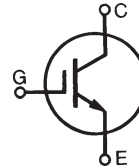


# High Voltage IGBT

**IXGH 10N170A**  
**IXGT 10N170A**

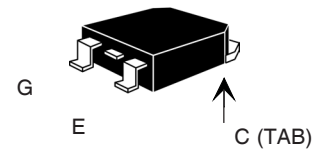
$V_{CES} = 1700 \text{ V}$   
 $I_{C25} = 10 \text{ A}$   
 $V_{CE(sat)} = 6.0 \text{ V}$   
 $t_{fi(typ)} = 35 \text{ ns}$

## Preliminary Data Sheet

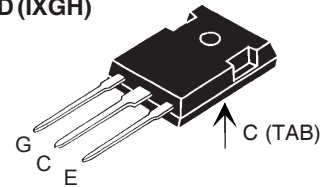


| Symbol                                                                          | Test Conditions                                                                               | Maximum Ratings                  |                  |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------------------|------------------|
| $V_{CES}$                                                                       | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                                                | 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                |
| $I_{C25}$                                                                       | $T_C = 25^\circ\text{C}$                                                                      | 10                               | A                |
| $I_{C90}$                                                                       | $T_C = 90^\circ\text{C}$                                                                      | 5                                | A                |
| $I_{CM}$                                                                        | $T_C = 25^\circ\text{C}, 1 \text{ ms}$                                                        | 20                               | A                |
| <b>SSOA</b><br><b>(RBSOA)</b>                                                   | $V_{GE} = 15 \text{ V}, T_{VJ} = 125^\circ\text{C}, R_G = 22\Omega$<br>Clamped inductive load | $I_{CM} = 20$<br>@ $0.8 V_{CES}$ | A                |
| $t_{SC}$                                                                        | $T_J = 125^\circ\text{C}, V_{CE} = 1200 \text{ V}; V_{GE} = 15 \text{ V}, R_G = 22\Omega$     | 10                               | $\mu\text{s}$    |
| $P_C$                                                                           | $T_C = 25^\circ\text{C}$                                                                      | 140                              | W                |
| $T_J$                                                                           |                                                                                               | -55 ... +150                     | $^\circ\text{C}$ |
| $T_{JM}$                                                                        |                                                                                               | 150                              | $^\circ\text{C}$ |
| $T_{stg}$                                                                       |                                                                                               | -55 ... +150                     | $^\circ\text{C}$ |
| $M_d$                                                                           | Mounting torque (M3)                                                                          | (TO-247)                         | 1.13/10Nm/lb.in. |
| Maximum lead temperature for soldering<br>1.6 mm (0.062 in.) from case for 10 s |                                                                                               | 300                              | $^\circ\text{C}$ |
| <b>Weight</b>                                                                   | TO-247                                                                                        | 6                                | g                |
|                                                                                 | TO-268                                                                                        | 4                                | g                |

### TO-268 (IXGT)



### TO-247 AD (IXGH)



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

### Features

- International standard packages JEDEC TO-268 and JEDEC TO-247 AD
- High current handling capability
- Very high frequency
- MOS Gate turn-on - drive simplicity
- Rugged NPT structure
- Molding epoxies meet UL 94 V-0 flammability classification

### Applications

- Pulser circuits
- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies

### Advantages

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

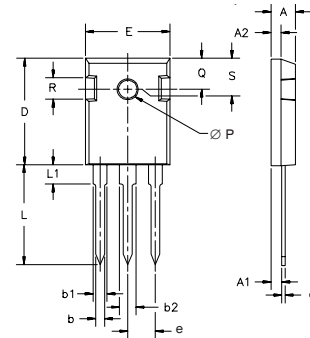
| Symbol        | Test Conditions                                                                                 | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                                       |
|---------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|---------------------------------------|
|               |                                                                                                 | min.                                                                              | typ. | max.                                  |
| $BV_{CES}$    | $I_C = 250 \mu\text{A}, V_{GE} = 0 \text{ V}$                                                   | 1700                                                                              |      | V                                     |
| $V_{GE(th)}$  | $I_C = 250 \mu\text{A}, V_{CE} = V_{GE}$                                                        | 3.0                                                                               |      | 5.0 V                                 |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$<br>$V_{GE} = 0 \text{ V}$<br>Note 1                                |                                                                                   |      | 25 $\mu\text{A}$<br>500 $\mu\text{A}$ |
| $I_{GES}$     | $V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$                                               |                                                                                   |      | $\pm 100 \text{ nA}$                  |
| $V_{CE(sat)}$ | $I_C = I_{C90}, V_{GE} = 15 \text{ V}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$ | 4.5<br>5.2                                                                        |      | 6.0 V<br>V                            |

| Symbol       | Test Conditions                                                                                                                                  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |          |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------|
|              |                                                                                                                                                  | min.                                                                              | typ. | max.     |
| $g_{fs}$     | $I_C = I_{C25}; V_{CE} = 20\text{ V}$<br>Note 2                                                                                                  | 3                                                                                 | 5    | S        |
| $C_{ies}$    | $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$                                                                                    |                                                                                   | 650  | pF       |
| $C_{oes}$    |                                                                                                                                                  |                                                                                   | 40   | pF       |
| $C_{res}$    |                                                                                                                                                  |                                                                                   | 22   | pF       |
| $Q_G$        | $I_C = I_{C90}, V_{GE} = 15\text{ V}, V_{CE} = 0.5 V_{CES}$                                                                                      |                                                                                   | 29   | nC       |
| $Q_{GE}$     |                                                                                                                                                  |                                                                                   | 5    | nC       |
| $Q_{GC}$     |                                                                                                                                                  |                                                                                   | 10   | nC       |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = I_{C25}, V_{GE} = 15\text{ V}$<br>$R_G = 22\ \Omega, V_{CE} = 0.5 V_{CES}$  |                                                                                   | 46   | ns       |
| $t_{ri}$     |                                                                                                                                                  |                                                                                   | 57   | ns       |
| $t_{d(off)}$ |                                                                                                                                                  |                                                                                   | 190  | ns       |
| $t_{fi}$     |                                                                                                                                                  |                                                                                   | 35   | ns       |
| $E_{off}$    |                                                                                                                                                  |                                                                                   | 0.38 | 0.8 mJ   |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = I_{C25}, V_{GE} = 15\text{ V}$<br>$R_G = 22\ \Omega, V_{CE} = 0.5 V_{CES}$ |                                                                                   | 48   | ns       |
| $t_{ri}$     |                                                                                                                                                  |                                                                                   | 59   | ns       |
| $E_{on}$     |                                                                                                                                                  |                                                                                   | 1.2  | mJ       |
| $t_{d(off)}$ |                                                                                                                                                  |                                                                                   | 200  | ns       |
| $t_{fi}$     |                                                                                                                                                  |                                                                                   | 40   | ns       |
| $E_{off}$    |                                                                                                                                                  |                                                                                   | 0.6  | mJ       |
| $R_{thJC}$   | (TO-247)                                                                                                                                         |                                                                                   |      | 0.89 K/W |
| $R_{thCK}$   |                                                                                                                                                  |                                                                                   | 0.25 | K/W      |

Notes: 1. Device must be heatsunk for high temperature leakage current measurements to avoid thermal runaway.

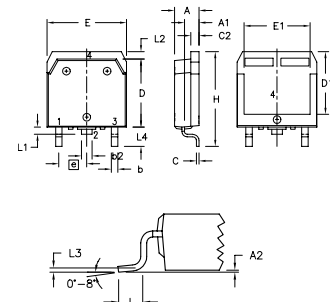
2. Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$

## TO-247 AD Outline



| 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   |

## TO-268 Outline



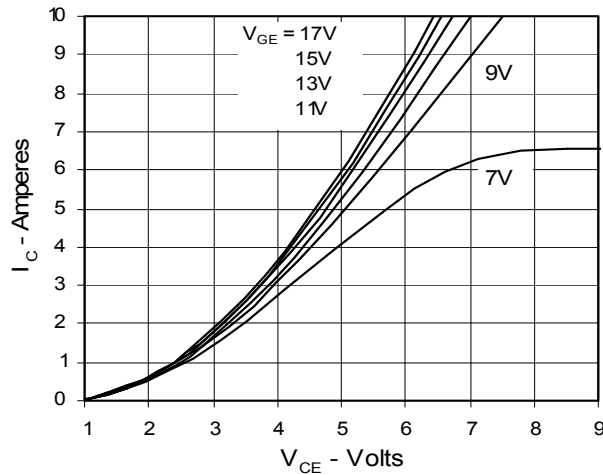
| Dim.           | Millimeter |          | Inches |          |
|----------------|------------|----------|--------|----------|
|                | Min.       | Max.     | Min.   | Max.     |
| A              | 4.9        | 5.1      | .193   | .201     |
| A <sub>1</sub> | 2.7        | 2.9      | .106   | .114     |
| A <sub>2</sub> | .02        | .25      | .001   | .010     |
| b              | 1.15       | 1.45     | .045   | .057     |
| b <sub>2</sub> | 1.9        | 2.1      | .075   | .083     |
| C              | .4         | .65      | .016   | .026     |
| D              | 13.80      | 14.00    | .543   | .551     |
| E              | 15.85      | 16.05    | .624   | .632     |
| E <sub>1</sub> | 13.3       | 13.6     | .524   | .535     |
| e              | 5.45       | BSC      | .215   | BSC      |
| H              | 18.70      | 19.10    | .736   | .752     |
| L              | 2.40       | 2.70     | .094   | .106     |
| L1             | 1.20       | 1.40     | .047   | .055     |
| L2             | 1.00       | 1.15     | .039   | .045     |
| L3             |            | 0.25 BSC |        | .010 BSC |
| L4             | 3.80       | 4.10     | .150   | .161     |

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

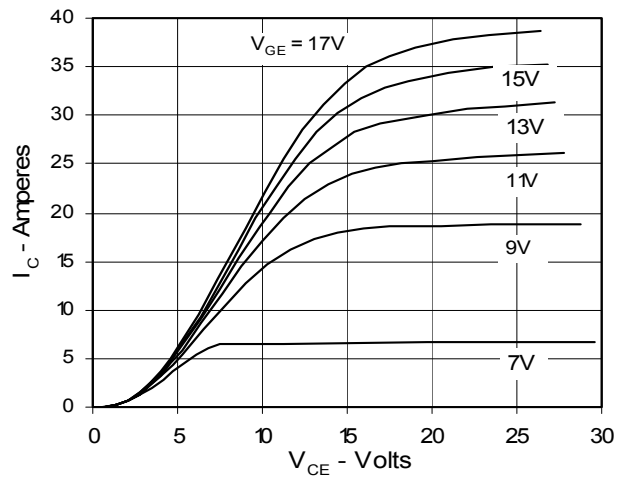
IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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 6,583,505

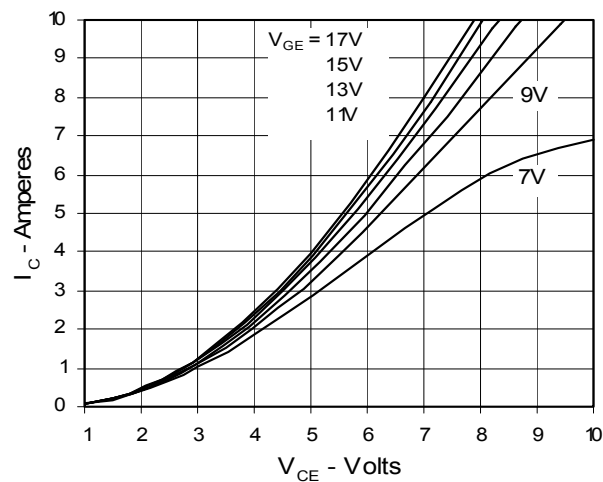
**Fig. 1. Output Characteristics**  
@ 25 Deg. C



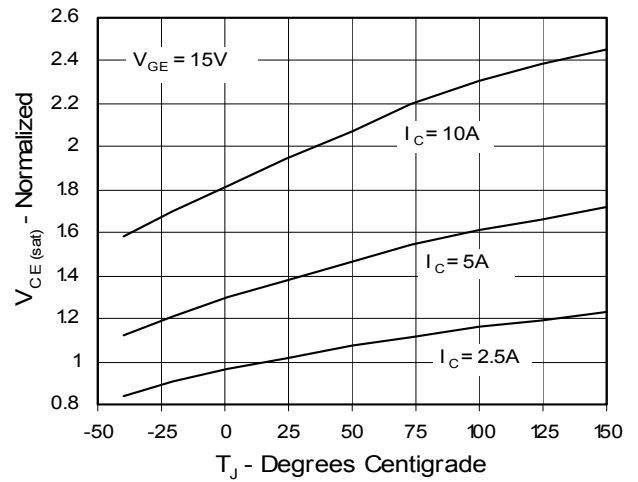
**Fig. 2. Extended Output Characteristics**  
@ 25 deg. C



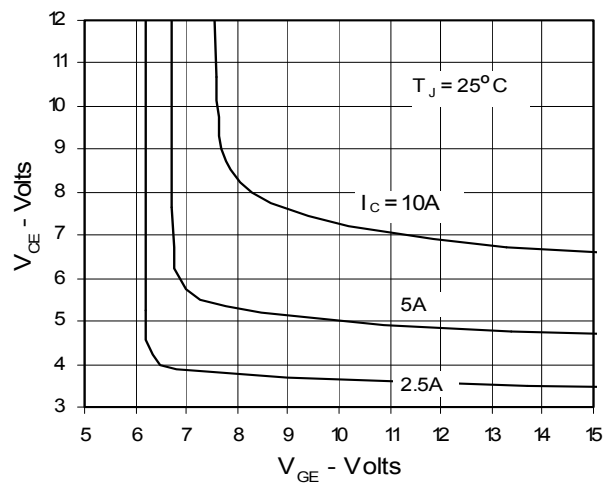
**Fig. 3. Output Characteristics**  
@ 125 Deg. C



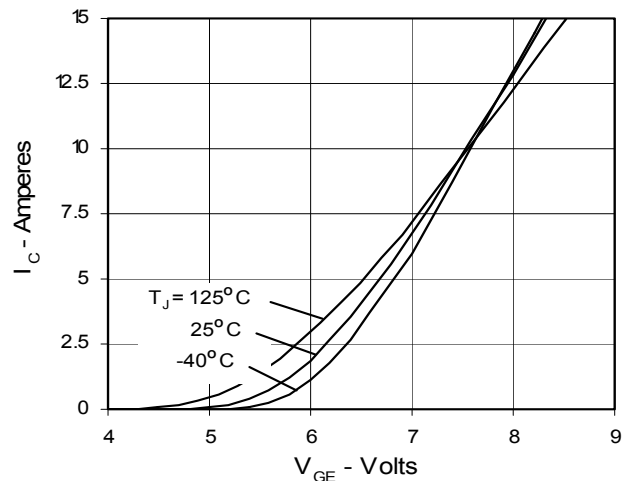
**Fig. 4. Temperature Dependence of  $V_{CE(sat)}$**



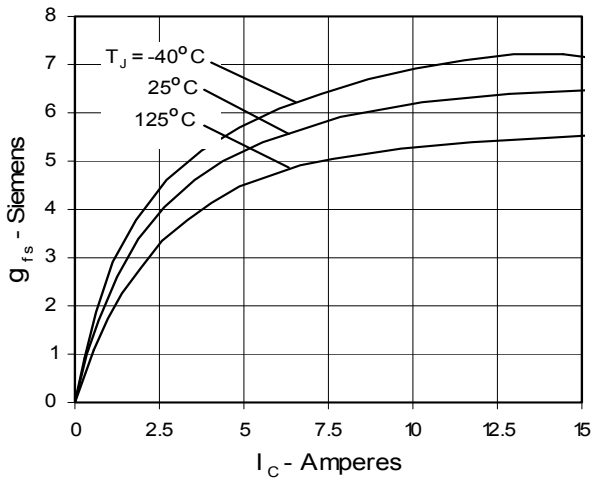
**Fig. 5. Collector-to-Emitter Voltage**  
**vs. Gate-to-Emitter voltage**



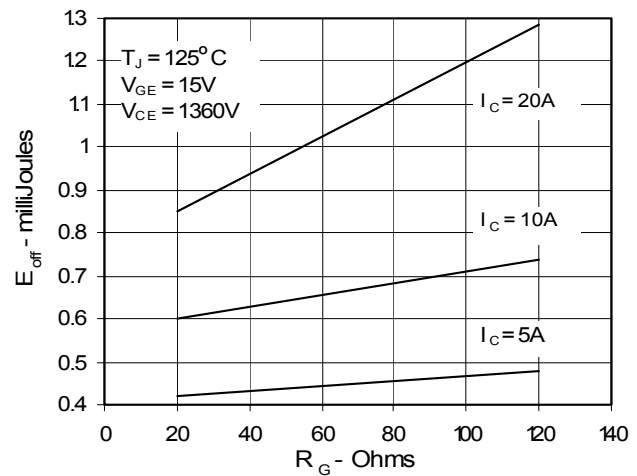
**Fig. 6. Input Admittance**



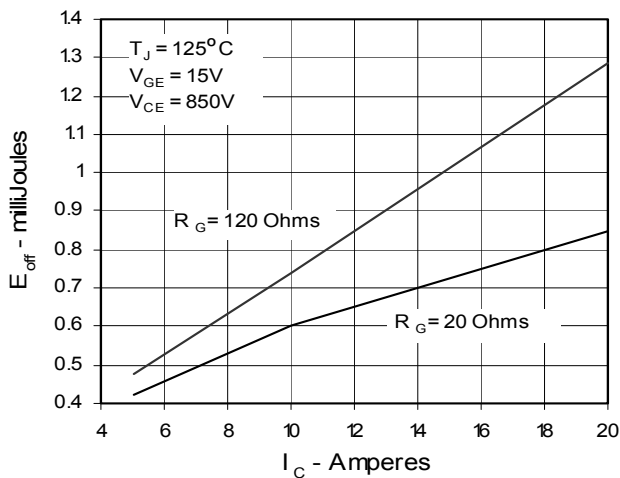
### Fig. 7. Transconductance



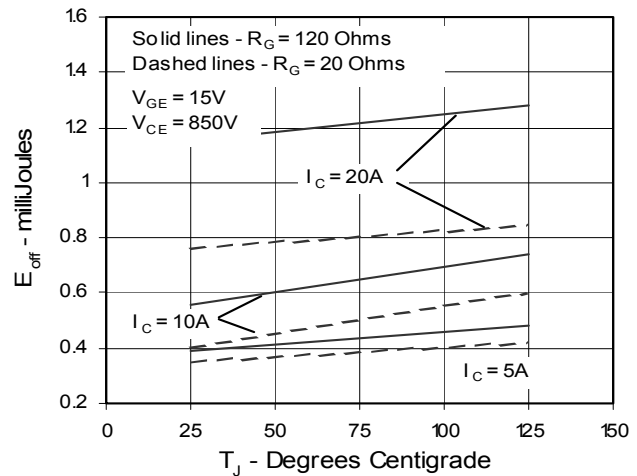
**Fig. 8. Dependence of  $E_{\text{off}}$  on  $R_G$**



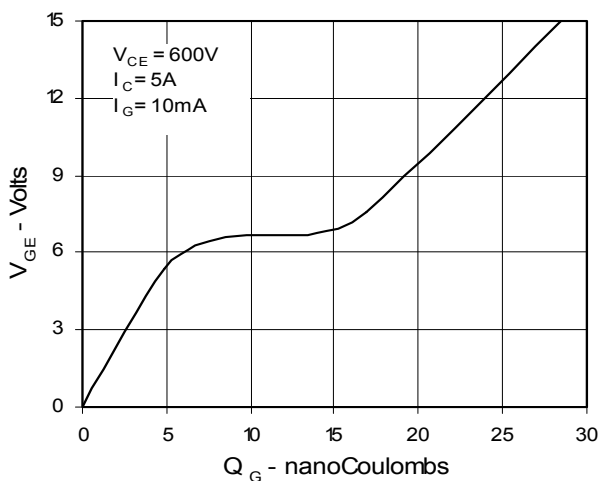
**Fig. 9. Dependence of  $E_{\text{off}}$  on  $I_C$**



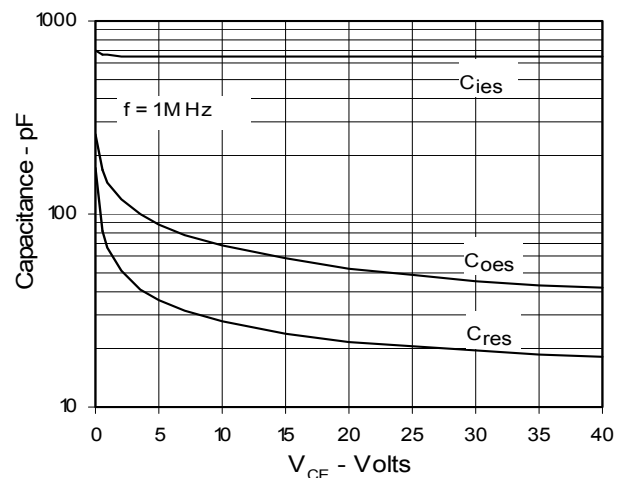
**Fig. 10. Dependence of  $E_{\text{off}}$  on Temperature**



**Fig. 11. Gate Charge**



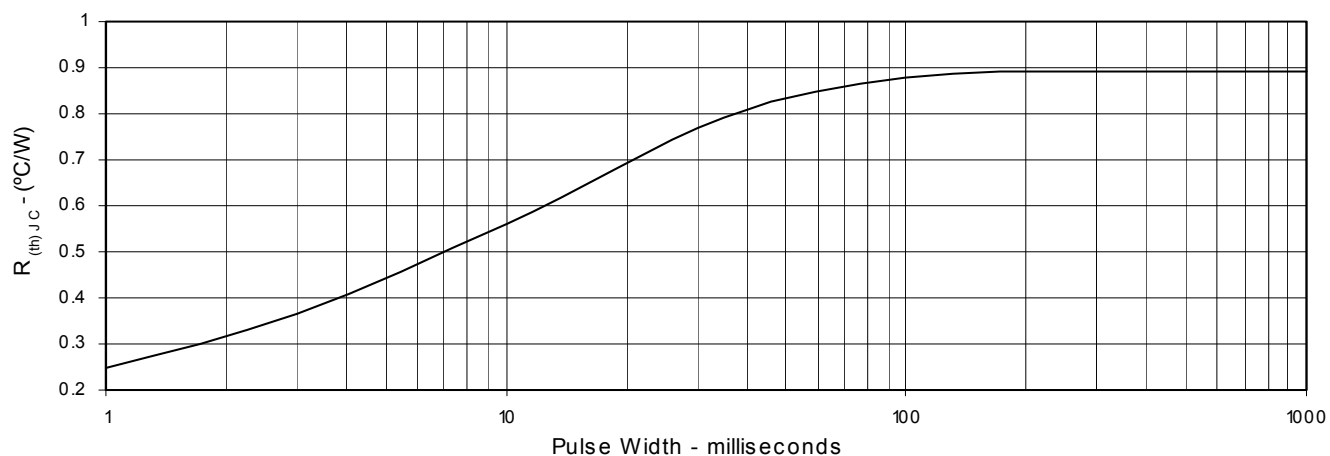
**Fig. 12. Capacitance**



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 6,583,505 |

Fig. 13. Maximum Transient Thermal Resistance





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