

## 1200 V ultrafast recovery diode

### Features

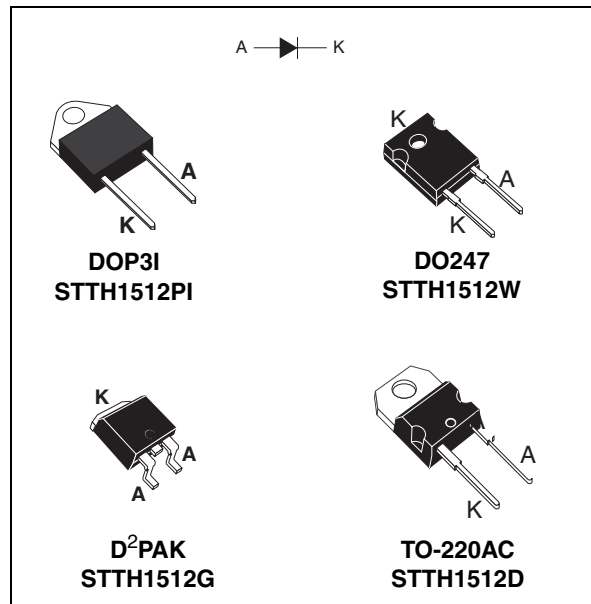
- Ultrafast, soft recovery
- Very low conduction and switching losses
- High frequency and/or high pulsed current operation
- High reverse voltage capability
- High junction temperature
- Insulated package: DOP3I
  - Electrical insulation = 2500 V rms
  - Capacitance = 12 pF

### Description

The high quality design of this diode has produced a device with low leakage current, regularly reproducible characteristics and intrinsic ruggedness. These characteristics make it ideal for heavy duty applications that demand long term reliability.

Such demanding applications include industrial power supplies, motor control, and similar mission-critical systems that require rectification and freewheeling. These diodes also fit into auxiliary functions such as snubber, bootstrap, and demagnetization applications.

The improved performance in low leakage current, and therefore thermal runaway guard band, is an immediate competitive advantage for this device.



**Table 1. Device summary**

Symbol	Value
$I_{F(AV)}$	15 A
$V_{RRM}$	1200 V
$T_j$	175 °C
$V_F$ (typ)	1.20 V
$t_{rr}$ (typ)	53 ns

# 1 Characteristics

**Table 2. Absolute ratings (limiting values at 25 °C, unless otherwise specified)**

Symbol	Parameter		Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage		1200	V
$I_{F(RMS)}$	Forward rms current	TO-220AC / DO247 / DOP3I / D <sup>2</sup> PAK	50	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$	TO-220AC / D <sup>2</sup> PAK / DO247	15	A
		DOP3I		
$I_{FRM}$	Repetitive peak forward current	$t_p = 5 \mu s, F = 5 \text{ kHz square}$	200	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10 \text{ ms Sinusoidal}$	200	A
$T_{stg}$	Storage temperature range		-65 to + 175	°C
$T_j$	Maximum operating junction temperature		175	°C

**Table 3. Thermal parameters**

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case	TO-220AC / D <sup>2</sup> PAK / DO247	1.3	°C/W
		DOP3I	2	°C/W

**Table 4. Static electrical characteristics**

Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25 \text{ °C}$	$V_R = V_{RRM}$			15	$\mu A$
		$T_j = 125 \text{ °C}$			10	100	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25 \text{ °C}$	$I_F = 15 \text{ A}$			2.10	V
		$T_j = 125 \text{ °C}$			1.25	1.90	
		$T_j = 150 \text{ °C}$			1.20	1.80	

1. Pulse test:  $t_p = 5 \text{ ms}, \delta < 2 \%$
2. Pulse test:  $t_p = 380 \mu s, \delta < 2 \%$

To evaluate the conduction losses use the following equation:

$$P = 1.4 \times I_{F(AV)} + 0.027 I_{F(RMS)}^2$$

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$I_F = 1 \text{ A}$ , $di_F/dt = -50 \text{ A}/\mu\text{s}$ , $V_R = 30 \text{ V}$ , $T_j = 25 \text{ }^\circ\text{C}$			105	ns
		$I_F = 1 \text{ A}$ , $di_F/dt = -100 \text{ A}/\mu\text{s}$ , $V_R = 30 \text{ V}$ , $T_j = 25 \text{ }^\circ\text{C}$		53	75	
$I_{RM}$	Reverse recovery current	$I_F = 15 \text{ A}$ , $di_F/dt = -200 \text{ A}/\mu\text{s}$ , $V_R = 600 \text{ V}$ , $T_j = 125 \text{ }^\circ\text{C}$		20	28	A
S	Softness factor	$I_F = 15 \text{ A}$ , $di_F/dt = -200 \text{ A}/\mu\text{s}$ , $V_R = 600 \text{ V}$ , $T_j = 125 \text{ }^\circ\text{C}$		1.5		
$t_{fr}$	Forward recovery time	$I_F = 15 \text{ A}$ $di_F/dt = 50 \text{ A}/\mu\text{s}$ $V_{FR} = 1.5 \times V_{Fmax}$ , $T_j = 25 \text{ }^\circ\text{C}$			600	ns
$V_{FP}$	Forward recovery voltage	$I_F = 15 \text{ A}$ , $di_F/dt = 50 \text{ A}/\mu\text{s}$ , $T_j = 25 \text{ }^\circ\text{C}$		5.5		V

Figure 1. Conduction losses versus average current

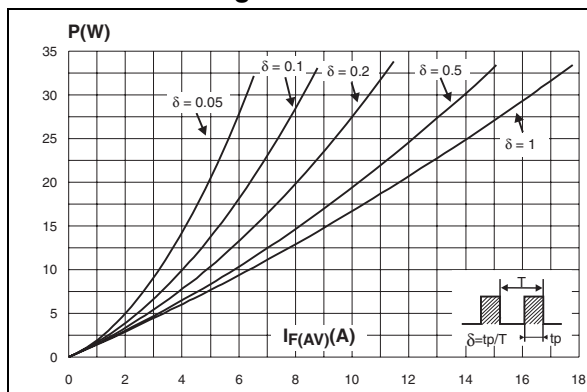


Figure 2. Forward voltage drop versus forward current

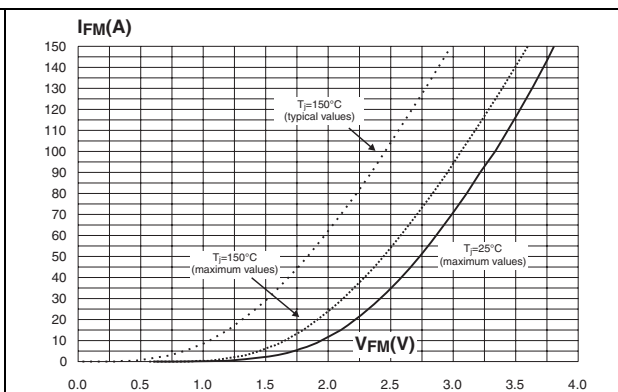


Figure 3. Relative variation of thermal impedance junction to case versus pulse duration

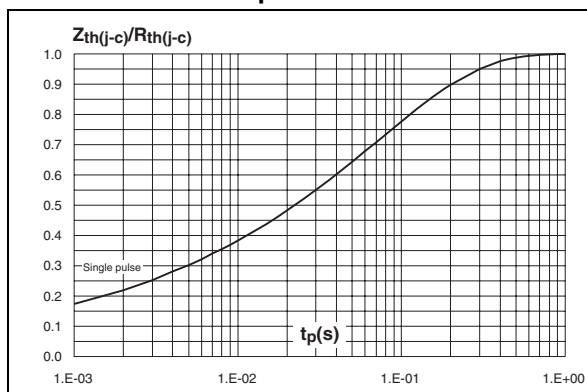
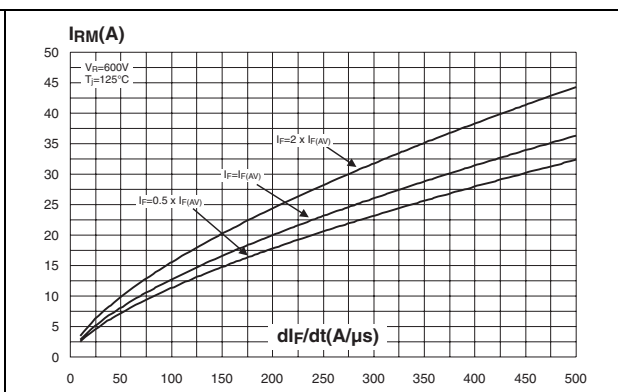
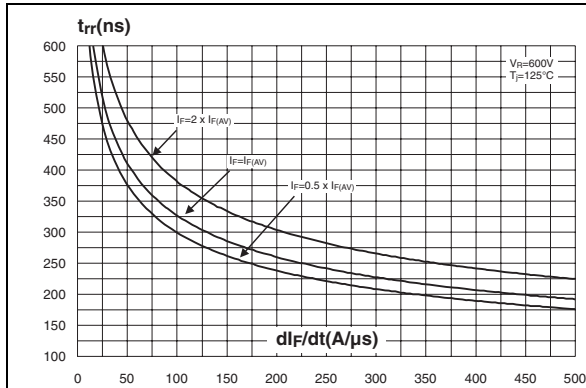


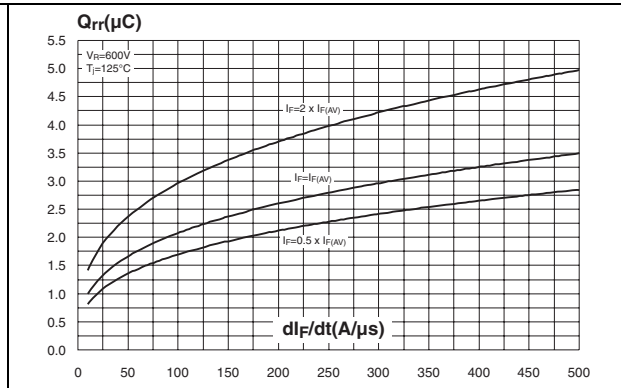
Figure 4. Peak reverse recovery current versus di\_F/dt (typical values)



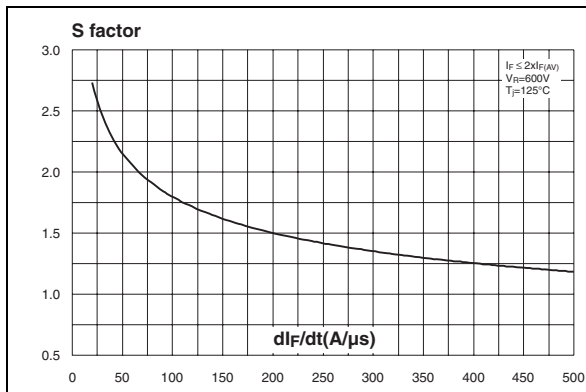
**Figure 5. Reverse recovery time versus  $di_F/dt$  (typical values)**



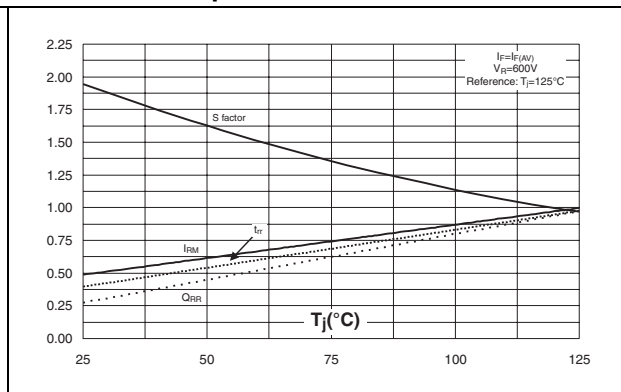
**Figure 6. Reverse recovery charges versus  $di_F/dt$  (typical values)**



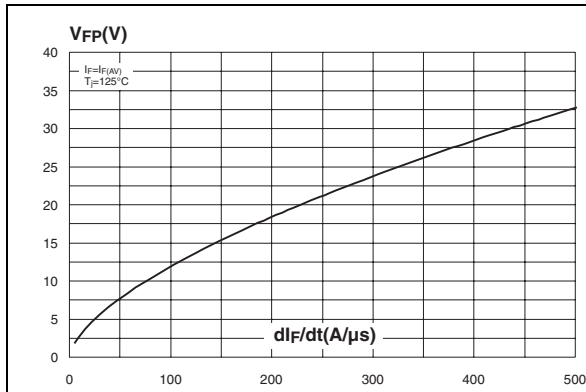
**Figure 7. Softness factor versus  $di_F/dt$  (typical values)**



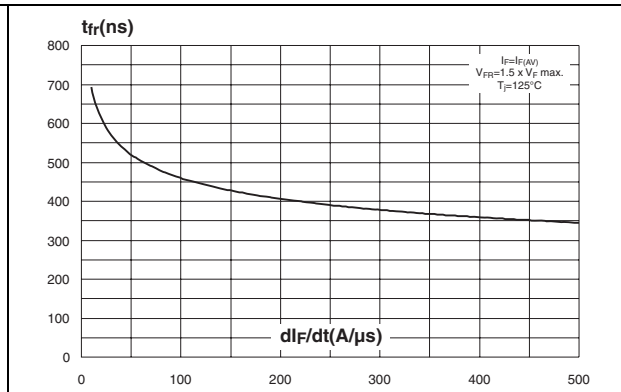
**Figure 8. Relative variations of dynamic parameters versus junction temperature**



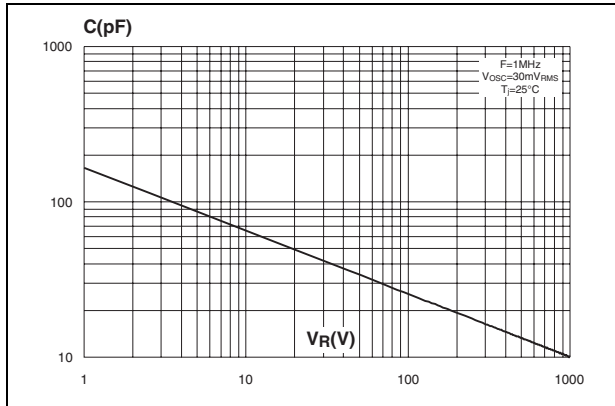
**Figure 9. Transient peak forward voltage versus  $di_F/dt$  (typical values)**



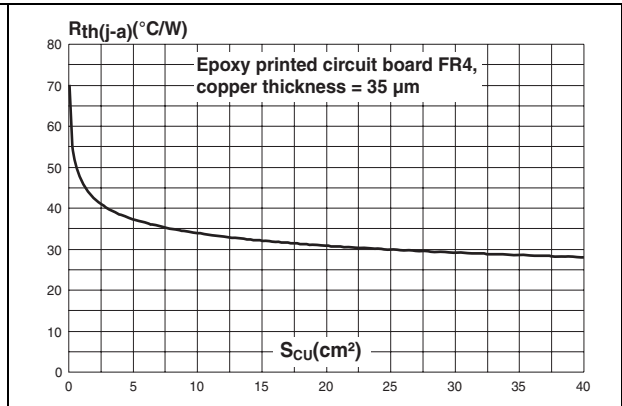
**Figure 10. Forward recovery time versus  $di_F/dt$  (typical values)**



**Figure 11. Junction capacitance versus reverse voltage applied (typical values)**



**Figure 12. Thermal resistance junction to ambient versus copper surface under each lead**

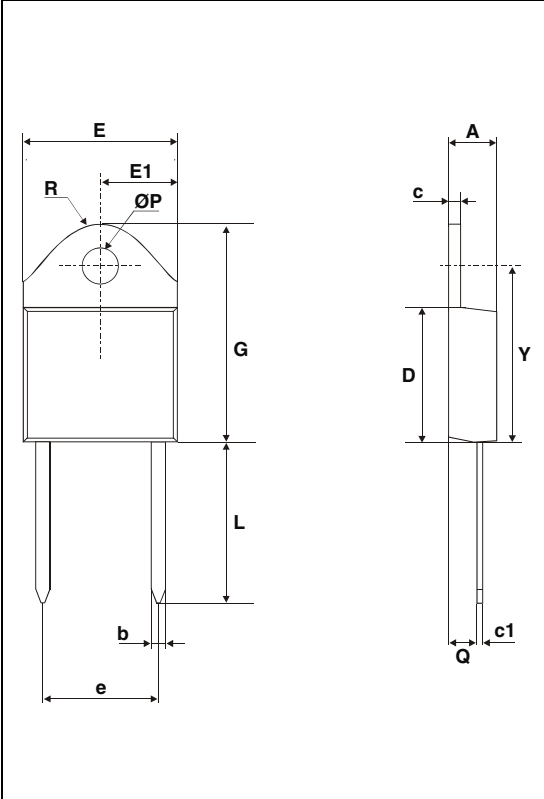


## 2 Package information

- Epoxy meets UL94, V0
- Cooling method: by conduction (C)
- Recommended torque value: 0.4 to 0.6 N·m (TO-220AC)
- Recommended torque value: 0.80 N·m (DOP3I)
- Maximum torque value: 1.0 N·m (DOP3I)

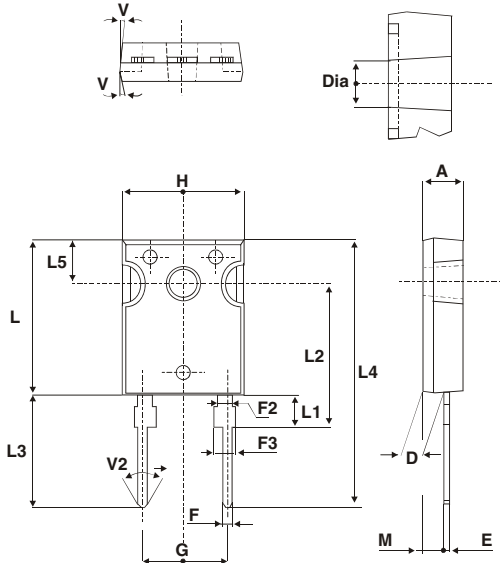
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK® is an ST trademark.

**Table 6. DOP3 dimensions**



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
b	1.20	1.40	0.047	0.055
c	1.45	1.55	0.057	0.061
c1	0.50	0.70	0.020	0.028
D	12.15	13.10	0.474	0.516
E	15.10	15.50	0.594	0.610
E1	7.55	7.75	0.297	0.305
e	10.80	11.30	0.425	0.445
G	20.4	21.10	0.815	0.831
L	14.35	15.60	0.565	0.614
P	4.08	4.17	0.161	0.164
Q	2.70	2.90	0.106	0.114
R	4.60 typ.		0.181 typ.	
Y	15.80	16.50	0.622	0.650

Table 7. DO247 dimensions



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.85		5.15	0.191		0.203
D	2.20		2.60	0.086		0.102
E	0.40		0.80	0.015		0.031
F	1.00		1.40	0.039		0.055
F2		2.00			0.078	
F3	2.00		2.40	0.078		0.094
G		10.90			0.429	
H	15.45		15.75	0.608		0.620
L	19.85		20.15	0.781		0.793
L1	3.70		4.30	0.145		0.169
L2		18.50			0.728	
L3	14.20		14.80	0.559		0.582
L4		34.60			1.362	
L5		5.50			0.216	
M	2.00		3.00	0.078		0.118
V		5°			5°	
V2		60°			60°	
Dia.	3.55		3.65	0.139		0.143

Table 8. D<sup>2</sup>PAK dimensions

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°

Figure 13. Footprint (dimensions in mm)

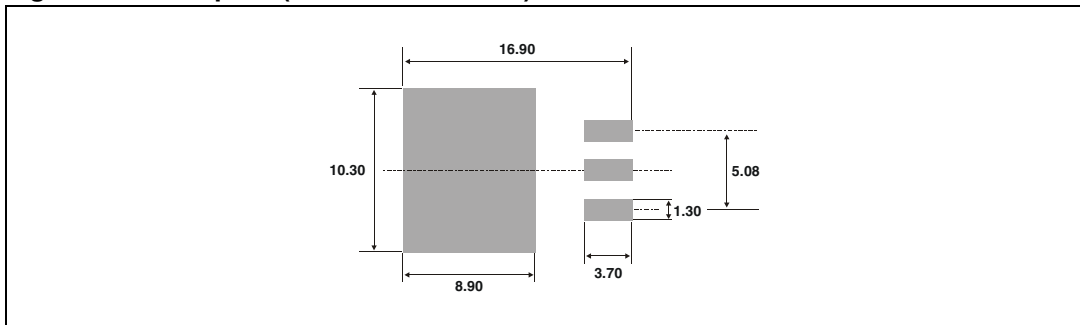
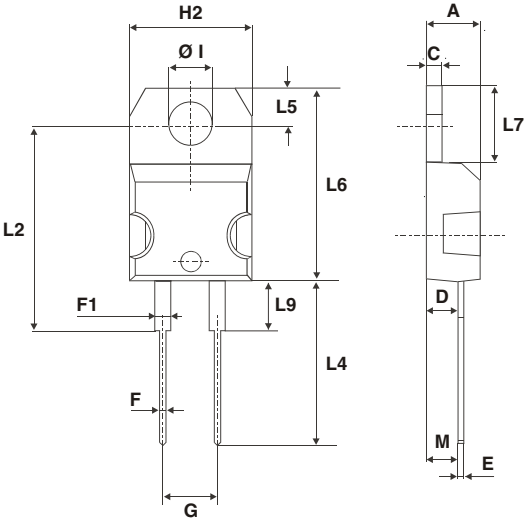




Table 9. TO-220AC dimensions



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
G	4.95	5.15	0.194	0.202
H2	10.00	10.40	0.393	0.409
L2	16.40 typ.		0.645 typ.	
L4	13.00	14.00	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.	
Diam. I	3.75	3.85	0.147	0.151

### 3 Ordering information

Table 10. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
STTH1512D	STTH1512D	TO-220AC	1.86g	50	Tube
STTH1512PI	STTH1512PI	DOP3I	4.46 g	30	Tube
STTH1512W	STTH1512W	DO-247	4.4 g	30	Tube
STTH1512G	STTH1512G	D <sup>2</sup> PAK	1.48 g	50	Tube
STTH1512G-TR	STTH1512G	D <sup>2</sup> PAK	1.48 g	1000	Tape and reel

### 4 Revision history

Table 11. Document revision history

Date	Revision	Changes
02-Mar-2006	1	Initial release.
19-Apr-2010	2	Updated I <sub>FSM</sub> in <a href="#">Table 2</a> from 150 A to 200 A. Updated ECOPACK statement.

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



单击下面可查看定价，库存，交付和生命周期等信息

[>>STMicro\(意法半导体\)](#)