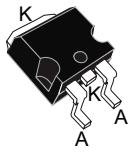
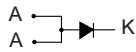



Automotive 300 V, 10 A high efficiency ultrafast diode


D²PAK

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 | $T_j = 25\text{ °C}$ | $V_R = V_{RRM}$ | - | | 10 | μA |
| | | $T_j = 125\text{ °C}$ | | - | 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)

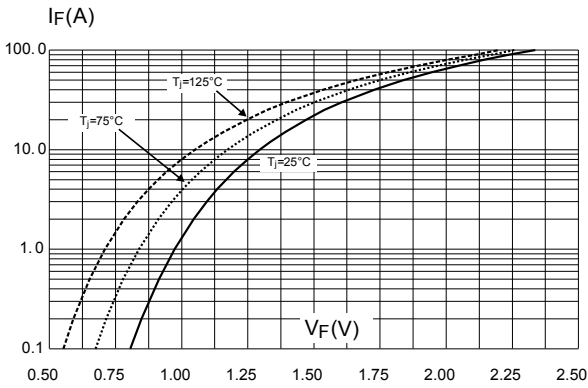


Figure 2. Peak reverse recovery current versus di_F/dt (90% confidence)

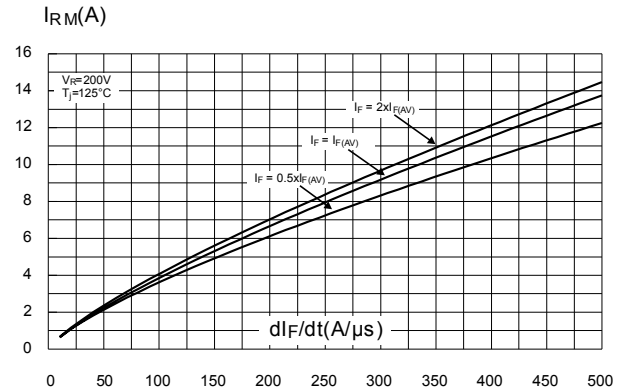


Figure 3. Reverse recovery time versus di_F/dt (90 % confidence)

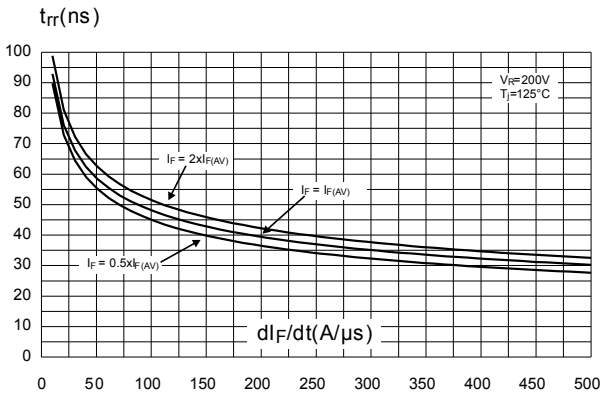


Figure 4. Softness factor versus di_F/dt (typical values)

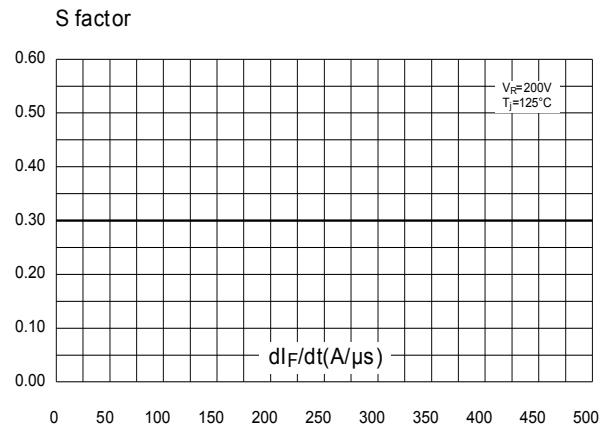


Figure 5. Relative variations of dynamic parameters versus junction temperature (reference: $T_j = 125\text{ }^\circ\text{C}$)

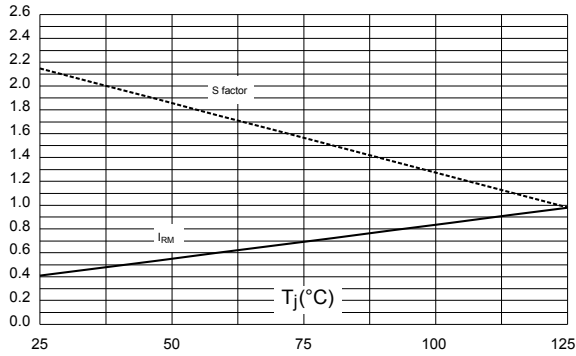


Figure 6. Transient peak forward voltage versus di_F/dt (90% confidence)

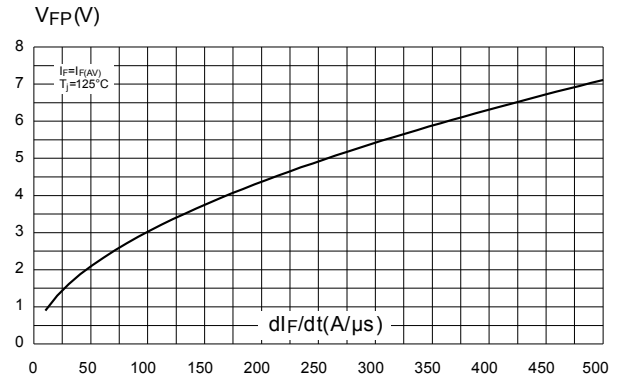


Figure 7. Forward recovery versus di_F/dt (90% confidence)

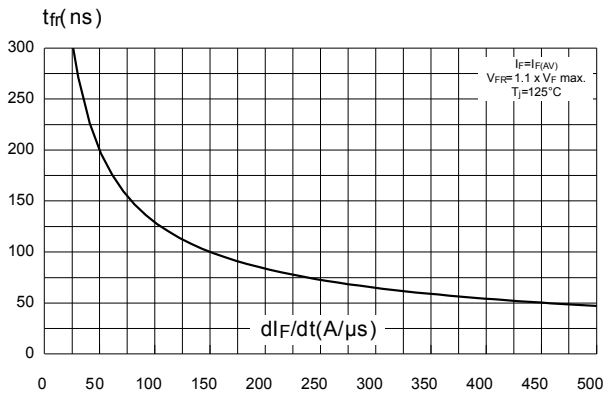
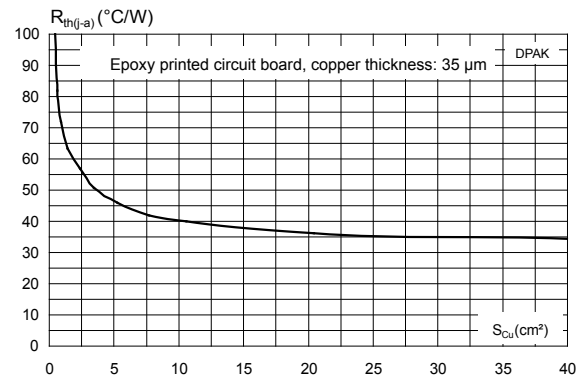


Figure 8. Thermal resistance junction to ambient versus copper surface under tab (typical values)



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. ECOPACK® is an ST trademark.

2.1 DPAK package information

- Epoxy meets UL94, V0
- Lead-free packages

Figure 9. DPAK package outline

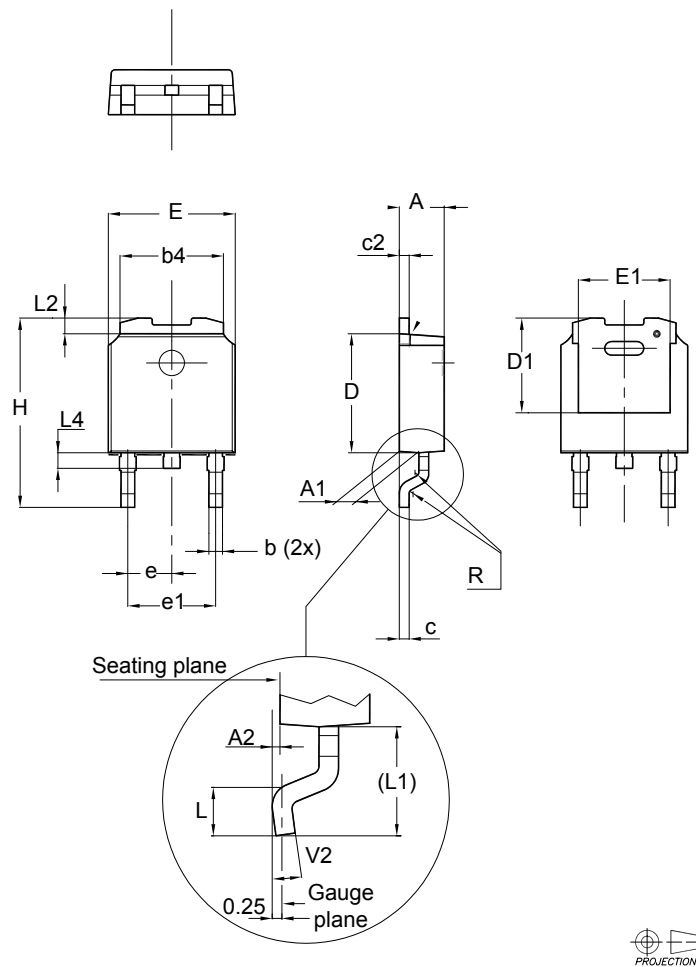
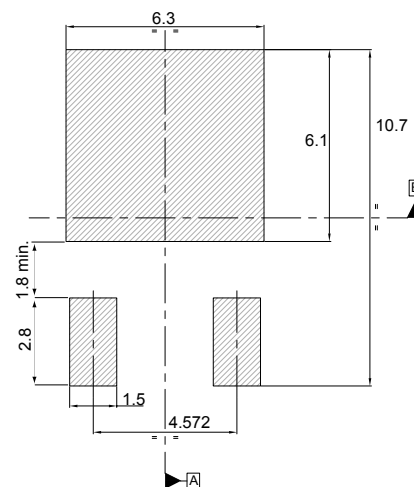


Table 5. DPAK mechanical data

| 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 $\Phi 0.05$ 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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