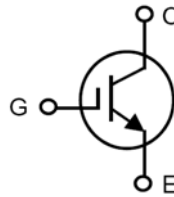


**900V XPT™ IGBT**  
**GenX3™**
**IXYH24N90C3**

 High-Speed IGBT  
 for 20-50 kHz Switching


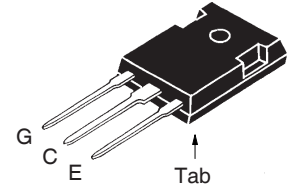
$$V_{CES} = 900V$$

$$I_{C110} = 24A$$

$$V_{CE(sat)} \leq 3.0V$$

$$t_{fi(typ)} = 90ns$$

TO-247


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

| Symbol                        | Test Conditions                                                                      | Maximum Ratings                          |            |
|-------------------------------|--------------------------------------------------------------------------------------|------------------------------------------|------------|
| $V_{CES}$                     | $T_J = 25^\circ C$ to $175^\circ C$                                                  | 900                                      | V          |
| $V_{CGR}$                     | $T_J = 25^\circ C$ to $175^\circ C$ , $R_{GE} = 1M\Omega$                            | 900                                      | V          |
| $V_{GES}$                     | Continuous                                                                           | $\pm 20$                                 | V          |
| $V_{GEM}$                     | Transient                                                                            | $\pm 30$                                 | V          |
| $I_{C25}$                     | $T_C = 25^\circ C$                                                                   | 46                                       | A          |
| $I_{C110}$                    | $T_C = 110^\circ$                                                                    | 24                                       | A          |
| $I_{CM}$                      | $T_C = 25^\circ C$ , 1ms                                                             | 110                                      | A          |
| $I_A$                         | $T_C = 25^\circ C$                                                                   | 15                                       | A          |
| $E_{AS}$                      | $T_C = 25^\circ C$                                                                   | 150                                      | mJ         |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_{VJ} = 150^\circ C$ , $R_G = 10\Omega$<br>Clamped Inductive Load | $I_{CM} = 48$<br>@ $V_{CE} \leq V_{CES}$ | A          |
| $P_C$                         | $T_C = 25^\circ C$                                                                   | 240                                      | W          |
| $T_J$                         |                                                                                      | -55 ... +175                             | $^\circ C$ |
| $T_{JM}$                      |                                                                                      | 175                                      | $^\circ C$ |
| $T_{stg}$                     |                                                                                      | -55 ... +175                             | $^\circ C$ |
| $T_L$                         | Maximum Lead Temperature for Soldering                                               | 300                                      | $^\circ C$ |
| $T_{SOLD}$                    | 1.6 mm (0.062in.) from Case for 10s                                                  | 260                                      | $^\circ C$ |
| $M_d$                         | Mounting Torque                                                                      | 1.13/10                                  | Nm/lb.in.  |
| <b>Weight</b>                 |                                                                                      | 6                                        | g          |

**Features**

- Optimized for Low Switching Losses
- Square RBSOA
- Positive Thermal Coefficient of  $V_{ce(sat)}$
- Avalanche Rated
- High Current Handling Capability
- International Standard Package

**Advantages**

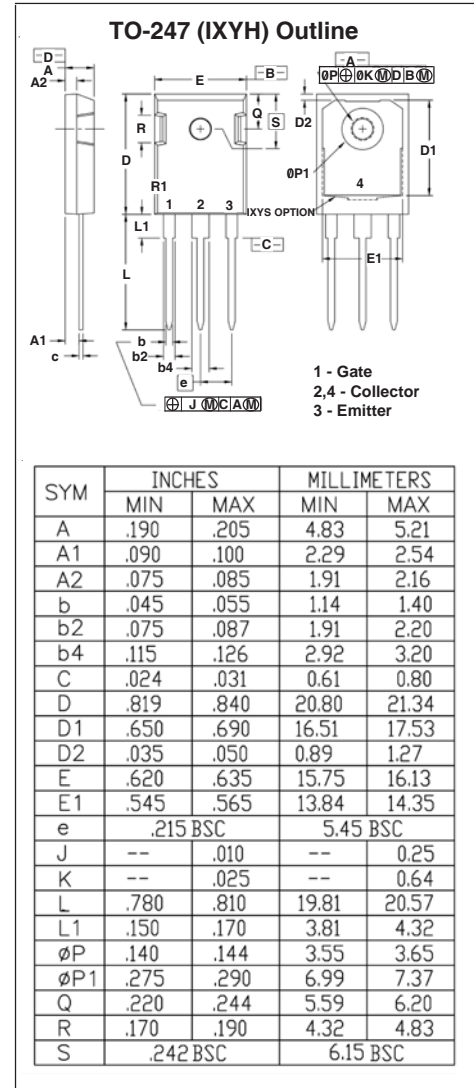
- High Power Density
- Low Gate Drive Requirement

**Applications**

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

| Symbol        | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |            |                           |
|---------------|-----------------------------------------------------------------------|-----------------------|------------|---------------------------|
|               |                                                                       | Min.                  | Typ.       | Max.                      |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                                      | 950                   |            | V                         |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                  | 3.5                   |            | V                         |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 150^\circ C$             |                       |            | 15 $\mu A$<br>400 $\mu A$ |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                    |                       |            | $\pm 100$ nA              |
| $V_{CE(sat)}$ | $I_C = 24A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 150^\circ C$          |                       | 2.3<br>3.1 | V<br>V                    |

| Symbol Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified) |                                                                                                                                                                  | Characteristic Values |      |                    |
|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|--------------------|
|                                                                                  |                                                                                                                                                                  | Min.                  | Typ. | Max.               |
| $g_{fs}$                                                                         | $I_C = 24\text{A}, V_{CE} = 10\text{V}$ , Note 1                                                                                                                 | 8                     | 14   | S                  |
| $C_{ies}$                                                                        | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$                                                                                                       |                       | 1190 | pF                 |
| $C_{oes}$                                                                        |                                                                                                                                                                  |                       | 64   | pF                 |
| $C_{res}$                                                                        |                                                                                                                                                                  |                       | 22   | pF                 |
| $Q_{g(on)}$                                                                      | $I_C = 24\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$                                                                                              |                       | 40   | nC                 |
| $Q_{ge}$                                                                         |                                                                                                                                                                  |                       | 10   | nC                 |
| $Q_{gc}$                                                                         |                                                                                                                                                                  |                       | 18   | nC                 |
| $t_{d(on)}$                                                                      | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 24\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 0.5 \cdot V_{CES}, R_G = 10\Omega$<br>Note 2  |                       | 20   | ns                 |
| $t_{ri}$                                                                         |                                                                                                                                                                  |                       | 36   | ns                 |
| $E_{on}$                                                                         |                                                                                                                                                                  |                       | 1.35 | mJ                 |
| $t_{d(off)}$                                                                     |                                                                                                                                                                  |                       | 73   | ns                 |
| $t_{fi}$                                                                         |                                                                                                                                                                  |                       | 90   | ns                 |
| $E_{off}$                                                                        |                                                                                                                                                                  |                       | 0.40 | 0.70 mJ            |
| $t_{d(on)}$                                                                      | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 24\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 0.5 \cdot V_{CES}, R_G = 10\Omega$<br>Note 2 |                       | 22   | ns                 |
| $t_{ri}$                                                                         |                                                                                                                                                                  |                       | 38   | ns                 |
| $E_{on}$                                                                         |                                                                                                                                                                  |                       | 2.60 | mJ                 |
| $t_{d(off)}$                                                                     |                                                                                                                                                                  |                       | 85   | ns                 |
| $t_{fi}$                                                                         |                                                                                                                                                                  |                       | 130  | ns                 |
| $E_{off}$                                                                        |                                                                                                                                                                  |                       | 0.55 | mJ                 |
| $R_{thJC}$                                                                       |                                                                                                                                                                  |                       | 0.62 | $^\circ\text{C/W}$ |
| $R_{thCS}$                                                                       |                                                                                                                                                                  | 0.21                  |      | $^\circ\text{C/W}$ |



**Notes:**

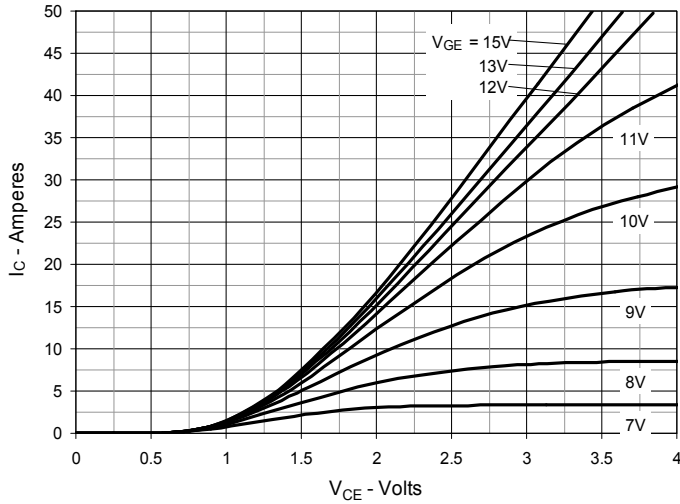
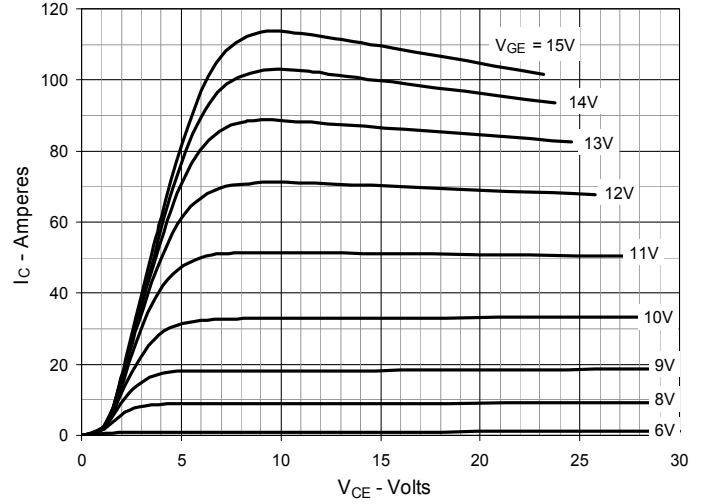
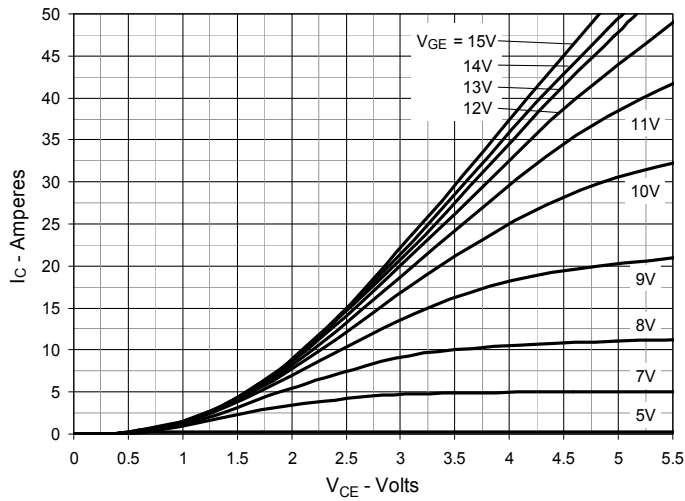
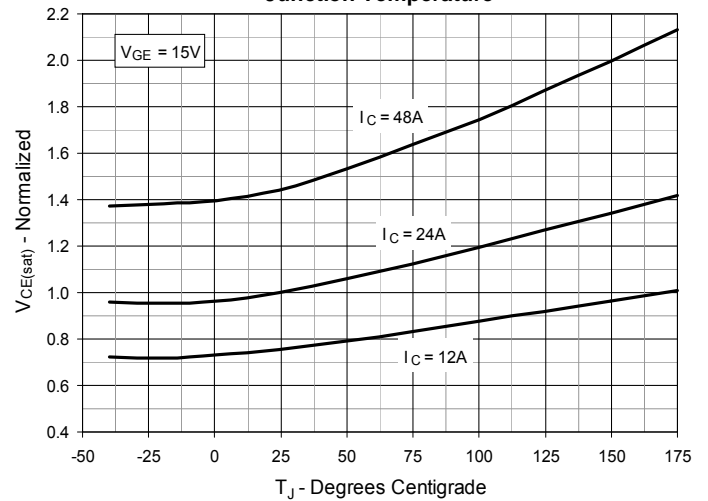
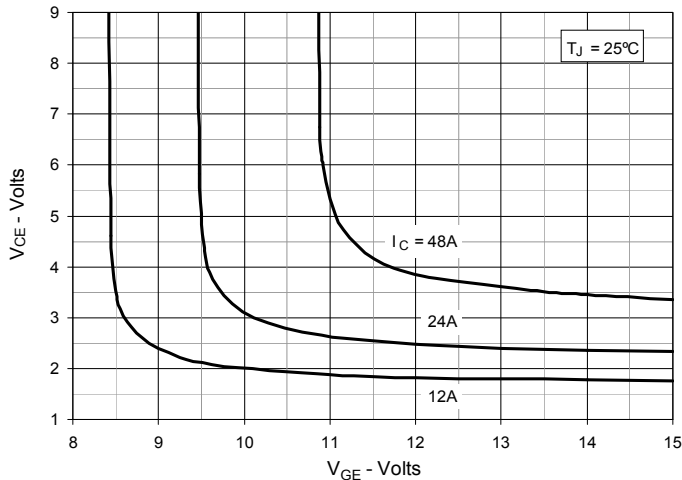
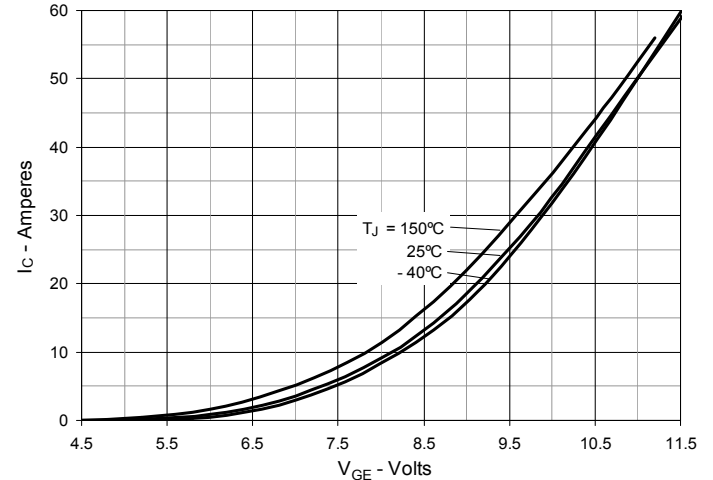
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Switching times & energy losses may increase for higher  $V_{CE}$ (clamp),  $T_J$  or  $R_G$ .

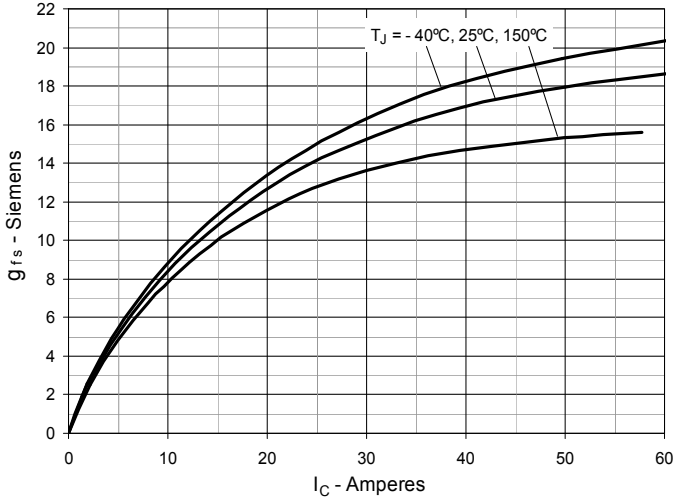
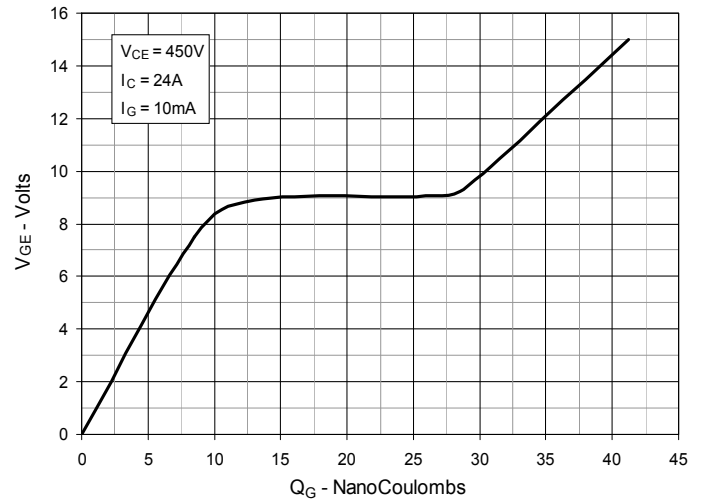
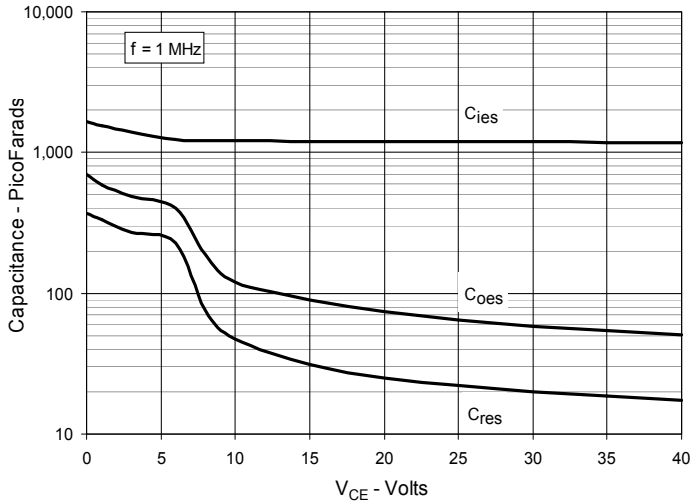
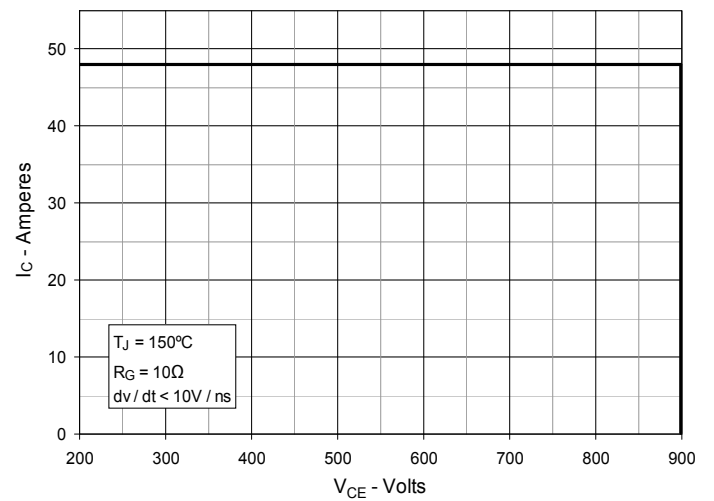
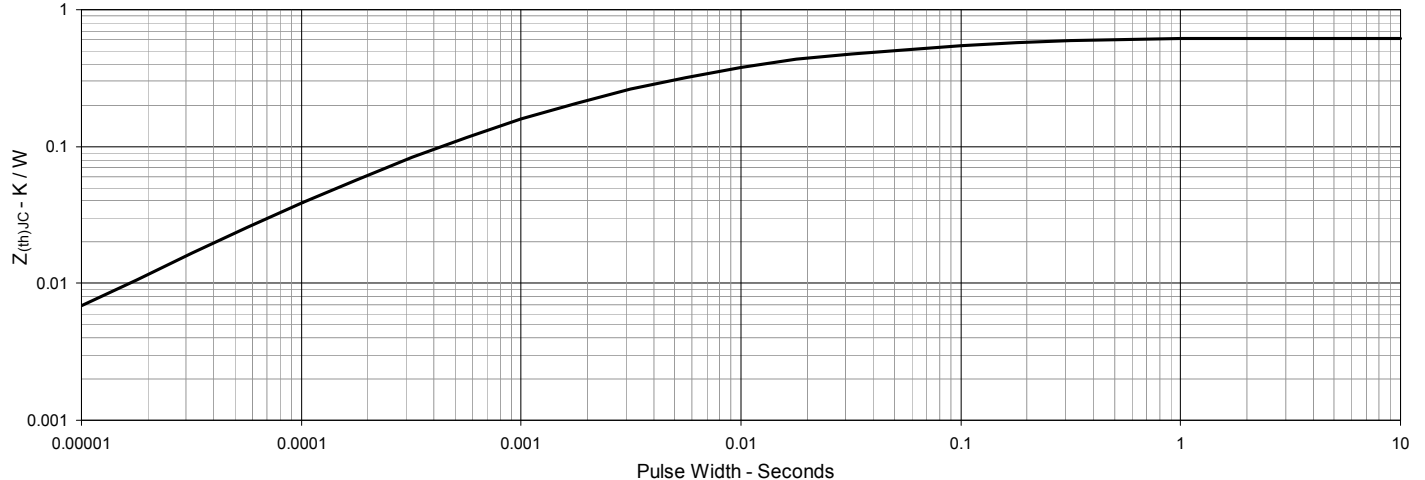
**PRELIMINARY TECHNICAL INFORMATION**

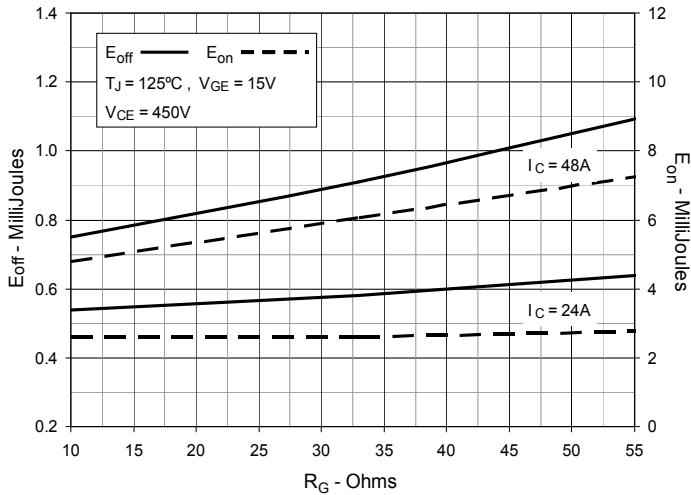
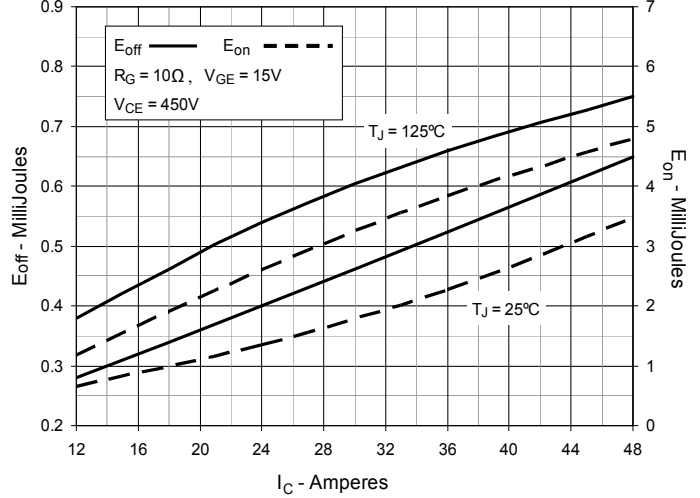
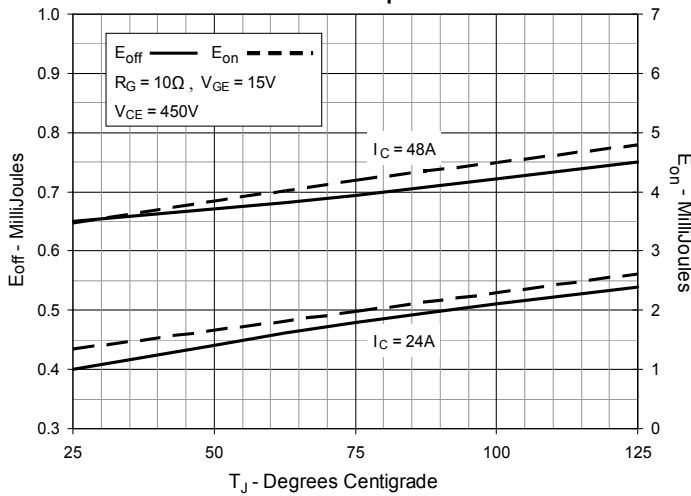
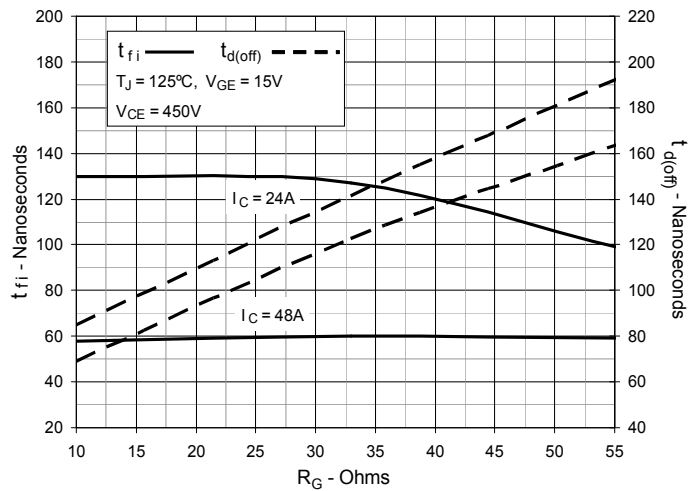
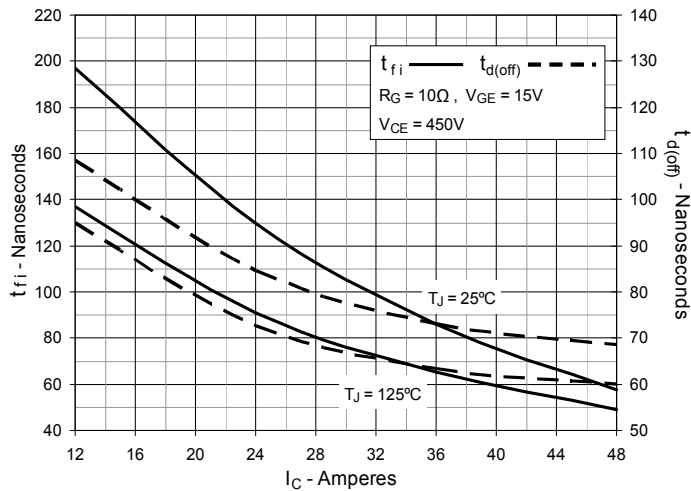
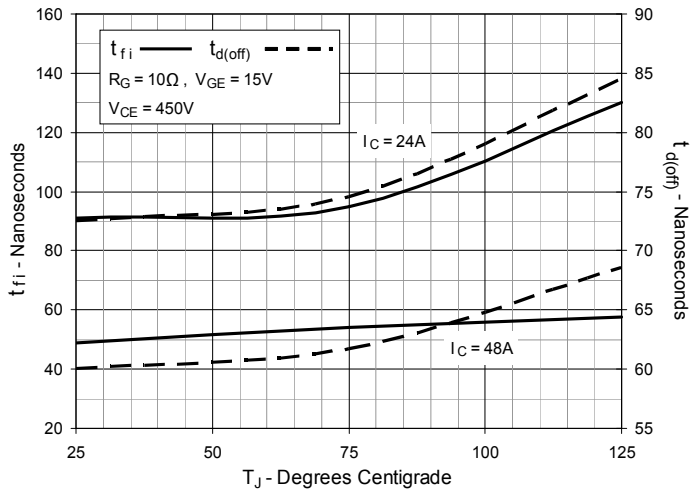
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test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

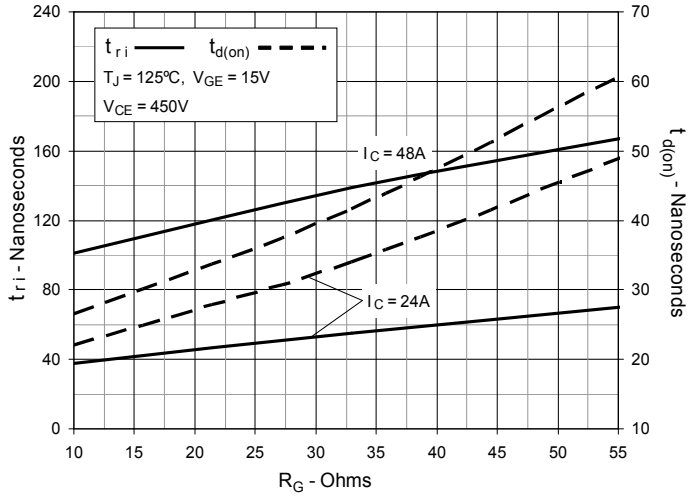
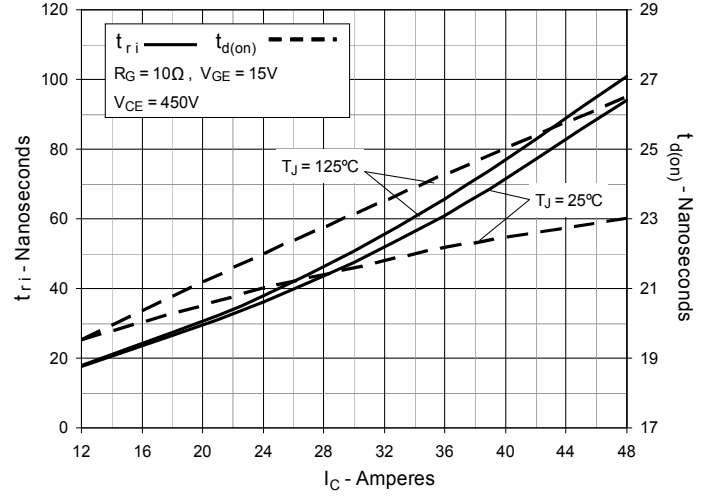
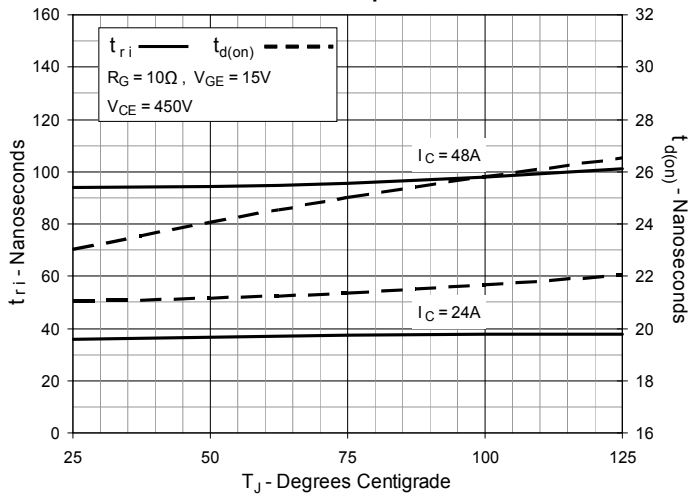
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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**




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