



STH180N10F3-2 STP180N10F3

N-channel 100 V, 3.2 mΩ, 180 A STripFET™ Power MOSFET
H²PAK, TO-220

Features

Type	V _{DSS}	R _{DS(on) max.}	I _D
STH180N10F3-2	100 V	4 mΩ	180 A
STP180N10F3	100 V	4.8 mΩ	120 A

- Ultra low on-resistance
- 100% avalanche tested

Application

- High current switching applications

Description

These devices are the latest refinement of STMicroelectronics unique “single feature size” strip-based process with less critical alignment steps and therefore a remarkable manufacturing reproducibility. The resulting transistor shows extremely high packing density for low on resistance, rugged avalanche characteristics and low gate charge.

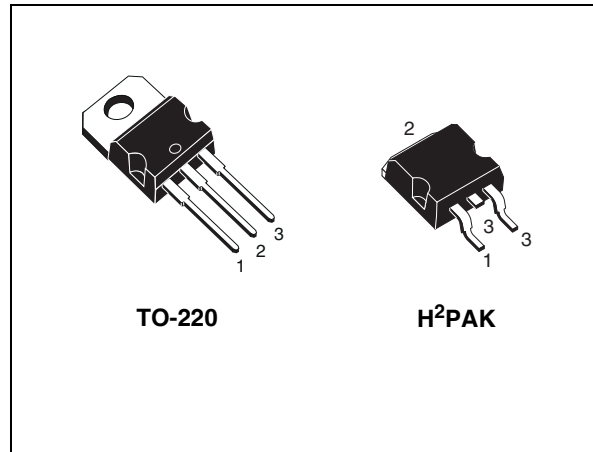


Figure 1. Internal schematic diagram

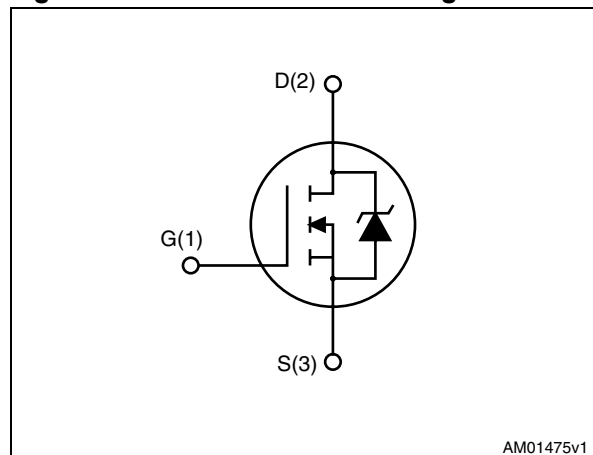


Table 1. Device summary

Order codes	Marking	Package	Packaging
STH180N10F3-2	180N10F3	H ² PAK	Tape and reel
STP180N10F3	180N10F3	TO-220	Tube

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
3	Test circuits	6
4	Package mechanical data	7
5	Revision history	11

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		TO-220	H ² PAK	
V _{DS}	Drain-source voltage (V _{GS} =0)	100		V
V _{GS}	Gate-source voltage	± 20		V
I _D ⁽¹⁾	Drain current (continuous) at T _C = 25°C	120	180	A
I _D ⁽¹⁾	Drain current (continuous) at T _C =100°C	110	120	A
I _{DM} ⁽²⁾	Drain current (pulsed)	480	720	A
P _{TOT}	Total dissipation at T _C = 25°C	315		W
	Derating factor	2.1		W/°C
dv/dt	Peak diode recovery voltage slope	TBD		V/ns
E _{AS} ⁽³⁾	Single pulse avalanche energy	TBD		mJ
T _j T _{stg}	Operating junction temperature storage temperature	- 55 to 175		°C

1. Current limited by package.
2. Pulse width limited by safe operating area.
3. Starting T_j = 25 °C, I_D = 60 A, V_{DD} = 40 V

Table 3. Thermal data

Symbol	Parameter	TO-220	H ² PAK	Unit
R _{thj-case}	Thermal resistance junction-case	0.48		°C/W
R _{thj-a}	Thermal resistance junction-ambient max	62.5		°C/W
R _{thj-pcb} ⁽¹⁾	Thermal resistance junction-ambient max		35	°C/W
T _l	Maximum lead temperature for soldering purpose	300		°C

1. When mounted on FR-4 board, on 1inch², 2oz Cu.

2 Electrical characteristics

($T_{CASE}=25^{\circ}\text{C}$ unless otherwise specified)

Table 4. On/off states

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250 \mu\text{A}$, $V_{GS} = 0$	100			V
I_{DSS}	Zero gate voltage drain current ($V_{GS} = 0$)	$V_{DS} = \text{max rating}$, $V_{DS} = \text{max rating}$, @ 125°C			10 100	μA μA
I_{GSS}	Gate body leakage current ($V_{DS} = 0$)	$V_{GS} = \pm 20 \text{ V}$			± 200	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250 \mu\text{A}$	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10 \text{ V}$, $I_D = 60 \text{ A}$ H ² PAK TO-220		3.2 3.84	4 4.8	$\text{m}\Omega$ $\text{m}\Omega$

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{iss}	Input capacitance	$V_{DS} = 25 \text{ V}$, $f = 1 \text{ MHz}$, $V_{GS} = 0$	-	6446	-	pF
C_{oss}	Output capacitance			710		pF
C_{rss}	Reverse transfer capacitance			51.2		pF
Q_g	Total gate charge	$V_{DD} = 44 \text{ V}$, $I_D = 120 \text{ A}$,	-	100	-	nC
Q_{gs}	Gate-source charge	$V_{GS} = 10 \text{ V}$		TBD		nC
Q_{gd}	Gate-drain charge	(see Figure 3)		TBD		nC

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 27.5 \text{ V}$, $I_D = 60 \text{ A}$ $R_G = 4.7 \Omega$, $V_{GS} = 10 \text{ V}$ (see Figure 2 , Figure 7)	-	TBD	-	ns
t_r	Rise time			TBD		ns
$t_{d(off)}$	Turn-off delay time			TBD		ns
t_f	Fall time			TBD		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}^{(1)}$	Source-drain current Source-drain current (pulsed)		-		120 480	A A
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD}=120\text{ A}$, $V_{GS}=0$	-		1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD}=120\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD}=30\text{ V}$, $T_j=150^\circ\text{C}$ (see Figure 4)	-	TBD TBD TBD		ns μC A

1. Pulse width limited by safe operating area
2. Pulsed: pulse duration = 300 μs , duty cycle 1.5%

3 Test circuits

Figure 2. Switching times test circuit for resistive load

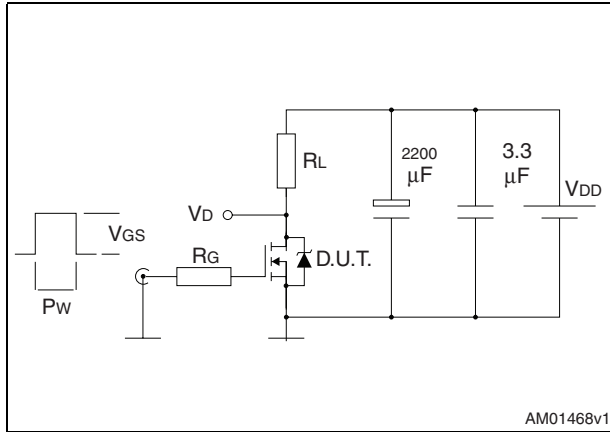


Figure 3. Gate charge test circuit

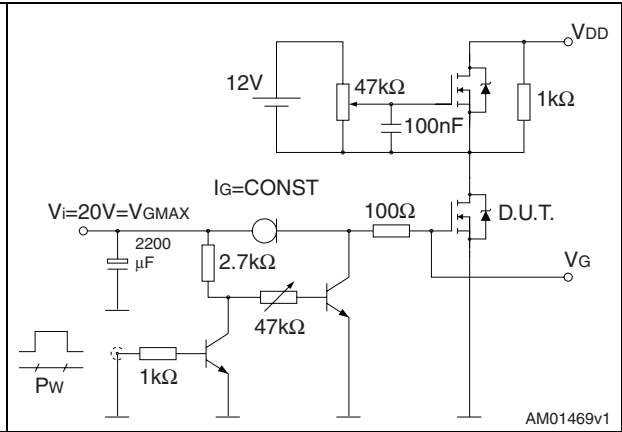


Figure 4. Test circuit for inductive load switching and diode recovery times

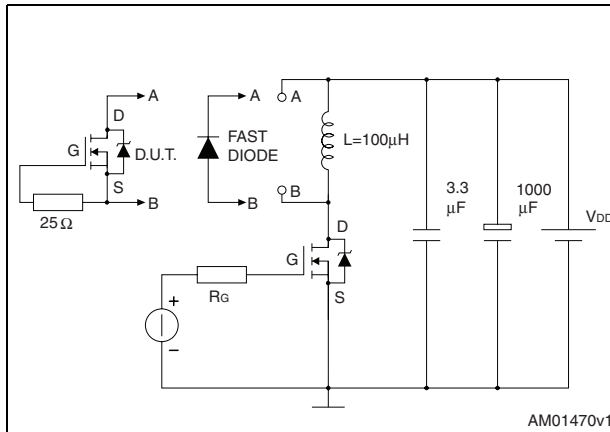


Figure 5. Unclamped inductive load test circuit

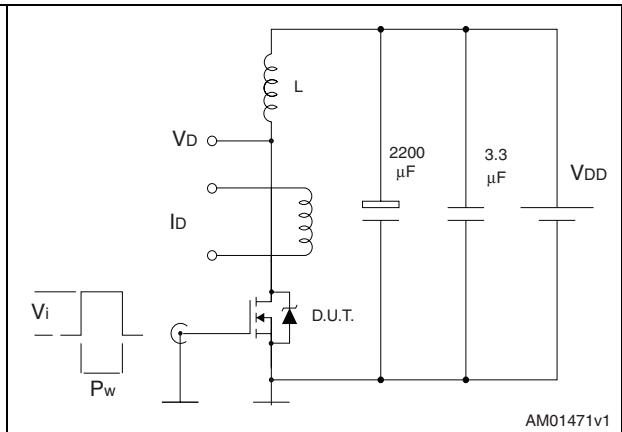


Figure 6. Unclamped inductive waveform

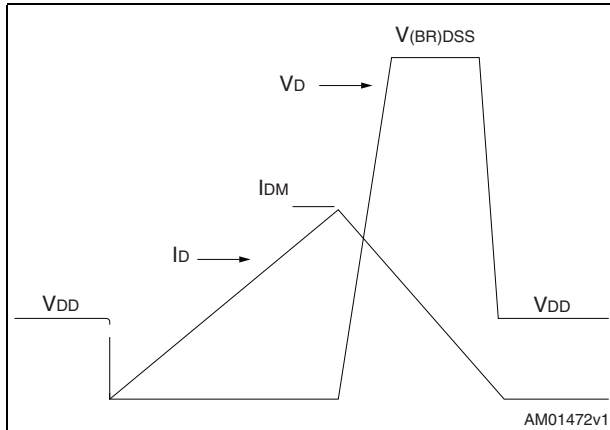
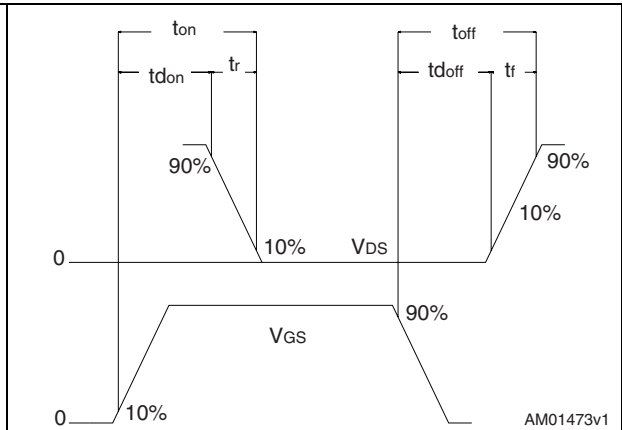


Figure 7. Switching time waveform



4 Package mechanical data

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.

TO-220 mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.48		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
∅P	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116

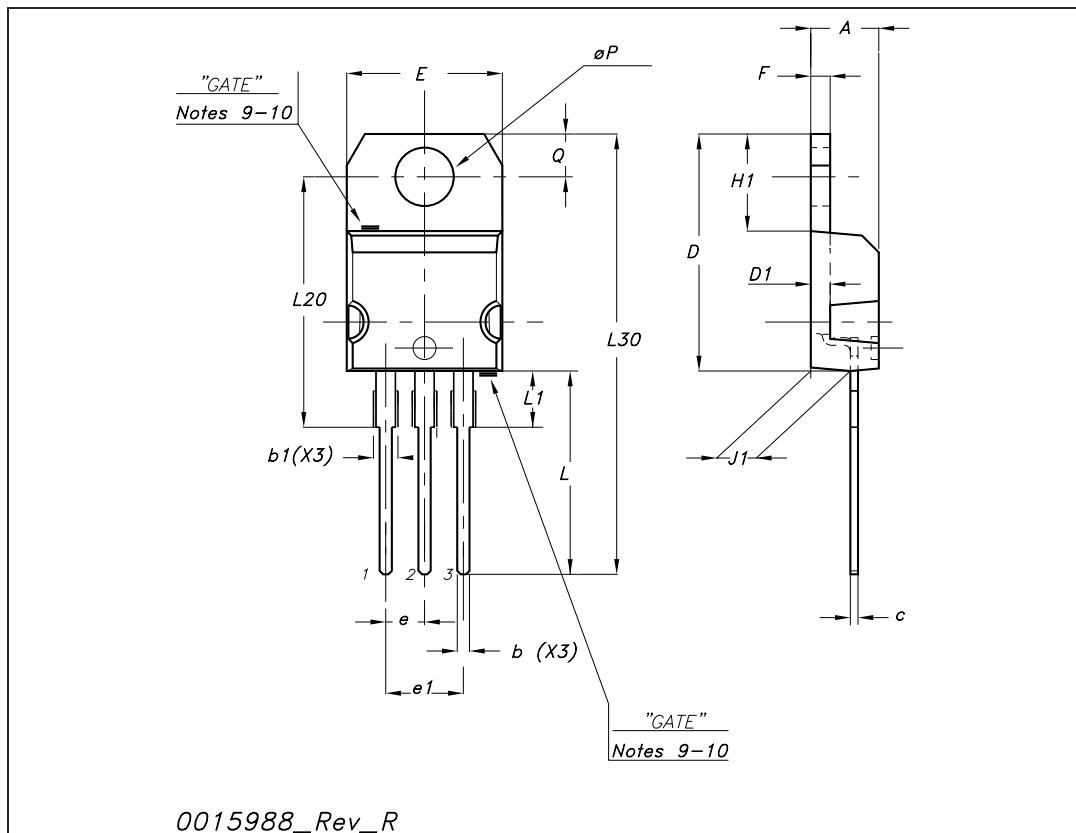
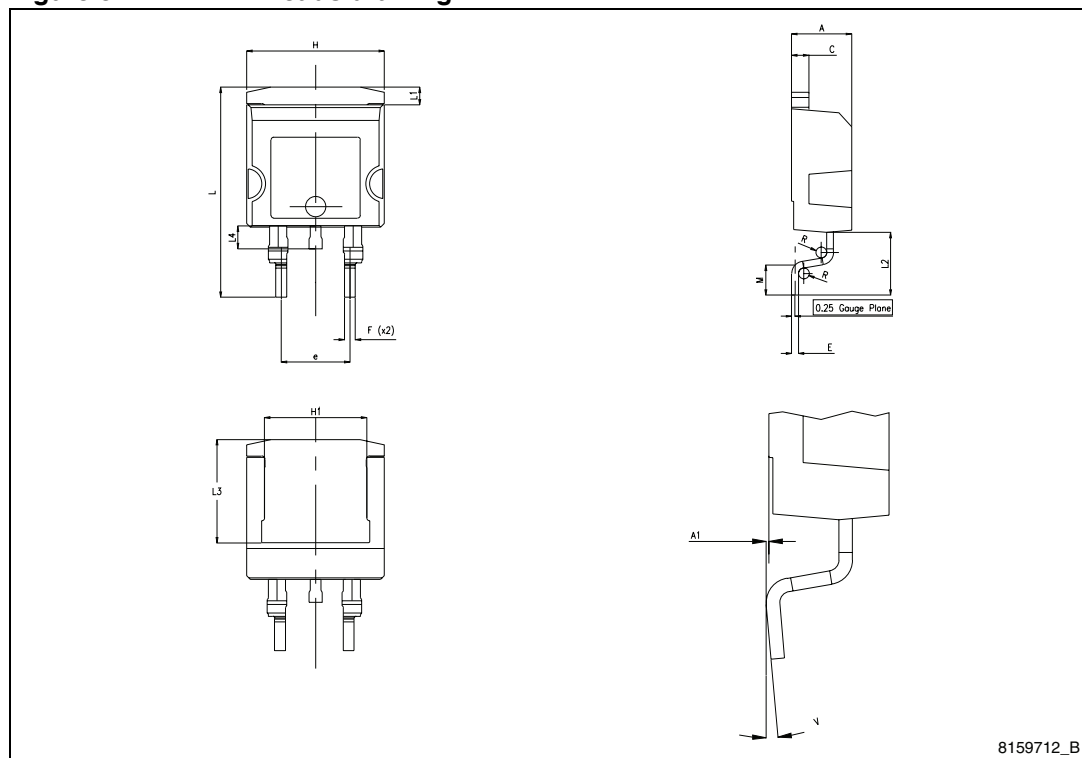


Table 8. H²PAK 2 leads mechanical data

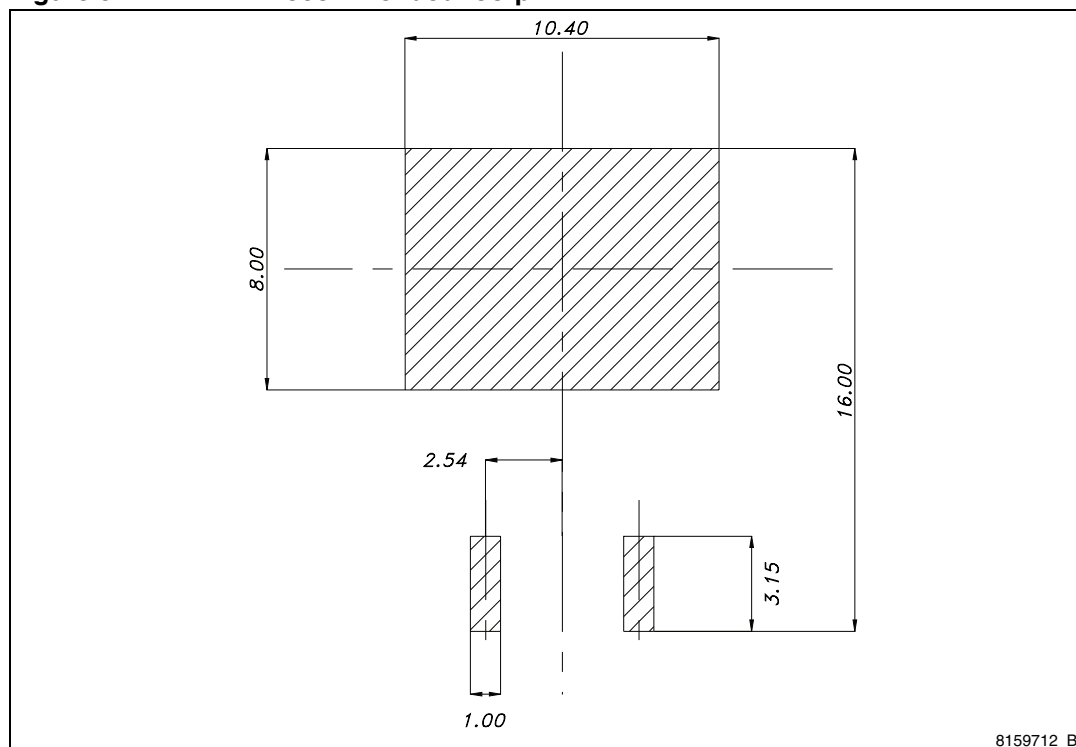
Dim.	mm		
	Min.	Typ.	Max.
A	4.30		4.80
A1	0.03		0.20
C	1.17		1.37
e	4.98		5.18
E	0.50		0.90
F	0.78		0.85
H	10.00		10.40
H1	7.171		7.971
L	15.30		15.80
L1	1.27		1.40
L2	4.93		5.23
L3	7.45		7.85
L4	1.5		1.7
M	2.6		2.9
R	0.20		0.60
V	0°		8°

Figure 8. H²PAK 2 leads drawing



8159712_B

Figure 9. H²PAK 2 recommended footprint



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
01-Aug-2008	1	First version
03-jun-2010	2	– Removed package, mechanical data: D ² PAK – Added new package mechanical data: H ² PAK

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.

© 2010 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