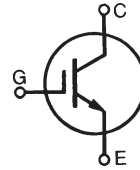


# High Voltage IGBT

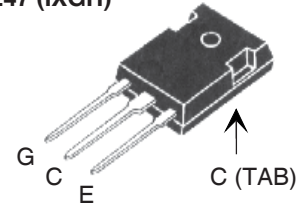
# IXGH10N170 IXGT10N170

$V_{CES} = 1700V$   
 $I_{C90} = 10A$   
 $V_{CE(sat)} \leq 4.0V$

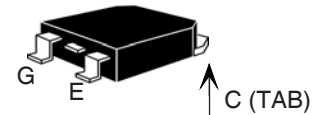


| Symbol         | Test Conditions  | Maximum Ratings       |            |
|----------------|--|-----------------------|------------|
| $V_{CES}$      | $T_C = 25^\circ C$ to $150^\circ C$                        | 1700                  | V          |
| $V_{CGR}$      | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$  | 1700                  | V          |
| $V_{GES}$      | Continuous   | $\pm 20$              | V          |
| $V_{GEM}$      | Transient  | $\pm 30$              | V          |
| $I_{C25}$      | $T_C = 25^\circ C$   | 20                    | A          |
| $I_{C90}$      | $T_C = 90^\circ C$   | 10                    | A          |
| $I_{CM}$       | $T_C = 25^\circ C$ , 1ms                                   | 70                    | A          |
| <b>SSOA</b>    | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 16\Omega$ | $I_{CM} = 20$         | A          |
| <b>(RBSOA)</b> | Clamped inductive load                                     | @ $0.8 \cdot V_{CES}$ |            |
| $P_C$          | $T_C = 25^\circ C$   | 110                   | 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 (IXGH)



TO-268 (IXGT)



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

### Features

- International standard packages JEDEC TO-268 and JEDEC TO-247 AD
- High current handling capability
- MOS Gate turn-on - drive simplicity
- Rugged NPT structure
- Molding epoxies meet UL 94 V-0 flammability classification

### Applications

- Capacitor discharge & pulser circuits
- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies

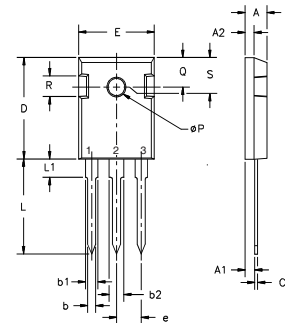
### Advantages

- High power density
- Suitable for surface mounting
- Easy to mount with 1 screw, (isolated mounting screw hole)

| Symbol        | Test Conditions   | Characteristic Values |            |                           |
|---------------|---|-----------------------|------------|---------------------------|
|               |   | Min.                  | Typ.       | Max.                      |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                                  | 1700                  |            | V                         |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                              | 3.0                   |            | V                         |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$<br>$V_{GE} = 0V$ $T_J = 125^\circ C$ |                       |            | 50 $\mu A$<br>500 $\mu A$ |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                |                       |            | $\pm 100$ nA              |
| $V_{CE(sat)}$ | $I_C = I_{C90}$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ C$  |                       | 2.7<br>3.4 | 4.0 V                     |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified)  | Characteristic Values |      |                    |
|--------------|--|-----------------------|------|--------------------|
|              |  | Min.                  | Typ. | Max.               |
| $g_{fs}$     | $I_C = 10\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$   | 3.8                   | 6.3  | S                  |
| $I_{C(ON)}$  | $V_{CE} = 10\text{V}, V_{GE} = 10\text{V}$   |                       | 33   | A                  |
| $C_{ies}$    | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$   |                       | 700  | pF                 |
| $C_{oes}$    |  | 40                    | pF   |                    |
| $C_{res}$    |  | 14                    | pF   |                    |
| $Q_g$        | $I_C = 10\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$  |                       | 32   | nC                 |
| $Q_{ge}$     |  | 4                     | nC   |                    |
| $Q_{gc}$     |  | 16                    | nC   |                    |
| $t_{d(on)}$  | <b>Resistive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 10\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 850\text{V}, R_G = 16\Omega$  |                       | 30   | ns                 |
| $t_r$        |  | 69                    | ns   |                    |
| $t_{d(off)}$ |  | 132                   | ns   |                    |
| $t_f$        |  | 600                   | ns   |                    |
| $t_{d(on)}$  | <b>Resistive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 10\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 850\text{V}, R_G = 16\Omega$ |                       | 30   | ns                 |
| $t_{ri}$     |  | 270                   | ns   |                    |
| $t_{d(off)}$ |  | 135                   | ns   |                    |
| $t_{fi}$     |  | 495                   | ns   |                    |
| $R_{thJC}$   |  |                       | 1.1  | $^\circ\text{C/W}$ |
| $R_{thCS}$   | (TO-247)   | 0.25                  |      | $^\circ\text{C/W}$ |

### TO-247 AD Outline

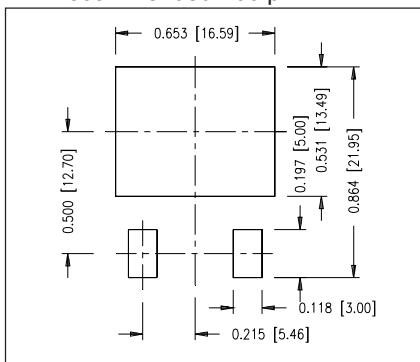


Terminals: 1 - Gate 2 - Drain

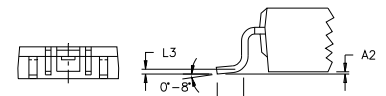
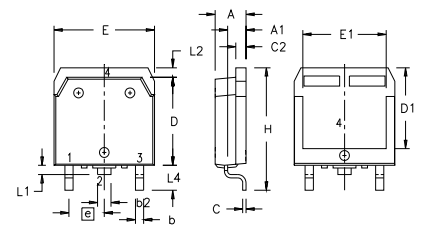
| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub>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

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

### Min Recommended Footprint



### TO-268 Outline



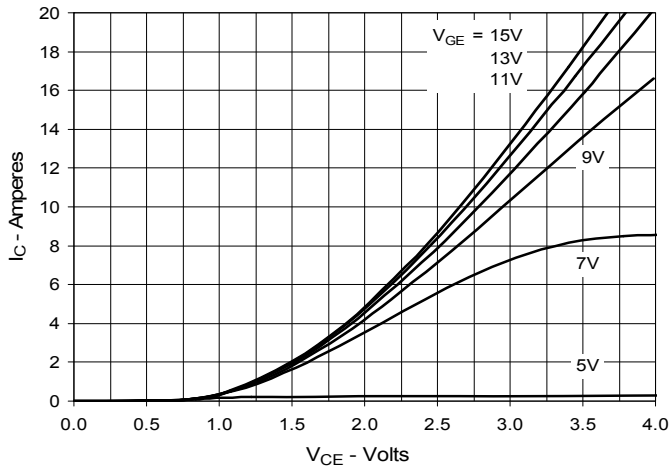
Terminals: 1 - Gate 2 - Drain

| 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  |

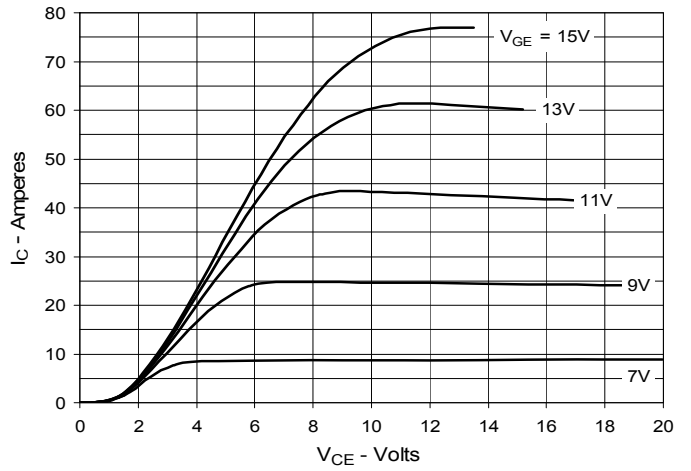
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4,881,106 5,034,796 5,187,117 5,486,715 6,306,728 B1 6,583,505 6,710,463 6,771,478 B2 7,071,537

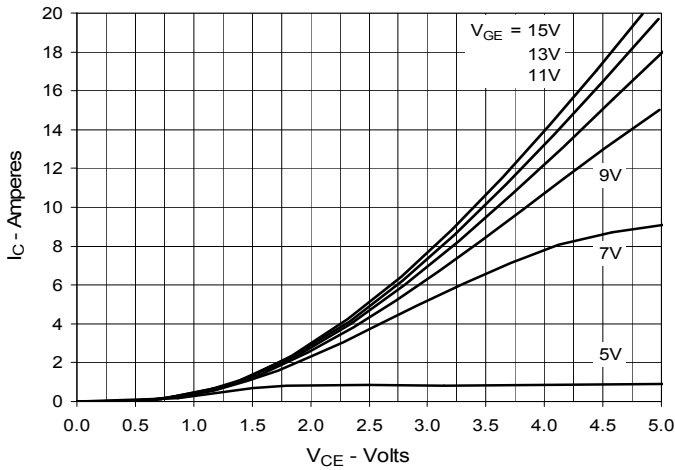
**Fig. 1. Output Characteristics @ 25°C**



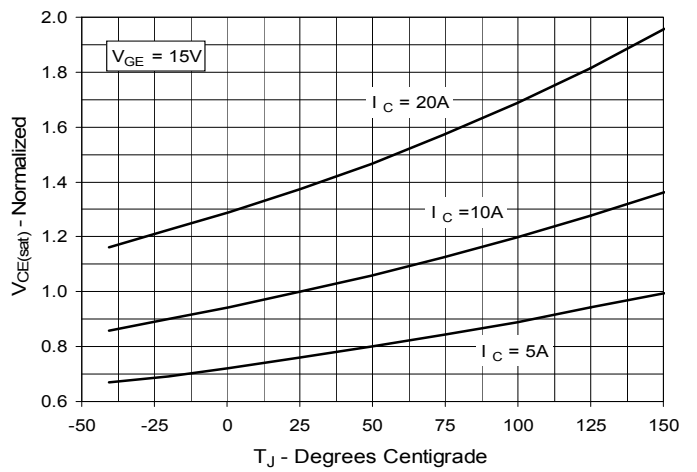
**Fig. 2. Extended Output Characteristics @ 25°C**



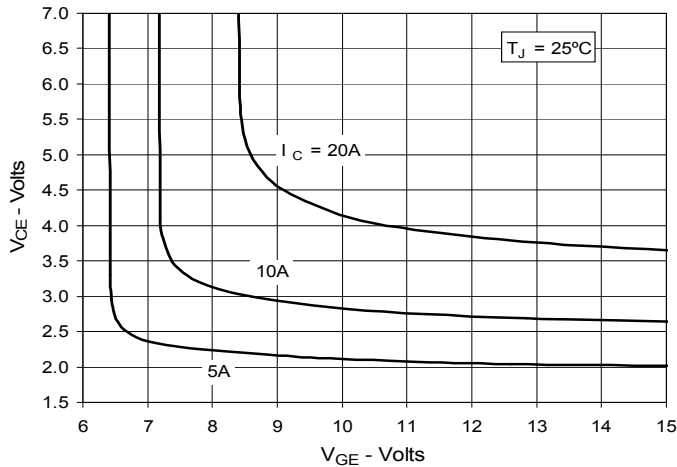
**Fig. 3. Output Characteristics @ 125°C**



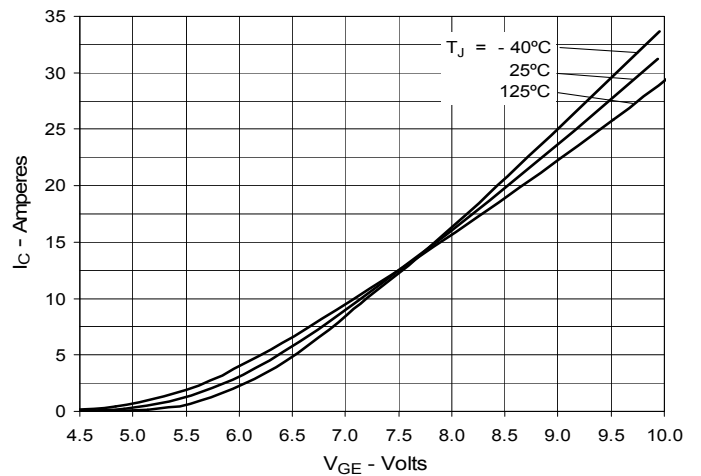
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



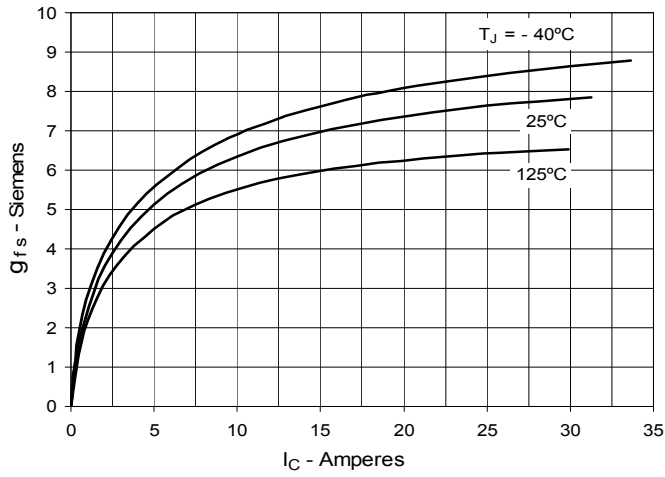
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



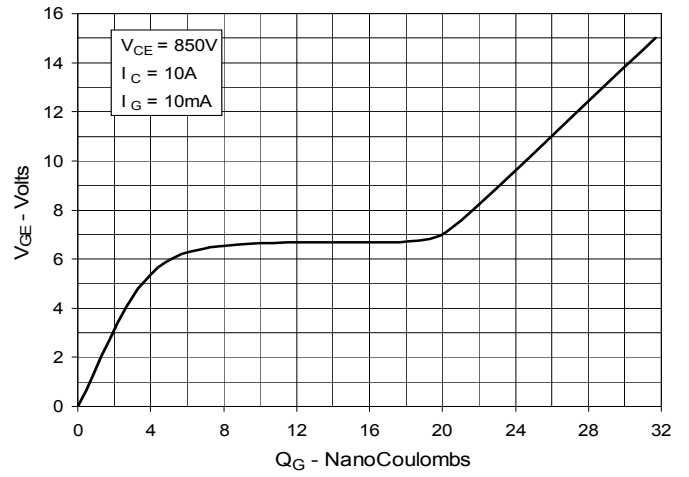
**Fig. 6. Input Admittance**



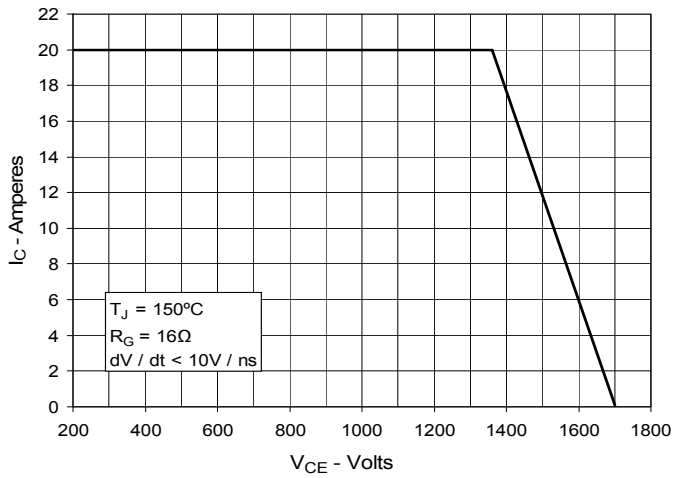
**Fig. 7. Transconductance**



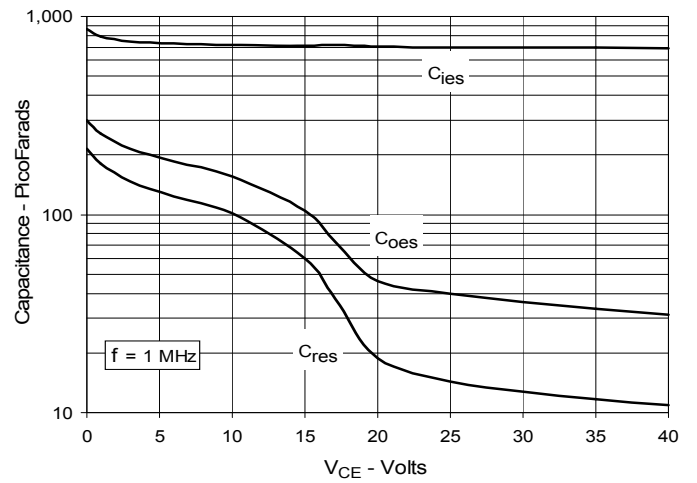
**Fig. 8. Gate Charge**



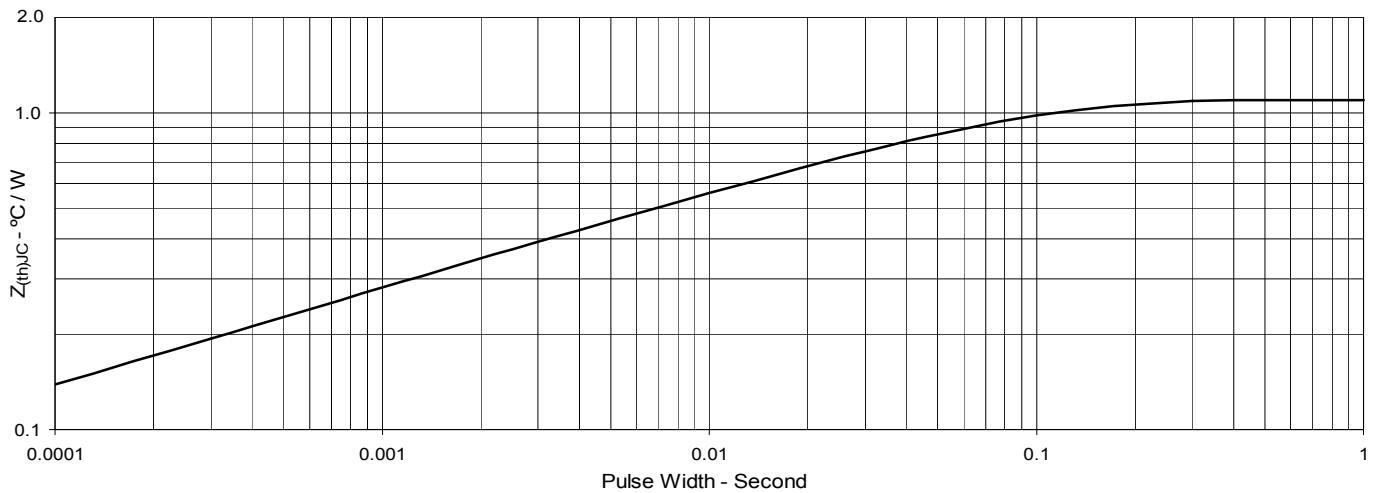
**Fig. 9. Reverse-Bias Safe Operating Area**



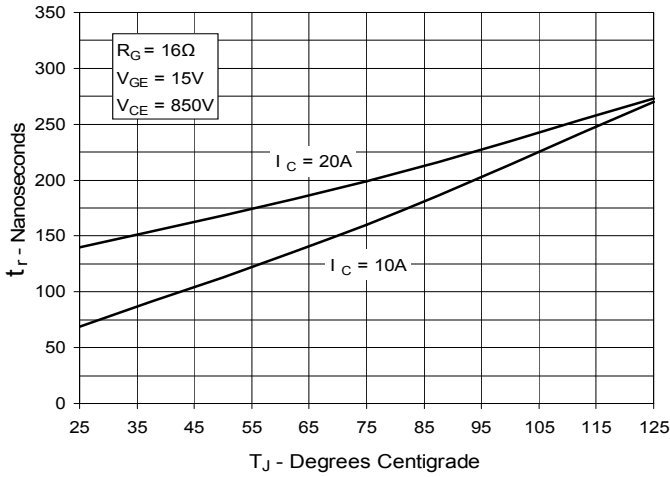
**Fig. 10. Capacitance**



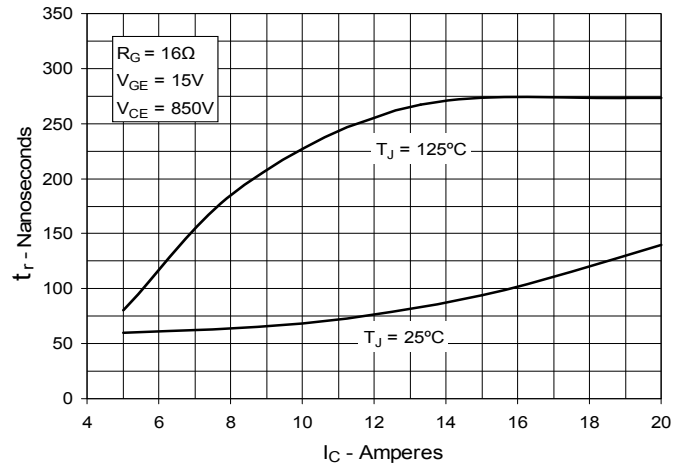
**Fig. 11. Maximum Transient Thermal Impedance**



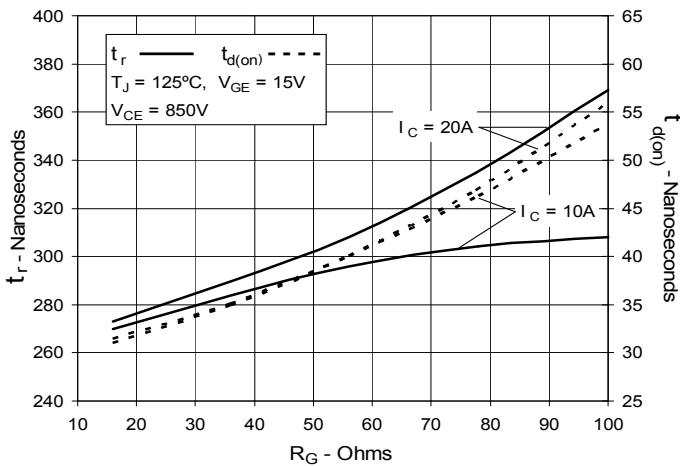
**Fig. 12. Resistive Turn-on Rise Time vs. Junction Temperature**



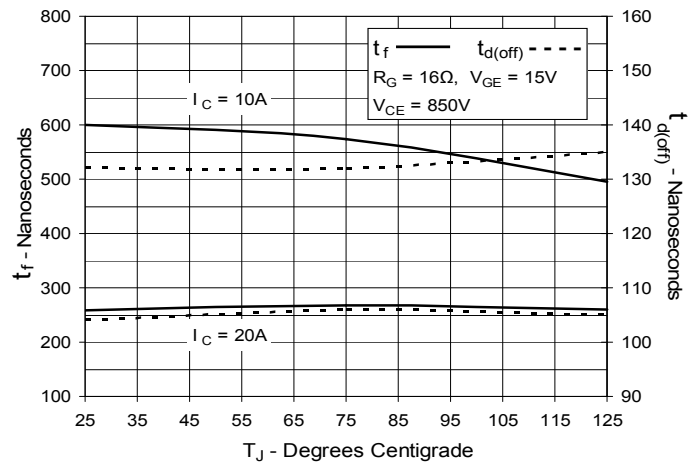
**Fig. 13. Resistive Turn-on Rise Time vs. Collector Current**



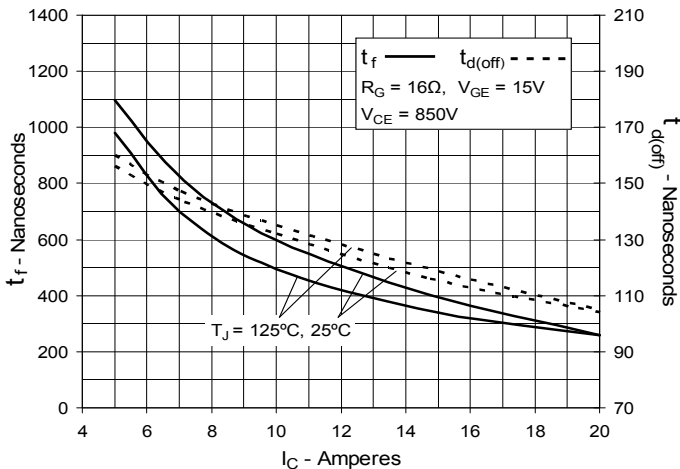
**Fig. 14. Resistive Turn-on Switching Times vs. Gate Resistance**



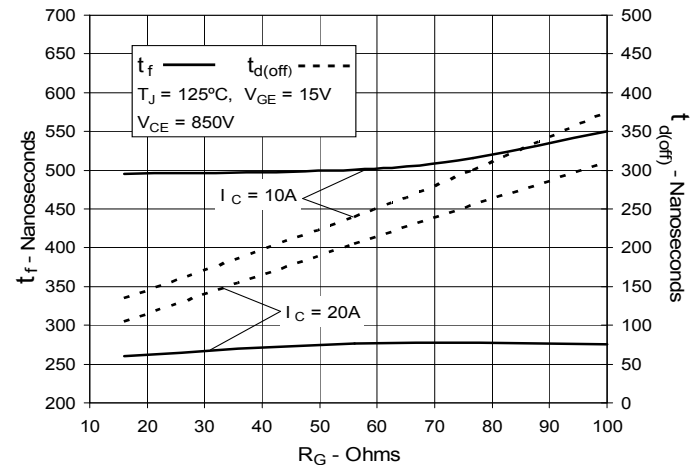
**Fig. 15. Resistive Turn-off Switching Times vs. Junction Temperature**



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



**Fig. 17. Resistive Turn-off Switching Times vs. Gate Resistance**



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