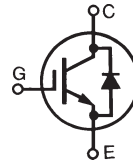


# High Voltage, High Gain BIMOSFET™ Monolithic Bipolar MOS Transistor

## IXBH20N300 IXBT20N300



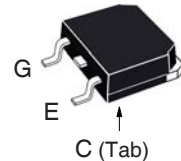
$$V_{CES} = 3000V$$

$$I_{C110} = 20A$$

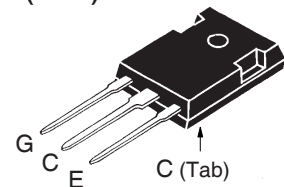
$$V_{CE(sat)} \leq 3.2V$$

| Symbol                        | Test Conditions                                                                      | Maximum Ratings        |            |
|-------------------------------|--------------------------------------------------------------------------------------|------------------------|------------|
| $V_{CES}$                     | $T_C = 25^\circ C$ to $150^\circ C$                                                  | 3000                   | V          |
| $V_{CGR}$                     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$                            | 3000                   | V          |
| $V_{GES}$                     | Continuous                                                                           | $\pm 20$               | V          |
| $V_{GEM}$                     | Transient                                                                            | $\pm 30$               | V          |
| $I_{C25}$                     | $T_C = 25^\circ C$                                                                   | 50                     | A          |
| $I_{C110}$                    | $T_C = 110^\circ C$                                                                  | 20                     | A          |
| $I_{CM}$                      | $T_C = 25^\circ C$ , 1ms                                                             | 140                    | A          |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 20\Omega$<br>Clamped Inductive Load | $I_{CM} = 130$<br>1500 | A<br>V     |
| $P_C$                         | $T_C = 25^\circ C$                                                                   | 250                    | W          |
| $T_J$                         |                                                                                      | -55 ... +150           | $^\circ C$ |
| $T_{JM}$                      |                                                                                      | 150                    | $^\circ C$ |
| $T_{stg}$                     |                                                                                      | -55 ... +150           | $^\circ C$ |
| $T_L$                         | 1.6mm (0.062 in.) from Case for 10s                                                  | 300                    | $^\circ C$ |
| $T_{SOLD}$                    | Plastic Body for 10 seconds                                                          | 260                    | $^\circ C$ |
| $M_d$                         | Mounting Torque (TO-247)                                                             | 1.13/10                | Nm/lb.in.  |
| <b>Weight</b>                 | TO-247                                                                               | 6                      | g          |
|                               | TO-268                                                                               | 4                      | g          |

TO-268 (IXBT)



TO-247 (IXBH)



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

| Symbol        | Test Conditions                                                     | Characteristic Values |            |                      |
|---------------|---------------------------------------------------------------------|-----------------------|------------|----------------------|
|               |                                                                     | Min.                  | Typ.       | Max.                 |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                                    | 3000                  |            | V                    |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                | 2.5                   |            | V                    |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 125^\circ C$ |                       |            | 35 $\mu A$<br>1.5 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>$T_J = 125^\circ C$        |                       | 2.7<br>3.2 | V<br>V               |

### Features

- High Blocking Voltage
- Anti-Parallel Diode
- International Standard Packages
- Low Conduction Losses

### Advantages

- Low Gate Drive Requirement
- High Power Density

### Applications:

- Switch-Mode and Resonant-Mode Power Supplies
- Uninterruptible Power Supplies (UPS)
- Laser Generators
- Capacitor Discharge Circuits
- AC Switches

### 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                                                                                                             | 11   | 18   |      | S                  |
| $C_{ies}$    | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$                                                                                                   |      | 2230 |      | pF                 |
| $C_{oes}$    |                                                                                                                                                              |      | 92   |      | pF                 |
| $C_{res}$    |                                                                                                                                                              |      | 33   |      | pF                 |
| $Q_g$        | $I_C = 20\text{A}, V_{GE} = 15\text{V}, V_{CE} = 1000\text{V}$                                                                                               |      | 105  |      | nC                 |
| $Q_{ge}$     |                                                                                                                                                              |      | 13   |      | nC                 |
| $Q_{gc}$     |                                                                                                                                                              |      | 45   |      | nC                 |
| $t_{d(on)}$  | <b>Resistive Switching Times, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 20\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 1250\text{V}, R_G = 10\Omega$  |      | 64   |      | ns                 |
| $t_r$        |                                                                                                                                                              |      | 210  |      | ns                 |
| $t_{d(off)}$ |                                                                                                                                                              |      | 300  |      | ns                 |
| $t_f$        |                                                                                                                                                              |      | 504  |      | ns                 |
| $t_{d(on)}$  | <b>Resistive Switching Times, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 20\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 1250\text{V}, R_G = 10\Omega$ |      | 68   |      | ns                 |
| $t_r$        |                                                                                                                                                              |      | 540  |      | ns                 |
| $t_{d(off)}$ |                                                                                                                                                              |      | 300  |      | ns                 |
| $t_f$        |                                                                                                                                                              |      | 395  |      | ns                 |
| $R_{thJC}$   |                                                                                                                                                              |      |      | 0.50 | $^\circ\text{C/W}$ |
| $R_{thCS}$   | (TO-247)                                                                                                                                                     |      | 0.21 |      | $^\circ\text{C/W}$ |

### Reverse Diode

### Symbol Test Conditions

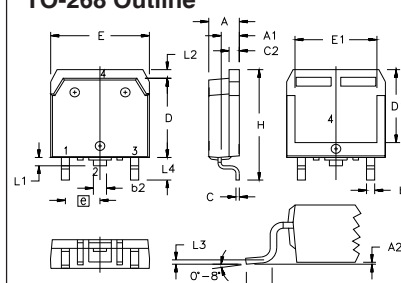
( $T_J = 25^\circ\text{C}$  Unless Otherwise Specified)

### Characteristic Values

|          |                                                                            | Min.                                    | Typ. | Max. |               |
|----------|----------------------------------------------------------------------------|-----------------------------------------|------|------|---------------|
| $V_F$    | $I_F = 20\text{A}, V_{GE} = 0\text{V}$                                     |                                         |      | 2.1  | V             |
| $t_{rr}$ | $I_F = 10\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 100\text{A}/\mu\text{s}$ |                                         | 1.35 |      | $\mu\text{s}$ |
| $I_{RM}$ |                                                                            | $V_R = 100\text{V}, V_{GE} = 0\text{V}$ |      | 30   |               |

Note 1: Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

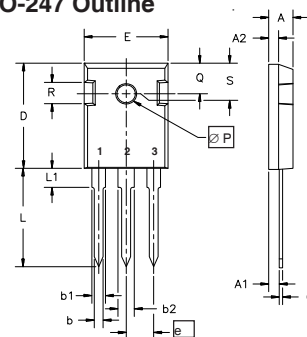
### TO-268 Outline



Terminals: 1 - Gate  
3 - Emitter  
2,4 - Collector

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .193     | .201 | 4.90        | 5.10  |
| A1  | .106     | .114 | 2.70        | 2.90  |
| A2  | .001     | .010 | 0.02        | 0.25  |
| b   | .045     | .057 | 1.15        | 1.45  |
| b2  | .075     | .083 | 1.90        | 2.10  |
| C   | .016     | .026 | 0.40        | 0.65  |
| C2  | .057     | .063 | 1.45        | 1.60  |
| D   | .543     | .551 | 13.80       | 14.00 |
| D1  | .488     | .500 | 12.40       | 12.70 |
| E   | .624     | .632 | 15.85       | 16.05 |
| E1  | .524     | .535 | 13.30       | 13.60 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| H   | .736     | .752 | 18.70       | 19.10 |
| L   | .094     | .106 | 2.40        | 2.70  |
| L1  | .047     | .055 | 1.20        | 1.40  |
| L2  | .039     | .045 | 1.00        | 1.15  |
| L3  | .010 BSC |      | 0.25 BSC    |       |
| L4  | .150     | .161 | 3.80        | 4.10  |

### TO-247 Outline



Terminals: 1 - Gate  
3 - Emitter  
2 - Collector

| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub> | 2.2        | 2.6   | .059   | .098  |
| b              | 1.0        | 1.4   | .040   | .055  |
| b <sub>1</sub> | 1.65       | 2.13  | .065   | .084  |
| b <sub>2</sub> | 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  |
| ∅P             | 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   |

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 |
| 4,860,072 | 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 @  $T_J = 25^\circ\text{C}$

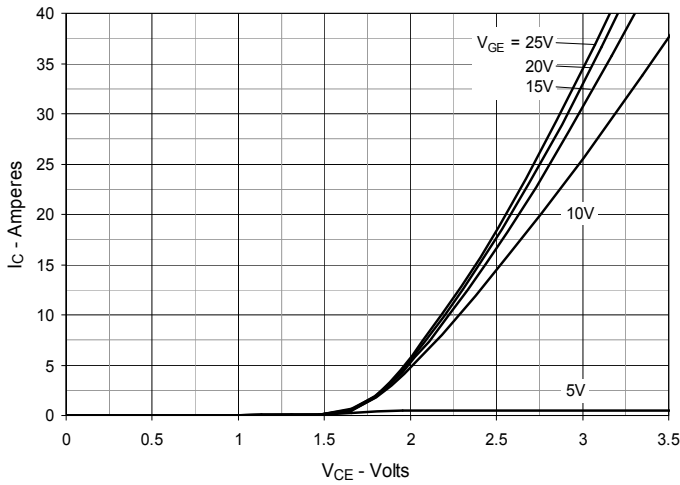


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

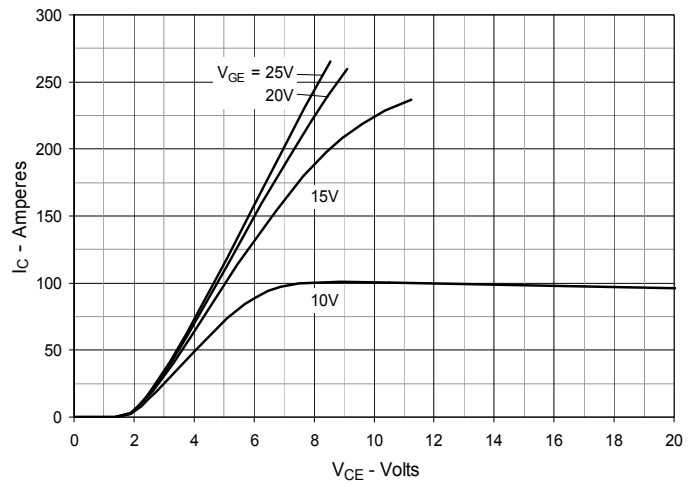


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

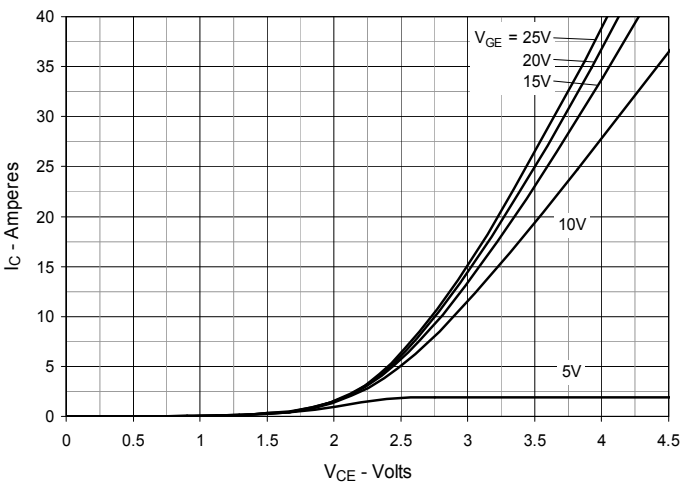


Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature

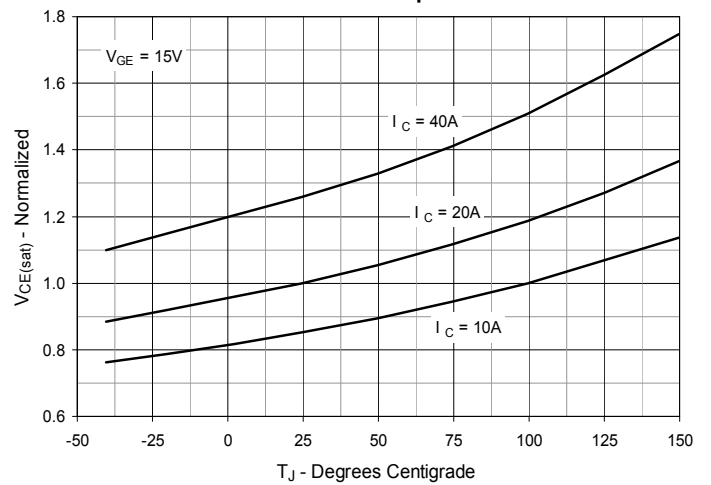


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

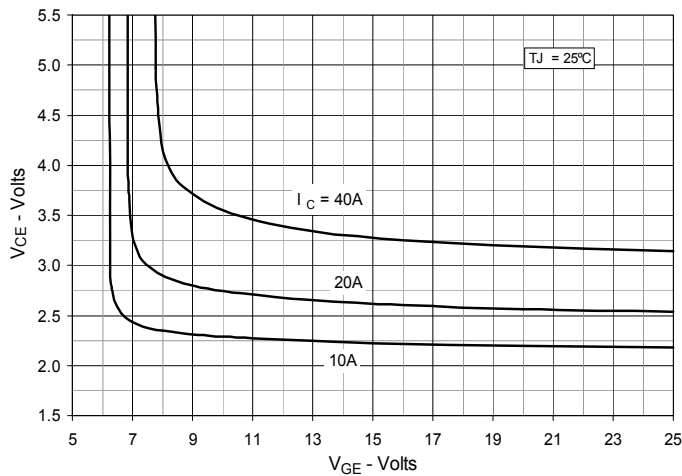
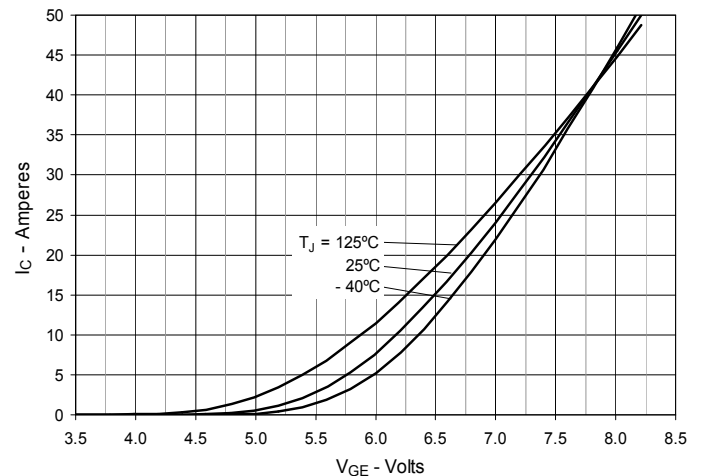
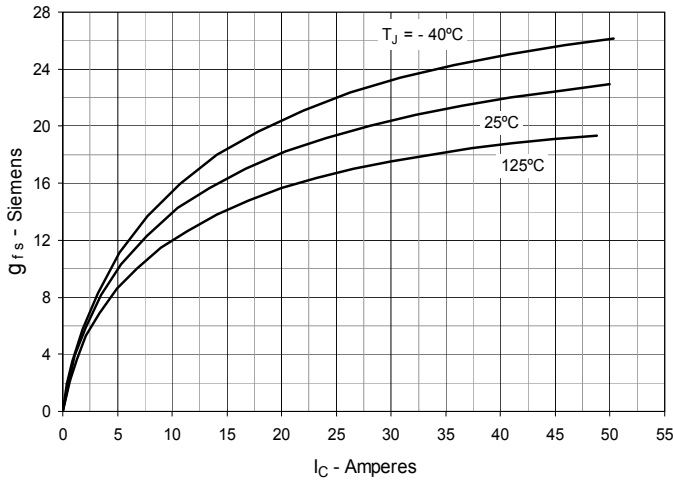


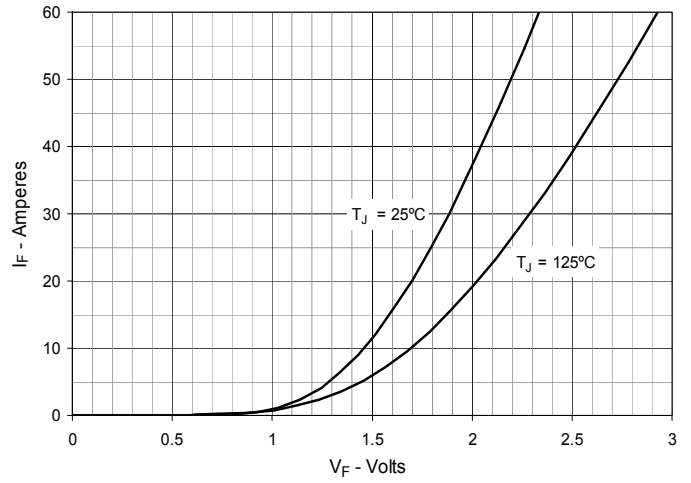
Fig. 6. Input Admittance



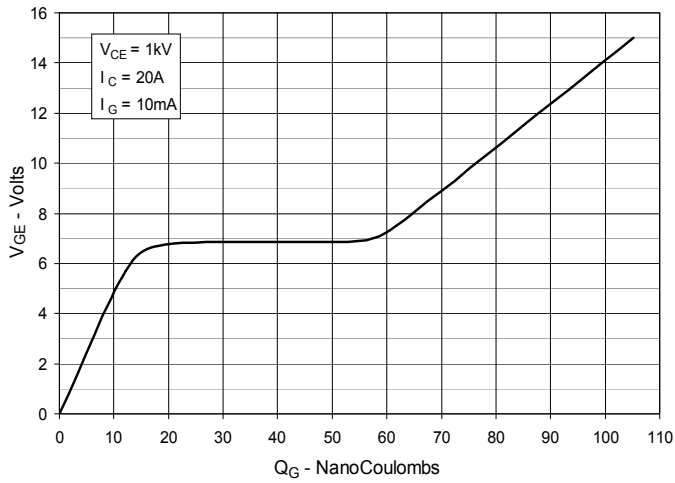
**Fig. 7. Transconductance**



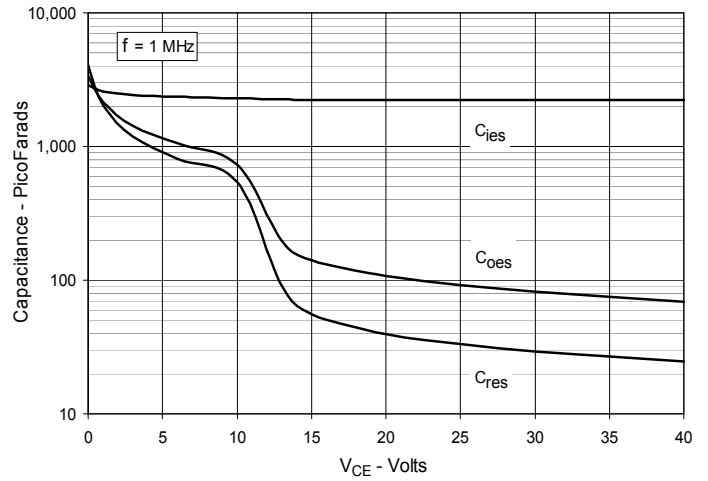
**Fig. 8. Forward Voltage Drop of Intrinsic Diode**



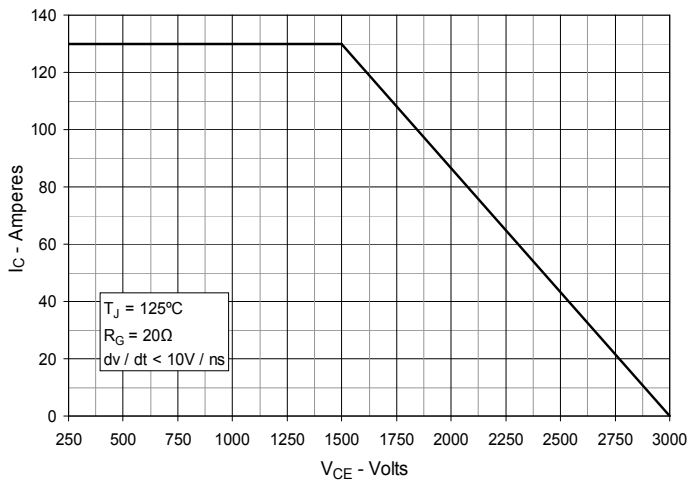
**Fig. 9. Gate Charge**



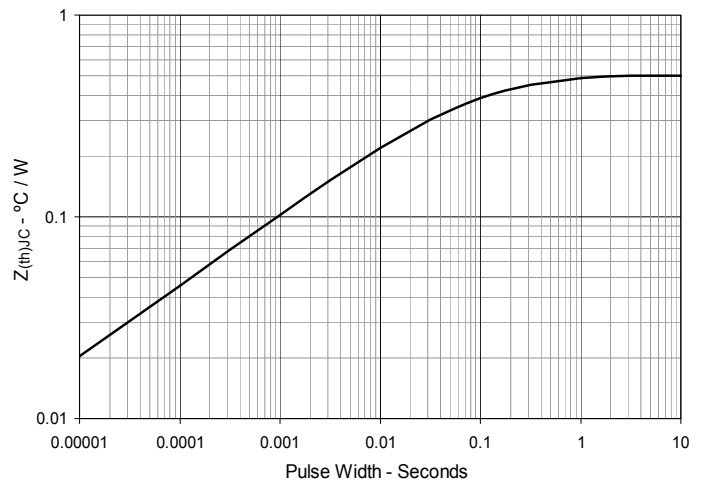
**Fig. 10. Capacitance**



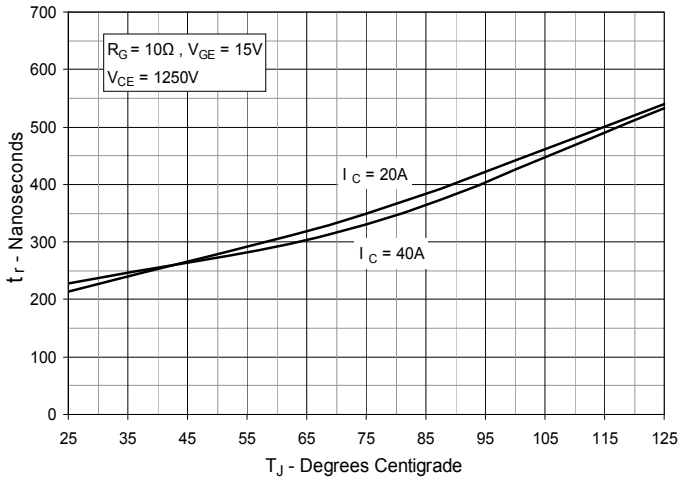
**Fig. 11. Reverse-Bias Safe Operating Area**



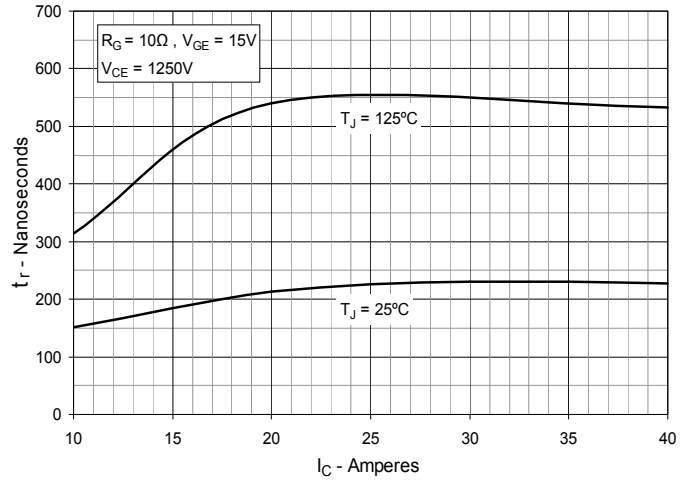
**Fig. 12. Maximum Transient Thermal Impedance**



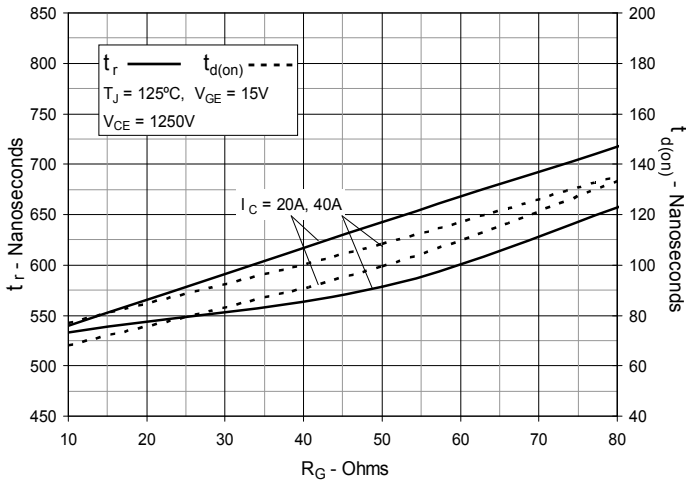
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



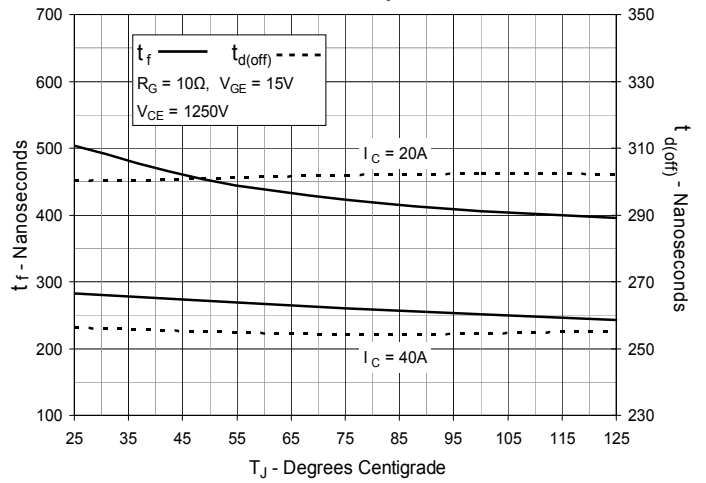
**Fig. 14. Resistive Turn-on Rise Time vs. Collector Current**



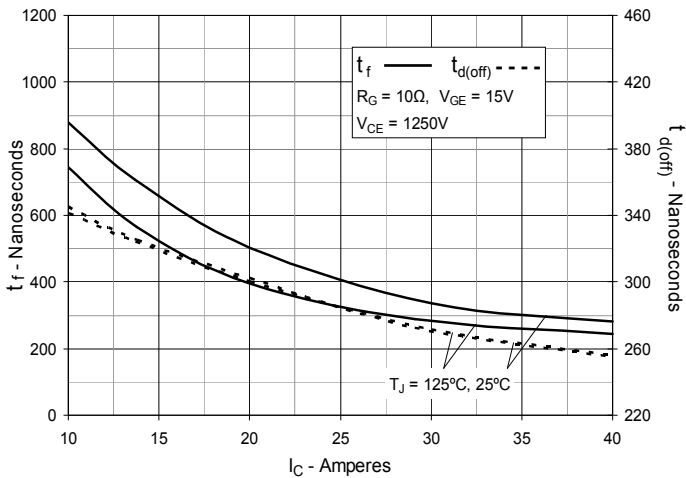
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



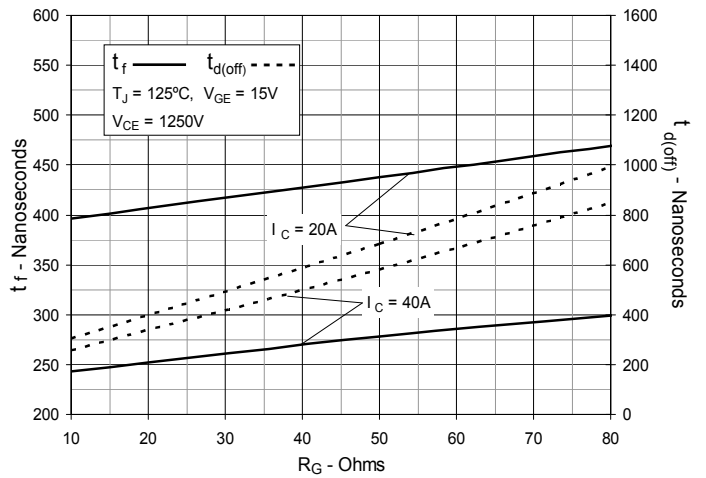
**Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature**



**Fig. 17. Resistive Turn-off Switching Times vs. Collector Current**



**Fig. 18. Resistive Turn-off Switching Times vs. Gate Resistance**



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