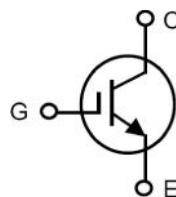


# 1200V XPT™ GenX4™ IGBT

# IXYA20N120C4HV IXYP20N120C4

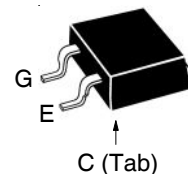
High-Speed IGBT  
for 20-50 kHz Switching



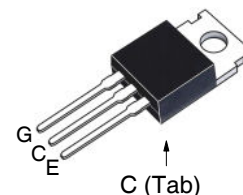
$V_{CES} = 1200V$   
 $I_{C110} = 20A$   
 $V_{CE(sat)} \leq 2.5V$   
 $t_{fi(typ)} = 58ns$

| Symbol                        | Test Conditions  | Maximum Ratings                                  |            |
|-------------------------------|--|--|------------|
| $V_{CES}$                     | $T_J = 25^\circ C$ to $175^\circ C$  | 1200   | V          |
| $V_{CGR}$                     | $T_J = 25^\circ C$ to $175^\circ C$ , $R_{GE} = 1M\Omega$                            | 1200   | V          |
| $V_{GES}$                     | Continuous   | $\pm 20$   | V          |
| $V_{GEM}$                     | Transient  | $\pm 30$   | V          |
| $I_{C25}$                     | $T_C = 25^\circ C$   | 68   | 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> | $V_{GE} = 15V$ , $T_{VJ} = 150^\circ C$ , $R_G = 10\Omega$<br>Clamped Inductive Load | $I_{CM} = 40$<br>$V_{CE} \leq 0.8 \cdot V_{CES}$ | A          |
| $P_C$                         | $T_C = 25^\circ C$   | 375  | W          |
| $T_J$                         |  | -55 ... +175                                     | $^\circ C$ |
| $T_{JM}$                      |  | 175  | $^\circ C$ |
| $T_{stg}$                     |  | -55 ... +175                                     | $^\circ C$ |
| $T_L$                         | Maximum Lead Temperature for Soldering   | 300  | $^\circ C$ |
| $T_{SOLD}$                    | 1.6 mm (0.062in.) from Case for 10s  | 260  | $^\circ C$ |
| $M_d$                         | Mounting Torque (TO-220)   | 1.13/10  | Nm/lb.in   |
| $F_C$                         | Mounting Force (TO-263HV)  | 10..65 / 22..14.6                                | N/lb       |
| <b>Weight</b>                 | TO-263HV   | 2.5  | g          |
|                               | TO-220   | 3.0  | g          |

TO-263HV  
(IXYA..HV)



TO-220  
(IXYP)



G = Gate      D = Collector  
E = Emitter    Tab = Collector

### Features

- Optimized for 20-50kHz Switching
- Positive Thermal Coefficient of  $V_{ce(sat)}$
- International Standard Packages

### Advantages

- High Power Density
- Low Gate Drive Requirement

### Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- Battery Chargers
- Welding Machines
- Lamp Ballasts

| 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                  |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                  | 4.0                   |            | 6.5 V              |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 150^\circ C$             |                       |            | 25 $\mu A$<br>5 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>$T_J = 150^\circ C$          |                       | 2.1<br>2.5 | V<br>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   | 7.5                   | 12.5 | S                              |
| $C_{ies}$  | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$   |                       | 890  | pF                             |
| $C_{oes}$  |  |                       | 95   | pF                             |
| $C_{res}$  |  |                       | 33   | pF                             |
| $Q_{g(on)}$  | $I_C = 20\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$  |                       | 44   | nC                             |
| $Q_{ge}$   |  |                       | 8    | nC                             |
| $Q_{gc}$   |  |                       | 20   | 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>$V_{CE} = 0.8 \cdot V_{CES}, R_G = 10\Omega$<br>Note 2  |                       | 14   | ns                             |
| $t_{ri}$   |  |                       | 53   | ns                             |
| $E_{on}$   |  |                       | 4.4  | mJ                             |
| $t_{d(off)}$   |  |                       | 160  | ns                             |
| $t_{fi}$   |  |                       | 58   | ns                             |
| $E_{off}$  |  |                       | 1.0  | 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>$V_{CE} = 0.8 \cdot V_{CES}, R_G = 10\Omega$<br>Note 2 |                       | 13   | ns                             |
| $t_{ri}$   |  |                       | 37   | ns                             |
| $E_{on}$   |  |                       | 4.9  | mJ                             |
| $t_{d(off)}$   |  |                       | 200  | ns                             |
| $t_{fi}$   |  |                       | 86   | ns                             |
| $E_{off}$  |  |                       | 1.6  | mJ                             |
| $R_{thJC}$   | TO-220   |                       |      | 0.40 $^\circ\text{C}/\text{W}$ |
| $R_{thCS}$   |  | 0.50                  |      | $^\circ\text{C}/\text{W}$      |

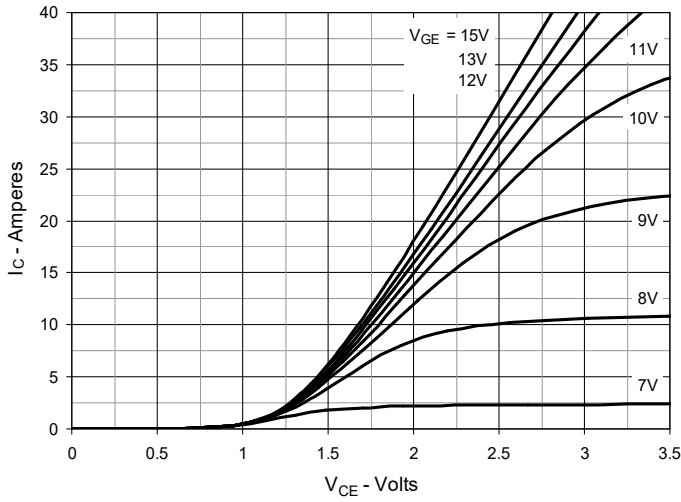
**Notes:**

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  $R_G$ .

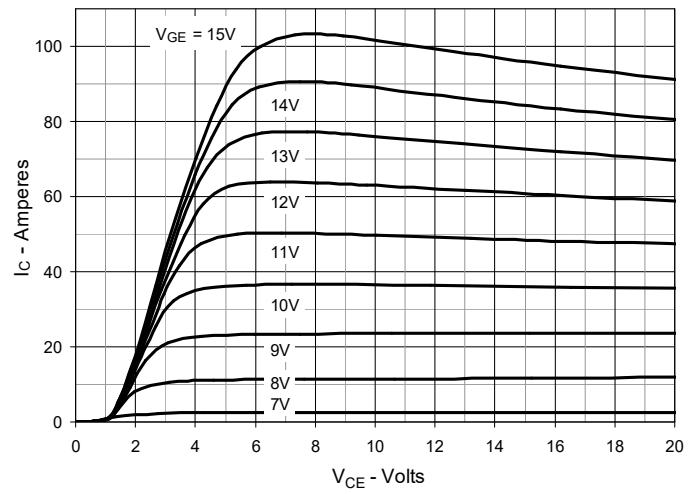
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

IXYS MOSFETs and IGBTs are covered 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  
by one or more of the following U.S. patents: 4,860,072 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

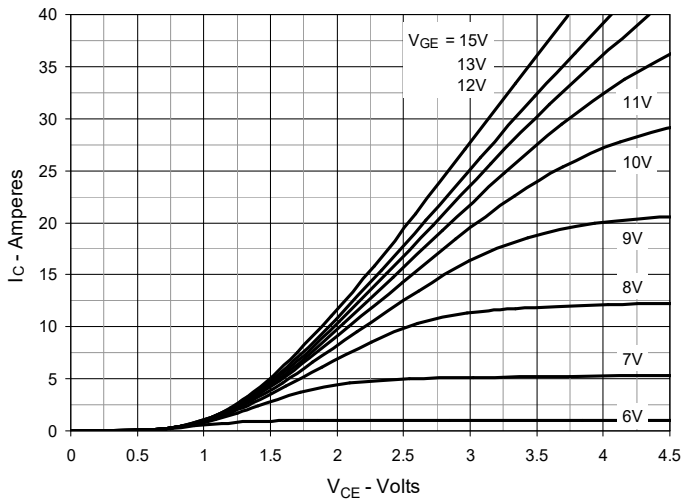
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



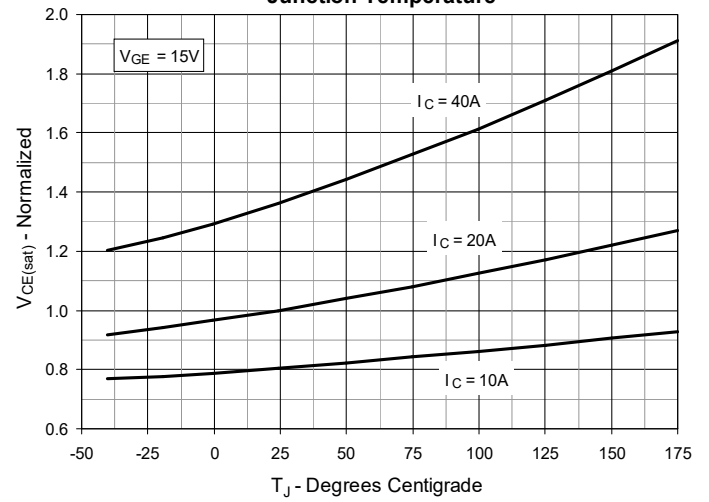
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



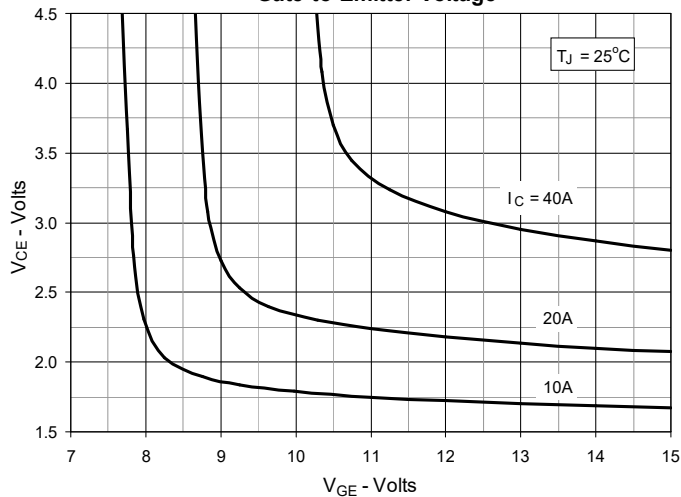
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



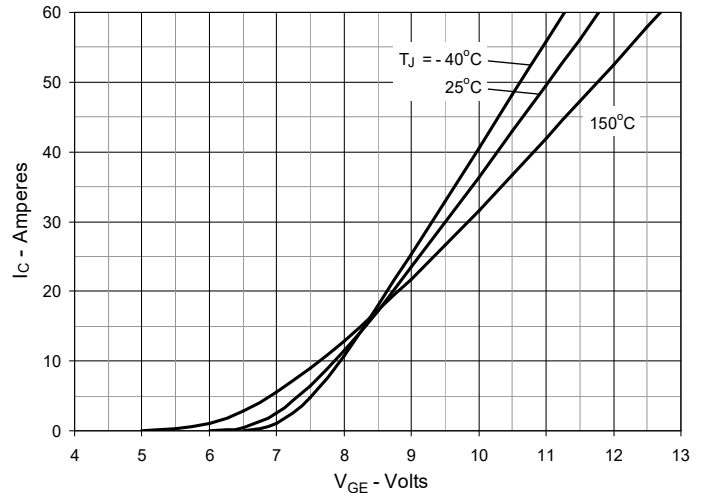
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



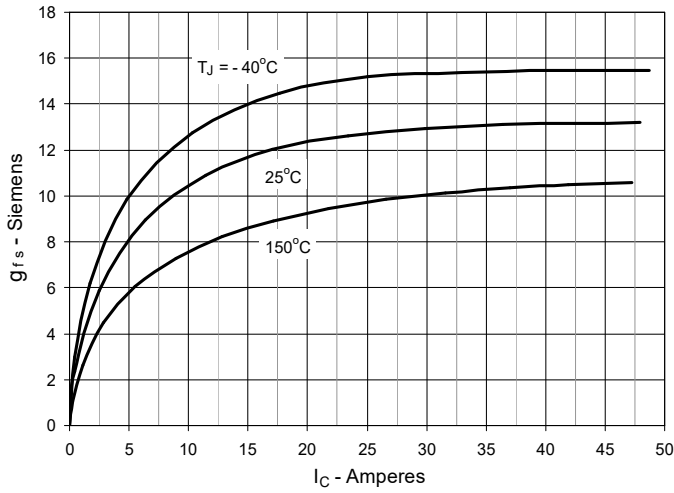
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



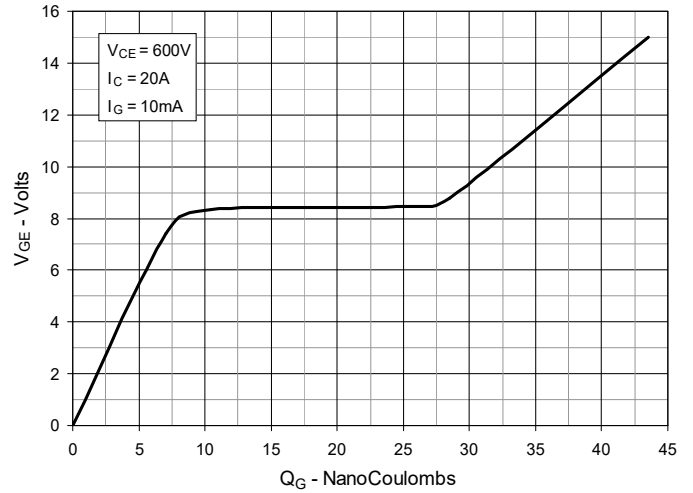
**Fig. 6. Input Admittance**



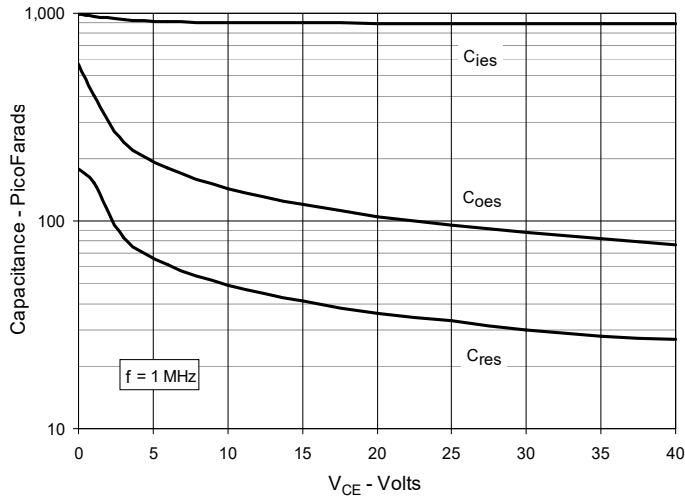
**Fig. 7. Transconductance**



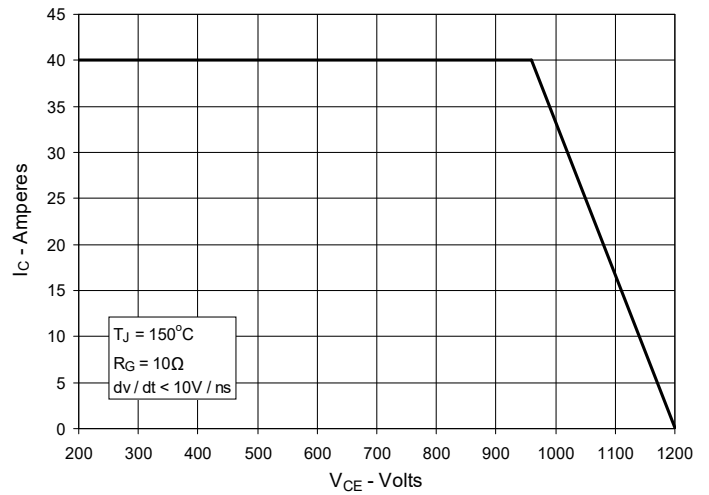
**Fig. 8. Gate Charge**



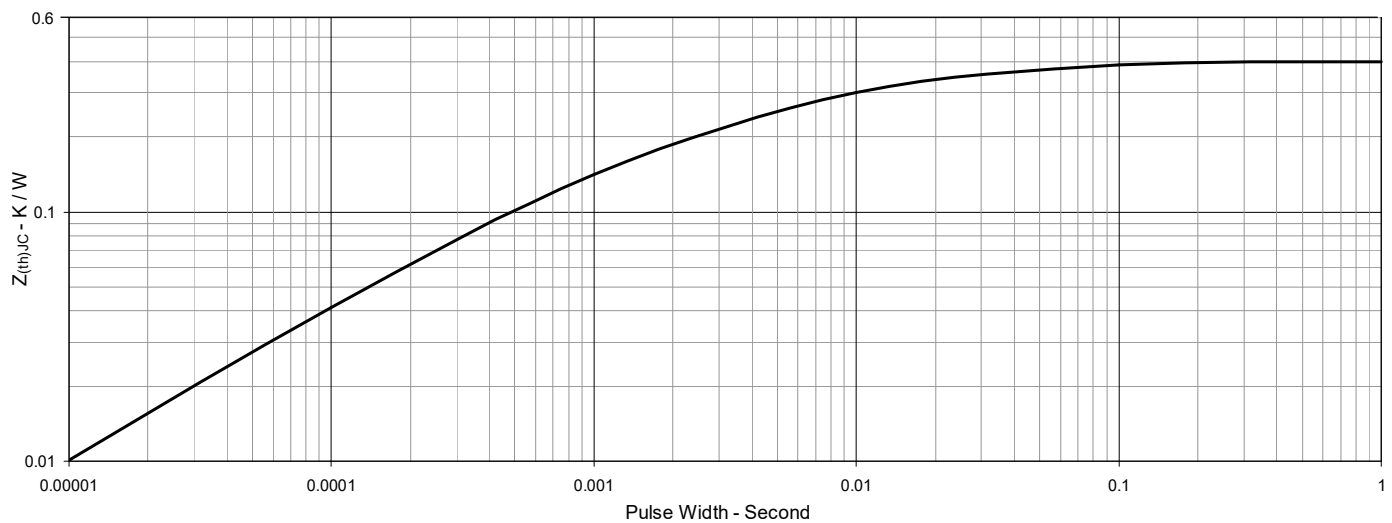
**Fig. 9. Capacitance**



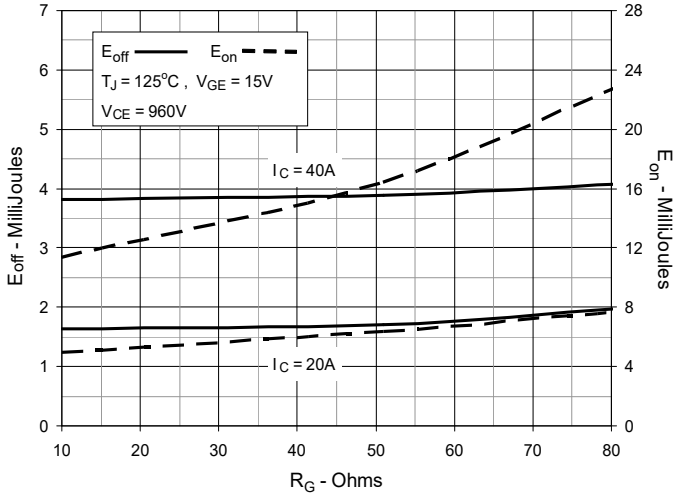
**Fig. 10. Reverse-Bias Safe Operating Area**



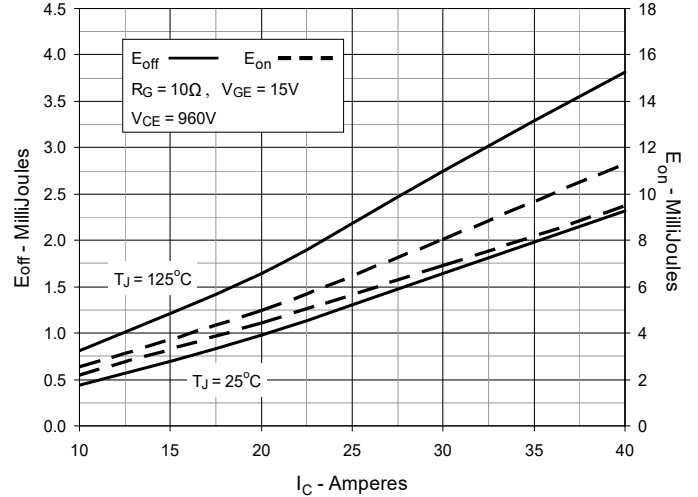
**Fig. 11. Maximum Transient Thermal Impedance**



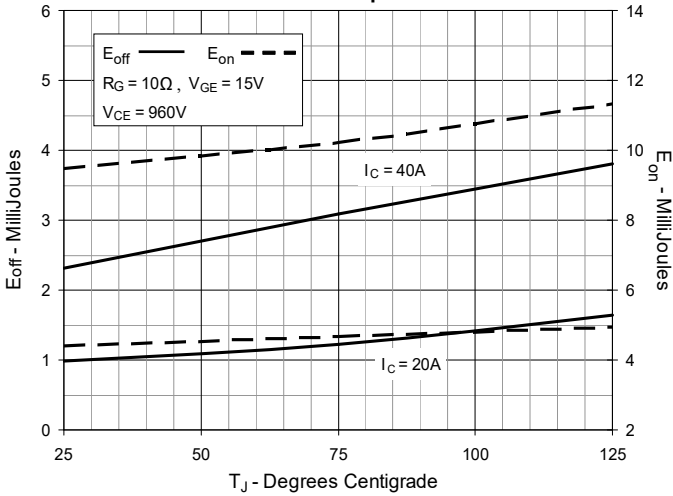
**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**



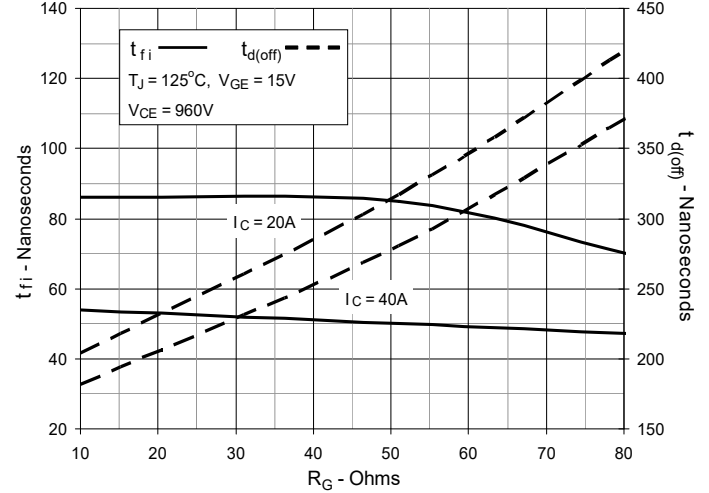
**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**



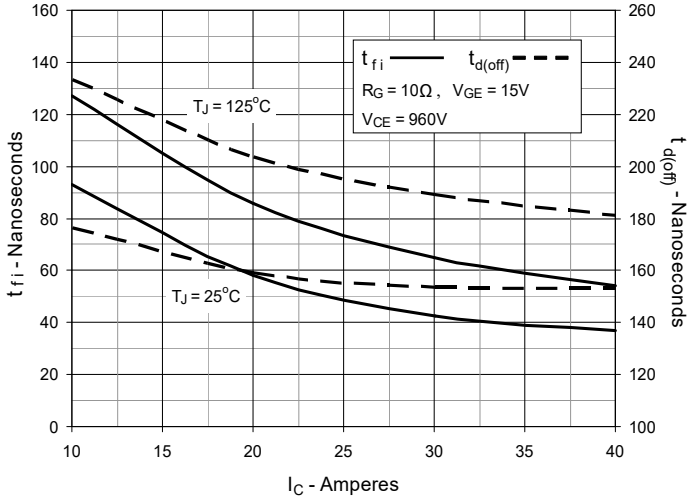
**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**



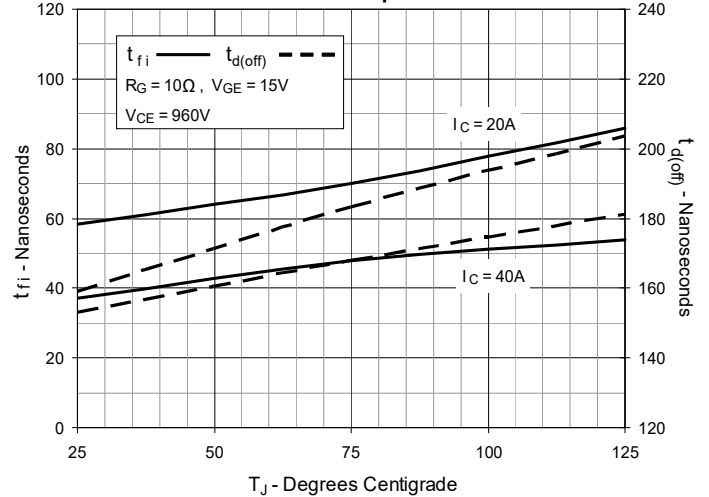
**Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance**



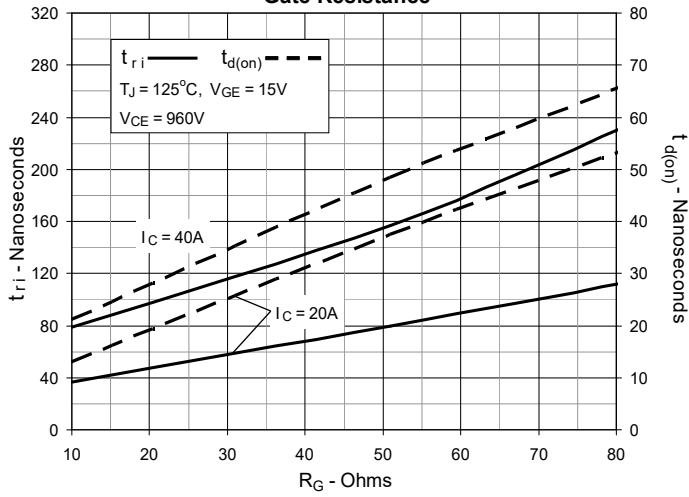
**Fig. 16. Inductive Turn-off Switching Times vs. Collector Current**



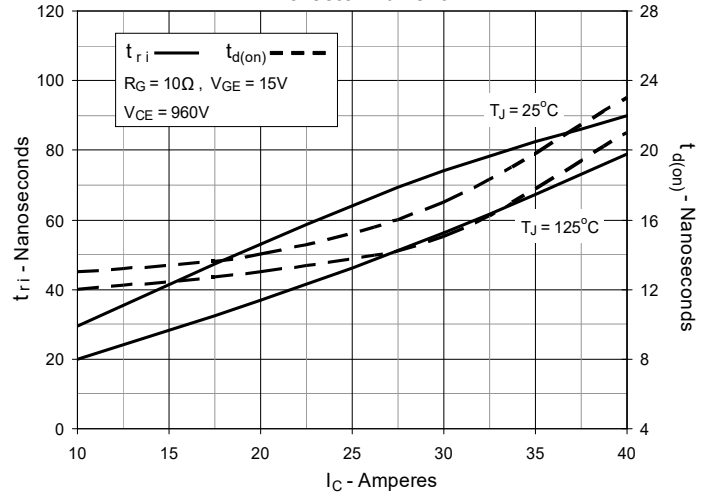
**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**



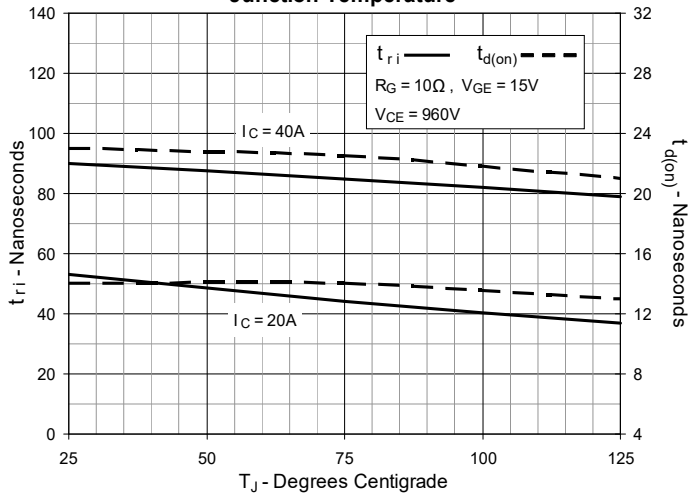
**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**

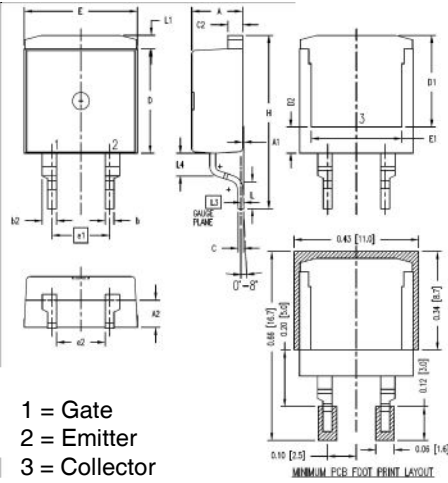


**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**

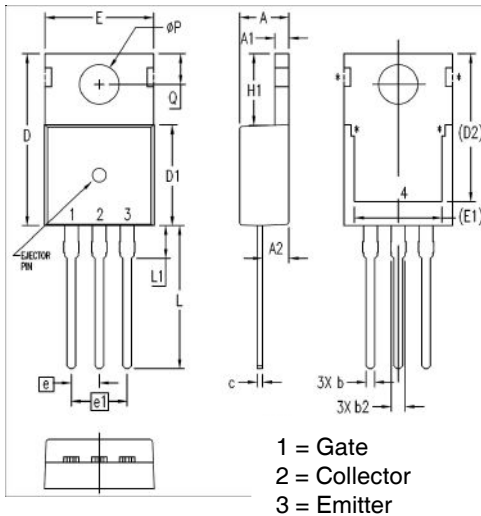


**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**



**TO-263HV Outline**


| SYM  | INCHES   |      | MILLIMETER |       |
|------|----------|------|------------|-------|
|      | MIN      | MAX  | MIN        | MAX   |
| A    | .170     | .185 | 4.30       | 4.70  |
| A1   | .000     | .008 | 0.00       | 0.20  |
| A2   | .091     | .098 | 2.30       | 2.50  |
| b    | .028     | .035 | 0.70       | 0.90  |
| b2   | .046     | .054 | 1.18       | 1.38  |
| C    | .018     | .024 | 0.45       | 0.60  |
| C2   | .049     | .055 | 1.25       | 1.40  |
| D    | .354     | .370 | 9.00       | 9.40  |
| D1   | .311     | .327 | 7.90       | 8.30  |
| D2   | .083     | .098 | 2.10       | 2.50  |
| E    | .386     | .402 | 9.80       | 10.20 |
| E1   | .307     | .323 | 7.80       | 8.20  |
| e1   | .200 BSC |      | 5.08 BSC   |       |
| (e2) | .163     | .174 | 4.13       | 4.43  |
| H    | .591     | .614 | 15.00      | 15.60 |
| L    | .079     | .102 | 2.00       | 2.60  |
| L1   | .039     | .055 | 1.00       | 1.40  |
| L3   | .010 BSC |      | 0.254 BSC  |       |
| (L4) | .071     | .087 | 1.80       | 2.20  |

**TO-220 Outline**


| SYM  | INCHES   |      | MILLIMETERS |       |
|------|----------|------|-------------|-------|
|      | MIN      | MAX  | MIN         | MAX   |
| A    | .169     | .185 | 4.30        | 4.70  |
| A1   | .047     | .055 | 1.20        | 1.40  |
| A2   | .079     | .106 | 2.00        | 2.70  |
| b    | .024     | .039 | 0.60        | 1.00  |
| b2   | .045     | .057 | 1.15        | 1.45  |
| c    | .014     | .026 | 0.35        | 0.65  |
| D    | .587     | .626 | 14.90       | 15.90 |
| D1   | .335     | .370 | 8.50        | 9.40  |
| (D2) | .500     | .531 | 12.70       | 13.50 |
| E    | .382     | .406 | 9.70        | 10.30 |
| (E1) | .283     | .323 | 7.20        | 8.20  |
| e    | .100 BSC |      | 2.54 BSC    |       |
| e1   | .200 BSC |      | 5.08 BSC    |       |
| H1   | .244     | .268 | 6.20        | 6.80  |
| L    | .492     | .547 | 12.50       | 13.90 |
| L1   | .110     | .154 | 2.80        | 3.90  |
| ØP   | .134     | .150 | 3.40        | 3.80  |
| Q    | .106     | .126 | 2.70        | 3.20  |

