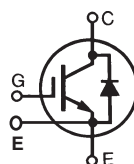


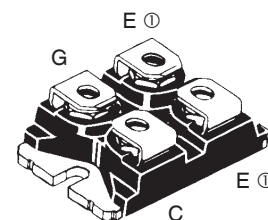
# XPT™ 650V GenX4™ IXXN110N65B4H1 w/ Sonic Diode

Extreme Light Punch Through  
IGBT for 10-30kHz Switching



$$\begin{aligned} V_{CES} &= 650V \\ I_{C110} &= 110A \\ V_{CE(sat)} &\leq 2.10V \\ t_{fi(typ)} &= 43ns \end{aligned}$$

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                           |                          |
|-------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------|
| $V_{CES}$                     | $T_J = 25^\circ\text{C to } 175^\circ\text{C}$                                              | 650                                       | V                        |
| $V_{CGR}$                     | $T_J = 25^\circ\text{C to } 175^\circ\text{C}, R_{GE} = 1M\Omega$                           | 650                                       | V                        |
| $V_{GES}$                     | Continuous                                                                                  | $\pm 20$                                  | V                        |
| $V_{GEM}$                     | Transient                                                                                   | $\pm 30$                                  | V                        |
| $I_{C25}$                     | $T_C = 25^\circ\text{C}$ (Chip Capability)                                                  | 230                                       | A                        |
| $I_{C25}$                     | Terminal Current Limit                                                                      | 200                                       | A                        |
| $I_{C110}$                    | $T_C = 110^\circ\text{C}$                                                                   | 110                                       | A                        |
| $I_{F110}$                    | $T_C = 110^\circ\text{C}$                                                                   | 70                                        | A                        |
| $I_{CM}$                      | $T_C = 25^\circ\text{C}, 1\text{ms}$                                                        | 650                                       | A                        |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V, T_{VJ} = 150^\circ\text{C}, R_G = 2\Omega$<br>Clamped Inductive Load         | $I_{CM} = 220$<br>@ $V_{CE} \leq V_{CES}$ | A                        |
| $t_{sc}$<br><b>(SCSOA)</b>    | $V_{GE} = 15V, V_{CE} = 360V, T_J = 150^\circ\text{C}$<br>$R_G = 82\Omega$ , Non Repetitive | 10                                        | $\mu\text{s}$            |
| $P_C$                         | $T_C = 25^\circ\text{C}$                                                                    | 750                                       | W                        |
| $T_J$                         |                                                                                             | -55 ... +175                              | $^\circ\text{C}$         |
| $T_{JM}$                      |                                                                                             | 175                                       | $^\circ\text{C}$         |
| $T_{stg}$                     |                                                                                             | -55 ... +175                              | $^\circ\text{C}$         |
| $V_{ISOL}$                    | 50/60Hz<br>$I_{ISOL} \leq 1\text{mA}$                                                       | $t = 1\text{min}$<br>$t = 1\text{s}$      | 2500<br>3000<br>V~<br>V~ |
| $M_d$                         | Mounting Torque<br>Terminal Connection Torque                                               | 1.5/13<br>1.3/11.5                        | Nm/lb.in.<br>Nm/lb.in.   |
| <b>Weight</b>                 |                                                                                             | 30                                        | g                        |

## Features

- International Standard Package
- miniBLOC, with Aluminium Nitride Isolation
- 2500V~ Isolation Voltage
- Anti-Parallel Sonic Diode
- Optimized for 10-30kHz 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

| Symbol        | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |              |                          |
|---------------|-----------------------------------------------------------------------------|-----------------------|--------------|--------------------------|
|               |                                                                             | Min.                  | Typ.         | Max.                     |
| $BV_{CES}$    | $I_C = 250\mu\text{A}, V_{GE} = 0V$                                         | 650                   |              | V                        |
| $V_{GE(th)}$  | $I_C = 250\mu\text{A}, V_{CE} = V_{GE}$                                     | 4.0                   |              | 6.5 V                    |
| $I_{CES}$     | $V_{CE} = V_{CES}, V_{GE} = 0V$<br>$T_J = 150^\circ\text{C}$                |                       |              | 50 $\mu\text{A}$<br>3 mA |
| $I_{GES}$     | $V_{CE} = 0V, V_{GE} = \pm 20V$                                             |                       |              | $\pm 100$ nA             |
| $V_{CE(sat)}$ | $I_C = 110A, V_{GE} = 15V$ , Note 1<br>$T_J = 150^\circ\text{C}$            |                       | 1.72<br>2.05 | V<br>V                   |

## Symbol Test Conditions

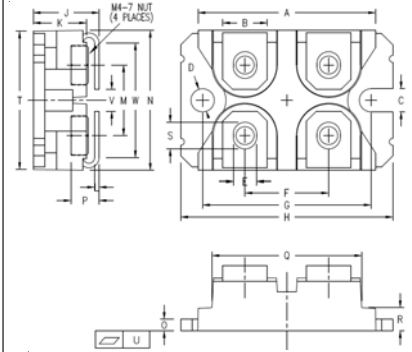
( $T_J = 25^\circ\text{C}$  Unless Otherwise Specified)

## Characteristic Values

Min. Typ. Max.

|              |                                                                                                                                         |      |      |                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|------|------|-------------------------|
| $g_{fs}$     | $I_C = 60\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$                                                                                  | 30   | 52   | S                       |
| $C_{ies}$    | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$                                                                              |      | 3650 | pF                      |
| $C_{oes}$    |                                                                                                                                         |      | 470  | pF                      |
| $C_{res}$    |                                                                                                                                         |      | 80   | pF                      |
| $Q_g$        | $I_C = 110\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$                                                                    |      | 183  | nC                      |
| $Q_{ge}$     |                                                                                                                                         |      | 32   | nC                      |
| $Q_{gc}$     |                                                                                                                                         |      | 83   | nC                      |
| $t_{d(on)}$  | Inductive load, $T_J = 25^\circ\text{C}$<br>$I_C = 55\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 400\text{V}, R_G = 2\Omega$<br>Note 2  |      | 26   | ns                      |
| $t_{ri}$     |                                                                                                                                         |      | 40   | ns                      |
| $E_{on}$     |                                                                                                                                         |      | 2.20 | mJ                      |
| $t_{d(off)}$ |                                                                                                                                         |      | 146  | ns                      |
| $t_{fi}$     |                                                                                                                                         |      | 43   | ns                      |
| $E_{off}$    |                                                                                                                                         |      | 1.05 | mJ                      |
| $t_{d(on)}$  | Inductive load, $T_J = 150^\circ\text{C}$<br>$I_C = 55\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 400\text{V}, R_G = 2\Omega$<br>Note 2 |      | 25   | ns                      |
| $t_{ri}$     |                                                                                                                                         |      | 40   | ns                      |
| $E_{on}$     |                                                                                                                                         |      | 3.00 | mJ                      |
| $t_{d(off)}$ |                                                                                                                                         |      | 140  | ns                      |
| $t_{fi}$     |                                                                                                                                         |      | 110  | ns                      |
| $E_{off}$    |                                                                                                                                         |      | 2.16 | mJ                      |
| $R_{thJC}$   |                                                                                                                                         |      |      | 0.20 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                         | 0.05 |      | $^\circ\text{C/W}$      |

## SOT-227B miniBLOC (IXXN)



| 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 Sonic Diode (FRD)

## Symbol Test Conditions

( $T_J = 25^\circ\text{C}$  Unless Otherwise Specified)

## Characteristic Values

Min. Typ. Max.

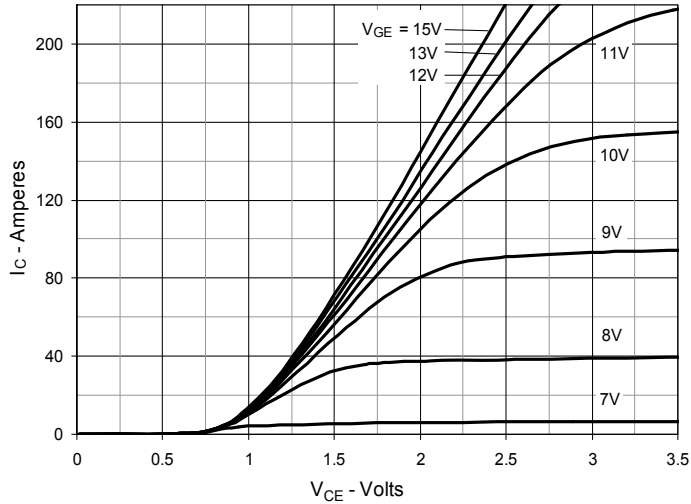
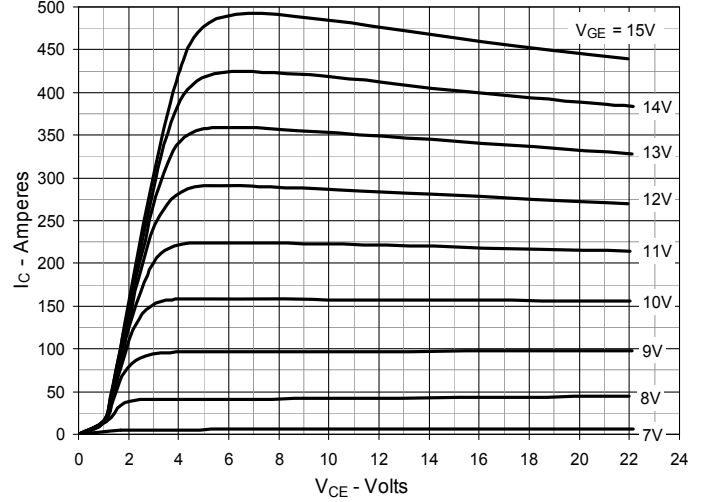
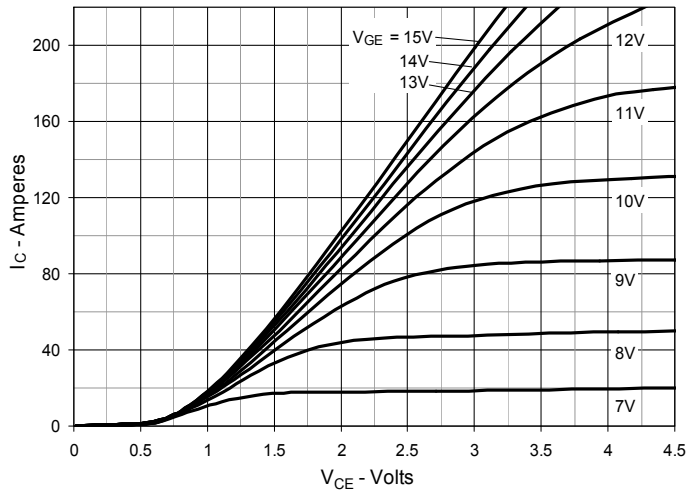
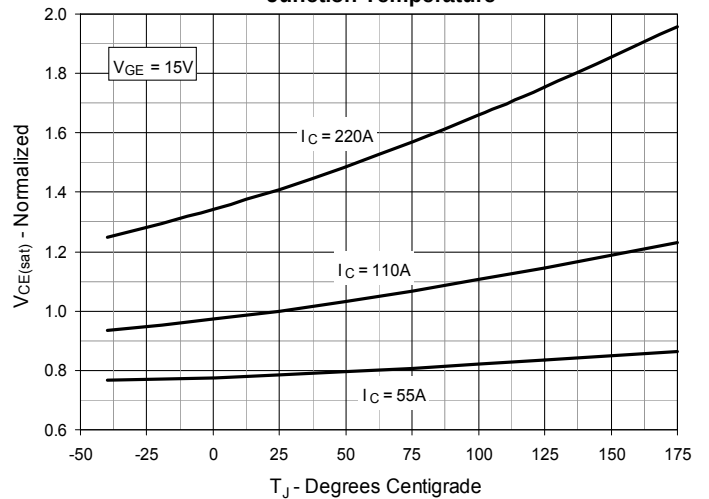
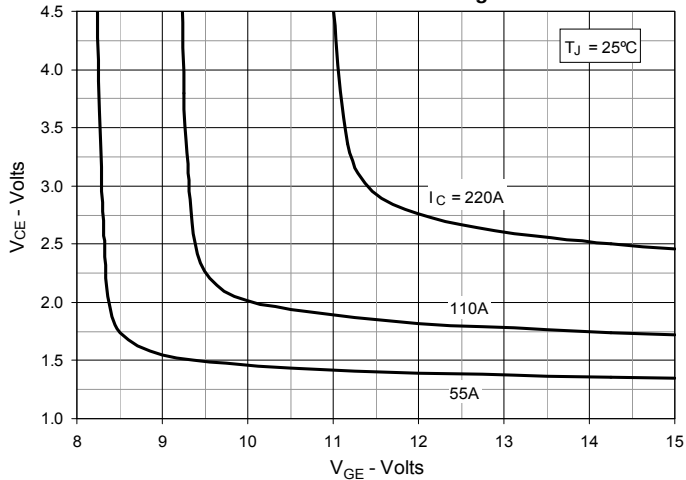
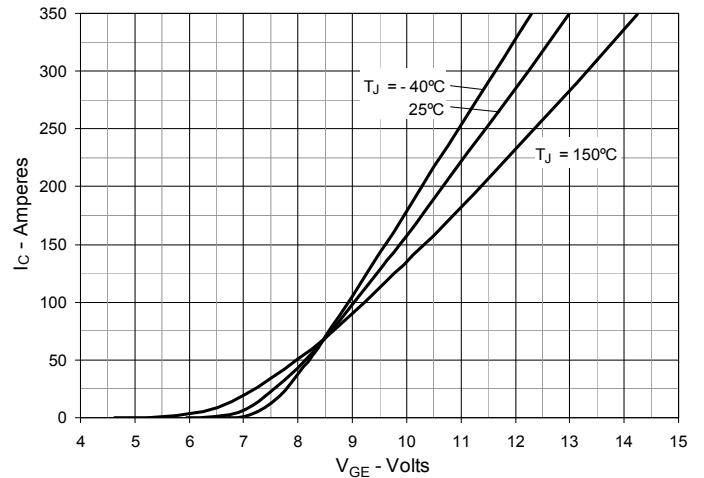
|            |                                                                                                      |                           |     |      |                    |
|------------|------------------------------------------------------------------------------------------------------|---------------------------|-----|------|--------------------|
| $V_F$      | $I_F = 100\text{A}, V_{GE} = 0\text{V}, \text{Note 1}$                                               |                           | 1.7 | 2.3  | V                  |
|            | $T_J = 150^\circ\text{C}$                                                                            |                           | 1.8 |      | V                  |
| $I_{RM}$   | $I_F = 100\text{A}, V_{GE} = 0\text{V},$<br>$-di_F/dt = 1500\text{A}/\mu\text{s}, V_R = 300\text{V}$ | $T_J = 150^\circ\text{C}$ | 95  |      | A                  |
| $t_{rr}$   |                                                                                                      |                           | 100 |      | ns                 |
| $R_{thJC}$ |                                                                                                      |                           |     | 0.42 | $^\circ\text{C/W}$ |

## Notes:

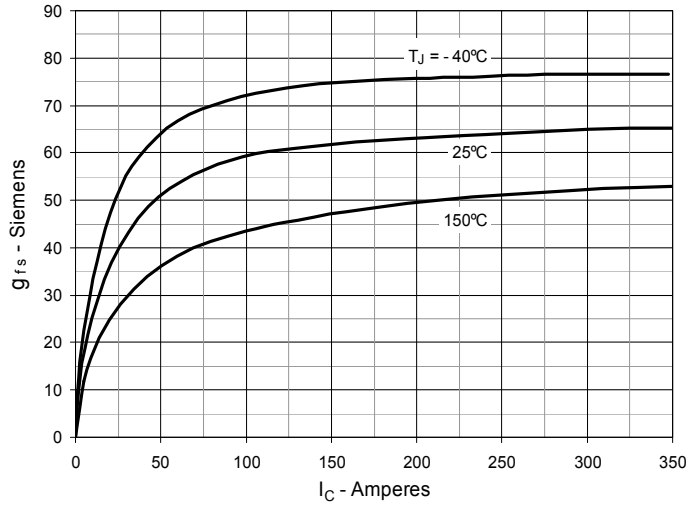
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Switching times & energy losses may increase for higher  $V_{CE}(\text{clamp})$ ,  $T_J$  or  $R_G$ .

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

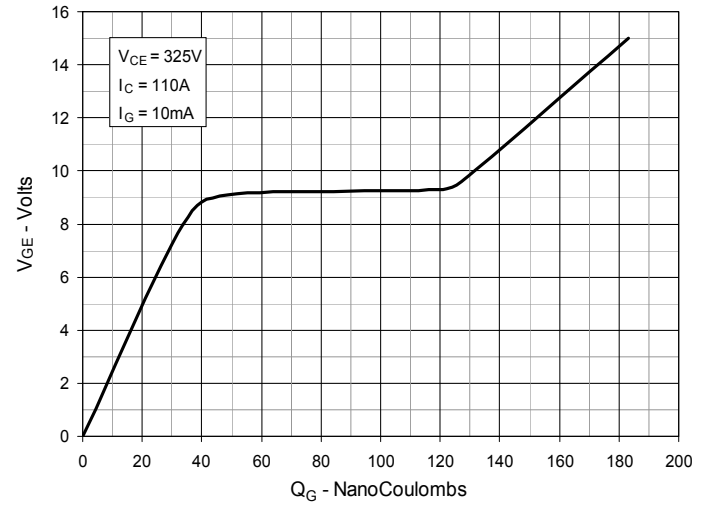
IXYS MOSFETs and IGBTs are covered 4,835,592 4,931,844 5,049,961 5,237,481 6,162,665 6,404,065 B1 6,683,344 6,727,585 7,005,734 B2 7,157,338B2  
by one or more of the following U.S. patents: 4,860,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405 B2 6,759,692 7,063,975 B2  
4,881,106 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**


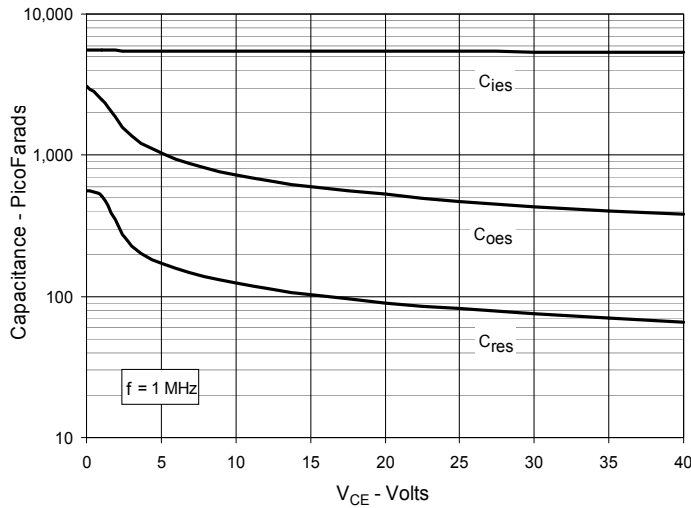
**Fig. 7. Transconductance**



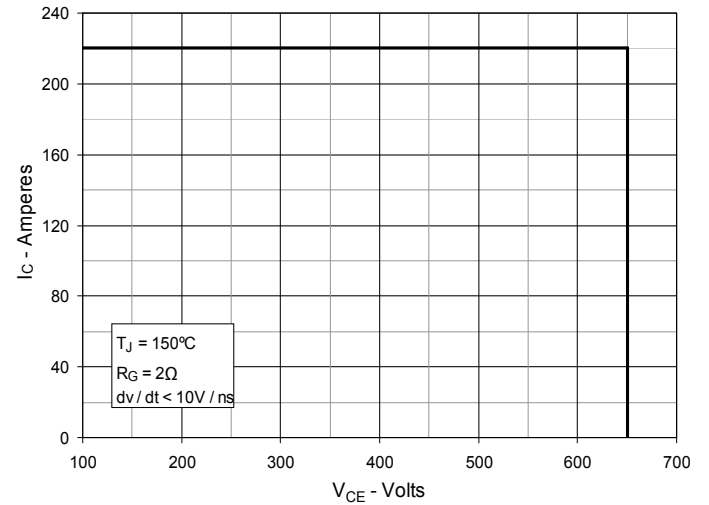
**Fig. 8. Gate Charge**



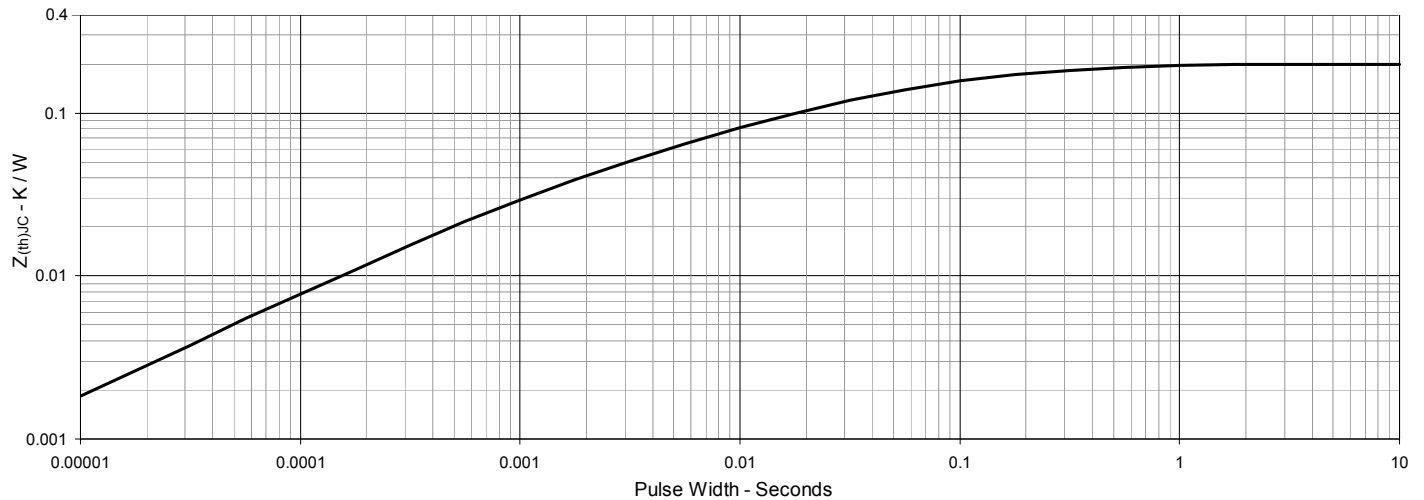
**Fig. 9. Capacitance**



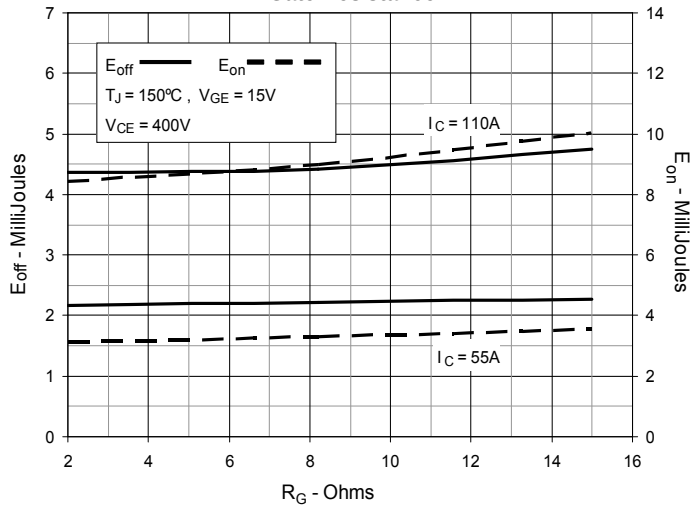
**Fig. 10. Reverse-Bias Safe Operating Area**



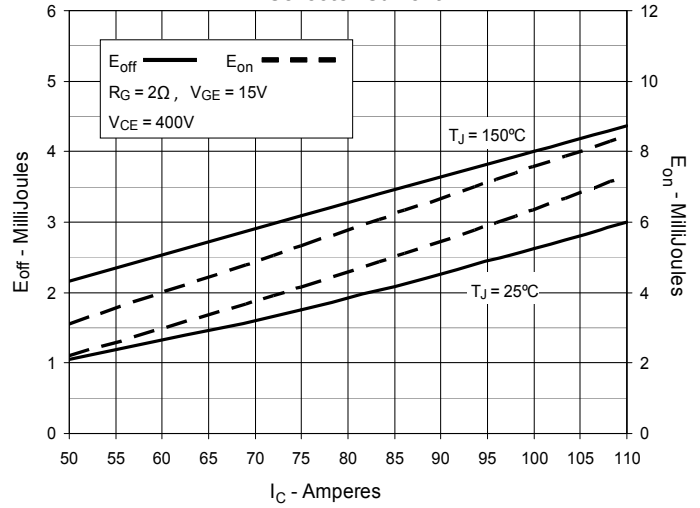
**Fig. 11. Maximum Transient thermal Impedance (IGBT)**



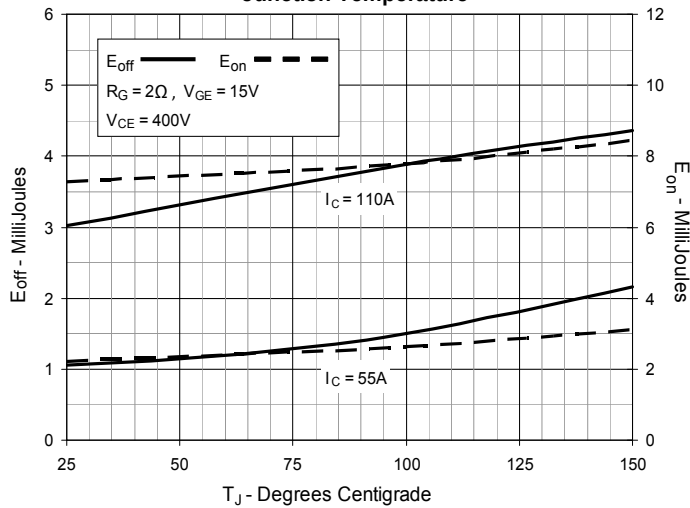
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



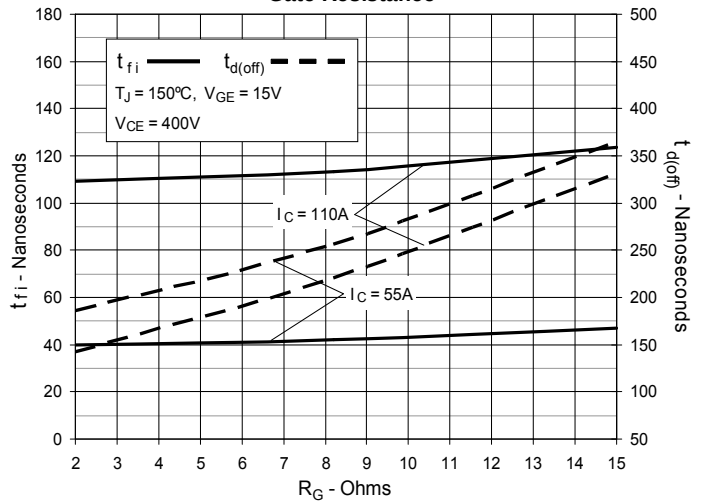
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



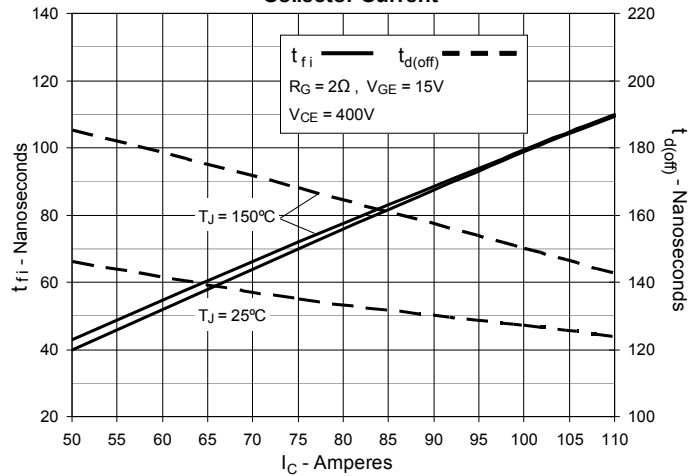
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



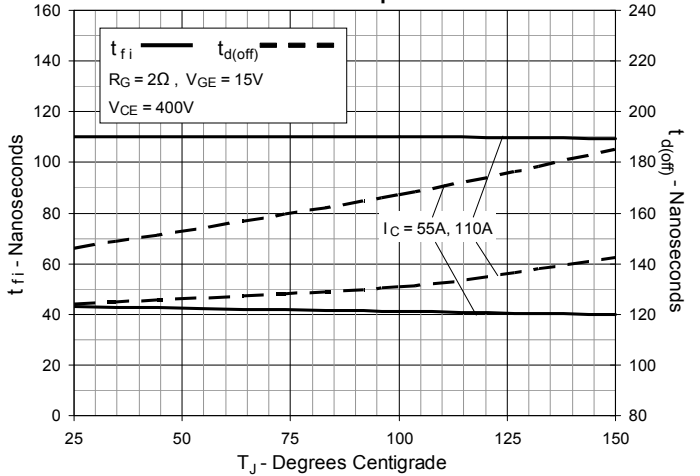
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



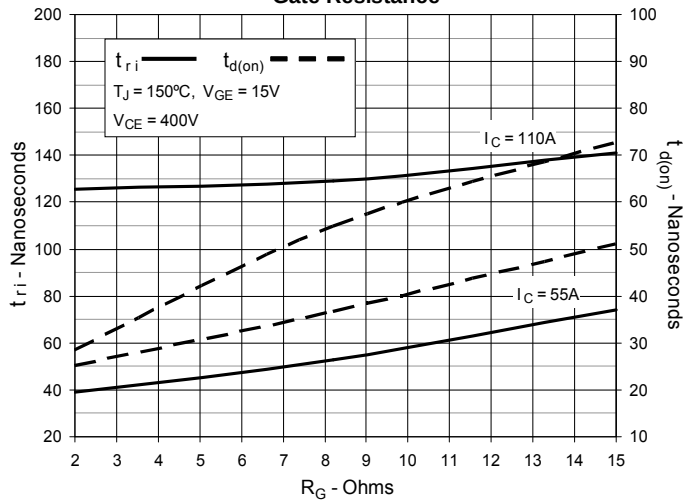
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



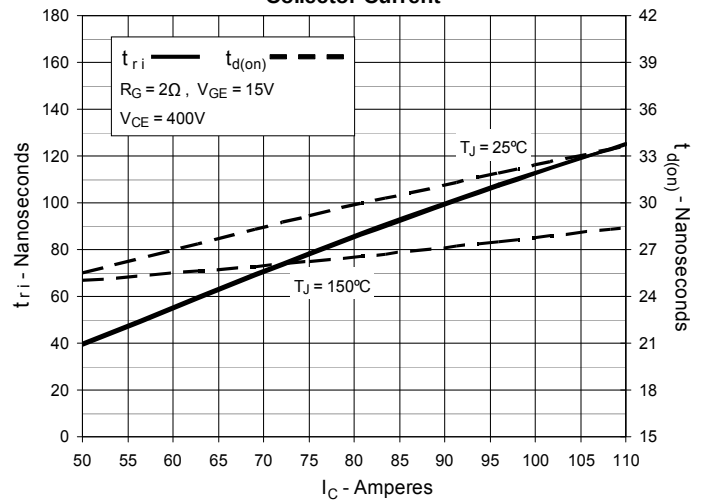
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



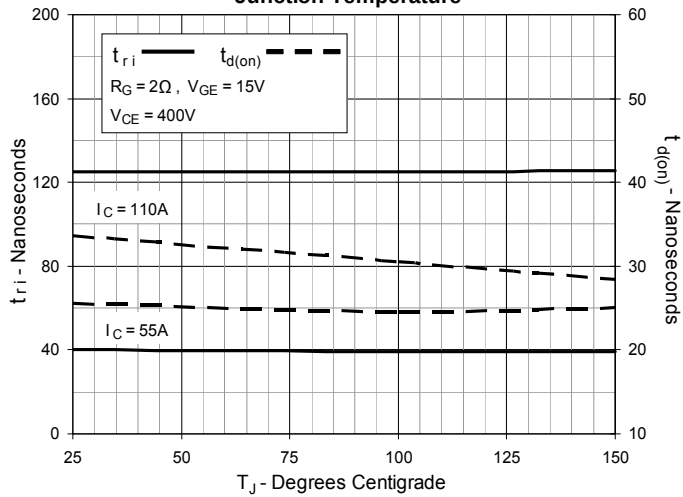
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



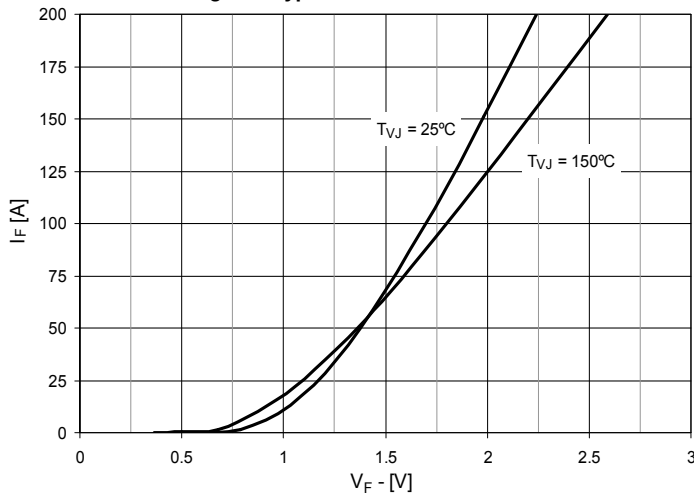
**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**



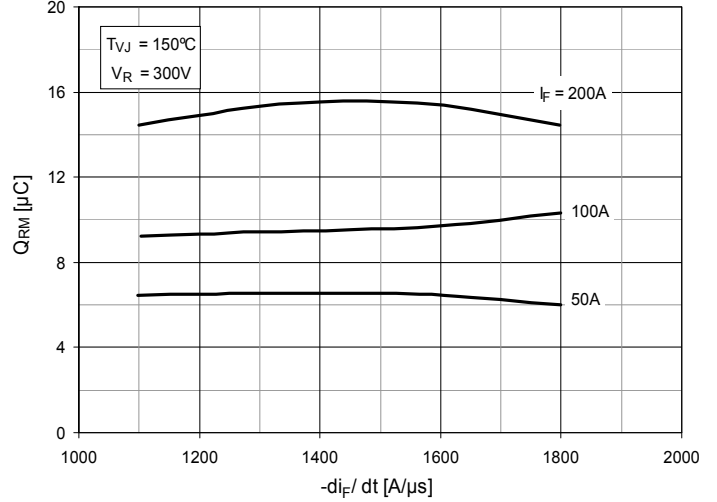
**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**



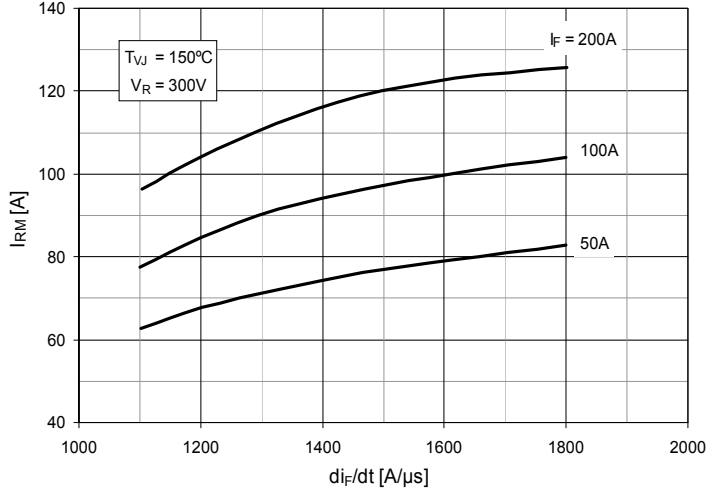
**Fig. 21. Typ. Forward characteristics**



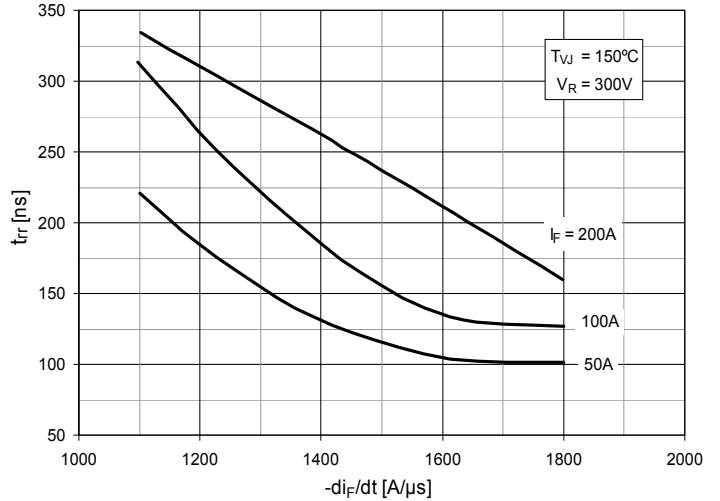
**Fig. 22. Typ. Reverse Recovery Charge  $Q_{rr}$  vs.  $-di_F/dt$**



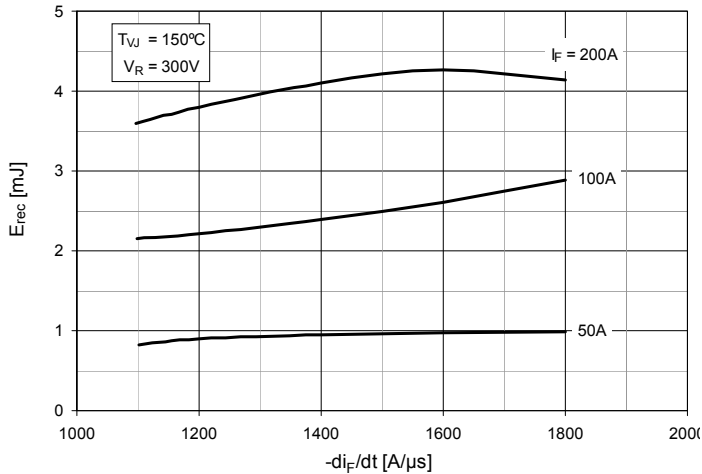
**Fig. 23. Typ. Peak Reverse Current  $I_{RM}$  vs.  $-di_F/dt$**



**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 ( Diode )**

