

**BiMOSFET™ Monolithic  
Bipolar MOS Transistor  
High Voltage,  
High Frequency**

**IXBX50N360HV**



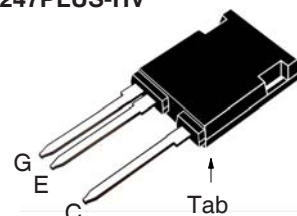
$$V_{CES} = 3600V$$

$$I_{C110} = 50A$$

$$V_{CE(sat)} \leq 2.9V$$

| Symbol                                 | Test Conditions  | Maximum Ratings                       |            |
|--|--|---------------------------------------|------------|
| $V_{CES}$                              | $T_J = 25^\circ C$ to $150^\circ C$  | 3600                                  | V          |
| $V_{CGR}$                              | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$                                      | 3600                                  | V          |
| $V_{GES}$                              | Continuous   | $\pm 20$                              | V          |
| $V_{GEM}$                              | Transient  | $\pm 30$                              | V          |
| $I_{C25}$                              | $T_C = 25^\circ C$   | 125                                   | A          |
| $I_{C110}$                             | $T_C = 110^\circ C$  | 50                                    | A          |
| $I_{CM}$                               | $T_C = 25^\circ C$ , 1ms   | 420                                   | A          |
| <b>SSOA<br/>(RBSOA)</b>                | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 5\Omega$<br>Clamped Inductive Load            | $I_{CM} = 200$<br>$0.8 \cdot V_{CES}$ | A<br>V     |
| <b><math>T_{SC}</math><br/>(SCSOA)</b> | $V_{GE} = 15V$ , $T_J = 125^\circ C$ ,<br>$R_G = 10\Omega$ , $V_{CE} = 1500V$ , Non-Repetitive | 10                                    | $\mu s$    |
| $P_C$                                  | $T_C = 25^\circ C$   | 660                                   | 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                                   | $^\circ C$ |
| $T_{SOLD}$                             | Plastic Body for 10s   | 260                                   | $^\circ C$ |
| $F_C$                                  | Mounting Force   | 20..120/4.5..27                       | N/lb       |
| <b>Weight</b>                          |  | 6                                     | g          |

TO-247PLUS-HV



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

**Features**

- High Blocking Voltage
- High Voltage Package
- Low Conduction Losses

**Advantages**

- Easy to Mount
- Space Savings
- High Power Density

**Applications**

- Uninterruptible Power Supplies (UPS)
- Switch-Mode and Resonant-Mode Power Supplies
- Capacitor Discharge Circuits
- Laser Generators

| Symbol        | Test Conditions<br>( $T_J = 25^\circ C$ Unless Otherwise Specified)         | Characteristic Values |            |                    |
|---------------|---|-----------------------|------------|--------------------|
|               |   | Min.                  | Typ.       | Max.               |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$  | 3600                  |            | V                  |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$  | 3.0                   |            | 5.0 V              |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$ , $V_{GE} = 0V$<br>Note 2, $T_J = 125^\circ C$ |                       |            | 25 $\mu A$<br>1 mA |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$  |                       |            | $\pm 200$ nA       |
| $V_{CE(SAT)}$ | $I_C = 50A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ C$                |                       | 2.4<br>3.0 | V<br>V             |

| Symbol  | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)   | Characteristic Values |      |                    |
|---|---|-----------------------|------|--------------------|
|   |   | Min.                  | Typ. | Max.               |
| $g_{fs}$                                      | $I_C = 50\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$  | 24                    | 40   | S                  |
| $C_{ies}$<br>$C_{oes}$<br>$C_{res}$           | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$  |                       | 3990 | pF                 |
|   |   |                       | 195  | pF                 |
|   |   |                       | 100  | pF                 |
| $Q_{g(on)}$<br>$Q_{ge}$<br>$Q_{gc}$           | $I_C = 50\text{A}, V_{GE} = 15\text{V}, V_{CE} = 1000\text{V}$  |                       | 210  | nC                 |
|   |   |                       | 27   | nC                 |
|   |   |                       | 77   | nC                 |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$ | <b>Resistive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 50\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 960\text{V}, R_G = 5\Omega$  |                       | 46   | ns                 |
|   |   |                       | 420  | ns                 |
|   |   |                       | 205  | ns                 |
|   |   |                       | 1750 | ns                 |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$ | <b>Resistive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 50\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 960\text{V}, R_G = 5\Omega$ |                       | 44   | ns                 |
|   |   |                       | 845  | ns                 |
|   |   |                       | 210  | ns                 |
|   |   |                       | 1670 | ns                 |
| $R_{thJC}$<br>$R_{thCS}$                      |   |                       | 0.19 | $^\circ\text{C/W}$ |
|   |   | 0.15                  |      | $^\circ\text{C/W}$ |

**Reverse Diode**

| Symbol                           | Test Conditions<br>( $T_J = 25^\circ\text{C}$ Unless Otherwise Specified)   | Characteristic Values |      |               |
|----------------------------------|---|-----------------------|------|---------------|
|                                  |   | Min.                  | Typ. | Max.          |
| $V_F$                            | $I_F = 50\text{A}, V_{GE} = 0\text{V}, \text{Note 1}$   |                       |      | 3.0 V         |
| $t_{rr}$<br>$I_{RM}$<br>$Q_{RM}$ | $I_F = 25\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}, V_{GE} = 0\text{V}$ |                       | 1.7  | $\mu\text{s}$ |
|                                  |   |                       | 48   | A             |
|                                  |   |                       | 40   | $\mu\text{C}$ |

**Notes:**

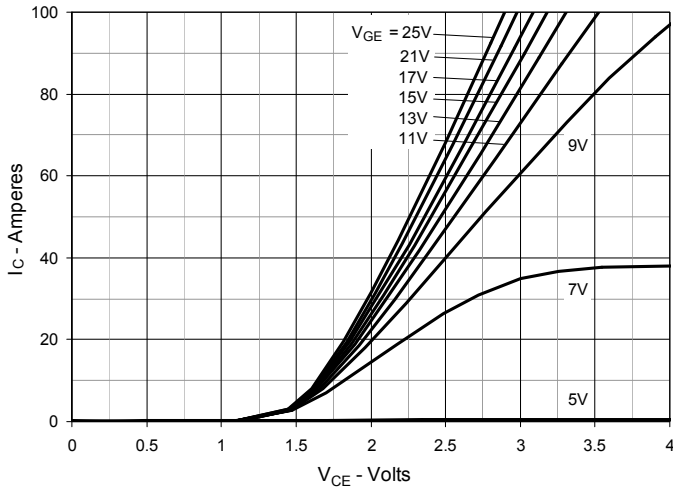
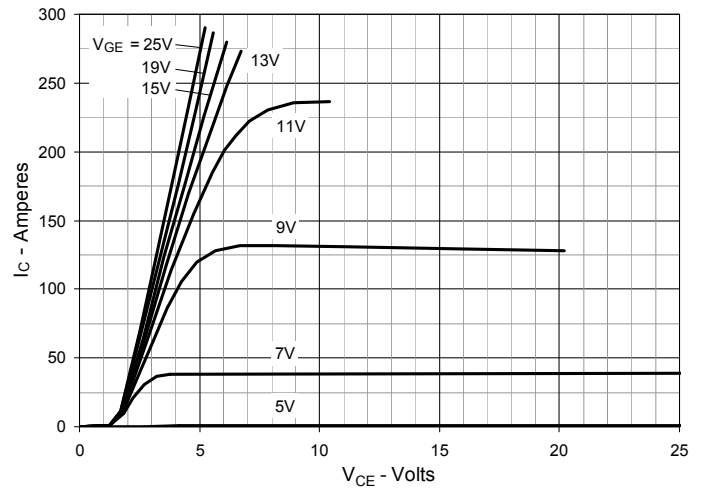
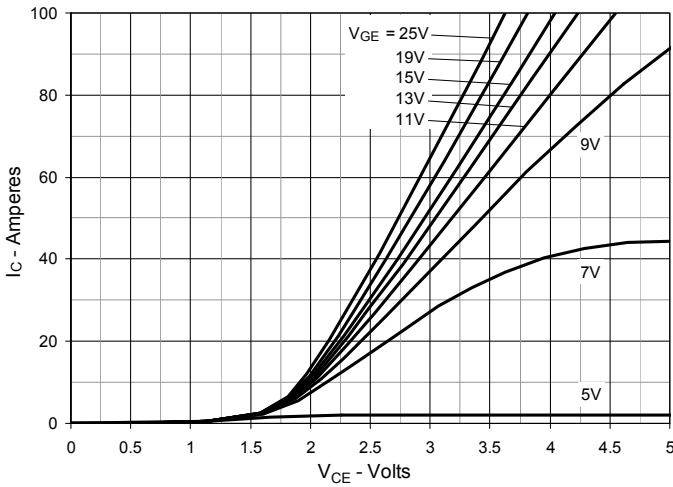
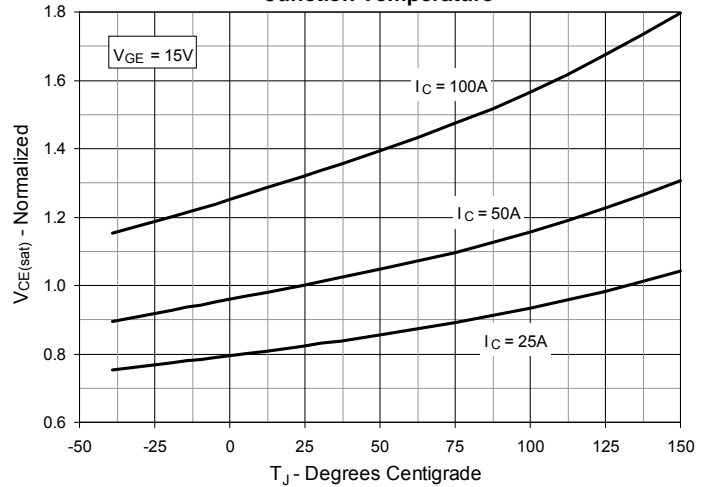
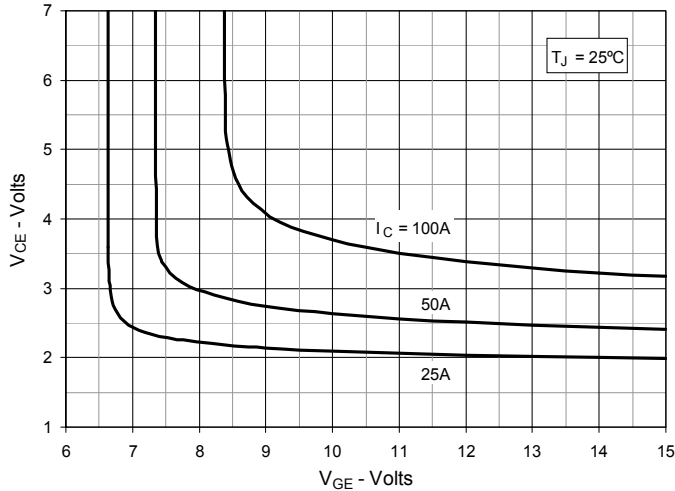
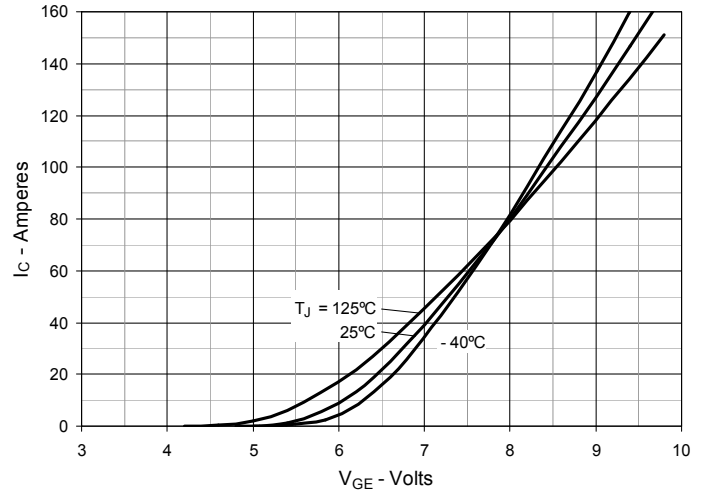
1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
2. Device must be heatsunk for high-temperature leakage current measurements to avoid thermal runaway.

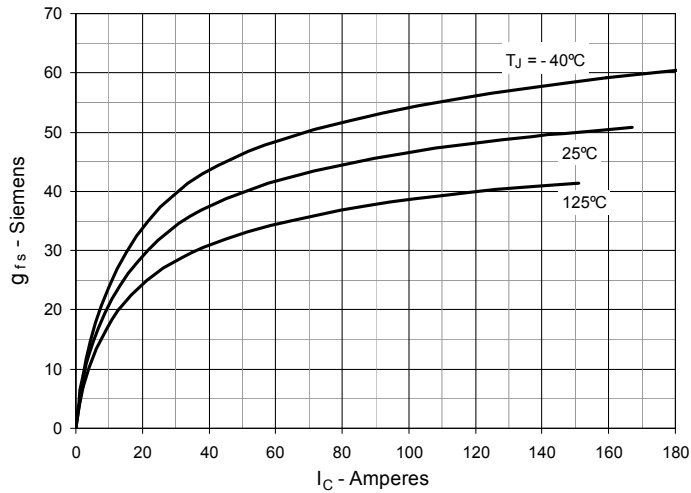
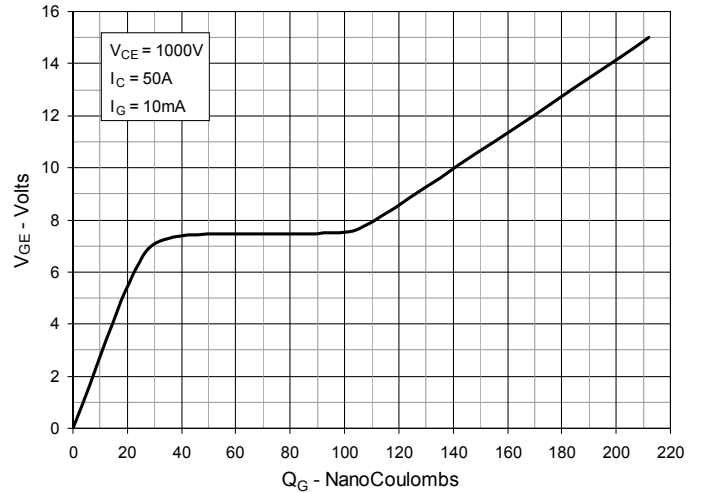
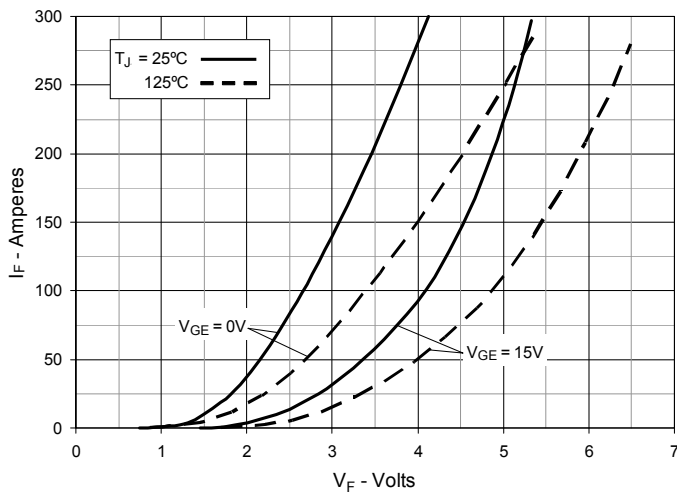
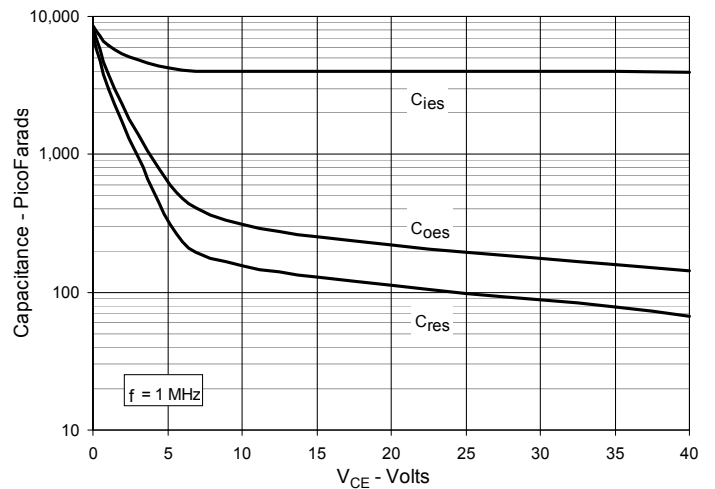
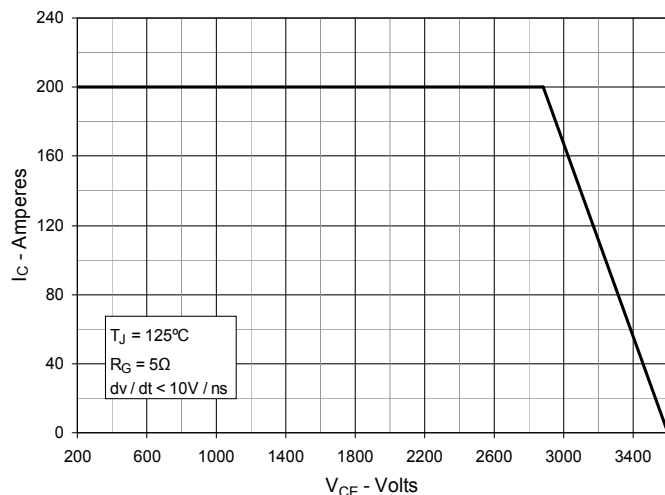
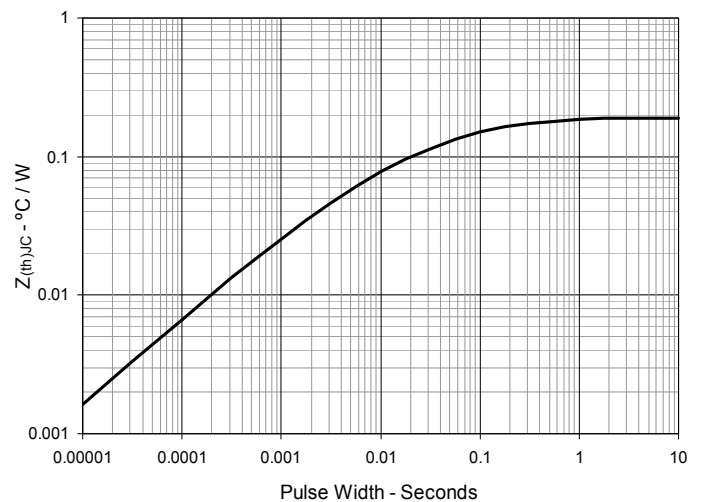
**ADVANCE TECHNICAL INFORMATION**

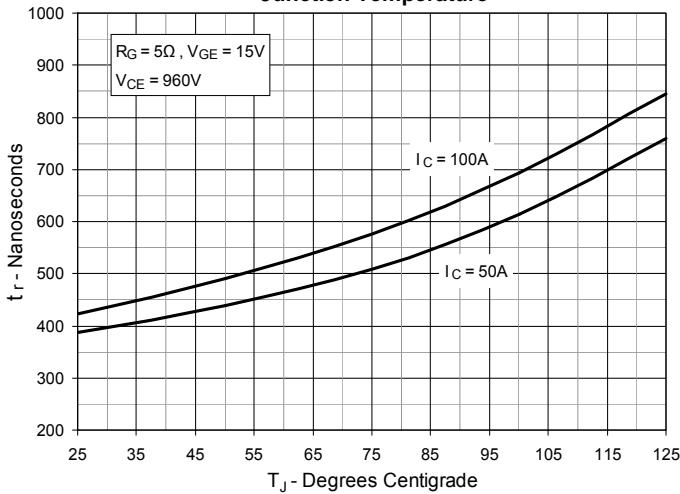
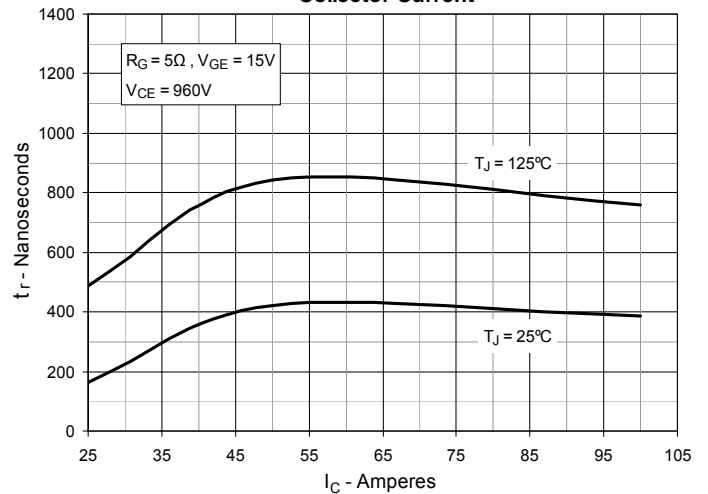
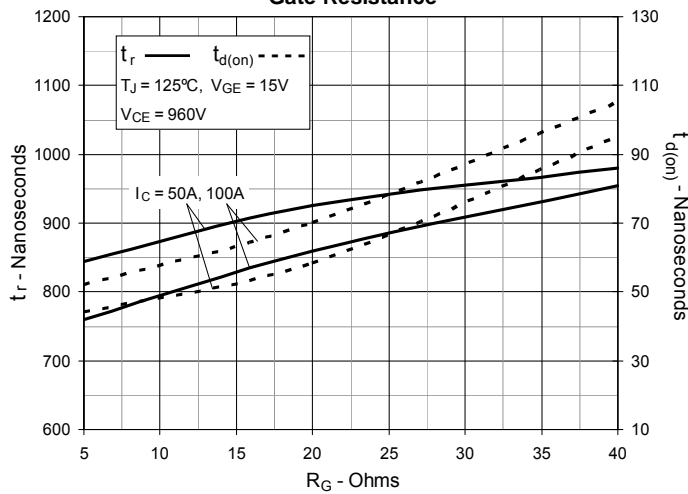
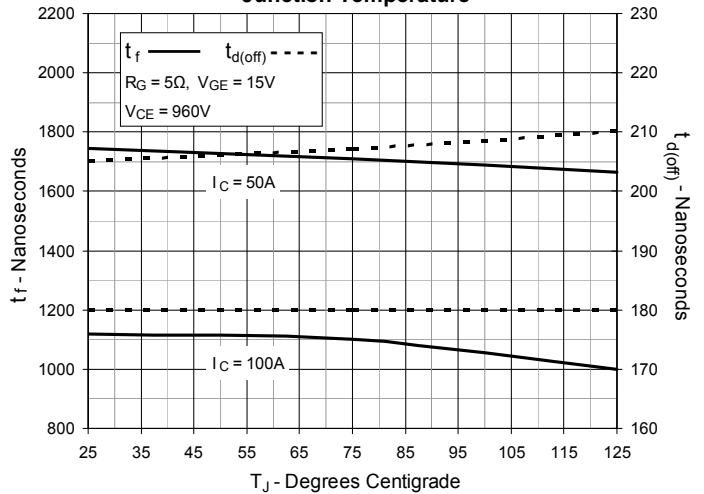
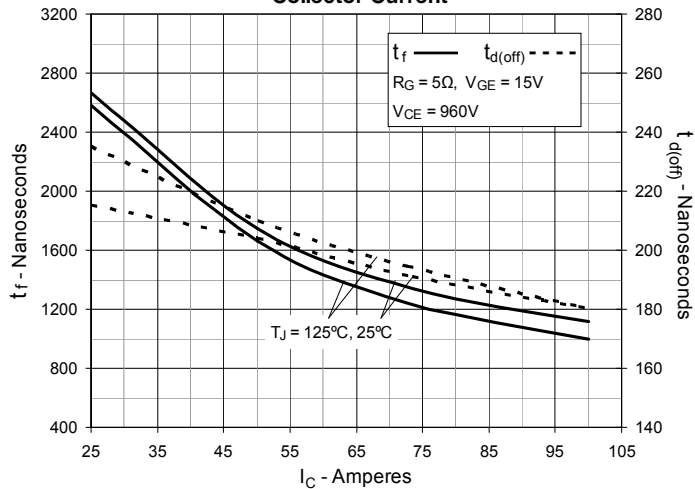
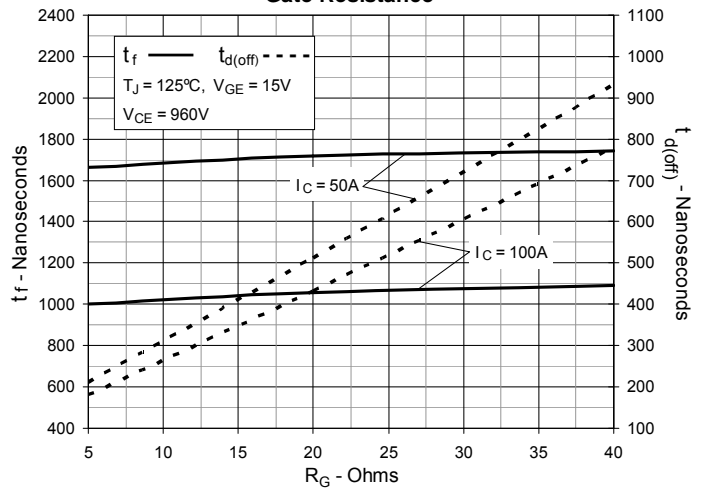
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test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

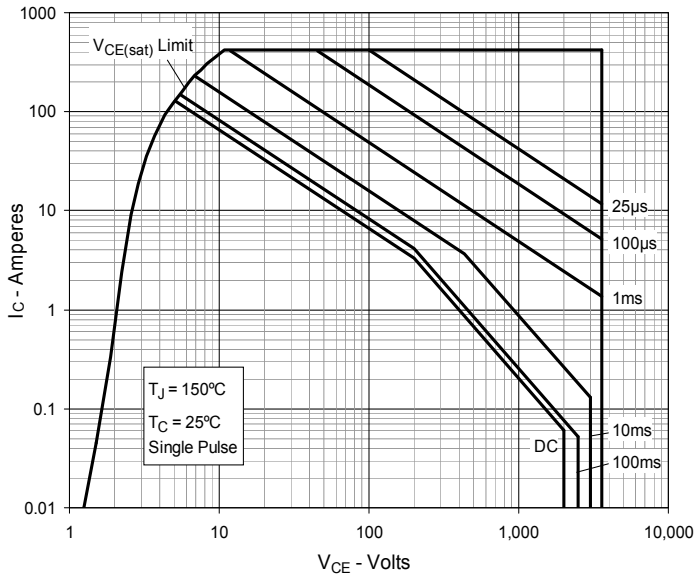
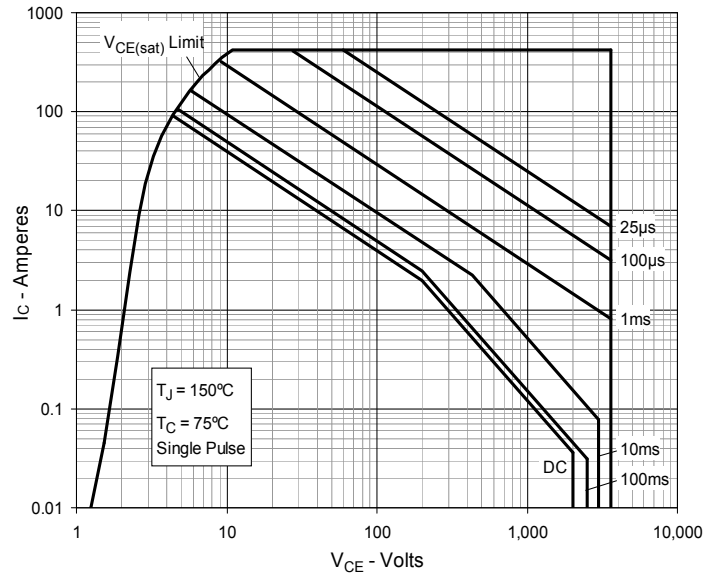
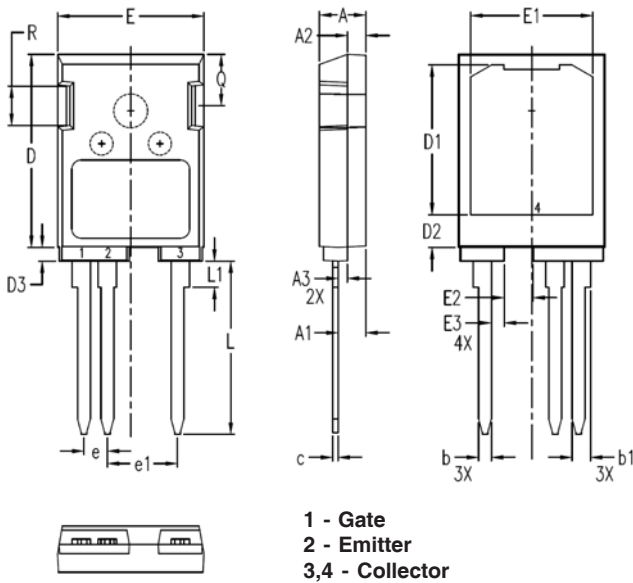
IXYS Reserves the Right to Change Limits, Test Conditions and Dimensions.

|   |           |           |           |           |              |              |              |              |              |             |
|---|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| IXYS MOSFETs and IGBTs are covered<br>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 @  $T_J = 125^\circ\text{C}$** 

**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. Forward Voltage Drop of Intrinsic Diode**

**Fig. 10. Capacitance**

**Fig. 11. Reverse-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**


**Fig. 19. Forward-Bias Safe Operating Area @  $T_C = 25^\circ\text{C}$** 

**Fig. 20. Forward-Bias Safe Operating Area @  $T_C = 75^\circ\text{C}$** 

**TO-247PLUS-HV Outline**


| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .193     | .201 | 4.90        | 5.10  |
| A1  | .114     | .122 | 2.90        | 3.10  |
| A2  | .075     | .083 | 1.90        | 2.10  |
| A3  | .035     | .043 | 0.90        | 1.10  |
| b   | .053     | .059 | 1.35        | 1.50  |
| b1  | .075     | .083 | 1.90        | 2.10  |
| c   | .022     | .030 | 0.55        | 0.75  |
| D   | .819     | .843 | 20.80       | 21.40 |
| D1  | .638     | .646 | 16.20       | 16.40 |
| D2  | .134     | .146 | 3.40        | 3.70  |
| D3  | .055     | .063 | 1.40        | 1.60  |
| E   | .622     | .638 | 15.80       | 16.20 |
| E1  | .520     | .528 | 13.20       | 13.40 |
| E2  | .118     | .126 | 3.00        | 3.20  |
| E3  | .051     | .059 | 1.30        | 1.50  |
| e   | .100 BSC |      | 2.54 BSC    |       |
| e1  | .300 BSC |      | 7.62 BSC    |       |
| L   | .732     | .748 | 18.60       | 19.00 |
| L1  | .106     | .118 | 2.70        | 3.00  |
| Q   | .216     | .224 | 5.50        | 5.70  |
| R   | .165     | .169 | 4.20        | 4.30  |

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