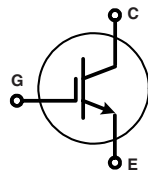


# NPT<sup>3</sup> IGBT

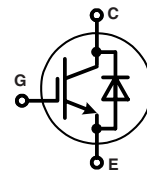
$$I_{C25} = 36 \text{ A}$$

$$V_{CES} = 1200 \text{ V}$$

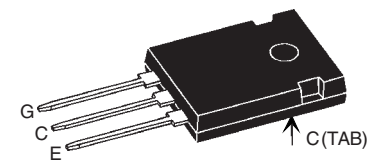
$$V_{CE(sat) \text{ typ}} = 2.6 \text{ V}$$



IXEH25N120



IXEH25N120D1

**TO-247 AD**

**IGBT**

| Symbol                | Conditions   | Maximum Ratings |               |
|-----------------------|--|-----------------|---------------|
| $V_{CES}$             | $T_{VJ} = 25^{\circ}\text{C to } 150^{\circ}\text{C}$  | 1200            | V             |
| $V_{GES}$             |  | $\pm 20$        | V             |
| $I_{C25}$             | $T_C = 25^{\circ}\text{C}$   | 36              | A             |
| $I_{C90}$             | $T_C = 90^{\circ}\text{C}$   | 24              | A             |
| $I_{CM}$<br>$V_{CEK}$ | $V_{GE} = \pm 15 \text{ V}; R_G = 68 \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>RBSOA, Clamped inductive load; $L = 100 \mu\text{H}$ | 60              | A             |
|                       |  | $V_{CES}$       |               |
| $t_{SC}$<br>(SCSOA)   | $V_{CE} = 900\text{V}; V_{GE} = \pm 15 \text{ V}; R_G = 68 \Omega; T_{VJ} = 125^{\circ}\text{C}$<br>non-repetitive                 | 10              | $\mu\text{s}$ |
| $P_{tot}$             | $T_C = 25^{\circ}\text{C}$   | 200             | W             |

**Features**

- NPT<sup>3</sup> IGBT
  - positive temperature coefficient of saturation voltage for easy paralleling
  - fast switching
  - short tail current for optimized performance in resonant circuits
- optional HiPerFRED™ diode
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
- TO-247 package
  - industry standard outline
  - epoxy meets UL 94V-0

**Applications**

- AC drives
- DC drives and choppers
- Uninterruptible power supplies (UPS)
- switched-mode and resonant-mode power supplies
- inductive heating, cookers

| Symbol   | Conditions   | Characteristic Values<br>( $T_{VJ} = 25^{\circ}\text{C}$ , unless otherwise specified) |  |                                  |         |
|--|--|--|--|----------------------------------|---------|
|  |  | min.   | typ.                                   | max.                             |         |
| $V_{CE(sat)}$  | $I_C = 25 \text{ A}; V_{GE} = 15 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$                                     |  | 2.6<br>3.2                             | V<br>V                           |         |
| $V_{GE(th)}$   | $I_C = 0.6 \text{ mA}; V_{GE} = V_{CE}$  | 4.5  |  | 6.5 V                            |         |
| $I_{CES}$  | $V_{CE} = V_{CES}; V_{GE} = 0 \text{ V}; T_{VJ} = 25^{\circ}\text{C}$<br>$T_{VJ} = 125^{\circ}\text{C}$  |  | 0.2                                    | mA<br>mA                         |         |
| $I_{GES}$  | $V_{CE} = 0 \text{ V}; V_{GE} = \pm 20 \text{ V}$  |  |  | 200 nA                           |         |
| $t_{d(on)}$<br>$t_r$<br>$t_{d(off)}$<br>$t_f$<br>$E_{on}$<br>$E_{off}$ | Inductive load, $T_{VJ} = 125^{\circ}\text{C}$<br>$V_{CE} = 600 \text{ V}; I_C = 20 \text{ A}$<br>$V_{GE} = \pm 15 \text{ V}; R_G = 68 \Omega$ |  | 205<br>105<br>320<br>175<br>4.1<br>1.5 | ns<br>ns<br>ns<br>ns<br>mJ<br>mJ |         |
| $C_{ies}$  |  | $V_{CE} = 25 \text{ V}; V_{GE} = 0 \text{ V}; f = 1 \text{ MHz}$                       |  | 1.2                              | nF      |
| $Q_{Gon}$  |  | $V_{CE} = 600 \text{ V}; V_{GE} = 15 \text{ V}; I_C = 20 \text{ A}$                    |  | 100                              | nC      |
| $R_{thJC}$   |  |  |  |                                  | 0.63 KW |

**Diode [D1 version only]**

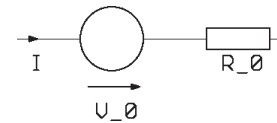
| Symbol    | Conditions               | Maximum Ratings |   |
|-----------|--------------------------|-----------------|---|
| $I_{F25}$ | $T_C = 25^\circ\text{C}$ | 31              | A |
| $I_{F90}$ | $T_C = 90^\circ\text{C}$ | 19              | A |

| Symbol               | Conditions  | Characteristic Values |      |         |
|----------------------|---|-----------------------|------|---------|
|                      |   | min.                  | typ. | max.    |
| $V_F$                | $I_F = 25\text{ A}; T_{VJ} = 25^\circ\text{C}$<br>$T_{VJ} = 125^\circ\text{C}$  | 2.7                   | 3.2  | V       |
|                      |   | 2.1                   |      | V       |
| $I_{RM}$<br>$t_{rr}$ | $I_F = 15\text{ A}; di_F/dt = -400\text{ A}/\mu\text{s}; T_{VJ} = 125^\circ\text{C}$<br>$V_R = 600\text{ V}; V_{GE} = 0\text{ V}$ | 16                    |      | A       |
|                      |   | 130                   |      | ns      |
| $R_{thJC}$           |   |                       |      | 1.6 K/W |

**Component**

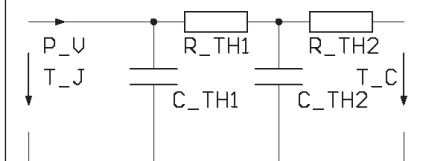
| Symbol    | Conditions      | Maximum Ratings |                  |
|-----------|-----------------|-----------------|------------------|
| $T_{VJ}$  |                 | -55...+150      | $^\circ\text{C}$ |
| $T_{stg}$ |                 | -55...+150      | $^\circ\text{C}$ |
| $M_d$     | mounting torque | 0.8...1.2       | Nm               |

| Symbol     | Conditions             | Characteristic Values |      |      |
|------------|------------------------|-----------------------|------|------|
|            |                        | min.                  | typ. | max. |
| $R_{thCH}$ | with heatsink compound | 0.25                  |      | K/W  |
| Weight     |                        | 6                     |      | g    |

**Equivalent Circuits for Simulation**
**Conduction**


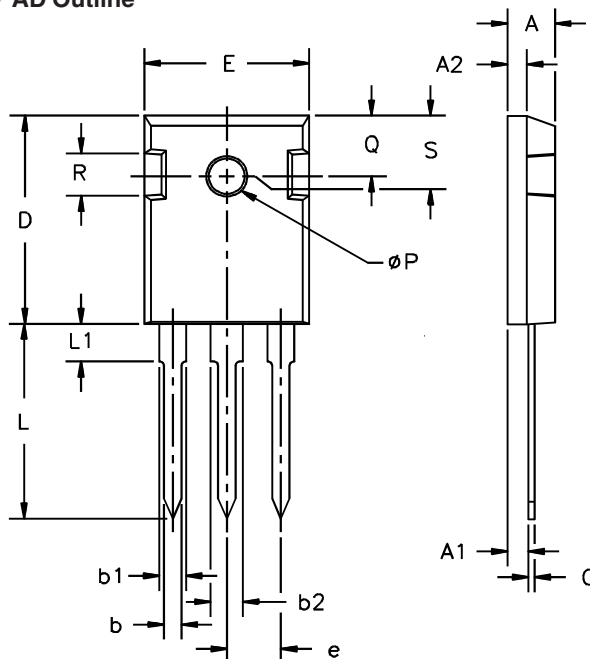
IGBT (typ. at  $V_{GE} = 15\text{ V}; T_J = 125^\circ\text{C}$ )  
 $V_0 = 1.09\text{ V}; R_0 = 85\text{ m}\Omega$

Free Wheeling Diode (typ. at  $T_J = 125^\circ\text{C}$ )  
 $V_0 = 1.3\text{ V}; R_0 = 32\text{ m}\Omega$

**Thermal Response**


IGBT (typ.)  
 $C_{th1} = 0.004\text{ J/K}; R_{th1} = 0.335\text{ K/W}$   
 $C_{th2} = 0.133\text{ J/K}; R_{th2} = 0.295\text{ K/W}$

Free Wheeling Diode (typ.)  
 $C_{th1} = 0.004\text{ J/K}; R_{th1} = 1.076\text{ K/W}$   
 $C_{th2} = 0.078\text{ J/K}; R_{th2} = 0.524\text{ K/W}$

**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   |

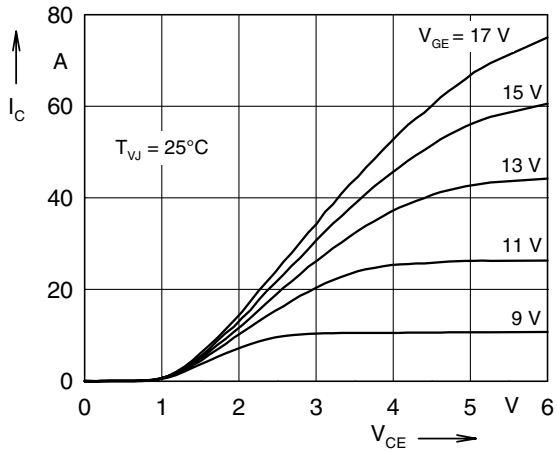


Fig. 1 Typ. output characteristics

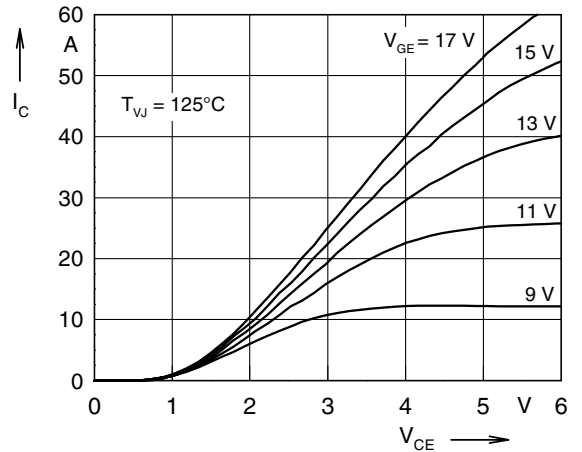


Fig. 2 Typ. output characteristics

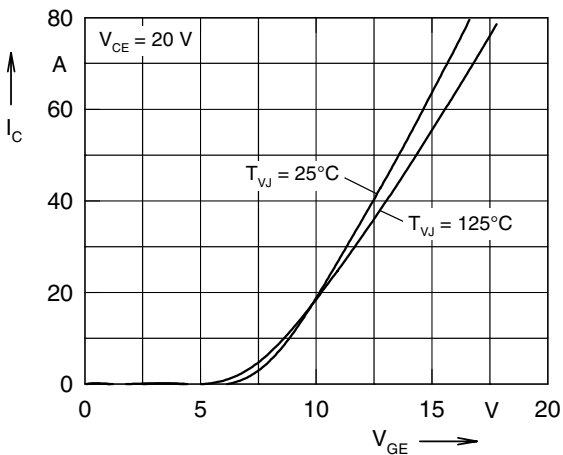


Fig. 3 Typ. transfer characteristics

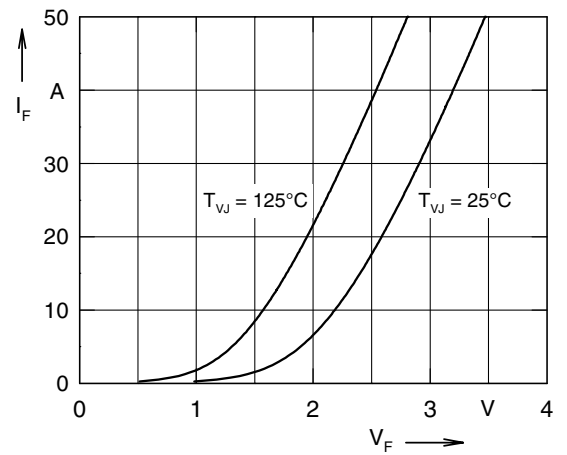


Fig. 4 Typ. forward characteristics of free wheeling diode

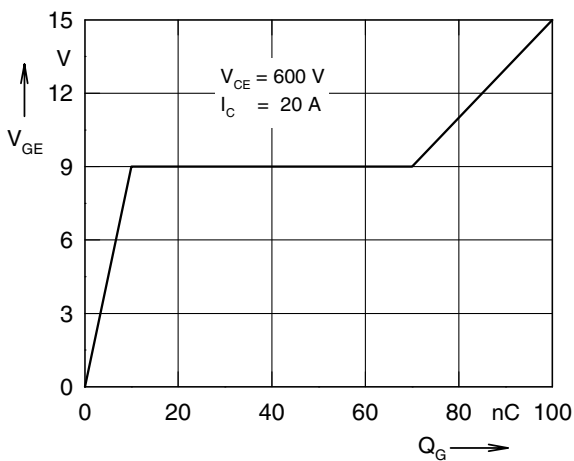


Fig. 5 Typ. turn on gate charge

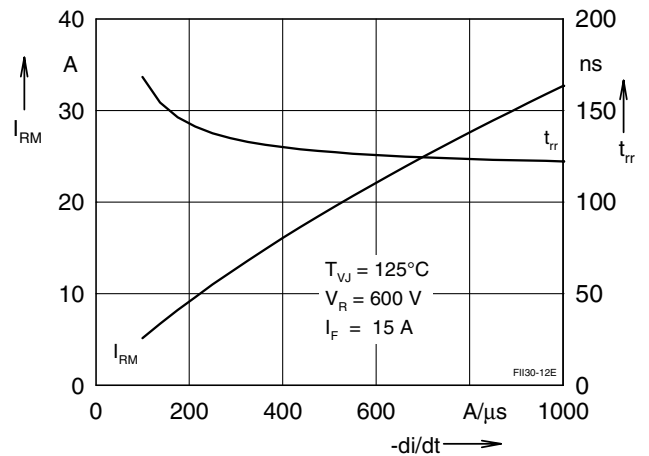


Fig. 6 Typ. turn off characteristics of free wheeling diode

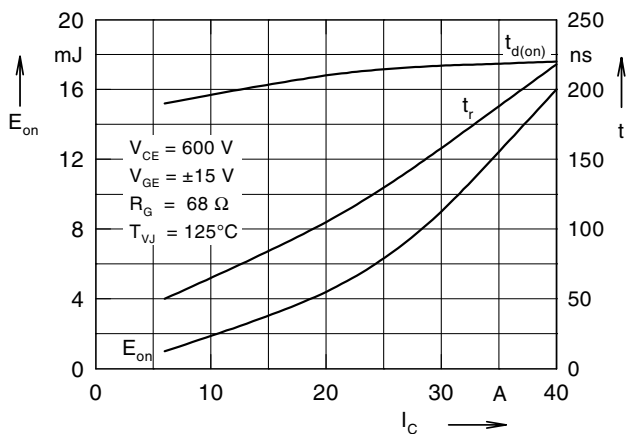


Fig. 7 Typ. turn on energy and switching times versus collector current

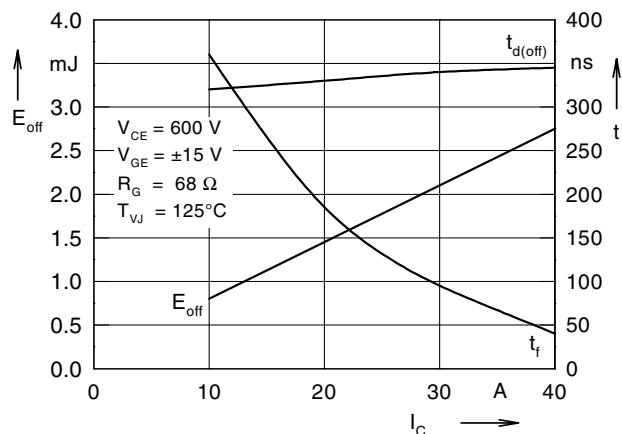


Fig. 8 Typ. turn off energy and switching times versus collector current

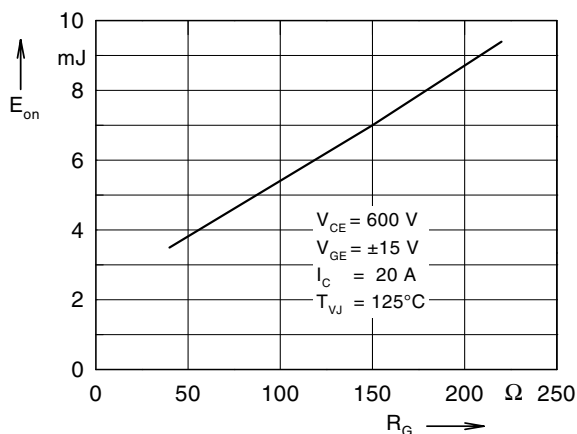


Fig. 9 Typ. turn on energy vs gate resistor

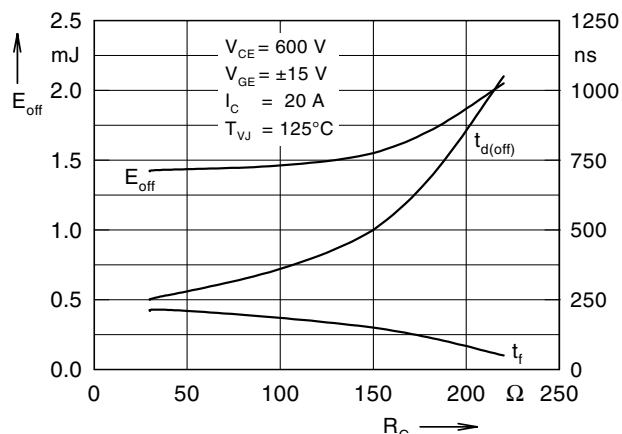


Fig.10 Typ. turn off energy and switching times versus gate resistor

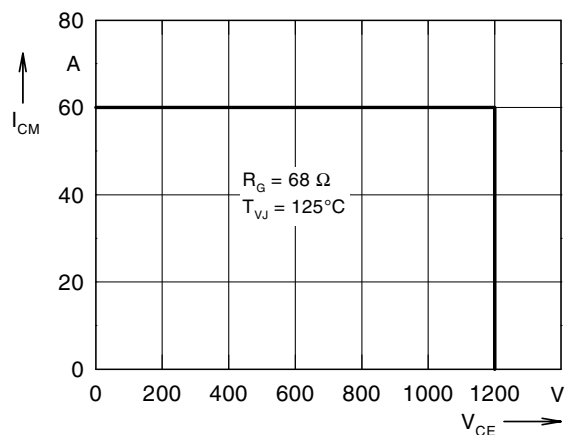


Fig. 11 Reverse biased safe operating area RBSOA

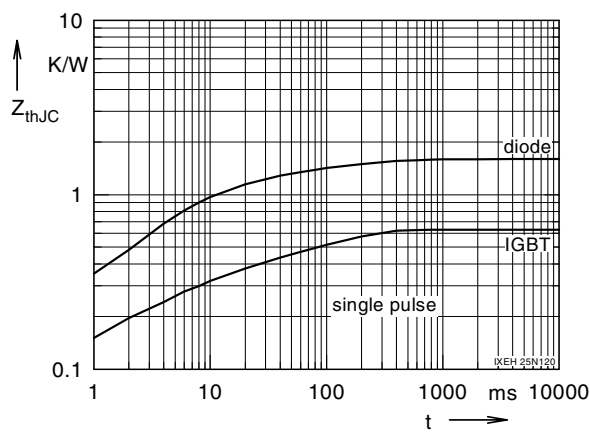


Fig. 12 Typ. transient thermal impedance