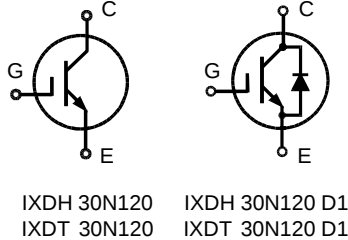


# High Voltage IGBT with optional Diode

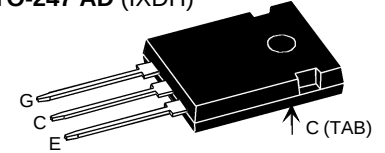
Short Circuit SOA Capability  
Square RBSOA

IXDH 30N120  
IXDH 30N120 D1  
IXDT 30N120  
IXDT 30N120 D1

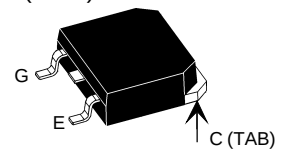
$V_{CES} = 1200 \text{ V}$   
 $I_{C25} = 60 \text{ A}$   
 $V_{CE(sat) \text{ typ}} = 2.4 \text{ V}$



TO-247 AD (IXDH)



TO-268 AA (IXDT)



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

| Symbol                                                                          | Conditions                                                                                                                  | Maximum Ratings                      |                      |
|---------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------------------|
| $V_{CES}$                                                                       | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                                                             | 1200                                 | V                    |
| $V_{CGR}$                                                                       | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GE} = 20 \text{ k}\Omega$                                             | 1200                                 | V                    |
| $V_{GES}$                                                                       | Continuous                                                                                                                  | $\pm 20$                             | V                    |
| $V_{GEM}$                                                                       | Transient                                                                                                                   | $\pm 30$                             | V                    |
| $I_{C25}$                                                                       | $T_C = 25^\circ\text{C}$                                                                                                    | 60                                   | A                    |
| $I_{C90}$                                                                       | $T_C = 90^\circ\text{C}$                                                                                                    | 38                                   | A                    |
| $I_{CM}$                                                                        | $T_C = 90^\circ\text{C}$ , $t_p = 1 \text{ ms}$                                                                             | 76                                   | A                    |
| <b>RBSOA</b>                                                                    | $V_{GE} = \pm 15 \text{ V}$ , $T_J = 125^\circ\text{C}$ , $R_G = 47 \Omega$<br>Clamped inductive load, $L = 30 \mu\text{H}$ | $I_{CM} = 50$<br>$V_{CEK} < V_{CES}$ | A                    |
| <b><math>t_{SC}</math><br/>(SCSOA)</b>                                          | $V_{GE} = \pm 15 \text{ V}$ , $V_{CE} = V_{CES}$ , $T_J = 125^\circ\text{C}$<br>$R_G = 47 \Omega$ , non repetitive          | 10                                   | $\mu\text{s}$        |
| $P_C$                                                                           | $T_C = 25^\circ\text{C}$                                                                                                    | IGBT<br>Diode                        | 300<br>135<br>W<br>W |
| $T_J$                                                                           |                                                                                                                             | -55 ... +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                                                                                                             | 1.1/10                               | Nm/lb.in.            |
| <b>Weight</b>                                                                   |                                                                                                                             | 6                                    | g                    |

## Features

- NPT IGBT technology
- low saturation voltage
- low switching losses
- square RBSOA, no latch up
- high short circuit capability
- positive temperature coefficient for easy paralleling
- MOS input, voltage controlled
- optional ultra fast diode
- International standard packages

## Advantages

- Space savings
- High power density
- IXDT:  
surface mountable high power package

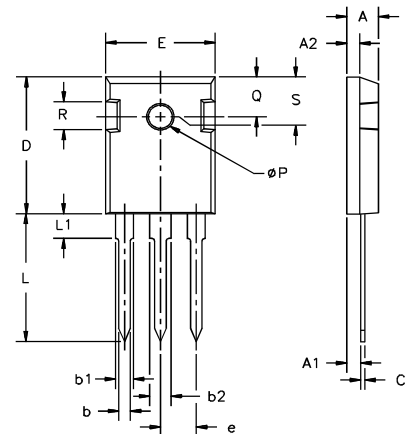
## Typical Applications

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

| Symbol        | Conditions                                                                  | Characteristic Values<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                      |
|---------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------|----------------------|
|               |                                                                             | min.                                                                              | typ. | max.                 |
| $V_{(BR)CES}$ | $V_{GE} = 0 \text{ V}$                                                      | 1200                                                                              |      | V                    |
| $V_{GE(th)}$  | $I_C = 1 \text{ mA}$ , $V_{CE} = V_{GE}$                                    | 4.5                                                                               |      | 6.5 V                |
| $I_{CES}$     | $V_{CE} = V_{CES}$<br>$T_J = 25^\circ\text{C}$<br>$T_J = 125^\circ\text{C}$ |                                                                                   | 2.5  | 1.5 mA<br>mA         |
| $I_{GES}$     | $V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$                        |                                                                                   |      | $\pm 500 \text{ nA}$ |
| $V_{CE(sat)}$ | $I_C = 30 \text{ A}$ , $V_{GE} = 15 \text{ V}$                              |                                                                                   | 2.4  | 2.9 V                |

| Symbol              | Conditions                                                                                                                                  | Characteristic Values                               |      |          |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|------|----------|
|                     |                                                                                                                                             | (T <sub>J</sub> = 25°C, unless otherwise specified) |      |          |
|                     |                                                                                                                                             | min.                                                | typ. | max.     |
| C <sub>ies</sub>    | V <sub>CE</sub> = 25 V, V <sub>GE</sub> = 0 V, f = 1 MHz                                                                                    |                                                     | 1650 | pF       |
| C <sub>oes</sub>    |                                                                                                                                             |                                                     | 250  | pF       |
| C <sub>res</sub>    |                                                                                                                                             |                                                     | 110  | pF       |
| Q <sub>g</sub>      | I <sub>C</sub> = 30 A, V <sub>GE</sub> = 15 V, V <sub>CE</sub> = 0.5 V <sub>CES</sub>                                                       |                                                     | 120  | nC       |
| t <sub>d(on)</sub>  | Inductive load, T <sub>J</sub> = 125°C<br>I <sub>C</sub> = 30 A, V <sub>GE</sub> = ±15 V,<br>V <sub>CE</sub> = 600 V, R <sub>G</sub> = 47 Ω |                                                     | 100  | ns       |
| t <sub>r</sub>      |                                                                                                                                             |                                                     | 70   | ns       |
| t <sub>d(off)</sub> |                                                                                                                                             |                                                     | 500  | ns       |
| t <sub>f</sub>      |                                                                                                                                             |                                                     | 70   | ns       |
| E <sub>on</sub>     |                                                                                                                                             |                                                     | 4.6  | mJ       |
| E <sub>off</sub>    |                                                                                                                                             |                                                     | 3.4  | mJ       |
| R <sub>thJC</sub>   | Package with heatsink compound                                                                                                              |                                                     |      | 0.42 K/W |
| R <sub>thCK</sub>   |                                                                                                                                             |                                                     | 0.25 | K/W      |

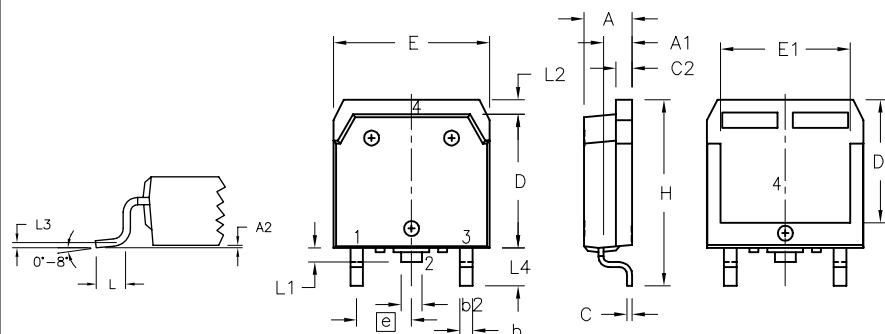
TO-247 AD Outline



| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub> | 2.2        | 2.6   | .059   | .098  |
| b              | 1.0        | 1.4   | .040   | .055  |
| b <sub>1</sub> | 1.65       | 2.13  | .065   | .084  |
| b <sub>2</sub> | 2.87       | 3.12  | .113   | .123  |
| C              | .4         | .8    | .016   | .031  |
| D              | 20.80      | 21.46 | .819   | .845  |
| E              | 15.75      | 16.26 | .610   | .640  |
| e              | 5.20       | 5.72  | 0.205  | 0.225 |
| L              | 19.81      | 20.32 | .780   | .800  |
| L1             |            | 4.50  |        | .177  |
| ØP             | 3.55       | 3.65  | .140   | .144  |
| Q              | 5.89       | 6.40  | 0.232  | 0.252 |
| R              | 4.32       | 5.49  | .170   | .216  |
| S              | 6.15       | BSC   | .242   | BSC   |

| Reverse Diode (FRED) [D1 version only] |                                                                                                     | Characteristic Values                               |      |       |
|----------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------|------|-------|
|                                        |                                                                                                     | (T <sub>J</sub> = 25°C, unless otherwise specified) |      |       |
| Symbol                                 | Conditions                                                                                          | min.                                                | typ. | max.  |
| V <sub>F</sub>                         | I <sub>F</sub> = 30 A, V <sub>GE</sub> = 0 V                                                        |                                                     | 2.5  | 2.7 V |
|                                        | I <sub>F</sub> = 30 A, V <sub>GE</sub> = 0 V, T <sub>J</sub> = 125°C                                |                                                     | 2.0  | V     |
| I <sub>F</sub>                         | T <sub>C</sub> = 25°C                                                                               |                                                     |      | 60 A  |
|                                        | T <sub>C</sub> = 90°C                                                                               |                                                     |      | 35 A  |
| I <sub>RM</sub>                        | I <sub>F</sub> = 30 A, -di <sub>F</sub> /dt = 400 A/μs, V <sub>R</sub> = 600 V                      |                                                     | 20   | A     |
| t <sub>rr</sub>                        | V <sub>GE</sub> = 0 V, T <sub>J</sub> = 125°C                                                       |                                                     | 200  | ns    |
| t <sub>rr</sub>                        | 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 |                                                     | 40   | ns    |
| R <sub>thJC</sub>                      |                                                                                                     |                                                     |      | 1 K/W |

TO-268 AA Outline



| 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>1</sub> | 1.9        | 2.1      | .075   | .083     |
| 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     |
| L1             | 1.20       | 1.40     | .047   | .055     |
| L2             | 1.00       | 1.15     | .039   | .045     |
| L3             |            | 0.25 BSC |        | .010 BSC |
| L4             | 3.80       | 4.10     | .150   | .161     |

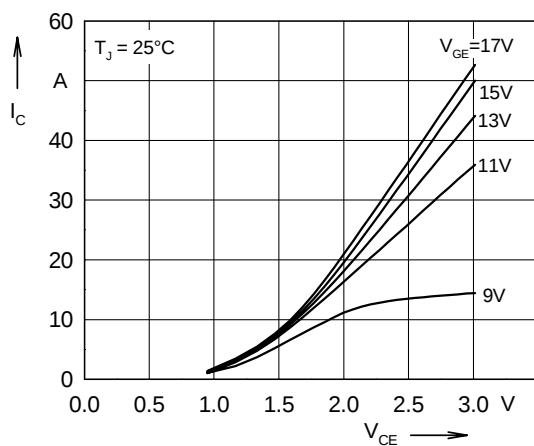


Fig. 1 Typ. output characteristics

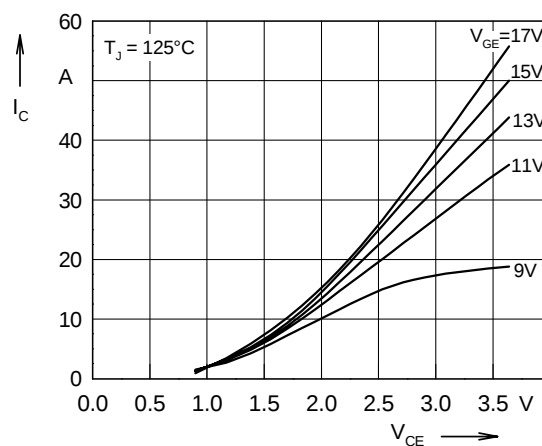


Fig. 2 Typ. output characteristics

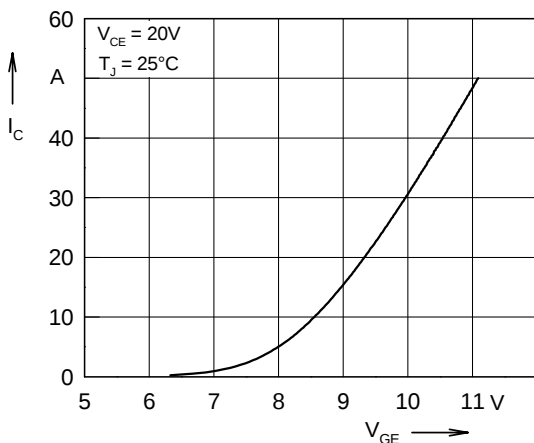


Fig. 3 Typ. transfer characteristics

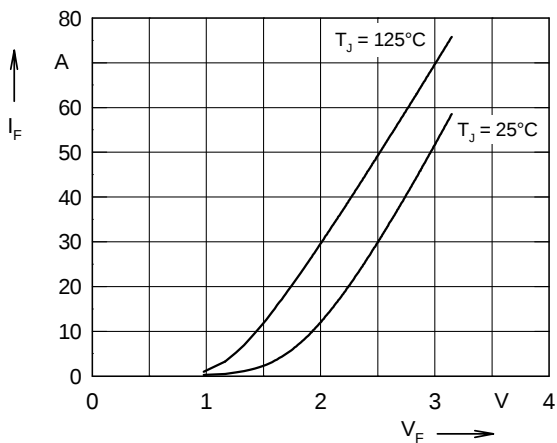


Fig. 4 Typ. forward characteristics of free wheeling diode

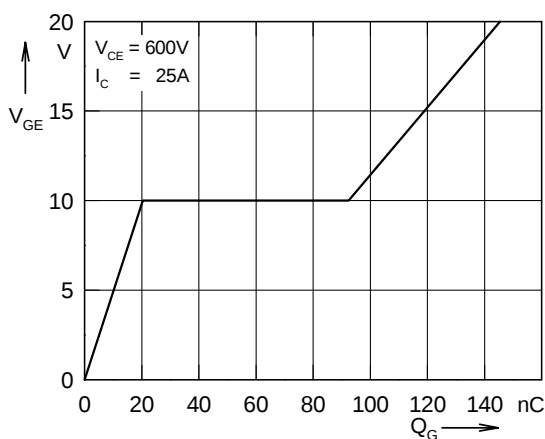


Fig. 5 Typ. turn on gate charge

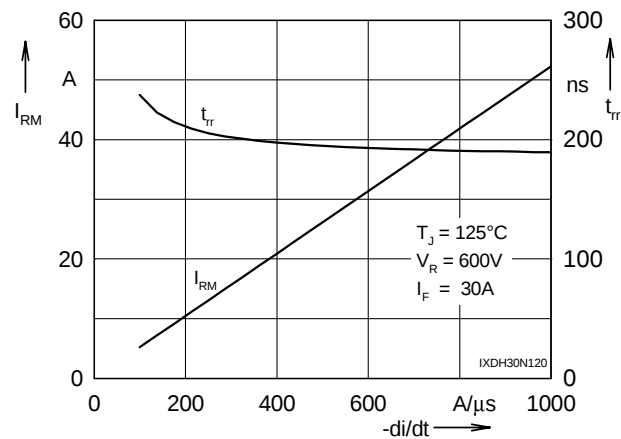


Fig. 6 Typ. turn off characteristics of free wheeling diode

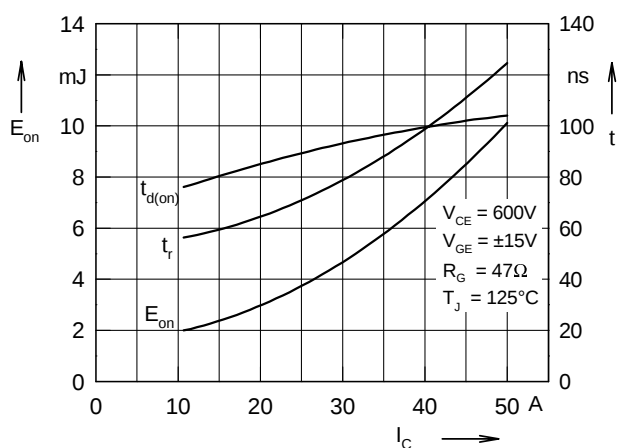


Fig. 7 Typ. turn on energy and switching times versus collector current

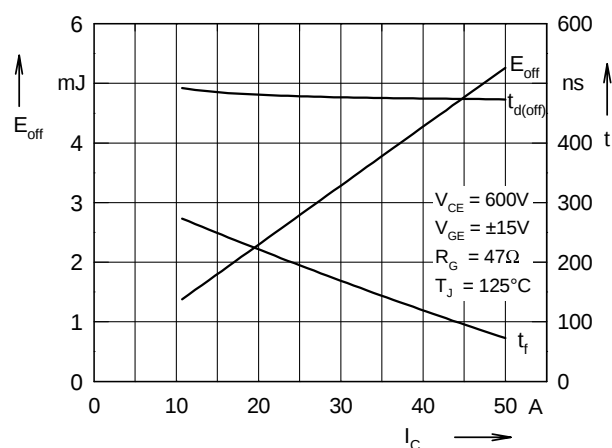


Fig. 8 Typ. turn off energy and switching times versus collector current

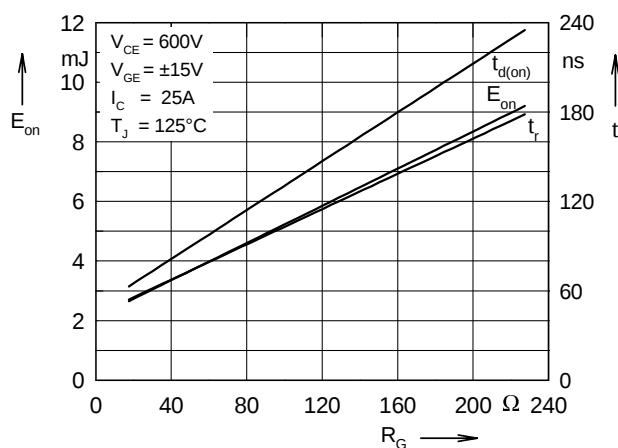


Fig. 9 Typ. turn on energy and switching times versus gate resistor

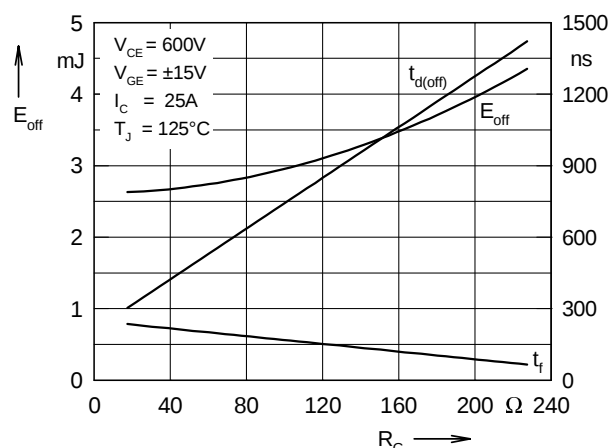


Fig. 10 Typ. turn off energy and switching times versus gate resistor

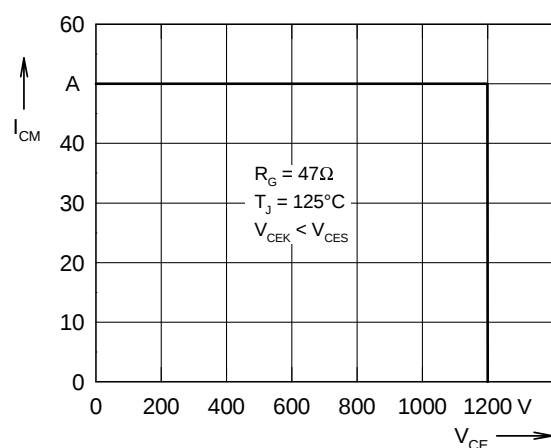


Fig. 11 Reverse biased safe operating area RBSOA

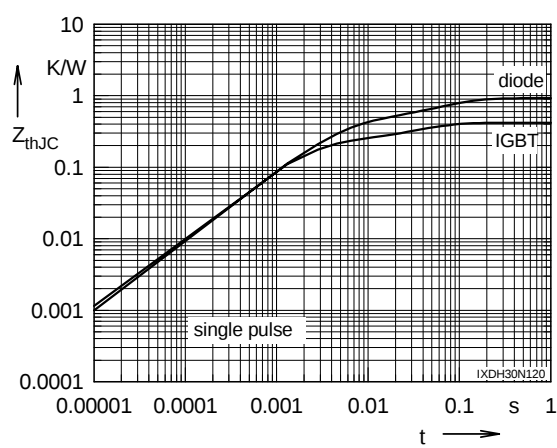


Fig. 12 Typ. transient thermal impedance