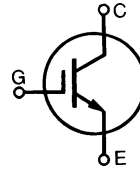


## Ultra-Low $V_{CE(sat)}$ IGBT

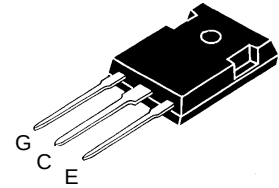
## IXGH 38N60

$$\begin{aligned} V_{CES} &= 600 \text{ V} \\ I_{C25} &= 76 \text{ A} \\ V_{CE(sat)} &= 1.8 \text{ V} \end{aligned}$$



| 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 $150^\circ\text{C}$ ; $R_{GE} = 1 \text{ M}\Omega$                                              | 600                              | V                |
| $V_{GES}$                                                                       | Continuous                                                                                                                  | $\pm 20$                         | V                |
| $V_{GEM}$                                                                       | Transient                                                                                                                   | $\pm 30$                         | V                |
| $I_{C25}$                                                                       | $T_C = 25^\circ\text{C}$                                                                                                    | 76                               | A                |
| $I_{C90}$                                                                       | $T_C = 90^\circ\text{C}$                                                                                                    | 38                               | A                |
| $I_{CM}$                                                                        | $T_C = 25^\circ\text{C}$ , 1 ms                                                                                             | 152                              | A                |
| <b>SSOA (RBSOA)</b>                                                             | $V_{GE} = 15 \text{ V}$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 10 \Omega$<br>Clamped inductive load, $L = 100 \mu\text{H}$ | $I_{CM} = 76$<br>@ $0.8 V_{CES}$ | A                |
| $P_C$                                                                           | $T_C = 25^\circ\text{C}$                                                                                                    | 200                              | 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)                                                                                                        | 1.13/10                          | Nm/lb.in.        |
| <b>Weight</b>                                                                   |                                                                                                                             | 6                                | g                |
| Maximum lead temperature for soldering<br>1.6 mm (0.062 in.) from case for 10 s |                                                                                                                             | 300                              | $^\circ\text{C}$ |

### TO-247 AD



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

### Features

- International standard package JEDEC TO-247 AD
- 2nd generation HDMOS™ process
- Low  $V_{CE(sat)}$  - for minimum on-state conduction losses
- High current handling capability
- MOS Gate turn-on - drive simplicity

### Applications

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

### Advantages

- Easy to mount with 1 screw (isolated mounting screw hole)
- Low losses, high efficiency
- High power density

| 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 V                       |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$<br>$V_{GE} = 0 \text{ V}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$ |                                                                                   |      | 200 $\mu\text{A}$<br>1 mA |
| $I_{GES}$     | $V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$                                                            |                                                                                   |      | $\pm 100 \text{ nA}$      |
| $V_{CE(sat)}$ | $I_C = I_{C90}$ , $V_{GE} = 15 \text{ V}$                                                                       |                                                                                   |      | 1.8 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, $t \leq 300\text{ }\mu\text{s}$ , duty cycle $\leq 2\%$                                                                                                                                                                                                                      | 15                                                                                | 20   | S        |
| $C_{ies}$    | $V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$                                                                                                                                                                                                                                                                    |                                                                                   | 2500 | pF       |
| $C_{oes}$    |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 230  | pF       |
| $C_{res}$    |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 70   | pF       |
| $Q_g$        | $I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$                                                                                                                                                                                                                                                                      |                                                                                   | 125  | nC       |
| $Q_{ge}$     |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 23   | nC       |
| $Q_{gc}$     |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 50   | nC       |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\text{ }\mu\text{H}$ ,<br>$V_{CE} = 0.8 V_{CES}$ , $R_G = R_{off} = 10\text{ }\Omega$<br>Remarks: Switching times may increase<br>for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or<br>increased $R_G$ |                                                                                   | 30   | ns       |
| $t_{ri}$     |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 150  | ns       |
| $t_{d(off)}$ |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 600  | ns       |
| $t_{fi}$     |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 500  | ns       |
| $E_{off}$    |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 9    | mJ       |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = I_{C90}$ , $V_{GE} = 15\text{ V}$ , $L = 100\text{ }\mu\text{H}$<br>$V_{CE} = 0.8 V_{CES}$ , $R_G = R_{off} = 10\text{ }\Omega$<br>Remarks: Switching times may increase<br>for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher $T_J$ or<br>increased $R_G$  |                                                                                   | 40   | ns       |
| $t_{ri}$     |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 160  | ns       |
| $E_{on}$     |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 1    | mJ       |
| $t_{d(off)}$ |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 800  | ns       |
| $t_{fi}$     |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 1000 | ns       |
| $E_{off}$    |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 15   | mJ       |
| $R_{thJC}$   |                                                                                                                                                                                                                                                                                                                                        |                                                                                   |      | 0.62 K/W |
| $R_{thCK}$   |                                                                                                                                                                                                                                                                                                                                        |                                                                                   | 0.25 | K/W      |

**TO-247 AD Outline**
