

LQ10N200CQ

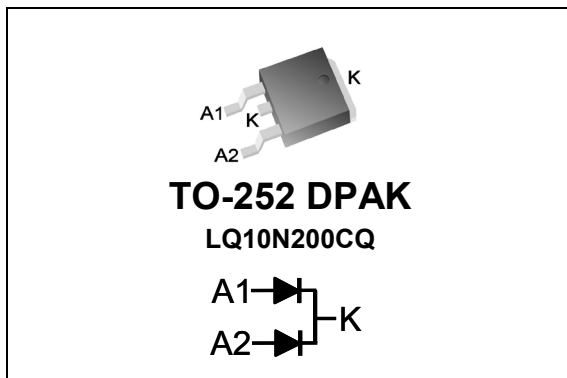
Qspeed™ Automotive Family

200 V, 10 A Common-Cathode Diode for Audio Automotive Applications

Product Summary

| | | |
|------------------------------------|------|----|
| $I_{F(AVG)}$ per diode | 5 | A |
| V_{RRM} | 200 | V |
| Q_{RR} (Typ at 125 °C) | 32.4 | nC |
| I_{RRM} (Typ at 125 °C) | 2.6 | A |
| Softness t_b/t_a (Typ at 125 °C) | 0.39 | |

Pin Assignment



RoHS Compliant

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

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 | $T_J = 25\text{ °C}$ | 200 | V |
| $I_{F(AVG)}$ | Average forward current | Per Diode, $T_J = 150\text{ °C}$, $T_C = 130\text{ °C}$ | 5 | A |
| | | Per Device, $T_J = 150\text{ °C}$, $T_C = 130\text{ °C}$ | 10 | A |
| I_{FSM} | Non-repetitive peak surge current | Per Diode, 60 Hz, 1/2 cycle | 60 | A |
| I_{FSM} | Non-repetitive peak surge current | Per Diode, 1/2 cycle of $t = 28\text{ }\mu\text{s}$ Sinusoid, $T_C = 25\text{ °C}$ | 350 | A |
| T_J | Operating junction temperature range | | -40 to 150 | °C |
| T_{STG} | Storage temperature | | -55 to 150 | °C |
| | Lead soldering temperature | Leads at 1.6mm from case, 10 sec | 300 | °C |
| P_D | Power dissipation | $T_C = 25\text{ °C}$ | 27.7 | W |

Thermal Resistance

| Symbol | Resistance from: | Conditions | Rating | Units |
|-----------------|------------------|------------|--------|-------|
| $R_{\theta JC}$ | Junction to case | Per Diode | 4.5 | °C/W |
| | | Per Device | 2.3 | °C/W |

General Description

This device has the lowest Q_{RR} of any 200 V Silicon diode. Its recovery characteristics increase efficiency, reduce EMI and eliminate snubbers.

Applications

- Automotive
 - AEC-Q101 qualified
 - Fab, assembly and test certified to IATF 16949
 - ESD HBM classification H0

Features

- Low Q_{RR} , Low I_{RRM} , Low t_{RR}
- Soft recovery

Benefits

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

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Units | |
|--|---|---|-----------------------------------|------|------|---------------|----|
| DC Characteristics per diode | | | | | | | |
| I_R | Reverse current per diode | $V_R = 200\text{ V}, T_J = 25\text{ }^\circ\text{C}$ | - | - | 250 | μA | |
| | | $V_R = 200\text{ V}, T_J = 125\text{ }^\circ\text{C}$ | - | 0.23 | - | mA | |
| V_F | Forward voltage per diode | $I_F = 5\text{ A}, T_J = 25\text{ }^\circ\text{C}$ | - | 0.95 | 1.1 | V | |
| | | $I_F = 5\text{ A}, T_J = 150\text{ }^\circ\text{C}$ | - | 0.8 | - | V | |
| C_J | Junction capacitance per diode | $V_R = 10\text{ V}, 1\text{ MHz}$ | - | 22 | - | pF | |
| Dynamic Characteristics per diode | | | | | | | |
| t_{RR} | Reverse recovery time, per diode | $dI_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 130\text{ V},$ $I_F = 5\text{ A}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 13.9 | - | ns |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 19.5 | - | ns |
| Q_{RR} | Reverse recovery charge, per diode | $dI_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 130\text{ V},$ $I_F = 5\text{ A}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 15.6 | 25.5 | nC |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 32.4 | - | nC |
| I_{RRM} | Maximum reverse recovery current, per diode | $dI_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 130\text{ V},$ $I_F = 5\text{ A}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 1.78 | 2.65 | A |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 2.6 | - | A |
| S | Softness per diode = $\frac{t_b}{t_a}$ | $dI_F/dt = 200\text{ A}/\mu\text{s}$ $V_R = 130\text{ V},$ $I_F = 5\text{ A}$ | $T_J = 25\text{ }^\circ\text{C}$ | - | 0.44 | - | |
| | | | $T_J = 125\text{ }^\circ\text{C}$ | - | 0.39 | - | |

Note to component engineers: Q-Series diodes employ Schottky technologies in their design and construction. Therefore, component engineers should plan their test setups to be similar to traditional Schottky test setups. (For further details, see application note AN-300.)

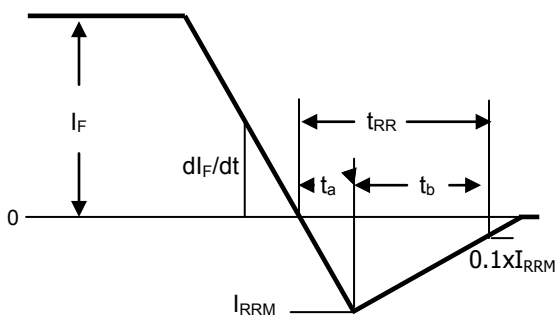


Figure 1. Reverse Recovery Definitions

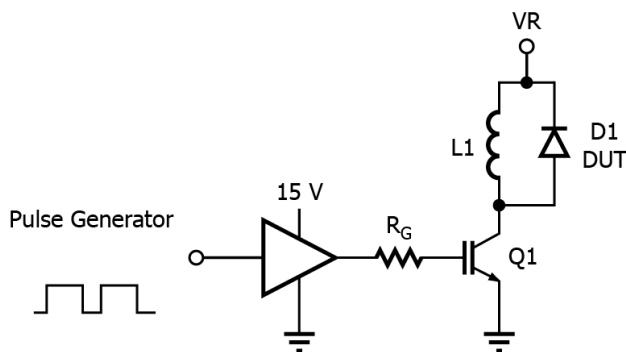


Figure 2. Reverse Recovery Test Circuit

PI-7614-041315

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

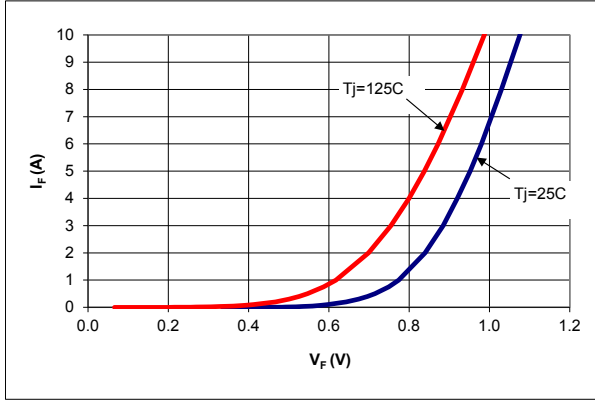


Figure 3. Typical I_F vs. V_F

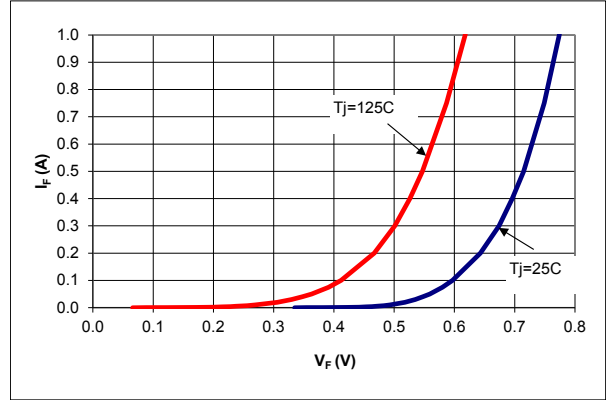


Figure 4. Typical I_F vs. V_F

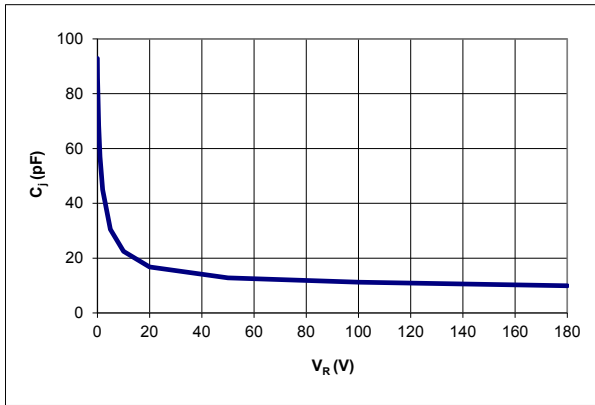


Figure 5. Typical C_J vs. V_R

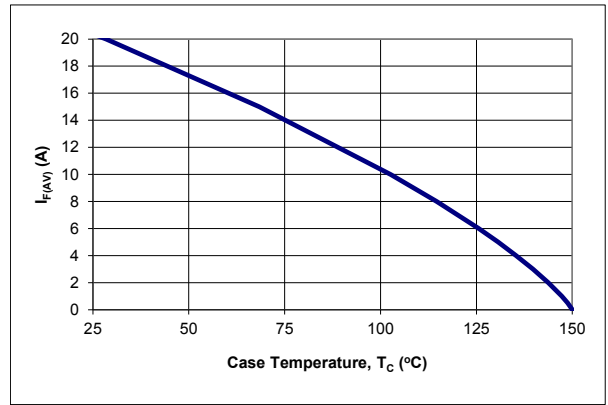


Figure 6. DC Current Derating Curve

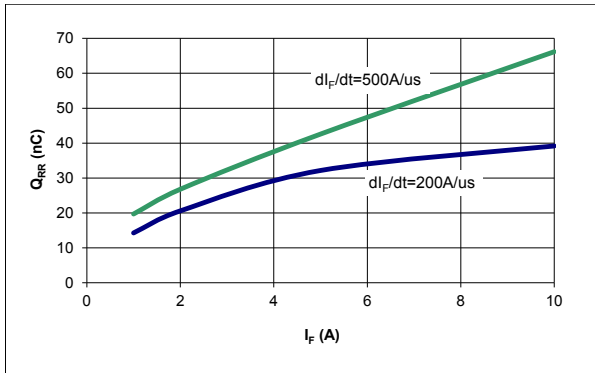


Figure 7. Typical Q_{RR} vs. I_F at $T_J=125\text{ }^\circ\text{C}$

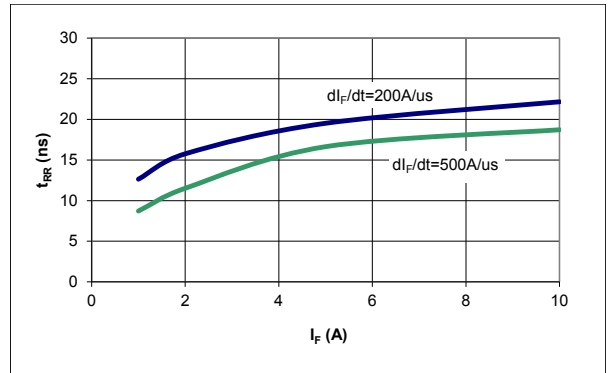


Figure 8. Typical t_{RR} vs. I_F at $T_J=125\text{ }^\circ\text{C}$

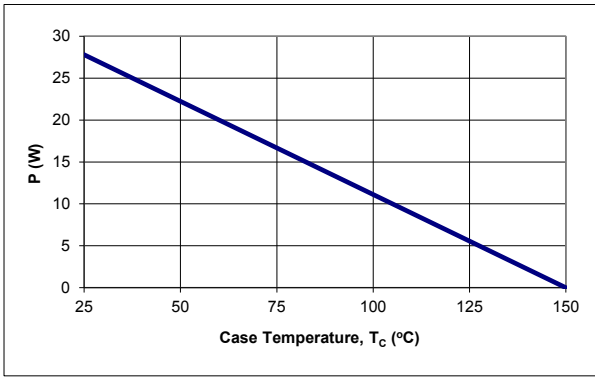


Figure 9. Power Derating Curve

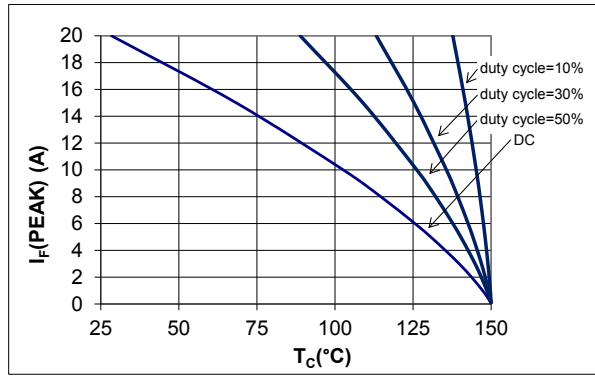


Figure 10. I_f (Peak) vs. T_C , $f = 70$ kHz

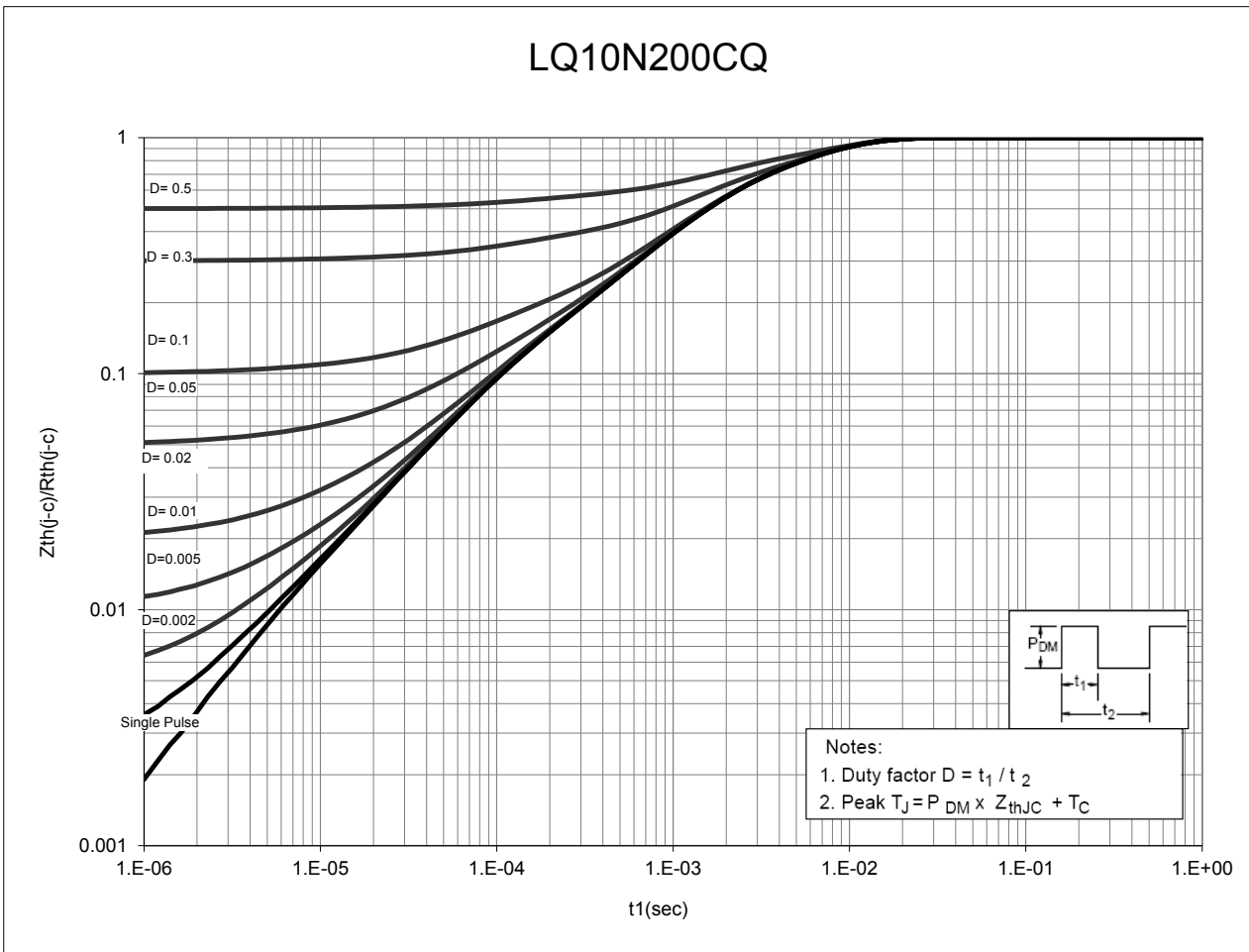
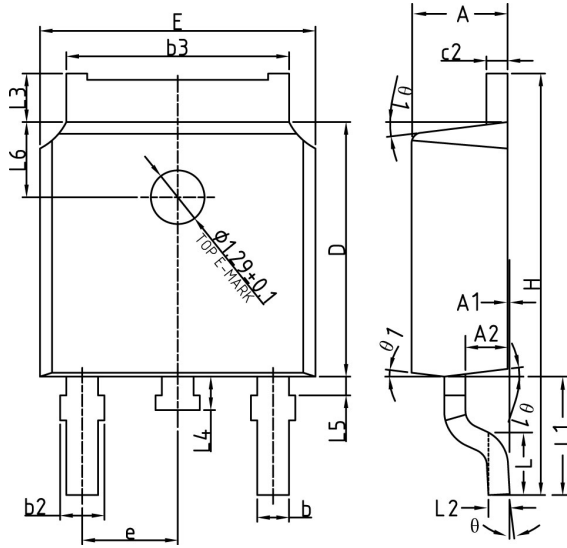


Figure 11. Normalized Maximum Transient Thermal Impedance

Dimensional Outline Drawings

TO-252 DPAK



| Dim | Millimeters | |
|------------------------------|-------------|-------|
| | MIN | MAX |
| A | 2.20 | 2.38 |
| A1 | 0 | 0.10 |
| A2 | 0.90 | 1.10 |
| b | 0.72 | 0.85 |
| b2 | 0.72 | 0.90 |
| b3 | 5.13 | 5.46 |
| c2 | 0.47 | 0.60 |
| D | 6.00 | 6.20 |
| E | 6.50 | 6.70 |
| e | 2.186 | 2.386 |
| H | 9.80 | 10.40 |
| L | 1.40 | 1.70 |
| L1 | 2.90 REF | |
| L2 | 0.51 BSC | |
| L3 | 0.90 | 1.25 |
| L4 | 0.60 | 1.00 |
| L5 | 0.15 | 0.75 |
| L6 | 1.80 REF | |
| θ | 0° | 8° |
| $\theta 1$ | 5° | 9° |

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 |
|-------------|-------------|-----------------|
| LQ10N200CQ | TO-252 DPAK | 2500 units/reel |

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

| Revision | Notes | Date |
|-----------------|-----------------|-------------|
| 1.1 | Code A release. | 03/19 |

For the latest updates, visit our website: 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. 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, HiperPLC, HiperPFS, HiperTFS, InnoSwitch, Innovation in Power Conversion, InSOP, LinkSwitch, LinkZero, LYTSwitch, SENZero, TinySwitch, TOPSwitch, PI, PI Expert, SCALE, SCALE-1, SCALE-2, SCALE-3 and SCALE-iDriver, are trademarks of Power Integrations, Inc. Other trademarks are property of their respective companies. ©2019, 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

CHINA (SHANGHAI)

Rm 2410, Charity Plaza, No. 88,
North Caoxi Road,
Shanghai, PRC 200030
Phone: +86-21-6354-6323
e-mail: 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

GERMANY (AC-DC/LED Sales)

Einsteinring 24
85609 Dornach/Aschheim
Germany
Tel: +49-89-5527-39100
e-mail: eurosales@power.com

GERMANY (Gate Driver Sales)

HellwegForum 1
59469 Ense
Germany
Tel: +49-2938-64-39990
e-mail: igbt-driver.sales@power.com

INDIA

#1, 14th Main Road
Vasanthanagar
Bangalore-560052
India
Phone: +91-80-4113-8020
e-mail: indiasales@power.com

ITALY

Via Milanese 20, 3rd. Fl.
20099 Sesto San Giovanni (MI) Italy
Phone: +39-024-550-8701
e-mail: 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

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

SINGAPORE

51 Newton Road,
#19-01/05 Goldhill Plaza
Singapore, 308900
Phone: +65-6358-2160
e-mail: 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

UK

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