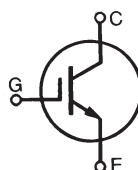


# 1200V XPT™ IGBT

## GenX4™

# IXYH75N120B4

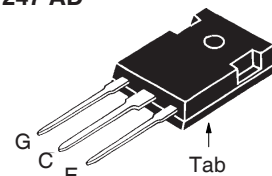
Extreme Light Punch Through  
IGBT for 5-15 kHz Switching



$$\begin{aligned} V_{CES} &= 1200V \\ I_{C110} &= 75A \\ V_{CE(sat)} &\leq 2.20V \\ t_{fi(typ)} &= 150ns \end{aligned}$$

| Symbol                             | Test Conditions                                                                                     | Maximum Ratings |                  |
|------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{CES}$                          | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$                                                     | 1200            | V                |
| $V_{CGR}$                          | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GE} = 1M\Omega$                               | 1200            | V                |
| $V_{GES}$                          | Continuous                                                                                          | $\pm 20$        | V                |
| $V_{GEM}$                          | Transient                                                                                           | $\pm 30$        | V                |
| $I_{C25}$                          | $T_C = 25^\circ\text{C}$                                                                            | 240             | A                |
| $I_{LRMS}$                         | Terminal Current Limit                                                                              | 160             | A                |
| $I_{C110}$                         | $T_C = 110^\circ\text{C}$                                                                           | 75              | A                |
| $I_{CM}$                           | $T_C = 25^\circ\text{C}$ , 1ms                                                                      | 440             | A                |
| <b>SSOA (RBSOA)</b>                | $V_{GE} = 15V$ , $T_{VJ} = 150^\circ\text{C}$ , $R_G = 3\Omega$                                     | $I_{CM} = 150$  | A                |
|                                    | Clamped Inductive Load                                                                              | 1360            | V                |
| <b><math>T_{SC}</math> (SCSOA)</b> | $V_{GE} = 15V$ , $T_J = 150^\circ\text{C}$ ,<br>$R_G = 10\Omega$ , $V_{CE} = 600V$ , Non-Repetitive | 10              | $\mu\text{s}$    |
| $P_C$                              | $T_C = 25^\circ\text{C}$                                                                            | 1150            | W                |
| $T_J$                              |                                                                                                     | -55 ... +175    | $^\circ\text{C}$ |
| $T_{JM}$                           |                                                                                                     | 175             | $^\circ\text{C}$ |
| $T_{stg}$                          |                                                                                                     | -55 ... +175    | $^\circ\text{C}$ |
| $T_L$                              | Maximum Lead Temperature for Soldering                                                              | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$                         | 1.6 mm (0.062in.) from Case for 10s                                                                 | 260             | $^\circ\text{C}$ |
| $M_d$                              | Mounting Torque                                                                                     | 1.13/10         | Nm/lb.in.        |
| <b>Weight</b>                      |                                                                                                     | 6               | g                |

### TO-247 AD



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

### Features

- Optimized for 5-15kHz Switching
- Short Circuit Capability
- International Standard Package

### Advantages

- High Power Density
- Low Gate Drive Requirement

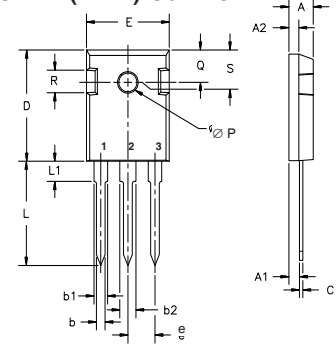
### Applications

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

| Symbol        | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |              |                          |
|---------------|-----------------------------------------------------------------------------|-----------------------|--------------|--------------------------|
|               |                                                                             | Min.                  | Typ.         | Max.                     |
| $BV_{CES}$    | $I_C = 250\mu\text{A}$ , $V_{GE} = 0V$                                      | 1200                  |              | V                        |
| $V_{GE(th)}$  | $I_C = 250\mu\text{A}$ , $V_{CE} = V_{GE}$                                  | 3.5                   |              | 6.0 V                    |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 150^\circ\text{C}$             |                       |              | 25 $\mu\text{A}$<br>1 mA |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                          |                       |              | $\pm 100$ nA             |
| $V_{CE(sat)}$ | $I_C = 75A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 150^\circ\text{C}$          |                       | 1.85<br>2.27 | V<br>V                   |

| 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                                                                                                                | 24                    | 40   | S                       |
| $R_{Gi}$                                                                         | Gate Input Resistance                                                                                                                                           |                       | 2.6  | $\Omega$                |
| $C_{ies}$                                                                        | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$                                                                                                      |                       | 5140 | pF                      |
| $C_{oes}$                                                                        |                                                                                                                                                                 |                       | 210  | pF                      |
| $C_{res}$                                                                        |                                                                                                                                                                 |                       | 36   | pF                      |
| $Q_{g(on)}$                                                                      | $I_C = 75\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$                                                                                             |                       | 157  | nC                      |
| $Q_{ge}$                                                                         |                                                                                                                                                                 |                       | 39   | nC                      |
| $Q_{gc}$                                                                         |                                                                                                                                                                 |                       | 40   | nC                      |
| $t_{d(on)}$                                                                      | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 50\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 0.5 \cdot V_{CES}, R_G = 3\Omega$<br>Note 2  |                       | 22   | ns                      |
| $t_{ri}$                                                                         |                                                                                                                                                                 |                       | 66   | ns                      |
| $E_{on}$                                                                         |                                                                                                                                                                 |                       | 4.5  | mJ                      |
| $t_{d(off)}$                                                                     |                                                                                                                                                                 |                       | 182  | ns                      |
| $t_{fi}$                                                                         |                                                                                                                                                                 |                       | 150  | ns                      |
| $E_{off}$                                                                        |                                                                                                                                                                 |                       | 2.7  | mJ                      |
| $t_{d(on)}$                                                                      | <b>Inductive load, <math>T_J = 150^\circ\text{C}</math></b><br>$I_C = 50\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 0.5 \cdot V_{CES}, R_G = 3\Omega$<br>Note 2 |                       | 24   | ns                      |
| $t_{ri}$                                                                         |                                                                                                                                                                 |                       | 40   | ns                      |
| $E_{on}$                                                                         |                                                                                                                                                                 |                       | 6.5  | mJ                      |
| $t_{d(off)}$                                                                     |                                                                                                                                                                 |                       | 235  | ns                      |
| $t_{fi}$                                                                         |                                                                                                                                                                 |                       | 250  | ns                      |
| $E_{off}$                                                                        |                                                                                                                                                                 |                       | 4.8  | mJ                      |
| $R_{thJC}$                                                                       |                                                                                                                                                                 |                       |      | 0.13 $^\circ\text{C/W}$ |
| $R_{thCS}$                                                                       |                                                                                                                                                                 |                       | 0.21 | $^\circ\text{C/W}$      |

## TO-247 (IXYH) Outline



Terminals: 1 - Gate 2 - Collector  
3 - Emitter

| 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   |

### Notes:

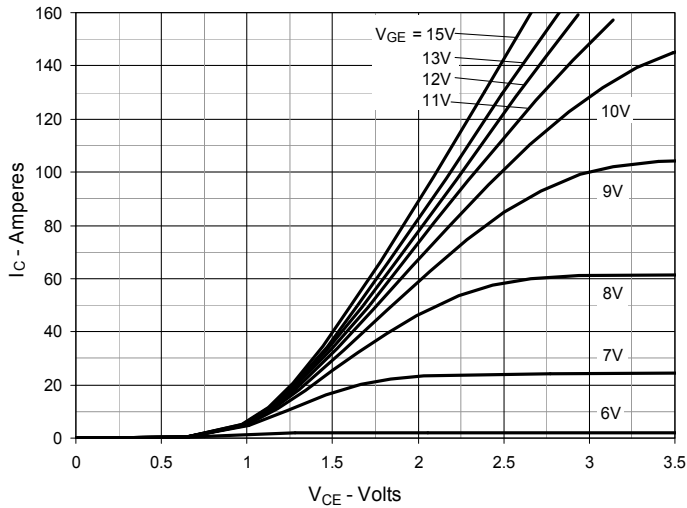
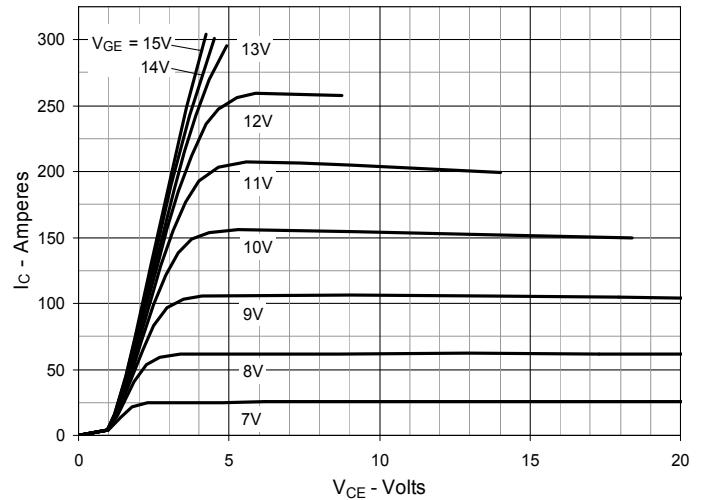
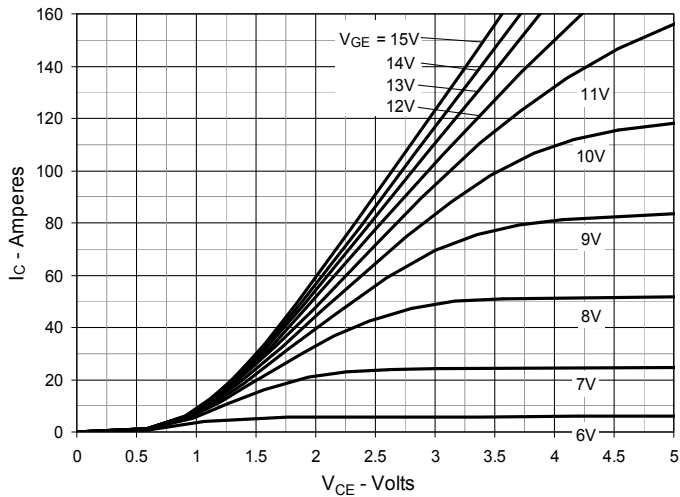
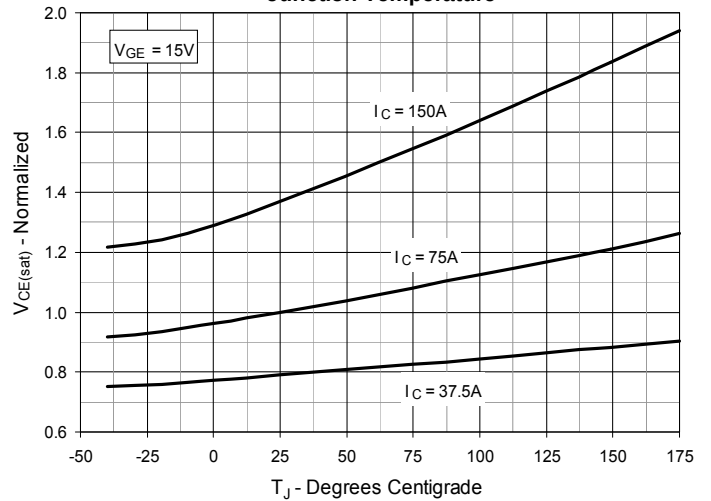
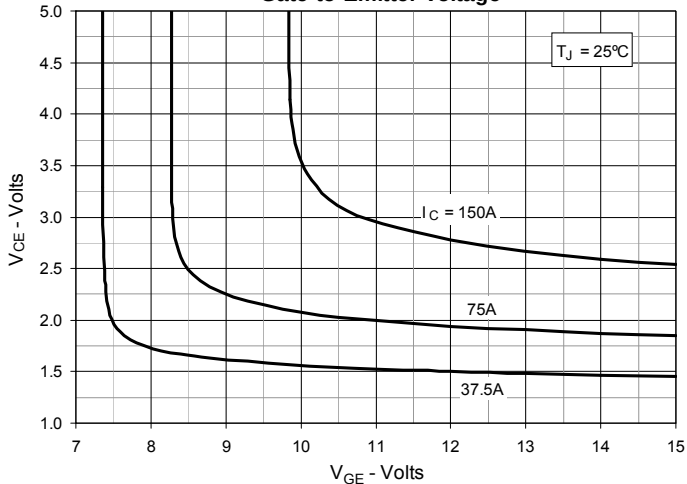
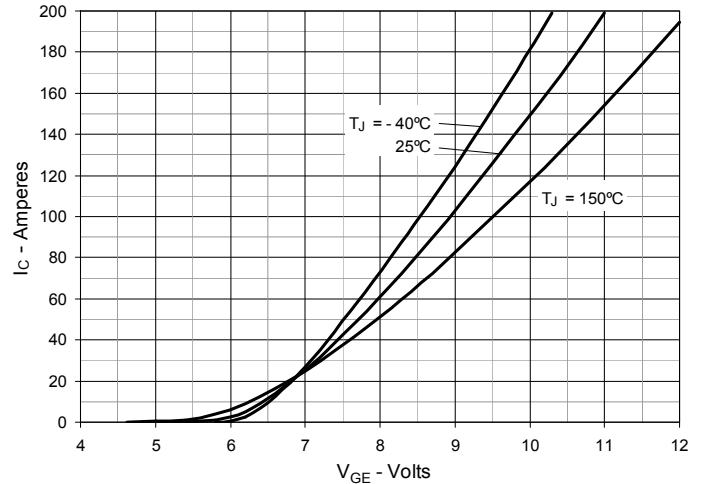
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Switching times & energy losses may increase for higher  $V_{CE}$  (clamp),  $T_J$  or  $R_G$ .

### ADVANCE TECHNICAL INFORMATION

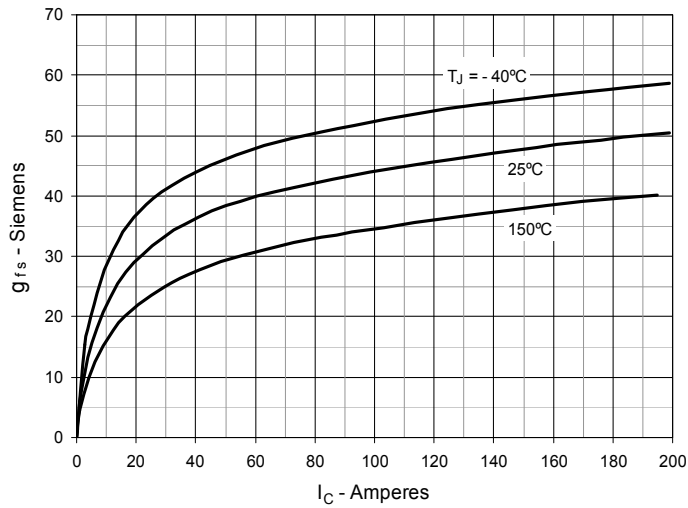
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

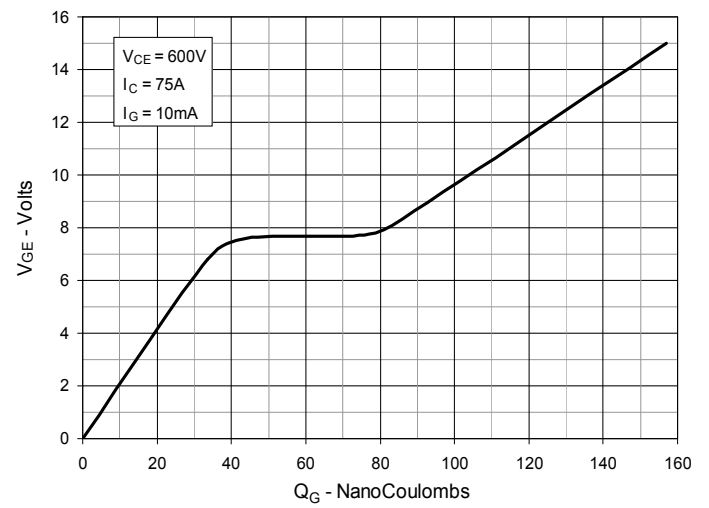
|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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 |
|                                                                                  | 4,860,072 | 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 @  $T_J = 150^\circ\text{C}$** 

**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**


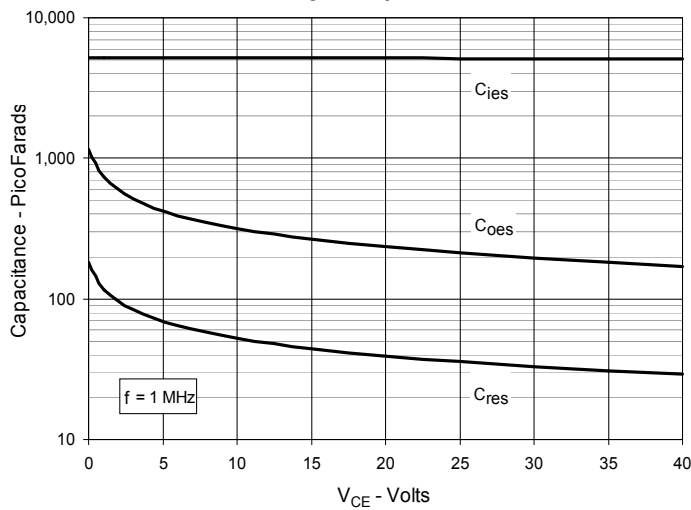
**Fig. 7. Transconductance**



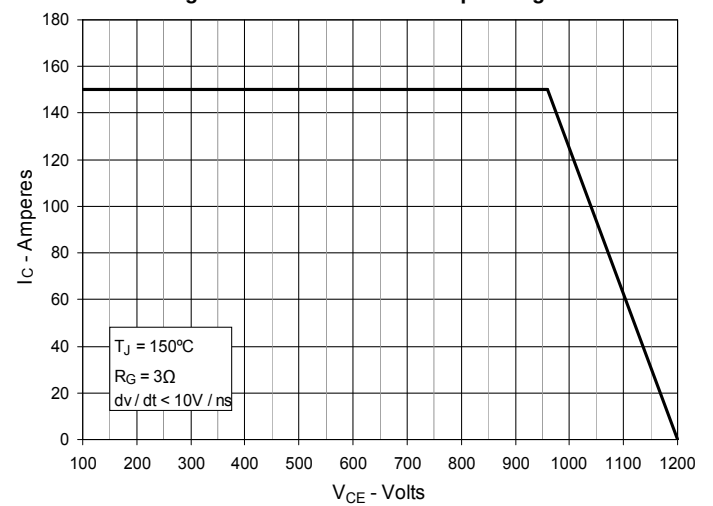
**Fig. 8. Gate Charge**



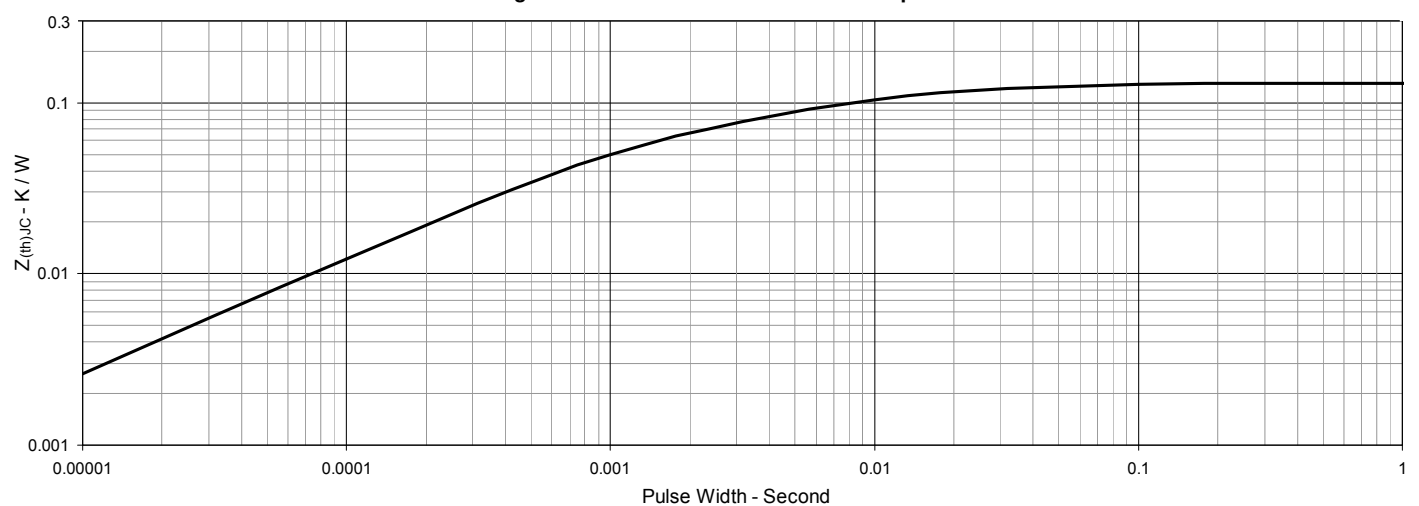
**Fig. 9. Capacitance**

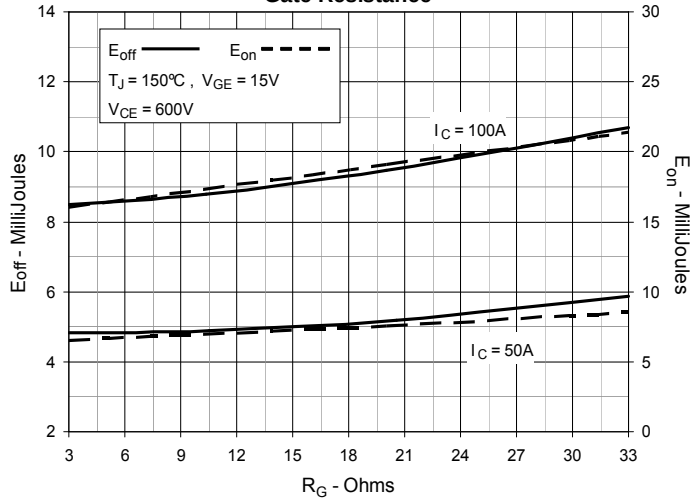
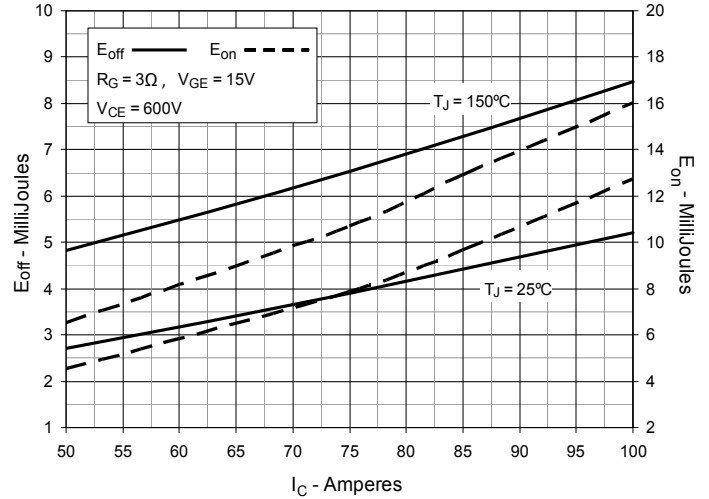
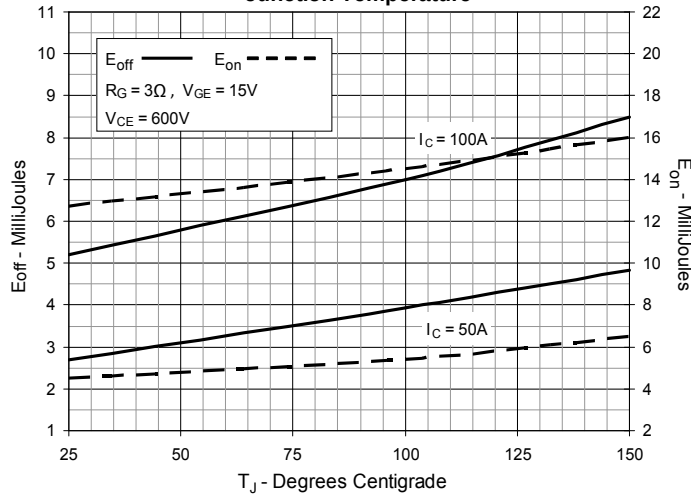
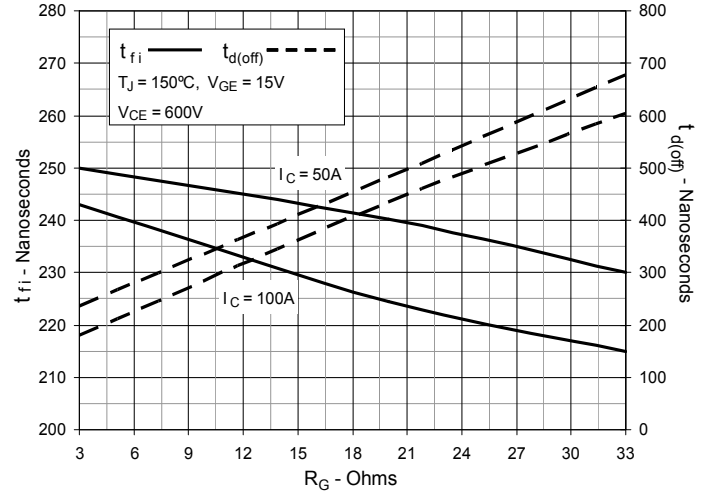
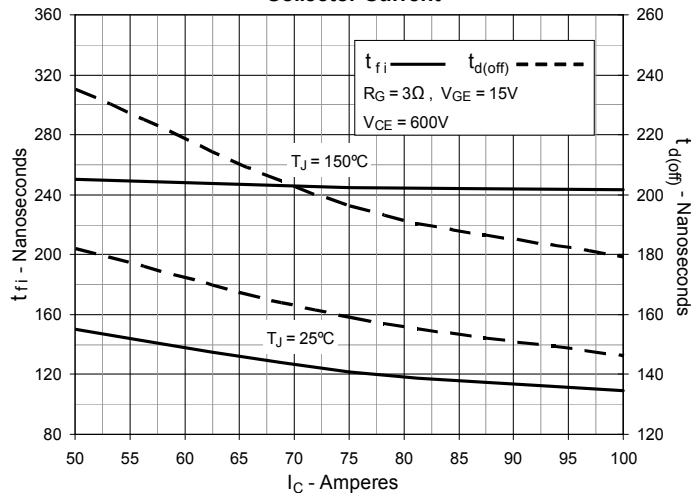
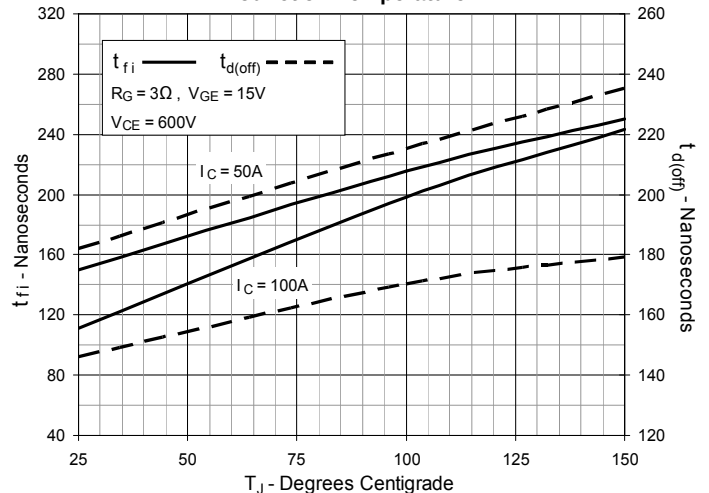


**Fig. 10. Reverse-Bias Safe Operating Area**

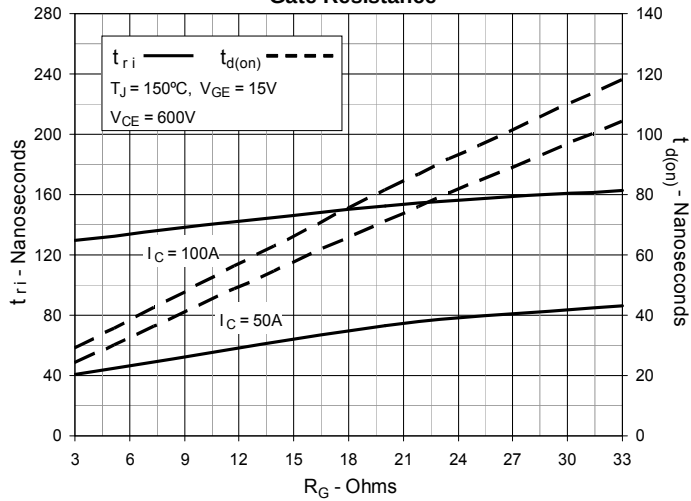


**Fig. 11. Maximum Transient Thermal Impedance**

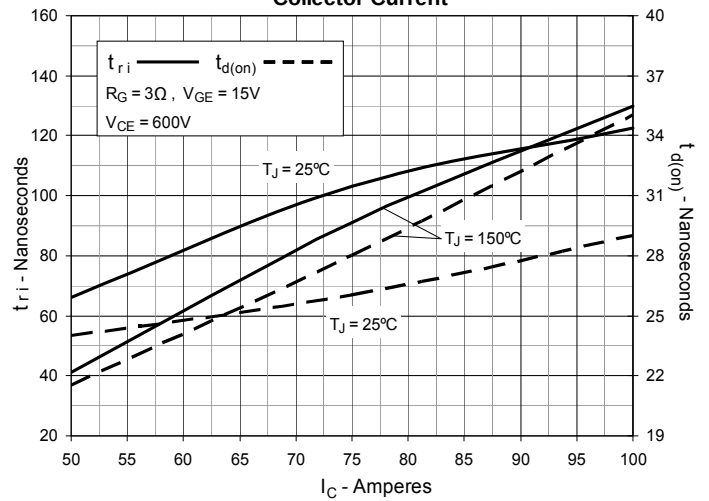


**Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance**

**Fig. 13. Inductive Switching Energy Loss vs. Collector Current**

**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature**

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

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

**Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature**


**Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance**



**Fig. 19. Inductive Turn-on Switching Times vs. Collector Current**



**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature**

