

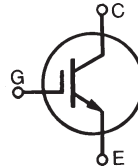
## High-Gain IGBTs

**IXGA24N60C4**

**IXGP24N60C4**

**IXGH24N60C4**

## High-Speed PT Trench IGBTs

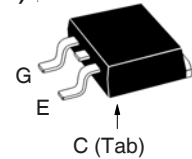


$$\begin{aligned} V_{CES} &= 600V \\ I_{C110} &= 24A \\ V_{CE(sat)} &\leq 2.70V \\ t_{fi(typ)} &= 68ns \end{aligned}$$

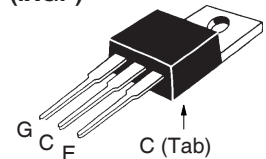
| Symbol                        | Test Conditions                                                                            | Maximum Ratings                   |                  |
|-------------------------------|--------------------------------------------------------------------------------------------|-----------------------------------|------------------|
| $V_{CES}$                     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                            | 600                               | V                |
| $V_{CGR}$                     | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GE} = 1M\Omega$                      | 600                               | V                |
| $V_{GES}$                     | Continuous                                                                                 | $\pm 20$                          | V                |
| $V_{GEM}$                     | Transient                                                                                  | $\pm 30$                          | V                |
| $I_{C25}$                     | $T_C = 25^\circ\text{C}$                                                                   | 56                                | A                |
| $I_{C110}$                    | $T_C = 110^\circ\text{C}$                                                                  | 24                                | A                |
| $I_{CM}$                      | $T_C = 25^\circ\text{C}$ , 1ms                                                             | 130                               | A                |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 10\Omega$<br>Clamped Inductive Load | $I_{CM} = 48$<br>@ $\leq V_{CES}$ | A                |
| $P_C$                         | $T_C = 25^\circ\text{C}$                                                                   | 190                               | W                |
| $T_J$                         |                                                                                            | -55 ... +150                      | $^\circ\text{C}$ |
| $T_{JM}$                      |                                                                                            | 150                               | $^\circ\text{C}$ |
| $T_{stg}$                     |                                                                                            | -55 ... +150                      | $^\circ\text{C}$ |
| $T_L$                         | Maximum Lead Temperature for Soldering                                                     | 300                               | $^\circ\text{C}$ |
| $T_{SOLD}$                    | 1.6 mm (0.062in.) from Case for 10s                                                        | 260                               | $^\circ\text{C}$ |
| $F_C$                         | 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>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |              |                                       |
|---------------|-----------------------------------------------------------------------------|-----------------------|--------------|---------------------------------------|
|               |                                                                             | Min.                  | Typ.         | Max.                                  |
| $BV_{CES}$    | $I_C = 250\mu\text{A}$ , $V_{GE} = 0V$                                      | 600                   |              | V                                     |
| $V_{GE(th)}$  | $I_C = 250\mu\text{A}$ , $V_{CE} = V_{GE}$                                  | 4.0                   |              | 6.5 V                                 |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 125^\circ\text{C}$             |                       |              | 10 $\mu\text{A}$<br>500 $\mu\text{A}$ |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                          |                       |              | $\pm 100$ nA                          |
| $V_{CE(sat)}$ | $I_C = I_{C110}$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ\text{C}$     |                       | 2.28<br>1.95 | 2.70 V<br>V                           |

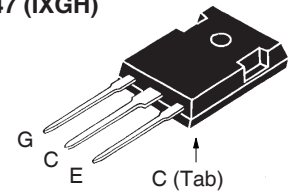
TO-263 (IXGA)



TO-220 (IXGP)



TO-247 (IXGH)



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

## Features

- Optimized for Low Switching Losses
- Square RBSOA
- International Standard Packages

## Advantages

- High Power Density
- Low Gate Drive Requirement

## Applications

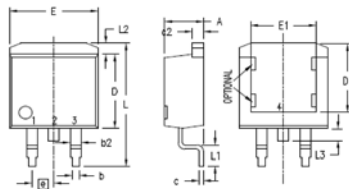
- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

**Symbol Test Conditions**
 $(T_J = 25^\circ\text{C Unless Otherwise Specified})$ 
**Characteristic Values**

|              |                                                                                                                                            | Min. | Typ. | Max.                    |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------|------|------|-------------------------|
| $g_{fs}$     | $I_C = I_{C110}, V_{CE} = 10V, \text{Note 1}$                                                                                              | 10   | 17   | S                       |
| $C_{ies}$    | $V_{CE} = 25V, V_{GE} = 0V, f = 1\text{MHz}$                                                                                               |      | 875  | pF                      |
| $C_{oes}$    |                                                                                                                                            |      | 60   | pF                      |
| $C_{res}$    |                                                                                                                                            |      | 28   | pF                      |
| $Q_g$        | $I_C = I_{C110}, V_{GE} = 15V, V_{CE} = 0.5 \cdot V_{CES}$                                                                                 |      | 64   | nC                      |
| $Q_{ge}$     |                                                                                                                                            |      | 7    | nC                      |
| $Q_{gc}$     |                                                                                                                                            |      | 28   | nC                      |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = I_{C110}, V_{GE} = 15V$<br>$V_{CE} = 360V, R_G = 10\Omega$<br>Note 2  |      | 21   | ns                      |
| $t_{ri}$     |                                                                                                                                            |      | 33   | ns                      |
| $E_{on}$     |                                                                                                                                            |      | 0.40 | mJ                      |
| $t_{d(off)}$ |                                                                                                                                            |      | 143  | ns                      |
| $t_{fi}$     |                                                                                                                                            |      | 68   | ns                      |
| $E_{off}$    |                                                                                                                                            |      | 0.30 | mJ                      |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = I_{C110}, V_{GE} = 15V$<br>$V_{CE} = 360V, R_G = 10\Omega$<br>Note 2 |      | 20   | ns                      |
| $t_{ri}$     |                                                                                                                                            |      | 32   | ns                      |
| $E_{on}$     |                                                                                                                                            |      | 0.63 | mJ                      |
| $t_{d(off)}$ |                                                                                                                                            |      | 130  | ns                      |
| $t_{fi}$     |                                                                                                                                            |      | 118  | ns                      |
| $E_{off}$    |                                                                                                                                            |      | 0.50 | mJ                      |
| $R_{thJC}$   |                                                                                                                                            |      |      | 0.65 $^\circ\text{C/W}$ |
| $R_{thCS}$   | TO-247                                                                                                                                     |      | 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  $V_{CE}(\text{clamp})$ ,  $T_J$  or  $R_G$ .

**TO-263 Outline**


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

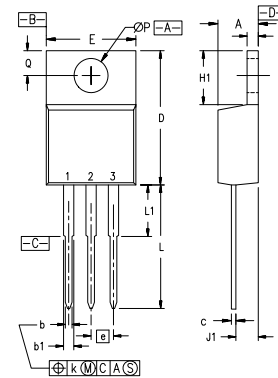
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .160     | .190 | 4.06        | 4.83  |
| A1  | .080     | .110 | 2.03        | 2.79  |
| b   | .020     | .039 | 0.51        | 0.99  |
| b1  | .045     | .055 | 1.14        | 1.40  |
| c   | .016     | .029 | 0.40        | 0.74  |
| c1  | .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  |

**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.

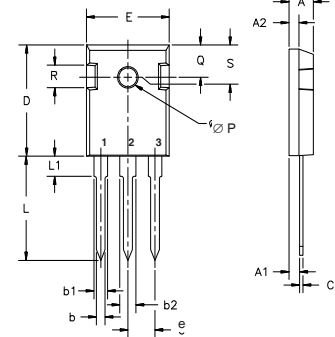
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |              |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| 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 | 7,157,338 B2 |
|                                                                                  | 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-220 Outline**


- Terminals: 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  |
| ØP  | .139     | .161 | 3.53        | 4.08  |
| Q   | .100     | .125 | 2.54        | 3.18  |

**TO-247 Outline**


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

| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 4.7        | 5.3   | .185   | .209  |
| A1   | 2.2        | 2.54  | .087   | .102  |
| A2   | 2.2        | 2.6   | .059   | .098  |
| b    | 1.0        | 1.4   | .040   | .055  |
| b1   | 1.65       | 2.13  | .065   | .084  |
| b2   | 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   |