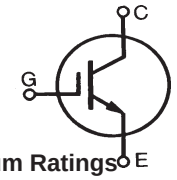
IXYS

Preliminary Technical Information

# GenX3™ 1200V IGBT IXGH40N120C3

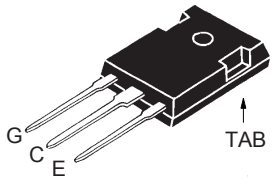
$V_{CES}$ = 1200V
$I_{C110}$ = 40A
$V_{CE(sat)}$ ≤ 4.4V
$t_{fi(typ)}$ = 57ns

## High speed PT IGBTs for 20 - 50 kHz switching




| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_J$ = 25°C to 150°C | 1200 | V |
| $V_{CGR}$ | $T_J$ = 25°C to 150°C, $R_{GE}$ = 1MΩ | 1200 | V |
| $V_{GES}$ | Continuous | ±20 | V |
| $V_{GEM}$ | Transient | ±30 | V |
| $I_{C25}$ | $T_C$ = 25°C (limited by leads) | 75 | A |
| $I_{C110}$ | $T_C$ = 110°C | 40 | A |
| $I_{CM}$ | $T_C$ = 25°C, 1ms | 200 | A |
| $I_A$ | $T_C$ = 25°C | 30 | A |
| $E_{AS}$ | $T_C$ = 25°C | 500 | mJ |
| **SSOA (RBSOA)** | $V_{GE}$ = 15V, $T_J$ = 125°C, $R_G$ = 3Ω<br>Clamped inductive load @$V_{CE}$ ≤ 1200V | $I_{CM}$ = 80 | A |
| $P_C$ | $T_C$ = 25°C | 380 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $M_d$ | Mounting torque | 1.13 / 10 | Nm/lb.in. |
| $T_L$ | Maximum lead temperature for soldering | 300 | °C |
| $T_{SOLD}$ | 1.6mm (0.062 in.) from case for 10s | 260 | °C |
| **Weight** | | 6 | g |

**TO-247 (IXGH)**




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

### Features

- International standard packages: JEDEC TO-247AD
- IGBT and anti-parallel FRED in one package
- MOS Gate turn-on
  - drive simplicity

### Applications

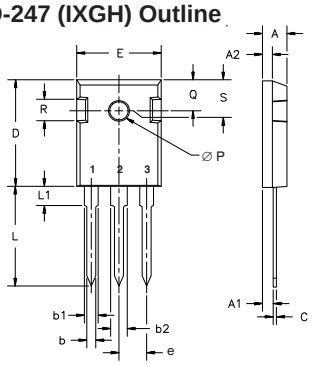
- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

| Symbol | Test Conditions ($T_J$ = 25°C, unless otherwise specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{CES}$ | $I_C$ = 250μA, $V_{GE}$ = 0V | 1200 | | | V |
| $V_{GE(th)}$ | $I_C$ = 250μA, $V_{CE}$ = $V_{GE}$ | 3.0 | | 5.0 | V |
| $I_{CES}$ | $V_{CE}$ = $V_{CES}$ | | | 75 | μA |
| | $V_{GE}$ = 0V $T_J$ = 125°C | | | 1.5 | mA |
| $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ±20V | | | ±100 | nA |
| $V_{CE(sat)}$ | $I_C$ = 30A, $V_{GE}$ = 15V, Note 1 | | | 4.4 | V |
| | $T_J$ = 125°C | | 2.7 | | V |

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| Symbol | Test Conditions ($T_J$ = 25°C, unless otherwise specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $I_C$ = 30A, $V_{CE}$ = 10V, Note 1 | 18 | 30 | | S |
| $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | | 2930 | | pF |
| $C_{oes}$ | | | 225 | | pF |
| $C_{res}$ | | | 93 | | pF |
| $Q_g$ | $I_C$ = 40A, $V_{GE}$ = 15V, $V_{CE}$ = 0.5 • $V_{CES}$ | | 142 | | nC |
| $Q_{ge}$ | | | 19 | | nC |
| $Q_{gc}$ | | | 62 | | nC |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 25°C** $I_C$ = 30A, $V_{GE}$ = 15V $V_{CE}$ = 600V, $R_G$ = 3Ω Note 1 | | 17 | | ns |
| $t_{ri}$ | | | 33 | | ns |
| $E_{on}$ | | | 1.8 | | mJ |
| $t_{d(off)}$ | | | 130 | | ns |
| $t_{fi}$ | | | 57 | | ns |
| $E_{off}$ | | | 0.55 | 1.0 | mJ |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 125°C** $I_C$ = 30A, $V_{GE}$ = 15V $V_{CE}$ = 600V, $R_G$ = 3Ω Note 1 | | 17 | | ns |
| $t_{ri}$ | | | 35 | | ns |
| $E_{on}$ | | | 3.5 | | mJ |
| $t_{d(off)}$ | | | 177 | | ns |
| $t_{fi}$ | | | 298 | | ns |
| $E_{off}$ | | | 1.6 | | mJ |
| $R_{thJC}$ | | | | 0.33 | °C/W |
| $R_{thCK}$ | | | 0.21 | | °C/W |

**TO-247 (IXGH) Outline**




Terminals: 1 - Gate 2 - Drain
3 - Source Tab - Drain

| Dim. | Millimeter Min. | Max. | Inches 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 |
| ØP | 3.55 | 3.65 | .140 | .144 |
| Q | 5.89 | 6.40 | 0.232 | 0.252 |
| R | 4.32 | 5.49 | .170 | .216 |
| S | 6.15 BSC | | 242 BSC | |

Notes: 1. Pulse test, t ≤ 300μs; duty cycle, d ≤ 2%.

**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 4,850,072 4,881,106 4,931,844 5,017,508 5,034,796 5,049,961 5,063,307 5,187,117 5,237,481 5,381,025 5,486,715 6,162,665 6,259,123 B1 6,306,728 B1 6,404,065 B1 6,534,343 6,583,505 6,683,344 6,710,405 B2 6,710,463 6,727,585 6,759,692 6,771,478 B2 7,005,734 B2 7,063,975 B2 7,071,537 7,157,338B2

**Fig. 1. Output Characteristics @ 25ºC**

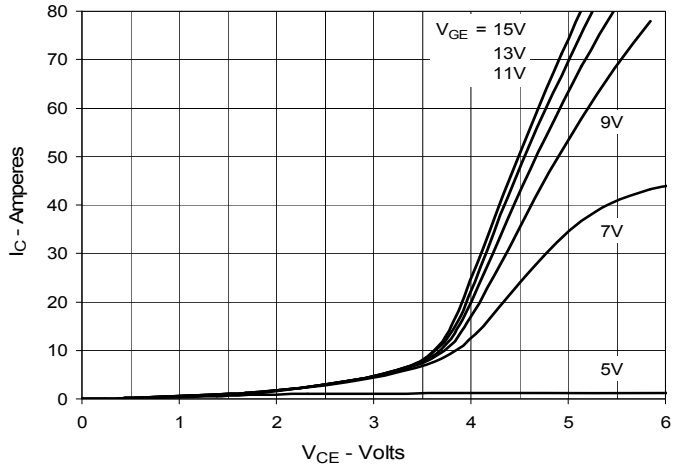



**Fig. 2. Extended Output Characteristics @ 25ºC**

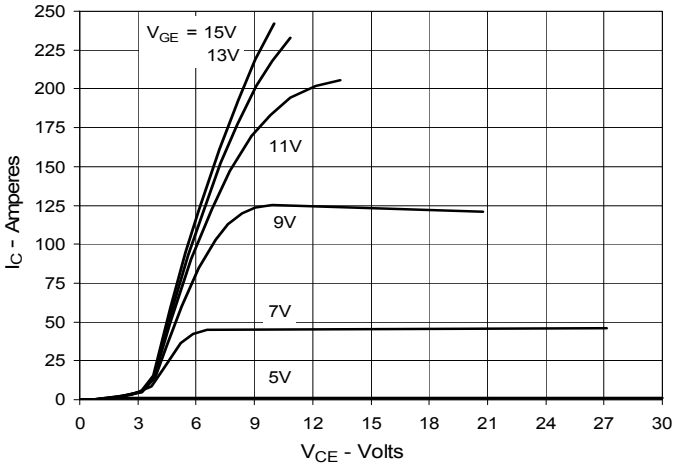



**Fig. 3. Output Characteristics @ 125ºC**

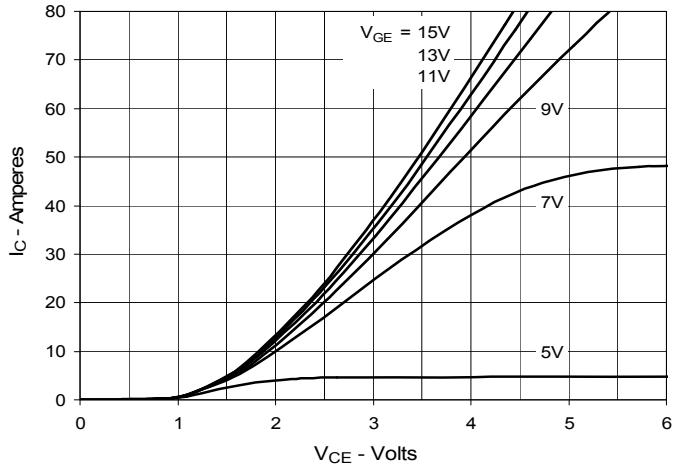



**Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature**

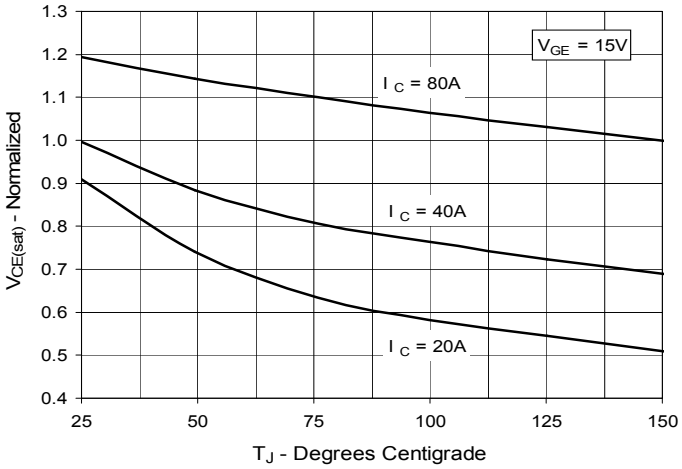



**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

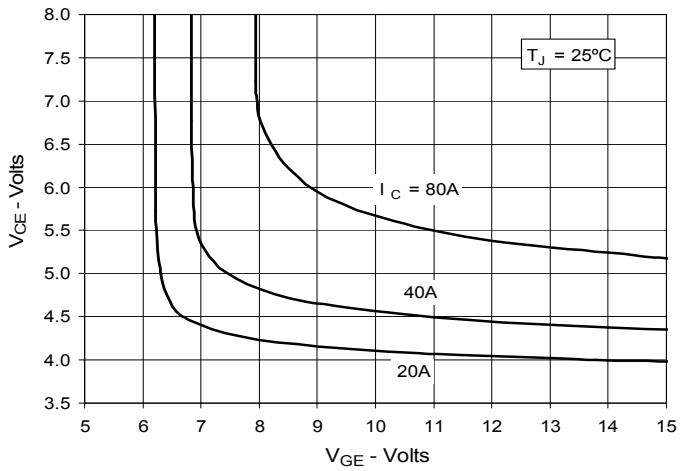
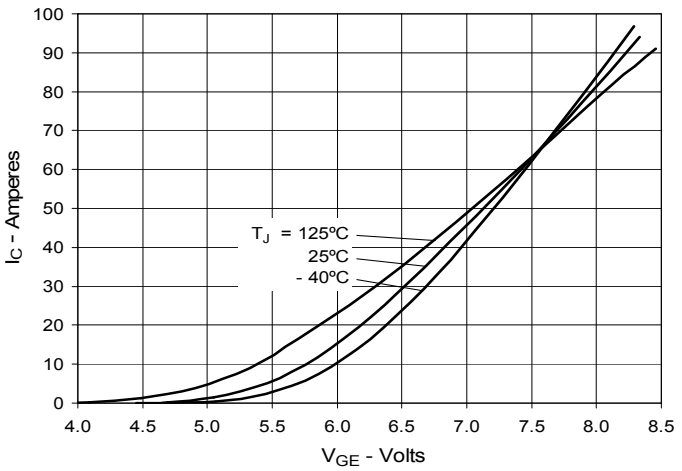



**Fig. 6. Input Admittance**




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**Fig. 7. Transconductance**

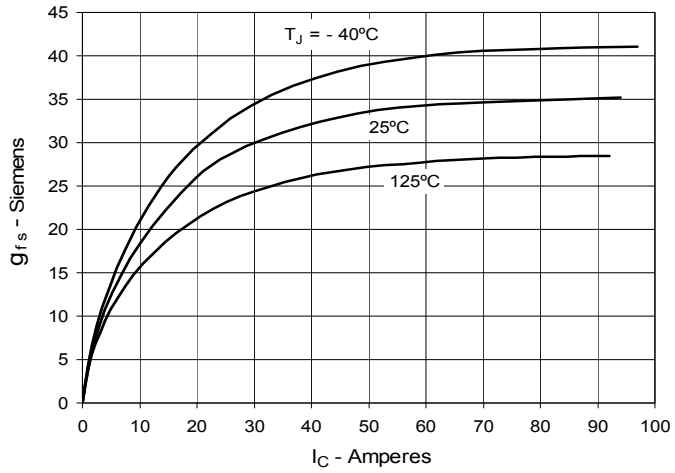



**Fig. 8. Gate Charge**

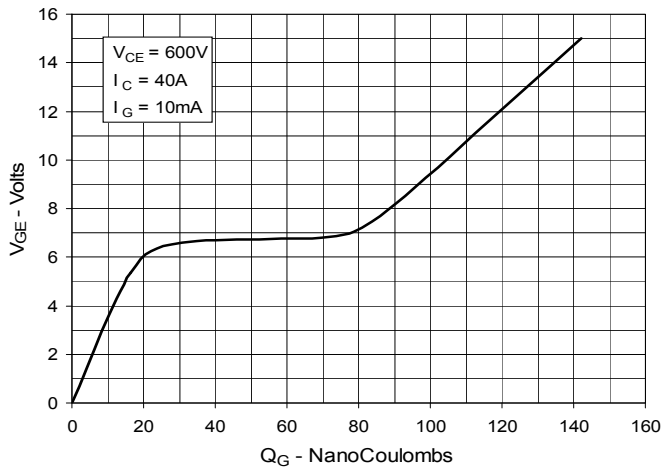



**Fig. 9. Capacitance**

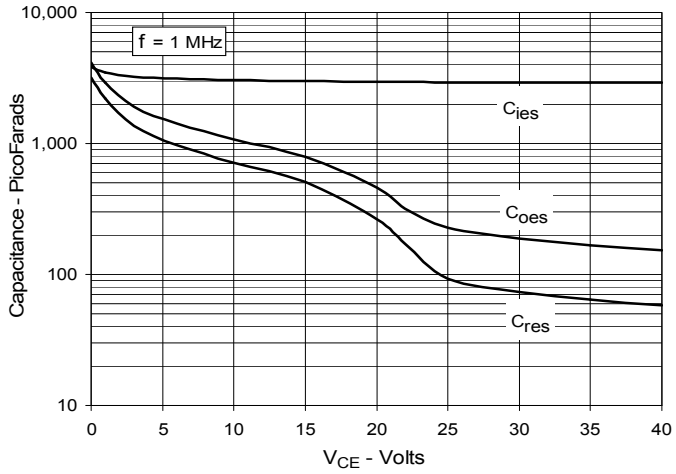



**Fig. 10. Reverse-Bias Safe Operating Area**

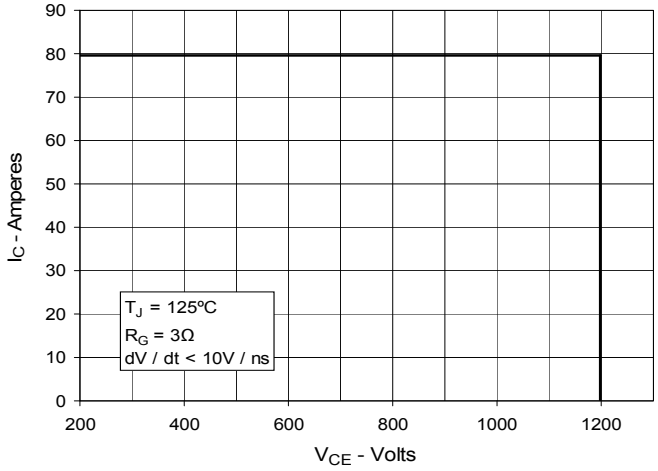
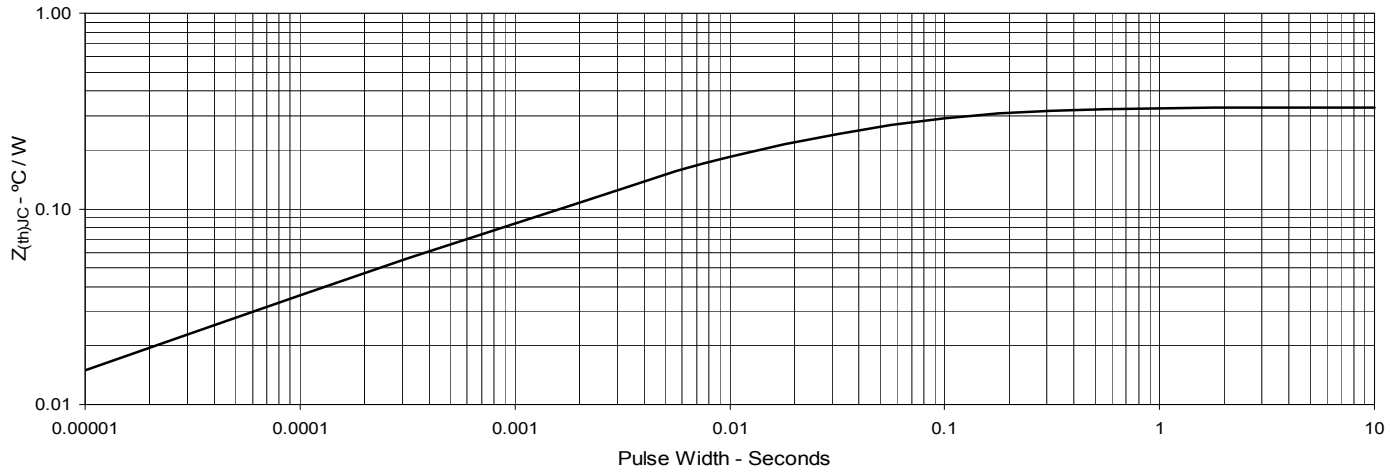



**Fig. 11. Maximum Transient Thermal Impedance**




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

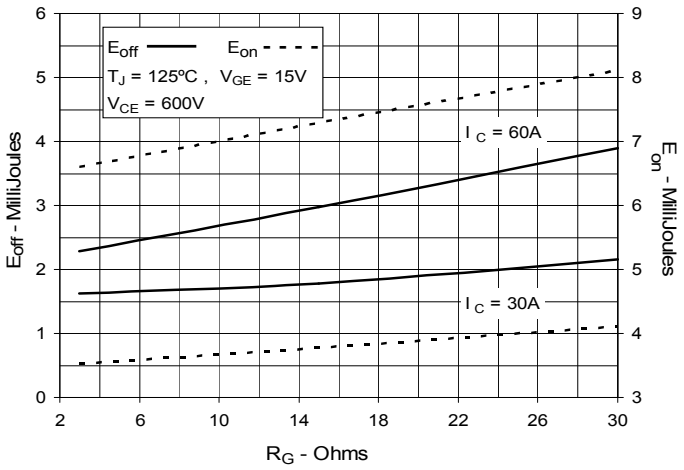



**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**

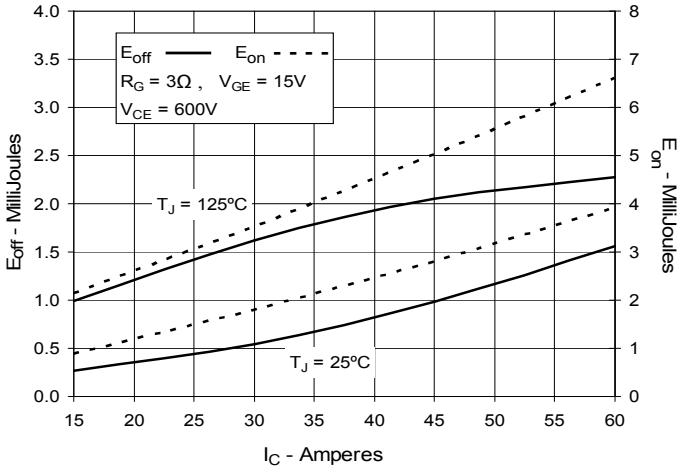



**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**

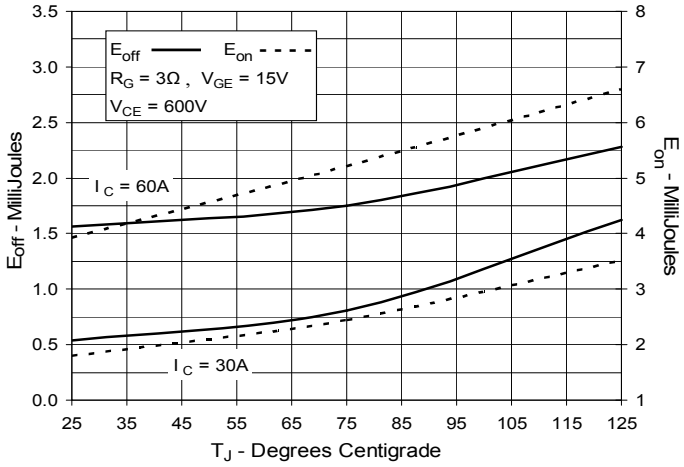



**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**

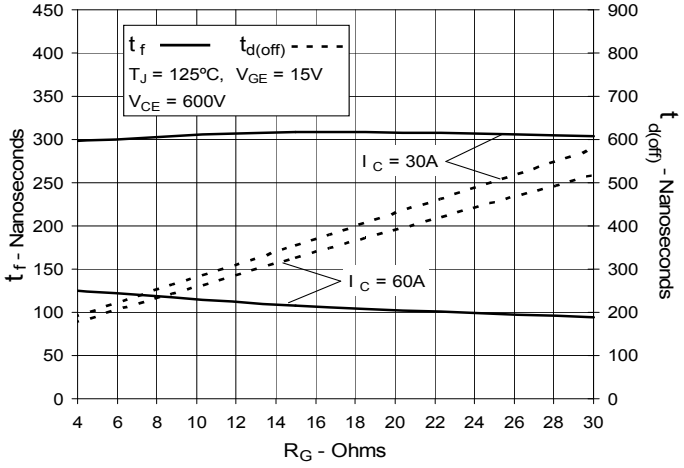



**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**

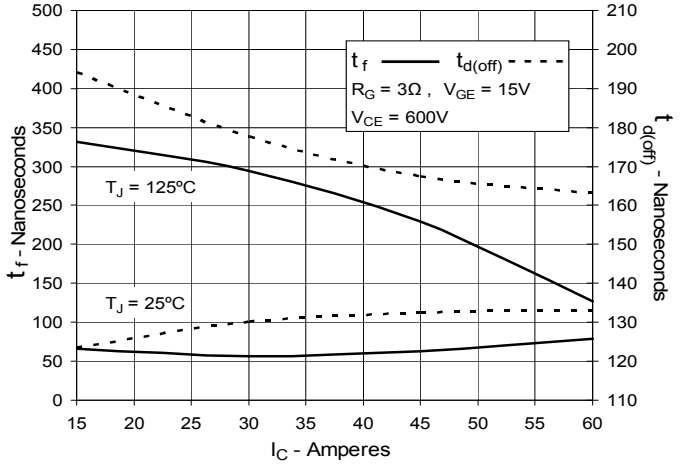
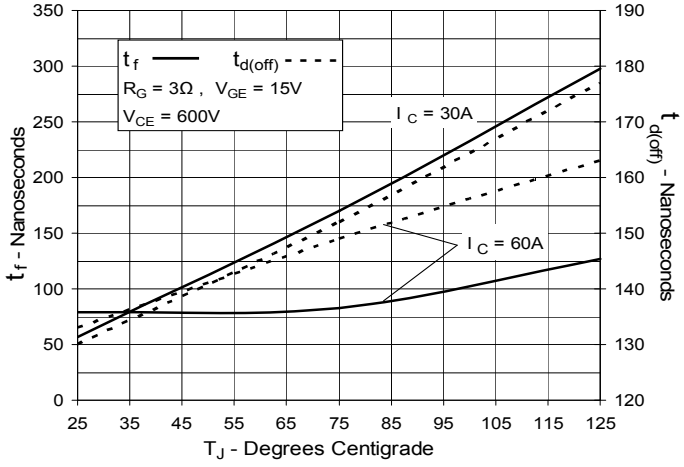



**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**




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

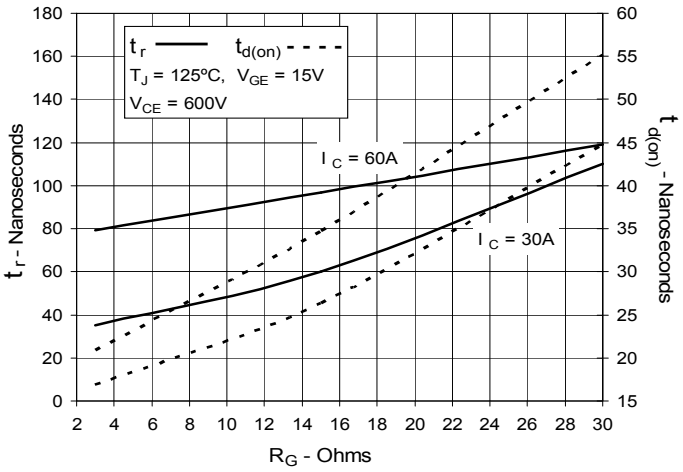



**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**

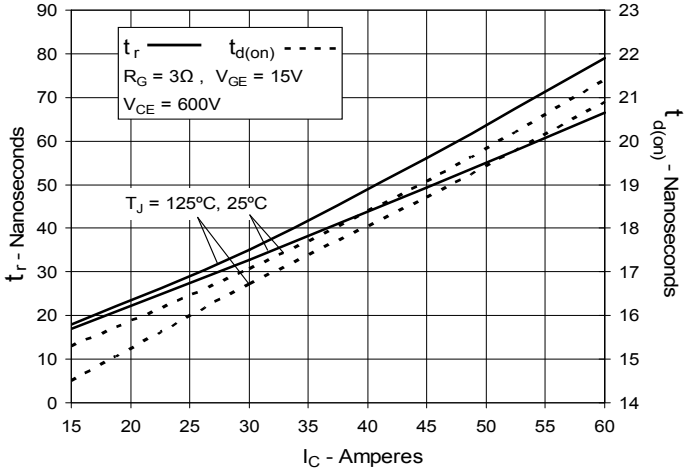
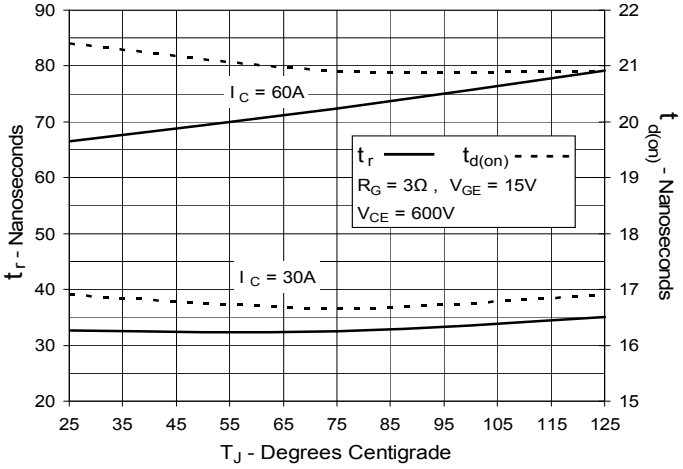



**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**




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