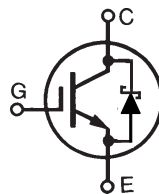


GenX3™ 600V IGBT w/ SiC Anti-Parallel Diode

IXGH48N60C3C1

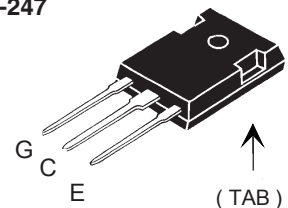


$$\begin{aligned}
 V_{CES} &= 600V \\
 I_{C110} &= 48A \\
 V_{CE(sat)} &\leq 2.5V \\
 t_{fi(typ)} &= 38ns
 \end{aligned}$$

High Speed PT IGBT for
40 - 100kHz Switching

| 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 , $R_{GE} = 1M\Omega$ | 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_{C110} | $T_C = 110^\circ\text{C}$ | 48 | A |
| I_{F110} | $T_C = 110^\circ\text{C}$ | 20 | A |
| I_{CM} | $T_C = 25^\circ\text{C}$, 1ms | 250 | A |
| I_A | $T_C = 25^\circ\text{C}$ | 30 | A |
| E_{AS} | $T_C = 25^\circ\text{C}$ | 300 | mJ |
| SSOA | $V_{GE} = 15V$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 3\Omega$ | $I_{CM} = 100$ | A |
| (RBSOA) | Clamped Inductive Load | @ $\leq V_{CES}$ | |
| 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 | $^\circ\text{C}$ |
| T_L | 1.6mm (0.062 in.) from Case for 10s | 300 | $^\circ\text{C}$ |
| T_{SOLD} | Plastic Body for 10 Seconds | 260 | $^\circ\text{C}$ |
| F_C | Mounting Torque | 1.13/10 | Nm/lb.in |
| Weight | | 6 | g |

TO-247



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

Features

- Optimized for Low Switching Losses
- Square RBSOA
- Anti-Parallel Schottky Diode
- Fast Switching
- Avalanche Rated
- International Standard Package

Advantages

- High Power Density
- Low Gate Drive Requirement

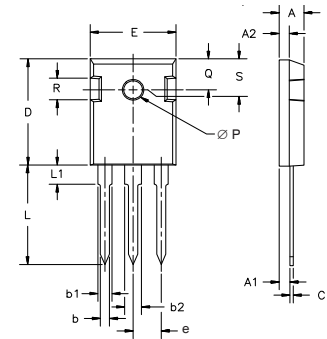
Applications

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

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|---------------|---|-----------------------|------------|-----------------------------|
| | | Min. | Typ. | Max. |
| $V_{GE(th)}$ | $I_C = 250\mu\text{A}$, $V_{CE} = V_{GE}$ | 3.0 | | 5.5 V |
| I_{CES} | $V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 125^\circ\text{C}$ | | | 50 μA 1.75 mA |
| I_{GES} | $V_{CE} = 0V$, $V_{GE} = \pm 20V$ | | | ± 100 nA |
| $V_{CE(sat)}$ | $I_C = 30A$, $V_{GE} = 15V$, Note 1 $T_J = 125^\circ\text{C}$ | | 2.3 1.8 | 2.5 V V |

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|--------------|---|-----------------------|------|--------------------|
| | | Min. | Typ. | Max. |
| g_{fs} | $I_C = 30\text{A}, V_{CE} = 10\text{V}$, Note 1 | 20 | 30 | S |
| C_{ies} | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$ | | 2120 | pF |
| C_{oes} | | | 420 | pF |
| C_{res} | | | 50 | pF |
| Q_g | $I_C = 30\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$ | | 77 | nC |
| Q_{ge} | | | 16 | nC |
| Q_{gc} | | | 32 | nC |
| $t_{d(on)}$ | Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 30\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 3\Omega$ Note 2 | | 19 | ns |
| t_{ri} | | | 25 | ns |
| E_{on} | | | 0.33 | mJ |
| $t_{d(off)}$ | | | 60 | 100 ns |
| t_{fi} | | | 38 | ns |
| E_{off} | | | 0.23 | 0.42 mJ |
| $t_{d(on)}$ | Inductive Load, $T_J = 125^\circ\text{C}$ $I_C = 30\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 3\Omega$ Note 2 | | 19 | ns |
| t_{ri} | | | 28 | ns |
| E_{on} | | | 0.37 | mJ |
| $t_{d(off)}$ | | | 92 | ns |
| t_{fi} | | | 95 | ns |
| E_{off} | | | 0.57 | mJ |
| R_{thJC} | | | 0.42 | $^\circ\text{C/W}$ |
| R_{thCS} | | 0.21 | | $^\circ\text{C/W}$ |

TO-247 AD Outline



| Dim. | Millimeter | | Inches | |
|----------------|------------|-------|--------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.7 | 5.3 | .185 | .209 |
| A ₁ | 2.2 | 2.54 | .087 | .102 |
| A ₂ | 2.2 | 2.6 | .059 | .098 |
| b | 1.0 | 1.4 | .040 | .055 |
| b ₁ | 1.65 | 2.13 | .065 | .084 |
| b ₂ | 2.87 | 3.12 | .113 | .123 |
| C | .4 | .8 | .016 | .031 |
| D | 20.80 | 21.46 | .819 | .845 |
| E | 15.75 | 16.26 | .610 | .640 |
| e | 5.20 | 5.72 | 0.205 | 0.225 |
| L | 19.81 | 20.32 | .780 | .800 |
| L1 | | 4.50 | | .177 |
| ∅P | 3.55 | 3.65 | .140 | .144 |
| Q | 5.89 | 6.40 | 0.232 | 0.252 |
| R | 4.32 | 5.49 | .170 | .216 |

Reverse Diode (SiC)

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|------------|--|-----------------------|--------------|-------------------------|
| | | Min. | Typ. | Max. |
| V_F | $I_F = 20\text{A}, V_{GE} = 0\text{V}$, Note 1 $T_J = 125^\circ\text{C}$ | | 1.65 1.80 | V V |
| R_{thJC} | | | | 0.90 $^\circ\text{C/W}$ |

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} (Clamp), T_J or R_G .

PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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 @ 25°C

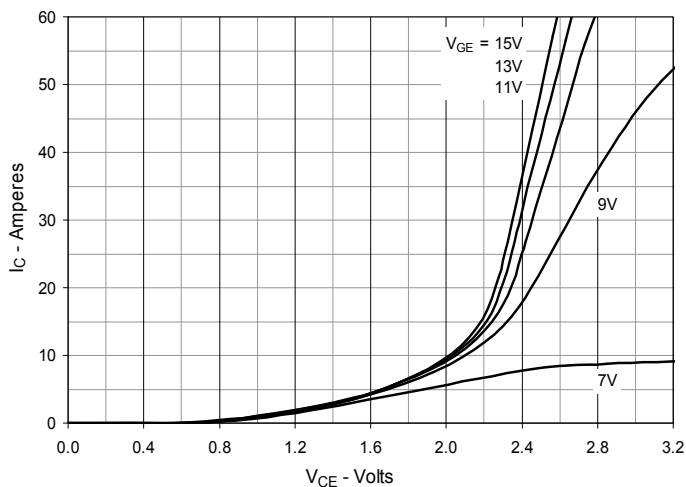


Fig. 2. Extended Output Characteristics @ 25°C

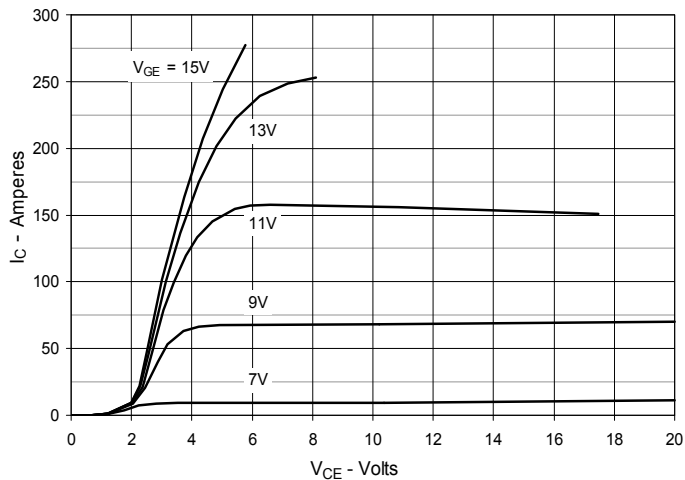


Fig. 3. Output Characteristics @ 125°C

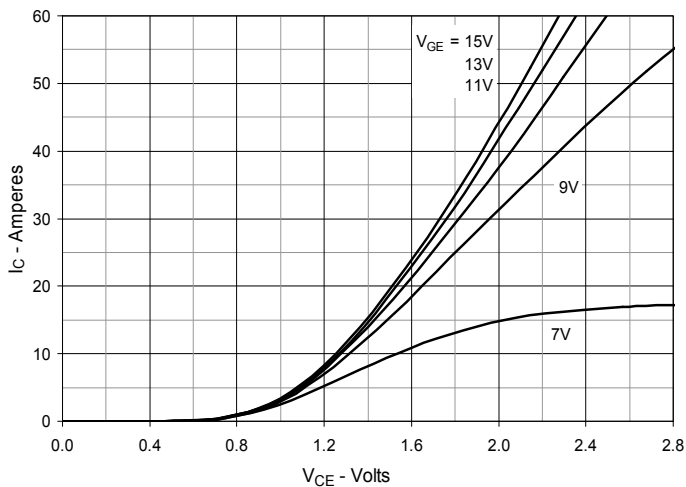


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

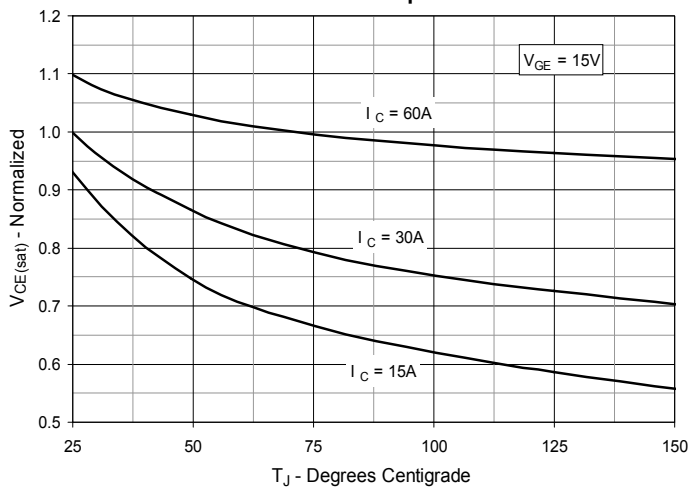


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

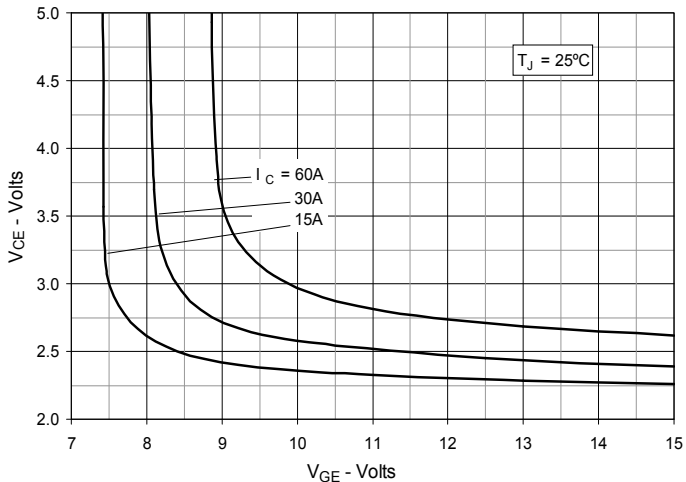


Fig. 6. Input Admittance

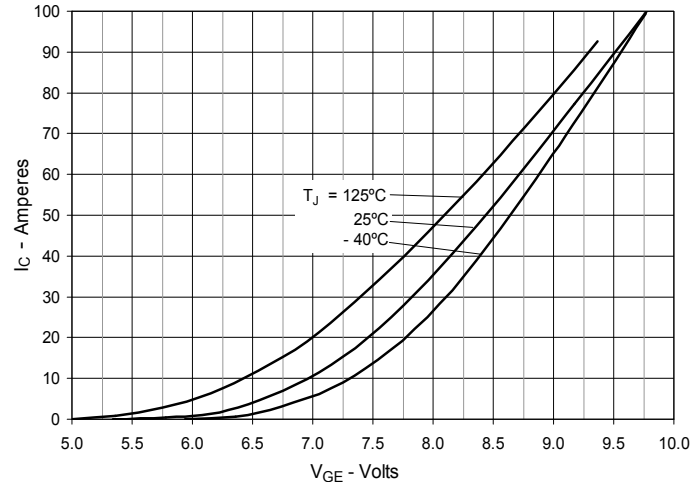


Fig. 7. Transconductance

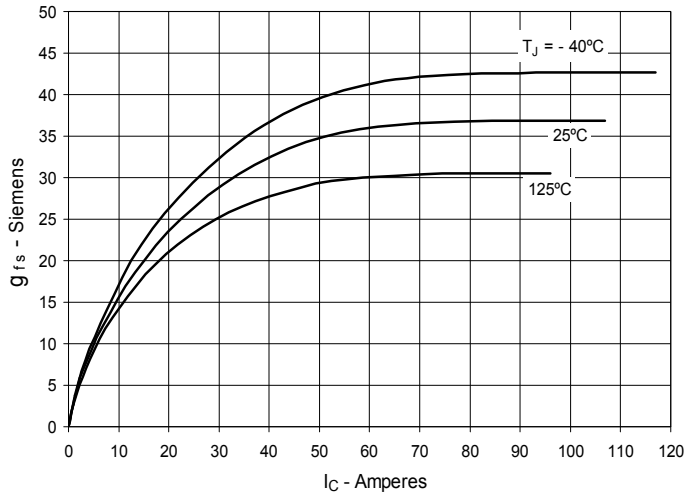


Fig. 8. Gate Charge

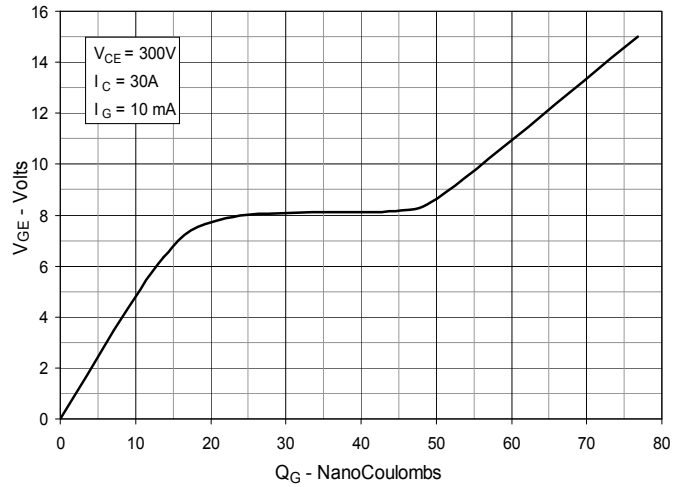


Fig. 9. Capacitance

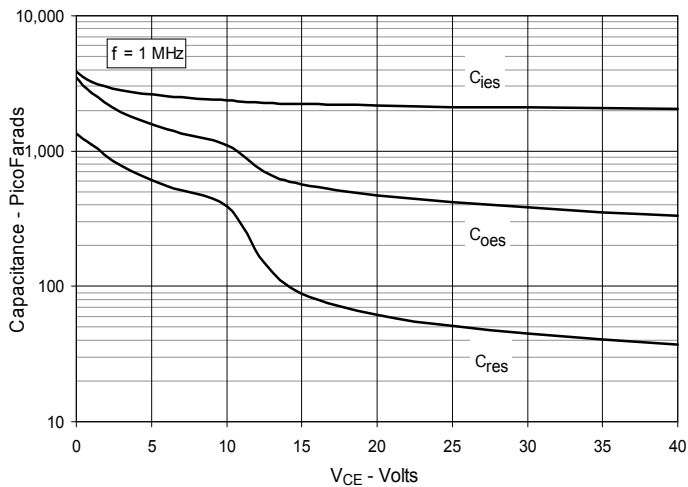


Fig. 10. Reverse-Bias Safe Operating Area

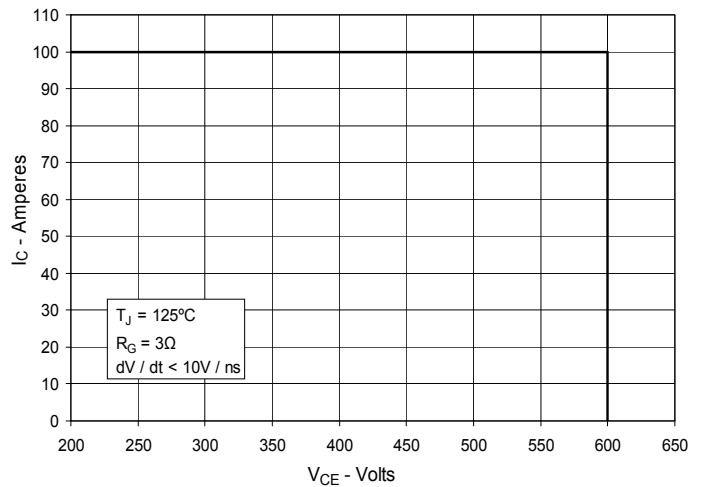
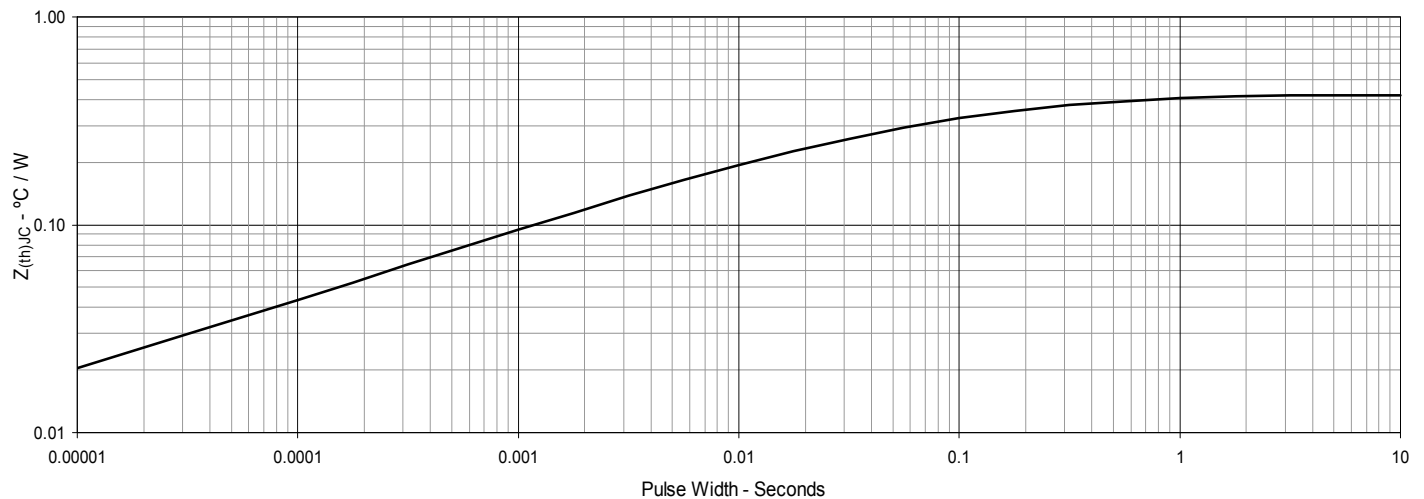
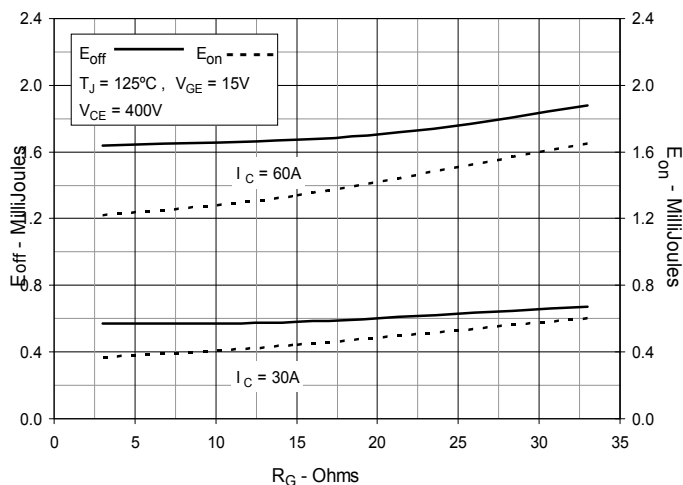
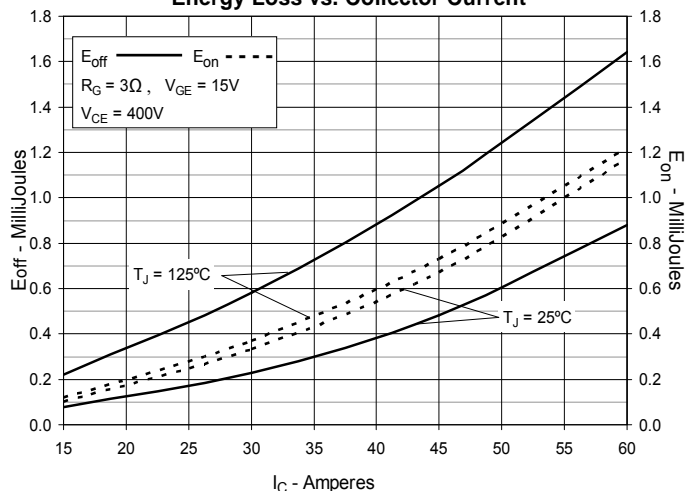
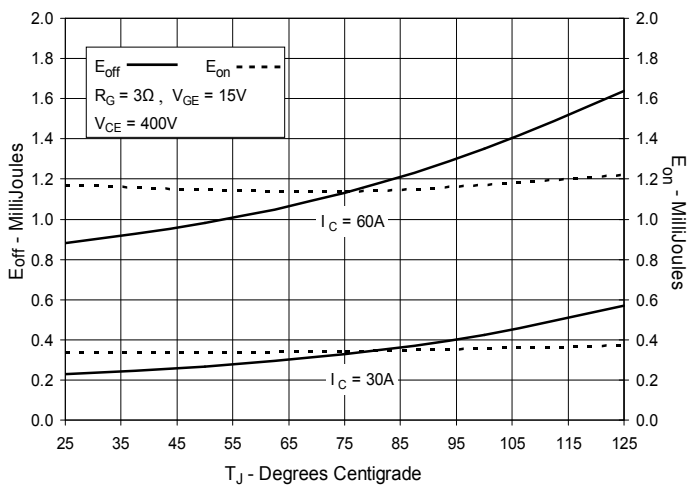
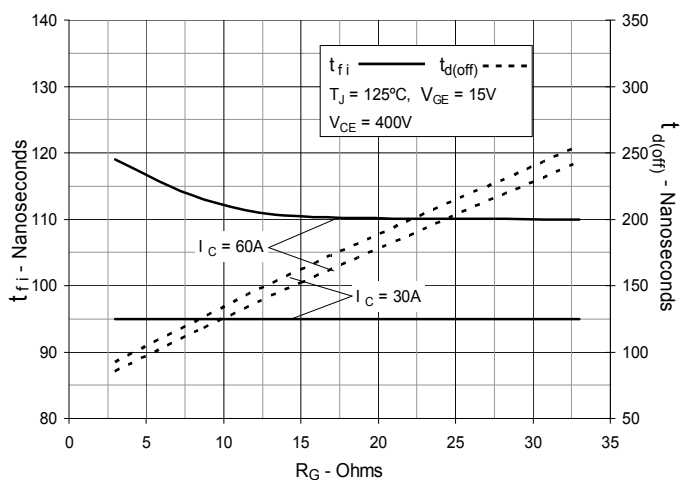
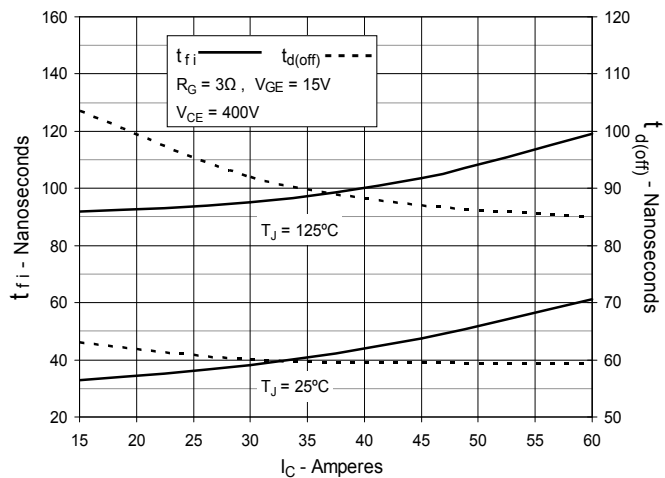
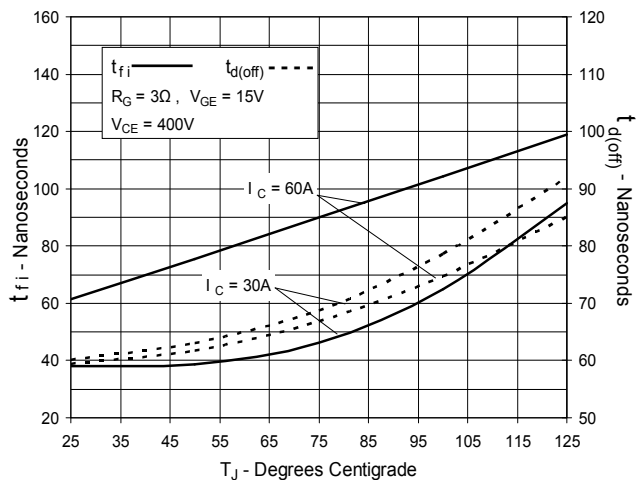
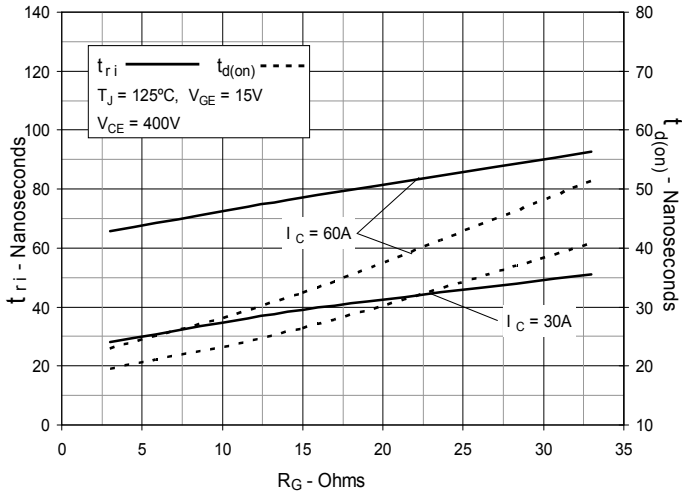


Fig. 11. Maximum Transient Thermal Impedance

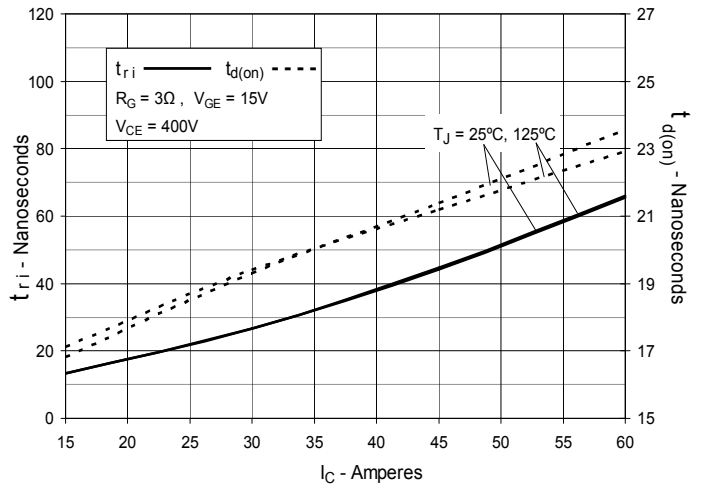


**Fig. 12. Inductive Switching
Energy Loss vs. Gate Resistance**

**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**

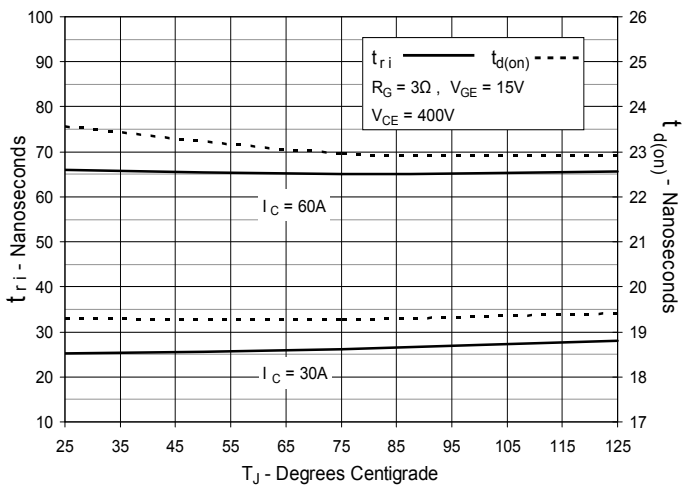


Fig. 21. Forward Current vs. Forward Voltage

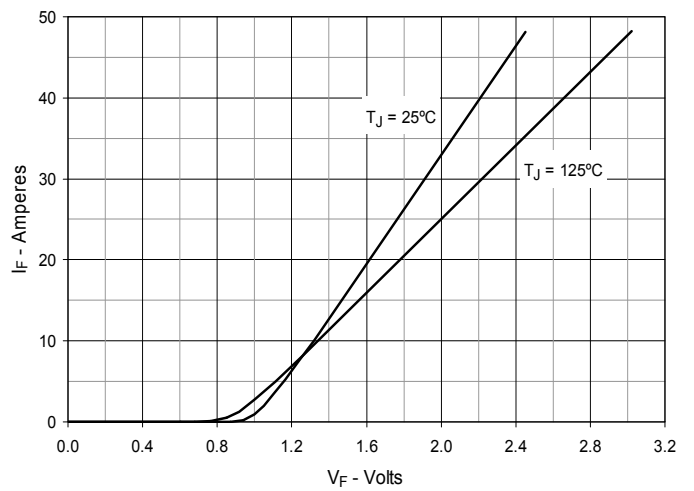
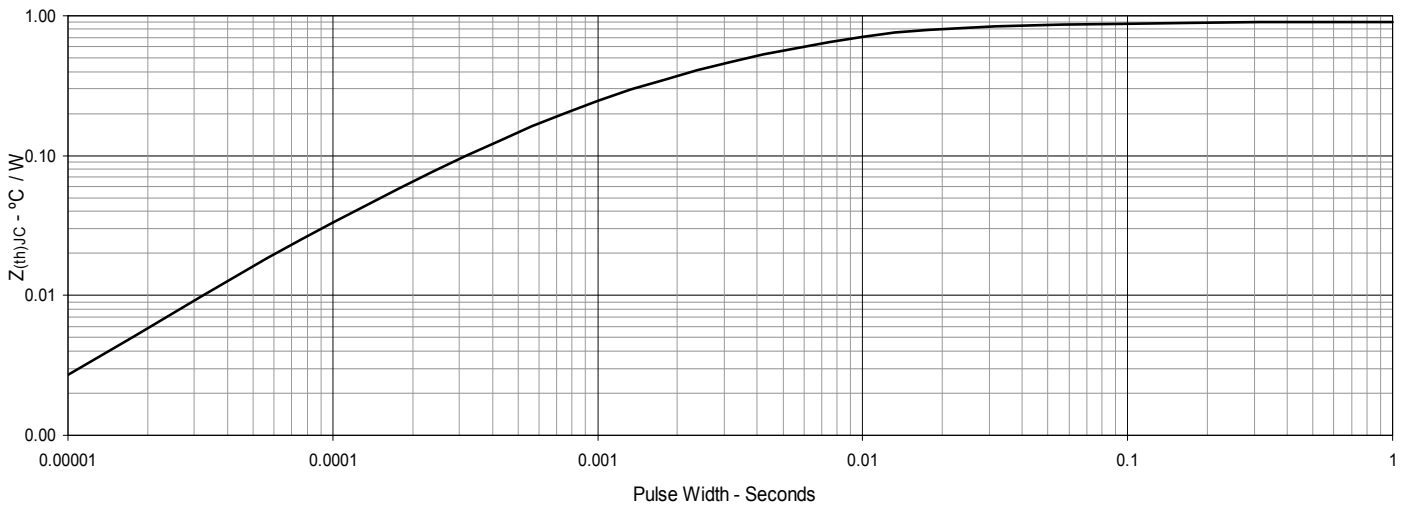


Fig. 22. Maximum Transient Thermal Impedance for Diode





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