

## Automotive power Schottky rectifier

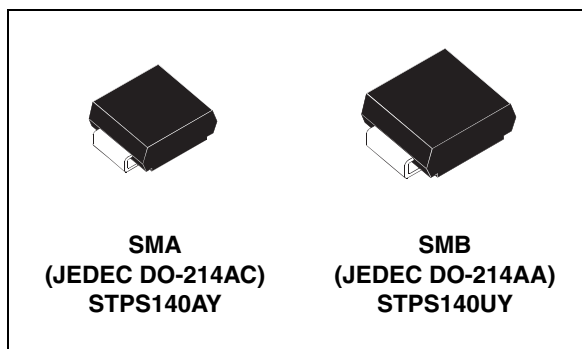
### Features

- Very small conduction losses
- Negligible switching losses
- Low forward voltage drop
- Surface mount miniature packages
- Avalanche capability specified
- AEC-Q101 qualified
- ECOPACK®2 compliant component

### Description

Single chip Schottky rectifiers suited to Switched Mode Power Supplies and high frequency DC to DC converters.

Packaged in SMA and SMB, this device is especially intended for surface mounting and used in low voltage, high frequency inverters, free wheeling and polarity protection for automotive applications.



**Table 1. Device summary**

Symbol	Value
$I_{F(AV)}$	1 A
$V_{RRM}$	40 V
$T_j(max)$	150 °C
$V_F(max)$	0.5 V

# 1 Characteristics

**Table 2. Absolute Ratings (limiting values)**

Symbol	Parameter			Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage			40	V
$I_{F(RMS)}$	Forward rms voltage			7	A
$I_{F(AV)}$	Average forward current	SMA	$T_L = 130\text{ °C } \delta = 0.5$	1	A
		SMB	$T_L = 135\text{ °C } \delta = 0.5$		A
$I_{FSM}$	Surge non repetitive forward current		$t_p = 10\text{ ms sinusoidal}$	60	A
$I_{RRM}$	Repetitive peak reverse current		$t_p = 2\text{ }\mu\text{s } F = 1\text{ kHz square}$	1	A
$I_{RSM}$	Non repetitive peak reverse current		$t_p = 100\text{ }\mu\text{s square}$	1	A
$P_{ARM}$	Repetitive peak avalanche power		$t_p = 1\text{ }\mu\text{s } T_j = 25\text{ °C}$	900	W
$T_{stg}$	Storage temperature range			- 65 to + 150	°C
$T_j$	Operating junction temperature range <sup>(1)</sup>			- 40 to + 150	°C
$dV/dt$	Critical rate of rise of reverse voltage			10000	V/ $\mu\text{s}$

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

**Table 3. Thermal resistance**

Symbol	Parameter		Value	Unit
$R_{th(j-l)}$	Junction to lead	SMA	30	°C/W
		SMB	25	

**Table 4. Static electrical characteristics**

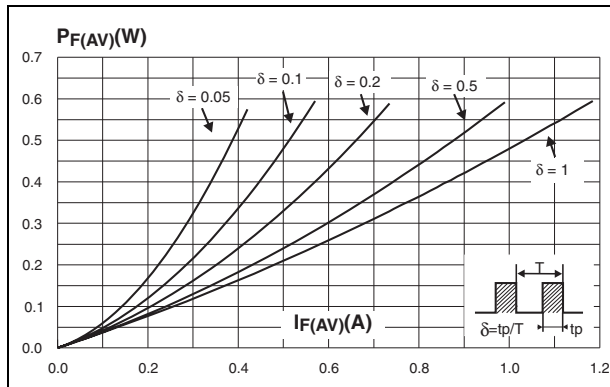
Symbol	Parameter	Test Conditions		Min.	Typ.	Max.	Unit
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$			12	$\mu\text{A}$
		$T_j = 100\text{ °C}$			0.25	2	mA
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 1\text{ A}$			0.55	V
		$T_j = 125\text{ °C}$			0.43	0.5	
		$T_j = 25\text{ °C}$	$I_F = 2\text{ A}$			0.65	
		$T_j = 125\text{ °C}$			0.53	0.6	

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

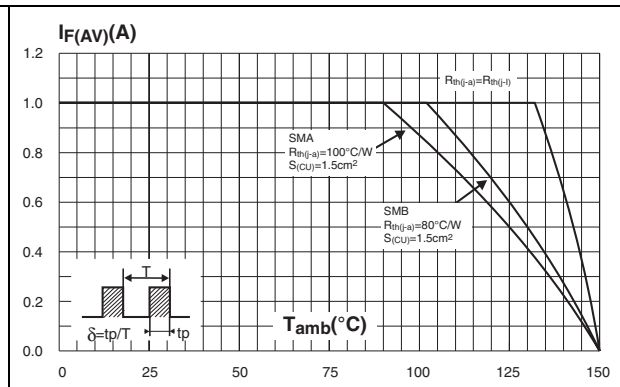
2. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:  $P = 0.4 \times I_{F(AV)} + 0.10 I_{F(RMS)}^2$

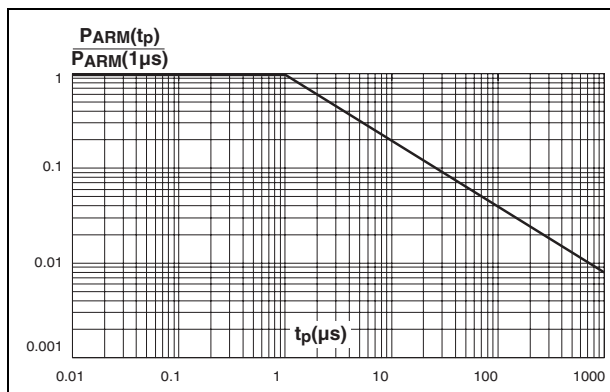
**Figure 1. Average forward power dissipation versus average forward current**



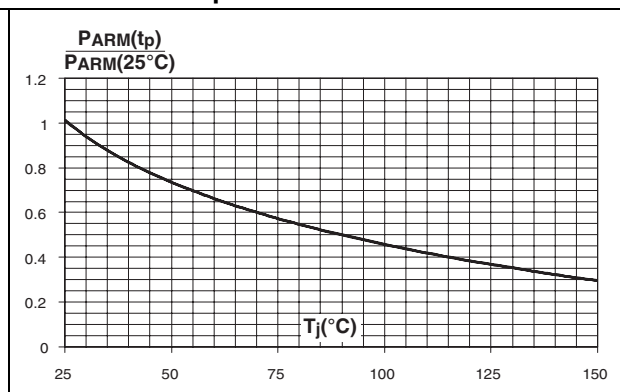
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ )**



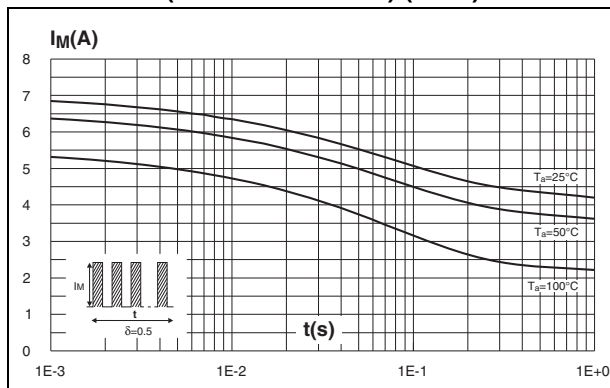
**Figure 3. Normalized avalanche power derating versus pulse duration**



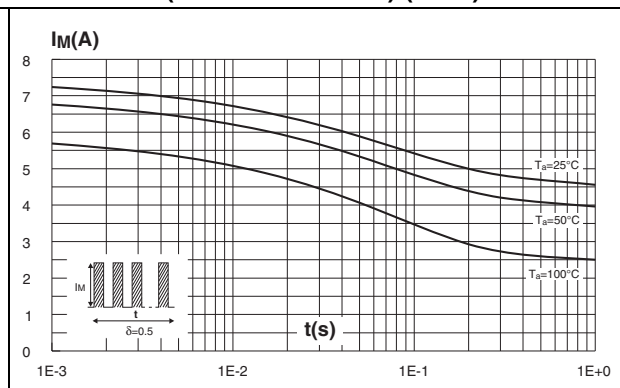
**Figure 4. Normalized avalanche power derating versus junction temperature**



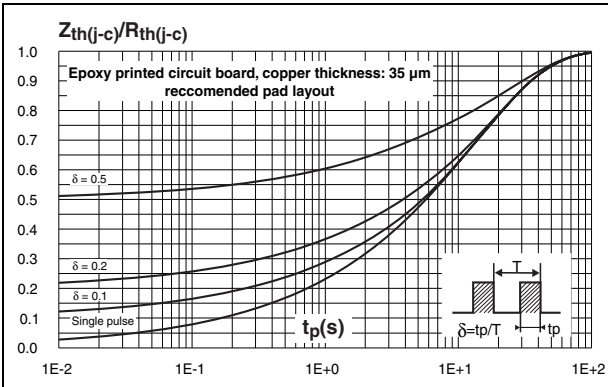
**Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values) (SMA)**



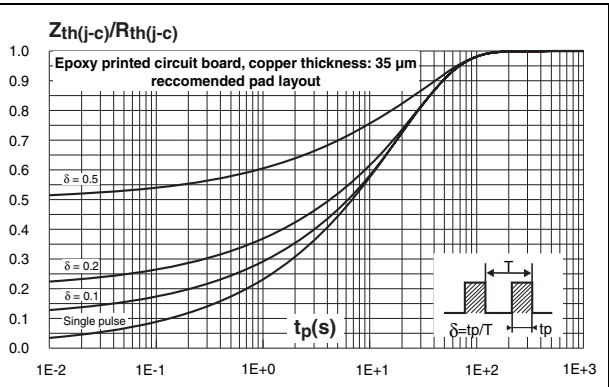
**Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values) (SMB)**



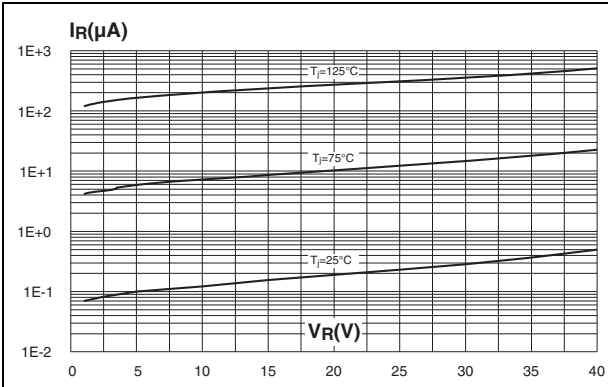
**Figure 7. Relative variation of thermal impedance junction to ambient versus pulse duration (SMA)**



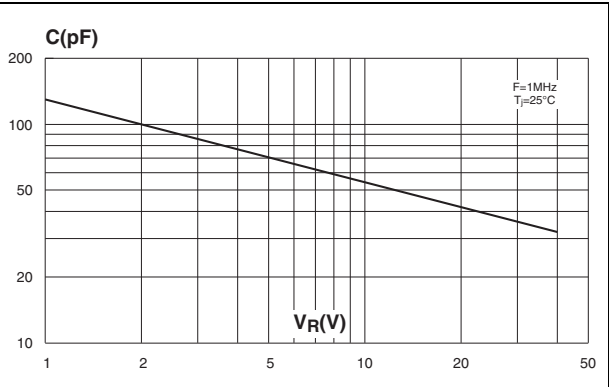
**Figure 8. Relative variation of thermal impedance junction to ambient versus pulse duration (SMB)**



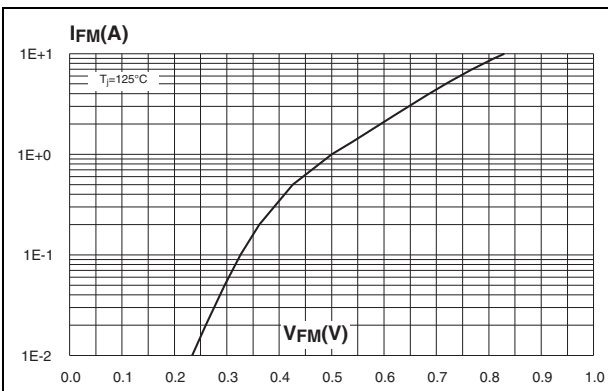
**Figure 9. Reverse leakage current versus reverse voltage applied (typical values)**



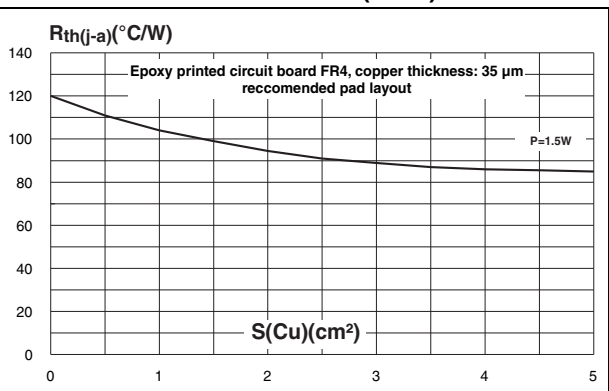
**Figure 10. Junction capacitance versus reverse voltage applied (typical values)**



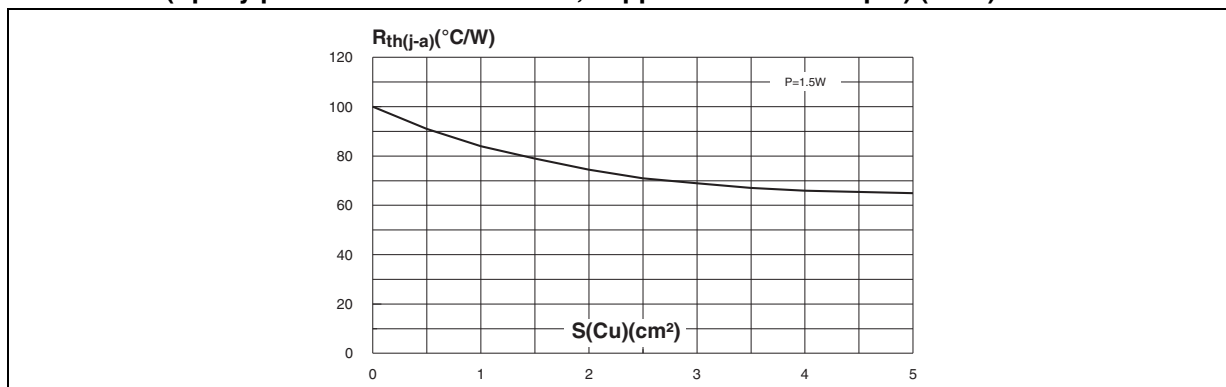
**Figure 11. Forward voltage drop versus forward current (maximum values)**



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



**Figure 13. Thermal resistance junction to ambient versus copper surface under each lead (Epoxy printed circuit board FR4, copper thickness: 35  $\mu\text{m}$ ) (SMB)**



## 2 Package information

- Band indicates cathode
- Epoxy meets UL94, V0

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.

Figure 14. SMA package mechanical data

Ref	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.03	0.075	0.080
A2	0.05	0.20	0.002	0.008
b	1.25	1.65	0.049	0.065
c	0.15	0.41	0.006	0.016
E	4.80	5.60	0.189	0.220
E1	3.95	4.60	0.156	0.181
D	2.25	2.95	0.089	0.116
L	0.75	1.60	0.030	0.063

Figure 15. SMA footprint dimensions (in millimeters)

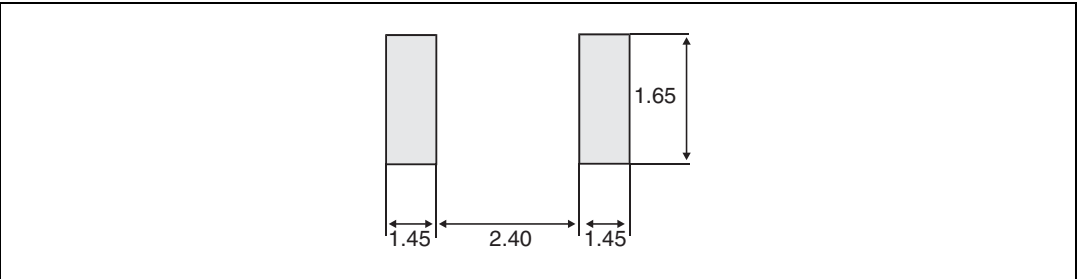
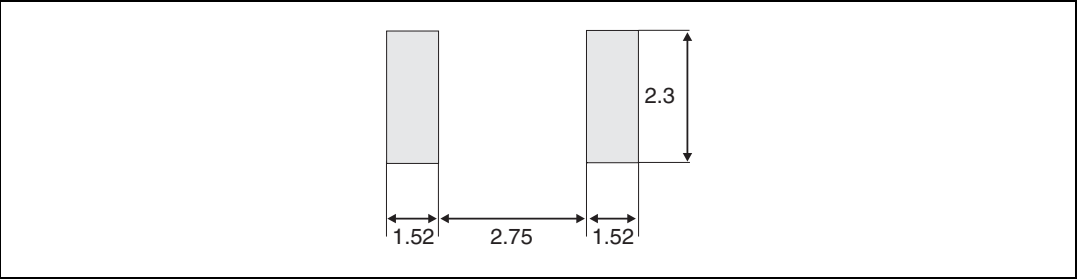


Figure 16. SMB package mechanical data

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	0.41	0.006	0.016
E	5.10	5.60	0.201	0.220
E1	4.05	4.60	0.159	0.181
D	3.30	3.95	0.130	0.156
L	0.75	1.60	0.030	0.063

Figure 17. SMB footprint dimensions (in millimeters)



### 3 Ordering information

**Table 5. Ordering information**

Order code	Marking	Package	Weight	Base qty	Delivery mode
STPS140A	S140Y	SMA	0.068 g	5000	Tape and reel
STPS140U	G14Y	SMB	0.107 g	2500	Tape and reel

### 4 Revision history

**Table 6. Document revision history**

Date	Revision	Changes
10-Dec-2010	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 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)

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[STMicroelectronics:](#)

[STPS140AY](#) [STPS140UY](#)