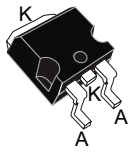
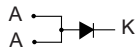



## Automotive 300 V, 10 A high efficiency ultrafast diode


**D<sup>2</sup>PAK**

### Features

- AEC-Q101 qualified 
- Ultrafast recovery
- Low power losses
- High surge capability
- Low leakage current
- High junction temperature
- ECOPACK<sup>®2</sup> compliant

### Applications

- DC/DC converter
- Reverse battery protection
- Battery management system
- Audio amplification

### Description

This **STTH1003S-Y** is an ultrafast recovery power rectifier dedicated to energy recovery in automotive applications.

This **STTH1003S-Y** is also intended for the clamping function in an energy recovery block.

The compromise between forward voltage drop and recovery time offers optimized performances.

#### Product status links

[STTH1003S-Y](#)

#### Product summary

$I_{F(AV)}$	10 A
$V_{RRM}$	300 V
$T_{j(max.)}$	175 °C
$V_{F(typ.)}$	0.9 V
$T_{rr(max.)}$	13 ns

# 1 Characteristics

**Table 1. Absolute ratings (limiting values, at 25 °C, unless otherwise specified)**

Symbol	Parameter	Value	Unit
$V_{RRM}$	Repetitive peak reverse voltage, $T_j = -40\text{ °C}$ to $+175\text{ °C}$	300	V
$I_{F(RMS)}$	Forward rms current	20	A
$I_{F(AV)}$	Average forward current, $\delta = 0.5$ , square wave	$T_C = 150\text{ °C}$ 10	A
$I_{FSM}$	Surge non repetitive forward current	$t_p = 10\text{ ms}$ sinusoidal 100	A
$T_{stg}$	Storage temperature range	-65 to +175	°C
$T_j$	Operating junction temperature range	-40 to +175	°C

**Table 2. Thermal parameters**

Symbol	Parameter	Maximum value	Unit
$R_{th(j-c)}$	Junction to case	4	°C/W

For more information, please refer to the following application note :

- AN5088 : Rectifiers thermal management, handling and mounting recommendations

**Table 3. Static electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit	
$I_R^{(1)}$	Reverse leakage current	$T_j = 25\text{ °C}$	$V_R = V_{RRM}$	-		10	$\mu\text{A}$
		$T_j = 125\text{ °C}$		-	10	100	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	$I_F = 10\text{ A}$	-		1.30	V
		$T_j = 125\text{ °C}$		-	0.90	1.10	

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

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

To evaluate the conduction losses, use the following equation:

$$P = 0.86 \times I_{F(AV)} + 0.024 \times I_F^2 (RMS)$$

For more information, please refer to the following application notes related to the power losses:

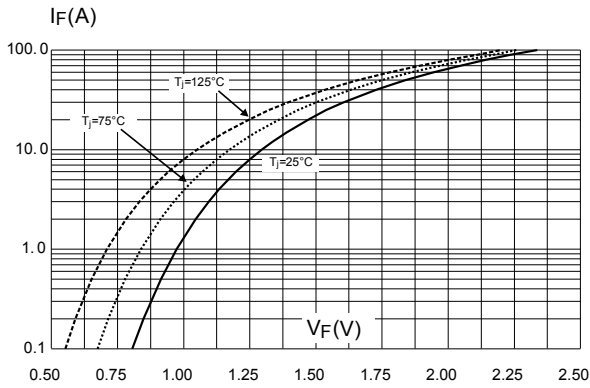
- AN604: Calculation of conduction losses in a power rectifier
- AN5028: Calculation of turn-off power losses generated by an ultrafast diode

**Table 4. Dynamic electrical characteristics**

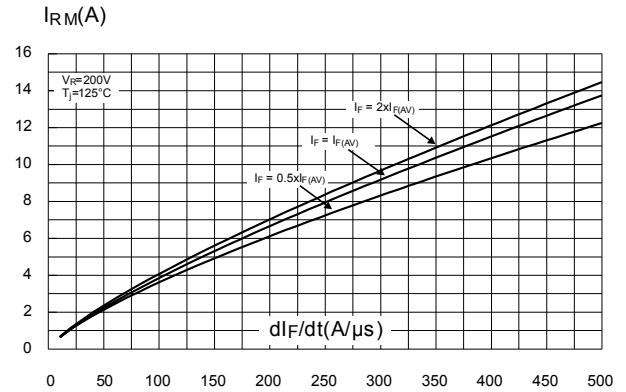
Symbol	Parameter	Test conditions		Min.	Typ.	Max.	Unit
$t_{rr}$	Reverse recovery time	$T_j = 25\text{ }^\circ\text{C}$	$I_F = 0.5\text{ A}, I_{rr} = 0.25\text{ A}, I_R = 1\text{ A}$	-	13	17	ns
			$I_F = 1\text{ A}, V_R = 30\text{ V}, di_F/dt = -50\text{ A}/\mu\text{s}$	-	28	35	
$I_{RM}$	Reverse recovery current		$I_F = 10\text{ A}, V_R = 200\text{ V}, di_F/dt = 200\text{ A}/\mu\text{s}$	-	5.7	7.5	A
$S_{factor}$	Softness factor			-	0.3	-	-
$t_{fr}$	Forward recovery time		$I_F = 10\text{ A}, V_{FR} = 1.1 \times V_{Fmax}, di_F/dt = 100\text{ A}/\mu\text{s}$			200	ns
$V_{FP}$	Forward recovery voltage		$I_F = 10\text{ A}, di_F/dt = 100\text{ A}/\mu\text{s}$		2.5	3.5	V

## 1.1 Characteristics (curves)

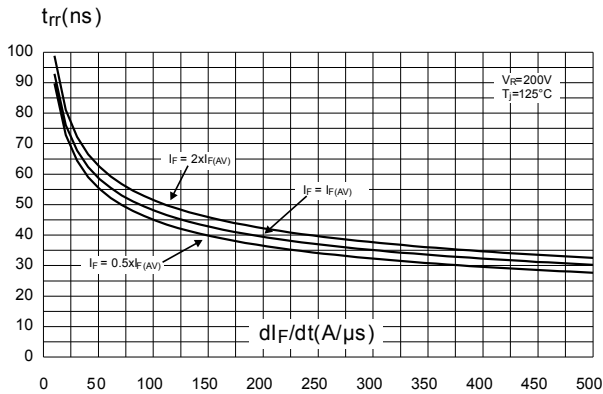
**Figure 1. Forward voltage drop versus current (maximum values)**



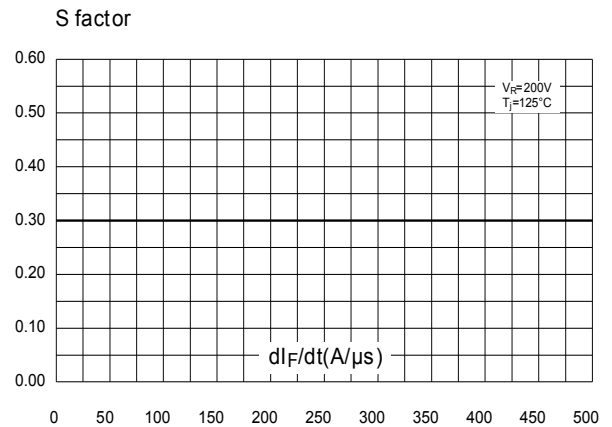
**Figure 2. Peak reverse recovery current versus  $di_F/dt$  (90% confidence)**



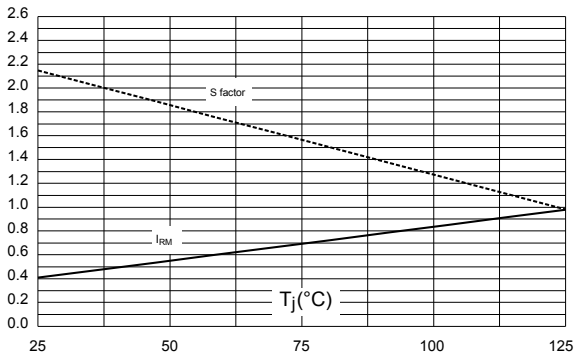
**Figure 3. Reverse recovery time versus  $di_F/dt$  (90 % confidence)**



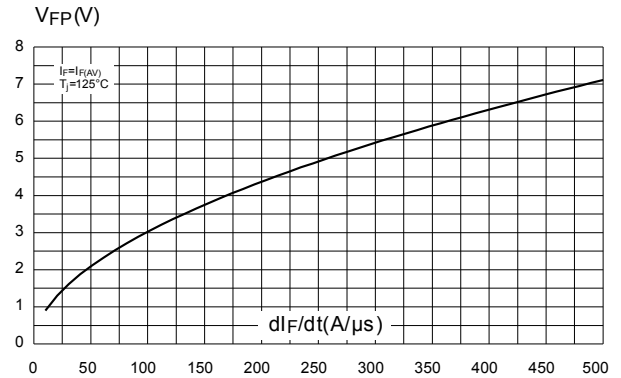
**Figure 4. Softness factor versus  $di_F/dt$  (typical values)**



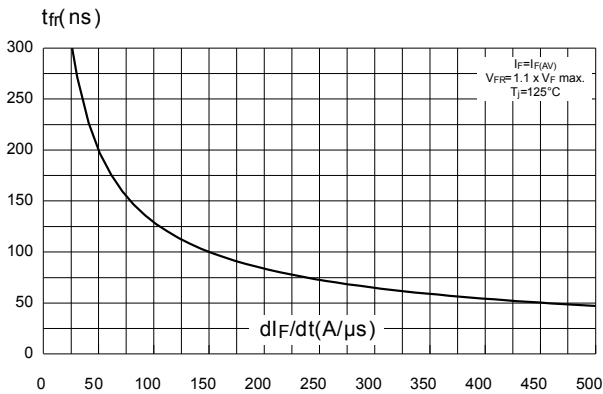
**Figure 5. Relative variations of dynamic parameters versus junction temperature (reference:  $T_j = 125\text{ }^\circ\text{C}$ )**



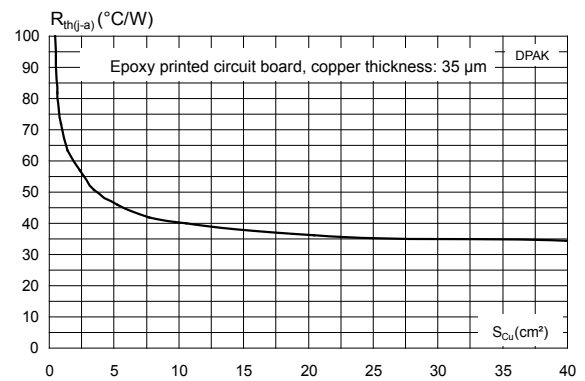
**Figure 6. Transient peak forward voltage versus  $di_F/dt$  (90% confidence)**



**Figure 7. Forward recovery versus  $di_F/dt$  (90% confidence)**



**Figure 8. Thermal resistance junction to ambient versus copper surface under tab (typical values)**



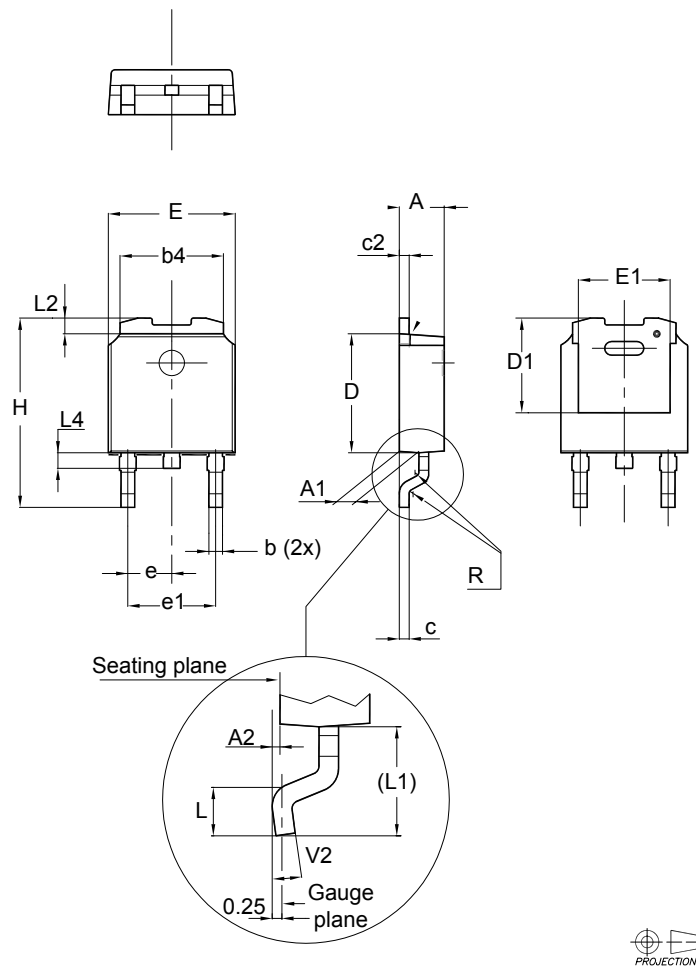
## 2 Package information

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.

### 2.1 DPAK package information

- Epoxy meets UL94, V0
- Lead-free packages

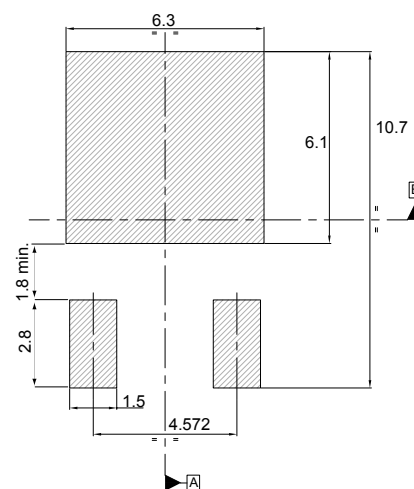
Figure 9. DPAK package outline



**Table 5. DPAK mechanical data**

Dim.	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.087		0.094
A1	0.90		1.10	0.035		0.043
A2	0.03		0.23	0.001		0.009
b	0.64		0.90	0.025		0.035
b4	5.20		5.40	0.205		0.213
c	0.45		0.60	0.018		0.024
c2	0.48		0.60	0.019		0.024
D	6.00		6.20	0.236		0.244
D1	4.95	5.10	5.25	0.195	0.201	0.207
E	6.40		6.60	0.252		0.260
E1	4.60	4.70	4.80	0.181	0.185	0.189
e	2.159	2.286	2.413	0.085	0.090	0.095
e1	4.445	4.572	4.699	0.175	0.180	0.185
H	9.35		10.10	0.368		0.398
L	1.00		1.50	0.039		0.059
(L1)	2.60	2.80	3.00	0.102	0.110	0.118
L2	0.65	0.80	0.95	0.026	0.031	0.037
L4	0.60		1.00	0.024		0.039
R		0.20			0.008	
V2	0°		8°	0°		8°

1. Inches dimensions given for reference only

**Figure 10. DPAK recommended footprint (dimensions are in mm)**


The device must be positioned within  $\Phi 0.05$  A B

### 3 Ordering information

**Table 6. Order code**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
STTH1003SBY-TR	TH10 03SBY	DPAK	0.32 g	2500	Tape and reel



## Revision history

**Table 7. Document revision history**

Date	Revision	Changes
24-Oct-2012	1	Initial release.
28-Jan-2019	2	Added <a href="#">Section Applications</a> . Updated <a href="#">Table 6</a> . Added <a href="#">Figure 8</a> .

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