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Preliminary Technical Information

# XPT™ 650V GenX4™ w/ Sonic Diode

# IXXN110N65C4H1

勝 特 力 材 料 886-3-5753170
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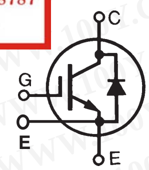
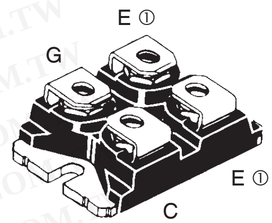
$V_{CES}$ = 650V
$I_{C110}$ = 110A
$V_{CE(sat)}$ ≤ 2.35V
$t_{fi(typ)}$ = 30ns

Extreme Light Punch Through IGBT for 20-60kHz Switching




**SOT-227B, miniBLOC**
E153432




G = Gate, C = Collector, E = Emitter
① either emitter terminal can be used as Main or Kelvin Emitter

| 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 (Chip Capability) | 210 | A |
| $I_{C25}$ | Terminal Current Limit | 200 | A |
| $I_{C110}$ | $T_C$ = 110°C | 110 | A |
| $I_{F110}$ | $T_C$ = 110°C | 70 | A |
| $I_{CM}$ | $T_C$ = 25°C, 1ms | 470 | A |
| **SSOA (RBSOA)** | $V_{GE}$ = 15V, $T_{VJ}$ = 150°C, $R_G$ = 2Ω<br>Clamped Inductive Load | $I_{CM}$ = 220<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 | 10 | μs |
| $P_C$ | $T_C$ = 25°C | 750 | W |
| $T_J$ | | -55 ... +175 | °C |
| $T_{JM}$ | | 175 | °C |
| $T_{stg}$ | | -55 ... +175 | °C |
| $V_{ISOL}$ | 50/60Hz t = 1min | 2500 | V~ |
| | $I_{ISOL} \leq$ 1mA t = 1s | 3000 | V~ |
| $M_d$ | Mounting Torque | 1.5/13 | Nm/lb.in. |
| | Terminal Connection Torque | 1.3/11.5 | Nm/lb.in. |
| **Weight** | | 30 | g |

## Features

- International Standard Package
- miniBLOC, with Aluminium Nitride Isolation
- 2500V~ Isolation Voltage
- Anti-Parallel Sonic Diode
- Optimized for 20-60kHz Switching
- Square RBSOA
- Short Circuit Capability
- 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
- High Frequency Power Inverters

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{CES}$ | $I_C$ = 250μA, $V_{GE}$ = 0V | 650 | | | V |
| $V_{GE(th)}$ | $I_C$ = 250μA, $V_{CE}$ = $V_{GE}$ | 4.0 | | 6.5 | 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 |
| $V_{CE(sat)}$ | $I_C$ = 110A, $V_{GE}$ = 15V, Note 1 | | 1.98 | 2.35 | V |
| | $T_J$ = 150°C | | 2.34 | | V |

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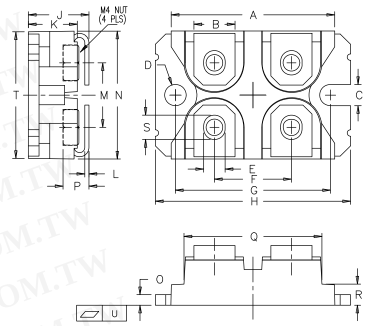
| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $I_C$ = 60A, $V_{CE}$ = 10V, Note 1 | 24 | 40 | | S |
| $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | | 3690 | | pF |
| $C_{oes}$ | | | 440 | | pF |
| $C_{res}$ | | | 140 | | pF |
| $Q_{g(on)}$ | $I_C$ = 110A, $V_{GE}$ = 15V, $V_{CE}$ = 0.5 • $V_{CES}$ | | 180 | | nC |
| $Q_{ge}$ | | | 32 | | nC |
| $Q_{gc}$ | | | 76 | | nC |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 25°C** | | 35 | | ns |
| $t_{ri}$ | $I_C$ = 55A, $V_{GE}$ = 15V | | 46 | | ns |
| $E_{on}$ | $V_{CE}$ = 400V, $R_G$ = 2Ω | | 2.30 | | mJ |
| $t_{d(off)}$ | Note 2 | | 143 | | ns |
| $t_{fi}$ | | | 30 | | ns |
| $E_{off}$ | | | 0.60 | 1.05 | mJ |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 150°C** | | 30 | | ns |
| $t_{ri}$ | $I_C$ = 55A, $V_{GE}$ = 15V | | 32 | | ns |
| $E_{on}$ | $V_{CE}$ = 400V, $R_G$ = 2Ω | | 2.90 | | mJ |
| $t_{d(off)}$ | Note 2 | | 130 | | ns |
| $t_{fi}$ | | | 43 | | ns |
| $E_{off}$ | | | 0.77 | | mJ |
| $R_{thJC}$ | | | | 0.20 | °C/W |
| $R_{thCS}$ | | | 0.05 | | °C/W |

## SOT-227B miniBLOC (IXXN)




| SYM | INCHES MIN | INCHES MAX | MILLIMETERS MIN | MILLIMETERS 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 | 1.496 | 1.505 | 38.00 | 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 |

**Reverse Sonic Diode (FRD)**

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | | Min. | Typ. | Max. | |
|---|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 100A, $V_{GE}$ = 0V, Note 1 | | | 1.7 | 2.0 | V |
| | | $T_J$ = 150°C | | 1.8 | | V |
| $I_{RM}$ | $I_F$ = 100A, $V_{GE}$ = 0V, | $T_J$ = 150°C | | 95 | | A |
| $t_{rr}$ | $-di_F/dt$ = 1500A/μs, $V_R$ = 300V | | | 100 | | ns |
| $R_{thJC}$ | | | | | 0.42 | °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 $R_G$.

**PRELIMINARY TECHNICAL INFORMATION**

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. 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

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

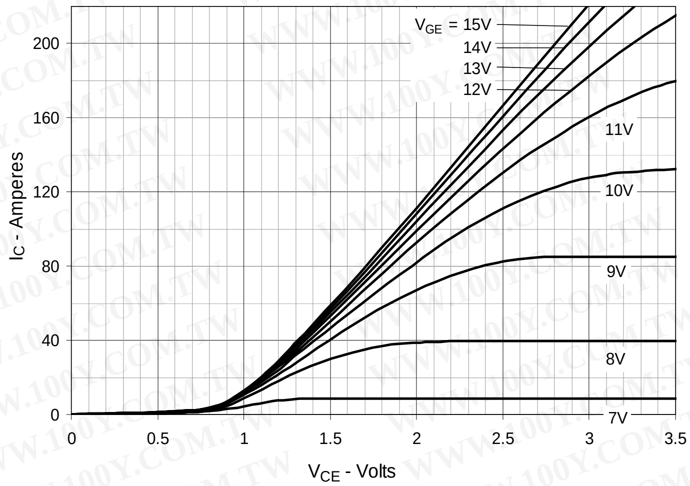


**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

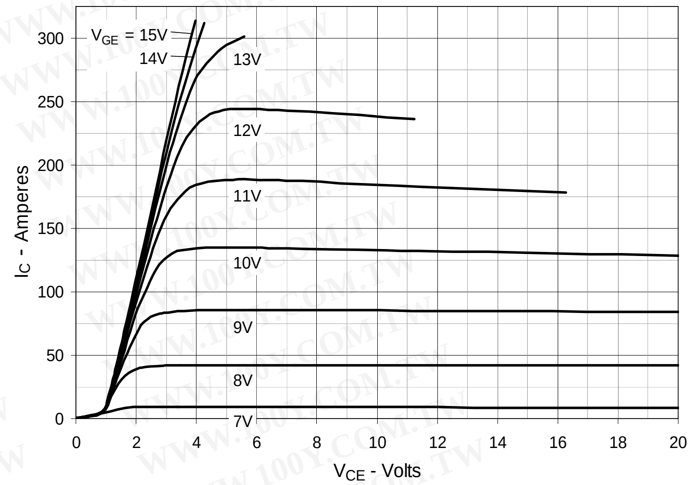


**Fig. 3. Output Characteristics @ $T_J$ = 150ºC**

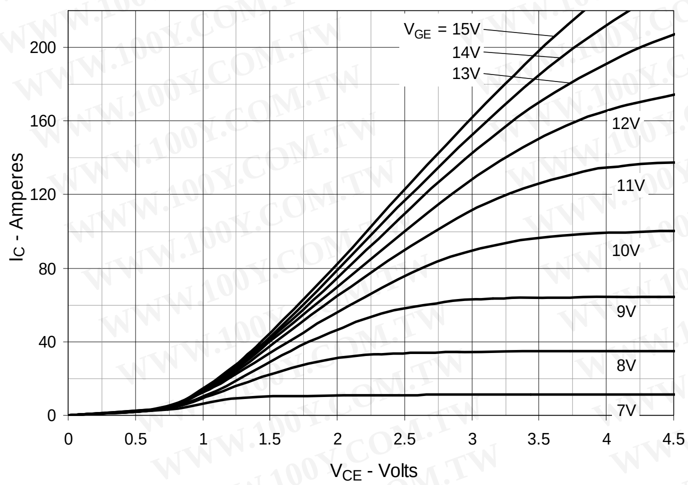


**Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature**

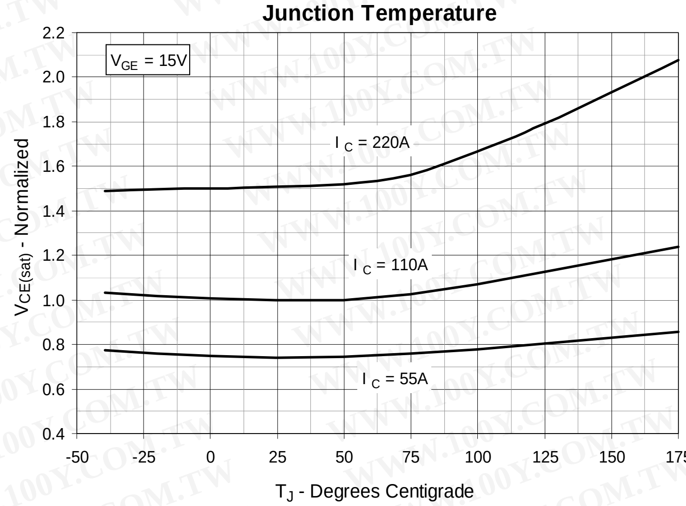


**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

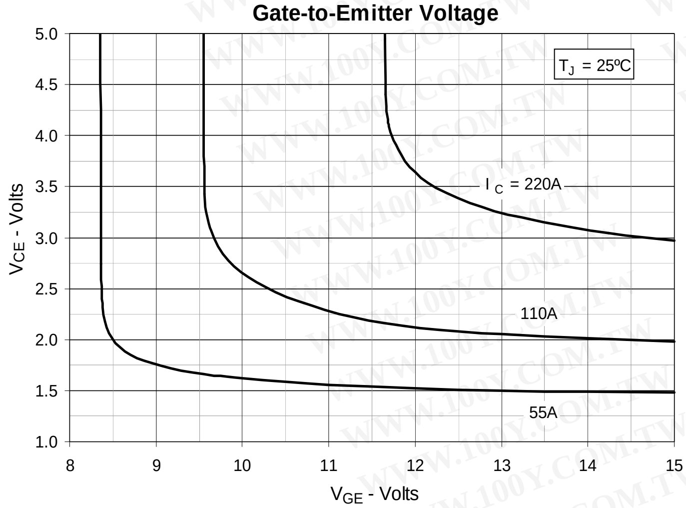


**Fig. 6. Input Admittance**

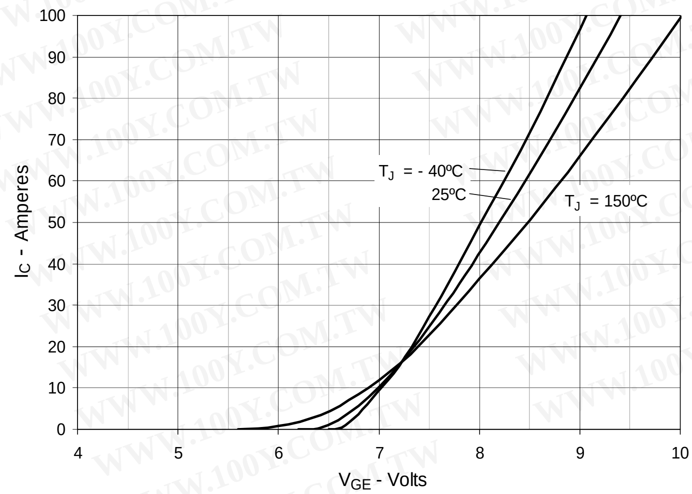


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**Fig. 7. Transconductance**

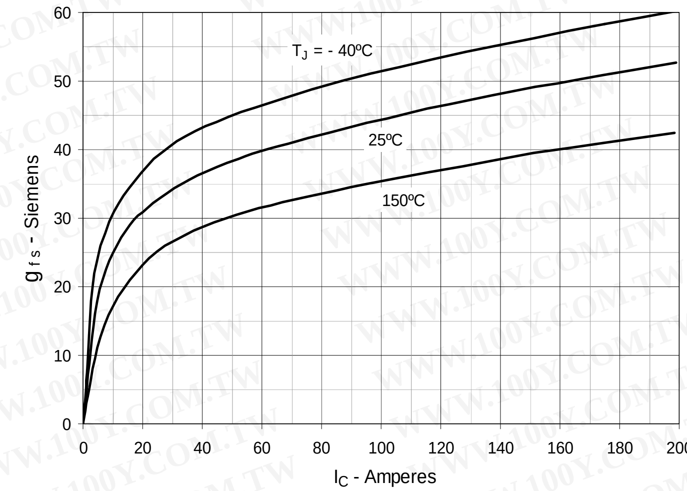


**Fig. 8. Gate Charge**

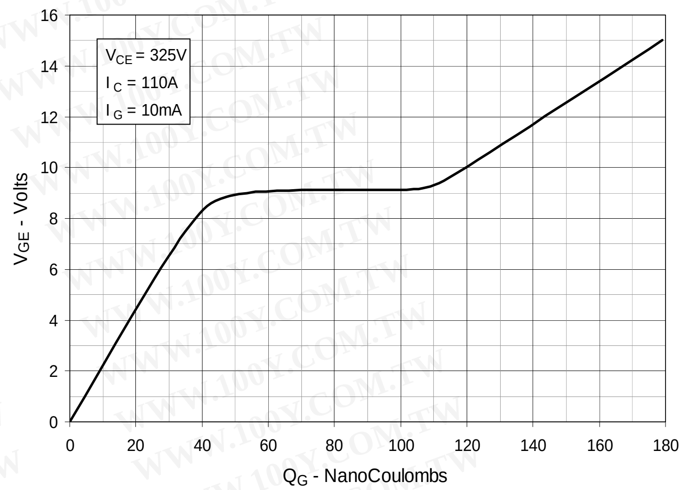


**Fig. 9. Capacitance**

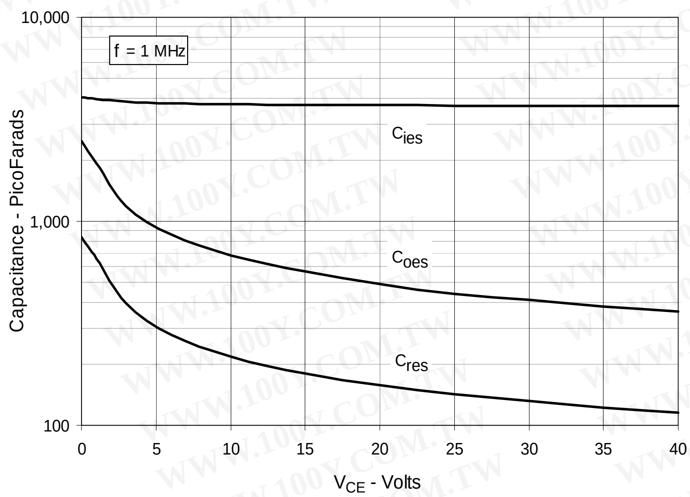


**Fig. 10. Reverse-Bias Safe Operating Area**

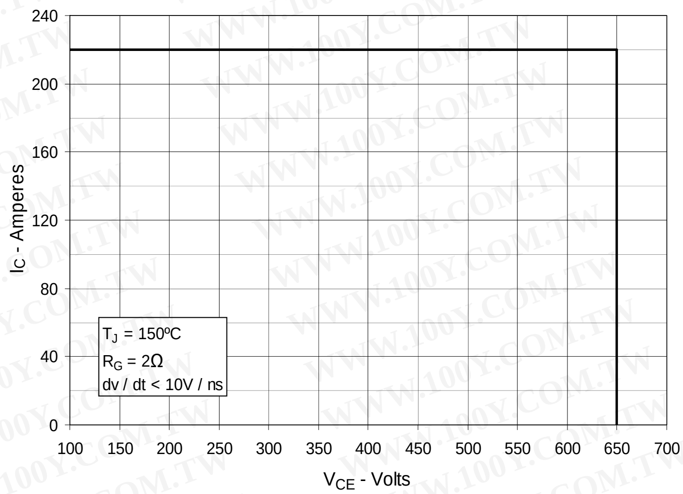


**Fig. 11. Maximum Transient Thermal Impedance**

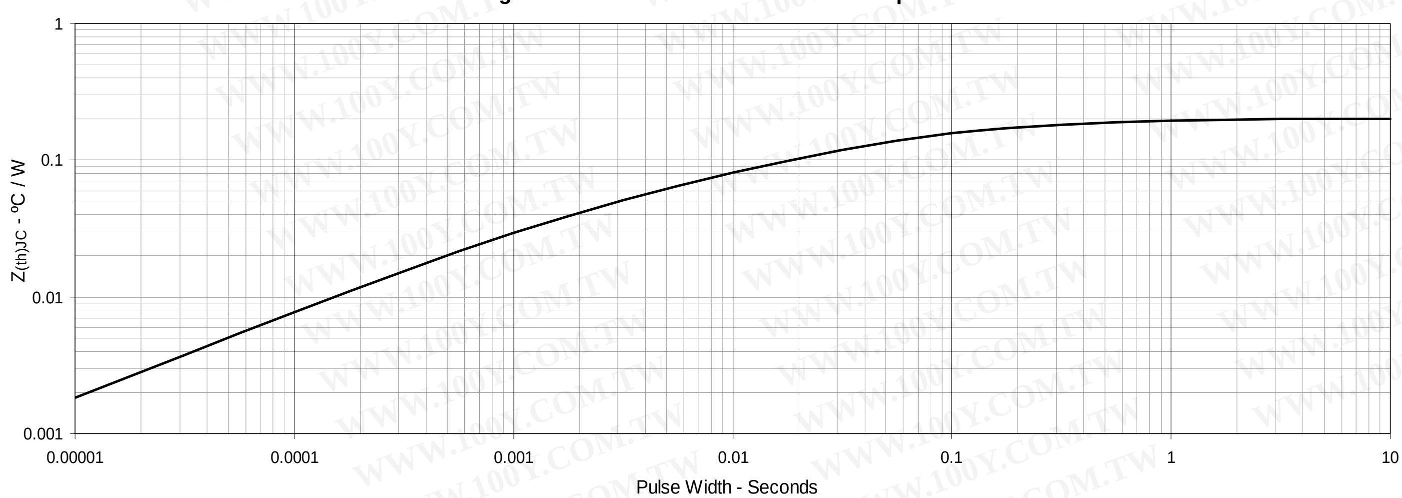


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**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**

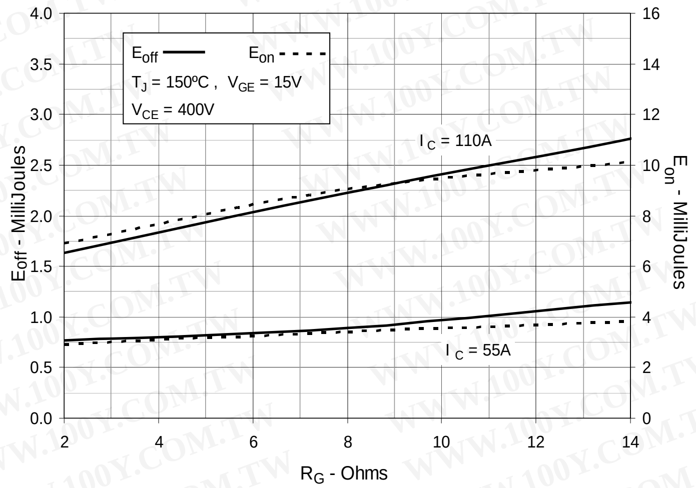


**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**

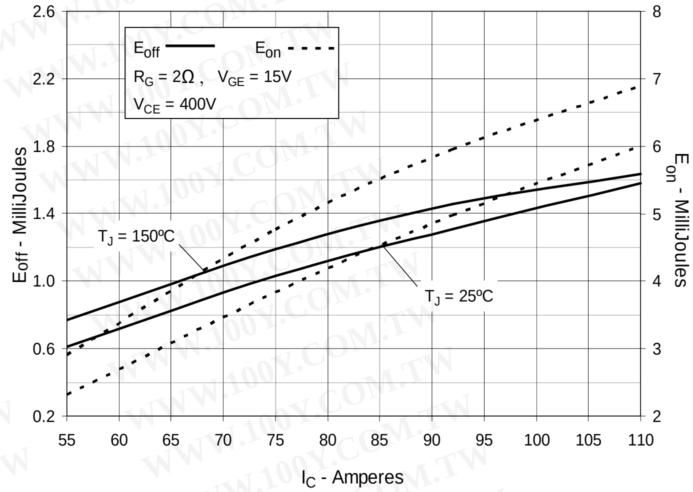


**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**

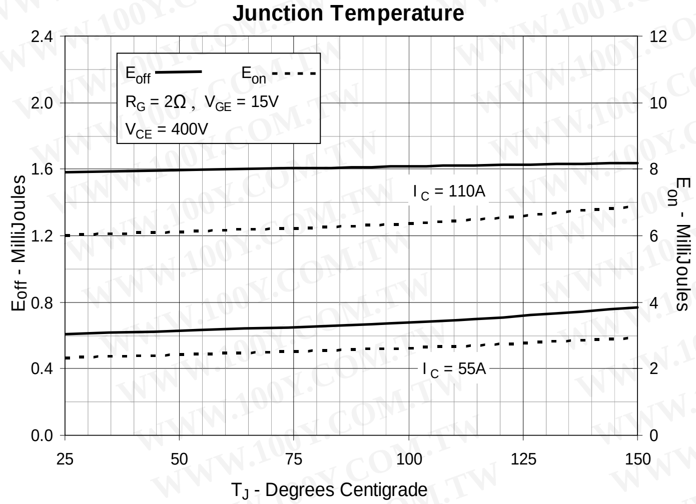


**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**

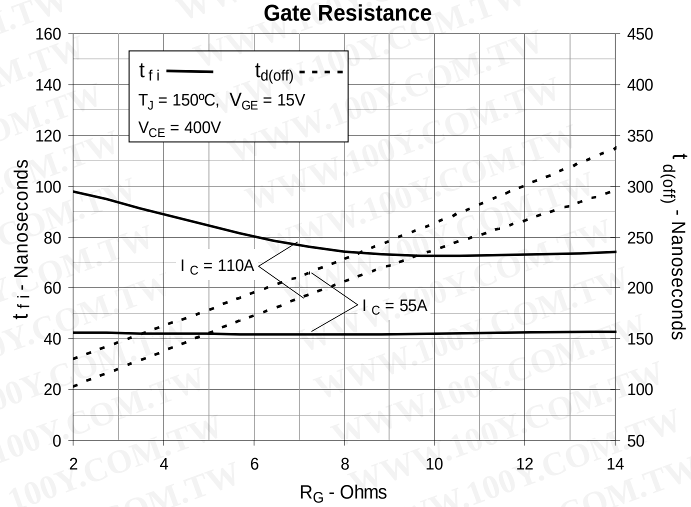


**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**

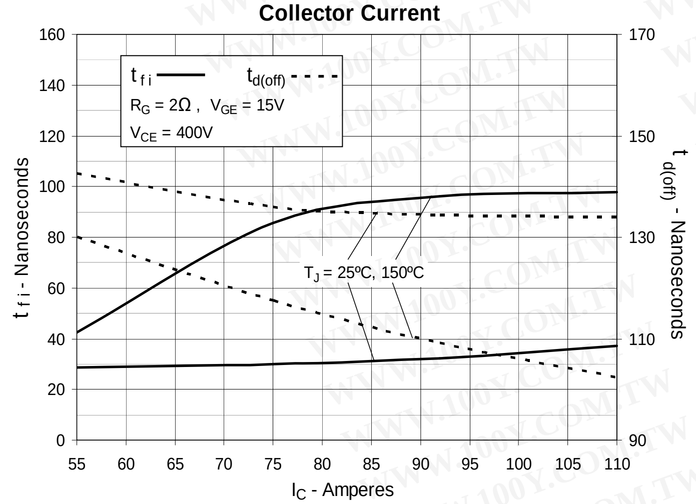


**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**

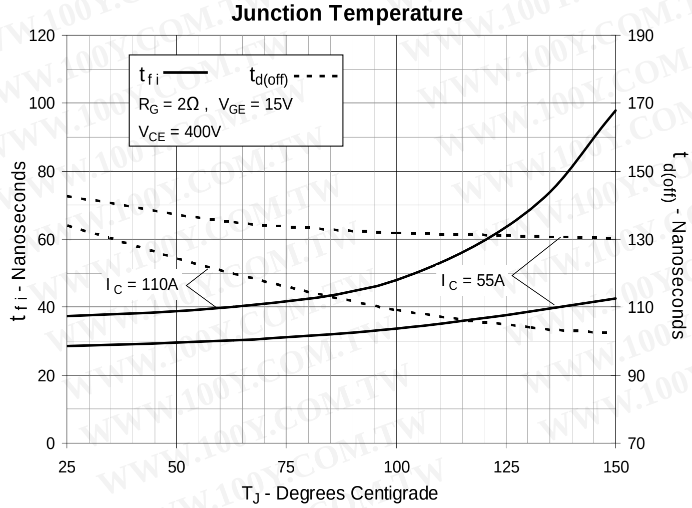


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**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**

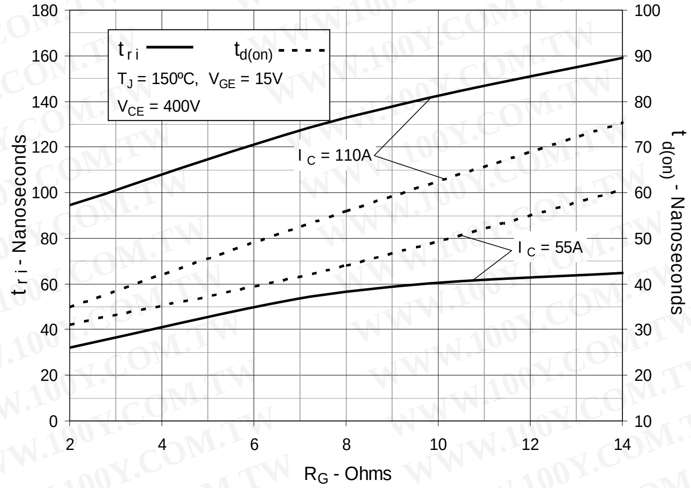


**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**

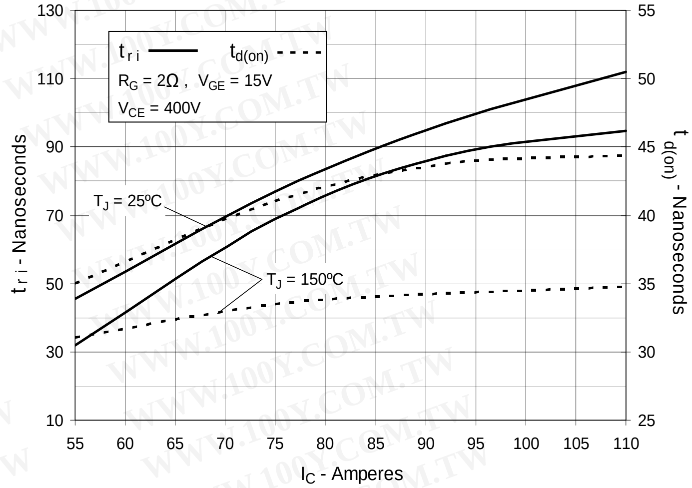


**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**

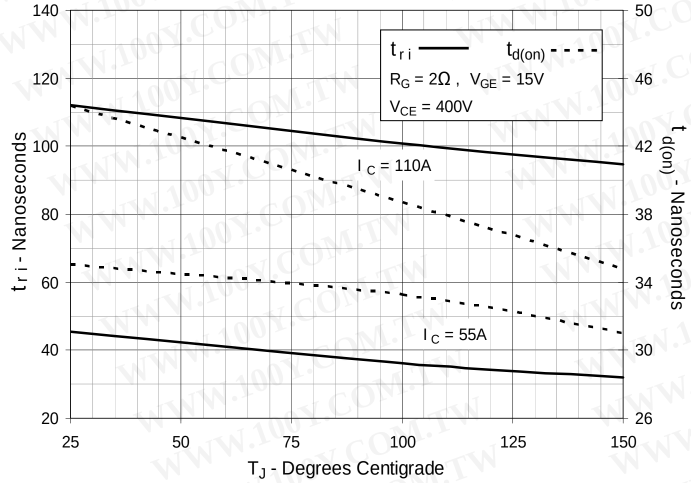


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Fig. 21. Typ. Forward characteristics

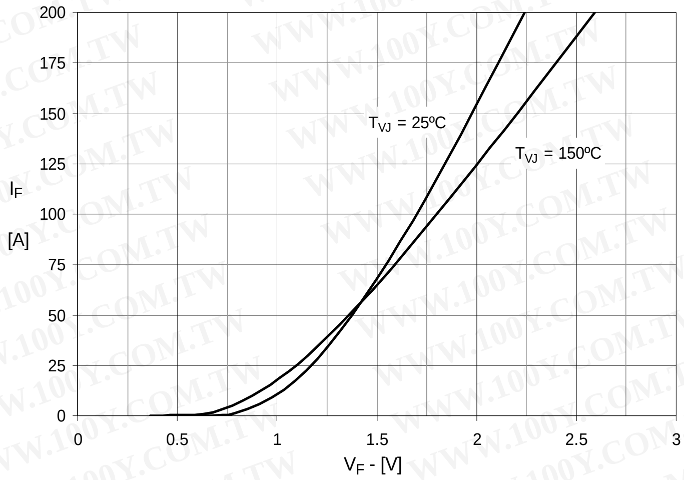



Fig. 22. Typ. Reverse Recovery Charge $Q_{rr}$ vs. $-di_F/dt$

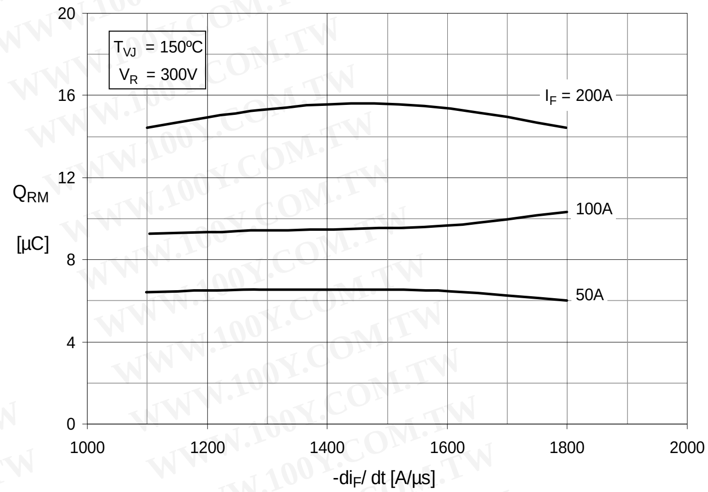



Fig. 23. Typ. Peak Reverse Current $I_{RM}$ vs. $-di_F/dt$

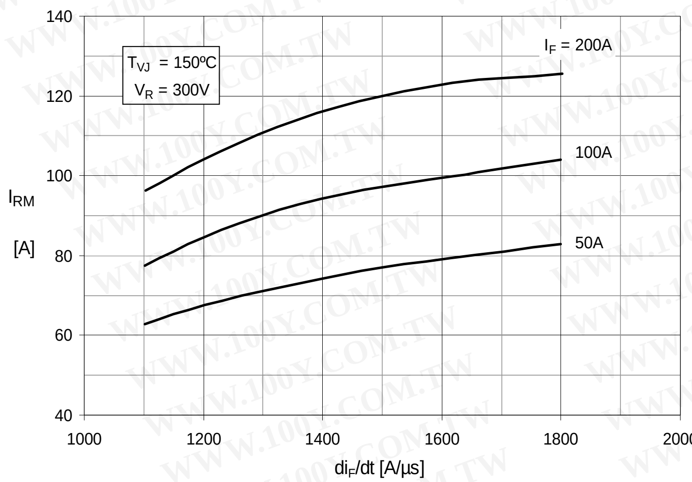



Fig. 24. Typ. Recovery Time $t_{rr}$ vs. $-di_F/dt$

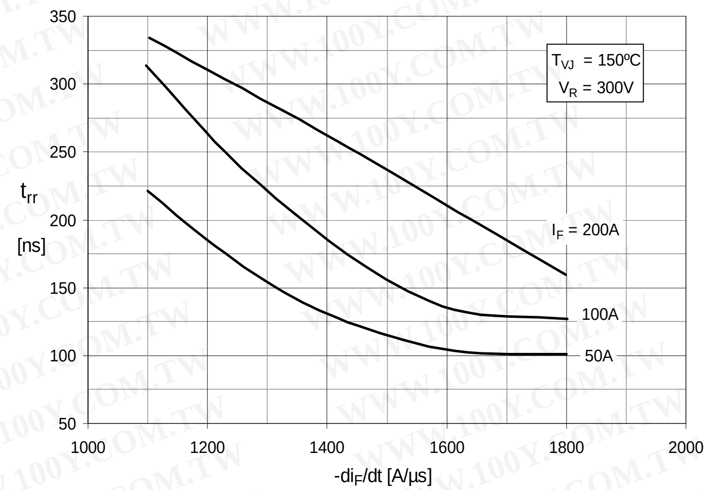



Fig. 25. Typ. Recovery Energy $E_{rec}$ vs. $-di_F/dt$

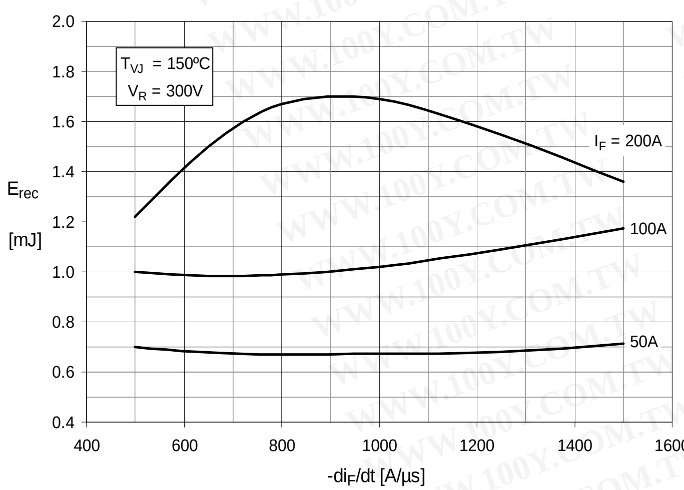
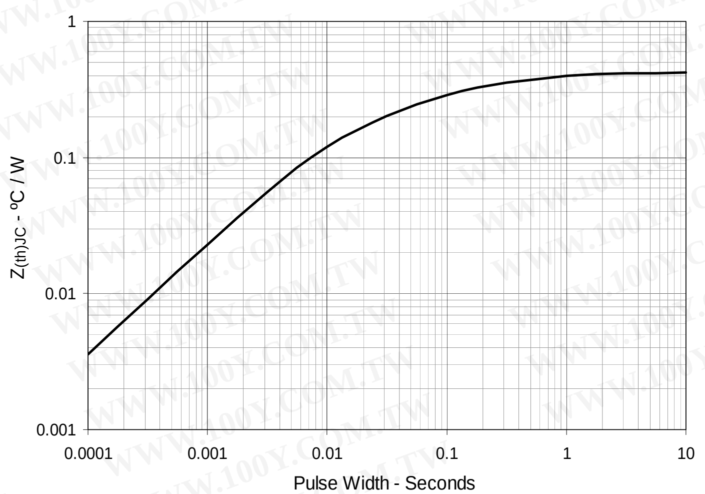



Fig. 26. Maximum Transient Thermal Impedance

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