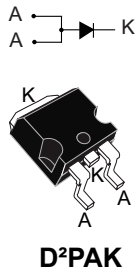


Automotive 300 V, 10 A high efficiency ultrafast diode



Features

- AEC-Q101 qualified
- Ultrafast recovery
- Low power losses
- High surge capability
- Low leakage current
- High junction temperature
- ECOPACK[®]2 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	$T_j = 25\text{ °C}$	-		10	μA
		$T_j = 125\text{ °C}$	-	10	100	
$V_F^{(2)}$	Forward voltage drop	$T_j = 25\text{ °C}$	-		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)

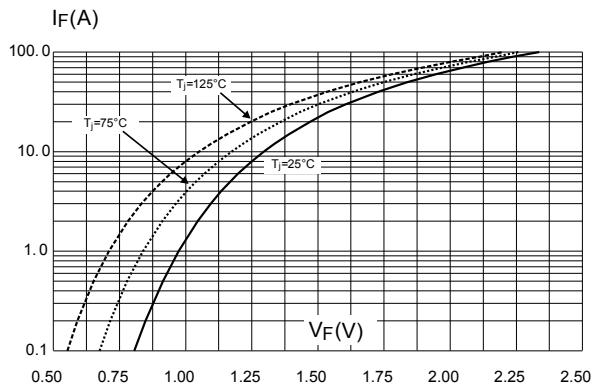


Figure 2. Peak reverse recovery current versus dl_F/dt (90% confidence)

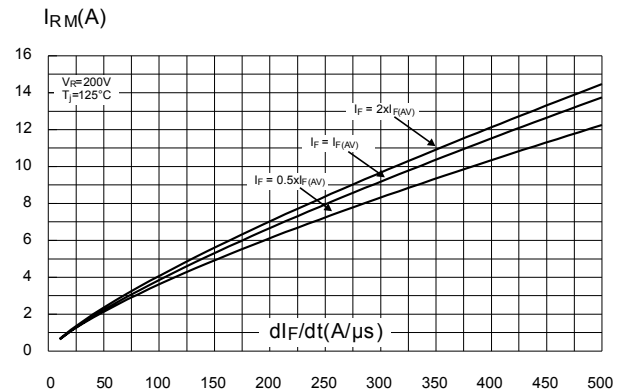


Figure 3. Reverse recovery time versus dl_F/dt (90 % confidence)

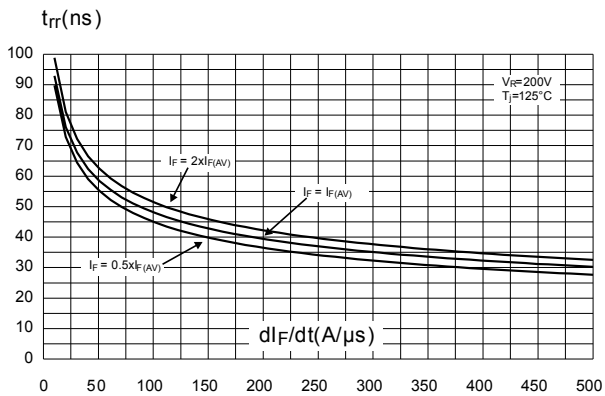


Figure 4. Softness factor versus dl_F/dt (typical values)

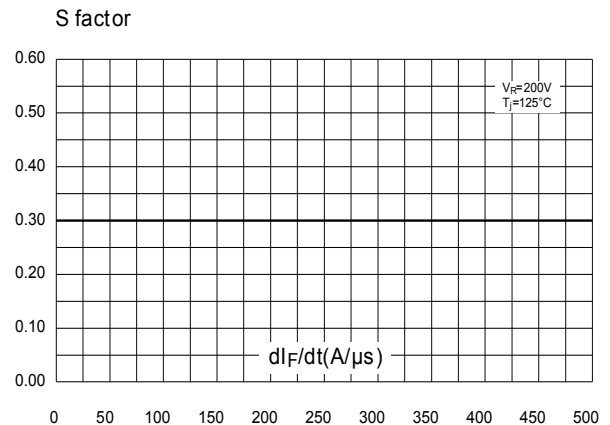
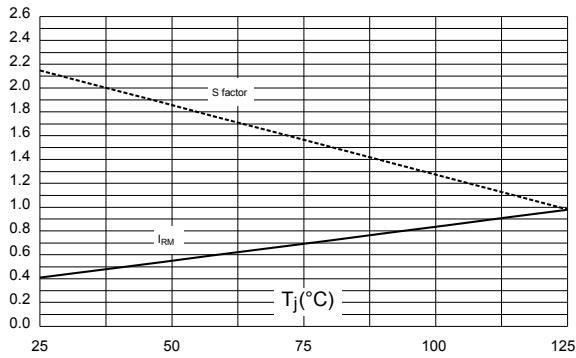
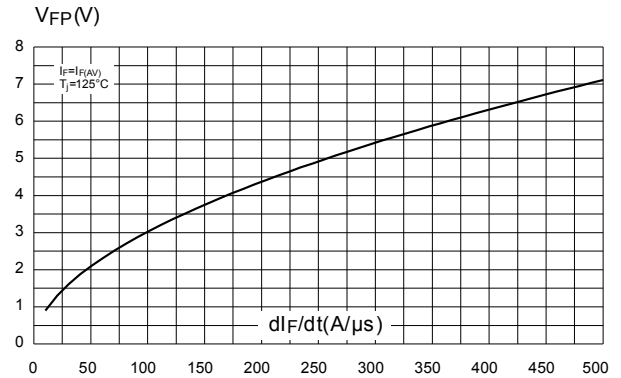
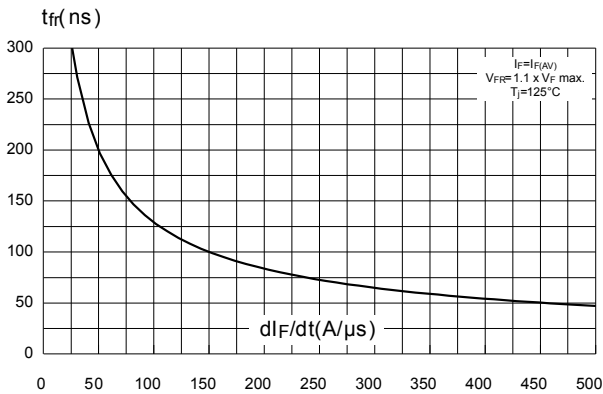
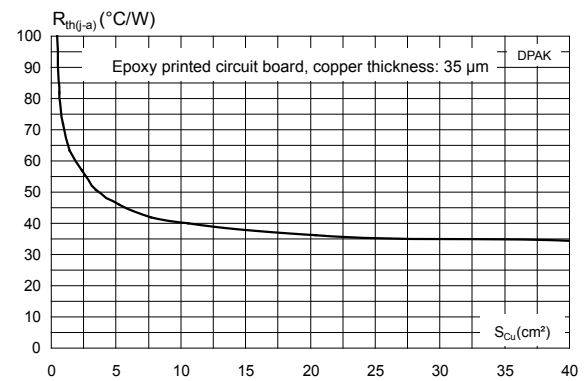


Figure 5. Relative variations of dynamic parameters versus junction temperature (reference: $T_j = 125^\circ\text{C}$)

Figure 6. Transient peak forward voltage versus dl_F/dt (90% confidence)

Figure 7. Forward recovery versus dl_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. ECOPACK® is an ST trademark.

2.1 DPAK package information

- Epoxy meets UL94, V0
- Lead-free packages

Figure 9. DPAK package outline

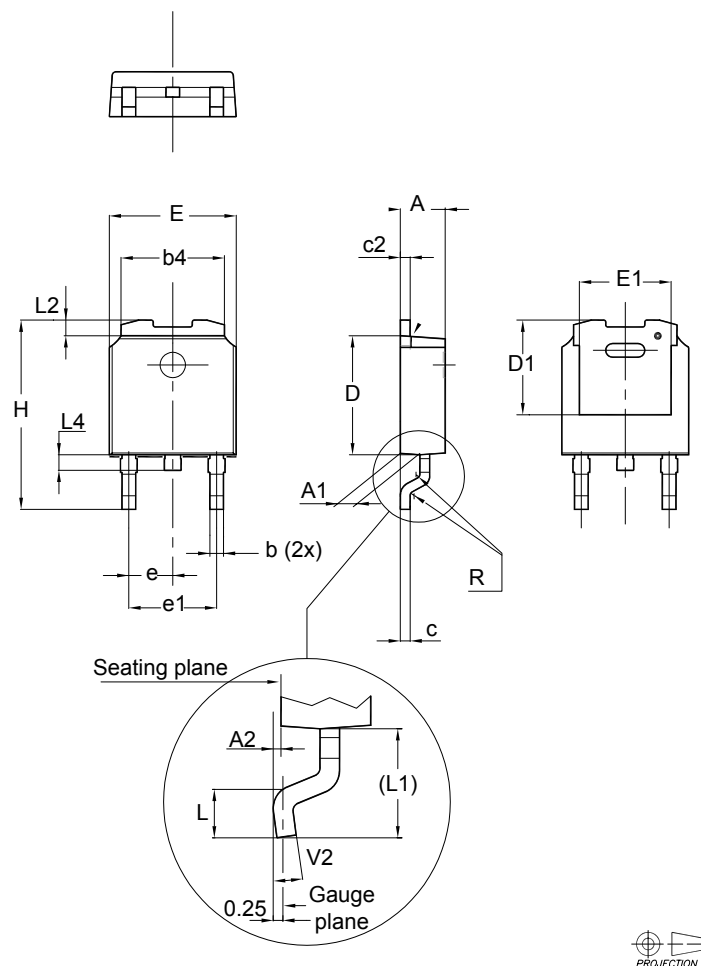
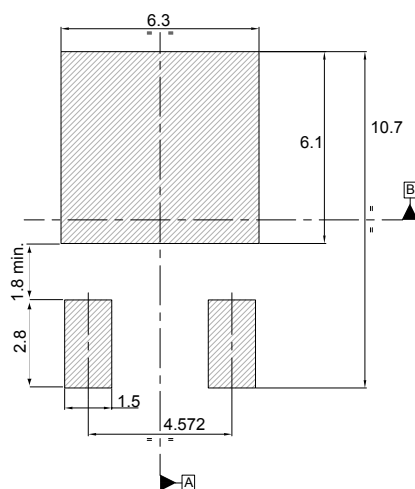


Table 5. DPAK mechanical data

Dim.	Dimensions					
	Millimeters			Inches ⁽¹⁾		
	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 $\Phi 0.05 \text{ A B}$

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 Section Applications . Updated Table 6 . Added Figure 8 .

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