

### Features

- High current capability
- Avalanche rated
- Low forward voltage drop
- High frequency operation

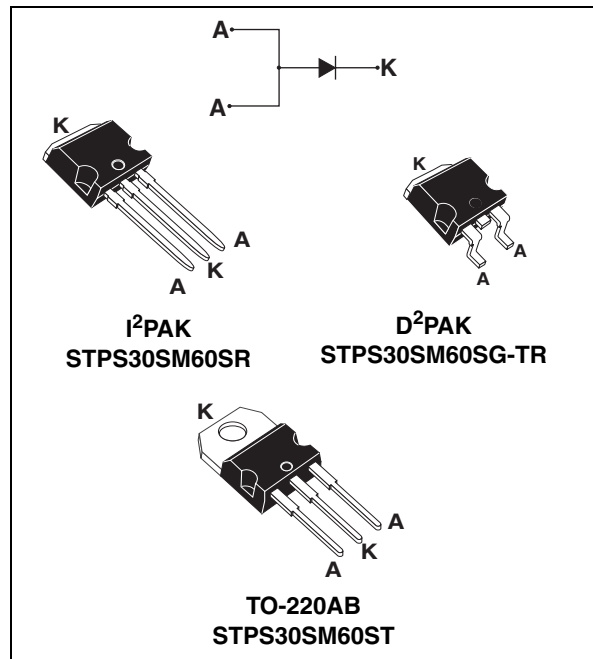
### Description

The STPS30SM60S is a single Schottky diode, suited for high frequency switch mode power supply.

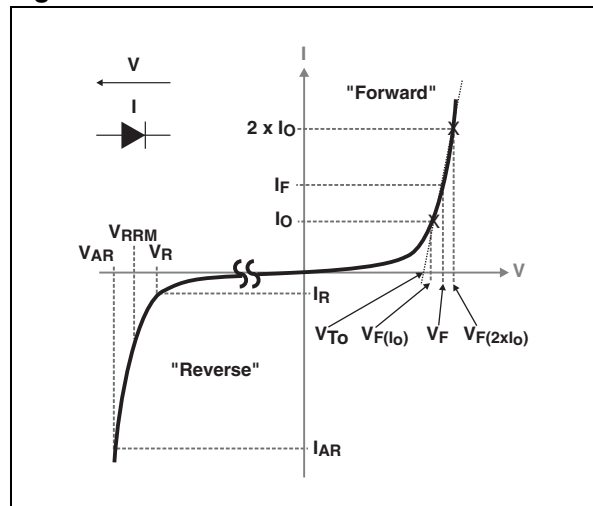
Packaged in TO-220AB, I<sup>2</sup>PAK and D<sup>2</sup>PAK, this device is intended to be used in notebook, game station and desktop adapters, providing in these applications a good efficiency at both low and high load.

**Table 1. Device summary**

| Symbol      | Value   |
|-------------|---------|
| $I_{F(AV)}$ | 30 A    |
| $V_{RRM}$   | 60 V    |
| $V_F$ (typ) | 0.405 V |
| $T_j$ (max) | 150 °C  |



**Figure 1. Electrical characteristics<sup>(a)</sup>**



- a.  $V_{ARM}$  and  $I_{ARM}$  must respect the reverse safe operating area defined in [Figure 12](#).  $V_{AR}$  and  $I_{AR}$  are pulse measurements ( $t_p < 1 \mu s$ ).  $V_R$ ,  $I_R$ ,  $V_{RRM}$  and  $V_F$  are static characteristics

# 1 Characteristics

**Table 2. Absolute ratings (limiting values with terminals 1 and 3 short circuited at 25 °C, unless otherwise specified)**

| Symbol                          | Parameter                                             |                                                                         |             | Value       | Unit |
|---------------------------------|-------------------------------------------------------|-------------------------------------------------------------------------|-------------|-------------|------|
| V <sub>RRM</sub>                | Repetitive peak reverse voltage                       |                                                                         |             | 60          | V    |
| I <sub>F(RMS)</sub>             | Forward rms current                                   |                                                                         |             | 90          | A    |
| I <sub>F(AV)</sub>              | Average forward current, δ = 0.5                      | T <sub>c</sub> = 125 °C                                                 | Per package | 30          | A    |
| I <sub>FSM</sub>                | Surge non repetitive forward current                  | t <sub>p</sub> = 10 ms sine-wave                                        |             | 600         | A    |
| P <sub>ARM</sub> <sup>(1)</sup> | Repetitive peak avalanche power                       | T <sub>j</sub> = 25 °C, t <sub>p</sub> = 1 μs                           |             | 28000       | W    |
| V <sub>ARM</sub> <sup>(2)</sup> | Maximum repetitive peak avalanche voltage             | t <sub>p</sub> < 1 μs, T <sub>j</sub> < 150 °C, I <sub>AR</sub> < 105 A |             | 80          | V    |
| V <sub>ASM</sub> <sup>(2)</sup> | Maximum single-pulse peak avalanche voltage           | t <sub>p</sub> < 1 μs, T <sub>j</sub> < 150 °C, I <sub>AR</sub> < 105 A |             | 80          | V    |
| T <sub>stg</sub>                | Storage temperature range                             |                                                                         |             | -65 to +175 | °C   |
| T <sub>j</sub>                  | Maximum operating junction temperature <sup>(3)</sup> |                                                                         |             | 150         | °C   |

1. For temperature or pulse time duration deratings, please refer to [Figure 4](#) and [5](#). More details regarding the avalanche energy measurements and diode validation in the avalanche are provided in the application notes AN1768 and AN2025.

2. See [Figure 12](#)

3.  $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$  condition to avoid thermal runaway for a diode on its own heatsink

**Table 3. Thermal resistance**

| Symbol        | Parameter        | Value | Unit |
|---------------|------------------|-------|------|
| $R_{th(j-c)}$ | Junction to case | 1.0   | °C/W |

**Table 4. Static electrical characteristics (terminals 1 and 3 short circuited)**

| Symbol      | Parameter               | Test conditions       | Min. | Typ.  | Max.  | Unit          |
|-------------|-------------------------|-----------------------|------|-------|-------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | -    | 30    | 135   | $\mu\text{A}$ |
|             |                         | $T_j = 125\text{ °C}$ | -    | 20    | 80    | mA            |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | -    | 0.490 | 0.530 | V             |
|             |                         | $T_j = 125\text{ °C}$ | -    | 0.405 | 0.450 |               |
|             |                         | $T_j = 25\text{ °C}$  | -    | 0.560 | 0.615 |               |
|             |                         | $T_j = 125\text{ °C}$ | -    | 0.500 | 0.570 |               |

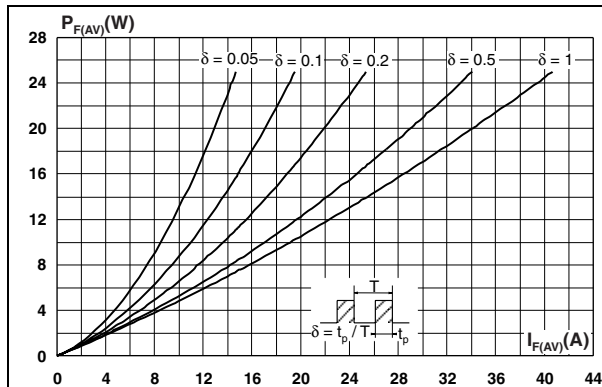
1. Pulse test:  $t_p = 5\text{ ms}, \delta < 2\%$

2. Pulse test:  $t_p = 380\text{ }\mu\text{s}, \delta < 2\%$

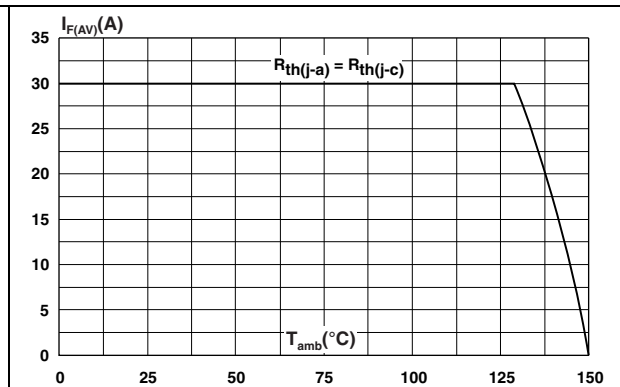
To evaluate the conduction losses use the following equation:

$$P = 0.440 \times I_{F(AV)} + 0.0043 \times I_{F(RMS)}^2$$

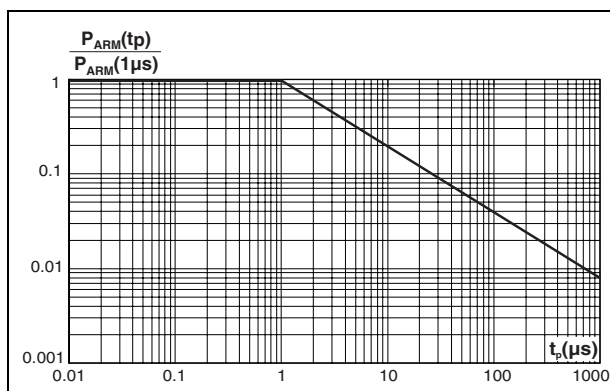
**Figure 2. Average forward power dissipation versus average forward current**



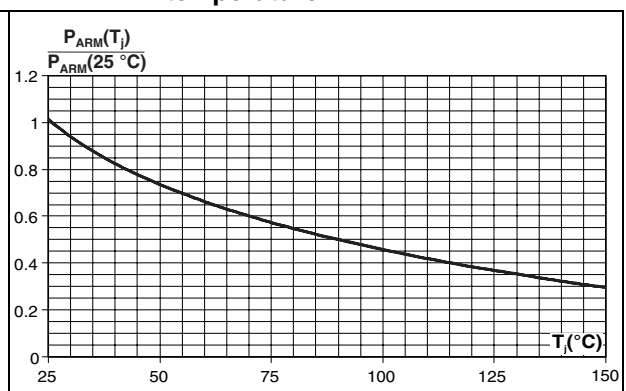
**Figure 3. Average forward current versus ambient temperature ( $\delta = 0.5$ )**



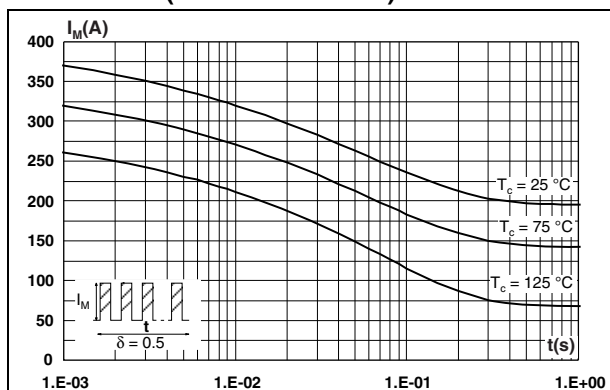
**Figure 4. Normalized avalanche power derating versus pulse duration**



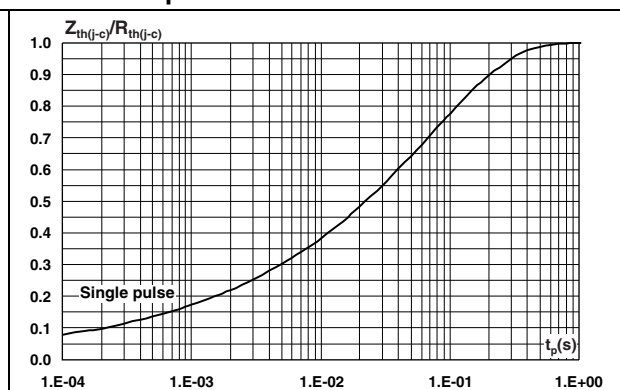
**Figure 5. Normalized avalanche power derating versus junction temperature**



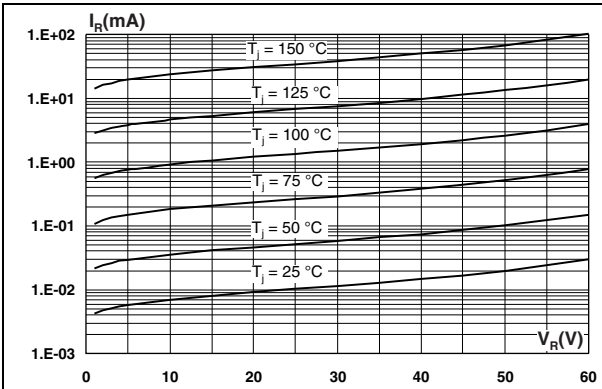
**Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values)**



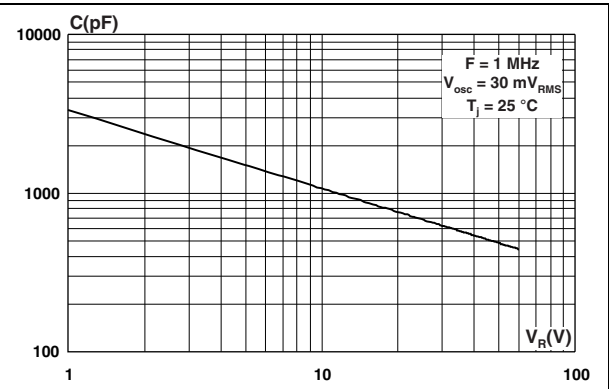
**Figure 7. Relative variation of thermal impedance junction to case versus pulse duration**



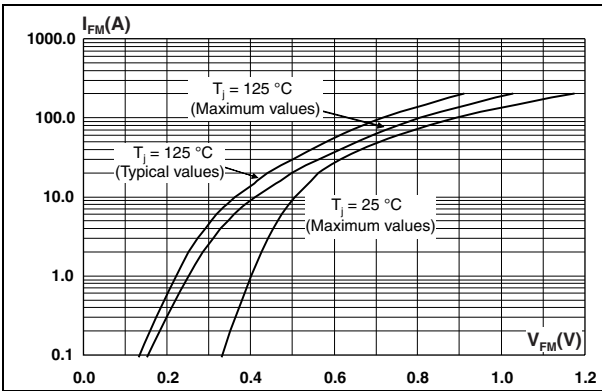
**Figure 8. Reverse leakage current versus reverse voltage applied (typical values)**



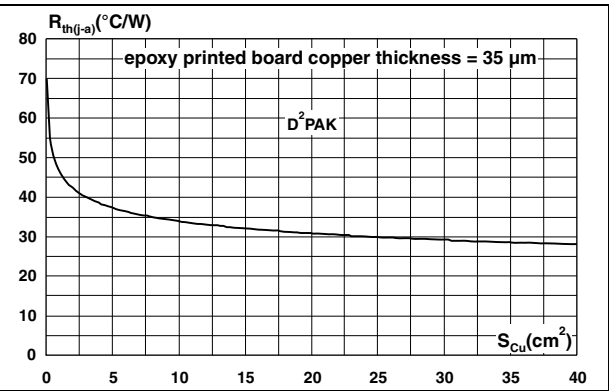
**Figure 9. Junction capacitance versus reverse voltage applied (typical values)**



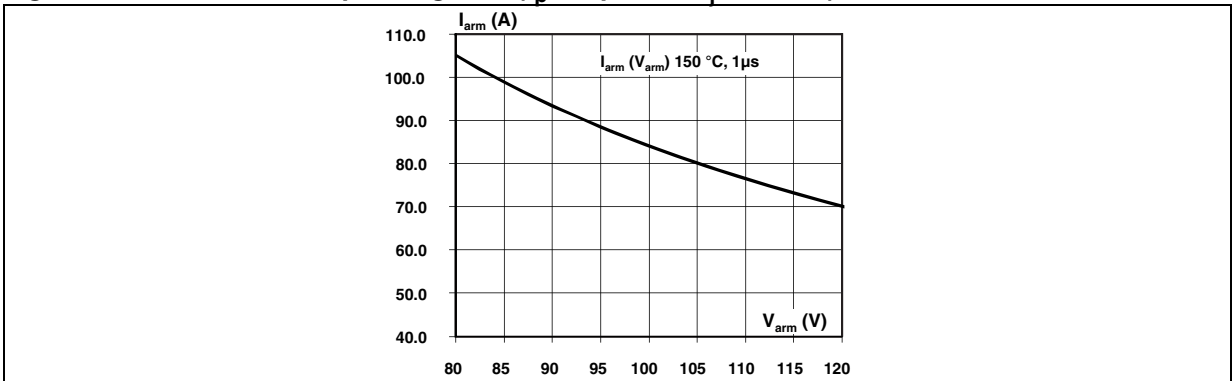
**Figure 10. Forward voltage drop versus forward current**



**Figure 11. Thermal resistance junction to ambient versus copper surface under tab**



**Figure 12. Reverse safe operating area ( $t_p < 1 \mu s$  and  $T_J < 150 \text{ }^\circ\text{C}$ )**



## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m

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](http://www.st.com). ECOPACK® is an ST trademark.

**Table 5. TO-220AB dimensions**

| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.40        | 4.60  | 0.173      | 0.181 |
| C    | 1.23        | 1.32  | 0.048      | 0.051 |
| D    | 2.40        | 2.72  | 0.094      | 0.107 |
| E    | 0.49        | 0.70  | 0.019      | 0.027 |
| F    | 0.61        | 0.88  | 0.024      | 0.034 |
| F1   | 1.14        | 1.70  | 0.044      | 0.066 |
| F2   | 1.14        | 1.70  | 0.044      | 0.066 |
| G    | 4.95        | 5.15  | 0.194      | 0.202 |
| G1   | 2.40        | 2.70  | 0.094      | 0.106 |
| H2   | 10          | 10.40 | 0.393      | 0.409 |
| L2   | 16.4 Typ.   |       | 0.645 Typ. |       |
| L4   | 13          | 14    | 0.511      | 0.551 |
| L5   | 2.65        | 2.95  | 0.104      | 0.116 |
| L6   | 15.25       | 15.75 | 0.600      | 0.620 |
| L7   | 6.20        | 6.60  | 0.244      | 0.259 |
| L9   | 3.50        | 3.93  | 0.137      | 0.154 |
| M    | 2.6 Typ.    |       | 0.102 Typ. |       |
| Dia. | 3.75        | 3.85  | 0.147      | 0.151 |

The technical drawing illustrates the geometry of a mechanical component from three perspectives:

- Front View (Left):** Shows the overall height L, mounting flange width E, and various offset dimensions L2, L3, G, B, and B2.
- Top View (Bottom Left):** Provides a plan view of the base, highlighting the flat zone M and the angled section V2.
- Side View (Right):** Details the profile of the component, including dimensions A, C2, D, R, and A1.

\* FLAT ZONE NO LESS THAN 2mm

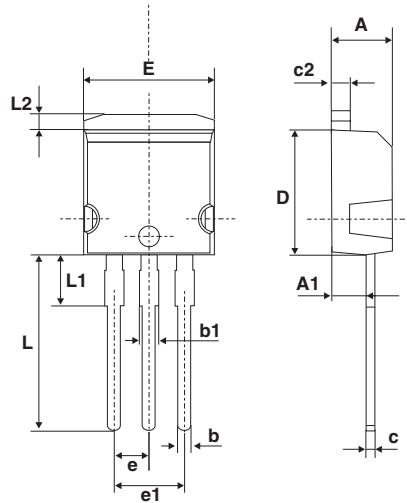
| Ref. | Dimensions  |       |            |       |
|------|-------------|-------|------------|-------|
|      | Millimeters |       | Inches     |       |
|      | Min.        | Max.  | Min.       | Max.  |
| A    | 4.40        | 4.60  | 0.173      | 0.181 |
| A1   | 2.49        | 2.69  | 0.098      | 0.106 |
| A2   | 0.03        | 0.23  | 0.001      | 0.009 |
| B    | 0.70        | 0.93  | 0.027      | 0.037 |
| B2   | 1.14        | 1.70  | 0.045      | 0.067 |
| C    | 0.45        | 0.60  | 0.017      | 0.024 |
| C2   | 1.23        | 1.36  | 0.048      | 0.054 |
| D    | 8.95        | 9.35  | 0.352      | 0.368 |
| E    | 10.00       | 10.40 | 0.393      | 0.409 |
| G    | 4.88        | 5.28  | 0.192      | 0.208 |
| L    | 15.00       | 15.85 | 0.590      | 0.624 |
| L2   | 1.27        | 1.40  | 0.050      | 0.055 |
| L3   | 1.40        | 1.75  | 0.055      | 0.069 |
| M    | 2.40        | 3.20  | 0.094      | 0.126 |
| R    | 0.40 typ.   |       | 0.016 typ. |       |
| V2   | 0°          | 8°    | 0°         | 8°    |

Technical drawing showing the front and side views of a mechanical part with the following dimensions:

- Front View (Left):
  - Overall width: 16.90
  - Overall height: 10.30
  - Bottom width: 8.90
- Side View (Right):
  - Overall width: 3.70
  - Height of the top section: 5.08
  - Height of the bottom section: 1.30

Table 7. I<sup>2</sup>PAK dimensions

| Ref. | Dimensions  |       |        |       |
|------|-------------|-------|--------|-------|
|      | Millimeters |       | Inches |       |
|      | Min.        | Max.  | Min.   | Max.  |
| A    | 4.40        | 4.60  | 0.173  | 0.181 |
| A1   | 2.40        | 2.72  | 0.094  | 0.107 |
| b    | 0.61        | 0.88  | 0.024  | 0.035 |
| b1   | 1.14        | 1.70  | 0.044  | 0.067 |
| c    | 0.49        | 0.70  | 0.019  | 0.028 |
| c2   | 1.23        | 1.32  | 0.048  | 0.052 |
| D    | 8.95        | 9.35  | 0.352  | 0.368 |
| e    | 2.40        | 2.70  | 0.094  | 0.106 |
| e1   | 4.95        | 5.15  | 0.195  | 0.203 |
| E    | 10          | 10.40 | 0.394  | 0.409 |
| L    | 13          | 14    | 0.512  | 0.551 |
| L1   | 3.50        | 3.93  | 0.138  | 0.155 |
| L2   | 1.27        | 1.40  | 0.050  | 0.055 |



### 3 Ordering information

**Table 8. Ordering information**

| Order code      | Marking      | Package            | Weight | Base qty | Delivery mode |
|-----------------|--------------|--------------------|--------|----------|---------------|
| STPS30SM60ST    | STPS30SM60ST | TO-220AB           | 2.2 g  | 50       | Tube          |
| STPS30SM60SR    | STPS30SM60SR | I <sup>2</sup> PAK | 1.49 g | 50       | Tube          |
| STPS30SM60SG-TR | STPS30SM60SG | D <sup>2</sup> PAK | 1.48 g | 1000     | Tape and reel |

### 4 Revision history

**Table 9. Revision history**

| Date        | Revision | Changes      |
|-------------|----------|--------------|
| 24-Oct-2011 | 1        | First issue. |



**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 TWO AUTHORIZED ST REPRESENTATIVES, 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.

© 2011 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](http://www.st.com)