

Description

The STTH1003S is an ultrafast recovery power rectifier dedicated to energy recovery in PDP applications.

It is especially designed for clamping function in energy recovery block. The compromise between forward voltage drop and recovery time offers optimized performances.

Table 1. Device summary

| Symbol | Value |
|---------------|--------|
| $I_{F(AV)}$ | 10 A |
| V_{RRM} | 300 V |
| $t_{rr}(typ)$ | 13 ns |
| $T_j(max)$ | 175 °C |
| $V_F(typ)$ | 0.9 V |

Features

- Ultrafast recovery
- Low power losses
- High surge capability
- Low leakage current
- High junction temperature
- ECOPACK[®]2 compliant component for DPAK on demand

1 Characteristics

Table 2. Absolute ratings (limiting values, at 25 °C, unless otherwise specified)

| Symbol | Parameter | | Value | Unit |
|--------------|---|--------------------------------------|-------------|------|
| V_{RRM} | Repetitive peak reverse voltage | | 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 |
| I_{RSM} | Non repetitive peak reverse current | $t_p = 20\text{ }\mu\text{s}$ square | 4 | A |
| T_{stg} | Storage temperature range | | -65 to +175 | °C |
| T_j | Maximum operating junction temperature | | 175 | °C |

Table 3. Thermal resistance

| Symbol | Parameter | Package | Max. value | Unit |
|---------------|------------------|---------|------------|------|
| $R_{th(j-c)}$ | Junction to case | DPAK | 4 | °C/W |

Table 4. 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:

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

Table 5. Dynamic electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit | |
|--------------|--------------------------|-----------------------|---|------|------|------|----|
| t_{rr} | Reverse recovery time | $T_j = 25\text{ °C}$ | $I_F = 0.5\text{ A}$ $I_{rr} = 0.25\text{ A}$ $I_R = 1\text{ A}$ | - | 13 | 17 | ns |
| | | | $I_F = 1\text{ A}$ $V_R = 30\text{ V}$ $di_F/dt = -50\text{ A}/\mu\text{s}$ | - | 28 | 35 | |
| t_{fr} | Forward recovery time | $T_j = 25\text{ °C}$ | $I_F = 10\text{ A}$ $V_{FR} = 1.1 \times V_{Fmax}$ $di_F/dt = 100\text{ A}/\mu\text{s}$ | - | - | 200 | ns |
| V_{FP} | Peak forward voltage | | $I_F = 10\text{ A}$ $di_F/dt = 100\text{ A}/\mu\text{s}$ | - | 2.5 | 3.5 | V |
| I_{RM} | Reverse recovery current | $T_j = 125\text{ °C}$ | $I_F = 10\text{ A}$ $V_R = 200\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ | - | 5.7 | 7.5 | A |
| S_{factor} | Softness factor | | $I_F = 10\text{ A}$ $V_R = 200\text{ V}$ $di_F/dt = 200\text{ A}/\mu\text{s}$ | - | 0.3 | - | - |

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

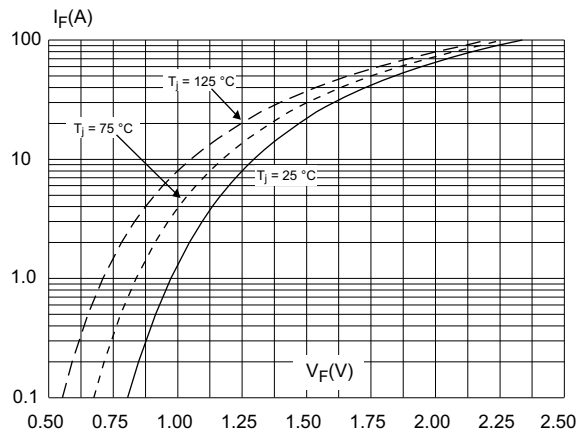


Figure 2. Peak reverse recovery current versus di_F/dt (typical values)

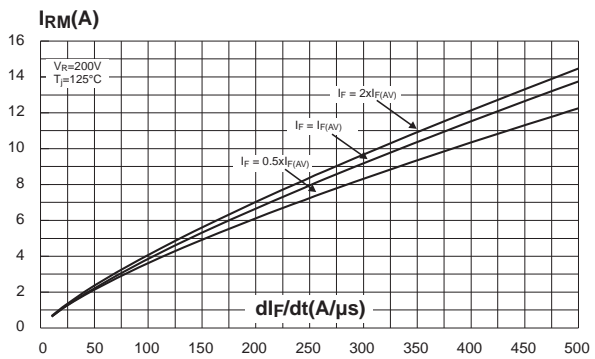


Figure 3. Reverse recovery time versus di_F/dt (typical values)

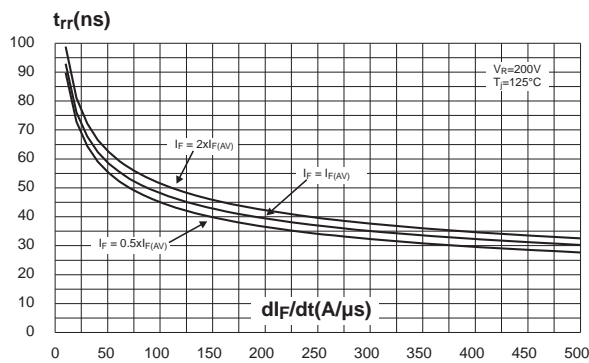


Figure 4. Softness factor versus di_F/dt (typical values)

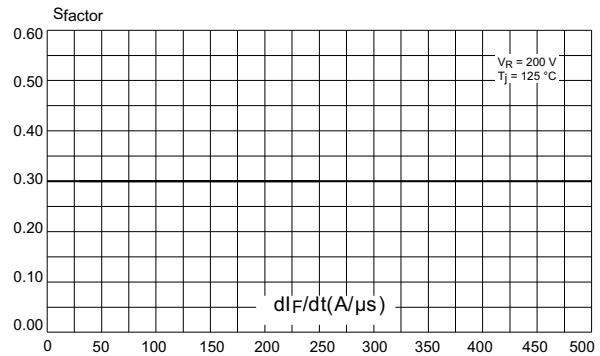


Figure 5. Relative variations of dynamic parameters versus junction temperature (reference: $T_j = 125^\circ\text{C}$)

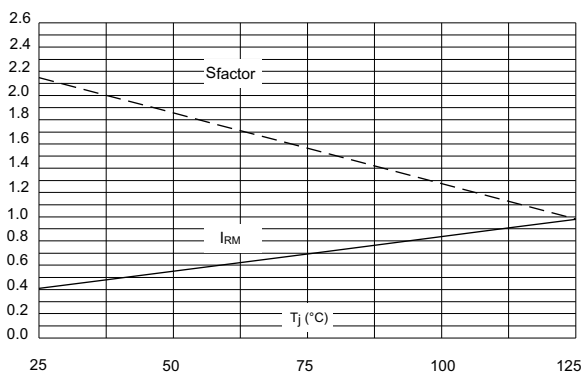


Figure 6. Transient peak forward voltage versus di_F/dt (typical values)

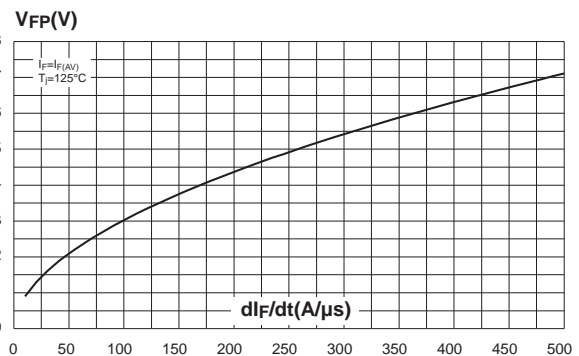
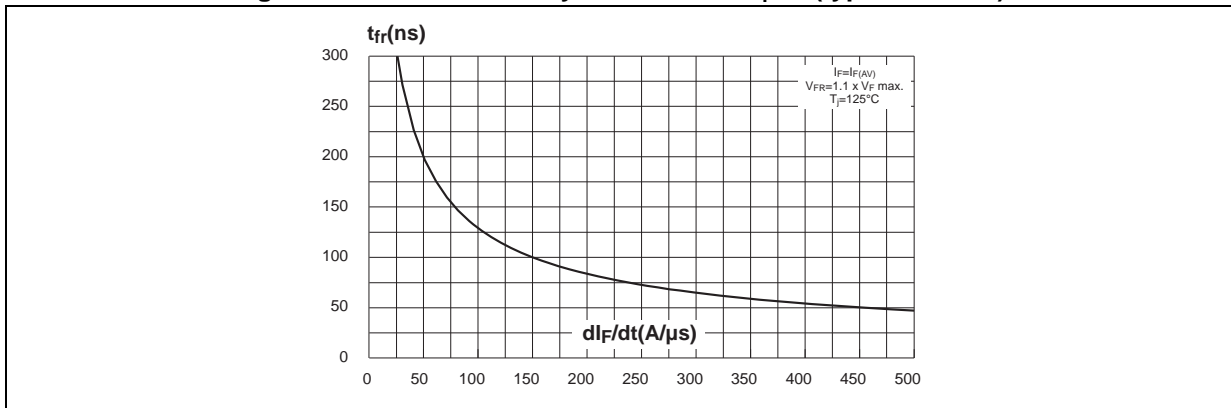


Figure 7. Forward recovery time versus di_F/dt (typical values)



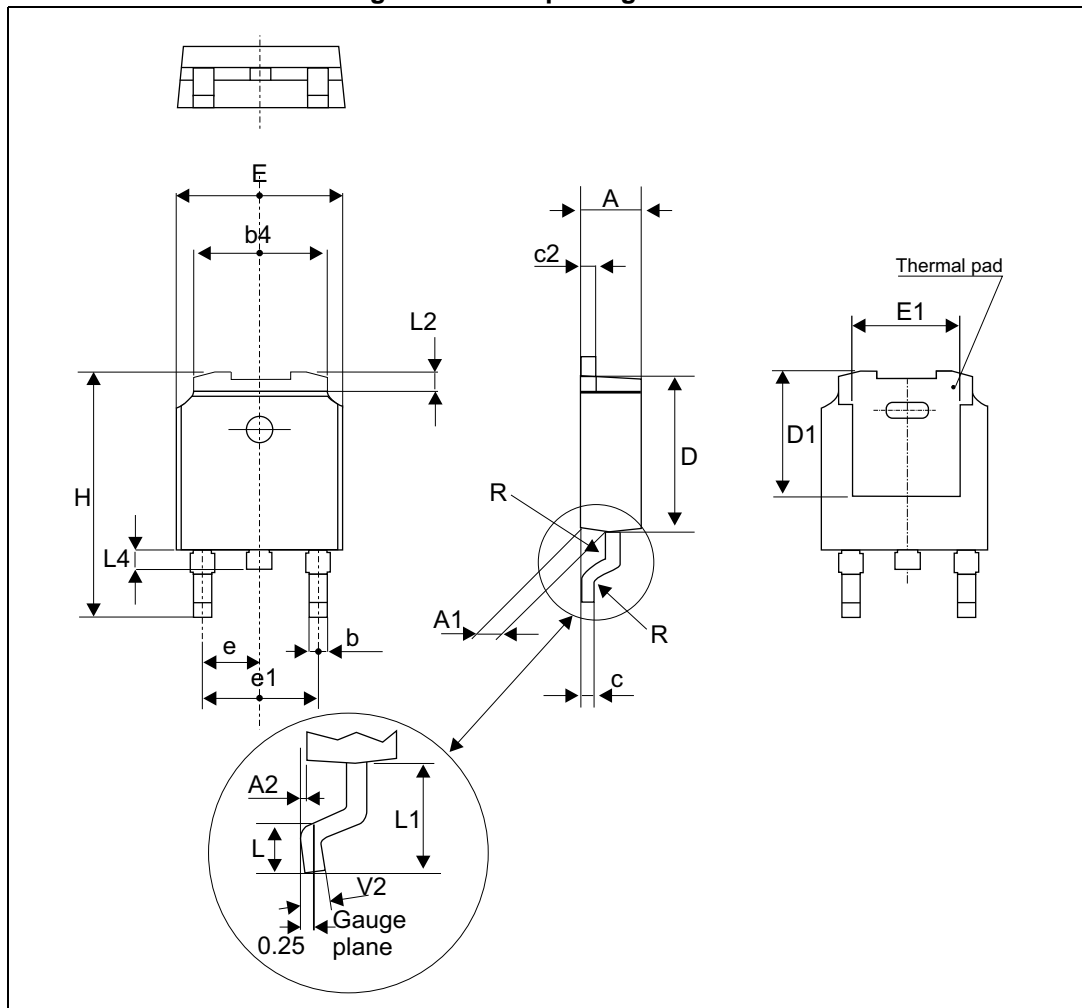
2 Package Information

- Epoxy meets UL94, V0

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

Figure 8. DPAK package outline

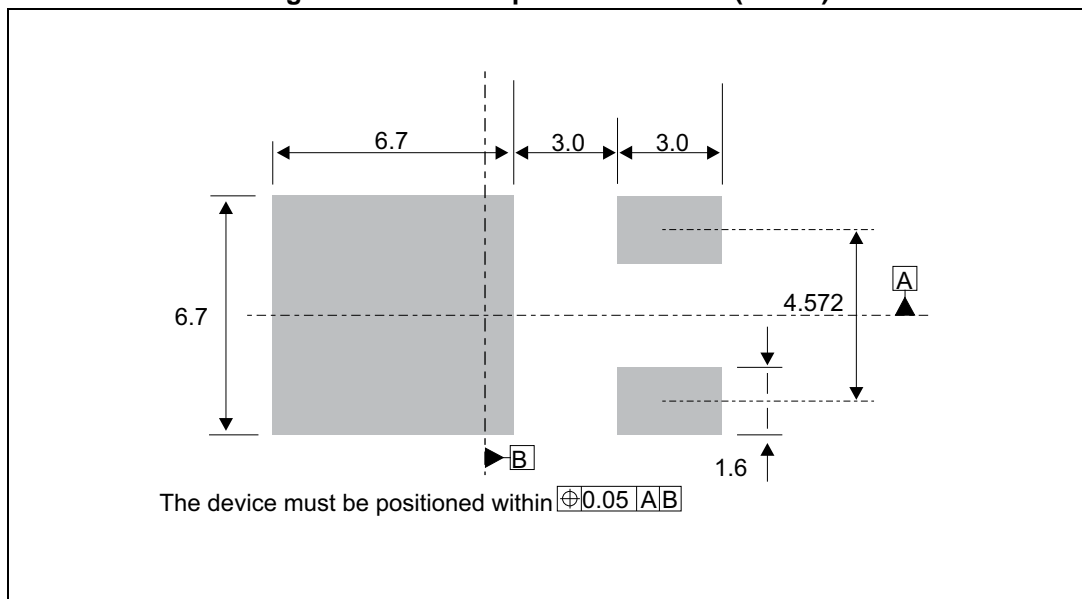


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6. DPAK package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.18 | | 2.40 | 0.085 | | 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 | 4.95 | | 5.46 | 0.194 | | 0.214 |
| c | 0.46 | | 0.61 | 0.018 | | 0.024 |
| c2 | 0.46 | | 0.60 | 0.018 | | 0.023 |
| D | 5.97 | | 6.22 | 0.235 | | 0.244 |
| D1 | 4.95 | | 5.60 | 0.194 | | 0.220 |
| E | 6.35 | | 6.73 | 0.250 | | 0.264 |
| E1 | 4.32 | | 5.50 | 0.170 | | 0.216 |
| e | | 2.28 | | | 0.090 | |
| e1 | 4.40 | | 4.70 | 0.173 | | 0.185 |
| H | 9.35 | | 10.40 | 0.368 | | 0.409 |
| L | 1.00 | | 1.78 | 0.039 | | 0.070 |
| L2 | | | 1.27 | | | 0.050 |
| L4 | 0.60 | | 1.02 | 0.023 | | 0.040 |
| V2 | -8° | | +8° | -8° | | 8° |

Figure 9. DPAK footprint dimensions (in mm)



3 Ordering Information

Table 7. Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|---------------|------------|---------|--------|-----------|---------------|
| STTH1003SB-TR | STTH1 003S | DPAK | 0.32 g | 2500 | Tape and reel |

4 Revision history

Table 8. Document revision history

| Date | Revision | Description of changes |
|-------------|----------|---|
| 24-Aug-2005 | 1 | First issue. |
| 18-May-2009 | 2 | Reformatted to current standards. Modified configuration diagram on front page. |
| 01-Apr-2014 | 3 | Updated dimensions F1 and F2 in TO-220FPAB package dimensions. |
| 01-Aug-2014 | 4 | Updated DPAK package information and removed D ² PAK and TO-220FPAB package and characteristics. |
| 17-Sep-2014 | 5 | Updated <i>Figure 8</i> and <i>Figure 9</i> . |
| 14-Nov-2016 | 6 | Updated DPAK package information and reformatted to current standard. |

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