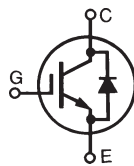


GenX3™ 600V IGBT with Diode

IXGR72N60C3D1

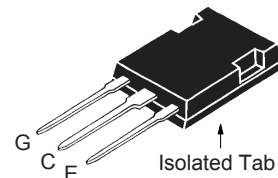
High-Speed Low-V_{sat} PT IGBT
40-100 kHz Switching



$V_{CES} = 600V$
 $I_{C110} = 35A$
 $V_{CE(sat)} \leq 2.7V$
 $t_{fi(typ)} = 55ns$

| Symbol | Test Conditions | Maximum Ratings | |
|----------------|---|-----------------------|------------|
| V_{CES} | $T_J = 25^\circ C$ to $150^\circ C$ | 600 | V |
| V_{CGR} | $T_J = 25^\circ C$ to $150^\circ C$, $R_{GE} = 1M\Omega$ | 600 | V |
| V_{GES} | Continuous | ± 20 | V |
| V_{GEM} | Transient | ± 30 | V |
| I_{C25} | $T_C = 25^\circ C$ (Limited by Leads) | 75 | A |
| I_{C110} | $T_C = 110^\circ C$ | 35 | A |
| I_{F110} | $T_C = 110^\circ C$ | 36 | A |
| I_{CM} | $T_C = 25^\circ C$, 1ms | 400 | A |
| I_A | $T_C = 25^\circ C$ | 50 | A |
| E_{AS} | $T_C = 25^\circ C$ | 500 | mJ |
| SSOA | $V_{GE} = 15V$, $T_{VJ} = 125^\circ C$, $R_G = 2\Omega$ | $I_{CM} = 150$ | A |
| (RBSOA) | Clamped Inductive Load | $V_{CE} \leq V_{CES}$ | |
| P_C | $T_C = 25^\circ C$ | 200 | W |
| T_J | | -55 ... +150 | $^\circ C$ |
| T_{JM} | | 150 | $^\circ C$ |
| T_{stg} | | -55 ... +150 | $^\circ C$ |
| V_{ISOL} | 50/60 Hz, RMS, t = 1Minute $I_{ISOL} < 1mA$ t = 20 Seconds | 2500 3000 | V~ V~ |
| F_C | Mounting Force | 20..120/4.5..27 | N/lb |
| T_L | Maximum Lead Temperature for Soldering | 300 | $^\circ C$ |
| T_{SOLD} | 1.6mm (0.062 in.) from Case for 10s | 260 | $^\circ C$ |
| Weight | | 5 | g |

ISOPLUS 247™



G = Gate C = Collector
E = Emitter

Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Optimized for Low Switching Losses
- Square RBSOA
- Isolated Mounting Surface
- Anti-Parallel Ultra Fast Diode
- Avalanche Rated
- 2500V Electrical Isolation

Advantages

- High Power Density
- Low Gate Drive Requirement

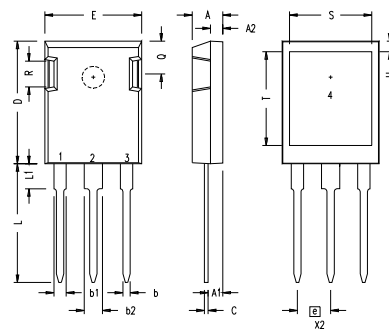
Applications

- High Frequency 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. |
| $V_{GE(th)}$ | $I_C = 250\mu A$, $V_{CE} = V_{GE}$ | 3.0 | | 5.5 V |
| I_{CES} | $V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 125^\circ C$ | | | 300 μA 5 mA |
| I_{GES} | $V_{CE} = 0V$, $V_{GE} = \pm 20V$ | | | ± 100 nA |
| $V_{CE(sat)}$ | $I_C = 50A$, $V_{GE} = 15V$, Note 1 $T_J = 125^\circ C$ | | 2.10 1.65 | V V |

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|--------------|--|-----------------------|------|--------------------|
| | | Min. | Typ. | Max. |
| g_{fs} | $I_C = 50\text{A}$, $V_{CE} = 10\text{V}$, Note 1 | 33 | 55 | S |
| C_{ies} | $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$ | | 4780 | pF |
| C_{oes} | | | 330 | pF |
| C_{res} | | | 117 | pF |
| Q_g | $I_C = 50\text{A}$, $V_{GE} = 15\text{V}$, $V_{CE} = 0.5 \cdot V_{CES}$ | | 175 | nC |
| Q_{ge} | | | 33 | nC |
| Q_{gc} | | | 72 | nC |
| $t_{d(on)}$ | Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 50\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}$, $R_G = 2\Omega$, Note 2 | | 27 | ns |
| t_{ri} | | | 37 | ns |
| E_{on} | | | 1.03 | mJ |
| $t_{d(off)}$ | | | 77 | 130 ns |
| t_{fi} | | | 55 | 110 ns |
| E_{off} | | | 0.48 | 0.95 mJ |
| $t_{d(on)}$ | Inductive Load, $T_J = 125^\circ\text{C}$ $I_C = 50\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}$, $R_G = 2\Omega$, 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} | | | 0.62 | $^\circ\text{C/W}$ |
| R_{thCS} | | 0.15 | | $^\circ\text{C/W}$ |

ISOPLUS247 (IXGR) Outline



| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .190 | .205 | 4.83 | 5.21 |
| A1 | .090 | .100 | 2.29 | 2.54 |
| A2 | .075 | .085 | 1.91 | 2.16 |
| b | .045 | .055 | 1.14 | 1.40 |
| b1 | .075 | .084 | 1.91 | 2.13 |
| b2 | .115 | .123 | 2.92 | 3.12 |
| C | .024 | .031 | 0.61 | 0.80 |
| D | .819 | .840 | 20.80 | 21.34 |
| E | .620 | .635 | 15.75 | 16.13 |
| e | .215 BSC | | 5.45 BSC | |
| L | .780 | .800 | 19.81 | 20.32 |
| L1 | .150 | .170 | 3.81 | 4.32 |
| Q | .220 | .244 | 5.59 | 6.20 |
| R | .170 | .190 | 4.32 | 4.83 |
| S | .520 | .540 | 13.21 | 13.72 |
| T | .620 | .640 | 15.75 | 16.26 |
| U | .065 | .080 | 1.65 | 2.03 |

- 1 - GATE
- 2 - DRAIN (COLLECTOR)
- 3 - SOURCE (EMITTER)
- 4 - NO CONNECTION

NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.

Reverse Diode (FRED)

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|------------|--|-----------------------|------|-------------------------|
| | | Min. | Typ. | Max. |
| V_F | $I_F = 60\text{A}$, $V_{GE} = 0\text{V}$, Note 1 $T_J = 150^\circ\text{C}$ | | 1.4 | 2.5 V |
| I_{RM} | $I_F = 60\text{A}$, $V_{GE} = 0\text{V}$, $-di_F/dt = 100\text{A}/\mu\text{s}$, $V_R = 100\text{V}$ $T_J = 100^\circ\text{C}$ | | 8.3 | A |
| t_{rr} | $I_F = 1\text{A}$, $-di/dt = 200\text{A}/\mu\text{s}$, $V_R = 30\text{V}$ | | 35 | ns |
| R_{thJC} | | | | 0.85 $^\circ\text{C/W}$ |

Notes:

- Pulse test, $t \leq 300\mu\text{s}$, duty cycle, $d \leq 2\%$.
- 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 |
| | 4,850,072 | 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 | |

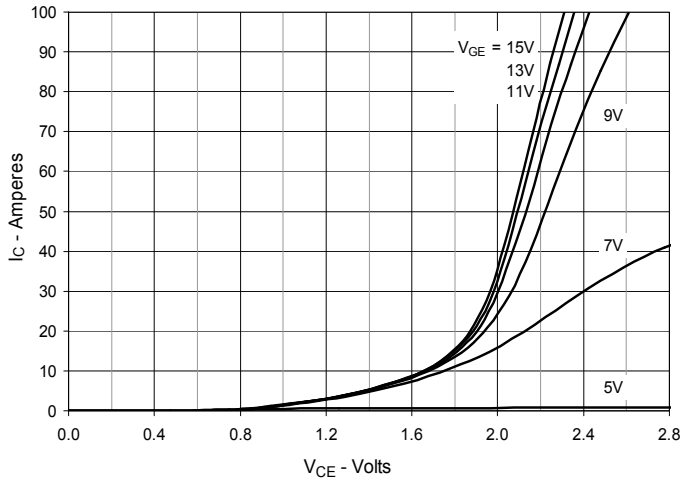
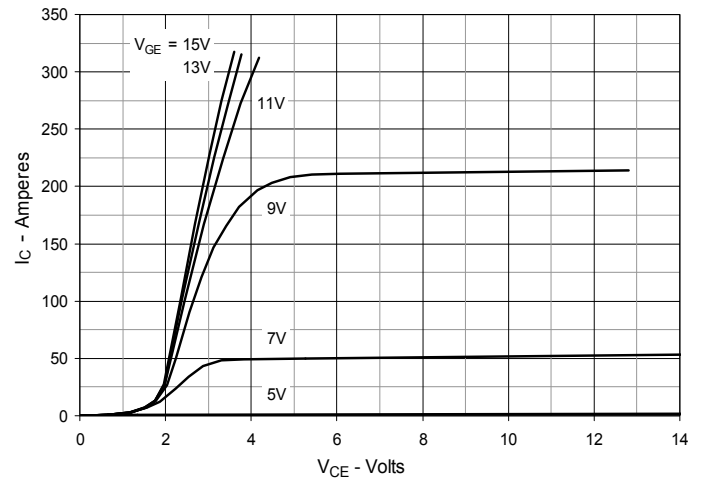
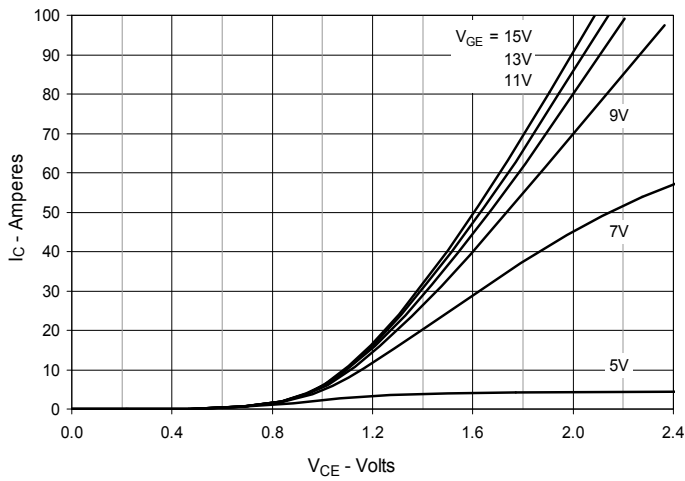
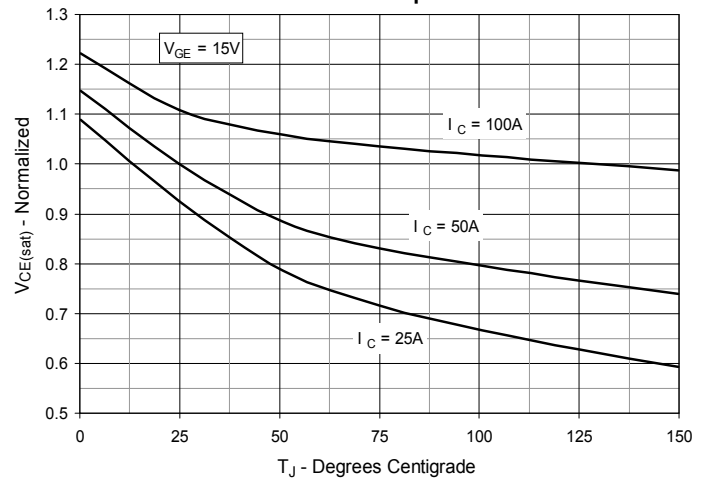
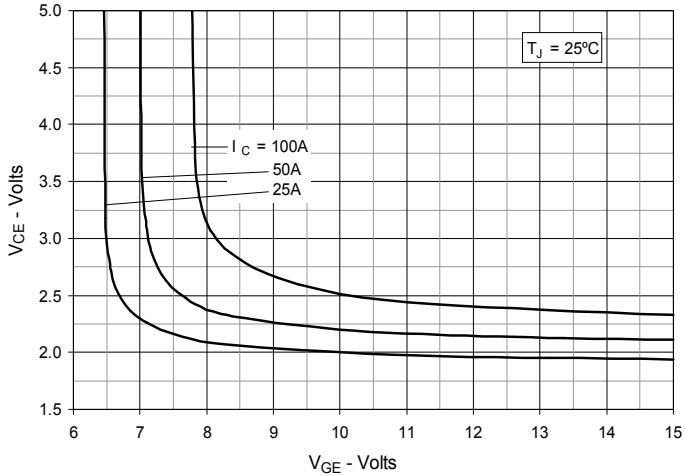
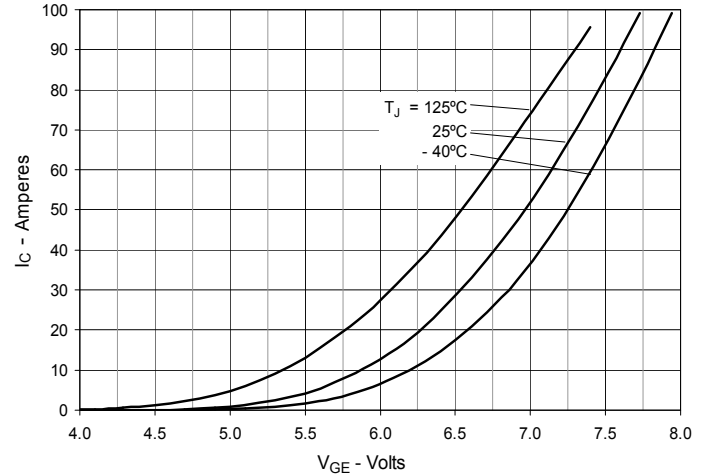
Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$

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

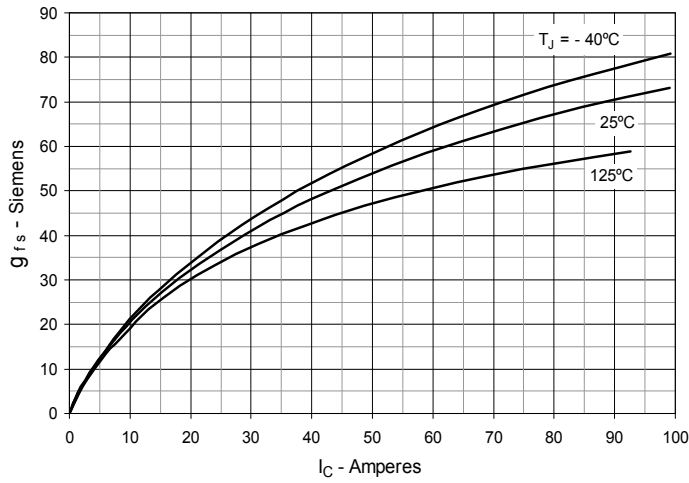


Fig. 8. Gate Charge

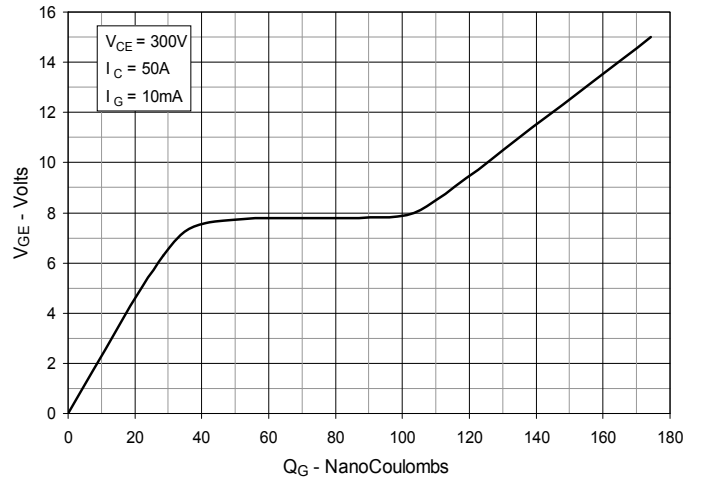


Fig. 9. Capacitance

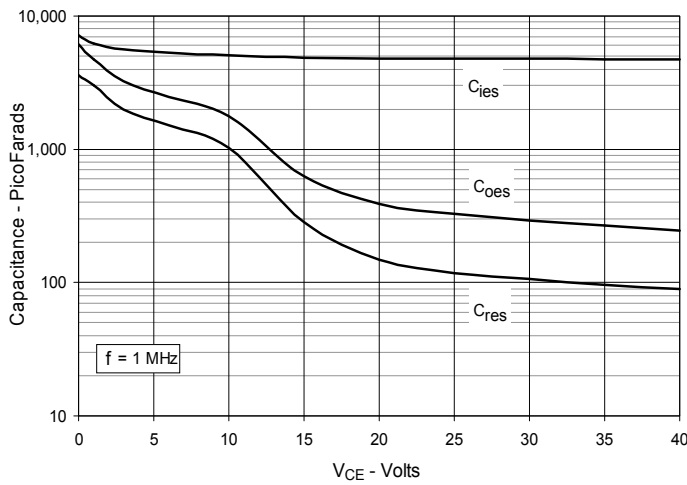


Fig. 10. Reverse-Bias Safe Operating Area

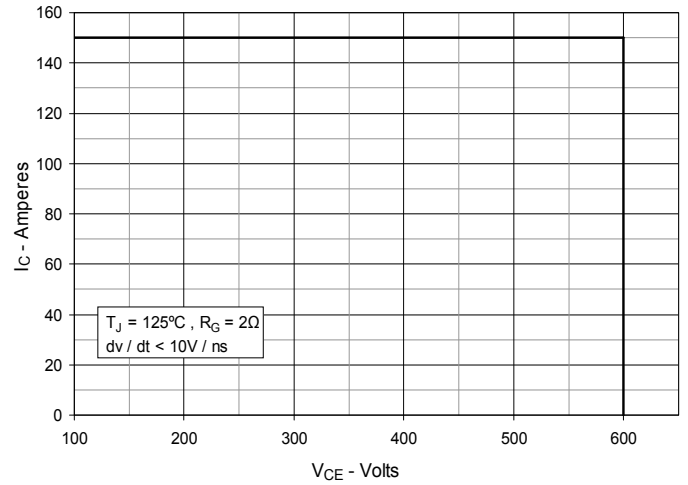
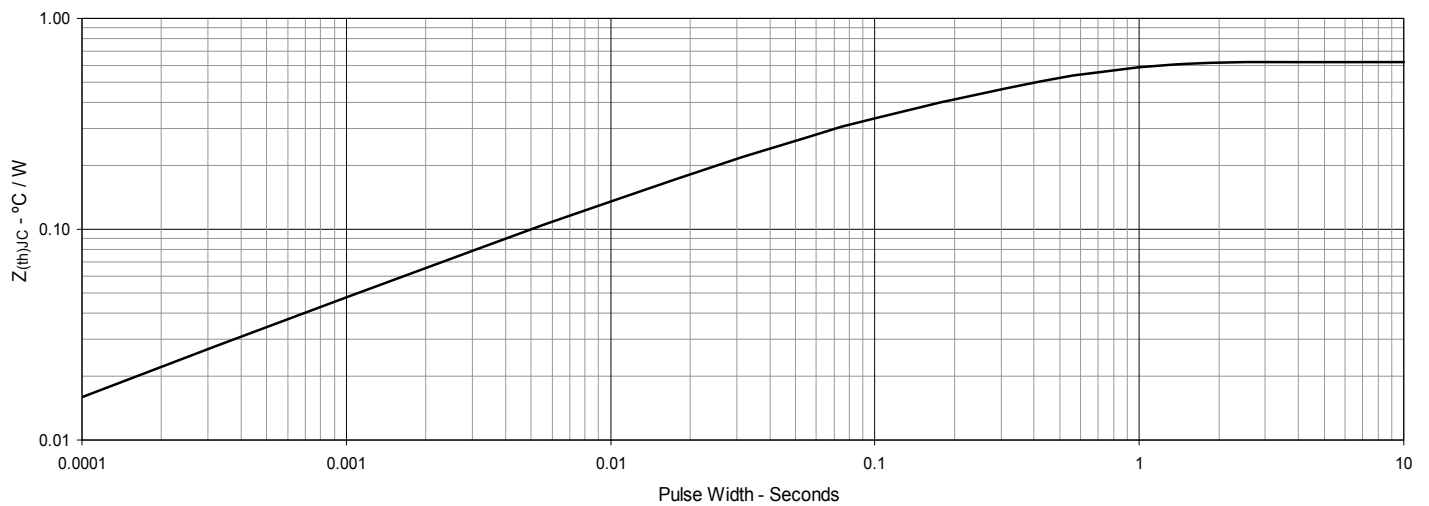
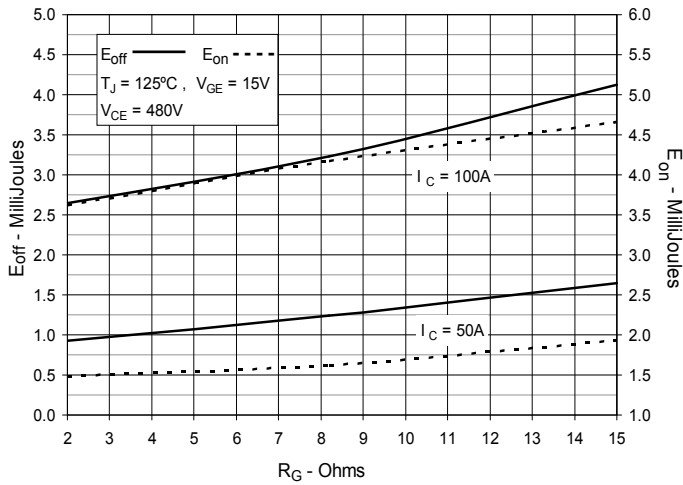


Fig. 11. Maximum Transient Thermal Impedance

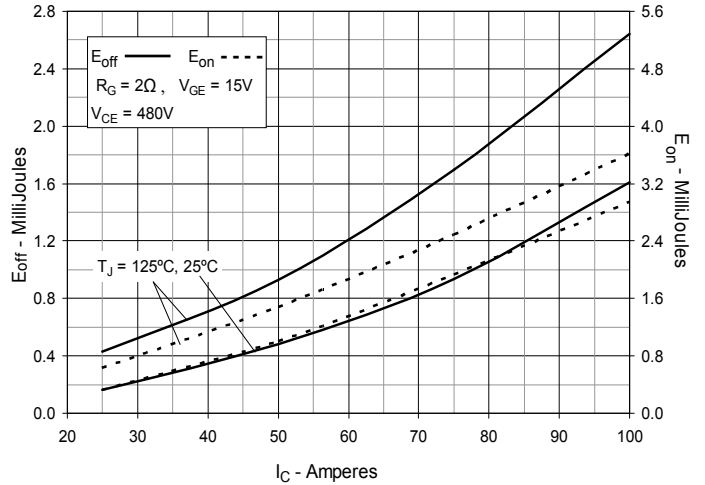


IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

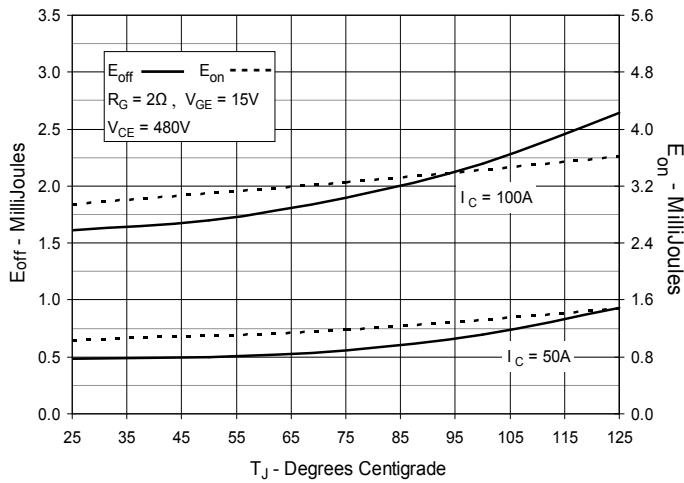
**Fig. 12. Inductive Switching
Energy Loss vs. Gate Resistance**



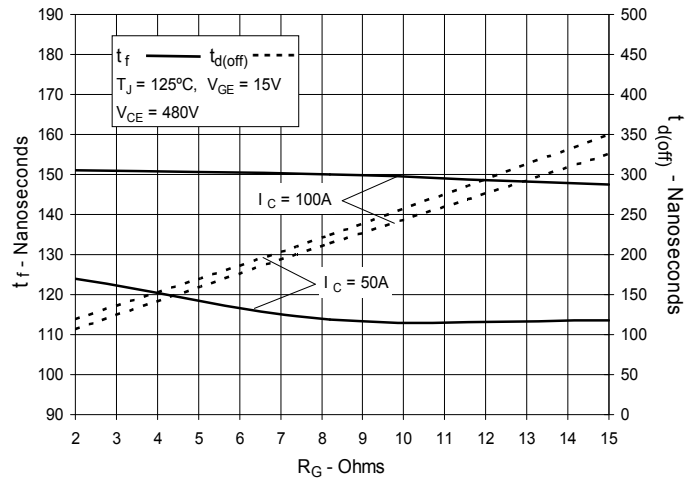
**Fig. 13. Inductive Switching
Energy Loss vs. Collector Current**



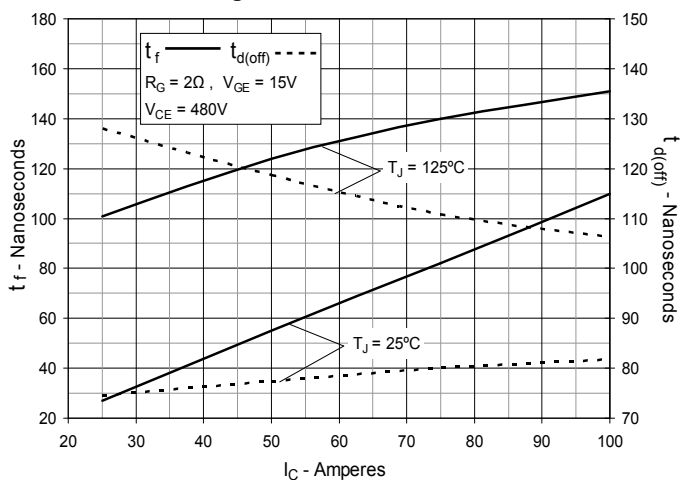
**Fig. 14. Inductive Switching
Energy Loss vs. Junction Temperature**



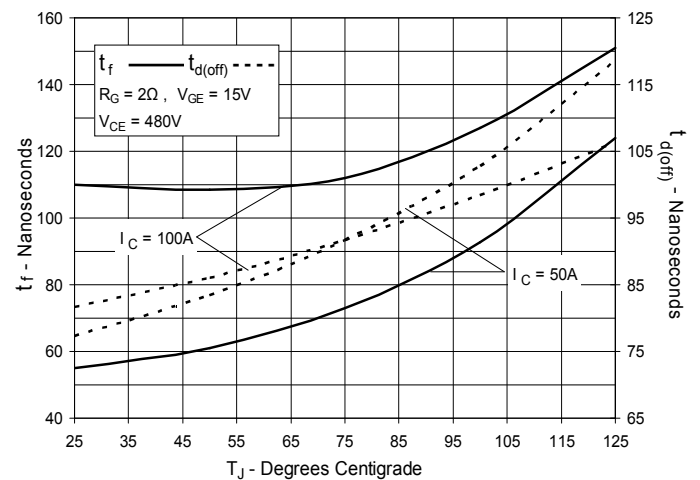
**Fig. 15. Inductive Turn-off
Switching Times vs. Gate Resistance**



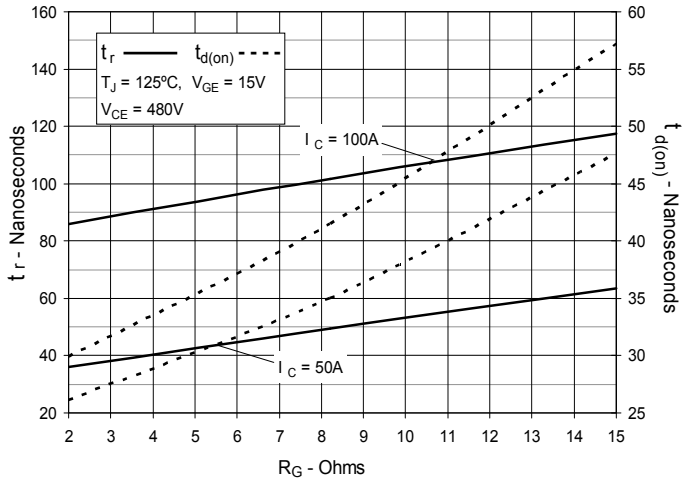
**Fig. 16. Inductive Turn-off
Switching Times vs. Collector Current**



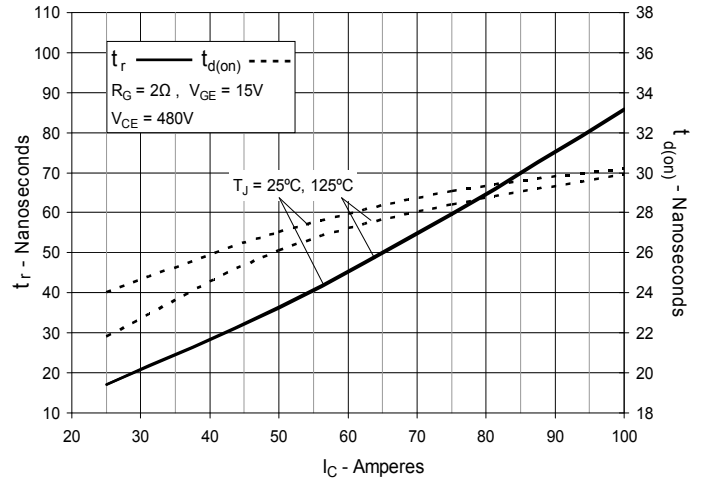
**Fig. 17. Inductive Turn-off
Switching Times vs. Junction Temperature**



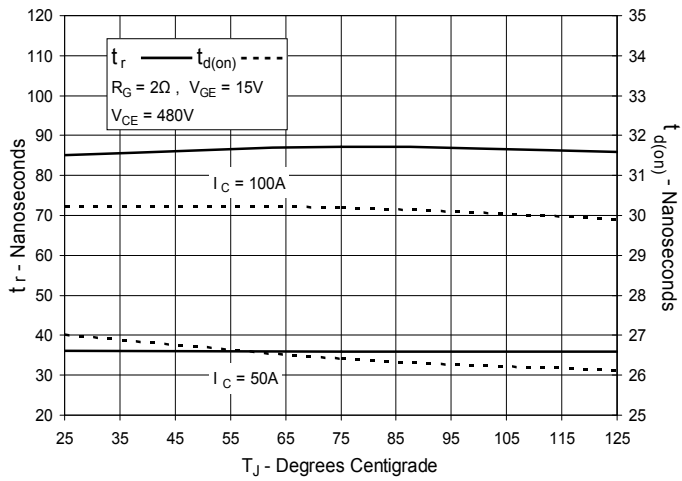
**Fig. 18. Inductive Turn-on
Switching Times vs. Gate Resistance**



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



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



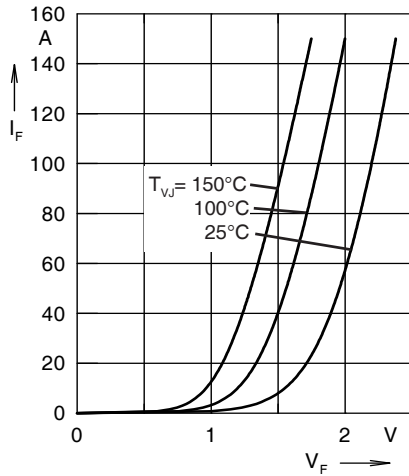


Fig. 21. Forward Current I_F Versus V_F

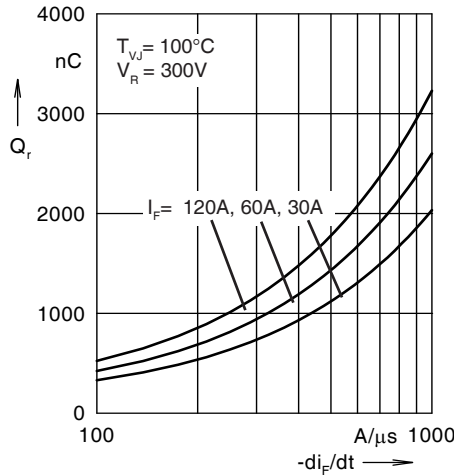


Fig. 22. Reverse Recovery Charge Q_r Versus $-di_F/dt$

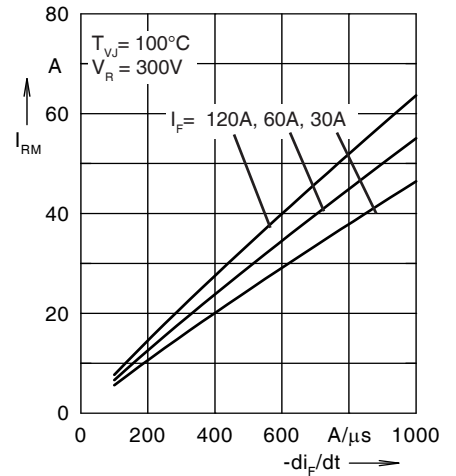


Fig. 23. Peak Reverse Current I_{RM} Versus $-di_F/dt$

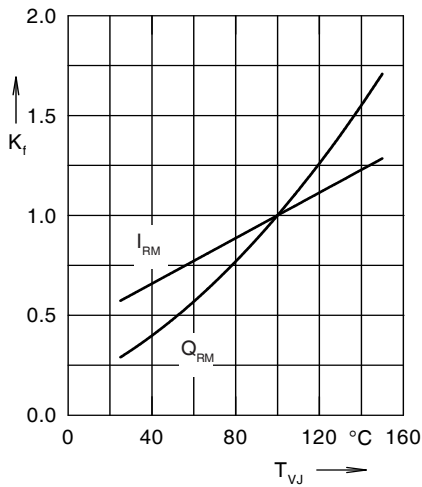


Fig. 24. Dynamic parameters Q_r, I_{RM} Versus T_{VJ}

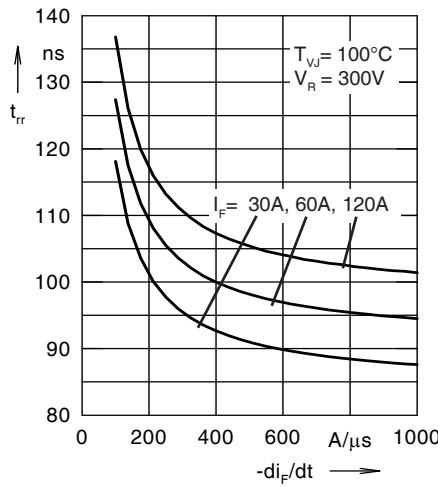


Fig. 25. Recovery Time t_{rr} Versus $-di_F/dt$

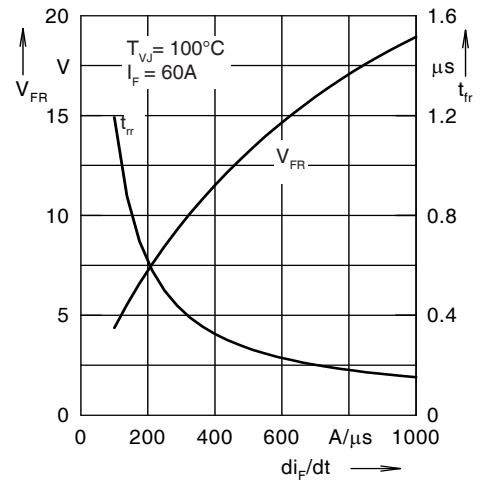


Fig. 26. Peak Forward Voltage V_{FR} and t_{rr} Versus $-di_F/dt$

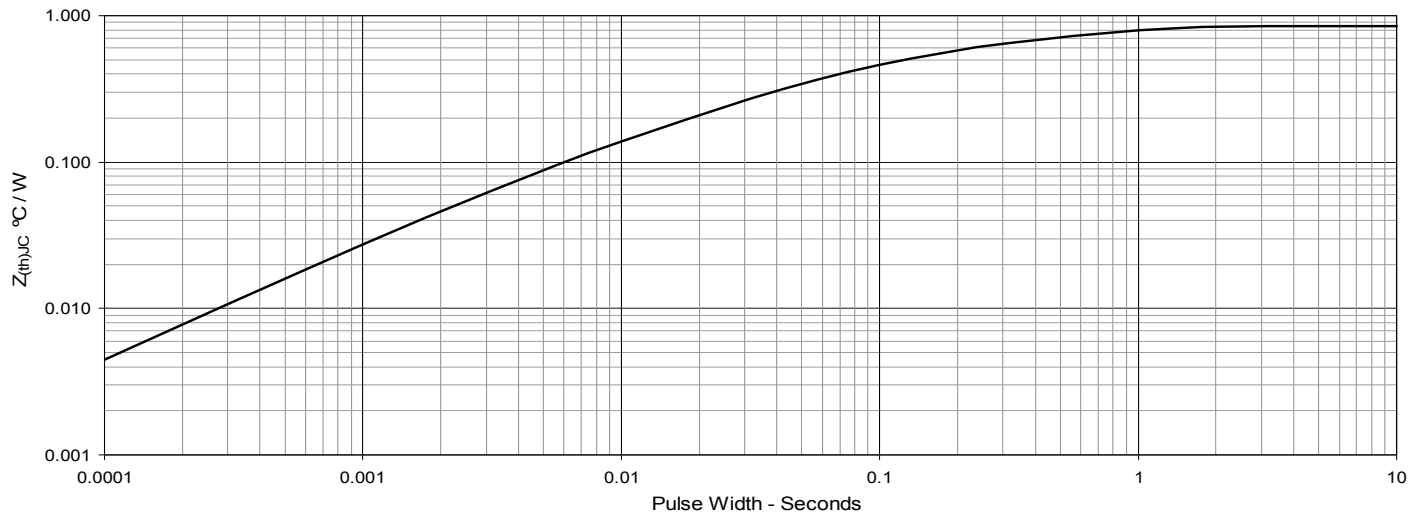


Fig. 27. Maximum Transient Thermal Impedance (for diode)