

Turbo 2 ultrafast high voltage rectifier

Table 1. Main product characteristics

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

Features and benefits

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

Description

The STTH1R06, which uses ST Turbo 2 600 V technology, is especially suited as a 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.

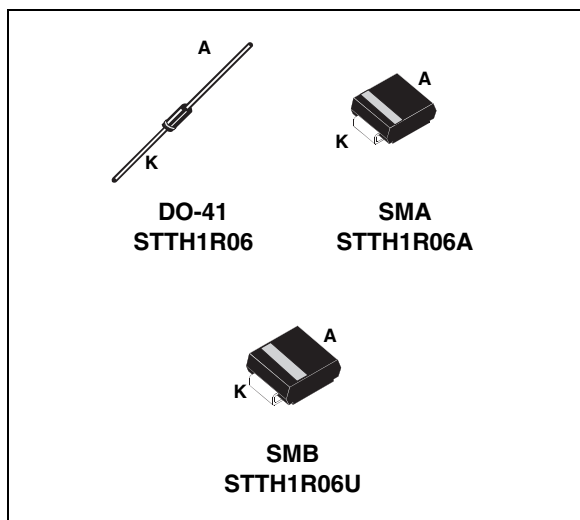


Table 2. Order codes

Part number	Marking
STTH1R06	STTH1R06
STTH1R06RL	STTH1R06
STTH1R06A	HR6
STTH1R06U	BR6

Table 3. Absolute ratings (limiting values)

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		600	V
$I_{F(RMS)}$	RMS forward current	DO-41	10	A
		SMA / SMB	7	
$I_{F(AV)}$	Average forward current	DO-41	$T_c = 100^\circ \text{C} \quad \delta = 0.5$	A
		SMA	$T_c = 125^\circ \text{C} \quad \delta = 0.5$	
		SMB	$T_c = 135^\circ \text{C} \quad \delta = 0.5$	
I_{FSM}	Surge non repetitive forward current	DO-41	$t_p = 10\text{ms sinusoidal}$	A
		SMA / SMB		
T_{stg}	Storage temperature range		-65 to + 175	° C
T_j	Maximum operating junction temperature		175	° C

1 Characteristics

Table 4. 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 $S = S \text{ cm}^2$ (see [Figure 14](#)).

Table 5. Static electrical characteristics

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

To evaluate the conduction losses use the following equation:

$$P = 1.03 \times I_{F(AV)} + 0.27 I_F^2 (RMS)$$

Table 6. Dynamic characteristics

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

Figure 1. Conduction losses versus average forward current

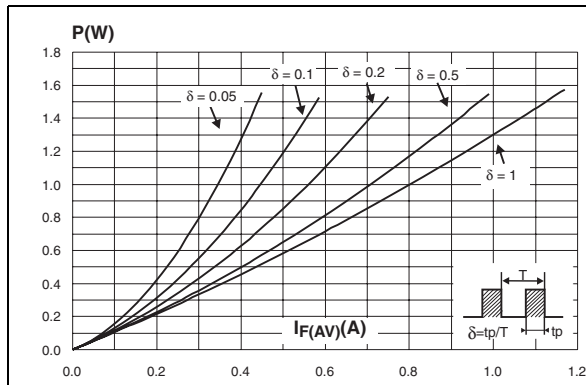


Figure 2. Forward voltage drop versus forward current

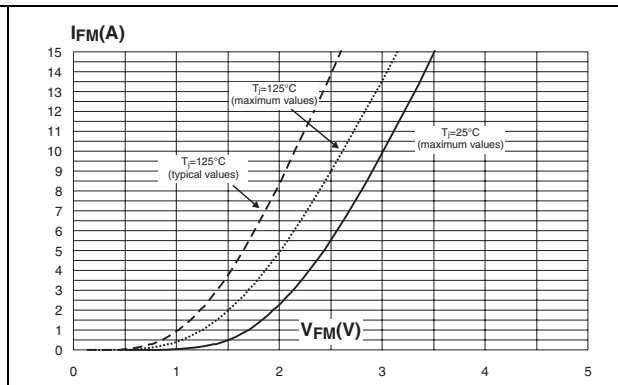


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration (DO-41)

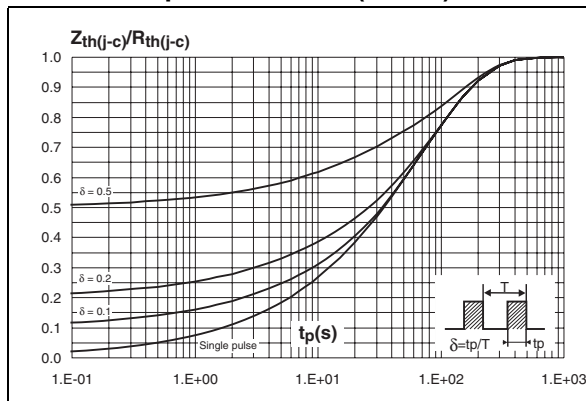


Figure 4. Relative variation of thermal impedance junction to case versus pulse duration (SMA)

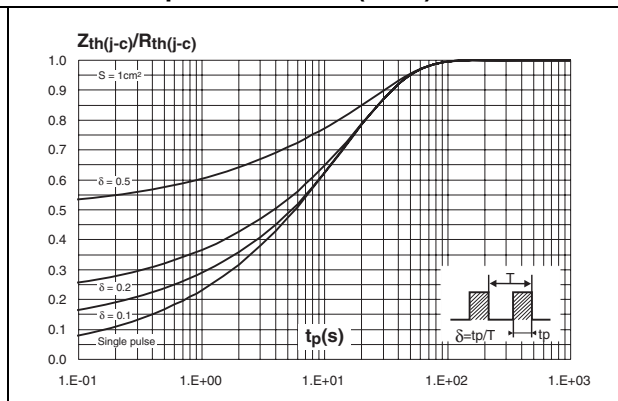


Figure 5. Relative variation of thermal impedance junction to case versus pulse duration (SMB)

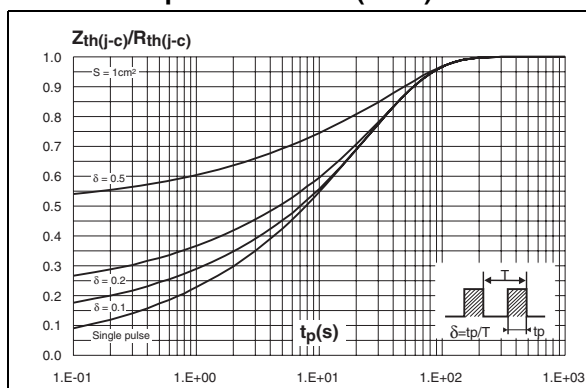


Figure 6. Peak reverse recovery current versus di_F/dt (typical values)

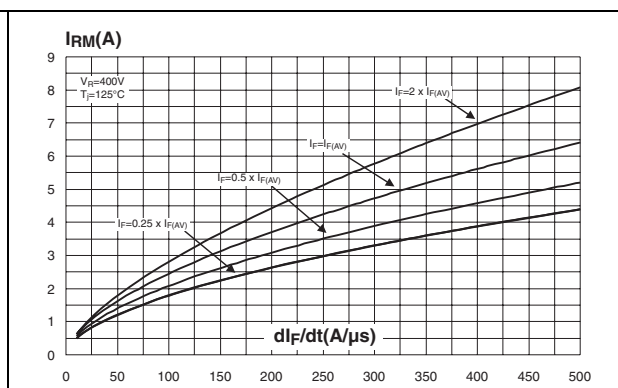


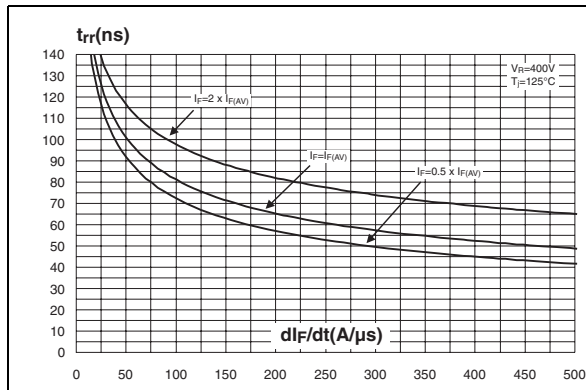
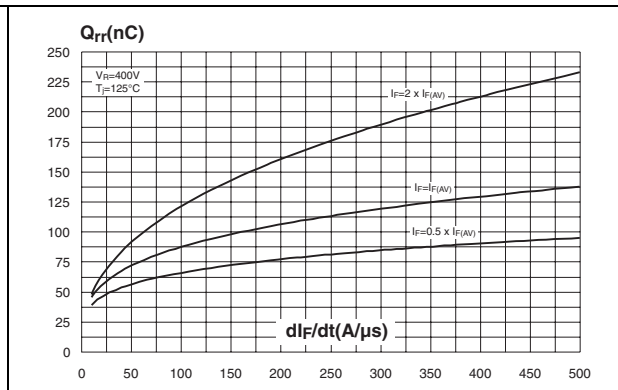
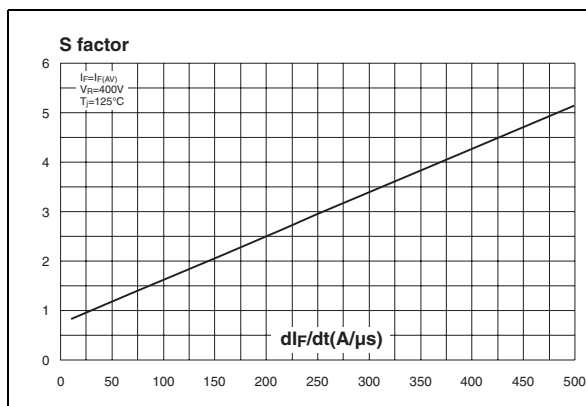
Figure 7. Reverse recovery time versus di_F/dt (typical values)Figure 8. Reverse recovery charges versus di_F/dt (typical values)Figure 9. Reverse recovery softness factor versus di_F/dt (typical values)

Figure 10. Relative variations of dynamic parameters versus junction temperature

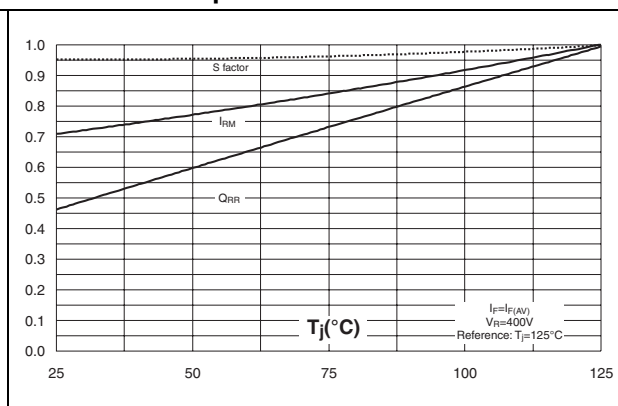
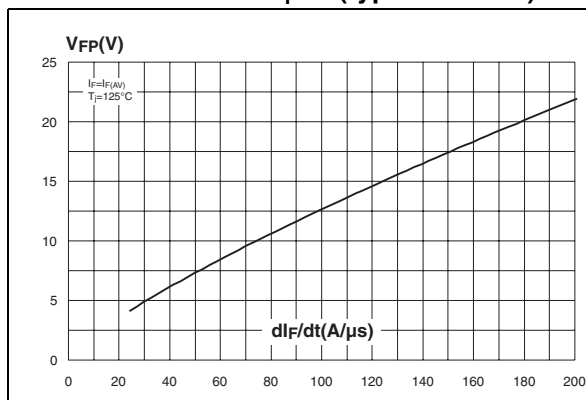
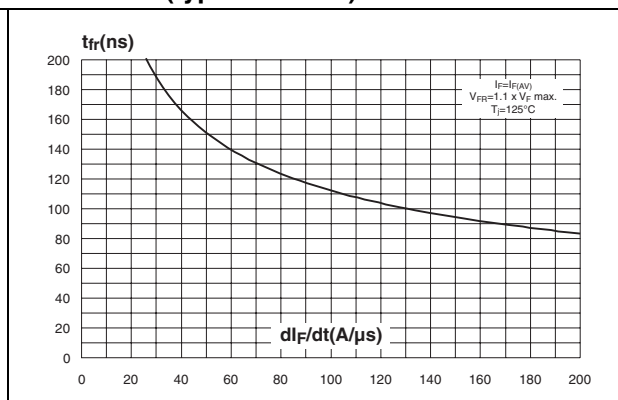
Figure 11. Transient peak forward voltage versus di_F/dt (typical values)Figure 12. Forward recovery time versus di_F/dt (typical values)

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

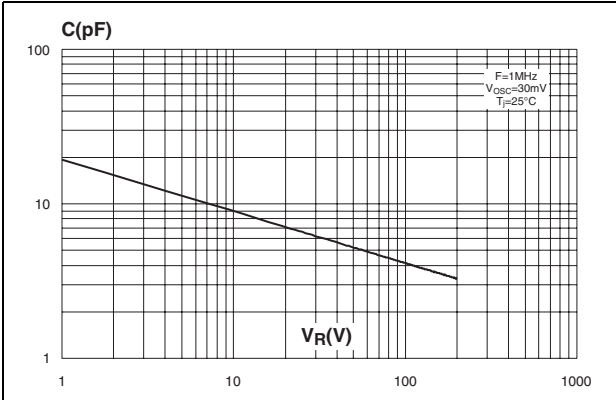


Figure 14. Thermal resistance junction to ambient versus copper surface under each lead (epoxy FR4, copper thickness = 35 μm) (DO-41, SMB)

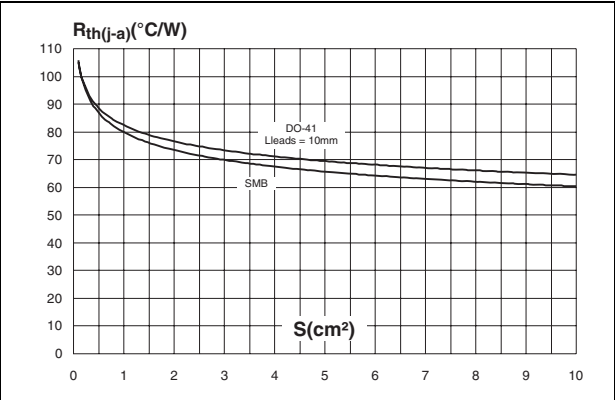
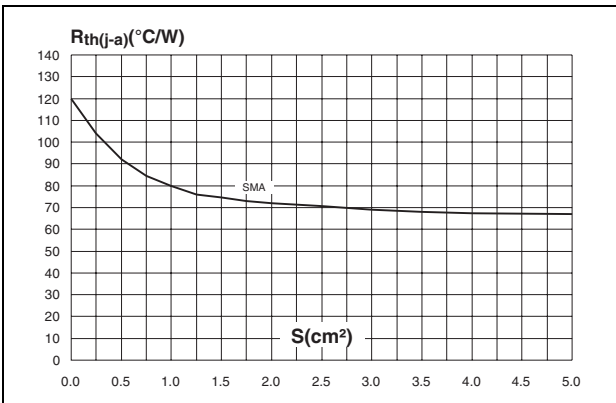


Figure 15. Thermal resistance junction to ambient versus copper surface under each lead (epoxy FR4, copper thickness = 35 μm) (SMA)



2 Package information

- Epoxy meets UL94, V0

Table 7. 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 (inches)

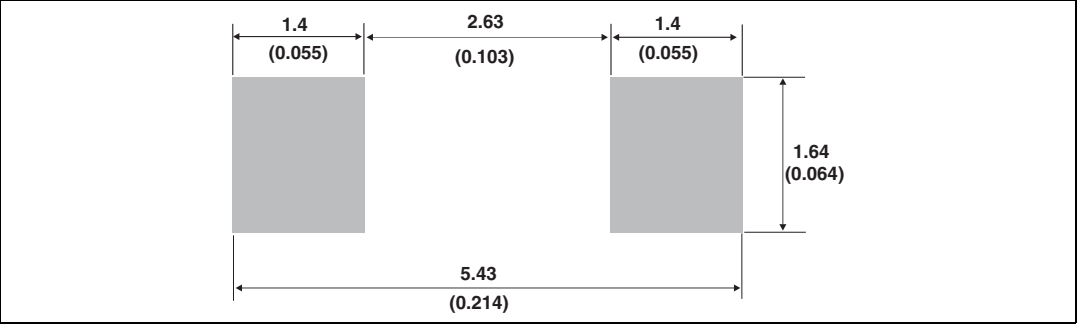
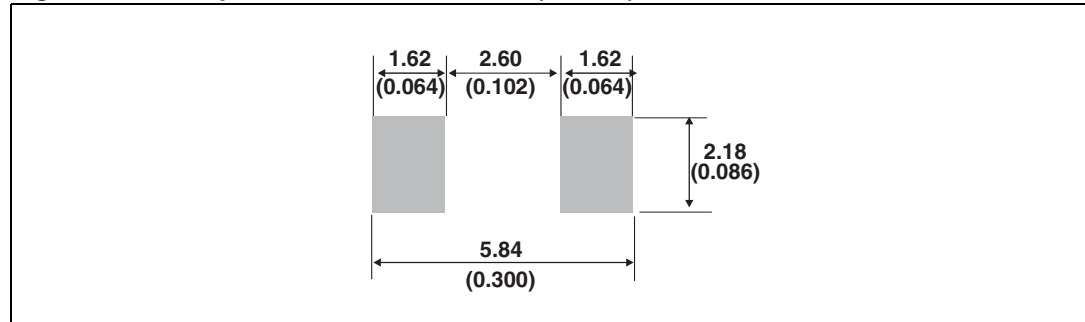


Table 8. SMB dimensions

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
D	3.30	3.95	0.130	0.156
E	5.10	5.60	0.201	0.220
E1	4.05	4.60	0.159	0.181
L	0.75	1.50	0.030	0.059

Figure 17. Footprint, dimensions in mm (inches)**Table 9. DO-41 (glass) 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	28		1.102	
D	0.712	0.863	0.028	0.034

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

3 Ordering information

Table 10. Ordering information

Part number	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 11. Revision history

Date	Revision	Description of 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 inches) to 2.03 mm (0.080 inches).
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 10.

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.

© 2007 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 - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com