

Low drop power Schottky rectifier in flat package

Features

- Very low profile package: 0.85 mm
- Backward compatible with standard STmite footprint
- Very small conduction losses
- Negligible switching losses
- Extremely fast switching
- Low forward voltage drop for higher efficiency and extended battery life
- Low thermal resistance
- Avalanche capability specified

Description

Single Schottky rectifier suited for switch mode power supplies and high frequency dc to dc converters.

Packaged in STmite flat, this device is intended for use in low voltage, high frequency inverters, free wheeling and polarity protection applications. Due to the very small size of the package this device fits battery powered equipment (cellular, notebook, PDA's, printers) as well as chargers and PCMCIA cards.

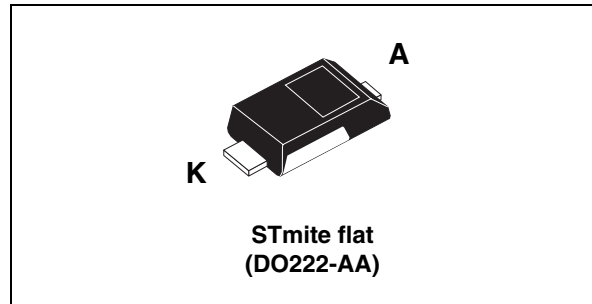


Table 1. Device summary

| Symbol | Value |
|-------------|--------|
| $I_{F(AV)}$ | 1 A |
| V_{RRM} | 20 V |
| T_j (max) | 150 °C |
| V_F (max) | 0.37 V |

1 Characteristics

Table 2. Absolute ratings (limiting values)

| Symbol | Parameter | Value | Unit |
|--------------|--|---|------------|
| V_{RRM} | Repetitive peak reverse voltage | 20 | V |
| $I_{F(RMS)}$ | Forward current rms | 2 | A |
| $I_{F(AV)}$ | Average forward current | $T_c = 140\text{ °C} \quad \delta = 0.5$ | A |
| I_{FSM} | Surge non repetitive forward current | $t_p = 10\text{ ms sinusoidal}$ | A |
| P_{ARM} | Repetitive peak avalanche power | $t_p = 1\text{ }\mu\text{s} \quad T_j = 25\text{ °C}$ | W |
| T_{stg} | Storage temperature range | - 65 to + 150 | °C |
| T_j | Maximum operating junction temperature ⁽¹⁾ | 150 | °C |
| dV/dt | Critical rate of rise of reverse voltage (rated V_R , $T_j = 25\text{ °C}$) | 10000 | V/ μ s |

1. $\frac{dP_{tot}}{dT_j} < \frac{1}{R_{th(j-a)}}$ condition to avoid thermal runaway for a diode on its own heatsink

Table 3. Thermal resistance

| Symbol | Parameter | Value | Unit |
|---------------------|---------------------|-------|------|
| $R_{th(j-c)}$ | Junction to case | 20 | °C/W |
| $R_{th(j-a)}^{(1)}$ | Junction to ambient | 250 | °C/W |

1. Mounted with minimum recommended pad size, PC board FR4

Table 4. Static electrical characteristics

| Symbol | Parameter | Tests conditions | Min. | Typ. | Max. | Unit |
|-------------|-------------------------|----------------------|---------------------|-------|-------|------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$ | $V_R = V_{RRM}$ | 0.015 | 0.075 | mA |
| | | $T_j = 85\text{ °C}$ | | 0.90 | 4.50 | |
| | | $T_j = 25\text{ °C}$ | $V_R = 10\text{ V}$ | 0.005 | 0.035 | |
| | | $T_j = 85\text{ °C}$ | | 0.45 | 2.50 | |
| | | $T_j = 25\text{ °C}$ | $V_R = 5\text{ V}$ | 0.003 | 0.025 | |
| | | $T_j = 85\text{ °C}$ | | 0.30 | 1.60 | |
| $V_F^{(1)}$ | Forward voltage drop | $T_j = 25\text{ °C}$ | $I_F = 1\text{ A}$ | 0.38 | 0.43 | V |
| | | $T_j = 85\text{ °C}$ | | 0.32 | 0.37 | |
| | | $T_j = 25\text{ °C}$ | $I_F = 2\text{ A}$ | 0.42 | 0.47 | |
| | | $T_j = 85\text{ °C}$ | | 0.37 | 0.42 | |
| | | $T_j = 25\text{ °C}$ | $I_F = 3\text{ A}$ | 0.46 | 0.53 | |
| | | $T_j = 85\text{ °C}$ | | 0.42 | 0.49 | |
| | | $T_j = 25\text{ °C}$ | $I_F = 4\text{ A}$ | 0.50 | 0.60 | |
| | | $T_j = 85\text{ °C}$ | | 0.46 | 0.56 | |

1. Pulse test: = 380 μ s, $\delta < 2\%$

To evaluate the conduction losses use the following equation:

$$P = 0.32 \times I_{F(AV)} + 0.05 I_{F(RMS)}^2$$

Figure 1. Conduction losses versus average current

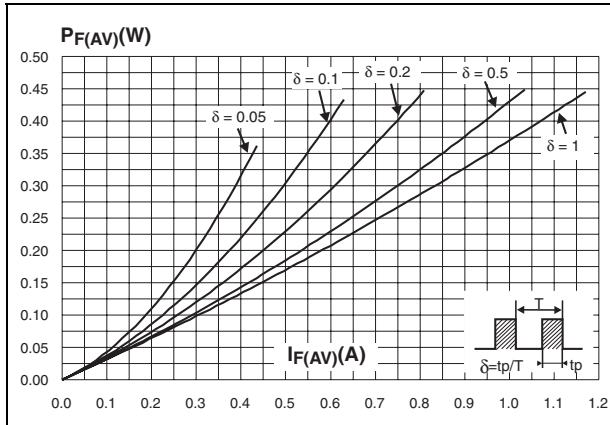


Figure 2. Average forward current versus ambient temperature (delta = 0.5)

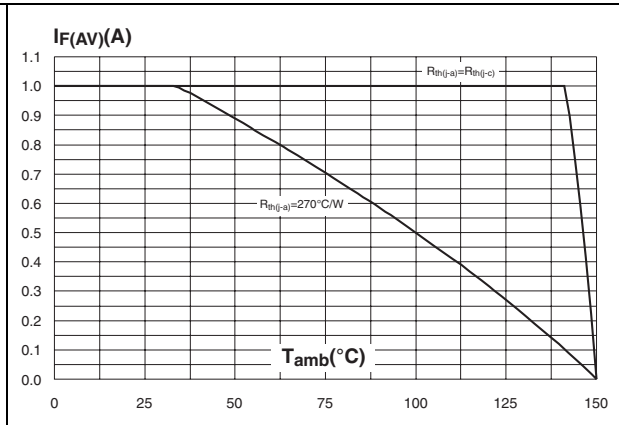


Figure 3. Normalized avalanche power derating versus pulse duration

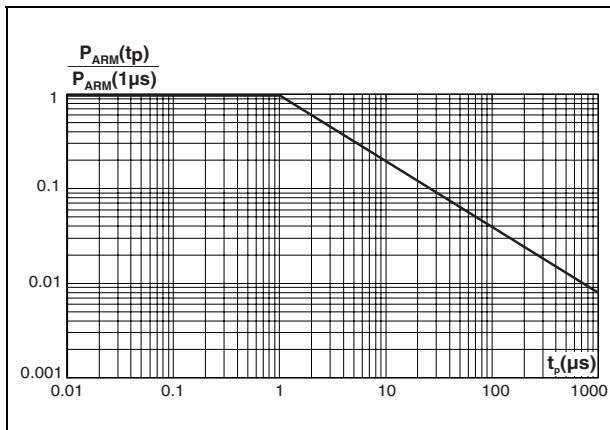


Figure 4. Normalized avalanche power derating versus junction temperature

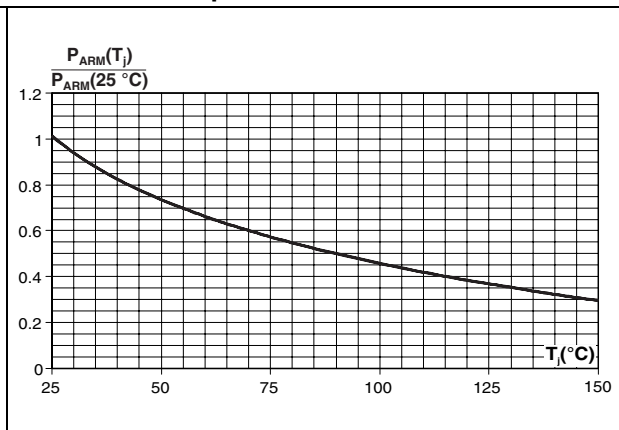


Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values)

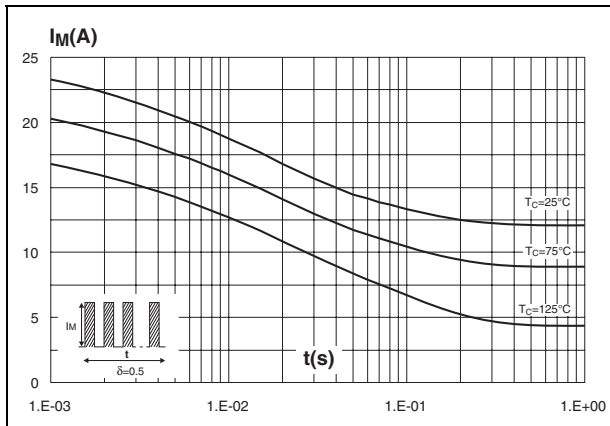


Figure 6. Relative variation of thermal impedance junction to case versus pulse duration

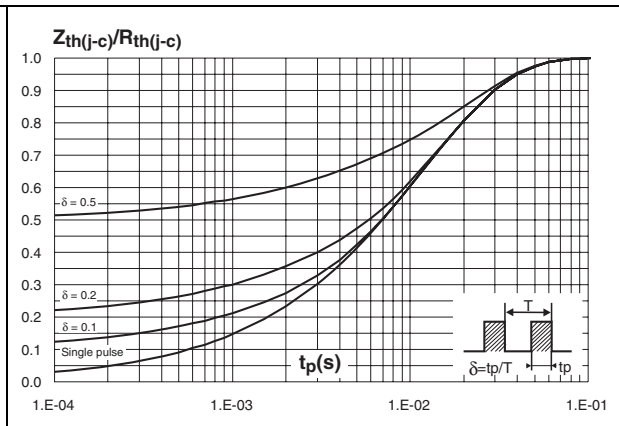


Figure 7. Reverse leakage current versus reverse voltage applied (typical values)

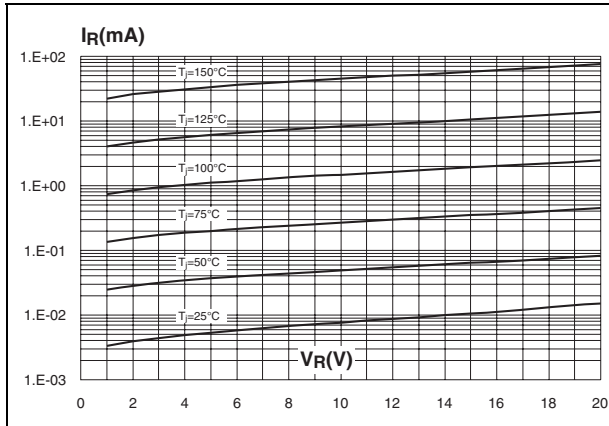


Figure 8. Reverse leakage current versus junction temperature (typical values)

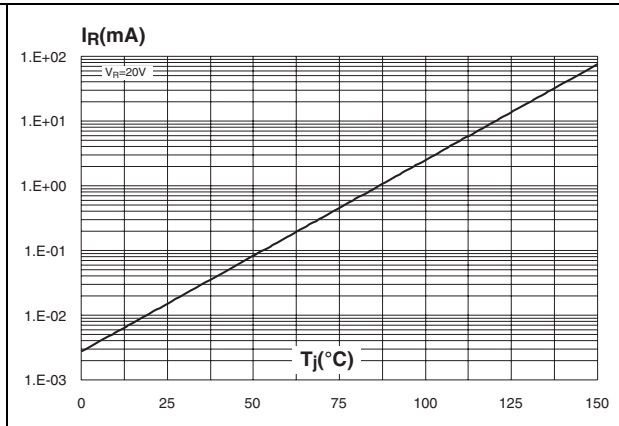


Figure 9. Junction capacitance versus reverse voltage applied (typical values)

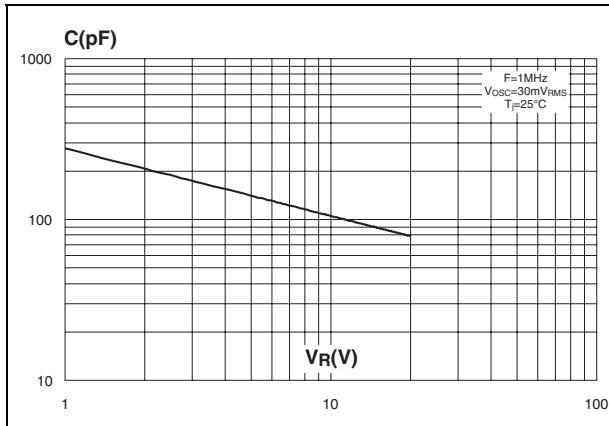


Figure 10. Forward voltage drop versus forward current

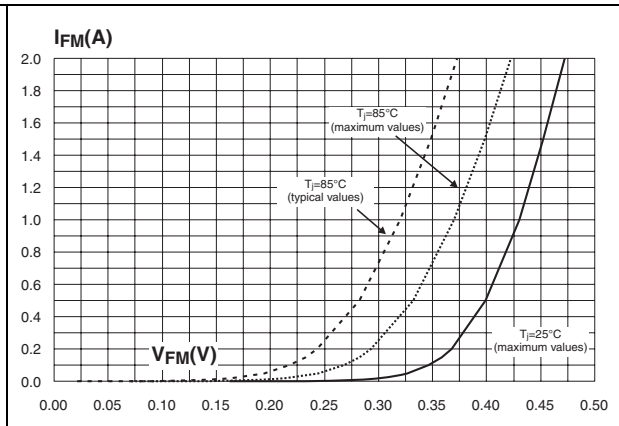
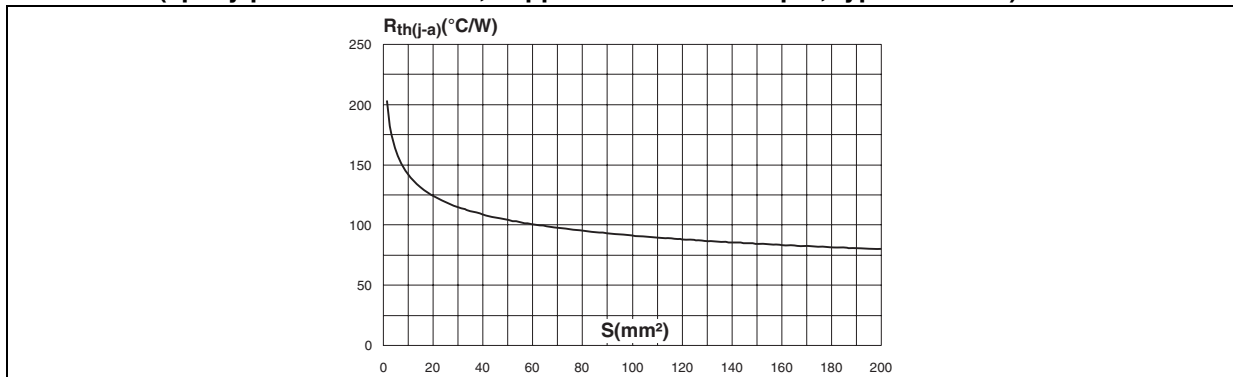


Figure 11. Thermal resistance junction to ambient versus copper surface under tab (epoxy printed board FR4, copper thickness = 35 μm, typical values)



2 Package information

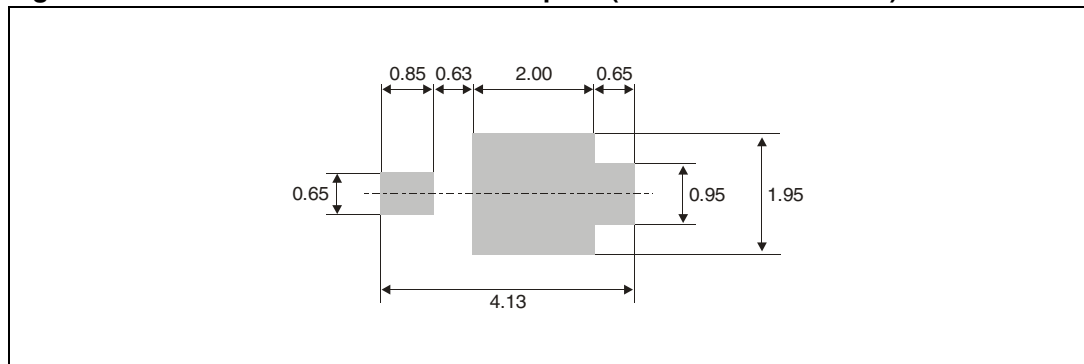
- Epoxy meets UL94, V0
- Lead-free packages

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.

Table 5. STmite flat dimensions

| Ref. | Dimensions | | | | | |
|------|-------------|------|------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 0.80 | 0.85 | 0.95 | 0.031 | 0.033 | 0.037 |
| b | 0.40 | 0.55 | 0.65 | 0.016 | 0.022 | 0.026 |
| b2 | 0.70 | 0.85 | 1.00 | 0.027 | 0.033 | 0.039 |
| c | 0.10 | 0.15 | 0.25 | 0.004 | 0.006 | 0.009 |
| D | 1.75 | 1.90 | 2.05 | 0.069 | 0.075 | 0.081 |
| E | 3.60 | 3.80 | 3.90 | 0.142 | 0.150 | 0.154 |
| E1 | 2.80 | 2.95 | 3.10 | 0.110 | 0.116 | 0.122 |
| L | 0.50 | 0.55 | 0.80 | 0.020 | 0.022 | 0.031 |
| L1 | 2.10 | 2.40 | 2.60 | 0.083 | 0.094 | 0.102 |
| L2 | 0.45 | 0.60 | 0.75 | 0.018 | 0.024 | 0.030 |
| L3 | 0.20 | 0.35 | 0.50 | 0.008 | 0.014 | 0.020 |

Figure 12. STmite flat recommended footprint (all dimensions in mm)



3 Ordering information

Table 6. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|------------|---------|-------------|--------|----------|---------------|
| STPS1L20MF | F1L2 | STmite flat | 16 mg | 12000 | Tape and reel |

4 Revision history

Table 7. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 21-Aug-2006 | 1 | First issue. |
| 07-Jul-2011 | 2 | Reformatted to current standards. Updated caption for Figure 6 . |

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