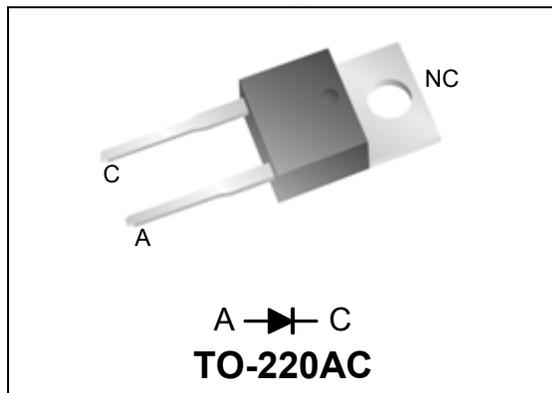


## 600V, 12A H-Series PFC Rectifier

### Product Summary

|                                    |      |    |
|------------------------------------|------|----|
| $I_{F(AVG)}$                       | 12   | A  |
| $V_{RRM}$                          | 600  | V  |
| $Q_{RR}$ (Typ at 125 °C)           | 30   | nC |
| $I_{RRM}$ (Typ at 125 °C)          | 2.2  | A  |
| Softness $t_b/t_a$ (Typ at 125 °C) | 0.65 |    |

### Pin Assignment



### RoHS Compliant

Package uses Lead-free plating and Green mold compound.  
Halogen free per IEC 61249-2-21.

### General Description

Utilizing proprietary Qspeed technology this device has the lowest  $Q_{RR}$  of any 600V Silicon diode. Its recovery characteristics increase efficiency, reduce EMI and eliminate snubbers.

### Applications

- Power Factor Correction (PFC) Boost Diode
- Motor drive circuits
- DC-AC Inverters

### Features

- Low  $Q_{RR}$ , Low  $I_{RRM}$ , Low  $t_{RR}$
- High  $di_F/dt$  capable (1000A/ $\mu$ s)
- Soft recovery

### Benefits

- Increases efficiency
  - Eliminates need for snubber circuits
  - Reduces EMI filter component size & count
- Enables extremely fast switching

### Absolute Maximum Ratings

Absolute maximum ratings are the values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

| Symbol       | Parameter                         | Conditions  | Rating     | Units |
|--------------|-----------------------------------|---|------------|-------|
| $V_{RRM}$    | Peak repetitive reverse voltage   |   | 600        | V     |
| $I_{F(AVG)}$ | Average forward current           | $T_J = 150\text{ °C}$ , $T_C = 90\text{ °C}$                        | 12         | A     |
| $I_{FSM}$    | Non-repetitive peak surge current | 60 Hz, 1/2 cycle  | 100        | A     |
| $I_{FSM}$    | Non-repetitive peak surge current | 1/2 cycle of $t=28\text{ }\mu\text{s}$ Sinusoid, $T_C=25\text{ °C}$ | 350        | A     |
| $T_{J(MAX)}$ | Maximum junction temperature      |   | 150        | °C    |
| $T_{STG}$    | Storage temperature               |   | -55 to 150 | °C    |
|              | Lead soldering temperature        | Leads at 1.6 mm from case, 10 sec                                   | 300        | °C    |
| $V_{ISOL}$   | Isolation voltage (leads-to-tab)  | AC  | 2500       | V     |
| $P_D$        | Power dissipation                 | $T_C = 25\text{ °C}$  | 61         | W     |

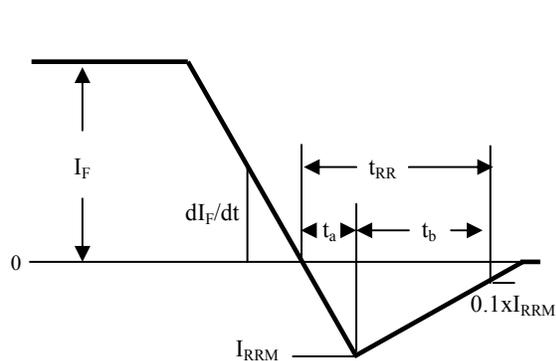
### Thermal Resistance

| Symbol          | Resistance from:    | Conditions | Rating | Units |
|-----------------|---------------------|------------|--------|-------|
| $R_{\theta JA}$ | Junction to ambient | TO-220     | 62     | °C/W  |
| $R_{\theta JC}$ | Junction to case    | TO-220     | 2.05   | °C/W  |

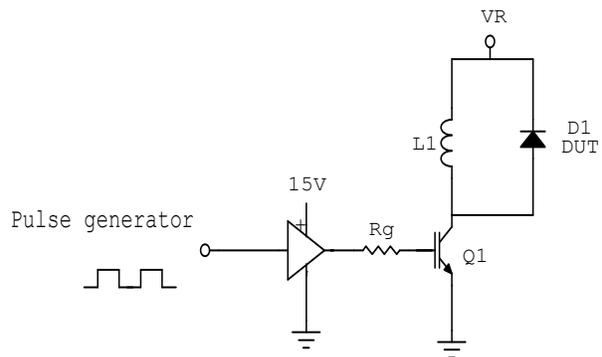
**Electrical Specifications at T<sub>J</sub> = 25 °C (unless otherwise specified)**

| Symbol                         | Parameter                           | Conditions   | Min                     | Typ  | Max  | Units |    |
|--------------------------------|-------------------------------------|--|-------------------------|------|------|-------|----|
| <b>DC Characteristics</b>      |                                     |  |                         |      |      |       |    |
| I <sub>R</sub>                 | Reverse current                     | V <sub>R</sub> = 600V, T <sub>J</sub> = 25 °C                  | -                       | -    | 250  | μA    |    |
|                                |                                     | V <sub>R</sub> = 600V, T <sub>J</sub> = 125 °C                 | -                       | 0.6  | -    | mA    |    |
| V <sub>F</sub>                 | Forward voltage                     | I <sub>F</sub> = 12A, T <sub>J</sub> = 25 °C                   | -                       | 2.65 | 3.1  | V     |    |
|                                |                                     | I <sub>F</sub> = 12A, T <sub>J</sub> = 150 °C                  | -                       | 2.33 | -    | V     |    |
| C <sub>J</sub>                 | Junction capacitance                | V <sub>R</sub> = 10V, 1 MHz                                    | -                       | 34   | -    | pF    |    |
| <b>Dynamic Characteristics</b> |                                     |  |                         |      |      |       |    |
| t <sub>RR</sub>                | Reverse recovery time               | dI/dt = 200A/μs<br>V <sub>R</sub> = 400V, I <sub>F</sub> = 12A | T <sub>J</sub> = 25 °C  | -    | 11.6 | -     | ns |
|                                |                                     |  | T <sub>J</sub> = 125 °C | -    | 20.5 | -     | ns |
| Q <sub>RR</sub>                | Reverse recovery charge             | dI/dt = 200A/μs<br>V <sub>R</sub> = 400V, I <sub>F</sub> = 12A | T <sub>J</sub> = 25 °C  | -    | 9.2  | 14    | nC |
|                                |                                     |  | T <sub>J</sub> = 125 °C | -    | 30   | -     | nC |
| I <sub>RRM</sub>               | Maximum reverse recovery current    | dI/dt = 200A/μs<br>V <sub>R</sub> = 400V, I <sub>F</sub> = 12A | T <sub>J</sub> = 25 °C  | -    | 1.27 | 1.8   | A  |
|                                |                                     |  | T <sub>J</sub> = 125 °C | -    | 2.2  | -     | A  |
| S                              | Softness factor = $\frac{t_b}{t_a}$ | dI/dt = 200A/μs<br>V <sub>R</sub> = 400V, I <sub>F</sub> = 12A | T <sub>J</sub> = 25 °C  | -    | 0.6  | -     |    |
|                                |                                     |  | T <sub>J</sub> = 125 °C | -    | 0.65 | -     |    |

**Note to component engineers:** Qspeed rectifiers employ Schottky technologies in their design and construction. Therefore, Component Engineers should plan their test setups to be similar to those for traditional Schottky test setups. (For additional details, see Qspeed Application Note AN-300.)

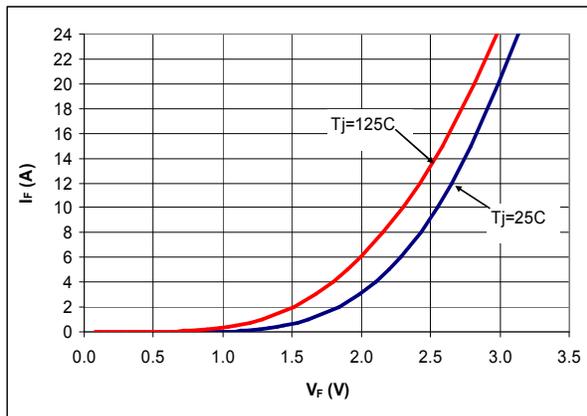


**Figure 1. Reverse Recovery Definitions**

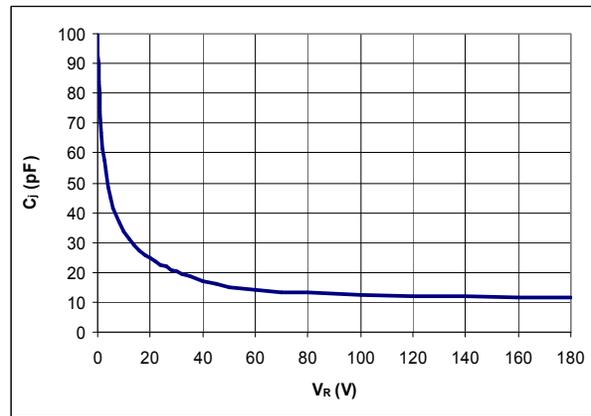


**Figure 2. Reverse Recovery Test Circuit**

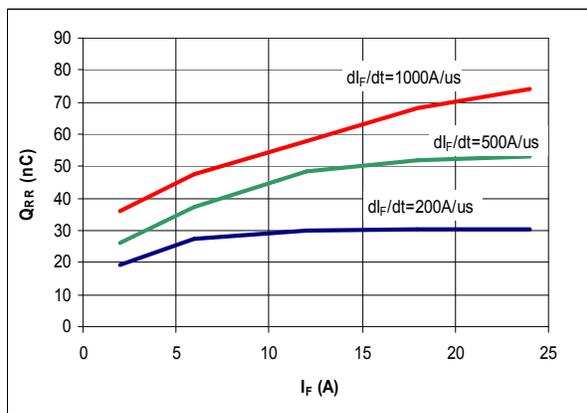
**Electrical Specifications at  $T_J = 25\text{ }^\circ\text{C}$  (unless otherwise specified)**



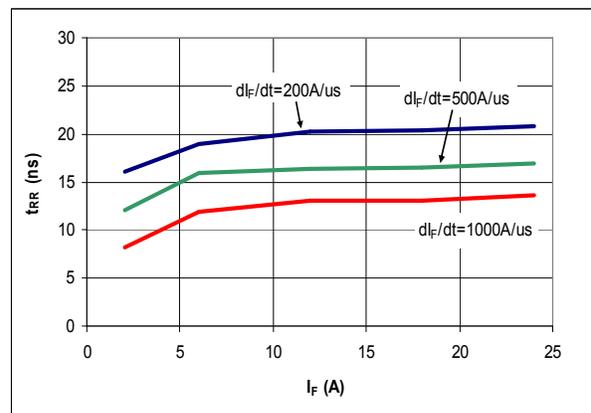
**Figure 3. Typical  $I_F$  vs  $V_F$**



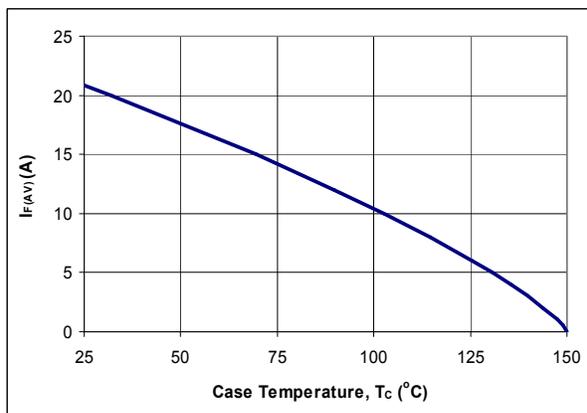
**Figure 4. Typical  $C_J$  vs  $V_R$**



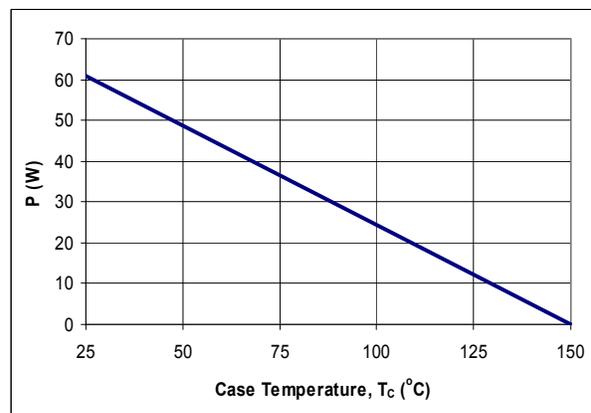
**Figure 5. Typical  $Q_{RR}$  vs  $I_F$  at  $T_J = 125\text{ }^\circ\text{C}$**



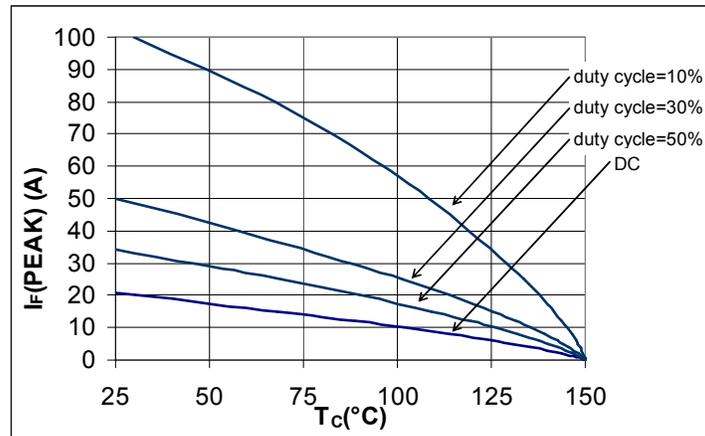
**Figure 6. Typical  $t_{RR}$  vs  $I_F$  at  $T_J = 125\text{ }^\circ\text{C}$**



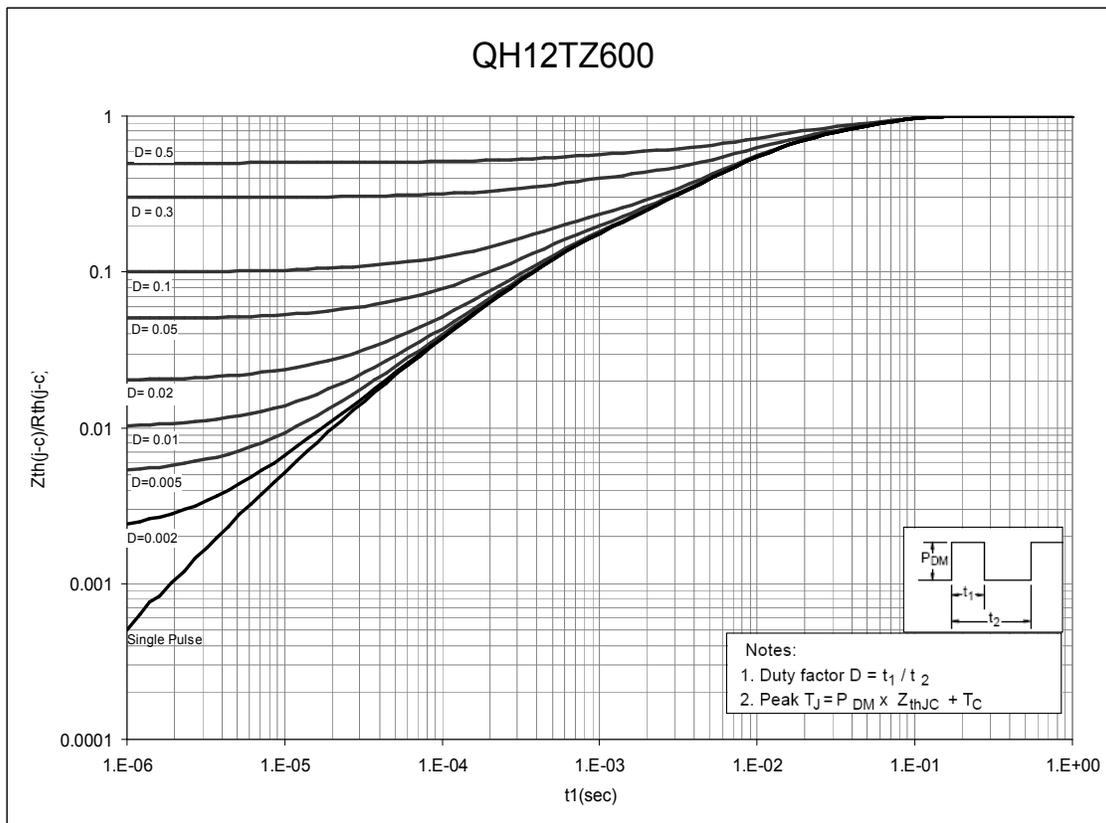
**Figure 7. DC Current Derating Curve**



**Figure 8. Power Derating Curve**

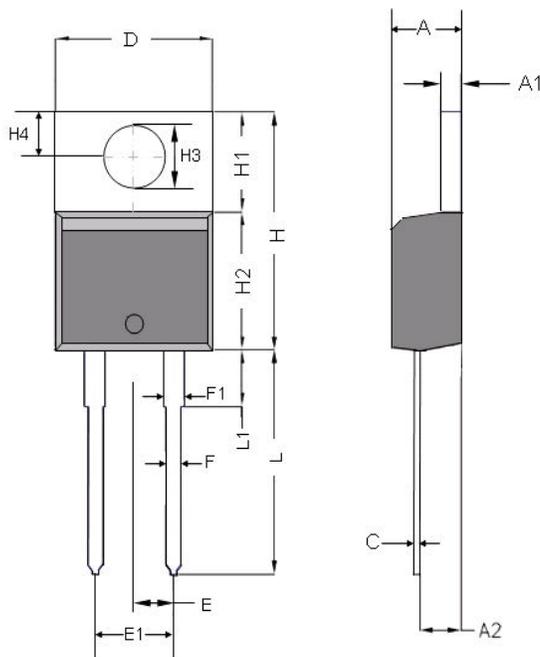


**Figure 9.  $I_F(\text{PEAK})$  vs  $T_C$ ,  $f=70$  kHz**



**Figure 10. Normalized Maximum Transient Thermal Impedance**

## Dimensional Outline Drawings



| Dim | Millimeters |       |
|-----|-------------|-------|
|     | MIN         | MAX   |
| A   | 4.32        | 4.70  |
| A1  | 1.14        | 1.40  |
| A2  | 2.03        | 2.79  |
| C   | 0.34        | 0.610 |
| D   | 9.65        | 10.67 |
| E   | 2.49        | 2.59  |
| E1  | 4.98        | 5.18  |
| F   | 0.508       | 1.016 |
| F1  | 1.14        | 1.78  |
| H   | 14.71       | 16.51 |
| H1  | 5.84        | 6.795 |
| H2  | 8.40        | 9.00  |
| H3  | 3.53        | 3.96  |
| H4  | 2.54        | 3.05  |
| L   | 12.70       | 14.22 |
| L1  | -           | 6.35  |

| Mechanical Mounting Method        | Maximum Torque / Pressure specification   |
|-----------------------------------|---|
| Screw through hole in package tab | 1 Newton Meter (nm) or 8.8 inch-pounds (lb-in)  |
| Clamp against package body        | 12.3 kilogram-force per square centimeter (kgf/cm <sup>2</sup> ) or 175 lbf/in <sup>2</sup> |

**Soldering time and temperature:** This product has been designed for use with high-temperature, lead-free solder. The component leads can be subjected to a maximum temperature of 300 °C, for up to 10 seconds. See Application Note AN-303, for more details.

## Ordering Information

| Part Number | Package  | Packing       |
|-------------|----------|---------------|
| QH12TZ600   | TO-220AC | 50 units/tube |

The information contained in this document is subject to change without notice.

### LIFE SUPPORT POLICY

This product is not designed for use in life support appliances, devices or systems where malfunction of the product may result in personal injury. Qspeed Semiconductor cannot be held liable for damages or injuries that might result from the failure of the Qspeed Semiconductor product in such applications.