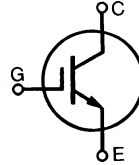


# HiPerFAST™ IGBT

IXGH 20N60B  
IXGT 20N60B

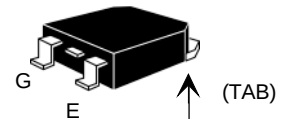
$V_{CES} = 600 \text{ V}$   
 $I_{C25} = 40 \text{ A}$   
 $V_{CE(sat)typ} = 1.7 \text{ V}$   
 $t_{fi(typ)} = 100 \text{ ns}$

Preliminary data sheet

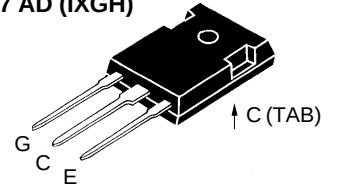


| Symbol                                                                                  | Test Conditions                                                                                                       | Maximum Ratings                  |                  |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------|------------------|
| $V_{CES}$                                                                               | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                                                                        | 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</b><br><b>(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                     | $^\circ\text{C}$ |
| Maximum Lead and Tab temperature for soldering<br>1.6 mm (0.062 in.) from case for 10 s |                                                                                                                       | 300                              | $^\circ\text{C}$ |
| $M_d$                                                                                   | Mounting torque, TO-247 AD                                                                                            | 1.13/10                          | Nm/lb.in.        |
| <b>Weight</b>                                                                           | TO-247                                                                                                                | 6                                | g                |
|                                                                                         | TO-268                                                                                                                | 4                                | g                |

## TO-268 (D3) (IXGT)



## TO-247 AD (IXGH)



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

## Features

- International standard packages JEDEC TO-268 surface mountable and JEDEC TO-247 AD
- High current handling capability
- Latest generation HDMOS™ process
- MOS Gate turn-on - drive simplicity

## Applications

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

## Advantages

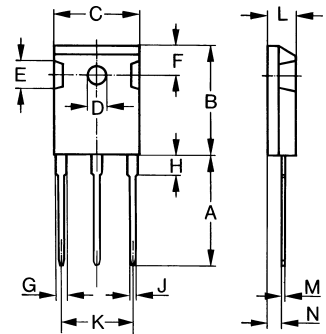
- Space savings (two devices in one package)
- High power density
- Suitable for surface mounting
- Switching speed for high frequency applications
- Easy to mount with 1 screw, TO-247 (isolated mounting screw hole)

| 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                                                                               |      | 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 |
| $I_{GES}$     | $V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$                                                               |                                                                                   |      | $\pm 100 \text{ nA}$      |
| $V_{CE(sat)}$ | $I_C = I_{C90}, V_{GE} = 15 \text{ V}$                                                                          | 1.7                                                                               | 2.0  | V                         |

| Symbol                                                                                                                                                       | Test Conditions                                                                                                                                                                                                             | Characteristic Values<br>(T <sub>J</sub> = 25°C, unless otherwise specified) |      |                                  |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------|----------------------------------|---------------------------------------|
|                                                                                                                                                              |                                                                                                                                                                                                                             | min.                                                                         | typ. | max.                             |                                       |
| g <sub>fs</sub>                                                                                                                                              | I <sub>C</sub> = I <sub>C90</sub> ; V <sub>CE</sub> = 10 V,<br>Pulse test, t ≤ 300 μs, duty cycle ≤ 2 %                                                                                                                     | 9                                                                            | 17   | S                                |                                       |
| C <sub>ies</sub><br>C <sub>oes</sub><br>C <sub>res</sub>                                                                                                     | V <sub>CE</sub> = 25 V, V <sub>GE</sub> = 0 V, f = 1 MHz                                                                                                                                                                    | 1500<br>175<br>40                                                            |      | pF<br>pF<br>pF                   |                                       |
| Q <sub>g</sub><br>Q <sub>ge</sub><br>Q <sub>gc</sub>                                                                                                         |                                                                                                                                                                                                                             |                                                                              |      | 90<br>11<br>30                   | nC<br>nC<br>nC                        |
| t <sub>d(on)</sub><br>t <sub>ri</sub><br>E <sub>on</sub><br>t <sub>d(off)</sub><br>t <sub>fi</sub><br>E <sub>off</sub>                                       |                                                                                                                                                                                                                             |                                                                              |      |                                  | 15<br>35<br>0.15<br>150<br>100<br>0.7 |
| Inductive load, T <sub>J</sub> = 25°C                                                                                                                        |                                                                                                                                                                                                                             |                                                                              |      |                                  |                                       |
| I <sub>C</sub> = I <sub>C90</sub> , V <sub>GE</sub> = 15 V, L = 100 μH,<br>V <sub>CE</sub> = 0.8 V <sub>CES</sub> , R <sub>G</sub> = R <sub>off</sub> = 10 Ω |                                                                                                                                                                                                                             |                                                                              |      |                                  |                                       |
| Note 1                                                                                                                                                       |                                                                                                                                                                                                                             |                                                                              |      |                                  |                                       |
| t <sub>d(on)</sub><br>t <sub>ri</sub><br>E <sub>on</sub><br>t <sub>d(off)</sub><br>t <sub>fi</sub><br>E <sub>off</sub>                                       | Inductive load, T <sub>J</sub> = 125°C<br><br>I <sub>C</sub> = I <sub>C90</sub> , V <sub>GE</sub> = 15 V, L = 100 μH<br><br>V <sub>CE</sub> = 0.8 V <sub>CES</sub> , R <sub>G</sub> = R <sub>off</sub> = 10 Ω<br><br>Note 1 | 15<br>35<br>0.15<br>220<br>140<br>1.2                                        |      | ns<br>ns<br>mJ<br>ns<br>ns<br>mJ |                                       |
|                                                                                                                                                              |                                                                                                                                                                                                                             |                                                                              |      |                                  |                                       |
|                                                                                                                                                              |                                                                                                                                                                                                                             |                                                                              |      |                                  |                                       |
| R <sub>thJC</sub><br>R <sub>thCK</sub>                                                                                                                       |                                                                                                                                                                                                                             | 0.25                                                                         |      | 0.83 K/W<br>K/W                  |                                       |

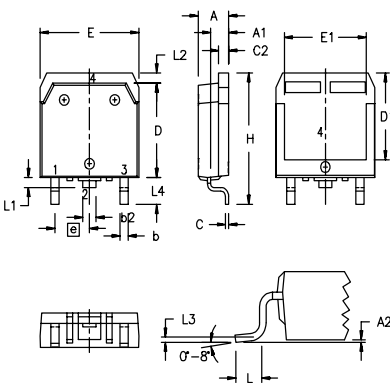
Note 1: Switching times may increase for  $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$ , higher  $T_J$  or increased  $R_G$

## TO-247 AD (IXGH) Outline



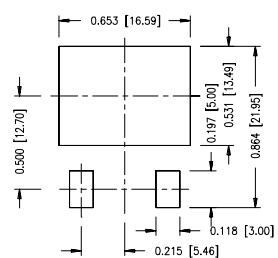
| Dim. | Millimeter |       | Inches |       |
|------|------------|-------|--------|-------|
|      | Min.       | Max.  | Min.   | Max.  |
| A    | 19.81      | 20.32 | 0.780  | 0.800 |
| B    | 20.80      | 21.46 | 0.819  | 0.845 |
| C    | 15.75      | 16.26 | 0.610  | 0.640 |
| D    | 3.55       | 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 |

## Min. Recommended Footprint



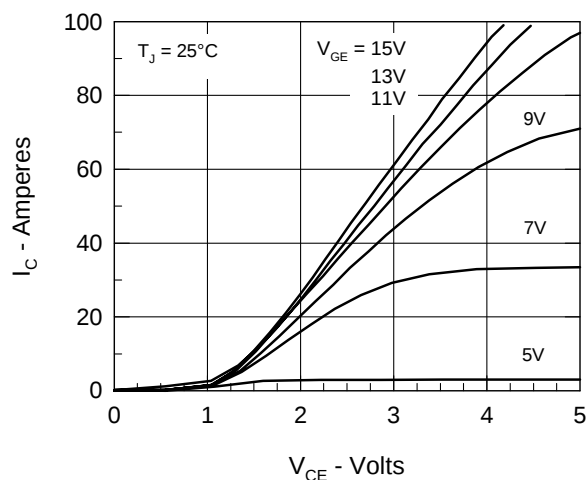


Fig. 1. Output Characteristics

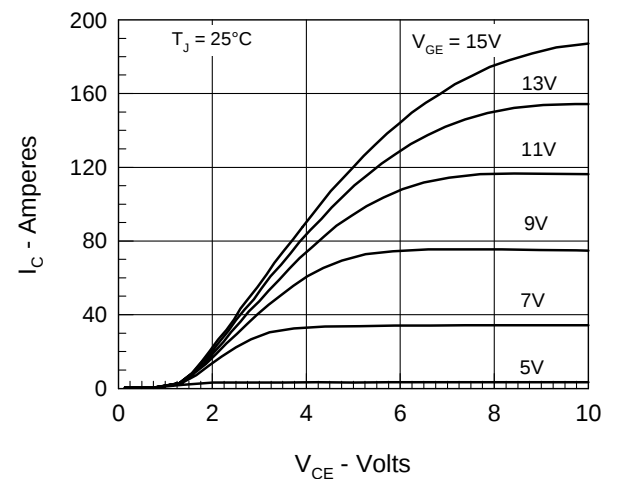


Fig. 2. Extended Output Characteristics

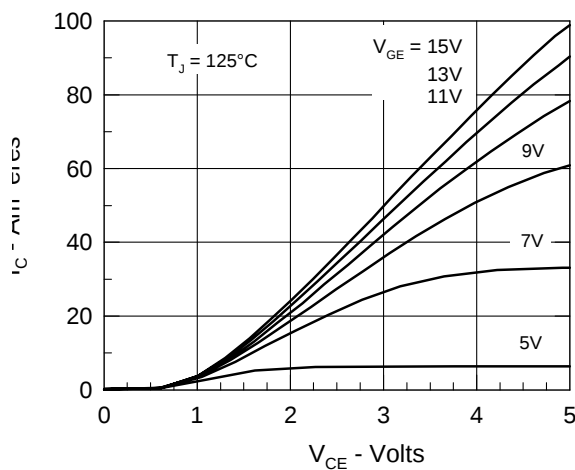


Fig. 3. High Temperature Output Characteristics

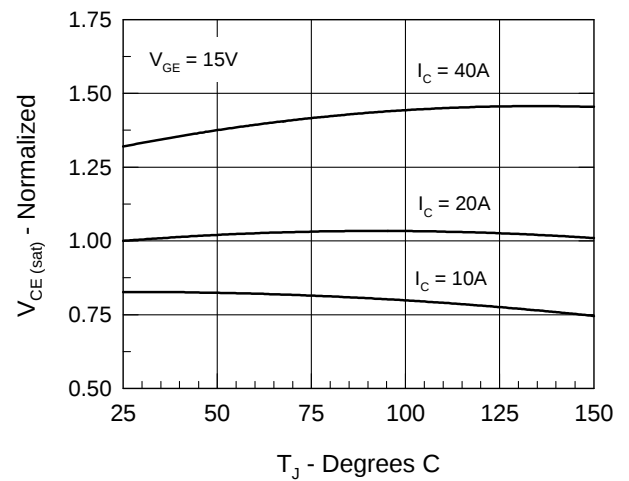


Fig. 4. Temperature Dependence of  $V_{CE(sat)}$

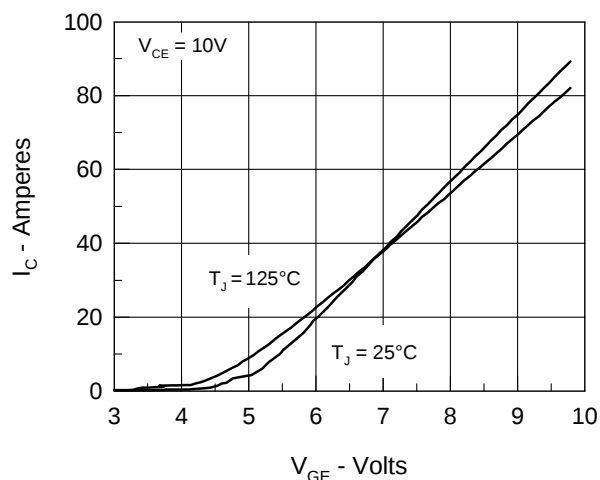


Fig. 5. Admittance Curves

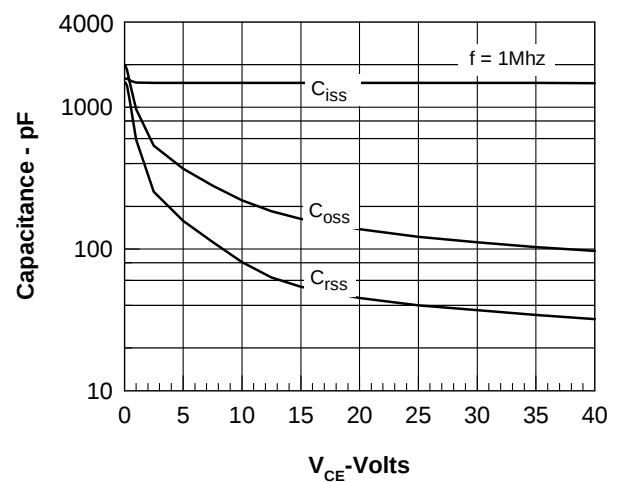


Fig. 6. Capacitance Curves

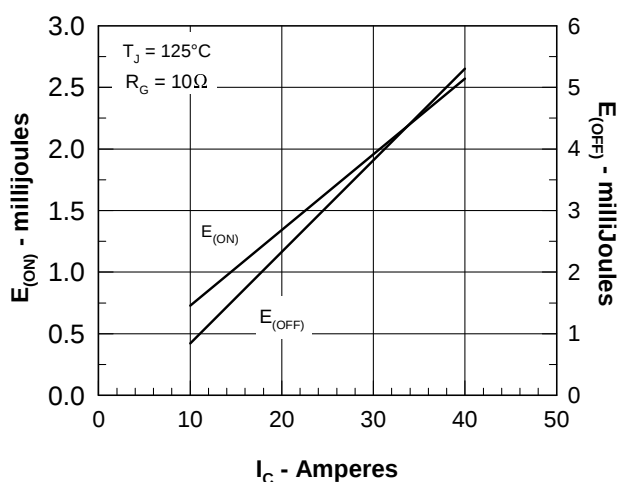


Fig. 7. Dependence of  $E_{ON}$  and  $E_{OFF}$  on  $I_C$ .

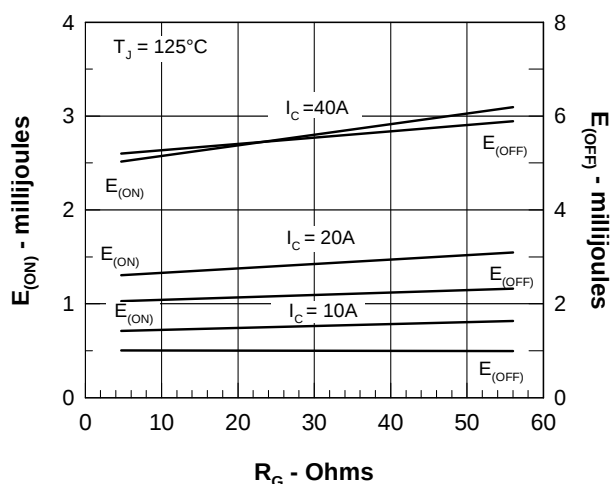


Fig. 8. Dependence of  $E_{ON}$  and  $E_{OFF}$  on  $R_G$ .

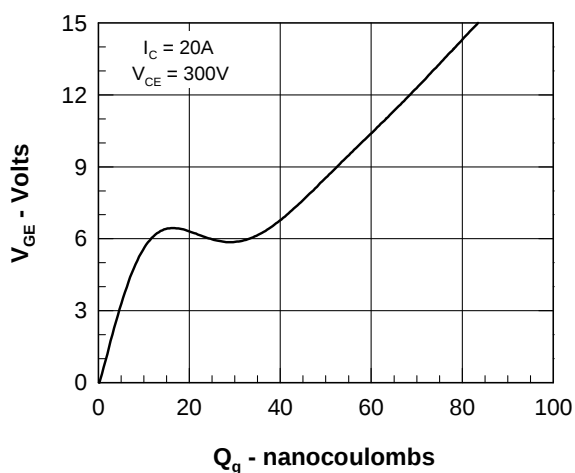


Fig. 9. Gate Charge

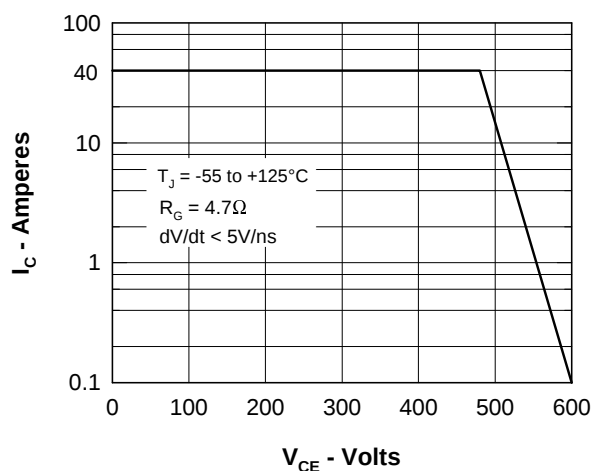


Fig. 10. Turn-off Safe Operating Area

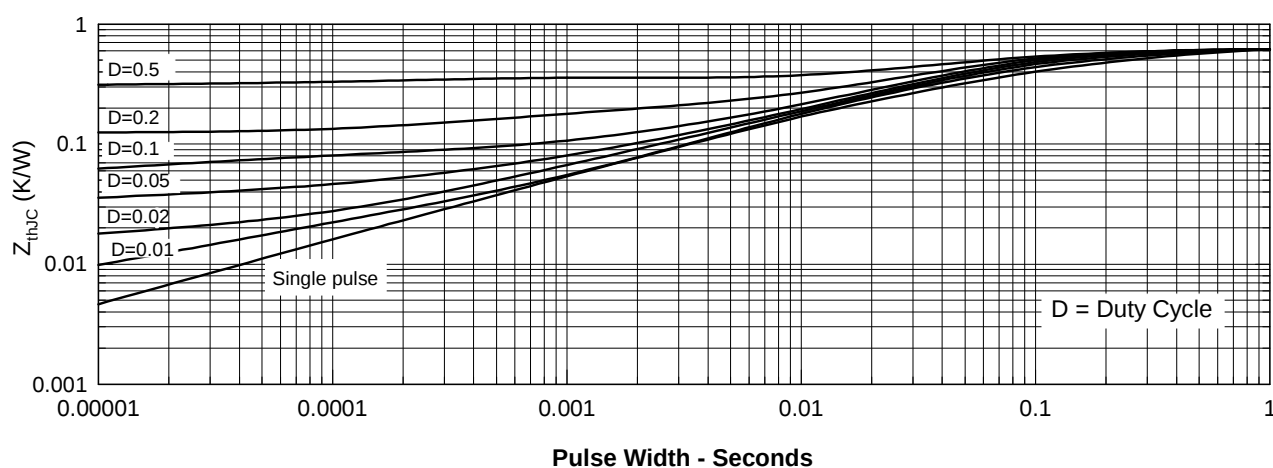


Fig. 11. IGBT Transient Thermal Resistance Junction-to-Case