

# QH30TZ650

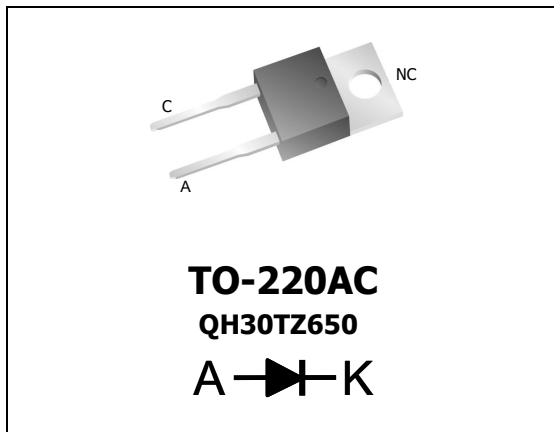
## Qspeed™ Family

650 V, 30 A H-Series PFC Diode

### Product Summary

$I_{F(AVG)}$	30	A
$V_{RRM}$	650	V
$Q_{RR}$ (Typ at 125 °C)	180	nC
$I_{RRM}$ (Typ at 125 °C)	5.8	A
Softness $t_B/t_A$ (Typ at 125 °C)	0.3	

### Pin Assignment



### RoHS Compliant

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

### General Description

This device has the lowest  $Q_{RR}$  of any 650 V silicon diode. Its recovery characteristics increases efficiency, reduces EMI and eliminates snubbers. Replaces SiC diodes for similar efficiency performance in high switching frequency applications.

### Applications

- Power Factor Correction boost diode
- Server power supplies
- Motor drive circuits
- DC-AC inverters
- Output rectifier

### Features

- High  $dI_F/dt$  capable (1000 A /  $\mu$ 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	$T_J = 25\text{ °C}$	650	V
$I_{F(AVG)}$	Average forward current	$T_J = 150\text{ °C}, T_C = 25\text{ °C}$	30	A
$I_{FSM}$	Non-repetitive peak surge current	60 Hz, 1/2 cycle, $T_C = 25\text{ °C}$	160	A
$I_{FSM}$	Non-repetitive peak surge current	1/2 cycle of $t = 28\text{ }\mu$ s Sinusoid, $T_C = 25\text{ °C}$	350	A
$T_J$	Operating junction temperature range		-55 to 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, TO-220	2500	V
$P_D$	Power dissipation	$T_C = 25\text{ °C}$	78	W

## Thermal Resistance

Symbol	Resistance from:	Conditions	Rating	Units
$R_{\theta JA}$	Junction to ambient	TO-220	62	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}$	Junction to case		1.6	$^{\circ}\text{C}/\text{W}$

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

Symbol	Parameter	Conditions	Min	Typ	Max	Units	
<b>DC Characteristics</b>							
$I_R$	Reverse current	$V_R = 650\text{ V}, T_J = 25\text{ }^{\circ}\text{C}$	-	-	500	$\mu\text{A}$	
		$V_R = 650\text{ V}, T_J = 125\text{ }^{\circ}\text{C}$	-	3.7	-	$\text{mA}$	
$V_F$	Forward voltage	$I_F = 30\text{ A}, T_J = 25\text{ }^{\circ}\text{C}$	-	2.75	3.15	$\text{V}$	
		$I_F = 30\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$	-	2.32	-	$\text{V}$	
$C_J$	Junction capacitance	$V_R = 10\text{ V}, 1\text{ MHz}$	-	142	-	$\text{pF}$	
<b>Dynamic Characteristics</b>							
$t_{RR}$	Reverse recovery time	$di/dt = 200\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}, I_F = 30\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	28.4	-	$\text{ns}$
			$T_J = 125\text{ }^{\circ}\text{C}$	-	47.0	-	$\text{ns}$
$Q_{RR}$	Reverse recovery charge	$di/dt = 200\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}, I_F = 30\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	65	105	$\text{nC}$
			$T_J = 125\text{ }^{\circ}\text{C}$	-	180	-	$\text{nC}$
$I_{RRM}$	Maximum reverse recovery current	$di/dt = 200\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}, I_F = 30\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	3.5	5.0	$\text{A}$
			$T_J = 125\text{ }^{\circ}\text{C}$	-	5.8	-	$\text{A}$
$S$	Softness factor = $\frac{t_B}{t_A}$	$di/dt = 200\text{ A}/\mu\text{s}$ $V_R = 400\text{ V}, I_F = 30\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$	-	0.5	-	
			$T_J = 125\text{ }^{\circ}\text{C}$	-	0.3	-	

**Note to component engineers:** H-Series diodes 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 Application Note AN-300.)

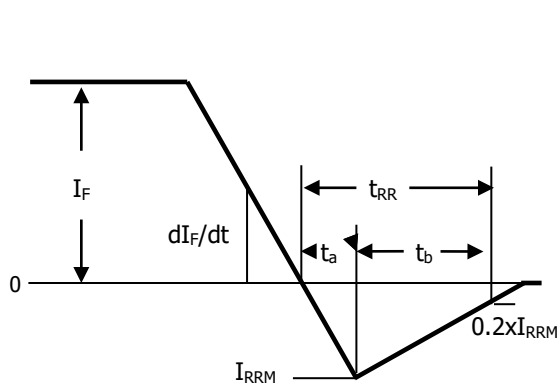
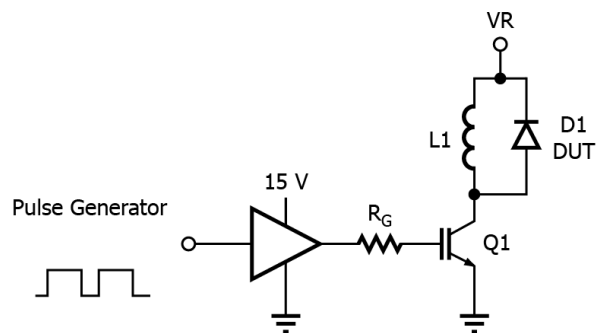


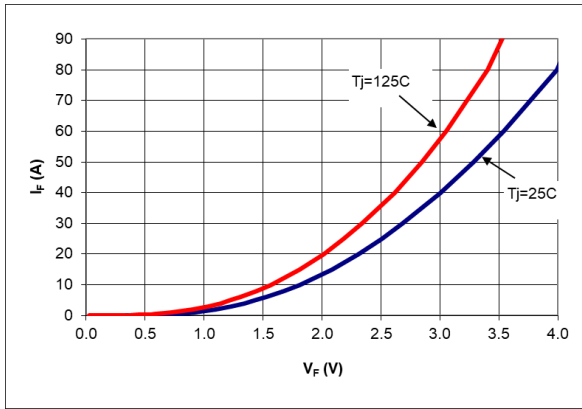
Figure 1. Reverse Recovery Definitions



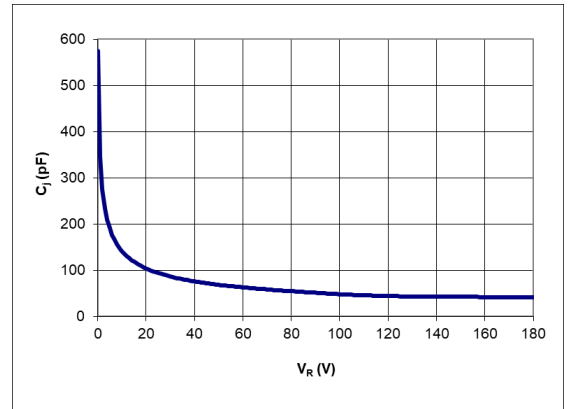
PI-7614-041315

Figure 2. Reverse Recovery Test Circuit

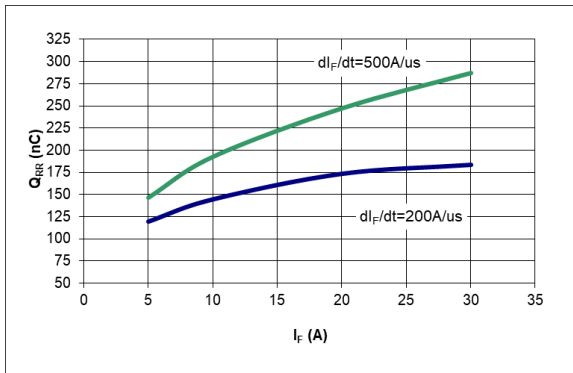
**Electrical Specifications at  $T_J = 25\text{ }^\circ\text{C}$  (unless otherwise specified)**



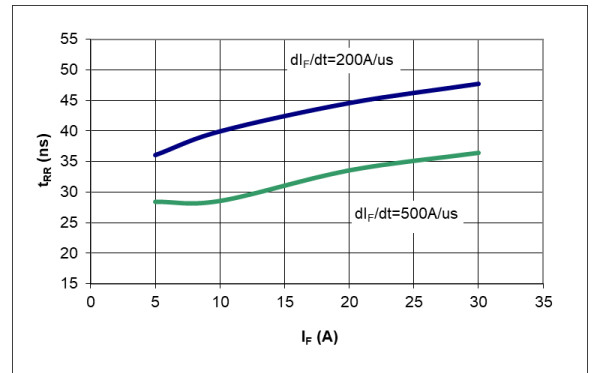
**Figure 3. Typical  $I_F$  vs  $V_F$**



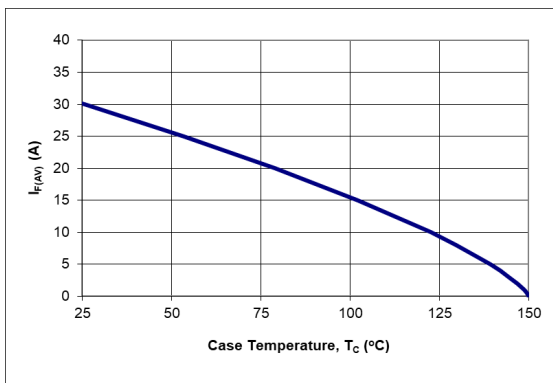
**Figure 4. Typical  $C_j$  vs  $V_R$**



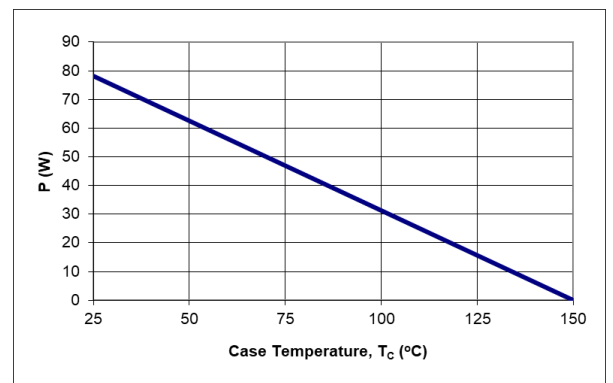
**Figure 5. Typical  $Q_{RR}$  vs  $I_F$  at  $T_J = 125\text{ }^\circ\text{C}$**



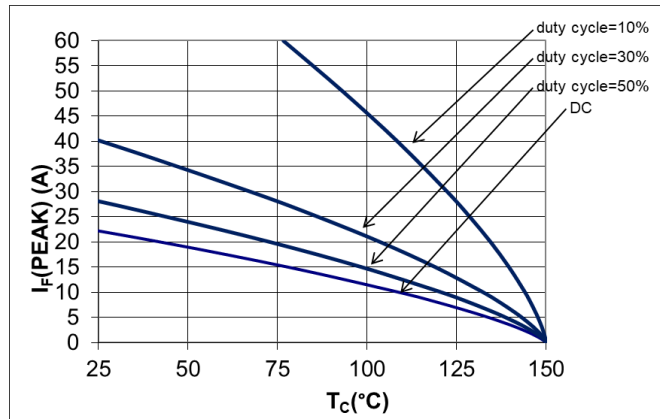
**Figure 6. Typical  $t_{RR}$  vs  $I_F$  at  $T_J = 125\text{ }^\circ\text{C}$**



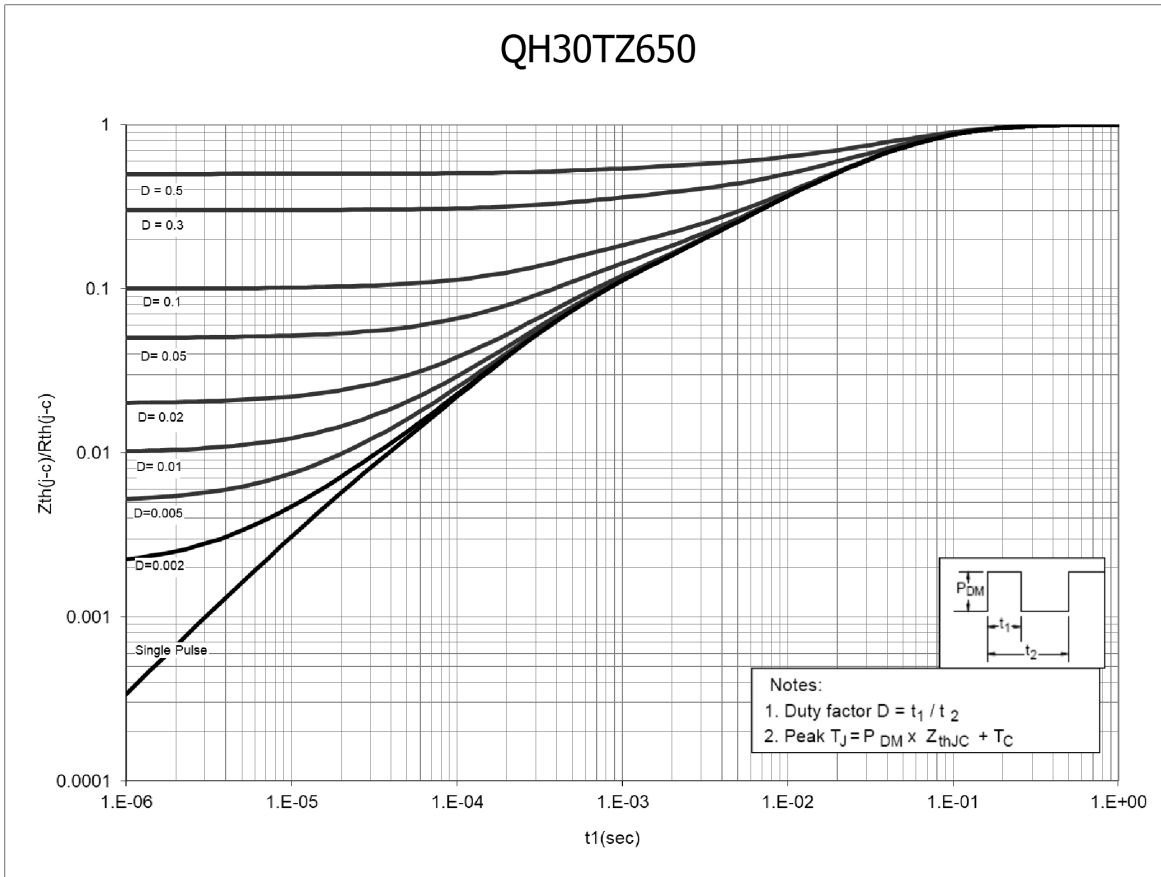
**Figure 7. DC Current Derating Curve**



**Figure 8. Power Derating Curve**



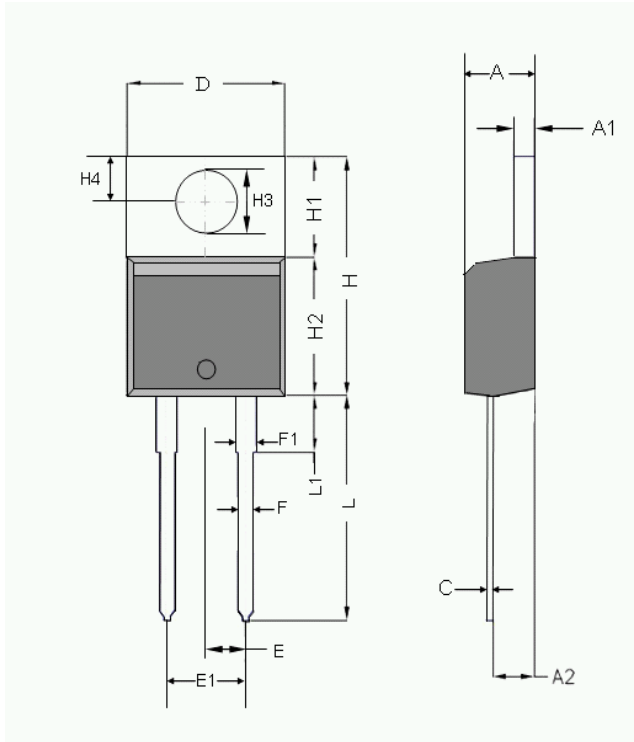
**Figure 9.  $I_F(\text{PEAK})$  vs  $T_C$ ,  $f = 70 \text{ kHz}$**



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

## Dimensional Outline Drawings

TO-220AC



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
QH30TZ650	TO-220AC	50 units/tube

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

---

<b>Revision</b>	<b>Notes</b>	<b>Date</b>
1.0	Production release.	0824

## For the latest updates, visit our website: [www.power.com](http://www.power.com)

Reference Designs are technical proposals concerning how to use Power Integrations' gate drivers in particular applications and/or with certain power modules. These proposals are "as is" and are not subject to any qualification process. The suitability, implementation and qualification are the sole responsibility of the end user. The statements, technical information and recommendations contained herein are believed to be accurate as of the date hereof. All parameters, numbers, values and other technical data included in the technical information were calculated and determined to our best knowledge in accordance with the relevant technical norms (if any). They may be based on assumptions or operational conditions that do not necessarily apply in general. We exclude any representation or warranty, express or implied, in relation to the accuracy or completeness of the statements, technical information and recommendations contained herein. No responsibility is accepted for the accuracy or sufficiency of any of the statements, technical information, recommendations or opinions communicated and any liability for any direct, indirect or consequential loss or damage suffered by any person arising therefrom is expressly disclaimed.

Power Integrations reserves the right to make changes to its products at any time to improve reliability or manufacturability. Power Integrations does not assume any liability arising from the use of any device or circuit described herein. POWER INTEGRATIONS MAKES NO WARRANTY HEREIN AND SPECIFICALLY DISCLAIMS ALL WARRANTIES INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF THIRD PARTY RIGHTS.

### Patent Information

The products and applications illustrated herein (including transformer construction and circuits' external to the products) may be covered by one or more U.S. and foreign patents, or potentially by pending U.S. and foreign patent applications assigned to Power Integrations. A complete list of Power Integrations' patents may be found at [www.power.com](http://www.power.com). Power Integrations grants its customers a license under certain patent rights as set forth at <http://www.power.com/ip.htm>.

Power Integrations, the Power Integrations logo, CAPZero, ChiPhy, CHY, DPA-Switch, EcoSmart, E-Shield, eSIP, eSOP, HiperLCS, HiperPLC, HiperPFS, HiperTFS, InnoSwitch, Innovation in Power Conversion, InSOP, LinkSwitch, LinkZero, LYTSwitch, SENZero, TinySwitch, TOPSwitch, PI, PI Expert, PowiGaN, SCALE, SCALE-1, SCALE-2, SCALE-3 and SCALE-iDriver, are trademarks of Power Integrations, Inc. Other trademarks are property of their respective companies. ©2022, Power Integrations, Inc.

## Power Integrations Worldwide Sales Support Locations

### WORLD HEADQUARTERS

5245 Hellyer Avenue  
San Jose, CA 95138, USA.  
Main: +1-408-414-9200  
Customer Service:  
Worldwide: +1-65-635-64480  
Americas: +1-408-414-9621  
e-mail: [usasales@power.com](mailto:usasales@power.com)

### CHINA (SHANGHAI)

Rm 2410, Charity Plaza, No. 88,  
North Caoxi Road,  
Shanghai, PRC 200030  
Phone: +86-21-6354-6323  
e-mail: [chinasales@power.com](mailto:chinasales@power.com)

### CHINA (SHENZHEN)

17/F, Hivac Building, No. 2, Keji  
Nan 8th Road, Nanshan District,  
Shenzhen, China, 518057  
Phone: +86-755-8672-8689  
e-mail: [chinasales@power.com](mailto:chinasales@power.com)

### GERMANY

(AC-DC/LED/Motor Control  
Sales)  
Einsteinring 24  
85609 Dornach/Aschheim  
Germany  
Tel: +49-89-5527-39100  
e-mail: [eurosales@power.com](mailto:eurosales@power.com)

### GERMANY (Gate Driver Sales)

HellwegForum 3  
59469 Ense  
Germany  
Tel: +49-2938-64-39990  
e-mail: [igbt-driver.sales@power.com](mailto:igbt-driver.sales@power.com)

### INDIA

#1, 14<sup>th</sup> Main Road  
Vasanthanagar  
Bangalore-560052  
India  
Phone: +91-80-4113-8020  
e-mail: [indiasales@power.com](mailto:indiasales@power.com)

### ITALY

Via Milanese 20, 3<sup>rd</sup>. Fl.  
20099 Sesto San Giovanni (MI) Italy  
Phone: +39-024-550-8701  
e-mail: [eurosales@power.com](mailto:eurosales@power.com)

### JAPAN

Yusen Shin-Yokohama 1-chome Bldg.  
1-7-9, Shin-Yokohama, Kohoku-ku  
Yokohama-shi,  
Kanagawa 222-0033 Japan  
Phone: +81-45-471-1021  
e-mail: [japansales@power.com](mailto:japansales@power.com)

### KOREA

RM 602, 6FL  
Korea City Air Terminal B/D,  
159-6  
Samsung-Dong, Kangnam-Gu,  
Seoul, 135-728 Korea  
Phone: +82-2-2016-6610  
e-mail: [koreasales@power.com](mailto:koreasales@power.com)

### SINGAPORE

51 Newton Road,  
#19-01/05 Goldhill Plaza  
Singapore, 308900  
Phone: +65-6358-2160  
e-mail: [singaporesales@power.com](mailto:singaporesales@power.com)

### TAIWAN

5F, No. 318, Nei Hu Rd.,  
Sec. 1  
Nei Hu District  
Taipei 11493, Taiwan R.O.C.  
Phone: +886-2-2659-4570  
e-mail: [taiwansales@power.com](mailto:taiwansales@power.com)

### UK

Building 5, Suite 21  
The Westbrook Centre  
Milton Road  
Cambridge  
CB4 1YG  
Phone: +44 (0) 7823-557484  
e-mail: [eurosales@power.com](mailto:eurosales@power.com)