

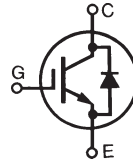


# High Voltage, High Gain BIMOSFET™ Monolithic Bipolar MOS Transistor

**IXBH 10N170**  
**IXBT 10N170**

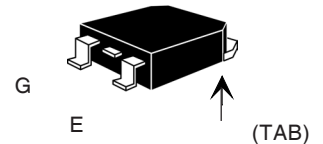
$$\begin{aligned} V_{CES} &= 1700 \text{ V} \\ I_{C25} &= 20 \text{ A} \\ V_{CE(sat)} &= 3.8 \text{ V} \end{aligned}$$

## Preliminary Data Sheet

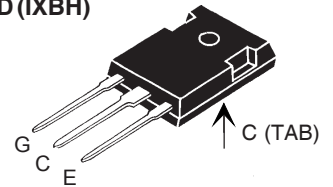


| Symbol                                                                          | Test Conditions                                                                                | Maximum Ratings                   |                  |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------|------------------|
| $V_{CES}$                                                                       | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                                                 | 1700                              | V                |
| $V_{CGR}$                                                                       | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$                     | 1700                              | V                |
| $V_{GES}$                                                                       | Continuous                                                                                     | $\pm 20$                          | V                |
| $V_{GEM}$                                                                       | Transient                                                                                      | $\pm 30$                          | V                |
| $I_{C25}$                                                                       | $T_C = 25^\circ\text{C}$                                                                       | 20                                | A                |
| $I_{C90}$                                                                       | $T_C = 90^\circ\text{C}$                                                                       | 10                                | A                |
| $I_{CM}$                                                                        | $T_C = 25^\circ\text{C}, 1 \text{ ms}$                                                         | 40                                | A                |
| <b>SSOA</b><br><b>(RBSOA)</b>                                                   | $V_{GE} = 15 \text{ V}, T_{VJ} = 125^\circ\text{C}, R_G = 33 \Omega$<br>Clamped inductive load | $I_{CM} = 20$<br>$V_{CES} = 1350$ | A<br>V           |
| $P_C$                                                                           | $T_C = 25^\circ\text{C}$                                                                       | 140                               | W                |
| $T_J$                                                                           |                                                                                                | -55 ... +150                      | $^\circ\text{C}$ |
| $T_{JM}$                                                                        |                                                                                                | 150                               | $^\circ\text{C}$ |
| $T_{stg}$                                                                       |                                                                                                | -55 ... +150                      | $^\circ\text{C}$ |
| Maximum Lead temperature for soldering<br>1.6 mm (0.062 in.) from case for 10 s |                                                                                                | 300                               | $^\circ\text{C}$ |
| Maximum Tab temperature for soldering SMD devices for 10 s                      |                                                                                                | 260                               | $^\circ\text{C}$ |
| $M_d$                                                                           | Mounting torque (M3) (TO-247)                                                                  | 1.13/10Nm/lb.in.                  |                  |
| <b>Weight</b>                                                                   | TO-247 AD                                                                                      | 6                                 | g                |
|                                                                                 | TO-268                                                                                         | 4                                 | g                |

### TO-268 (IXBT)



### TO-247 AD (IXBH)



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

### Features

- High Blocking Voltage
- JEDEC TO-268 surface and JEDEC TO-247 AD
- Low conduction losses
- High current handling capability
- MOS Gate turn-on - drive simplicity
- Molding epoxies meet UL 94 V-0 flammability classification

### Applications

- AC motor speed control
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies
- Capacitor discharge circuits

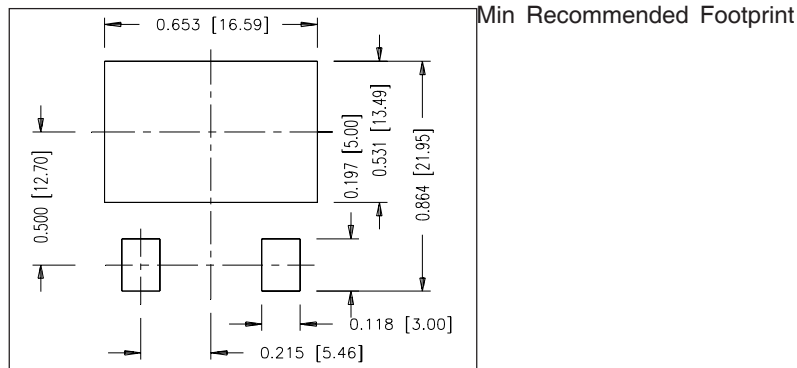
### Advantages

- High power density
- Suitable for surface mounting
- Easy to mount with 1 screw, (isolated mounting screw hole)

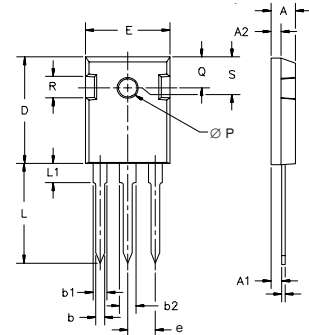
| Symbol        | Test Conditions                                                                                           | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |        |                         |
|---------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--------|-------------------------|
|               |                                                                                                           | min.                                                                              | typ.   | max.                    |
| $BV_{CES}$    | $I_C = 250 \mu\text{A}, V_{GE} = 0 \text{ V}$<br>Temperature Coefficient                                  | 1700                                                                              | 0.10   | V<br>%/K                |
| $V_{GE(th)}$  | $I_C = 250 \mu\text{A}, V_{CE} = V_{GE}$<br>Temperature Coefficient                                       | 3.0                                                                               | - 0.24 | V<br>%/K                |
| $I_{CES}$     | $V_{CE} = 0.8 V_{CES}$<br>$V_{GE} = 0 \text{ V}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$ |                                                                                   |        | 10<br>100 $\mu\text{A}$ |
| $I_{GES}$     | $V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$                                                         |                                                                                   |        | $\pm 100 \text{ nA}$    |
| $V_{CE(sat)}$ | $I_C = I_{C90}, V_{GE} = 15 \text{ V}$<br>$T_J = 125^\circ\text{C}$                                       | 3.4<br>4.1                                                                        | 3.8    | V<br>V                  |

| Symbol       | Test Conditions                                                                                                                                             | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |          |
|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------|
|              |                                                                                                                                                             | min.                                                                              | typ. | max.     |
| $g_{fs}$     | $I_C = I_{C90}$ ; $V_{CE} = 10\text{ V}$ ,<br>Pulse test, $t \leq 300\text{ }\mu\text{s}$ , duty cycle $\leq 2\%$                                           | 4.0                                                                               | 6.5  | S        |
| $C_{ies}$    | $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$                                                                                         |                                                                                   | 700  | pF       |
| $C_{oes}$    |                                                                                                                                                             |                                                                                   | 40   | pF       |
| $C_{res}$    |                                                                                                                                                             |                                                                                   | 12   | pF       |
| $Q_g$        | $I_C = I_{C90}$ ; $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5\text{ V}_{CES}$                                                                                    |                                                                                   | 30   | nC       |
| $Q_{ge}$     |                                                                                                                                                             |                                                                                   | 6    | nC       |
| $Q_{gc}$     |                                                                                                                                                             |                                                                                   | 10   | nC       |
| $t_{d(on)}$  | Inductive load, $T_J = 25^\circ\text{C}$<br>$I_C = I_{C90}$ ; $V_{GE} = 15\text{ V}$<br>$V_{CE} = 0.8\text{ V}_{CES}$ ; $R_G = R_{off} = 56\text{ }\Omega$  |                                                                                   | 35   | ns       |
| $t_{ri}$     |                                                                                                                                                             |                                                                                   | 28   | ns       |
| $t_{d(off)}$ |                                                                                                                                                             |                                                                                   | 500  | ns       |
| $t_{fi}$     |                                                                                                                                                             |                                                                                   | 1000 | ns       |
| $E_{off}$    |                                                                                                                                                             |                                                                                   | 6    | mJ       |
| $t_{d(on)}$  | Inductive load, $T_J = 125^\circ\text{C}$<br>$I_C = I_{C90}$ ; $V_{GE} = 15\text{ V}$<br>$V_{CE} = 0.8\text{ V}_{CES}$ ; $R_G = R_{off} = 56\text{ }\Omega$ |                                                                                   | 35   | ns       |
| $t_{ri}$     |                                                                                                                                                             |                                                                                   | 28   | ns       |
| $E_{on}$     |                                                                                                                                                             |                                                                                   | 0.7  | mJ       |
| $t_{d(off)}$ |                                                                                                                                                             |                                                                                   | 600  | ns       |
| $t_{fi}$     |                                                                                                                                                             |                                                                                   | 1200 | ns       |
| $E_{off}$    |                                                                                                                                                             |                                                                                   | 8    | mJ       |
| $R_{thJC}$   |                                                                                                                                                             |                                                                                   |      | 0.89 K/W |
| $R_{thCK}$   | (TO-247)                                                                                                                                                    |                                                                                   | 0.25 | K/W      |

| Symbol   | Test Conditions                                                                                                    | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |       |
|----------|--------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|-------|
|          |                                                                                                                    | min.                                                                              | typ. | max.  |
| $V_F$    | $I_F = I_{C90}$ ; $V_{GE} = 0\text{ V}$ , Pulse test,<br>$t \leq 300\text{ }\mu\text{s}$ , duty cycle $d \leq 2\%$ |                                                                                   |      | 3.0 V |
| $I_{RM}$ | $I_F = I_{C90}$ ; $V_{GE} = 0\text{ V}$ , $-di_F/dt = 50\text{ A}/\mu\text{s}$<br>$V_R = 100\text{ V}$             |                                                                                   | 10   | A     |
| $t_{rr}$ |                                                                                                                    |                                                                                   | 360  | ns    |

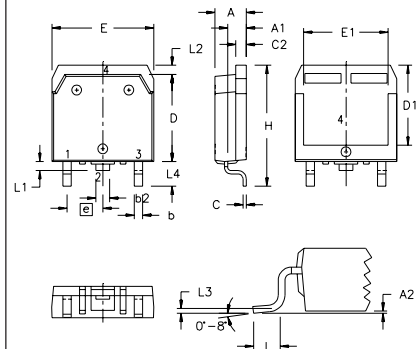


TO-247 AD Outline



| Dim.           | Millimeter<br>Min. | Max.  | Inches<br>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  |
| L <sub>1</sub> |                    | 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   |

TO-268 Outline



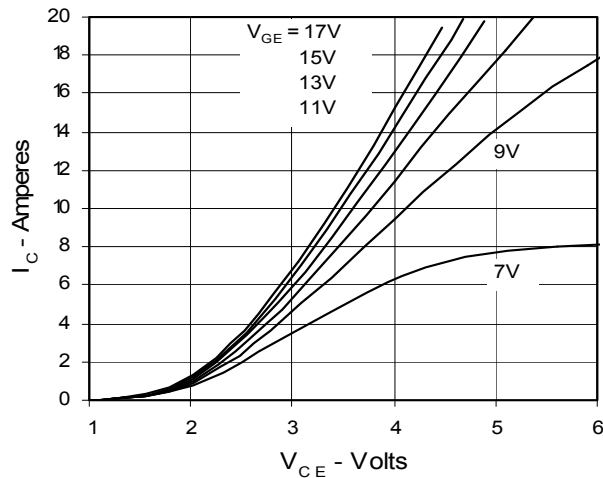
| SYM            | INCHES |      | MILLIMETERS |       |
|----------------|--------|------|-------------|-------|
|                | MIN    | MAX  | MIN         | MAX   |
| A              | .193   | .201 | 4.90        | 5.10  |
| A <sub>1</sub> | .106   | .114 | 2.70        | 2.90  |
| A <sub>2</sub> | .001   | .010 | 0.02        | 0.25  |
| b              | .045   | .057 | 1.15        | 1.45  |
| b <sub>2</sub> | .075   | .083 | 1.90        | 2.10  |
| C              | .016   | .026 | 0.40        | 0.65  |
| C <sub>2</sub> | .057   | .063 | 1.45        | 1.60  |
| D              | .543   | .551 | 13.80       | 14.00 |
| D <sub>1</sub> | .488   | .500 | 12.40       | 12.70 |
| E              | .624   | .632 | 15.85       | 16.05 |
| E <sub>1</sub> | .524   | .535 | 13.30       | 13.60 |
| e              | .215   | BSC  | 5.45        | BSC   |
| H              | .736   | .752 | 18.70       | 19.10 |
| L              | .094   | .106 | 2.40        | 2.70  |
| L <sub>1</sub> | .047   | .055 | 1.20        | 1.40  |
| L <sub>2</sub> | .039   | .045 | 1.00        | 1.15  |
| L <sub>3</sub> | .010   | BSC  | 0.25        | BSC   |
| L <sub>4</sub> | .150   | .161 | 3.80        | 4.10  |

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

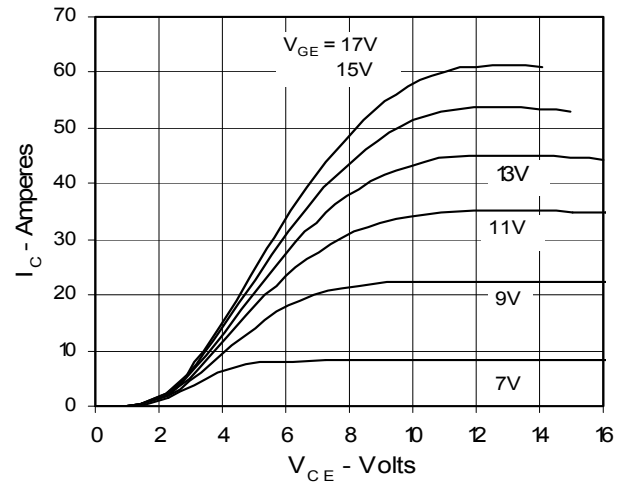
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715 6,306,728B1 6,259,123B1 6,306,728B1  
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025 6,404,065B1 6,162,665 6,534,343

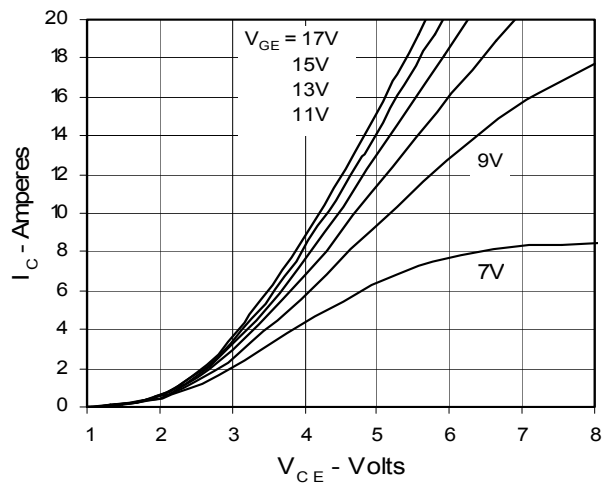
**Fig. 1. Output Characteristics**  
**@ 25 Deg. C**



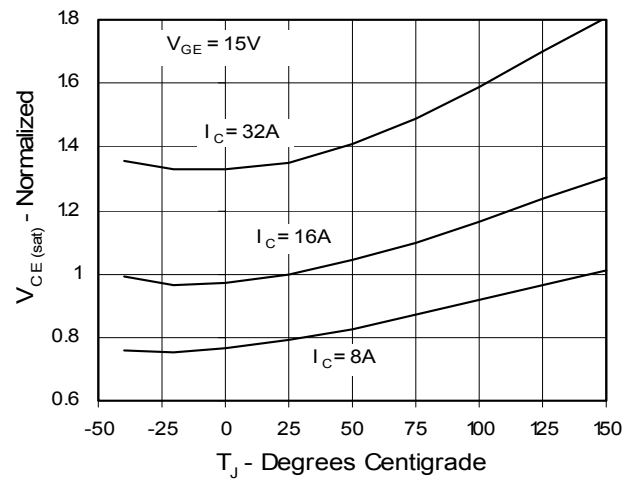
**Fig. 2. Extended Output Characteristics**  
**@ 25 deg. C**



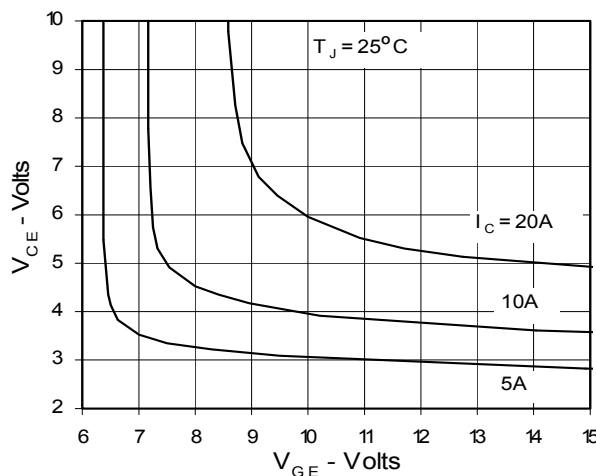
**Fig. 3. Output Characteristics**  
**@ 125 Deg. C**



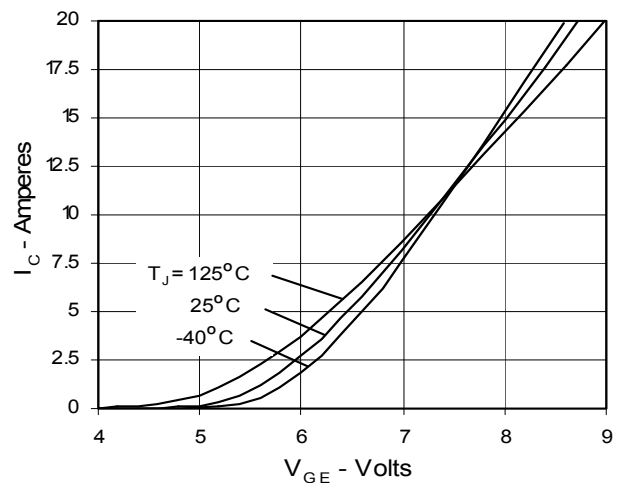
**Fig. 4. Temperature Dependence of  $V_{CE(sat)}$**

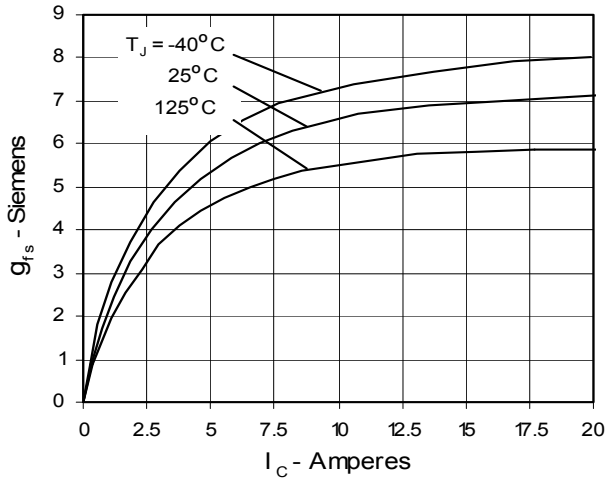
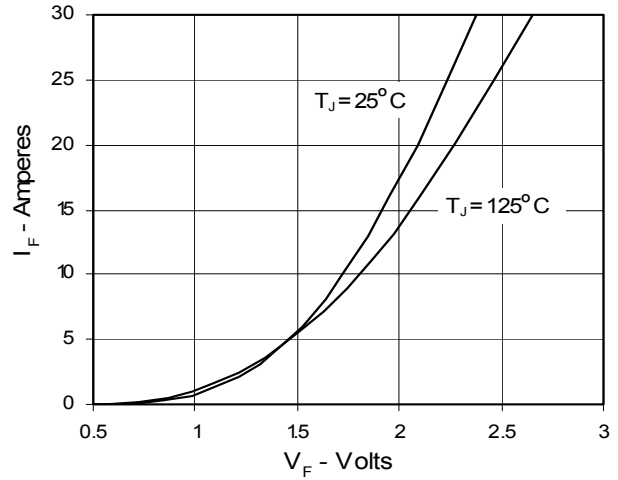
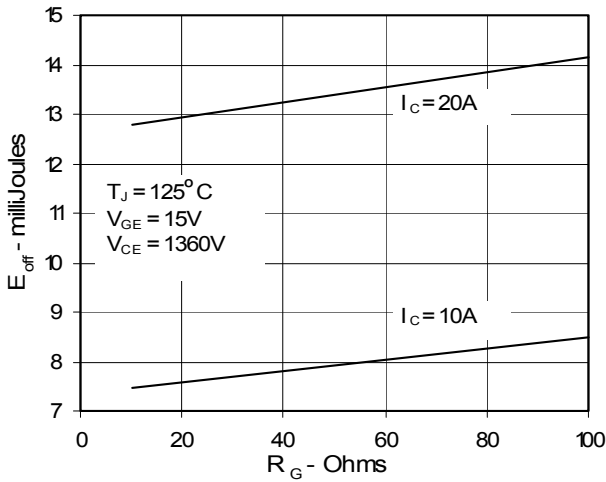
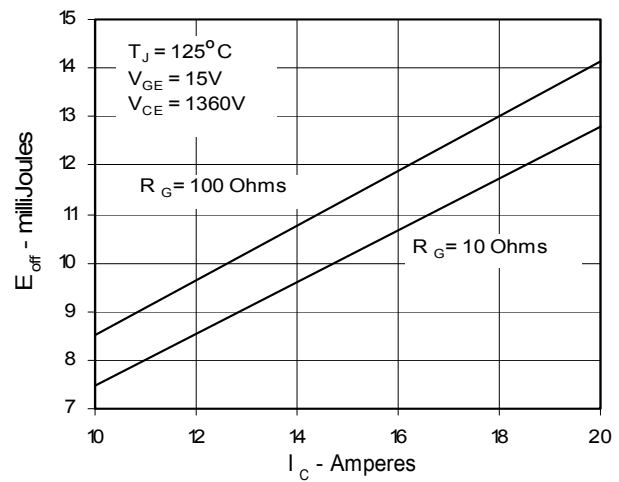
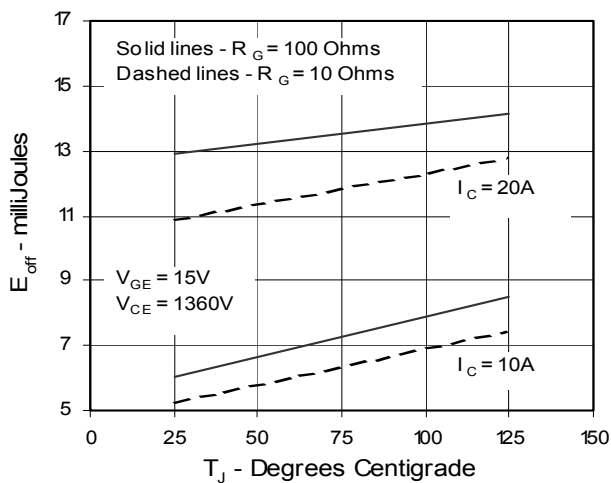
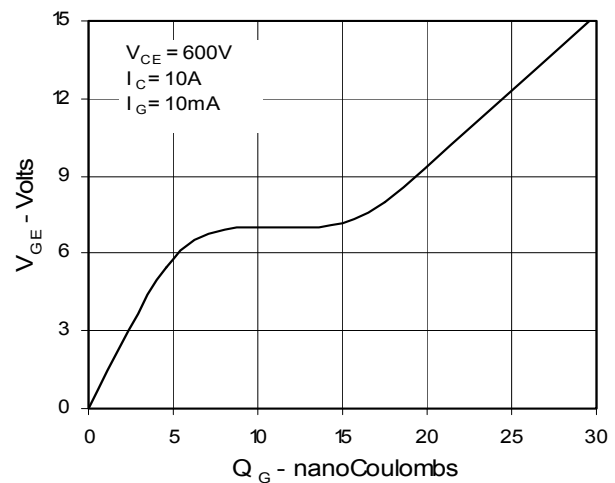


**Fig. 5. Collector-to-Emitter Voltage**  
**vs. Gate-to-Emitter voltage**



**Fig. 6. Input Admittance**



**Fig. 7. Transconductance**

**Fig. 8. Forward Voltage Drop of Intrinsic Diode**

**Fig. 9. Dependence of  $E_{off}$  on  $R_G$** 

**Fig. 10. Dependence of  $E_{off}$  on  $I_C$** 

**Fig. 11. Dependence of  $E_{off}$  on Temperature**

**Fig. 12. Gate Charge**


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 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715 6,306,728B1 6,259,123B1 6,306,728B1  
 4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025 6,404,065B1 6,162,665 6,534,343

Fig. 12. Capacitance

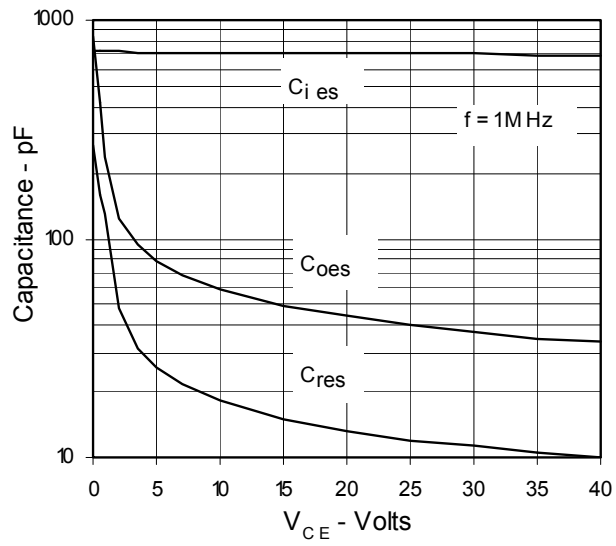


Fig. 13. Maximum Transient Thermal Resistance

