



# STD60N55-1 STD60N55

N-channel 55V - 8.0mΩ - 65A - DPAK - IPAK  
MDmesh™ low voltage Power MOSFET

PRELIMINARY DATA

## General features

Type	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>	P <sub>w</sub>
STD60N55	55V	<10.5mΩ	65A	110W
STD60N55-1	55V	<10.5mΩ	65A	110W

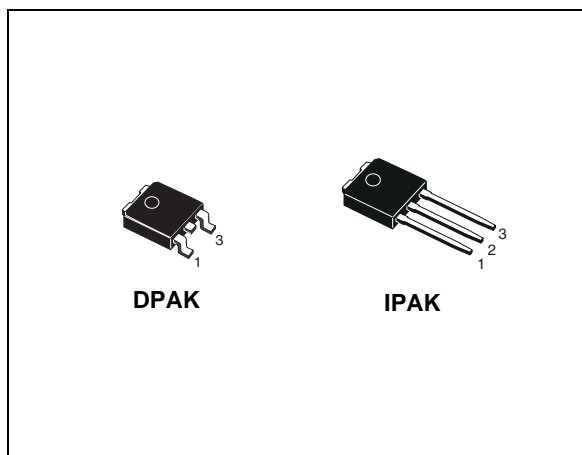
- Standard threshold drive
- 100% avalanche tested

## Description

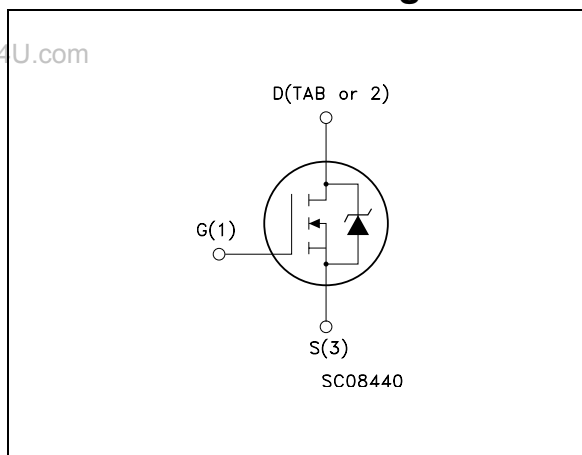
This n-channel enhancement mode Power MOSFET is the latest refinement of STMicroelectronic unique “Single Feature Size™” strip-based process with less critical alignment steps and therefore a remarkable manufacturing reproducibility. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and low gate charge.

## Applications

- Switching application



## Internal schematic diagram



## Order codes

Part number	Marking	Package	Packaging
STD60N55	D60N55	DPAK	Tape & reel
STD60N55-1	D60N55-1	IPAK	Tube

July 2006

Rev 1

1/12

This is preliminary information on a new product now in development or undergoing evaluation. Details are subject to change without notice.

[www.st.com](http://www.st.com)

# Contents

1	<b>Electrical ratings</b> .....	3
2	<b>Electrical characteristics</b> .....	4
3	<b>Test circuit</b> .....	6
4	<b>Package mechanical data</b> .....	7
5	<b>Packaging mechanical data</b> .....	9
6	<b>Revision history</b> .....	10



# 1 Electrical ratings

**Table 1. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage ( $V_{GS}=0$ )	55	V
$V_{GS}$	Gate-source voltage	$\pm 20$	V
$I_D$	Drain current (continuous) at $T_C = 25^\circ\text{C}$	65	A
$I_D$	Drain current (continuous) at $T_C = 100^\circ\text{C}$	46	A
$I_{DM}^{(1)}$	Drain current (pulsed)	260	A
$P_{TOT}$	Total dissipation at $T_C = 25^\circ\text{C}$	110	W
	Derating factor	0.73	W/ $^\circ\text{C}$
$dv/dt^{(2)}$	Peak diode recovery voltage slope	8	V/ns
$E_{AS}^{(3)}$	Single pulse avalanche energy	390	mJ
$T_j$ $T_{stg}$	Operating junction temperature Storage temperature	-55 to 175	$^\circ\text{C}$

1. Pulse width limited by safe operating area
2.  $I_{SD} \leq 65\text{A}$ ,  $di/dt \leq 300\text{A}/\mu\text{s}$ ,  $V_{DD} \leq V_{(BR)DSS}$ ,  $T_j \leq T_{jmax}$
3. Starting  $T_j=25^\circ\text{C}$ ,  $I_d=32\text{A}$ ,  $V_{dd}=40\text{V}$

**Table 2. Thermal resistance**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1.36	$^\circ\text{C}/\text{W}$
$R_{thj-pcb}^{(1)}$	Thermal resistance junction-ambient max	50	$^\circ\text{C}/\text{W}$
$T_l$	Maximum lead temperature for soldering purpose	275	$^\circ\text{C}$

1. When mounted on FR-4 board of 1inch<sup>2</sup>, 2oz Cu

## 2 Electrical characteristics

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

**Table 3. Static**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source breakdown voltage	$I_D = 250\mu A, V_{GS} = 0$	55			V
$I_{DSS}$	Zero gate voltage drain current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max rating},$ $V_{DS} = \text{Max rating}, T_c = 125^{\circ}C$			10 100	$\mu A$ $\mu A$
$I_{GSS}$	Gate body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20V$			$\pm 200$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2		4	V
$R_{DS(on)}$	Static drain-source on resistance	$V_{GS} = 10V, I_D = 32A$		8.0	10.5	m $\Omega$

**Table 4. Dynamic**

Symbol	Parameter	Test conditions	Min	Typ.	Max.	Unit
$g_{fs}^{(1)}$	Forward transconductance	$V_{DS} = 25V, I_D = 32A$		50		S
$C_{iss}$	Input capacitance	$V_{DS} = 25V, f = 1MHz, V_{GS} = 0$		2200		pF
$C_{oss}$	Output capacitance			500		pF
$C_{rss}$	Reverse transfer capacitance			25		pF
$Q_g$	Total gate charge	$V_{DD} = 27V, I_D = 65A$		33.5	45	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 10V$		12.5		nC
$Q_{gd}$	Gate-drain charge	(see Figure 2)		9.5		nC

1. Pulsed: pulse duration = 300 $\mu s$ , duty cycle 1.5%

**Table 5. Switching on/off (inductive load)**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on delay time Rise time	$V_{DD} = 27V$ , $I_D = 32A$ , $R_G = 4.7\Omega$ , $V_{GS} = 10V$ (see Figure 3)		20 50		ns ns
$t_{d(off)}$ $t_f$	Turn-off delay time Fall time	$V_{DD} = 27V$ , $I_D = 32A$ , $R_G = 4.7\Omega$ , $V_{GS} = 10V$ (see Figure 3)		35 11.5		ns ns

**Table 6. Source drain diode**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain current				65	A
$I_{SDM}^{(1)}$	Source-drain current (pulsed)				260	A
$V_{SD}$	Forward on voltage	$I_{SD} = 65A$ , $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse recovery time	$I_{SD} = 65A$ , $V_{DD} = 30V$		47		ns
$Q_{rr}$	Reverse recovery charge	$di/dt = 100A/\mu s$ ,		87		nC
$I_{RRM}$	Reverse recovery current	$T_j = 150^\circ C$ (see Figure 5)		3.7		A

1. Pulsed: pulse duration = 300 $\mu s$ , duty cycle 1.5%

### 3 Test circuit

Figure 1. Unclamped inductive load test circuit

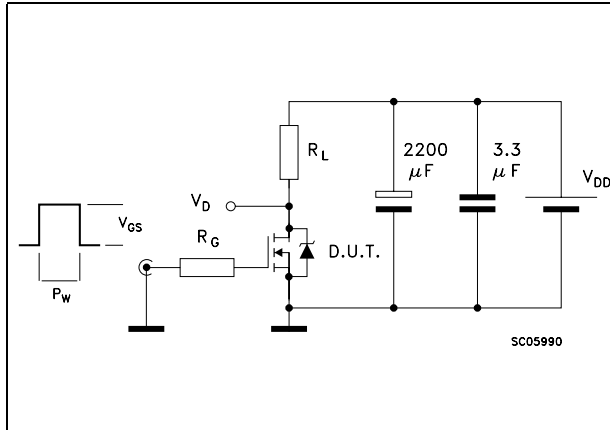


Figure 2. Unclamped inductive waveform

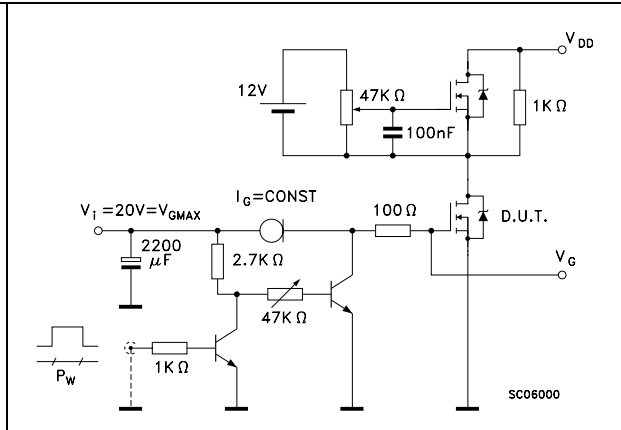


Figure 3. Switching times test circuit for resistive load

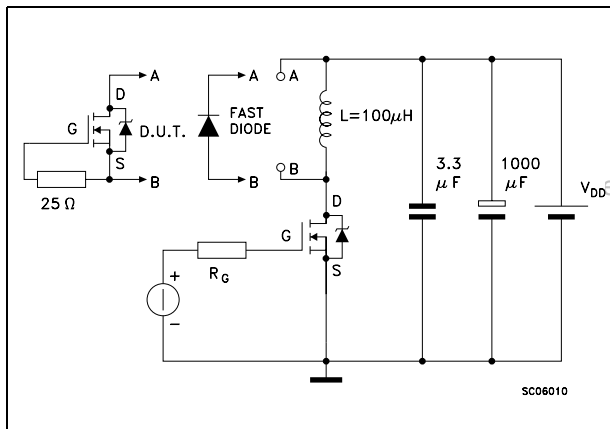


Figure 4. Gate charge test circuit

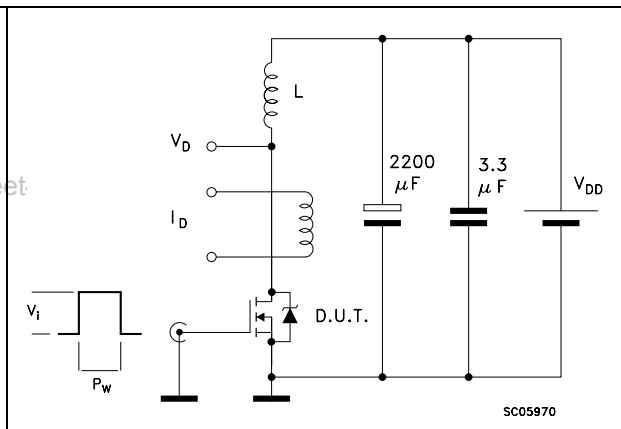


Figure 5. Test circuit for inductive load switching and diode recovery times

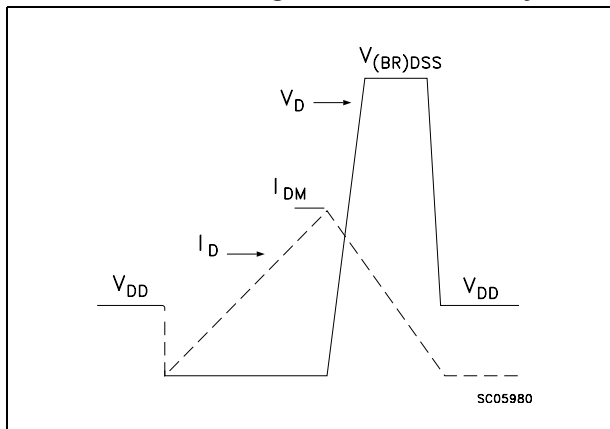
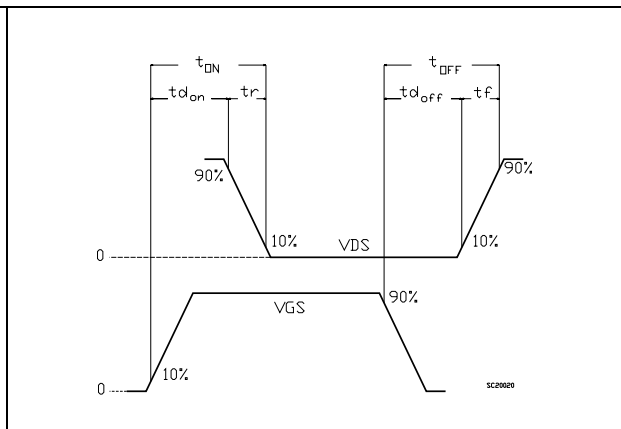


Figure 6. Switching time waveform

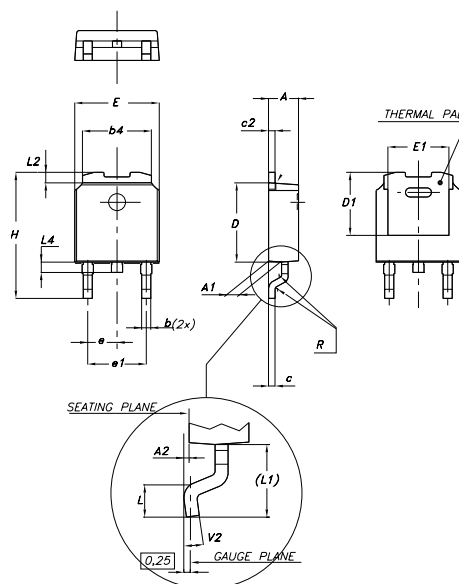


## 4 Package mechanical data

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](http://www.st.com)

## DPAK MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
b4	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
D1		5.1			0.200	
E	6.4		6.6	0.252		0.260
E1		4.7			0.185	
e		2.28			0.090	
e1	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L	1			0.039		
(L1)		2.8			0.110	
L2		0.8			0.031	
L4	0.6		1	0.023		0.039
R		0.2			0.008	
V2	0°		8°	0°		8°

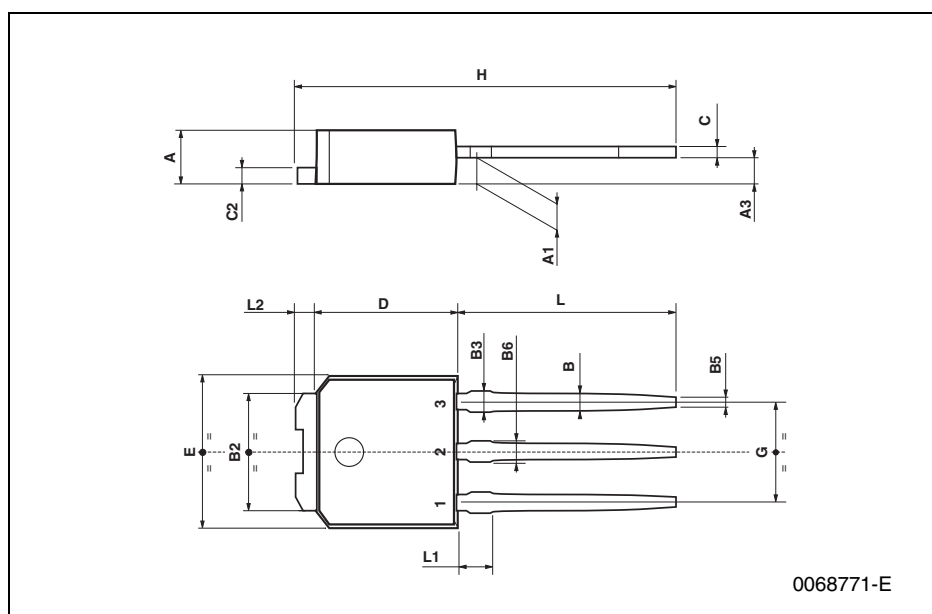


0068772-F



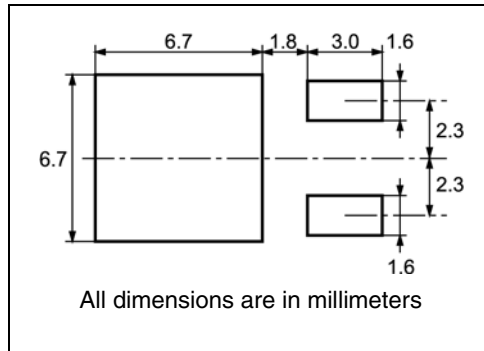
## TO-251 (IPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039

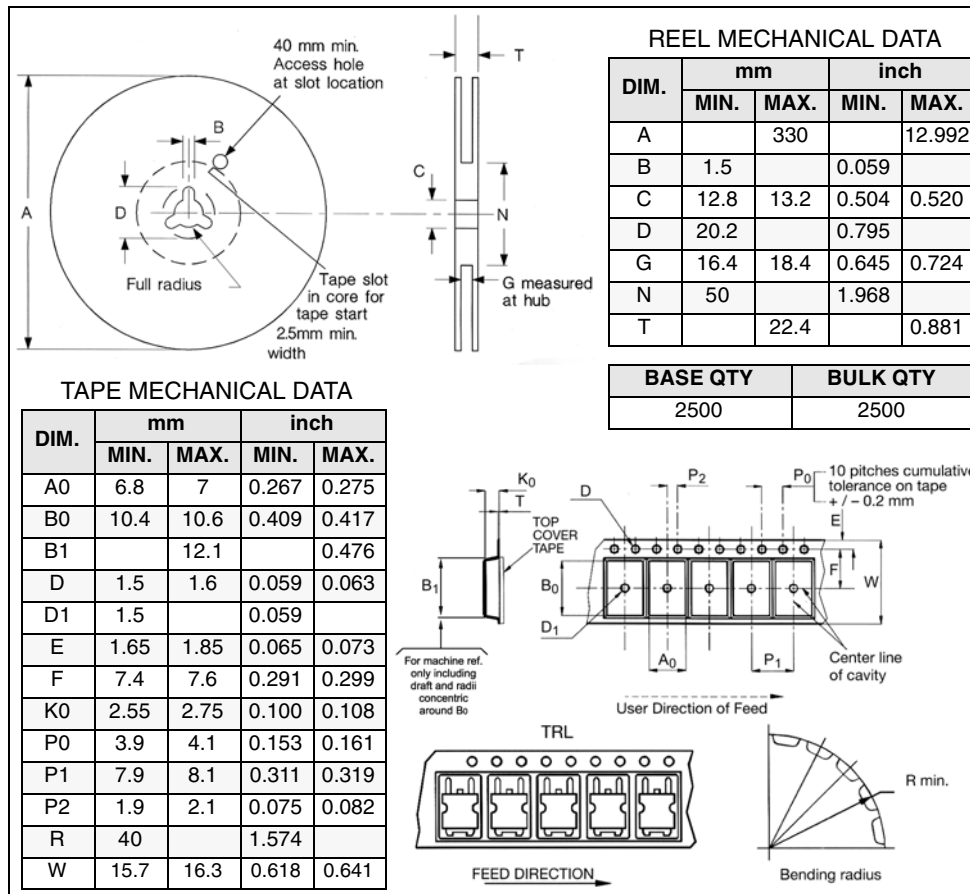


## 5 Packaging mechanical data

### DPAK FOOTPRINT



### TAPE AND REEL SHIPMENT



## 6 Revision history

Table 7. Revision history

Date	Revision	Changes
17-Jul-2005	1	First release

**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.

© 2006 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](http://www.st.com)