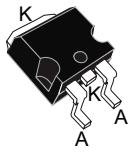
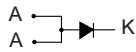



## Automotive 300 V, 10 A high efficiency ultrafast diode


**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>®</sup>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                      | $T_C = 150\text{ °C}$<br>10            | A    |
| $I_{FSM}$    | Surge non repetitive forward current                                       | $t_p = 10\text{ ms}$ sinusoidal<br>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:

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

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

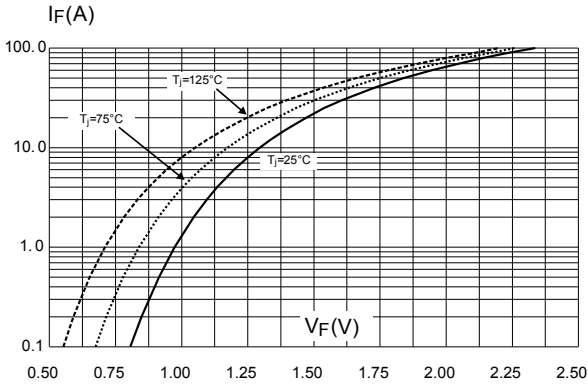
- AN604: Calculation of conduction losses in a power rectifier
- AN5028: Calculation of turn-off power losses generated by an ultrafast diode

**Table 4. Dynamic electrical characteristics**

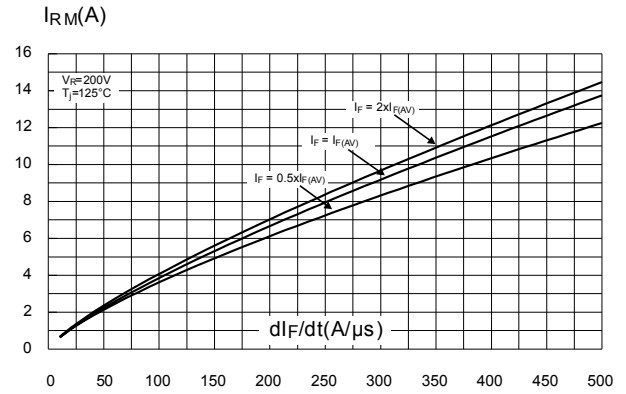
| Symbol       | Parameter                | Test conditions                  |   | Min. | Typ. | Max. | Unit |
|--------------|--------------------------|----------------------------------|---|------|------|------|------|
| $t_{rr}$     | Reverse recovery time    | $T_j = 25\text{ }^\circ\text{C}$ | $I_F = 0.5\text{ A}, I_{rr} = 0.25\text{ A}, I_R = 1\text{ A}$                        | -    | 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)

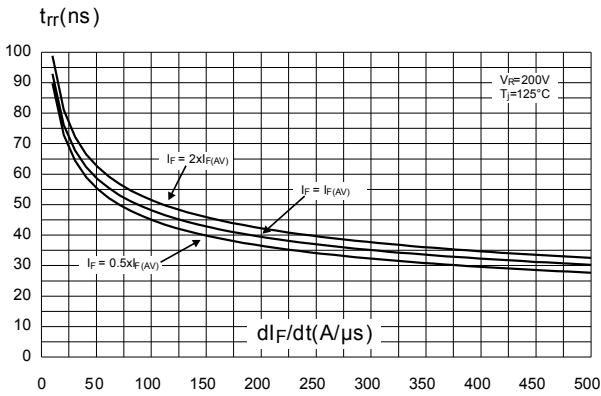
**Figure 1. Forward voltage drop versus current (maximum values)**



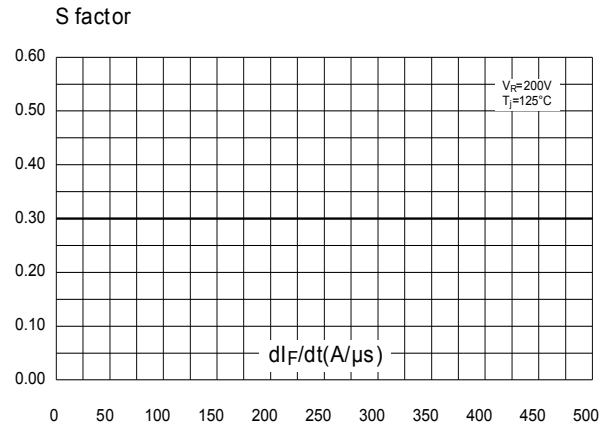
**Figure 2. Peak reverse recovery current versus  $di_F/dt$  (90% confidence)**



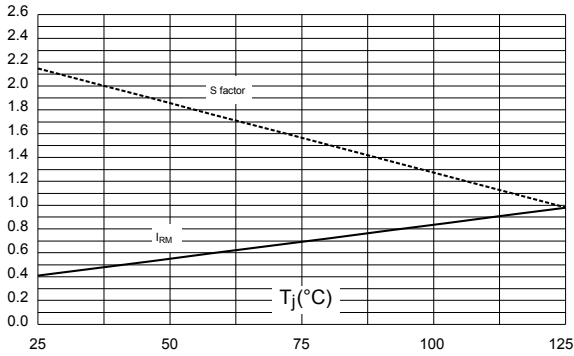
**Figure 3. Reverse recovery time versus  $di_F/dt$  (90 % confidence)**



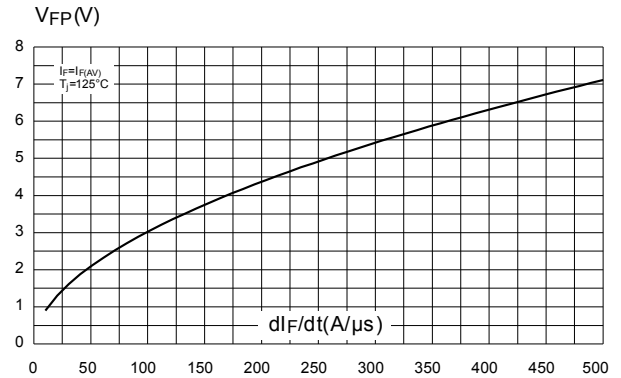
**Figure 4. Softness factor versus  $di_F/dt$  (typical values)**



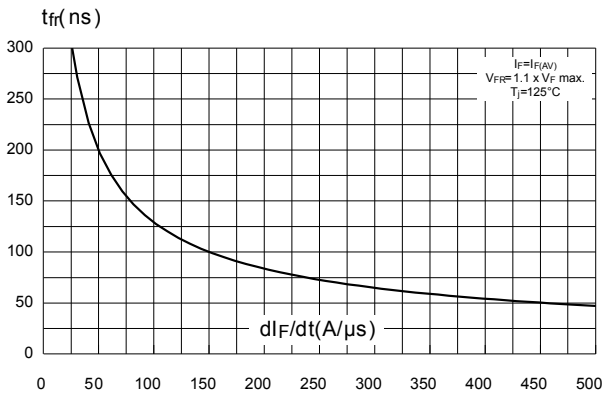
**Figure 5. Relative variations of dynamic parameters versus junction temperature (reference:  $T_j = 125\text{ }^\circ\text{C}$ )**



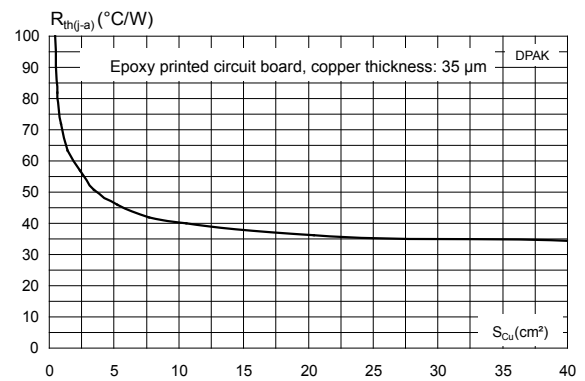
**Figure 6. Transient peak forward voltage versus  $di_F/dt$  (90% confidence)**



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



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



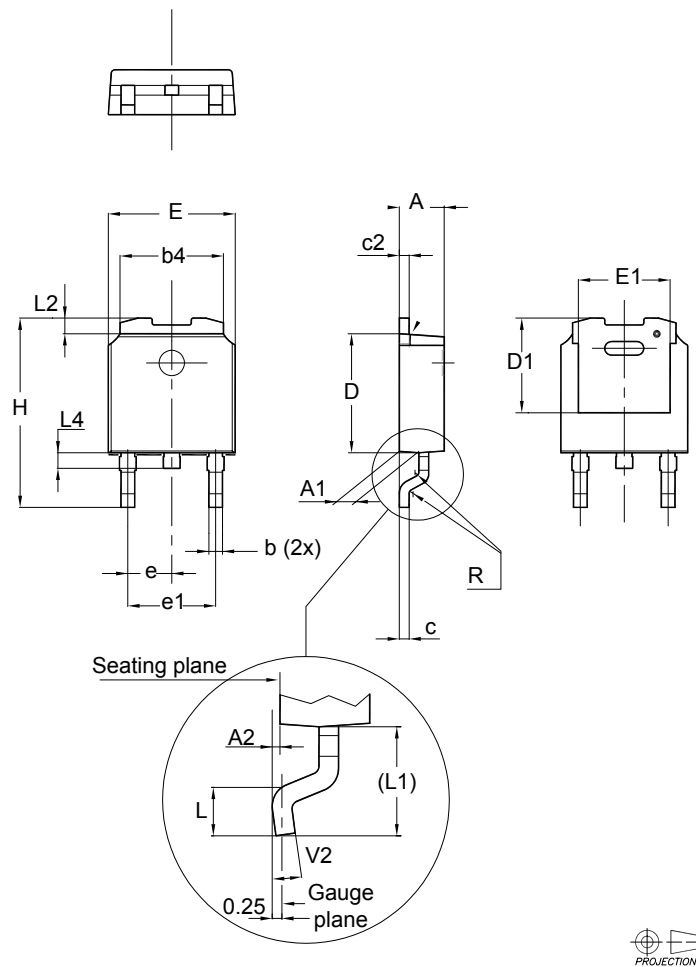
## 2 Package information

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

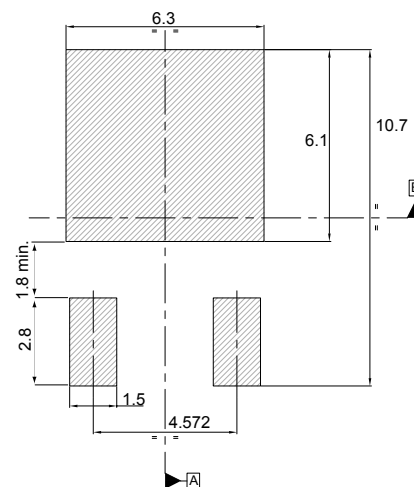


**Table 5. DPAK mechanical data**

| 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  $\Phi 0.05 \text{ A B}$

### 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 <a href="#">Section Applications</a> . Updated <a href="#">Table 6</a> . Added <a href="#">Figure 8</a> . |

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