

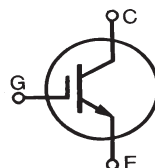
## GenX3™ 300V IGBT

### IXGK400N30A3

### IXGX400N30A3\*

\*Obsolete Part Number

Ultra-low  $V_{sat}$  PT IGBTs for  
up to 10kHz switching

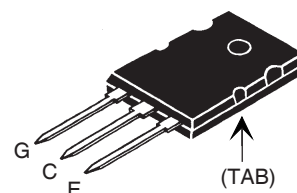


$$V_{CES} = 300V$$

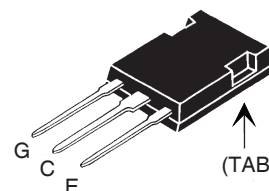
$$I_{C25} = 400A$$

$$V_{CE(sat)} \leq 1.15V$$

TO-264



PLUS247™



G = Gate  
C = Collector

E = Emitter  
TAB = Collector

| Symbol                        | Test Conditions                                                                      | Maximum Ratings                         |             |
|-------------------------------|--------------------------------------------------------------------------------------|-----------------------------------------|-------------|
| $V_{CES}$                     | $T_J = 25^{\circ}C$ to $150^{\circ}C$                                                | 300                                     | V           |
| $V_{CGR}$                     | $T_J = 25^{\circ}C$ to $150^{\circ}C$ , $R_{GE} = 1M\Omega$                          | 300                                     | V           |
| $V_{GES}$                     | Continuous                                                                           | $\pm 20$                                | V           |
| $V_{GEM}$                     | Transient                                                                            | $\pm 30$                                | V           |
| $I_{C25}$                     | $T_C = 25^{\circ}C$                                                                  | 400                                     | A           |
| $I_{C110}$                    | $T_C = 110^{\circ}C$                                                                 | 200                                     | A           |
| $I_{LRMS}$                    | Terminal Current Limit                                                               | 75                                      | A           |
| $I_{CM}$                      | $T_C = 25^{\circ}C$ , 1ms                                                            | 400                                     | A           |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_{VJ} = 125^{\circ}C$ , $R_G = 1\Omega$<br>Clamped inductive load | $I_{CM} = 400$<br>@ $0.8 \cdot V_{CES}$ | A           |
| $P_C$                         | $T_C = 25^{\circ}C$                                                                  | 1000                                    | W           |
| $T_J$                         |                                                                                      | -55 ... +150                            | $^{\circ}C$ |
| $T_{JM}$                      |                                                                                      | 150                                     | $^{\circ}C$ |
| $T_{stg}$                     |                                                                                      | -55 ... +150                            | $^{\circ}C$ |
| $T_L$                         | Maximum lead temperature for soldering                                               | 300                                     | $^{\circ}C$ |
| $T_{SOLD}$                    | 1.6 mm (0.062 in.) from case for 10                                                  | 260                                     | $^{\circ}C$ |
| $M_d$                         | Mounting torque ( IXGK )                                                             | 1.13/10                                 | Nm/lb.in.   |
| $F_c$                         | Mounting force ( IXGX )                                                              | 20..120/4.5..27                         | N/lb.       |
| <b>Weight</b>                 | TO-264                                                                               | 10                                      | g           |
|                               | PLUS247                                                                              | 6                                       | g           |

| Symbol        | Test Conditions<br>( $T_J = 25^{\circ}C$ , unless otherwise specified) | Characteristic Values |      |                    |
|---------------|------------------------------------------------------------------------|-----------------------|------|--------------------|
|               |                                                                        | Min.                  | Typ. | Max.               |
| $BV_{CES}$    | $I_C = 1mA$ , $V_{GE} = 0V$                                            | 300                   |      | V                  |
| $V_{GE(th)}$  | $I_C = 4mA$ , $V_{CE} = V_{GE}$                                        | 3.0                   |      | 5.0 V              |
| $I_{CES}$     | $V_{CE} = V_{CES}$<br>$V_{GE} = 0V$<br>$T_J = 125^{\circ}C$            |                       |      | 50 $\mu A$<br>2 mA |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                     |                       |      | $\pm 400$ nA       |
| $V_{CE(sat)}$ | $I_C = 100A$ , $V_{GE} = 15V$ , Note 1<br>$I_C = 400A$                 | 1.70                  |      | 1.15 V<br>V        |

### Features

- Optimized for low switching losses
- Square RBSOA
- High avalanche capability
- International standard packages

### Advantages

- High power density
- Low gate drive requirement

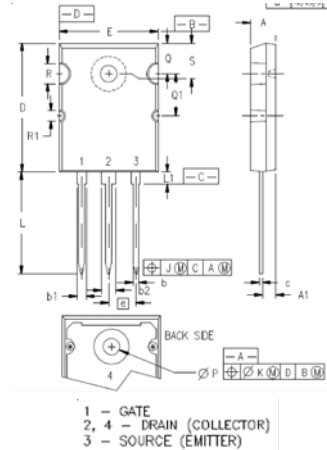
### Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts
- Inrush Current Protection Circuits

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified)                                                                            | Characteristic Values |       |                    |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------|--------------------|
|              |                                                                                                                                                        | Min.                  | Typ.  | Max.               |
| $g_{fs}$     | $I_C = 60\text{A}$ , $V_{CE} = 10\text{V}$ , Note 1                                                                                                    | 100                   | 170   | S                  |
| $C_{ies}$    | $V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$                                                                                       |                       | 19    | nF                 |
| $C_{oes}$    |                                                                                                                                                        |                       | 1350  | pF                 |
| $C_{res}$    |                                                                                                                                                        |                       | 190   | pF                 |
| $Q_{g(on)}$  | $I_C = 100\text{A}$ , $V_{GE} = 15\text{V}$ , $V_{CE} = 0.5 \cdot V_{CES}$                                                                             |                       | 560   | nC                 |
| $Q_{ge}$     |                                                                                                                                                        |                       | 83    | nC                 |
| $Q_{gc}$     |                                                                                                                                                        |                       | 185   | nC                 |
| $t_{d(on)}$  | <b>Resistive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 100\text{A}$ , $V_{GE} = 15\text{V}$<br>$V_{CE} = 240\text{V}$ , $R_G = 1\Omega$  |                       | 45    | ns                 |
| $t_r$        |                                                                                                                                                        |                       | 45    | ns                 |
| $t_{d(off)}$ |                                                                                                                                                        |                       | 210   | ns                 |
| $t_f$        |                                                                                                                                                        |                       | 107   | ns                 |
| $t_{d(on)}$  |                                                                                                                                                        |                       | 47    | ns                 |
| $t_r$        | <b>Resistive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 100\text{A}$ , $V_{GE} = 15\text{V}$<br>$V_{CE} = 240\text{V}$ , $R_G = 1\Omega$ |                       | 53    | ns                 |
| $t_{d(off)}$ |                                                                                                                                                        |                       | 240   | ns                 |
| $t_f$        |                                                                                                                                                        |                       | 315   | ns                 |
| $R_{thJC}$   |                                                                                                                                                        |                       | 0.125 | $^\circ\text{C/W}$ |
| $R_{thCK}$   |                                                                                                                                                        | 0.15                  |       | $^\circ\text{C/W}$ |

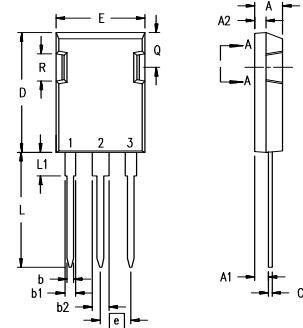
Note: 1. Pulse test,  $t \leq 300\mu\text{s}$ ; duty cycle,  $d \leq 2\%$ .

### TO-264 (IXGK) Outline



| SYM | INCHES   |       | MILLIMETERS |       |
|-----|----------|-------|-------------|-------|
|     | MIN      | MAX   | MIN         | MAX   |
| A   | .185     | .209  | 4.70        | 5.31  |
| A1  | .102     | .118  | 2.59        | 3.00  |
| b   | .037     | .055  | 0.94        | 1.40  |
| b1  | .087     | .102  | 2.21        | 2.59  |
| b2  | .110     | .126  | 2.79        | 3.20  |
| c   | .017     | .029  | 0.43        | 0.74  |
| D   | 1.007    | 1.047 | 25.58       | 26.59 |
| E   | .760     | .799  | 19.30       | 20.29 |
| e   | .215 BSC |       | 5.46 BSC    |       |
| J   | .000     | .010  | 0.00        | 0.25  |
| K   | .000     | .010  | 0.00        | 0.25  |
| L   | .779     | .842  | 19.79       | 21.39 |
| L1  | .087     | .102  | 2.21        | 2.59  |
| ØP  | .122     | .138  | 3.10        | 3.51  |
| Q   | .240     | .256  | 6.10        | 6.50  |
| Q1  | .330     | .346  | 8.38        | 8.79  |
| ØR  | .155     | .187  | 3.94        | 4.75  |
| ØR1 | .085     | .093  | 2.16        | 2.36  |
| S   | .243     | .253  | 6.17        | 6.43  |

### PLUS247™ (IXGX) Outline



Terminals: 1 - Gate  
2 - Drain (Collector)  
3 - Source (Emitter)

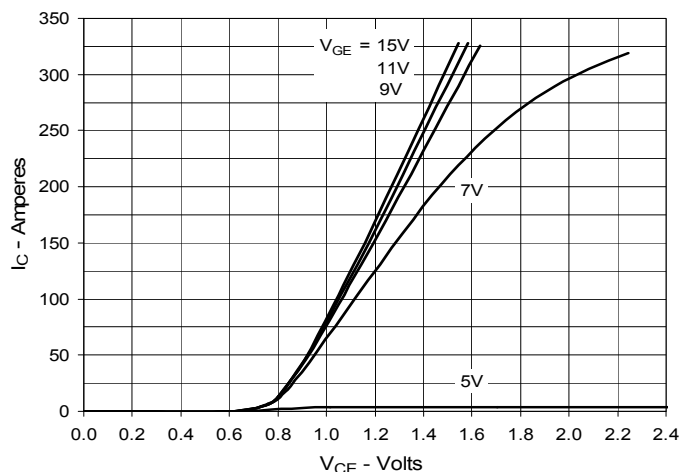
| Dim.           | Millimeter |       | Inches   |       |
|----------------|------------|-------|----------|-------|
|                | Min.       | Max.  | Min.     | Max.  |
| A              | 4.83       | 5.21  | .190     | .205  |
| A <sub>1</sub> | 2.29       | 2.54  | .090     | .100  |
| A <sub>2</sub> | 1.91       | 2.16  | .075     | .085  |
| b              | 1.14       | 1.40  | .045     | .055  |
| b <sub>1</sub> | 1.91       | 2.13  | .075     | .084  |
| b <sub>2</sub> | 2.92       | 3.12  | .115     | .123  |
| C              | 0.61       | 0.80  | .024     | .031  |
| D              | 20.80      | 21.34 | .819     | .840  |
| E              | 15.75      | 16.13 | .620     | .635  |
| e              | 5.45 BSC   |       | .215 BSC |       |
| L              | 19.81      | 20.32 | .780     | .800  |
| L1             | 3.81       | 4.32  | .150     | .170  |
| Q              | 5.59       | 6.20  | .220     | 0.244 |
| R              | 4.32       | 4.83  | .170     | .190  |

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

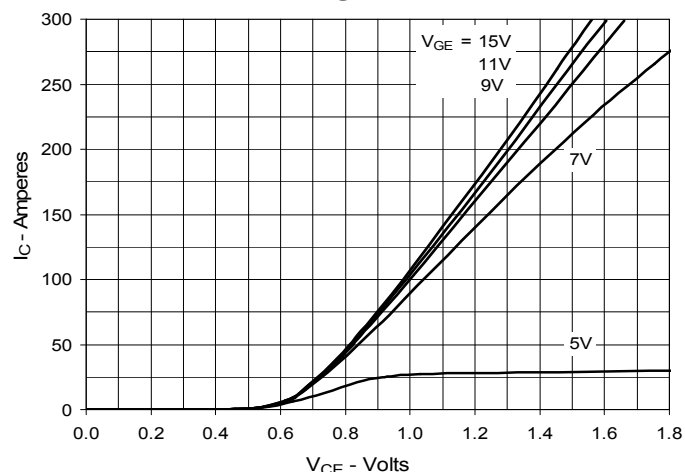
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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

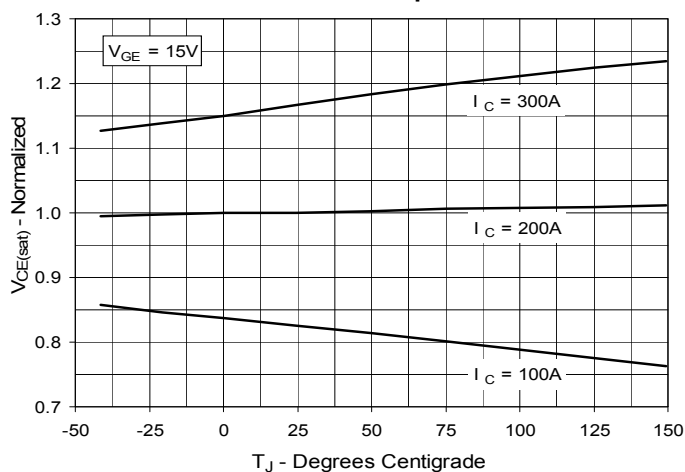
**Fig. 1. Output Characteristics**  
@ 25°C



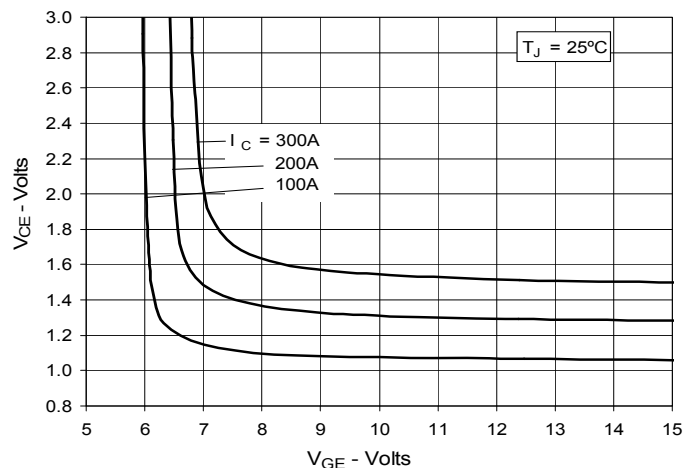
**Fig. 2. Output Characteristics**  
@ 125°C



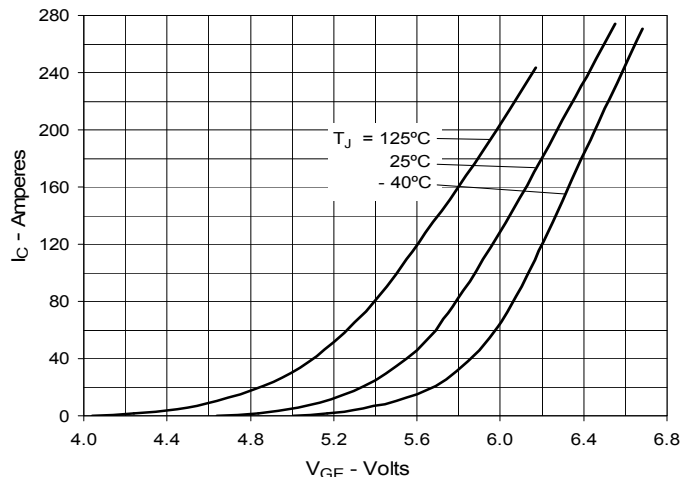
**Fig. 3. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



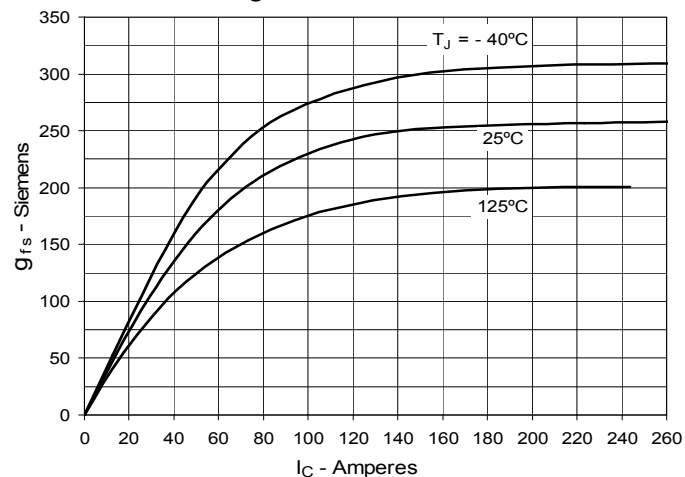
**Fig. 4. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



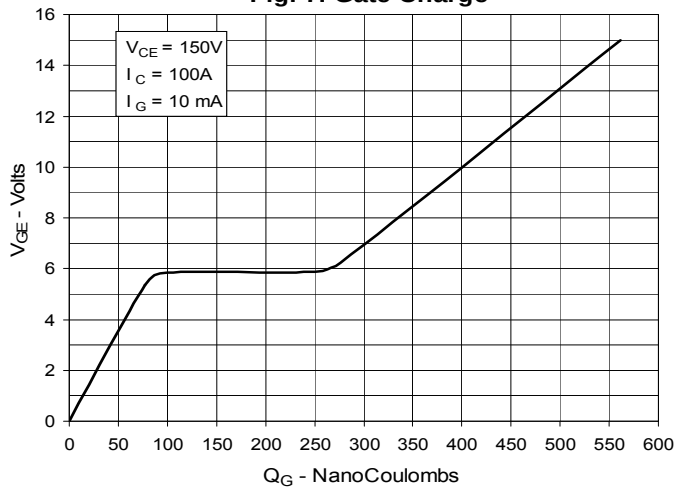
**Fig. 5. Input Admittance**



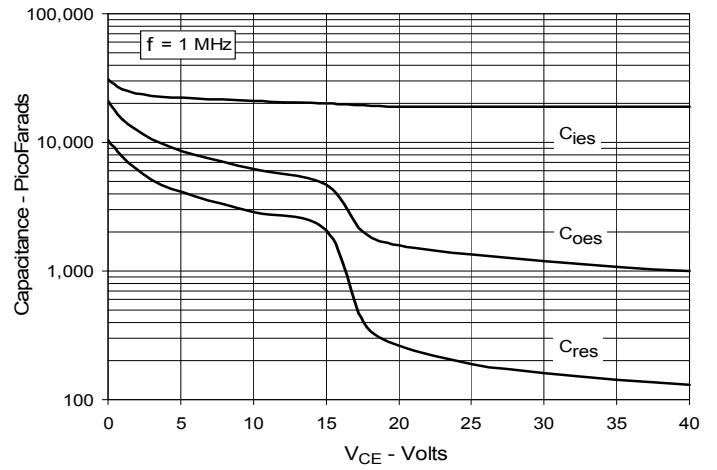
**Fig. 6. Transconductance**



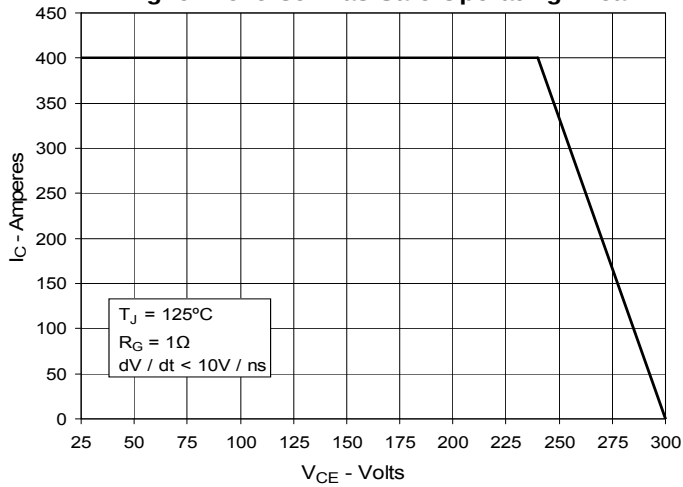
**Fig. 7. Gate Charge**



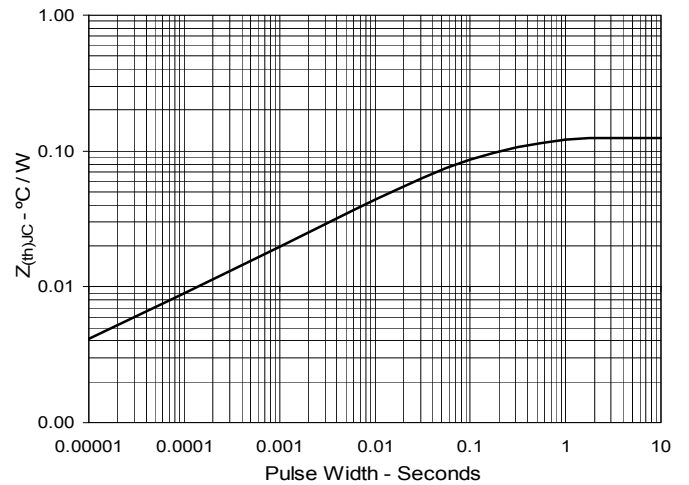
**Fig. 8. Capacitance**

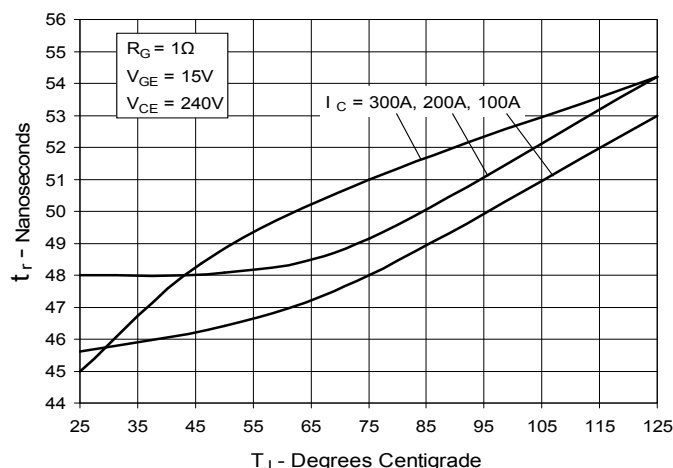
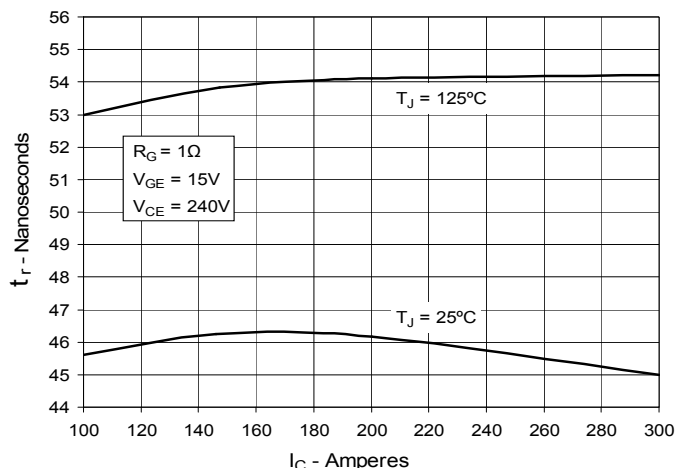
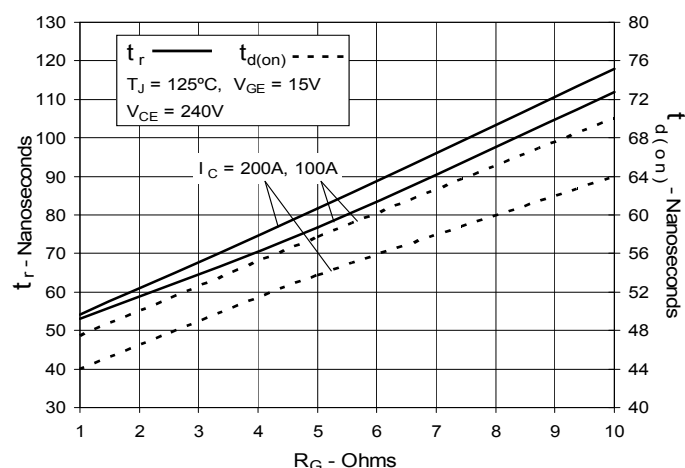
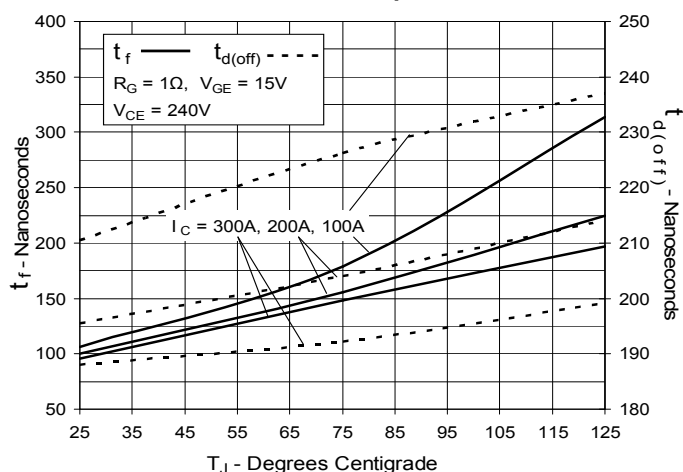
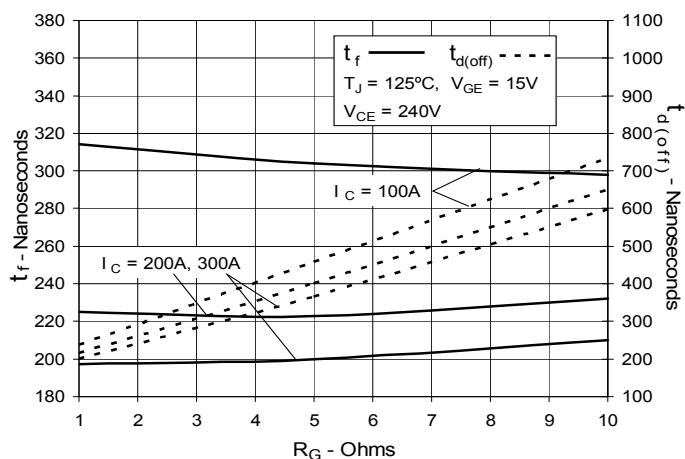
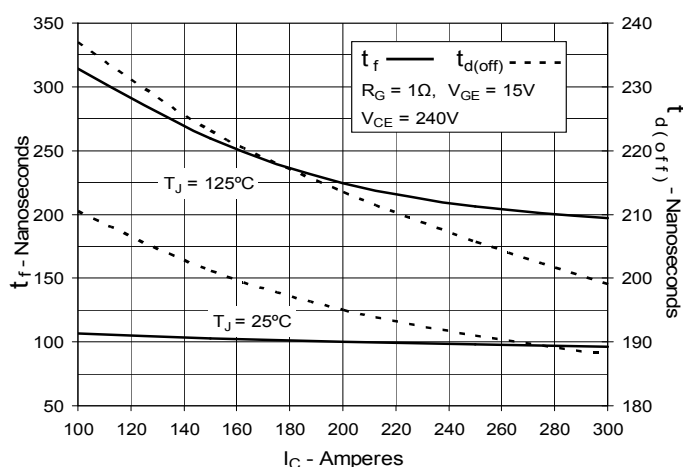


**Fig. 9. Reverse-Bias Safe Operating Area**



**Fig. 10. Maximum Transient Thermal Impedance**



**Fig. 11. Resistive Turn-on Rise Time vs. Junction Temperature**

**Fig. 12. Resistive Turn-on Rise Time vs. Collector Current**

**Fig. 13. Resistive Turn-on Switching Times vs. Gate Resistance**

**Fig. 14. Resistive Turn-off Switching Times vs. Junction Temperature**

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

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




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