

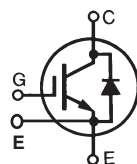
**XPT™ 650V IGBT
GenX3™ w/ Diode**
IXYN120N65C3D1

$$V_{CES} = 650V$$

$$I_{C110} = 100A$$

$$V_{CE(sat)} \leq 2.8V$$

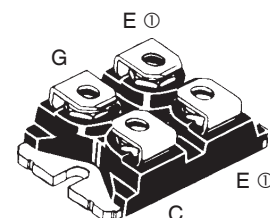
$$t_{fi(typ)} = 46ns$$

 Extreme Light Punch through
IGBT for 20-60kHz Switching


| Symbol | Test Conditions | Maximum Ratings | |
|-------------------------------|---|---|----------------------|
| V_{CES} | $T_J = 25^\circ C$ to $175^\circ C$ | 650 | V |
| V_{CGR} | $T_J = 25^\circ C$ to $175^\circ C$, $R_{GE} = 1M\Omega$ | 650 | V |
| V_{GES} | Continuous | ± 20 | V |
| V_{GEM} | Transient | ± 30 | V |
| I_{C25} | $T_C = 25^\circ C$ | 190 | A |
| I_{C110} | $T_C = 110^\circ C$ | 100 | A |
| I_{F110} | $T_C = 110^\circ C$ | 72 | A |
| I_{CM} | $T_C = 25^\circ C$, 1ms | 620 | A |
| I_A | $T_C = 25^\circ C$ | 60 | A |
| E_{AS} | $T_C = 25^\circ C$ | 1 | J |
| SSOA (RBSOA) | $V_{GE} = 15V$, $T_{VJ} = 150^\circ C$, $R_G = 2\Omega$ Clamped Inductive Load | $I_{CM} = 240$ $V_{CE} \leq V_{CES}$ | A |
| t_{sc} (SCSOA) | $V_{GE} = 15V$, $V_{CE} = 400V$, $T_J = 150^\circ C$ $R_G = 82\Omega$, Non Repetitive | 8 | μs |
| P_C | $T_C = 25^\circ C$ | 830 | W |
| T_J | | -55 ... +175 | $^\circ C$ |
| T_{JM} | | 175 | $^\circ C$ |
| T_{stg} | | -55 ... +175 | $^\circ C$ |
| TV_{ISOL} | 50/60Hz $I_{ISOL} \leq 1mA$ | $t = 1min$ $t = 1s$ | 2500 V~ 3000 V~ |
| M_d | Mounting Torque Terminal Connection Torque | 1.5/13 1.3/11.5 | Nm/lb.in Nm/lb.in |
| Weight | | 30 | g |

SOT-227B, miniBLOC

E153432



G = Gate, C = Collector, E = Emitter
 Ⓧ either emitter terminal can be used as
 Main or Kelvin Emitter

Features

- International Standard Package
- miniBLOC, with Aluminium Nitride Isolation
- 2500V~ Isolation Voltage
- Optimized for 20-60kHz Switching
- Square RBSOA
- Avalanche Rated
- Short Circuit Capability
- High Current Handling Capability
- Anti-Parallel Fast Diode

Advantages

- High Power Density
- Low Gate Drive Requirement

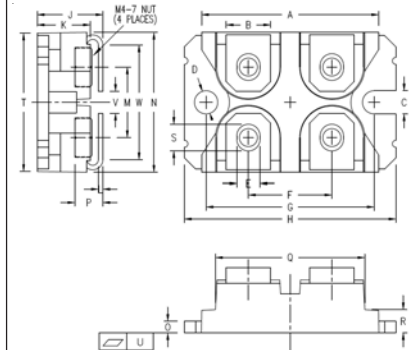
Applications

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

| Symbol | Test Conditions ($T_J = 25^\circ C$, Unless Otherwise Specified) | Characteristic Values | | |
|---------------|---|-----------------------|------------|-----------------------|
| | | Min. | Typ. | Max. |
| BV_{CES} | $I_C = 250\mu A$, $V_{GE} = 0V$ | 650 | | V |
| $V_{GE(th)}$ | $I_C = 250\mu A$, $V_{CE} = V_{GE}$ | 3.5 | | 6.0 V |
| I_{CES} | $V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 150^\circ C$ | | | 25 μA 1.25 mA |
| I_{GES} | $V_{CE} = 0V$, $V_{GE} = \pm 20V$ | | | ± 100 nA |
| $V_{CE(sat)}$ | $I_C = 100A$, $V_{GE} = 15V$, Note 1 $T_J = 150^\circ C$ | | 2.3 2.8 | 2.8 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 | 40 | 68 | S |
| C_{ies} | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$ | | 6900 | pF |
| C_{oes} | | | 585 | pF |
| C_{res} | | | 140 | pF |
| $Q_{g(on)}$ | $I_C = 120\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$ | | 265 | nC |
| Q_{ge} | | | 50 | nC |
| Q_{gc} | | | 110 | nC |
| $t_{d(on)}$ | Inductive load, $T_J = 25^\circ\text{C}$ $I_C = 50\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 2\Omega$ Note 2 | | 28 | ns |
| t_{ri} | | | 29 | ns |
| E_{on} | | | 1.25 | mJ |
| $t_{d(off)}$ | | | 127 | ns |
| t_{fi} | | | 46 | ns |
| E_{off} | | | 0.50 | mJ |
| $t_{d(on)}$ | Inductive load, $T_J = 150^\circ\text{C}$ $I_C = 50\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 2\Omega$ Note 2 | | 27 | ns |
| t_{ri} | | | 30 | ns |
| E_{on} | | | 2.45 | mJ |
| $t_{d(off)}$ | | | 156 | ns |
| t_{fi} | | | 60 | ns |
| E_{off} | | | 0.70 | mJ |
| R_{thJC} | | | 0.18 | $^\circ\text{C}/\text{W}$ |
| R_{thCS} | | 0.05 | | $^\circ\text{C}/\text{W}$ |

SOT-227B miniBLOC (IXYN)



| SYM | INCHES | | MILLIMETERS | |
|-----|--------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 1.240 | 1.255 | 31.50 | 31.88 |
| B | .307 | .323 | 7.80 | 8.20 |
| C | .161 | .169 | 4.09 | 4.29 |
| D | .161 | .169 | 4.09 | 4.29 |
| E | .161 | .169 | 4.09 | 4.29 |
| F | .587 | .595 | 14.91 | 15.11 |
| G | 1.186 | 1.193 | 30.12 | 30.30 |
| H | 1.489 | 1.505 | 37.80 | 38.23 |
| J | .460 | .481 | 11.68 | 12.22 |
| K | .351 | .378 | 8.92 | 9.60 |
| L | .030 | .033 | 0.76 | 0.84 |
| M | .496 | .506 | 12.60 | 12.85 |
| N | .990 | 1.001 | 25.15 | 25.42 |
| O | .078 | .084 | 1.98 | 2.13 |
| P | .195 | .235 | 4.95 | 5.97 |
| Q | 1.045 | 1.059 | 26.54 | 26.90 |
| R | .155 | .174 | 3.94 | 4.42 |
| S | .186 | .191 | 4.72 | 4.85 |
| T | .968 | .987 | 24.59 | 25.07 |
| U | -.002 | .004 | -0.05 | 0.1 |
| V | .130 | .180 | 3.30 | 4.57 |
| W | .780 | .830 | 19.81 | 21.08 |

Reverse Diode (FRED)

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$ Unless Otherwise Specified) | Characteristic Values | | |
|------------|--|-----------------------|------|--------------------------------|
| | | Min. | Typ. | Max. |
| V_F | $I_F = 100\text{A}, V_{GE} = 0\text{V}$, Note 1 $T_J = 150^\circ\text{C}$ | | 2.0 | 3.0 V |
| I_{rr} | $I_F = 100\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 700\text{A}/\mu\text{s},$ $V_R = 400\text{V}$ $T_J = 150^\circ\text{C}$ | | 42 | A |
| t_{rr} | | | 150 | ns |
| R_{thJC} | | | | 0.38 $^\circ\text{C}/\text{W}$ |

Notes:

1. Pulse test, $t \leq 300\mu\text{s}$, duty cycle, $d \leq 2\%$.
2. Switching times & energy losses may increase for higher $V_{CE}(\text{clamp})$, T_J or R_G .

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.

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| | | | | | | | | | | |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 | |

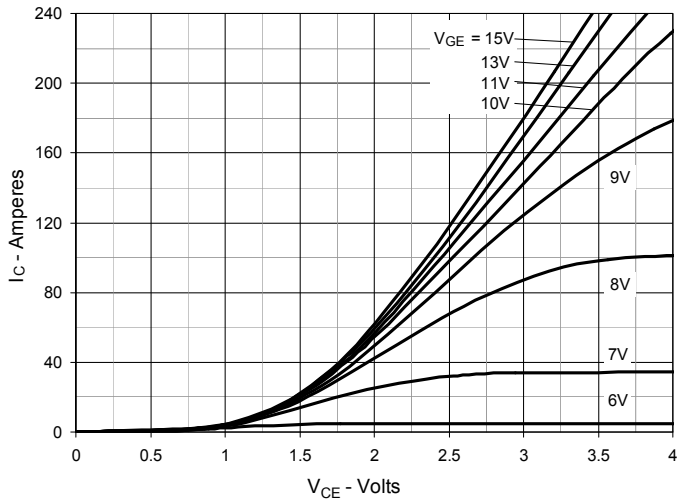
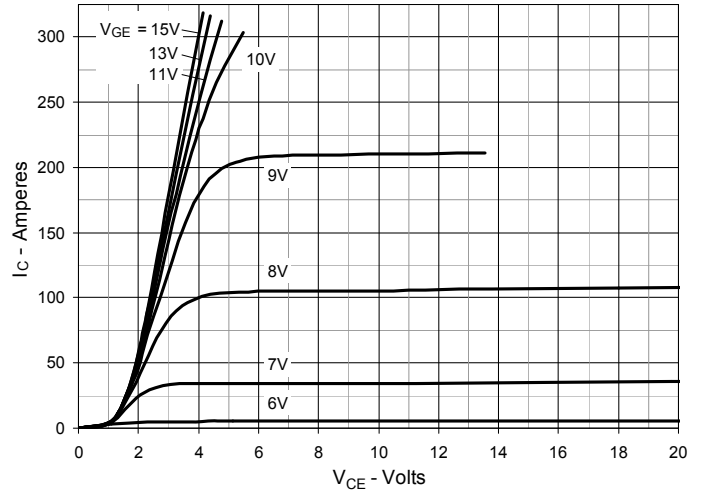
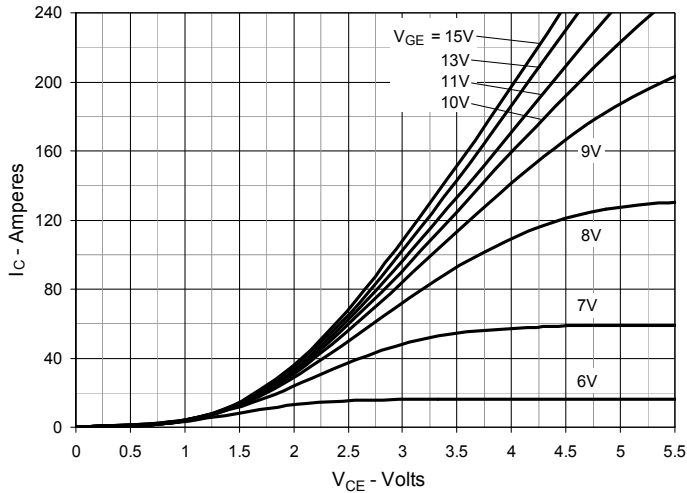
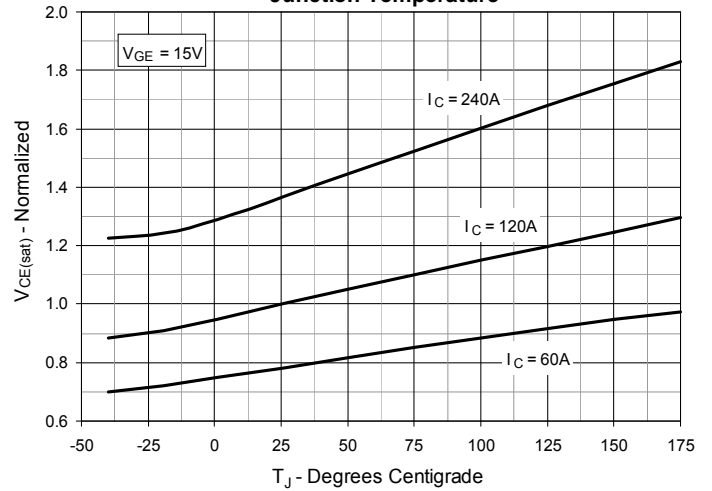
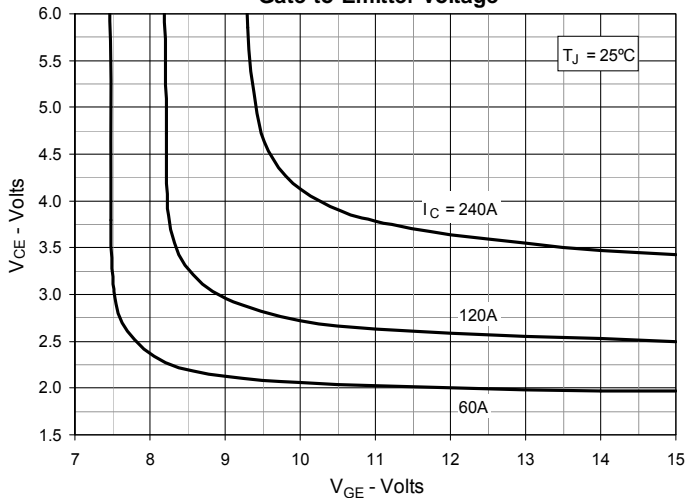
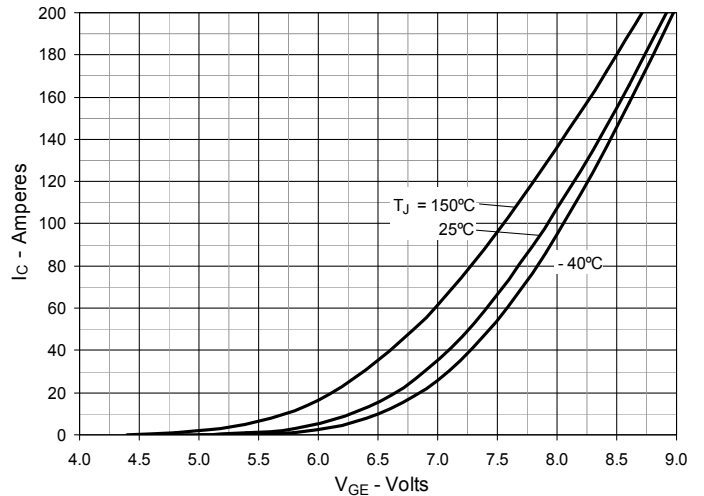
Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$

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

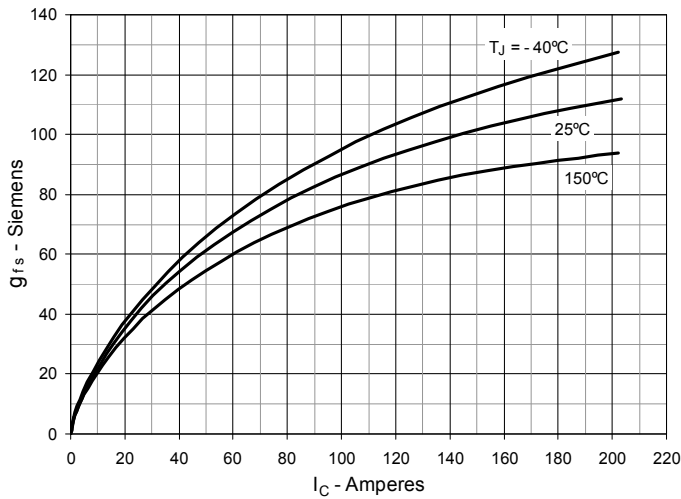


Fig. 8. Gate Charge

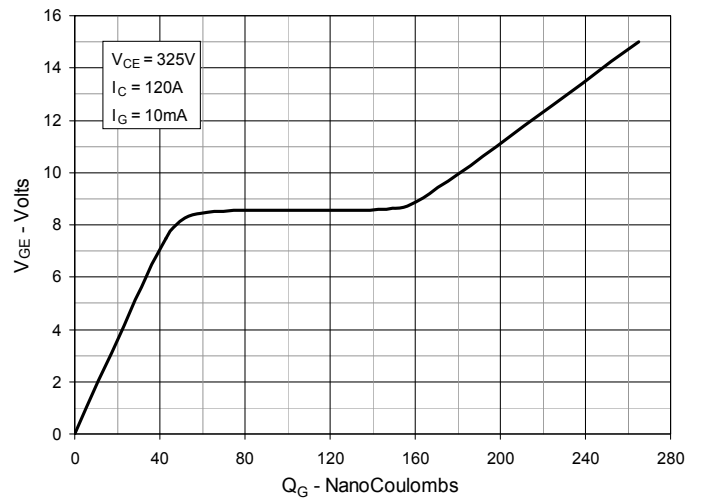


Fig. 9. Capacitance

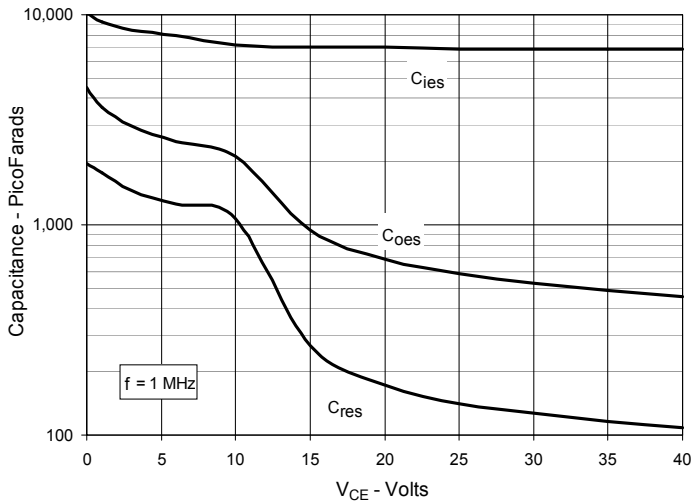


Fig. 10. Reverse-Bias Safe Operating Area

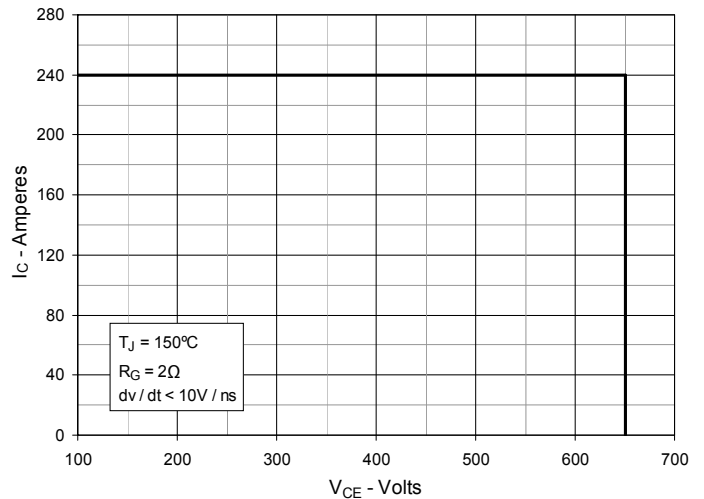


Fig. 11. Forward-Bias Safe Operating Area

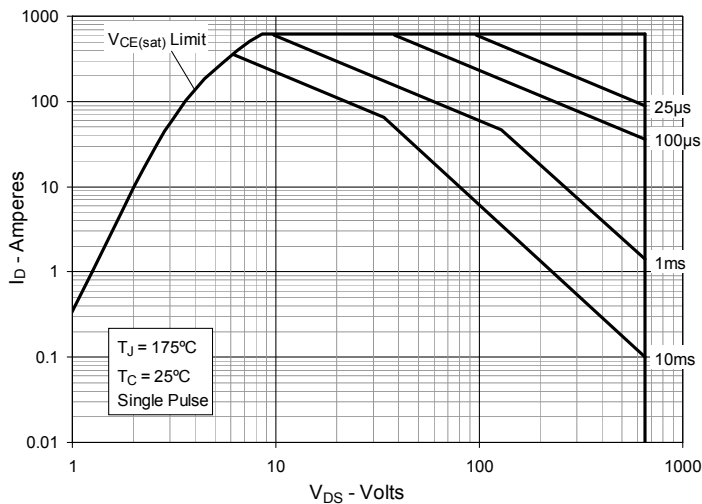


Fig. 12. Maximum Transient Thermal Impedance (IGBT)

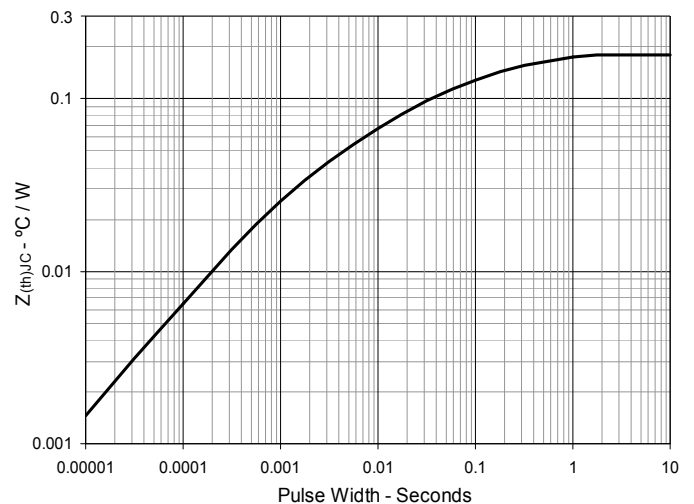


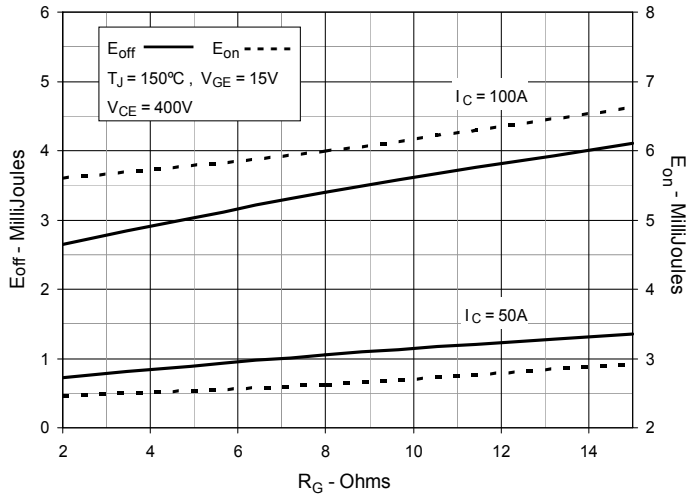
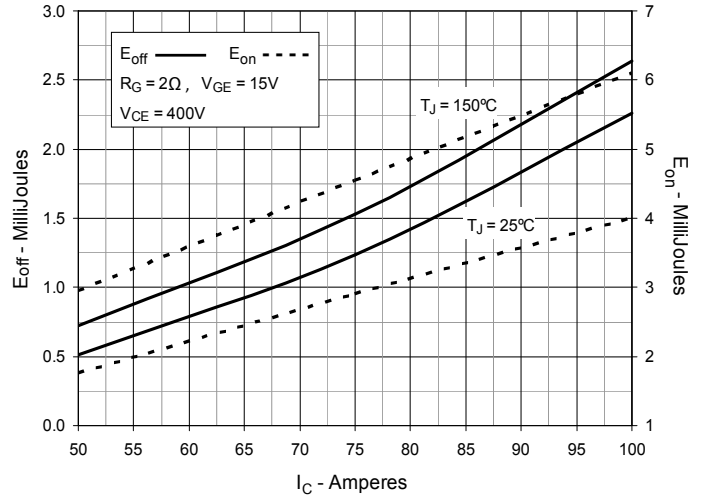
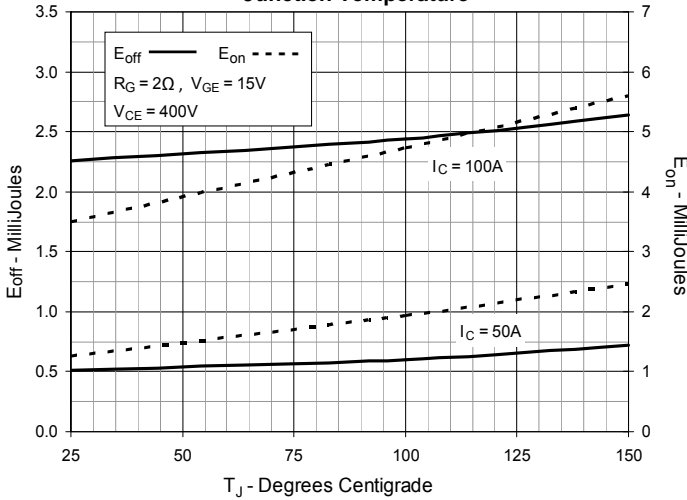
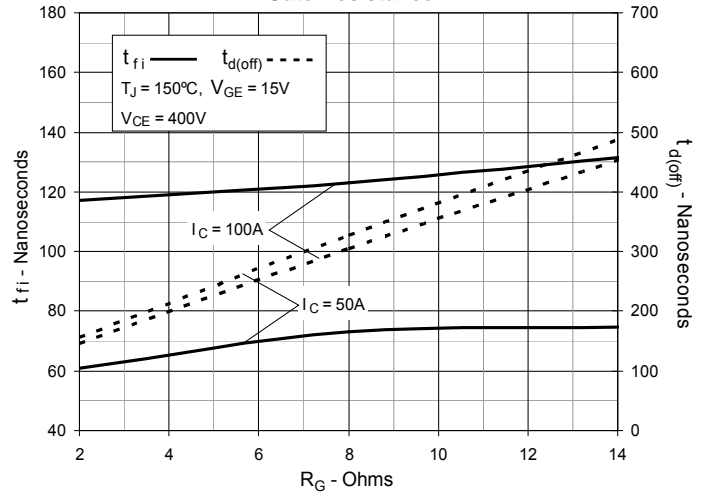
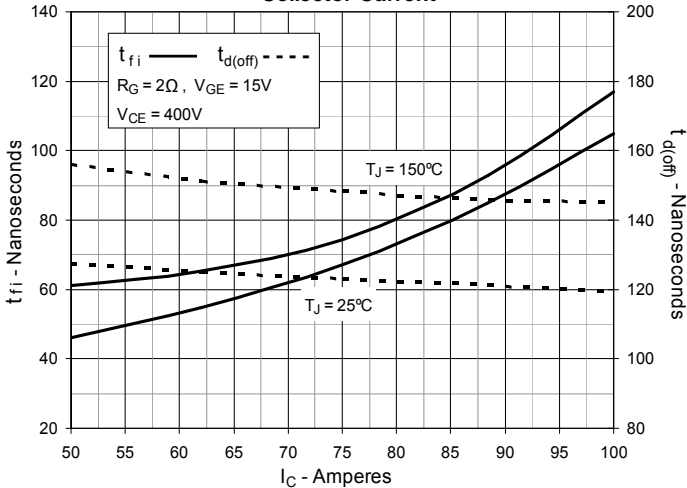
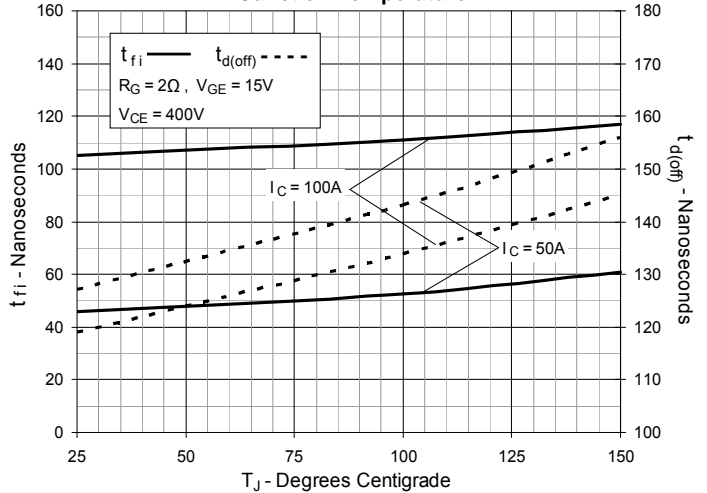
Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

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


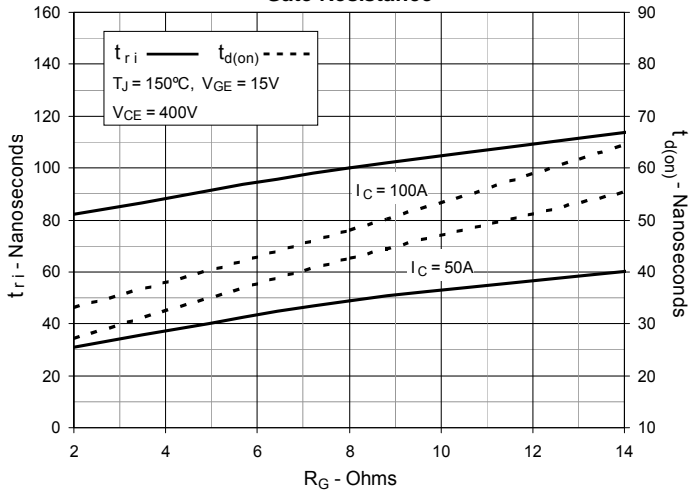
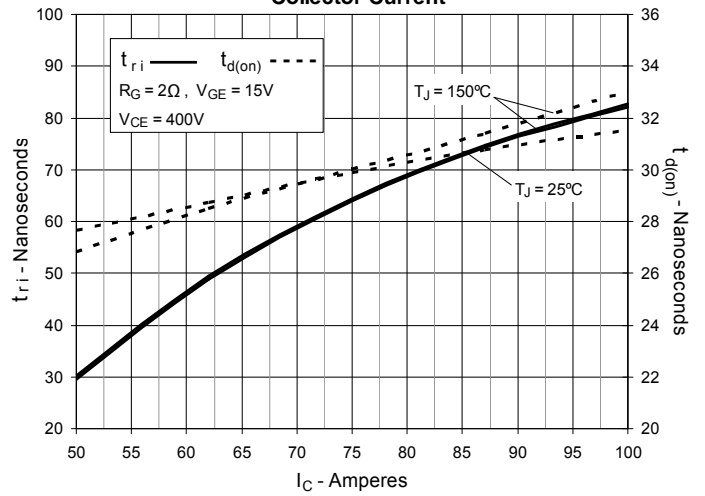
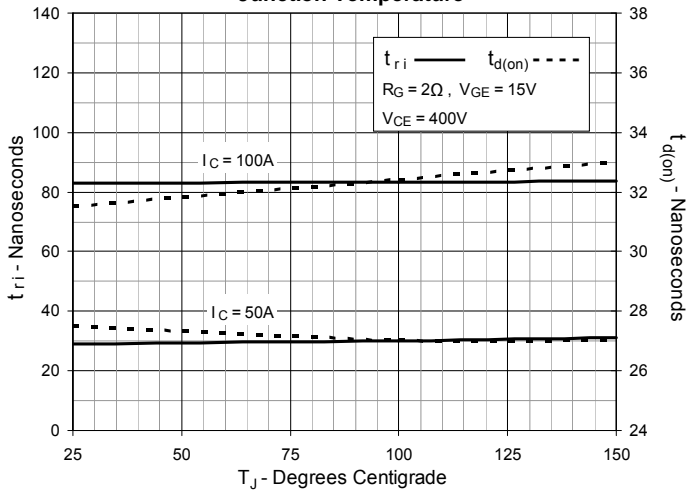
Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

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

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


Fig. 22. Diode Forward Characteristics

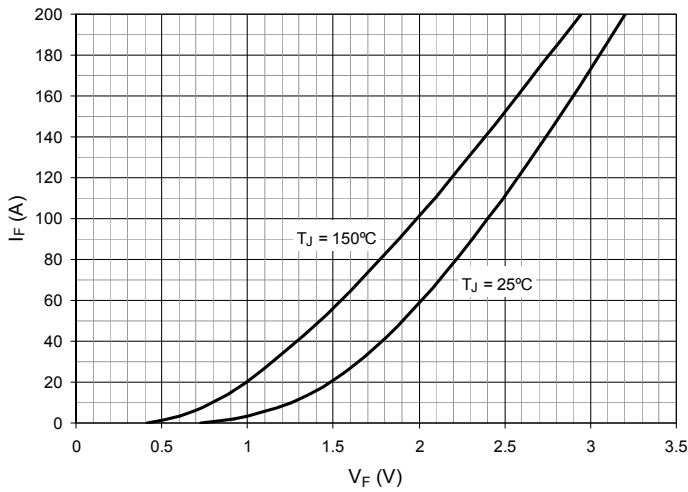


Fig. 23. Reverse Recovery Charge vs. $-di_F/dt$

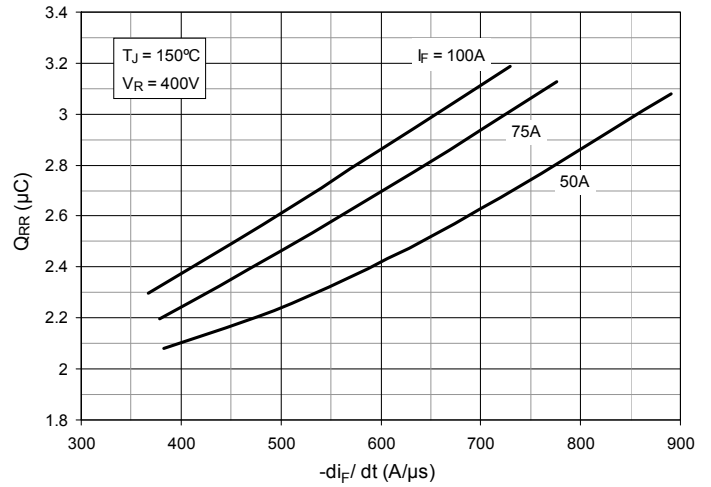


Fig. 24. Reverse Recovery Current vs. $-di_F/dt$

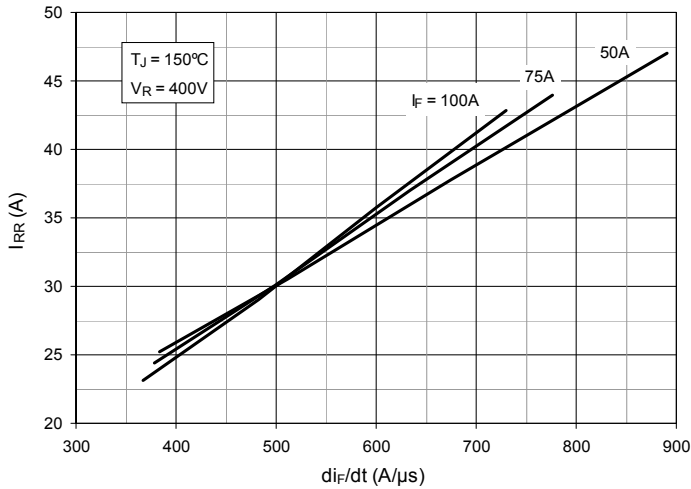


Fig. 25. Reverse Recovery Time vs. $-di_F/dt$

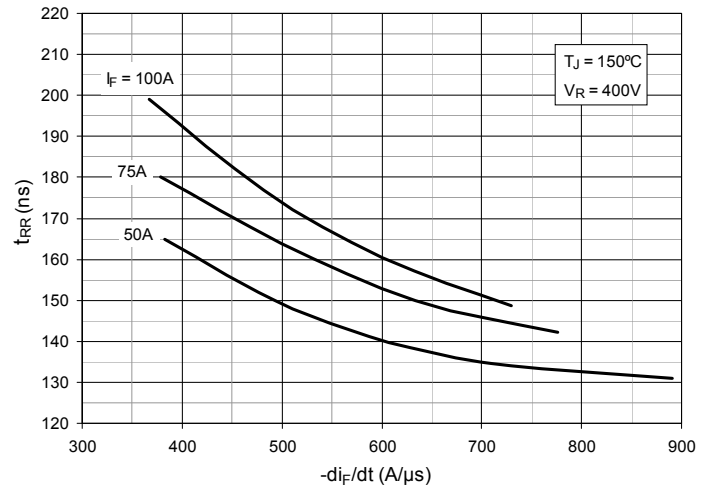


Fig. 26. Dynamic Parameters Q_{RR} , I_{RR} vs. Junction Temperature

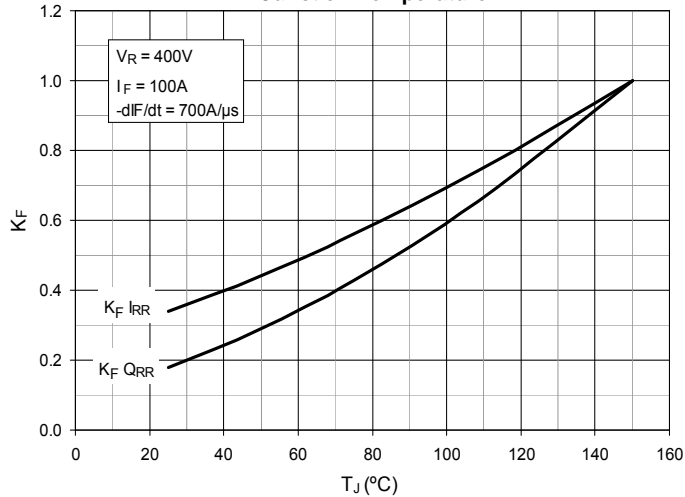
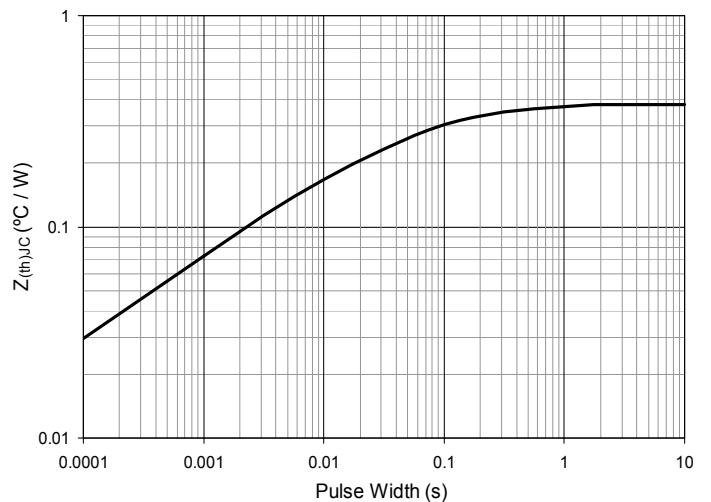


Fig. 27. Maximum Transient Thermal Impedance (Diode)





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