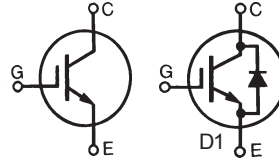


# HiPerFAST™ IGBT C2-Class High Speed IGBT

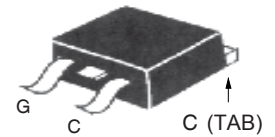
IXGA 16N60C2  
IXGP 16N60C2  
IXGA 16N60C2D1  
IXGP 16N60C2D1

$V_{CES}$  = 600 V  
 $I_{C25}$  = 40 A  
 $V_{CE(sat)}$  = 3.0 V  
 $t_{fi(typ)}$  = 35 ns

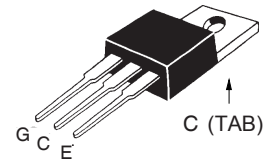


| Symbol              | Test Conditions   | Maximum Ratings                  |                  |
|---------------------|---|----------------------------------|------------------|
| $V_{CES}$           | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$   | 600                              | V                |
| $V_{CGR}$           | $T_J = 25^\circ\text{C}$ 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                |
| $I_{C25}$           | $T_C = 25^\circ\text{C}$  | 40                               | A                |
| $I_{C110}$          | $T_C = 110^\circ\text{C}$   | 16                               | A                |
| $I_{D110}$          | $T_C = 110^\circ\text{C}$ (IXG_16N60C2D1 diode)   | 11                               | A                |
| $I_{CM}$            | $T_C = 25^\circ\text{C}$ , 1 ms   | 100                              | A                |
| <b>SSOA (RBSOA)</b> | $V_{GE} = 15\text{ V}$ , $T_J = 125^\circ\text{C}$ , $R_G = 22\ \Omega$<br>Clamped inductive load | $I_{CM} = 32$<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 (M3.5 screw)  | 0.55/5 Nm/lb.in.                 |                  |
|                     | Maximum lead temperature for soldering<br>1.6 mm (0.062 in.) from case for 10 s                   | 300                              | $^\circ\text{C}$ |
|                     | Maximum tab temperature<br>soldering SMD devices for 10s  | 260                              | $^\circ\text{C}$ |
| <b>Weight</b>       | TO-220  | 4                                | g                |
|                     | TO-263  | 2                                | g                |

## TO-263 (IXGA)



## TO-220 (IXGP)



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

## Features

- Very high frequency IGBT
- High current handling capability
- MOS Gate turn-on  
- drive simplicity

## Applications

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

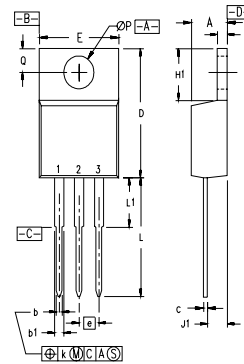
## Advantages

- High power density
- Very fast switching speeds for high frequency applications

| Symbol        | Test Conditions                                    | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                     |
|---------------|--|---|------|---------------------|
|               |  | min.  | typ. | max.                |
| $V_{GE(th)}$  | $I_C = 250\ \mu\text{A}$ , $V_{CE} = V_{GE}$       | 2.5   |      | 5.0 V               |
| $I_{CES}$     | $V_{CE} = V_{CES}$                                 |   |      | 25 $\mu\text{A}$    |
|               | $V_{GE} = 0\text{ V}$                              |   |      | 50 $\mu\text{A}$    |
| $I_{GES}$     | $V_{CE} = 0\text{ V}$ , $V_{GE} = \pm 20\text{ V}$ |   |      | $\pm 100\text{ nA}$ |
| $V_{CE(sat)}$ | $I_C = 12\text{ A}$ , $V_{GE} = 15\text{ V}$       |   |      | 3.0 V               |
|               | Note 2   |   | 2.1  | V                   |

| Symbol                    | Test Conditions  | Characteristic Values                               |      |          |
|---------------------------|--|---|------|----------|
|                           |  | (T <sub>J</sub> = 25°C, unless otherwise specified) |      |          |
|                           |  | min.  | typ. | max.     |
| <b>g<sub>fs</sub></b>     | I <sub>C</sub> = 12A; V <sub>CE</sub> = 10 V,<br>Note 2.                             | 8   | 12   | S        |
| <b>C<sub>ies</sub></b>    | V <sub>CE</sub> = 25 V, V <sub>GE</sub> = 0 V, f = 1 MHz                             |   | 720  | pF       |
| <b>C<sub>oes</sub></b>    |  |   | 55   | pF       |
|                           | 16N60C2  |   | 65   | pF       |
|                           | 16N60C2D1  |   |      |          |
| <b>C<sub>res</sub></b>    |  |   | 19   | pF       |
| <b>Q<sub>g</sub></b>      | I <sub>C</sub> = 20A, V <sub>GE</sub> = 15 V, V <sub>CE</sub> = 0.5 V <sub>CES</sub> |   | 32   | nC       |
| <b>Q<sub>ge</sub></b>     |  |   | 6    | nC       |
| <b>Q<sub>gc</sub></b>     |  |   | 10   | nC       |
| <b>t<sub>d(on)</sub></b>  | <b>Inductive load, T<sub>J</sub> = 25°C</b>  |   | 25   | ns       |
| <b>t<sub>ri</sub></b>     | I <sub>C</sub> = 12 A; V <sub>GE</sub> = 15 V  |   | 15   | ns       |
| <b>t<sub>d(off)</sub></b> | V <sub>CE</sub> = 400 V; R <sub>G</sub> = R <sub>off</sub> = 22 Ω                    |   | 60   | 120 ns   |
| <b>t<sub>fi</sub></b>     | Note 1.  |   | 35   | ns       |
| <b>E<sub>off</sub></b>    |  |   | 60   | 100 μJ   |
| <b>t<sub>d(on)</sub></b>  | <b>Inductive load, T<sub>J</sub> = 125°C</b>   |   | 25   | ns       |
| <b>t<sub>ri</sub></b>     | I <sub>C</sub> = 12A; V <sub>GE</sub> = 15 V   |   | 18   | ns       |
| <b>E<sub>on</sub></b>     | V <sub>CE</sub> = 400 V; R <sub>G</sub> = R <sub>off</sub> = 22 Ω                    | 16N60C2D1   | 0.38 | mJ       |
| <b>t<sub>d(off)</sub></b> | Note 1   |   | 120  | ns       |
| <b>t<sub>fi</sub></b>     |  |   | 70   | ns       |
| <b>E<sub>off</sub></b>    |  |   | 150  | μJ       |
| <b>R<sub>thJC</sub></b>   |  |   |      | 0.83 K/W |
| <b>R<sub>thCK</sub></b>   | (IXGP)   |   | 0.5  | K/W      |

**TO-220 Outline**



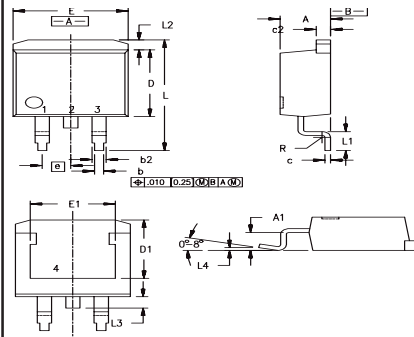
Pins: 1 - Gate 2 - Collector  
3 - Emitter 4 - Collector

| 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  |

| Reverse Diode (FRED)    |   | Characteristic Values                               |      |                |
|-------------------------|---|---|------|----------------|
|                         |   | (T <sub>J</sub> = 25°C, unless otherwise specified) |      |                |
| Symbol                  | Test Conditions   | min.  | typ. | max.           |
| <b>V<sub>F</sub></b>    | I <sub>F</sub> = 10 A, V <sub>GE</sub> = 0 V<br>T <sub>J</sub> = 125 °C                             |   |      | 2.66 V<br>1.66 |
| <b>I<sub>RM</sub></b>   | I <sub>F</sub> = 12 A; -di <sub>F</sub> /dt = 100 A/μs, V <sub>R</sub> = 100 V                      |   | 2.5  | A              |
| <b>t<sub>rr</sub></b>   | V <sub>GE</sub> = 0 V; T <sub>J</sub> = 125 °C  |   | 110  | ns             |
| <b>t<sub>rr</sub></b>   | I <sub>F</sub> = 1 A; -di <sub>F</sub> /dt = 100 A/μs; V <sub>R</sub> = 30 V, V <sub>GE</sub> = 0 V |   | 30   | ns             |
| <b>R<sub>thJC</sub></b> |   |   |      | 2.5 K/W        |

Notes: 1. Switching times may increase for V<sub>CE</sub> (Clamp) > 0.8 • V<sub>CES</sub>, higher T<sub>J</sub>, or increased R<sub>G</sub>.  
 2. Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %

**TO-263 Outline**



| 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 |

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 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715 6,306,728B1 6,259,123B1 6,306,728B1  
 4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025 6,404,065B1 6,162,665 6,534,343