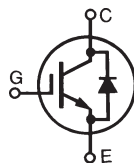


## High Voltage, High Gain BIMOSFET™ Monolithic Bipolar MOS Transistor

### IXBH6N170 IXBT6N170



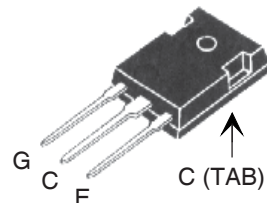
$$V_{CES} = 1700V$$

$$I_{C90} = 6A$$

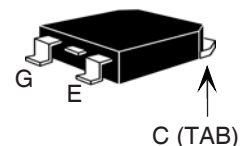
$$V_{CE(sat)} \leq 3.4V$$

| Symbol         | Test Conditions                                            | Maximum Ratings     |            |
|----------------|------------------------------------------------------------|---------------------|------------|
| $V_{CES}$      | $T_C = 25^\circ C$ to $150^\circ C$                        | 1700                | V          |
| $V_{CGR}$      | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$  | 1700                | V          |
| $V_{GES}$      | Continuous                                                 | $\pm 20$            | V          |
| $V_{GEM}$      | Transient                                                  | $\pm 30$            | V          |
| $I_{C25}$      | $T_C = 25^\circ C$                                         | 12                  | A          |
| $I_{C90}$      | $T_C = 90^\circ C$                                         | 6                   | A          |
| $I_{CM}$       | $T_C = 25^\circ C$ , 1ms                                   | 36                  | A          |
| <b>SSOA</b>    | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 24\Omega$ | $I_{CM} = 16$       | A          |
| <b>(RBSOA)</b> | Clamped inductive load                                     | $V_{CES} \leq 1350$ | V          |
| $P_C$          | $T_C = 25^\circ C$                                         | 75                  | 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-247 (IXBH)



TO-268 (IXBT)



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

### Features

- High blocking voltage
- Integrated Anti-parallel diode
- International standard packages
- Low conduction losses

### Advantages

- Low gate drive requirement
- High power density

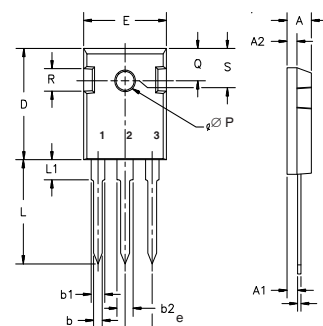
### Applications:

- Switched-mode and resonant-mode power supplies
- Uninterruptible power supplies (UPS)
- Laser generator
- Capacitor discharge circuit
- AC switches

| Symbol        | Test Conditions<br>( $T_J = 25^\circ C$ , unless otherwise specified) | Characteristic Values |      |                           |
|---------------|-----------------------------------------------------------------------|-----------------------|------|---------------------------|
|               |                                                                       | Min.                  | Typ. | Max.                      |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                  | 1700                  |      | V                         |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                  | 2.5                   |      | 5.5 V                     |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$<br>$V_{GE} = 0V$ $T_J = 125^\circ C$     |                       |      | 10 $\mu A$<br>100 $\mu A$ |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                    |                       |      | $\pm 100$ nA              |
| $V_{CE(sat)}$ | $I_C = 6A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ C$           | 2.84<br>3.46          |      | V<br>V                    |

| Symbol       | Test Conditions                                                                                                                 | Characteristic Values |      |                   |
|--------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------|
|              |                                                                                                                                 | Min.                  | Typ. | Max.              |
| $g_{fs}$     | $I_C = 6A, V_{CE} = 10V$ , Note 1                                                                                               | 2.0                   | 3.5  | S                 |
| $C_{ies}$    | $V_{CE} = 25V, V_{GE} = 0V, f = 1MHz$                                                                                           |                       | 378  | pF                |
| $C_{oes}$    |                                                                                                                                 |                       | 25   | pF                |
| $C_{res}$    |                                                                                                                                 |                       | 9    | pF                |
| $Q_g$        | $I_C = 6A, V_{GE} = 15V, V_{CE} = 0.5 \cdot V_{CES}$                                                                            |                       | 17.0 | nC                |
| $Q_{ge}$     |                                                                                                                                 |                       | 2.5  | nC                |
| $Q_{gc}$     |                                                                                                                                 |                       | 9.6  | nC                |
| $t_{d(on)}$  | <b>Resistive Switching times, <math>T_J = 25^\circ C</math></b><br>$I_C = 6A, V_{GE} = 15V$<br>$V_{CE} = 850V, R_G = 24\Omega$  |                       | 32   | ns                |
| $t_r$        |                                                                                                                                 |                       | 59   | ns                |
| $t_{d(off)}$ |                                                                                                                                 |                       | 105  | ns                |
| $t_f$        |                                                                                                                                 |                       | 690  | ns                |
| $t_{d(on)}$  | <b>Resistive Switching times, <math>T_J = 125^\circ C</math></b><br>$I_C = 6A, V_{GE} = 15V$<br>$V_{CE} = 850V, R_G = 24\Omega$ |                       | 35   | ns                |
| $t_r$        |                                                                                                                                 |                       | 69   | ns                |
| $t_{d(off)}$ |                                                                                                                                 |                       | 100  | ns                |
| $t_f$        |                                                                                                                                 |                       | 600  | ns                |
| $R_{thJC}$   |                                                                                                                                 |                       |      | 1.65 $^\circ C/W$ |
| $R_{thCS}$   |                                                                                                                                 | 0.25                  |      | $^\circ C/W$      |

## TO-247 (IXBH) Outline



Terminals: 1 - Gate  
2 - Drain  
3 - Source

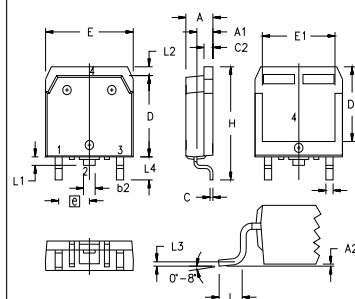
| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub> | 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  |
| 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   |

## Reverse Diode

| Symbol   | Test Conditions                                                             | Characteristic Values |      |         |
|----------|-----------------------------------------------------------------------------|-----------------------|------|---------|
|          |                                                                             | Min.                  | Typ. | Max.    |
| $V_F$    | $I_F = 6A, V_{GE} = 0V$ , Note 1                                            |                       |      | 3.0 V   |
| $t_{rr}$ | $I_F = 6A, V_{GE} = 0V, -di_F/dt = 100A/\mu s$<br>$V_R = 100V, V_{GE} = 0V$ |                       | 1.08 | $\mu s$ |
| $I_{RM}$ |                                                                             |                       | 12.0 | A       |

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

## TO-268 (IXBT) Outline



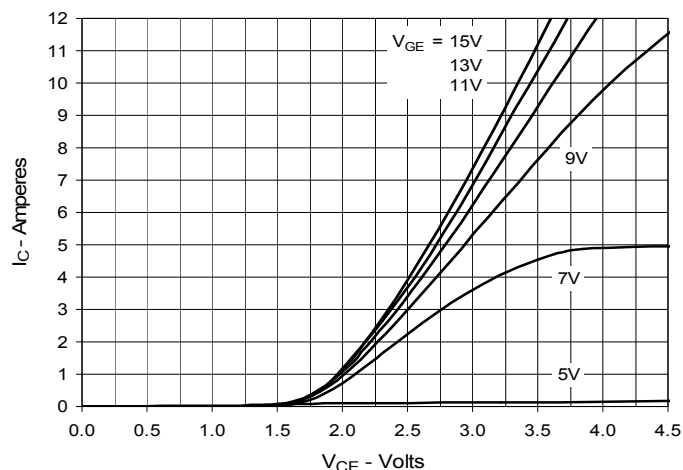
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .193     | .201 | 4.90        | 5.10  |
| A1  | .106     | .114 | 2.70        | 2.90  |
| A2  | .001     | .010 | 0.02        | 0.25  |
| b   | .045     | .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  |

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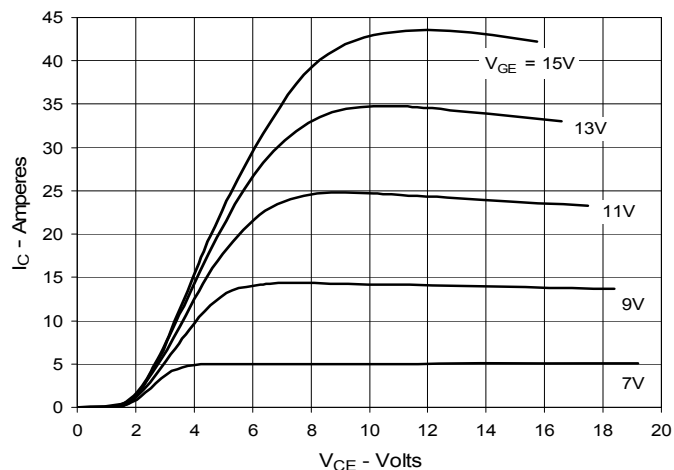
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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

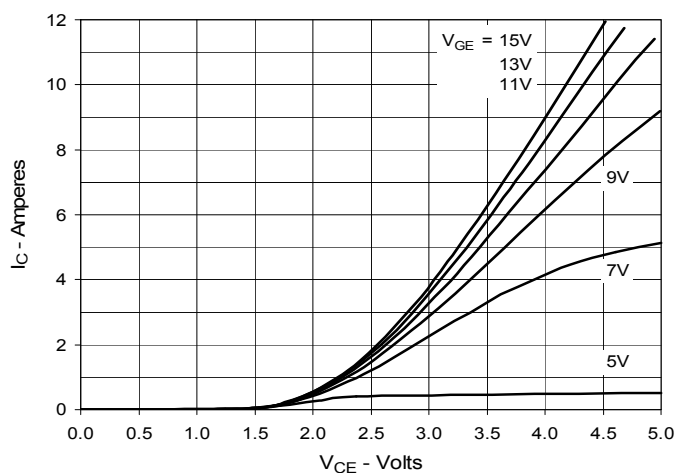
**Fig. 1. Output Characteristics**  
**@ 25°C**



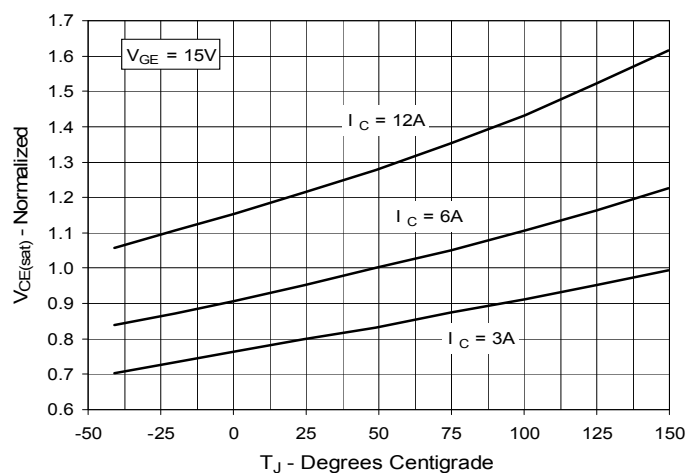
**Fig. 2. Extended Output Characteristics**  
**@ 25°C**



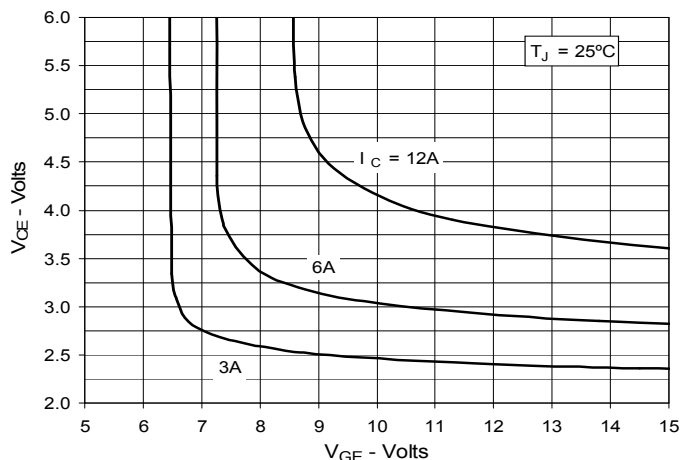
**Fig. 3. Output Characteristics**  
**@ 125°C**



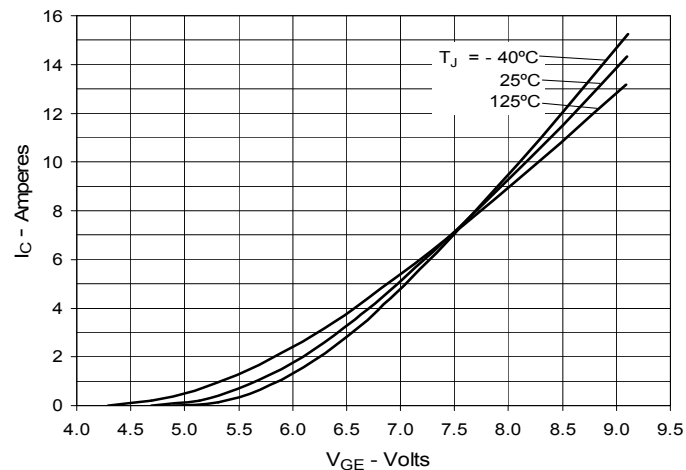
**Fig. 4. Dependence of  $V_{CE(sat)}$  on**  
**Junction Temperature**



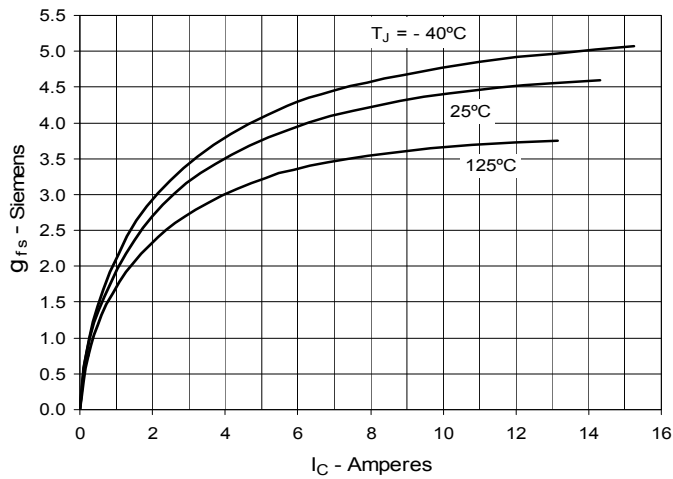
**Fig. 5. Collector-to-Emitter Voltage**  
**vs. Gate-to-Emitter Voltage**



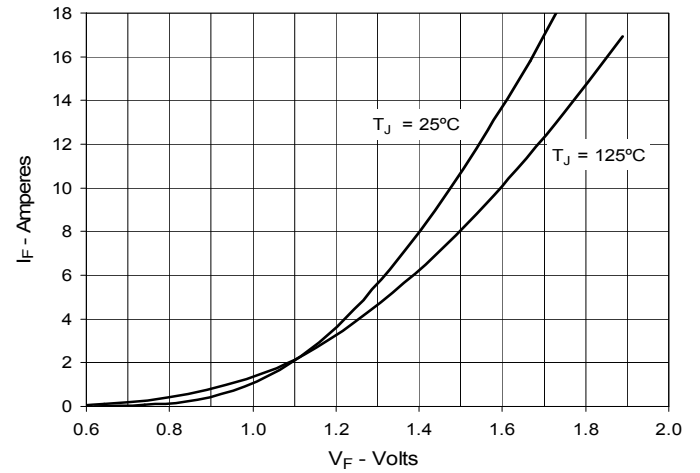
**Fig. 6. Input Admittance**



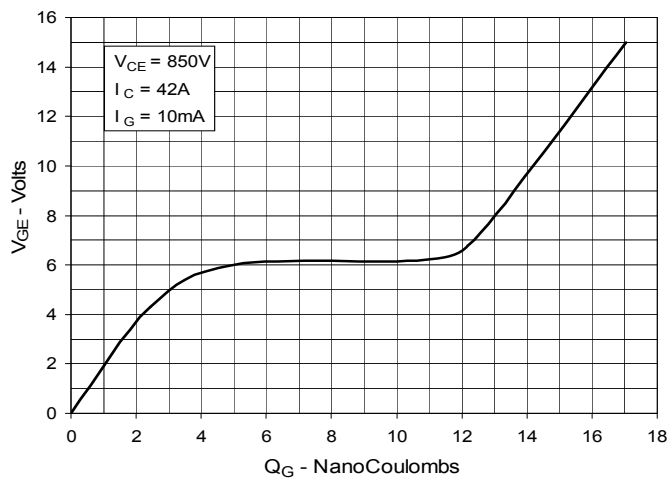
**Fig. 7. Transconductance**



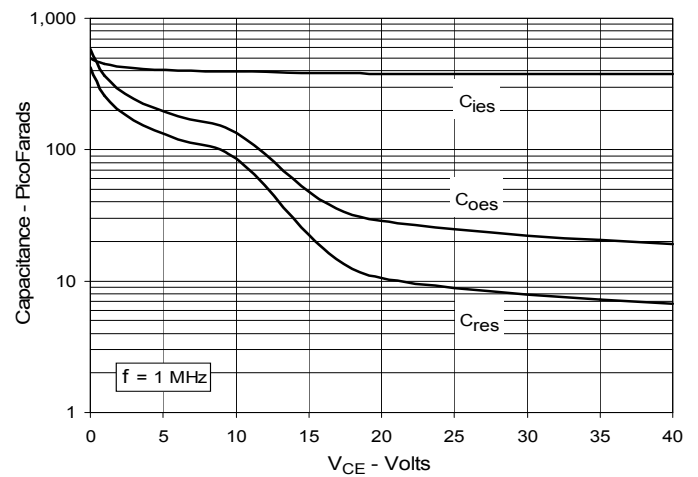
**Fig. 8. Forward Voltage Drop of Intrinsic Diode**



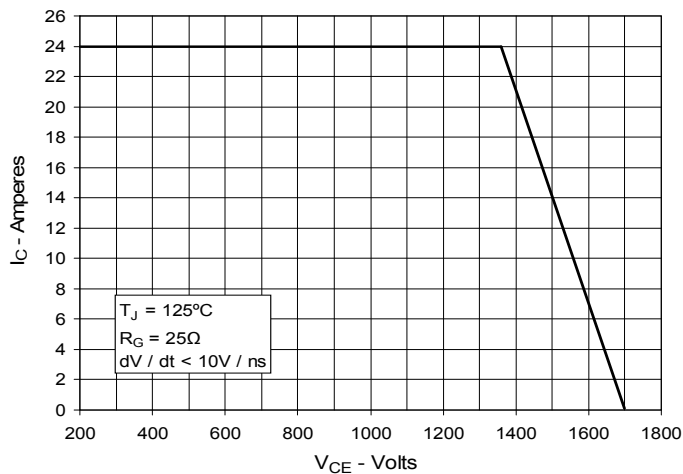
**Fig. 9. Gate Charge**



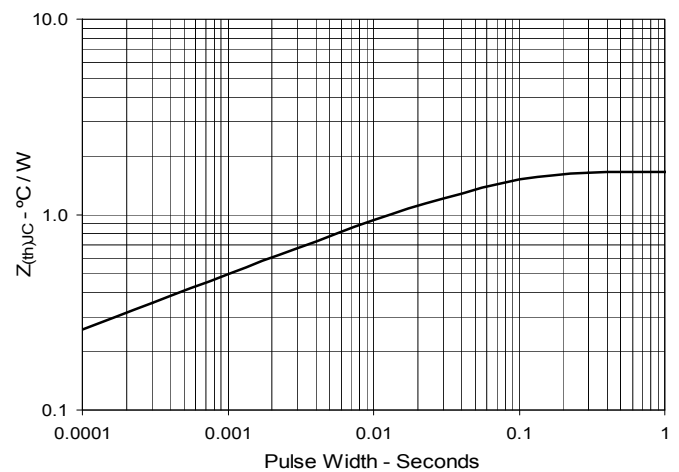
**Fig. 10. Capacitance**



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

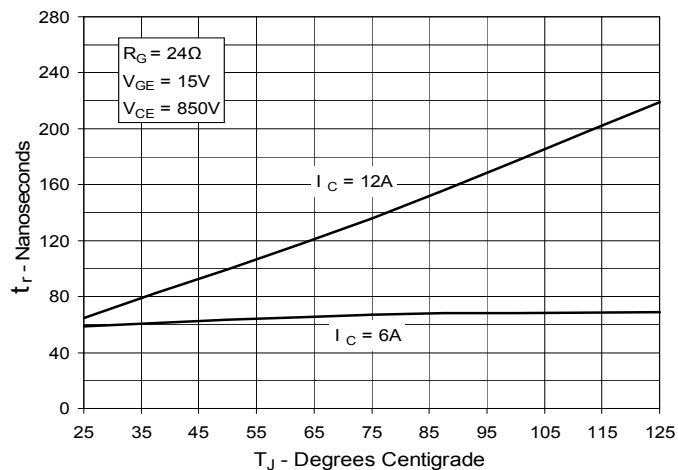


**Fig. 12. Maximum Transient Thermal Impedance**

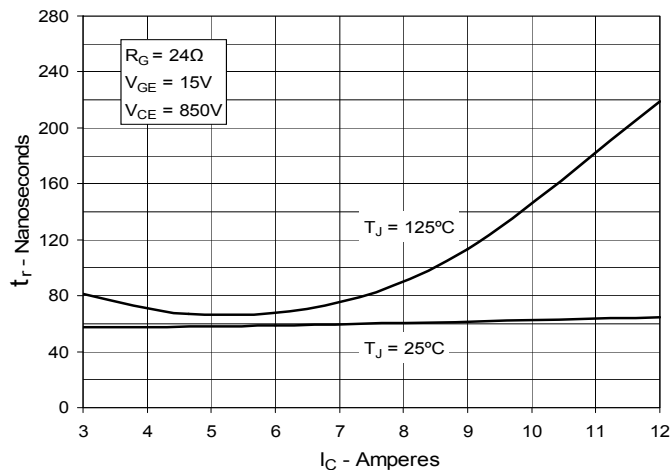


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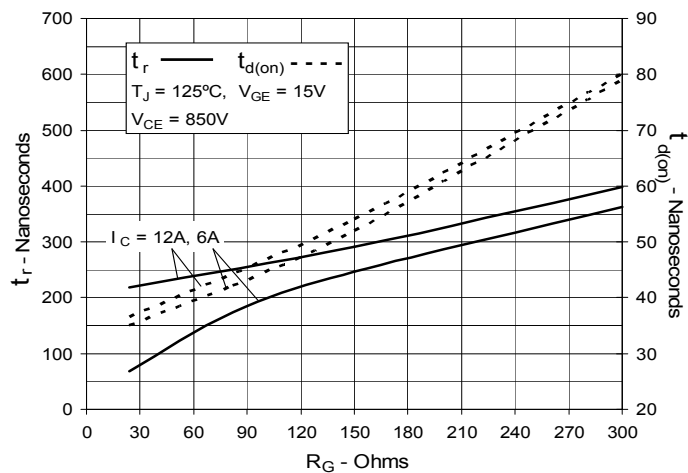
**Fig. 13. Resistive Turn-on  
Rise Time vs. Junction Temperature**



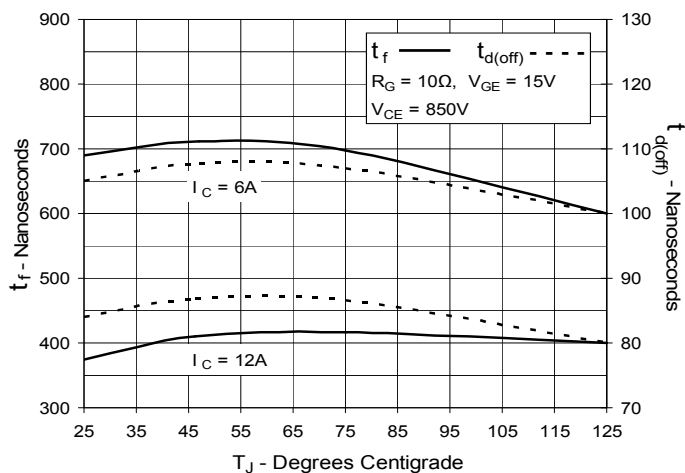
**Fig. 14. Resistive Turn-on  
Rise Time vs. Drain Current**



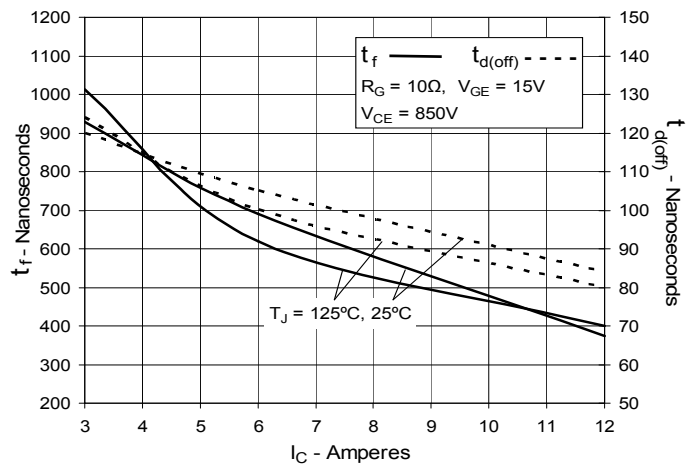
**Fig. 15. Resistive Turn-on  
Switching Times vs. Gate Resistance**



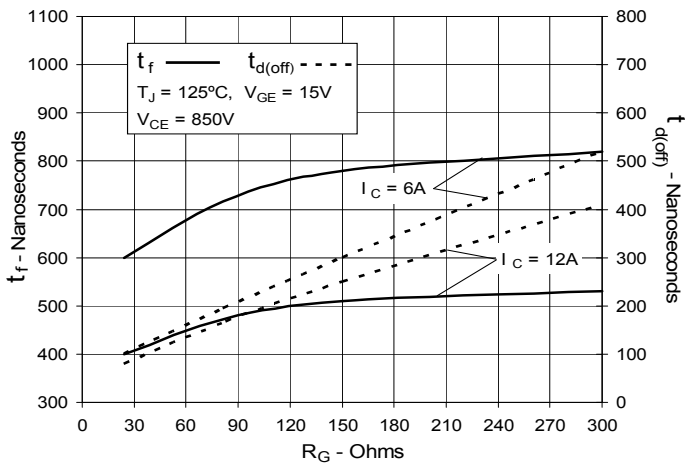
**Fig. 16. Resistive Turn-off  
Switching Times vs. Junction Temperature**



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



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





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