

Turbo 2 ultrafast high voltage rectifier

Features

- Ultrafast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching and conduction losses

Description

The STTH1R06, which is using ST Turbo 2 600 V technology, is specially suited as boost diode in power factor correction circuitry.

The device is also intended for use as a free wheeling diode in power supplies and other power switching applications.

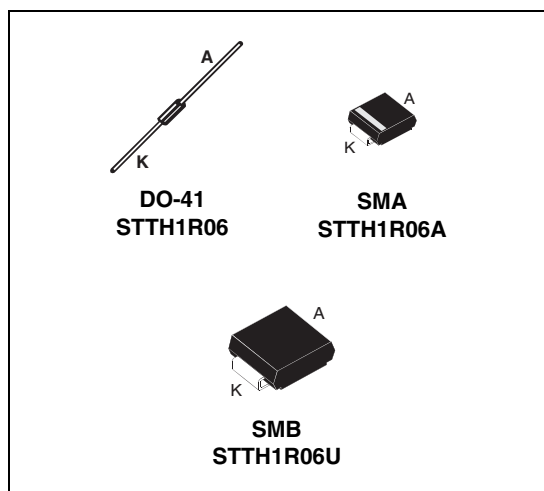


Table 1. Device summary

| Symbol | Value |
|----------------|------------|
| $I_{F(AV)}$ | 1 A |
| V_{RRM} | 600 V |
| I_R (max) | 75 μ A |
| T_j | 175 °C |
| V_F (typ) | 1.0 V |
| t_{rr} (max) | 25 ns |

1 Characteristics

Table 2. Absolute ratings (limiting values)

| Symbol | Parameter | | Value | Unit | |
|--------------|--|-----------|--------------|------|--------------------------------------|
| V_{RRM} | Repetitive peak reverse voltage | | 600 | V | |
| $I_{F(RMS)}$ | Forward rms current | DO-41 | 10 | A | |
| | | SMA / SMB | 7 | | |
| $I_{F(AV)}$ | Average forward current | DO-41 | 1 | A | |
| | | SMA | | | $T_c = 100\text{ °C}$ $\delta = 0.5$ |
| | | SMB | | | $T_c = 125\text{ °C}$ $\delta = 0.5$ |
| I_{FSM} | Surge non repetitive forward current | DO-41 | 25 | A | |
| | | SMA / SMB | | | $t_p = 10\text{ms sinusoidal}$ |
| T_{stg} | Storage temperature range | | -65 to + 175 | °C | |
| T_j | Maximum operating junction temperature | | 175 | °C | |

Table 3. Thermal resistance

| Symbol | Parameter | | | Value (max) | Unit |
|---------------|------------------------------------|-----------|-------|-------------|------|
| $R_{th(j-l)}$ | Junction to lead | L = 10 mm | DO-41 | 45 | °C/W |
| | | | SMA | 30 | |
| | | | SMB | 25 | |
| $R_{th(j-a)}$ | Junction to ambient ⁽¹⁾ | L = 10 mm | DO-41 | 70 | °C/W |

1. $R_{th(j-a)}$ is measured with a copper area $S = 5\text{cm}^2$ (see [Figure 14](#)).

Table 4. Static electrical characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|--------|-------------------------|-----------------------|-------------------|------|------|------|---------------|
| I_R | Reverse leakage current | $T_j = 25\text{ °C}$ | $V_R = V_{RRM}$ | | | 1 | μA |
| | | $T_j = 150\text{ °C}$ | | | 10 | 75 | |
| V_F | Forward voltage drop | $T_j = 25\text{ °C}$ | $I_F = 1\text{A}$ | | | 1.7 | V |
| | | $T_j = 150\text{ °C}$ | | | 1.0 | 1.25 | |

To evaluate the conduction losses use the following equation: $P = 1.03 \times I_{F(AV)} + 0.27 I_{F(RMS)}^2$

Table 5. Dynamic characteristics

| Symbol | Parameter | Test conditions | | Min. | Typ. | Max. | Unit |
|----------|--------------------------|----------------------------------|--|------|------|------|------|
| t_{rr} | Reverse recovery time | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 0.5\text{A}$ $I_{rr} = 0.25\text{A}$ $I_R = 1\text{A}$ | | | 25 | ns |
| | | | $I_F = 1\text{A}$ $di_F/dt = -50\text{ A}/\mu\text{s}$ $V_R = 30\text{V}$ | | 30 | 45 | |
| t_{fr} | Forward recovery time | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 1\text{A}$ $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$ | | | 100 | ns |
| V_{FP} | Forward recovery voltage | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 1\text{A}$ $di_F/dt = 100\text{ A}/\mu\text{s}$ $V_{FR} = 1.1 \times V_{Fmax}$ | | | 10 | V |

Figure 1. Conduction losses versus average forward current Figure 2. Forward voltage drop vs forward current

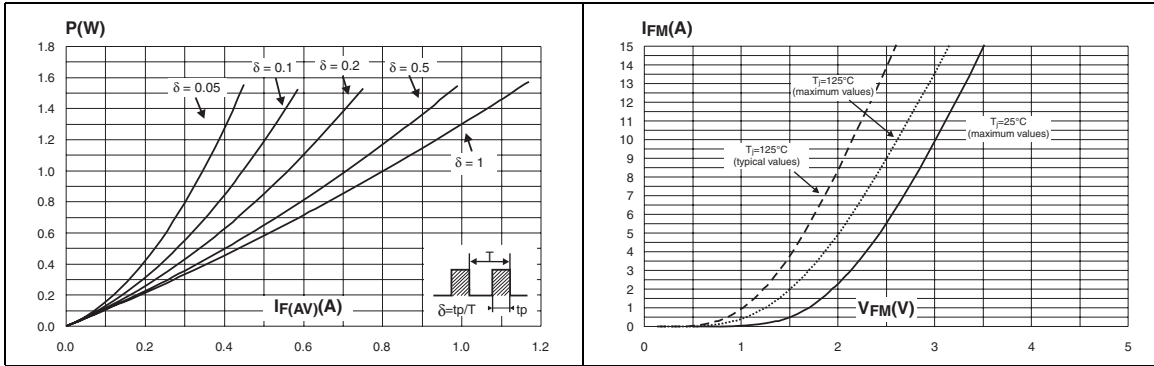


Figure 3. Relative variation of thermal impedance junction to case vs pulse duration (DO-41) Figure 4. Relative variation of thermal impedance junction to case vs pulse duration (SMA)

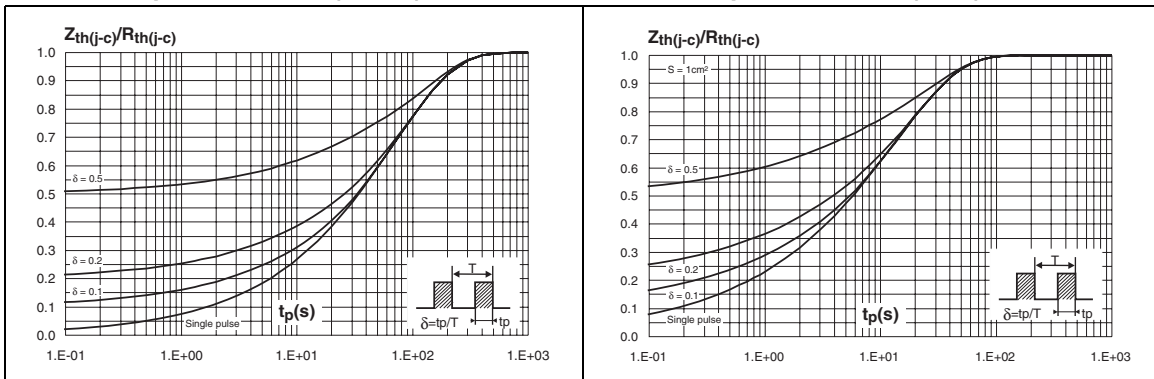


Figure 5. Relative variation of thermal impedance junction to case vs pulse duration (SMB)

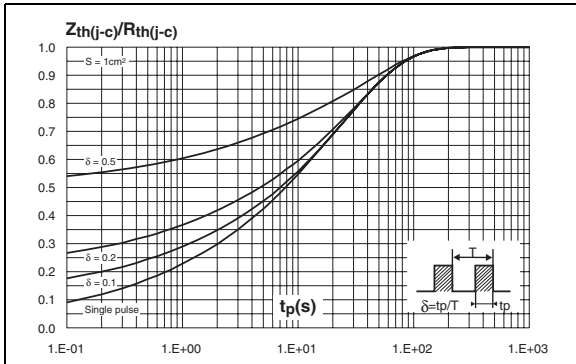


Figure 6. Peak reverse recovery current vs di_F/dt (typical values)

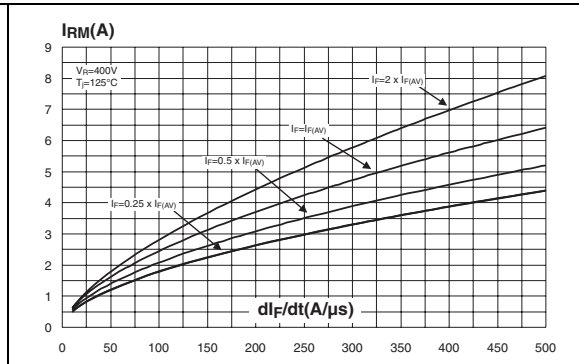


Figure 7. Reverse recovery time versus di_F/dt (typical values)

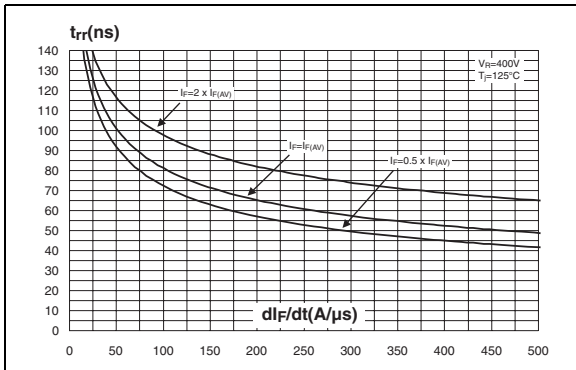


Figure 8. Reverse recovery charges versus di_F/dt (typical values)

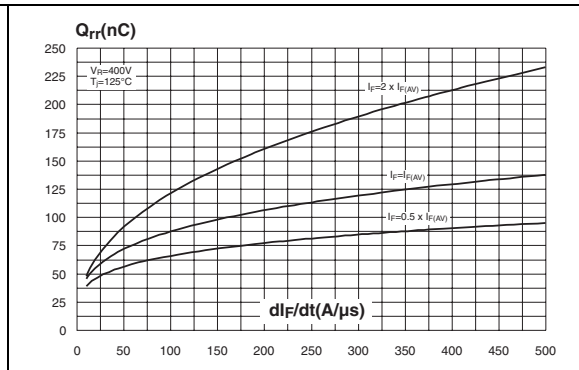


Figure 9. Reverse recovery softness factor vs di_F/dt (typical values)

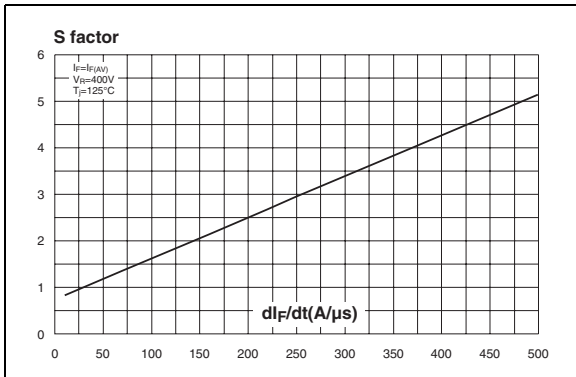


Figure 10. Relative variations of dynamic parameters vs junction temperature

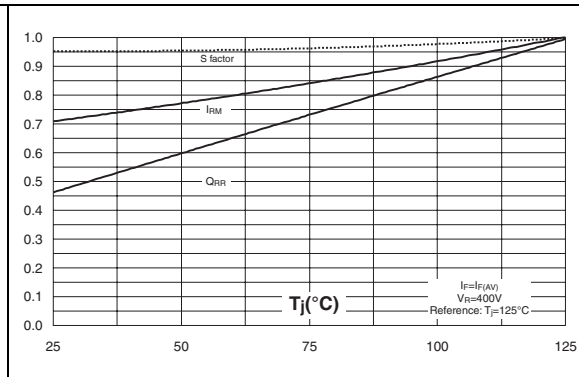


Figure 11. Transient peak forward voltage vs di_F/dt (typical values)

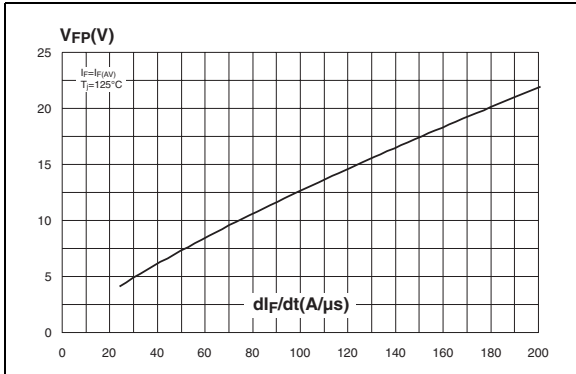


Figure 12. Forward recovery time vs di_F/dt (typical values)

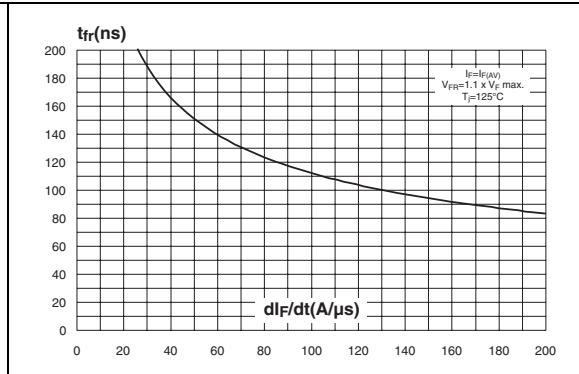


Figure 13. Junction capacitance versus reverse voltage applied (typical values)

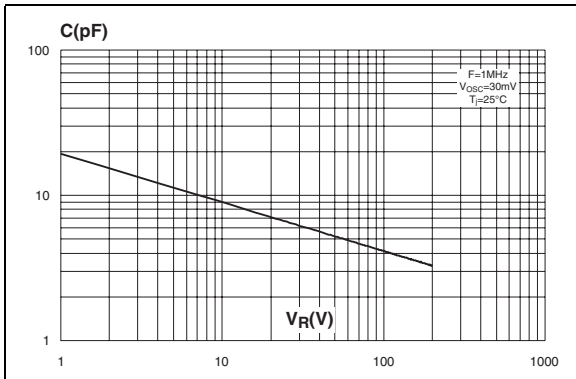


Figure 14. Thermal resistance junction to ambient versus copper surface under each lead

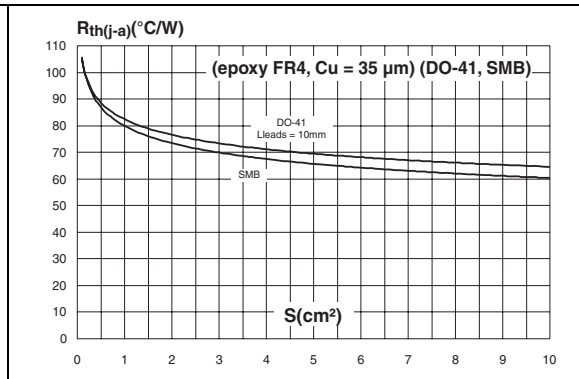
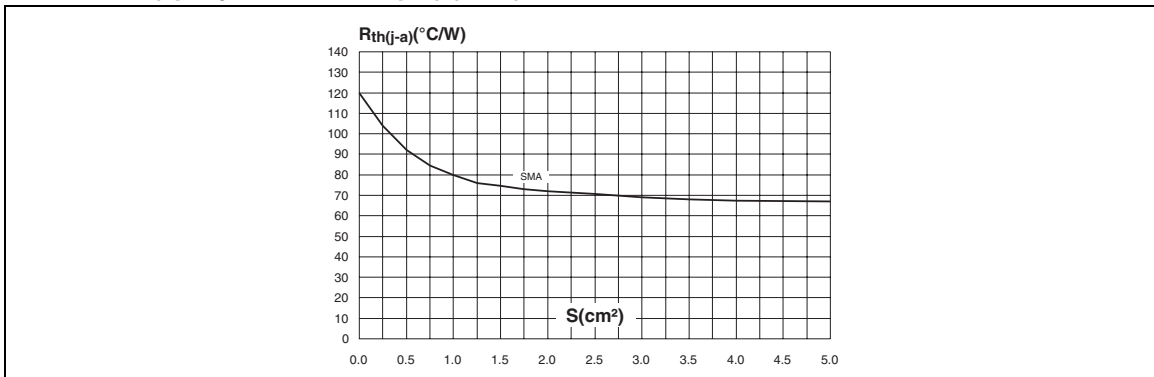


Figure 15. Thermal resistance junction to ambient versus copper surface under each lead (epoxy FR4, Cu = 35 μm) (SMA)



2 Package information

- Epoxy meets UL94, V0
- Lead-free packages

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Table 6. SMA dimensions

| Ref. | Dimensions | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A1 | 1.90 | 2.45 | 0.075 | 0.094 |
| A2 | 0.05 | 0.20 | 0.002 | 0.008 |
| b | 1.25 | 1.65 | 0.049 | 0.065 |
| c | 0.15 | 0.40 | 0.006 | 0.016 |
| D | 2.25 | 2.90 | 0.089 | 0.114 |
| E | 4.80 | 5.35 | 0.189 | 0.211 |
| E1 | 3.95 | 4.60 | 0.156 | 0.181 |
| L | 0.75 | 1.50 | 0.030 | 0.059 |

Figure 16. Footprint (dimensions in mm)

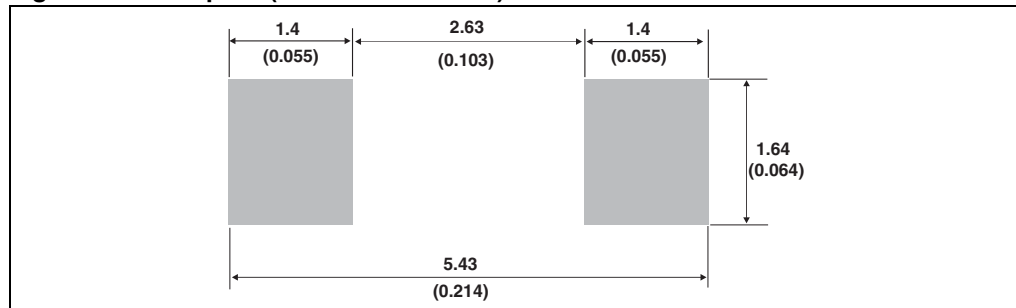


Table 7. SMB dimensions

| Ref. | Dimensions | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A1 | 1.90 | 2.45 | 0.075 | 0.096 |
| A2 | 0.05 | 0.20 | 0.002 | 0.008 |
| b | 1.95 | 2.20 | 0.077 | 0.087 |
| c | 0.15 | 0.40 | 0.006 | 0.016 |
| E | 5.10 | 5.60 | 0.201 | 0.220 |
| E1 | 4.05 | 4.60 | 0.159 | 0.181 |
| D | 3.30 | 3.95 | 0.130 | 0.156 |
| L | 0.75 | 1.50 | 0.030 | 0.059 |

Figure 17. Footprint (dimensions in mm)

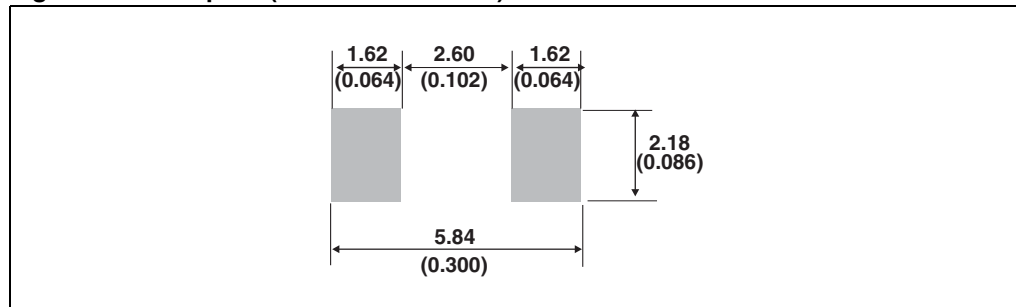


Table 8. DO-41 (plastic) dimensions

| Ref. | Dimensions | | | |
|------|-------------|------|--------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.07 | 5.20 | 0.160 | 0.205 |
| B | 2.04 | 2.71 | 0.080 | 0.107 |
| C | 25.4 | | 1 | |
| D | 0.71 | 0.86 | 0.028 | 0.034 |

3 Ordering information

Table 9. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|------------|----------|---------|---------|----------|---------------|
| STTH1R06 | STTH1R06 | DO-41 | 0.34 g | 2000 | Ammopack |
| STTH1R06RL | STTH1R06 | DO-41 | 0.34 g | 5000 | Tape and reel |
| STTH1R06A | HR6 | SMA | 0.068 g | 5000 | Tape and reel |
| STTH1R06U | BR6 | SMB | 0.11 g | 2500 | Tape and reel |

4 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| Apr-2003 | 1 | First issue. |
| 07-Sep-2004 | 2 | DO-41 and SMA packages added. |
| 24-Feb-2005 | 3 | SMA package dimensions update. Reference A1 max. changed from 2.70 mm (0.106 inc.) to 2.03 mm (0.080). |
| 02-Jul-2007 | 4 | Reformatted to current standards. Added cathode bars to cover illustrations. Updated dimensions and footprint illustrations for SMA and SMB packages. Corrected part number in Table 9. |
| 30-Sep-2009 | 5 | Updated table 8 package dimensions. |

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2009 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com

