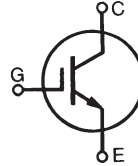


# High-Gain IGBT

**IXGA50N60C4**  
**IXGP50N60C4**  
**IXGH50N60C4**

**$V_{CES} = 600V$**   
 **$I_{C90} = 50A$**   
 **$V_{CE(sat)} \leq 2.50V$**

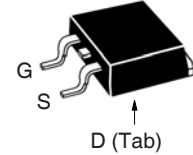
# High-Speed PT Trench IGBT



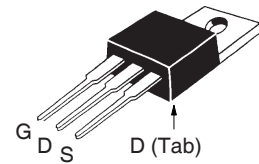
| Symbol                        | Test Conditions  | Maximum Ratings                        |            |
|-------------------------------|--|--|------------|
| $V_{CES}$                     | $T_J = 25^\circ C$ to $150^\circ C$  | 600                                    | V          |
| $V_{CGR}$                     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$                            | 600                                    | V          |
| $V_{GES}$                     | Continuous   | $\pm 20$                               | V          |
| $V_{GEM}$                     | Transient  | $\pm 30$                               | V          |
| $I_{C25}$                     | $T_C = 25^\circ C$   | 90                                     | A          |
| $I_{C90}$                     | $T_C = 90^\circ C$   | 50                                     | A          |
| $I_{CM}$                      | $T_C = 25^\circ C$ , 1ms   | 220                                    | A          |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 10\Omega$<br>Clamped Inductive Load | $I_{CM} = 72$<br>$V_{CE} \leq V_{CES}$ | A          |
| $P_C$                         | $T_C = 25^\circ C$   | 290                                    | 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                                    | $^\circ C$ |
| $F_C$                         | Mounting Force (TO-263)  | 10..65 / 2.2..14.6                     | N/lb.      |
| $M_d$                         | Mounting Torque (TO-220 & TO-247)  | 1.13 / 10                              | Nm/lb.in.  |
| <b>Weight</b>                 | TO-263   | 2.5                                    | g          |
|                               | TO-220   | 3.0                                    | g          |
|                               | TO-247   | 6.0                                    | g          |

| Symbol        | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                    |
|---------------|---|-----------------------|------|--------------------|
|               |   | Min.                  | Typ. | Max.               |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                                      | 600                   |      | V                  |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                  | 3.0                   |      | 5.5 V              |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 125^\circ C$             |                       |      | 50 $\mu A$<br>1 mA |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                    |                       |      | $\pm 100$ nA       |
| $V_{CE(sat)}$ | $I_C = 36A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ C$          | 1.95                  | 2.50 | V<br>V             |

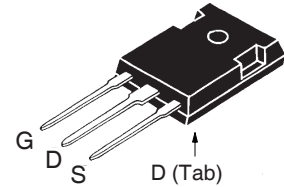
TO-263 AA (IXGA)



TO-220AB (IXGP)



TO-247 (IXGH)



G = Gate      D = Drain  
 S = Source    Tab = Drain

## Features

- Optimized for Low Switching Losses
- Square RBSOA

## Advantages

- Easy to Mount
- Space Savings

## Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Lamp Ballasts

**Symbol Test Conditions**

( $T_J = 25^\circ\text{C}$  Unless Otherwise Specified)

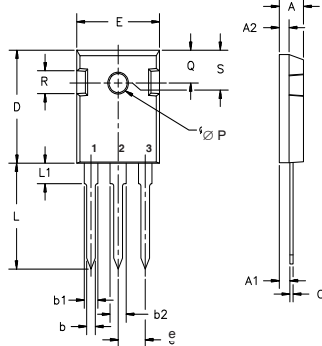
**Characteristic Values**

|              |  | Min. | Typ. | Max. |                    |
|--------------|--|------|------|------|--------------------|
| $g_{fs}$     | $I_C = I_{C90}, V_{CE} = 10V$ , Note 1   | 20   | 30   |      | S                  |
| $C_{ies}$    | $V_{CE} = 25V, V_{GE} = 0V, f = 1\text{MHz}$   |      | 1900 |      | pF                 |
| $C_{oes}$    |  |      | 100  |      | pF                 |
| $C_{res}$    |  |      | 60   |      | pF                 |
| $Q_g$        | $I_C = I_{C90}, V_{GE} = 15V, V_{CE} = 0.5 \cdot V_{CES}$  |      | 113  |      | nC                 |
| $Q_{ge}$     |  |      | 13   |      | nC                 |
| $Q_{gc}$     |  |      | 44   |      | nC                 |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 36A, V_{GE} = 15V$<br>$V_{CE} = 400V, R_G = 5\Omega$<br>Note 2  |      | 30   |      | ns                 |
| $t_{ri}$     |  |      | 53   |      | ns                 |
| $E_{on}$     |  |      | 0.81 |      | mJ                 |
| $t_{d(off)}$ |  |      | 190  |      | ns                 |
| $t_{fi}$     |  |      | 40   |      | ns                 |
| $E_{off}$    |  |      | 0.54 | 1.00 | mJ                 |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 36A, V_{GE} = 15V$<br>$V_{CE} = 400V, R_G = 5\Omega$<br>Note 2 |      | 27   |      | ns                 |
| $t_{ri}$     |  |      | 35   |      | ns                 |
| $E_{on}$     |  |      | 0.98 |      | mJ                 |
| $t_{d(off)}$ |  |      | 157  |      | ns                 |
| $t_{fi}$     |  |      | 105  |      | ns                 |
| $E_{off}$    |  |      | 0.82 |      | mJ                 |
| $R_{thJC}$   |  |      |      | 0.43 | $^\circ\text{C/W}$ |
| $R_{thCS}$   | TO-247   | 0.21 |      |      | $^\circ\text{C/W}$ |
|              | TO-220   | 0.50 |      |      | $^\circ\text{C/W}$ |

**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-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 |       |

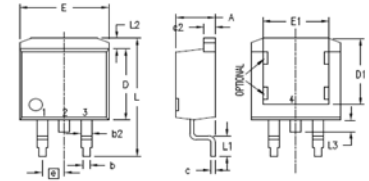
**ADVANCE TECHNICAL INFORMATION**

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 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 |
|  | 4,850,072 | 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    |             |

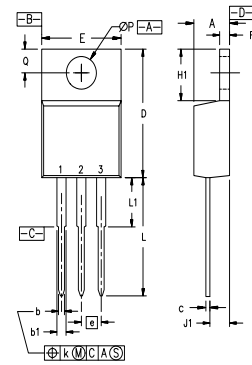
**TO-263 Outline**



- 1 = Gate
- 2 = Collector
- 3 = Emitter
- 4 = Collector

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .160     | .190 | 4.06        | 4.83  |
| A1  | .080     | .110 | 2.03        | 2.79  |
| b   | .020     | .039 | 0.51        | 0.99  |
| b2  | .045     | .055 | 1.14        | 1.40  |
| c   | .016     | .029 | 0.40        | 0.74  |
| c2  | .045     | .055 | 1.14        | 1.40  |
| D   | .340     | .380 | 8.64        | 9.65  |
| D1  | .315     | .350 | 8.00        | 8.89  |
| E   | .380     | .410 | 9.65        | 10.41 |
| E1  | .245     | .320 | 6.22        | 8.13  |
| e   | .100 BSC |      | 2.54 BSC    |       |
| L   | .575     | .625 | 14.61       | 15.88 |
| L1  | .090     | .110 | 2.29        | 2.79  |
| L2  | .040     | .055 | 1.02        | 1.40  |
| L3  | .050     | .070 | 1.27        | 1.78  |
| L4  | 0        | .005 | 0           | 0.13  |

**TO-220 Outline**



- 1 = Gate
- 2 = Collector
- 3 = Emitter

| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .170     | .190 | 4.32        | 4.83  |
| b   | .025     | .040 | 0.64        | 1.02  |
| b1  | .045     | .065 | 1.15        | 1.65  |
| c   | .014     | .022 | 0.35        | 0.56  |
| D   | .580     | .630 | 14.73       | 16.00 |
| E   | .390     | .420 | 9.91        | 10.66 |
| e   | .100 BSC |      | 2.54 BSC    |       |
| F   | .045     | .055 | 1.14        | 1.40  |
| H1  | .230     | .270 | 5.85        | 6.85  |
| J1  | .090     | .110 | 2.29        | 2.79  |
| k   | 0        | .015 | 0           | 0.38  |
| L   | .500     | .550 | 12.70       | 13.97 |
| L1  | .110     | .230 | 2.79        | 5.84  |
| ∅P  | .139     | .161 | 3.53        | 4.08  |
| Q   | .100     | .125 | 2.54        | 3.18  |