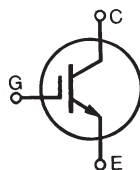


# Trench Gate IGBT

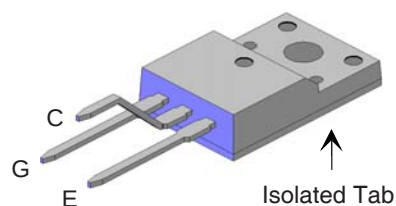
For PDP Applications

## IXGP50N33TBM-A



$$\begin{aligned} V_{CES} &= 330V \\ I_{CP} &= 200A \\ V_{CE(sat)} &\leq 1.6V \end{aligned}$$

| Symbol       | Test Conditions                                                                | Maximum Ratings |                  |
|--------------|--------------------------------------------------------------------------------|-----------------|------------------|
| $V_{CES}$    | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                | 330             | V                |
| $V_{GEM}$    | Transient                                                                      | $\pm 30$        | V                |
| $I_{C25}$    | $T_C = 25^\circ\text{C}$                                                       | 30              | A                |
| $I_{CP}$     | $T_J \leq 150^\circ\text{C}$ , $tp \leq 10\mu\text{s}$ , duty cycle $\leq 1\%$ | 200             | A                |
| $I_{C(RMS)}$ | Lead current limit                                                             | 75              | A                |
| $P_C$        | $T_C = 25^\circ\text{C}$                                                       | 50              | W                |
| $T_J$        |                                                                                | -55 ... +150    | $^\circ\text{C}$ |
| $T_{JM}$     |                                                                                | 150             | $^\circ\text{C}$ |
| $T_{stg}$    |                                                                                | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$        | 1.6mm (0.062 in.) from case for 10s                                            | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$   | Plastic body for 10 seconds                                                    | 260             | $^\circ\text{C}$ |
| $M_d$        | Mounting torque                                                                | 1.13/10         | Nm/lb.in.        |
| Weight       |                                                                                | 2.5             | g                |

OVERMOLDED TO-220 W/ FORMED  
LEAD (IXGP...M-A)


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

### Features

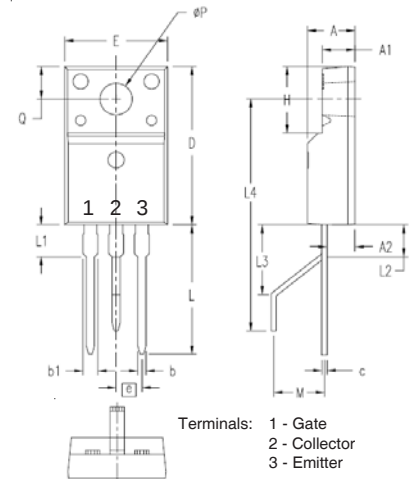
- Fast switching
- Plastic overmolded tab for electrical isolation
- Low  $V_{CE(sat)}$ 
  - for minimum on-state conduction losses

### Applications

- PDP Systems
- Capacitive load circuits
- Switching power supplies

| Symbol        | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) | Characteristic Values |      |                                      |
|---------------|-----------------------------------------------------------------------------|-----------------------|------|--------------------------------------|
|               |                                                                             | Min.                  | Typ. | Max.                                 |
| $BV_{CES}$    | $I_C = 250\mu\text{A}$ , $V_{GE} = 0V$                                      | 330                   |      | V                                    |
| $V_{GE(th)}$  | $I_C = 250\mu\text{A}$ , $V_{CE} = V_{GE}$                                  | 3.0                   |      | 5.0 V                                |
| $I_{CES}$     | $V_{CE} = 330V$<br>$V_{GE} = 0V$ $T_J = 125^\circ\text{C}$                  |                       |      | 2 $\mu\text{A}$<br>125 $\mu\text{A}$ |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                          |                       |      | $\pm 100$ nA                         |
| $V_{CE(sat)}$ | $V_{GE} = 15V$ , $I_C = 25A$<br><br>$T_J = 125^\circ\text{C}$               |                       | 1.37 | 1.60 V                               |
|               |                                                                             |                       | 1.35 | V                                    |
|               | $I_C = 50A$<br><br>$T_J = 125^\circ\text{C}$                                |                       | 1.71 | V                                    |
|               |                                                                             |                       | 1.76 | V                                    |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ unless otherwise specified)                                                            | Characteristic Values |      |                        |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|------------------------|
|              |                                                                                                                                      | Min.                  | Typ. | Max.                   |
| $g_{fs}$     | $I_C = 25\text{A}$ , $V_{CE} = 10\text{V}$ , Note 1                                                                                  | 25                    | 42   | S                      |
| $C_{ies}$    | $V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$                                                                     |                       | 1480 | pF                     |
| $C_{oes}$    |                                                                                                                                      |                       | 108  | pF                     |
| $C_{res}$    |                                                                                                                                      |                       | 15   | pF                     |
| $Q_g$        | $I_C = 25\text{A}$ , $V_{GE} = 15\text{V}$ , $V_{CE} = 0.5 \cdot V_{CES}$                                                            |                       | 42   | nC                     |
| $Q_{ge}$     |                                                                                                                                      |                       | 9    | nC                     |
| $Q_{gc}$     |                                                                                                                                      |                       | 12   | nC                     |
| $t_{d(on)}$  | Resistive load, $T_J = 25^\circ\text{C}$<br>$I_C = 25\text{A}$ , $V_{GE} = 15\text{V}$<br>$V_{CE} = 240\text{V}$ , $R_G = 15\Omega$  |                       | 14   | ns                     |
| $t_{ri}$     |                                                                                                                                      |                       | 30   | ns                     |
| $t_{d(off)}$ |                                                                                                                                      |                       | 53   | ns                     |
| $t_{fi}$     |                                                                                                                                      |                       | 142  | ns                     |
| $t_{d(on)}$  | Resistive load, $T_J = 125^\circ\text{C}$<br>$I_C = 25\text{A}$ , $V_{GE} = 15\text{V}$<br>$V_{CE} = 240\text{V}$ , $R_G = 15\Omega$ |                       | 13   | ns                     |
| $t_{ri}$     |                                                                                                                                      |                       | 32   | ns                     |
| $t_{d(off)}$ |                                                                                                                                      |                       | 74   | ns                     |
| $t_{fi}$     |                                                                                                                                      |                       | 270  | ns                     |
| $R_{thJC}$   |                                                                                                                                      |                       |      | 2.5 $^\circ\text{C/W}$ |

**OVERMOLDED TO-220 W/ FORMED LEAD (IXGP...M-A)**


| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .177     | .193 | 4.50        | 4.90  |
| A1  | .092     | .108 | 2.34        | 2.74  |
| A2  | .101     | .117 | 2.56        | 2.96  |
| b   | .028     | .035 | 0.70        | 0.90  |
| b1  | .050     | .058 | 1.27        | 1.47  |
| c   | .016     | .024 | 0.40        | 0.60  |
| D   | .617     | .633 | 15.67       | 16.07 |
| E   | .392     | .408 | 9.96        | 10.36 |
| e   | .100 BSC |      | 2.54 BSC    |       |
| H   | .255     | .271 | 6.48        | 6.88  |
| L   | .500     | .523 | 12.70       | 13.30 |
| L1  | .119     | .135 | 3.03        | 3.43  |
| L2  | .098     | .138 | 2.50        | 3.50  |
| L3  | .256     | .295 | 6.50        | 7.50  |
| L4  | .906     | .945 | 23.00       | 24.00 |
| M   | .177     | .216 | 4.50        | 5.50  |
| ØP  | .121     | .129 | 3.08        | 3.28  |
| Q   | .126     | .134 | 3.20        | 3.40  |

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

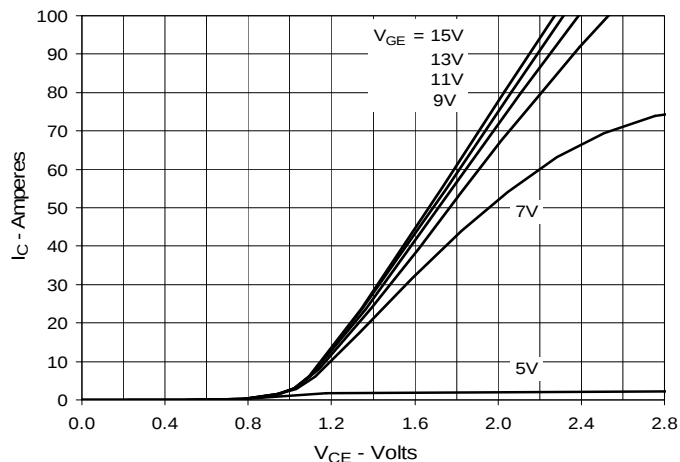
**PRELIMINARY TECHNICAL INFORMATION**

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

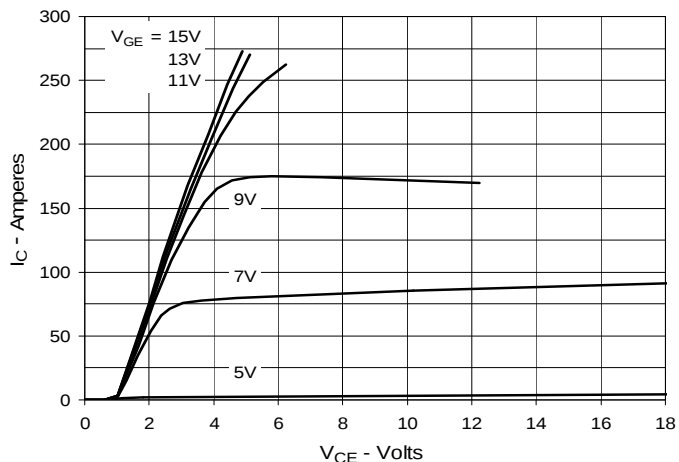
IXYS reserves the right to change limits, test conditions, and dimensions.

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

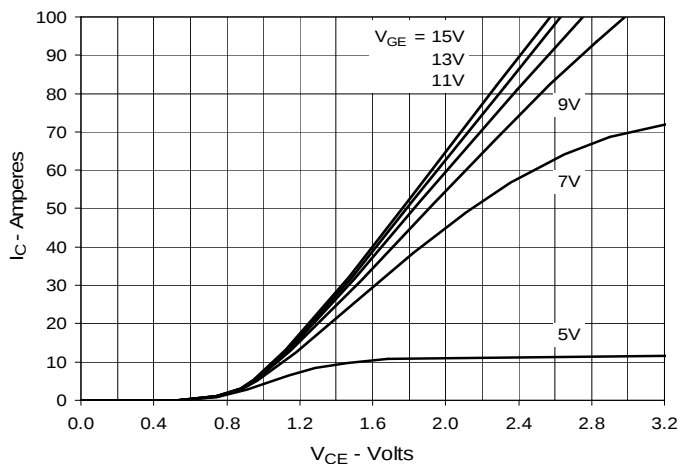
**Fig. 1. Output Characteristics**  
@ 25°C



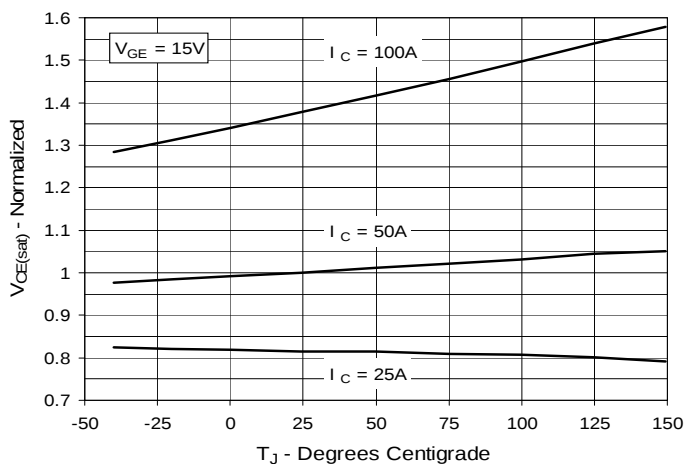
**Fig. 2. Extended Output Characteristics**  
@ 25°C



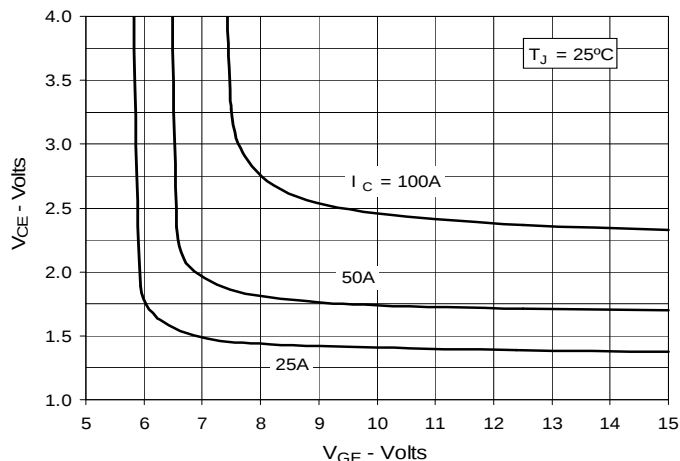
**Fig. 3. Output Characteristics**  
@ 125°C



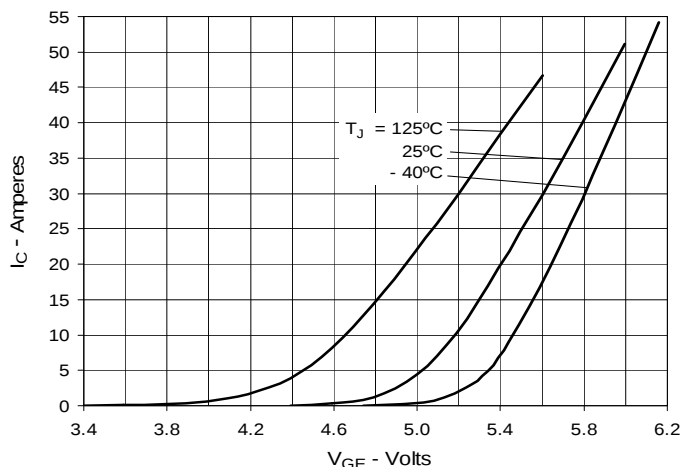
**Fig. 4. Dependence of  $V_{CE(sat)}$  on**  
Junction Temperature

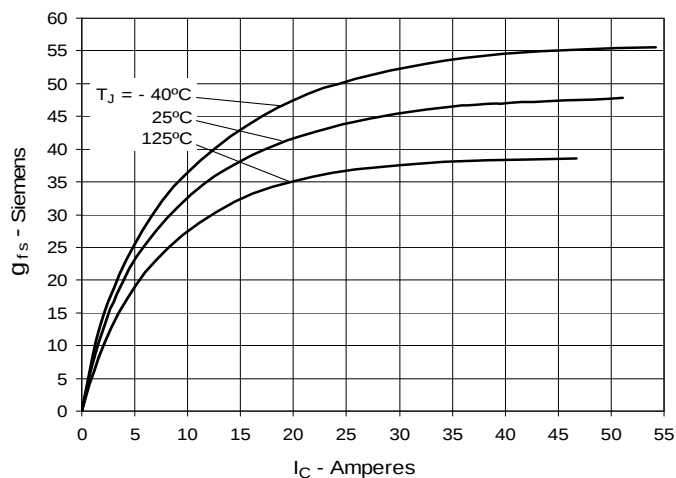
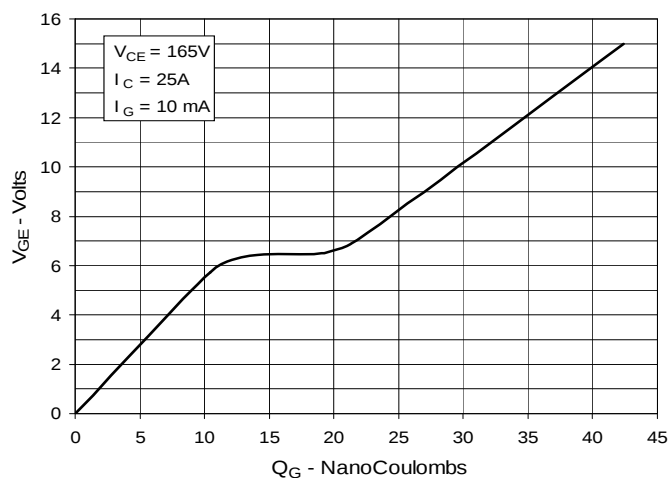
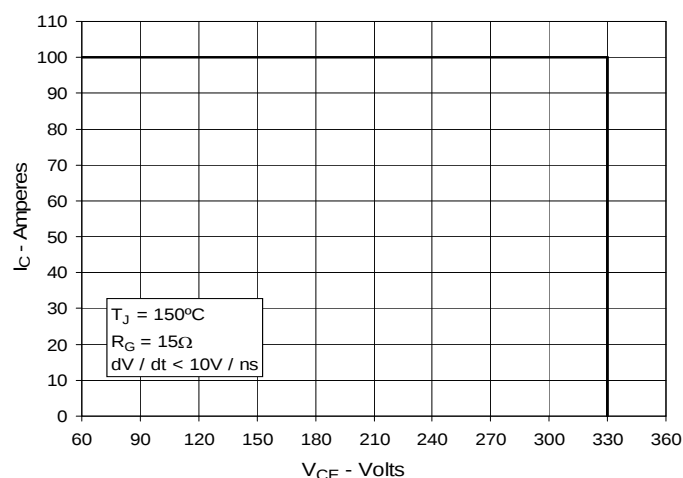
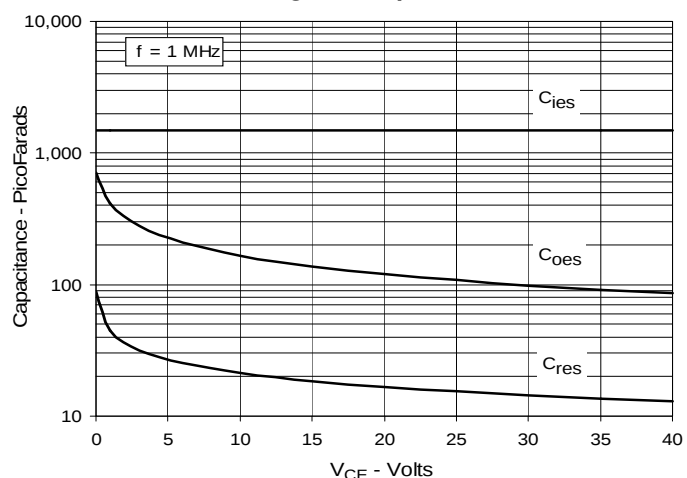
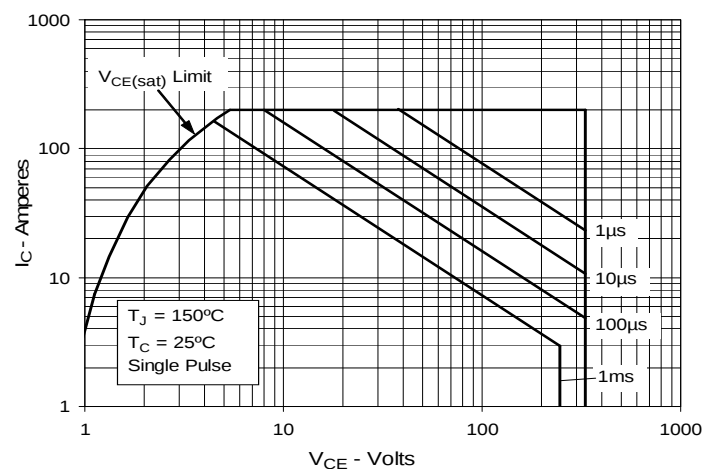
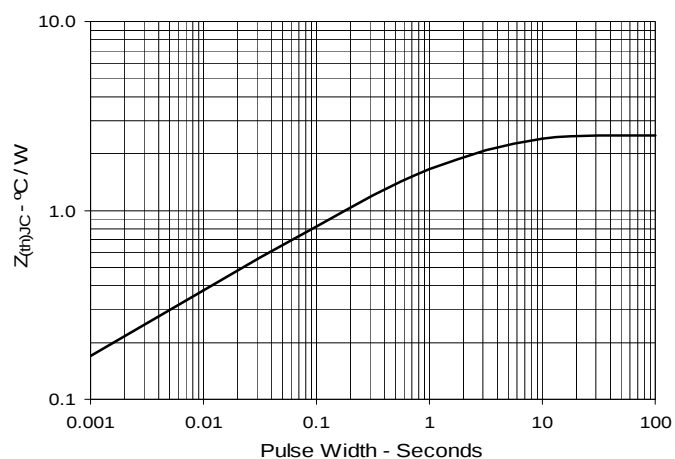


**Fig. 5. Collector-to-Emitter Voltage**  
vs. Gate-to-Emitter Voltage

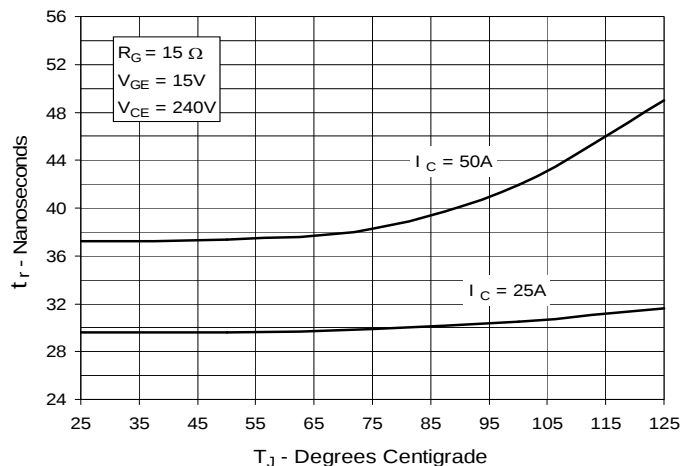


**Fig. 6. Input Admittance**

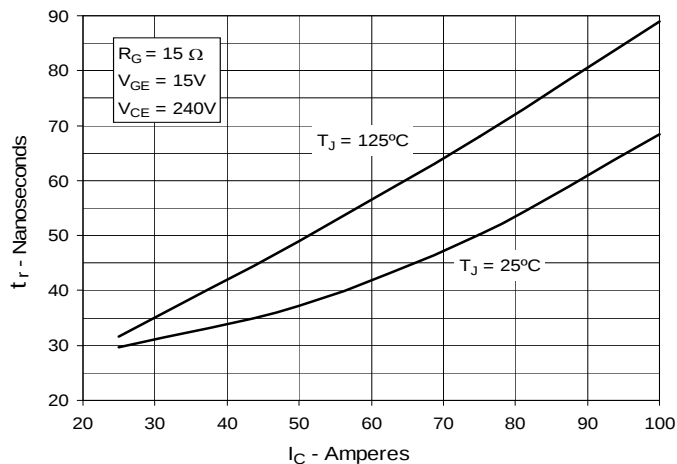


**Fig. 7. Transconductance**

**Fig. 8. Gate Charge**

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

**Fig. 10. Capacitance**

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

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


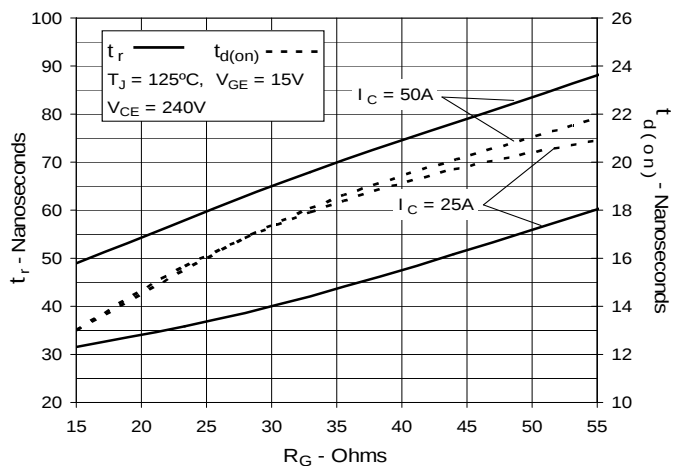
**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**



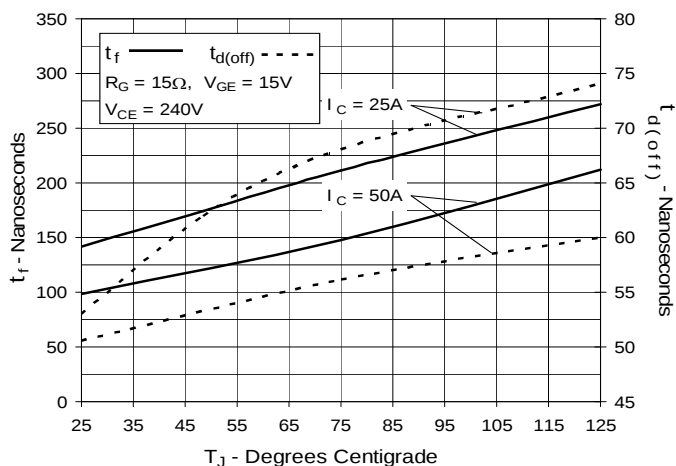
**Fig. 14. Resistive Turn-on Rise Time vs. Collector Current**



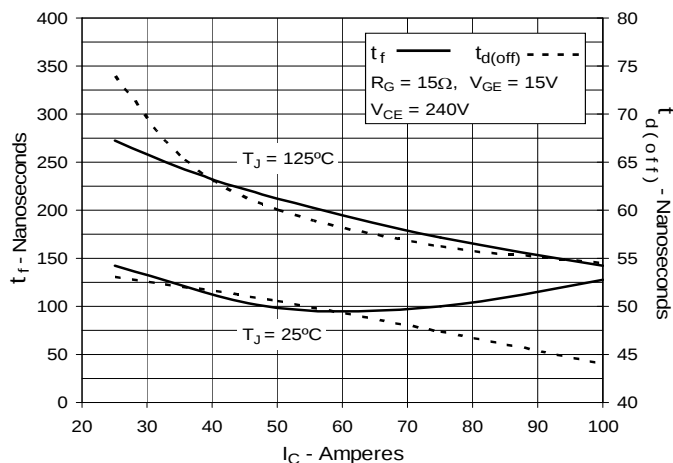
**Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance**



**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**

