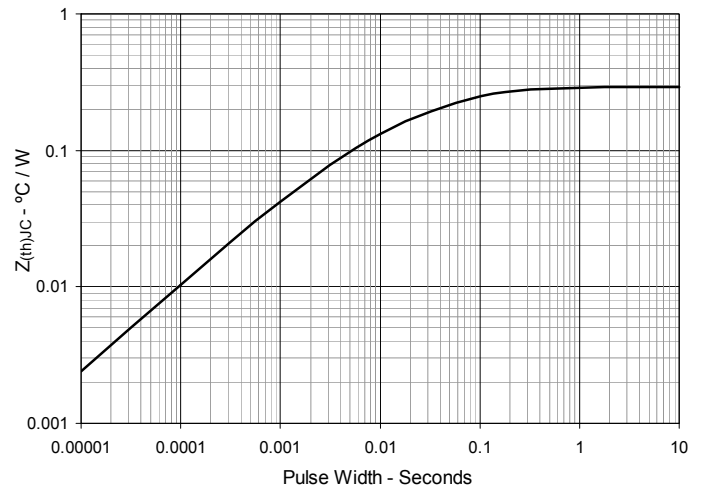


Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

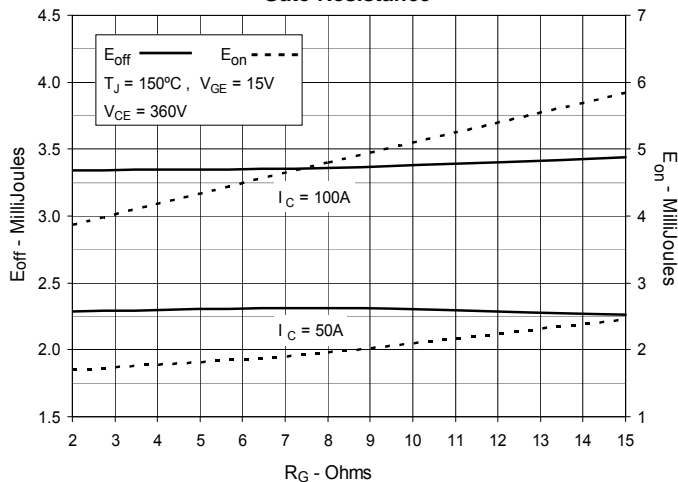


Fig. 14. Inductive Switching Energy Loss vs. Collector Current

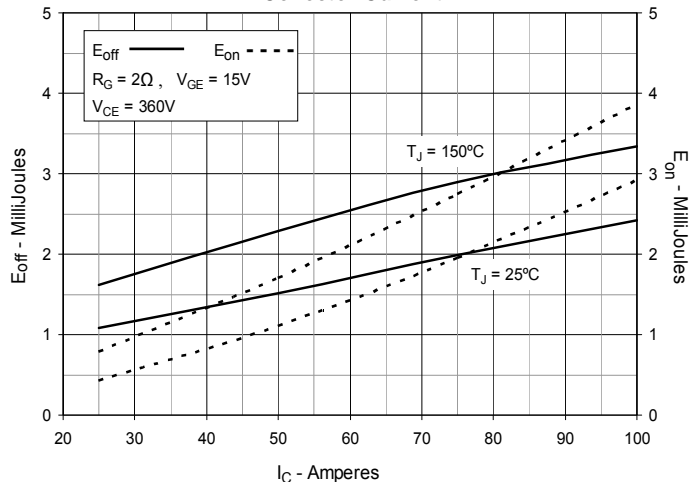


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

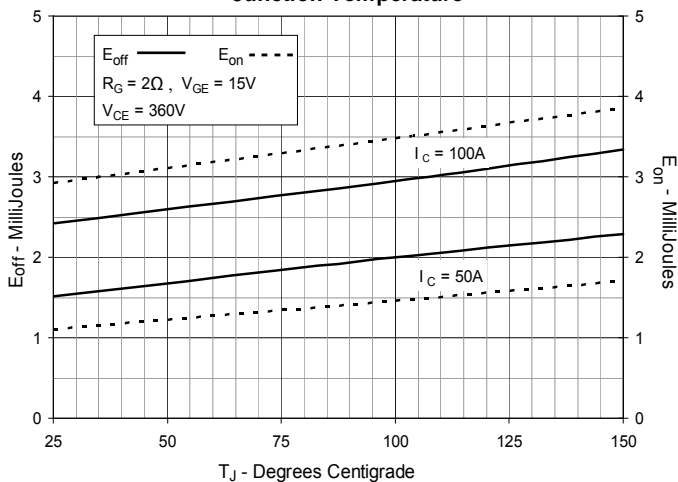


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

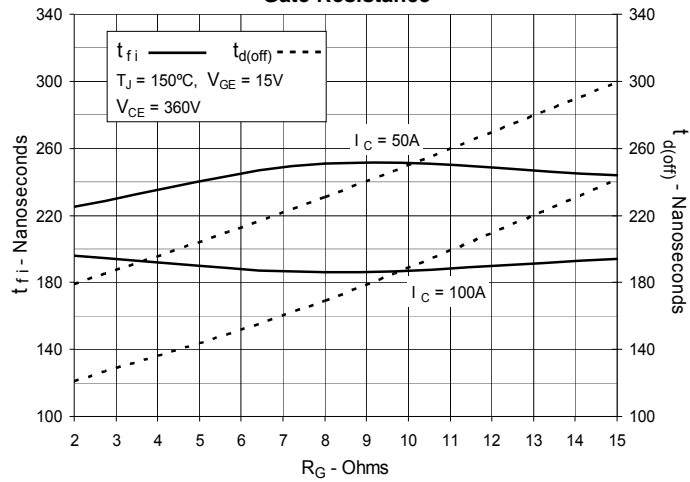


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

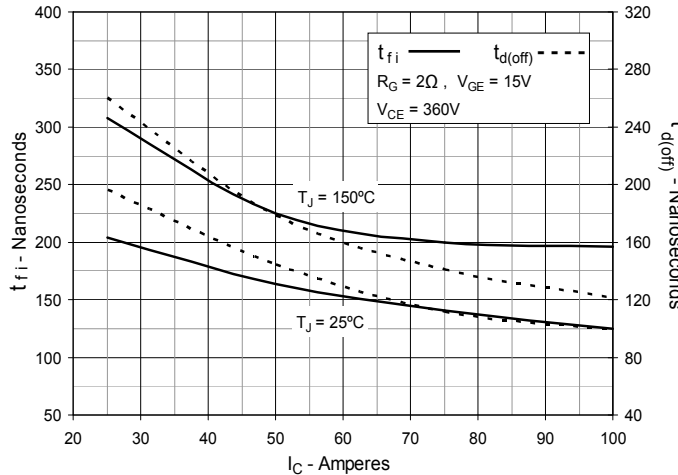


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature

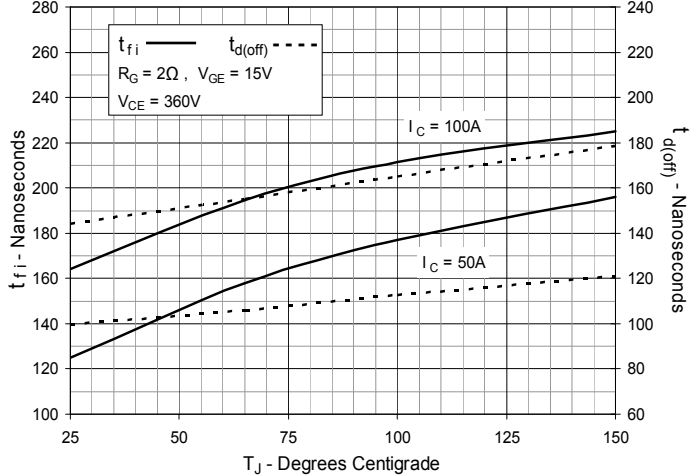


Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

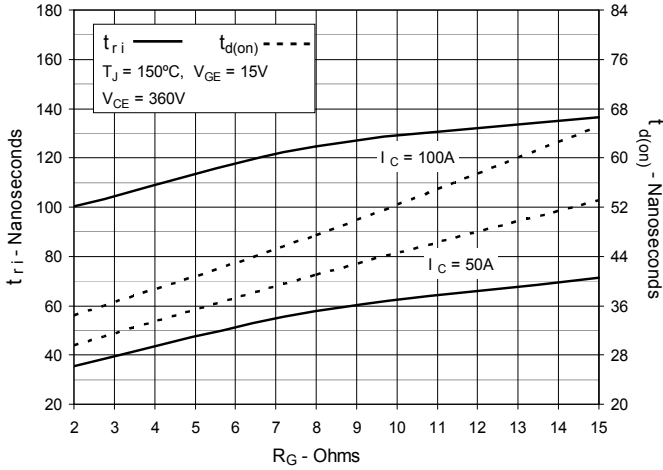


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

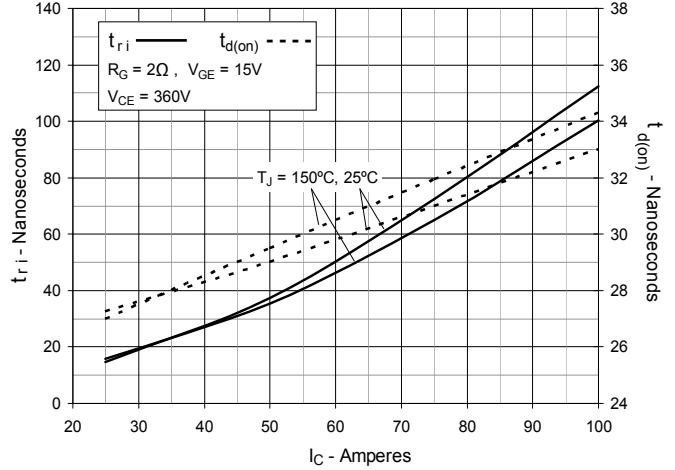
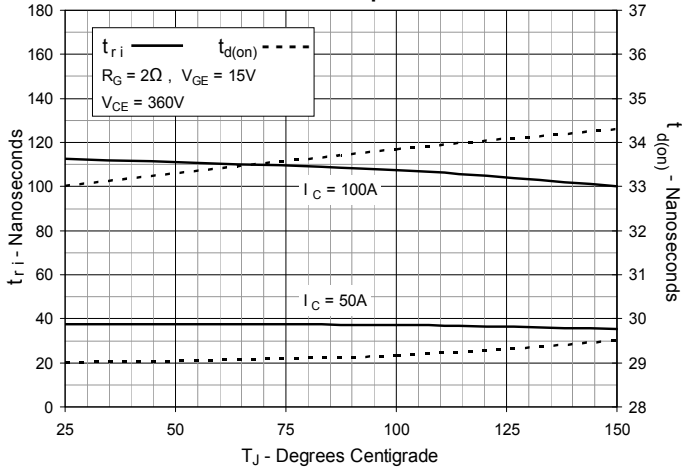


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature



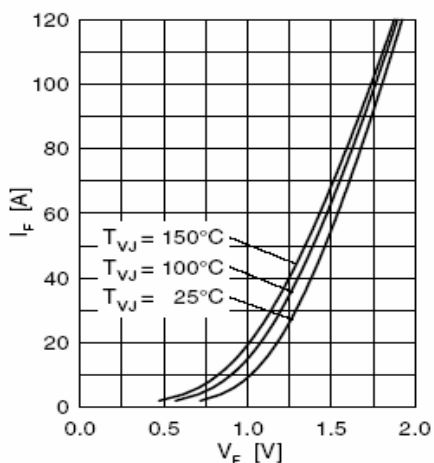


Fig. 22 Forward Current I_F vs. V_F

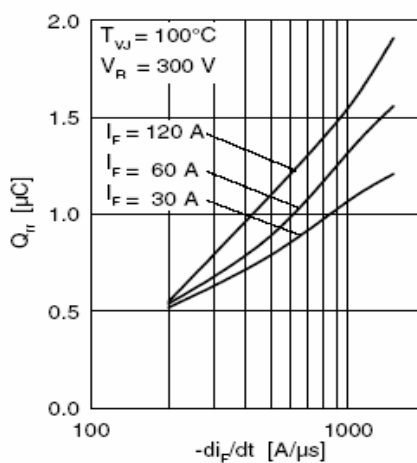


Fig. 23 Typ. Reverse Recovery Charge Q_{rr}

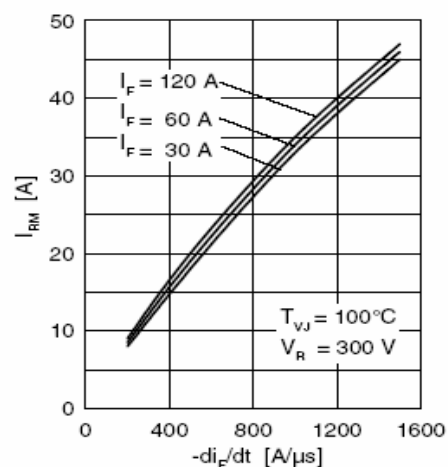


Fig. 24 Typ. Peak Reverse Current I_{RM}

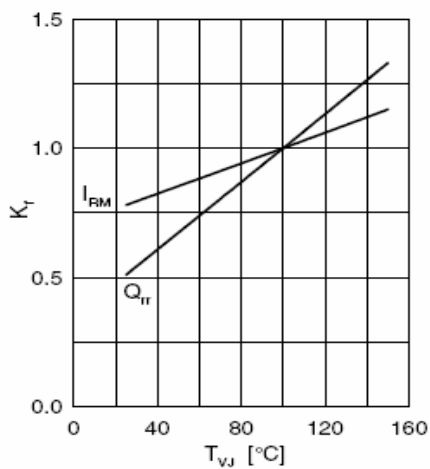


Fig. 25 Typ. Dynamic Parameters Q_{rr} , I_{RM}

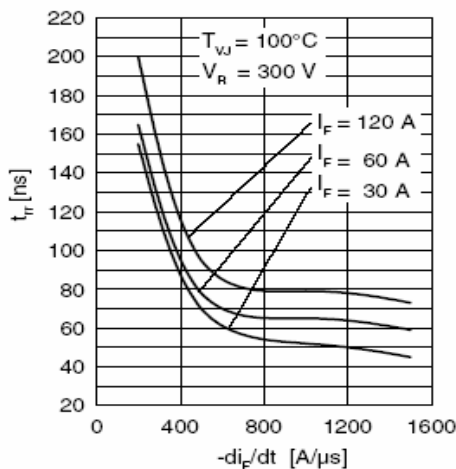


Fig. 26 Typ. Recovery Time t_{rr}

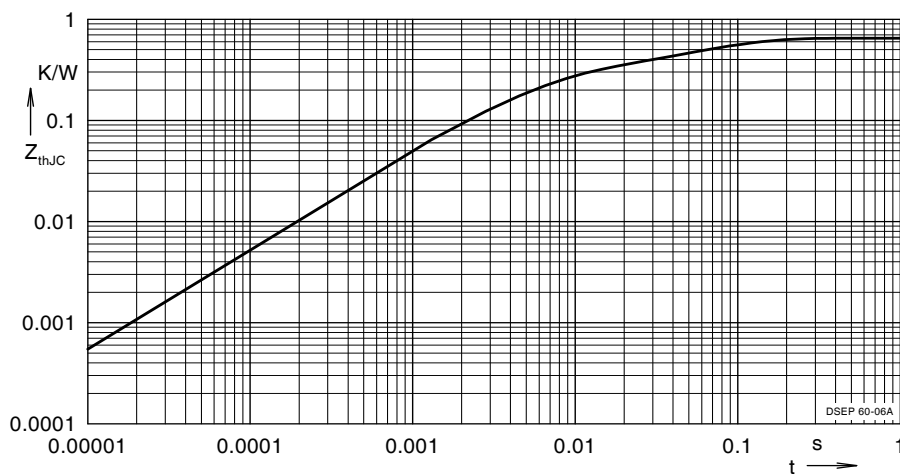


Fig. 27. Maximum Transient Thermal Impedance



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