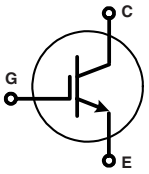
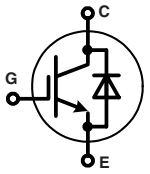
# NPT³ IGBT

$I_{C25}$ = 36 A
$V_{CES}$ = 1200 V
$V_{CE(sat)\,typ}$ = 2.6 V




IXEH 25N120

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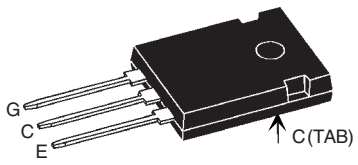
**TO-247 AD**




**IGBT**

| Symbol | Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_{VJ}$ = 25°C to 150°C | 1200 | V |
| $V_{GES}$ | | ± 20 | V |
| $I_{C25}$ | $T_C$ = 25°C | 36 | A |
| $I_{C90}$ | $T_C$ = 90°C | 24 | A |
| $I_{CM}$ | $V_{GE}$ = ±15 V; $R_G$ = 68 Ω; $T_{VJ}$ = 125°C | 60 | A |
| $V_{CEK}$ | RBSOA, Clamped inductive load; L = 100 µH | $V_{CES}$ | |
| $t_{SC}$ (SCSOA) | $V_{CE}$ = 900V; $V_{GE}$ = ±15 V; $R_G$ = 68 Ω; $T_{VJ}$ = 125°C non-repetitive | 10 | µs |
| $P_{tot}$ | $T_C$ = 25°C | 200 | W |

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

**Features**

- NPT³ 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
- Uninteruptible power supplies (UPS)
- switched-mode and resonant-mode power supplies
- inductive heating, cookers

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## Diode [D1 version only]

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

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

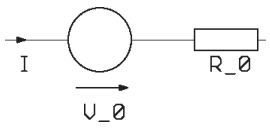
## Component

| Symbol | Conditions | Maximum Ratings | |
|---|---|---|---|
| $T_{VJ}$ | | -55...+150 | °C |
| $T_{stg}$ | | -55...+150 | °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

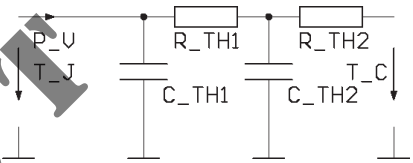
**Conduction**




IGBT (typ. at $V_{GE}$ = 15 V; $T_J$ = 125°C)
*$V_0$ = 1.09 V; $R_0$ = 85 mΩ*

Free Wheeling Diode (typ. at $T_J$ = 125°C)
*$V_0$ = 1.3 V; $R_0$ = 32 mΩ*

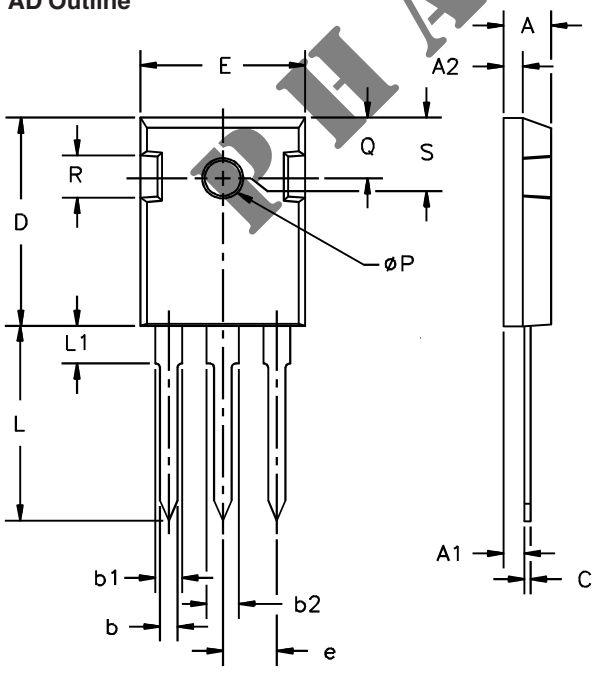
**Thermal Response**




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

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

### TO-247 AD Outline




| Dim. | Millimeter Min. | Max. | Inches Min. | Max. |
|---|---|---|---|---|
| A | 4.7 | 5.3 | .185 | .209 |
| $A_1$ | 2.2 | 2.54 | .087 | .102 |
| $A_2$ | 2.2 | 2.6 | .059 | .098 |
| b | 1.0 | 1.4 | .040 | .055 |
| $b_1$ | 1.65 | 2.13 | .065 | .084 |
| $b_2$ | 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 |

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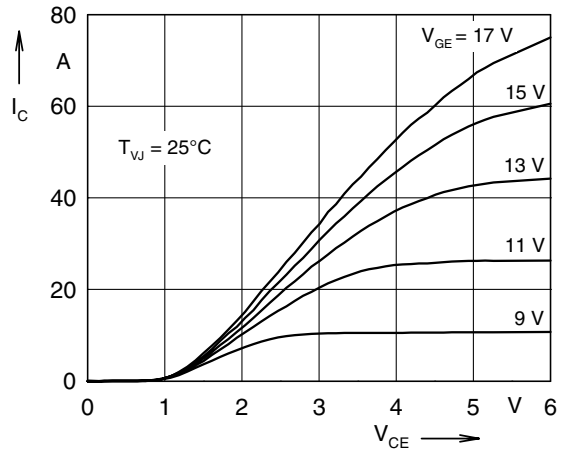


Fig. 1 Typ. output characteristics

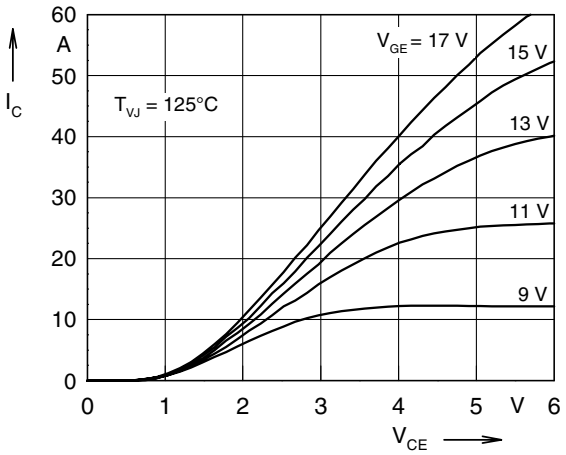


Fig. 2 Typ. output characteristics

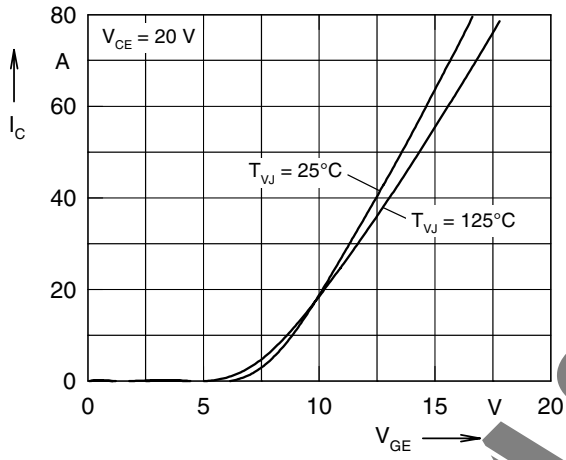


Fig. 3 Typ. transfer characteristics

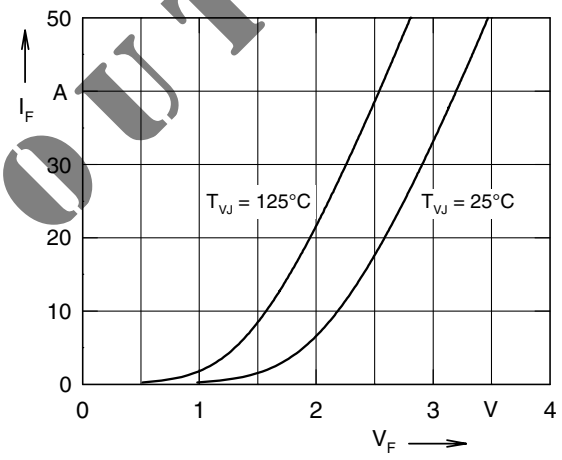


Fig. 4 Typ. forward characteristics of free wheeling diode

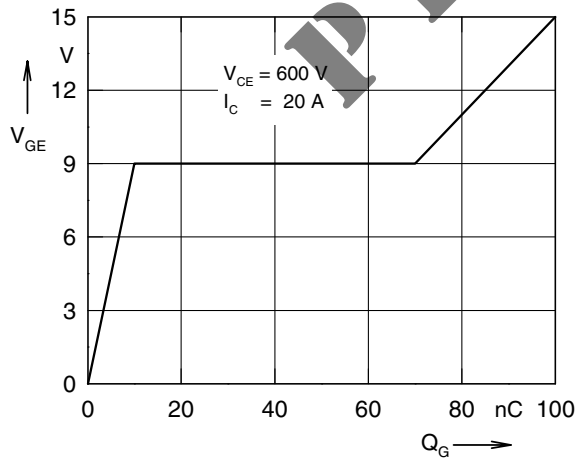


Fig. 5 Typ. turn on gate charge

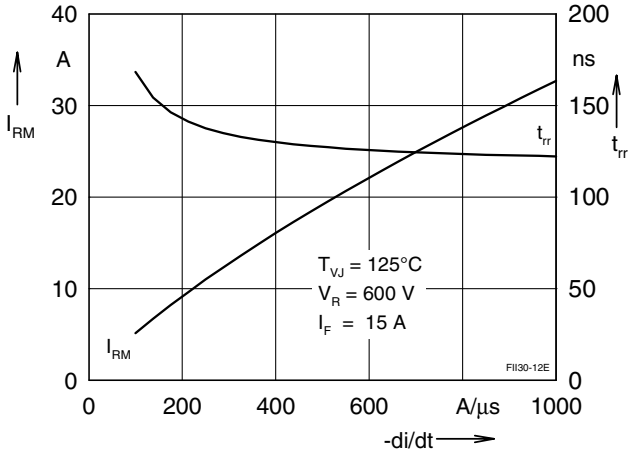


Fig. 6 Typ. turn off characteristics of free wheeling diode

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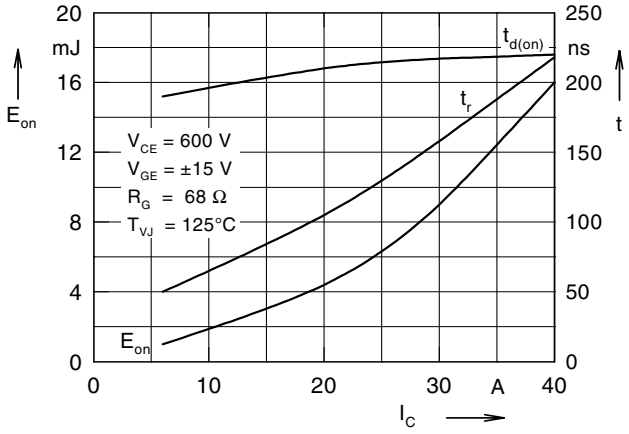


Fig. 7 Typ. turn on energy and switching times versus collector current

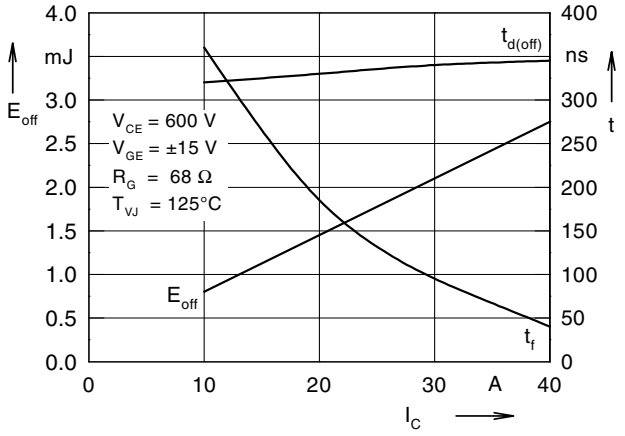


Fig. 8 Typ. turn off energy and switching times versus collector current

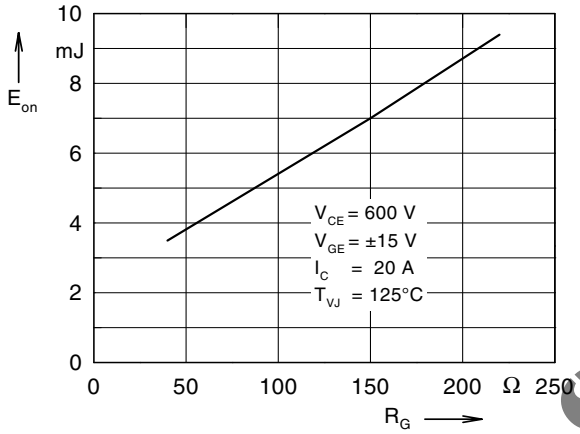


Fig. 9 Typ. turn on energy vs gate resistor

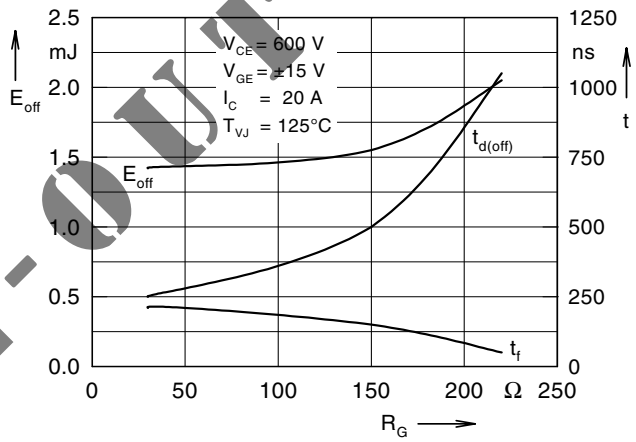


Fig.10 Typ. turn off energy and switching times versus gate resistor

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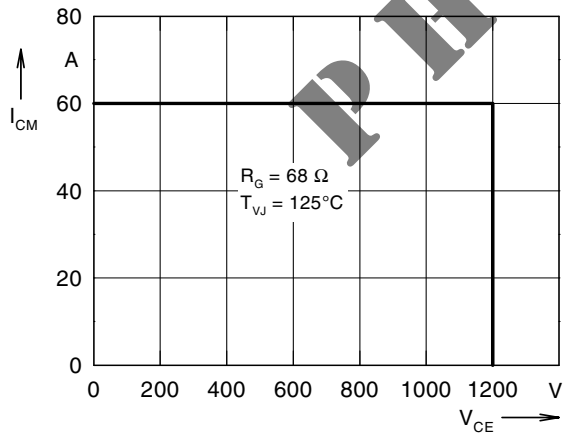


Fig. 11 Reverse biased safe operating area RBSOA

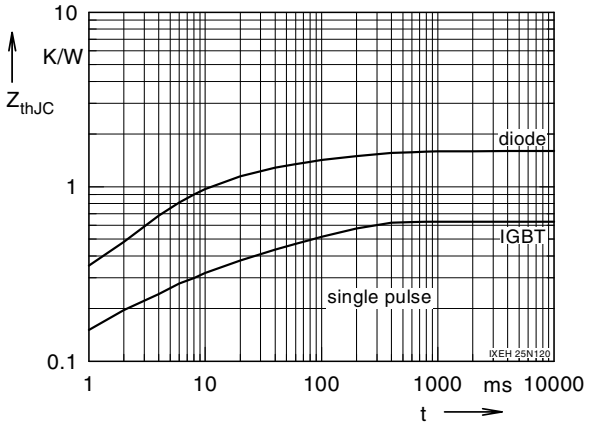


Fig. 12 Typ. transient thermal impedance

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