

## Automotive power Schottky rectifier

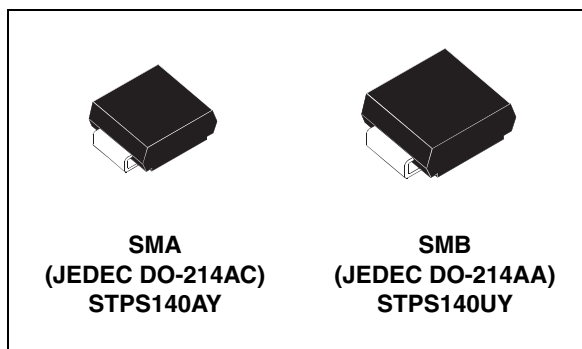
### Features

- Very small conduction losses
- Negligible switching losses
- Low forward voltage drop
- Surface mount miniature packages
- Avalanche capability specified
- AEC-Q101 qualified
- ECOPACK®2 compliant component

### Description

Single chip Schottky rectifiers suited to Switched Mode Power Supplies and high frequency DC to DC converters.

Packaged in SMA and SMB, this device is especially intended for surface mounting and used in low voltage, high frequency inverters, free wheeling and polarity protection for automotive applications.



**Table 1. Device summary**

| Symbol      | Value  |
|-------------|--------|
| $I_{F(AV)}$ | 1 A    |
| $V_{RRM}$   | 40 V   |
| $T_j(max)$  | 150 °C |
| $V_F(max)$  | 0.5 V  |

# 1 Characteristics

**Table 2. Absolute Ratings (limiting values)**

| Symbol       | Parameter                                           |     |                                                       | Value         | Unit             |
|--------------|-----------------------------------------------------|-----|-------------------------------------------------------|---------------|------------------|
| $V_{RRM}$    | Repetitive peak reverse voltage                     |     |                                                       | 40            | V                |
| $I_{F(RMS)}$ | Forward rms voltage                                 |     |                                                       | 7             | A                |
| $I_{F(AV)}$  | Average forward current                             | SMA | $T_L = 130\text{ °C } \delta = 0.5$                   | 1             | A                |
|              |                                                     | SMB | $T_L = 135\text{ °C } \delta = 0.5$                   |               | A                |
| $I_{FSM}$    | Surge non repetitive forward current                |     | $t_p = 10\text{ ms sinusoidal}$                       | 60            | A                |
| $I_{RRM}$    | Repetitive peak reverse current                     |     | $t_p = 2\text{ }\mu\text{s } F = 1\text{ kHz square}$ | 1             | A                |
| $I_{RSM}$    | Non repetitive peak reverse current                 |     | $t_p = 100\text{ }\mu\text{s square}$                 | 1             | A                |
| $P_{ARM}$    | Repetitive peak avalanche power                     |     | $t_p = 1\text{ }\mu\text{s } T_j = 25\text{ °C}$      | 900           | W                |
| $T_{stg}$    | Storage temperature range                           |     |                                                       | - 65 to + 150 | °C               |
| $T_j$        | Operating junction temperature range <sup>(1)</sup> |     |                                                       | - 40 to + 150 | °C               |
| $dV/dt$      | Critical rate of rise of reverse voltage            |     |                                                       | 10000         | V/ $\mu\text{s}$ |

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 |
|---------------|------------------|-----|-------|------|
| $R_{th(j-l)}$ | Junction to lead | SMA | 30    | °C/W |
|               |                  | SMB | 25    |      |

**Table 4. Static electrical characteristics**

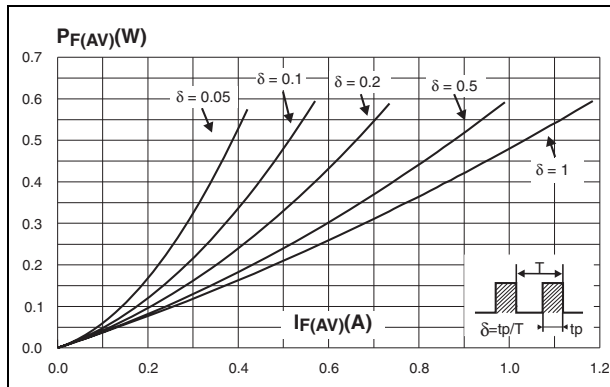
| Symbol      | Parameter               | Test Conditions       |                    | Min. | Typ. | Max. | Unit          |
|-------------|-------------------------|-----------------------|--------------------|------|------|------|---------------|
| $I_R^{(1)}$ | Reverse leakage current | $T_j = 25\text{ °C}$  | $V_R = V_{RRM}$    |      |      | 12   | $\mu\text{A}$ |
|             |                         | $T_j = 100\text{ °C}$ |                    |      | 0.25 | 2    | mA            |
| $V_F^{(2)}$ | Forward voltage drop    | $T_j = 25\text{ °C}$  | $I_F = 1\text{ A}$ |      |      | 0.55 | V             |
|             |                         | $T_j = 125\text{ °C}$ |                    |      | 0.43 | 0.5  |               |
|             |                         | $T_j = 25\text{ °C}$  | $I_F = 2\text{ A}$ |      |      | 0.65 |               |
|             |                         | $T_j = 125\text{ °C}$ |                    |      | 0.53 | 0.6  |               |

1. Pulse test:  $t_p = 380\text{ }\mu\text{s}$ ,  $\delta < 2\%$

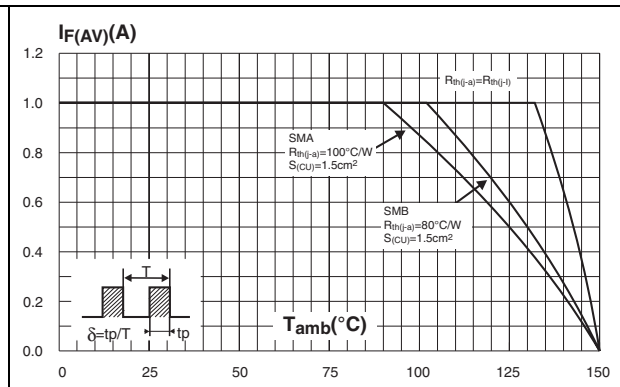
2. Pulse test:  $t_p = 5\text{ ms}$ ,  $\delta < 2\%$

To evaluate the conduction losses use the following equation:  $P = 0.4 \times I_{F(AV)} + 0.10 I_{F(RMS)}^2$

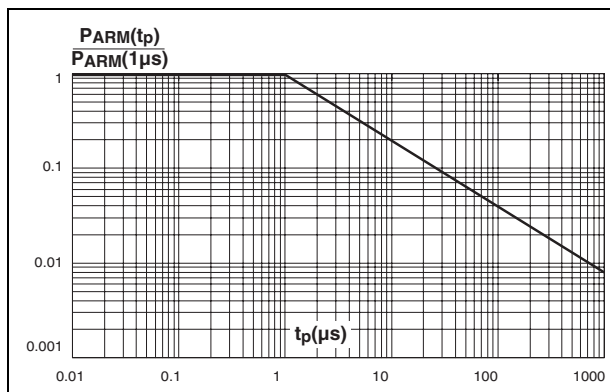
**Figure 1. Average forward power dissipation versus average forward current**



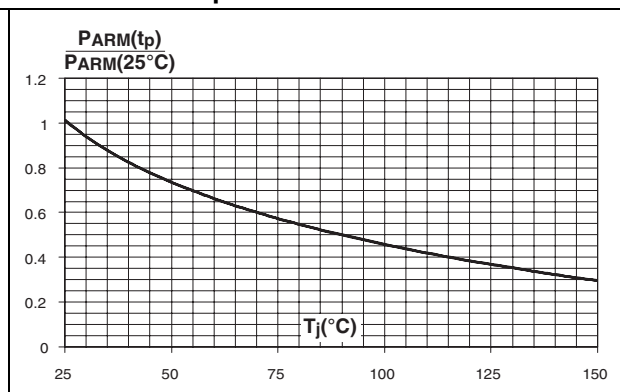
**Figure 2. Average forward current versus ambient temperature ( $\delta = 0.5$ )**



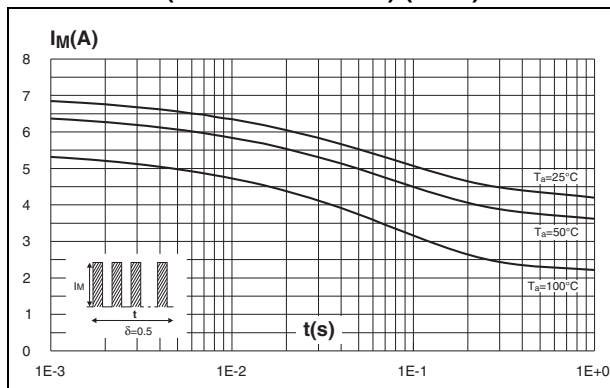
**Figure 3. Normalized avalanche power derating versus pulse duration**



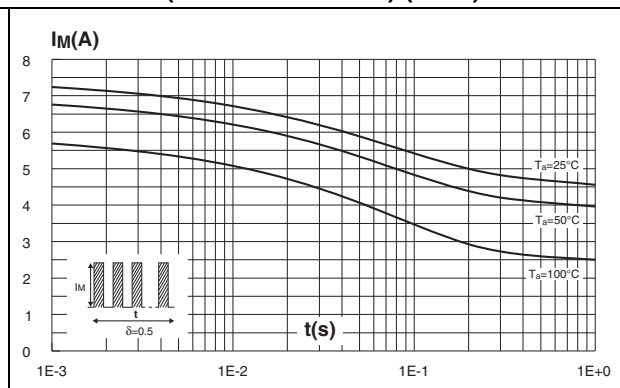
**Figure 4. Normalized avalanche power derating versus junction temperature**



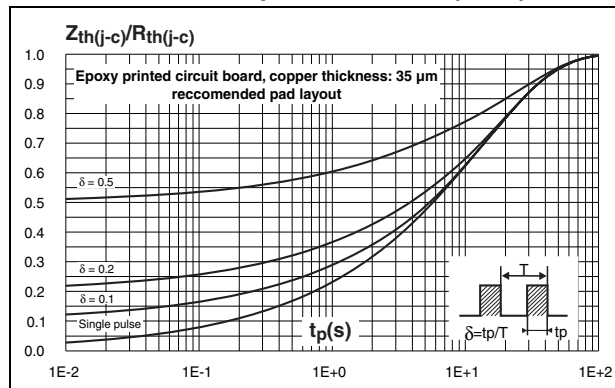
**Figure 5. Non repetitive surge peak forward current versus overload duration (maximum values) (SMA)**



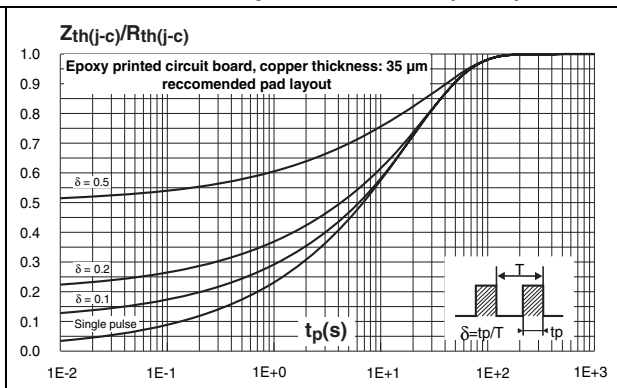
**Figure 6. Non repetitive surge peak forward current versus overload duration (maximum values) (SMB)**



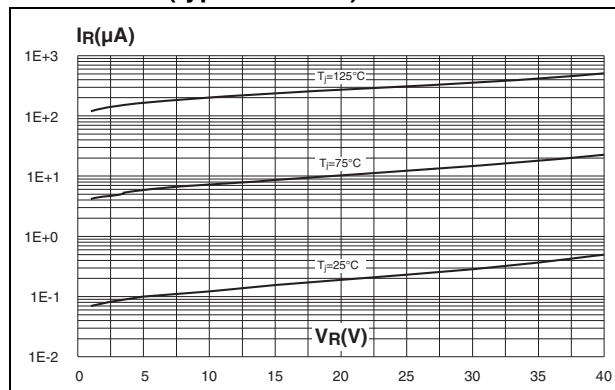
**Figure 7. Relative variation of thermal impedance junction to ambient versus pulse duration (SMA)**



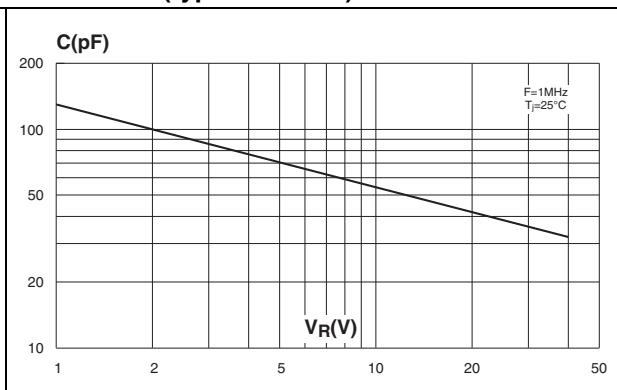
**Figure 8. Relative variation of thermal impedance junction to ambient versus pulse duration (SMB)**



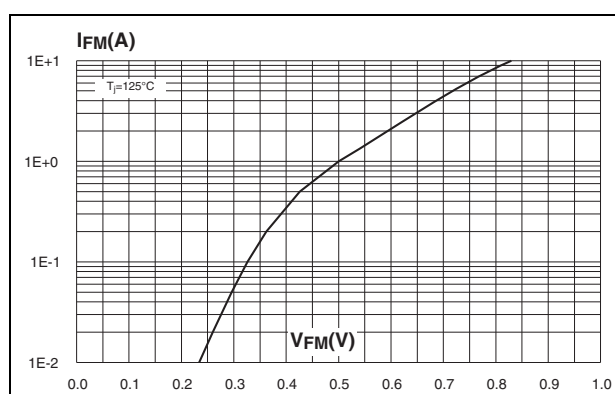
**Figure 9. Reverse leakage current versus reverse voltage applied (typical values)**



**Figure 10. Junction capacitance versus reverse voltage applied (typical values)**



**Figure 11. Forward voltage drop versus forward current (maximum values)**



**Figure 12. Thermal resistance junction to ambient versus copper surface under each lead (SMA)**

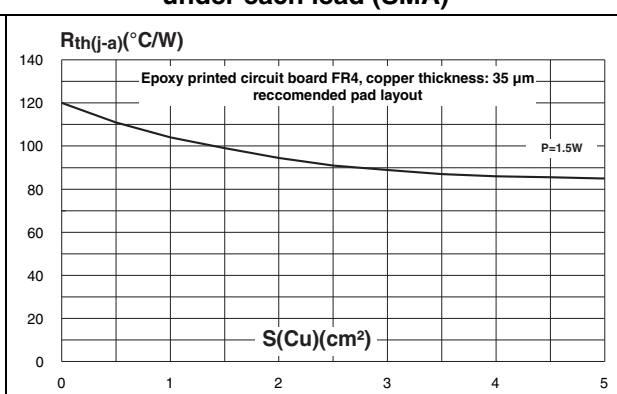
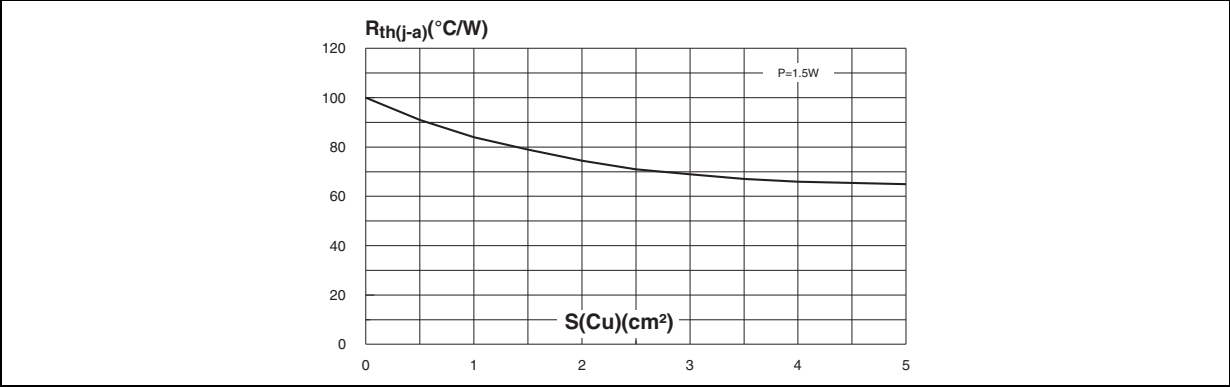


Figure 13. Thermal resistance junction to ambient versus copper surface under each lead (Epoxy printed circuit board FR4, copper thickness: 35 μm) (SMB)



## 2 Package information

- Band indicates cathode
- Epoxy meets UL94, V0

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Figure 14. SMA package mechanical data

| Ref | Dimensions  |      |        |       |
|-----|-------------|------|--------|-------|
|     | Millimeters |      | Inches |       |
|     | Min.        | Max. | Min.   | Max.  |
| A1  | 1.90        | 2.03 | 0.075  | 0.080 |
| A2  | 0.05        | 0.20 | 0.002  | 0.008 |
| b   | 1.25        | 1.65 | 0.049  | 0.065 |
| c   | 0.15        | 0.41 | 0.006  | 0.016 |
| E   | 4.80        | 5.60 | 0.189  | 0.220 |
| E1  | 3.95        | 4.60 | 0.156  | 0.181 |
| D   | 2.25        | 2.95 | 0.089  | 0.116 |
| L   | 0.75        | 1.60 | 0.030  | 0.063 |

Figure 15. SMA footprint dimensions (in millimeters)

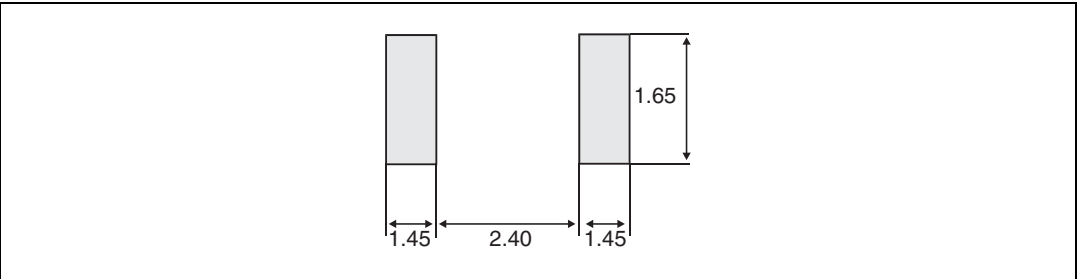


Figure 16. SMB package mechanical data

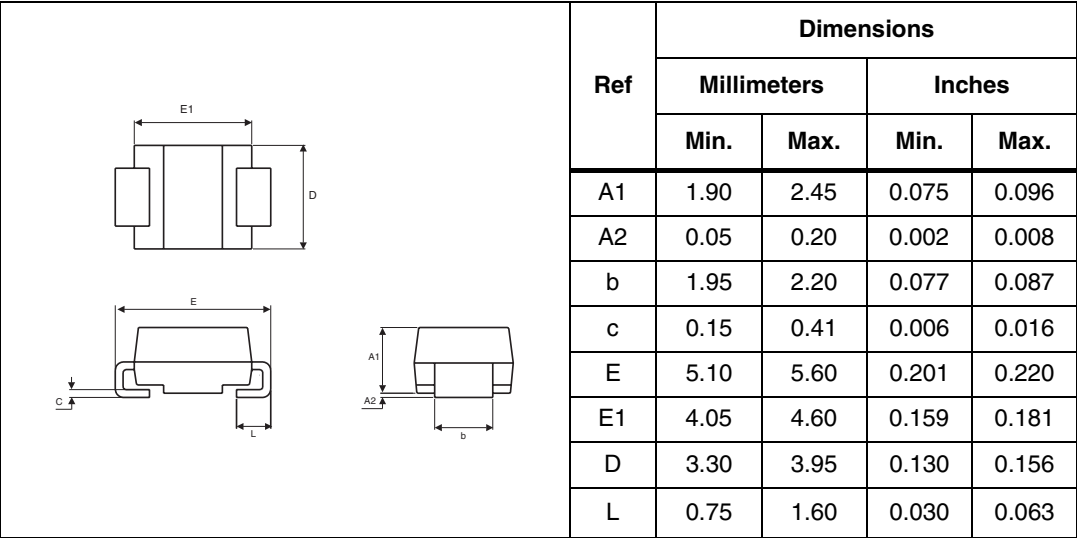
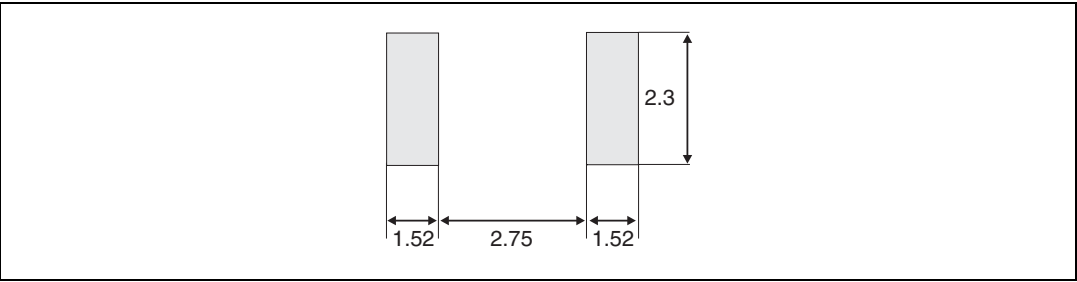


Figure 17. SMB footprint dimensions (in millimeters)



### 3 Ordering information

**Table 5. Ordering information**

| Order code | Marking | Package | Weight  | Base qty | Delivery mode |
|------------|---------|---------|---------|----------|---------------|
| STPS140A   | S140Y   | SMA     | 0.068 g | 5000     | Tape and reel |
| STPS140U   | G14Y    | SMB     | 0.107 g | 2500     | Tape and reel |

### 4 Revision history

**Table 6. Document revision history**

| Date        | Revision | Changes      |
|-------------|----------|--------------|
| 10-Dec-2010 | 1        | First issue. |

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