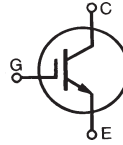


# GenX3™ 1200V IGBTs

**IXGA20N120A3**  
**IXGP20N120A3**  
**IXGH20N120A3**

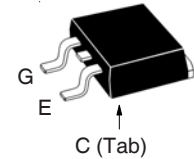
**$V_{CES} = 1200V$**   
 **$I_{C110} = 20A$**   
 **$V_{CE(sat)} \leq 2.5V$**

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

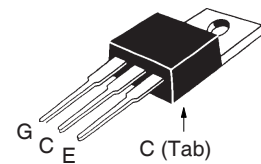


| Symbol                        | Test Conditions   | Maximum Ratings                      |            |
|-------------------------------|---|--------------------------------------|------------|
| $V_{CES}$                     | $T_J = 25^\circ C$ to $150^\circ C$   | 1200                                 | V          |
| $V_{CGR}$                     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$                         | 1200                                 | V          |
| $V_{GES}$                     | Continuous  | $\pm 20$                             | V          |
| $V_{GEM}$                     | Transient   | $\pm 30$                             | V          |
| $I_{C25}$                     | $T_C = 25^\circ C$  | 40                                   | A          |
| $I_{C110}$                    | $T_C = 110^\circ C$   | 20                                   | A          |
| $I_{CM}$                      | $T_C = 25^\circ C$ , 1ms  | 120                                  | A          |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_J = 125^\circ C$ , $R_G = 10\Omega$<br>Clamped Inductive Load | $I_{CM} = 40$<br>$@ V_{CE} \leq 960$ | A<br>V     |
| $P_C$                         | $T_C = 25^\circ C$  | 180                                  | W          |
| $T_J$                         |   | -55 ... +150                         | $^\circ C$ |
| $T_{JM}$                      |   | 150                                  | $^\circ C$ |
| $T_{stg}$                     |   | -55 ... +150                         | $^\circ C$ |
| $M_d$                         | 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                                  | $^\circ C$ |
| $T_{SOLD}$                    | 1.6mm (0.062 in.) from Case for 10s   | 260                                  | $^\circ C$ |
| <b>Weight</b>                 | TO-263  | 2.5                                  | g          |
|                               | TO-220  | 3.0                                  | g          |
|                               | TO-247  | 6.0                                  | g          |

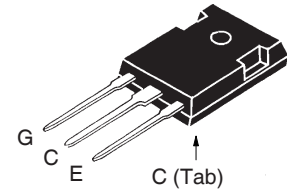
## TO-263 AA (IXGA)



## 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<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                    |
|---------------|---|-----------------------|------|--------------------|
|               |   | Min.                  | Typ. | Max.               |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                                      | 1200                  |      | V                  |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                  | 2.5                   |      | 5.0 V              |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 125^\circ C$             |                       |      | 25 $\mu A$<br>1 mA |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                    |                       |      | $\pm 100$ nA       |
| $V_{CE(sat)}$ | $I_C = 20A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ C$          | 2.3                   | 2.5  | V                  |
|               |   | 2.5                   |      | V                  |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , 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   |
| $t_{d(on)}$  | <b>Inductive Load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 20\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 960\text{V}, R_G = 10\Omega$<br>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   |
| $t_{d(on)}$  | <b>Inductive Load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 20\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 960\text{V}, R_G = 10\Omega$<br>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<br>TO-247   |                       |              | 0.69 $^\circ\text{C}/\text{W}$                         |
| $R_{thCK}$   |  |                       | 0.50<br>0.21 | $^\circ\text{C}/\text{W}$<br>$^\circ\text{C}/\text{W}$ |

**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  |

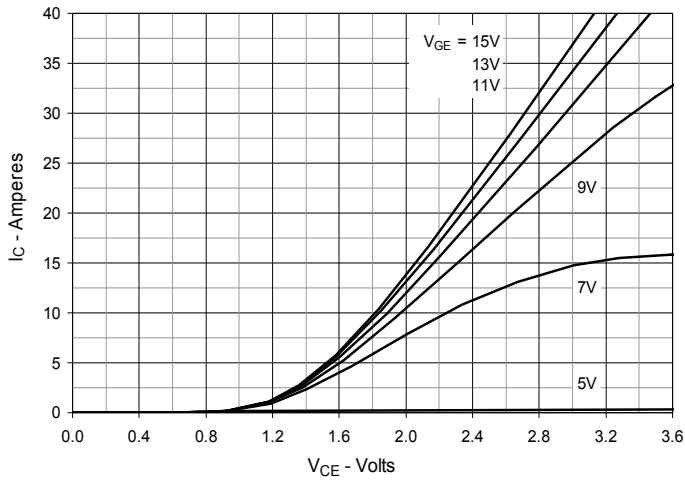
### TO-263 (IXGA) Outline

| 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  |

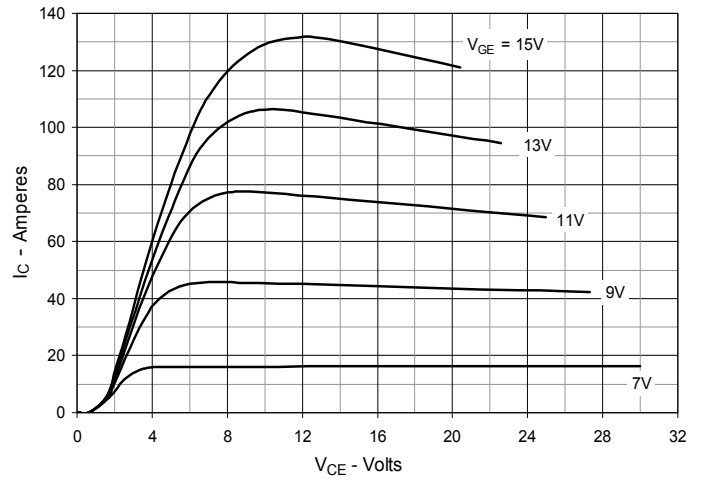
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|  |           |           |           |           |              |              |              |              |              |             |
|--|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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    |             |

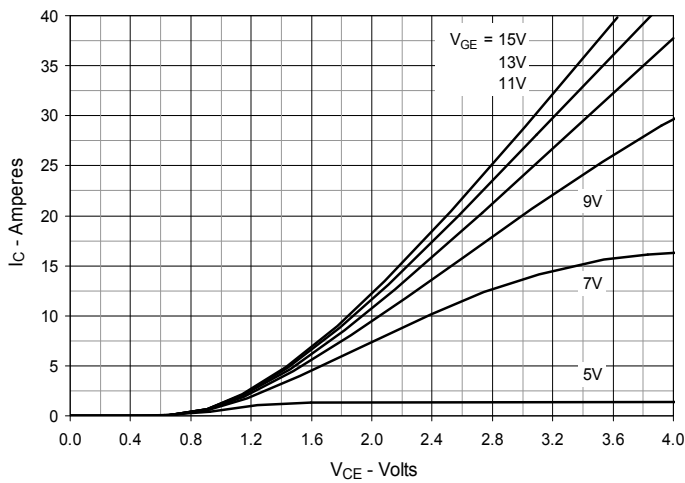
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



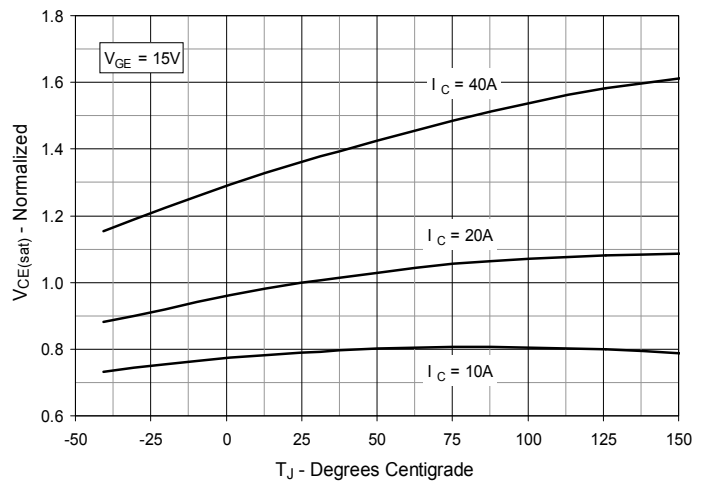
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



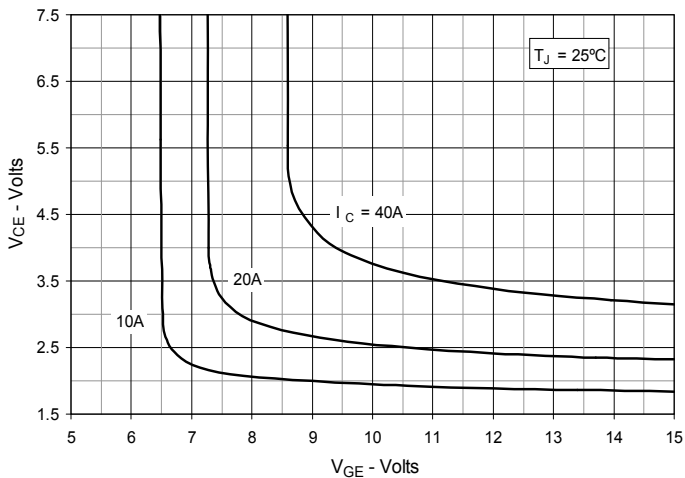
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



**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**

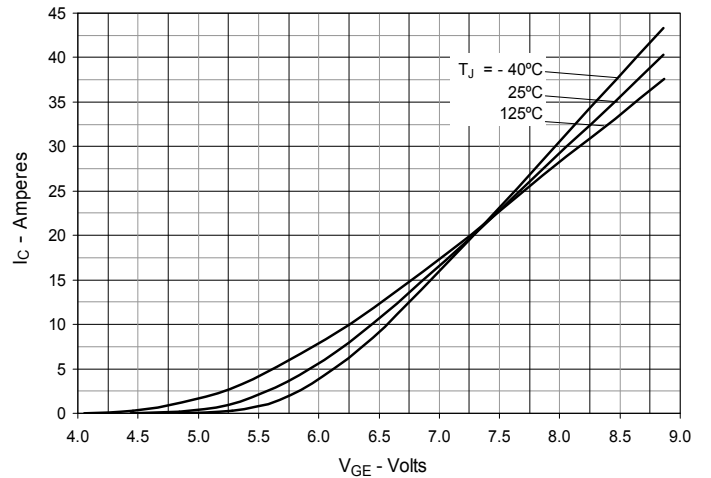


Fig. 7. Transconductance

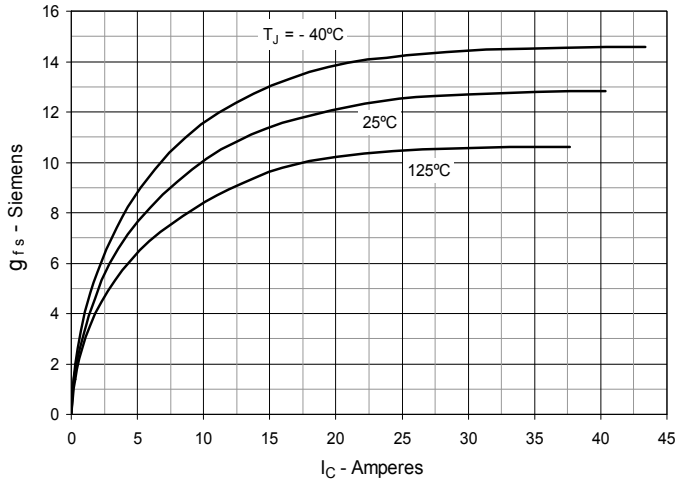


Fig. 8. Gate Charge

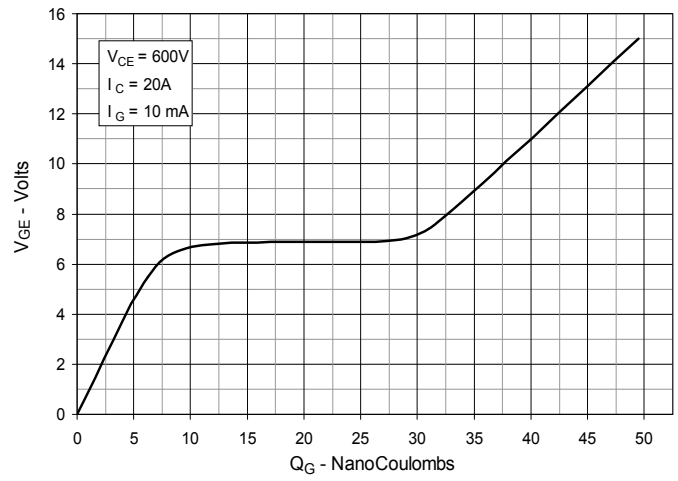


Fig. 9. Capacitance

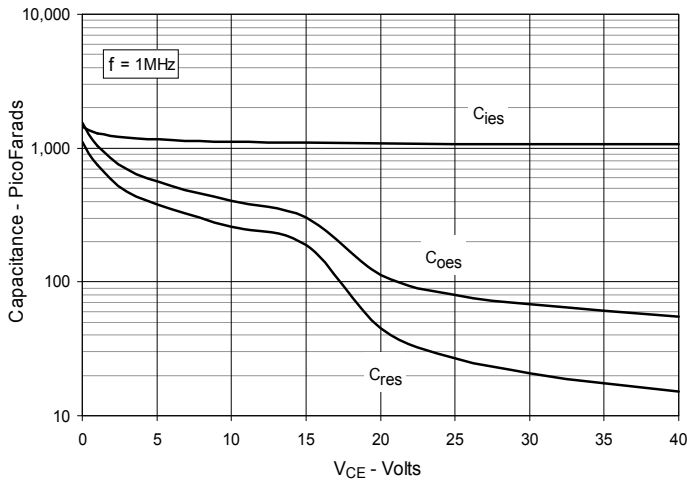


Fig. 10. Reverse-Bias Safe Operating Area

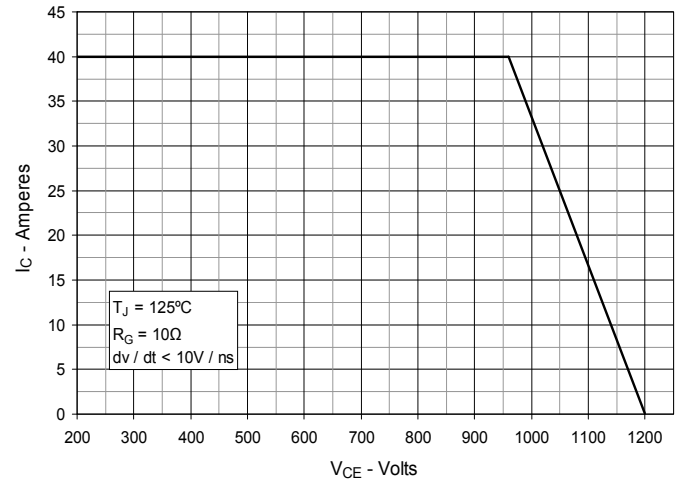
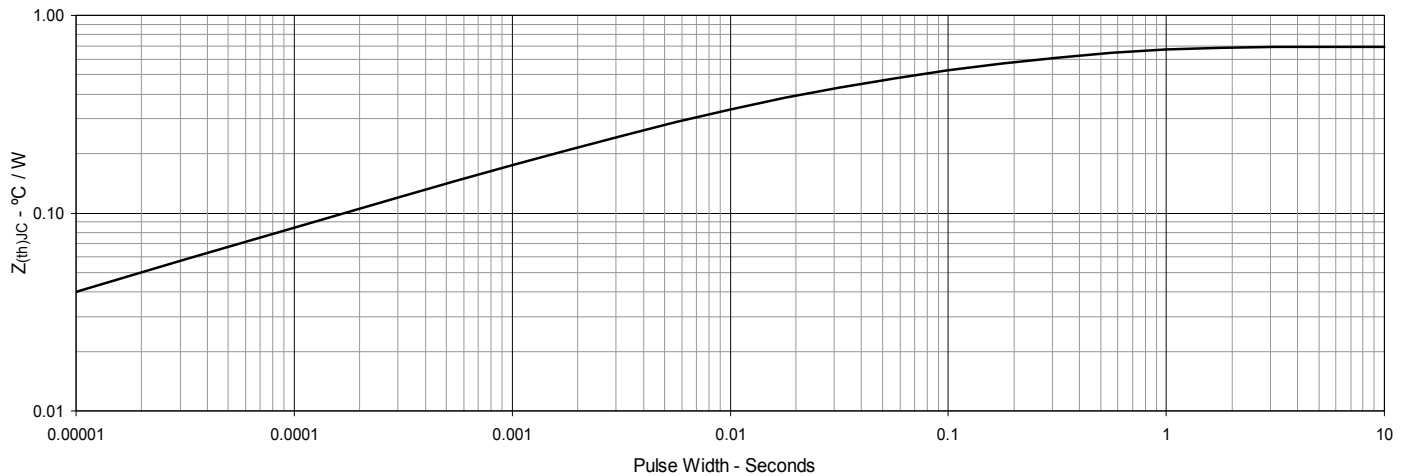
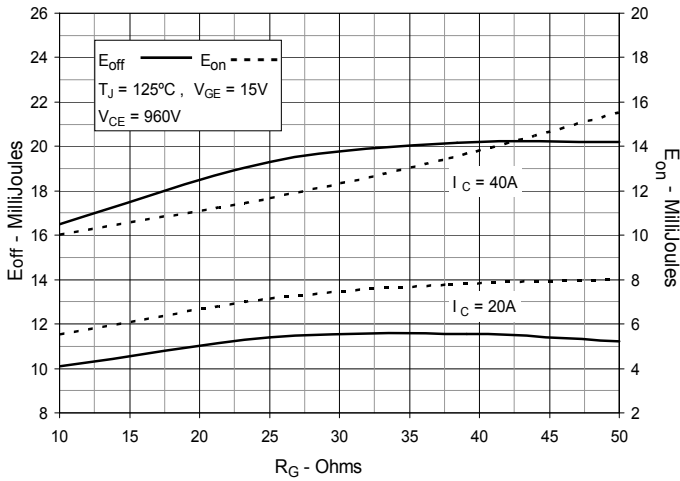


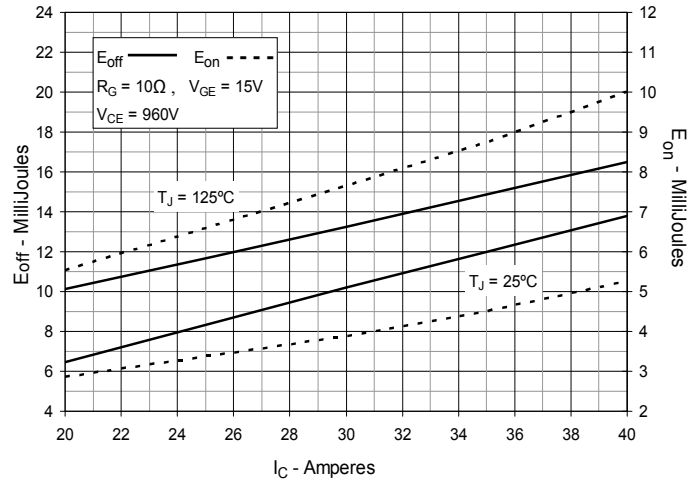
Fig. 11. Maximum Transient Thermal Impedance



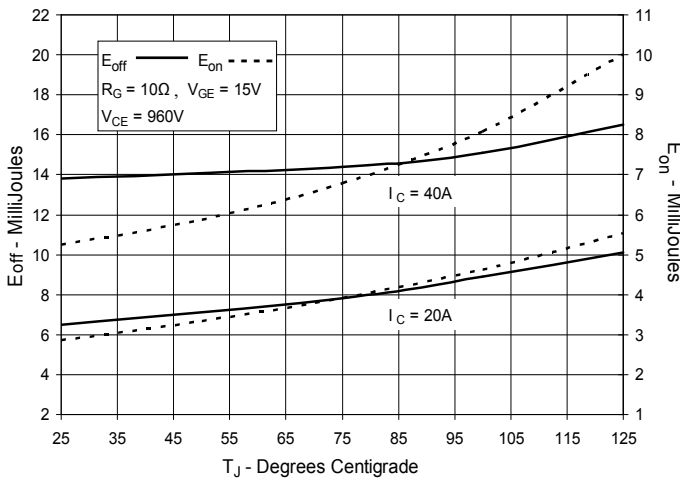
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



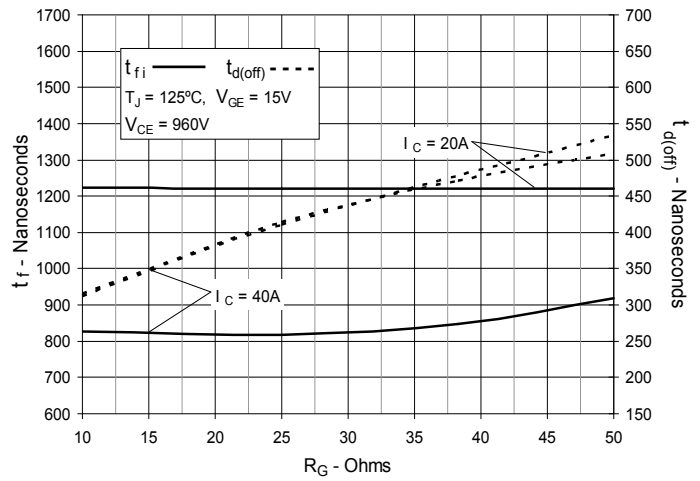
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



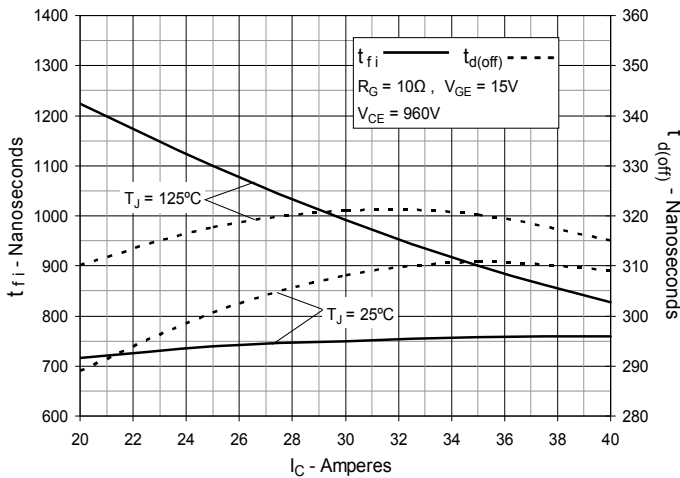
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



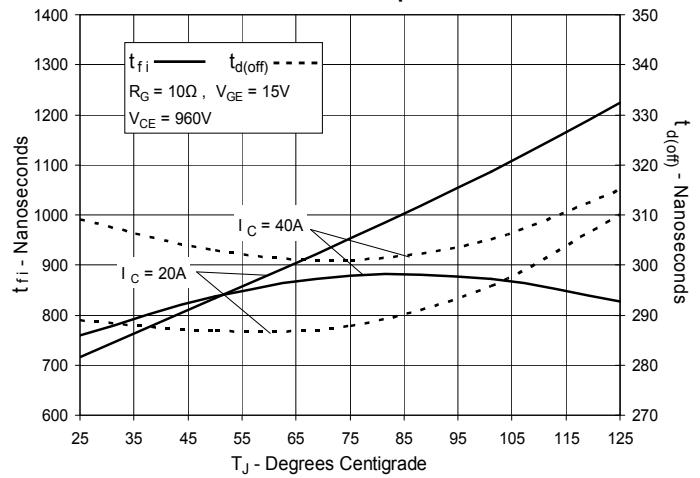
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



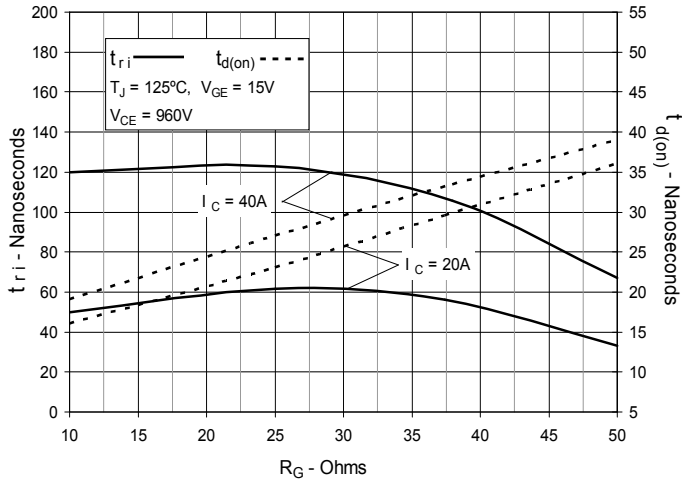
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



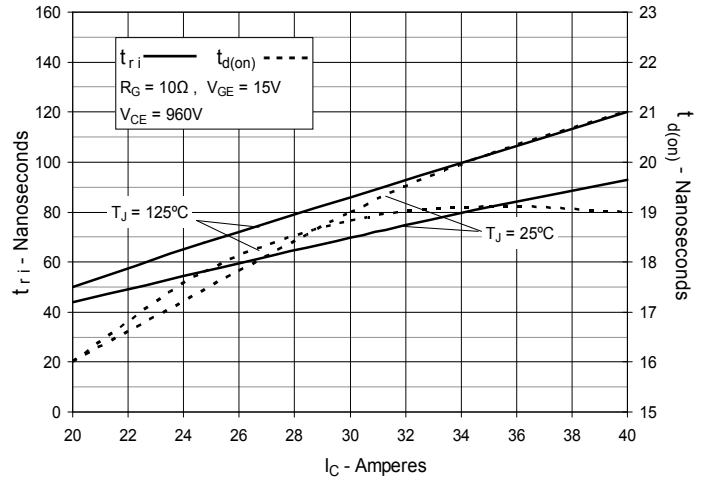
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



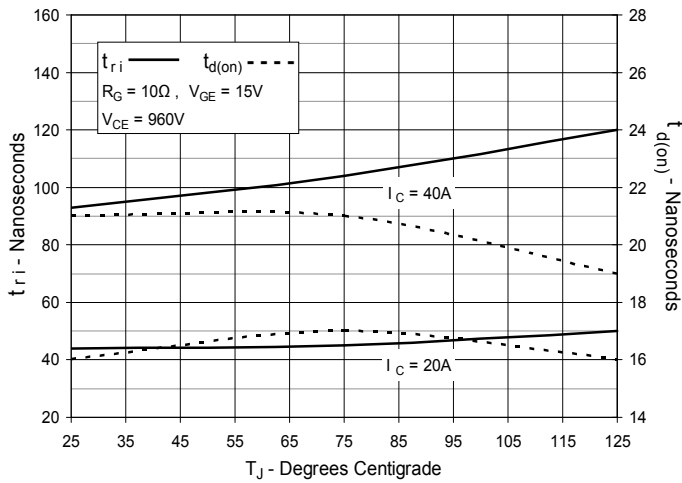
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



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



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





---

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).