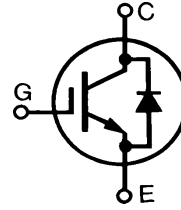


# HiPerFAST™ IGBT with Diode

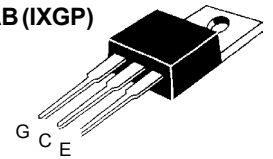
**IXGA 7N60BD1**  
**IXGP 7N60BD1**

$V_{CES} = 600 \text{ V}$   
 $I_{C25} = 14 \text{ A}$   
 $V_{CE(sat)} = 2.0 \text{ V}$   
 $t_{fi} = 150 \text{ ns}$

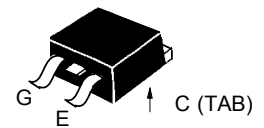


| Symbol  | Test Conditions  | Maximum Ratings |                                      |
|---|--|-----------------|--------------------------------------|
| $V_{CES}$   | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$   | 600             | V                                    |
| $V_{CGR}$   | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$                                     | 600             | V                                    |
| $V_{GES}$   | Continuous   | $\pm 20$        | V                                    |
| $V_{GEM}$   | Transient  | $\pm 30$        | V                                    |
| $I_{C25}$   | $T_C = 25^\circ\text{C}$   | 14              | A                                    |
| $I_{C90}$   | $T_C = 90^\circ\text{C}$   | 7               | A                                    |
| $I_{CM}$  | $T_C = 25^\circ\text{C}, 1 \text{ ms}$   | 56              | A                                    |
| <b>SSOA (RBSOA)</b>   | $V_{GE} = 15 \text{ V}, T_{VJ} = 125^\circ\text{C}, R_G = 18 \Omega$<br>Clamped inductive load @ $0.8 V_{CES}$ | $I_{CM} = 14$   | A                                    |
| $P_C$   | $T_C = 25^\circ\text{C}$   | 80              | W                                    |
| $T_J$   |  | -55 ... +150    | $^\circ\text{C}$                     |
| $T_{JM}$  |  | 150             | $^\circ\text{C}$                     |
| $T_{stg}$   |  | -55 ... +150    | $^\circ\text{C}$                     |
| Maximum lead temperature for soldering<br>1.6 mm (0.062 in.) from case for 10 s |  | 300             | $^\circ\text{C}$                     |
| $M_d$   | Mounting torque, (TO-220)  | M3<br>M3.5      | 0.45/4 Nm/lb.in.<br>0.55/5 Nm/lb.in. |
| <b>Weight</b>   | TO-220   |                 | 4 g                                  |
|   | TO-263   |                 | 2 g                                  |

TO-220AB (IXGP)



TO-263 AA (IXGA)



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

## Features

- International standard packages JEDEC TO-263 surface mountable and JEDEC TO-220 AB
- 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

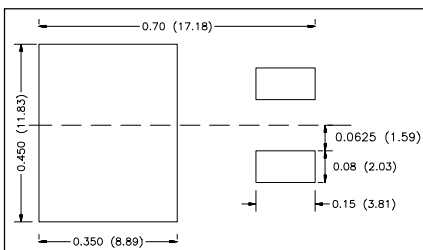
## Advantages

- High power density
- Suitable for surface mounting

| 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>$V_{GE} = 0 \text{ V}$ |   |      | $T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$<br>100 $\mu\text{A}$<br>750 $\mu\text{A}$ |
| $I_{GES}$     | $V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$      |   |      | $\pm 100 \text{ nA}$  |
| $V_{CE(sat)}$ | $I_C = I_{C90}, V_{GE} = 15 \text{ V}$                 | 1.8   | 2.0  | V   |

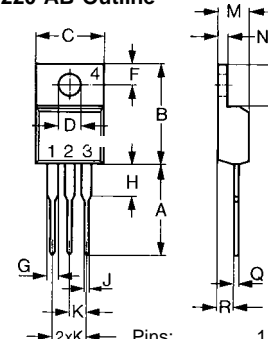
| Symbol       | Test Conditions  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |      |     |
|--------------|--|---|------|------|-----|
|              |  | min.  | typ. | max. |     |
| $g_{fs}$     | $I_C = I_{C90}$ ; $V_{CE} = 10\text{ V}$ ,<br>Pulse test, $t \leq 300\ \mu\text{s}$ , duty cycle $\leq 2\%$  | 3   | 7    | S    |     |
| $C_{ies}$    | $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$  |   | 500  | pF   |     |
| $C_{oes}$    |  |   | 50   | pF   |     |
| $C_{res}$    |  |   | 17   | pF   |     |
| $Q_g$        | $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$  |   | 25   | nC   |     |
| $Q_{ge}$     |  |   | 15   | nC   |     |
| $Q_{gc}$     |  |   | 10   | nC   |     |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$<br>$V_{CE} = 0.8 \cdot V_{CES}$ , $R_G = R_{off} = 18\ \Omega$<br>Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or increased $R_G$  |   | 10   | ns   |     |
| $t_{ri}$     |  |   | 10   | ns   |     |
| $t_{d(off)}$ |  |   | 100  | 200  | ns  |
| $t_{fi}$     |  |   | 150  | 250  | ns  |
| $E_{off}$    |  |   | 0.3  | 0.6  | mJ  |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$<br>$V_{CE} = 0.8 \cdot V_{CES}$ , $R_G = R_{off} = 18\ \Omega$<br>Remarks: Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or increased $R_G$ |   | 10   | ns   |     |
| $t_{ri}$     |  |   | 15   | ns   |     |
| $E_{on}$     |  |   | 0.15 | mJ   |     |
| $t_{d(off)}$ |  |   | 200  | ns   |     |
| $t_{fi}$     |  |   | 250  | ns   |     |
| $E_{off}$    |  | 0.6   | mJ   |      |     |
| $R_{thJC}$   | IGBT   |   |      | 1.56 | K/W |
| $R_{thCK}$   |  | 0.50  |      |      | K/W |

| Symbol     | Test Conditions  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |      |     |
|------------|--|---|------|------|-----|
|            |  | min.  | typ. | max. |     |
| $V_F$      | $I_F = 10\text{ A}$ ; $T_{VJ} = 150^\circ\text{C}$<br>$T_{VJ} = 25^\circ\text{C}$  |   |      | 1.96 | V   |
|            |  |   |      | 2.95 | V   |
| $I_{RM}$   | $V_R = 100\text{ V}$ ; $I_F = 25\text{ A}$ ; $-di_F/dt = 100\text{ A}/\mu\text{s}$<br>$L < 0.05\ \mu\text{H}$ ; $T_{VJ} = 100^\circ\text{C}$ |   | 2    | 2.5  | V   |
| $t_{rr}$   | $I_F = 1\text{ A}$ ; $-di/dt = 50\text{ A}/\mu\text{s}$ ;<br>$V_R = 30\text{ V}$ $T_J = 25^\circ\text{C}$                                    |   | 35   |      | ns  |
| $R_{thJC}$ | Diode  |   |      | 1.6  | K/W |



**Min. Recommended Footprint**  
(Dimensions in inches and mm)

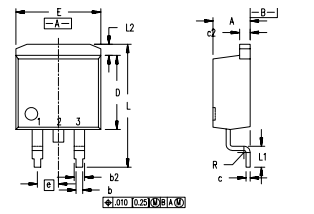
### TO-220 AB Outline



Pins: 1 - Gate  
2 - Collector 3 - Emitter  
4 - Collector Bottom Side

| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 12.70      | 13.97 | 0.500  | 0.550 |
| B    | 14.73      | 16.00 | 0.580  | 0.630 |
| C    | 9.91       | 10.66 | 0.390  | 0.420 |
| D    | 3.54       | 4.08  | 0.139  | 0.161 |
| E    | 5.85       | 6.85  | 0.230  | 0.270 |
| F    | 2.54       | 3.18  | 0.100  | 0.125 |
| G    | 1.15       | 1.65  | 0.045  | 0.065 |
| H    | 2.79       | 5.84  | 0.110  | 0.230 |
| J    | 0.64       | 1.01  | 0.025  | 0.040 |
| K    | 2.54       | BSC   | 0.100  | BSC   |
| M    | 4.32       | 4.82  | 0.170  | 0.190 |
| N    | 1.14       | 1.39  | 0.045  | 0.055 |
| Q    | 0.35       | 0.56  | 0.014  | 0.022 |
| R    | 2.29       | 2.79  | 0.090  | 0.110 |

### TO-263 AA Outline



1. Gate  
2. Collector  
3. Emitter  
4. Collector  
Bottom Side

| Dim. | Millimeter |       | Inches |      |
|------|------------|-------|--------|------|
|      | Min.       | Max.  | Min.   | Max. |
| A    | 4.06       | 4.83  | .160   | .190 |
| A1   | 2.03       | 2.79  | .080   | .110 |
| b    | 0.51       | 0.99  | .020   | .039 |
| b2   | 1.14       | 1.40  | .045   | .055 |
| c    | 0.46       | 0.74  | .018   | .029 |
| c2   | 1.14       | 1.40  | .045   | .055 |
| D    | 8.64       | 9.65  | .340   | .380 |
| D1   | 7.11       | 8.13  | .280   | .320 |
| E    | 9.65       | 10.29 | .380   | .405 |
| E1   | 6.86       | 8.13  | .270   | .320 |
| e    | 2.54       | BSC   | .100   | BSC  |
| L    | 14.61      | 15.88 | .575   | .625 |
| L1   | 2.29       | 2.79  | .090   | .110 |
| L2   | 1.02       | 1.40  | .040   | .055 |
| L3   | 1.27       | 1.78  | .050   | .070 |
| L4   | 0          | 0.38  | 0      | .015 |
| R    | 0.46       | 0.74  | .018   | .029 |

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