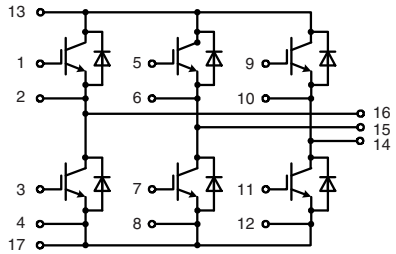
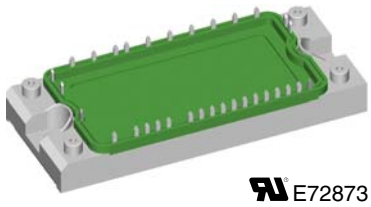
# IGBT Module
## Sixpack

Short Circuit SOA Capability
Square RBSOA

$I_{C25}$ = 52 A
$V_{CES}$ = 1200 V
$V_{CE(sat)\ typ.}$ = 1.9 V




See outline drawing for pin arrangement

### Features

- NPT³ IGBTs
  - low saturation voltage
  - positive temperature coefficient for easy paralleling
  - fast switching
  - short tail current for optimized performance also in resonant circuits
- HiPerFRED™ diode:
  - fast reverse recovery
  - low operating forward voltage
  - low leakage current
- Industry Standard Package
  - solderable pins for PCB mounting
  - isolated copper base plate

### Typical Applications

- AC drives
- power supplies with power factor correction

### IGBTs

| 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 | 52 | A |
| $I_{C80}$ | $T_C$ = 80°C | 36 | A |
| $I_{CM}$ | $V_{GE}$ = ±15 V; $R_G$ = 39 Ω; $T_{VJ}$ = 125°C | 70 | A |
| $V_{CEK}$ | RBSOA; clamped inductive load; L = 100 µH | $V_{CES}$ | |
| $t_{SC}$ | $V_{CE}$ = 900 V; $V_{GE}$ = ±15 V; $R_G$ = 39 Ω; $T_{VJ}$ = 125°C<br>SCSOA; non-repetitive | 10 | µs |
| $P_{tot}$ | $T_C$ = 25°C | 225 | 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 | | 1.9 | 2.4 | V |
| | $T_{VJ}$ = 125°C | | 2.1 | | V |
| $V_{GE(th)}$ | $I_C$ = 1 mA; $V_{GE}$ = $V_{CE}$ | 4.5 | | 6.5 | V |
| $I_{CES}$ | $V_{CE}$ = $V_{CES}$; $V_{GE}$ = 0 V; $T_{VJ}$ = 25°C | | | 0.4 | mA |
| | $T_{VJ}$ = 125°C | | 0.4 | | mA |
| $I_{GES}$ | $V_{CE}$ = 0 V; $V_{GE}$ = ± 20 V | | | 200 | nA |
| $t_{d(on)}$ | Inductive load, $T_{VJ}$ = 125°C | | 80 | | ns |
| $t_r$ | $V_{CE}$ = 600 V; $I_C$ = 25 A | | 50 | | ns |
| $t_{d(off)}$ | $V_{GE}$ = ±15 V; $R_G$ = 39 Ω | | 440 | | ns |
| $t_f$ | | | 50 | | ns |
| $E_{on}$ | | | 3.8 | | mJ |
| $E_{off}$ | | | 2.0 | | mJ |
| $C_{ies}$ | $V_{CE}$ = 25 V; $V_{GE}$ = 0 V; f = 1 MHz | | 2 | | nF |
| $Q_{Gon}$ | $V_{CE}$ = 600 V; $V_{GE}$ = 15 V; $I_C$ = 35 A | | 150 | | nC |
| $R_{thJC}$ | (per IGBT) | | | 0.55 | K/W |

IXYS reserves the right to change limits, test conditions and dimensions.

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| Symbol | Conditions | Maximum Ratings | |
|---|---|---|---|
| $I_{F25}$ | $T_C$ = 25°C | 50 | A |
| $I_{F80}$ | $T_C$ = 80°C | 33 | A |

| Symbol | Conditions | Characteristic Values min. | typ. | max. | |
|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 25 A; $V_{GE}$ = 0 V; $T_{VJ}$ = 25°C | | 2.3 | 2.7 | V |
| | $T_{VJ}$ = 125°C | | 1.7 | | V |
| $I_{RM}$ | $I_F$ = 30 A; $di_F/dt$ = -1100 A/µs; $T_{VJ}$ = 125°C | | 51 | | A |
| $t_{rr}$ | $V_R$ = 600 V; $V_{GE}$ = 0 V | | 180 | | ns |
| $E_{rec(off)}$ | | | 1.8 | | mJ |
| $R_{thJC}$ | (per diode) | | | 1.19 | K/W |

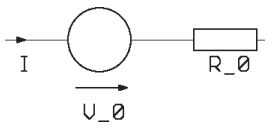
## Module

| Symbol | Conditions | Maximum Ratings | |
|---|---|---|---|
| $T_{VJ}$ | | -40...+150 | °C |
| $T_{stg}$ | | -40...+125 | °C |
| $V_{ISOL}$ | $I_{ISOL} \leq$ 1 mA; 50/60 Hz | 2500 | V~ |
| $M_d$ | Mounting torque (M5) | 2.7 - 3.3 | Nm |

| Symbol | Conditions | Characteristic Values min. | typ. | max. | |
|---|---|---|---|---|---|
| $R_{pin-chip}$ | | | 5 | | mΩ |
| $d_S$ | Creepage distance on surface | 6 | | | mm |
| $d_A$ | Strike distance in air | 6 | | | mm |
| $R_{thCH}$ | with heatsink compound | | 0.02 | | K/W |
| **Weight** | | | 180 | | g |

### Equivalent Circuits for Simulation

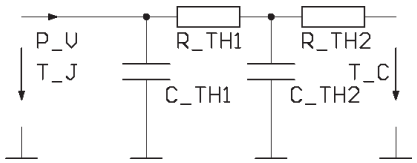
**Conduction**




IGBT (typ. at $V_{GE}$ = 15 V; $T_J$ = 125°C)
*$V_0$ = 0.95 V; $R_0$ = 48 mΩ*

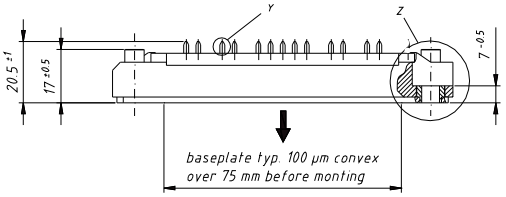
Free Wheeling Diode (typ. at $T_J$ = 125°C)
*$V_0$ = 1.3 V; $R_0$ = 16.0 mΩ*

**Thermal Response**

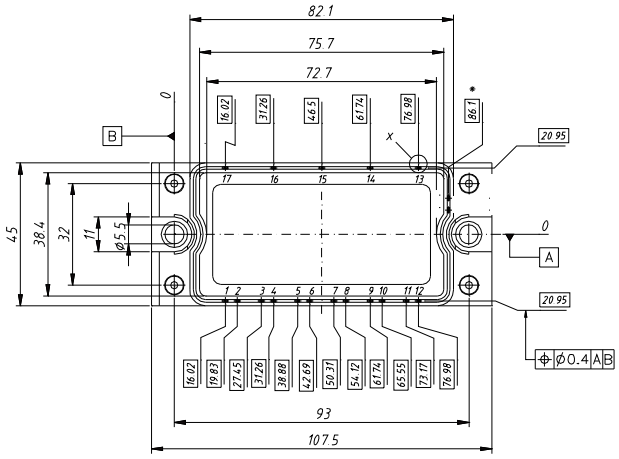



IGBT (typ.)
*$C_{th1}$ = 0.129 J/K; $R_{th1}$ = 0.415 K/W*
*$C_{th2}$ = 1.279 J/K; $R_{th2}$ = 0.135 K/W*

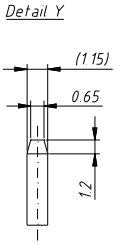
Free Wheeling Diode (typ.)
*$C_{th1}$ = 0.069 J/K; $R_{th1}$ = 0.956 K/W*
*$C_{th2}$ = 0.847 J/K; $R_{th2}$ = 0.234 K/W*

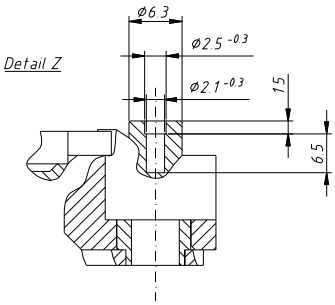



**Dimensions in mm (1 mm = 0.0394")**





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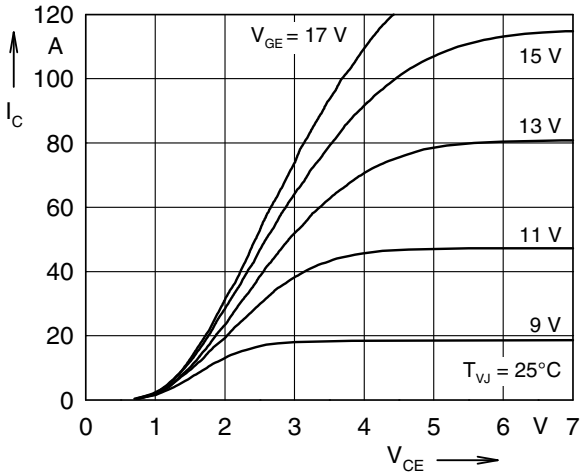


Fig. 1 Typ. output characteristics

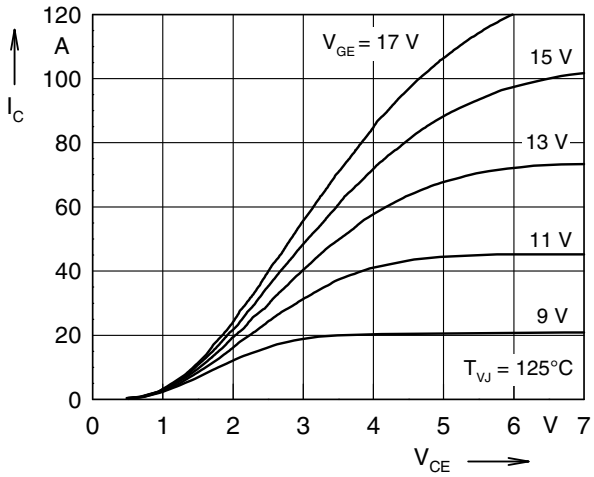


Fig. 2 Typ. output characteristics

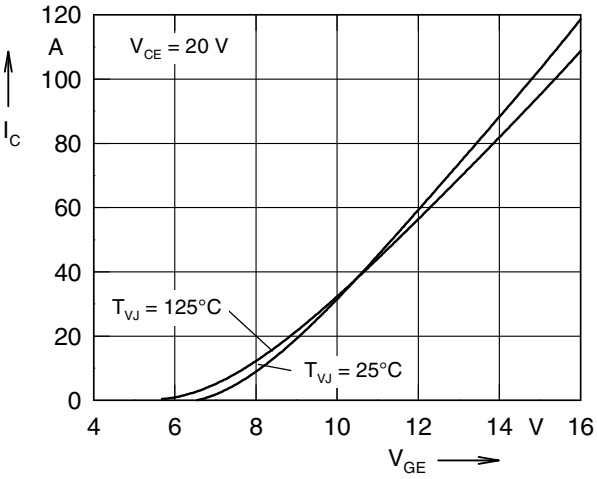


Fig. 3 Typ. transfer characteristics

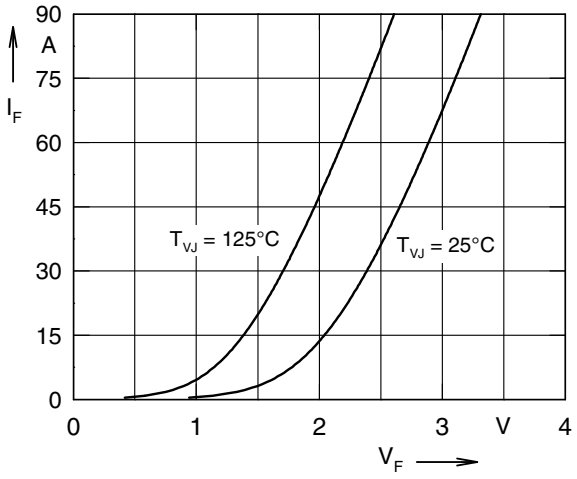


Fig. 4 Typ. forward characteristics of free wheeling diode

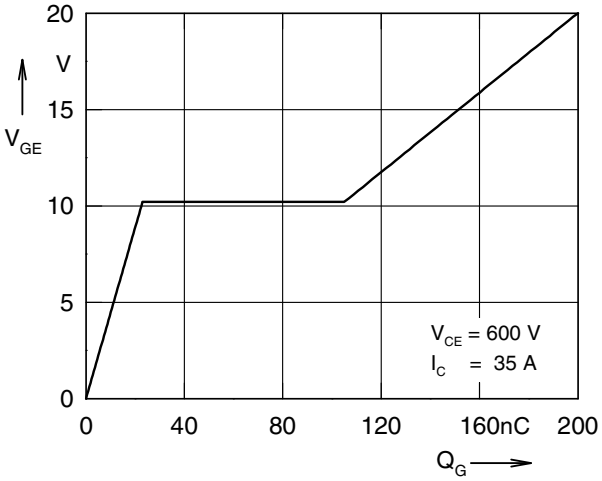


Fig. 5 Typ. turn on gate charge

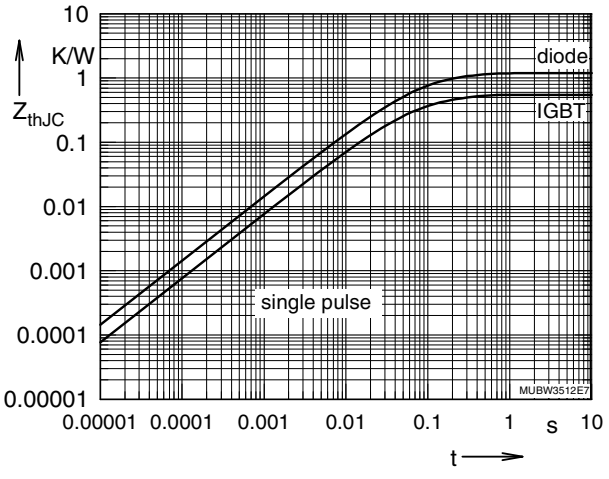


Fig. 6 Typ. transient thermal impedance

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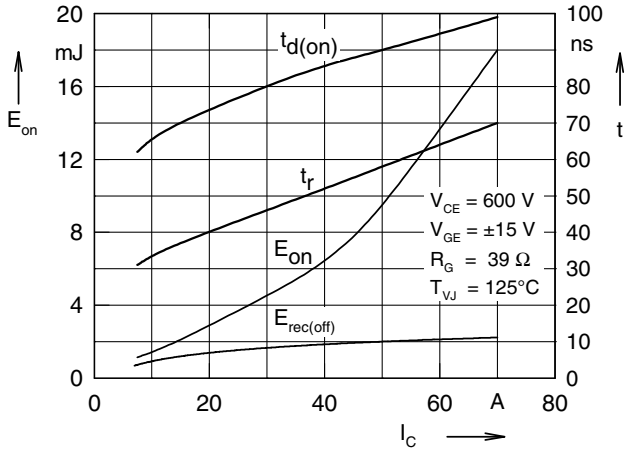


Fig. 7 Typ. turn on energy and switching times versus collector current

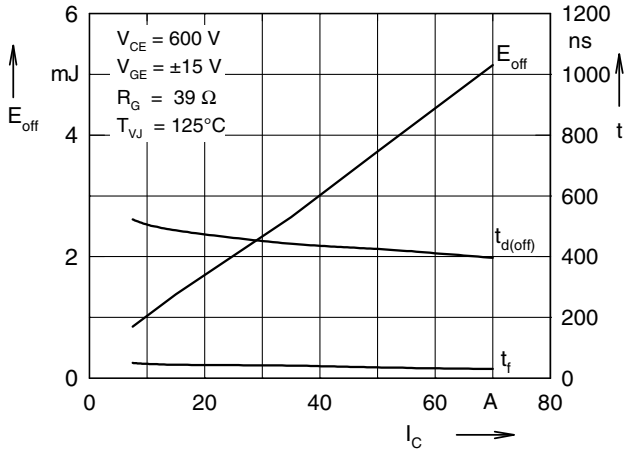


Fig. 8 Typ. turn off energy and switching times versus collector current

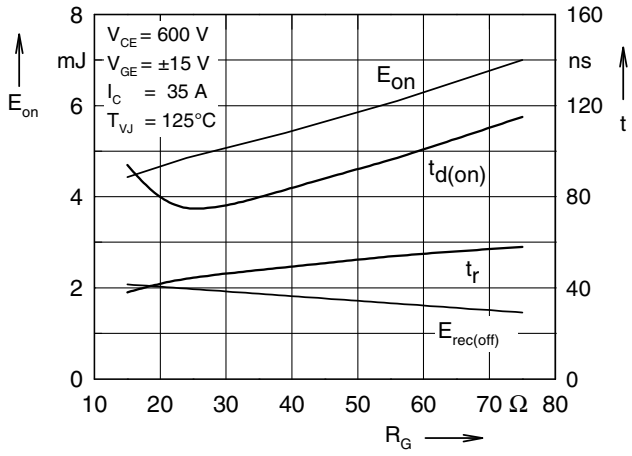


Fig. 9 Typ. turn on energy and switching times versus gate resistor

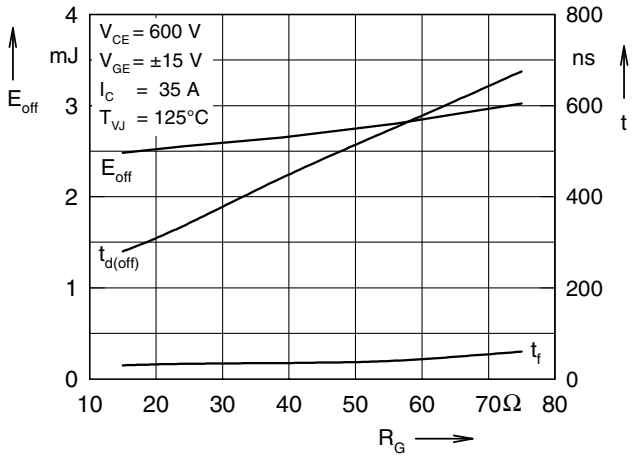


Fig.10 Typ. turn off energy and switching times versus gate resistor

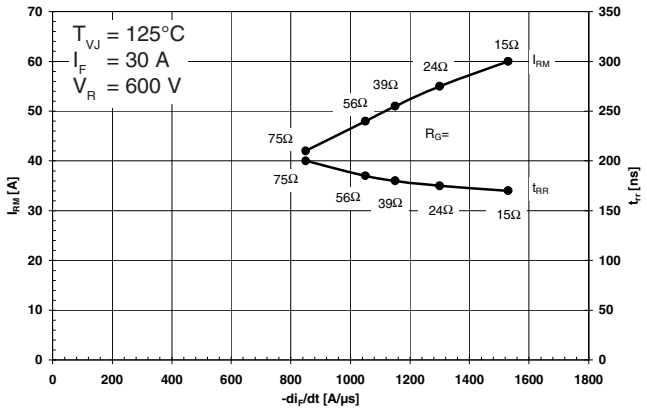


Fig. 11 Typ. turn off characteristics of free wheeling diode

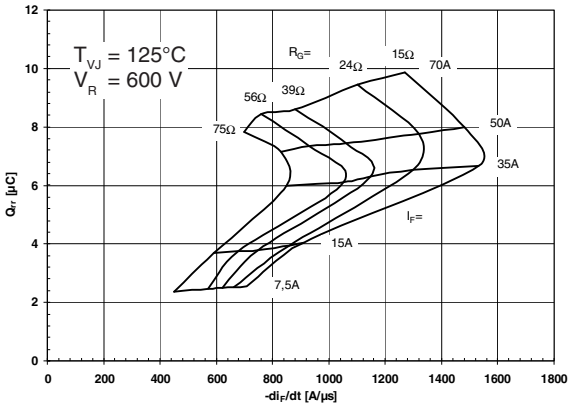


Fig. 12 Typ. turn off characteristics of free wheeling diode

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