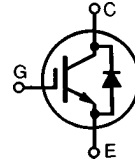


HiPerFAST™ IGBT with Diode

IXGK 50N60AU1

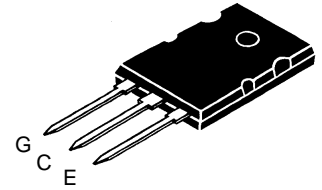
$V_{CES} = 600 \text{ V}$
 $I_{C25} = 75 \text{ A}$
 $V_{CE(sat)} = 2.7 \text{ V}$
 $t_{fi} = 275 \text{ ns}$

Combi Pack



| Symbol | Test Conditions | Maximum Ratings | |
|---|--|-----------------------------------|------------------|
| V_{CES} | $T_J = 25^\circ\text{C}$ to 150°C | 600 | V |
| V_{CGR} | $T_J = 25^\circ\text{C}$ to 150°C ; $R_{GE} = 1 \text{ M}\Omega$ | 600 | V |
| V_{GES} | Continuous | ± 20 | V |
| V_{GEM} | Transient | ± 30 | V |
| I_{C25} | $T_C = 25^\circ\text{C}$, limited by leads | 75 | A |
| I_{C90} | $T_C = 90^\circ\text{C}$ | 50 | A |
| I_{CM} | $T_C = 25^\circ\text{C}$, 1 ms | 200 | A |
| SSOA (RBSOA) | $V_{GE} = 15 \text{ V}$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 10 \Omega$ Clamped inductive load, $L = 30 \mu\text{H}$ | $I_{CM} = 100$ @ $0.8 V_{CES}$ | A |
| P_C | $T_C = 25^\circ\text{C}$ | 300 | W |
| T_J | | -55 ... +150 | $^\circ\text{C}$ |
| T_{JM} | | 150 | $^\circ\text{C}$ |
| T_{stg} | | -55 ... +150 | $^\circ\text{C}$ |
| M_d | Mounting torque (M4) | 0.9/6 | Nm/lb.in. |
| Weight | | 10 | g |
| Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s | | 300 | $^\circ\text{C}$ |

TO-264 AA



G = Gate, C = Collector,
 E = Emitter, TAB = Collector

Features

- International standard package JEDEC TO-264 AA
- High frequency IGBT and anti-parallel FRED in one package
- 2nd generation HDMOS™ process
- Low $V_{CE(sat)}$ - for minimum on-state conduction losses
- MOS Gate turn-on - drive simplicity
- Fast Recovery Epitaxial Diode (FRED) - soft recovery with low I_{RM}

Applications

- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

Advantages

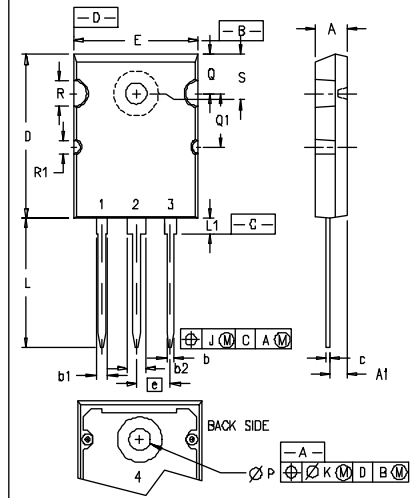
- Space savings (two devices in one package)
- Easy to mount with 1 screw (isolated mounting screw hole)
- Reduces assembly time and cost
- High power density

| Symbol | Test Conditions | Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified) | | |
|---------------|--|---|------|---|
| | | min. | typ. | max. |
| BV_{CES} | $I_C = 500 \mu\text{A}$, $V_{GE} = 0 \text{ V}$ | 600 | | V |
| $V_{GE(th)}$ | $I_C = 500 \mu\text{A}$, $V_{CE} = V_{GE}$ | 2.5 | | 5.5 V |
| I_{CES} | $V_{CE} = 0.8 \cdot V_{CES}$ $V_{GE} = 0 \text{ V}$ | | | $T_J = 25^\circ\text{C}$: 250 μA $T_J = 125^\circ\text{C}$: 15 mA |
| I_{GES} | $V_{CE} = 0 \text{ V}$, $V_{GE} = \pm 20 \text{ V}$ | | | $\pm 100 \text{ nA}$ |
| $V_{CE(sat)}$ | $I_C = I_{C90}$, $V_{GE} = 15 \text{ V}$ | | | 2.7 V |

| Symbol | Test Conditions | Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified) | | |
|--------------|---|---|------|----------|
| | | min. | typ. | max. |
| g_{fs} | $I_C = I_{C90}$; $V_{CE} = 10\text{ V}$, Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$ | 25 | 35 | S |
| Q_g | $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $V_{CE} = 0.5 V_{CES}$ | | 200 | nC |
| Q_{ge} | | | 50 | nC |
| Q_{gc} | | | 80 | nC |
| $t_{d(on)}$ | Inductive load, $T_J = 25^\circ\text{C}$ | | 50 | ns |
| t_{ri} | $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\ \mu\text{H}$, $V_{CE} = 0.8 V_{CES}$, $R_G = R_{off} = 2.7\ \Omega$ | | 210 | ns |
| $t_{d(off)}$ | | | 200 | ns |
| t_{fi} | Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G | | 275 | 400 ns |
| E_{off} | | | 4.8 | mJ |
| $t_{d(on)}$ | Inductive load, $T_J = 125^\circ\text{C}$ | | 50 | ns |
| t_{ri} | $I_C = I_{C90}$, $V_{GE} = 15\text{ V}$, $L = 100\ \mu\text{H}$, $V_{CE} = 0.8 V_{CES}$, $R_G = R_{off} = 2.7\ \Omega$ | | 240 | ns |
| E_{on} | | | 3 | mJ |
| $t_{d(off)}$ | Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G | | 280 | ns |
| t_{fi} | | | 600 | ns |
| E_{off} | | 9.6 | mJ | |
| R_{thJC} | | | | 0.42 K/W |
| R_{thCK} | | 0.15 | | K/W |

| Symbol | Test Conditions | Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified) | | |
|------------|---|---|------|----------|
| | | min. | typ. | max. |
| V_F | $I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $d \leq 2\%$ | | | 1.7 V |
| I_{RM} | $I_F = I_{C90}$, $V_{GE} = 0\text{ V}$, $-di_F/dt = 480\text{ A}/\mu\text{s}$ $V_R = 360\text{ V}$ $T_J = 125^\circ\text{C}$ | | 19 | 33 A |
| t_{rr} | | | 175 | ns |
| | $I_F = 1\text{ A}$; $-di/dt = 200\text{ A}/\mu\text{s}$; $V_R = 30\text{ V}$ $T_J = 25^\circ\text{C}$ | | 35 | 50 ns |
| R_{thJC} | | | | 0.75 K/W |

TO-264 AA Outline



| SYM | INCHES | | MILLIMETERS | |
|-----|----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .185 | .209 | 4.70 | 5.31 |
| A1 | .102 | .118 | 2.59 | 3.00 |
| b | .037 | .055 | 0.94 | 1.40 |
| b1 | .087 | .102 | 2.21 | 2.59 |
| b2 | .110 | .126 | 2.79 | 3.20 |
| c | .017 | .029 | 0.43 | 0.74 |
| D | 1.007 | 1.047 | 25.58 | 26.59 |
| E | .760 | .799 | 19.30 | 20.29 |
| e | .215 BSC | | 5.46 BSC | |
| J | .000 | .010 | 0.00 | 0.25 |
| K | .000 | .010 | 0.00 | 0.25 |
| L | .779 | .842 | 19.79 | 21.39 |
| L1 | .087 | .102 | 2.21 | 2.59 |
| ØP | .122 | .138 | 3.10 | 3.51 |
| Q | .240 | .256 | 6.10 | 6.50 |
| Q1 | .330 | .346 | 8.38 | 8.79 |
| ØR | .155 | .187 | 3.94 | 4.75 |
| ØR1 | .085 | .093 | 2.16 | 2.36 |
| S | .243 | .253 | 6.17 | 6.43 |

- 1 - GATE
- 2, 4 - DRAIN (COLLECTOR)
- 3 - SOURCE (EMITTER)

Fig. 1 Saturation Characteristics

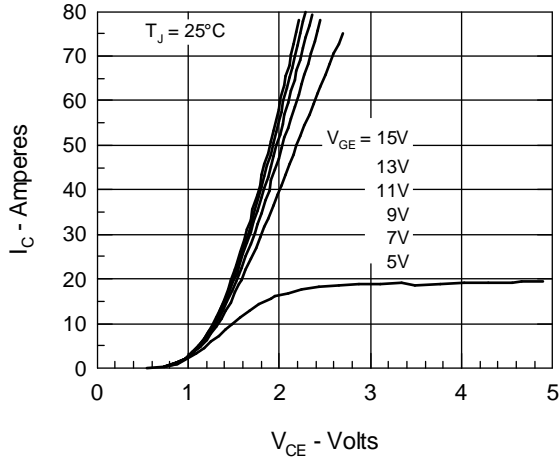


Fig. 2 Output Characteristics

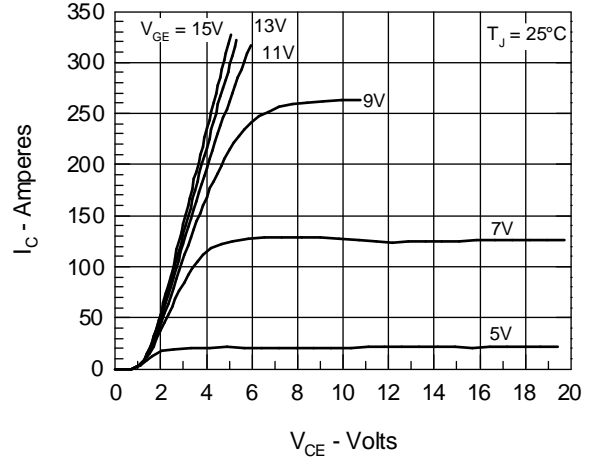


Fig. 3 Collector-Emitter Voltage vs. Gate-Emitter Voltage

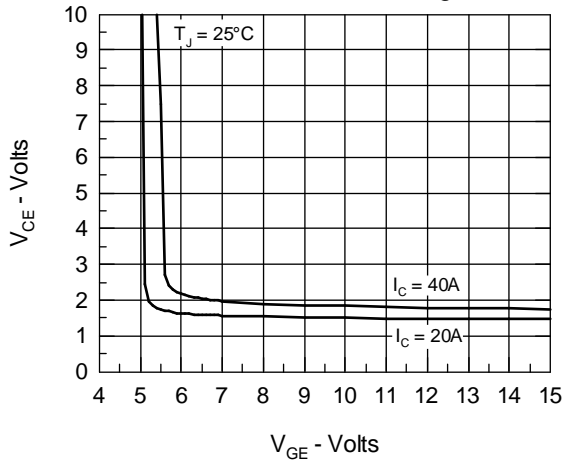


Fig. 4 Temperature Dependence of Output Saturation Voltage

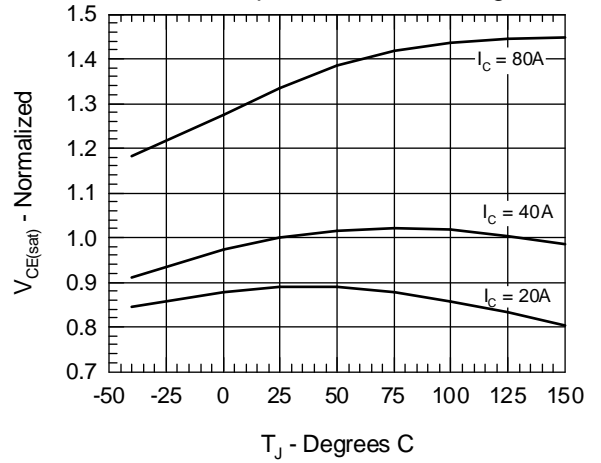


Fig. 5 Input Admittance

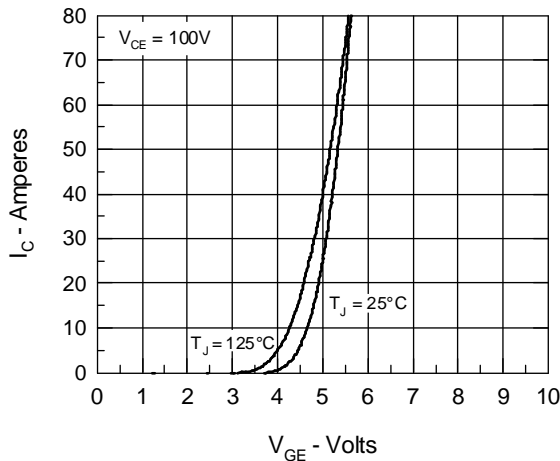


Fig. 6 Temperature Dependence of Breakdown and Threshold Voltage

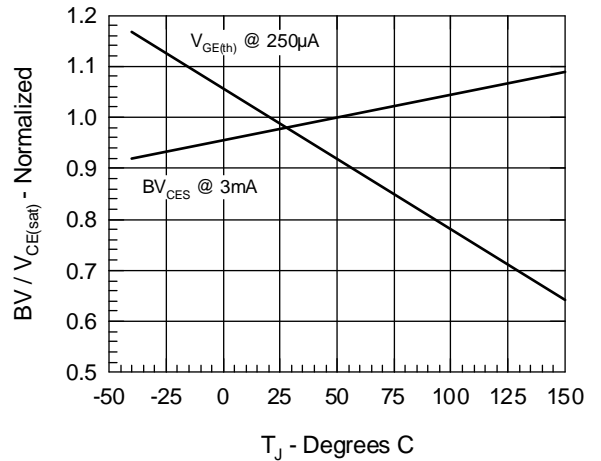


Fig.7 Gate Charge

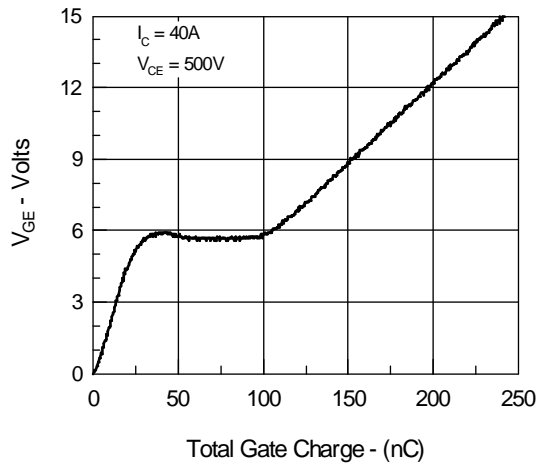


Fig.8 Turn-Off Safe Operating Area

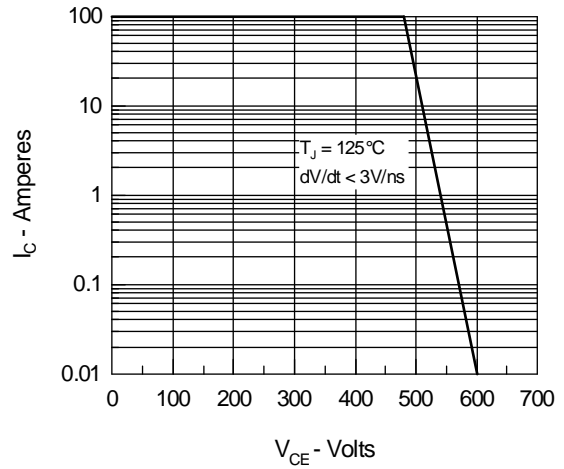


Fig.9 Capacitance Curves

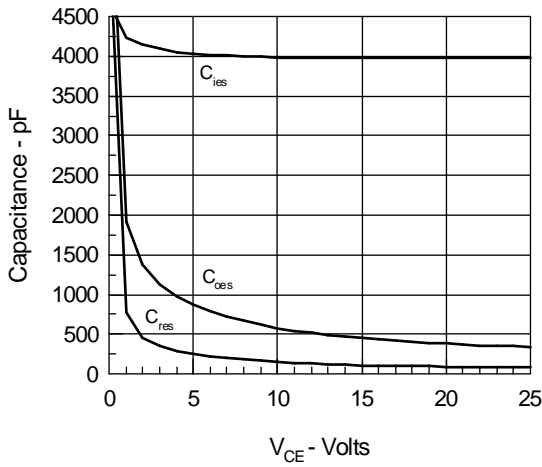
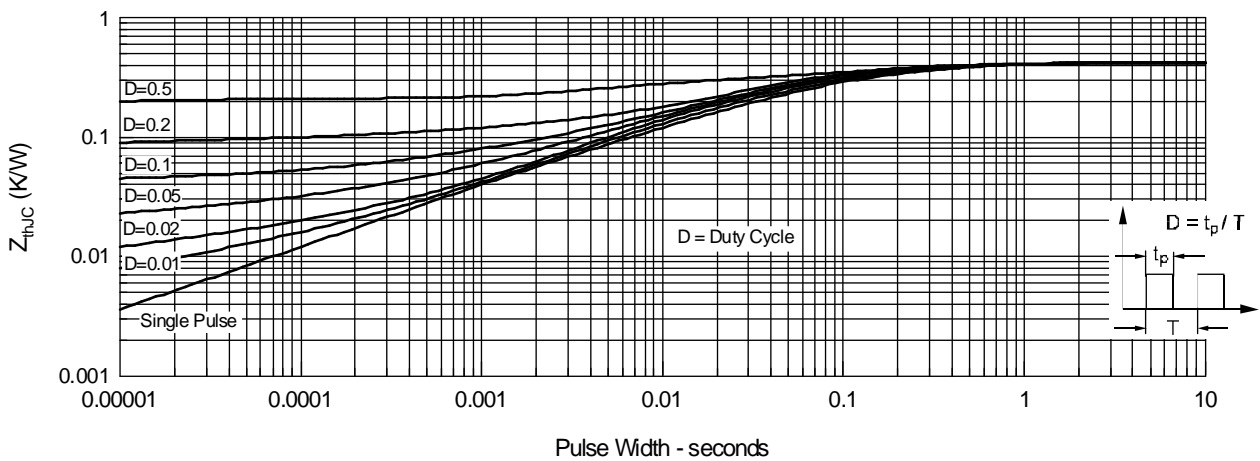


Fig.10 Transient Thermal Impedance



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 | 4,881,106 | 5,017,508 | 5,049,961 | 5,187,117 | 5,486,715 |
| 4,850,072 | 4,931,844 | 5,034,796 | 5,063,307 | 5,237,481 | 5,381,025 |

Fig. 12. Maximum Forward Voltage Drop

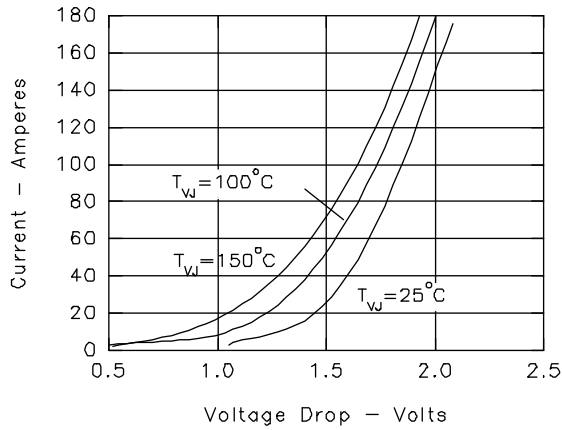


Fig. 13. Peak Forward Voltage V_{FR} and Forward Recovery Time t_{FR}

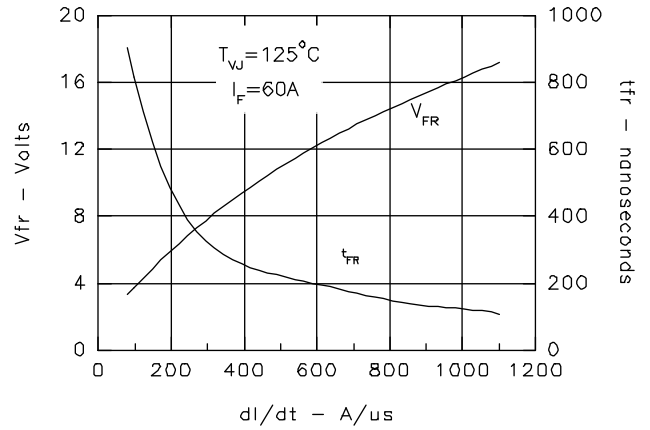


Fig. 14. Junction Temperature Dependence of I_{RM} and Q_R

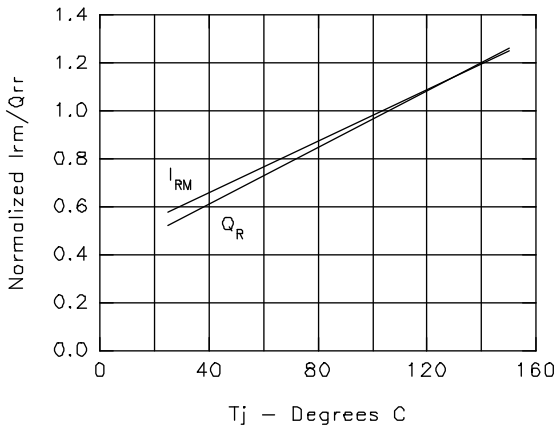


Fig. 15. Maximum Reverse Recovery Charge

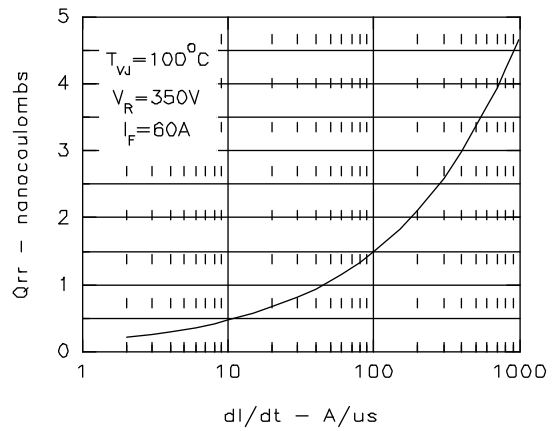


Figure 16. Peak Reverse Recovery Current.

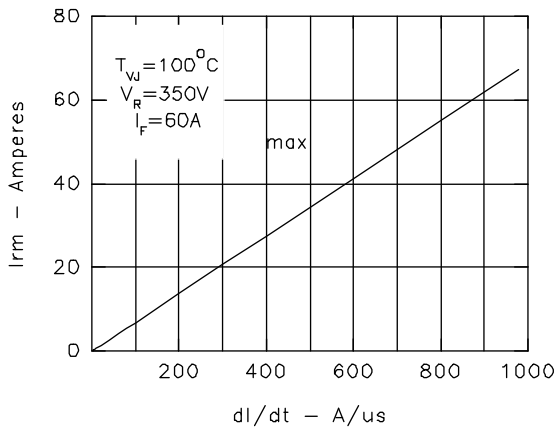
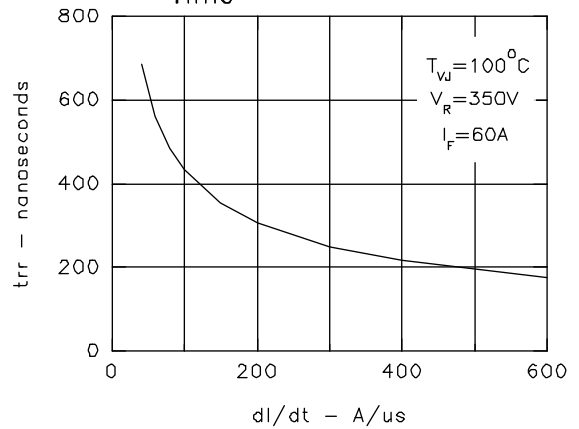


Fig. 17. Maximum Reverse Recovery Time



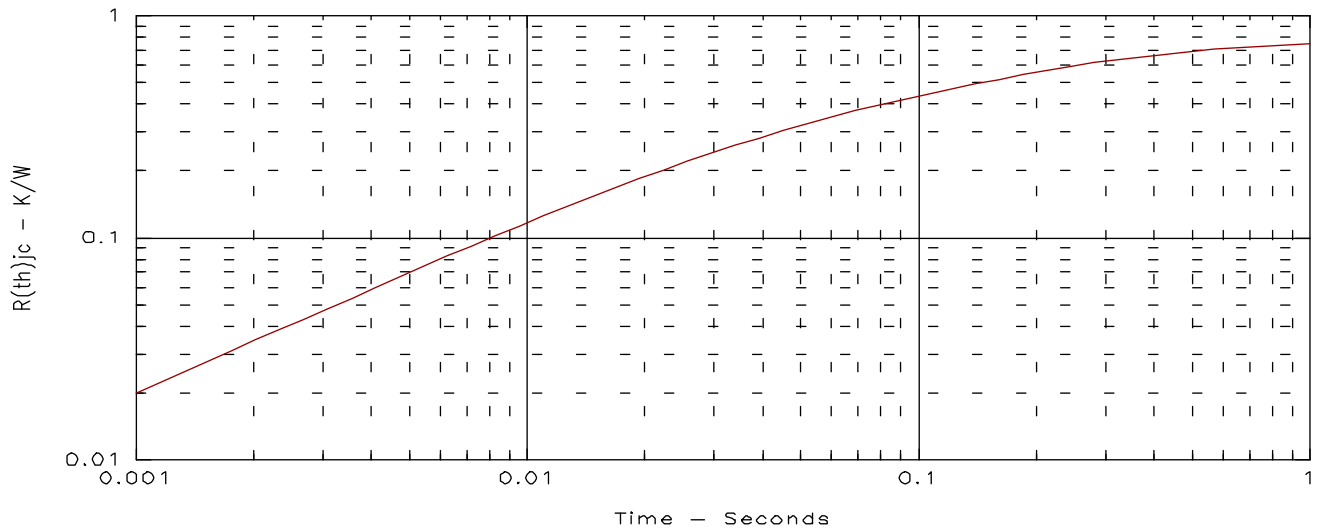


Fig. 18. Diode transient thermal resistance junction-to-case.