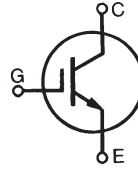


# High Voltage IGBT

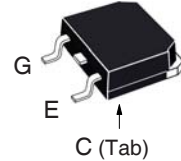
# IXGT6N170 IXGH6N170

$V_{CES} = 1700V$   
 $I_{C90} = 6A$   
 $V_{CE(sat)} \leq 4.0V$   
 $t_{fi(typ)} = 290ns$

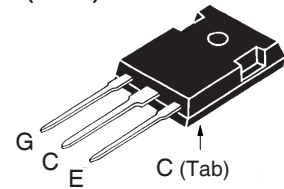


| Symbol         | Test Conditions  | Maximum Ratings       |            |
|----------------|--|-----------------------|------------|
| $V_{CES}$      | $T_C = 25^\circ C$ to $150^\circ C$                        | 1700                  | V          |
| $V_{CGR}$      | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$  | 1700                  | V          |
| $V_{GES}$      | Continuous   | $\pm 20$              | V          |
| $V_{GEM}$      | Transient  | $\pm 30$              | V          |
| $I_{C25}$      | $T_C = 25^\circ C$   | 12                    | A          |
| $I_{C90}$      | $T_C = 90^\circ C$   | 6                     | A          |
| $I_{CM}$       | $T_C = 25^\circ C$ , 1ms                                   | 24                    | A          |
| <b>SSOA</b>    | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 33\Omega$ | $I_{CM} = 12$         | A          |
| <b>(RBSOA)</b> | Clamped Inductive Load                                     | @ $0.8 \cdot V_{CES}$ |            |
| $P_C$          | $T_C = 25^\circ C$   | 75                    | 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 (0.062in.) from Case for 10s                        | 260                   | $^\circ C$ |
| $M_d$          | Mounting Torque (TO-247)                                   | 1.13/10               | Nm/lb.in.  |
| <b>Weight</b>  | TO-268   | 4                     | g          |
|                | TO-247   | 6                     | g          |

TO-268 (IXGT)



TO-247 (IXGH)



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

## Features

- International Standard Packages
- High Voltage Package

## Advantages

- High Power Density
- Low Gate Drive Requirement

## Applications

- Capacitor Discharge & Pulse Circuits
- Uninterruptible Power Supplies (UPS)
- Motor Drives
- DC Servo & Robot Drives
- DC Choppers
- Switched-Mode & Resonant-Mode Power Supplies

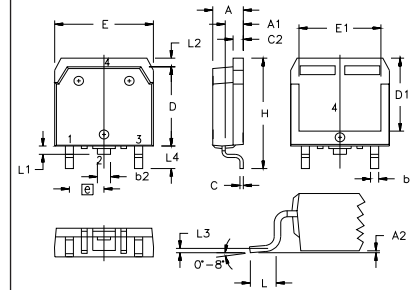
| Symbol        | Test Conditions<br>( $T_J = 25^\circ C$ Unless Otherwise Specified) | Characteristic Values |            |                           |
|---------------|---|-----------------------|------------|---------------------------|
|               |   | Min.                  | Typ.       | Max.                      |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                                    | 1700                  |            | V                         |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                | 3.0                   |            | V                         |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 125^\circ C$ |                       |            | 10 $\mu A$<br>100 $\mu A$ |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                  |                       |            | $\pm 100$ nA              |
| $V_{CE(sat)}$ | $I_C = I_{C90}$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ C$    |                       | 3.0<br>4.0 | 4.0 V                     |

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)   | Characteristic Values |      |                         |    |
|--------------|---|-----------------------|------|-------------------------|----|
|              |   | Min.                  | Typ. | Max.                    |    |
| $g_{fs}$     | $I_C = 6\text{A}$ , $V_{CE} = 10\text{V}$ , Note 1  | 3.0                   | 4.5  | S                       |    |
| $I_{C(ON)}$  | $V_{GE} = 15\text{V}$ , $V_{CE} = 10\text{V}$   |                       | 28   | A                       |    |
| $C_{ies}$    | $V_{CE} = 25\text{V}$ , $V_{GE} = 0\text{V}$ , $f = 1\text{MHz}$  |                       | 330  | pF                      |    |
| $C_{oes}$    |   |                       | 23   | pF                      |    |
| $C_{res}$    |   |                       | 6    | pF                      |    |
| $Q_g$        | $I_C = 6\text{A}$ , $V_{GE} = 15\text{V}$ , $V_{CE} = 0.5 \cdot V_{CES}$  |                       | 20.0 | nC                      |    |
| $Q_{ge}$     |   |                       | 3.6  | nC                      |    |
| $Q_{gc}$     |   |                       | 8.0  | nC                      |    |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 6\text{A}$ , $V_{GE} = 15\text{V}$<br>$V_{CE} = 0.8 \cdot V_{CES}$ , $R_G = 33\Omega$<br>Note 2  |                       | 40   | ns                      |    |
| $t_{ri}$     |   |                       | 36   | ns                      |    |
| $t_{d(off)}$ |   |                       | 250  | 500                     | ns |
| $t_{fi}$     |   |                       | 290  | 500                     | ns |
| $E_{off}$    |   |                       | 1.5  | 2.5                     | mJ |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 6\text{A}$ , $V_{GE} = 15\text{V}$<br>$V_{CE} = 0.8 \cdot V_{CES}$ , $R_G = 33\Omega$<br>Note 2 |                       | 45   | ns                      |    |
| $t_{ri}$     |   |                       | 40   | ns                      |    |
| $E_{on}$     |   |                       | 0.5  | mJ                      |    |
| $t_{d(off)}$ |   |                       | 300  | ns                      |    |
| $t_{fi}$     |   |                       | 300  | ns                      |    |
| $E_{off}$    |   | 2.0                   | mJ   |                         |    |
| $R_{thJC}$   | TO-247  |                       |      | 1.65 $^\circ\text{C/W}$ |    |
| $R_{thCK}$   |   |                       | 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  $R_G$ .

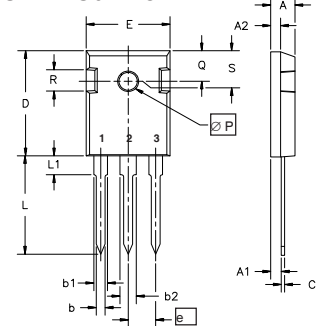
**TO-268 Outline**



Terminals: 1 - Gate, 2,4 - Collector, 3 - Emitter

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .193     | .201 | 4.90        | 5.10  |
| A1  | .106     | .114 | 2.70        | 2.90  |
| A2  | .001     | .010 | 0.02        | 0.25  |
| b   | .045     | .057 | 1.15        | 1.45  |
| b2  | .075     | .083 | 1.90        | 2.10  |
| C   | .016     | .026 | 0.40        | 0.65  |
| C2  | .057     | .063 | 1.45        | 1.60  |
| D   | .543     | .551 | 13.80       | 14.00 |
| D1  | .488     | .500 | 12.40       | 12.70 |
| E   | .624     | .632 | 15.85       | 16.05 |
| E 1 | .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  |
| L1  | .047     | .055 | 1.20        | 1.40  |
| L2  | .039     | .045 | 1.00        | 1.15  |
| L3  | .010 BSC |      | 0.25 BSC    |       |
| L4  | .150     | .161 | 3.80        | 4.10  |

**TO-247 Outline**



Terminals: 1 - Gate, 2 - Collector, 3 - Emitter

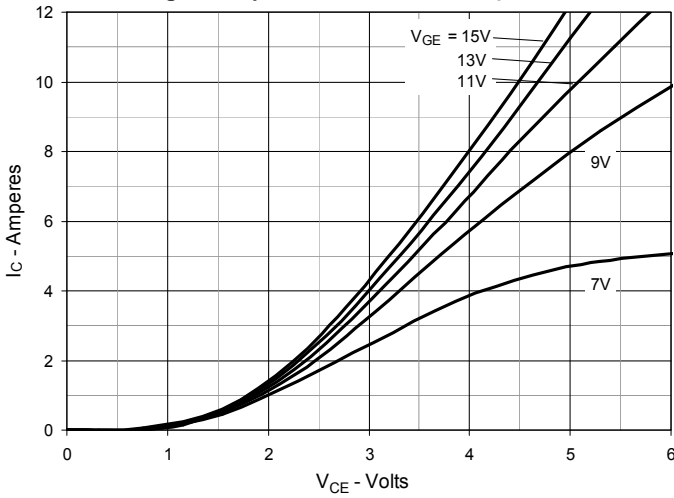
| Dim.           | Millimeter |          | Inches |         |
|----------------|------------|----------|--------|---------|
|                | Min.       | Max.     | Min.   | Max.    |
| A              | 4.7        | 5.3      | .185   | .209    |
| A <sub>1</sub> | 2.2        | 2.54     | .087   | .102    |
| 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    |
| ∅P             | 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 |

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

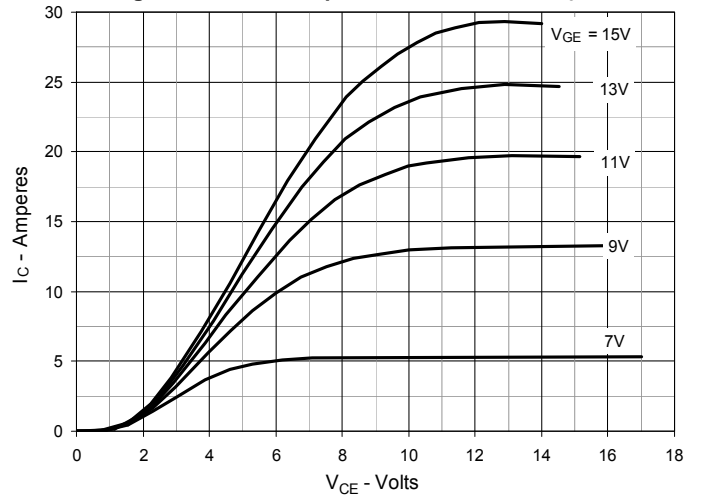
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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

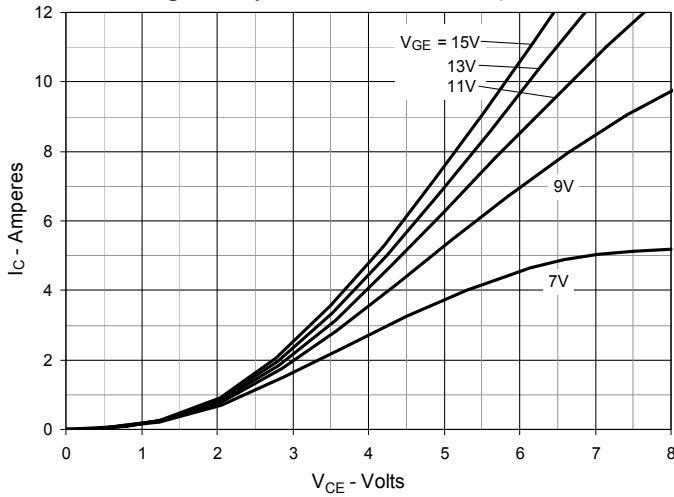
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



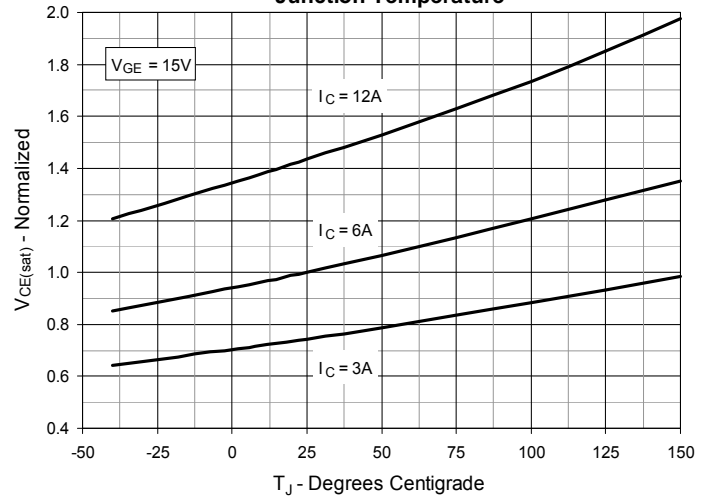
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



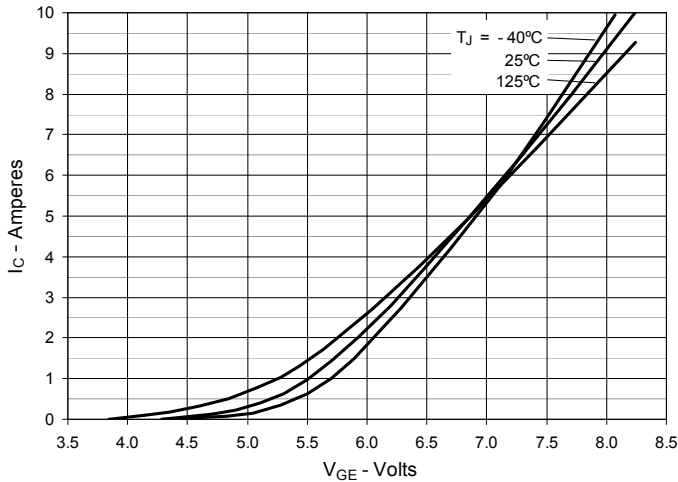
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



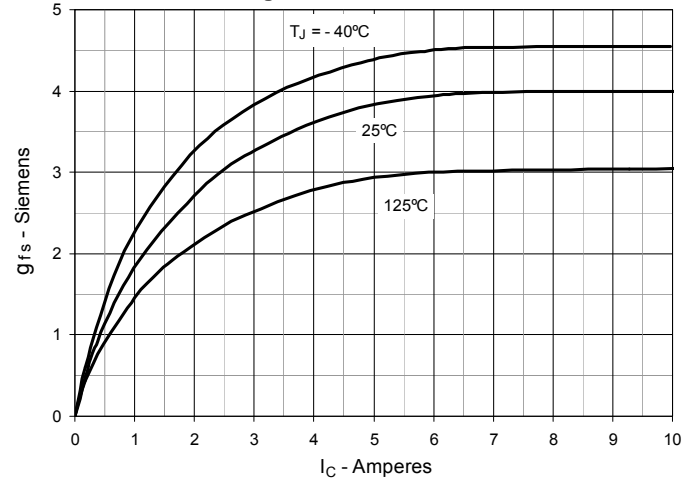
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



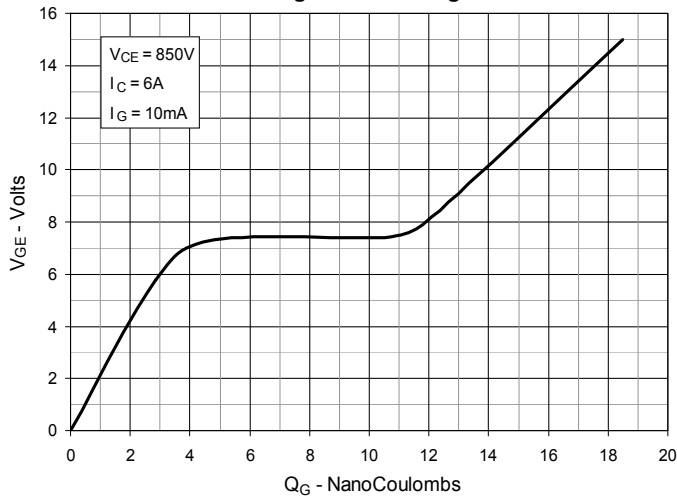
**Fig. 5. Input Admittance**



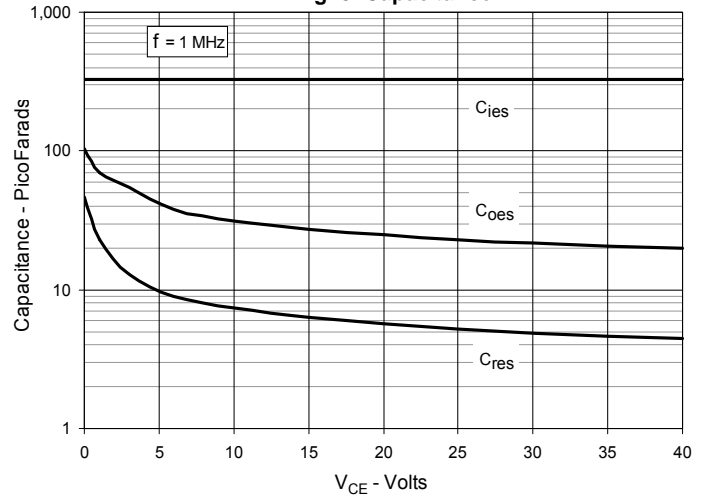
**Fig. 6. Transconductance**



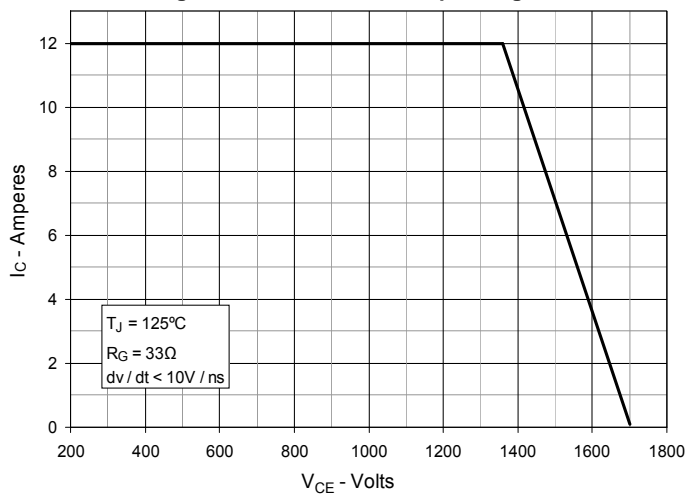
**Fig. 7. Gate Charge**



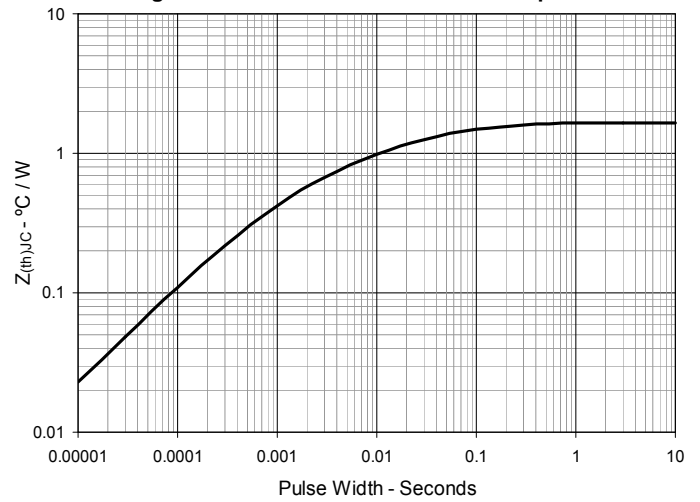
**Fig. 8. Capacitance**



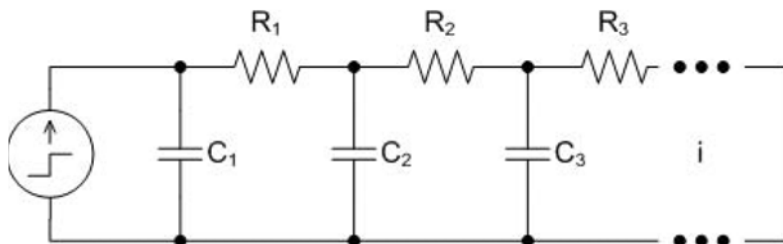
**Fig. 9. Reverse-Bias Safe Operating Area**



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



**Fig. 11. Cauer Thermal Network**



| i | R <sub>i</sub> (°C/W) | C <sub>i</sub> (J/°C) |
|---|-----------------------|-----------------------|
| 1 | 0.11615               | 0.0019257             |
| 2 | 0.29930               | 0.0016574             |
| 3 | 0.26377               | 0.0262960             |



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