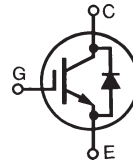


# GenX3™ 600V IGBT with Diode

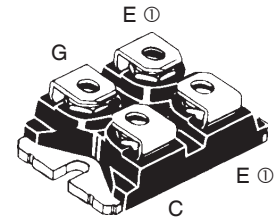
## IXGN72N60C3H1

High-Speed Low-V<sub>sat</sub> PT  
IGBTs 40-100 kHz Switching



$$\begin{aligned} V_{CES} &= 600V \\ I_{C110} &= 52A \\ V_{CE(sat)} &\leq 2.50V \\ t_{fi(typ)} &= 55ns \end{aligned}$$

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 $150^\circ\text{C}$                       | 600                     | V                |
| $V_{CGR}$      | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GE} = 1M\Omega$ | 600                     | V                |
| $V_{GES}$      | Continuous                                                            | $\pm 20$                | V                |
| $V_{GEM}$      | Transient                                                             | $\pm 30$                | V                |
| $I_{C25}$      | $T_C = 25^\circ\text{C}$                                              | 78                      | A                |
| $I_{C110}$     | $T_C = 110^\circ\text{C}$                                             | 52                      | A                |
| $I_{CM}$       | $T_C = 25^\circ\text{C}$ , 1ms                                        | 360                     | A                |
| $I_A$          | $T_C = 25^\circ\text{C}$                                              | 50                      | A                |
| $E_{AS}$       | $T_C = 25^\circ\text{C}$                                              | 500                     | mJ               |
| <b>SSOA</b>    | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 2\Omega$       | $I_{CM} = 150$          | A                |
| <b>(RBSOA)</b> | Clamped Inductive Load                                                | @ $V_{CE} \leq V_{CES}$ |                  |
| $P_C$          | $T_C = 25^\circ\text{C}$                                              | 360                     | W                |
| $T_J$          |                                                                       | -55 ... +150            | $^\circ\text{C}$ |
| $T_{JM}$       |                                                                       | 150                     | $^\circ\text{C}$ |
| $T_{stg}$      |                                                                       | -55 ... +150            | $^\circ\text{C}$ |
| $V_{ISOL}$     | 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.        |
| <b>Weight</b>  |                                                                       | 30                      | g                |

### Features

- Optimized for Low Switching Losses
- Square RBSOA
- Aluminium Nitride Isolation
- High Power Dissipation
- Isolation Voltage 3000V~
- Avalanche Rated
- Anti-Parallel Ultra Fast Diode
- International Standard Package

### Advantages

- High Power Density
- Low Gate Drive Requirement

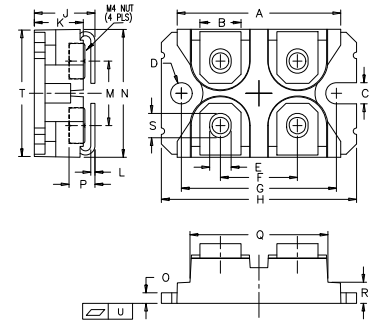
### Applications

- 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.                |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                        | 3.0                   |      | 5.5 V               |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |      | 250 $\mu A$<br>3 mA |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                          |                       |      | $\pm 100$ nA        |
| $V_{CE(sat)}$ | $I_C = 50A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ\text{C}$          | 2.10<br>1.65          | 2.50 | V                   |

| Symbol       | Test Conditions                                                                                             | Characteristic Values |      |                  |
|--------------|-------------------------------------------------------------------------------------------------------------|-----------------------|------|------------------|
|              |                                                                                                             | Min.                  | Typ. | Max.             |
| $g_{fs}$     | $I_C = 50A, V_{CE} = 10V$ , Note 1                                                                          | 33                    | 55   | S                |
| $C_{ies}$    | $V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$                                                                       |                       | 4780 | pF               |
| $C_{oes}$    |                                                                                                             |                       | 330  | pF               |
| $C_{res}$    |                                                                                                             |                       | 117  | pF               |
| $Q_g$        | $I_C = 50A, V_{GE} = 15V, V_{CE} = 0.5 \cdot V_{CES}$                                                       |                       | 174  | nC               |
| $Q_{ge}$     |                                                                                                             |                       | 33   | nC               |
| $Q_{gc}$     |                                                                                                             |                       | 72   | nC               |
| $t_{d(on)}$  | Inductive load, $T_J = 25^\circ C$<br>$I_C = 50A, V_{GE} = 15V$<br>$V_{CE} = 480V, R_G = 2\Omega$ , Note 2  |                       | 27   | ns               |
| $t_{ri}$     |                                                                                                             |                       | 37   | ns               |
| $E_{on}$     |                                                                                                             |                       | 1.03 | mJ               |
| $t_{d(off)}$ |                                                                                                             |                       | 77   | ns               |
| $t_{fi}$     |                                                                                                             |                       | 55   | ns               |
| $E_{off}$    |                                                                                                             |                       | 0.48 | mJ               |
| $t_{d(on)}$  | Inductive load, $T_J = 125^\circ C$<br>$I_C = 50A, V_{GE} = 15V$<br>$V_{CE} = 480V, R_G = 2\Omega$ , Note 2 |                       | 26   | ns               |
| $t_{ri}$     |                                                                                                             |                       | 36   | ns               |
| $E_{on}$     |                                                                                                             |                       | 1.48 | mJ               |
| $t_{d(off)}$ |                                                                                                             |                       | 120  | ns               |
| $t_{fi}$     |                                                                                                             |                       | 124  | ns               |
| $E_{off}$    |                                                                                                             |                       | 0.93 | mJ               |
| $R_{thJC}$   |                                                                                                             |                       | 0.05 | $0.35^\circ C/W$ |
| $R_{thCS}$   |                                                                                                             |                       |      | $^\circ C/W$     |

## SOT-227B miniBLOC



M4 screws (4x) supplied

| 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   | 1.496  | 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 Diode (FRED)

| Symbol     | Test Conditions                                                                          | Characteristic Values |            |                   |
|------------|------------------------------------------------------------------------------------------|-----------------------|------------|-------------------|
|            |                                                                                          | Min.                  | Typ.       | Max.              |
| $V_F$      | $I_F = 60A, V_{GE} = 0V$ , Note 1<br>$T_J = 150^\circ C$                                 |                       | 1.6<br>1.4 | 2.0<br>V<br>V     |
| $I_{RM}$   | $I_F = 60A, V_{GE} = 0V$ ,<br>$-di_F/dt = 200A/\mu s, V_R = 300V$<br>$T_J = 100^\circ C$ |                       | 8.3        | A                 |
| $t_{rr}$   |                                                                                          |                       | 140        | ns                |
| $R_{thJC}$ |                                                                                          |                       |            | 0.42 $^\circ C/W$ |

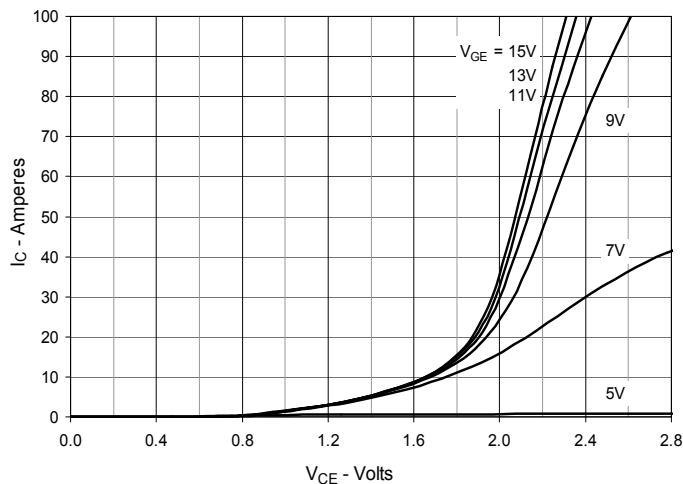
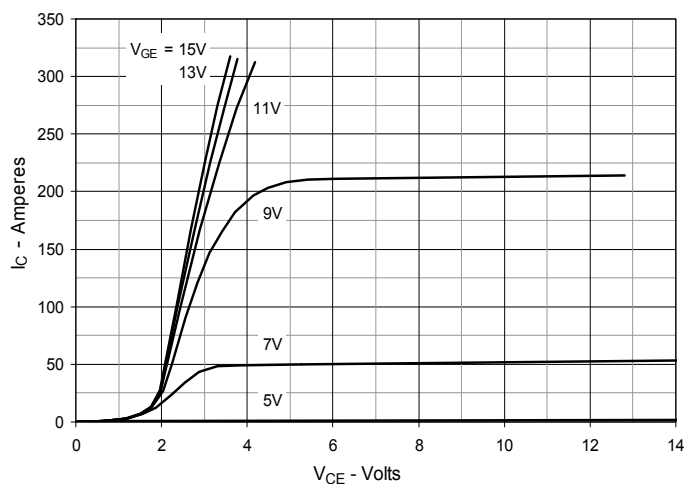
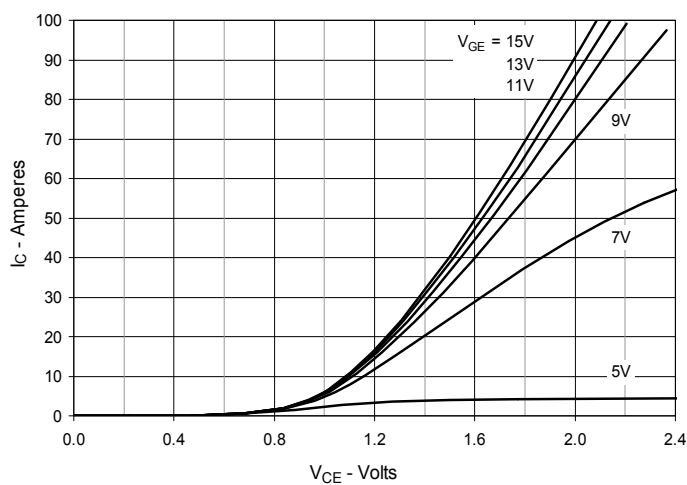
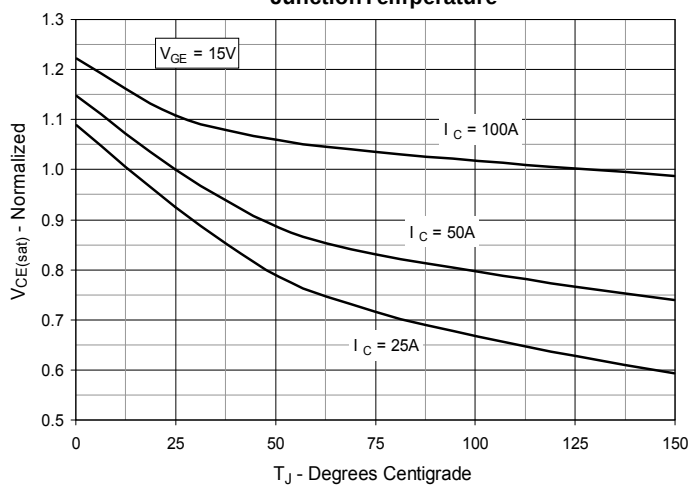
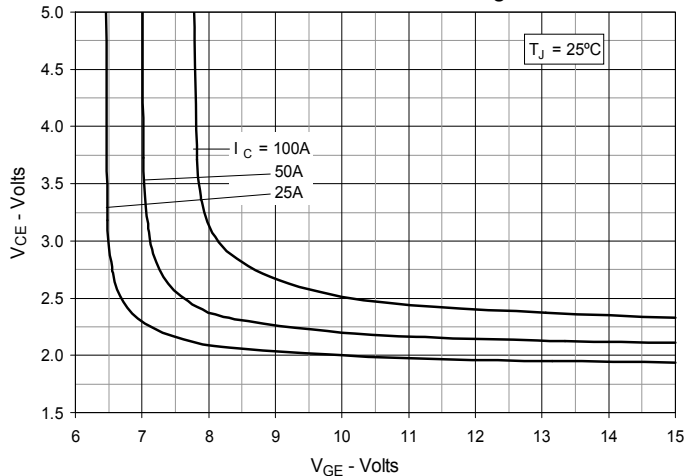
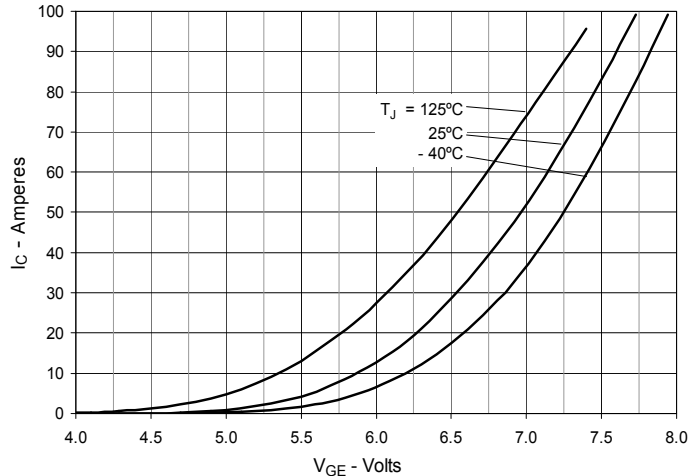
## Notes:

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

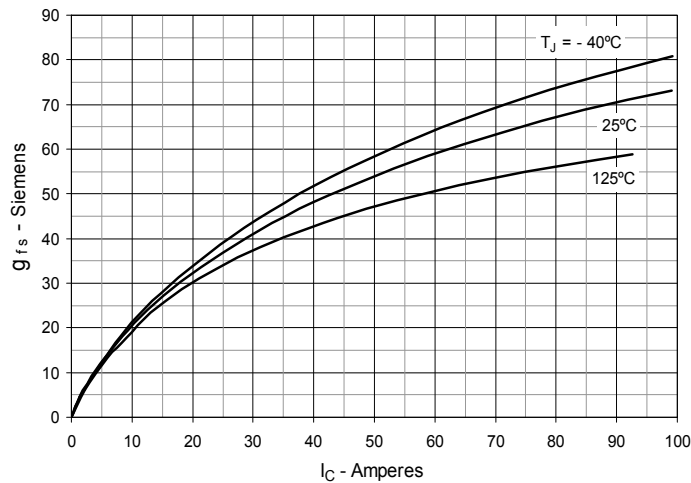
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

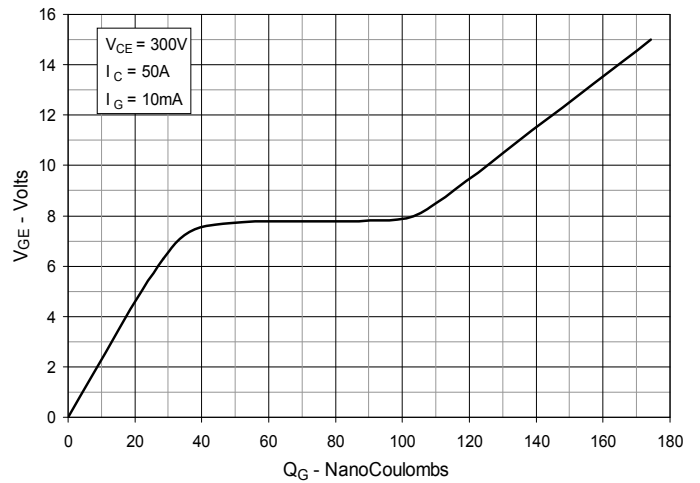
|           |           |           |           |              |              |              |              |              |              |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665    | 6,404,065 B1 | 6,683,344    | 6,727,585    | 7,005,734 B2 | 7,157,338 B2 |
| 4,850,072 | 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 @  $T_J = 125^\circ\text{C}$** 

**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**


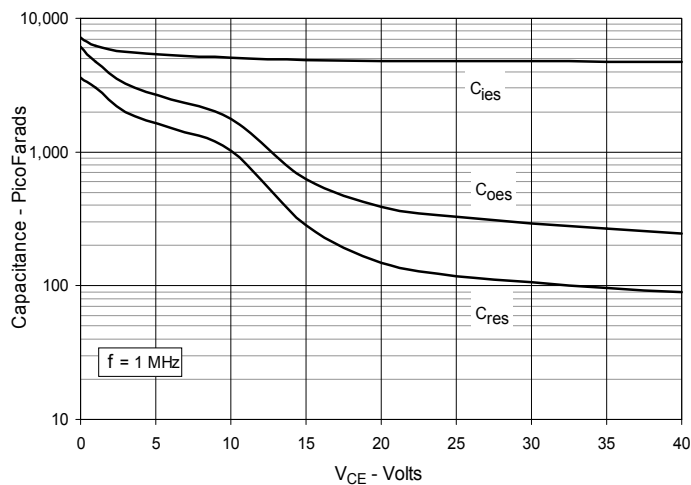
**Fig. 7. Transconductance**



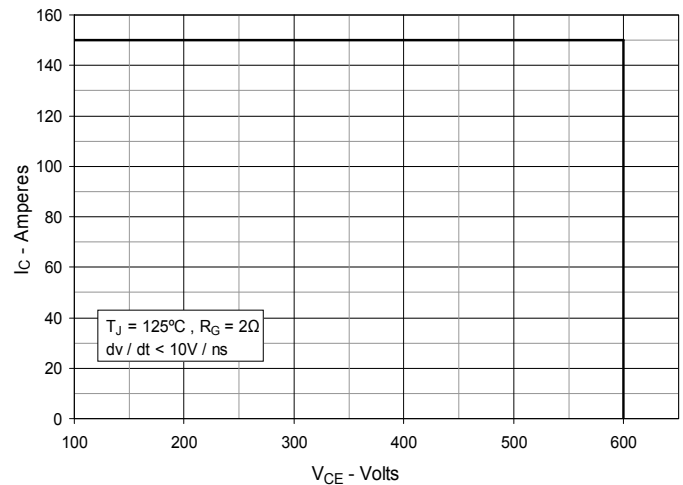
**Fig. 8. Gate Charge**



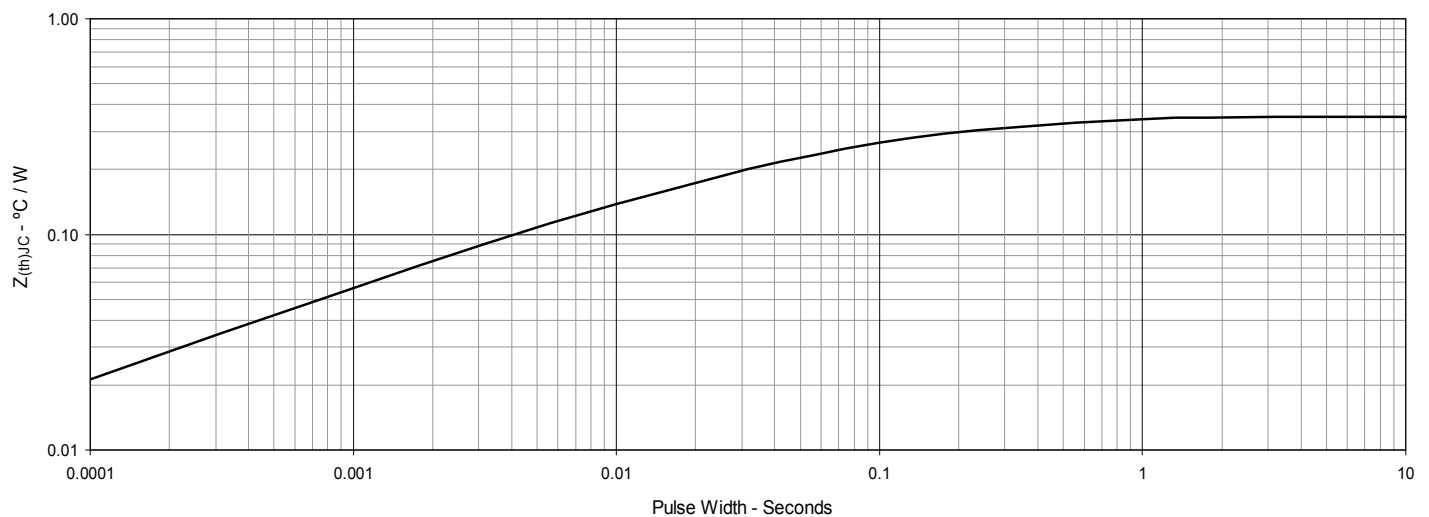
**Fig. 9. Capacitance**



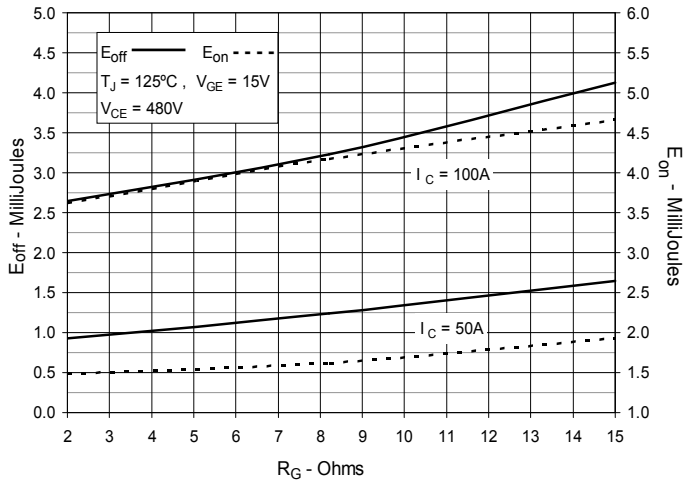
**Fig. 10. Reverse-Bias Safe Operating Area**



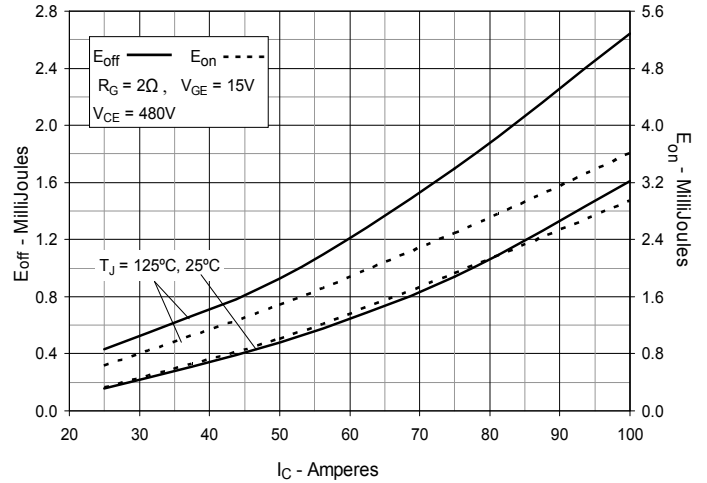
**Fig. 11. Maximum Transient Thermal Impedance**



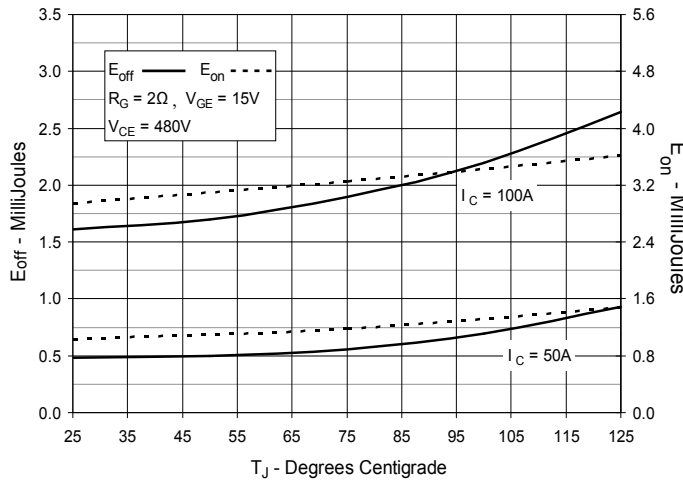
**Fig. 12. Inductive Switching  
Energy Loss vs. Gate Resistance**



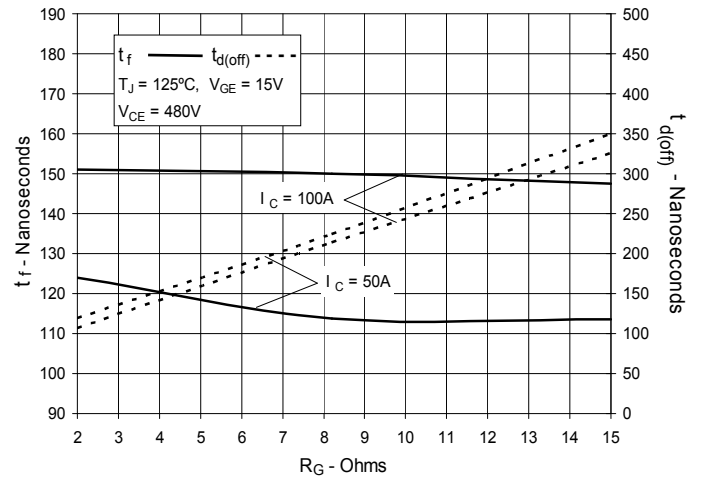
**Fig. 13. Inductive Switching  
Energy Loss vs. Collector Current**



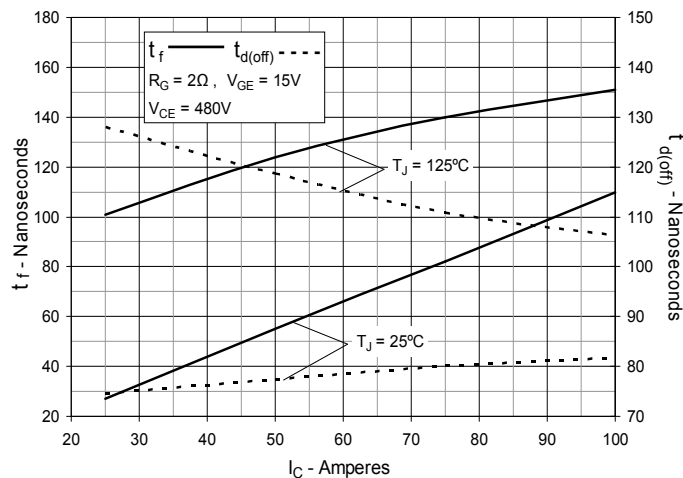
**Fig. 14. Inductive Switching  
Energy Loss vs. Junction Temperature**



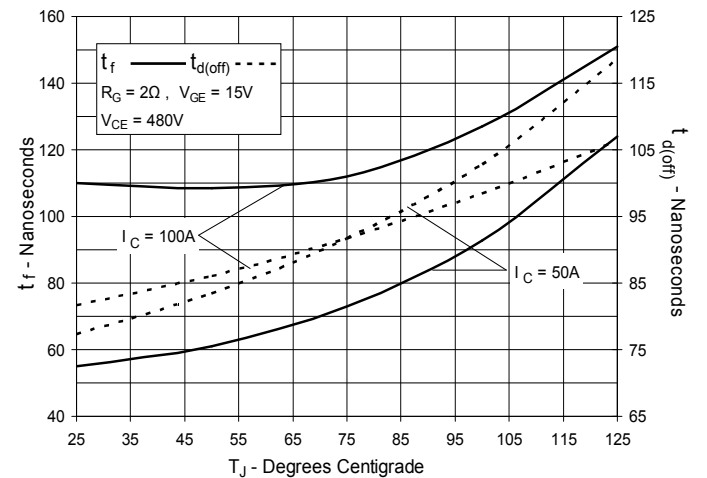
**Fig. 15. Inductive Turn-off  
Switching Times vs. Gate Resistance**



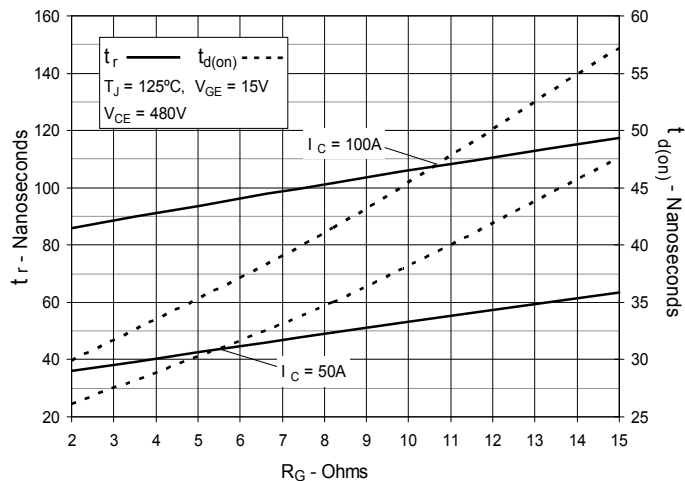
**Fig. 16. Inductive Turn-off  
Switching Times vs. Collector Current**



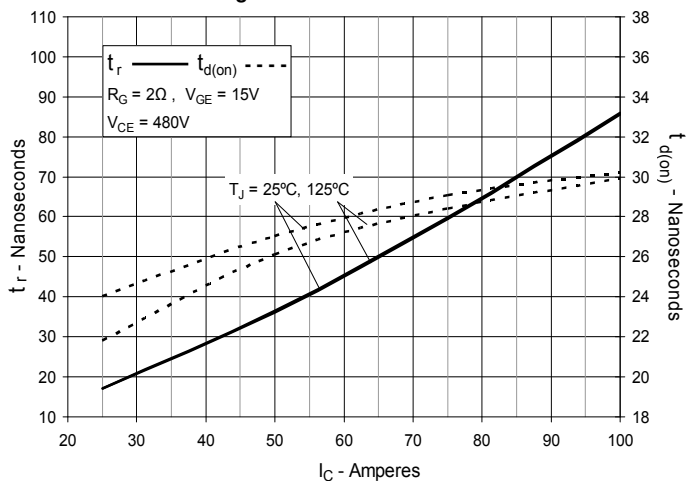
**Fig. 17. Inductive Turn-off  
Switching Times vs. Junction Temperature**



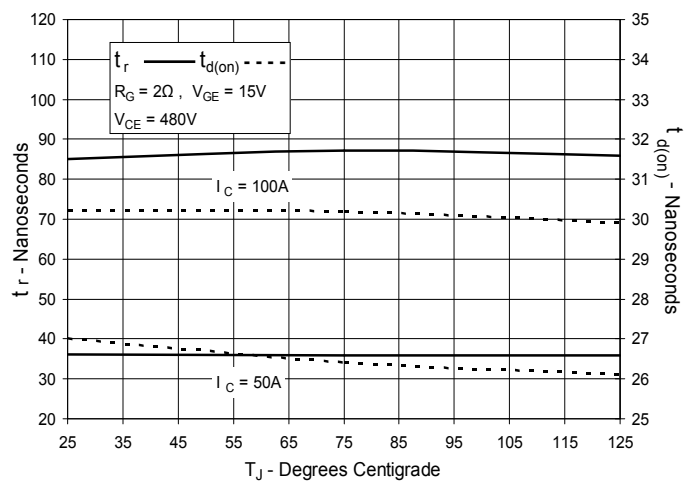
**Fig. 18. Inductive Turn-on  
Switching Times vs. Gate Resistance**



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



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



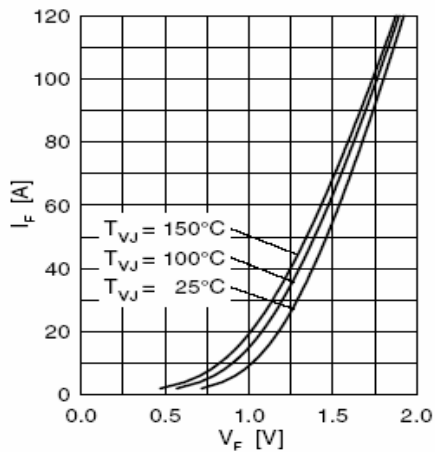


Fig. 21 Forward current  $I_F$  vs.  $V_F$

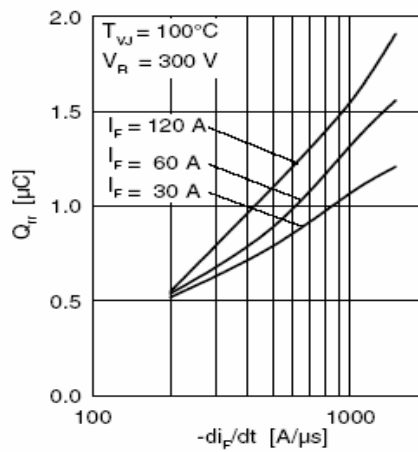


Fig. 22 Typ. reverse recovery charge  $Q_{rr}$

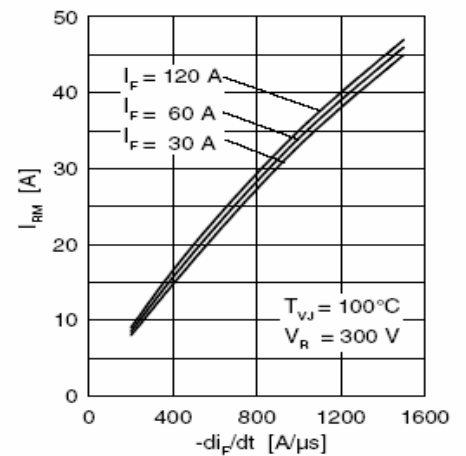


Fig. 23 Typ. peak reverse current  $I_{RM}$

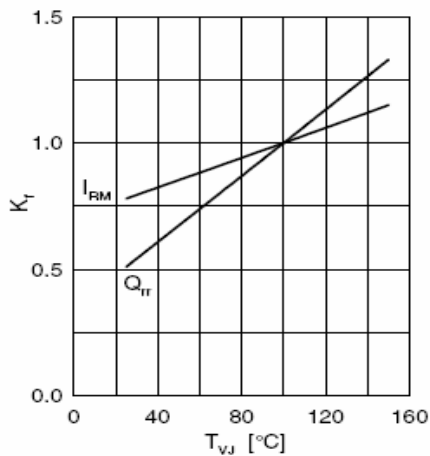


Fig. 24 Typ. dynamic parameters  $Q_{rr}$ ,  $I_{RM}$

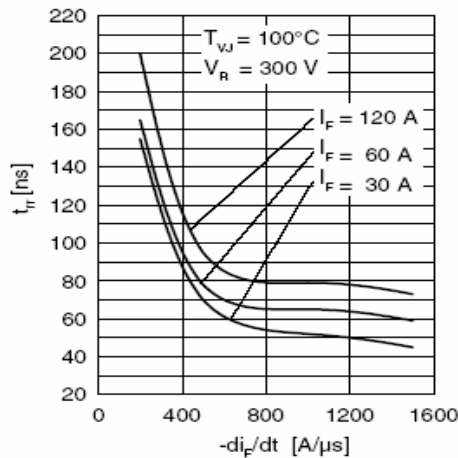


Fig. 25 Typ. recovery time  $t_{rr}$

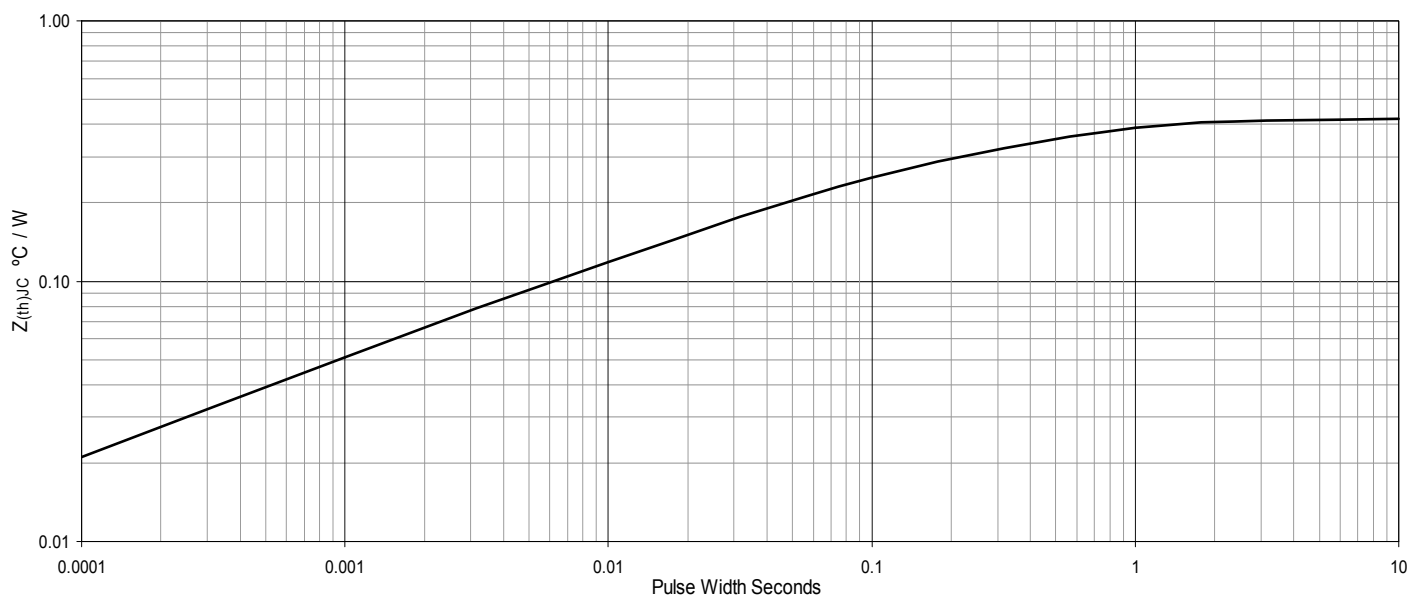


Fig. 26. Maximum Transient Thermal Impedance



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