

# QH20TZ650

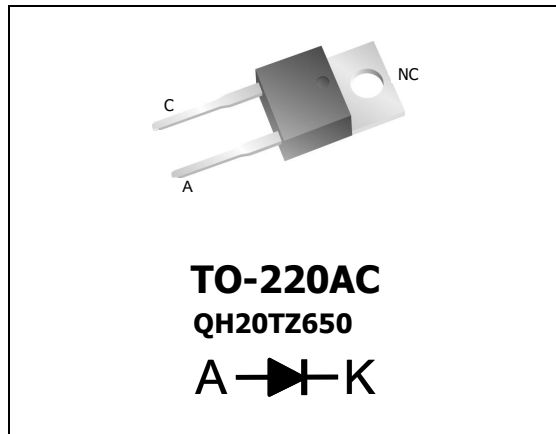
## Qspeed™ 产品系列

650V/20A H 系列 PFC 二极管

### 产品概览

$I_{F(AVG)}$	20	A
$V_{RRM}$	650	V
$Q_{RR}$ (125° C 下典型值)	140	nC
$I_{RRM}$ (125° C 下典型值)	5.0	A
软度 $t_B/t_A$ (125° C 下典型值)	0.4	

### 引脚分配



符合 RoHS 标准

封装采用无铅电镀和“绿色环保”模封料。

根据 IEC 61249-2-21 标准, 不含卤素。

### 绝对最大额定值

绝对最大额定值是指一旦超过就可能使器件受损或缩短其使用寿命的极限值。不建议在此类条件下进行功能性工作。

符号	参数	条件	额定值	单位
$V_{RRM}$	峰值重复反向电压	$T_J = 25^\circ C$	650	V
$I_{F(AVG)}$	平均前馈电流	$T_J = 150^\circ C, T_C = 42^\circ C$	20	A
$I_{FSM}$	非重复峰值浪涌电流	60Hz, $\frac{1}{2}$ 周期, $T_C = 25^\circ C$	105	A
$I_{FSM}$	非重复峰值浪涌电流	$t = 28 \mu s$ 正弦的 $\frac{1}{2}$ 周期, $T_C = 25^\circ C$	350	A
$T_J$	工作结温范围		-55 至 150	$^\circ C$
$T_{STG}$	存储温度		-55 至 150	$^\circ C$
	引线焊接温度	引线距壳体 1.6mm, 10 秒	300	$^\circ C$
$V_{ISOL}$	绝缘强度 (引线至散热片)	AC, TO-220	2500	V
$P_D$	功耗	$T_C = 25^\circ C$	60	W

### 概述

该器件在所有 650V 硅二极管中具有最低的  $Q_{RR}$ 。其恢复特性能提高效率、降低 EMI 并省去缓冲电路。可替代 SiC 二极管, 在高开关频率应用中实现类似的高效率性能。

### 支持的应用场景

- 功率因数校正升压二极管
- 服务器电源
- 电机驱动电路
- DC-AC 逆变器
- 输出整流管

### 特性

- 可实现高  $dI_F/dt$  值(1000A/ $\mu s$ )
- 软恢复

### 优势

- 提高效率
  - 无需缓冲电路
  - 减少 EMI 滤波元件的尺寸和数目
- 可实现极快速开关

## 热阻

符号	电阻, 自:	条件	额定值	单位
$R_{\theta JA}$	结至环境	TO-220	62	$^{\circ}\text{C}/\text{W}$
$R_{\theta JC}$	结至壳体		2.1	$^{\circ}\text{C}/\text{W}$

电气规格,  $T_J = 25^{\circ}\text{C}$  (除非另有指定)

符号	参数	条件	最小值	典型值	最大值	单位	
<b>直流特性</b>							
$I_R$	反向电流	$V_R = 650\text{V}, T_J = 25^{\circ}\text{C}$	-	-	250	$\mu\text{A}$	
		$V_R = 650\text{V}, T_J = 125^{\circ}\text{C}$	-	3	-	$\text{mA}$	
$V_F$	正向电压	$I_F = 20\text{A}, T_J = 25^{\circ}\text{C}$	-	2.65	3.15	$\text{V}$	
		$I_F = 20\text{A}, T_J = 150^{\circ}\text{C}$	-	2.35	-	$\text{V}$	
$C_J$	结电容	$V_R = 10\text{V}, 1\text{MHz}$	-	92	-	$\text{pF}$	
<b>动态特性</b>							
$t_{RR}$	反向恢复时间	$dI/dt = 200\text{A}/\mu\text{s}$ $V_R = 400\text{V}, I_F = 20\text{A}$	$T_J = 25^{\circ}\text{C}$	-	26.5	-	$\text{ns}$
			$T_J = 125^{\circ}\text{C}$	-	41.3	-	$\text{ns}$
$Q_{RR}$	反向恢复电荷	$dI/dt = 200\text{A}/\mu\text{s}$ $V_R = 400\text{V}, I_F = 20\text{A}$	$T_J = 25^{\circ}\text{C}$	-	51	80	$\text{nC}$
			$T_J = 125^{\circ}\text{C}$	-	140	-	$\text{nC}$
$I_{RRM}$	最大反向恢复电流	$dI/dt = 200\text{A}/\mu\text{s}$ $V_R = 400\text{V}, I_F = 20\text{A}$	$T_J = 25^{\circ}\text{C}$	-	3	4	$\text{A}$
			$T_J = 125^{\circ}\text{C}$	-	5.0	-	$\text{A}$
S	软度系数 = $\frac{t_B}{t_A}$	$dI/dt = 200\text{A}/\mu\text{s}$ $V_R = 400\text{V}, I_F = 20\text{A}$	$T_J = 25^{\circ}\text{C}$	-	0.7	-	
			$T_J = 125^{\circ}\text{C}$	-	0.4	-	

**元件工程师注意事项:** H 系列二极管的设计和结构采用肖特基技术。因此, 元件工程师应规划其测试方法, 使其与传统的肖特基测试方法类似。(更多详情请参考应用指南 AN-300。)

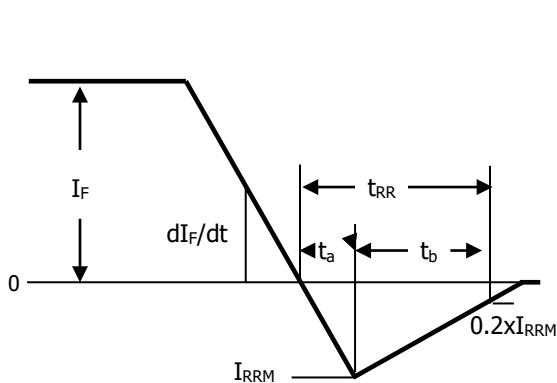
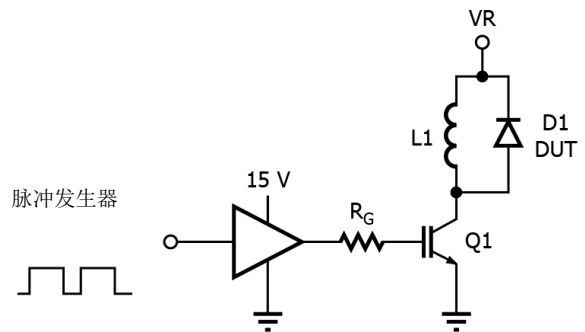


图1. 反向恢复定义



PI-7614-041315

图2. 反向恢复测试电路

电气规格,  $T_J = 25^\circ\text{C}$  (除非另有指定)

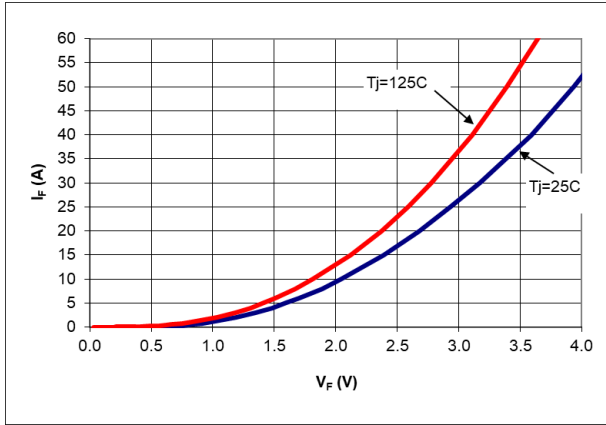


图 3. 典型  $I_F$  相对于  $V_F$  的变化

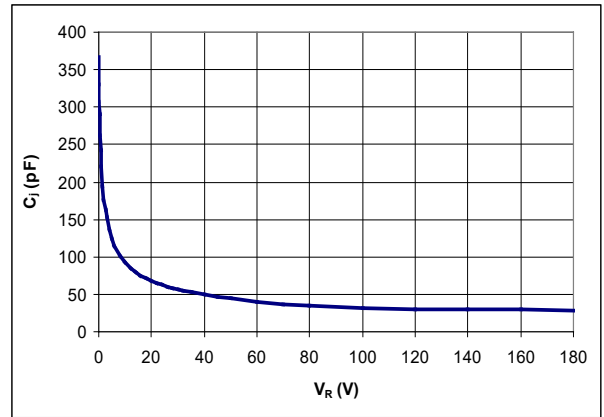


图 4. 典型  $C_j$  相对于  $V_R$  的变化

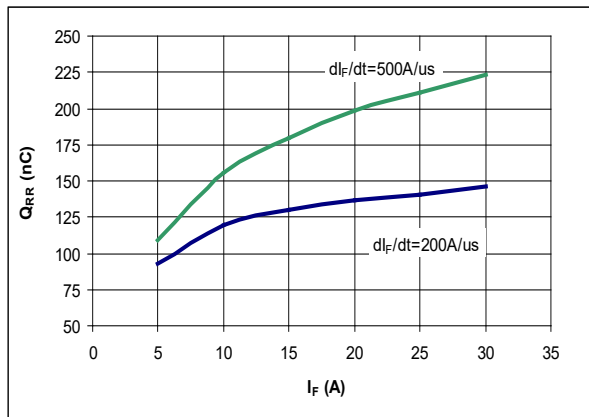


图 5. 典型  $Q_{RR}$  相对于  $I_F$  的变化,  $T_J = 125^\circ\text{C}$

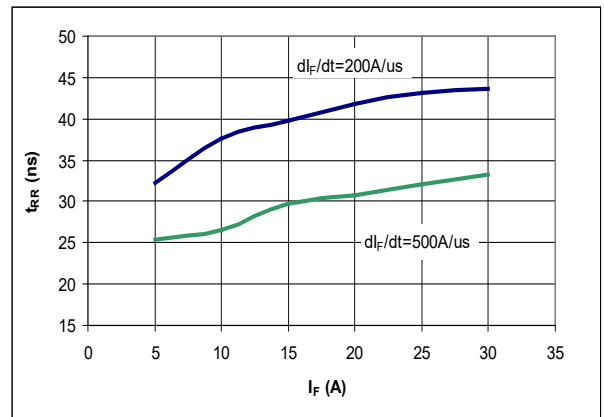


图 6. 典型  $t_{RR}$  相对于  $I_F$  的变化,  $T_J = 125^\circ\text{C}$

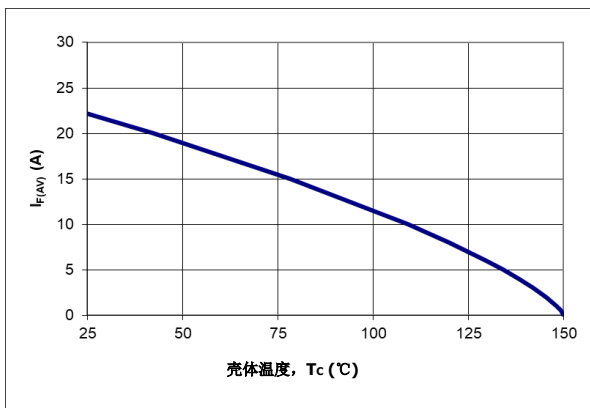


图 7. DC 电流降额曲线

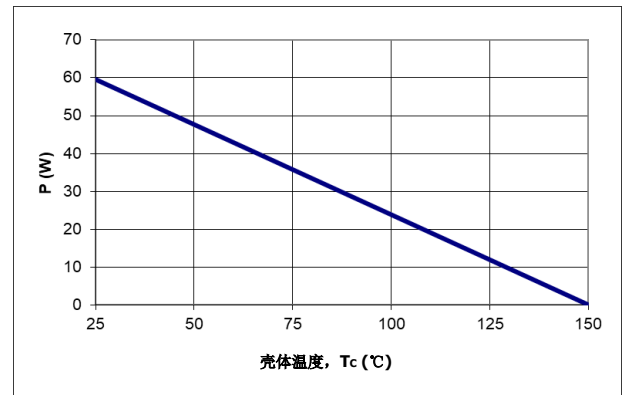


图 8. 功率降额曲线

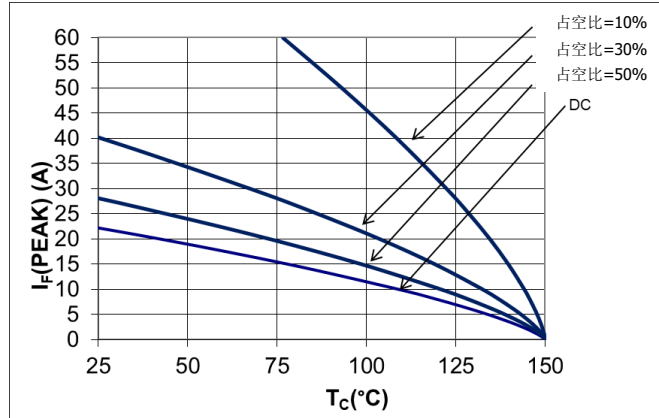


图 9.  $I_F(\text{PEAK})$  相对于  $T_c$  的变化,  $f = 70\text{kHz}$

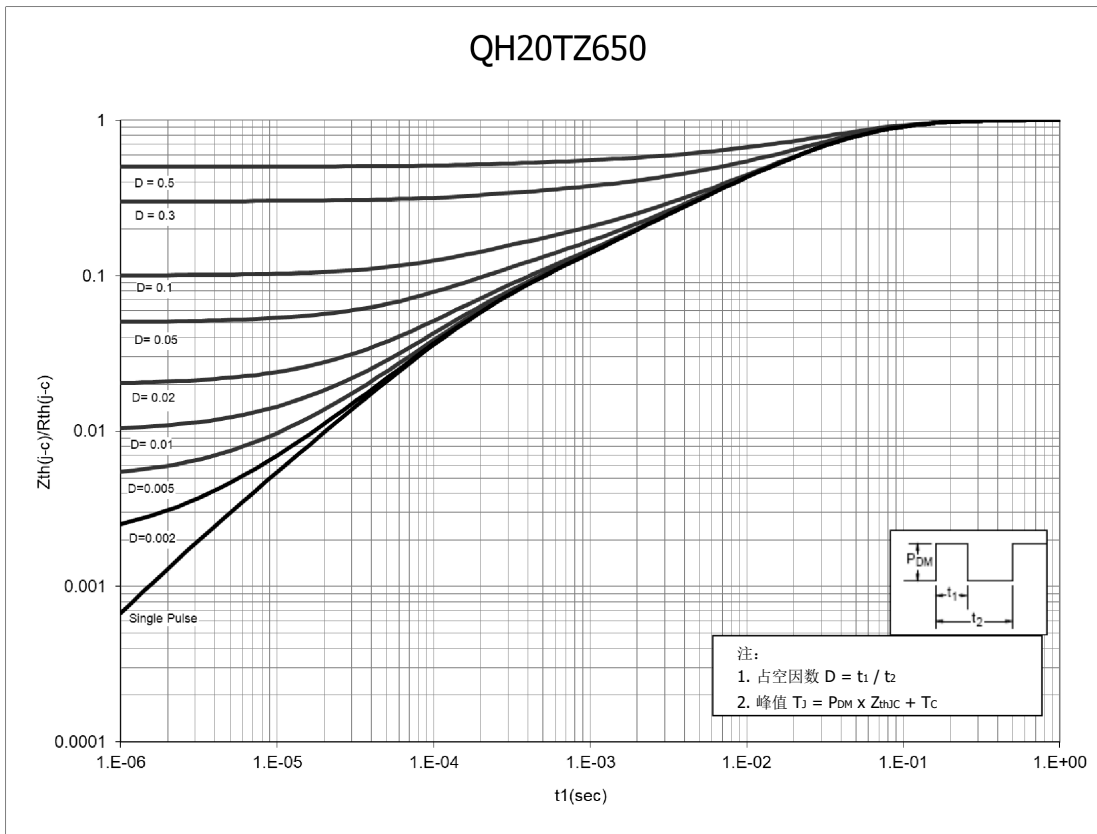
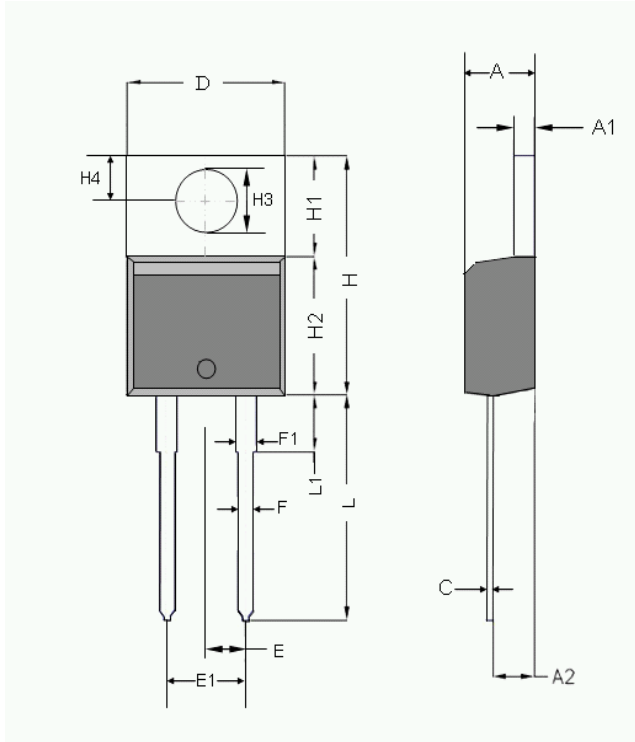


图 10. 归一化最大动态热阻抗

## 外形尺寸图

TO-220AC



尺寸	毫米(mm)	
	最小值	最大值
<b>A</b>	4.32	4.70
<b>A1</b>	1.14	1.40
<b>A2</b>	2.03	2.79
<b>C</b>	0.34	0.610
<b>D</b>	9.65	10.67
<b>E</b>	2.49	2.59
<b>E1</b>	4.98	5.18
<b>F</b>	0.508	1.016
<b>F1</b>	1.14	1.78
<b>H</b>	14.71	16.51
<b>H1</b>	5.84	6.795
<b>H2</b>	8.40	9.00
<b>H3</b>	3.53	3.96
<b>H4</b>	2.54	3.05
<b>L</b>	12.70	14.22
<b>L1</b>	-	6.35

机械安装方法	最大扭矩/压力规格
螺丝穿过封装片中的孔	1 牛米(nm)或 8.8 英寸磅(lb-in)
夹住封装体	每平方厘米 12.3 千克力(kgf/cm <sup>2</sup> )或 175lb/in <sup>2</sup>

**焊接时间和温度：**本产品经设计可用于高温、无铅焊接。元件引线可持续 10 秒承受 300° C 的最高温度。更多详情请参考应用指南 AN-303。

## 元件订购信息

型号	封装	包装
QH20TZ650	TO-220AC	50 件/管

本文档所提供的信息可能会发生变更，恕不另行通知。

---

修订版本	注释	日期
1.0	生产发布。	08/24

有关最新产品信息，请访问：[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 base 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 全球销售支持网络

#### 全球总部

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)

#### 中国（上海）

徐汇区漕溪北路88号圣爱广场  
1601-1603室  
上海|中国, 200030  
电话: +86-21-6354-6323  
电子邮箱:  
[chinasales@power.com](mailto:chinasales@power.com)

#### 中国（深圳）

南山区科技南八路二号豪威科技  
大厦17层  
深圳|中国, 518057  
电话: +86-755-8672-8689  
电子邮箱:  
[chinasales@power.com](mailto:chinasales@power.com)

#### 德国

（AC-DC/LED/电机控制销售）  
Einsteinerring 24  
85609 Dornach/Aschheim  
Germany  
Tel: +49-89-5527-39100  
e-mail: [eurosales@power.com](mailto:eurosales@power.com)

#### 德国（门极驱动器销售）

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

#### 印度

#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)

#### 意大利

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)

#### 日本

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)

#### 韩国

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)

#### 新加坡

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

#### 台湾地区

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)

#### 英国

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)