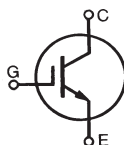


GenX3™ 1200V IGBTs

IXGA20N120A3
IXGP20N120A3
IXGH20N120A3

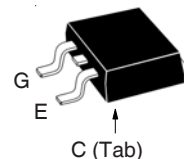
V_{CES} = 1200V
I_{C110} = 20A
V_{CE(sat)} ≤ 2.5V

Ultra-Low V_{sat} PT IGBTs for
up to 3 kHz Switching

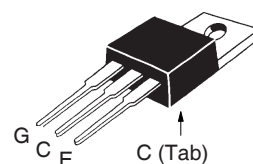


| Symbol | Test Conditions | Maximum Ratings | |
|-------------------------------|-----------------------------------------------------------------------------------------------|-------------------------------------------------|-----------|
| V _{CES} | T _J = 25°C to 150°C | 1200 | V |
| V _{CGR} | 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 | 40 | A |
| I _{C110} | T _C = 110°C | 20 | A |
| I _{CM} | T _C = 25°C, 1ms | 120 | A |
| SSOA (RBSOA) | V _{GE} = 15V, T _J = 125°C, R _G = 10Ω Clamped Inductive Load | I _{CM} = 40 @ V _{CE} ≤ 960 | A V |
| P _C | T _C = 25°C | 180 | W |
| T _J | | -55 ... +150 | °C |
| T _{JM} | | 150 | °C |
| T _{stg} | | -55 ... +150 | °C |
| M _d | Mounting Torque (TO-247 & TO-220) | 1.13/10 | Nm/lb.in. |
| F _C | Mounting Force (TO-263) | 10..65 / 2.2..14.6 | N/lb. |
| T _L | Maximum Lead Temperature for Soldering | 300 | °C |
| T _{SOLD} | 1.6mm (0.062 in.) from Case for 10s | 260 | °C |
| Weight | TO-263 | 2.5 | g |
| | TO-220 | 3.0 | g |
| | TO-247 | 6.0 | g |

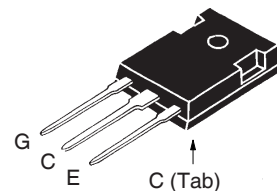
TO-263 AA (IXGA)



TO-220AB (IXGP)



TO-247 (IXGH)



G = Gate C = Collector
E = Emitter Tab = Collector

Features

- Optimized for Low Conduction Losses
- International Standard Packages

Advantages

- High Power Density
- Low Gate Drive Requirement

Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts
- Inrush Current Protection Circuits

| 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} | 2.5 | | 5.0 V |
| I _{CES} | V _{CE} = V _{CES} , V _{GE} = 0V T _J = 125°C | | | 25 μA 1 mA |
| I _{GES} | V _{CE} = 0V, V _{GE} = ±20V | | | ±100 nA |
| V _{CE(sat)} | I _C = 20A, V _{GE} = 15V, Note 1 T _J = 125°C | 2.3 | 2.5 | V |
| | | 2.5 | | V |

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------------|--------------------------------------------------------|
| | | Min. | Typ. | Max. |
| g_{fs} | $I_C = 20\text{A}, V_{CE} = 10\text{V}$, Note 1 | 7 | 12 | S |
| C_{ies} | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$ | | 1075 | pF |
| C_{oes} | | | 80 | pF |
| C_{res} | | | 27 | pF |
| Q_g | $I_C = 20\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$ | | 50 | nC |
| Q_{ge} | | | 7.3 | nC |
| Q_{gc} | | | 23 | nC |
| $t_{d(on)}$ | Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 20\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 960\text{V}, R_G = 10\Omega$ Note 2 | | 16 | ns |
| t_{ri} | | | 44 | ns |
| E_{on} | | | 2.85 | mJ |
| $t_{d(off)}$ | | | 290 | ns |
| t_{fi} | | | 715 | ns |
| E_{off} | | | 6.47 | mJ |
| $t_{d(on)}$ | Inductive Load, $T_J = 125^\circ\text{C}$ $I_C = 20\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 960\text{V}, R_G = 10\Omega$ Note 2 | | 16 | ns |
| t_{ri} | | | 50 | ns |
| E_{on} | | | 5.53 | mJ |
| $t_{d(off)}$ | | | 310 | ns |
| t_{fi} | | | 1220 | ns |
| E_{off} | | | 10.10 | mJ |
| R_{thJC} | TO-220 TO-247 | | | 0.69 $^\circ\text{C}/\text{W}$ |
| R_{thCK} | | | 0.50 0.21 | $^\circ\text{C}/\text{W}$ $^\circ\text{C}/\text{W}$ |

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 .

TO-247 (IXGH) AD Outline

| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .185 | .209 | 4.7 | 5.3 |
| A1 | .087 | .102 | 2.2 | 2.54 |
| A2 | .059 | .098 | 2.2 | 2.6 |
| b | .040 | .055 | 1.0 | 1.4 |
| b1 | .065 | .084 | 1.65 | 2.13 |
| b2 | .113 | .123 | 2.87 | 3.12 |
| C | .016 | .031 | .4 | .8 |
| D | .819 | .845 | 20.80 | 21.46 |
| E | .610 | .640 | 15.75 | 16.26 |
| e | .215 BSC | | 5.45 BSC | |
| L | .780 | .800 | 19.81 | 20.32 |
| L1 | | .177 | | 4.50 |
| ØP | .140 | .144 | 3.55 | 3.65 |
| Q | .212 | .244 | 5.4 | 6.2 |
| R | .170 | .216 | 4.32 | 5.49 |
| S | .242 BSC | | 6.15 BSC | |

TO-220 (IXGP) Outline

| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .170 | .190 | 4.32 | 4.83 |
| b | .025 | .040 | 0.64 | 1.02 |
| b1 | .045 | .065 | 1.15 | 1.65 |
| c | .014 | .022 | 0.35 | 0.56 |
| D | .580 | .630 | 14.73 | 16.00 |
| E | .390 | .420 | 9.91 | 10.66 |
| e | .100 BSC | | 2.54 BSC | |
| F | .045 | .055 | 1.14 | 1.40 |
| H1 | .230 | .270 | 5.85 | 6.85 |
| J1 | .090 | .110 | 2.29 | 2.79 |
| k | 0 | .015 | 0 | 0.38 |
| L | .500 | .550 | 12.70 | 13.97 |
| L1 | .110 | .230 | 2.79 | 5.84 |
| ØP | .139 | .161 | 3.53 | 4.08 |
| Q | .100 | .125 | 2.54 | 3.18 |

TO-263 (IXGA) Outline

| SYM | INCHES | | MILLIMETERS | |
|-----|----------|------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | .160 | .190 | 4.06 | 4.83 |
| A1 | .080 | .110 | 2.03 | 2.79 |
| b | .020 | .039 | 0.51 | 0.99 |
| b2 | .045 | .055 | 1.14 | 1.40 |
| c | .016 | .029 | 0.40 | 0.74 |
| c2 | .045 | .055 | 1.14 | 1.40 |
| D | .340 | .380 | 8.64 | 9.65 |
| D1 | .315 | .350 | 8.00 | 8.89 |
| E | .380 | .410 | 9.65 | 10.41 |
| E1 | .245 | .320 | 6.22 | 8.13 |
| e | .100 BSC | | 2.54 BSC | |
| L | .575 | .625 | 14.61 | 15.88 |
| L1 | .090 | .110 | 2.29 | 2.79 |
| L2 | .040 | .055 | 1.02 | 1.40 |
| L3 | .050 | .070 | 1.27 | 1.78 |
| L4 | 0 | .005 | 0 | 0.13 |

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

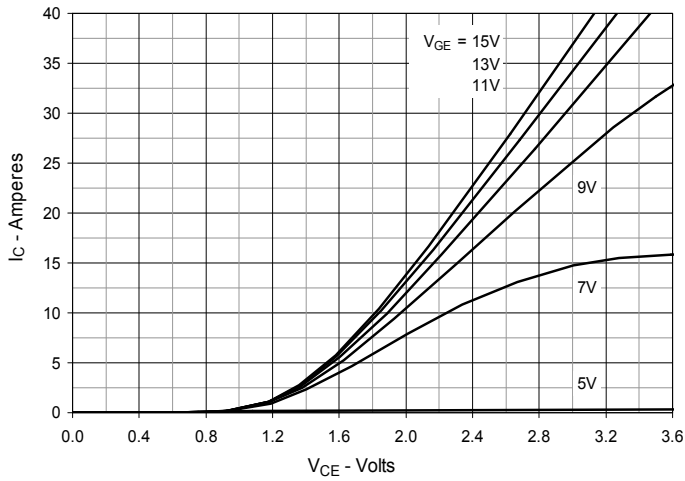


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

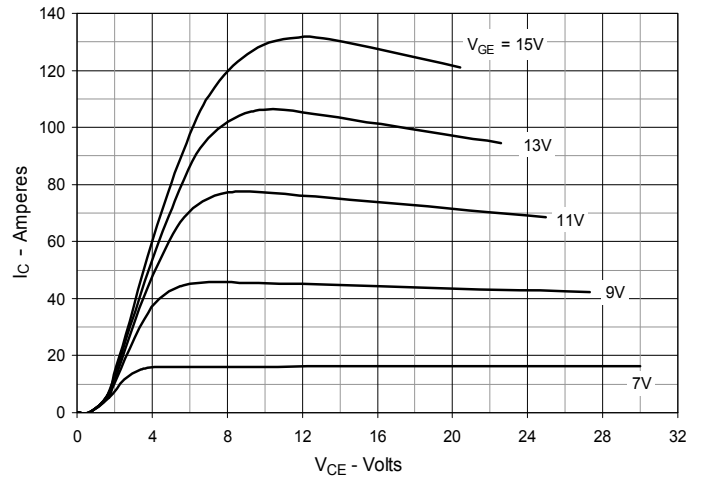


Fig. 3. Output Characteristics @ $T_J = 125^\circ\text{C}$

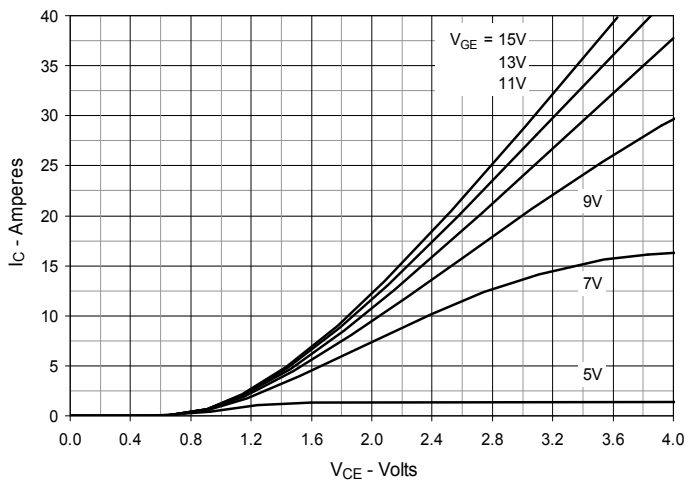


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

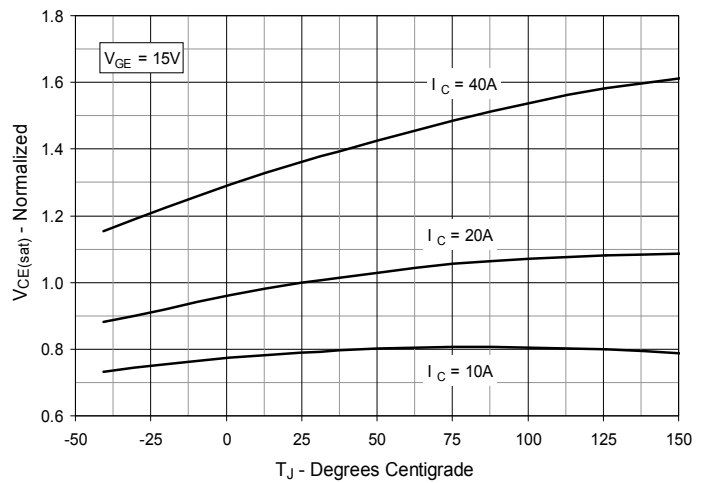


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

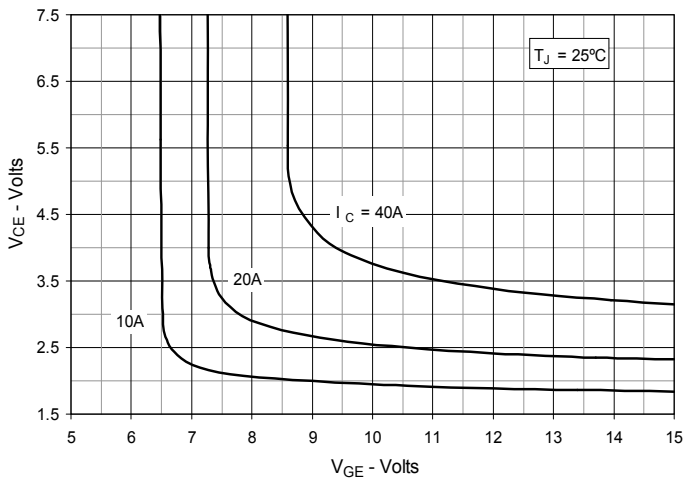


Fig. 6. Input Admittance

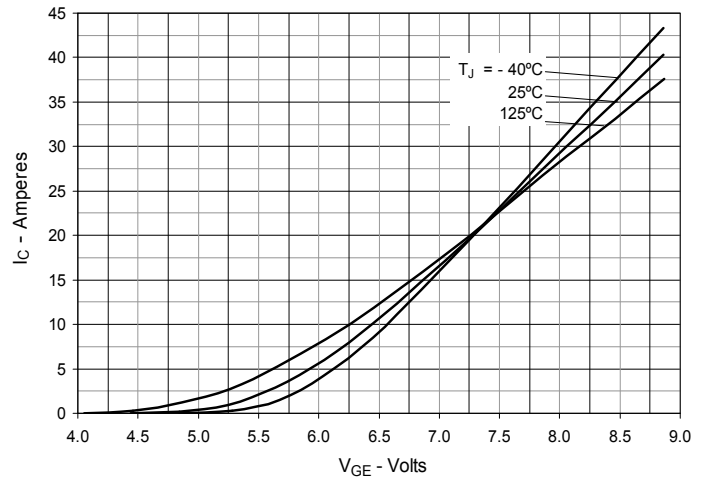


Fig. 7. Transconductance

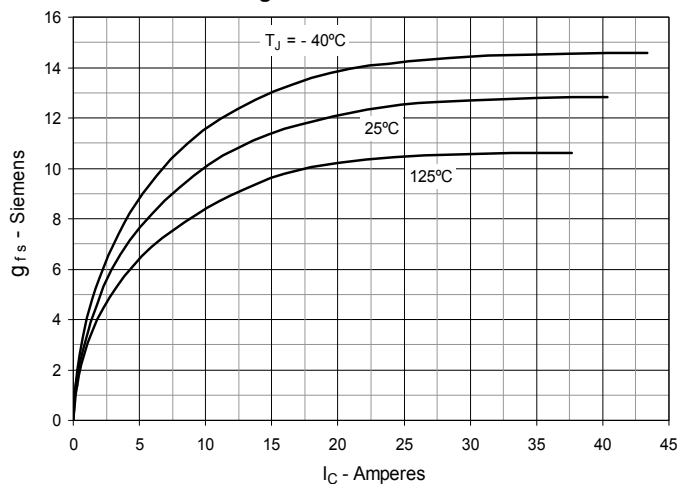


Fig. 8. Gate Charge

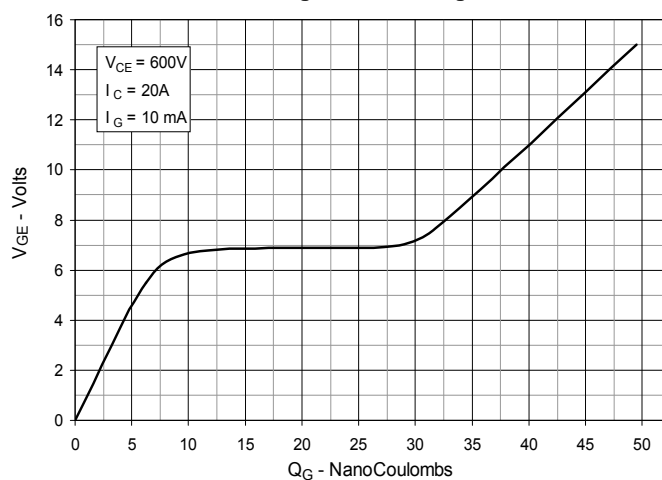


Fig. 9. Capacitance

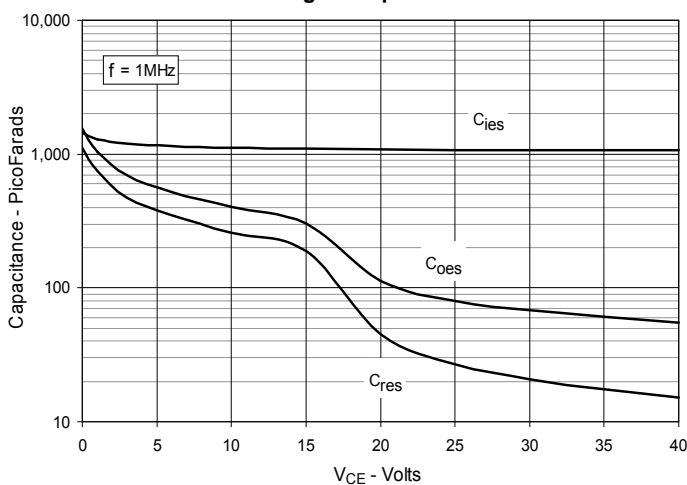


Fig. 10. Reverse-Bias Safe Operating Area

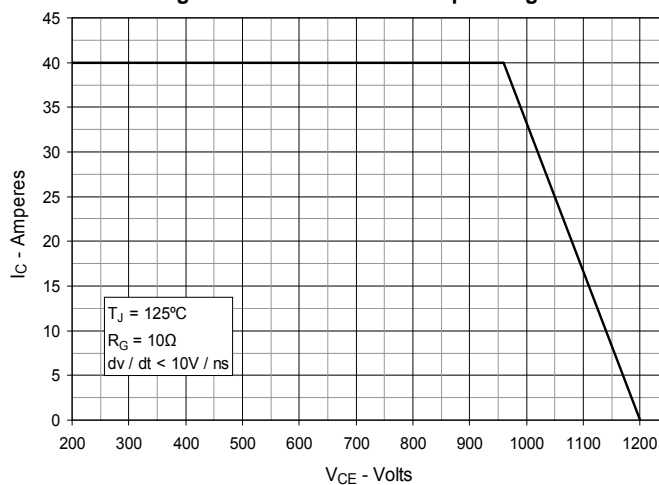


Fig. 11. Maximum Transient Thermal Impedance

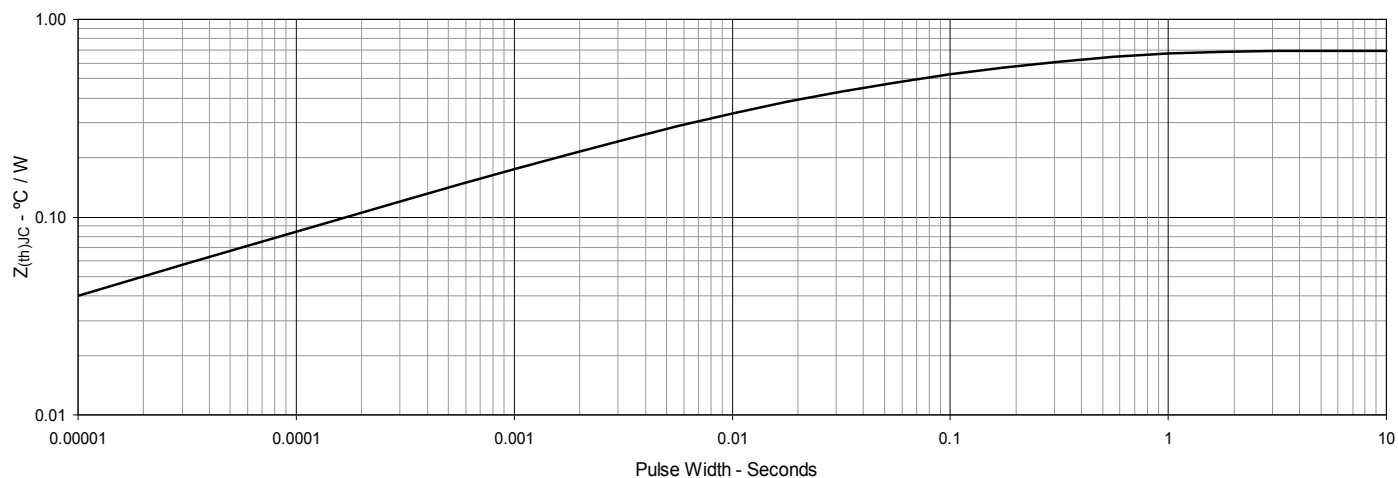


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

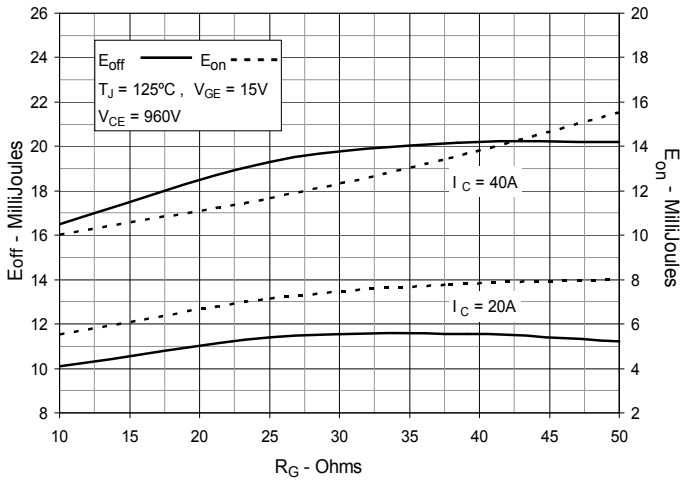


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

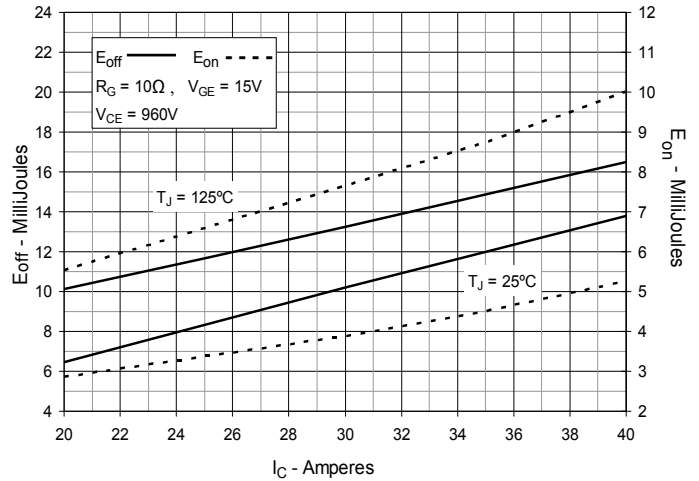


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

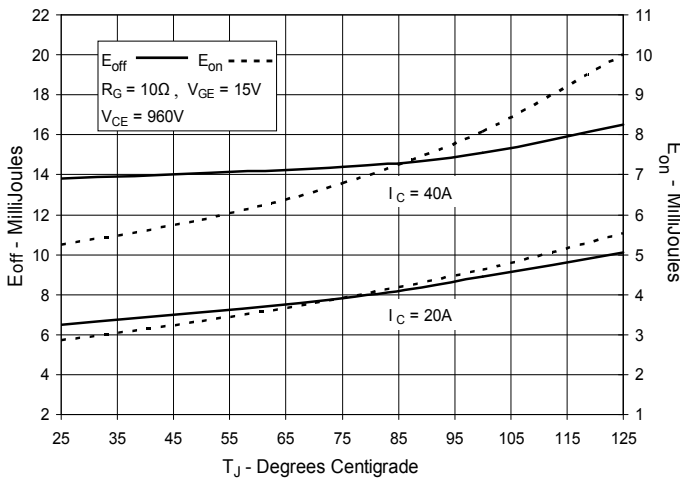


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

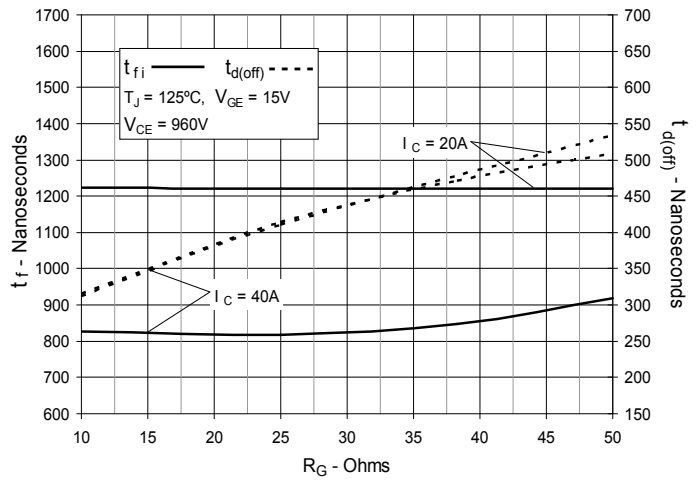


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

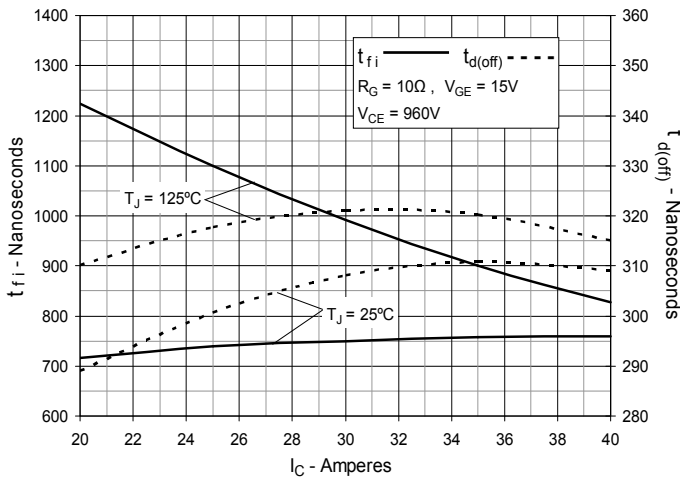


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

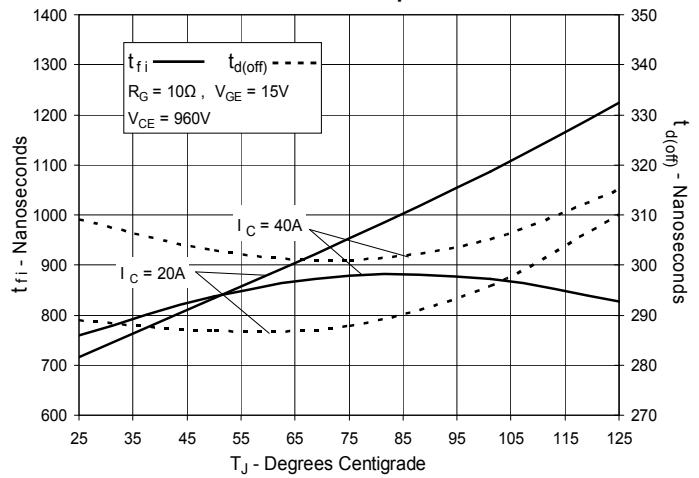


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

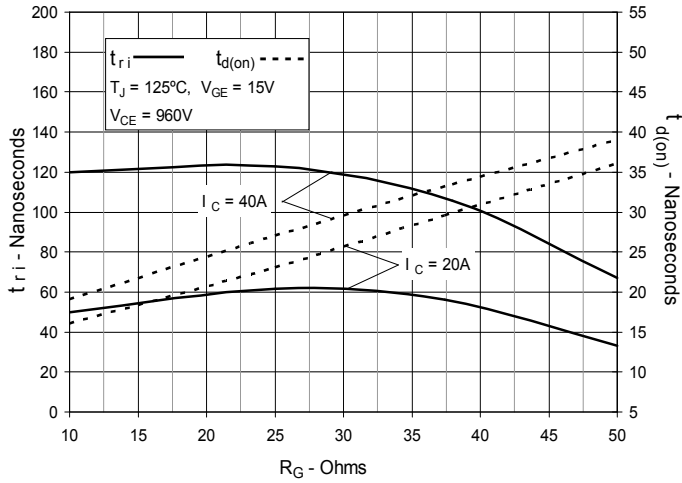


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

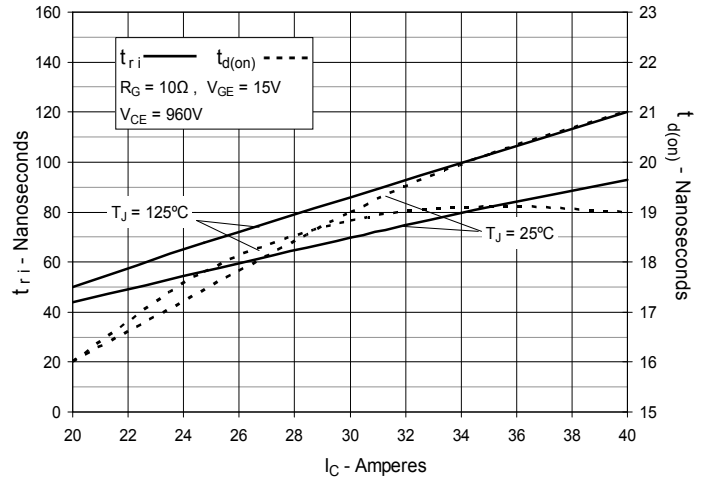


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

