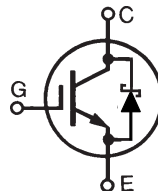


GenX3™ 600V IGBT w/ SiC Anti-Parallel Diode

IXGR60N60C3C1

(Electrically Isolated Back Surface)

High Speed PT IGBT for 40-100kHz Switching



$$V_{CES} = 600V$$

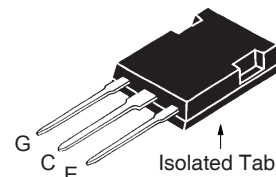
$$I_{C110} = 30A$$

$$V_{CE(sat)} \leq 2.5V$$

$$t_{fi(typ)} = 50ns$$

| 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} | $T_C = 110^\circ C$ | 30 | A |
| I_{F110} | $T_C = 110^\circ C$ | 13 | A |
| I_{CM} | $T_C = 25^\circ C$, 1ms | 260 | A |
| I_A | $T_C = 25^\circ C$ | 40 | A |
| E_{AS} | $T_C = 25^\circ C$ | 400 | mJ |
| SSOA (RBSOA) | $V_{GE} = 15V$, $T_{VJ} = 125^\circ C$, $R_G = 3\Omega$ Clamped Inductive Load | $I_{CM} = 125$ @ $V_{CE} \leq V_{CES}$ | A |
| P_C | $T_C = 25^\circ C$ | 170 | W |
| T_J | | -55 ... +150 | $^\circ C$ |
| T_{JM} | | 150 | $^\circ C$ |
| T_{stg} | | -55 ... +150 | $^\circ C$ |
| V_{ISOL} | 50/60 Hz, RMS, $t = 1$ minute $I_{ISOL} < 1mA$ $t = 10$ s | 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 |

ISOPLUS247™



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
- High Speed Silicon Carbide Schottky Co-Pack Diode
- No Reverse Recovery
- 2500V Electrical Isolation
- Avalanche Rated

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} | $V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 125^\circ C$ | | | 50 μA 1 mA |
| I_{GES} | $V_{CE} = 0V$, $V_{GE} = \pm 20V$ | | | ± 100 nA |
| $V_{CE(sat)}$ | $I_C = 40A$, $V_{GE} = 15V$, Note 1 $T_J = 125^\circ C$ | 2.2 1.7 | | 2.5 V V |

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|--|---|-----------------------|--|---------|
| | | Min. | Typ. | Max. |
| g_{fs} | $I_C = 40\text{A}$, $V_{CE} = 10\text{V}$, Note 1 | 23 | 38 | S |
| C_{ies} C_{oes} C_{res} | $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$ | | 2810 | pF |
| | | | 210 | pF |
| | | | 80 | pF |
| Q_g Q_{ge} Q_{gc} | $I_C = 50\text{A}$, $V_{GE} = 15\text{V}$, $V_{CE} = 0.5 \cdot V_{CES}$ | | 115 | nC |
| | | | 43 | nC |
| | | | 22 | nC |
| $t_{d(on)}$ t_{ri} E_{on} $t_{d(off)}$ t_{fi} E_{off} | Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 40\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}$, $R_G = 3\Omega$ Note 2 | | 24 | ns |
| | | | 40 | ns |
| | | | 0.83 | mJ |
| | | | 70 | 110 ns |
| | | | 50 | ns |
| | | | 0.45 | 0.80 mJ |
| $t_{d(on)}$ t_{ri} E_{on} $t_{d(off)}$ t_{fi} E_{off} | Inductive Load, $T_J = 125^\circ\text{C}$ $I_C = 40\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}$, $R_G = 3\Omega$ Note 2 | | 23 | ns |
| | | | 39 | ns |
| | | | 0.78 | mJ |
| | | | 112 | ns |
| | | | 86 | ns |
| | | | 0.80 | mJ |
| R_{thJC} R_{thCS} | | | 0.73 $^\circ\text{C/W}$ 0.15 $^\circ\text{C/W}$ | |

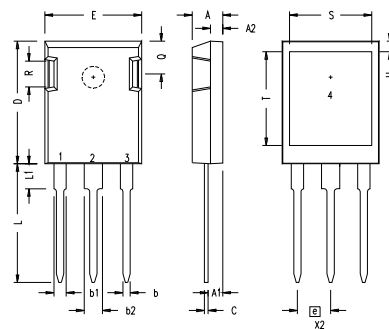
Reverse Diode (SiC)

| 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} | | | | 1.75 $^\circ\text{C/W}$ |

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 .

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.

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 @ $T_J = 25^\circ\text{C}$

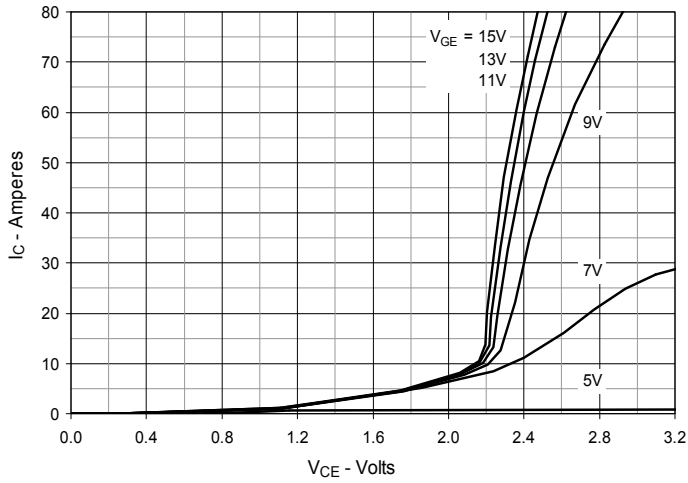


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

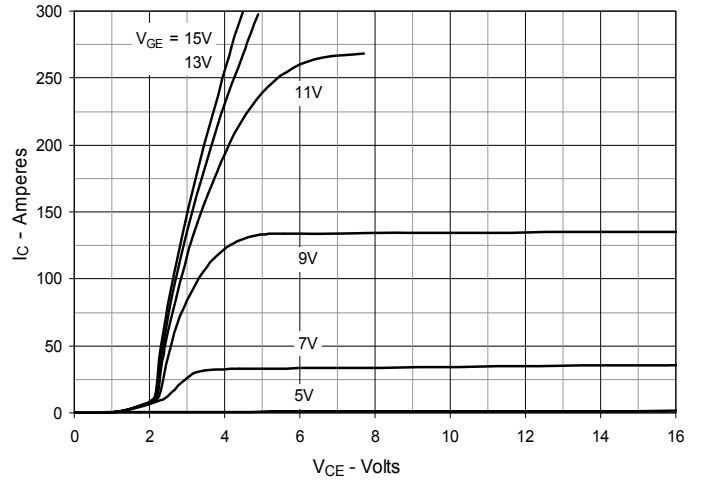


Fig. 3. Output Characteristics @ $T_J = 125^\circ\text{C}$

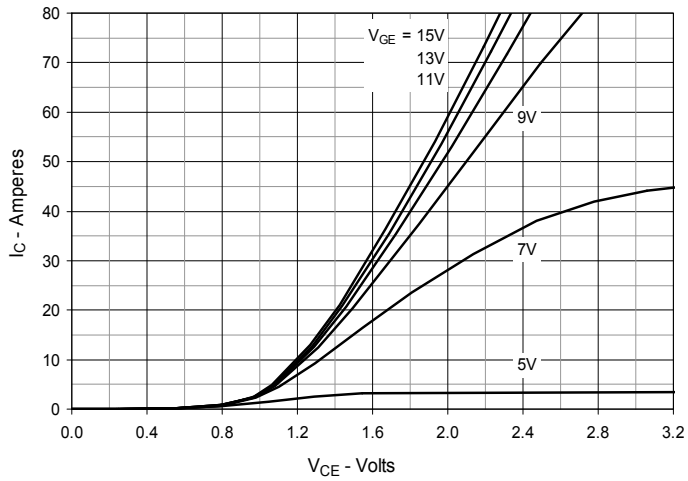


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

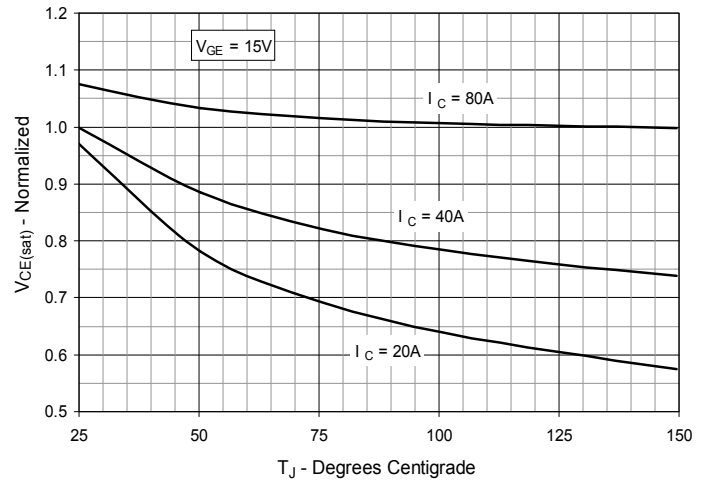


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

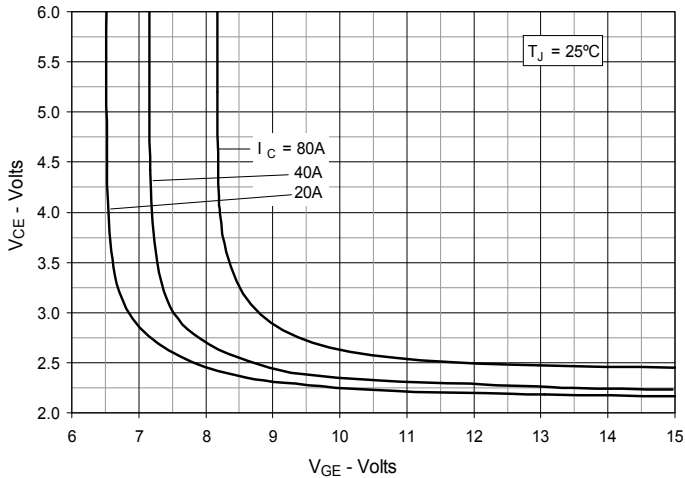


Fig. 6. Input Admittance

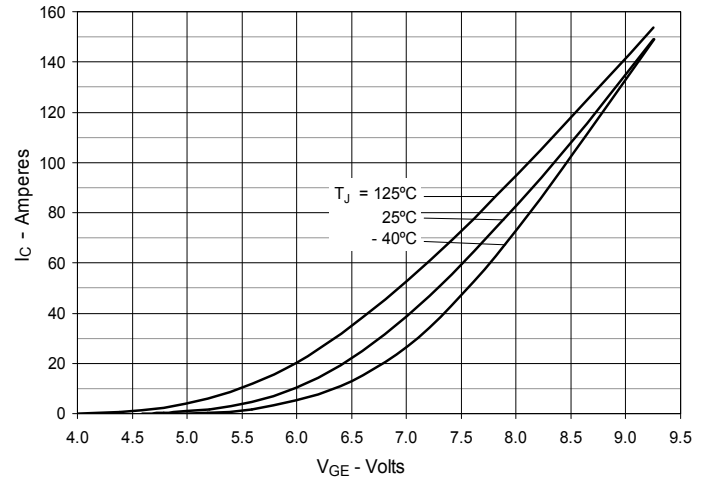


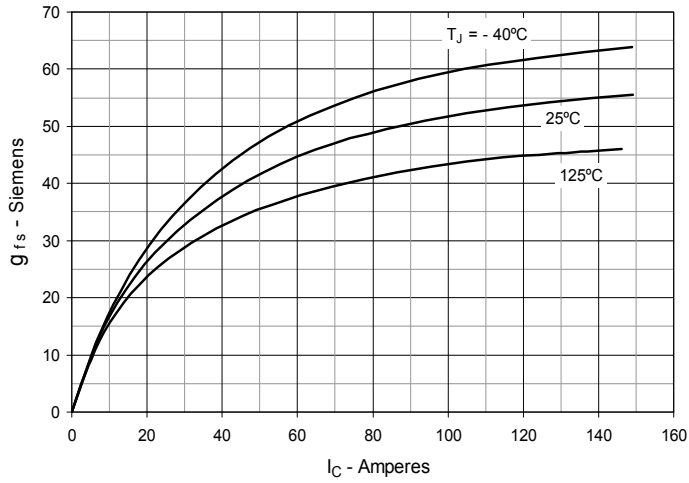
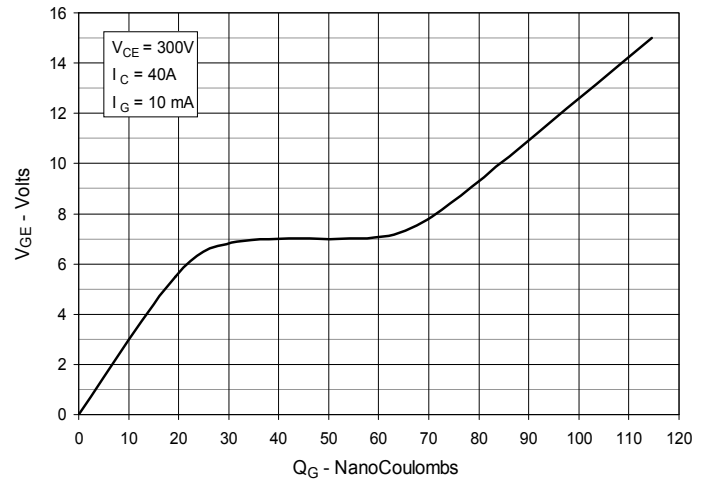
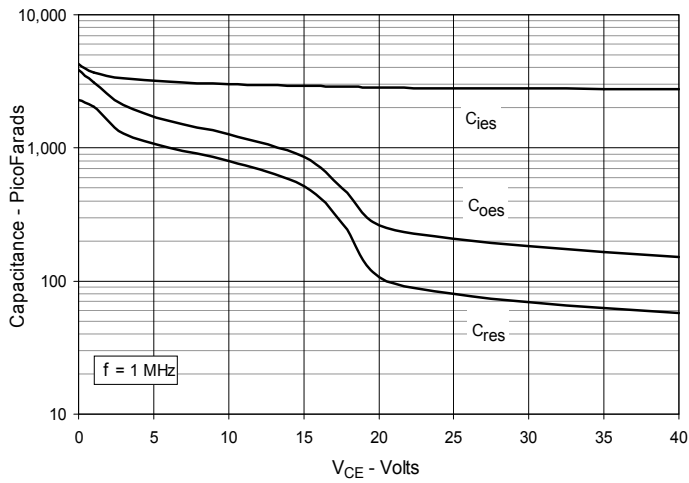
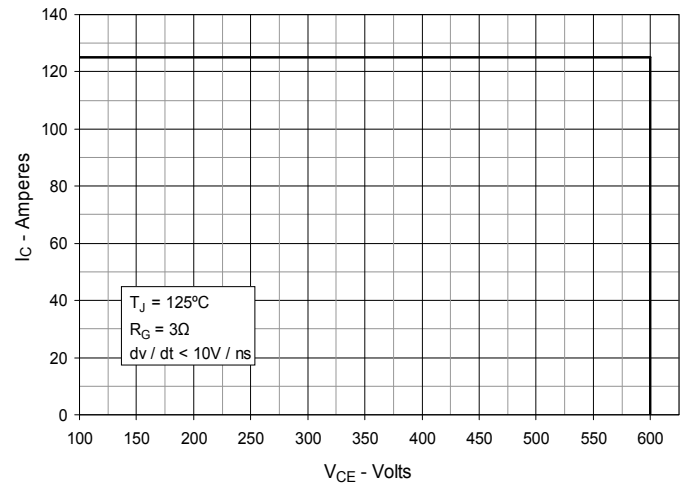
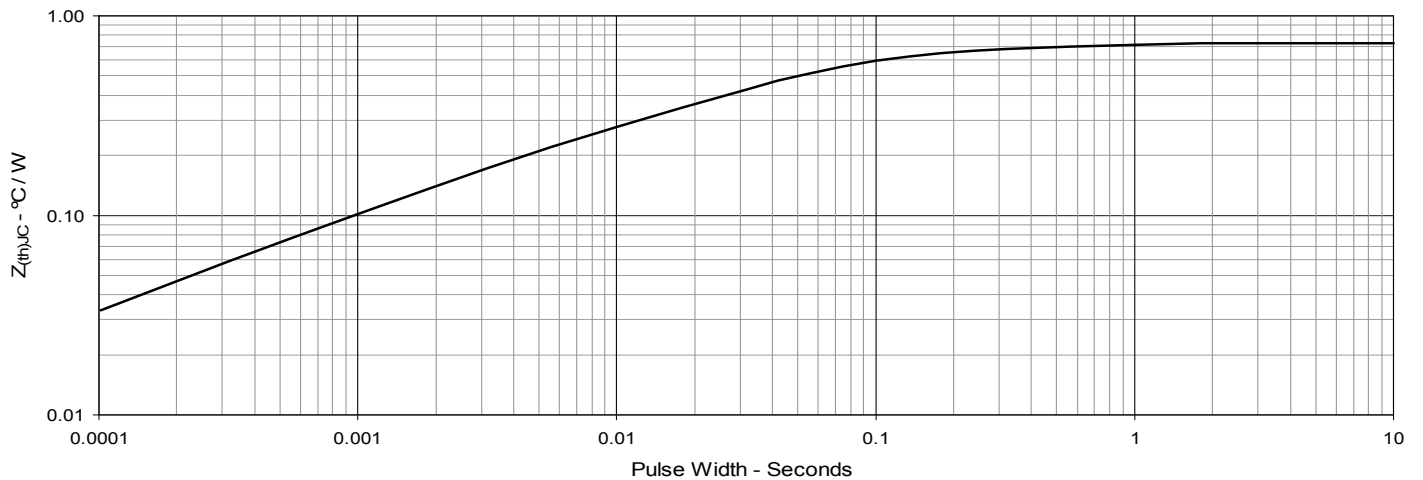
Fig. 7. Transconductance

Fig. 8. Gate Charge

Fig. 9. Capacitance

Fig. 10. Reverse-Bias Safe Operating Area

Fig. 11. Maximum Transient Thermal Impedance


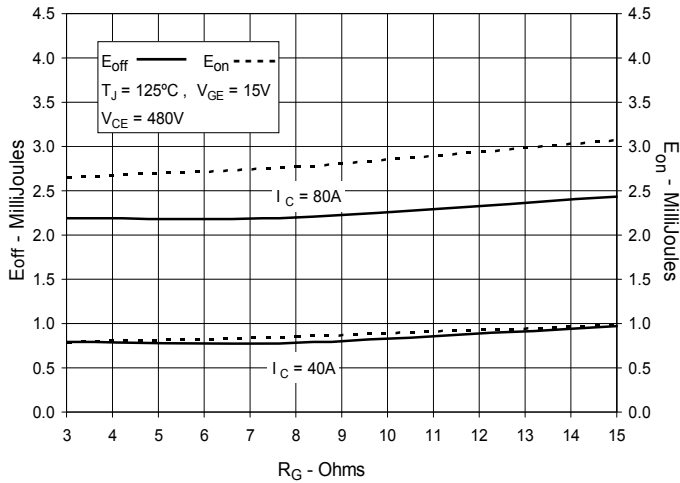
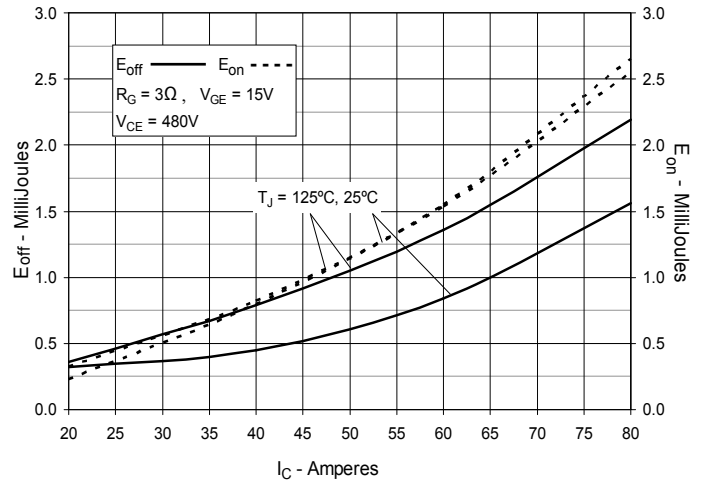
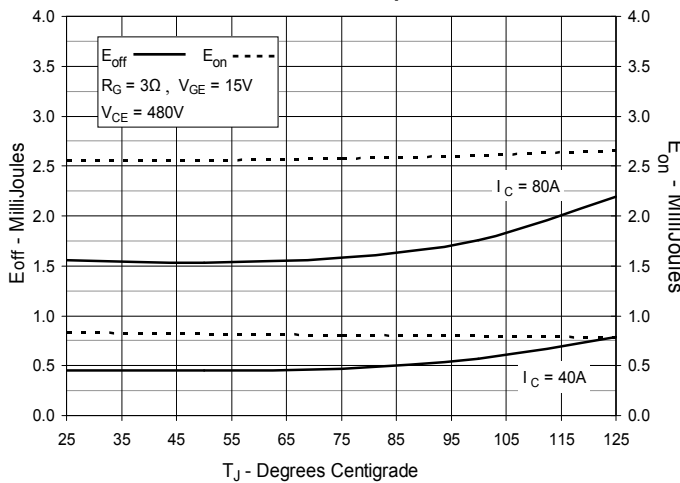
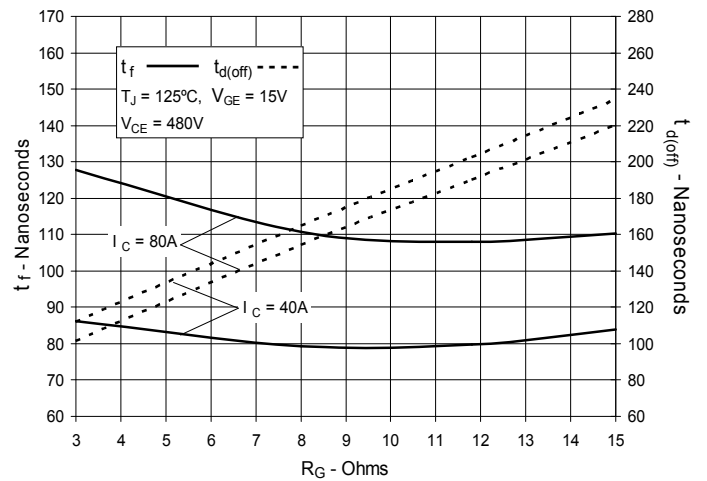
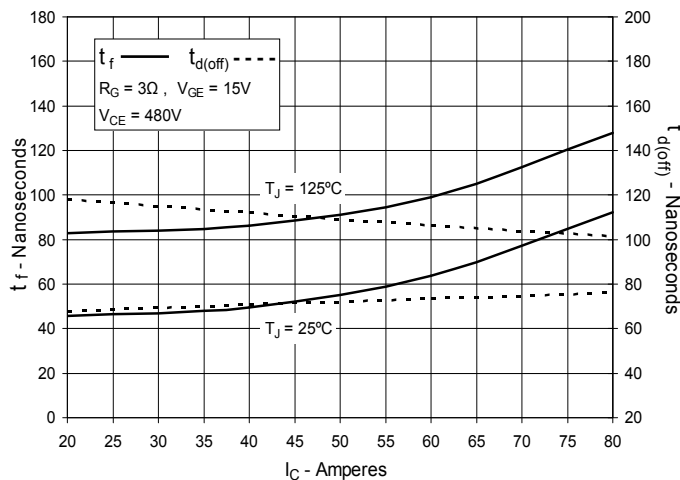
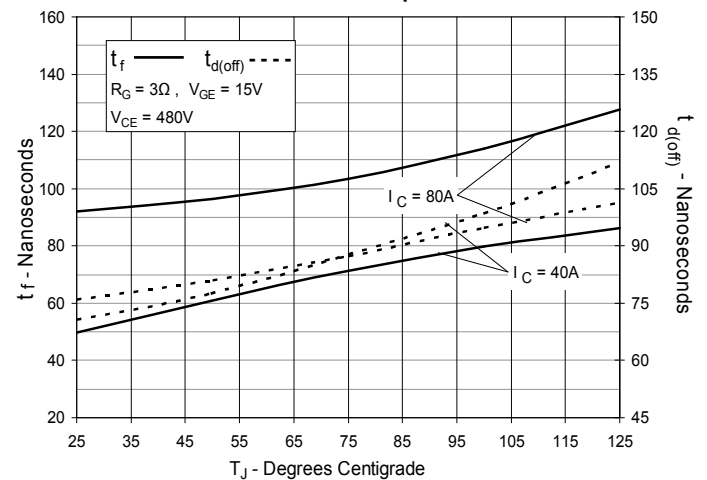
Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

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

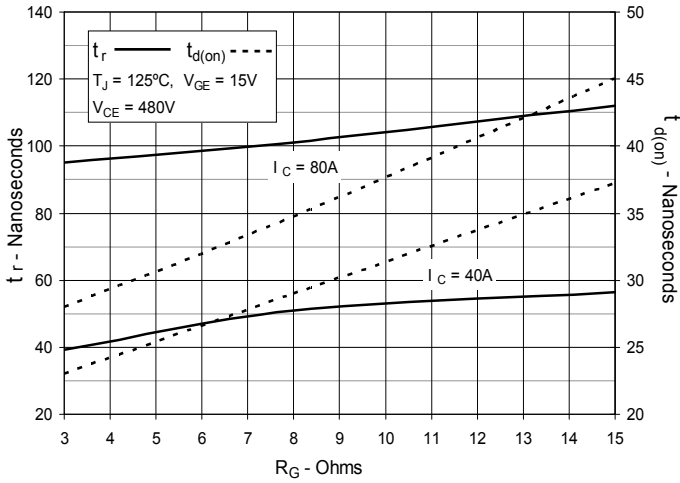


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

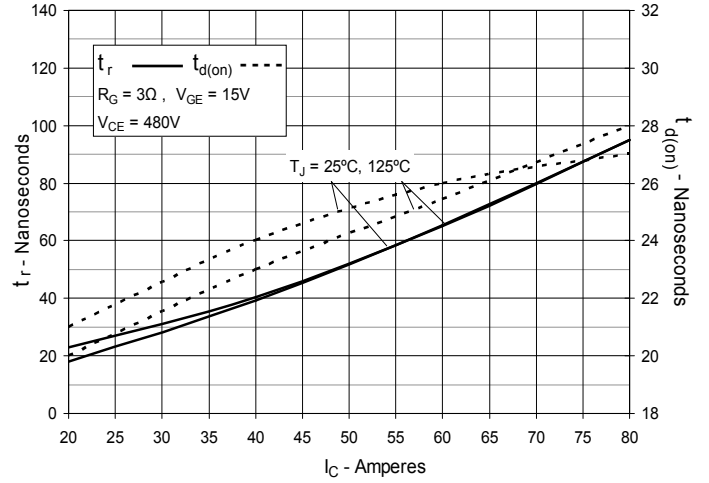


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

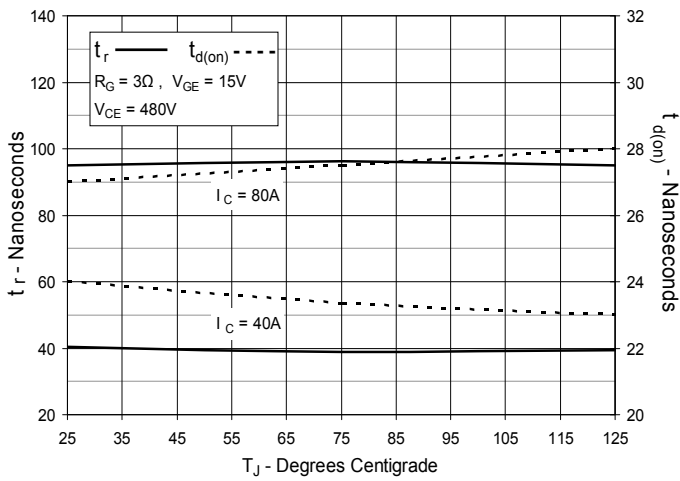


Fig. 21. Forward Current vs. Forward Voltage

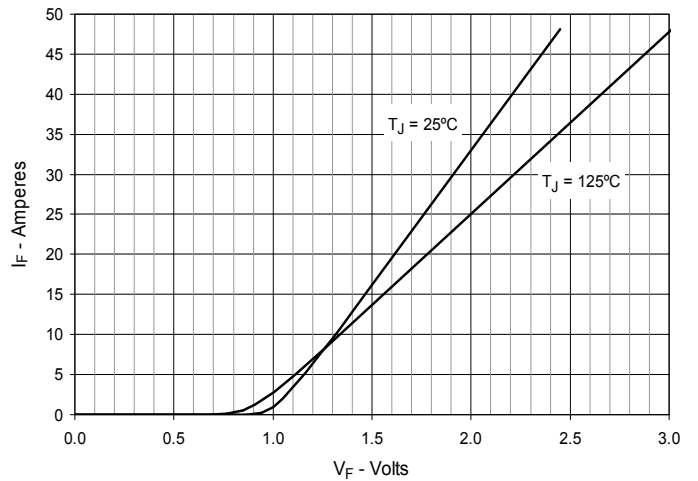


Fig. 22. Maximum Transient Thermal Impedance for Diodes

