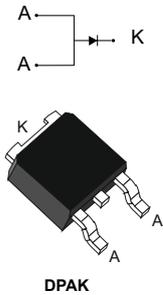


Automotive 300 V, 10 A high efficiency ultrafast diode



Features

- AEC-Q101 qualified 
- Ultrafast recovery
- Low power losses
- High surge capability
- Low leakage current
- High junction temperature
- ECOPACK2 compliant

Applications

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

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 |

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.

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 °C to +175 °C | 300 | V |
| I _{F(RMS)} | Forward rms current | 20 | A |
| I _{F(AV)} | Average forward current, δ = 0.5, square wave | T _C = 150 °C 10 | A |
| I _{FSM} | Surge non repetitive forward current | t _p = 10 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 °C | V _R = V _{RRM} | - | | 10 | μA |
| | | T _j = 125 °C | | - | 10 | 100 | |
| V _F ⁽²⁾ | Forward voltage drop | T _j = 25 °C | I _F = 10 A | - | | 1.30 | V |
| | | T _j = 125 °C | | - | 0.90 | 1.10 | |

1. Pulse test: t_p = 5 ms, δ < 2%

2. Pulse test: t_p = 380 μs, δ < 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 | I _F = 0.5 A, I _{rr} = 0.25 A, I _R = 1 A | - | 13 | 17 | ns |
| | | I _F = 1 A, V _R = 30 V, dI _F /dt = -50 A/μs | - | 28 | 35 | |
| I _{RM} | Reverse recovery current | T _j = 25 °C I _F = 10 A, V _R = 200 V, dI _F /dt = 200 A/μs | - | 5.7 | 7.5 | A |
| S _{factor} | Softness factor | | - | 0.3 | | - |
| t _{fr} | Forward recovery time | I _F = 10 A, V _{FR} = 1.1 × V _{Fmax} , dI _F /dt = 100 A/μs | | | 200 | ns |
| V _{FP} | Forward recovery voltage | I _F = 10 A, dI _F /dt = 100 A/μs | | 2.5 | 3.5 | V |

1.1 Characteristics (curves)

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

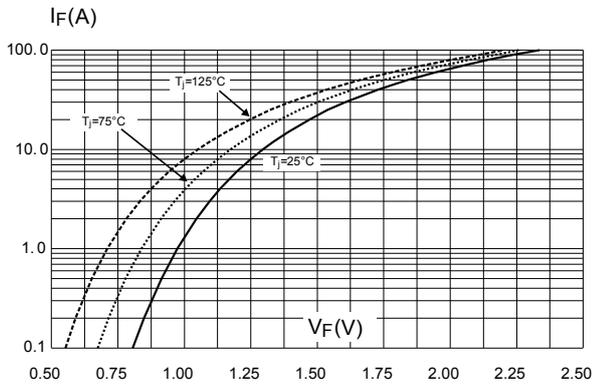


Figure 2. Peak reverse recovery current versus di_F/dt (90% confidence)

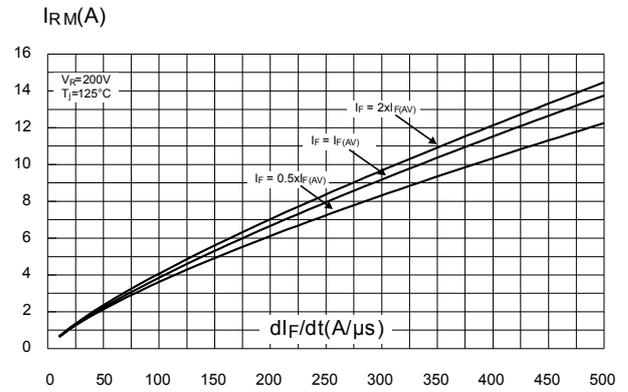


Figure 3. Reverse recovery time versus di_F/dt (90 % confidence)

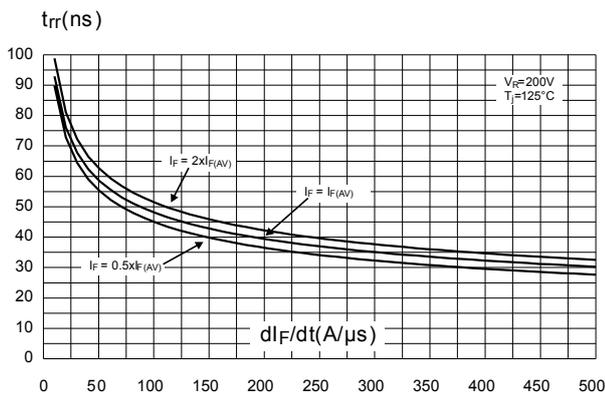


Figure 4. Softness factor versus di_F/dt (typical values)

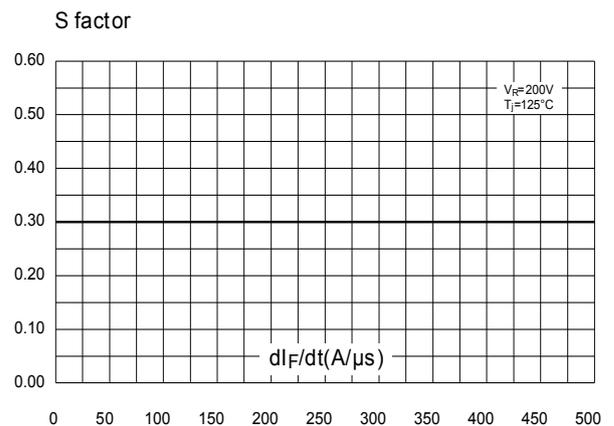


Figure 5. Relative variations of dynamic parameters versus junction temperature (reference: $T_j = 125^\circ\text{C}$)

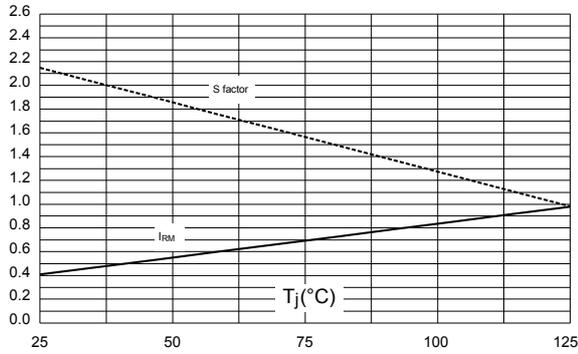


Figure 6. Transient peak forward voltage versus dl_F/dt (90% confidence)

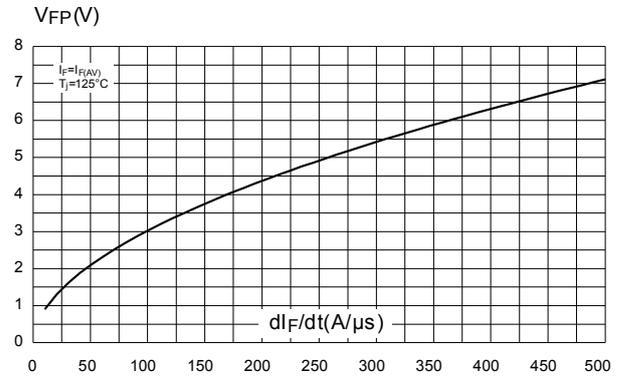


Figure 7. Forward recovery versus dl_F/dt (90% confidence)

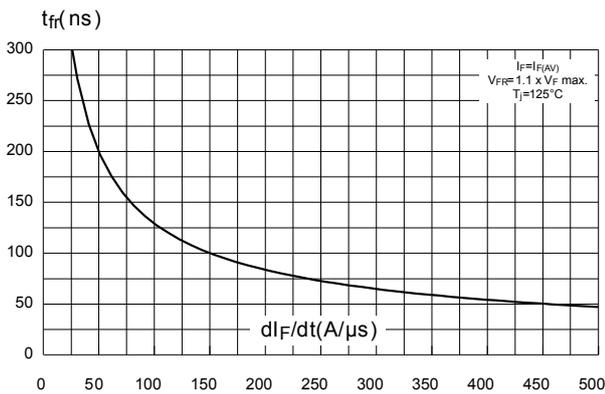
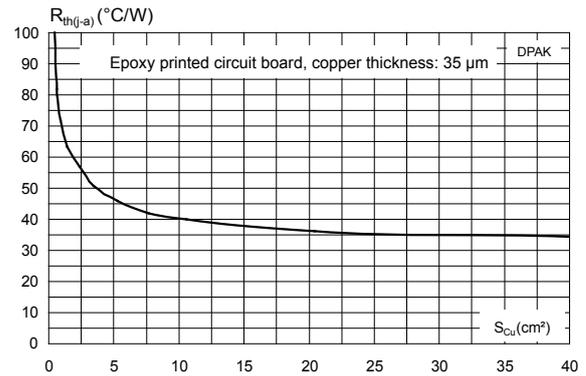


Figure 8. Thermal resistance junction to ambient versus copper surface under tab (typical values)



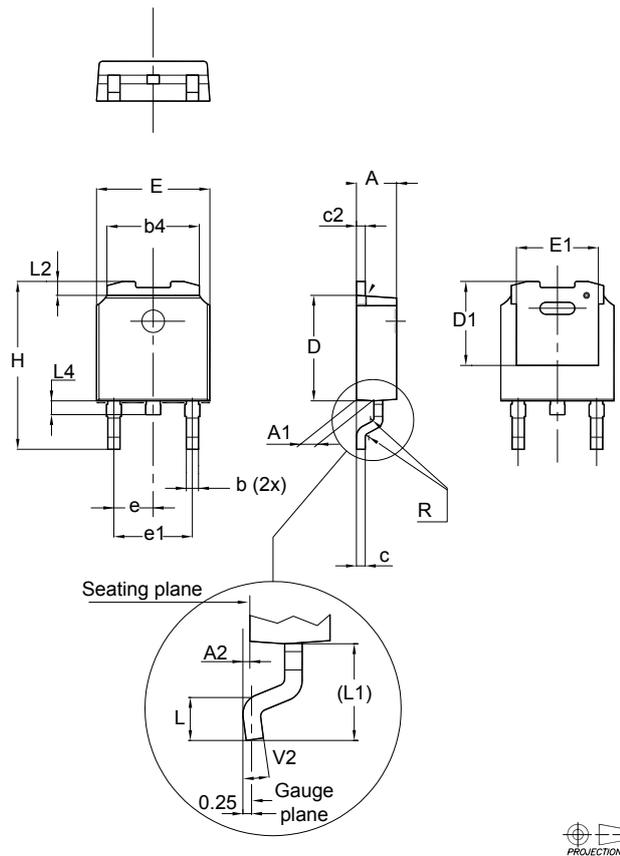
2 Package information

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

Figure 9. DPAK package outline

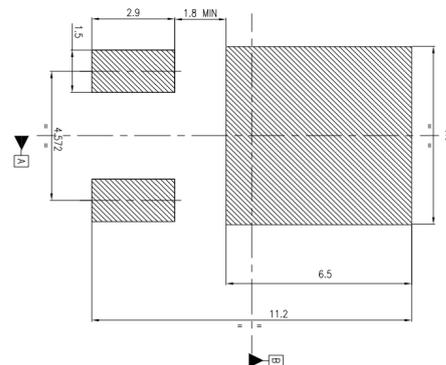


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

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)


Note: For package and tape orientation, reel and inner box dimensions and tape outline please check [TN1173](#)

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 <i>Section Applications</i> . Updated <i>Table 6</i> . Added <i>Figure 8</i> . |
| 03-Jun-2024 | 3 | Updated package view on cover page. |

IMPORTANT NOTICE – READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgment.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2024 STMicroelectronics – All rights reserved