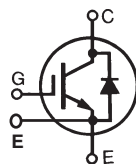


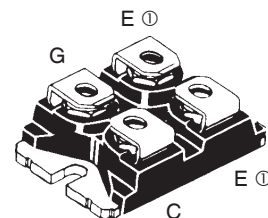
# XPT™ 650V GenX4™ IXXN110N65C4H1 w/ Sonic Diode

Extreme Light Punch Through  
IGBT for 20-60kHz Switching



$$\begin{aligned} V_{CES} &= 650V \\ I_{C110} &= 110A \\ V_{CE(sat)} &\leq 2.35V \\ t_{fi(typ)} &= 35ns \end{aligned}$$

SOT-227B, miniBLOC  
E153432



G = Gate, C = Collector, E = Emitter  
Ⓢ 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)  | 210                                       | 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                        |
| $I_{CM}$                      | $T_C = 25^\circ\text{C}, 1\text{ms}$  | 670                                       | 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 20-60kHz Switching
- Square RBSOA
- Short Circuit Capability
- High Current Handling Capability

## Advantages

- High Power Density
- Low Gate Drive Requirement

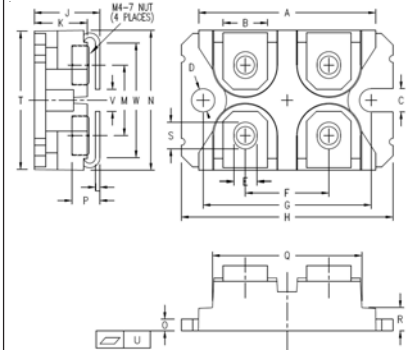
## Applications

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

| Symbol        | Test Conditions<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                        |
| $V_{GE(th)}$  | $I_C = 4\text{mA}, V_{CE} = V_{GE}$   | 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             |
| $V_{CE(sat)}$ | $I_C = 110\text{A}, V_{GE} = 15V$ , Note 1<br>$T_J = 150^\circ\text{C}$     | 2.06<br>2.50          |      | 2.35 V<br>V              |

| Symbol Test Conditions<br>( $T_J = 25^\circ\text{C}$ 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                  |
| $C_{ies}$  | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$  |                       | 5500 | pF                 |
| $C_{oes}$  |   |                       | 440  | pF                 |
| $C_{res}$  |   |                       | 80   | pF                 |
| $Q_{g(on)}$  | $I_C = 110\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$  |                       | 167  | nC                 |
| $Q_{ge}$   |   |                       | 44   | nC                 |
| $Q_{gc}$   |   |                       | 63   | nC                 |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 55\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 400\text{V}, R_G = 2\Omega$<br>Note 2  |                       | 30   | ns                 |
| $t_{ri}$   |   |                       | 45   | ns                 |
| $E_{on}$   |   |                       | 2.50 | mJ                 |
| $t_{d(off)}$   |   |                       | 110  | ns                 |
| $t_{fi}$   |   |                       | 35   | ns                 |
| $E_{off}$  |   |                       | 0.63 | 1.05 mJ            |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 150^\circ\text{C}</math></b><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                 |
| $t_{ri}$   |   |                       | 45   | ns                 |
| $E_{on}$   |   |                       | 3.55 | mJ                 |
| $t_{d(off)}$   |   |                       | 120  | ns                 |
| $t_{fi}$   |   |                       | 40   | ns                 |
| $E_{off}$  |   |                       | 0.90 | 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<br>( $T_J = 25^\circ\text{C}$ 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>$-di_F/dt = 1500\text{A}/\mu\text{s}, V_R = 300\text{V}$ |                       | 95   | A                  |
| $t_{rr}$   |  |                       | 100  | ns                 |
| $R_{thJC}$   |  |                       | 0.42 | $^\circ\text{C/W}$ |

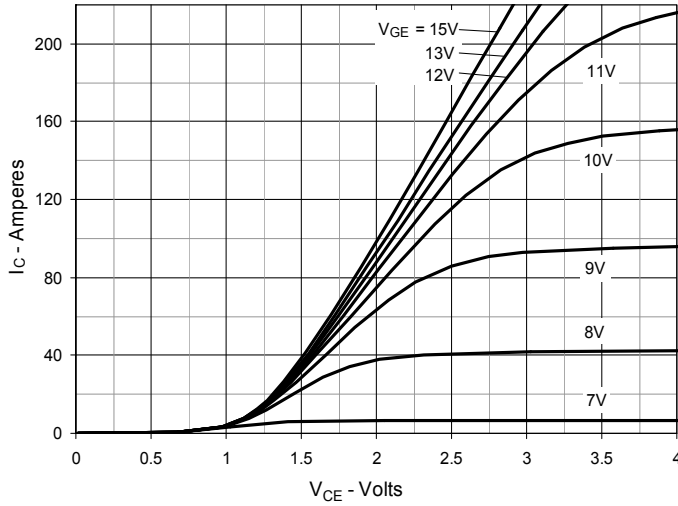
#### Notes:

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  $R_G$ .

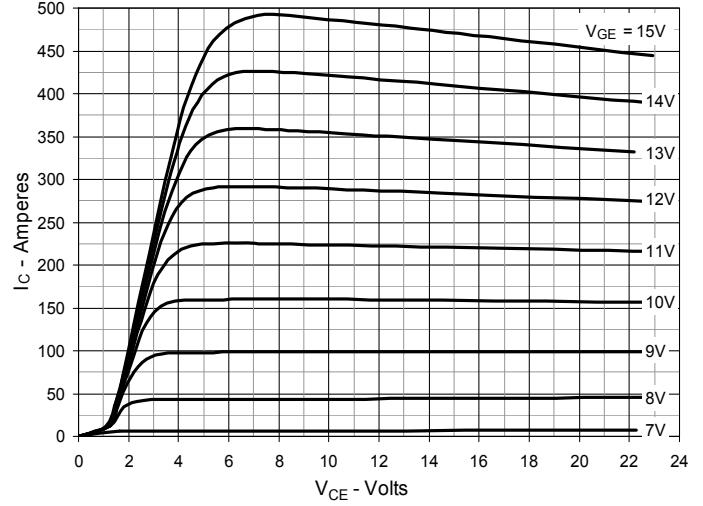
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|  |           |           |           |           |              |              |              |              |              |             |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| IXYS MOSFETs and IGBTs are covered 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    |             |

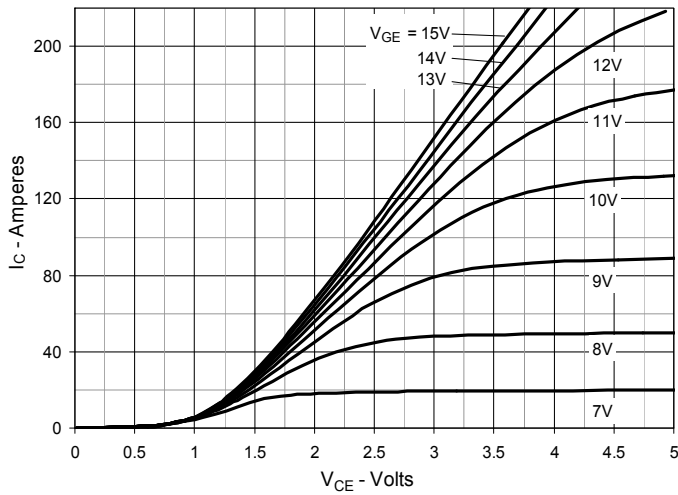
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



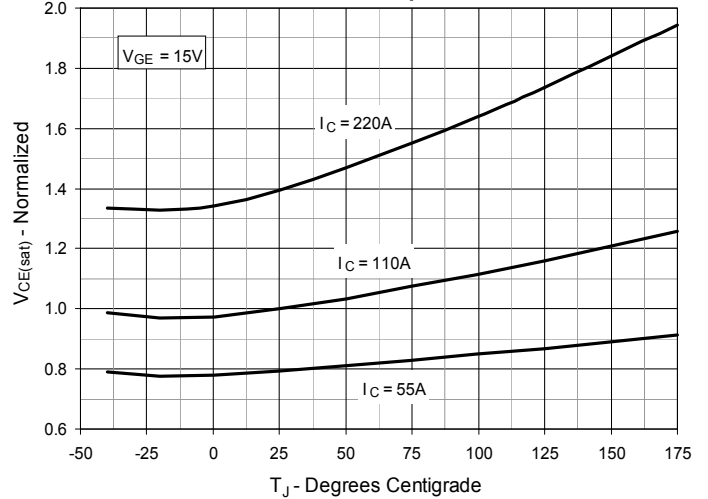
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



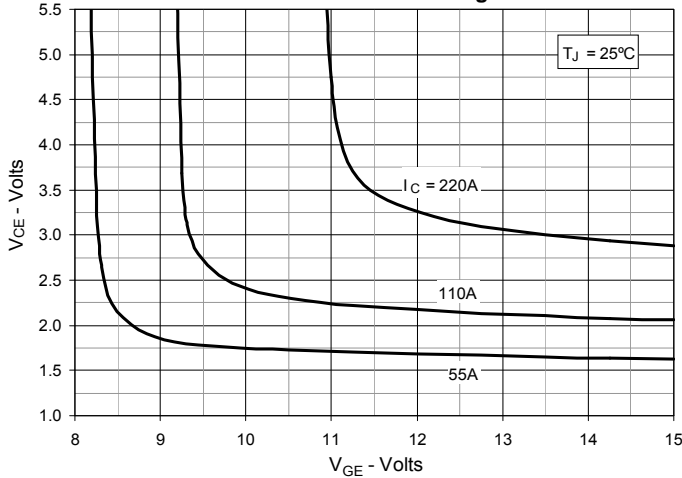
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



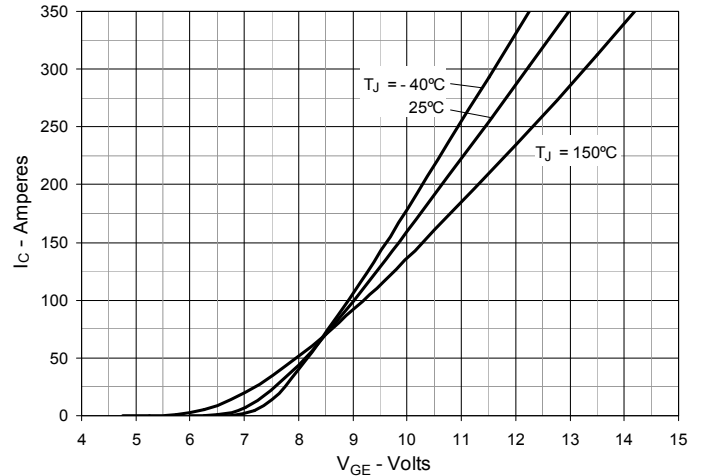
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



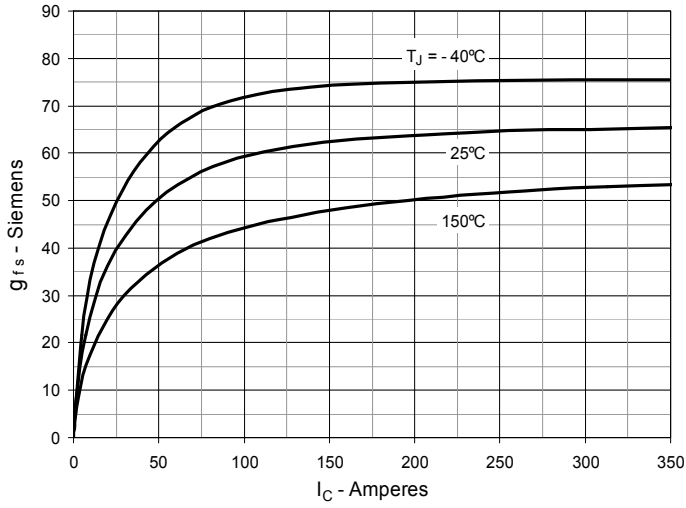
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



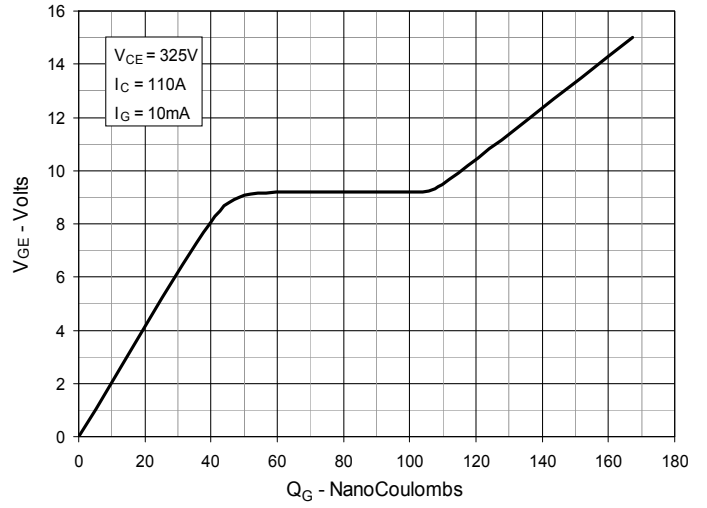
**Fig. 6. Input Admittance**



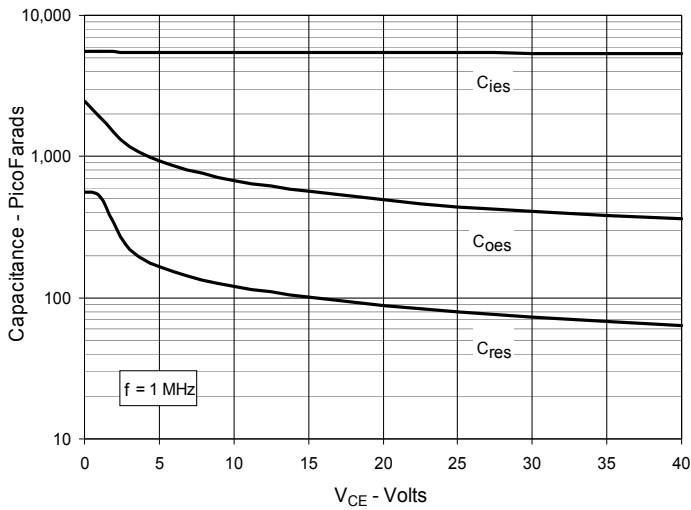
**Fig. 7. Transconductance**



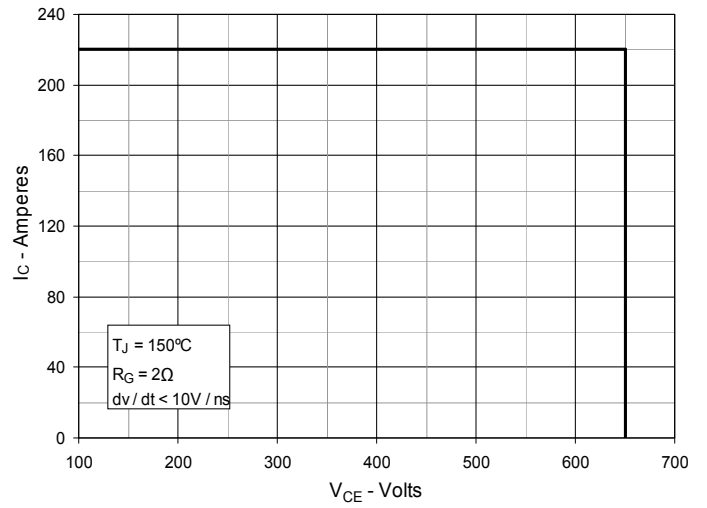
**Fig. 8. Gate Charge**



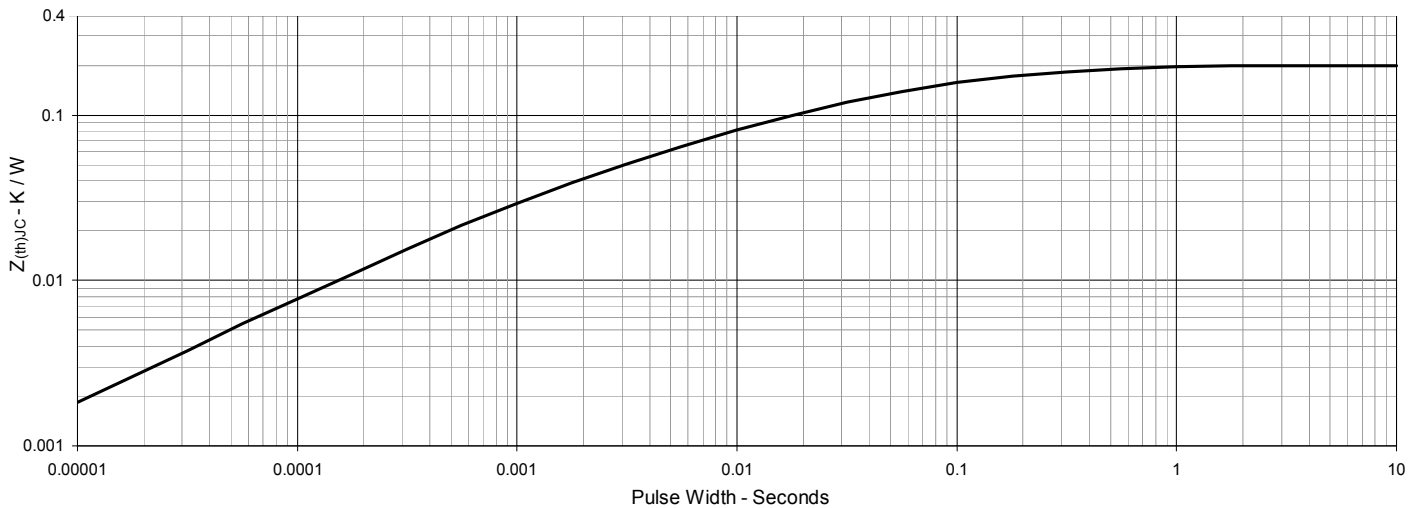
**Fig. 9. Capacitance**

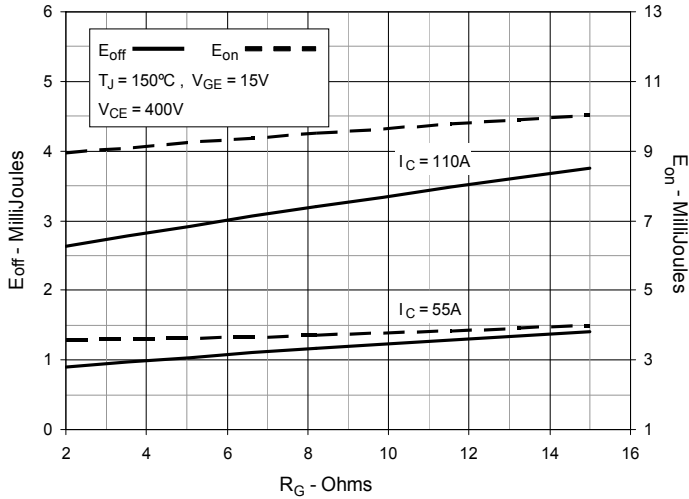
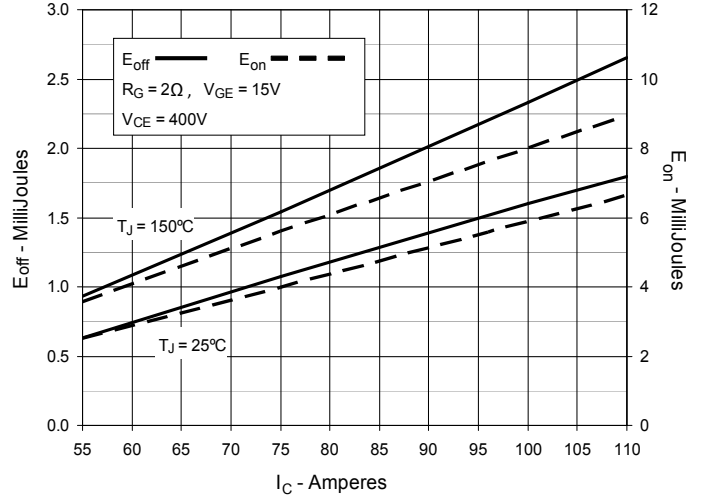
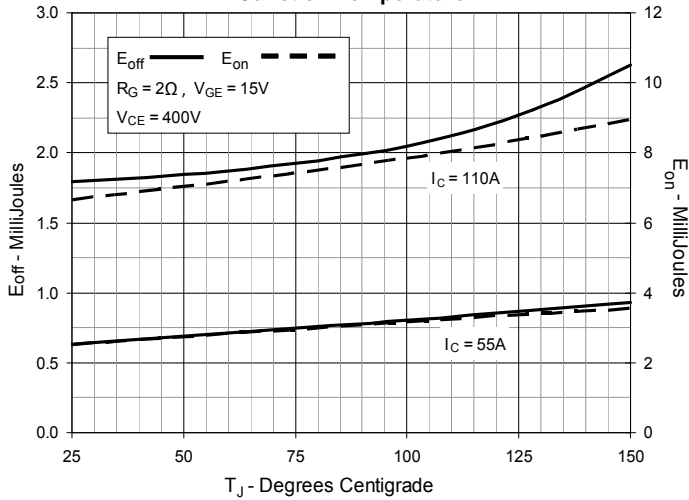
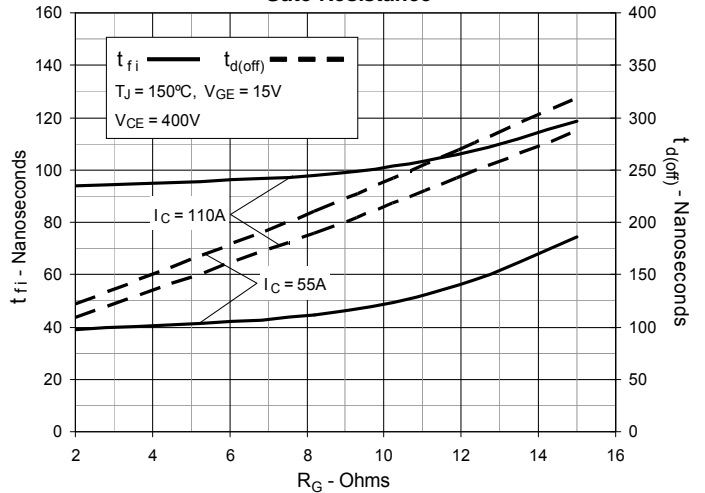
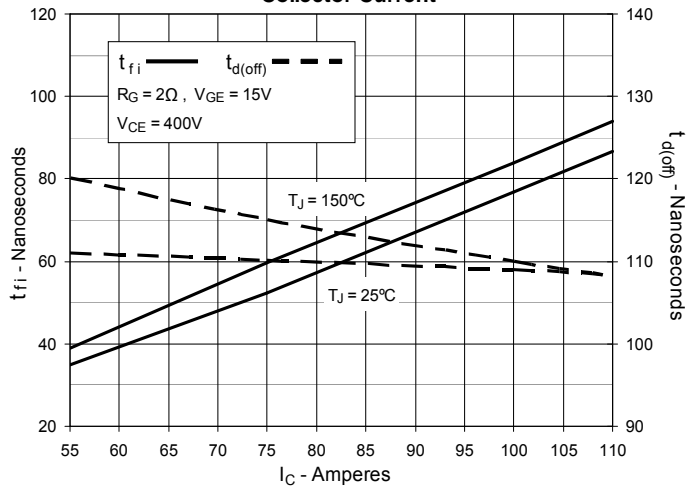
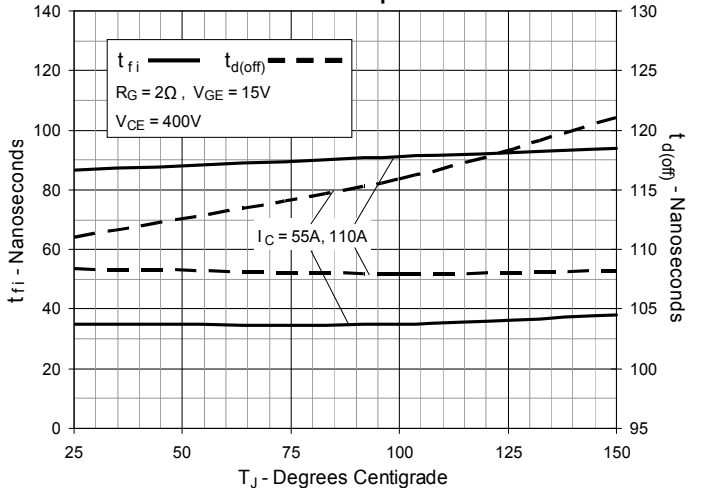


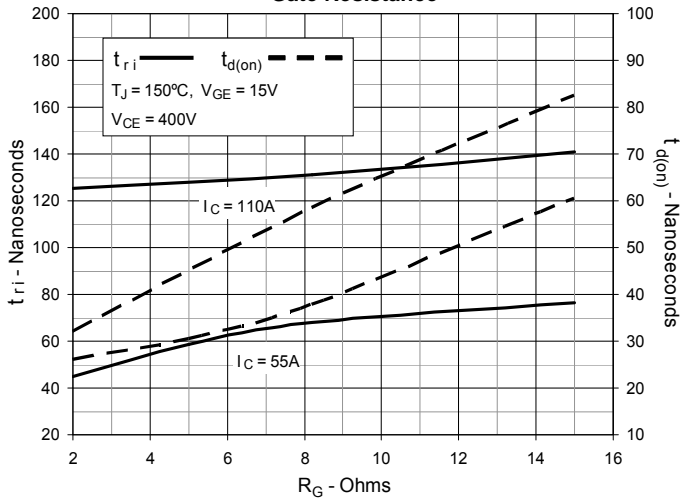
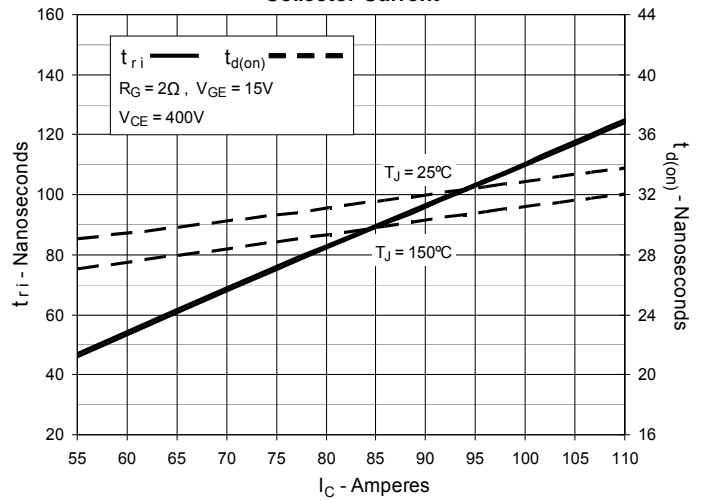
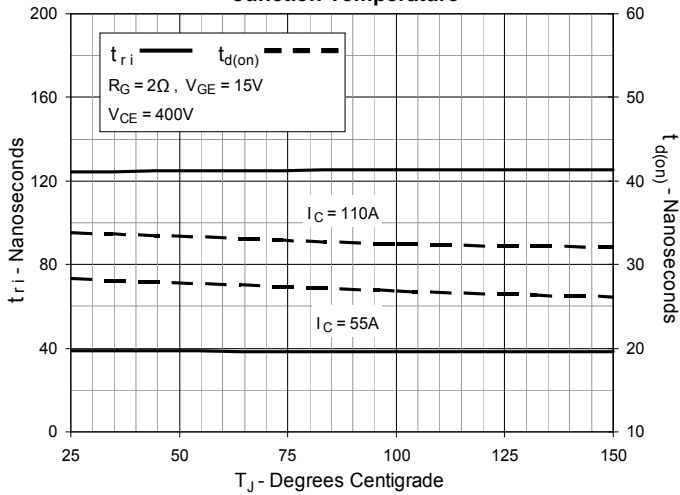
**Fig. 10. Reverse-Bias Safe Operating Area**



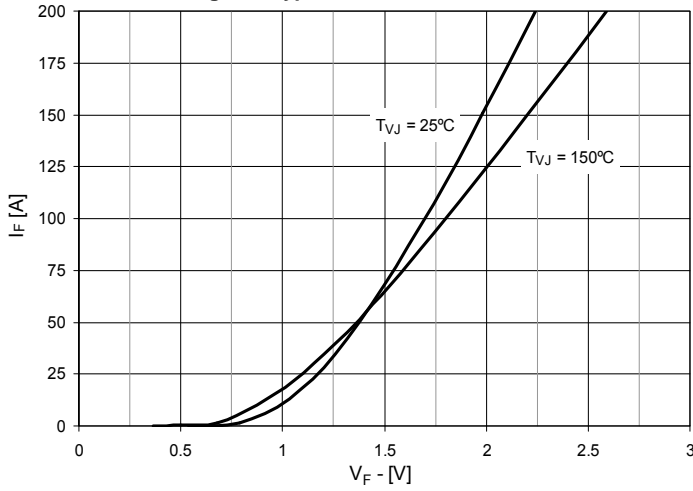
**Fig. 11. Maximum Transient thermal Impedance (IGBT)**



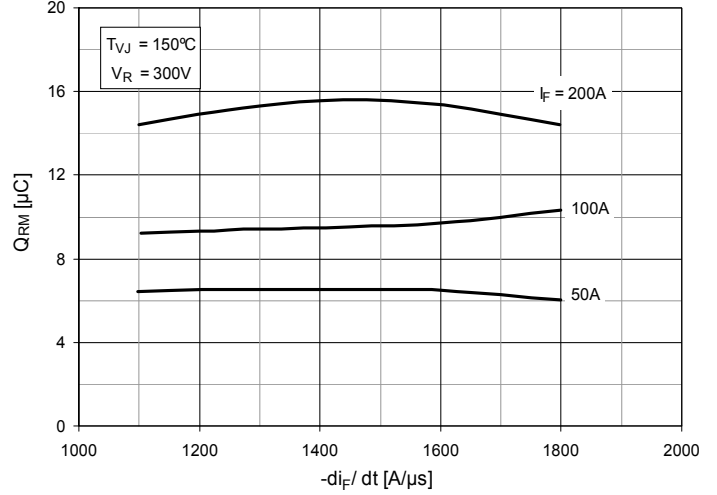
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**

**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**


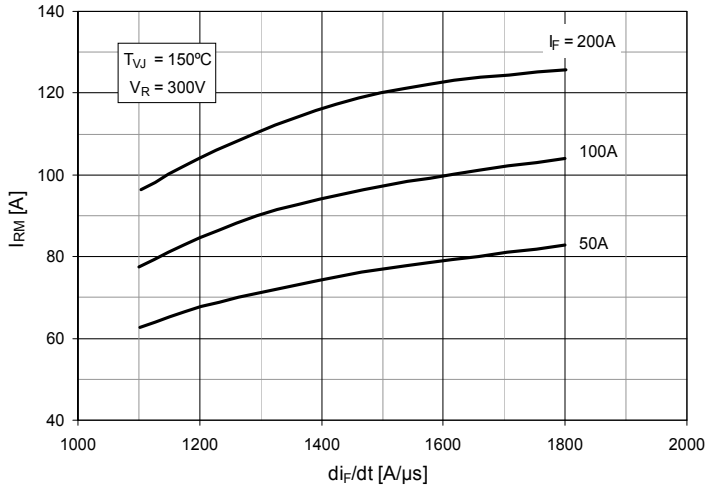
**Fig. 21. Typ. Forward characteristics**



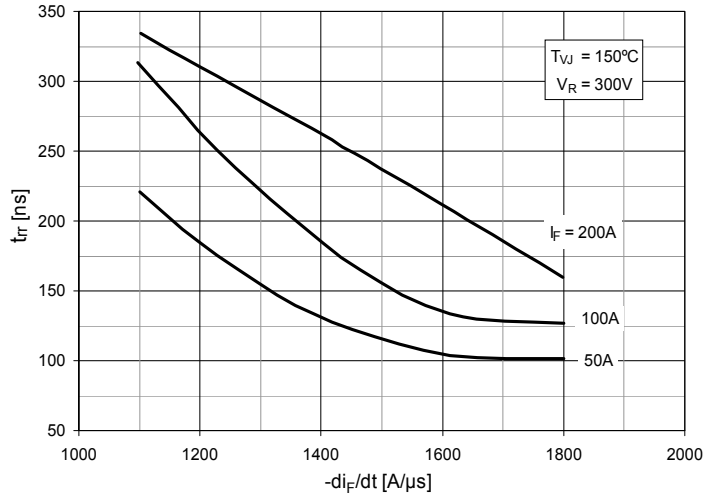
**Fig. 22. Typ. Reverse Recovery Charge  $Q_{rr}$  vs.  $-di_F/dt$**



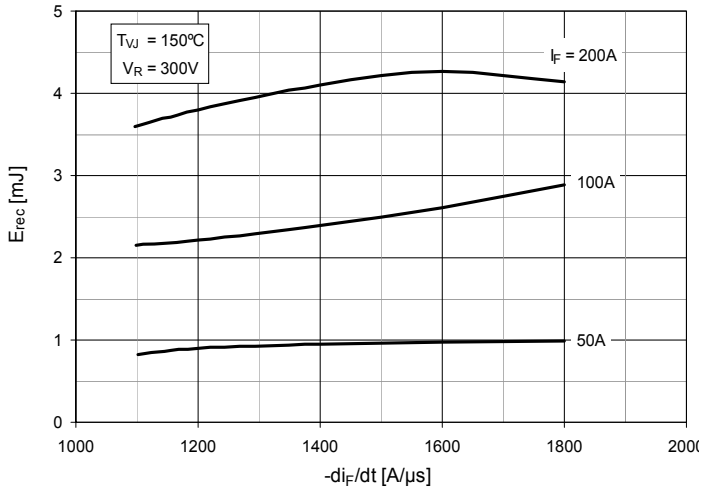
**Fig. 23. Typ. Peak Reverse Current  $I_{RM}$  vs.  $-di_F/dt$**



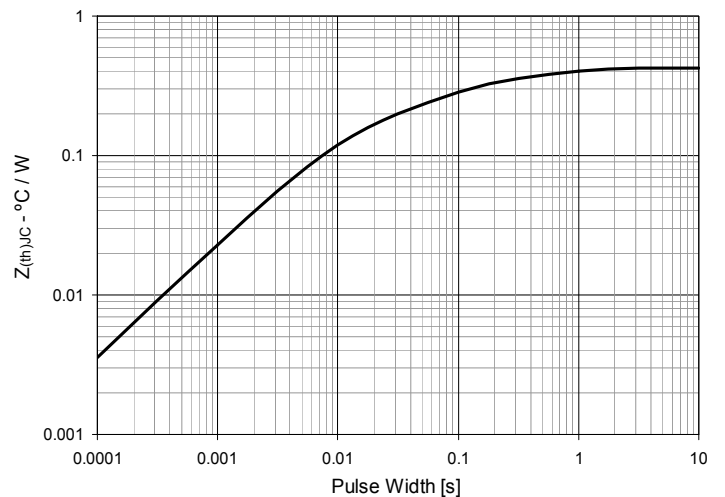
**Fig. 24. Typ. Recovery Time  $t_{rr}$  vs.  $-di_F/dt$**



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



**Fig. 26. Maximum Transient Thermal Impedance ( Diode )**





---

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).