



**THE DATASHEET OF  
IXGH20N60BD1**

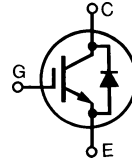


# HiPerFAST™ IGBT with Diode

**IXGH 20N60BD1**  
**IXGT 20N60BD1**

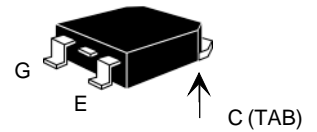
$V_{CES} = 600 \text{ V}$   
 $I_{C25} = 40 \text{ A}$   
 $V_{CE(sat)typ} = 1.7 \text{ V}$   
 $t_{fi(typ)} = 100 \text{ ns}$

Preliminary data

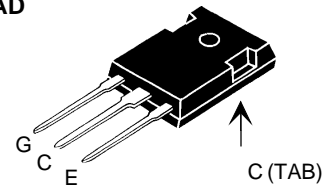


| Symbol  | Test Conditions   | Maximum Ratings                  |                  |
|---|---|----------------------------------|------------------|
| $V_{CES}$   | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$  | 600                              | V                |
| $V_{CGR}$   | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$  | 600                              | V                |
| $V_{GES}$   | Continuous  | $\pm 20$                         | V                |
| $V_{GEM}$   | Transient   | $\pm 30$                         | V                |
| $I_{C25}$   | $T_C = 25^\circ\text{C}$  | 40                               | A                |
| $I_{C90}$   | $T_C = 90^\circ\text{C}$  | 20                               | A                |
| $I_{CM}$  | $T_C = 25^\circ\text{C}, 1 \text{ ms}$  | 80                               | A                |
| <b>SSOA (RBSOA)</b>   | $V_{GE} = 15 \text{ V}, T_{VJ} = 125^\circ\text{C}, R_G = 22 \Omega$<br>Clamped inductive load, $L = 100 \mu\text{H}$ | $I_{CM} = 40$<br>@ $0.8 V_{CES}$ | A                |
| $P_C$   | $T_C = 25^\circ\text{C}$  | 150                              | 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-247AD   | 1.13/10                          | Nm/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-247AD  | 6                                | g                |
|   | TO-268  | 4                                | g                |

**TO-268 (IXGT)**



**TO-247 AD (IXGH)**



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

## Features

- International standard packages
- High frequency IGBT and antiparallel FRED in one package
- High current handling capability
- HiPerFAST™ HDMOS™ process
- MOS Gate turn-on -drive simplicity

## Applications

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

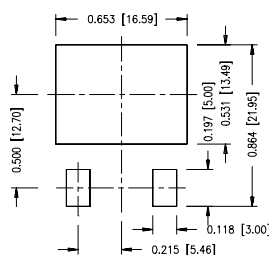
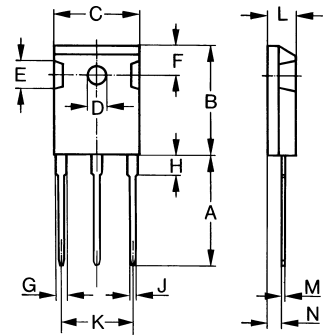
## Advantages

- Space savings (two devices in one package)
- High power density
- Suitable for surface mounting
- Very low switching losses for high frequency applications
- Easy to mount with 1 screw, TO-247 (insulated mounting screw hole)

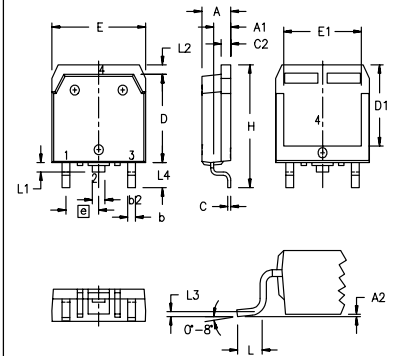
| Symbol        | Test Conditions  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                      |
|---------------|--|---|------|----------------------|
|               |  | min.  | typ. | max.                 |
| $BV_{CES}$    | $I_C = 250 \mu\text{A}, V_{GE} = 0 \text{ V}$          | 600   |      | V                    |
| $V_{GE(th)}$  | $I_C = 250 \mu\text{A}, V_{CE} = V_{GE}$               | 2.5   |      | 5.5 V                |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$<br>$V_{GE} = 0 \text{ V}$ | $T_J = 25^\circ\text{C}$  |      | 200 $\mu\text{A}$    |
|               |  | $T_J = 150^\circ\text{C}$   |      | 3 mA                 |
| $I_{GES}$     | $V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$      |   |      | $\pm 100 \text{ nA}$ |
| $V_{CE(sat)}$ | $I_C = I_{C90}, V_{GE} = 15 \text{ V}$                 | 1.7   | 2.0  | 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, $t \leq 300\ \mu\text{s}$ , duty cycle $\leq 2\%$  | 9   | 17   | S        |    |
| $C_{ies}$    | $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$  |   | 1500 | pF       |    |
| $C_{oes}$    |  |   | 150  | pF       |    |
| $C_{res}$    |  |   | 40   | pF       |    |
| $Q_g$        | $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$  |   | 55   | nC       |    |
| $Q_{ge}$     |  |   | 12   | nC       |    |
| $Q_{gc}$     |  |   | 20   | nC       |    |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\ \mu\text{H}$ ,<br>$V_{CE} = 0.8 V_{CES}$ , $R_G = R_{off} = 10\ \Omega$<br>Remarks: Switching times may increase<br>for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or<br>increased $R_G$ |   | 15   | ns       |    |
| $t_{ri}$     |  |   | 25   | ns       |    |
| $t_{d(off)}$ |  |   | 110  | 200      | ns |
| $t_{fi}$     |  |   | 100  | 150      | ns |
| $E_{off}$    |  |   | 0.7  | 1.0      | mJ |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\ \mu\text{H}$<br>$V_{CE} = 0.8 V_{CES}$ , $R_G = R_{off} = 10\ \Omega$<br>Remarks: Switching times may increase<br>for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or<br>increased $R_G$  |   | 15   | ns       |    |
| $t_{ri}$     |  |   | 35   | ns       |    |
| $E_{on}$     |  |   | 0.75 | mJ       |    |
| $t_{d(off)}$ |  |   | 220  | ns       |    |
| $t_{fi}$     |  |   | 140  | ns       |    |
| $E_{off}$    |  |   | 1.2  | mJ       |    |
| $R_{thJC}$   |  |   |      | 0.83 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.                   |
| $V_F$      | $I_F = 30\text{ A}$ , $V_{GE} = 0\text{ V}$ ,<br>Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $d \leq 2\%$  |   | $T_J = 150^\circ\text{C}$<br>$T_J = 25^\circ\text{C}$ | 1.6 V<br>2.5 V         |
| $I_{RM}$   | $I_F = 30\text{ A}$ , $V_{GE} = 0\text{ V}$ , $-di_F/dt = 100\text{ A}/\mu\text{s}$<br>$V_R = 100\text{ V}$<br>$I_F = 1\text{ A}$ ; $-di/dt = 100\text{ A}/\mu\text{s}$ ; $V_R = 30\text{ V}$ |   | $T_J = 100^\circ\text{C}$<br>$T_J = 25^\circ\text{C}$ | 6 A<br>100 ns<br>25 ns |
| $t_{rr}$   |   |   |   |                        |
| $R_{thJC}$ |   |   |   | 1.0 K/W                |

**Min. Recommended Footprint**

**TO-247 AD (IXGH) Outline**


| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 19.81      | 20.32 | 0.780  | 0.800 |
| B    | 20.80      | 21.46 | 0.819  | 0.845 |
| C    | 15.75      | 16.26 | 0.610  | 0.640 |
| D    | 3.55       | 3.65  | 0.140  | 0.144 |
| E    | 4.32       | 5.49  | 0.170  | 0.216 |
| F    | 5.4        | 6.2   | 0.212  | 0.244 |
| G    | 1.65       | 2.13  | 0.065  | 0.084 |
| H    | -          | 4.5   | -      | 0.177 |
| J    | 1.0        | 1.4   | 0.040  | 0.055 |
| K    | 10.8       | 11.0  | 0.426  | 0.433 |
| L    | 4.7        | 5.3   | 0.185  | 0.209 |
| M    | 0.4        | 0.8   | 0.016  | 0.031 |
| N    | 1.5        | 2.49  | 0.087  | 0.102 |

**TO-268AA (D<sup>3</sup> PAK)**


| 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   | .75      | .83  |
| 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 |
| L <sub>1</sub> | 1.20       | 1.40  | .047     | .055 |
| L <sub>2</sub> | 1.00       | 1.15  | .039     | .045 |
| L <sub>3</sub> | 0.25 BSC   |       | .010 BSC |      |
| L <sub>4</sub> | 3.80       | 4.10  | .150     | .161 |

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